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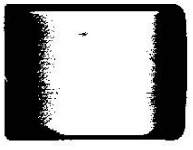

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GMT-425S

VHF FM COMMUNICATIONS TRANSCEIVER MAINTENANCE MANUAL

LIMITED

WARRANTY

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

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

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

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

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

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

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

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GENERAL AVIATION ELECTRONICS, INC.

4141 Kingman Drive, Indianapolis, Indiana 46226

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SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

This service manual contains all the information normally required to install, operate, and maintain the Genave GMT-425S VHF-FM transceiver.

1-2. DESCRIPTION

The GMT-425S is a solid-state, VHF-FM transceiver designed for the transmission and reception of frequency modulated (16F3) radio signals on a maximum of four channels within the VHF range from 143.9 MHz to 173.4 MHz. Any one of four possible channels in the unit may be selected manually by a front-panel, rotary switch or, the channels may be scanned automatically.

In the "scan" mode, the RECEIVE frequencies are scanned automatically by an internal scanner which is designed to give priority to signals on channel A -- that is, a signal on channel A will cause the scanner to lock on channel A within approximately one second, regardless of any other channels being used. No provisions are made for locking out channels.

The transceiver employs the latest in semiconductor and integrated - circuit technology -- the transmitter provides a maximum RF output of 25 watts to a standard 50-ohm antenna system. An improved heat-sink increases transmit-power stability.

The receiver is a crystal-controlled, dual-conversion superheterodyne employing an 8-pole monolithic crystal filter for the selectivity required for operation in a crowded urban environment. A 10.7 MHz 1st IF provides good image rejection, while the 455 kHz 2nd IF improves receiver stability. An optional 6-MHz broadband receiver front end is available.

A 15-pin male plug mounted on rear panel of the GMT-425S transceiver is designated as an "Accessory Connector," and mates with a 15-pin female connector to provide a convenient method of connecting power or optional accessories to the unit. Standard wiring of the accessory connector utilizes five pins, leaving ten pins available for options or customized installation.

The transceiver features an internally-mounted speaker which can be disconnected and replaced by an external speaker via connections to the rear-panel accessory connector. A plug-in microphone receptacle provides a convenient method for connecting optional Genave microphones to the unit. The optional mic. styles include: A standard hand microphone, a desk-style unit, and a telephone type handset.

Provisions are made within each transceiver for the addition of an optional SA-1 Subaudible Tone Encoder-Decoder. This subaudible-tone system keeps the receiver squelched until a signal containing the proper subaudible, continuous tone is received. The SA-1 board generates the subaudible tone used to modulate the transmitter to activate the receivers in the system, and also decodes incoming signals. Note that only ONE channel in unit can be set-up for subaudible-tone option.

> NOTE: If subaudible-tone system is used, the carrier is automatically modulated by the subaudible tone during entire time that transmission is taking place. Also, the operating frequency must be monitored to ascertain that it is NOT in use prior to originating a call. This monitoring is accomplished automatically by any of the Genave microphones utilized with the subaudible tone system.

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The GMT-425S transceiver is designed to operate on +13.75 volts DC primary power. The Genave PSI-10 power supply can be utilized when it is desired to operate the instrument from a 117 volt, 50-60 Hz source. For portable operation, transceiver can be powered by an optional PSI-21 Portable Power Pack.

Each transceiver is enclosed in a vinyl clad, two-piece, aluminum cover that protects instrument from physical damage.

1-3. SPECIFICATIONS

GENERAL:

Front-Panel Size:	2.5" (6.35 cm) x 6.5" (16.51 cm)
Over-all Dimensions:	2.5" (6.35 cm) x 6.5" (16.51 cm) x 10.5" (26.67 cm)
Power Supply:	13.75 VDC negative ground -- 11.5 volts minimum
Current Drain:	6.5 amps max. xmit; 0.2 amps receive
Frequency Range:	143.9 to 173.4 MHz
Number of Channels	4 -- max. separation 1 MHz; optional 6 MHz
Temperature Range:	-30°C to +60°C
Weight:	Approx. 6 lbs (2.72 kg)

RECEIVE:

Sensitivity:	0.25 µV for 12-dB SINAD -- less than 0.5 µV for 20-dB quieting
Selectivity:	±7.5 kHz
Squelch Threshold:	Less than 0.25 µV
Tight Squelch Threshold:	2 µV max.
Modulation Acceptance:	More than 5 kHz
Adjacent Chan. Rejection:	70-dB min. @ ±25 kHz (EIA); 85-dB for 20-dB quieting
Intermodulation Response:	70-dB min. (EIA)
Image Response:	65-dB min. (EIA); 80-dB for 20-dB quieting
Spurious Response:	65-dB min. (EIA); 80-dB for 20-dB quieting
Audio Output Power:	5 watts; 4 watts @ 15% distortion
Hum & Noise Level:	Better than 35-dB below rated output
Frequency Accuracy:	±500 Hz
Frequency Stability:	.001%

TRANSMIT:

Power Output:	25 watts typical 143.9 to 160.0 MHz -- 20 watts min. 160.0 to 173.4 MHz -- 15 watts min.
Frequency Range:	143.9 to 173.4 MHz
Output Impedance:	50-ohms
Deviation:	5 kHz max.; 4 kHz min.
Frequency Accuracy:	±500 Hz Subaudible deviation 1 kHz ±200 Hz Subaudible frequency tolerance ±0.3 Hz
Frequency Stability:	.0005%
Transmitter Spurious:	-57 dB min.

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SECTION II

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INSTALLATION MANUAL

2-1. INTRODUCTION

This section provides installation data and recommendations for fixed, mobile, or portable operation. For complete technical specifications on GMT-425S, consult the appropriate owner's manual or maintenance manual.

2-2. EQUIPMENT SUPPLIED

a. GMT-425S Communications Transceiver
b. Mounting Bracket with hardware
c. Hand Microphone with hang-up clip
d. Mounting Lock
e. Accessory Connector, 15-pin female

2-3. EQUIPMENT REQUIRED, BUT NOT SUPPLIED

a. Vehicle or Base Antenna, 50-ohm
b. Antenna Cable, RG-8A/U or RG-58A, as required
c. Co-axial Connector, PL-259 (83-1SP)
d. Cabling for Power and Audio wiring, as required

2-4. OPTIONAL EQUIPMENT AVAILABLE

a. SA-1, Subaudible-Tone Module
b. Telephone-Style Handset
c. Desk Microphone, split-bar
d. Remote Speakers, SP-5 or SP-6
e. PSI-10, AC Power Supply
f. PSI-21, Portable Power Pack

2-5. PRE-INSTALLATION CHECK

Visually inspect the unit for any obvious external damage - such as dents, broken knobs, etc. Any damage NOT related to shipping should be reported to General Aviation Electronics, Inc., 4141 Kingman Drive, Indianapolis, Ind., (46226), Telephone (317) 546-1111, as soon as possible.

If the packing case shows damage, make a notation to that effect on the express receipt or freight bill. Report to the transportation company any damage due to shipping, and file a claim promptly.

2-6. INSTALLATION PLANNING

The unit has been pre-aligned at the factory on transmit and receive frequencies listed on tag attached to the unit. If it should be necessary to change the transmit or receive frequency, alignment procedures contained in the GMT-425S maintenance manual should be performed by an authorized technician, using proper test equipment; however, if new frequency differs from the factory-alignment frequency by not more than one half of maximum channel separation as listed in the Specifications (normally 1 MHz), it will only be necessary to install and net the new crystals.

If GMT-425S is equipped with optional SA-1 (Subaudible-Tone Squelch System), the subaudible-tone frequency will be listed on tag attached to the unit, and also on a label affixed to the inside of transceiver. If it should be necessary to readjust subaudible-tone frequency from factory-set frequency, refer to "Tone-Frequency Adjustment" procedure in this manual (Section 4-7).

Before starting transceiver installation, determine desired mounting method and location; ascertain that required AC or DC power is available; determine location for antenna installation and routing of co-ax cable to transceiver.

NOTE: In choosing an operating location for the instrument, remember that F.C.C. Rules require that: "Each transmitter shall be so installed and protected that it is not accessible to or capable of operation by persons other than those duly authorized by the licensee," and "The operating position must be under the control and supervision of the licensee."

The transceiver may be mounted in any convenient position; unit performance is not affected by the mounting position. However, the unit should NOT be mounted directly above a hot-air register or radiator.

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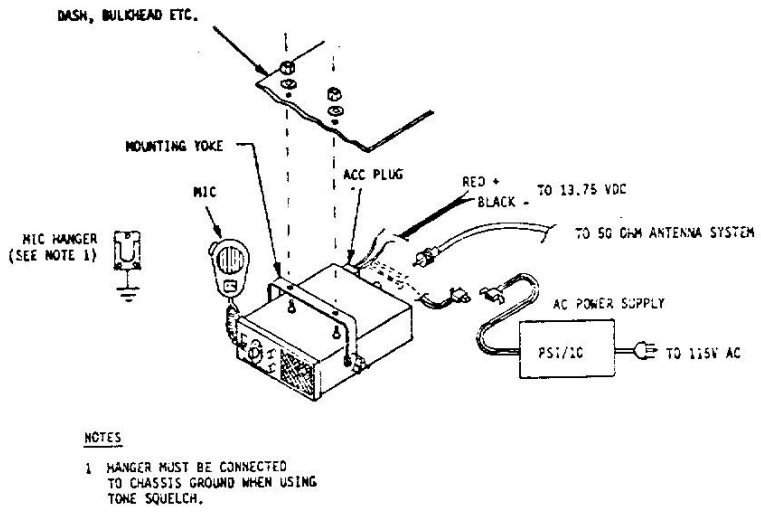

Figure 2-1. Typical Installation.

2-7. FIXED OR MOBILE INSTALLATION

1. Refer to Figure 2-1. If mounting yoke has been installed on transceiver, remove yoke temporarily. For fixed operation, yoke may be repositioned on bottom side of unit to function as a supporting stand. For either fixed or mobile operation, the yoke may be secured in the desired location (under dash or shelf, on console or desk top, or overhead, etc.) with appropriate screws or bolts through two holes provided in the mounting yoke.

2. Connect color-coded power leads, terminated in the rear-panel 15-pin connector, to a power source. For fixed operation, the source may be a well - regulated, low-ripple AC power supply, such as the Genave Model PSI-10. For mobile operation, the source may be a battery or the vehicle's electrical system. This transceiver is designed to operate ONLY on a supply with neg. ground.

   Be SURE to connect RED power lead to +13.75 volts, and BLACK lead to -13.75 volts (ground). If it is necessary to extend power leads, use #14 or heavier gauge insulated copper wire.

   If supply polarity is reversed accidentally, the unit will be inoperative. In this event, check wiring polarity (RED to positive, and BLACK to negative), and check the protective fuse located on transceiver circuit board just below the rear-panel power connector. A blown fuse should be replaced ONLY with a type 3AG 7 amp.

3. The GMT-425S transceiver is equipped with a plug-in microphone receptacle which allows use of either a standard Genave hand microphone or desk-style microphone interchangeably. A Genave telephone-type handset can also be connected to the mic. receptacle; however, if transceiver audio is to be cut-off from speaker during two-way communications, or if SA-1 subaudible-tone option is used, then a handset hanger with internal switching is required. Recommended accessory-

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connector and microphone - wiring changes are shown in this section.

NOTE: If standard hand microphone is used with "subaudible-tone option," the microphone-mounting clip should be attached to the desired mounting surface; then, clip MUST be electrically connected to chassis ground in order to provide Hang Up receiver squelching.

4. After any optional or custom wiring has been completed, replace transceiver in mounting yoke, and tighten both thumbscrews, or install the mounting lock.

5. Connect microphone or handset to transceiver, and connect 15-pin receptacle to mating rear-panel plug.

6. Install co-axial connector on antenna cable, and connect cable to rear-panel mounted antenna connector.

NOTE: The transceiver is designed to match standard 50-ohm VHF communications antennas. In the interest of maximum efficiency, the antenna system should exhibit a low VSWR.

2-8. PORTABLE OPERATION

1. The easiest method of portable operation is to utilize a Genave PSI-21 Portable Power Pack. The PSI-21 unit includes a rechargeable battery, AC-powered charger, carrying handle with microphone clip and portable antenna.

2. Portable operation of the transceiver requires the same basic considerations as fixed or mobile operations, that is, connections to the power source, antenna system, and microphone.

2-9. MOUNTING-LOCK INSTALLATION

If desired, the mounting lock can be used to secure transceiver to mounting bracket (yoke) when unit is attached to a desk-top, bulkhead, overhead, or an under-panel configuration. The lock can be used when transceiver is secured via either the top or bottom mounting holes of bracket; however, the bottom mounting holes will assist in concealing the heads of screws used to secure bracket to the mounting surface. To install the mounting lock, proceed as follows:

1. Remove mounting screw from side of transceiver - mounting bracket to which lock is to be attached.

2. Position mounting lock so that hole in lock and locking tab are aligned with two holes in mounting bracket.

3. Secure mounting lock to unit, using one of the hex-head mounting screws provided. Be sure that screw passes through correct hole in mounting bracket. Refer to Figure 2-2.

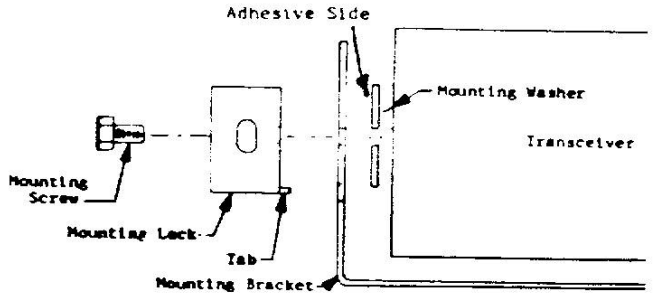

Figure 2-2. Mounting-Lock Installation

4. Attach a padlock through holes in sides of mounting lock, as shown in Figure 2-3; then, latch padlock to prevent removal of unit from mounting bracket.

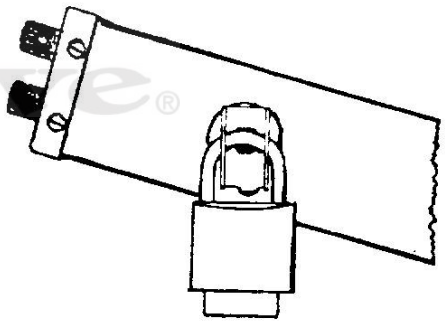

Figure 2-3. Lock Placement

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2-10. ANTENNA-CONNECTOR ASSEMBLY

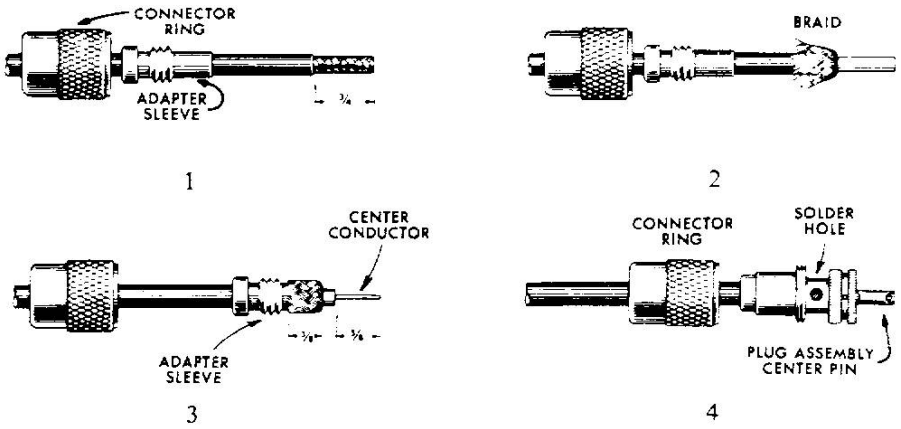

Figure 2-4. Connector Assembly

1. Trim end of co-ax cable flush; then remove outer jacket from cable to dimension shown in Figure 2-4. Next slide connector ring and adapter sleeve on cable.

2. Fan out braid, and fold back as shown in (2) of Figure 2-4.

3. Remove a 5/8" length of insulation from the center conductor as shown. Tin center conductor; then, press braid over adapter sleeve and trim to dimension shown.

4. Screw the plug assembly onto adapter sleeve, and solder braid to plug assembly through solder holes in side of sleeve. Next, solder center conductor to plug assembly center pin. To complete assembly, screw connector ring over the plug assembly.

2-11. ACCESSORY CONNECTOR - P101

The 15-pin male plug mounted on rear panel of the GMT-425S transceiver is designated as an "Accessory Connector," and mates with a 15-pin female connector to provide a convenient method of connecting power or optional accessories to the unit. Standard wiring of the accessory connector utilizes five pins, leaving ten pins available for options or customized installation. Figure 2-5 illustrates standard wiring of the accessory connector, and the recommended connections for use with a handset-hanger switch. The connections to the accessory connector pins are described below:

PIN 1 - No connection

PIN 2 - High - level audio output from receiver section of the transceiver; this audio is applied either to the internal speaker or to an external 4-ohm speaker, as determined by wiring of the accessory connector. To use the internal speaker, a jumper is connected between pins 2 and 10 of the female connector; to connect an external speaker, the speaker leads are connected between pins 2 and 7 of the 15-pin female connector.

If a telephone-style handset is used with the transceiver, the handset-hanger switch should be connected between pins 2 and 10 of the female connector to disable the internal speaker when the handset is removed from its hanger. The handset has an internal earphone which is wired through the microphone plug; thus, cutting off the internal speaker allows the operator some privacy.

PIN 3 - No connection

PIN 4 - No connection

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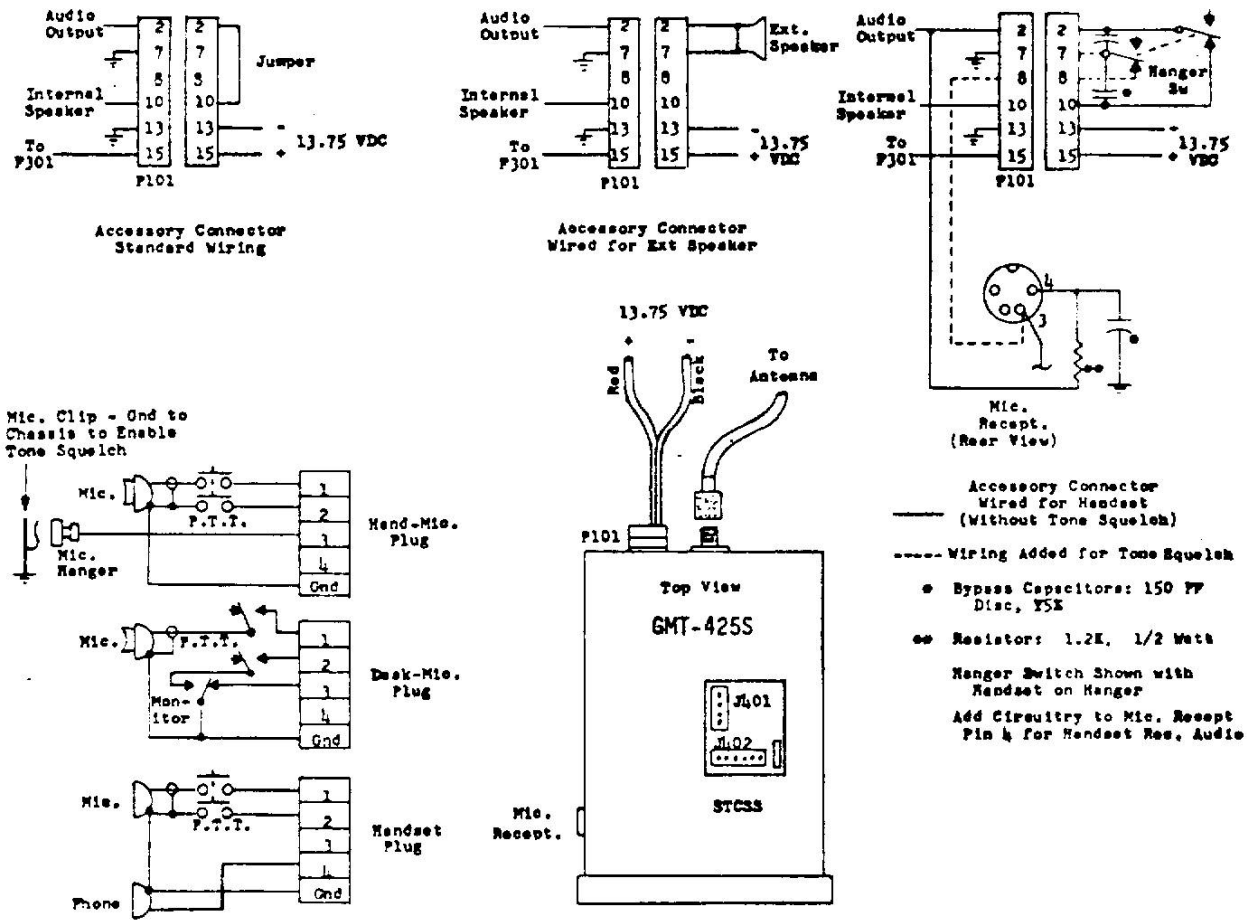

Figure 2-5. Accessory Connector & Mic. Wiring

PIN 5 - No connection

PIN 6 - No connection

PIN 7 - A chassis ground - particularly intended for audio circuitry such as an external speaker, tone-squelch enable, etc.

PIN 8 - No connection, normally; however, if a handset AND "subaudible tone squelch" are both used with transceiver, pin 8 of the male plug should be connected internally to pin 3 of the microphone receptacle to provide a "tone-squelch enable" wire. The handset hanger "tone-squelch enable" switch is then connected to pins 7 and 8 of the 15-pin female connector as shown in Figure 2-5. Therefore, pin 8 will be held at ground potential when the handset is in place on its hanger. The ground will be removed from pin 8 when handset is lifted from the hanger; thus, tone squelch is disabled to allow monitoring of operating frequency prior to starting transmission.

PIN 9 - No connection

PIN 10 - Input connection to the internal 4-ohm speaker in transceiver. This pin is normally jumpered to pin 2.

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PIN 11 - No connection

PIN 12 - No connection

PIN 13 - Chassis ground, and DC-input voltage negative connection. The female connector has a black lead, some four feet in length, attached to this pin for connection to the DC-power source.

PIN 14 - No connection

PIN 15 - DC-input voltage positive connection. The female connector has a red lead, approx. four feet in length, attached to this pin for connection to the DC-power source.

2-12. MICROPHONE RECEPTACLE

The microphone receptacle is a 5 conductor jack (4 pins plus shell) mounted on left-side panel of the GMT-425S. Internal connections are factory-made to this receptacle so that the standard Genave hand microphones, desk-style microphones, or telephone-type handsets can be used interchangeably. However, if a handset is to be used, receiver audio for the handset earphone should be connected to mic. receptacle pin 4 as described below (refer to Figure 2-5). The connections to the microphone receptacle pins are described below:

PIN 1 - Microphone-audio connection to input of transmitter-modulator circuitry.

PIN 2 - Microphone push-to-talk switch connection. When this switch is closed, one side of transmitter keying relay is grounded; thus, energizing relay and applying power to transmitter.

PIN 3 - Tone-squelch enable connection. If transceiver is NOT equipped with SA-1 Subaudible-Tone Option, this pin has no function; however, if tone-squelch option is used, this pin must be connected to ground for the tone-squelch circuitry to squelch the receiver. Removing ground from this pin disables the tone squelch - allowing the frequency to be monitored.

The method of grounding pin 3 is dependent upon type microphone being used: The hand microphone grounds this pin via the mic. hanger and mic. mounting clip; the desk-style microphone grounds pin 3 through contacts on the Monitor Switch; whereas the handset grounds pin 3 by means of switch contacts in the handset hanger. Refer to Figure 2-5.

NOTE: If a handset hanger AND tone squelch are to be used with the transceiver, a wire must be connected internally between pin 8 of the rear-panel Accessory Plug and pin 3 of the mic. receptacle as shown in Figure 2-5.

PIN 4 - No connection, normally; however, if a telephone-style handset is used, the receiver audio should be connected to this pin as shown in Figure 2-5. Provisions have been made on the PC board to mount the 1.2K resistor - a copper track on the PC board extends from the resistor mounting pad to the receiver audio output. A wire must be connected from remaining resistor mounting pad to pin 4 on the microphone receptacle, and a 150 pF disc capacitor should be connected from pin 4 to the chassis ground, using short leads.

NOTE: The value of the 1.2K resistor may be increased or decreased as desired to set the maximum earphone volume.

GND - - Provides a chassis-ground connection for microphone audio and push-to-talk circuits.

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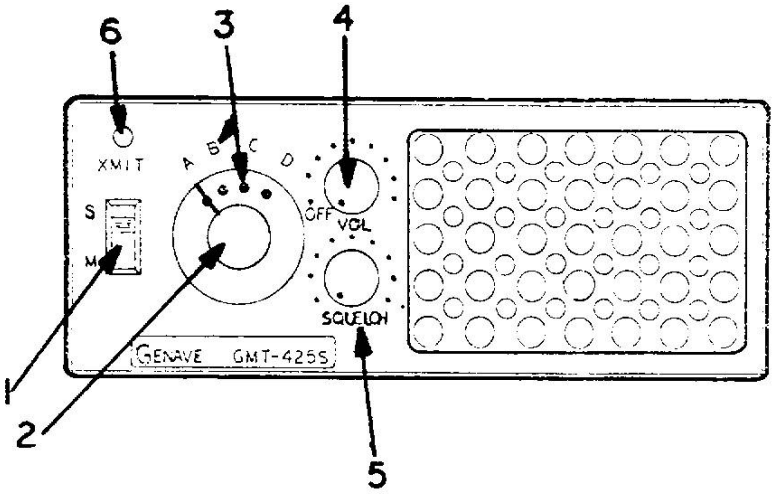
SECTION III
OPERATING MANUAL



3-1. OPERATING CONTROLS

For reliability and operating convenience, only essential operating controls are installed on the unit's front panel. The functions of these controls are as follows:

1. Manual/Scan switch
2. Channel-selector switch
3. Channel-indicator LEDs
4. Volume control/On-Off switch
5. Squelch control
6. Red transmit-indicator lamp

The push-to-talk button on the microphone also functions as an operating control. Unit operation is quite simple, as explained below:

3-2. OPERATING INSTRUCTIONS

1. Turn VOLUME (#4) and SQUELCH (#5) controls fully counterclockwise.

2. Rotate CHANNEL SELECTOR (#2) to desired operating frequency, and place MANUAL/SCAN switch (#1) in manual (M) position.

3. Rotate VOLUME control clockwise until switch clicks; this turns ON transceiver power.

4. If transceiver is equipped with a "subaudible tone - squelch system," it will be necessary to deactivate tone squelch by removing the microphone from its hanger, or by depressing MONITOR button on the desk style microphone.

5. Now, rotate VOLUME control clockwise to adjust receiver volume to desired level.

6. Turn SQUELCH control clockwise until background noise just disappears.

   NOTE: Do NOT attempt to adjust the SQUELCH control while a signal is being received.

7. The MANUAL/SCAN switch may now be placed in its manual (M) or scan (S) position, as desired. With the switch in the manual position, unit will transmit or receive on channel selected by CHANNEL-SELECTOR switch (#2); the selected channel is indicated by lighting of the appropriate CHANNEL-INDICATOR LED (#3).

   With switch in the scan position, the RECEIVE frequencies are scanned

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automatically by an internal scanner which is designed to give priority to signals on channel A. That is, a signal on channel A will make scanner lock on channel A within approximately one second regardless of any other channels in use. No provisions are made for locking out channels.

NOTE: Only the RECEIVE channels are scanned; the unit ALWAYS transmits on frequency selected by CHANNEL SELECTOR (#2). If unit is in scan mode when preparing to answer or initiate a call, IT IS RECOMMENDED THAT UNIT BE SWITCHED TO MANUAL MODE AND APPROPRIATE CHANNEL SELECTED - this will prevent unit from resuming scanning each time mic. button is released.

8. To transmit, depress the microphone "transmit" pushbutton. If unit is equipped with "subaudible-tone" option, it is important to monitor channel before transmitting to insure that it is clear. The hand microphone circuitry is designed in such manner that receiver squelching is deactivated when microphone is removed from its hanger; whereas the G-11 desk-style microphone is designed so that its TRANSMIT button will not function unless the MONITOR switch has also been depressed.

9. The TRANSMIT - INDICATOR LAMP (#6) will illuminate when the transmitter is operating; then, hold the microphone 3 to 6 inches from your mouth, and talk in a normal voice.

10. Release the TRANSMIT pushbutton to listen.

NOTE: The squelch circuitry starts and stops the scan cycle; therefore Squelch control MUST be adjusted to squelch the receiver in the absence of a signal. If Squelch control is turned counterclockwise beyond the point at which receiver is just squelched, the scan cycle will be disabled, and receiver will remain on priority channel (channel A).

3-3. LICENSING INFORMATION

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

The following technical information is intended to aid GMT-425S users in completing the application for radio station authorization. Only technical data pertaining to the transceiver are shown below; all other stations particulars must be furnished by the licensee.

Transmitter Input Power:	60 watts
Transmitter Output Power:	25 watts
Type of Unit:	Transceiver
Type Acceptance/Model No:	T-7042600
Frequency Range (MHz):	143.9 to 173.4
Frequency Tolerance:	.0005%
Emission:	16F3
Approved under Rule Part Numbers:	21, 74, 81, 87, 89, 91, and 93

For additional information on filling out the appropriate application forms, consult the F.C.C. instruction sheet provided with that form. Note that some forms may be completed either by PRINTING IN INK, or by TYPING; whereas, TYPING is MANDATORY for certain F.C.C. application forms. Two of the more common forms used to apply for a license for the GMT-425S transceiver are F.C.C. forms 400 or 425, depending upon the usage and/or geographic location of the proposed station. To determine which form is required, contact nearest F.C.C. Field Engineering Office as listed be-

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low -- they will also supply the appropriate forms.

The procedures for obtaining necessary licenses are found in the Federal Communications Commission Rules and Regulations. The services and the corresponding F.C.C. rule part numbers, under which the GMT-425S can be used, are as follows:

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

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

Experimental, Auxiliary, and Special Broadcast,
- F.C.C. Rules & Regulations, Volume III, Part 74
  - Remote Pickup Stations

Stations on Land in the Maritime Services
- F.C.C. Rules & 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 & Regulations, Volume V, Part 87
  - Civil Air Patrol Stations

Public Safety Radio Services
- F.C.C. Rules & 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 & 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 & Regulations, Volume V, Part 93
  - Motor Carrier Radio Service
  - Railroad Radio Service
  - Taxicab Radio Service
  - Automobile Emergency Radio Service

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3-4. F.C.C. FIELD ENGINEERING OFFICES

Alaska, Anchorage 99510, FCC, room G-63, U.S.P.O. and Courthouse Bldg., P.O. Box 644, 4th and F Sts.

California, Long Beach, FCC, room 501, 3711 Long Beach Blvd.

California, San Diego 92101, FCC, Fox Theatre Bldg., 1245 7th Ave.

California, San Francisco 94111, FCC, 323-A Customhouse, 555 Battery St.

Colorado, Denver 80202, FCC, suite 2925, The Executive Tower, 1405 Curtis St.

Florida, Miami 33130, FCC, room 919, 51 Southwest 1st Ave.

Florida, Tampa 33602, FCC, Barnett Office Bldg., room 809, 1000 Ashley Dr.

District of Columbia, Washington 20554, FCC, 1919 M St. NW., room 411.

Georgia, Atlanta 30309, FCC, room 440, Massell Bldg., 1365 Peachtree St. NE.

Hawaii, Honolulu 96808, FCC, 502 Federal Bldg., P.O. Box 1021, 355 Merchant St.

Illinois, Chicago 60604, FCC, 230 South Dearborn St., room 3935.

Louisiana, New Orleans 70130, FCC, 829 F. Edward Hebert Federal Bldg., 600 South St.

Maryland, Baltimore 21201, FCC, 819 Federal Bldg., 31 Hopkins Plaza.

Massachusetts, Boston 02109, FCC, 1600 Customhouse, 165 State St.

Michigan, Detroit 48226, FCC, 1054 Federal Bldg., 231 West LaFayette St.

Minnesota, St. Paul 55101, FCC, 691 Federal Bldg. and U.S. Courthouse, 316 North Robert St.

Missouri, Kansas City 64106, FCC, 1703 Federal Bldg., 601 East 12th St.

New York, Buffalo 14202, FCC, 1307 Federal Bldg., 111 West Huron St.

New York, New York 10014, FCC, 201 Varick St.

Ohio, Cincinnati 45231, FCC, 8620 Winton Road.

Oregon, Portland 97204, FCC, 1782 Federal Office Bldg., 1220 Southwest 3d Ave.

Pennsylvania, Philadelphia 19106, FCC, James A. Byrne Federal Courthouse, 601 Market St.

Pennsylvania, Monroeville 15146 (Pittsburgh Area), FCC, William Penn Highway.

Puerto Rico, Hato Rey 00918, FCC, room 747, Federal Bldg.

Texas, Dallas 75242, FCC, Earle Cabell Federal Bldg., U.S. Courthouse, room 13E7, 1100 Commerce St.

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Texas, Houston 77002, FCC, New Federal Office Bldg., 515 Rusk Ave., room 5636.

Virginia, Norfolk 23502, FCC, Military Circle, 870 North Military Highway.

Washington, Seattle 98174, FCC, 3256 Federal Bldg., 915 2d Ave.

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SECTION IV
MAINTENANCE MANUAL

4-1. INTRODUCTION

The Genave Model GMT-425S transceiver is a VHF-FM unit designed to transmit and receive 16F3 emissions in the various land-mobile or business-radio services between 143.9 and 173.4 MHz. The instrument supplies a maximum RF power output of 25 watts on any one of four possible channels.

Basically, the receiver is a dual conversion superheterodyne, in which the 1st LO quartz crystals can be switched by a timing circuit contained on the scanner board. A single integrated circuit performs the limiting and detection functions, while an 8-pole monolithic crystal filter provides needed selectivity.

In conjunction with the following circuit description, refer to the appropriate transceiver main board or scanner schematic, and the block diagram of Figure 4-1.

4-2. THEORY OF OPERATION - RECEIVER

4-2-1. Low-Pass Filter

From antenna connector J301, the received signal is applied to a low-pass filter comprised of C387, L315, and C386. After the signal leaves the low-pass filter, it is routed to pin 15 of T/R relay K301. In the "receive" mode, pin 14 of the T/R relay feeds the incoming signal to the receiver input filter.

NOTE: The low-pass filter is used to filter both the received and the transmitted signals.

4-2-2. Input Filter and RF Amplifier

The single-tuned receiver input filter consists of C103 and L102, with the output tap on L102 coupled to RF amplifier Q101. The RF amplifier output is applied to a double-tuned circuit comprised of L103, C106, C109, and L104; then, **the tap on L10**4 is coupled to a second RF amplifier, Q102. The output of Q102 is applied to another double-tuned circuit consisting of L105, C111, L106, and C114. The output tap on L106 routes the amplified signal to a dual-gate FET first-mixer.

NOTE: An optional 6 MHz broad-band front-end input is available on the GMT-425S. The broad-band input replaces the single-tuned filter with a double-tuned circuit consisting of L101, C102, L102, and C103. The values of double-tuned circuit coupling capacitors, C158, C108 and C112, are selected to provide the 6-MHz bandwidth.

4-2-3. 1st Local Oscillator & Tripler

The first local oscillator is located on the scanner board, and consists of Q507 and its associated circuitry. The proper crystal in the 44.4 to 54.2333 MHz range is used in the oscillator circuit to produce the desired injection frequency: C510, C511, C512, and C513 allow the receive crystals to be adjusted to exact freqeuncy. Transistors Q501, 502, 503, 504, and 505 select the desired receive crystal by pulling selected crystal to ground thru its associated netting trimmer. In the "manual" mode, the appropriate transistor is turned ON by applying base-bias voltage through Manual/Scan SW501 and Channel-Selector switch SW301A. In the "scan" mode, the transistors are each turned ON in sequence by IC502, IC503 and associated circuitry. Manual /Scan switch SW501 applies voltage to timer IC502 in "scan" mode.

The collector circuit of Q507 is tuned to the crystal frequency, and the output is coupled to the base of tripler

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Q110, which is located on the main PC board. The output of Q110 is tuned by C155 and the primary of T109 to cover the frequency range from 133.2 to 162.7 MHz; then, the secondary of T109 is connected to gate 2 of dual-gate first-mixer Q103. The first LO injection frequency is 10.7 MHz below the desired "receive" frequency.

4-2-4. 1st Mixer and 1st IF Amplifier

The 10.7 MHz difference signal produced in the first mixer is coupled by T101 to a 4-pole monolithic crystal filter consisting of FL101 and FL102. The output of the filter is transformer coupled by T102 to the first stage, Q104, of the first IF amplifier. Output from Q104 is coupled by T103 to another 4-pole monolithic crystal filter consisting of FL103 and FL104. The filter output is then transformer coupled by T104 to the second stage, Q105, of the first IF amplifier.

4-2-5. Second Mixer/Autodyne Converter

The output of Q105 is transformer coupled by T105 to the second mixer, Q106, which operates as an autodyne converter with crystal Y123 oscillating at 10.245 MHz to produce a second IF of 455 kHz.

4-2-6. Second IF Amplifier

Transformer T106 applies the resultant 455 kHz difference frequency to IC101, which functions as a high-gain 455 kHz IF amplifier.

4-2-7. Audio Limiter/Detector/Squelch

The output of IC101 is coupled by T107 to IC102 pins 1 and 2 - IC102 performs the limiting and detection functions in the receiver. C130 sets the de-emphasis level in the detection circuitry, while T108, R121, and C131 form the quadrature detector circuit. Detected audio on pin 8 of IC102 is fed through C132 and R122 to the audio amplification circuits via pin 14 on IC102. Detected audio from pin 8 is also applied to a noise amplifier consisting of Q107 and associated circuitry. The amplified noise from Q107 is fed to the voltage-doubling detectors CR103 and CR104. The detected noise then charges C137 and biases the base of Q108. The Squelch control, R127, determines the authority of the detected-noise level on the base of Q108 in the absence of an incoming signal - as Q108 is turned on by the detected noise, it pulls pin 1 of hex inverter IC501 (on scanner board) to ground. This action starts the scan (if instrument is in scan mode), and also squelches receiver audio by turning off FET Q506 which is in series with detected audio to the Volume control and audio circuits.

When a signal is received, the detected noise level at base of Q108 falls below the value required to make it conduct; therefore, Q108 turns off and thus removes the ground from pin 1 of IC501. This action stops timer IC502 and the selected crystal will remain in operation. At the same time, FET Q506 is turned on and applies detected audio to the Volume control and audio amplifier.

When the received signal disappears, the detected-noise level increases, and thus turns on Q108 which resumes the scan cycle and squelches receiver audio again.

NOTE: The squelch circuitry starts and stops the scan cycle; therefore Squelch control R127 MUST be set to squelch the receiver in the absence of a signal. If Squelch control is turned fully counterclockwise, the scan circuitry will be disabled.

4-2-8. Audio Amplifier

Volume Control R131 sets the level of audio fed to audio amplifier IC103. The frequency-response shaping of the audio amplifier is performed by R132 and C142 while C144, C145, and C147 provide the feedback to various stages within IC103. Audio output from pin 12 of IC103 is applied through C149 to the speaker.

To quiet receiver audio during transmission, relay K301 removes all receiver DC voltage, and grounds receiver DC-supply line through R145, while transmit circuits are energized.

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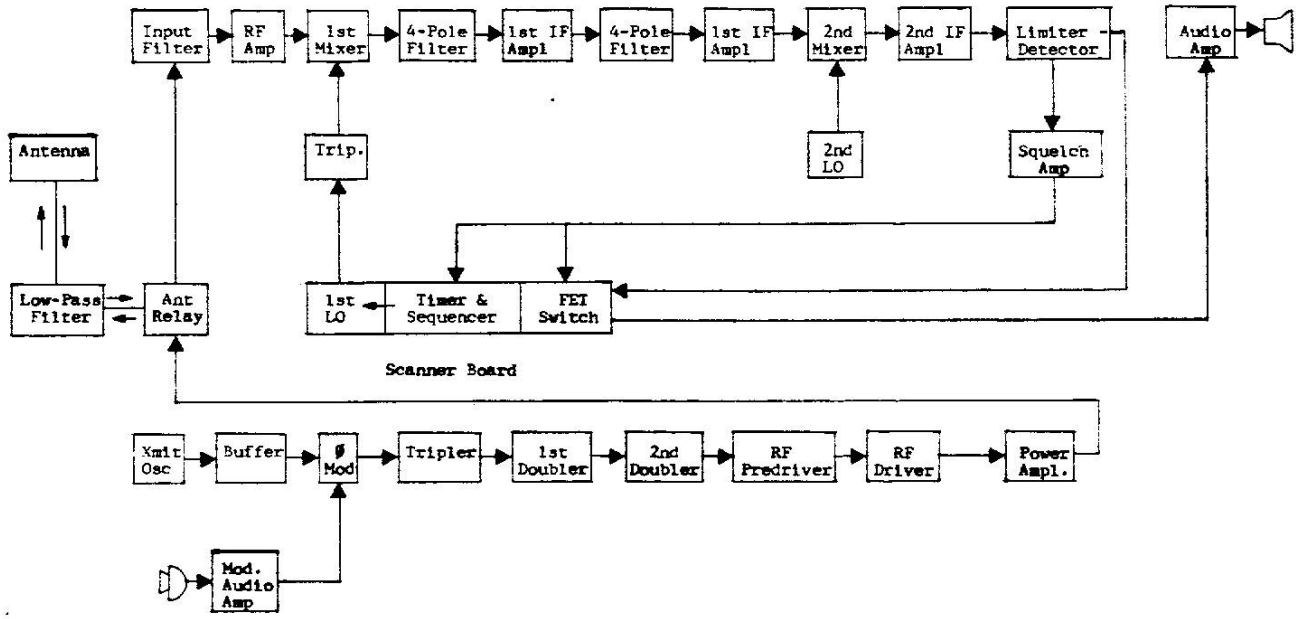

Figure 4-1. Block Diagram

4-3. THEORY OF OPERATION - TRANSMITTER

4-3-1. Microphone Amplifier/Limiter

The modulation audio amplifier in the transmitter is built around a single integrated-circuit, IC301. This IC is a dual operational amplifier, shown on the schematic as IC301A and IC301B. The ceramic microphone audio output is amplified by IC301A - a 6 dB per octave rising characteristic is given to the audio frequencies by loading the 1500 pF microphone capacitance with the bias resistor, R331. IC301 also provides the clipping required for limiting modulation by its saturating symmetrically against supply voltage and ground. The 6.8 volt regulated-supply voltage for the modulator is obtained by applying 13.75 VDC primary power through series resistor R332 and across 6.8 volt zener diode, CR305.

The output from IC301A is applied to IC301B - which acts as an active, 2-pole, Chebyshev low-pass filter with a cutoff frequency of 3 kHz. R338 and C400 add a third pole to the filter, and ensure an 18 dB per octave roll-off above 3 kHz. Voice Deviation control, R339, sets the audio level applied to the modulator diodes, while C401 provides an audio return for R339.

4-3-2. Voice Modulator

CR302 and CR311 function as the phase modulators. DC bias for the modulation diodes is provided by IC301B through R338, R339, and R340, while R340 and C346 perform pre-emphasis of the audio applied to the phase-modulator circuitry.

A signal between 11.991 and 14.45 MHz from the transmit crystal oscillator is applied to CR302 and CR311 by tuned transformer T301. As an audio signal from the modulation amplifier is applied to the varactor diodes, the capacitance of the diodes changes - thus varying the resonant frequency of tuned transformer T301. This results in phase modulation of the carrier signal.

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4-3-3. Subaudible-Tone Modulator

The subaudible-tone modulator circuitry is located on the scanner board. The circuitry composed of C410, C411, C412, CR310, L316, R348, R349, and R350 is used to frequency modulate the transmit crystal oscillator when the subaudible-tone encoder is employed. The amount of frequency modulation which results from the subaudible-tone input is limited by the applied-tone level. R349 is used to change the conduction angle of CR310 and, therefore, symmetry of the subaudible modulation. This circuitry is used ONLY when the SA-1 Subaudible Tone Encoder/Decoder circuit board is used in the GMT-425S.

4-3-4. Transmit Crystal Oscillator

Q301 and associated circuitry form the "transmit" oscillator, which is a basic Colpitts crystal circuit. A variable capacitor is used in series with each crystal to alow exact setting of the generated frequency.

4-3-5. Crystal Oven

The circuitry comprised of R344, R345, R347, R346 and Q310 is used to apply heat to the "transmit" oscillator crystal. Thermistor R347 controls transistor Q310 in a manner that causes resistors R345 and R346 to produce heat when the ambient temperature drops below 0° C. Each resistor (R345 and R346) is held in contact with two crystals; thus by heating the crystals, the frequency does not change as radio is subjected to colder temperatures.

4-3-6. Buffer

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

4-3-7. Tripler

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

4-3-8. First Doubler

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

4-3-9. Second Doubler

The 78 MHz signal from the first doubler is applied to the base of Q305, another Class C doubler stage. Here, the modulated 78 MHz RF signal from the first doubler is again doubled to the final output frequency in the 156 MHz range. The output of Q305 is matched to following amplifier stages by a resonant "L" section consisting of L302 and C360. This circuit also provides suppression of any subharmonics of the desired output signal.

4-3-10. RF Predriver

The 156 MHz signal from the final multiplier stage is applied to the base of Q306, which functions as the first RF-power amplifier. This Class C amplifier increases RF-signal level from 50 mW to approximately 500 mW. The predriver RF output is coupled to following driver stage by means of a filter network consisting of L303, C365, C366, and L304. This circuit provides both filtering of any undesired spurious responses, and impedance matching into driver stage.

4-3-11. RF Driver

Q307 and associated circuitry function as an RF driver in a Class C configuration. L305, C368, L306, C369 and C370 form a frequency - selective matching

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4-3-12. Final Power Amplifier

Q308 functions as the final RF - power amplifier - the GMT-425S develops 25 watts of RF power. C373, C374, L309, and C406 comprise a resonant matching network, which matches the output from Q308 to the 50-ohm antenna impedance. The remainder of the components up to the output connector form an elliptic-function filter, which reduces the level of all spurious outputs to less than -13 dBm.

4-3-13. Power Supply

Power to operate the transceiver is obtained from an external 13.75 volt DC-power source via input connector P101, fuse F301, and switch SW302. The 13.75 volt line supplies power to the following circuits: Crystal-Oven Heater; the Transmit-Indicator LED; ED-33 Subaudible Tone board; T/R Relay K301; all Transmitter stages, through pins 12 and 13 of K301; Receiver output IC and 9.7 volt regulator, through K301 pins 5 and 6.

Power to operate the "transmit" oscillator is regulated to 6.8 volts DC by R301 and CR301, prior to application to the oscillator circuit. Regulated 6.8 volts DC for the modulation amplifier is provided by R332 and CR305.

Voltages for all receiver stages, except receiver output IC103, are obtained from a zener-diode stabilized pass-transistor regulator, consisting of R150, R151, CR106, CR107, and Q111. The output of this regulator is approximately 9.7 volts DC.

4-4. ALIGNMENT PROCEDURE - GENERAL

The transceiver is properly aligned before shipment from the factory, and realignment should never be necessary during normal life of the unit unless components within the instrument have been replaced.

NEVER attempt to realign the transceiver circuits unless the test equipment specified for each section is available.

4-4-1. Disassembly

Prior to performing any service work on the instrument, the aluminum top cover must be removed. The bottom cover need not be removed, unless it is necessary to gain access to bottom-side of main PC board. To remove either cover, remove two 4/40 x 1/2" screws securing each side of cover to transceiver chassis; then, slide cover back and lift it off unit.

With unit top cover removed, the component side of main PC board, as well as the scanner board, is accessible for alignment or frequency adjustments. If installed, the ED-33 subaudible -tone board is accessible for service with the unit top cover removed.

4-5. RECEIVER ALIGNMENT

4-5-1. RF-Input Filter Alignment - Standard Front End

1. Connect an FM Signal Generator to transceiver antenna connector J301, and set generator to desired frequency with 1 kHz modulation at ±5 kHz deviation.

2. Turn radio ON and adjust following trimmer capacitors for best sensitivity: C103, C106, C109, C111, and C114. Refer to Main Board Component Location Diagram for location of adjustments.

4-5-2. RF-Input Filter Alignment - 6 MHz Broadband Front End

1. With transceiver OFF, connect RF-output cable of sweep generator to transceiver antenna connector J301. Connect a high-impedance detector (Figure 4-2) to gate 1 of 1st mixer Q103; then, connect detector output to oscilloscope vertical input.

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

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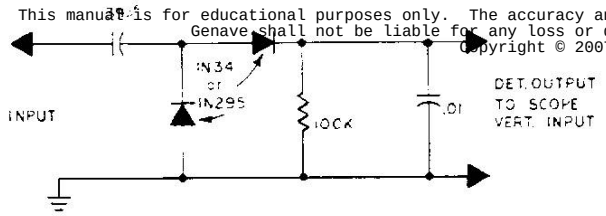

Figure 4-2. High - Impedance Detector

3. Set sweep generator to sweep a band covering the 6-MHz range desired. Use an RF-generator to produce the necessary markers if sweep generator does not contain appropriate marker frequencies.

4. Turn transceiver power switch ON. Set scope vertical attenuator to its most sensitive position; then, set sweep generator RF-output level low enough to prevent overdriving transceiver RF amplifier.

5. Adjust C102, C103, C106, C109, C111 and C114 to give a 6.0-MHz bandpass similar to that shown in Figure 4-3.

6. Turn unit power switch OFF, disconnect test equipment from unit, and remove shorting jumper from secondary of T109.

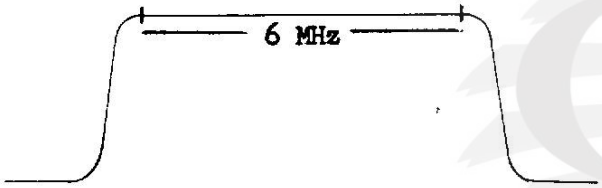

Figure 4-3. Input-Filter Response

4-5-3. 1st Local Oscillator Alignment

1. Set Manual/Scan switch to MANUAL position, and the Channel-Selector switch to channel A.

NOTE: In following steps, refer to Scanner Board and Main Board Component Location Diagrams in this section for adjustment points.

2. Preset L501 by setting top of slug even with top of coil form and then turning slug four turns into form. (On scanner board).

3. Connect a VTVM RF probe to gate 2 of 1st mixer Q103 on main board.

4. Turn transceiver power switch ON, and adjust slug in T109 (on main PC board) for a maximum reading on the VTVM. If no reading is obtained, adjust L501 and L502 alternately in small increments until the crystal starts; then adjust T109 for maximum VTVM indication.

5. Set Channel-Selector switch to each position which has a crystal installed, and note that each crystal starts promptly as indicated by the VTVM. If a crystal does not start, or is slow to start, change adjustment of L501/L502 slightly.

NOTE: These are preliminary adjustments; L501 and T109 will be touched up later for best quieting.

6. Turn transceiver power switch OFF, and disconnect VTVM probe.

7. Connect frequency counter to gate 2 of mixer Q103.

8. Set Channel Selector to channel A. Turn transceiver power switch ON, and note reading on the frequency counter. This reading should be within $\pm$.001% of the L.O. injection frequency. The injection frequency can be found by subtracting 10.7 MHz from the channel, or operating, frequency. If the frequency is not within appropriate tolerance, adjust associated crystal - netting trimmer capacitor C510. Repeat this step for the remaining channels, adjusting C511 for channel B, C512 for channel C, and C513 for channel D.

NOTE: If difficulty is encountered in adjusting a majority of crystals "on frequency," particularly if all crystals measure "low" or all mea-

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sure "high," this indicates that the netting coil, L502, should be readjusted. Then, the netting capacitor for each channel must be adjusted as given in step 8 above.

EXAMPLE: Oper. freq. = 151.625
LO freq = 151.625 - 10.7
LO Freq = 140.925
Tolerance = 140.925 x .00001
Tolerance = ±1409.25 Hz

9. Turn transceiver power switch OFF, and remove frequency-counter connection from mixer Q103.

4-5-4. 10.7 MHz & 455 kHz IF Alignment

1. Connect a high-impedance detector (Figure 4-2) to drain of FET amplifier Q105; then, connect detector output to scope vertical input. Set scope vertical attenuator to its most sensitive position.

2. The connection point for the sweep-input signal depends upon frequency range of sweep generator being used: If generator covers 10.7 MHz, the sweep signal can be applied through a 39 pF capacitor to gate 1 of mixer Q103; however if generator covers operating frequency of the transceiver, the sweep signal can be applied directly to antenna input connector J301. Turn transceiver power switch ON.

NOTE: During alignment of monolithic crystal filters, keep sweep signal input level low enough to prevent overdriving the detector -- signal level at the detector should be approximately 10 - 20 mV. Set generator sweep width for approximately 25 kHz at a sweep rate of not more than 40 Hz.

3. Adjust T101, T102, T103, T104, and T105 for a bandpass response similar to that shown below. The ripple should not exceed 2 dB, and in most cases will be 1 dB or less.

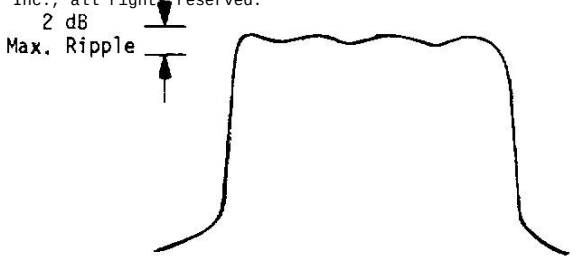

Figure 4-4. IF Response

4. Turn transceiver power OFF, and disconnect sweep generator, detector, and scope.

NOTE: After the 10.7 MHz crystal filters have been properly aligned using a swept signal, DO NOT change adjustments of T101 through T105.

5. Connect an AC voltmeter across unit speaker terminals; turn squelch and volume controls fully counterclockwise.

6. Apply a 10.7 MHz CW signal by either of the following methods:

(1) Inject an accurate 10.7 MHz CW signal into gate 1 of mixer Q103 through a 39 pF capacitor. Short secondary of T109 to ground.

(2) Connect a signal generator, set to desired "receive" frequency, to antenna connector J301, and connect a frequency counter to pin 1 of IF IC101. Turn instrument power switch ON, and increase generator output until 2nd IF is read on counter. "Fine-tune" signal generator until 2nd-IF frequency reads 455 kHz.

7. Disconnect RF generator from transceiver, and with transceiver power switch ON, adjust volume control for a 0.5-volt noise level on the AC voltmeter.

8. Reconnect signal generator to the transceiver, and increase unmodulated signal from signal generator until noise level drops to 0.25 VAC on voltmeter.

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9. Now, adjust T106 and T107 in that order, for maximum quieting as indicated on the AC voltmeter.

   If using "Method #2," also adjust slugs in L501 and T109 for maximum quieting. Decrease RF input, as necessary, to maintain a usable reading on AC voltmeter during the alignment. Repeat step 9 until no further quieting is obtained.

10. Turn transceiver power OFF and disconnect AC voltmeter. Now, connect an oscilloscope across speaker terminals, and turn transceiver power switch ON.

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

12. Adjust T108 for maximum amplitude of the 1-kHz tone on scope screen.

13. If "Method #1" is used for alignment, turn transceiver power OFF and remove shorting jumper from the secondary of T109. Again connect an AC voltmeter across transceiver speaker terminals.

    Connect a signal generator, set to desired "receive" frequency, to antenna connector J301. Set receiver and generator levels as given in steps 7 and 8 above; then, adjust slugs in L501 and T109 for maximum quieting.

14. Turn transceiver power switch OFF, and disconnect all test equipment from unit.

4-5-5. RF Input for 20-dB Quieting

1. Turn FM signal-generator modulation OFF, and set generator RF attenuator for minimum output. Set transceiver and generator for desired channel.

2. Adjust transceiver volume control so that receiver background noise indicates +10 dB on AC VTVM connected across speaker terminals.

3. Slowly increase setting of FM signal generator RF attenuator, until AC VTVM indicates -30 dB. Note RF level shown on signal-generator attenuator. This is the RF input required to produce 20-dB receiver quieting; an input of -112 dBm (0.45 µV) will quiet receiver 20 dB. Check additional frequencies as desired.

4-5-6. Squelch Operation

1. Set signal generator to desired "receive" frequency, and modulate generator with a 1 kHz tone at ±5 kHz deviation. Set RF attenuator for minimum RF output.

2. Turn squelch control fully clockwise. Receiver audio control should be set for maximum volume. Receiver is fully squelched, and should be completely silent.

3. Reduce DC-input voltage to approximately 11 volts, and note that receiver is still fully squelched. Return DC input to 13.75 VDC, set volume control at midrange, and adjust squelch control fully counter-clockwise; then set squelch clockwise until receiver background noise just disappears.

4. Increase setting of signal-generator RF attenuator until the squelch just fully opens. The RF attenuator should show -121 dBm (0.2 µV) or better.

4-5-7. Audio-Output Power

1. Set FM signal generator on desired "receive" frequency, and modulate generator with a 1-kHz tone at ±5 kHz deviation. Set RF attenuator in the vicinity of 5 µV.

2. Turn volume control fully clockwise. The AC VTVM should indicate not less than 4 volts (4 watts).

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3. Modulate generator with 500 Hz tone at +5 kHz deviation, and note that AC VTVM indicates at least 4 volts with transceiver volume control fully clockwise.

4. Modulate signal generator with a 3-kHz tone at +5 kHz deviation. Again AC VTVM should indicate at least 4 volts at maximum setting of the transceiver volume control.

5. Turn OFF transceiver power switch, and disconnect AC VTVM from transceiver speaker.

4-6. TRANSMITTER ALIGNMENT

4-6-1. Equipment Required

To properly align the GMT-425S transmitter, the following test equipment, or its equivalent, is required:

a) Power Meter: 50-watts @ 175 MHz, or relative output indicating device (Figure 4-5).

b) Dummy Load: For above, 50-ohm, 50-watts.

c) Frequency Counter: DC to 175 MHz; or other accurate frequency measuring device.

d) Deviation Meter: To read at least +5 kHz.

e) VTVM: Any accurate instrument.

f) Oscilloscope: DC to 8 MHz, DC coupled, calibrated vertical attenuator.

g) Audio Generator: To supply 500 Hz, 1700 Hz, and 3,000 Hz.

h) Power Supply: Filtered, 13.75 VDC at 8 amps minimum.

4-6-2. Preparation for Alignment

1. Attach a 50-ohm dummy load to the transceiver RF - output connector through a power meter or relative output indicating device (Figure 4-5).

2. Preset the deviation potentiometer (R339) to its lowest setting (Potentiometer rotated toward receiver side of mainboard). Refer to Component Layout Diagram in this section.

3. Connect instrument to a 13.75-volt DC power source.

4. Adjust subaudible deviation potentiometer R349(on Scanner board) to its approximate midrange position.

NOTE: This potentiometer does not require further adjustment, unless an ED-33 Subaudible-Tone Encoder & Decoder is installed in the future.

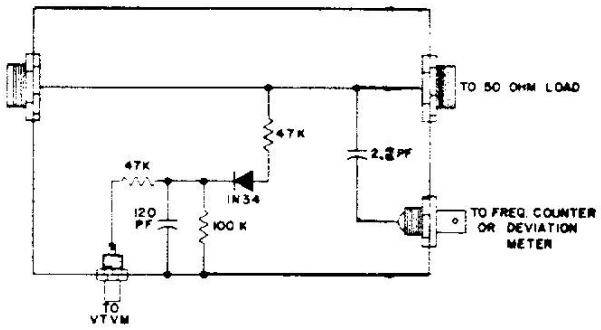

Figure 4-5. Relative Output Indicator

4-6-3. Frequency and Power Alignment

1. Rotate Channel-Selector dial to the desired channel.

NOTE: The signal peak-voltage measurements in the following steps of this section are made with a VTVM and DC probe. Key transmitter ONLY while adjustments are being made.

2. Connect DC probe to emitter of Q303, key transmitter, and adjust slug in T301 for a peak at the fundamental frequency. Adjust VTVM attenuator for an on-scale reading. The peak should reach approximately 1.5 volts.

3. Move DC probe to emitter of Q304. Key transmitter, and adjust the two slugs in T302 for a peak, centered on third harmonic. Each slug should

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adjust between its associated winding and the outisde end of the coil form. The signal should peak at approximately 0.2 volts.

4. Adjust T303 by connecting DC probe to emitter of Q305, keying transmitter, and adjusting the two slugs in T303 for a peak, centered on the 6th harmonic. Each slug should adjust between its associated winding and the outside end of coil form. The signal should peak at about 1.2 volts.

5. If relative output indicating device of Figure 4-5 is used, connect VTVM DC probe to the relative output terminal; otherwise, observe the wattmeter or other relative output indicator.

6. Preset C366 by tightening its adjustment screw down firmly; then, backing it off 1/2 turn.

7. Key transmitter, and adjust C360, C365, C366, C368, C370, C374, and C406 for maximum relative output indication. This step may be repeated as necessary.

8. After unit has been on for approximately ten minutes to stabilize crystal oven, select channel A, key transmitter, and adjust crystal-netting trimmer C405 for a correct frequency reading on the frequency counter or other frequency measuring device.

9. Repeat step 8 for each "transmit" crystal installed in the transceiver; adjust trimmer C302 for channel B, C303 for channel C, and C304 for channel D. Refer to Main Board Component Location Diagram for location of "transmit" crystal-netting trimmers.

4-6-4. Power-Measurement Procedure

1. Key transmitter, and note RF-power output readings. The power should be as follows: 143.9 to 160.0 MHz -- 20 watts minimum; 160.0 to 173.4 MHz -- 15 watts minimum.

4-6-5. Subaudible-Tone Deviation Adjustment (If Used)

1. Connect deviation meter to "Freq. Counter/Deviation Meter" output of the relative output indicating device.

2. Key transmitter and adjust "Subaudible Tone Deviation Adjustment" (located on subaudible-tone board) to produce an output deviation of ±1 kHz, as indicated on the deviation meter. R349, the "Subaudible Symmetry Adjustment" (located on scanner board) should be adjusted simultaneously to produce identical + and - deviation.

NOTE: After any adjustment of R349, BE SURE TO PERFORM STEPS 8 AND 9 OF 4-6-3 TO ENSURE XMIT CRYSTAL IS NETTED TO PROPER FREQUENCY.

4-6-6. Carrier Deviation Adjustment

1. Feed an audio signal of 1700 Hz into transceiver microphone. Set Mic. Gain potentiometer, R333, to maximum resistance (max. gain) by rotating its wiper toward receiver side of main circuit board. Do NOT key transmitter during this step. Connect vertical input lead of the oscilloscope to pin 1 of IC301 and adjust R331, the symmetry adjustment, until displayed waveform limits symmetrically on both top and bottom of the waveform.

2. Connect deviation meter to "Freq. Counter /Deviation Meter" output of the relative output indicating device.

3. Key transmitter, observe frequency deviation meter, and increase the microphone audio input until no further increase in deviation is indicated. The modulator stage is now saturated.

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4. With frequency-deviation meter set to either + or - deviation, key the transmitter and adjust slug in T301 for a peak reading. The deviation potentiometer, R339, can be adjusted for an on-scale reading of the deviation meter.

5. Set deviation potentiometer, R339, as follows:

   Without subaudible tone: Set R339 for a deviation reading of ±5 kHz with the 1700 Hz tone applied to microphone.

   With subaudible tone: Set R339 for a combined subaudible and 1700 Hz tone deviation reading of ±5 kHz.

   Switch deviation meter to the + and - positions and check amount of deviation in each position.

6. If a difference exists between + and - deviation levels, adjust T301 by rocking its slug slightly until the two levels are brought into balance. The difference in deviation levels should not exceed 0.4 kHz.

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

4-7. TONE-FREQUENCY ADJUSTMENT

If transceiver is equipped with Subaudible Tone-Squelch option (SA-1), the tone frequency is listed on a tag attached to unit, and also on a label affixed to inside of transceiver. The tone-squelch board is located at right-center of main PC board, as shown in Figure 2-5. If it should be necessary to change tone frequency from the factory-set value, proceed as follows:

1. With top cover removed from transceiver, locate the Ceramic Resonator on subaudible - tone PC board. This Resonator determines the tone frequency; therefore, a different Resonator is required for each discrete subaudible - tone frequency.

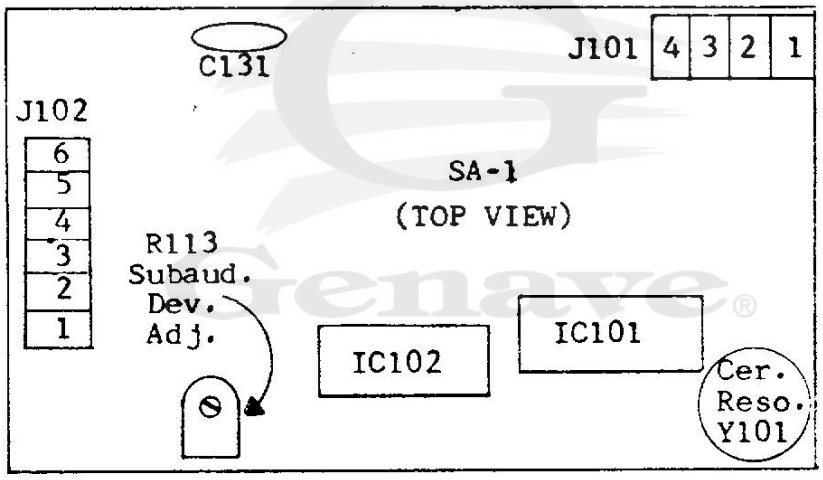

Figure 4-6. Tone-Frequency Adjustment

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2. **Remove SA-1 subaudible-tone board from the transceiver by lifting the board up and off mating pins. Unsolder and remove Ceramic Resonator.**

3. If subaudible-tone frequency is between 67 and 131.8 Hz, connect pin 8 of IC102 to pin 14 of IC101; but, if frequency is between 136.5 and 250.3 Hz, connect pin 8 of IC102 to pin 6 of IC101. Refer to Figure 4-6.

4. **Solder new Resonator leads in place and carefully replace tone board in transceiver. Connect transceiver to its power source.**

5. **If another unit with the correct subaudible-tone frequency is available, it may be used for on-the-air testing; otherwise, set a signal generator to a 10 μV level on the appropriate operating frequency with ±1 kHz deviation at the desired subaudible - tone frequency.**

6. **With test signal applied to receiver, note that receiver unsquelches and operates normally.**

7. **The transmitter subaudible deviation should be checked. The deviation should be 1 kHz ±200 Hz.**

4-8. FREQUENCY CHANGES

Installation of new frequencies in this unit can be easily accomplished by performing the following steps:

NOTE: To aid in obtaining proper crystals for the GMT-425S, complete crystal specifications are given in Section 5-1 of this manual.

1. Remove top cover from instrument as explained in Section 4-4-1.

2. Install "receive" crystals in appropriate sockets on scanner board. For crystal locations, refer to the Scanner Board Component Layout. Note that channel A (crystal Y501) is the most important (PRIORITY) channel -- install crystals accordingly.

3. Install "transmit" crystals in appropriate sockets at front right-hand corner of main PC board. Refer to Main Board Component Location Diagram for transmit crystal locations. Be sure that transmit and receive crystals are properly paired.

Channel	Receive Crystal	Transmit Crystal
A	Y501	Y301
B	Y502	Y302
C	Y503	Y303
D	Y504	Y304

4. To bring the receive crystal(s) "on frequency," perform steps 7 and 8 given in Section 4-5-3 of this manual.

5. To adjust transmit crystal(s) "on frequency," perform steps 7 and 8 given in Section 4-6-3.

NOTE: If new frequencies differ appreciably from original alignment frequencies, it may be necessary to completely re-align transmitter and receiver circuits as detailed in Sections 4-5 and 4-6.

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4-9. SCHEMATICS AND COMPONENT LAYOUTS

The following pages contain schematics and parts layout for the Scanner and Main PC Boards in the GMT-425S.

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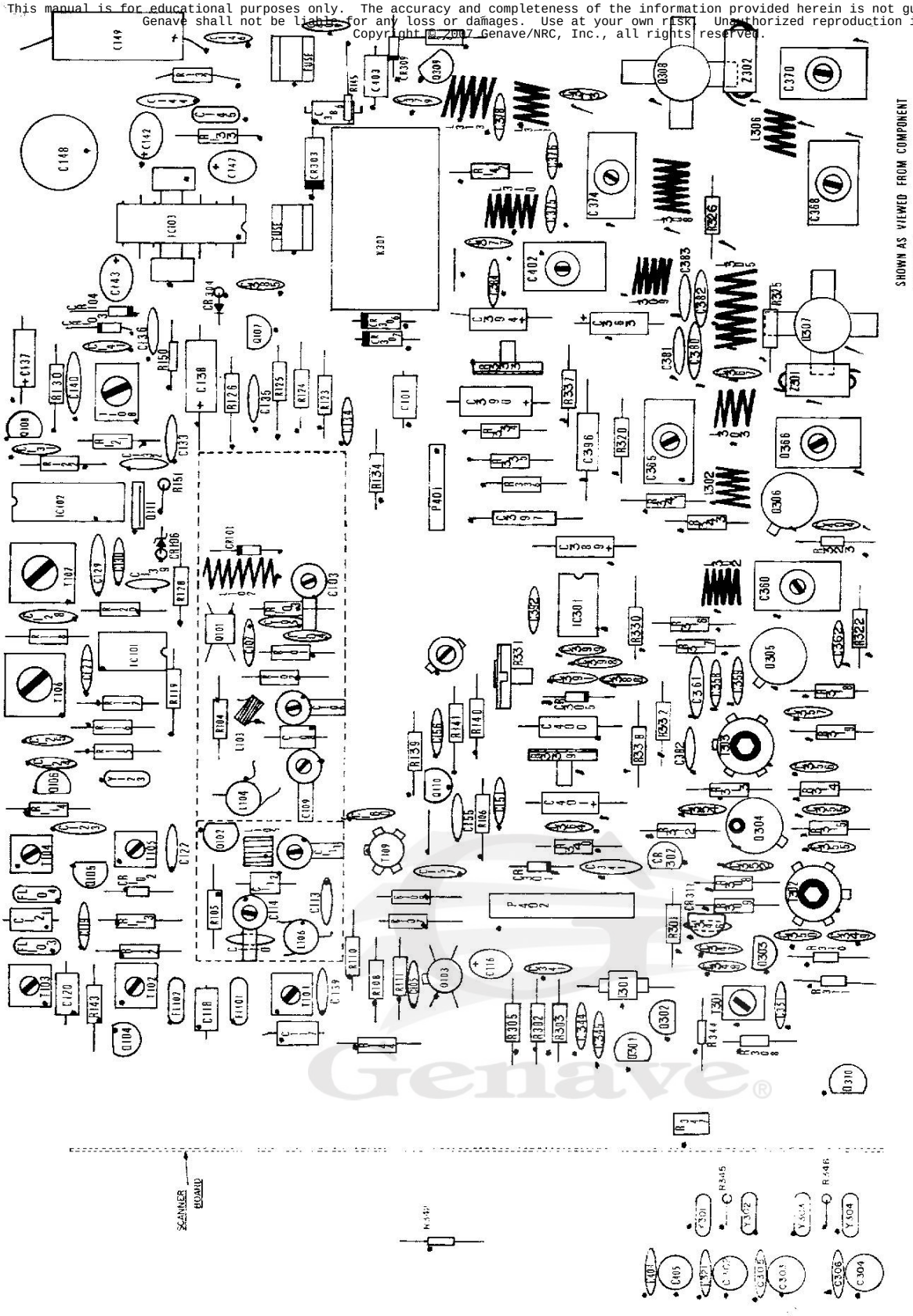

Figure 4-7. Main Board Component Layout

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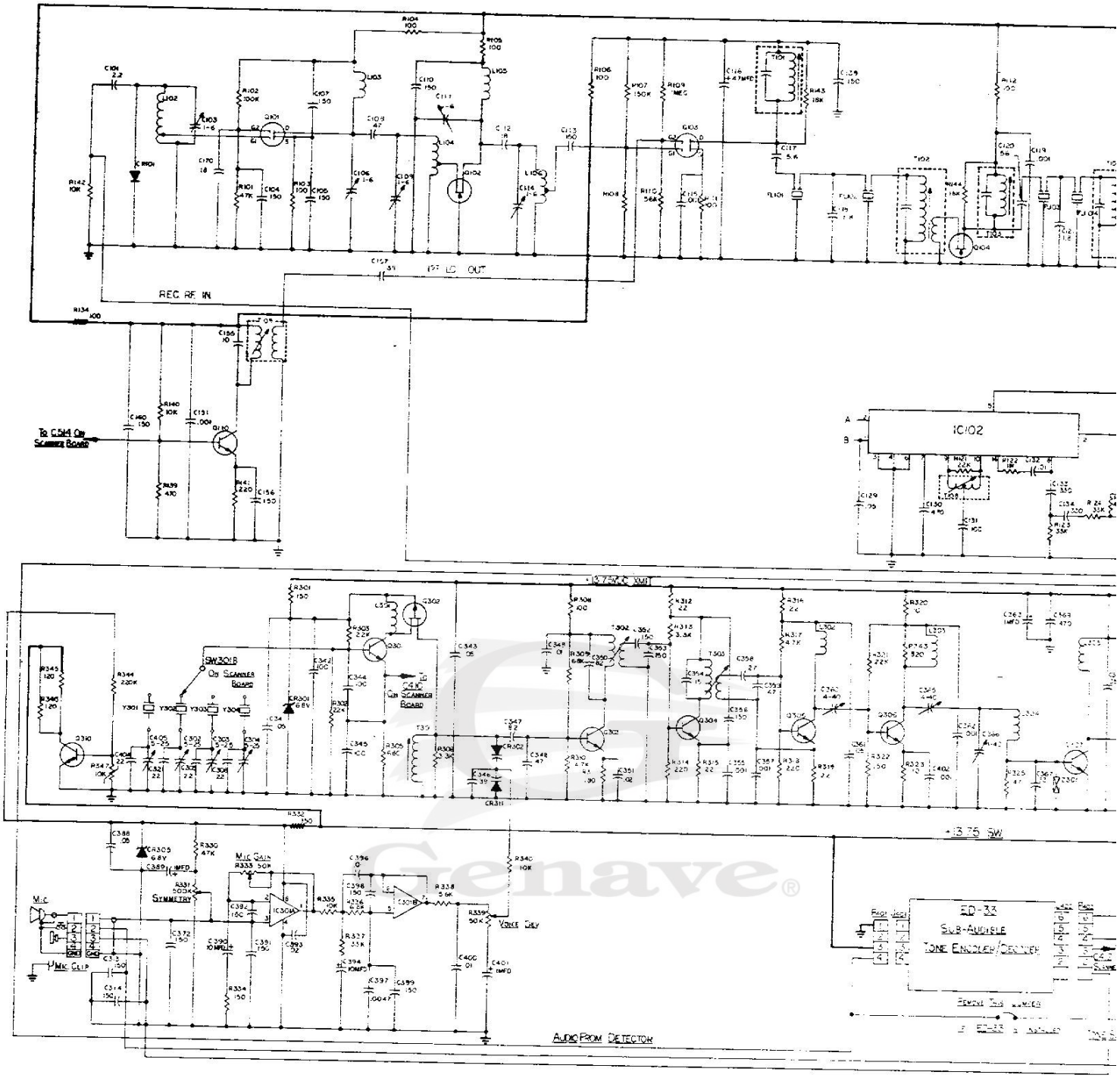

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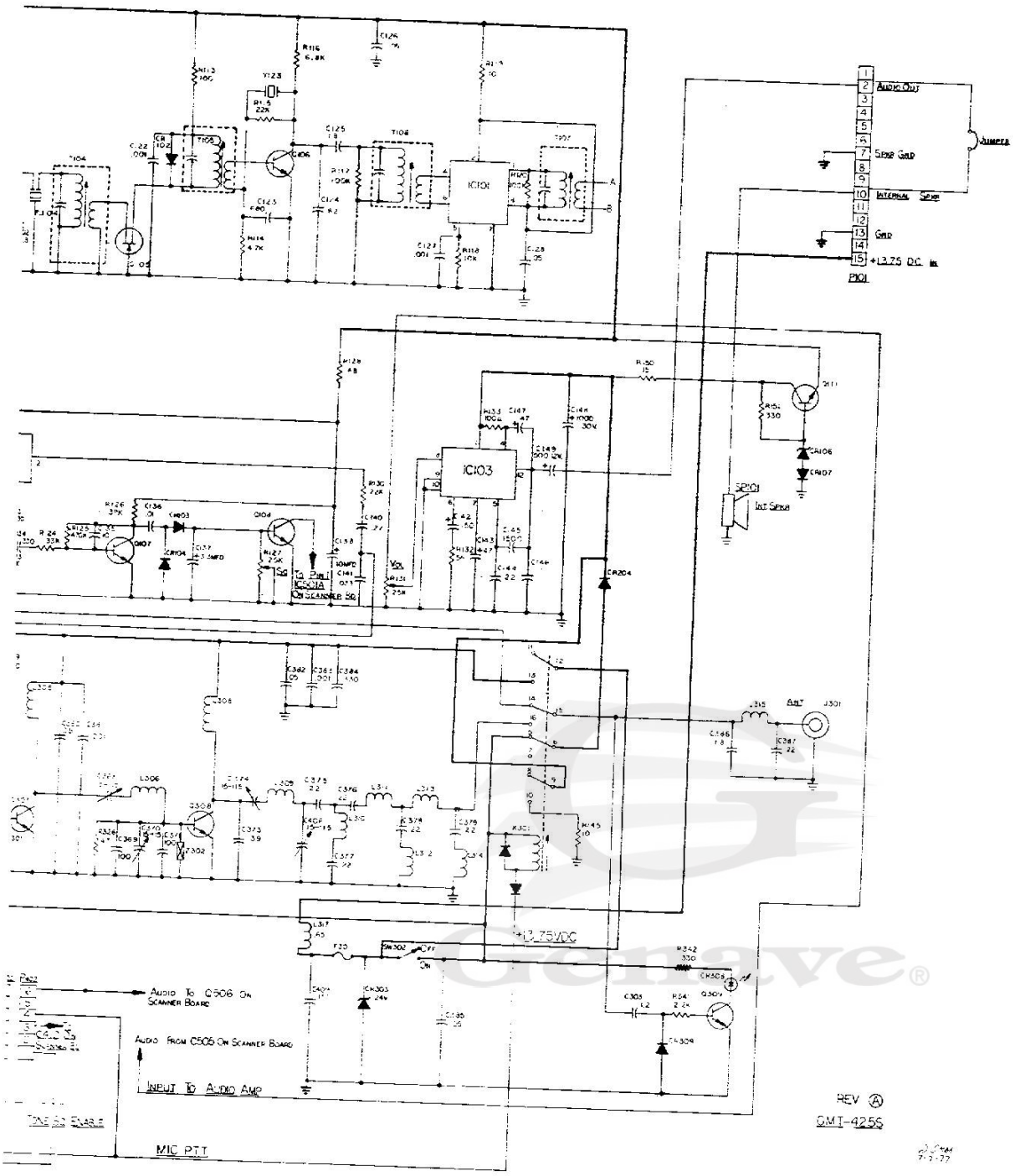

Figure 4-8. Main Board Schematic

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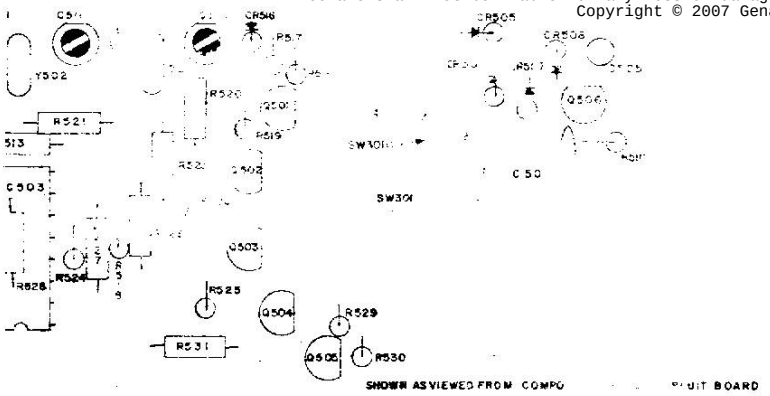
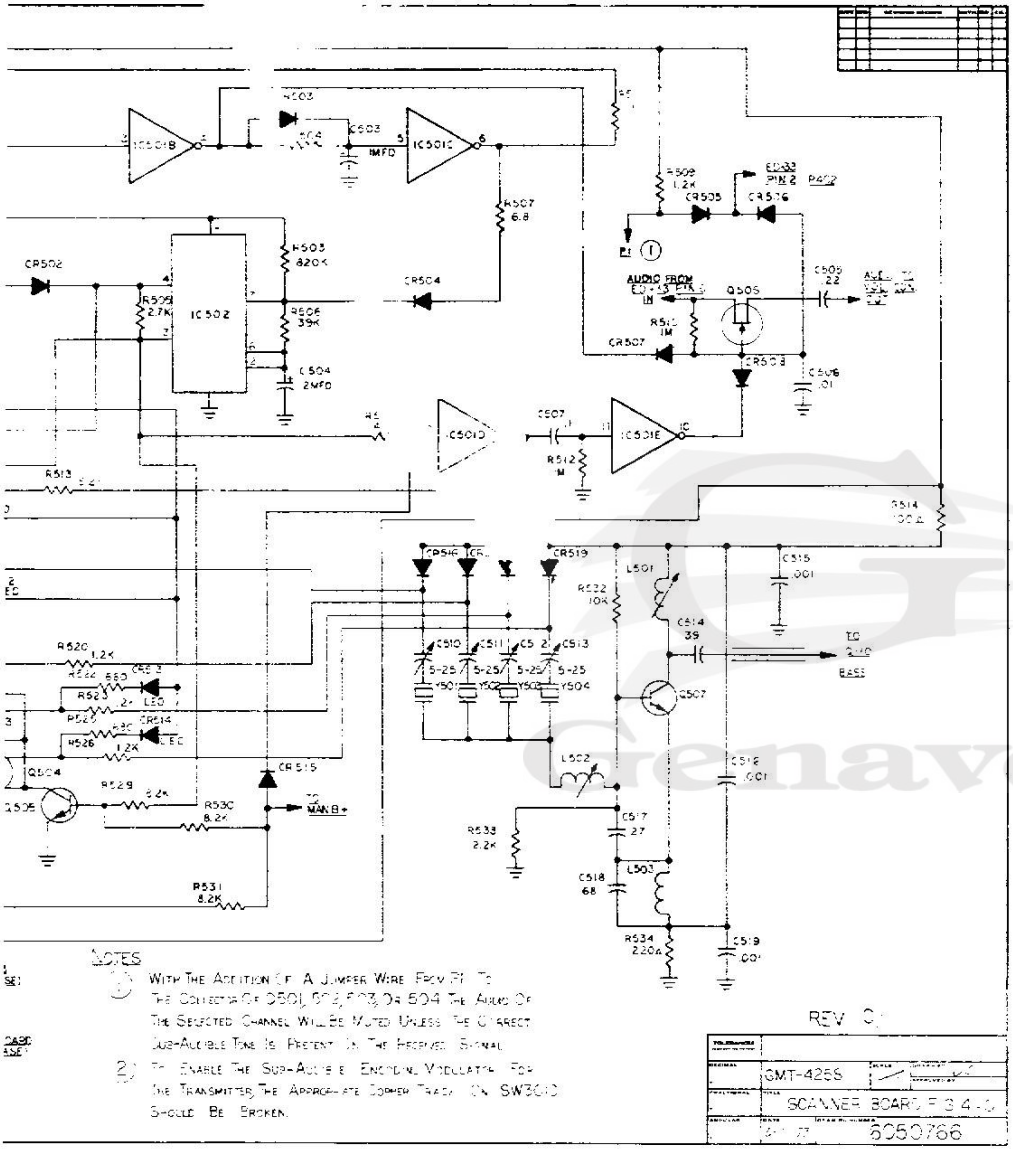


BOARD COMPONENT LAYOUT

FIG. 4-9.



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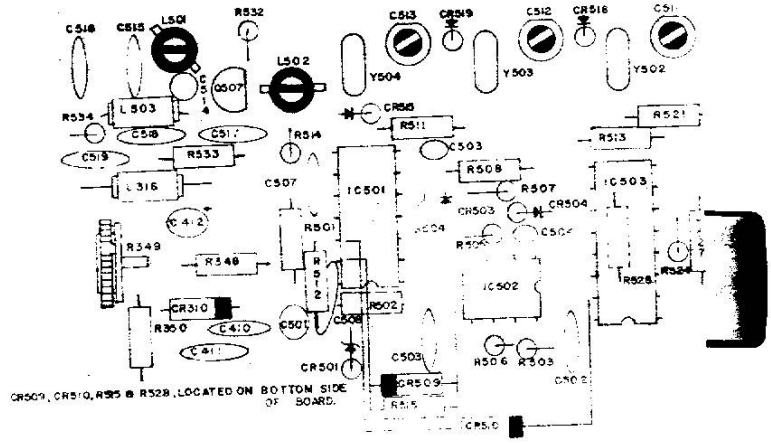

SCANNER BOARD

FIG

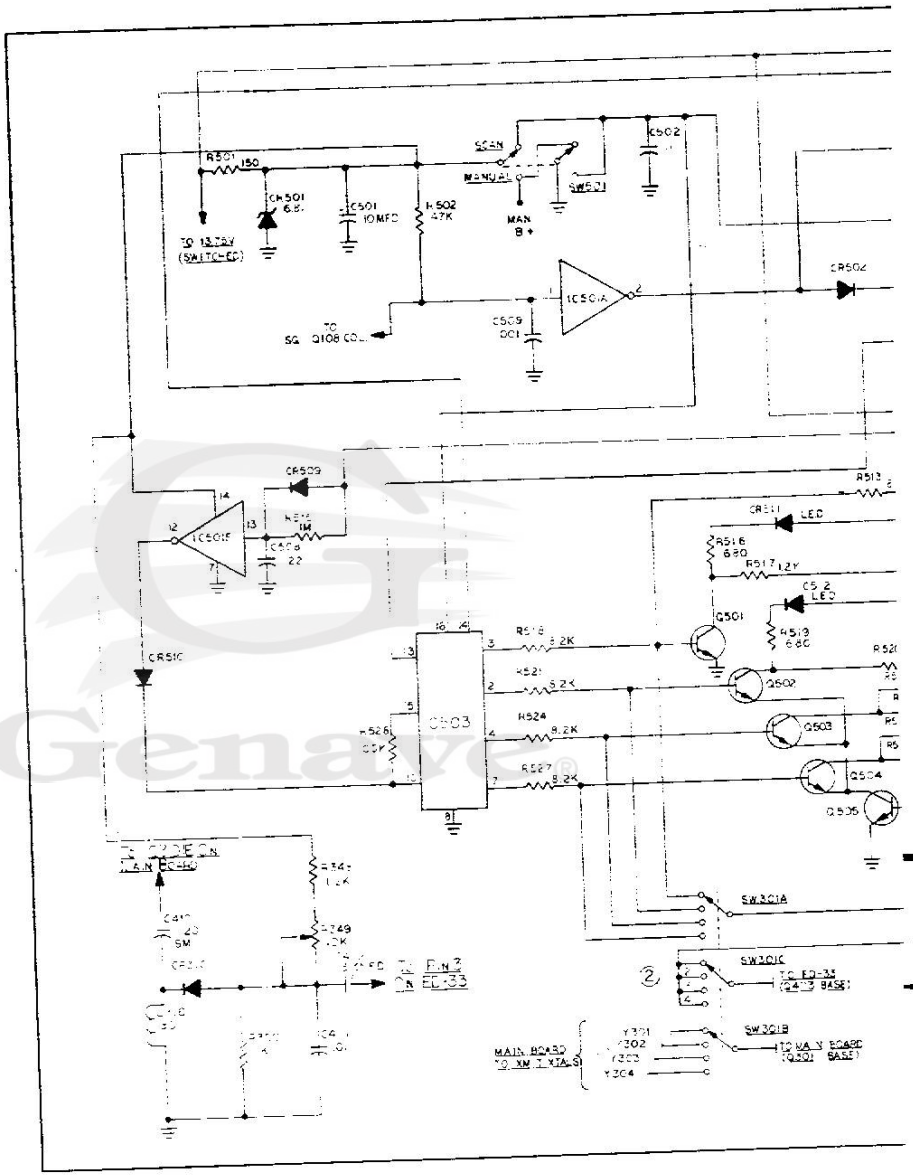

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Figure 4-10. Scanner Schematic

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SECTION V
PARTS LIST

This section of the Maintenance Manual lists replacement electronic parts, as well as major mechanical components, for use in the GMT-425S VHF-FM Transceiver.

The first column in the Parts list contains component reference numbers as shown on schematics or wiring diagrams.

In general, 100-series numbers pertain to receiver components, 300-series to transmitter parts, 400-series to the ED-33 PC board, and 500-series to the scanner PC board. Genave part numbers for replaceable items appear in the Part Number column, while a brief description for each part is shown in the Description column.

Reference Number	Part Number	Description
Capacitors		
C101	1510015	Gimmick, 2.2 pf, NPO, ±10%
C102	1570120	Trimmer, 1-6 pf (Optional - Broadband front end)
C103	1570120	Trimmer, 1-6 pf
C104	1520028	Y5E, Disc, 150 pf, ±10%
C105	1520028	Y5E, Disc, 150 pf, ±10%
C106	1570120	Trimmer, 1-6 pf
C107	1520028	Y5E, Disc, 150 pf, ±10%
C108	1510007	Gimmick, 0.47 pf, NPO
C109	1570120	Trimmer, 1-6 pf
C110	1520028	Y5E, Disc, 150 pf, ±10%
C111	1570120	Trimmer, 1-6 pf
C112	1510002	NPO, Gimmick, 0.18 pf
C113	1520028	Y5E, Disc, 150 pf, ±10%
C114	1570120	Trimmer, 1-6 pf
C115	1520071	Z5P, Disc, .001 mfd, ±10%
C116	1550005	Tant., 47 mfd, ±10%, 15V
C117	1510026	NPO, Gimmick, 5.6 pf, ±10%
C118	1510014	NPO, Gimmick, 1.8 pf, ±10%
C119	1520071	Z5P, Disc, .001 mfd, ±10%
C120	1510026	NPO, Gimmick, 5.6 pf, ±10%
C121	1510014	NPO, Gimmick, 1.8 pf, ±10%
C122	1520071	Z5P, Disc, .001 mfd, ±10%
C123	1530007	Silver Mica, 680 pf, ±10%
C124	1520176	N330, Disc, 82 pf, ±10%
C125	1520010	NPO, Disc, 18 pf, ±10%
C126	1520054	M25, Disc, .05 mfd, 25V, +80-20%
C127	1520071	Z5P, Disc, .001 mfd, ±10%
C128	1520054	M25, Disc, .05 mfd, 25V, +80-20%
C129	1520054	M25, Disc, .05 mfd, 25V, +80-20%
C130	1520042	Y5E, Disc, 470 pf, ±10%
C131	1520022	N220, Disc, 100 pf, ±10%

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Part Number	Part Number	Description
C132	1520051	Y5U, Disc, .01 mfd, 25V, ±20%
C133	1520037	Y5E, Disc, 330 pf, ±10%
C134	1520037	Y5E, Disc, 330 pf, ±10%
C135	1520007	NPO, Disc, 10 pf, ±10%
C136	1520051	Y5U, Disc, .01 mfd, 25V, +20%
C137	1540014	Electrolytic, 10 mfd, 25V, +10% (GMT-425 only)
C137	1550003	Tant., 3.3 mfd, 35V (GMT-425S)
C138	1540014	Electrolytic, 10 mfd, 25V, ±10%
C139	1520028	Y5E, Disc, 150 pf, ±10%
C140	1520057	Disc, .22 mfd, +80-20%
C141	1520083	Y5T, Disc, .003 mfd, +20%
C142	1540024	150 MFD, Electro., ±10%
C143	1550005	Tant., 47 mfd, 15V, ±10%
C144	1520057	Disc, .22 mfd, +80-20%
C145	1500004	Mylar, .0015 mfd, ±10%
C146	1520055	Disc, .1 mfd, +80-20%, 12V
C147	1550005	Tant., 47 mfd, 15V, ±10%
C148	1540038	Electrolytic, 1000 mfd, 25V
C149	1540049	Electrolytic, 500 mfd, 12V, +10%
C150	1520071	Z5P, Disc, .001 mfd, +10% (GMT-425 only)
C151	1520071	Z5P, Disc, .001 mfd, ±10%
C152	1520014	NPO, Disc, 39 pf, ±10% (GMT-425 only)
C153	1520024	N1500, Disc, 100 pf, ±10% (GMT-425S only)
C154	1520013	NPO, Disc, 33 pf, ±10% (GMT-425 only)
C155	1520007	NPO, Disc, 10 pf, ±10%
C156	1520028	Y5E, Disc, 150 pf, ±10%
C157	1520014	NPO, Disc, 39 pf, ±10%
C158	1510006	NPO, Gimmick, 0.39 pf, ±10% (Broadband Front End)
C159	1520071	Z5P, Disc, .001 mfd, ±10% (GMT-425 only)
C160	1520028	Y5E, Disc, 150 pf
C170	1520010	NPO, Disc, 18 pf, ±10%
C171	1570121	Trimmer 5-25 pf (GMT-425 only)
C172	1570121	Trimmer 5-25 pf (GMT-425 only)
C173	1570121	Trimmer 5-25 pf (GMT-425 only)
C174	1570121	Trimmer 5-25 pf (GMT-425 only)
C183	1520009	NPO, Disc, 15 pf, ±10% (GMT-425 only)
C184	1520009	NPO, Disc, 15 pf, ±10% (GMT-425 only)
C185	1570121	Trimmer, 5-25 pf (GMT-425 only)
C186	1570121	Trimmer, 5-25 pf (GMT-425 only)
C302	1570121	Trimmer, 5-25 pf
C305	1520011	NPO, Disc, 22 pf, ±10%
C306	1520011	NPO, Disc, 22 pf, ±10%
C313	1520028	Y5E, Disc, 150 pf, ±10%
C314	1520028	Y5E, Disc, 150 pf, ±10%
C321	1520011	NPO, Disc, 22 pf, ±10%
C341	1520054	Disc, .05 mfd, +80-20%, 12V
C342	1520022	N220, Dsic, 100 pf, ±10%
C343	1520054	Disc, .05 mfd, +80-20%, 12V
C344	1520022	N220, Disc, 200 pf, ±10%
C345	1520022	N220, Disc, 100 pf, ±10%
C346	1520192	N1500, Disc, 39 pf, ±10
C347	1520176	N330, Disc, 82 pf, ±10%
C348	1520015	N1500, Disc, 47 pf, ±10%
C349	1520051	Y5U, Disc, .01 mfd, 25V, ±20%
C350	1520176	N330, Disc, 82 pf, ±10%

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Reference Number	Part Number	Description
C351	1520053	M25, Disc, .02 mfd, 25V, ±10%
C352	1520027	N750, Disc, 150 pf, ±10%
C353	1520027	N750, Disc, 150 pf, ±10%
C354	1520009	NPO, Disc, 15 pf, ±10%
C355	1520071	Z5P, Disc, .001 mfd, ±10%
C356	1520027	N750, Disc, 150 pf, ±10%
C357	1520071	Z5P, Disc, .001 mfd, ±10%
C358	1520012	NPO, Disc, 27 pf, ±10%
C359	1520015	N1500 Disc, 47 pf, ±10%
C360	1560403	Trimmer, 40 pf
C361	1520054	M25, Disc, .05 mfd, +80-20%
C362	1520071	Z5P, Disc, .001 mfd, ±10%
C363	1540002	Electro., 1 mfd, 35V, ±10%
C364	1520042	Y5E, Disc, 470 pf, ±10%
C365	1560403	Trimmer, 40 pf
C366	1560403	Trimmer, 40 pf
C367	1520013	NPO, Disc, 33 pf, ±10%
C368	1560406	Trimmer, 115 pf
C369	1520022	N220, Disc, 100 pf, ±10%
C370	1560406	Trimmer, 115 pf
C371	1520022	N220, Disc, 100 pf, ±10%
C372	1520028	Y5E, Disc, 150 pf, ±10%
C373	1520014	NPO, Disc, 39 pf, ±10%
C374	1560406	Trimmer, 115 pf
C375	1520011	NPO, Disc, 22 pf, ±10%
C376	1520011	NPO, Disc, 22 pf, ±10%
C377	1520011	NPO, Disc, 22 pf, ±10%
C378	1520011	NPO, Disc, 22 pf, ±10%
C379	1520011	NPO, Disc, 22 pf, ±10%
C380	1520054	M25, Disc, .05 mfd, +80-20%
C381	1520071	Z5P, Disc, .001 mfd, ±10%
C382	1520054	M25, Disc, .05 mfd, +80-20%
C383	1520071	Z5P, Disc, .001 mfd, ±10%
C384	1520037	Y5E, Disc, 330 pf, ±10%
C385	1520054	M25, Disc, .05 mfd, +80-20%
C386	1510014	NPO, Gimmick, 1.8 pf, ±10%
C387	1520011	NPO, Disc, 22 pf, ±10%
C388	1520054	M25, Disc, .05 mfd, +80-20%
C389	1540002	Electro., 1 mfd, 35V, ±10%
C390	1540014	Electrolytic, 10 mfd, 25V, ±10%
C391	1520028	Y5E, Disc, 150 pf, ±10%
C392	1520028	Y5E, Disc, 150 pf, ±10%
C393	1520053	M25, Disc, .02 mfd, 25V, ±10%
C394	1540014	Electrolytic, 10 mfd, 25V, ±10%
C395		Not Assigned
C396	1500018	Mylar, .01 mfd, 100V, ±10%
C397	1500013	Mylar, .0047 mfd, 100V, ±10%
C398	1520028	Y5E, Disc, 150 pf, ±10%
C399	1520028	Y5E, Disc, 150 pf, ±10%
C400	1500018	Mylar, .01 mfd, 100V, ±10%
C401	1540002	Electro., 1 mfd, 35V, ±10%

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Reference Number	Part Number	Description
C402	1520071	Z5P, Disc, .001 mfd, ±10%
C403	1510012	NPO, Gimmick, 1.2 pf, ±10%
C404	1520011	NPO, Disc, 22 pf, ±10%
C405	1570121	Trimmer, 5-25 pf
C406	1560406	Trimmer, 115 pf
C407		Not Assigned
C408		Not Assigned
C409	1520028	Y5E, Disc, 150 pf, ±10%
C410	1530002	Silver Mica, 120 pf, ±5%
C411	1520051	Y5U, Disc, .01 mfd, 25V, ±20%
C412	1550003	Tant., 3.3 mfd, 35V
C501	1550007	Tant, 10 mfd, 35V, ±20% (GMT-425S only)
C502	1520055	Disc, .1 mfd, +80-20% (GMT-425S only)
C503	1550002	Tant, 1 mfd, 20%, 35V (GMT-425S only)
C504	1550015	Tant, 2 mfd, 5V, ±20% (GMT-425S only)
C505	1550001	Tant, .22 mfd, ±10%, 35V (GMT-425S only)
C506	1520051	Y5U, Disc, .01 mfd, ±20%, 25V (GMT-425S only)
C507	1520055	Disc, .1 mfd, +80-20%, 35V (GMT-425S only)
C508	1550001	Tant, .22 mfd, ±20%, 35V (GMT-425S only)
C509	1520071	Disc, .001 mfd, 1000V (GMT-425S only)
C510	1570009	Trimmer, 5 pf (GMT-425S only)
C511	1570009	Trimmer, 5 pf (GMT-425S only)
C512	1570009	Trimmer, 5 pf (GMT-425S only)
C513	1570009	Trimmer, 5 pf (GMT-425S only)
C514	1520201	NPO, Disc, 39 pf, ±5% (GMT-425S only)
C515	1520071	Disc, .001 mfd, 1000V (GMT-425S only)
C516	1520071	Disc, .001 mfd, 1000V (GMT-425S only)
C517	1520012	NPO, Disc, 27 pf, ±10% (GMT-425S only)
C518	1520019	NPO, Disc, 68 pf, ±10% (GMT-425S only)
C519	1520071	Disc, .001 mfd, 1000V (GMT-425S only)

Diodes

CR101	4810017	High Frequency Switching, 1N4148
CR102	4810017	High Frequency Switching, 1N4148
CR103	4810021	1N34A
CR104	4810021	1N34A
CR301	4810007	Zener, 6.8V, 3/4W, ±5%
CR302	4812109	Varicap, MV2109
CR303	4810011	Zener, 24V, 1W, ±10%
CR304	4810013	General Purpose, 100V, 1A
CR305	4810007	Zener, 6.8V, 3/4W, ±5%
CR306	4810013	General Purpose, 100V, 1A
CR307	4810013	General Purpose, 100V, 1A
CR308	3900030	Light Emitting Diode, FLV 110
CR309	4810017	High Frequency Switching, 1N4148
CR310	4810017	High Frequency Switching, 1N4148
CR311	4812113	Varicap, MV2113
CR106	4810008	Zener, 10V, Z510A

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Reference Number	Part Number	Description
CR501	4810007	Zener 6.8V (GMT-425S only)
CR502	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR503	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR504	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR505	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR506	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR507	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR508	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR509	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR510	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR511	3900030	L.E.D. FLV110 (GMT-425S only)
CR512	3900030	L.E.D. FLV110 (GMT-425S only)
CR513	3900030	L.E.D. FLV110 (GMT-425S only)
CR514	3900030	L.E.D. F.V110 (GMT-425S only)
CR515	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR516	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR517	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR518	4810017	High Frequency Switching 1N4148 (GMT-425S only)
CR519	4810017	High Frequency Switching 1N4148 (GMT-425S only)
Integrated Circuits		
IC101	3130017	MC1350P, IF amplifier
IC102	3130024	CA3075, Quadrature detector
IC103	3130020	CA810Q, Audio Amplifier
IC301	3130012	N5558, Dual op-amp
IC501	3130359	MC14584 BCP, Hex Inverter
IC502	3130355	NE555V, Timer
IC503	3130357	CD4017, Quad Multiplexer
Inductors		
L101	1800226	Coil Rec, RF amp input (Broad Front End)
L102	1800225	Coil Rec, RF amp
L103	1800116	Coil Rec, RF amp
L104	1800117	Coil Rec, RF amp
L105	1800118	Coil Rec, RF amp
L106	1800119	Coil Rec, RF amp
L107	1800308	Coil, Rec. osc, (GMT-425 only)
L108	1800350	Coil, 1 µh choke, ML10G (GMT-425 only)
L301	1800032	Coil, 80 µh choke
L302	1800203	Coil, 3 1/2 T, LHH
L303	1800201	Coil, 2 1/2 T, LHH
L304	1800201	Coil, 2 1/2 T, LHH
L305	1800202	Coil, 3 1/2 T, RHH
L306	1800201	Coil, 2 1/2 T, LHH
L307		Not Assigned
L308	1800204	Coil, 4 1/2 T, LHH
L 309	1800201	Coil, 2 1/2 T, LHH
L310	1800204	Coil, 4 1/2 T, LHH

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Reference Number	Part Number	Description
L311	1800201	Coil, 2 1/2 T, LHH
L312		Coil etched on PC board
L313	1800203	Coil, 3 1/2 T, LHH
L314		Coil etched on PC board
L315	1800205	Coil, 2 T, LHH
L316	1800032	Coil, 80 µH choke
L317	1800247	Coil, .65 mH min. @ 1 kHz & 7 Amps DC
L501	1800308	Coil, 8 1/2 T
L502	1800316	Coil, 16 1/2 T
L503	1800350	Coil, 1 mH

Transistors

Q101	4800068	MOSFET, DualGate 3N201 (SFE 801)
Q102	4805486	J-FET, N-channel, 2N5486
Q103	4800068	MOSFET, DualGate, 3N201 (SFE801)
Q104	4805484	J-FET, N-channel, 2N5484
Q105	4805484	J-FET, N-channel, 2N5484
Q106	4800026	Silicon, NPN, MPS-3693
Q107	4800028	Silicon, NPN Red Dot, MPS-6514S
Q108	4805089	Silicon, NPN, 2N5089
Q109	4800026	NPN Silicon, MPS3693 (GMT-425 only)
Q110	4800024	NPN Silicon, Blue Dot, MPS3563
Q111	4800018	NPN Silicon, MPS-U01
Q301	4800033	NPN Silicon, MPS5172
Q302	4805461	N-FET, P-channel 2N5461
Q303	4800026	NPN Silicon, MPS 3693
Q304	4804427	NPN Silicon, 2N4427
Q305	4804427	NPN Silicon, 2N4427
Q306	4804427	NPN Silicon, 2N4427
Q307	4806080	NPN Silicon, RF Power, 2N6080
Q308	4806082	NPN Silicon, RF Power, 2N6082
Q309	4800051	NPN Silicon, Darlington, MPSA13
Q310	4800051	NPN Silicon, Darlington, MPSA13
Q501	4800033	NPN Silicon MPS5172
Q502	4800033	NPN Silicon MPS5172
Q503	4800033	NPN Silicon MPS5172
Q504	4800033	NPN Silicon MPS5172
Q505	4800033	NPN Silicon MPS5172
Q506	4805484	J. FET N-Channel 2N5484
Q507	4800026	NPN Silicon MPS3693

Resistors

R101	4700045	47K, ±10%, 1/2 W
R102	4700049	100K, ±10%, 1/2 W
R103	4700013	100 ohm, ±10%, 1/2 W
R104	4700013	100 ohm, ±10%, 1/2 W
R105	4700013	100 ohm, ±10%, 1/2 W
R106	4700013	100 ohm, ±10%, 1/2 W
R107	4700051	150K, ±10%, 1/2 W
R108	4700035	6.8K, ±10%, 1/2 W

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Reference Number	Part Number	Description
R109	4700058	1M, ±10%, 1/2 W
R110	4700046	56K, ±10%, 1/2 W
R111	4700013	100 ohm, ±10%, 1/2 W
R112	4700013	100 ohm, ±10%, 1/2 W
R113	4700013	100 ohm, ±10%, 1/2 W
R114	4700033	4.7K, ±10%, 1/2 W
R115	4700041	22K, ±10%,1/2 W
R116	4700035	6.8K, ±10%, 1/2 W
R117	4700049	100K, ±10%, 1/2 W
R118	4700037	10K, ±10%, 1/2 W
R119	4700003	10 ohm, ±10%, 1/2 W
R120	4700049	100K, ±10%, 1/2 W
R121	4700041	22K, ±10%, 1/2 W
R122	4700058	1M, ±10%, 1/2 W
R123	4700043	33K, ±10%, 1/2 W
R124	4700043	33K, ±10%, 1/2 W
R125	4700057	470K, ±10%, 1/2 W
R126	4700032	3.9K, ±10%, 1/2 W
R127	4760051	25K, variable ±30% Linear
R128	4700011	68 ohm, ±10%, 1/2 W
R129		Not Assigned
R130	4700041	22K, ±10%, 1/2 W
R131	4760052	25K, variable ±30%, audio taper, with SW302
R132	4700010	56 ohm, ±10%, 1/2 W
R132	4700010	56 ohm, ±10%, 1/2 W
R133	4700013	100 ohm, ±10%, 1/2 W
R134	4700013	100 ohm, ±10%, 1/2 W
R135	4700013	100 ohm, ±10%, 1/2 W (GMT-425 only)
R136	4700041	22K, ±10%, 1/2 W (GMT-425 only)
R137	4700041	22K, ±10%, 1/2 W (GMT-425 only)
R138	4700015	150 ohm, ±10%, 1/2 W (GMT-425 only)
R139	4700021	470 ohm, ±10%, 1/2 W
R140	4700037	10K, ±10%, 1/2 W
R141	4700017	220 ohm, ±10%, 1/2 W
R142	4700037	10K, ±10%, 1/2 W
R143	4700040	18K, ±10%, 1/2 W
R144	4700040	18K, ±10%, 1/2 W
R145	4700003	10 ohm, ±10%, 1/2 W
R150	4710002	15 ohm, ±10%, 1/2 W
R151	4710012	330 ohm, ±10%, 1/4 W
R301	4700015	150 ohm, ±10%, 1/2 W
R302	4700041	22K, ±10%, 1/2 W
R303	4700041	22K, ±10%, 1/2 W
R304		Not Assigned
R305	4700023	680 ohm, ±10%, 1/2 W
R306	4700031	3.3K, ±10%, 1/2 W
R307		Not Assigned
R308	4700013	100 ohm, ±10%, 1/2 W
R309	4700047	68K, ±10%, 1/2 W
R310	4700033	4.7K, ±10%, 1/2 W
R311	4700016	180 ohm, ±10%, 1/2 W

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Reference Number	Part Number	Description
R312	4700006	22 ohm, ±10%, 1/2 W
R313	4700031	3.3K, ±10%, 1/2 W
R314	4700017	220 ohm, ±10%, 1/2 W
R315	4700006	22 ohm, ±10%, 1/2 W
R316	4700006	22 ohm, ±10%,1/2 W
R317	4700033	4.7K, ±10%, 1/2 W
R318	4700017	220 ohm, ±10%, 1/2 W
R319	4700006	22 ohm, ±10%, 1/2 W
R320	4700003	10 ohm, ±10%, 1/2 W
R321	4700029	2.2K, ±10%, 1/2 W
R322	4700015	150 ohm, ±10%, 1/2 W
R323	4700003	10 ohm, ±10%, 1/2 W
R324		Not Assigned
R325	4700009	47 ohm, ±10%, 1/2 W
R326	4700009	47 ohm, ±10%, 1/2 W
R327		Not Assigned
R328		Not Assigned
R329		Not Assigned
R330	4700045	47K, ±10%, 1/2 W
R331	4760039	500K, Variable, ±20%
R332	4700015	150 ohm, ±10%, 1/2 W
R333	4760021	50K, Variable, ±20%
R334	4700015	150 ohm, ±10%, 1/2 W
R335	4700037	10K, ±10%, 1/2 W
R336	4700035	6.8K, ±10%,1/2 W
R337	4700043	33K, ±10%, 1/2 W
R338	4700034	5.6K, ±10%, 1/2 W
R339	4760021	50K, Variable, ±20%
R340	4700037	10K, ±10%, 1/2 W
R341	4700029	2.2K, ±10%, 1/2 W
R342	4700019	330 ohm, ±10%, 1/2 W
R343	4700024	820 ohm, ±10%, 1/2 W
R344	4710054	120K, ±5%, 1/4 W
R345	4700014	120 ohm, ±10%, 1/2 W
R346	4700014	120 ohm, ±10%, 1/2 W
R347	4760034	10K, Thermistor
R348	4700026	1.2K, ±10%, 1/2 W
R349	4760019	10K, Variable, ±20%
R350	4700025	1K, ±10%, 1/2 W
R501	4710009	150 ohm, ±5%, 1/4 W (GMT-425S only)
R502	4710035	47K, ±5%, 1/4 W (GMT-425S only)
R503	4710016	820 ohm, ±5%, 1/4 W (GMT-425S only)
R504	4710042	1 MEG ±5%, 1/4 W (GMT-425S only)
R505	4710022	2.7K, ±5%, 1/4 W (GMT-425S only)
R506	4710034	39K, ±10%, 1/4 W (GMT-425S only)
R507	4710027	68K, ±5%, 1/4 W (GMT-425S only)
R508	4710035	47K, ±5%, 1/4 W (GMT-425S only)
R509	4710018	1.2 K, ±5%,1/4 W (GMT-425S only)
R510	4710042	1 MEG, ±5%, 1/4 W (GMT-425S only)

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Reference Number	Part Number	Description
R511	4710035	47K, ±5%, 1/4 W (GMT-425S only)
R512	4710042	1 MEG, ±5%, 1/4 W (GMT 425S only)
R513	4710028	8.2K ±5%, 1/4 W (GMT-425S only)
R514	4710008	100 ohm, ±5%, 1/4 W (GMT-425S only)
R515	4710042	1 MEG, ±5%, 1/4 W (GMT-425S only)
R516	4710015	680 ohm, ±10%, 1/4 W (GMT-425S only)
R517	4710018	1.2K, ±5%, 1/4 W (GMT-425S only)
R518	4710028	8.2K ±5%, 1/4 W (GMT-425S only)
R519	4710015	680 ohm, ±10%, 1/4 W (GMT-425S only)
R520	4710018	1.2K, ±5%, 1/4 W (GMT-425S only)
R521	4710028	8.2K ±5%, 1/4 W (GMT-425S only)
R522	4710015	680 ohm, ±10%, 1/4 W (GMT-425S)
R523	4710018	1.2 K, ±5%, 1/4 W (GMT-425S only)
R524	4710028	8.2K ±5%, 1/4 W (GMT-425S only)
R525	4710015	680 ohm, ±10%, 1/4 W (GMT-425S only)
R526	4710018	1.2K, ±5%, 1/4 W (GMT-425S only)
R527	4710028	8.2K ±5%, 1/4 W (GMT-425S only)
R528	4710038	100K, ±5%, 1/4 W (GMT-425S only)
R529	4710028	8.2K ±5%, 1/4 W (GMT-425S only)
R530	4710028	8.2K ±5%, 1/4 W (GMT-425S only)
R531	4710028	8.2K ±5%, 1/4 W (GMT-425S only)
R532	4710029	10K, ±5%, 1/4 W (GMT-425S only)
R533	4710021	2.2K, ±5%, 1/4 W (GMT-425S only)
R534	4710011	220 ohm, ±5%, 1/4 W (GMT-425S only)
R535	Not Assigned	

Transformers

T101	5600098	10.7 MHz IF
T102	5600098	10.7 MHz IF
T103	5600098	10.7 MHz IF
T104	5600098	10.7 MHz IF
T105	5600046	10.7 MHz IF
T106	5600012	455 kHz IF
T107	5600012	455 kHz IF
T108	5600012	455 kHz IF
T109	5600048	Tripler - local oscillator
T301	5600072	Transmit oscillator
T302	5600082	Transmit Tripler
T303	5600083	Transmit Frist Doubler

Crystals

Y101	2300226	Xtal (GMT-425 only)
Y102	2300226	Xtal (GMT-425 only)
Y103	2300226	Xtal (GMT-425 only)
Y104	2300226	Xtal (GMT-425 only)
Y123	2300252	Second L.O. 10.245 MHz
Y301	2300211	Xtal
Y302	2300211	Xtal
Y303	2300211	Xtal
Y304	2300211	Xtal

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Reference Number	Part Number	Description
Y501	2300226	Xtal (GMT-425S only)
Y502	2300226	Xtal (GMT-425S only)
Y503	2300226	Xtal (GMT-425S only)
Y504	2300226	Xtal (GMT-425S only)
Switches		
SW301	5100110	Switch, 4 Pos
SW302		ON-OFF, Part of R131
Chokes		
Z301	1800063	Ferrox Cube, VK-200-19-4B
Z303	1870004	Ceramic core 15-1362
Miscellaneous		
FL101	2303504	Crystal Filter - 10.7 MHz, monolythic
FL102	2303504	Crystal Filter - 10.7 MHz, monolythic
FL103	2303504	Crystal Filter - 10.7 MHz, monolythic
FL104	2303504	Crystal Filter - 10.7 MHz, monolythic
K301	4500008	Relay, 4PDT, 12 VDC
J101	2100252	Connector, Molex, 15-pin Female
----	2100254	Terminal, Female, for J101
P101	2100255	Connector, Molex, 15-pin Male
----	2100253	Terminal, Male, for P101
J301	2100256	Receptacle, Co-ax - Amphenol 83-878
F301	5140008	Fuse, 3AG, 7 Amp
SP101	1320020	Speaker 3-ohm, 3-watt, Quam 72-5276
	1325069	Microphone, Ceramic
	2100076	Microphone Plug, Male
	2510123	Panel, Front (GMT-425 only)
	2510108	Panel, Front (GMT-425S only)
	2510138	Insert, Front Panel (GMT-425)
	2510140	Insert, Front Panel (GMT-425S only)
	2510156	Knob, Volume and Squelch
	2510153	Panel, Sub.
	2510129	Chassis, Side Panel
	2510128	Chassis, Side Panel
	2510165	Chassis, Rear Plate
	2510130	Cover, Chassis (Top)
	2510131	Cover, Chassis (Bottom)
	2502051	Foot, Bumper
	2510158	Frame, Front
	2502281	Bracket, Transistor
	2508532	Bracket, Lock
	2400023	Knob, Thumbwheel

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Reference Number	Part Number	Description
	2510162	Bracket, Mounting Handle
P402		Connector, 6-pin plug for ED-33
P401		Connector, 4-pin plug for ED-33

Specifications Subject to Change Without Notice

	2510327	Switch, Cover
	2510328	Spacer, Slide Switch

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5-1. CRYSTAL INFORMATION

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

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

5-1-1. Transmit Crystals

Parallel Mode:	C_p = 32 pfd.
Fundamental Cut Tolerance:	±.001% Max. Calibration Tolerance at 25°C ±1°C. ±.0005% Max. Drift Over Temperature Range.
Temperature Range:	0° to +50°C
Holder:	HC-25/U
Crystal Frequency:	$\frac{\text{Operating Frequency}}{12}$
Series Resistance:	25 ohms Maximum
Genave Part Number:	2300211

5-1-2. Receive Crystals

Parallel Mode:	C_p = 32 pfd.
Third Overtone Tolerance:	±.001% Calibration Tolerance at 25° C ±1°C. ±.001% Max. Drift Over Temperature Range.
Temperature Range:	-30° to +60° C.
Holder:	HC-25/U
Crystal Frequency:	$\frac{\text{Operating Frequency - 10.7 MHz}}{3}$
Series Resistance:	40 ohms Maximum.
Genave Part Number:	2300226
Drive Level:	one mW

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