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GMT 1000
SYNTHESIZED
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

Genave

4141 Kingman Drive, Indianapolis, Indiana 46226

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SECTION 1
GENERAL INFORMATION

1-1. INTRODUCTION

Sections 1, 2, and 3 of this Owner's Manual contain all the information normally required to license, install, and operate the Genave Model GMT 1000 VHF-FM communications transceiver.

The GMT 1000 Maintenance Manual contains all the above information, and adds Section 4 (Theory of Operation, Alignment Procedures, and Schematics). Section 5 lists replacement electronic parts, as well as major mechanical components.

1-2. DESCRIPTION

This VHF-FM transceiver is designed to provide reliable, high-quality two-way communications in the various Public Safety, Industrial, and Business Radio Services authorized under F.C.C. Rules Part 90, Remote Pickup Stations under Rules Part 74, Limited Coast/Marine Utility Stations under Rules Part 81, and Domestic Public Radio Services under Rules Part 22. The unit is capable of transmitting and receiving frequency modulated (16F3) radio signals in the frequency range 143.9 to 173.4 MHz.

> NOTE: The GMT 1000 transceiver has the capability of transmitting and receiving on frequencies assigned by the F.C.C. to the Land Mobile Services, and thus MUST BE LICENSED PRIOR TO ACTUAL USE. While the seller may assist in filing the license application, the responsibility lies solely with the prospective licensee to assure that transmitting equipment is covered by a valid station license.

The Genave GMT 1000 is a fully synthesized VHF-FM transceiver, utilizing a single quartz crystal and a state-of-the-art CMOS synthesizer to provide receiver injection voltage and transmitter drive for the desired operating frequency(ies). A front-panel mounted rotary switch selects any one of four pre-programmed simplex or semi-duplex channels.

An internally-mounted, diode-matrix PC board provides a simple method of programming the desired frequencies by installing or removing diodes in proper BINARY positions on matrix board. Each of the four channels can be setup for either simplex or semi-duplex operation; however, the 2-MHz maximum channel separation must be observed.

> NOTE: This programming MUST BE done by or under the immediate supervision and responsibility of a person holding a first- or second-class radiotelephone operator license, who shall be responsible for the proper functioning of the station equipment.

The unit is completely solid-state, employing the latest in semiconductor and integrated-circuit technology. New-type CMOS devices are used in synthesizer circuitry, resulting in greatly reduced current-consumption. The frequency synthesizer utilizes only one quartz crystal to enable operation on all business frequencies within the range 143.9 MHz to 173.4 MHz.

The transmitter provides a typical RF output of 40 watts. The transceiver is designed to work into a standard 50-ohm antenna, using a standard UHF co-axial connector (83-1SP or PL259). A large, finned heatsink forms the rear panel of the instrument, and increases transmitter power thermal stability.

The superheterodyne receiver is a dual-conversion unit, employing a dual-gate MOSFET RF amplifier, and a JFET 1st mixer. The 10.7 MHz 1st IF provides good image rejection, and utilizes a 4-pole monolithic crystal filter for improved selectivity. The 455 kHz 2nd IF improves receiver stability, and in-

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corporates a 4-pole ceramic filter for excellent adjacent-channel rejection. A multi-function integrated circuit includes the 2nd local oscillator, 2nd mixer, limiting 2nd IF amplifier, quadrature discriminator, active filter and squelch mute switch in a single chip. The receiver provides 4-watts output at 15% distortion.

A 15-pin male plug mounted on rear panel of the GMT 1000 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 only two pins (+13.75VDC and Ground); thus, leaving the remainder available for options or customized installation.

An External Speaker jack (closed circuit) is located on the unit rear panel immediately beneath the Accessory Connector. Plugging an external speaker into this jack disables the internal speaker in the unit.

The GMT 1000 transceiver is designed to operate on +13.75 volts DC (negative ground); the minimum operating voltage is 11.5 VDC. For mobile operation, the power source may be a battery, or the vehicle electrical system. The Genave Model PSI-10N power supply can be utilized when it is desired to operate the instrument from a 117-volt, 50 - 60 Hz source.

Provisions are made within the transceiver for the addition of an optional SA-1, or equivalent, Subaudible-Tone Encoder/Decoder board. This subaudible-tone system keeps the receiver squelched until a signal containing the proper subaudible, continuous-tone modulation is received. The tone-board generates the subaudible tone used to activate the receivers in the system; then, in the receive mode the tone board decodes incoming signals and unsquelches the receiver upon receipt of proper tone.

Note that all channels setup in the GMT 1000 MUST utilize the same tone frequency - there are no provisions for changing frequency of tone on different operating channels.

If transceiver is equipped with the tone-squelch option, the operating frequency must be monitored to ascertain that it is NOT in use prior to originating a call. The GMT 1000 features a front-panel mounted BUSY light which glows when channel is in use. Aural monitoring also can be accomplished automatically when using any of the standard Genave microphones.

Each transceiver is enclosed in a two-piece, aluminum cover that protects instrument from dust, moisture, and physical damage. A combination mounting bracket/handle secures transceiver for under-dash, desktop, or bulkhead mounting.

1-3. SPECIFICATIONS

GENERAL:

Front-Panel Size:	6.5" (16.51 cm) x 2.5" (6.35 cm)
Over-all Dimensions:	6.5" (16.51 cm) x 2.5" (6.35 cm) x 11.5" (29.21 cm)
Power Supply:	13.75VDC, negative ground; 11.5 V min.
Frequency Range:	143.9 MHz to 173.4 MHz
Number of Channels:	4
Channel Separation:	2 MHz, maximum
Temperature Range:	-30°C to +60°C
Weight:	6 Lbs., approx. (2.72 kg)

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RECEIVER:

Sensitivity:	0.35 uV for 12 dB SINAD
Selectivity:	+7.5 kHz
Squelch Threshold:	0.3 uV
Modulation Acceptance:	More than 5 kHz
Adjacent Channel Rejection:	70 dB min @ +25 kHz (EIA)
Intermodulation Response:	70 dB min. (EIA)
Image Response:	65 dB min. (EIA)
Spurious Response:	65 dB min. (EIA)
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:	.0005%
Current Drain (Squelched):	0.2 amps

TRANSMITTER:

Power Output:	40 watts, typical
Frequency Range:	143.9 MHz to 173.4 MHz
Output Impedance:	50-Ohms
Audio Modulation Deviation:	5 kHz max. -- 4 kHz min.
Frequency Accuracy:	+200 Hz
Frequency Stability:	.0005%
Current Drain:	7 amps
Transmitter Spurious:	59 dB, min.
Subaudible-Tone Deviation:	+1000 Hz

1-4. EQUIPMENT SUPPLIED

a) GMT 1000 VHF-FM Transceiver, with hand microphone and hang-up mounting clip.

b) Mounting Bracket, with thumbscrews and washers.

c) Accessory Connector, 15-pin female

1-5. EQUIPMENT REQUIRED, BUT NOT SUPPLIED

a) Vehicle or Base Antenna, 50-Ohms.

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

c) Coaxial Connector, PL-259 (83-1SP)

d) Cabling for Power and Audio wiring as required.

1-6. OPTIONAL EQUIPMENT AVAILABLE

a) Subaudible-Tone Encoder/Decoder, SA-1 or equivalent.

b) PSI-10N AC Power Supply.

c) PSI-7NB Portable Power Pack.

d) G-11 Desk Microphone.

e) G-21 Telephone Handset, w/switch.

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SECTION II

INSTALLATION MANUAL

2-1. ANTENNA INSTALLATION WARNING

WARNING: Each year a number of persons are electrocuted while installing radio antennas; therefore, use extreme caution when installing antenna/antenna-support for use with this transceiver. Observe following precautions:

a. DO NOT attempt to erect antenna while a thunderstorm is gathering.

b. If at all possible, choose an antenna location separated from the nearest high-voltage lines by a distance equal to two times the height of the antenna and its support.

c. DO NOT allow antenna, mast, or cable to touch electric signs or overhead electric wires --- even if only 120 or 240-volt wiring.

d. If antenna or mast starts to fall toward overhead wires, get completely away. If the antenna comes to rest against electrical wires, DO NOT attempt to remove it, but call the local electric company.

e. REMEMBER - UNDER THE RIGHT CONDITIONS, ANY CONTACT WITH AN ELECTRICAL CIRCUIT CAN BE LETHAL.

2-2. INTRODUCTION

This section provides installation data and recommendations for fixed, mobile, or portable operation of the GMT 1000 VHF transceiver. For complete technical specifications of the unit, refer to Section 1-3 (Specifications) in this manual.

2-3. PRE-INSTALLATION CHECK

Visually inspect the unit for any obvious external damage - such as broken knobs, dents, damaged microphone or [illegible] radiator.

radio case. Any problem NOT related to shipping must be reported to GENAVE, 4141 Kingman Drive, Indianapolis, In., (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.

2-4. INSTALLATION PLANNING

The unit is programmed and pre-aligned at the factory for receive and transmit frequencies specified at time of order. If no specific frequencies are shown on order, a tag attached to instrument indicates the alignment and test frequencies. If it is necessary to change the frequencies, programming procedures in Section 4 of the GMT 1000 Maintenance Manual must be performed by a licensed technician who shall be responsible for proper functioning of the radio equipment.

If GMT 1000 transceiver employs SA-1, or equivalent, Tone-Squelch option, the subaudible-tone frequency is listed on a tag attached to the unit as well as on a label affixed to inside of transceiver. To readjust tone frequency from the factory-set value, refer to "Tone-Frequency Adjustment" procedure in Section 4 of GMT 1000 Maintenance Manual.

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 rear-panel mounted antenna connector. 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.

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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."

2-5. FIXED OR MOBILE INSTALLATION

1. Refer to Figure 2-1. If the mounting bracket/handle is installed on GMT 1000, remove bracket temporarily. For fixed operation, reposition the bracket on bottom side of unit to function as a supporting stand.

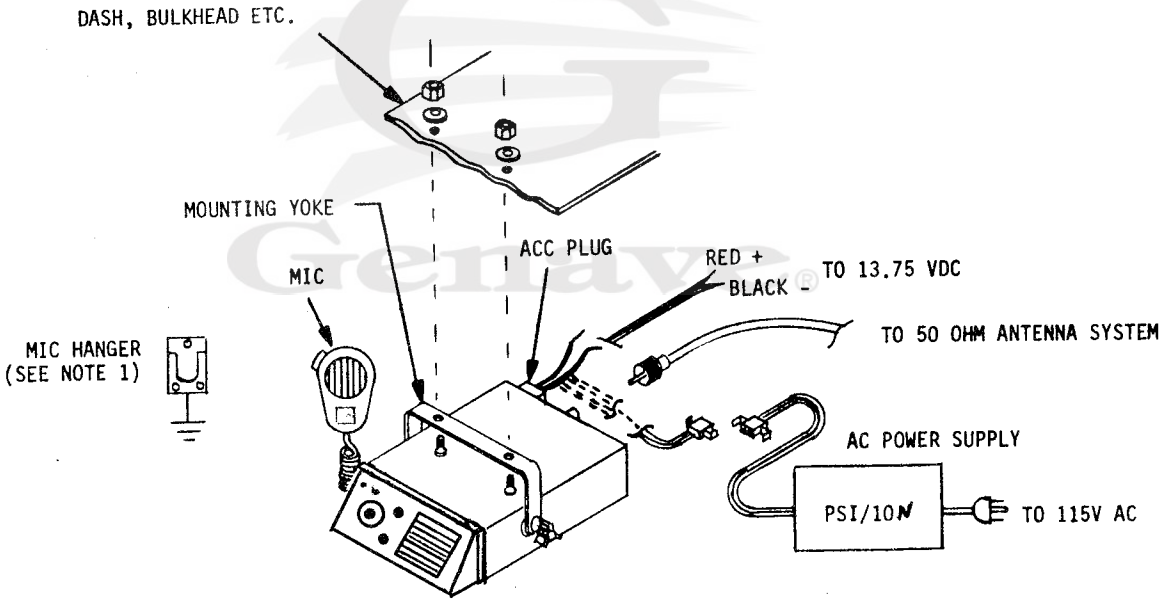
   Secure bracket in desired location, for either fixed or mobile operation, (under dash or shelf, on console or desktop, overhead, etc.) using appropriate screws or bolts through two holes provided in mounting bracket.

2. Connect RED and BLACK 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-10N; whereas, for mobile operation, the source may be a battery or the vehicle's 12V electrical system. This transceiver is designed to operate ONLY with a neg. ground.

   CAUTION: BE SURE to connect the RED power lead to +13.75 volts, and the BLACK lead to ground. If it is necessary to extend power leads use #14, or heavier gauge, insulated copper wire.

3. 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 trans-



NOTES

1 HANGER MUST BE CONNECTED TO CHASSIS GROUND WHEN USING TONE SQUELCH.

Figure 2-1. Typical Installation

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ceiver main PC board near the Ext. Speaker jack. Replace a blown fuse ONLY with a 3AG 10 amp. unit.

4. A "plug-in" microphone receptacle on left-hand side of GMT 1000 allows use of either a standard Genave hand microphone or a desk-style microphone interchangeably.

   A Genave G-21 telephone-type handset also can be connected to this mic. receptacle; however, if receiver audio is to be cut-off from speaker during two-way communications, or if subaudible-tone option is used, then a handset hanger with DPDT switching is required. Recommended Accessory Connector and mic. receptacle wiring changes are given in Section 2-9.

   NOTE: With subaudible-tone operation, the standard hand microphone provides "hang-up" receiver squelch by grounding the "squelch enable" line through the mic-mounting clip. Attach mounting clip to the desired mounting surface; then connect clip electrically to transceiver chassis ground. Lifting mic. from the clip disables tone squelch for monitoring purposes.

5. After any optional or custom wiring has been completed, replace transceiver in its mounting bracket, and tighten both thumbscrews, or install the mounting lock. See Sec. 2-7.

6. Connect a microphone or handset to transceiver, and insert 15-pin receptacle on mating rear-panel plug.

7. Install co-axial connector on antenna cable (refer to Section 2-6 below), and connect this cable to rear panel mounted antenna receptacle.

   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.

2-6. ANTENNA CONNECTOR ASSEMBLY

For maximum efficiency, the antenna should be fed with low-loss 50-ohm co-axial cable. The loss per 100 feet at 144 MHz is shown in Table 2-1 for several popular types of co-ax cable:

TABLE 2-1.

Cable Type	Impedance	dB Loss
RG58/A-AU	53-ohms	5.7 dB
RG58 Foam	50-ohms	4.1 dB
RG8/A-AU	52-ohms	2.5 dB
RG8 Foam	50-ohms	2.2 dB

The procedure for installing a PL-259 (83-1SP) antenna connector is dependent upon type co-axial cable used; the PL-259 is installed directly on 0.405" OD cable such as RG8/A, whereas, the plug requires an adapter when used with the 0.195" OD cable such as RG58/A. The procedures for both cable types are given below, and shown in Figure 2-2.

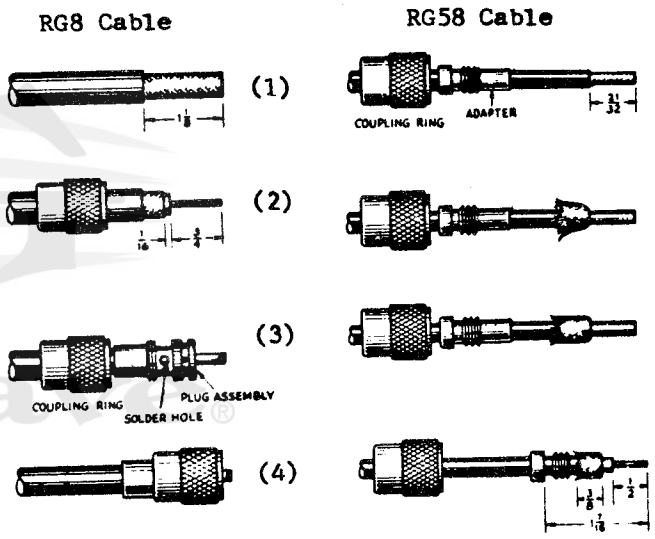

Figure 2-2. Connector Assembly

2-6-1. RG8 Cable Procedure

1. Trim end of cable flush; remove vinyl jacket from 1-1/8" of cable as shown in Figure 2-2(1). DO NOT nick braid.

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2. Bare 3/4" of center conductor. Trim braided shield 1/16" and tin. Slide coupling ring on cable. See Figure 2-2(2).

3. Screw plug assembly on cable; solder plug assembly to braid through solder holes; solder center conductor to plug assembly center pin.

4. Screw coupling ring on assembly.

2-6-2. RG58 Cable Procedure

1. Trim end of cable flush; remove vinyl jacket from 21/32" of cable as shown in Figure 2-2(1). DO NOT nick braid. Slide the coupling ring and adapter on cable.

2. Fan braid slightly and fold back over cable. See Figure 2-2(2).

3. Compress braid around cable, Figure 2-2(3), and position adapter to the dimension given in Figure 2-2(4). Press braid over adapter sleeve and trim to dimension shown.

4. Bare 1/2" of center conductor as shown --- do NOT nick conductor. Pre-tin exposed center conductor.

5. Screw plug assembly onto adapter sleeve, and solder the braid to plug assembly through solder holes. Next, solder center conductor to plug assembly center pin.

6. Screw coupling ring on plug assembly.

2-7. MOUNTING-LOCK INSTALLATION

If desired, the mounting lock can be used to secure transceiver to mounting bracket 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 thumbscrew 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 the two holes in vertical leg of 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 2-3.

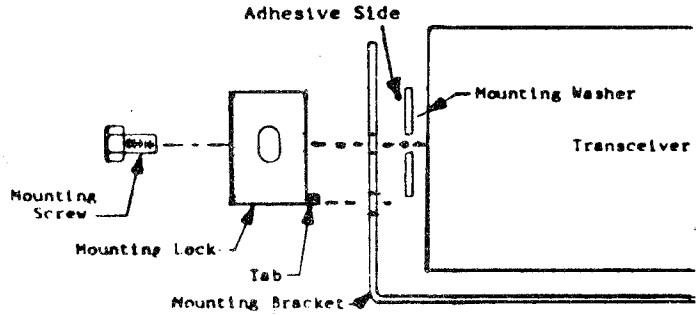

Figure 2-3. Mounting-Lock Installation

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

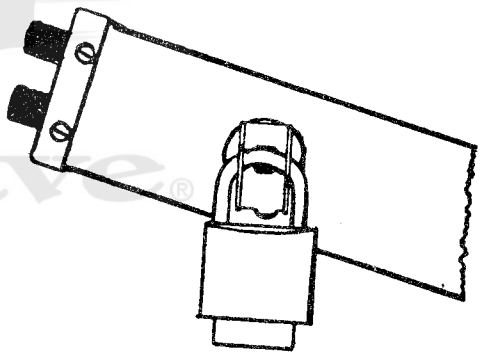

Figure 2-4. Lock Placement

2-8. PORTABLE OPERATION

1. The easiest method of portable operation is to utilize a Genave PSI-7NB Portable Power Pack. The PSI-7NB unit includes a rechargeable battery, an AC-powered charger, antenna connector, and carrying handle.

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

2-9. G-21 HANDSET INSTALLATION

The G-21 Telephone Handset has two basic advantages over the conventional hand microphone and speaker; it affords some privacy for incoming communications if used with a hanger switch to disable speaker when handset is picked up, and the handset earphone is easier to understand in a noisy location.

The following paragraphs detail modifications to GMT 1000 needed to install a handset with hanger switch and provisions for tone-squelch "enable."

2-9-1. Changes to GMT 1000 Wiring

1. Refer to drawing of GMT 1000 rear panel, shown in Figure 2-5 below.

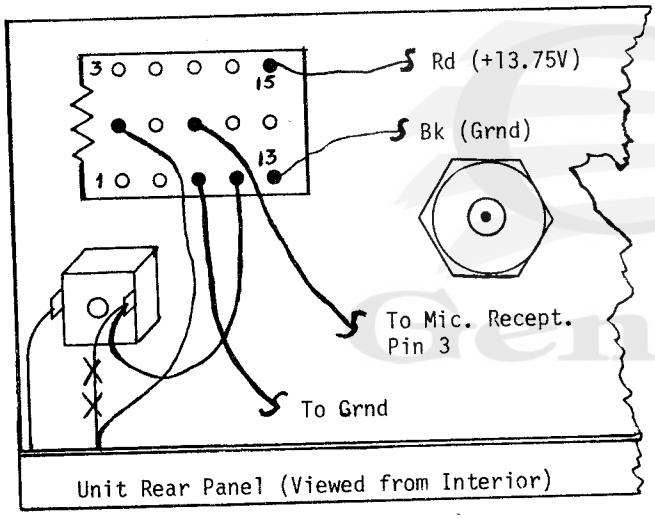

Figure 2-5. GMT 1000 Rear Panel

2. Locate and remove jumper which connects receiver audio from track on PC board to Ext. Speaker jack (jumper marked "XX" in Figure 2-5).

3. Select one of the four male pins supplied for use in rear-panel Accessory Connector. Solder pin to one end of 2" length of hook-up wire; solder remaining end of wire to PC board track from which jumper was removed in step 2. Insert pin into rear of Accessory Connector as pin 2 and carefully push pin until it is fully seated.

4. Solder another pin to a 2" length of hook-up wire; then solder other end of this wire to lug on Ext. Speaker jack from which jumper was removed in step 2. Insert pin into rear of Accessory Connector as pin 10, and push pin until it snaps into position.

5. Solder a male pin on a 3" length of hook-up wire; solder remaining end of wire to a good chassis ground. Insert pin into rear of Connector as pin 7, and push pin until it seats fully.

6. Prepare a 10" piece of hook-up wire. Solder a male pin to one end, and solder remaining end of wire to pin 3 of Mic. Receptacle in GMT 1000. Insert pin into rear of Accessory Connector as pin 8; push pin until it fully seats in connector.

7. This completes modification of GMT 1000 for use with handset. When the handset is lifted from its hanger, the hanger switch will cut-off audio from speaker, and also disable tone-squelch for monitoring purposes.

2-9-2. Handset-Hanger Connections

1. Pull mating, 15-pin receptacle from rear-panel Accessory Connector, if previously installed.

2. Refer to Figure 2-6, and connect a 4-wire cable to hanger switch as shown.

3. Solder a female connector pin (supplied) to the free end of each wire installed in step 2.

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4. Insert each pin into proper hole in rear of 15-pin Accessory receptacle; then, push each pin until it snaps into position.

5. Proceed with equipment installation, as given in Section 2-5 of this Manual.

NOTE: Figure 2-6 illustrates contact closure with handset ON hanger hook; pins 2 and 10 close speaker circuit, while pins 7 and 8 ground squelch "enable" wire.

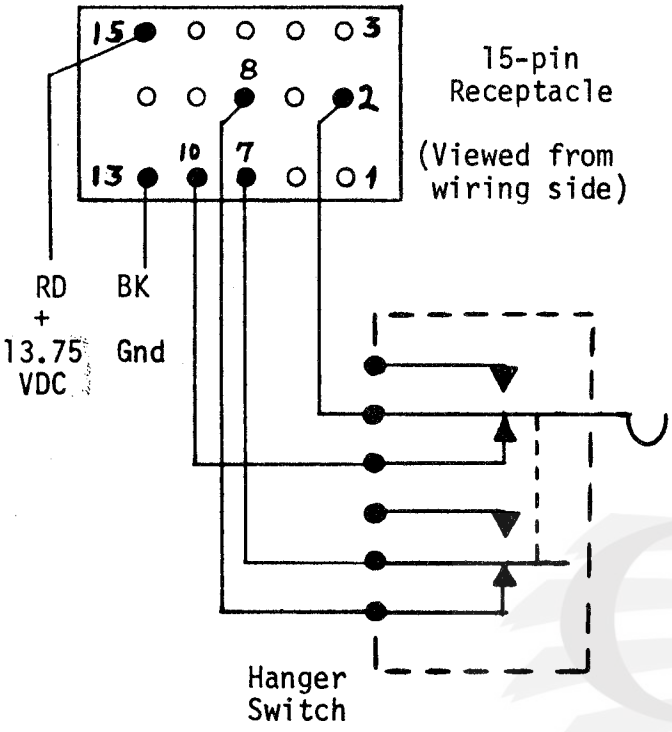

Figure 2-6. Hanger-Switch Wiring

2-10. MICROPHONE RECEPTACLE

The microphone receptacle is a 5 conductor jack (4 pins plus shell) mounted on left-side panel of the transceiver. 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. 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, the PTT line grounds, which energizes transmitter and switches antenna from receiver to transmitter.

PIN 3 - Tone-squelch enable connection. If transceiver is NOT equipped with CTCSS 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 Figures 2-5 and 2-6.

NOTE: If a handset hanger AND tone squelch are used with the GMT 1000 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 - This pin carries receiver audio output, but is used ONLY with a telephone-style handset. A 1.2K resistor is in series with the audio to pin 4 of the mic. receptacle. The value of the 1.2K resistor may be increased or decreased as desired to set maximum earphone volume.

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

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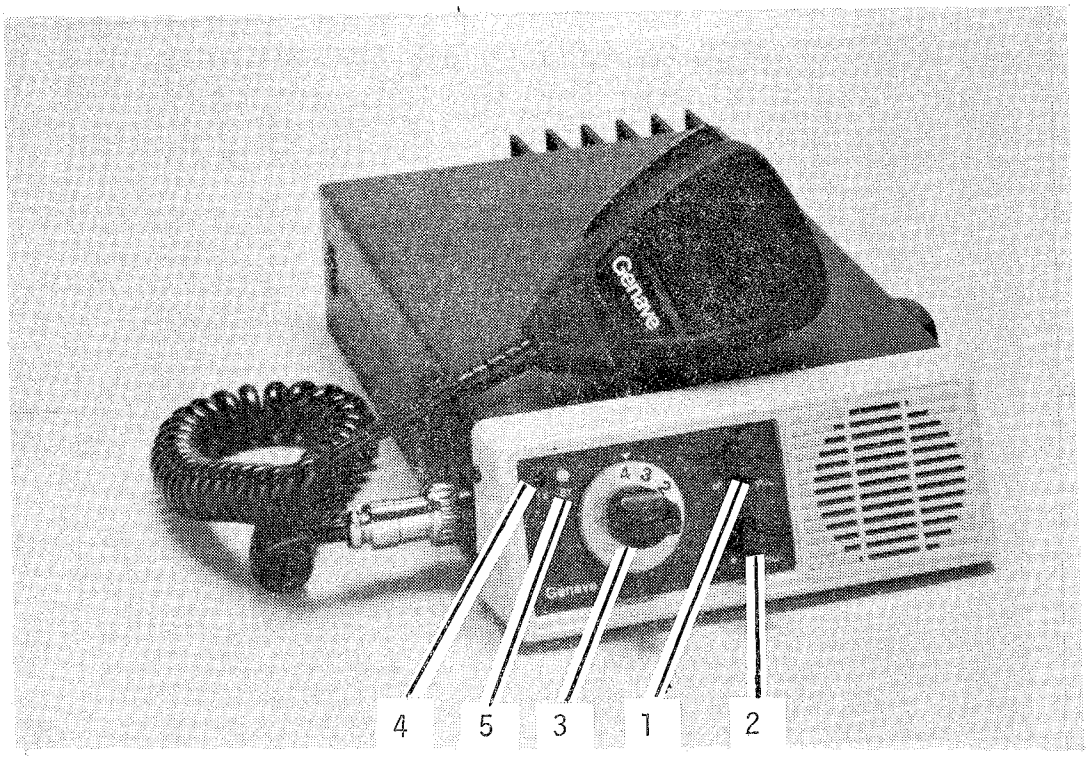
SECTION III

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. Volume control/On-Off switch
2. Squelch control
3. Channel-selector switch
4. RED Transmit-Indicator lamp
5. GREEN Busy-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 (#1) and SQUELCH (#2) controls fully counterclockwise.
2. Rotate CHANNEL-SELECTOR knob (#3) to desired operating channel.
3. Rotate VOLUME control clockwise until switch clicks; this turns ON transceiver power.
4. If transceiver is equipped with an SA-1, or equivalent subaudible-tone option, it is necessary to disable tone squelch by removing microphone from its hanger or, by depressing the MONITOR button on desk-style microphone.
5. Now, rotate VOLUME control clockwise to adjust receiver volume for desired level.
6. Turn SQUELCH control clockwise until background noise just disappears.

NOTE: DO NOT attempt to adjust the SQUELCH control if a signal is being received.

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7. If unit is equipped with subaudible tone squelch, it is important to monitor channel before transmitting to insure that channel is clear.

   The GMT 1000 transceiver contains a BUSY lamp which glows GREEN when selected channel is in use. This lamp turns OFF as soon as transmissions on the channel cease. In addition, the microphone circuitry is designed in such manner that rec. tone squelching is deactivated when microphone or handset is removed from its hanger, while the G-11 desk-style microphone is designed so the TRANSMIT button will NOT function unless the MONITOR switch has also been depressed. Thus, both aural and visual monitoring of the channel is provided.

8. To transmit, depress the microphone pushbutton. The TRANSMIT-INDICATOR lamp (#4) illuminates when transmitter is operating; then, hold the microphone one to two inches from your mouth, and talk in a normal voice.

9. Release the microphone pushbutton to listen.

NOTE: The carrier-squelch circuit, which is adjusted by front-panel control, quiets receiver in the absence of an incoming signal on the assigned operating frequency; however, any station in your vicinity, operating on this frequency, will be heard. With a tone-squelch system, however, only transmitted signals carrying the proper subaudible tone are heard, as explained previously.

3-3. OPERATING RANGE ESTIMATES

All VHF communications are basically limited to "line-of-sight" distances. The range to be expected with any particular system will depend primarily upon two factors: (1) Antenna heights, both at the transmitting station and at the receiving station and, (2) terrain between transmitting and receiving stations.

It is possible to generally predict operating range under average conditions. The following assume that the "Base" or "Repeater" antenna is located approx. 100 feet above average terrain, using low-loss coax cable and a high-gain antenna system. Average ground conductivity and normal urban noise conditions have been assumed.

A 2-watt handheld communicating directly with a 25-watt mobile can transmit approx. 2.8 miles to the mobile, but can receive the mobile for approx. 5.8 miles.

Two 25-watt mobile units can communicate directly for approximately 6.4 miles.

A 25-watt mobile communicating with a 90 watt base or repeater can transmit approx. 28 miles to the fixed station, but can receive the 90-watt station for approx. 30 miles.

3-4. LICENSING INFORMATION

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

Transmitter Input Power:	80 Watts
Transmitter Output Power:	40 Watts
Type of Unit:	Transceiver
Type Acceptance/Mod. No:	BJP9BQ GMT 1000
Frequency Range:	143.9 MHz to 173.4 MHz
Frequency Tolerance:	.0005%
Emission:	16F3
Approved under Rule Part Numbers:	22, 74, 81, 87. 90

Licensing requirements vary with the service for which this unit will be used; however, all services require that the station transmitter be licensed. Further, all transmitter adjustments or tests during or coincident with the installation, servicing or

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maintenance of a radio station, which may affect the proper operation of such station, shall be made by or under the immediate supervision and responsibility of a person holding a first or second-class commercial radio operator license, either radiotelephone or radiotelegraph, who shall be responsible for the proper functioning of the station equipment. Note, however, that in many services an unlicensed person, after having been authorized to do so by the station licensee, may operate from a control point a mobile, base, or fixed station, or from a dispatch point a base or fixed station, during the normal rendition of service. 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 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 1000 can be used, are listed below. Any of these volumes may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

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. To determine what form is required, contact nearest FCC Field Engineering Office as listed below ---- they will also supply the appropriate form.

3-4-1. F.C.C. Rule Part Numbers

Public Mobile Radio Services
F.C.C. Rules & Regulations, Volume VII, Part 22

- 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 Broadcast Stations

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

- Public Coast Stations
- Marine Utility Stations
- 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

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Private Land Mobile Radio Services
F.C.C. Rules & Regulations, Volume V, Part 90

Local government radio service	Subpart B
Police radio service	
Fire radio service	
Highway maintenance radio service	
Forestry-conservation radio service	
Medical services	Subpart C
Rescue organizations	
Veterinarians	
Disaster relief organizations	
School buses	
Beach patrols	
Paging operations	
Power radio service	Subpart D
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	
Motor carrier radio service	Subpart E
Railroad radio service	
Taxicab radio service	
Automobile emergency radio service	

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3-5. F.C.C FIELD ENGINEERING OFFICES (Engineer-In-Charge)

Anchorage District Office
1011 E. Tudor Road, Room 240,
P.O. Box 2955
Anchorage, Alaska 99510

Atlanta District Office
Room 440, Massell Building,
1365 Peachtreet Street, NE,
Atlanta, Georgia 30309

Baltimore District Office
1017 Federal Building,
31 Hopkins Plaza,
Baltimore, Maryland 21201

Beaumont Office
Jack Brooks Federal Building, Room 323
300 Willow Street,
Beaumont, Texas 77701

Boston District Office
1800 Customhouse,
165 State Street,
Boston, Massachusetts 02109

Buffalo District Office
1307 Federal Building
111 West Huron Street,
Buffalo, New York 14202

Chicago District Office
230 S. Dearborn Street, Room 3935,
Chicago, Illinois 60604

Cincinnati Office
3620 Winton Road,
Cincinnati, Ohio 45231

Dallas District Office
Earle Cabell Federal Building,
U.S. Courthouse, Room 13E7
1100 Commerce Strret,
Dallas, Texas 75242

Denver District Office
The Executive Tower, Room 2925
1405 Curtis Street,
Denver, Colorado 80202

Detroit District Office
1054 Federal Building,
231 W. LaFayette Street,
Detroit, Michigan 48226

Honolulu District Office
Prince Kuhio Federal Building,
300 Ala Moana Blvd., Room 7304,
P.O. Box 50223
Honolulu, Hawaii 96850

Houston District Office
New Federal Office Building,
515 Rusk Ave., Room 5636,
Houston, Texas 77002

Kansas City District Office
Brywood Office Tower, Room 320
8800 East 63rd Street,
Kansas City, Mossouri 64133

Long Beach District Office
3711 Long Beach Blvd., Room 501
Long Beach, California 90807

Miami District Office
51 S.W. First Ave., Room 919,
Miami, Florida 33130

New Orleans District Office
1007 F. Edward Hebert Federal Bldg.,
600 South Street,
New Orleans, Louisiana 70130

New York District Office
201 Varick Street,
New York, New York 10014

Norfolk District Office
Military Circle,
870 N. Military Highway,
Norfolk, Virginia 23502

Philadelphia District Office
1 Oxford Valley Office Bldg., Room 404
2300 E. Lincoln Highway
Langhorne, Pennsylvania 19047

Pittsburgh Office
3755 William Penn Highway,
Monroeville, Pennsylvania 15146

Portland District Office
1782 Federal Building
1220 S.W. Third Avenue,
Portland, Oregon 97204

St. Paul District Office
691 Federal Bldg., & U.S. Courthouse,
316 North Robert Street,
St. Paul, Minnesota 55101

San Diego Office
7840 El Cajon Blvd., Room 405,
La Mesa, California 92041

San Francisco District Office
323-A Customhouse,
555 Battery Street,
San Francisco, California 94111

San Juan District Office
747 Federal Building,
Hato Rey, Puerto Rico 00918

Savannah Office
238 Post Office Bldg. and Courthouse
P.O. Box 8004 (125 Bull Street)
Savannah, Georgia 31412

Seattle District Office
3256 Federal Building,
915 Second Avenue,
Seattle, Washington 98174

Tampa Office
ADP Building, Room 601,
1211 N. Westshore Blvd.,
Tampa, Florida 33607

Washington District Office
6525 Belcrest Road, Room 901-B
P.O. Box 1789,
Hyattsville, Maryland 20788

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SECTION IV
MAINTENANCE MANUAL

4-1. INTRODUCTION

The Genave GMT 1000 is a fully synthesized VHF-FM transceiver, utilizing a single quartz crystal and a state-of-the-art CMOS synthesizer to provide receiver injection voltage and transmitter drive for the desired operating frequency(ies). The unit is capable of transmitting and receiving frequency modulated (16F3) radio signals in the frequency range 143.9 to 173.4 MHz.

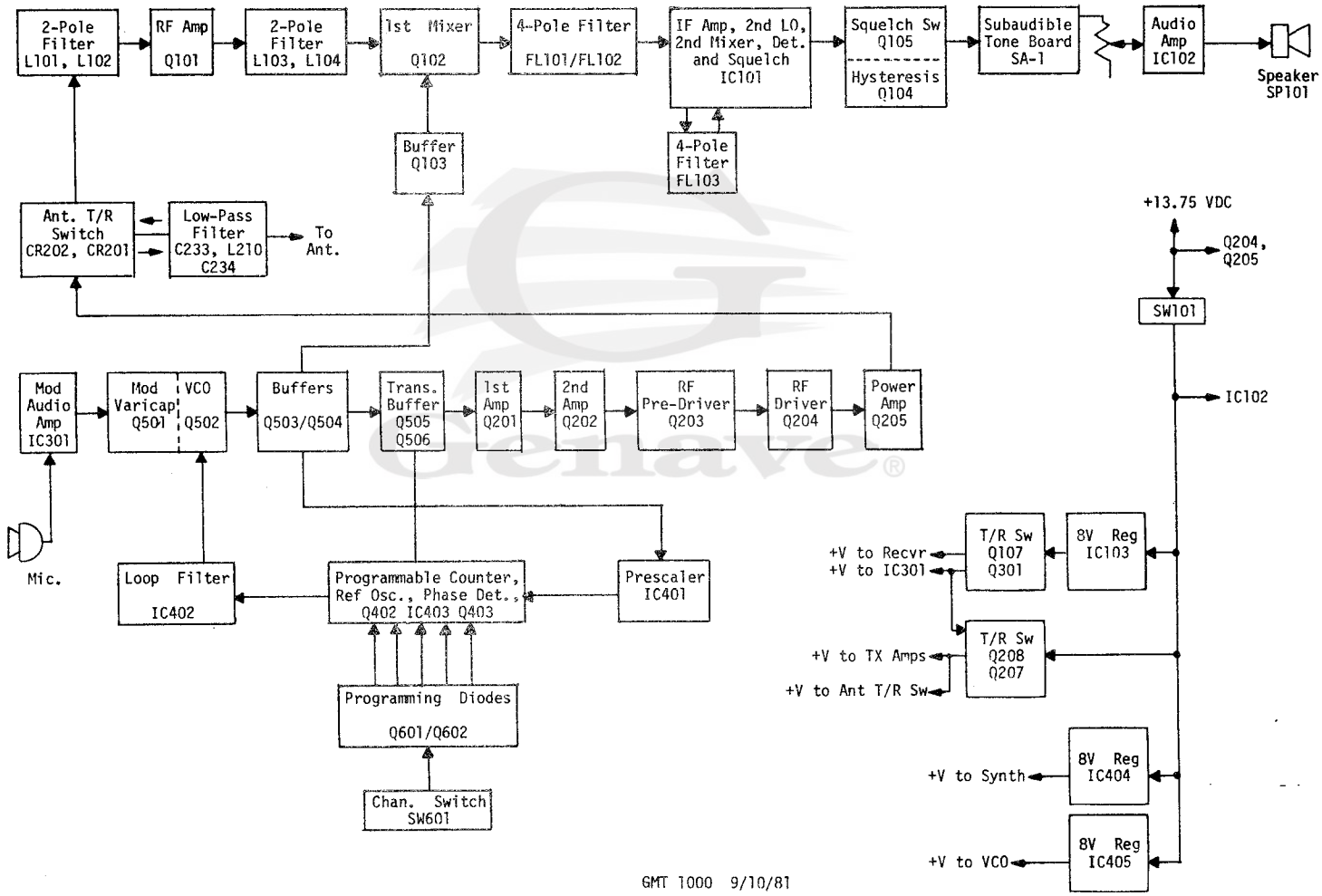
In conjunction with the following circuit description, refer to the block diagram of Figure 4-1, and to transceiver schematic in this Section of the GMT 1000 Maintenance Manual.

4-2. THEORY OF OPERATION - GENERAL

4-2-1. Power Supply and Regulators

+13.75 VDC primary power for the GMT 1000 is applied to the unit through rear-panel plug P101 and fuse F101. "Unswitched" primary voltage is applied directly to transmitter-driver Q204, and to output-stage Q205.

An On-Off switch, SW101, supplies 13.75 VDC "switched" to the following circuitry: dial backlight, CR110; transmit indicator, CR204; a busy lamp, CR105; audio output, IC102; 8.5 V regulator, IC103; out-of-lock lamp, CR601 on Programming Board; Synthesizer Board crys-



GMT 1000 9/10/81

Figure 4-1. Block Diagram

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tal heater, Q401 and 8-volt regulators, IC404 and IC405.

R139 and R140 program integrated chip IC103 for a regulated output of approximately 8.5 V. In the "receive" mode, a solid-state T/R switch, Q107, applies this regulated voltage to all receiver stages, except the output amplifier. In "transmit" mode, the T/R switch removes this DC supply from receiver stages and applies it to the transmitter modulator audio amplifier.

Two 3-terminal adjustable regulators are located on the Synthesizer Board: IC404 and IC405. R427 and R428 adjust output of regulator IC404 to approximately 8 volts for use by prescaler IC-401 and Synthesizer chip IC403. R429 and R430 program regulator IC405 for an output of approximately 8.5 VDC for use by VCO stages and loop filter IC402.

4-2-2. Solid-State Voltage Switching

The solid-state, T/R-switching circuitry, controlled by the mic. push-to-talk switch, performs two basic functions in the GMT 1000: It switches DC voltages to the appropriate receiver or transmitter circuitry, and it switches the antenna from receiver input to transmitter output.

In "receive" mode, the push-to-talk line is "high," and biases Q107 ON, but turns Q301 OFF. This energizes the receiver stages as given in Section 4-2-1 above. Depressing the microphone button grounds push-to-talk line; thus, Q107 turns OFF which removes DC voltage from all receiver stages except the output amplifier. At the same time, Q301 turns ON and applies operating voltage to the modulator audio amplifier, IC301, and to base of Q207. Q207 biases the pass-transistor, Q208, into conduction; thus applying voltage to transmitter buffer Q505, amplifier stages Q201, Q202, pre-driver Q203, and PIN diodes CR201 and CR202.

4-2-3. T/R Antenna Switch

The solid-state, transmit/receive antenna-switching circuit consists of a 1/4 wave "lumped-constant" line (C236, C237, and L211), in addition to CR201, CR202, L209, R216 and R217.

A short applied to the far end of a 1/4 wave line reflects high-impedance at the near end, whereas an open circuit at far end of line reflects a low impedance (short) at near end of quarter-wave line.

In "transmit" mode, the microphone button grounds push-to-talk (PTT) line. As explained above, Q208 turns ON; thereby forward biasing PIN diodes CR201 and CR202 through R216/R217, L209 and Z203. CR201 now presents a "low-impedance" path for the transmitter RF from the output stage to C231 and the low-pass filter. CR202 shorts receiver RF-input line to ground, and reflects "high impedance" to transmitter signal at input of quarter-wave line. Therefore, the receiver input is protected from the high-power transmitter.

When in "receive" mode, the PTT line is "high"; thus Q301, Q207, and Q208 turn OFF. This removes forward bias from CR-201 and CR202 so that each becomes an "open" circuit. CR201 effectively disconnects the transmitter from antenna and low-pass filter, and CR202 no longer shorts receiver input to ground.

4-3. THEORY OF OPERATION - SYNTHESIZER

The Frequency Synthesizer generates all frequencies required for operation of the GMT 1000 transmitter and receiver sections.

4-3-1. VCO

JFET Q502 functions as a VCO (voltage-controlled oscillator) which produces the VHF signal for the synthesizer. The

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buffer/amplifiers, Q503 and Q504, amplify the signal before applying it to the prescaler and receiver mixer circuitry.

Q501 further amplifies the signal before routing it to transmitter buffer Q201. Q506 disables Q505 when the synthesizer goes "out-of-lock." Q501 functions as the "modulating varicap" in transmit mode.

4-3-2. Prescaler IC401

The prescaler IC divides signal from the VCO by 40 before the signal is applied to synthesizer chip IC403.

4-3-3. Synthesizer Chip IC403

Synthesizer chip IC403 contains reference oscillator, counters, phase detector, and out-of-lock detector.

The counters divide the signal further, depending upon the binary information supplied by the diode matrix on the Programming Board.

The reference oscillator uses a 10.240 MHz crystal which is temperature controlled when the ambient temperature drops below approximately 0°C. At this temperature, thermistor R416 biases Q-401 ON and the resulting collector current heats R417 and R418 to warm the 10.24 MHz crystal.

The 10.24 MHz signal is divided by 2048 to give a 5 kHz reference signal for the phase detector.

The phase detector compares the reference signal with output from the counters and supplies a signal, based on the difference between the 5 kHz reference signal and counter output, to loop filter IC402.

4-3-4. Loop Filter IC402

IC402 and associated components form a loop filter, which removes all 5 kHz signal components from the phase detector output. The resulting, variable DC voltage is applied to the VCO varicap.

CR501, to lock signal on the frequency determined by binary information from the diode matrix on Programming Board.

4-3-5. Out-of-Lock Detector

Darlington amplifier, Q402, amplifies and inverts the out-of-lock signal from pin 28 of IC403. An out-of-lock condition turns Q403 "ON"; this, in turn, grounds the cathode of out-of-lock LED CR601, on the Programming Board, causing it to glow. At the same time, Q506 on the VCO Board turns "OFF," which opens emitter lead of transmit buffer Q505 and disables the transmitter.

4-3-6. Programming Board

The programming board consists of a diode matrix, two transistor switches, and associated components. Eight groups of diodes supply the binary information for four "receive" channels and four "transmit" channels. Each installed channel, whether transmit or receive, consists of 15 lines of binary information, each line of which may be either "high" or "low," as determined by diode installation.

In "receive" mode, the push-to-talk (PTT) line is "high"; therefore, Q601 turns ON and effectively grounds arm of channel-switch SW601A. This, in turn, applies a ground (low) to the "receive" channel line selected by SW601A. Thus, a diode connected from the channel line to a binary information line will apply a "low" to the binary line and thence to the counter chain. Binary lines not connected to the channel line by diodes remain "high."

In "transmit" mode, the push-to-talk line, goes "low," and Q601 turns OFF. This turns Q602 ON, and effectively grounds arm of channel-switch SW601B. This applies a ground (low) to the "transmit" channel line selected by SW-601B. Therefore, a diode connected from the channel line to a binary information line applies a "low" to the binary line and thence to the counter chain. The binary lines not grounded through diodes and the channel-switch remain "high."

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4-4. THEORY OF OPERATION - RECEIVER

4-4-1. Low-Pass Filter

From antenna connector J201, the received signal is applied to a low-pass filter comprised of C233, L210, and C-234. In the "receive" mode, after the incoming signal leaves the low-pass filter, C231 couples signal to the receiver input filter through the lumped-constant quarter-wave line (C237, L211, and C236) which is part of the T/R antenna switching circuitry.

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

4-4-2. Input Filter and RF Amplifier

The receiver input filter consists of a double-tuned circuit, L101, C102, C103, C104 and L102, with the output tap on L102 coupled to gate 1 of the dual-gate MOSFET RF amplifier, Q101. The RF amplifier output is applied to another double-tuned circuit comprised of L103, C110, C111, C112, and L104. The output tap on L104 routes the amplified signal to a JFET first mixer.

4-4-3. First Mixer Injection

C114 couples mixer injection signal to base of common-emitter amplifier, Q103, which amplifies the signal and isolates synthesizer circuitry from the receiver mixer. The mixer utilizes low-side injection; therefore, C118 and L106 tune output of Q103 to 10.7 MHz BELOW the desired "receive" frequency. The output tap on L106 routes injection signal through C119 to source of 1st mixer, Q-102.

4-4-4. First Mixer and 4-Pole Filter

Q102 is a JFET, common-source mixer with incoming signal connected to its gate, and the injection signal applied across source-resistor, R106. A JFET mixer offers greater immunity to cross-modulation and overload than a bipolar mixer, even though conversion gain is less.

The 10.7 MHz difference signal, produced in the 1st mixer, appears across T101 which couples the signal to a 4-pole monolithic crystal filter, consisting of FL101, FL102 and C121. T102 transformer couples the filter output to input of IC101.

4-4-5. 2nd LO, Mixer, Limiter, Detector and Squelch

IC101 is a multi-function integrated circuit, which includes the 2nd local oscillator, 2nd mixer, limiting 2nd IF amplifier, quadrature discriminator, active filter, and squelch mute in a single chip.

Y101, C123, and C124, together with IC-101 pins 1, 2, and 4, form an internally biased Colpitts-type oscillator. The collector, base, and emitter connections are at pins 4, 1, and 2 respectively. Low-side injection is used; therefore, the crystal frequency is 10.245 MHz (455 kHz BELOW the 10.7 MHz IF).

The 10.7 MHz IF signal is applied to the 2nd mixer through pins 18 and 15 of IC101. The 2nd LO also drives the 2nd mixer, which then provides a 455 kHz IF signal on pin 3 of IC101. Ceramic filter FL103 then couples IF signal to the input of a five-stage limiter at pin 5 of IC101. Quadrature-coil T103 tunes the FM-detector circuitry through pin 8 of IC101.

The recovered audio appears on pin 10 of IC101. From there the audio signal is applied to a de-emphasis network consisting of R120 and C139; then, the signal is routed through R123 and C140 to base of an emitter-follower, squelch switch Q105. The audio signal developed across emitter resistor R125 is applied through coupling capacitor C144 to pin 4 (audio input) on the SA-1 subaudible-tone board (if used).

In addition to squelch switch Q105, the squelch circuitry consists of squelch hysteresis transistor, Q104, and noise voltage-doubling detectors CR103 and CR104 with their associated components.

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The detected audio from IC101 also appears at input (pin 12) of a bandpass active filter, consisting of an internal op-amp and external components R-118, C134, and C135. The noise output of this filter, on pin 13, varies widely between signal and no-signal conditions, and drives a voltage-doubling detector (C132, C131, CR103, CR104, and R112) which detects noise signals ABOVE normal voice frequencies. The detector output is applied to IC101 pin 14. A positive voltage (high) on pin 14 will cause pin 16 to be "low" (no signal condition); whereas, a low at IC101 pin 14 will cause pin 16 to be "high" (input signal condition). Thus, receiver background noise provides an easy method to squelch receiver, as well as controlling other receiver functions.

For example a signal, which exceeds the receiver-sensitivity threshold, reduces receiver noise so that noise detector applies a "low" to IC101 pin 14. This pulls pin 16 "high" and places positive bias on bases of Busy-Lamp driver Q106, Squelch Switch Q105, and Squelch Hysteresis transistor Q104. When the incoming signal disappears, noise in the receiver again increases which causes IC101 pin 14 to become "high;" then, pin 16 is pulled "low" which turns OFF Q106, Q105, and Q104 -- thereby silencing receiver and turning OFF Busy Lamp.

With base of Driver Q106 approximately 0.6V positive, the driver turns ON and effectively grounds cathode of the Busy LED, CR105, through current-limiting resistor R131. Thus, the Busy Lamp will glow while a signal is being received.

With no incoming signal, the base-to-emitter junction of Squelch Switch, Q-105, is back-biased by R126 and emitter resistor R125. This opens the audio path between IC101 and the audio circuitry. When an incoming signal makes base of Q105 positive, Q105 turns ON and the detected audio from IC101 now appears across R125. C144 couples this signal to the audio circuitry, while blocking DC voltage.

To prevent "jitter" when an incoming signal is near the squelch threshold, Q104 provides hysteresis for squelch circuitry. An incoming signal causes base of Q104 to become positive by approximately 0.6V, as explained above. The collector of Q104 then pulls down which effectively parallels R128 across the front-panel squelch control, R129. This causes the squelch to open more easily and reduces tendency to pop in and out. When the incoming signal is removed, Q104 turns OFF and R128 is no longer connected across R129; therefore the squelch opening point is raised slightly.

4-4-6. SA-1 Subaudible-Tone Board

P103 and P104 are male plugs which provide a means of mounting and connecting an optional subaudible-tone encoder/decoder board, such as the Genave SA-1, in the transceiver. If a tone-board is NOT used, a jumper board or jumper wire must be installed to complete audio circuitry between pin 4 of P103 (audio in) and pin 6 of P104 (audio out). Refer to SA-1 Service Manual for theory and maintenance information.

4-4-7. Audio Output

The output audio amplifier consists of IC102 and associated components. P104 pin 6 routes audio signal to volume control, R132, which applies a portion of the signal to input of IC102 through wave-shaping components C146, C147, C-148 and R133.

R135, R136, and C154 form a feedback loop to improve amplifier linearity. Audio output from pin 4 of IC102 is applied through C153 either to an external speaker connected to J102, or via J102 to internal speaker, SP101. R134 routes audio signal to pin 4 of mic. connector, J301, for use with a telephone style handset, if desired. C152 prevents any tendency for IC102 to oscillate.

Pin 2 of IC102 is connected through CR-106 to the push-to-talk line; thus, the audio output is "shut-down" during time microphone is keyed to prevent hum or [illegible] from speaker while transmitting.

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4-5. THEORY OF OPERATION - TRANSMITTER

4-5-1. Modulator Audio Amplifier

The modulator audio amplifier in the transceiver is built around a single integrated-circuit chip, IC301. This IC is a dual operational amplifier, and is shown on the schematic as IC301A and IC301B.

Audio output of the ceramic microphone is amplified by IC301A - a 6 dB per octave rising characteristic is given to the audio frequencies by loading the 1500 pF microphone capacitance with bias resistor R302. CR301 and CR302 provide the clipping function required for limiting modulation, by clipping audio voltages which exceed the voltage determined by resistive divider R306, R305, and R307.

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. R313 and C311 add a third pole to the filter, which gives the required -18 dB per octave rolloff above 3 kHz. R314 controls audio level applied to the modulator varicap Q501.

4-5-2. Buffer Amplifiers

Q201 and Q202 are NPN, silicon, RF transistors which amplify the synthesizer output, as well as providing isolation between the transmitter power stages and the synthesizer.

4-5-3. RF Predriver

C207 routes the 143.9 to 173.4 MHz output from final buffer Q202 to the base of Q203, which is the first RF power amplifier. This Class C stage increases the RF signal from 50 milliwatts to approximately 500 milliwatts at its output. A filter network formed by L202, C210, C211 and L203 couples this output to the following driver stage, filters any undesired spurious responses, and matches impedance of Q203 to the driver stage.

4-5-4. RF Driver

Q204 and associated circuitry function as a Class C RF driver.

L205, C217 and C218 form a frequency-selective matching network, which also reduces any undesired outputs from the driver stage.

4-5-5. Final Power Amplifier

Q205 functions as the final power amplifier, and develops 40 watts of RF-output power when full drive is applied from Q204. L207, C226 and C227 comprise a resonant matching network which matches the output of Q205 to the 52-ohm antenna impedance.

C228, L208, C229, C233, L210, and C234 make up an eliptic-function filter which reduces level of all spurious outputs to less than -13 dBm.

4-6. DISASSEMBLY

Prior to performing any service work on the instrument, the aluminum top cover must be removed. If synthesizer adjustments are required, or if it is necessary to gain access to bottom-side of main PC board, the bottom cover must also be removed.

4-6-1. Cover Removal

1) To remove either cover, remove two 4/40 x 3/8" pan-head screws which secure each side of cover to the transceiver chassis.

2) Slide cover toward rear of unit, and lift it from transceiver.

4-6-2. SA-1 Tone-Board Removal

1) To remove SA-1 Encoder/Decoder PC board, grasp PC board by its edges and carefully pull upward, while rocking board slightly, until it disengages from connecting pins attached to unit main board.

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4-6-3. Programming Board Removal

1) Locate 10-pin socket which connects Programming Board to Channel Switch. Disconnect socket by carefully pulling it toward front panel until socket clears the mating plug.

2) Remove one Phillips-head screw located near center of Programming Board, between "A" and "B" counter diodes.

3) Grasp edges of Board and gently lift it from mating socket on the Synthesizer Board (refer to Figure 4-2).

4-6-4. VCO Board Removal

1) First, remove the three phono-type plugs from their mating sockets on the VCO shield.

2) Remove seven 4/40 slotted, pan-head screws which retain VCO board to Synthesizer Board (see GMT 1000 top view in Figure 4-4).

3) Grasp VCO unit adjacent to its phono sockets, and carefully lift upward on VCO until it clears the six connecting pins.

4-6-5. Synthesizer Board Removal

1) If VCO Board and Programming Board have been removed from Synthesizer previously, it is only necessary to remove two #4/40 pan-head machine screws which secure left-hand side of Synthesizer Board to transceiver main board.

2) Then, carefully lift upward on the Synthesizer Board until it clears the four male pins which provide electrical connections to GMT 1000 circuitry.

4-6-6. Synthesizer/VCO Removal As A Single Unit

Unless repairs are to be made to VCO, there is no advantage in removing VCO from the Synthesizer Board; thus, they may be removed from the GMT 1000 as a single unit, as follows:

1) Remove Programming Board as given in Section 4-6-3 above.

2) Remove four #4/40 pan-head machine screws from VCO board (one at each corner of VCO shield).

3) Remove two #4/40 pan-head screws which secure left-hand side of Synthesizer Board to transceiver Main Board.

4) Carefully lift upward on Synthesizer/VCO assembly until it clears the four connector pins on Main Board.

4-6-7. Front-Panel Removal

1) Remove four Phillips-head, self-tapping screws (two on each side) which secure plastic front-panel to transceiver siderails.

2) Carefully pull front-panel forward until it separates from siderails.

Removing front-panel from transceiver provides access to the speaker, or to the control panel.

CAUTION: Use care not to break the squelch, volume control, or frequency selector wires.

4-6-8. Control-Panel Removal

With front-panel removed from GMT 1000, the Control-Panel can be easily removed from front-panel for service.

1) If not already disconnected, disconnect Channel Switch 10-pin connector from Programming Board by pulling socket toward front of the transceiver.

2) Remove Volume, Squelch, and Channel Switch knobs. These knobs simply slide off the controls; however, they fit very snugly and care must be used NOT to damage

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the switch or controls.

3) Remove three self-tapping screws which secure Control-Panel to the plastic front-panel.

4) Pull control-panel board from rear of front-panel.

4-7. GMT 1000 PROGRAMMING INSTRUCTIONS

IMPORTANT NOTICE: If GMT 1000 was ORDERED WITHOUT SPECIFYING OPERATING FREQUENCIES, you must first program the radio for your specific frequencies BEFORE IT WILL WORK. The radio was factory aligned for 151.625 MHz, and the Programming Board in transceiver has all diodes installed, but not cut, in TX channel 1 and RX channel 1 as explained in NOTE following step 7 of the Programming Instructions.

To program unit initially, to change or add frequencies, follow the programming data given in following pages.

NOTE: This programming MUST BE done by or under the immediate supervision and responsibility of a person holding a first- or second-class (General) radiotelephone operator license, who shall be responsible for the proper functioning of the station equipment.

An internally-mounted, diode-matrix PC board provides a simple method of programming the desired frequencies by installing or removing diodes in proper BINARY positions on matrix board. Each of the four channels can be setup for either simplex or semi-duplex operation; however, the 2-MHz maximum channel separation for receive frequencies, as well as the 2-MHz maximum separation for transmit frequencies, must be observed.

To program the transceiver for desired frequency(ies) proceed as follows:

1) Determine TRANSMIT and RECEIVE frequencies to be installed in each channel.

2) Remove aluminum covers from the unit as given in Section 4-6-1 to gain access to Programming Board and Synthesizer adjustments.

3) Remove Programming Board as given in Section 4-6-3 of this manual.

4) Place Programming Board on a suitable work area, and provide a small-tipped, low-wattage soldering iron, as well as a quantity of 1N4148 silicon diodes. Depending upon the frequency, as many as 28 diodes can be required for each channel.

5) Using the TRANSMIT/RECEIVE frequencies for channel 1, as determined in step 1 above, refer to Programming Table 4-1 (Transmit Frequencies) and Table 4-2 (Receive Frequencies). The MHz steps are set by the "B" counter and the kHz steps are set by the "A" counter. Refer to example - step 6.

NOTE: In the Tables, "0" indicates that a diode is installed from the specified BINARY line (1 thru 6, or 1 thru 9) to desired CHANNEL line (1, 2, 3 or 4 -- TX or RX). "X" indicates diode is NOT USED from that binary line to Channel line for the specific frequency. See Figure 4-2.

6) The following example shows diode-matrix programming for a semi-duplex operation on channel 4. 158.490 MHz is the TX frequency, whereas the RX frequency is 152.030 MHz.

Now, refer to Table 4-1 "B COUNTER." Look down the "Frequency" column for 158.490 -- it falls on the line between 158.400 and 158.595 MHz. This line shows diodes are needed on 2, 3, 4, 7, 8 and 9 BINARY lines to the CHANNEL 4 TX line.

Refer to Table 4-1 "A COUNTER." Look down the "kHz Frequency" columns for 490; this line shows diodes must be used on 1, 3, 4, and 6 BINARY lines to the CHANNEL 4 TX line.

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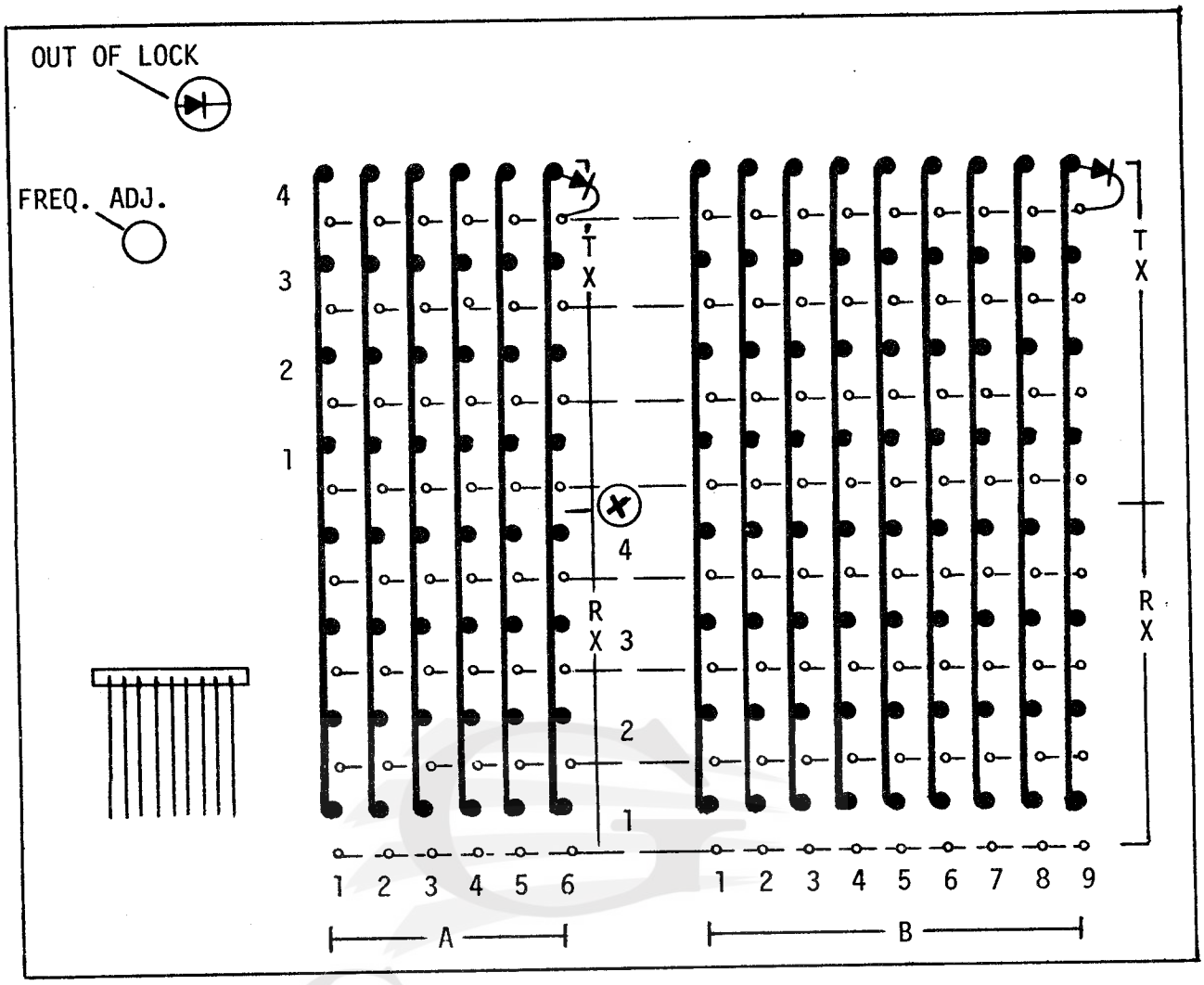

Figure 4-2. GMT 1000 Programming Board. Solid lines are BINARY information, and are located on top-side of PC board. The dashed lines are CHANNEL lines located on bottom-side of Programming Board. Two sample diodes are shown installed in Channel 4 TX, to illustrate correct polarity installation. The Phillips-head retaining screw is located near center of PC board, between "A" and "B" counter diodes.

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Now refer to Table 4-2 "B COUNTER." Look down the "Frequency" column for 152.030 -- it falls on the line between 151.900 and 152.095 MHz. This line shows diodes are needed on 1, 4, 5, 6, 7 and 9 BINARY lines to the CHANNEL 4 RX line.

Refer to Table 4-2 "A COUNTER." Look down the "kHz Frequency" columns for 030; this line shows diodes must be used on 1, 4 and 6 BINARY lines to the CHANNEL 4 RX line. See Fig. 4-3.

NOTE: All diodes MUST BE installed with same polarity; that is, ANODE connected to proper BINARY line, and CATHODE connected to desired CHANNEL line, as shown in Figure 4-3. All diodes are installed on TOP-SIDE of Programming Board, with solder connections on BOTTOM-SIDE.

7) Use diode-location data for channel 1, obtained from step 5) above, and install diodes as needed; see NOTE, below:

NOTE: Depending upon whether or not frequencies were specified in unit order, all 15 diodes may already be installed in TX channel 1, and in RX channel 1. In this event, it is only necessary to clip leads of unneeded diodes. Clip lead a short distance from diode body; then bend leads so they DO NOT touch. Thus if channel 1 programming is changed, it is only necessary to bend lead back into position and reconnect to diode with a drop of solder.

8) Repeat steps 5) and 7) for channels 2, 3, and 4 (if used).

9) After all channels have been programmed, and the diode installations double-checked, carefully plug Programming Board into socket on Synthesizer Board. Replace Phillips-head screw removed in step 3), and reconnect 10-pin socket to mating plug.

10) If semi-duplex channels have been programmed, in which RECEIVE frequency is 2 MHz or MORE below the TRANSMIT frequency, change C503 on VCO board from 6.8 pF to 10 pF. Remove VCO board per Section 4-6-4.

With a value of 6.8 pF for C503, channels may be programmed for simplex or for semi-duplex, if RECEIVE frequency is LESS than 2 MHz BELOW TRANSMIT frequency.

11) Adjust VCO tuning as explained in Section 4-8-1 of this manual.

12) If new frequencies vary 2 MHz or more from the original alignment frequencies, it may be necessary to "touch-up" receiver and/or transmitter tuning, as given in Sections 4-9 and/or 4-10 of this Manual.

13) Check the receiver sensitivity and transmitter power for each channel installed in unit. When transceiver meets specs., turn unit OFF, remove all test equipment, and replace top and bottom covers.

4-7-1. Programming Tables

The following pages contain the Frequency Programming Tables for the GMT 1000:

Table 4-1 contains MHz and kHz TRANSMIT frequency programming (140.0 - 173.4 MHz).

Table 4-2 contains MHz and kHz RECEIVE frequency programming (140.0 - 173.4 MHz).

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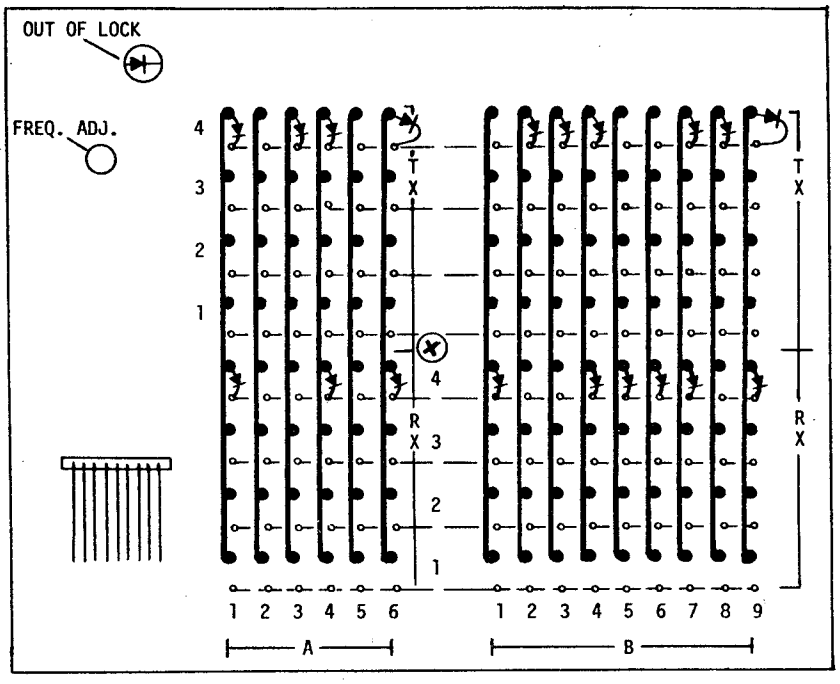

Figure 4-3. Programming Board set-up on channel 4 for 158.490 TX and 152.030 RX

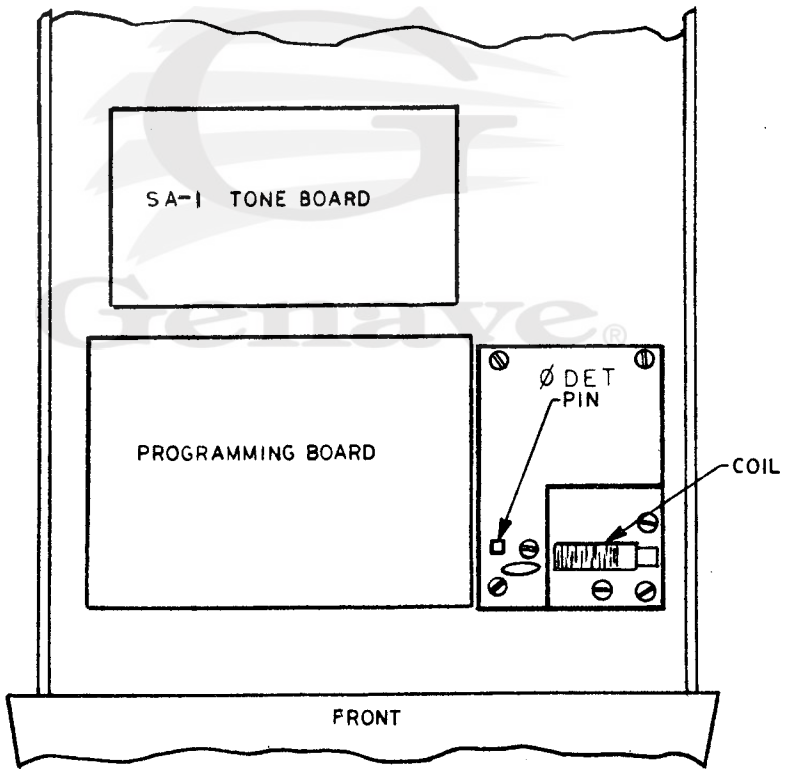

Figure 4-4. GMT 1000 Top View, test points and adjustments.

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TABLE 4-1 TRANSMIT FREQUENCY PROGRAMMING

TX Frequency; MHz	"B" Counter; Binary Lines								
	1	2	3	4	5	6	7	8	9
140.000 - 140.195	0	X	0	X	X	X	X	0	0
140.200 - 140.395	0	X	0	X	X	X	X	0	X
140.400 - 140.595	0	X	0	X	X	X	X	X	0
140.600 - 140.795	0	X	0	X	X	X	X	X	X
140.800 - 140.995	0	X	X	0	0	0	0	0	0
141.000 - 141.195	0	X	X	0	0	0	0	0	X
141.200 - 141.395	0	X	X	0	0	0	0	X	0
141.400 - 141.595	0	X	X	0	0	0	0	X	X
141.600 - 141.795	0	X	X	0	0	0	X	0	0
141.800 - 141.995	0	X	X	0	0	0	X	0	X
142.000 - 142.195	0	X	X	0	0	0	X	X	0
142.200 - 142.395	0	X	X	0	0	0	X	X	X
142.400 - 142.595	0	X	X	0	0	X	0	0	0
142.600 - 142.795	0	X	X	0	0	X	0	0	X
142.800 - 142.995	0	X	X	0	0	X	0	X	0
143.000 - 143.195	0	X	X	0	0	X	0	X	X
143.200 - 143.395	0	X	X	0	0	X	X	0	0
143.400 - 143.595	0	X	X	0	0	X	X	0	X
143.600 - 143.795	0	X	X	0	0	X	X	X	0
143.800 - 143.995	0	X	X	0	0	X	X	X	X
144.000 - 144.195	0	X	X	0	X	0	0	0	0
144.200 - 144.395	0	X	X	0	X	0	0	0	X
144.400 - 144.595	0	X	X	0	X	0	0	X	0
144.600 - 144.795	0	X	X	0	X	0	0	X	X
144.800 - 144.995	0	X	X	0	X	0	X	0	0
145.000 - 145.195	0	X	X	0	X	0	X	0	X
145.200 - 145.395	0	X	X	0	X	0	X	X	0
145.400 - 145.595	0	X	X	0	X	0	X	X	X
145.600 - 145.795	0	X	X	0	X	X	0	0	0
145.800 - 145.995	0	X	X	0	X	X	0	0	X
146.000 - 146.195	0	X	X	0	X	X	0	X	0
146.200 - 146.395	0	X	X	0	X	X	0	X	X
146.400 - 146.595	0	X	X	0	X	X	X	0	0
146.600 - 146.795	0	X	X	0	X	X	X	0	X
146.800 - 146.995	0	X	X	0	X	X	X	X	0
147.000 - 147.195	0	X	X	0	X	X	X	X	X
147.200 - 147.395	0	X	X	X	0	0	0	0	0
147.400 - 147.595	0	X	X	X	0	0	0	0	X
147.600 - 147.795	0	X	X	X	0	0	0	X	0
147.800 - 147.995	0	X	X	X	0	0	0	X	X
148.000 - 148.195	0	X	X	X	0	0	X	0	0
148.200 - 148.395	0	X	X	X	0	0	X	0	X
148.400 - 148.595	0	X	X	X	0	0	X	X	0
148.600 - 148.795	0	X	X	X	0	0	X	X	X
148.800 - 148.995	0	X	X	X	0	X	0	0	0
149.000 - 149.195	0	X	X	X	0	X	0	0	X
149.200 - 149.395	0	X	X	X	0	X	0	X	0
149.400 - 149.595	0	X	X	X	0	X	0	X	X
149.600 - 149.995	0	X	X	X	0	X	X	0	0
149.800 - 149.995	0	X	X	X	0	X	X	0	X

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TX Frequency; MHz	"B" Counter; Binary Lines								
	1	2	3	4	5	6	7	8	9
150.000 - 150.195	0	X	X	X	0	X	X	X	0
150.200 - 150.395	0	X	X	X	0	X	X	X	X
150.400 - 150.595	0	X	X	X	X	0	0	0	0
150.600 - 150.795	0	X	X	X	X	0	0	0	X
150.800 - 150.995	0	X	X	X	X	0	0	X	0
151.000 - 151.195	0	X	X	X	X	0	0	X	X
151.200 - 151.395	0	X	X	X	X	0	X	0	0
151.400 - 151.595	0	X	X	X	X	0	X	0	X
151.600 - 151.795	0	X	X	X	X	0	X	X	0
151.800 - 151.995	0	X	X	X	X	0	X	X	X
152.000 - 152.195	0	X	X	X	X	X	0	0	0
152.200 - 152.395	0	X	X	X	X	X	0	0	X
152.400 - 152.595	0	X	X	X	X	X	0	X	0
152.600 - 152.795	0	X	X	X	X	X	0	X	X
152.800 - 152.995	0	X	X	X	X	X	X	0	0
153.000 - 153.195	0	X	X	X	X	X	X	0	X
153.200 - 153.395	0	X	X	X	X	X	X	X	0
153.400 - 153.595	0	X	X	X	X	X	X	X	X
153.600 - 153.795	X	0	0	0	0	0	0	0	0
153.800 - 153.995	X	0	0	0	0	0	0	0	X
154.000 - 154.195	X	0	0	0	0	0	0	X	0
154.200 - 154.395	X	0	0	0	0	0	0	X	X
154.400 - 154.595	X	0	0	0	0	0	X	0	0
154.600 - 154.795	X	0	0	0	0	0	X	0	X
154.800 - 154.995	X	0	0	0	0	0	X	X	0
155.000 - 155.195	X	0	0	0	0	0	X	X	X
155.200 - 155.395	X	0	0	0	0	X	0	0	0
155.400 - 155.595	X	0	0	0	0	X	0	0	X
155.600 - 155.795	X	0	0	0	0	X	0	X	0
155.800 - 155.995	X	0	0	0	0	X	0	X	X
156.000 - 156.195	X	0	0	0	0	X	X	0	0
156.200 - 156.395	X	0	0	0	0	X	X	0	X
156.400 - 156.595	X	0	0	0	0	X	X	X	0
156.600 - 156.795	X	0	0	0	0	X	X	X	X
156.800 - 156.995	X	0	0	0	X	0	0	0	0
157.000 - 157.195	X	0	0	0	X	0	0	0	X
157.200 - 157.395	X	0	0	0	X	0	0	X	0
157.400 - 157.595	X	0	0	0	X	0	0	X	X
157.600 - 157.795	X	0	0	0	X	0	X	0	0
157.800 - 157.995	X	0	0	0	X	0	X	0	X
158.000 - 158.195	X	0	0	0	X	0	X	X	0
158.200 - 158.395	X	0	0	0	X	0	X	X	X
158.400 - 158.595	X	0	0	0	X	X	0	0	0
158.600 - 158.795	X	0	0	0	X	X	0	0	X
158.800 - 158.995	X	0	0	0	X	X	0	X	0
159.000 - 159.195	X	0	0	0	X	X	0	X	X
159.200 - 159.395	X	0	0	0	X	X	X	0	0
159.400 - 159.595	X	0	0	0	X	X	X	0	X
159.600 - 159.795	X	0	0	0	X	X	X	X	0
159.800 - 159.995	X	0	0	0	X	X	X	X	X

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TX Frequency; MHz	"B" Counter; Binary Lines								
	1	2	3	4	5	6	7	8	9
160.000 - 160.195	X	0	0	X	0	0	0	0	0
160.200 - 160.395	X	0	0	X	0	0	0	0	X
160.400 - 160.595	X	0	0	X	0	0	0	X	0
160.600 - 160.795	X	0	0	X	0	0	0	X	X
160.800 - 160.995	X	0	0	X	0	0	X	0	0
161.000 - 161.195	X	0	0	X	0	0	X	0	X
161.200 - 161.395	X	0	0	X	0	0	X	X	0
161.400 - 161.595	X	0	0	X	0	0	X	X	X
161.600 - 161.795	X	0	0	X	0	X	0	0	0
161.800 - 161.995	X	0	0	X	0	X	0	0	X
162.000 - 162.195	X	0	0	X	0	X	0	X	0
162.200 - 162.395	X	0	0	X	0	X	0	X	X
162.400 - 162.595	X	0	0	X	0	X	X	0	0
162.600 - 162.795	X	0	0	X	0	X	X	0	X
162.800 - 162.995	X	0	0	X	0	X	X	X	0
163.000 - 163.195	X	0	0	X	0	X	X	X	X
163.200 - 163.395	X	0	0	X	X	0	0	0	0
163.400 - 163.595	X	0	0	X	X	0	0	0	X
163.600 - 163.795	X	0	0	X	X	0	0	X	0
163.800 - 163.995	X	0	0	X	X	0	0	X	X
164.000 - 164.195	X	0	0	X	X	0	X	0	0
164.200 - 164.395	X	0	0	X	X	0	X	0	X
164.400 - 164.595	X	0	0	X	X	0	X	X	0
164.600 - 164.795	X	0	0	X	X	0	X	X	X
164.800 - 164.995	X	0	0	X	X	X	0	0	0
165.000 - 165.195	X	0	0	X	X	X	0	0	X
165.200 - 165.395	X	0	0	X	X	X	0	X	0
165.400 - 165.595	X	0	0	X	X	X	0	X	X
165.600 - 165.795	X	0	0	X	X	X	X	0	0
165.800 - 165.995	X	0	0	X	X	X	X	0	X
166.000 - 166.195	X	0	0	X	X	X	X	X	0
166.200 - 166.395	X	0	0	X	X	X	X	X	X
166.400 - 166.595	X	0	X	0	0	0	0	0	0
166.600 - 166.795	X	0	X	0	0	0	0	0	X
166.800 - 166.995	X	0	X	0	0	0	0	X	0
167.000 - 167.195	X	0	X	0	0	0	0	X	X
167.200 - 167.395	X	0	X	0	0	0	X	0	0
167.400 - 167.595	X	0	X	0	0	0	X	0	X
167.600 - 167.795	X	0	X	0	0	0	X	X	0
167.800 - 167.995	X	0	X	0	0	0	X	X	X
168.000 - 168.195	X	0	X	0	0	X	0	0	0
168.200 - 168.395	X	0	X	0	0	X	0	0	X
168.400 - 168.595	X	0	X	0	0	X	0	X	0
168.600 - 168.795	X	0	X	0	0	X	0	X	X
168.800 - 168.995	X	0	X	0	0	X	X	0	0
169.000 - 169.195	X	0	X	0	0	X	X	0	X
169.200 - 169.395	X	0	X	0	0	X	X	X	0
169.400 - 169.595	X	0	X	0	0	X	X	X	X
169.600 - 169.795	X	0	X	0	X	0	0	0	0
169.800 - 169.995	X	0	X	0	X	0	0	0	X

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TABLE 4-1. TRANSMIT FREQUENCY PROGRAMMING

TX Frequency; MHz	"B" Counter; Binary Lines								
	1	2	3	4	5	6	7	8	9
170.000 - 170.195	X	0	X	0	X	0	0	X	0
170.200 - 170.395	X	0	X	0	X	0	0	X	X
170.400 - 170.595	X	0	X	0	X	0	X	0	0
170.600 - 170.795	X	0	X	0	X	0	X	0	X
170.800 - 170.995	X	0	X	0	X	0	X	X	0
171.000 - 171.195	X	0	X	0	X	0	X	X	X
171.200 - 171.395	X	0	X	0	X	X	0	0	0
171.400 - 171.595	X	0	X	0	X	X	0	0	X
171.600 - 171.795	X	0	X	0	X	X	0	X	0
171.800 - 171.995	X	0	X	0	X	X	0	X	X
172.000 - 172.195	X	0	X	0	X	X	X	0	0
172.200 - 172.395	X	0	X	0	X	X	X	0	X
172.400 - 172.595	X	0	X	0	X	X	X	X	0
172.600 - 172.795	X	0	X	0	X	X	X	X	X
172.800 - 172.995	X	0	X	X	0	0	0	0	0
173.000 - 173.195	X	0	X	X	0	0	0	0	X
173.200 - 173.395	X	0	X	X	0	0	0	X	0
173.400	X	0	X	X	0	0	0	X	X

See following page for kHz frequencies

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TABLE 4-1. TRANSMIT FREQUENCY PROGRAMMING

TX Frequency; kHz					"A" Counter; Binary Lines					
					1	2	3	4	5	6
000	200	400	600	800	0	0	0	0	0	0
005	205	405	605	805	0	0	0	0	0	X
010	210	410	610	810	0	0	0	0	X	0
015	215	415	615	815	0	0	0	0	X	X
020	220	420	620	820	0	0	0	X	0	0
025	225	425	625	825	0	0	0	X	0	X
030	230	430	630	830	0	0	0	X	X	0
035	235	435	635	835	0	0	0	X	X	X
040	240	440	640	840	0	0	X	0	0	0
045	245	445	645	845	0	0	X	0	0	X
050	250	450	650	850	0	0	X	0	X	0
055	255	455	655	855	0	0	X	0	X	X
060	260	460	660	860	0	0	X	X	0	0
065	265	465	665	865	0	0	X	X	0	X
070	270	470	670	870	0	0	X	X	X	0
075	275	475	675	875	0	0	X	X	X	X
080	280	480	680	880	0	X	0	0	0	0
085	285	485	685	885	0	X	0	0	0	X
090	290	490	690	890	0	X	0	0	X	0
095	295	495	695	895	0	X	0	0	X	X
100	300	500	700	900	0	X	0	X	0	0
105	305	505	705	905	0	X	0	X	0	X
110	310	510	710	910	0	X	0	X	X	0
115	315	515	715	915	0	X	0	X	X	X
120	320	520	720	920	0	X	X	0	0	0
125	325	525	725	925	0	X	X	0	0	X
130	330	530	730	930	0	X	X	0	X	0
135	335	535	735	935	0	X	X	0	X	X
140	340	540	740	940	0	X	X	X	0	0
145	345	545	745	945	0	X	X	X	0	X
150	350	550	750	950	0	X	X	X	X	0
155	355	555	755	955	0	X	X	X	X	X
160	360	560	760	960	X	0	0	0	0	0
165	365	565	765	965	X	0	0	0	0	X
170	370	570	770	970	X	0	0	0	X	0
175	375	575	775	975	X	0	0	0	X	X
180	380	580	780	980	X	0	0	X	0	0
185	385	585	785	985	X	0	0	X	0	X
190	390	590	790	990	X	0	0	X	X	0
195	395	595	795	995	X	0	0	X	X	X

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TABLE 4-2. RECEIVE FREQUENCY PROGRAMMING

RX Frequency; MHz	"B" Counter; Binary Lines								
	1	2	3	4	5	6	7	8	9
140.000 - 140.095	0	X	0	0	0	0	X	X	0
140.100 - 140.295	0	X	0	0	0	0	X	X	X
140.300 - 140.495	0	X	0	0	0	X	0	0	0
140.500 - 140.695	0	X	0	0	0	X	0	0	X
140.700 - 140.895	0	X	0	0	0	X	0	X	0
140.900 - 141.095	0	X	0	0	0	X	0	X	X
141.000 - 141.295	0	X	0	0	0	X	X	0	0
141.300 - 141.495	0	X	0	0	0	X	X	0	X
141.500 - 141.695	0	X	0	0	0	X	X	X	0
141.700 - 141.895	0	X	0	0	0	X	X	X	X
141.900 - 142.095	0	X	0	0	X	0	0	0	0
142.100 - 142.295	0	X	0	0	X	0	0	0	X
142.300 - 142.495	0	X	0	0	X	0	0	X	0
142.500 - 142.695	0	X	0	0	X	0	0	X	X
142.700 - 142.895	0	X	0	0	X	0	X	0	0
142.900 - 143.095	0	X	0	0	X	0	X	0	X
143.100 - 143.295	0	X	0	0	X	0	X	X	0
143.300 - 143.495	0	X	0	0	X	0	X	X	X
143.500 - 143.695	0	X	0	0	X	X	0	0	0
143.700 - 143.895	0	X	0	0	X	X	0	0	X
143.900 - 144.095	0	X	0	0	X	X	0	X	0
144.100 - 144.295	0	X	0	0	X	X	0	X	X
144.300 - 144.495	0	X	0	0	X	X	X	0	0
144.500 - 144.695	0	X	0	0	X	X	X	0	X
144.700 - 144.895	0	X	0	0	X	X	X	X	0
144.900 - 145.095	0	X	0	0	X	X	X	X	X
145.100 - 145.295	0	X	0	X	0	0	0	0	0
145.300 - 145.495	0	X	0	X	0	0	0	0	X
145.500 - 145.695	0	X	0	X	0	0	0	X	0
145.700 - 145.895	0	X	0	X	0	0	0	X	X
145.900 - 146.095	0	X	0	X	0	0	X	0	0
146.100 - 146.295	0	X	0	X	0	0	X	0	X
146.300 - 146.495	0	X	0	X	0	0	X	X	0
146.500 - 146.695	0	X	0	X	0	0	X	X	X
146.700 - 146.895	0	X	0	X	0	X	0	0	0
146.900 - 147.095	0	X	0	X	0	X	0	0	X
147.100 - 147.295	0	X	0	X	0	X	0	X	0
147.300 - 147.495	0	X	0	X	0	X	0	X	X
147.500 - 147.695	0	X	0	X	0	X	X	0	0
147.700 - 147.895	0	X	0	X	0	X	X	0	X
147.900 - 148.095	0	X	0	X	0	X	X	X	0
148.100 - 148.295	0	X	0	X	0	X	X	X	X
148.300 - 148.495	0	X	0	X	X	0	0	0	0
148.500 - 148.695	0	X	0	X	X	0	0	0	X
148.700 - 148.895	0	X	0	X	X	0	0	X	0
148.900 - 149.095	0	X	0	X	X	0	0	X	X
149.100 - 149.295	0	X	0	X	X	0	X	0	0
149.300 - 149.495	0	X	0	X	X	0	X	0	X
149.500 - 149.695	0	X	0	X	X	0	X	X	0
149.700 - 149.895	0	X	0	X	X	0	X	X	X
149.900 - 150.095	0	X	0	X	X	X	0	0	0

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TABLE 4-2. RECEIVE FREQUENCY PROGRAMMING

RX Frequency; MHz	"B" Counter; Binary Lines								
	1	2	3	4	5	6	7	8	9
150.000 - 150.095	0	X	0	X	X	X	0	0	0
150.100 - 150.295	0	X	0	X	X	X	0	0	X
150.300 - 150.495	0	X	0	X	X	X	0	X	0
150.500 - 150.695	0	X	0	X	X	X	0	X	X
150.700 - 150.895	0	X	0	X	X	X	X	0	0
150.900 - 151.095	0	X	0	X	X	X	X	0	X
151.100 - 151.295	0	X	0	X	X	X	X	X	0
151.300 - 151.495	0	X	0	X	X	X	X	X	X
151.500 - 151.695	0	X	X	0	0	0	0	0	0
151.700 - 151.895	0	X	X	0	0	0	0	0	X
151.900 - 152.095	0	X	X	0	0	0	0	X	0
152.100 - 152.295	0	X	X	0	0	0	0	X	X
152.300 - 152.495	0	X	X	0	0	0	X	0	0
152.500 - 152.695	0	X	X	0	0	0	X	0	X
152.700 - 152.895	0	X	X	0	0	0	X	X	0
152.900 - 153.095	0	X	X	0	0	0	X	X	X
153.100 - 153.295	0	X	X	0	0	X	0	0	0
153.300 - 153.495	0	X	X	0	0	X	0	0	X
153.500 - 153.695	0	X	X	0	0	X	0	X	0
153.700 - 153.895	0	X	X	0	0	X	0	X	X
153.900 - 154.095	0	X	X	0	0	X	X	0	0
154.100 - 154.295	0	X	X	0	0	X	X	0	X
154.300 - 154.495	0	X	X	0	0	X	X	X	0
154.500 - 154.695	0	X	X	0	0	X	X	X	X
154.700 - 154.895	0	X	X	0	X	0	0	0	0
154.900 - 155.095	0	X	X	0	X	0	0	0	X
155.100 - 155.295	0	X	X	0	X	0	0	X	0
155.300 - 155.495	0	X	X	0	X	0	0	X	X
155.500 - 155.695	0	X	X	0	X	0	X	0	0
155.700 - 155.895	0	X	X	0	X	0	X	0	X
155.900 - 156.095	0	X	X	0	X	0	X	X	0
156.100 - 156.295	0	X	X	0	X	0	X	X	X
156.300 - 156.495	0	X	X	0	X	X	0	0	0
156.500 - 156.695	0	X	X	0	X	X	0	0	X
156.700 - 156.895	0	X	X	0	X	X	0	X	0
156.900 - 157.095	0	X	X	0	X	X	0	X	X
157.100 - 157.295	0	X	X	0	X	X	X	0	0
157.300 - 157.495	0	X	X	0	X	X	X	0	X
157.500 - 157.695	0	X	X	0	X	X	X	X	0
157.700 - 157.895	0	X	X	0	X	X	X	X	X
157.900 - 158.095	0	X	X	X	0	0	0	0	0
158.100 - 158.295	0	X	X	X	0	0	0	0	X
158.300 - 158.495	0	X	X	X	0	0	0	X	0
158.500 - 158.695	0	X	X	X	0	0	0	X	X
158.700 - 158.895	0	X	X	X	0	0	X	0	0
158.900 - 159.095	0	X	X	X	0	0	X	0	X
159.100 - 159.295	0	X	X	X	0	0	X	X	0
159.300 - 159.495	0	X	X	X	0	0	X	X	X
159.500 - 159.695	0	X	X	X	0	X	0	0	0
159.700 - 159.895	0	X	X	X	0	X	0	0	X
159.900 - 160.095	0	X	X	X	0	X	0	X	0

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TABLE 4-2. RECEIVE FREQUENCY PROGRAMMING

RX Frequency; MHz	"B" Counter; Binary Lines								
	1	2	3	4	5	6	7	8	9
160.100 - 160.295	0	X	X	X	0	X	0	X	X
160.300 - 160.495	0	X	X	X	0	X	X	0	0
160.500 - 160.695	0	X	X	X	0	X	X	0	X
160.700 - 160.895	0	X	X	X	0	X	X	X	0
160.900 - 161.095	0	X	X	X	0	X	X	X	X
161.100 - 161.295	0	X	X	X	X	0	0	0	0
161.300 - 161.495	0	X	X	X	X	0	0	0	X
161.500 - 161.695	0	X	X	X	X	0	0	X	0
161.700 - 161.895	0	X	X	X	X	0	0	X	X
161.900 - 162.095	0	X	X	X	X	0	X	0	0
162.100 - 162.295	0	X	X	X	X	0	X	0	X
162.300 - 162.495	0	X	X	X	X	0	X	X	0
162.500 - 162.695	0	X	X	X	X	0	X	X	X
162.700 - 162.895	0	X	X	X	X	X	0	0	0
162.900 - 163.095	0	X	X	X	X	X	0	0	X
163.100 - 163.295	0	X	X	X	X	X	0	X	0
163.300 - 163.495	0	X	X	X	X	X	0	X	X
163.500 - 163.695	0	X	X	X	X	X	X	0	0
163.700 - 163.895	0	X	X	X	X	X	X	0	X
163.900 - 164.095	0	X	X	X	X	X	X	X	0
164.100 - 164.295	0	X	X	X	X	X	X	X	X
164.300 - 164.495	X	0	0	0	0	0	0	0	0
164.500 - 164.695	X	0	0	0	0	0	0	0	X
164.700 - 164.895	X	0	0	0	0	0	0	X	0
164.900 - 165.095	X	0	0	0	0	0	0	X	X
165.100 - 165.295	X	0	0	0	0	0	X	0	0
165.300 - 165.495	X	0	0	0	0	0	X	0	X
165.500 - 165.695	X	0	0	0	0	0	X	X	0
165.700 - 165.895	X	0	0	0	0	0	X	X	X
165.900 - 166.095	X	0	0	0	0	X	0	0	0
166.100 - 166.295	X	0	0	0	0	X	0	0	X
166.300 - 166.495	X	0	0	0	0	X	0	X	0
166.500 - 166.695	X	0	0	0	0	X	0	X	X
166.700 - 166.895	X	0	0	0	0	X	X	0	0
166.900 - 167.095	X	0	0	0	0	X	X	0	X
167.100 - 167.295	X	0	0	0	0	X	X	X	0
167.300 - 167.495	X	0	0	0	0	X	X	X	X
167.500 - 167.695	X	0	0	0	X	0	0	0	0
167.700 - 167.895	X	0	0	0	X	0	0	0	X
167.900 - 168.095	X	0	0	0	X	0	0	X	0
168.100 - 168.295	X	0	0	0	X	0	0	X	X
168.300 - 168.495	X	0	0	0	X	0	X	0	0
168.500 - 168.695	X	0	0	0	X	0	X	0	X
168.700 - 168.895	X	0	0	0	X	0	X	X	0
168.900 - 169.095	X	0	0	0	X	0	X	X	X
169.100 - 169.295	X	0	0	0	X	X	0	0	0
169.300 - 169.495	X	0	0	0	X	X	0	0	X
169.500 - 169.695	X	0	0	0	X	X	0	X	0
169.700 - 169.895	X	0	0	0	X	X	0	X	X
169.900 - 170.095	X	0	0	0	X	X	X	0	0

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TABLE 4-2. RECEIVE FREQUENCY PROGRAMMING

RX Frequency; MHz	"B" Counter; Binary Lines								
	1	2	3	4	5	6	7	8	9
170.100 - 170.295	X	0	0	0	X	X	X	0	X
170.300 - 170.495	X	0	0	0	X	X	X	X	0
170.500 - 170.695	X	0	0	0	X	X	X	X	X
170.700 - 170.895	X	0	0	X	0	0	0	0	0
170.900 - 171.095	X	0	0	X	0	0	0	0	X
171.100 - 171.295	X	0	0	X	0	0	0	0	X
171.300 - 171.495	X	0	0	X	0	0	0	X	0
171.500 - 171.695	X	0	0	X	0	0	0	X	X
171.700 - 171.895	X	0	0	X	0	0	X	0	0
171.900 - 172.095	X	0	0	X	0	0	X	0	X
172.100 - 172.295	X	0	0	X	0	0	X	X	0
172.300 - 172.495	X	0	0	X	0	0	X	X	X
172.500 - 172.695	X	0	0	X	0	X	0	0	0
172.700 - 172.895	X	0	0	X	0	X	0	0	X
172.900 - 173.095	X	0	0	X	0	X	0	X	0
173.100 - 173.295	X	0	0	X	0	X	0	X	X
173.300 - 173.400	X	0	0	X	0	X	X	0	0

See following page for kHz frequencies

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TABLE 4-2. RECEIVE FREQUENCY PROGRAMMING

RX Frequency; kHz					"A" Counter; Binary Lines					
					1	2	3	4	5	6
000	200	400	600	800	0	X	0	X	0	0
005	205	405	605	805	0	X	0	X	0	X
010	210	410	610	810	0	X	0	X	X	0
015	215	415	615	815	0	X	0	X	X	X
020	220	420	620	820	0	X	X	0	0	0
025	225	425	625	825	0	X	X	0	0	X
030	230	430	630	830	0	X	X	0	X	0
035	235	435	635	835	0	X	X	0	X	X
040	240	440	640	840	0	X	X	X	0	0
045	245	445	645	845	0	X	X	X	0	X
050	250	450	650	850	0	X	X	X	X	0
055	255	455	655	855	0	X	X	X	X	X
060	260	460	660	860	X	0	0	0	0	0
065	265	465	665	865	X	0	0	0	0	X
070	270	470	670	870	X	0	0	0	X	0
075	275	475	675	875	X	0	0	0	X	X
080	280	480	680	880	X	0	0	X	0	0
085	285	485	685	885	X	0	0	X	0	X
090	290	490	690	890	X	0	0	X	X	0
095	295	495	695	895	X	0	0	X	X	X
100	300	500	700	900	0	0	0	0	0	0
105	305	505	705	905	0	0	0	0	0	X
110	310	510	710	910	0	0	0	0	X	0
115	315	515	715	915	0	0	0	0	X	X
120	320	520	720	920	0	0	0	X	0	0
125	325	525	725	925	0	0	0	X	0	X
130	330	530	730	930	0	0	0	X	X	0
135	335	535	735	935	0	0	0	X	X	X
140	340	540	740	940	0	0	X	0	0	0
145	345	545	745	945	0	0	X	0	0	X
150	350	550	750	950	0	0	X	0	X	0
155	355	555	755	955	0	0	X	0	X	X
160	360	560	760	960	0	0	X	X	0	0
165	365	565	765	965	0	0	X	X	0	X
170	370	570	770	970	0	0	X	X	X	0
175	375	575	775	975	0	0	X	X	X	X
180	380	580	780	980	0	X	0	0	0	0
185	385	585	785	985	0	X	0	0	0	X
190	390	590	790	990	0	X	0	0	X	0
195	395	595	795	995	0	X	0	0	X	X

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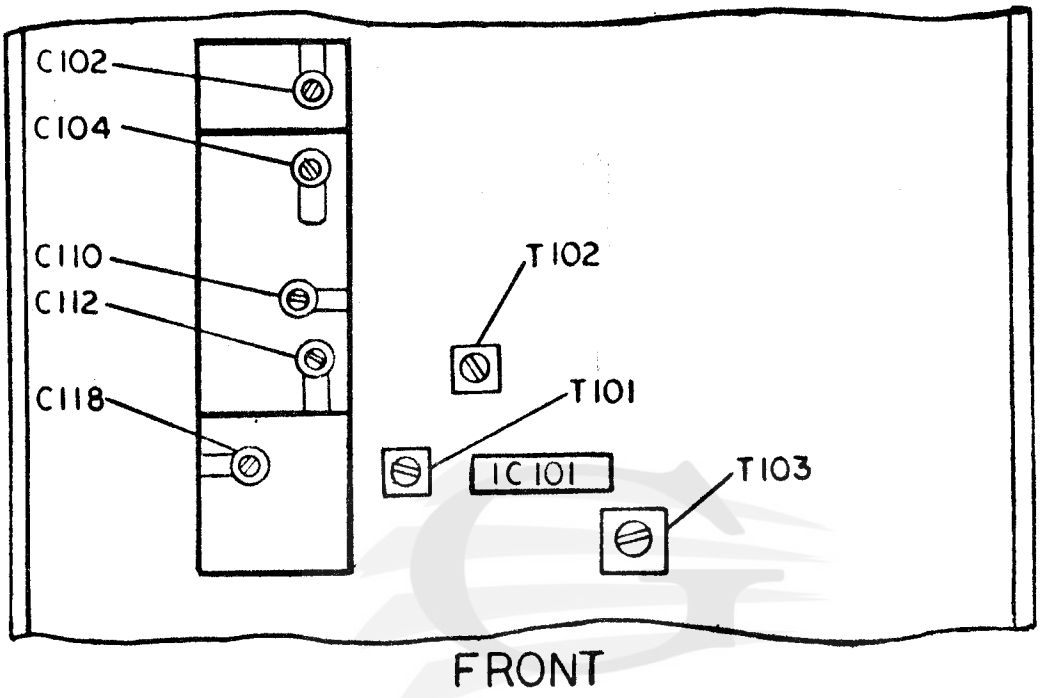

Receiver Adjustment Points

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4-8. VCO AND SYNTHESIZER ADJUSTMENTS

4-8-1. VCO Tuning

VCO coil L501 must be properly adjusted in order for the VCO to lock on frequency properly. Note that if VCO does unlock for any reason, the red LED on Programming Board (Figure 4-2) will glow, and the transmitter will be disabled.

To adjust VCO coil L501, proceed as follows:

1) Connect any VOM or DVM, capable of reading 4 to 8 VDC, to Ø detector connector pin (see Figure 4-4). Set transceiver Channel Selector to the lowest-frequency channel installed in GMT 1000.

2) Apply 13.75 VDC to GMT 1000. Use a standard alignment tool to adjust VCO coil (Figure 4-4) for a voltmeter reading between 4 and 7 VDC, but preferably near 6 volts. Note that "out-of-lock" LED is NOT glowing (indicating that VCO is locked on proper frequency). The VCO will unlock if voltage drops to approx. 2 volts.

NOTE: In a semi-duplex channel, in which the RECEIVE frequency is more than 2 MHz below the TRANSMIT frequency, it is necessary to change C503 in VCO from 6.8 pF to 10 pF. After this capacitor is changed, no simplex channels can be installed.

4-8-2. Synthesizer Frequency Adjustment

In order to assure that all frequencies in the unit are correct, the reference oscillator in the synthesizer must be set "on frequency." A frequency counter or an FM Test Set, such as a Cushman or a Singer, may be used to measure this frequency.

The transceiver should be turned on at least 10 minutes before the reference-oscillator frequency is adjusted; thus, the ideal time to set this frequency is at the conclusion of transmitter alignment as the test equipment will already be connected, and the equipment temperature will be stabilized.

1) With frequency counter loosely coupled to transmitter output, or with an FM Test Set a few feet from the transceiver, set transceiver to any transmit frequency.

2) Key transmitter, and note frequency shown on indicating device.

3) Rotate FREQ ADJ trimmer C416, accessible through hole in left-rear of the Programming Board, for the EXACT frequency selected in step 1) above. Refer to Figure 4-3 for location of Freq. Adj. trimmer.

Once the reference frequency has been set to produce one correct frequency, all other transmit and receive frequencies in the unit must also be correct, assuming the programming diodes are installed in proper locations.

4-9. RECEIVER ALIGNMENT

4-9-1. Test Equipment Required

To properly align the GMT 1000, the following test equipment, or its equivalent, is required:

a) FM Sig. Generator: 140 - 175 MHz; Internally modulated with 1000 Hz; Deviation adj. from 0 to ±5 kHz; Output level adj. from 0.2 uV to 50K uV.

b) AC VTVM: Any accurate instrument.

c) Sinadder: Helper Instrument Co.

The receiver front end may be swept, if optimum performance is desired over the full 2-MHz bandwidth. The following additional equipment is required:

d) Sweep Generator: At least 135 to 175 MHz; sweep width at least 2 MHz.

e) Oscilloscope: DC to 8 MHz; DC coupled; calibrated vert. attenuator.

f) High-Impedance Detector: Fig. 4-5.

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4-9-2. Sweep Alignment - RF Amplifier

1) With transceiver OFF, connect sweep generator output cable to transceiver antenna connector, J201.

2) Connect a high-impedance detector (Figure 4-5) to gate of 1st mixer Q-102; then, connect detector output to oscilloscope vertical input.

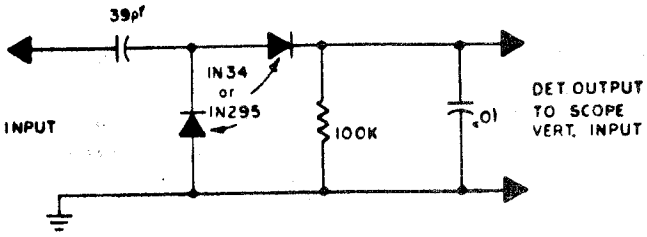

Figure 4-5. High-Z Detector

3) Remove mixer injection signal by disconnecting mixer-coax plug P503 from J503 on VCO shield.

4) Set sweep generator to sweep a 2 MHz band which includes the "receive" frequencies on which the transceiver is to be used. Use an RF generator to produce the necessary markers.

5) Turn transceiver power switch ON. Set scope vertical attenuator to its most sensitive position; then, set sweep generator output level low enough to prevent overdriving the detector.

6) Adjust trimmers C102, C104, C110 and C112 to give a 2-MHz bandpass similar to Figure 4-6. See page 4-24.

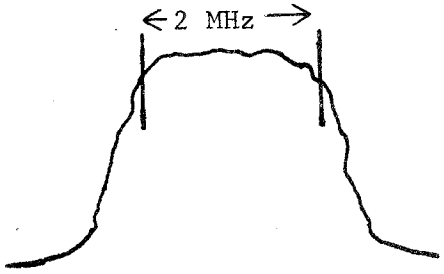

Figure 4-6. RF-Amplifier Response

7) Turn GMT 1000 power OFF, disconnect test equipment, and reconnect P503 to J503 on VCO.

8) Proceed with Section 4-9-3 below; however, DO NOT READJUST C102, C104, C110 or C112 in step 5, after the RF stage has been swept.

4-9-3. Peak Alignment - RF and IF Coils

If the GMT 1000 is to be operated on a single frequency, or on two or more frequencies separated by 1 MHz or less, very satisfactory results can be obtained by simply peaking the RF and IF tuning adjustments.

1) Connect an FM signal generator to rear-panel antenna connector J201 on GMT 1000.

2) Set generator frequency for the lowest frequency programmed in transceiver; modulate generator with 1000 Hz tone at ±3 kHz deviation.

3) Connect VTVM across GMT 1000 speaker leads.

4) Turn transceiver ON, and adjust generator output for a high-level signal of 1 mV or more.

5) Adjust L.O. buffer trimmer, C118, for maximum output as indicated on VTVM. If receiver front end was NOT previously swept, adjust trimmers C-102 and C104 on input of RF stage, C110 and C112 at output of RF stage, and L.O. buffer trimmer, C118, for maximum output or best S/N ratio as indicated on VTVM. Reduce generator output as necessary.

NOTE: Refer to Page 4-24 for location of trimmers and coils.

6) Repeat adjustments until no further increase is noted.

7) Connect a Sinadder across speaker leads; then, adjust T101, T102, and T103 for best SINAD.

8) Check sensitivity of each channel installed in GMT 1000.

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4-9-4. RF Input for 12-dB SINAD

1) Connect FM signal generator to antenna connector J201, and connect Sinadder across unit speaker terminals. Turn transceiver power switch ON.

2) Set GMT 1000 and FM generator to the desired test frequency.

3) Modulate the signal generator with a 1000 Hz tone at ±3 kHz deviation. Set generator output level at 3 - 5 uV.

4) Adjust the GMT 1000 volume control for a usable indication on Sinadder, but do not overdrive the instrument.

5) Reduce generator output level until Sinadder indicates 12-dB SINAD. The generator attenuator should show not more than 0.35 uV.

6) Check remaining channels in transceiver, if any.

4-9-5. Squelch Operation

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

2) Turn receiver squelch control fully clockwise. Receiver volume control should be set to maximum volume. The receiver is now fully squelched, and should be completely silent.

3) Now set volume control at midrange, and adjust the squelch control fully counterclockwise; then, set squelch clockwise until receiver background noise just disappears.

4) Increase setting of generator output until squelch just fully opens. The RF attenuator should show 0.30 uV or less.

4-9-6. 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 uV.

2) Disconnect Sinadder from transceiver speaker leads, and connect AC VTVM across speaker.

NOTE: If desired, a high-quality 8-ohm speaker may be plugged into the Ext. Speaker Jack on rear-panel of GMT 1000, and VTVM connected across its voice coil.

3) Turn the volume control fully clockwise. The VTVM should indicate 5.65 volts (4 watts) across the internal speaker or approx. 6.3 VAC (5 watts) across external speaker.

4) If 500-Hz and 3000-Hz tone sources are available, repeat steps 1) thru 3) modulating generator with 500-Hz and then with 3000-Hz.

5) Turn OFF transceiver power switch, and disconnect signal generator and AC VTVM from transceiver.

4-10. TRANSMITTER ALIGNMENT

4-10-1. Test Equipment Required

To properly align the GMT 1000 transmitter, the following test equipment, or its equivalent, is required:

a) Power meter, 50 watts @ 160 MHz; or, Relative Output Indicating Device (Figure 4-7) with 50-ohm dummy load.

b) Frequency counter, DC to 175 MHz; or other accurate frequency measuring device.

c) Deviation meter, to read at least ±5 kHz.

d) VTVM - any accurate instrument, with DC probe.

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e) Audio generator, to supply 1000 Hz and 1700 Hz.

f) Power supply, filtered, 13.75 VDC at 8 Amps, minimum.

NOTE: An FM Communications Test Set such as a Cushman, Singer, or Wavetek, may be used in lieu of some of the above items.

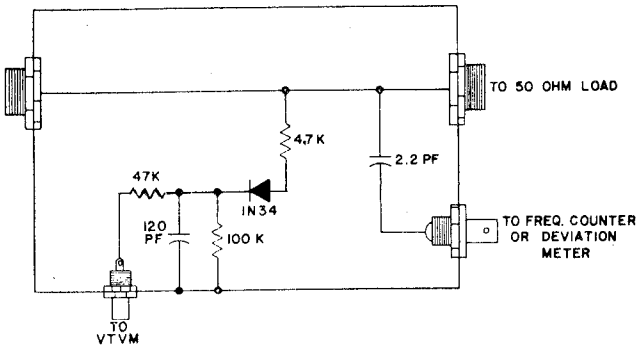

Figure 4-7. Relative Output Indicator

4-10-2. Preparation for Alignment

1) Attach 50-ohm dummy load to transceiver RF connector, J201, either through a power meter, or a relative output indicating device (see Figure 4-7).

2) Preset deviation potentiometer to its lowest setting (potentiometer rotated toward transmitter side of main board).

3) Connect transceiver to 13.75-volt DC power supply.

4-10-3. Power Alignment

NOTE: The emitter 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.

1) Connect DC probe to emitter of Q-203, key transmitter, and adjust C207 for a peak reading at the operating frequency. Adjust VTVM attenuator for an "onscale" reading.

2) If the relative output indicating device of Figure 4-7 is used, connect VTVM DC probe to the relative output terminal labeled "To VTVM." Otherwise, observe the wattmeter or other relative output indicator.

3) Preset C218 by tightening its adjustment screw down firmly; then, backing it off 1/2 turn.

4) Key transmitter, and adjust C211, C217, C218, C226, C227, C210, and C207 for maximum relative output indication on the operating frequency. Repeat this step as necessary.

4-10-4. Output Power Measurement

1) Set frequency-selector knob to channel 1; use an RF power meter (50 Ω)

2) Key transmitter, and note power output. The power should be 35 watts, or more.

3) Repeat step 2) for remaining channels (if any) in unit.

4-10-5. Subaudible- and Voice-Deviation Adjustment

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

2) Select desired operating frequency with channel-selector switch; then, if subaudible-tone squelch is used, key transmitter and adjust "Subaudible Dev. Adj." potentiometer, R113, (located on the SA-1 subaudible-tone board) to produce an output deviation of ±1 kHz, as indicated on the deviation meter. See Figure 4-8.

3) Feed a 1000-Hz audio signal into the transceiver mic. from a speaker.

4) Key transmitter, observe frequency-deviation meter, and increase 1000-Hz microphone audio input until no further increase in deviation is indicated. The modulator stage is now saturated.

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4-11-2. Programming Board DC Voltages:

Q601	RX	TX
E	0	0
B	0.72	0
C	0	3.4

Q602	RX	TX
E	0	0
B	0	0.77
C	13.4	0

4-11-3. Synthesizer Board DC Voltages:

Q401 (Xtal Heater @ Room Temp)	
E	0
B	0.84
C	13.70

Q402	Locked	Unlocked
E	0	0
B	1.3	0.50
C	0.7	8.50

Q403	Locked	Unlocked
E	0	0
B	0.34	0.62
C	11.5	0.14

4-11-4. VCO Module DC Voltages:

Q501	RX	TX
E	0	0
B	0.6	0
C	0	8.0

Q502	RX	TX
D	8.5	8.5
S	3.0	3.0
G	0	0

Q503	RX	TX
E	1.15	1.15
B	1.85	1.85
C	8.5	8.5

Q504	RX	TX
E	1.2	1.2
B	2.5	2.5
C	8.5	8.5

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4-11-4. VCO Module DC Voltages (Cont'd):

Q505	RX	TX
E	0	0.15
B	0	0.60
C	0	13.10

Q506	TX Locked	TX Unlocked
E	0	0
B	0.68	0.40
C	0.38	2.20

4-11-5. Main Board DC Voltages:

Q101	RX
G1	0
G2	2.10
S	0.33
D	6.65

Q102	RX
D	6.55
S	1.20
G	0

Q103	RX
E	0.57
B	1.30
C	6.68

Q104	Squelched	Unsquelched	
E	0	0	* Max, Squelch
B	0	0.69	fully CW.
C	*1.75	0	

Q105	Squelched	Unsquelched
E	0.59	2.65
B	0	3.15
C	6.55	6.65

Q106	Squelched	Unsquelched
E	0	0
B	0	0.75
C	12.25	0.08

Q107	RX	TX
E	6.60	0.87
B	7.25	1.50
C	8.20	8.50

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4-11-5. Main Board DC Voltages (Cont'd):

Q201	TX
E	1.25
B	1.75
C	11.54

Q202	TX
E	0.90
B	1.00
C	12.0

Q203	TX
E	1.25
B	0.40
C	11.5

Q204	TX
E	0
B	0
C	13.75

Q205	TX
E	0
B	0
C	13.75

Q206	TX	RX
E	0	0
B	0.75	0.50
C	0	13.75

Q207	TX	RX
E	0	0
B	0.75	0
C	0	13.75

Q208	TX	RX
E	12.75	13.75
B	11.95	0
C	12.45	0.75

Q301	TX	RX
E	8.00	8.00
B	7.20	8.00
C	8.00	0.60

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IC101	RX, SQ	IC101	RX, SQ
Pin 1	6.55	Pin 10	3.20
2	6.22	11	5.80
3	6.55	12	2.30
4	6.60	13	2.30
5	1.02	14	0.69
6	1.02	15	0.0
7	1.02	16	0.0 (3.45 Unsquelched)
8	6.60	17	0.0
9	3.90	18	2.00

IC102	RX
Pin 1	0.59
2	0.55
3	0.0
4	6.70
5	13.75

IC103	RX
In. 1	13.75
Out. 2	8.50
Com. 3	6.95

IC301	TX
Pin 1	3.75
2	4.10
3	4.06
4	0.0
5	4.12
6	4.06
7	4.12
8	8.25

4-12. SCHEMATICS AND COMPONENT LOCATION DIAGRAMS

This section of the GMT 1000 Maintenance Manual contains schematics of the unit main PC board, VCO module, synthesizer board, and programming board, as well as component-location diagrams for these items.

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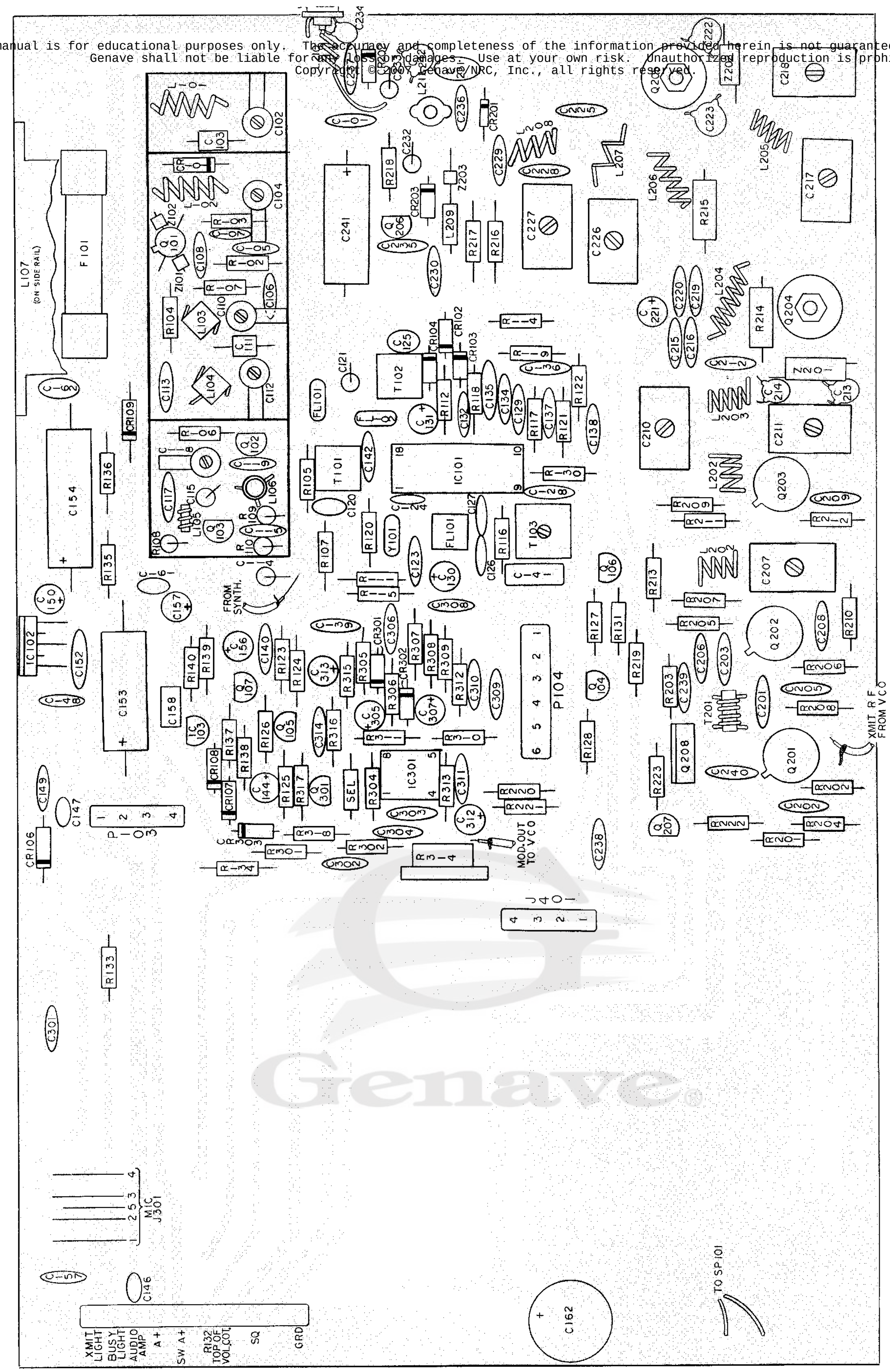

Figure 4-9. Main Board Component Locations (Top View)

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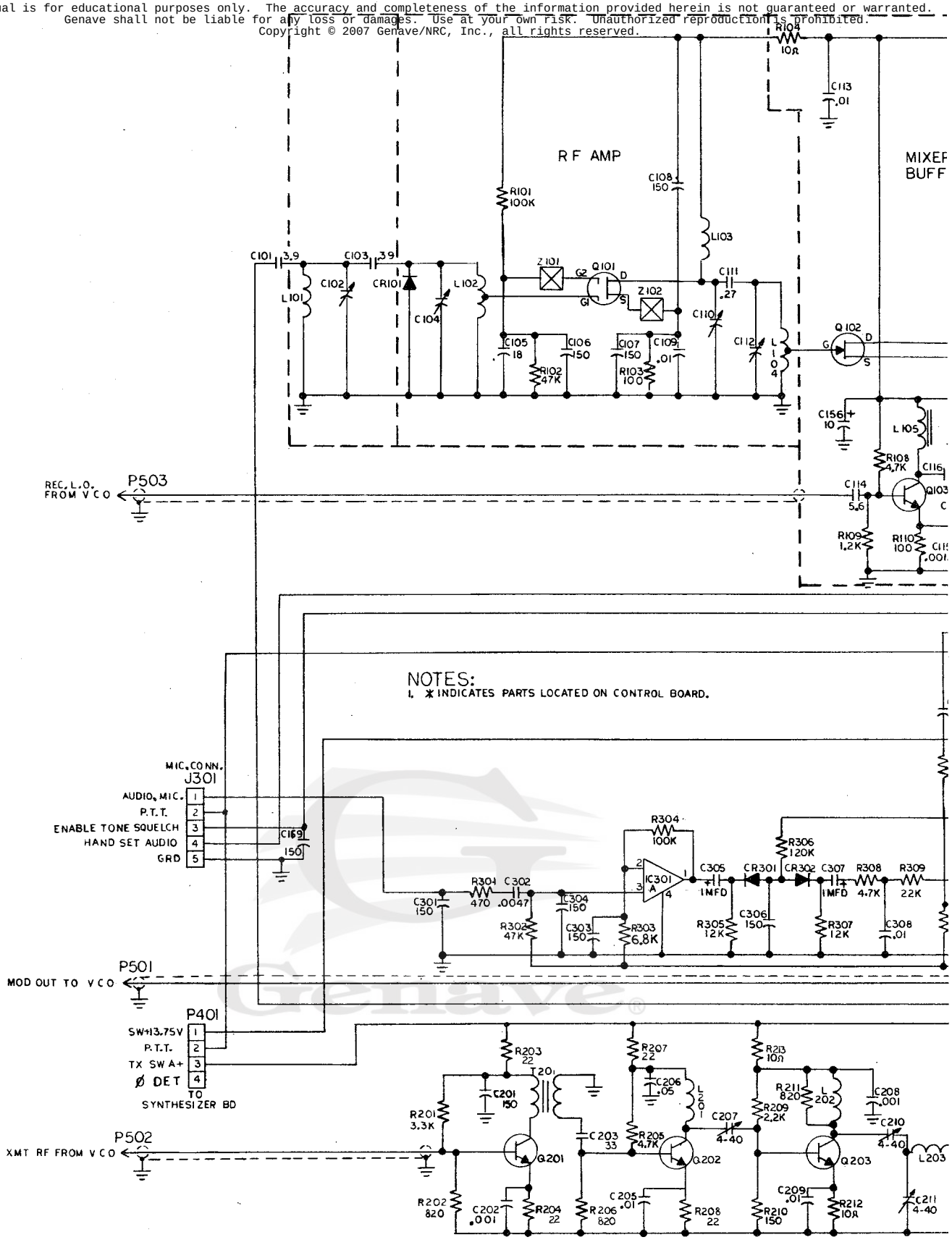

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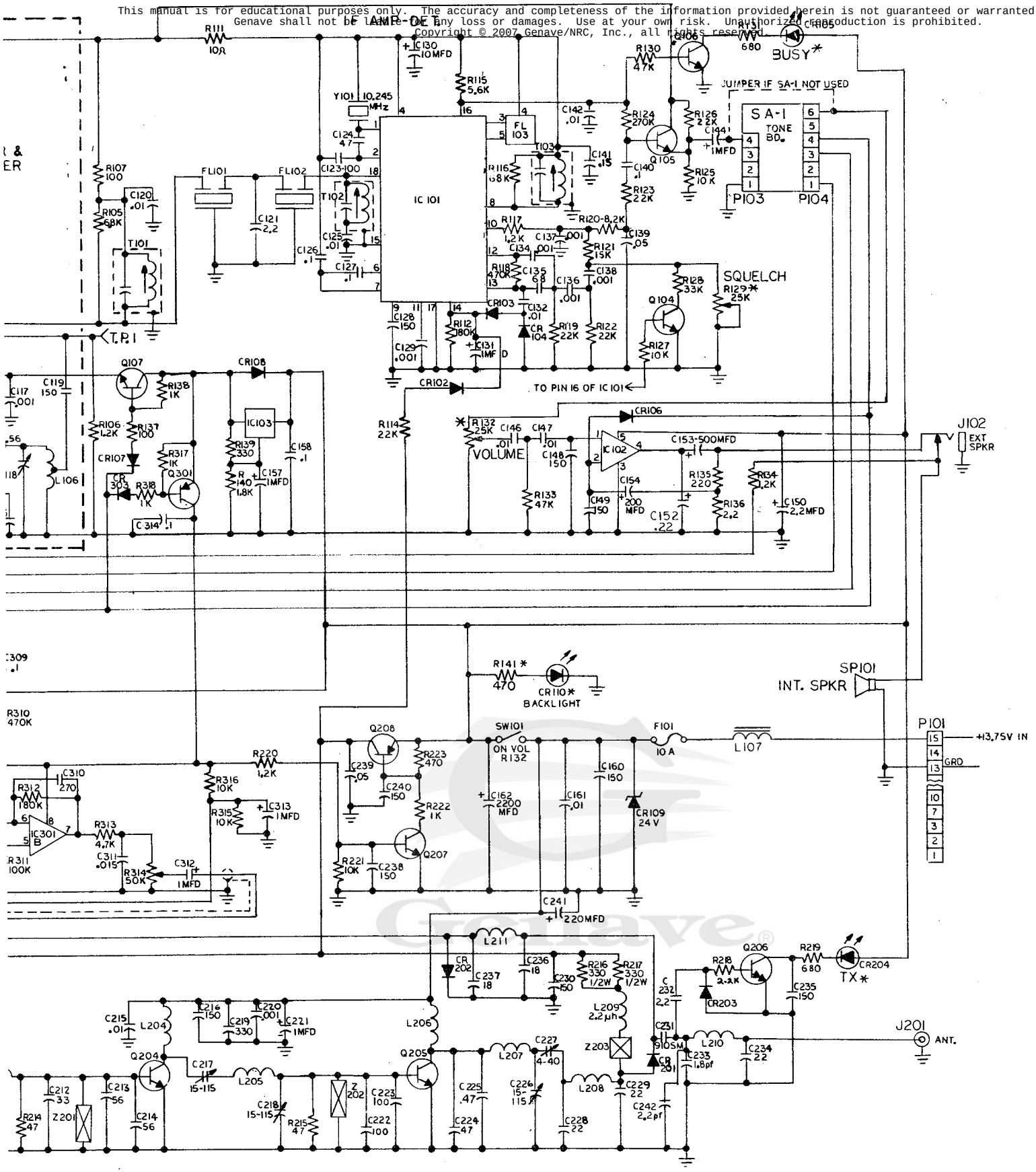

Figure 4-10. GMT 1000 Main Board Schematic

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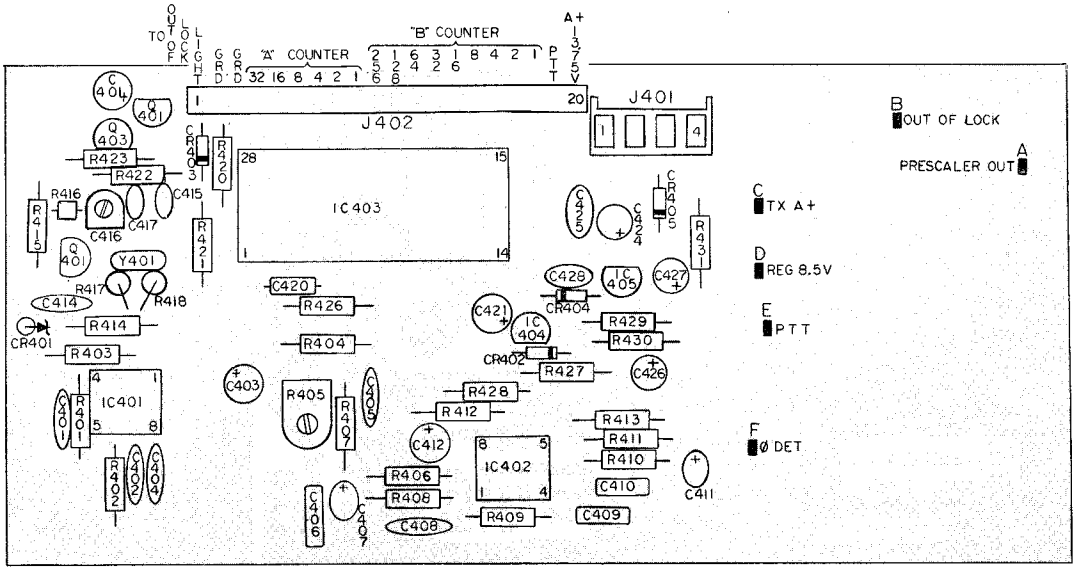

Figure 4-11. Synthesizer Component Locations

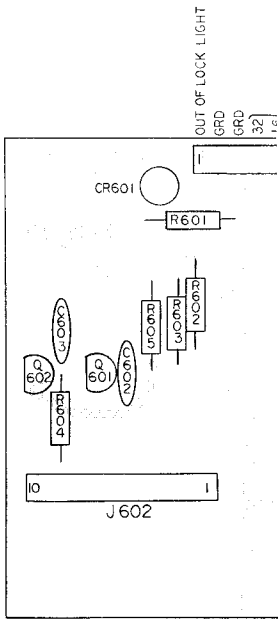

Figure 4-12. Program

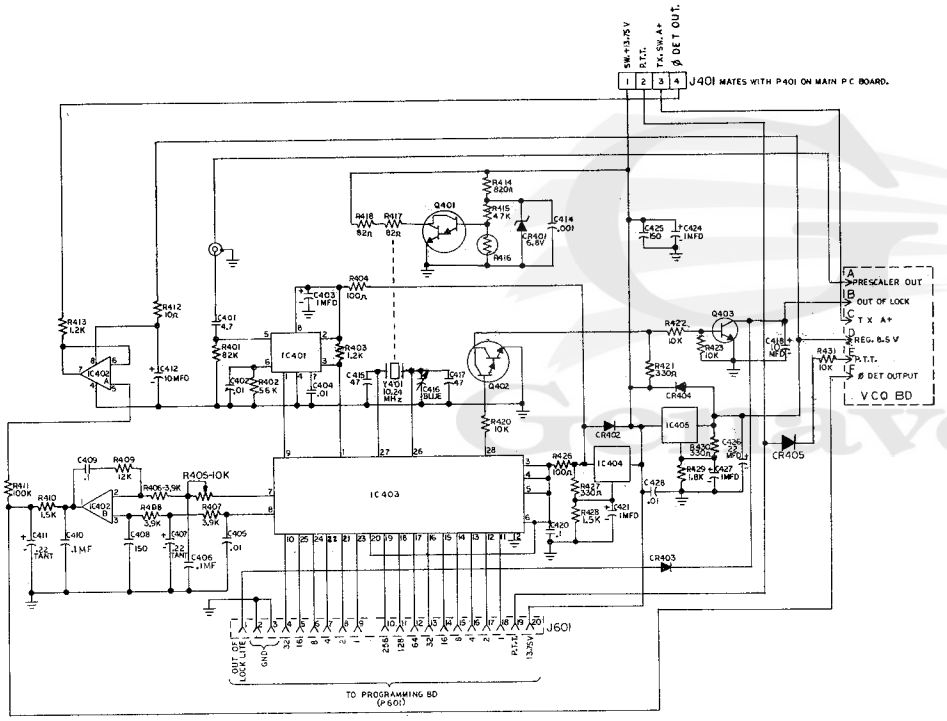

Figure 4-14. Synthesizer Bd. Schematic

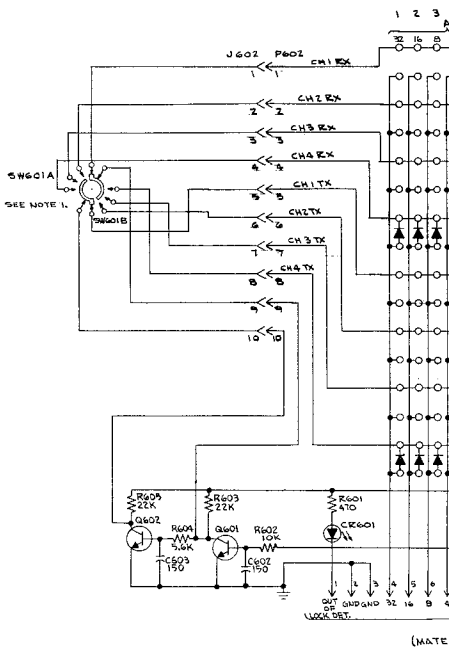

Figure 4-15. Pro

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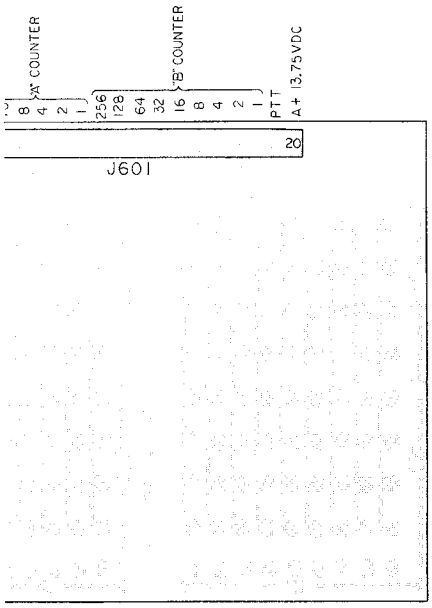


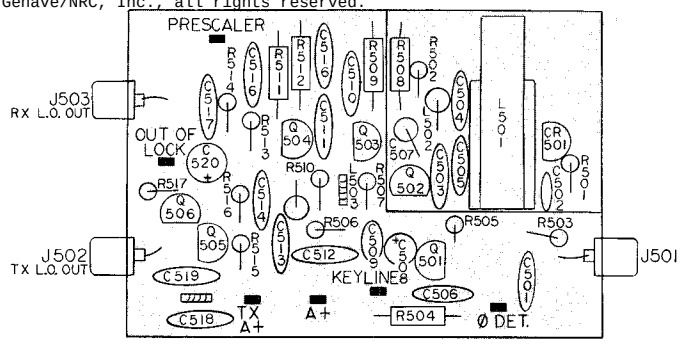
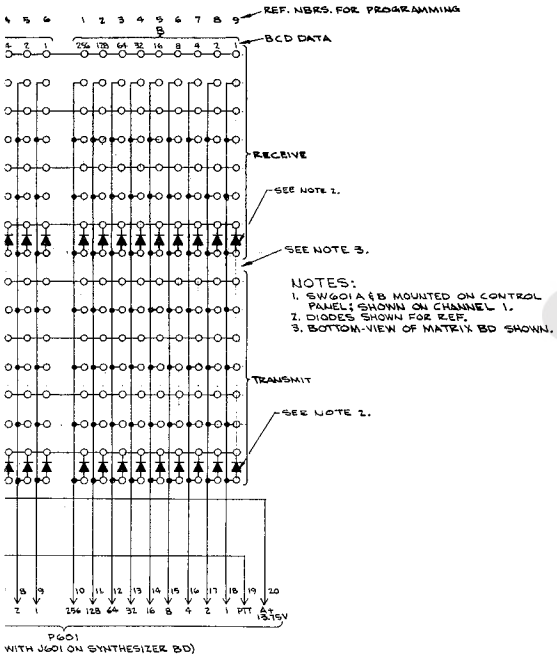


Figure 4-13. VCO Component Locations

mming Bd. Component Locations



gramming Bd. Schematic

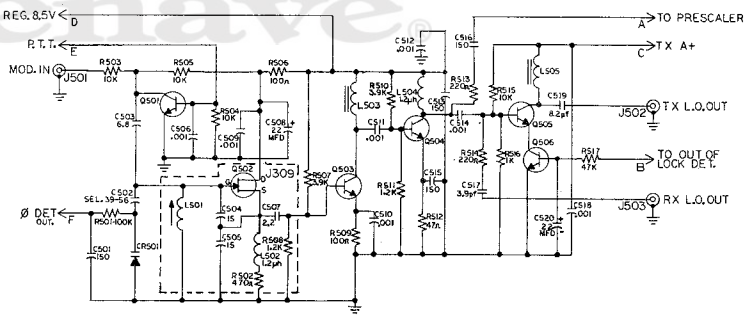


Figure 4-16. VCO Module Schematic

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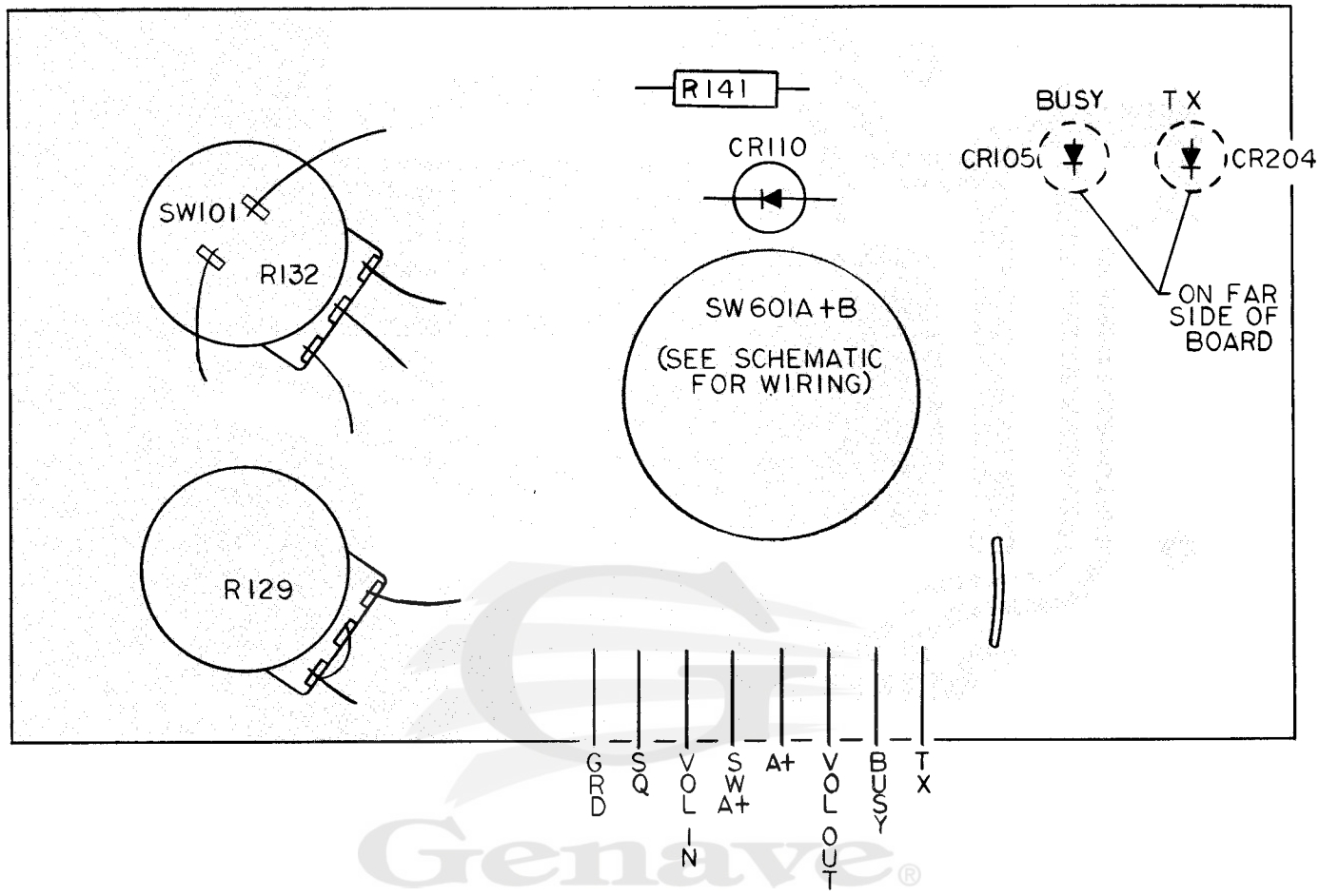

Figure 4-17. Control Panel Component Layout

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SECTION V
PARTS LIST

5-1. INTRODUCTION

This section contains a list of all replaceable electronic parts for the GMT 1000 transceiver, as well as major mechanical components.

The first column in the Parts List contains component-reference numbers. The three-digit circuit reference on the schematic is represented in the REFERENCE NUMBER column by the last one or two digits. The first digit represents the assembly, or section, of unit in which the part is located.

The assembly or section number (100, 200, ...) is indicated next to the reference number heading; that is, CAPACITORS C100, or CAPACITORS C200.

In general, the following system of numbering is used; 100-series numbers pertain to receiver items; 200-series numbers indicate transmitter parts; 300-series are amplifier/modulator; 400-series numbers are for synthesizer components; 500-series items are VCO parts; and 600-series numbers indicate "Programming Board" components.

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 C100		
1	1520003	NPO Disc, 3.9 pF, 10%
2, 4, 10, 12, 18	1570120	Trimmer, 1 - 6 pF
3	1510006	NPO Gimmick, .39 pF, 10%
5	1520010	NPO Disc, 18 pF, 10%
6, 7, 8, 19, 28, 48, 49, 59, 60	1520028	Y5E Disc, 150 pF, 10%, 25V
9, 13	1520051	Y5U Disc, .01 uF, 20%, 25V
11	1510004	NPO Gimmick, .27 pF, 10%
14	1510026	NPO Gimmick, 5.6 pF, 10%
15, 17, 29, 34, 36, 37, 38	1520071	JF Disc, .001 uF, 10%, 1kV
16	1510008	NPO Gimmick, .56 pF, 10%
20, 25, 32, 42, 46,	1540215	Mylar, .01 uF, 10%, 100V

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Reference Number	Part Number	Description
CAPACITORS C100 (Cont'd)		
21	1510015	NPO Gimmick, 2.2 pF, 10%
22, 33, 43, 45, 51, 55, 63	---	No Assigned
23	1520024	N1500 Disc, 100 pF, 10%
24	1520202	N150 Disc, 47 pF, 10%
26, 27	1520243	Z5U Disc, .1 uF, +80 -20%, 25V
30, 56	1540202	Elect. , 10 uF, 16V
31, 44, 57	1540205	Elect. , 1 uF, 50V
35	1520019	NPO Disc, 68 pF, 10%
39	1520054	Z5T Disc, .05 uF, +80 -20%, 25V
40	1520055	Magna Disc, .1 uF, +80 -20%, 12V
41	1500071	Mylar, .15 uF, 5%, 100V
50	1540004	Elect., 2.2 uF, 40V
52	1520057	Magna Disc, .22 uF, +80 -20%
53	1540049	Tant., 500 uF, 12V
54	1540212	Elect., 200 uF, 12V
58	1500070	Polystack, .1 uF, 100V
62	1541011	Elect., 2200 uF, 25V

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CAPACITORS C200		
1, 30, 35, 38, 40	1520028	Y5E Disc, 150 pF, 10%, 25V
2, 8, 20	1520071	JF Disc, .001 uF, 10%, 1kV
3, 12	1520013	NPO Disc, 33 pF, 10%
4, 24, 43	---	Not Assigned
5, 9, 15	1520051	Y5U Disc, .01 uF, 20%, 25V
6, 39	1520054	Z5T Disc, .05 uF, +80 -20%

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Reference Number	Part Number	Description
CAPACITORS C200 (Cont'd)		
7, 10, 11, 27	1560403	Trimmer, 4 - 40 pF
13, 14	1520018	N220 Disc, 56 pF, 10%
16	1520029	N1500 Disc, 150 pF, 10%
17, 18, 26	1560406	Trimmer, 15 - 115 pF
19	1520037	Y5E Disc, 330 pF, 10%, 25V
21	1540205	Elect., 1 uF, 50V
22, 23	1520022	N220 Disc, 100 pF, 10%
25	1520015	N1500 Disc, 47 pF, 10%
28, 29, 34	1520011	NPO Disc, 22 pF, 10%
31	1530009	Sil. Mica, 910 pF, 5%
32	1510015	NPO Gimmick, 2.2 pF, 10%
33	1510014	NPO Gimmick, 1.8 pF, 10%
36, 37	1520010	NPO Disc, 18 pF, 10%
41	1540026	Elect., 220 uF, 16V
42	1520001	NPO Disc, 2.2 pF, 10%
CAPACITORS C300		
1, 3, 4, 6, 15	1520028	Y5E Disc, 150 pF, 10%, 25V
2	1540216	Mylar, .0047 uF, 10%, 100V
5, 7, 12, 13	1540205	Elect., 1 uV, 50V
8, 11	1540215	Mylar, .01 uF, 10%, 100V
9, 14	1520055	Magna Disc, .1 uF, +80 -20%
10	1520033	Z5F Disc, 220 pF, 10%, 500V
16, 17, 18	---	Not Assigned

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Reference Number	Part Number	Description
CAPACITORS C400		
1	1520004	NPO Disc, 4.7 pF, 10%
2, 4, 5, 28	1520051	Y5U Disc, .01, 20%, 25V
3, 21, 24, 27	1540205	Elect., 1 uF, 50V
6, 9, 10, 20	1500070	Mylar, .1 uF, 100V
7, 11	1550001	Tant., .22 uF, 20%, 35V
8, 25	1520028	Y5E Disc, 150 pF, 10%, 25V
12, 18	1540202	Elect., 10 uF, 16V
13, 19, 22, 23, 29, 30	---	Not Assigned
14	1520071	JF Disc, .001 uF, 10%, 1kV
15, 17	1520202	N150 Disc, 47 pF, 10%
16	1570009	Trimmer, 3 - 8 pF
26	1540217	Elect., 22 uF, 10V
CAPACITORS C500		
1, 13, 15, 16	1520028	Y5E Disc, 150 pF, 10%, 25V
2	1520201	NPO Disc, 39 pF, 5%, 25V
3	1520005	NPO Disc, 6.8 pF, 10%
4, 5	1520009	NPO Disc, 15 pF, 10%
6, 9	1520196	Z5U Disc, .001 uF, 25V
7	1510015	NPO Gimmick, 2.2 pF, 10%
8, 20	1540217	Elect., 22 uF, 10V
10, 11, 12, 14, 18	1520071	JF Disc, .001 uF, 10%, 1kV
17	1520003	NPO Disc, 3.9 pF, 10%

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Reference Number	Part Number	Description
CAPACITORS C500 (Cont'd)		
19	1520006	NPO Disc, 8.2 pF, 10%
21, 22, 23	---	Not Assigned
CAPACITORS C600		
1	---	Not Assigned
2, 3	1520028	Y5E Disc, 150 pF, 10%, 25V
DIODES CR100		
1, 2, 3, 4, 7, 8	4810017	Diode, Sil., 1N4148
5	3900050	LED, Green, FLV310LED
6	4810022	Diode, Germanium, 1N295
9	4810011	Diode, Zener, 24V, 10%, 1W
10	3900507	LED, Yellow, NSL-5352A
DIODES CR200		
1	4810035	Diode, PIN, UHF, UM9401
2	4810036	Diode, PIN, SW, MPN3500
3	4810017	Diode, Sil., 1N4148
4	3900030	LED, Red, FLV110LED
DIODES CR300		
1, 2, 3	4810017	Diode, Sil., 1N4148

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Reference Number	Part Number	Description
DIODES CR400		
1	4810007	Diode, Zener, 6.8V, ZS6.8A
2, 3, 4, 5	4810017	Diode, Sil., 1N4148
DIODES CR500		
1	4810027	Diode, Varicap, MV2201
DIODES CR600		
1	3900030	LED, Red, FLV110LED
FILTERS FL100		
1, 2	2303504	Crystal Filter, Monolithic, 10.7 MHz, (Matched Pair)
3	2350050	Ceramic Filter, CFU-455E
INTEGRATED-CIRCUITS IC100		
1	3130375	IC, Low-Power IF, MC3359B
2	3130367	IC, Audio Amp., LM383T
3	3130376	IC, 3-Term., Pos. Reg., LM317LZ
INTEGRATED-CIRCUITS IC200		
1, 2, 3	---	Not Assigned

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Reference Number	Part Number	Description
INTEGRATED-CIRCUITS IC300		
1	3130377	IC, Dual J-FET Op. Amp, LF353N
INTEGRATED-CIRCUITS IC400		
1	3130379	IC, Prescaler, Divide by 40, SP8793
2	3130012	IC, Dual Op. Amp., MC1458P
3	3130378	IC, Synthesizer, MC145152P
4, 5	3130376	IC, 3-Term., Pos. Reg., LM317LZ
CONNECTORS (JACKS) J100		
1	2100252	Connector, 15-pin female, Molex 03-09-1152
	2100254	Terminal, female, Molex 02-09-1138
2	2100095	Jack, External Speaker
CONNECTORS (JACKS) J200		
1	2100256	Connector, Ant., Amphenol 83-878
CONNECTORS (JACKS) J300		
1	2100077	Connector, Mic., Switchcraft 60HA4F
CONNECTORS (JACKS) J400		
1	2100074	Connector, 4-pin, Molex 09-52-3042

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Reference Number	Part Number	Description
CONNECTORS (JACKS) J500		
1, 2, 3	2100019	Connector, Phono, CC107E3
CONNECTORS (JACKS) J600		
1	2101012	Socket, 20-pin, Molex 22-02-2205
---	2101013	Socket, IC, 28-pin
---	2101017	Socket, IC, 8-pin
CONNECTORS (PLUGS) P100		
1	2100255	Connector, 15-pin, male, Molex 03-09-2152
	2100253	Terminal, male, Molex 02-09-2136
2	---	Not Assigned
3	2100070	Plug, 4-pin, Molex 09-67-2042
4	2100069	Plug, 6-pin, Molex 09-67-2062
CONNECTORS (PLUGS) P400)		
1		
CONNECTORS (PLUGS) P500		
1, 2, 3	2100022	Plug, Phono, short, 610A2
CONNECTORS (PLUGS) P600		
1	2101015	Plug, 20-pin, Molex 22-03-2201

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Reference Number	Part Number	Description
CONNECTORS (PLUGS) P600 (Cont'd)		
---	2100277	Plug, 10-pin, Molex 22-05-2101
---	2100276	Socket, 10-pin, Molex 6471-22-01-2101
	2100241	Terminals, Molex, 08-50-0114
INDUCTORS L100		
1	1800226	Coil, 7T, 1/4" I.D., #20 LH
2	1800225	Coil, 7T, 3/16" I.D. Tap 3T
3	1800116	Coil, 4-1/2T, 5/32" I.D. #24
4	1800406	Coil, Modified 1800117
5	1800367	Coil, Toroid
6	1800117	Coil, 6-1/2T, 5/32" I.D., Tap at 1-1/4T
7	1800247	Choke, 1 mH
INDUCTORS L200		
1, 8	1800203	Coil, 3-1/2T, 3/16" I.D., #20 LH
2, 3, 5	1800201	Coil, 2-1/2T, 3/16" I.D., #20 LH
4	1800202	Coil, 3-1/2T, 3/16" I.D., #20 RH
6	1800204	Coil, 4-1/2T, 3/16" I.D., #20 LH
7	1800344	Coil, 1-1/2T, #16 RH
9	1800391	Choke, 2.2 uH, Wilco ML22G
10	1800205	Coil, 2T, 3/16" I.D., #20 LH

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Reference Number	Part Number	Description
INDUCTORS L200 (Cont'd)		
11	1800322	Coil, 4-1/2T, P. Smith #426 (Remove Slug)
INDUCTORS L500		
1	1800405	Coil, 2-1/2T - Coilcraft T7-117 with 10-32 Alum. 1/4" 51-181-142 core.
2, 4	1800359	Choke, 1.2 uH Wilco
3, 5	1800367	Coil, Toroid
TRANSISTORS Q100		
1	4800068	MOSFET, Dual Gate, SFE-801
2	4800071	JFET, N-Channel, J309
3	4800024	NPN Silicon, Blue Dot, MPS3563
4, 5, 6	4800028	NPN Silicon, Red Dot, MPS-6514S
7	4800042	NPN Silicon, Audio, 2N5220
TRANSISTORS Q200		
1, 2, 3	4804427	NPN Silicon, RF, 2N4427
4	4806080	NPN Silicon, RF Power, 2N6080
5	4806088	NPN Silicon, RF Power, SD1278

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Reference Number	Part Number	Description
TRANSISTORS Q200 (Cont'd)		
6	4800051	NPN Silicon, Darlington, MPSA13
7	4800028	NPN Silicon, Red Dot, MPS-6514S
8	4800022	PNP Silicon, Audio Power, MPSU51
TRANSISTORS Q300		
1	4800043	PNP Silicon, Audio, 2N5227
TRANSISTORS Q400		
1, 2	4800051	NPN Silicon, Darlington, MPSA13
3	4800028	NPN Silicon, Red Dot, MPS-6514S
TRANSISTORS Q500		
1, 6	4800028	NPN Silicon, Red Dot, MPS-6514S
2	4800071	JFET, N-Channel, J309
3, 4	4800024	NPN Silicon, Blue Dot, MPS3563
5	4800027	NPN Silicon, RF, MPS6511
TRANSISTORS Q600		
1, 2	4800028	NPN Silicon, Red Dot, MPS-6514S

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Reference Number	Part Number	Description
RESISTORS R100		
1	4710038	Film, 100K, 5%, 1/4W
2, 30, 33	4710035	Film, 47K, 5%, 1/4W
3, 7, 10, 37	4710008	Film, 100-ohm, 5%, 1/4W
4, 11	4710001	Comp, 10-ohm, 10%, 1/4W
5	4710027	Film, 6.8K, 5%, 1/4W
6, 9, 17, 34	4710018	Film, 1.2K, 5%, 1/4W
8	4710025	Film, 4.7K, 5%, 1/4W
12	4710052	Comp, 180K, 10%, 1/4W
13	---	Not Assigned
14, 19, 22, 23, 26	4710032	Film, 22K, 5%, 1/4W
15	4710026	Film, 5.6K, 5%, 1/4W
16	4710068	Comp, 68K, 10%, 1/4W
18	4710039	Comp, 470K, 10%, 1/4W
20	4710028	Film, 8.2K, 5%, 1/4W
21	4710030	Film, 15K, 5%, 1/4W
24	4710043	Film, 270K, 5%, 1/4W
25, 27	4710029	Film, 10K, 5%, 1/4W
28	4710033	Film, 33K, 5%, 1/4W
29	4760051	Pot., 25K, Linear, Squelch
31	4710015	Comp, 680-ohm, 10%, 1/4W
32	4760052	Pot., 25K, Volume Control
35	4710011	Film, 220-ohm, 5%, 1/4W
36	4700001	Comp, 2.2-ohm, 10%, 1/2W
38	4710017	Film, 1K, 5%, 1/4W
39	4710012	Film, 330-ohm, 5%, 1/4W

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Reference Number	Part Number	Description
RESISTORS R100 (Cont'd)		
40	4710020	Comp, 1.8K, 10%, 1/4W
41	4710013	Comp, 470-ohm, 10%, 1/4W
42, 43	---	Not Assigned
RESISTORS R200		
1	4710023	Film, 3.3K, 5%, 1/4W
2, 6, 11	4710016	Film, 820-ohm, 5%, 1/4W
3,4,7, 8	4710004	Film 22-ohm, 5%, 1/4W
5	4710025	Film, 4.7K, 5%, 1/4W
9, 18	4710021	Film, 2.2K, 5%, 1/4W
10	4710009	Film, 150-ohm, 5%, 1/4W
12, 13	4710001	Comp, 10-ohm, 10%, 1/4W
14, 15	4700009	Comp, 47-ohm, 10%, 1/2W
16, 17	4700019	Comp, 330-ohm, 10%, 1/2W
19	4710015	Comp, 680-ohm, 10%, 1/4W
20	4710018	Film, 1.2K, 5%, 1/4W
21	4710029	Film, 10K, 5%, 1/4W
22	4710017	Film, 1K, 5%, 1/4W
23	4710013	Comp, 470-ohm, 10%, 1/4W
RESISTORS R300		
1	4710013	Comp, 470-ohm, 10%, 1/4W
2	4710035	Film, 47K, 5%, 1/4W
3	4710027	Film, 6.8K, 5%, 1/4W
4, 11	4710038	Film, 100K, 5%, 1/4W

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Reference Number	Part Number	Description
RESISTORS R300 (Cont'd)		
5, 7	4710050	Film, 12K, 5%, 1/4W
6	4710054	Film, 120K, 5%, 1/4W
8, 13	4710025	Film, 4.7K, 5%, 1/4W
9	4710032	Film, 22K, 5%, 1/4W
10	4710039	Comp, 470K, 10%, 1/4W
12	4710052	Comp, 180K, 10%, 1/4W
14	4760021	Pot., Mini, 50K, 20%
15, 16	4710029	Film, 10K, 5%, 1/4W
17, 18	4710017	Film, 1K, 5%, 1/4W
RESISTORS R400		
1	4710037	Comp, 82K, 10%, 1/4W
2	4710036	Film, 56K, 5%, 1/4W
3, 13	4710018	Film, 1.2K, 5%, 1/4W
4, 26	4710008	Film, 100-ohm, 5%, 1/4W
5	4760019	Pot., 10K, 20%
6, 7, 8	4710024	Comp, 3.9K, 10%, 1/4W
9	4710050	Film, 12K, 5%, 1/4W
10, 28	4710019	Comp, 1.5K, 10%, 1/4W
11	4710038	Film, 100K, 5%, 1/4W
12	4710001	Comp, 10-ohm, 10%, 1/4W
14	4710016	Film, 820-ohm, 5%, 1/4W
15	4710035	Film, 47K, 5%, 1/4W
16	4760034	Thermistor, 10K, Fennal JA41J1
17, 18	4700012	Comp, 82-ohm, 10%, 1/2W

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Reference Number	Part Number	Description
RESISTORS R400 (Cont'd)		
19, 24, 25	---	Not Assigned
20, 22, 23, 31	4710029	Film, 10K, 5%, 1/4W
21, 27, 30	4710012	Film, 330-ohm, 5%, 1/4W
29	4710020	Comp, 1.8K, 10%, 1/4W
RESISTORS R500		
1	4710038	Film, 100K, 5%, 1/4W
2	4710013	Comp, 470-ohm, 10%, 1/4W
3, 4, 5, 15	4710029	Film, 10K, 5%, 1/4W
6, 9	4710008	Film, 100-ohm, 5%, 1/4W
7, 10	4710024	Comp, 3.9K, 10%, 1/4W
8, 11	4710018	Film, 1.2K, 5%, 1/4W
12	4710005	Film, 47-ohms, 5%, 1/4W
13, 14	4710011	Film, 220-ohm, 5%, 1/4W
16	4710017	Film, 1K, 5%, 1/4W
17	4710035	Film, 47K, 5%, 1/4W
RESISTORS R600		
1	4710013	Comp, 470-ohm, 10%, 1/4W
2	4710029	Film, 10K, 5%, 1/4W
3, 5	4710032	Film, 22K, 5%, 1/4W
4	4710026	Film, 5.6K, 5%, 1/4W

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Reference Number	Part Number	Description
SWITCHES SW100		
1	---	Switch, On-Off; Part of Vol. Control, R132
SWITCHES SW600		
1	5100140	Switch, Channel; 2-Pole, 4-Position
TRANSFORMERS T100		
1, 2	5600044	Transformer, 10.7 MHz IF
3	5600102	Transformer, 455 kHz
TRANSFORMERS T200		
1	5600099	Toroid, Buffer; 5 turns, bifilar wound
CRYSTALS Y100		
1	2300342	Crystal, Quartz; 2nd L.O., 10.245 MHz
CRYSTALS Y400		
1	2300343	Crystal, Quartz; Synthesizer, 10.24 MHz
CHOKES Z100		
1, 2	1870003	Ferrite Bead, 57-0180
CHOKES Z200		
1	1800339	Choke, Ferrite; 2-1/2T
2	1800063	Choke, Ferrite, 1-1/2T
3	1870003	Ferrite Bead, 57-0180

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Reference Number	Part Number	Description
MISCELLANEOUS		
---	7015900	Assembly, Main Board
---	7016000	Assembly, Synthesizer Bd
---	7016100	Assembly, VCO Board
---	7016200	Assembly, Programming Bd
---	7016300	Assembly, Control Board
SP101	2509991	Speaker, 8-ohm, 2-1/4"
---	4810017	Diodes, For Programming Board; 1N4148
---	2510590	Front, Plastic
---	2510433	Knob, Channel
---	2510432	Knob, Volume or Squelch
---	2510128J	Chassis, L.H.
---	2510129H	Chassis, R.H.
---	2510165F	Heatsink
---	2502281	Bracket, Heatsink
---	2510600	Cover, Top
---	2510601	Cover, Bottom
---	2510162	Bracket or Yoke, Mounting
---	2508532	Bracket, Lock
---	2400023	Thumbknob, 1/4 - 20 x 1/2"
---	2820010	Washer, Nylon
---	2508751	Washer, Friction
---	2800282	Screw, Machine; 1/4 - 20 x 1/2"
---	2510384	Clip, Mic.
---	7052400	1325077 Microphone, and 2100076 Mic. Plug
---	5142068	Clip, Fuse
---	5140024	Fuse, 3AG, 10A

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