ALPHA/200-200A*

NAV/COM

MAINTENANCE MANUAL

GENAVE/ NRC
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SECTION I
GENERAL INFORMATION

1-1. Introduction

This addition to the GENAVE ALPHA/200 maintenance manual will provide all of the information necessary to install, operate, and maintain the GENAVE/ALPHA 200A communications and navigation radio.

1-2. Description

The ALPHA/200A is merely an enhanced version of the field-proven ALPHA/200. There have been no major changes in the transmitter, exciter, oscillator, or modulation circuitry. A stop band filter has been added in front of the receiver input to reduce receiver spurious responses. An omni self-test circuit was added to the converter indicator circuitry to provide a means of checking omni accuracy in-flight. An ident filter is another feature which has been added to the original circuitry.

The remaining circuitry has not been changed significantly with the exception of a few component value changes which accompany changes of component manufacturers. There have been a few changes in the parts designations which have accompanied the above changes. The ALPHA/200A Parts List which is included has all of these changes incorporated.

The outstanding features and technical specifications of the ALPHA/200A are found on the ALPHA/200A Catalog Sheet, a copy of which is included.

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The outstanding features and technical specifications of the ALPHA/200A are found on the ALPHA/200A Catalog Sheet, a copy of which is included.

SECTION I
GENERAL INFORMATION

1-1. Introduction

This service manual contains all of the information normally required to install, operate, and maintain the GENAVE ALPHA/ 200 communications and navigation radio.

1-2. Description

The ALPHA/200 is a self-contained navigation and communications radio complete with integral regulated power supply and converter-indicator. It is a completely solid state design utilizing 59 active silicon transistors.

The navigation and communication frequencies are quartz crystal controlled and are selected by two independent digital readout dials. A front panel NAV-COM switch selects the mode of operation enabling instant conversion from one mode to the other. In addition, when operating in the navigation mode, internal electronic switching automatically tunes the transmitter to the selected communication frequency when the microphone button is keyed. This enables the pilot to listen on an Omni frequency and transmit on any selected communications frequency as easily as he does using simplex transmission.

The navigation receiver receives all 100 channels from 108.0 mHz to 117.9 mHz, including the 20 localizer channels. The converter-indicator is a state-of-the-art design using solid state computer circuitry and provides both Omni and Localizer course indications.

The communications receiver covers 100 channels, spaced 100 kHz apart, from 118.0 mHz to 127.9 mHz. The communications transmitter is a wide band solid-state unit modulated by an audio system with audio bandpass and preemphasis circuitry to provide the best quality, distortion free transmission.

1-3. Specifications

GENERAL:

WEIGHT: 5.3 lbs.

FRONT PANEL SIZE: 6½″ × 3½″

DEPTH BEHIND PANEL: 12″

INPUT POWER: Receive: 2.1 amps @ 14 VDC* Transmit: 2.8 amps @ 14 VDC*

(*28 VDC adapter available)

NUMBER OF TRANSISTORS: 60 All Silicon

AUDIO AMPLIFIER: Sidetone output: 50 mw nom. into 600 ohms.

Cabin Speaker output: 6 watts nom. into 3/4 ohm speaker

Auxiliary inputs: 2 (1 vrms will provide 6 watts output)

RECEIVER (Front panel switch selects Nav or Com mode):

RECEIVER CIRCUIT: double-conversion, superheterodyne, crystal tuned

Navigation

FREQUENCY RANGE: 108.0 — 117.9 MHz

NUMBER OF CHANNELS: 100 (80 Omni and 20 Localizer) all crystal controlled

CHANNEL SPACING: 100 kHz

SENSITIVITY: 1-2 microvolts for 6db $\frac{s+n}{n}$ nom. @ 30% modulation, 1000 Hz

PRIMARY IMAGE REJECTION & SPURIOUS RESPONSES: —60 db nom.

SELECTIVITY: —6 db 40 kHz —60 db 200 kHz

VOR ACCURACY: ±2 degrees

LOC ACCURACY: ±½ dot

AUDIO OUTPUT: 6 watts nom. into 3/4 ohm speaker; 50 mw. nom. into 600 ohm headset

AUTOPILOT OUTPUT: Standard

AGC: 3-6 db 10 – 30,000 microvolts

Communications:

FREQUENCY RANGE: 118.0 — 127.9 MHz

NUMBER OF CHANNELS: 100 all crystal controlled

CHANNEL SPACING: 100 kHz

SENSITIVITY: 1-2 microvolts for 6 db $\frac{s+n}{n}$ nom. @ 30% modulation, 1000 Hz

PRIMARY IMAGE REJECTION AND SPURIOUS RESPONSES: —60 db nom.

SELECTIVITY —6 db 40 kHz —60 db 200 kHz

SQUELCH: Adjustable

AGC: 3-6 db 10 - 30,000 microvolts

AUDIO OUTPUT: 6 watts nom. into 3/4 ohm speaker; 50 mw nom. into 600 ohm headset

TRANSMITTER:

(May be operated Simplex, or Duplex with Nav receive frequencies)

TRANSMITTER CIRCUIT: 6 stage, solid state, crystal tuned

FREQUENCY RANGE: 118.0 — 127.9 MHz

NUMBER OF CHANNELS: 100 all crystal controlled

CHANNEL SPACING: 100 kHz

POWER OUTPUT: 8 watts PEP nom. (2-3 watts carrier)

MODULATION. Audio processed, high level, automatic limiting

1-4. Equipment Supplied

a. 1—ALPHA/200 Radio
b. 1—Mounting Tray with Hardware
c. 1—Cable Connector (12 Pin)
d. 2—RF Connectors (1 short, 1 long)

1-5. Equipment Required, But Not Supplied

a. 1—Microphone & Jack
b. 1—Communications Antenna (See Installation Manual)
c. 1—Navigation Antenna
d. Cabin Speaker and/or headphones
e. Coaxial Cable, as required (RG 58A/U or equiv.)
f. Wire for Harness, as required
g. 1—250 ohm, 5 watt Dimmer Pot (Optional, See Installation Manual)

GENERAL AVIATION ELECTRONICS INC.

4141 KINGMAN DRIVE
INDIANAPOLIS, IND. 46226
AREA 317 • 546-1113

Information Bulletin

IB7002 February 1, 1970

The following information is provided for reference correction in the service manuals. These changes may be applicable to all units due to transistor variations. Changes should not be indiscriminately accomplished, but keep this information with manuals for cross references.

I. A/200 NAV/COM

A. Fig 4-5-27 only

1. Q105 and 106 may be silver / gray selected Beta WHITE dots.
2. All transistors (except Q113) designated GREEN are now BLACK dot (2N4248, 2N5086) select).
3. Q113 changed to 6.8 volt zener for higher reliability.
4. R163 changed to 330 ohms.
5. Q111 changed to 39940 (2N2102) for higher reliability.
6. R150 changed to 10K to compensate for low mikes.
7. .0033 cer cap added across R140 to reduce 9960Hz in speakers
8. .001 cer. capacitor added from junction of $149 & C142 to ground on some units.
9. Selected value of resistor parallels R132 to reduce squelch authority, (value 4.7k to 33k) on some units.

B. Fig 4-5-28

1. R209 changed to 20K.
2. Selected value of cap. should be shown parallel to L201 (220pf-820pf) to tune L201 to 9960.
3. 220pf cap added to some units. Base to collector of Q218, Q220.
4. C231 changed to 15000 mfd on some units.
5. Q230, 231, 232 may be 39940, 2N2102 or MPSUO1.
6. R254 value may be 10K or 15K ohms.

II. D/202 Marker Beacon

A. Fig 4-5-6

1. Q121 changed to 7.5V zener.
2. R160 changed to 470 ohms.
3. Q120 changed to MPS6531.
4. Q115, 117, 119 changed to 39940, 2N2102 or MPS UO1 for improved reliability.

GENERAL AVIATION ELECTRONICS INC.

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Service Bulletin

ALPHA/200

August 20, 1969

Subject: A/200 Oscillator Module Adjustment and/or Replacement

There have been occasions in field installation when a singular or several frequencies may appear to drop out or be intermittent. A quick check of the oscillator outputs may confirm this problem and often can be adjusted for stable operation. The following is an adjustment procedure for both the low frequency and the high frequency oscillator module. The service manual indicates a procedure which is usually satisfactory; however, some crystals may have a lower activity level and require a special adjustment. If this is necessary, using a high impedence probe, measure the oscillator outputs (osc. output range .15 to .4V DC on high freq., .3 to .6V DC on low freq.) and find the dead channel(s). Readjust the oscillator slug to bring in the desired channel. Check the remaining channels for stability on all functions, receive and transmit. If none of the above procedures improves operation, then a replacement is indicated.

Genave designed the Alpha/200 to be serviced through modular replacements and does not consider these modules normally field serviceable due to special test equipment required for replacement of individual parts and resultant testing. The crystals in the oscillator module are soldered into the circuits and replacement of an individual crystal would require complete tear-down of the module which may take several hours in itself. We therefore keep on hand a stock of replacement modules readily available for shipment upon your request. See Warranty Repair Policy for exchange prices on units not in warranty.

The following procedure is outlined here for the oscillator module removal and reinstallation:

1. Before attempting replacement, please note the positions of all wiring and lead dress and especially the positions of spring grounding straps on the shafts.

2. Begin removal of wiring by unsoldering four harness connections to wafers on front top of module. Secondly, unsolder tinplate shield from front base of module near input filter. Turn

over transceiver and remove seven wires and diode from connector panel on bottom. Unsolder and straighten two co-ax lines from tie points on bottom of board.

3. Loosen the four couplers from detents of oscillator module and slide couplers towards front of unit on long shafts.

4. Loosen and remove four half-inch nuts from rear panel holding detents.

5. Remove two screws from each side of rear panel and pull panel back from and to harness side of unit. Oscillator module should then lift out easily if side panel of unit is pulled slightly outward.

Installation of new module will be in reverse of above procedure. When tightening the four half-inch nuts check detents for bind and if necessary, loosen quarter turn and secure nuts with staking compound or lacquer. The loosening of the couplers will necessitate proper meshing of gears at front panel driving dials. Upon completion of mechanical assembly and soldering, a complete alignment check of unit should be performed. Make sure that straps on shafts are in proper position. If they are not, the effect of an intermittent oscillator will be evidenced. Carefully pack old module and return in original carton with explanation of failure.

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over transceiver and remove seven wires and diode from connector panel on bottom. Unsolder and straighten two co-ax lines from tie points on bottom of board.

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Service Bulletin

GENERAL AVIATION ELECTRONICS INC.

4141 KINGMAN DRIVE
INDIANAPOLIS, IND. 46226
AREA 317 • 546-1113

SB7308

August 9, 1973

Subject: Using 1800212 50000 Micro Henry Coils in OMNI Circuits

The enclosed part(s) are to be used as substitutes for old Genave part Nos. 1800033 coils in all Genave converter-indicator circuits. The enclosed "cup core" coils have the same inductance as the earlier "dinks" but are obviously larger in size and will require cementing into place when installed. A location open on the circuit board or side panel can be used. When the 1800212 coil is used, a 330 ohm ¼ watt resistor (supplied) must be used in series with one lead.

A suitable adhesive would be RTV or double-sided sticky tape. Lead length to the coil is not critical but place the coil no closer to the audio transformer.

If the coil is used for the IDENT filter, the resistor is not used but the component must still be secured with adhesive.

Be careful when crimping and soldering on the coil terminals. The coil wire is very fine and the terminals fragile.

GENERAL AVIATION ELECTRONICS INC.

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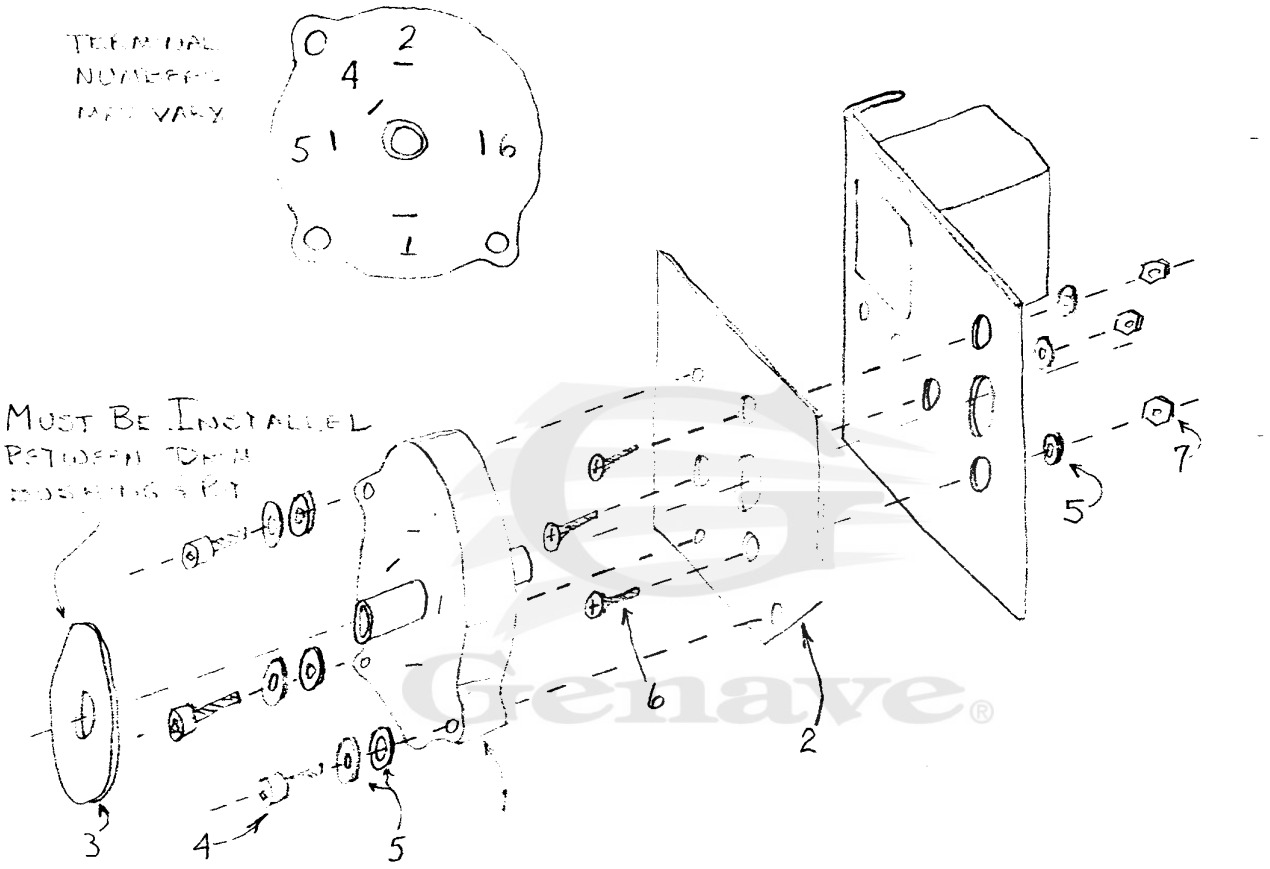
OBS POT ADAPTER KIT FOR GAE P/N 4760110

Genave has changed design and vendors of our OBSpot. 4760010 is no longer available and is replaced with 4760110; itis of different mechanical configuration and, using the adapter kit enclosed, can be retrofitted to Nav -Coms or Converter-Indicators using the old "RVP-162" as original equipment.

ITEM	GAE P/N	DESCRIPTION	QTY.
1	4760110	OBS Pot Linear Taper (Mfr#134FL1-110)	1
2	2502262	Plate, adapter,OBS	1
3	2501581	Washer, nylon (insulator)	1
4	2800176	Screw, 4X40X.6250 Socket hd. Cap	3
5	2820060	Washer, Flat #4	9
6	2800157	Screw, 4X40X .375 Phil flat hd.	3
7	2810045	Nut, 4X40X$\frac{1}{4}$	3



Instructions: Install the adapter plate to the relay or switch bracket or panel using the flat head screws. Then assemble the pot itself to the adapter plate. The insulator is used on units which may have an interference between the bushing and theterminals of the pot. It is not needed on pots which mount from the rear of the bracket as on converter-indicators.
Wiring: note the position of the wires on the old part relative to the wiper terminal. Wire the new part using the wiper terminal as reference point for the rest of the wires . Ignore terminal #'s.

1-22-74

GENERAL AVIATION ELECTRONICS INC.

4141 KINGMAN DRIVE
INDIANAPOLIS, IND. 46226
AREA 317 • 546-1113

Service Bulletin

SB 7402

January 24,1974

SUBJECT: Substitution of OBS pot types.

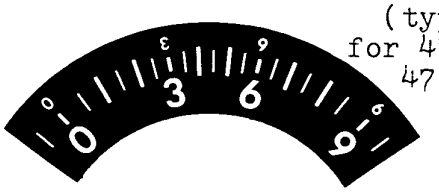
For reasons of availablity and quality Genave replaced the original OBS pot with one of a different design.

The old pot, GAE P/N 4760010 was identified with Mfr# RVP-162. The replacement part, GAE P/N 4760110, is identified with Mfr# 134FL1-110 stamped in YELLOW.

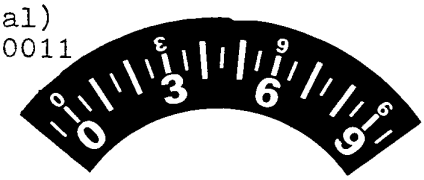
Because the new part mounts differently an adapter kit is supplied with each part.

ALL A/200's and some A/200A's, A/300's, & Th/100-200's used the old part and will require the 4760110 as a replacement part. If no part number appears in the Parts List or there is some doubt, identify pot by the drawings below.

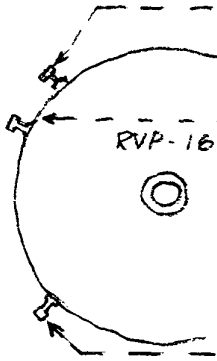
NON-Linear Dial (typical) for 4760010 & 4760110



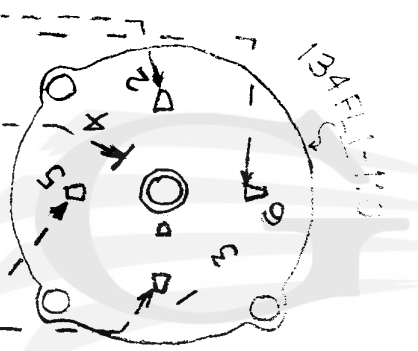
Linear Dial (typical) for 4760011



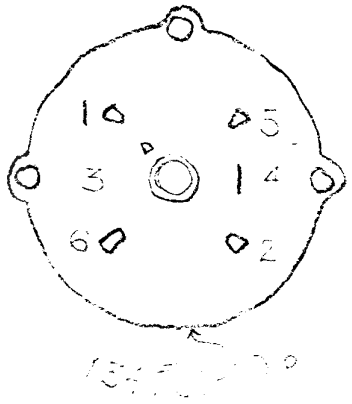
4760010



4760110 (BOTH)

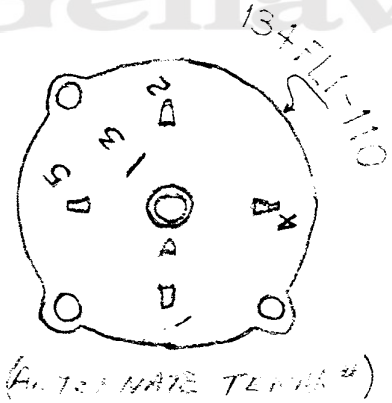


4760011



4760110 replaces old 4760010 but requires adapter kit for most radios(kit supplied w/part). Non-linear dial requires linear taper 4760110 pot.

Transfer wiring as shown by the dotted lines.Ignore terminal markings.



4760011 is installed in new equipment and identical replacement parts are available. NOTE: These are TANGENT Taper pots and use a linear dial.

Terminal #'s may vary; rewire in same mechanical position.

SECTION II

INSTALLATION MANUAL

The following Section

is reproduced

and included with every

ALPHA/200A

It is made a part of

this manual

for your permanent

reference

Model: ALPHA/200A

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GENERAL AVIATION ELECTRONICS, INC.

INSTALLATION MANUAL

ALPHA/200A NAV/COM

Please Note:

THIS UNIT MUST BE INSTALLED BY a properly certificated and authorized person in accordance with the Federal Aviation Regulations, Part 43. No responsibility for improper installation of this unit is either implied or assumed by the manufacturer. Units shown to be installed in violation of the FARs will not be covered by the warranty and will remove any and all responsibility from the manufacturer for such equipment.

Specifications:

GENERAL:

WEIGHT: 5.3 lbs.

FRONT PANEL SIZE: 6¼" x 3¼"

DEPTH BEHIND PANEL: 12"

INPUT POWER: Receive: 2.1 amps @ 14 VDC*
Transmit: 2.8 amps @ 14 VDC*

(*28 VDC adapter available)

NUMBER OF TRANSISTORS: 60 All Silicon

AUDIO AMPLIFIER: Sidetone output: 50 mw nom. into 600 ohms.

Cabin Speaker output: 6 watts nom. into 3 4 ohm speaker

Auxiliary inputs: 2 (1 vrms will provide 6 watts output)

RECEIVER (Front panel switch selects Nav or Com mode):

RECEIVER CIRCUIT: double-conversion, superheterodyne, crystal tuned

Navigation

FREQUENCY RANGE: 108.0 — 117.9 MHz

NUMBER OF CHANNELS: 100 (80 Omni and 20 Localizer) all crystal controlled

CHANNEL SPACING: 100 kHz

SENSITIVITY: 1-2 microvolts for 6db $\frac{s+n}{n}$ nom. @ 30% modulation, 1000 Hz

PRIMARY IMAGE REJECTION & SPURIOUS RESPONSES: —60 db nom.

SELECTIVITY: —6 db 40 kHz
—60 db 200 kHz

VOR ACCURACY: ±2 degrees

LOC ACCURACY: ±½ dot

AUDIO OUTPUT: 6 watts nom. into 3/4 ohm speaker; 50 mw. nom. into 600 ohm headset

AUDIO PILOT OUTPUT: Standard

AGC: 3-6 db 10 _ 10,000 microvolts

Communications:

FREQUENCY RANGE: 118.0 — 127.9 MHz

NUMBER OF CHANNELS: 100 all crystal controlled

CHANNEL SPACING: 100 kHz

SENSITIVITY: 1-2 microvolts for 6 db $\frac{s+n}{n}$ nom. @ 30% modulation, 1000 Hz

@ 30% modulation, 1000 Hz

PRIMARY IMAGE REJECTION AND SPURIOUS RESPONSES: —60 db nom

SELECTIVITY —6 db 40 kHz
—60 db 200 kHz

SQUELCH: Adjustable

AGC: 3-6 db 10 _ 10,000 microvolts

AUDIO OUTPUT: 6 watts nom. into 3/4 ohm speaker; 50 mw nom. into 600 ohm headset

TRANSMITTER:

(May be operated Simplex, or Duplex with Nav receive frequencies)

TRANSMITTER CIRCUIT: 6 stage, solid state, crystal tuned

FREQUENCY RANGE: 118.0 — 127.9 MHz

NUMBER OF CHANNELS: 100 all crystal controlled

CHANNEL SPACING: 100 kHz

POWER OUTPUT: 8 watts PEP nom. (2-3 watts carrier)

MODULATION. Audio processed, high level, automatic limiting

Unpacking

CAREFULLY REMOVE the ALPHA/200A and its mounting accessories from the shipping container by removing the staples from the top of the carton and lifting the contents straight out. The carton should be saved until the installation is complete in the event that damage is discovered or return of the unit is necessary for some reason. Any damage due to shipping should be reported and a claim filed as soon as possible with the shipping company.(If it is necessary to re-ship, use our container which is specifically designed for that purpose.)

Pre-Installation Check

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

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

All ALPHA/200A radios are shipped in perfect operating condition. However, a pre-installation electrical test may be performed to assure that the unit has suffered no internal damage during shipment. For a detailed test procedure, refer to the Maintenance Section of the ALPHA/200A Service Manual. DO NOT ATTEMPT to bench test the radio without proper equipment as specified in the Service Manual.

Installation Planning

THE LOCATION of the ALPHA/200A in the aircraft should be carefully selected with due consideration to the following:

1. The ALPHA/200A generates only a very small amount of heat and, as such, does not require any forced air or ram air cooling. However, the unit must NOT be mounted directly above a vacuum tube device or any other equipments that generate a large amount of heat unless such equipments have cooling provisions installed to keep the heat generated therein from coming in contact with other equipments mounted in close proximity to them.

MOUNTING THE ALPHA/200 DIRECTLY OVER UNCOOLED VACUUM TUBE EQUIPMENT OR IN THE HOT AIR BLAST OF ANY DEVICE INCLUDING CABIN HEATERS WILL AUTOMATICALLY VOID THE WARRANTY

2. The radio will extend about 12 3/8 inches behind the front surface of the aircraft panel. Therefore, at least 12 7/8 inches of clear space behind the panel must be available to mount the unit.

3. The placement of the unit should be such that all controls are easily accessible and all readouts are easily visible to the pilot.

4. The ALPHA/200A may be connected in parallel with the same speaker and headphone used by other equipment. However, considerably improved audio performance from the speaker will be obtained if the headphone outputs of other equipment are fed to the two auxiliary audio inputs of the ALPHA/200A . Alternately, the auxiliary input of another piece of equipment or to an audio mixer control. Either of these methods is preferred to direct paralleling which will reduce the available audio power in most cases.

5. A communications antenna approved by Genave, or its equivalent, MUST be used in the installation to validate the warranty. A set of minimum specifications for evaluating antennas is shown below. Genave recommends its LAMBDA/100 Com Rod antenna. It is recommended that the Factory be contacted before installing antennas of questionable performance.

A "bent wire" type of antenna is NOT suitable in any case, and the use of such an antenna will VOID THE WARRANTY.

Minimum Specifications for COM Antenna:

Impedance . . . . 50 ohms nominal

VSWR . . . . . 5:1 (Max) 118.0 to 127.9 mHz
(5:1 VSWR represents a 46% loss of output power)

Installation

1. The aircraft panel cutout for the ALPHA/200A is 6 1/4" wide X 3 11/32" high. Make this cutout in the selected location.

2. Insert the supplied mounting rack into the cutout. Mark the rack mounting holes on the panel support brackets on both sides of the cutout. If the location chosen does not provide the brackets, two angle brackets must be made and installed. Drill out the marked mounting holes with a #27 drill.

3. The mounting rack alone will provide sufficient support for the radio in most cases. If further support is required or desired, a rack support bracket must be fabricated and installed, A mounting hole in the rack for a support bracket has been provided. (See mounting rack illustration)! Other locations will generally cause mechanical interference when inserting the radio.

4. Install the rack in the aircraft panel, using the holes drilled in step 2, the #6-32 Binder head screws, washers, and nuts supplied, and the support bracket if used. All screws must have their heads inside the rack.

5. Fabricate the power and signal cable using the connector socket supplied. A wiring diagram is shown in this manual. The cable wires should be long enough to allow the connector to be passed through the panel cutout from the rear and extended to about 2" in front of the panel.

6. Fabricate the two RF cables as illustrated using 50 ohm coax, such as RG-58 A/U. These cables should also be long enough to protrude 2" through the cutout.

7. Connect the 3 cables just fabricated to the appropriate points in the aircraft's electronic system. Bring the connector ends through the cutout. Mechanically secure the cables at appropriate support points.

8. Attach the cables to the radio. Make sure that the RF cables go to the proper jack on the radio. The COM antenna cable (long plug) goes to the recessed antenna jack.

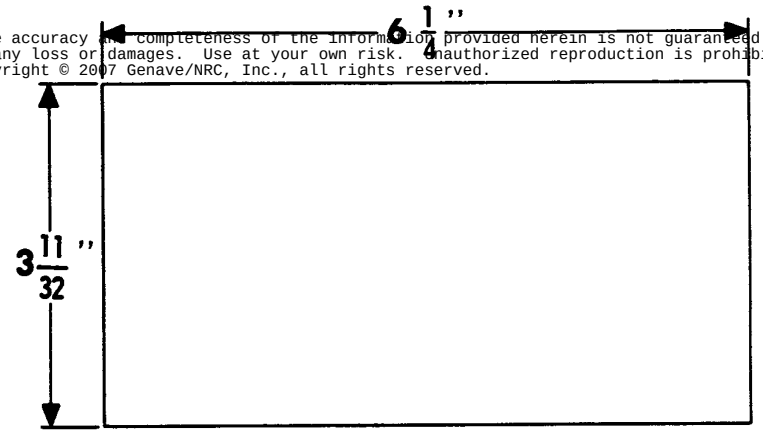
9. Insert the radio into the rack. Tighten the mounting bolt to secure the radio in the panel. Do not use excessive torque on the bolt. Tighten only until the radio is snugly secured against the front panel.

10. Update the appropriate logs and papers of the aircraft.

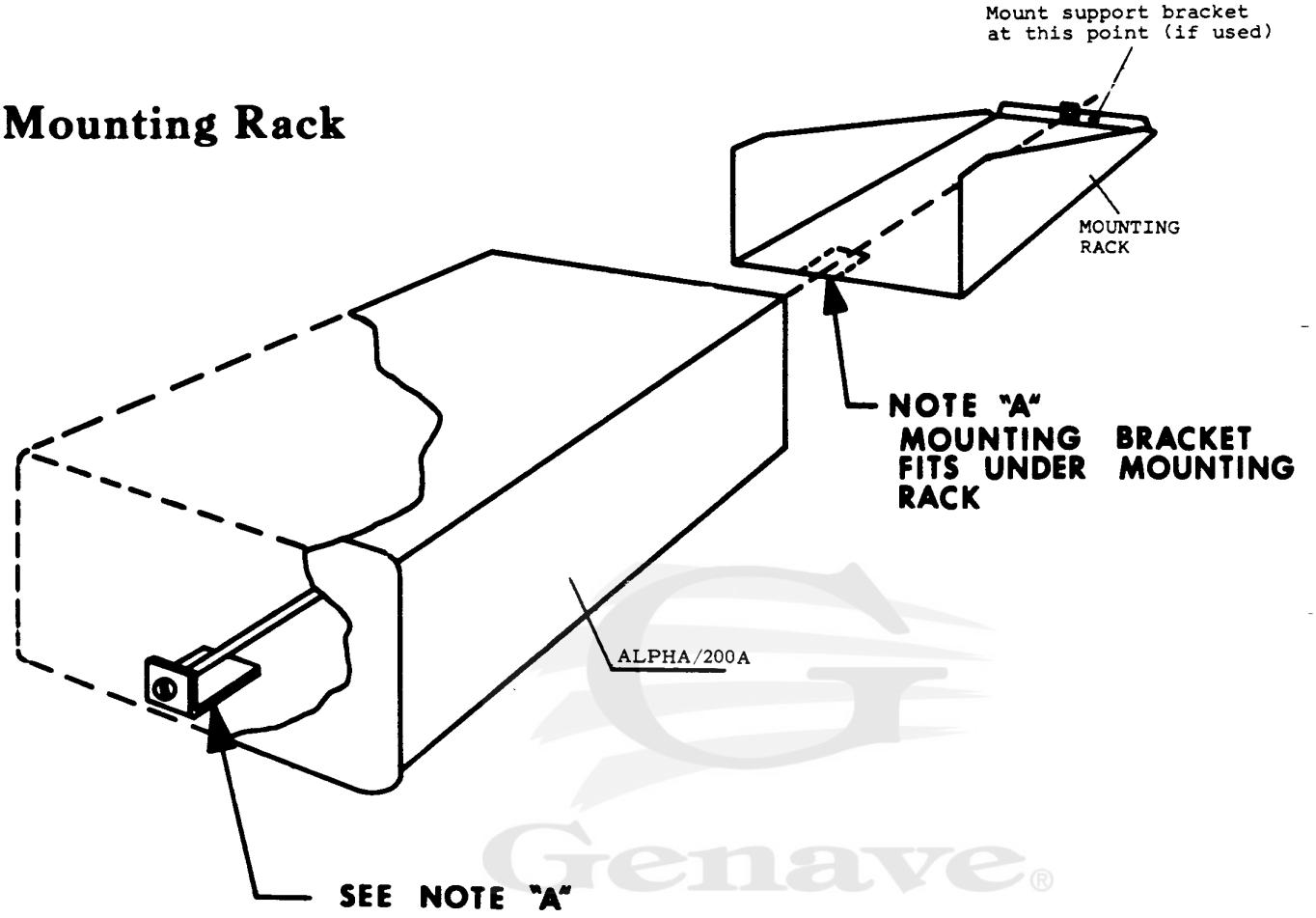
11. Fill out and return the bottom section of the warranty card.

12. Give the remainder of the warranty card and the Pilots Information Manual to your customer. The proper sections of the warranty card MUST be completed and returned to Genave by both the dealer and the customer for the warranty to be in effect.

Panel Cutout



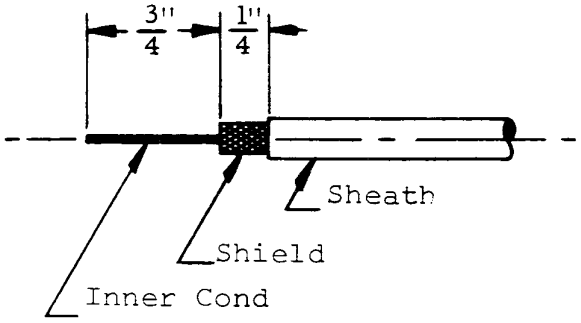
Mounting Rack



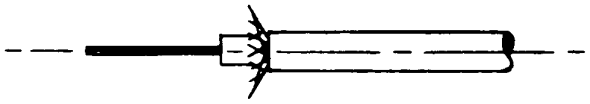
Post Installation Check

UPON COMPLETION of the installation, a flight test is desirable to insure that all three systems of the ALPHA/200A are operating properly. The navigation system should be checked on two or more different radials or on different Omnistations. The communications system should be checked for simplex operation on two or more frequencies and for duplex operation if possible. The localizer function should be checked if possible. A single frequency check is sufficient.

NAV Antenna Connector Assembly

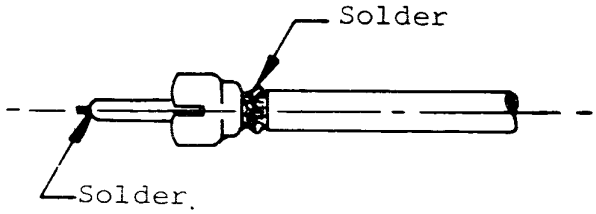


1. Cut and strip RG-58 A/U Coax as shown.



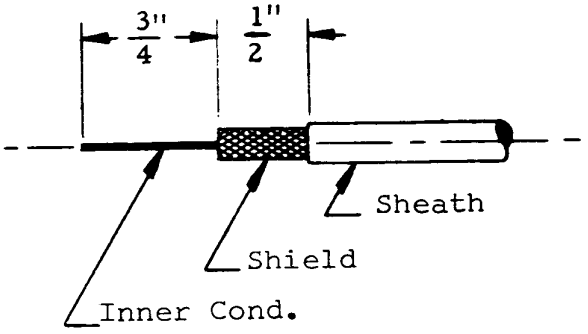
2. Spread shield. Do not pigtail.

3. Press short shank connector onto wire and against shield.

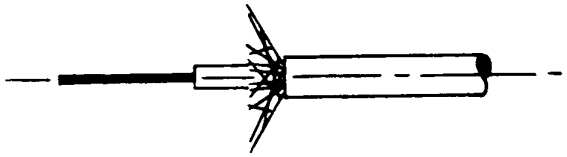


4. Fold shield over connector and solder all around. Flow solder into connector tip to secure inner conductor. Cut off tip of inner conductor which protrudes from connector.

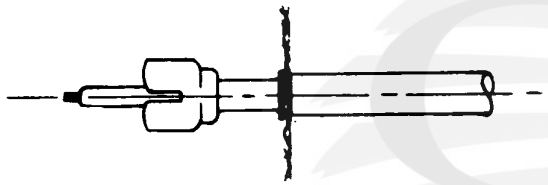
COM Antenna Connector Assembly



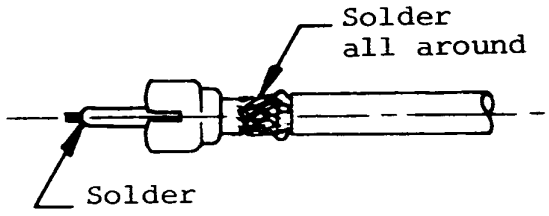
1. Cut and strip RG-58 A/U Coax as shown.



2. Spread shield. Do not pigtail.

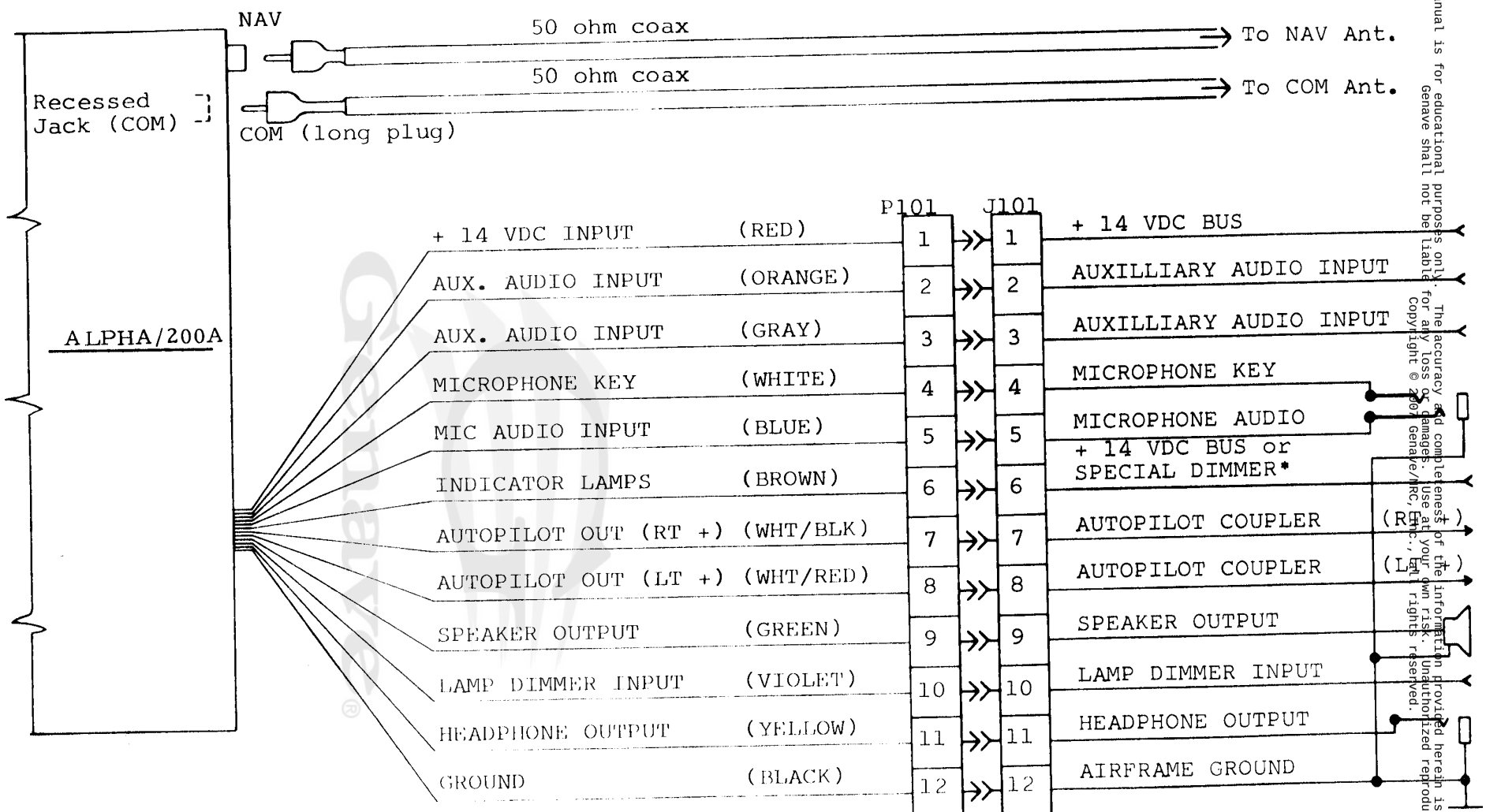


3. Press long shank connector onto wire and against shield.



4. Fold shield over connector and solder all around. Flow solder into connector tip to secure inner conductor. Cut off tip of inner connector which protrudes from connector.

Power and Signal Cable Connections



NOTE:

It is not necessary to connect power to pins 6 or 10 if dimming of the lamps is not required. These pins have been connected to switched A+ on the bottom of the unit with color coded jumper wires:

Brown jumper wire - Indicator lamps

Violet jumper wire - Backlighting lamps

IF DIMMING IS REQUIRED on either set of lamps, the appropriate jumper(s) MUST be removed. The wiring diagram should then be used to connect the lamps to the proper points in the aircraft electrical system.

*This input controls the intensity of the TO-FROM-OFF lamps. The following are alternate methods of installation:

1. Connect directly to the +14 VDC BUS, and the lamps will light at full intensity.
2. Connect through an auxilliary 250 ohm series dimmer potentiometer to the +14 VDC BUS.
3. Connect to existing panel dimmer, which will require panel lights to be set at full brightness during the day for the lamps to be visible.
4. Install a DAY-NIGHT switch, connecting input to +14 VDC BUS for DAY mode and to existing panel dimmer for NIGHT mode.

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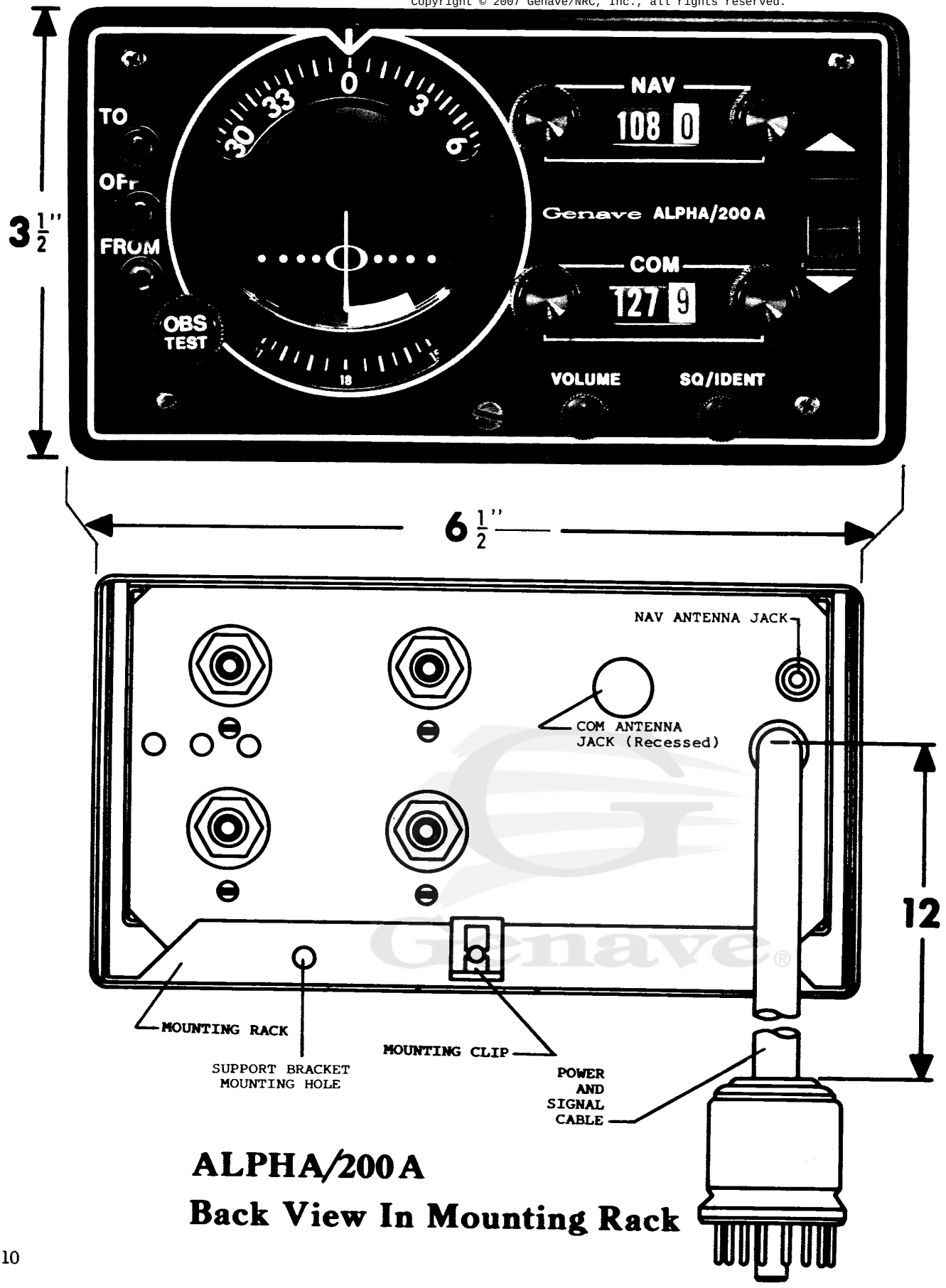
Front Panel



ALPHA/200A

Back View In Mounting Rack

SECTION II
INSTALLATION MANUAL

The following Section

is reproduced

and included with every

ALPHA/200A

It is made a part of

this manual

for your permanent

reference

Model: ALPHA/200A

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Specifications:

GENERAL:

WEIGHT: 5.3 lbs.

FRONT PANEL SIZE: 6½" × 3½"

DEPTH BEHIND PANEL: 12"

INPUT POWER: Receive: 2.1 amps @ 14 VDC*
Transmit: 2.8 amps @ 14 VDC*

(*28 VDC adapter available)

NUMBER OF TRANSISTORS: 60 All Silicon

AUDIO AMPLIFIER: Sidetone output: 50 mw nom. into 600 ohms.

Cabin Speaker output: 6 watts nom. into 3/4 ohm speaker

Auxiliary inputs: 2 (1 vrms will provide 6 watts output)

RECEIVER (Front panel switch selects Nav or Com mode):

RECEIVER CIRCUIT: double-conversion, superheterodyne, crystal tuned

Navigation

FREQUENCY RANGE: 108.0 — 117.9 MHz

NUMBER OF CHANNELS: 100 (80 Omni and 20 Localizer) all crystal controlled

CHANNEL SPACING: 100 kHz

SENSITIVITY: 1-2 microvolts for 6db $\frac{s+n}{n}$ nom. @ 30% modulation, 1000 Hz

PRIMARY IMAGE REJECTION & SPURIOUS RESPONSES: —60 db nom.

SELECTIVITY: —6 db 40 kHz
—60 db 200 kHz

VOR ACCURACY: ±2 degrees

LOC ACCURACY: ±½ dot

AUDIO OUTPUT: 6 watts nom. into 3/4 ohm speaker; 50 mw. nom. into 600 ohm headset

AUTOPILOT OUTPUT: Standard

AGC: 3-6 db 10 — 10,000 microvolts

Communications:

FREQUENCY RANGE: 118.0 — 127.9 MHz

NUMBER OF CHANNELS: 100 all crystal controlled

CHANNEL SPACING: 100 kHz

SENSITIVITY: 1-2 microvolts for 6 db $\frac{s+n}{n}$ nom. @ 30% modulation, 1000 Hz

@ 30% modulation, 1000 Hz

PRIMARY IMAGE REJECTION AND SPURIOUS RESPONSES: —60 db nom

SELECTIVITY —6 db 40 kHz
—60 db 200 kHz

SQUELCH: Adjustable

AGC: 3-6 db 10 — 10,000 microvolts

AUDIO OUTPUT: 6 watts nom. into 3/4 ohm speaker; 50 mw nom. into 600 ohm headset

TRANSMITTER:

(May be operated Simplex, or Duplex with Nav receive frequencies)

TRANSMITTER CIRCUIT: 6 stage, solid state, crystal tuned

FREQUENCY RANGE: 118.0 — 127.9 MHz

NUMBER OF CHANNELS: 100 all crystal controlled

CHANNEL SPACING: 100 kHz

POWER OUTPUT: 8 watts PEP nom. (2-3 watts carrier)

MODULATION: Audio processed, high level, automatic limiting

Unpacking

CAREFULLY REMOVE the ALPHA/200A and its mounting accessories from the shipping container by removing the staples from the top of the carton and lifting the contents straight out. The carton should be saved until the installation is complete in the event that damage is discovered or return of the unit is necessary for some reason. Any damage due to shipping should be reported and a claim filed as soon as possible with the shipping company. (If it is necessary to re-ship, use our container which is specifically designed for that purpose.)

Pre-Installation Check

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

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

All ALPHA/200A radios are shipped in perfect operating condition. However, a pre-installation electrical test may be performed to assure that the unit has suffered no internal damage during shipment. For a detailed test procedure, refer to the Maintenance Section of the ALPHA/200A Service Manual. DO NOT ATTEMPT to bench test the radio without proper equipment as specified in the Service Manual.

Installation Planning

THE LOCATION of the ALPHA/200A in the aircraft should be carefully selected with due consideration to the following:

1. The ALPHA/200A generates only a very small amount of heat and, as such, does not require any forced air or ram air cooling. However, the unit must NOT be mounted directly above a vacuum tube device or any other equipments that generate a large amount of heat unless such equipments have cooling provisions installed to keep the heat generated therein from coming in contact with other equipments mounted in close proximity to them.

MOUNTING THE ALPHA/200 DIRECTLY OVER UNCOOLED VACUUM TUBE EQUIPMENT OR IN THE HOT AIR BLAST OF ANY DEVICE INCLUDING CABIN HEATERS WILL AUTOMATICALLY VOID THE WARRANTY

2. The radio will extend about 12 3/8 inches behind the front surface of the aircraft panel. Therefore, at least 12 7/8 inches of clear space behind the panel must be available to mount the unit.

3. The placement of the unit should be such that all controls are easily accessible and all readouts are easily visible to the pilot.

4. The ALPHA/200A may be connected in parallel with the same speaker and headphone used by other equipment. However, considerably improved audio performance from the speaker will be obtained if the headphone outputs of other equipment are fed to the two auxiliary audio inputs of the ALPHA/200A . Alternately, the auxiliary input of another piece of equipment or to an audio mixer control. Either of these methods is preferred to direct paralleling which will reduce the available audio power in most cases.

5. A communications antenna approved by Genave, or its equivalent, MUST be used in the installation to validate the warranty. A set of minimum specifications for evaluating antennas is shown below. Genave recommends its LAMBDA/100 Com Rod antenna. It is recommended that the Factory be contacted before installing antennas of questionable performance.

A "bent wire" type of antenna is NOT suitable in any case, and the use of such an antenna will VOID THE WARRANTY.

Minimum Specifications for COM Antenna:

Impedance . . . . 50 ohms nominal

VSWR . . . . . 5:1 (Max) 118.0 to 127.9 mHz
(5:1 VSWR represents a 46% loss of output power)

Installation

1. The aircraft panel cutout for the ALPHA/200A is 6 1/4" wide X 3 11/32" high. Make this cutout in the selected location.

2. Insert the supplied mounting rack into the cutout. Mark the rack mounting holes on the panel support brackets on both sides of the cutout. If the location chosen does not provide the brackets, two angle brackets must be made and Installed. Drill out the marked mounting holes with a #27 drill.

3. The mounting rack alone will provide sufficient support for the radio in most cases. If further support is required or desired, a rack support bracket must be fabricated and installed, A mounting hole in the rack for a support bracket has been provided. (See mounting rack illustration)! Other locations will generally cause mechanical interference when inserting the radio.

4. Install the rack in the aircraft panel, using the holes drilled in step 2, the #6-32 Binder head screws, washers, and nuts supplied, and the support bracket if used. All screws must have their heads inside the rack.

5. Fabricate the power and signal cable using the connector socket supplied. A wiring diagram is shown in this manual. The cable wires should be long enough to allow the connector to be passed through the panel cutout from the rear and extended to about 2" in front of the panel.

6. Fabricate the two RF cables as illustrated using 50 ohm coax, such as RG-58 A/U. These cables should also be long enough to protrude 2" through the cutout.

7. Connect the 3 cables just fabricated to the appropriate points in the aircraft's electronic system. Bring the connector ends through the cutout. Mechanically secure the cables at appropriate support points.

8. Attach the cables to the radio. Make sure that the RF cables go to the proper jack on the radio. The COM antenna cable (long plug) goes to the recessed antenna jack.

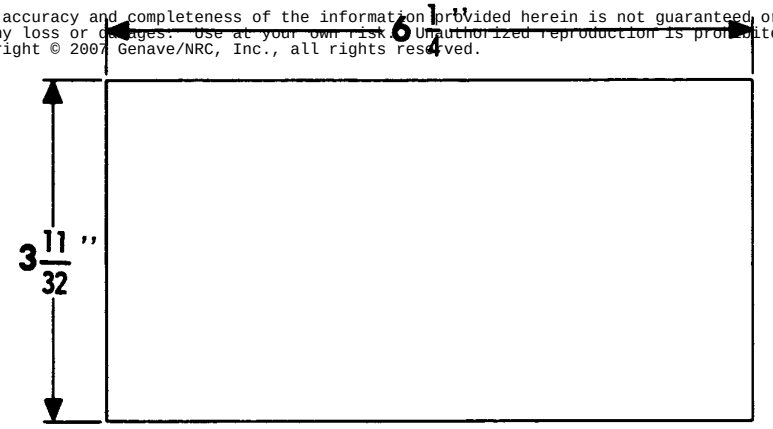
9. Insert the radio into the rack. Tighten the mounting bolt to secure the radio in the panel. Do not use excessive torque on the bolt. Tighten only until the radio is snugly secured against the front panel.

10. Update the appropriate logs and papers of the aircraft.

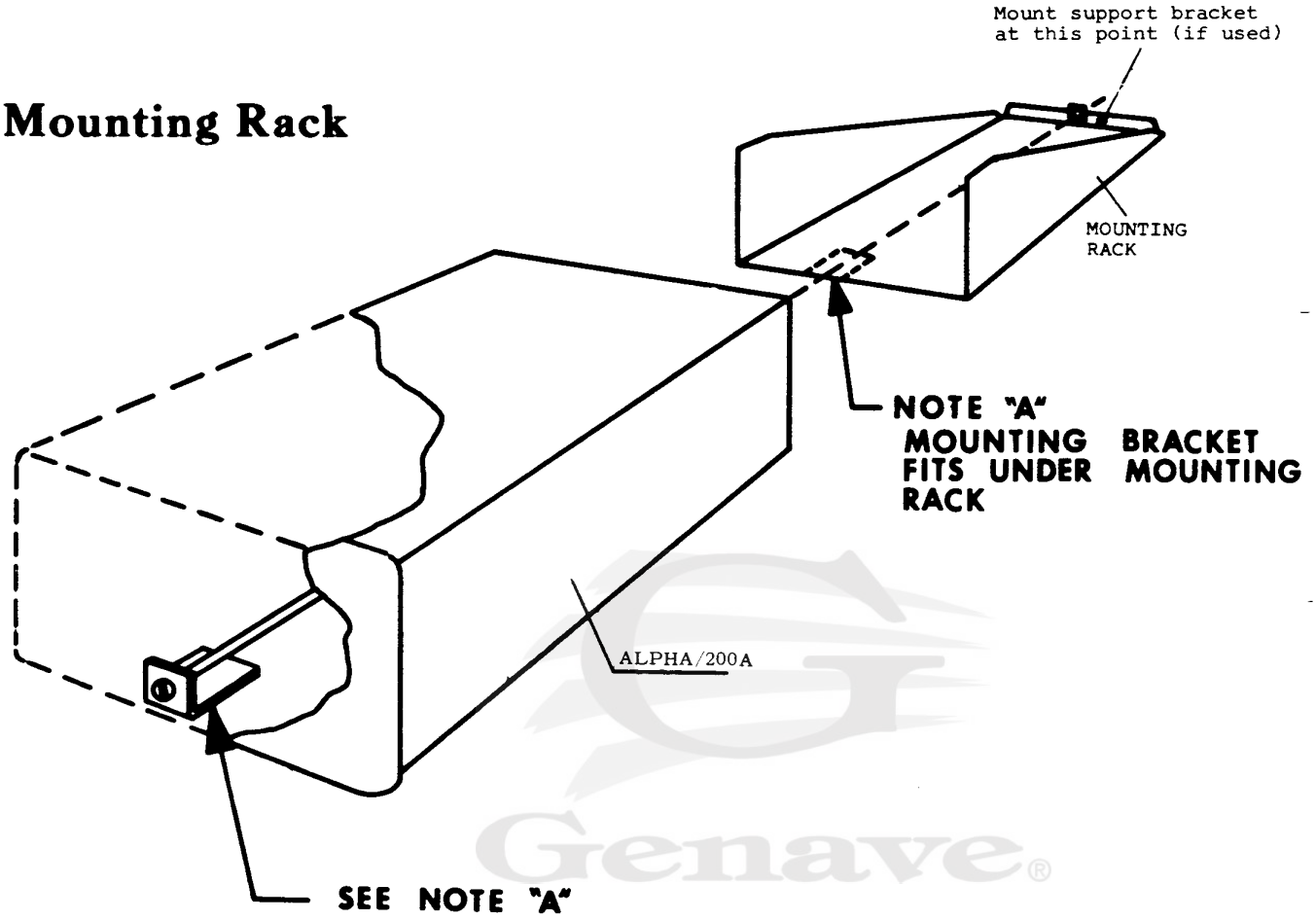
11. Fill out and return the bottom section of the warranty card.

12. Give the remainder of the warranty card and the Pilots Information Manual to your customer. The proper sections of the warranty card MUST be completed and returned to Genave by both the dealer and the customer for the warranty to be in effect.

Panel Cutout



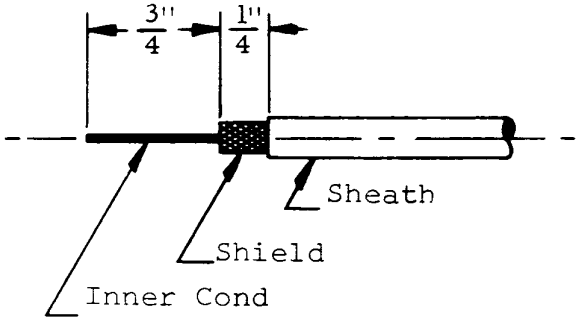
Mounting Rack



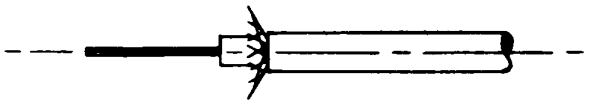
Post Installation Check

UPON COMPLETION of the installation, a flight test is desirable to insure that all three systems of the ALPHA/200A are operating properly. The navigation system should be checked on two or more different radials or on different Omnistations. The communications system should be checked for simplex operation on two or more frequencies and for duplex operation if possible. The localizer function should be checked if possible. A single frequency check is sufficient.

NAV Antenna Connector Assembly

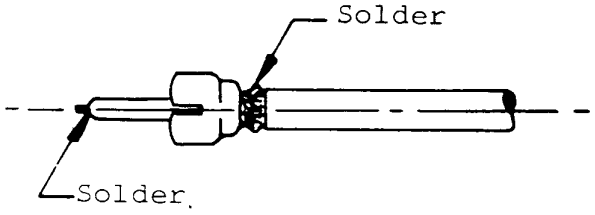


1. Cut and strip RG-58 A/U Coax as shown.



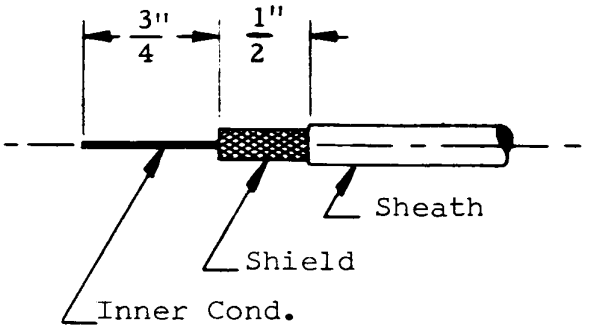
2. Spread shield. Do not pigtail.

3. Press short shank connector onto wire and against shield.



4. Fold shield over connector and solder all around. Flow solder into connector tip to secure inner conductor. Cut off tip of inner conductor which protrudes from connector.

COM Antenna Connector Assembly



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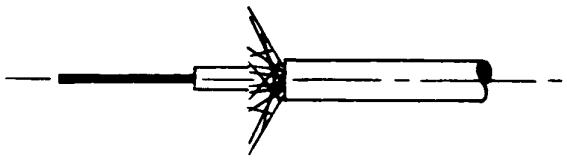

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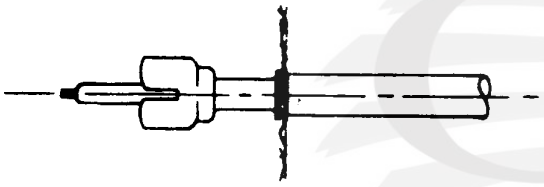

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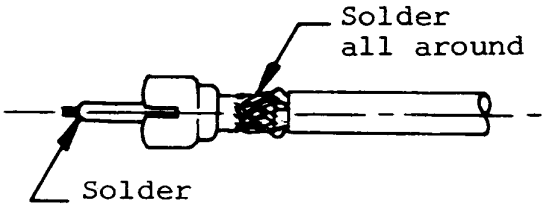

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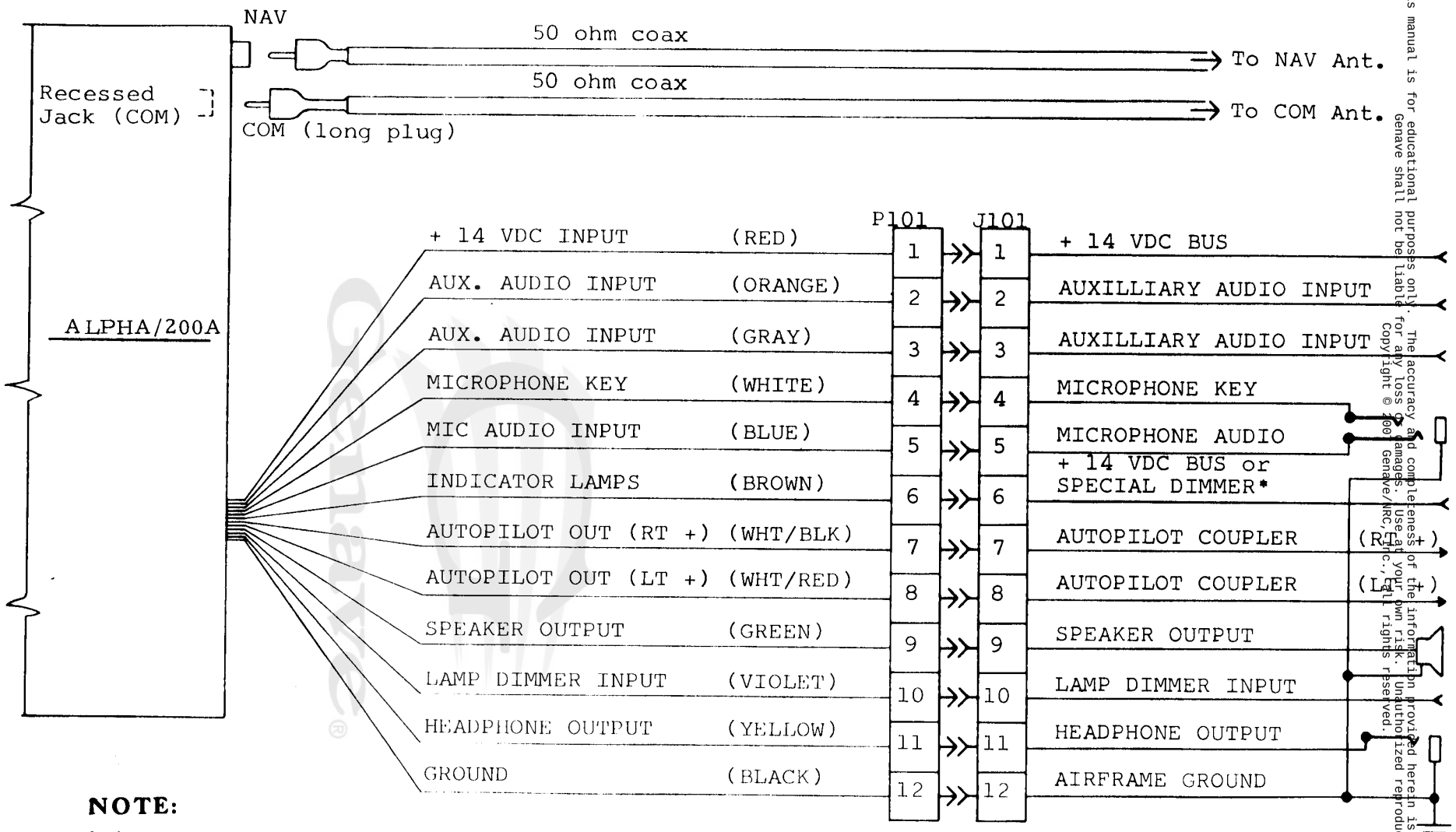
Power and Signal Cable Connections



NOTE:

It is not necessary to connect power to pins 6 or 10 if dimming of the lamps is not required. These pins have been connected to switched A+ on the bottom of the unit with color coded jumper wires:

Brown jumper wire - Indicator lamps
Violet jumper wire - Backlighting lamps

IF DIMMING IS REQUIRED on either set of lamps, the appropriate jumper(s) MUST be removed. The wiring diagram should then be used to connect the lamps to the proper points in the aircraft electrical system.

*This input controls the intensity of the TO-FROM-OFF lamps. The following are alternate methods of installation:

1. Connect directly to the +14 VDC BUS, and the lamps will light at full intensity.
2. Connect through an auxilliary 250 ohm series dimmer potentiometer to the +14 VDC BUS.
3. Connect to existing panel dimmer, which will require panel lights to be set at full brightness during the day for the lamps to be visible.
4. Install a DAY-NIGHT switch, connecting input to +14 VDC BUS for DAY mode and to existing panel dimmer for NIGHT mode.

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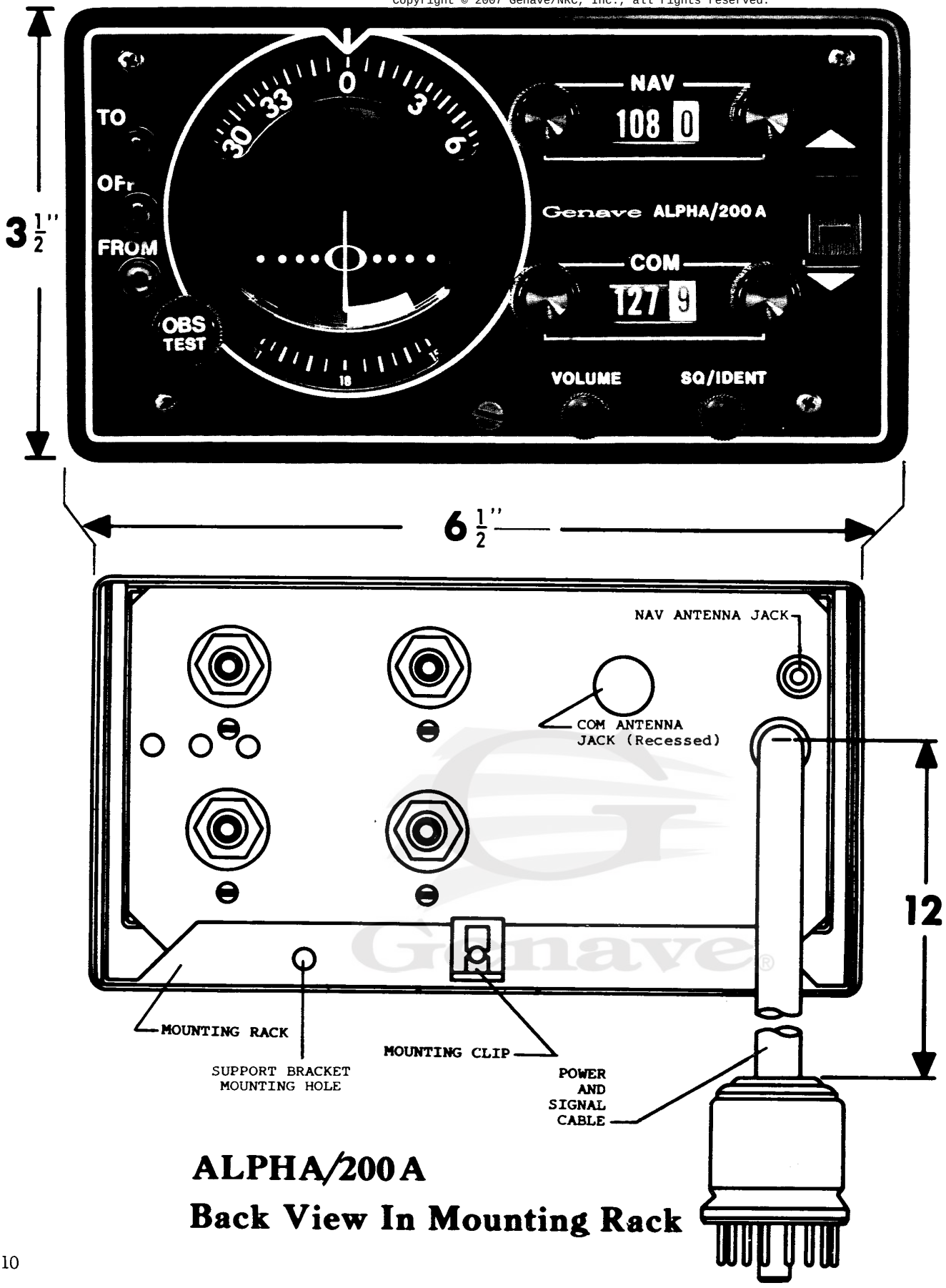
Front Panel



ALPHA/200 A

Back View In Mounting Rack

III. OPERATING MANUAL

3-1. Operating Controls and Indicators

The ALPHA/200 has eight operating controls as listed below:

1. On/Off/Volume
2. Squelch
3. OBS Selector
4. Communications Frequency Selector, mHz
5. Communications Frequency Selector, kHz
6. Navigation Frequency Selector, mHz
7. Navigation Frequency Selector, kHz
8. NAV/COM Switch

The ALPHA/200 has five readout or indicator devices as listed below:

1. Omni Bearing Dial
2. Course Deviation Needle
3. To-From-Off Lamps
4. Communications Frequency Readout
5. Navigation Frequency Readout

To operate the ALPHA/200, turn the unit on by rotating the On/Off Volume control clockwise past the click.

For operation as a communications receiver set the NAV/COM switch to COM. Rotate the squelch control to the maximum clockwise position. Set the desired communications frequency in the COM window using the COM mHz and kHz controls. Adjust the On/Off/Volume control for the desired audio output level. Adjust the Squelch control counter-clockwise to quiet the receiver when no signal is present.

To operate as a communications transmitter, set the desired communications frequency in the COM window with the COM mHz and kHz controls and push the microphone switch.

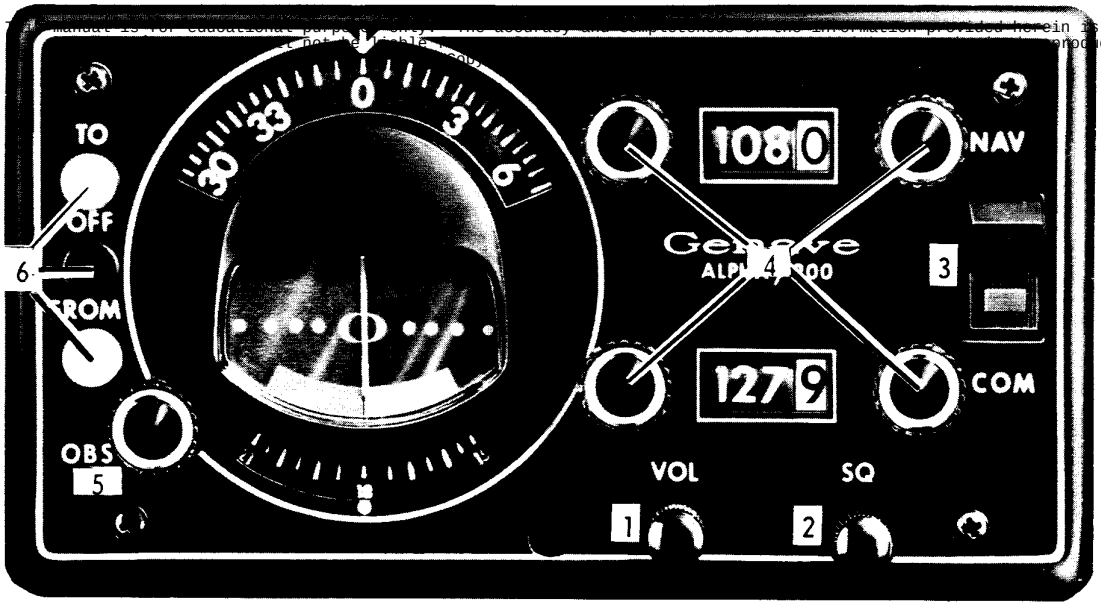
To operate as a navigation receiver, Omni or Localizer, set the NAV/COM switch to NAV. Set the desired navigation frequency in the NAV window using the NAV mHz and kHz controls. Adjust the On/Off/Volume control for the desired audio output level.

The squelch circuitry is automatically disabled when the unit is being used as a navigation receiver. When operating the unit as an Omni receiver, adjust the OBS Heading Selector for a centered course needle and a "To" or "From" lamp indication as desired. If insufficient signal is available for proper operation, the "Off" lamp will be on solid or intermittently at all OBS dial settings. A usable signal will always be indicated by a solid "To" or "From" lamp when the dial is set on the Omni radial corresponding to the location of the aircraft in relation to the selected Omni station. The Omni bearing "To" or "From" is read at the top of the rotating Omni Bearing dial. The course reciprocal is read at the bottom of the dial.

When operating the unit as a Localizer receiver, select the desired frequency with the NAV mHz and kHz controls. The NAV/COM switch should be set on NAV. The unit automatically switches to Localizer mode and feeds the proper signals to the course needle whenever a localizer frequency is selected. A usable signal is indicated by the solid illumination of the "To" lamp.

Duplex communication operation (transmission on a COM frequency, reception on an Omni or Localizer frequency) is effected by selection of the desired transmit and receive frequencies with the NAV/COM switch in the NAV position. When the microphone switch is depressed, the unit automatically transmits on the selected communications frequency and receives on the selected navigation frequency.

Simplex communication operation (Transmit and receive on the same frequency) is accomplished by placing the NAV/COM switch in the COM position and operating the unit as indicated above.



1. VOL control

Controls volume of receiver for both NAV and COM. Also controls ON-OFF for entire unit.

Rotate clockwise to turn set on and to increase volume. Rotate counter-clockwise to reduce volume and to turn set off.

2. SQ control

Adjusts squelch threshold to exclude noise between transmissions from ground.

Rotate Clockwise to disable squelch, then rotate counter-clockwise until noise stops. For weak or distant stations use full clockwise rotation. (Note: Squelch is disabled automatically when NAV-COM switch is in NAV position.)

3. NAV-COM switch

Selects the NAV or COM mode of the unit.

Depress the top of the switch to activate the NAV frequency shown in the upper digital readout window and the converter indicator. Depress the bottom of the switch to activate the COM frequency shown in the lower digital readout window.

4. FREQUENCY SELECTOR knobs

These knobs select the MHz (white numbers on black) or tenth MHz (black numbers on white) dial readout adjacent to the knob being turned.

Turn knobs clockwise to increase frequency. (When the readouts are blank the radio is inoperative. Knobs may be rotated through blank positions without damage to radio.) Knobs may be turned counter-clockwise to reduce frequency.

5. OMNI BEARING SELECTOR (OBS)

Adjusts OMNI to desired radial.

Turn knob clockwise or counter-clockwise to desired bearing on compass rose. Top numbers (larger size) indicate bearing. Bottom numbers (smaller size) are reciprocal.

6. TO-FROM-OFF lights

Provide pilot with TO-FROM-OFF information in relation to course deviation display.

GREEN : (to) Illuminates when OMNI signal of adequate strength is received, and the bearing selected on the OMNI Bearing Selector (OBS) is (or is close to) the reciprocal of the radial on which aircraft is located.

Illuminates when the Localizer signal of the frequency shown in the NAV digital readout window is of adequate strength.

YELLOW: (from) Illuminates when OMNI signal of adequate strength is received, and the bearing selected on the OMNI Bearing Selector (OBS) is the same as (or close to) the radial on which the aircraft is located.

RED : (off) Illuminates when the NAV-COM switch is in COM position, or when microphone button is depressed.

Illuminates when the OMNI or the Localizer signal strength is too low.

Illuminates in the cone of silence over an OMNI station to indicate station passage.

NOTE: NEEDLE DEFLECTIONS OF COURSE DEVIATION DISPLAY METER SHOULD *NOT* BE USED WHEN OFF LIGHT (Red) IS PARTIALLY OR FULLY ILLUMINATED.

Model: ALPHA/200

SECTION III
MAINTENANCE MANUAL

3-1. INTRODUCTION

This section, in conjunction with Section IV of Unit 1, provides the basic information required to electronically test, align, and repair the ALPHA/200A. It is assumed that the person working on the unit has a reasonable familiarity with the principles and terminology of communications and navigation electronics as applied to the aviation field.

3-2. THEORY OF OPERATION

I. General

The theory of operation of the ALPHA/200A is identical to that of the ALPHA/200, therefore only those portions of the circuitry which are new or have been modified will be discussed in the Detailed Theory.

II. Detailed Theory

A. *Receiver*—The receiver in the ALPHA/200A is identical to the receiver in the ALPHA/200 with the exception of the band stop filter which was added in front of the 5-pole input filter. The band stop filter consists of R175, C160, L107, C167, C161, L108, C168, C164, L109, C169, C165, and L110. This filter reduces spurious receiver responses by suppressing all incoming signals in the 88 MHz to 108 MHz range. The remaining receiver circuitry is very much unchanged from the ALPHA/200.

B. *Local Oscillator Assembly*—The local oscillator assembly is exactly the same as used in the ALPHA/200.

C. *Exciter*—The exciter is unchanged from that used in the ALPHA/200.

D. *Transmitter*—The transmitter is unchanged from the ALPHA/200.

E. *Converter Indicator*—With the exception of small value changes in component values which accompany semiconductor manufacturer changes, the only major change in the converter indicator circuitry is the addition of the Omni self-test circuitry. This circuitry consists of C247, R286, and R287.

The Omni self-test circuitry operates as follows. In the FM channel the 30 Hz FM modulation of the 9960 Hz subcarrier is detected and appears as a 30 Hz signal on Q213. Q213 is used as a phase inverter and provides two outputs which are 180° out of phase. The inverter outputs are fed to each of the two summing amps. In addition, the inverters collector output is fed to the Omni self-test circuitry. The Omni self-test circuitry is used to provide an additional phase shift to the inverter output signal and feed it to the AM channel when the Omni self-test switch SW201 is depressed. Therefore, the AM channel will have an input which is very nearly in phase with one of the FM channel outputs. When this signal is processed by the AM channel and fed to the summing amps it has the same appearance as a 0° Omni signal and if the OBS pot is on 0° the course deviation indicator will center with the "TO" lamp on.

F. *Audio Amplifier & Modulator*—There have been no major changes to the audio amplifier and modulator circuitry. However, an ident filter has been added to the line from the receiver to the audio amplifier.

This filter consists of L113, C135, C155, and R173 in a T-bridge configuration. When SW102 is open this filter is placed in the line and provides a 15 db rejection of the 1020 Hz identification tone.

G. *Power Supply*—The power supply used in the ALPHA/200A is of a different design than that employed in the ALPHA/200.

The regulated power supply consists of Q112, Q118, Q113, Q114, and their associated circuitry. CR112 is a 5.6 volt zener diode and is used to set the reference voltage. Q113 and Q114 operate similar to a differential amplifier. R144 controls the feedback level to the differential amplifier. This pot is set to provide a nominal regulated output voltage of 8.5 volts. Output from the differential amplifier is fed to Q118, which, connected in a Darlington configuration with Q112, forms the regulating element of the power supply. R143 supplies a portion of the load current thus allowing the regulating element to operate well within its dissipation capability.

3-3. TEST EQUIPMENT REQUIRED

The test equipment required to align the ALPHA/200 will also align the ALPHA/200A. The test equipment list in the ALPHA/200 manual is also correct for the ALPHA/200A.

3-4. ALIGNMENT PROCEDURES

A. *General*—The alignment procedures for the ALPHA/200A are identical to those for the ALPHA/200. Additional steps have been added to the alignment procedures for the ALPHA/200A in order to align the additional circuitry. Complexity of alignment procedures has not been increased however. The same alignment set up used for the ALPHA/200 is also used for ALPHA/200A alignment.

B. *Power Supply and Oscillators*

1. Perform the power supply, high frequency oscillator, and low frequency oscillator alignment according to parts B, C, and D of the ALPHA/200 alignment procedure.

C. *5-Pole Input Filter*

1. Adjust the slugs of capacitors C160, C161, C164, and C165 to their maximum capacitance position. In this position the top of the slug should be approximately flush with the top of the capacitor tube.
2. Perform the 5-pole input filter alignment steps in the ALPHA/200 manual.

D. *Band Stop Filter*

1. With the unit still connected for input filter alignment adjust the oscillator frequency on the sweep generator to center the 108 MHz edge of the waveform.
2. Adjust the C165 by tuning the slug outward until the first peak on the input filter waveform begins to decrease in amplitude. Then tune the slug back inward until the first peak returns to its original size and shape.
3. Repeat this process for the remaining capacitors until all have been aligned.
4. The band stop filter is now aligned.

E. *First and Second IF Alignment*

1. Perform the steps of Parts F and G of the ALPHA/200 alignment procedure.

F. *Localizer and Omni Alignment*

1. Perform the steps of Parts H and I of the ALPHA/200 alignment procedure.

G. *Omni Self-Test Circuitry Alignment*

1. With the unit still connected for omni alignment adjust the omni signal generator to produce a 500 microvolt 90° omni signal.
2. Adjust the OBS to the 0° position.
3. Depress the omni self-test button and adjust R286 to center the course deviation indicator.
4. The omni self-test circuitry alignment is complete.

H. *Ident Filter Alignment*

1. With the unit connected to the alignment set up and the ident switch in the full clockwise (Ident) position, connect an AC voltmeter or an oscilloscope across the speaker terminals or across the speaker load resistor if used. Set the AC volt-meter to a range that will indicate around 1.5 volts rms midscale.
2. Connect the RF generator to the receiver antenna jack and adjust the generator to produce a 500 microvolt signal on the frequency being received on the ALPHA/200A.
3. Apply 1020 Hz modulation to the generated RF signal.
4. Increase the volume using the volume control on the ALPHA/200A until around 2 volts rms of audio is indicated or audio is visible on the oscilloscope. Do not open the volume control so far that squaring of the audio waveform takes place.
5. Adjust the R173 for minimum audio output.
6. Disconnect unit from alignment set up.

SECTION IV
MAINTENANCE MANUAL

4-1. INTRODUCTION

This section provides the basic information required to electronically test, align, and repair the ALPHA/200. It is assumed that the person working on the unit has a reasonable familiarity with the principles and terminology of communications and navigation electronics as applied to the aviation field.

4-2. THEORY OF OPERATION

I. General

The ALPHA/200 employs 59 silicon transistors and 23 diodes in an all solid state design. The following is a breakdown of the functions and circuits within the unit.

A. Receiver (Nav & Com)
B. Local Oscillator Assembly
C. Exciter
D. Transmitter
E. Converter Indicator
F. Audio Amplifier & Modulator
G. Power Supply

The local oscillators, the exciter, and the transmitter are contained within separate, replaceable shielded modules. The receiver, the converter indicator, the power supply and the audio amplifier-modulator circuits are on the main circuit board.

II. Detailed Theory

A. *Receiver*—The receiver in the ALPHA/200 is a shared receiver; that is, it may be crystal tuned on either Nav or Com channels. The NAV-COM switch on the front panel determines the mode of operation and the two frequency selectors control the frequency. The receiver is a double conversion superheterodyne with a 4.0 mHz second IF. The first IF is switched and its center frequency is 30.5 mHz in NAV and 22.5 mHz in COM. The receiver is unique in that it does not employ mechanically tracked, tuned filters, or an RF amplifier. Signals from the antenna (the omni antenna is used by the receiver in both NAV & COM) are applied to a broad band, 108.0 mHz to 127.9 mHz 5 pole Chebyshev filter consisting of L101, L102, L103, L104, L105 and their associated tuning and coupling capacitors. This filter allows signals in the range of 108 to 128 mHz to pass to the bases of Q101 (COM 1st mixer) and Q102 (NAV 1st mixer).

The 1st Local Oscillator, LO1 also applies a signal through C151 to the bases of Q101 and Q102. The input filter prevents radiation of the local oscillator signal. The local oscillator signal is controlled by the front panel NAV-COM switch and by the NAV & COM mHz dials. The LO1 signal is approximately 30.5 mHz above the selected signal when in NAV and 22.5 mHz above the desired signal when in COM. Q101 and Q102 are switched by the front panel NAV-COM switch so that Q101 functions in COM and Q102 in NAV. T101 is a three pole filter tuned to a center frequency of 22.5 mHz and a bandwidth of 1 mHz. T102 is a three pole filter tuned to a center frequency of 30.5 mHz and a bandwidth of 1 mHz. The outputs of T101 and T102 are connected to Q103 the second mixer. CR109 and CR110 switch off the unused IF transformer. CR109 and 110 are controlled by the NAV-COM switch. The second local oscillator (L02) is connected to the emitter of Q103 thru R165 and C124. LO2 operates 4.0 mHz above the first IF frequency in COM and 4.0 mHz below the first IF frequency in NAV. The exact frequency of LO2 is controlled by the NAV-COM switch and by the front panel 0.1 mHz selector dials. Q103, 104, 105 and 106 and associated components form a 4.0 mHz center frequency second IF amplifier. CR102 functions as a detector. CR102 is biased above ground by R127 and R128 to provide a reference (No signal) AGC voltage. The DC output level of CR102 is amplified by emitter follower Q108 and is used as AGC applied to Q101. Q102, Q103 and Q104. C133 is connected as an additional AGC filter in NAV. The detected voice audio output from CR102 is applied through R140 (VOL control to emitter follower Q110. The output of Q110 is connected to the input of the audio amplifier through Relay RY 1 when in receive. CR104 with R136, R139 and C137 form a noise limiter that removes impulse noise from the voice audio. The detected output from CR102 is also connected to the base of Q109. Q109 is connected as an emit-

ter follower and provides Omni and localizer output to the converter indicator in NAV mode. CR105 is switched off when the NAV-COM switch is in COM to block output to the converter indicator. Q107 functions as a squelch amplifier and is controlled by R132 (SQ control) when in COM. In NAV, Q107 is disabled by CR103.

B. *Local Oscillator Assembly*—The local oscillator assembly consists of two circuits, a high frequency oscillator and a low frequency oscillator.

The high frequency oscillator, composed of Q301 and associated components, is a modified Colpitts, crystal controlled, transistor oscillator. The crystals are selected mechanically by rotary switches SW301 (Nav) and SW302 (Com). The switching of the selected Nav or Com crystal is accomlished with CR301 (Nav), CR302 (Com Rcv), and CR303 (Com Xmit) which are activated by the front panel Nav/Com switch or, in the transmit condition, by the transmit/receive relay, RY1.

Output from the oscillator is coupled to Q302, a doubler stage, which multiplies the oscillator frequencies by 2. The resulting frequencies are 138.94 mHz to 153.94 mHz in 1.0 mHz steps. The output of Q302 is passed through a 3-pole Chebyshev bandpass filter consisting of L303, C309, C310, C317, L304, C311, C312, C313, C314, L305, C316 and C315. The bandwidth of the filter is nominally 16 mHz centered around a frequency of 146.2 mHz. This filter suppresses all harmonics and subharmonics of the output frequency to a level of 60 dB or more below the desired output. The output of the filter is matched to a 50 ohm coaxial cable which is routed to the main circuit board and then to the Exciter assembly.

The high frequency oscillator is contained within a separate shielded compartment of the total oscillator assembly.

The low frequency oscillator, consisting of Q401 and associated circuitry, is a modified Colpitts, crystal controlled, transistor oscillator. The crystal frequencies are 26.040 mHz to 26.940 mHz in 100 kHz steps. The crystals are selected mechanically by rotary switches SW401 (Com) and SW402 (Nav). The switching of the selected Nav or Com crystal is accomplished with CR401 and CR402 which are activated by the front panel Nav/Com switch or, in the transmit condition, by the transmit/receive relay RY1.

T401, used to adjust the low frequency oscillator, is provided with a pickup link. This link is the first element of a 7-pole Chebyshev lowpass filter consisting of the link on T401, C406, L403, C405, L402, C404 and L401. This filter suppresses all unwanted outputs to 70 dB below the output frequency. The nominal cutoff frequency is 32.0 mHz. The output of the filter is matched to a 50 ohm coaxial cable which is routed to the main circuit board and then to the exciter assembly.

The low frequency oscillator is contained within a separate shielded compartment of the total oscillator assembly.

C. *Exciter Assembly*—Inputs from the high and low frequency oscillators are fed through resistive attenuators to the balanced mixer, consisting of Q603 and Q604. The low frequency input is applied through a tuned transformer, T601, and fed differentially to the transistor bases. The high frequency input is applied in-phase to both bases. Using this method of feeding the mixer, the high frequency input, its harmonics, and all even order harmonics of the low frequency input are suppressed in the collector circuit. Mixing action occurs in the base-emitter junctions and produces primarily the high frequency input plus and minus the low frequency input. Harmonically related spurious outputs also occur, but at lower levels. The desired output frequency is the high frequency input minus the low frequency input. The sum and difference frequencies appear in the collector circuit across the primary of T602. A pick-up link on T602 forms the first element in a 3 pole Chebyshev bandpass filter consisting of the link on T602. C625. C624. C623, L604, C622. C621, C620, C619. C618 and L603. The nominal bandwidth of this filter is 11 mHz centered around a frequency of 122.8 mHz. The filter suppresses all undesired outputs of the mixer to 60 dB below the desired output frequency.

The output of the filter is fed to a single-tuned bandpass amplifier, Q602. The output of Q602 is fed to an identical single-tuned stage, Q601. At this point all undesired outputs are over 70 dB below the desired.

The output of Q601 is matched to a 50 ohm coaxial cable which is routed to the transmitter power amplifier assembly. The entire exciter assembly is enclosed in a plated steel shield housing to eliminate direct radiations.

D. *Transmitter Power Amplifier Assembly*—The signal from the exciter assembly is brought in on 50 ohm coax and fed to a single-tuned Class A amplifier or predriver, Q503. The output of Q503 is fed to a single-tuned Class C driver, Q502.

The signal from Q502 is matched into the input of Q501 with a split inductor "Pi" matching sec-

tion consisting of Z503, C510, C509, L505 and Z501. Q501 is the final power amplifier stage. It is single-tuned into a 7-pole Chebyshev lowpass filter. The primary function of this filter is to remove harmonics of the output frequency which are generated in the Class C amplifier stages.

The filter reduces all of the harmonic and spurious outputs to over 60 dB below the desired output. The output of the filter is designed to match a 50 ohm communications antenna system. The antenna jack is directly connected to the transmitter power amplifier shield and housing assembly and connection to it is made through an access port in the rear panel.

E. *Converter/Indicator* — The converter/indicator circuitry in the ALPHA/200 bears little or no resemblance to any other system now on the market. Its operation cannot be understood by knowing how other systems work and therefore an attempt should be made to have at least a rudimentary understanding of its operation before any major service or repair is attempted.

The most obvious difference between the ALPHA/200 converter/ indicator circuitry and that of other sets is the absence of transformers of any type. The utilization of analog computer circuits and techniques has eliminated the need for transformers. Similarly, there are no "Twin-T" or "Bridged-T" circuits in the design which eliminates one of the major sources of aging error prevalent in most Converter-Indicators.

Omni and Localizer signals from Q109 are connected to a rotary switch wafer mounted on the oscillator assembly. The wafer is controlled by the NAV megahertz selector. For selected frequencies from 112.0 to 117.9 mHz the signal is connected to the Omni circuitry. For selected frequencies from 108.0 to 111.9 mHz the signal is connected to a secondary rotary switch wafer also located on the oscillator and controlled by the NAV tenth megahertz control. For all even tenth mHz frequencies from 108.0 to 111.8 mHz, the signal is routed to the Omni circuitry. For all odd tenth mHz frequencies from 108.1 to 111.9 mHz, the signal is connected to the Localizer circuitry.

When using the receiver on a Localizer channel, the signal is connected to two separate channels. The main channel is comprised of Q214 and Q215 which are used as the active elements in a two stage active RC filter. These two cascaded filters rotate the incoming signal by 90 degrees and provide a phase split between the 90 Hz and 150 Hz components of the waveform. The resulting output is fed to a phase splitting amplifier consisting of Q216 and Q217. This amplifier is broadly tuned at about 115 Hz. The two outputs from this amplifier are applied to the summing amplifiers one of which is built around Q218 and Q219 and the other of which is built around Q220 and Q221.

The second channel through which the original input signal is processed is comprised of a balance control R237, R254, C223, and C225. This network provides a phase shift of about 90 degrees to the incoming signal and feeds the resulting current to the two summing amplifiers mentioned above.

When the signals into each of the respective summing amplifiers are added together, the result is a waveform which in one case is predominantly 90 Hz and in the other case 150 Hz. The outputs of the amplifiers are then independently rectified by CR205 and CR206 respectively. The rectified outputs are applied to the meter drivers Q222 and Q223 which operate the front panel meter.

The signal at the collector of Q217 is rectified by CR207 and amplified by Q226. The resulting DC current is filtered by C237 and applied to the TO lamp amplifier Q229. The output of Q229 is further amplified by the TO lamp driver Q230 which illuminates the front panel TO lamp whenever the localizer signal is flyable.

When using the receiver on an Omni channel, the signal from the switch wafers is processed by two separate channels. One channel carries the 30 Hz AM signal and the other channel operates on the 9960 Hz FM signal.

The 30 Hz AM signal is fed to an RC tuned 30 Hz amplifier/phase splitter consisting of Q201, Q202, and Q203. The two resulting outputs are applied directly to the 90° and 270° terminals of the OBS potentiometer R213. A 90° RC phase shift network is connected between the two outputs and R209, the Phase Shift adjustment, allows the shift to be set to exactly 90°.

The output of the phase shift network is applied to a unity gain amplifier/phase splitter consisting of Q204 and Q203. The two outputs of the amplifier are applied directly to the 0° and 180° terminals of the OBS potentiometer. The signal from the wiper of the OBS pot is fed to both of the summing amplifiers in phase.

The 9960 Hz FM signal is channeled first to an LC tuned 9960 Hz amplifier/limiter consisting of Q206 and Q207. The output of the amplifier is connected to an RC tuned 9960 Hz amplifier/limiter.

The signal is then used to trigger a 50 microsecond monostable multivibrator whose average DC output is a direct function of the input frequency. The 30 Hz FM modulation of the 9960 Hz signal is therefore converted to a 30 Hz sine wave. The 9960 Hz carrier and its harmonics are removed in a 30 Hz RC tuned amplifier/phase splitter, Q212 and Q213. A phase trimming control, R230, is inserted in the input circuit of the amplifier to provide residual phase shift control for the entire Omni system.

The two outputs of the last amplifier are fed singly to the summing amplifiers.

The addition in the summing amplifiers of the in-phase inputs from the AM channel and the out-of-phase inputs from the FM channel results in the amplitude of the outputs of the amplifiers being a function of the phase difference of the input signals. When the AM channel input is exactly 90° out of phase with the FM channel inputs, the amplitude of the two amplifier outputs is the same. A deviation from 90° will cause one amplifier's output to increase and the other output to decrease.

The outputs of the amplifiers are then rectified, amplified, and applied to the front panel meter as in the case of the localizer signal discussed previously.

Two fixed 90° phase shift networks, R273 and C234, and R274 and C235, are connected to the outputs of the two summing amplifiers. The outputs of these networks have the same dependence on the relative phase of the input signals except that the amplitude response is shifted 90°. Therefore, when the outputs of the amplifiers are equal the output of one of the phase shift networks is at maximum and the output of the other network is at minimum. The outputs of these networks are rectified to DC by Q224 and Q225. C236 and C237 filter out the rectification ripple and the signals obtained are applied to the TO and FROM lamp amplifier transistors Q229 and Q228 respectively. R278, R279, and R280 are connected to the two DC signals and to the base of the OFF lamp amplifier Q227. These resistors preferentially bias Q227 to be on until the difference between the levels of the DC signals exceeds the threshold voltage determined by the ratio of the 3 resistor network mentioned above.

The outputs of the lamp amplifiers are fed to the bases of the TO, OFF, and FROM lamp driver transistors Q230, Q231, and Q232 respectively which in turn control the front panel indicator lamps.

F. *Audio Amplifier Modulator*—The audio amplifier in the ALPHA/200 is used as a power amplifier to drive the speaker for COM or NAV receive and as a modulator for the transmitter during transmit. The switching required for the change of function is accomplished by RY1 the Transmit/Receive relay which is activated by the microphone switch.

The circuit of the audio amplifier consists of Q115, Q116, and Q121. The entire amplifier is biased and DC stabilized by a DC feedback loop comprising R155, R156, and R157. AC feedback is applied by R154 and C145 which determine the high frequency rolloff of the amplifier. The low frequency roll-off is controlled by the RC input networks.

When the radio is in the receive mode, the audio amplifier has three (3) inputs which may be in use simultaneously. One input is connected to the receiver output signal and is controlled by the volume control R140. The other two inputs are auxiliary inputs which may be connected to other systems in the airplane such as a marker beacon, ADF receiver, a second NAV/COM, etc. These inputs are designed to provide full audio output power with an input signal of 1 Vrms.

When the radio is being used as a transmitter, the audio amplifier has a single input from the microphone. Microphone bias is supplied by R146 from the regulated power supply. The output of the amplifier is taken from the collector of Q121 and routed to the transmitter through RY1. CR108 a 24 volt diode, is used to limit the positive modulation peaks and prevent over modulation of the RF carrier.

G. *Regulated Power Supply*—The circuits in the ALPHA/200 which are sensitive to input voltage variations are operated from a regulated power supply consisiting of Q111, Q112, Q113, and Q114. The base-emitter junction of Q113 is used as a zener to provide the necessary reference voltage. Feedback amplifiers Q112 and Q114 control the pass transistor Q111. The output voltage of the supply is nominally 8.5 volts and is adjusted by R144, the feedback control. R142 supplies a portion of the load current which allows Q111 to operate well within its dissipation capabilities.

CR107, although not a direct part of the regulated supply, limits the maximum input to the supply to about 16 volts. This protects the supply and the circuits of the radio which use the full input voltage from the aircraft electrical supply from overvoltage spikes caused by starters, blowers, relays, etc.

4-3. TEST EQUIPMENT REQUIRED

a. NAV/COM Generator or Simulator
   Tel-Instruments T-12A, ARC H-14, or equivalent
b. Sweep Generator covering at least 4 mHz ± .500 kHz, 22.5 mHz ± 1 mHz, 30.5 mHz ± 1 mHz, 118 mHz ± 15 mHz, and 73 mHz ± 5 mHz.
   Heathkit IG-52 (Modified, Schematics available from GENAVE) or equivalent.
c. VTVM
   Any accurate instrument.
d. Frequency Counter usable to at least 159 mHz.
   Computer Measurements Corp. Model 616A
   Hewlett Packard Model 5254
e. Power Supply 14.00 VDC @ 3 amps, filtered
f. Oscilloscope, low frequency, DC coupled preferred
g. Audio Signal Generator
h. RF Signal Generator, 108 mHz to 128 mHz.
i. RF Power Meter, 0-5 watts
j. Dummy Detector
k. VOM

4-4. ALIGNMENT PROCEDURES

NOTE: Alignment procedures for the High Frequency Oscillator Doubler Filter, the Exciter Assembly, and the Transmitter Power Amplifier are not included since these are considered to be replaceable modules and not field repairable.

A. *General*—The receiver section of the ALPHA/200 employs several multi-element bandpass filters. These filters *MUST* be aligned using swept frequency techniques. Do not attempt to align any portion of the ALPHA/200 by "peaking" or other single frequency techniques.

The basic test equipment necessary for alignment of the receiver is a Heath Model IG-52. T. V. Alignment Generator modified according to instructions available from General Aviation Electronics.

B. *8.5 VDC Power Supply*

1. Connect an accurate VOM or VTVM to the output of the regulated 8.5 VDC power supply.
2. Adjust R144, 8.5 VDC ADJUST, for an output of 8.5 VDC.

C. *High Frequency Oscillator Alignment*

1. Connect the receiver to the Alignment and Test Setup shown in figure 4-4-1.
2. Connect a counter to the high frequency oscillator output cable where it connects to the main board. (*See figure 4-4-2*).
3. Turn on the receiver. Set the NAV/COM switch to COM. Set the frequency to 118.5 mHz.
4. Adjust the high frequency oscillator slug (*see figure 4-4-3*) counterclockwise until the oscillator stops. Slowly turn the slug clockwise until the oscillator starts. Note the exact frequency at which the oscillator starts.
5. Continue to rotate the slug clockwise until the frequency reaches a minimum. Note the exact minimum frequency.
6. Rotate the slug counterclockwise until the output frequency is halfway between the frequencies recorded in steps 4 and 5.
7. All of the crystals should now be checked for proper operation by counting the high frequency oscillator output frequency on all the mHz positions in the NAV receive, COM receive, and COM transmit conditions. (*See the Frequency Table in figure 4-4-4.*) If any of the crystals do not start, a very slight readjustment of the slug may be made to insure proper starting.

D. *Low Frequency Oscillator Alignment*

1. Connect the receiver to the Alignment and Test Setup shown in figure 4-4-1.
2. Connect a counter to the low frequency oscillator output cable where it connects to the main board. (*See figure 4-4-2*).
3. Turn on the receiver. Set the NAV/COM switch to COM. Set the frequency to 118.5 mHz.
4. Adjust the low frequency oscillator slug (*see figure 4-4-3*) counterclockwise until the oscillator stops. Slowly turn the slug clockwise until the oscillator starts. Note the exact frequency at which the oscillator starts.
5. Continue to rotate the slug clockwise until the frequency reaches a maximum. Note the exact maximum frequency.
6. Rotate the slug counterclockwise until the output frequency is halfway between the frequencies recorded in steps 4 and 5.
7. All of the crystals should now be checked for proper operation by counting the low frequency oscillator output frequency from .0 to .9 in both the NAV and COM receive conditions. See the Frequency Table in figure 4-4-4.

E. *5-Pole Input Filter*

1. Connect the radio to the Alignment and Test Setup shown in figure 4-4-1.
2. Turn the radio OFF.
3. Connect the Heath sweep generator to the

NAV antenna input jack using a 6 dB pad.

4. Set the sweep generator to Band C. Set the frequency to approximately 60 mc. Note that the second harmonic output of the sweep frequency is used.
5. Set the sweep width to maximum-wide. Set the output level to maximum.
6. Connect the high impedance detector (*see figure 4-4-5*) to the output tap of L105 and ground. Use the shortest possible lead length.
7. Connect the output of the high impedance detector to the vertical input of the scope.
8. Connect the horizontal output of the sweep generator to the horizontal input of the scope.
9. Set the Marker Switch to variable marker.
10. Set the Marker Amplitude to maximum.
11. Turn the radio ON. Set the NAV/COM Switch to NAV. Tune the NAV frequency to 108.0 mHz.
12. Adjust the sweep frequency and phasing controls on the generator to center the pattern.
13. Adjust the marker frequency around 108 mHz until the pattern expands upward on the screen. This sets the marker frequency to 108.0 mHz. Turn the radio OFF.
14. Adjust C101, C102, C107, C108, and C109 for the pattern shown in figure 4-4-6. The 108.0 marker should be located as shown about 1/3 of the way down the low frequency side of the pattern. It will be necessary to adjust each of the tuning capacitors several times to obtain the required pattern. Do not make gross adjustments of the capacitors, increments of 1/8 to 1/4 turn are generally proper. The correct pattern will be symmetrical and will contain 5 distinct peaks. It is not possible to obtain the correct pattern if the radio is ON.

F. *First IF Alignment*

1. Connect the radio to the Alignment and test Setup shown in figure 4-4-1.
2. Turn the radio OFF.
3. Connect the sweep generator to the NAV antenna input jack using a 6 dB pad.
4. Connect the high impedance detector (figure 4-4-5) to the collector of Q103, the second mixer.
5. Turn the radio ON. Set the NAV/COM Switch to NAV. Set the mHz dial to 116. Set the NAV 0.1 mHz dial to a blank spot.
6. Set the sweep generator to Band D. Adjust the Frequency and Sweepwidth controls for a bandpass presentation on the oscilloscope. Keep the input signal level as low as possible.
7. Adjust the three slugs of T102 (*see figure 4-4-12*) for a bandpass approximately 1 mHz wide (*see figure 4-4-7*). Proper bandwidth and frequency can be checked by using the 0.1 mHz local oscillator of the radio in the 0 and 9 positions. The marker spikes generated by the oscillator in these positions should be positioned equally from the corners of the bandpass curve. A distortion in the passband will be present when the oscillator is operating.
8. Set the NAV/COM switch to COM. Set the COM mHz dial to 123. Set the COM 0.1 mHz dial to a blank spot.
9. Repeat steps 6 & 7 and adjust T101 for the proper response. (*See figure 4-4-8.*) The amplitude of the bandpass will generally be different than in the NAV position.

G. *4 mHz IF Alignment*

1. Connect the receiver to the Alignment and Test Setup shown in figure 4-4-1.
2. Connect an oscilloscope to the receiver detector output using the isolation network shown in figure 4-4-9. The detector output point is labeled X on the schematic.
3. Connect the sweep generator through a 10K resistor to the junction of R167, C120, and the tap of T102.
4. Connect the Omni/Localizer Simulator to the NAV antenna input jack. Set the simulator up on a crystal controlled Omni frequency between 110 mHz and 117 mHz. Reduce all modulation to zero.
5. Turn on the receiver. Set the NAV/COM Switch to NAV. Tune the radio to the frequency selected in step 4.
6. Adjust the sweep generator frequency, width, and output controls for a bandpass presentation on the oscilloscope. Maintain the output well below clipping as indicated on the scope. The output level of the simulator should be adjusted to provide a marker for center band. Adjust both the cores in T103, T104, T105, and T106 for the pattern shown in figures 4-4-10 and 4-4-11. Do not make large adjustments of any one core, 1/8 turn at a time is recommended. Several repeated adjustments of all 8 cores will generally be required before the bandpass is correct. Any attempt to align this IF strip by "peaking" or tuning it for a single peak response will seriously degrade the performance of the receiver. The bandpass MUST be similar to that shown in figures 4-4-10 and 4-4-11, or the alignment is not correct.

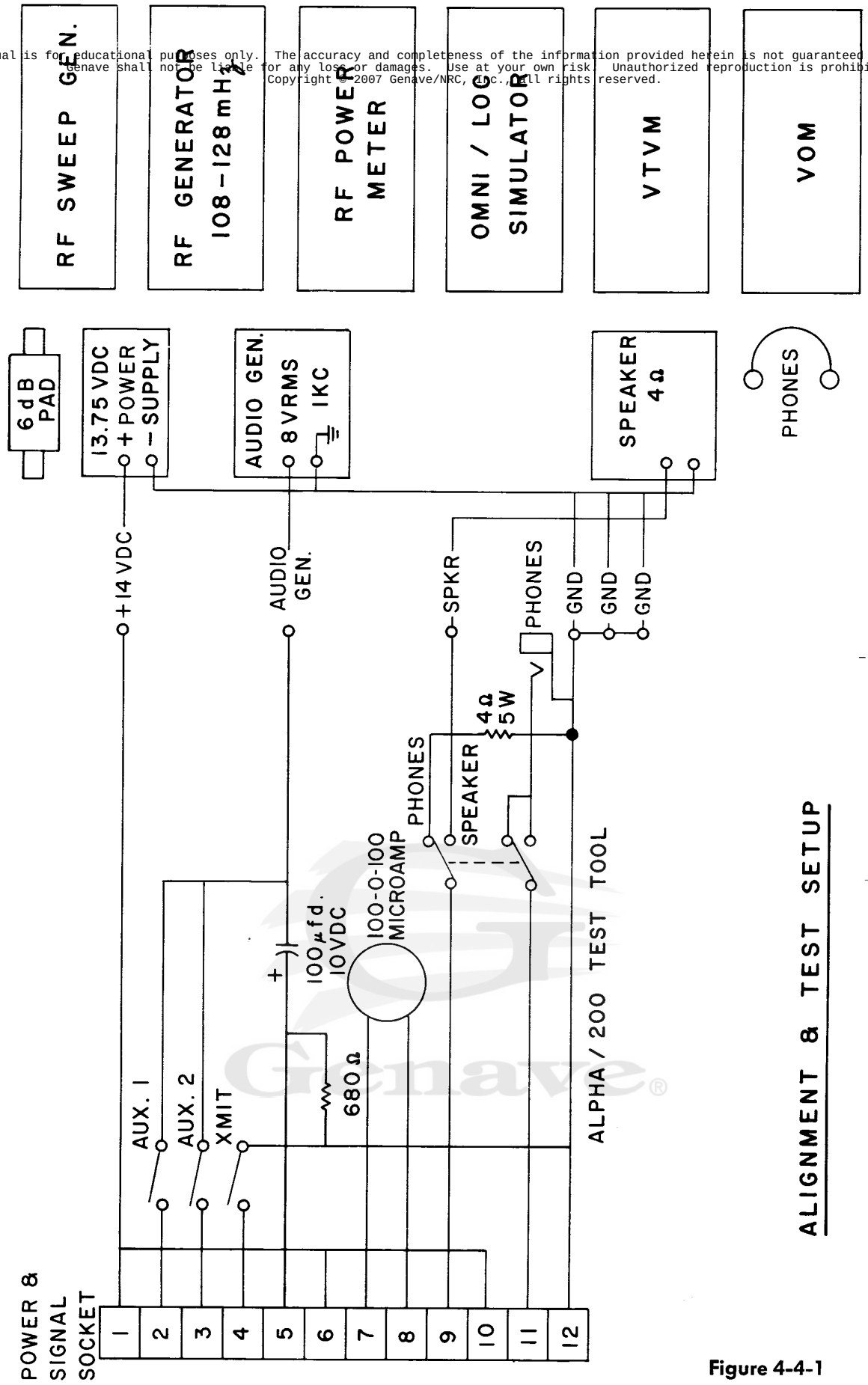
7. Set the NAV/COM Switch to COM. The bandpass shape should remain approximately the same. A slight adjustment in the bandpass shape may be necessary if the shape changes radically from NAV to COM. In this case, the shape of the bandpass in NAV is more important than in COM and if a compromise is necessary it should be biased toward a proper shape in NAV.

H. *Localizer Alignment*

1. Connect the receiver to the Alignment and Test Setup shown in figure 4-4-1.
2. Set the Omni/Localizer Simulator to a convenient Localizer frequency. Do not use an Omni frequency.
3. Adjust the RF output of the simulator to 500 microvolts. Set the modulation control for a centering signal. Adjust the modulation of the carrier to the proper level.
4. Turn the receiver ON. Set the NAV/COM Switch to NAV. Tune the radio to the frequency selected in step 2. The "TO" lamp shall light.
5. Adjust R237, Localizer Balance, for a centered meter.
6. Set the modulation control on the generator to + 4 dB. The meter should deflect approximately to the edge of the blue color band. There is no adjustment for deflection sensitivity. A deflection within—1/8″ to + 1/4″ of the color band edge is normal.
7. Set the modulation control on the generator to —4 dB. The meter should deflect approximately to the edge of the yellow color band. The same comments as in step 6 apply.

I. *Omni Alignment*

1. Connect the receiver to the Alignment and Test Setup shown in figure 4-4-1.
2. Set the Omni/Localizer Simulator to a convenient Omni frequency. Do not use a Localizer frequency. Adjust the RF output to 500 microvolts. Set the course selector for Omni modulation at 90°. Adjust the modulation of the carrier to the proper level.
3. Connect an ohmmeter between the yellow wire terminal and the gray wire terminal on R213 the OBC potentiometer *(see figure 4-4-12)*. Set the ohm-meter to Rx1. Adjust the OBS control for a minimum resistance reading. The resistance will be less than 10 ohms. The minimum should occur within 1/2 degree of 90° indicated on the OBS dial. If it is further off than this, loosen the set screw in the collar of the OBS drum and set the dial to 90° with a minimum resistance reading on the ohmmeter. Tighten the set screw. Disconnect the ohmmeter.
4. Turn on the receiver. Set the NAV/COM Switch to NAV. Tune the radio to the frequency selected in step 2. Set the OBS dial on the receiver to 90°.
5. Delete the 9960 Hz modulation of the carrier. Adjust R259, AM BALANCE, for a centered meter *(see figure 4-4-13)*.
6. Delete the 30 Hz modulation from the carrier and apply the 9960 Hz. Adjust R252, FM BALANCE, for a centered meter.
7. Rotate the OBS dial on the receiver to 270°. Readjust the FM BALANCE control for 1/2 of the indicated error if any.
8. Apply both 30 Hz and 9960 Hz modulation to the carrier. Set the receiver OBS dial to 90°. Adjust R230, PHASE CORRECT, for a centered meter. The "TO" light should be on.
9. Set the simulator course selector to 270°. Readjust the PHASE CORRECT control for 1/2 of the indicated error if any. The "FROM" light should be on.
10. Set the simulator course selector and the receiver OBS dial to 0°. Adjust R209, PHASE SHIFT, for a centered meter. The "TO" light should be on.
11. Set the simulator course selector to 180°. Readjust the PHASE SHIFT control for 1/2 of the indicated error if any. The "FROM" light should be on.
12. Check the accuracy of the Omni at the cardinal points. The accuracy should be within 2°. An error greater than this at any one point can be reduced by "trimming" the PHASE CORRECT or PHASE SHIFT controls.



ALIGNMENT & TEST SETUP

Figure 4-4-1

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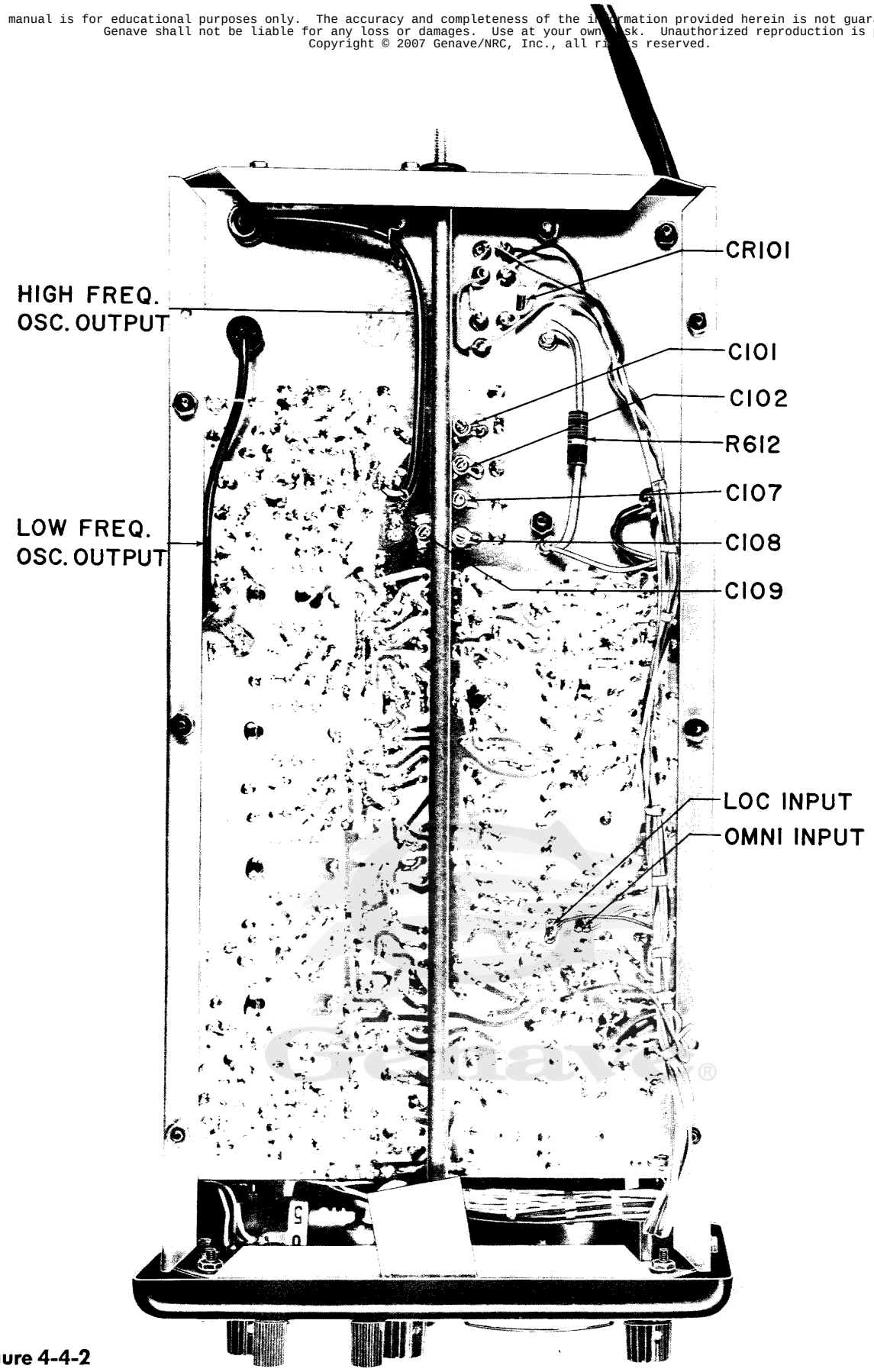


Figure 4-4-2

RADIO, BOTTOM VIEW

Model: ALPHA/200

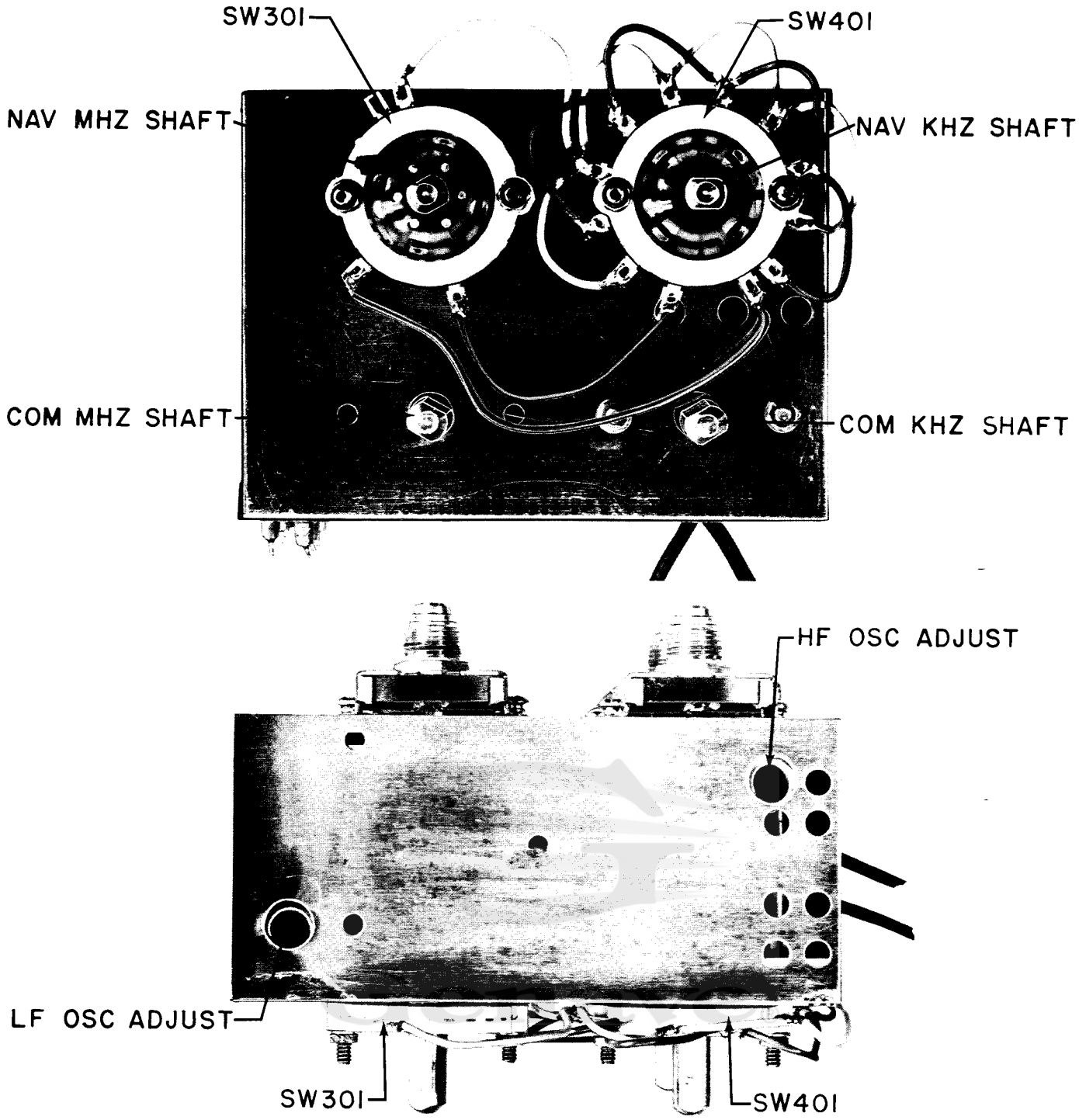


Figure 4-4-3

Model: ALPHA/200 **OSCILLATOR ASSEMBLY, FRONT & TOP VIEW**

Figure 4-4-4 OSCILLATOR FREQUENCY TABLES

LOW FREQUENCY OSCILLATOR, ALL CONDITIONS

DIAL READING	CRYSTAL & OUTPUT FREQ.
0	26.940 mHz ± 1 kHz
1	26.840 mHz ± 1 kHz
2	26.740 mHz ± 1 kHz
3	26.640 mHz ± 1 kHz
4	26.540 mHz ± 1 kHz
5	26.440 mHz ± 1 kHz
6	26.340 mHz ± 1 kHz
7	26.240 mHz ± 1 kHz
8	26.140 mHz ± 1 kHz
9	26.040 mHz ± 1 kHz

HIGH FREQUENCY OSCILLATOR

NAV RECEIVE

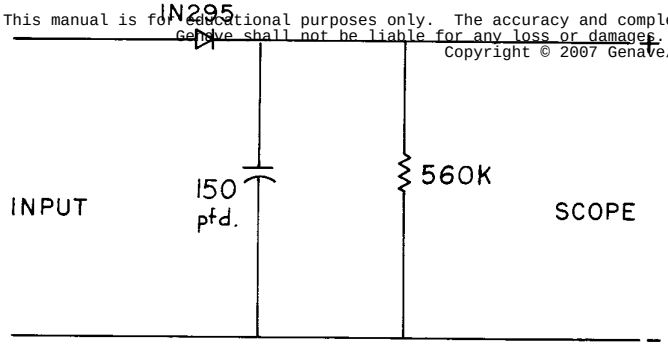
DIAL READING	CRYSTAL FREQ.	OSC. OUTPUT FREQ.
108	69.470 mHz ± 3.5 kHz	138.940 mHz ± 7 kHz
109	69.960 mHz ± 3.5 kHz	139.920 mHz ± 7 kHz
110	70.470 mHz ± 3.5 kHz	140.940 mHz ± 7 kHz
111	70.970 mHz ± 3.5 kHz	141.940 mHz ± 7 kHz
112	71.470 mHz ± 3.5 kHz	142.940 mHz ± 7 kHz
113	71.970 mHz ± 3.5 kHz	143.940 mHz ± 7 kHz
114	72.470 mHz ± 3.5 kHz	144.940 mHz ± 7 kHz
115	72.970 mHz ± 3.5 kHz	145.940 mHz ± 7 kHz
116	73.470 mHz ± 3.5 kHz	146.940 mHz ± 7 kHz
117	73.970 mHz ± 3.5 kHz	147.940 mHz ± 7 kHz

COM RECEIVE

DIAL READING	CRYSTAL FREQ.	OSC. OUTPUT FREQ.
118	70.470 mHz ± 3.5 kHz	140.940 mHz ± 7 kHz
119	70.970 mHz ± 3.5 kHz	141.940 mHz ± 7 kHz
120	71.470 mHz ± 3.5 kHz	142.940 mHz ± 7 kHz
121	71.970 mHz ± 3.5 kHz	143.940 mHz ± 7 kHz
122	72.470 mHz ± 2.0 kHz	144.940 mHz ± 4 kHz
123	72.970 mHz ± 2.0 kHz	145.940 mHz ± 4 kHz
124	73.470 mHz ± 2.0 kHz	146.940 mHz ± 4 kHz
125	73.970 mHz ± 2.0 kHz	147.940 mHz ± 4 kHz
126	74.470 mHz ± 2.0 kHz	148.940 mHz ± 4 kHz
127	74.970 mHz ± 2.0 kHz	149.940 mHz ± 4 kHz

COM TRANSMIT

DIAL READING	CRYSTAL FREQ.	OSC. OUTPUT FREQ.
118	72.470 mHz ± 2.0 kHz	144.940 mHz ± 4 kHz
119	72.970 mHz ± 2.0 kHz	145.940 mHz ± 4 kHz
120	73.470 mHz ± 2.0 kHz	146.940 mHz ± 4 kHz
121	73.970 mHz ± 2.0 kHz	147.940 mHz ± 4 kHz
122	74.470 mHz ± 2.0 kHz	148.940 mHz ± 4 kHz
123	74.970 mHz ± 2.0 kHz	149.940 mHz ± 4 kHz
124	75.470 mHz ± 2.0 kHz	150.940 mHz ± 4 kHz
125	75.970 mHz ± 2.0 kHz	151.940 mHz ± 4 kHz
126	76.470 mHz ± 2.0 kHz	152.940 mHz ± 4 kHz
127	76.970 mHz ± 2.0 kHz	153.940 mHz ± 4 kHz



HIGH IMPEDANCE DETECTOR

Figure 4-4-5

HIGH IMPEDANCE DETECTOR

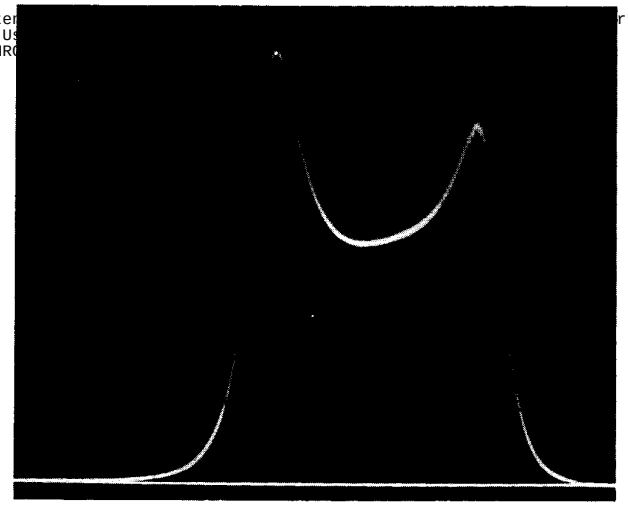


Figure 4-4-7

NAV 1st IF PASSBAND

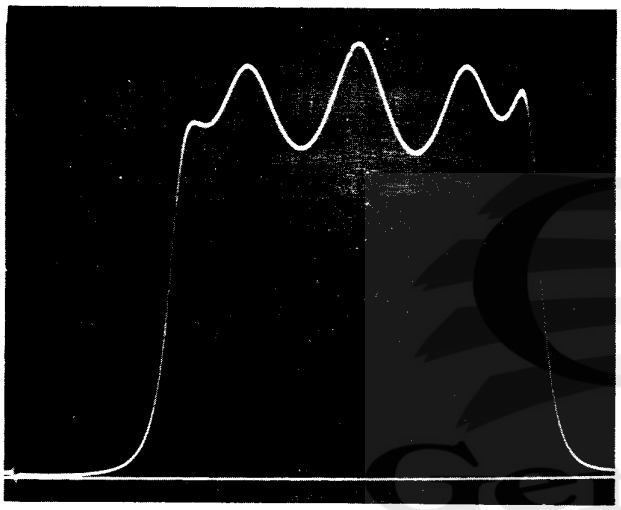
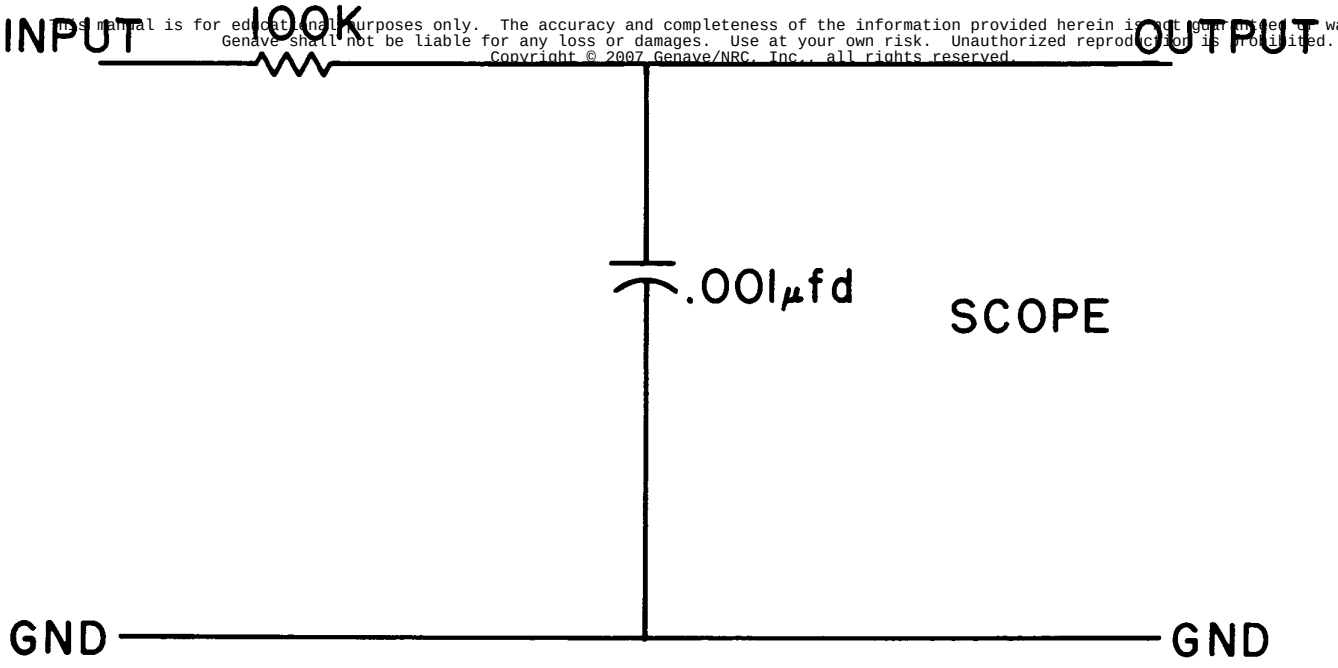


Figure 4-4-6

INPUT FILTER PASSBAND

Figure 4-4-8

COM 1st IF PASSBAND



SCOPE ISOLATION NETWORK

Figure 4-4-9

SCOPE ISOLATION NETWORK

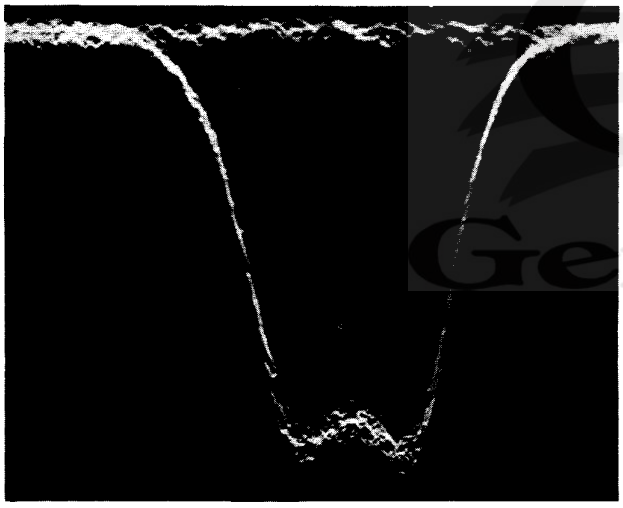


Figure 4-4-10

4 mHz PASSBAND (WITHOUT MARKER)

Figure 4-4-11

4 mHz PASSBAND (WITH MARKER)

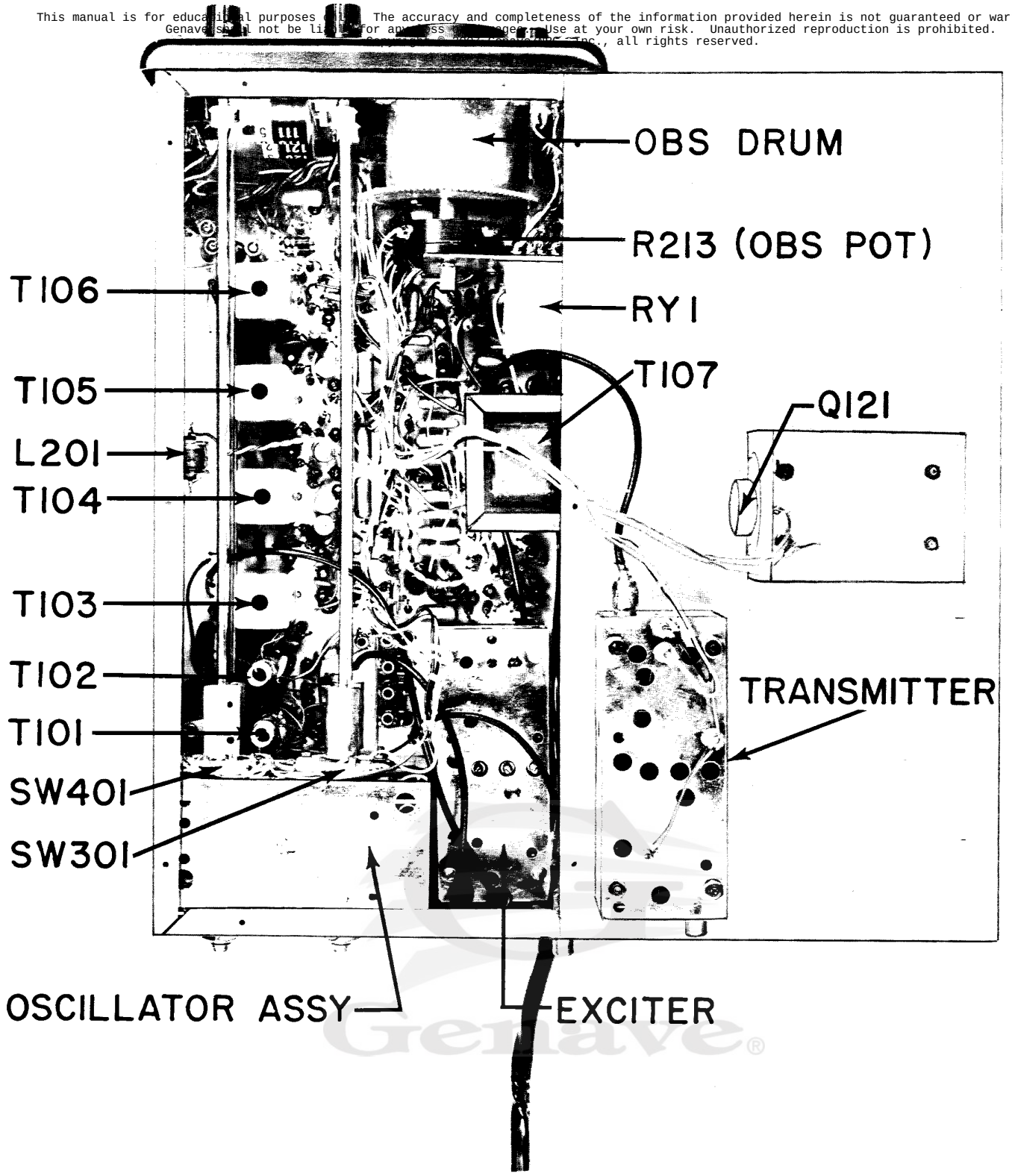


Figure 4-4-12

Model: ALPHA/200

RADIO, TOP VIEW

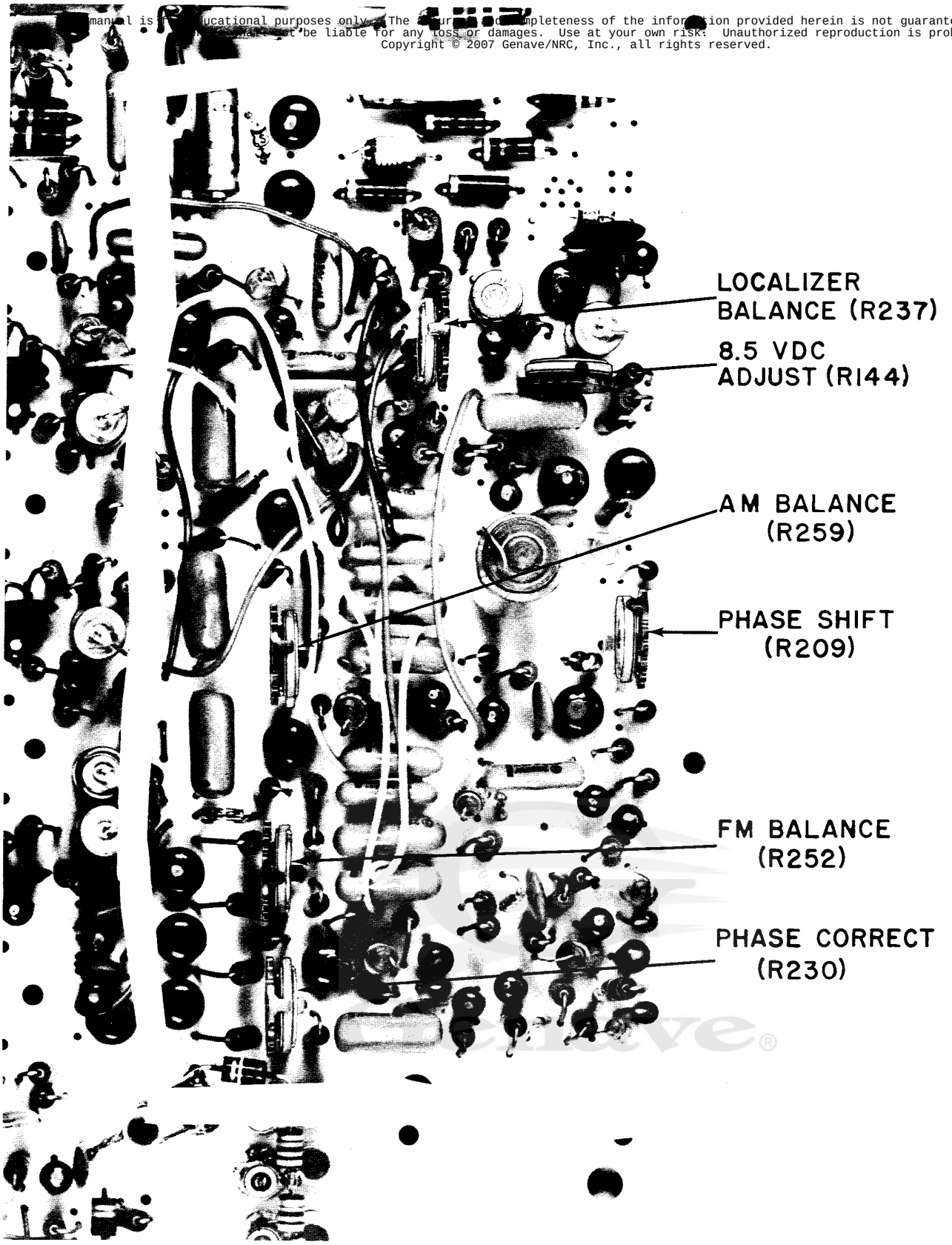


Figure 4-4-13

OMNI/LOCALIZER ADJUSTMENTS

Model: ALPHA/200

4-5. TROUBLESHOOTING INFORMATION

I. General

It is assumed that the technician performing any troubleshooting or repair work on the unit is familiar with the principles of aviation electronics and the procedures of troubleshooting electronic equipment. It is further assumed that he has a working knowledge of transistorized circuitry and the use of all the normal test equipment found in the field.

The primary aids to troubleshooting the radio are the DC Voltage Measurements given in Table 4-5-1, the Component Location Photographs (*figures 4-5-2 through 4-5-10*), the Omni-Localizer waveform photographs (*figures 4-5-11 through 4-5-26*), and the schematic diagrams (*figures 4-5-27 through 4-5-32*).

The above aids will locate the problem area in almost all cases. In some instances, however, the problem may be of such a nature that other approaches must be found. Table 4-5-35 lists a few such problems, and indicates possible causes and solutions.

It should be noted that some of the parts in the Converter Indicator are matched pairs. Before replacing parts in this section check figure 4-5-33. If one component of the matched pair is bad, be sure to replace both parts with another matched set.

II. Table of Figures

DC VOLTAGE MEASUREMENTS

All voltages shown in this table must be measured with a VTVM. The input voltage to the radio should be set to 13.75 VDC and the 8.5 VDC power supply should be set to 8.50 VDC. A variation of ± 20% of the measured voltages from those listed may be considered normal.

Ref. No.	Mode	Control Setting	No Signal Condition			500 microvolt Signal On Appropriate Frequency With Omni "TO" Modulation Except As Noted.			Notes
			E	B	C	E	B	C	
Q101	NAV		4.0	1.8	7.3	4.0	0.7	7.4	
Q101	COM		1.2	1.9	7.3	0.14	0.7	7.4	1300 Hz, 30% Modulation
Q102	NAV		1.2	1.8	7.3	0.13	0.7	7.4	
Q102	COM		4.0	1.9	7.3	4.0	0.7	7.4	
Q103			1.2	1.9	7.2	0.1	0.7	8.3	1300 Hz, 30% Modulation
Q104			1.2	1.9	7.2	0.1	0.7	8.3	
Q105			1.9	2.6	8.0	1.9	2.6	7.9	
Q106			1.9	2.6	8.0	1.9	2.6	7.9	
Q107		SQ CW	8.5	8.5	2.2	8.5	8.5	2.1	
Q107		SQ CCW	8.5	7.8	8.4	8.5	8.0	2.1	
Q108		SQ CW	1.9	2.4	2.9	0.7	1.1	7.9	
Q108		SQ CCW	1.9	2.4	7.7	0.7	1.1	7.9	
Q109	NAV		3.2	2.5	0.0	1.8	1.1	0.0	
Q109	COM		3.3	2.6	0.0	1.8	1.1	0.0	1300 Hz, 30% Modulation
Q110	NAV	V CW	2.0	2.5	8.5	1.2	1.7	8.5	
Q110	NAV	V CCW	2.2	2.7	8.5	2.2	2.7	8.5	
Q110	COM	SQ CW V CW	2.0	2.5	8.5	1.2	1.7	8.5	1300 Hz, 30% Modulation
Q110	COM	SQ CCW V CCW	3.9	2.8	8.5	2.2	2.7	8.5	1300 Hz, 30% Modulation
Q111			8.5	9.0	13.75	—	—	—	
Q112			9.0	8.4	8.5	—	—	—	
Q113			0.0	6.1	0.0	—	—	—	
Q114			6.1	6.6	8.4	—	—	—	
Q115			0.0	0.56	2.1	—	—	—	
Q116			1.5	2.0	12.6	—	—	—	
Q121			0.76	1.5	13.0	—	—	—	
Q201			0.0	0.40	2.8	—	—	—	
Q202			2.3	2.8	5.4	—	—	—	
Q203			6.1	5.5	2.3	—	—	—	
Q204			1.7	2.2	6.1	—	—	—	

Figure 4-5-1

DC VOLTAGE MEASUREMENTS

Ref. No.	Mode	Control Setting	No Signal Condition			500 Microvolt Signal On Appropriate Frequency With 1 KHz Modulation Except As Noted.			Notes
			E	B	C	E	B	C	
Q205			6.7	6.1	1.7	——	——	——	
Q206			8.5	7.9	6.6	——	——	——	
Q207			7.3	6.6	0.0	——	——	——	
Q208			8.5	7.9	6.8	——	——	——	
Q209			7.4	6.8	0.0	——	——	——	
Q210			8.5	8.6	8.0	8.5	8.7	8.0	
Q211			8.5	8.0	4.6	8.5	8.0	4.9	
Q212			0.0	0.42	5.0	——	——	——	
Q213			5.6	4.9	2.8	——	——	——	
Q214			3.8	3.2	0.0	2.6	1.9	0.0	Localizer Modulation
Q215			4.8	4.2	0.0	3.7	3.0	0.0	Localizer Modulation
Q216			0.0	0.44	5.4	——	——	——	Localizer Modulation
Q217			6.0	5.4	2.3	——	——	——	Localizer Modulation
Q218			0.0	0.44	3.6	——	——	——	
Q219			4.2	3.6	0.0	——	——	——	
Q220			0.0	0.44	3.6	——	——	——	
Q221			4.2	3.6	0.0	——	——	——	
Q222			7.7	7.1	0.2-1.3	7.0	6.6	1.4	Centered Needle
Q223			7.7	7.1	0.2-1.3	7.0	6.6	1.4	Centered Needle
Q224			4.0	4.4	0.7	2.9 4.9	4.5 4.3	0.8 0.8	To signal From signal
Q225			4.0	4.4	0.7	4.9 2.9	4.3 4.5	0.8 0.8	To signal From signal
Q226			0.0	0.0	4.9	0.0	0.2	0.2	Localizer Modulation
Q227			4.4	3.8	0.7	3.6	3.7	0.0	Either To or From sig
Q228			4.4	4.0	<0.4	3.6	4.8	0.0	To sig
Q228			——	——	——	3.6	3.0	0.7	From sig
Q229			4.4	4.0	<0.4	3.6	3.0	0.7	To sig
Q229			——	——	——	3.6	4.8	0.0	From sig
Q230			0.0	<0.4	13.75	0.0	0.7	<3.0	To sig
Q231			0.0	0.7	<3.0	0.0	0.0	13.75	Either To or From sig
Q232			0.0	<0.4	13.75	0.0	0.7	<3.0	From sig

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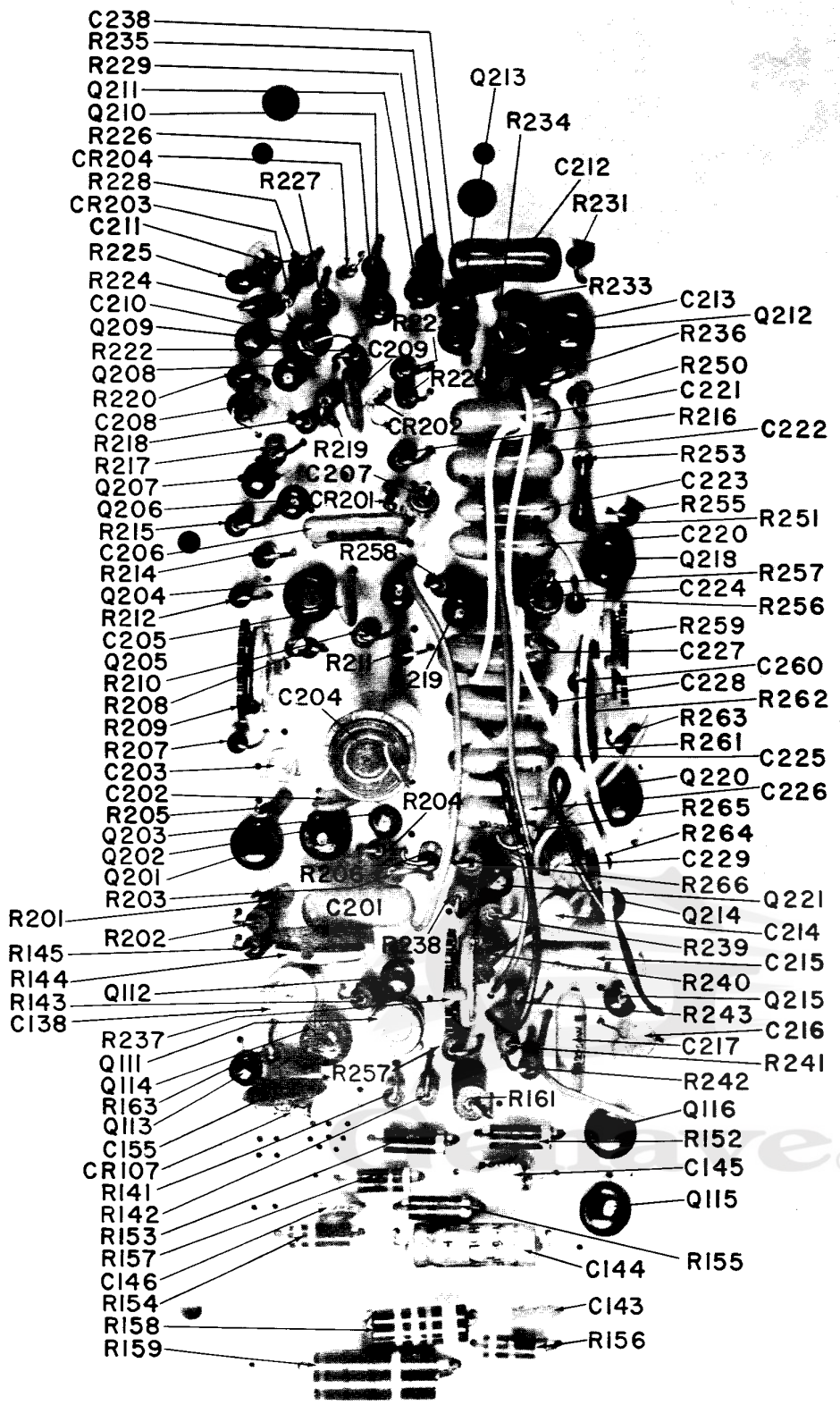


Figure 4-5-2

Model: ALPHA/200

COMPONENT LOCATION, MAIN BOARD, LEFT SIDE

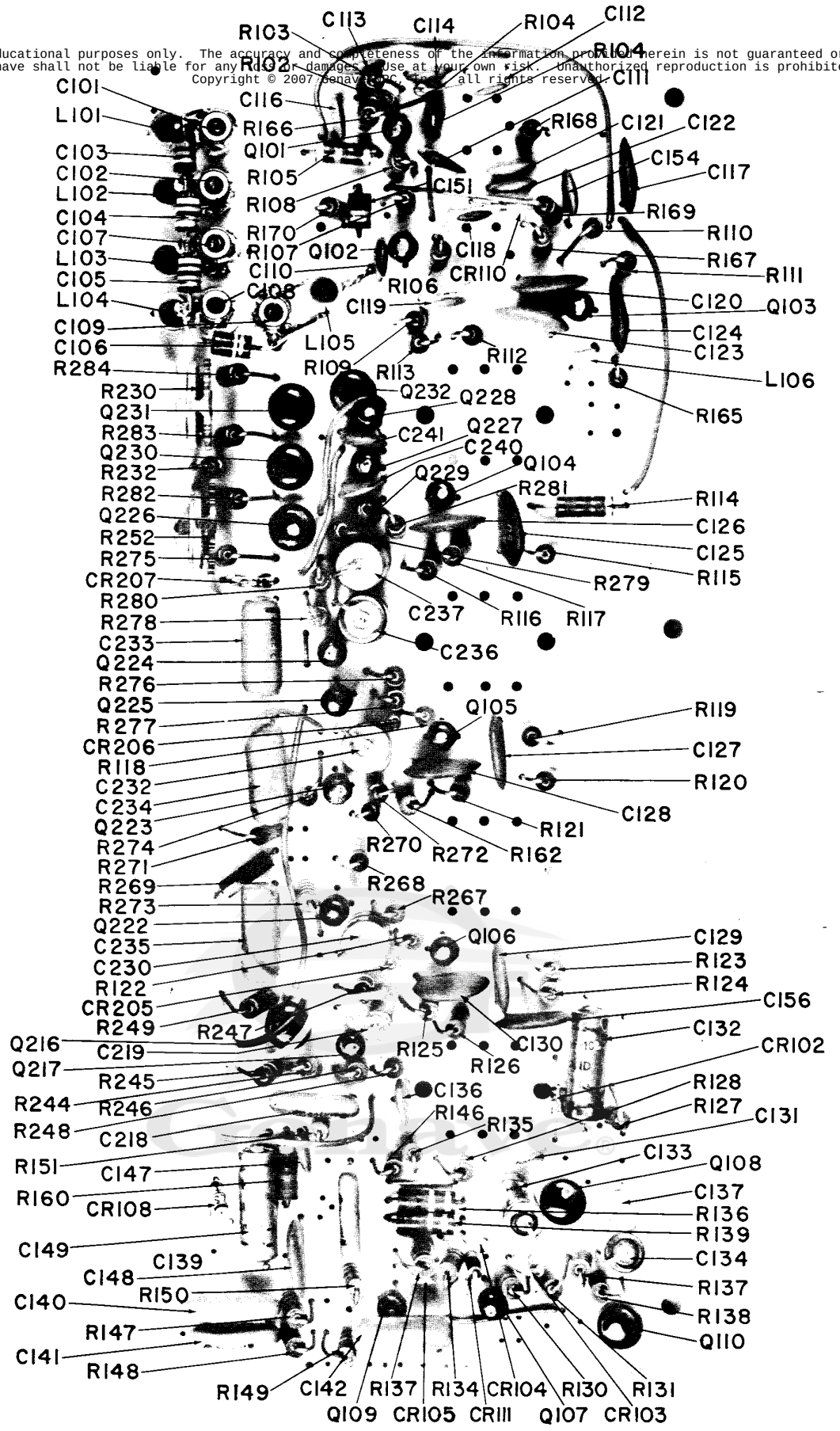


Figure 4-5-3

COMPONENT LOCATION, MAIN BOARD, RIGHT SIDE **Model: ALPHA/200**

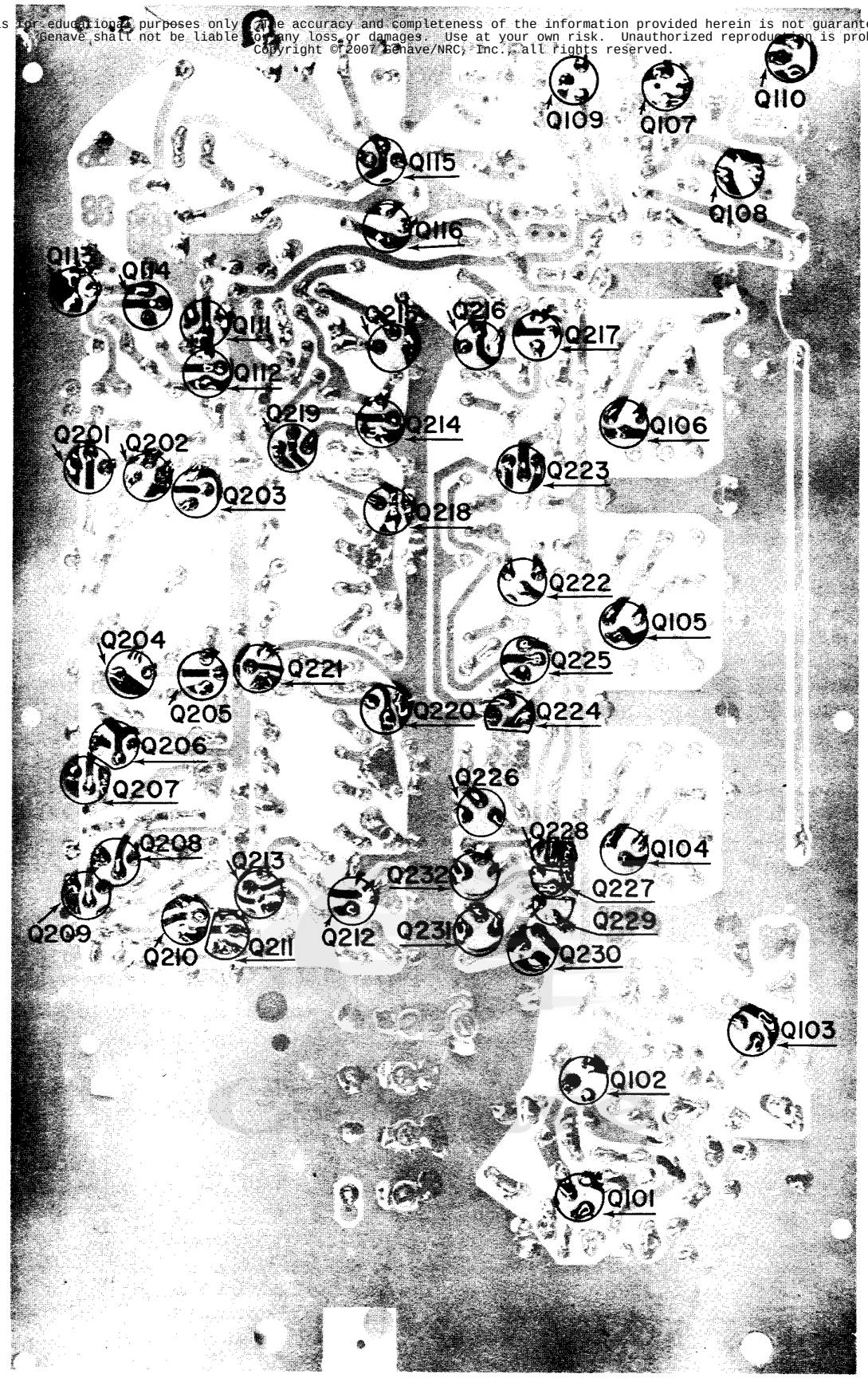


Figure 4-5-4

Model: ALPHA/200

TRANSISTOR LOCATIONS, MAIN BOARD, TRACK SIDE

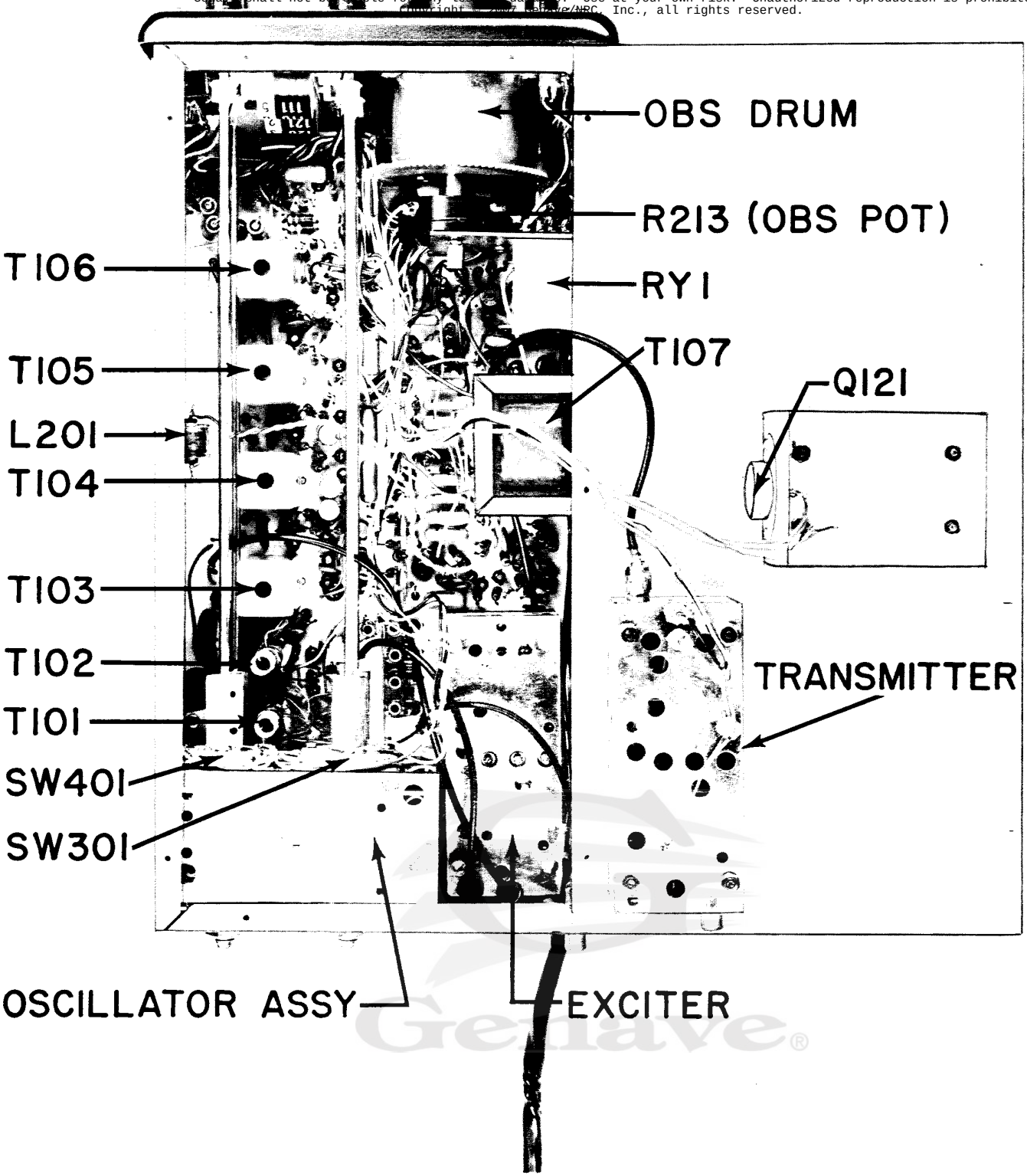


Figure 4-5-5

RADIO, TOP VIEW

Model: ALPHA/200

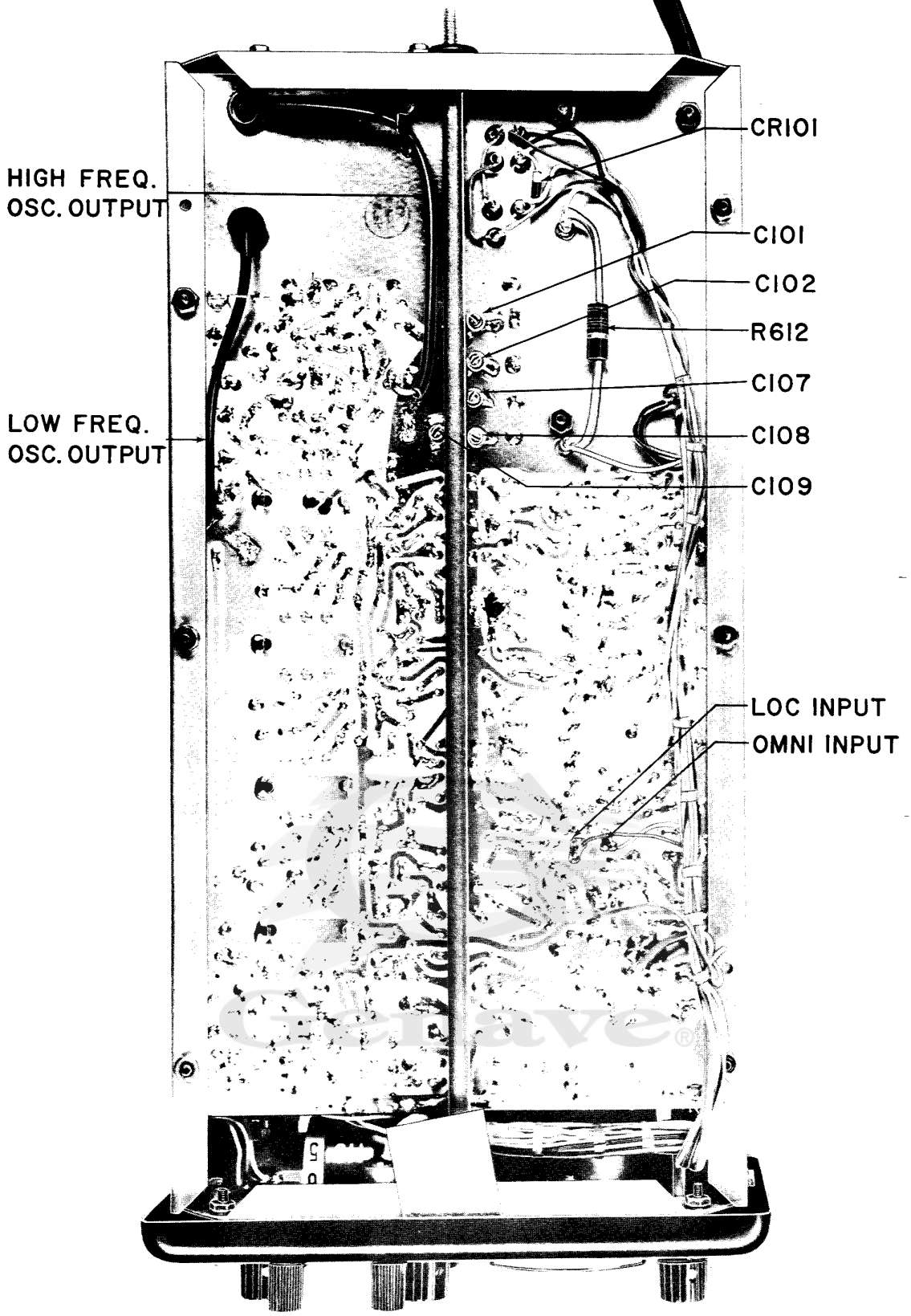


Figure 4-5-6

Model: ALPHA/200

RADIO, BOTTOM VIEW

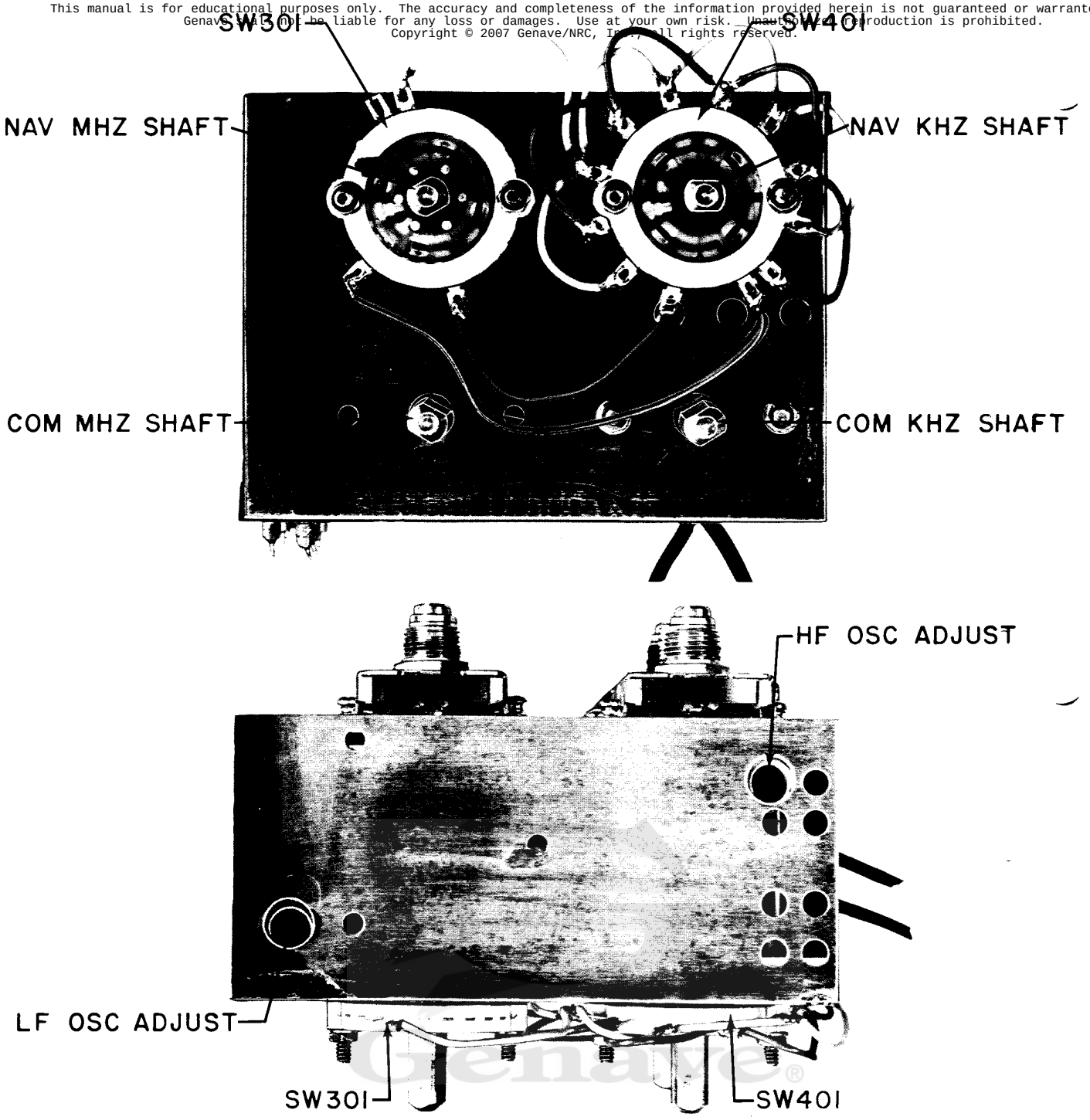


Figure 4-5-7

OSCILLATOR ASSEMBLY, FRONT & TOP VIEW **Model: ALPHA/200**

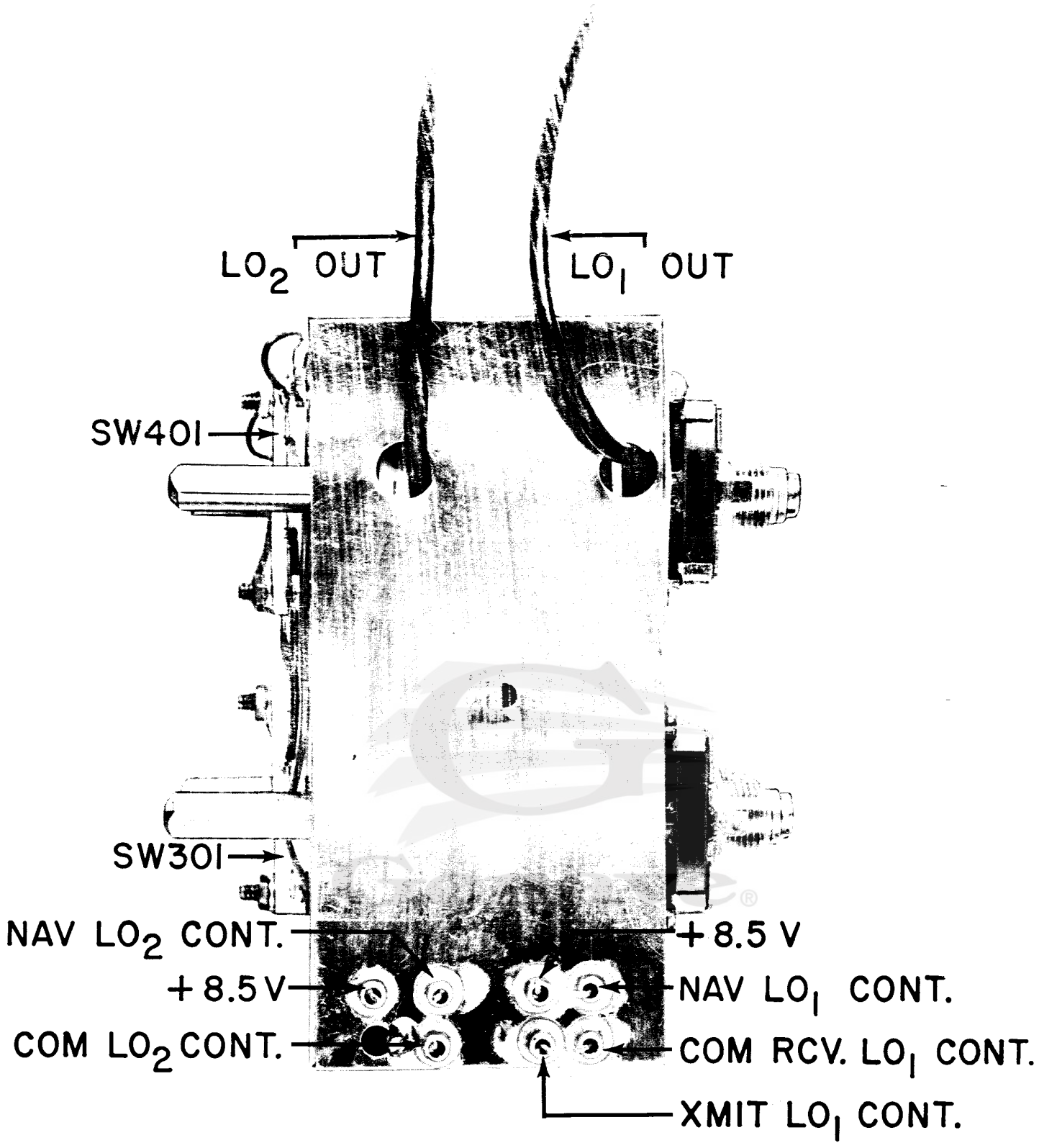


Figure 4-5-8

Model: ALPHA/200

OSCILLATOR ASSEMBLY, BOTTOM VIEW

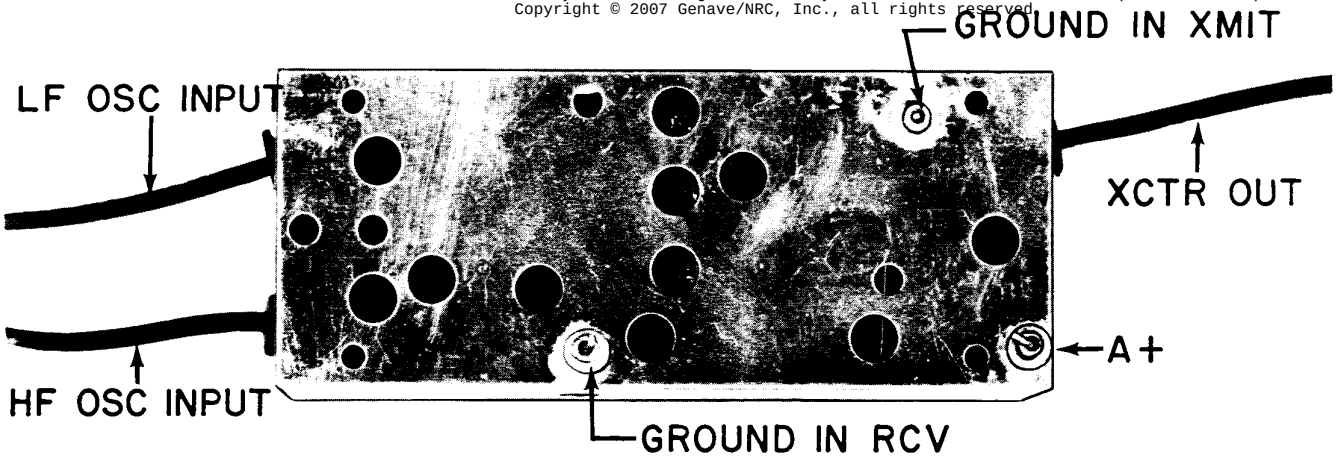


Figure 4-5-9

EXCITER ASSEMBLY

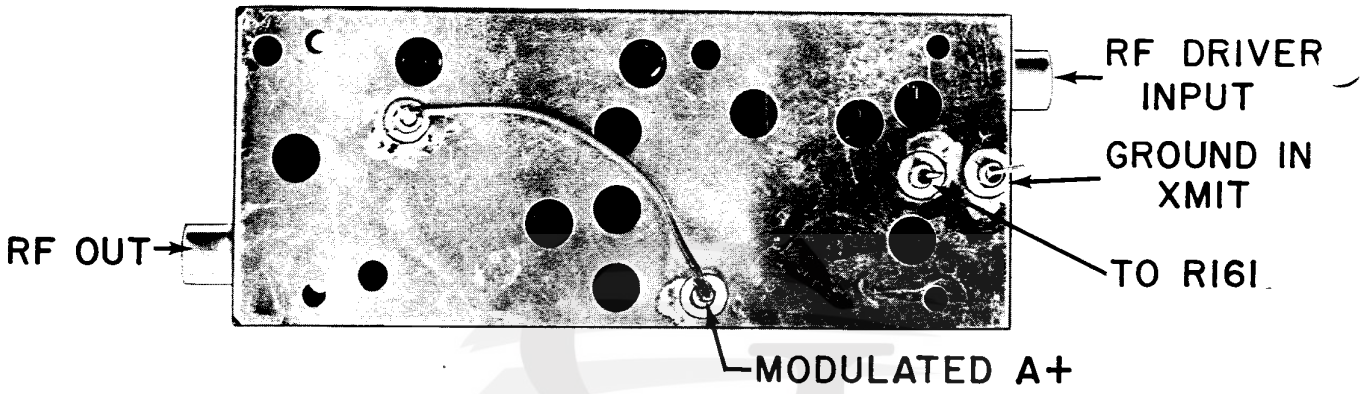


Figure 4-5-10

TRANSMITTER ASSEMBLY

Omni Waveform Photographs

The OMNI waveform photographs were taken under the following conditions:

Frequency: Any Omni channel
RF Input: 500 microvolts
Modulation: Standard Omni 0°
OBS Pot: Set at 0°

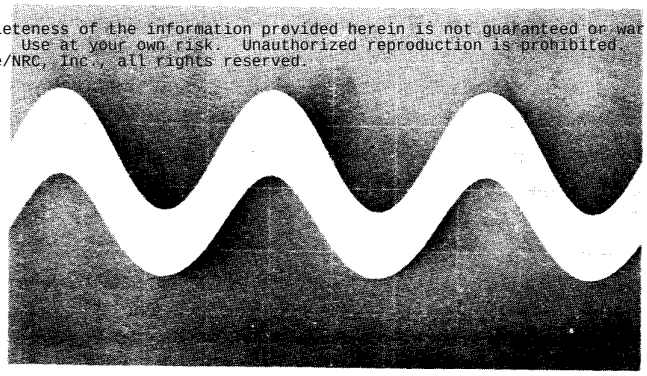


Figure 4-5-11

OMNI INPUT (SEE FIGURE 4-5-6)

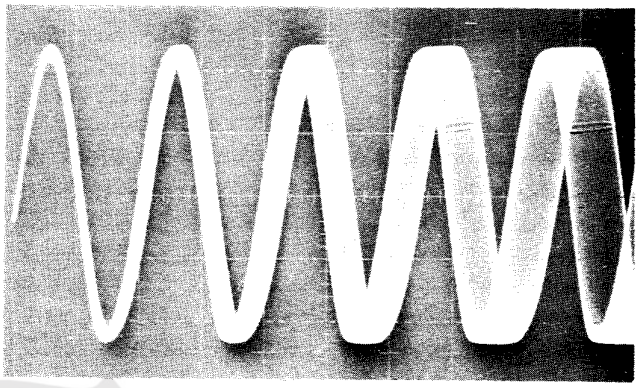


Figure 4-5-12

EMITTER, Q207

Figure 4-5-13

EMITTER, Q209

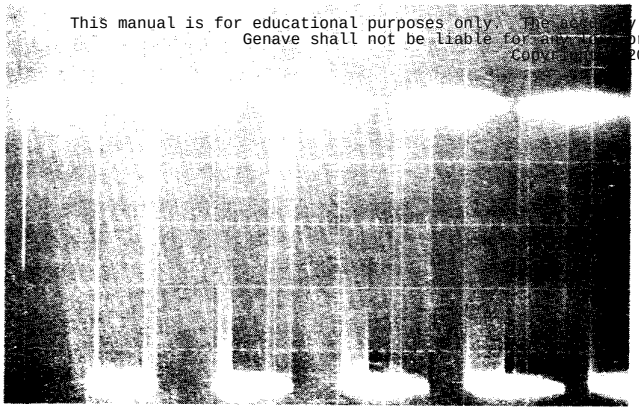


Figure 4-5-14

COLLECTOR, Q211

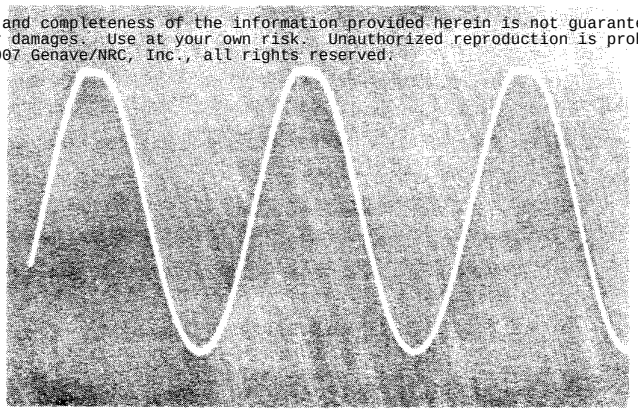


Figure 4-5-17

EMITTERS, Q219 & Q221 AND
BASES, Q222 & Q223

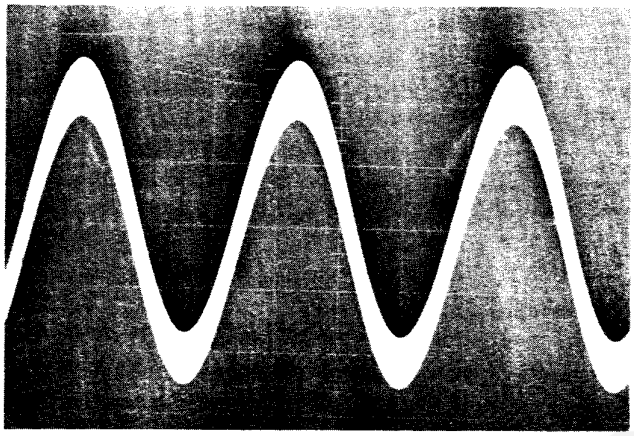


Figure 4-5-15

COLLECTOR OR EMITTER, Q213

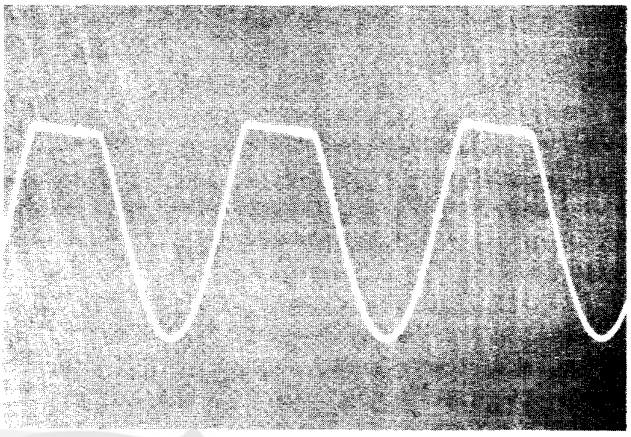


Figure 4-5-18

EMITTERS, Q222 & Q223

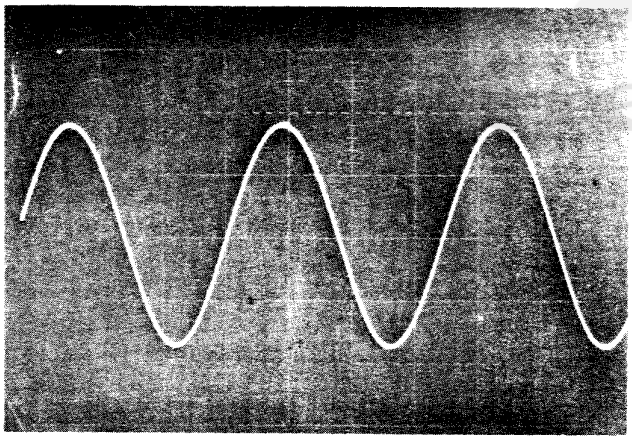


Figure 4-5-16

R213, OBS POT WIPER, ANY POSITION

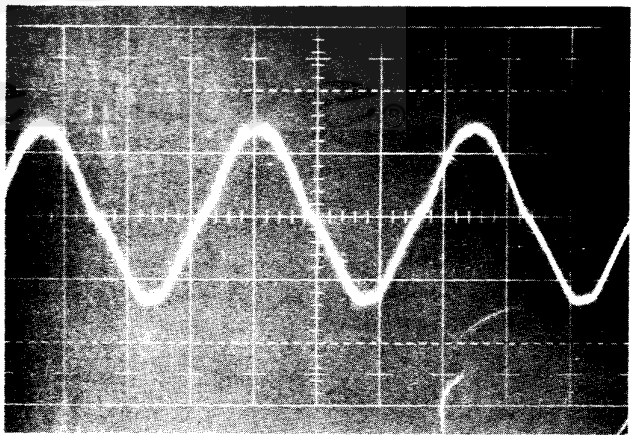


Figure 4-5-19

COLLECTORS, Q222 & Q223

Localizer Waveform Photographs

The Localizer waveform photographs were taken under the following conditions:

Frequency: Any Localizer channel

RF Input: 500 microvolts

Modulation: Standard Localizer centering signal.

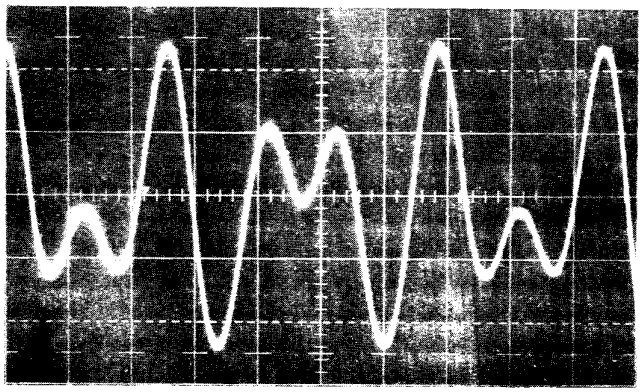


Figure 4-5-20

LOCALIZER INPUT (SEE FIGURE 4-5-6)

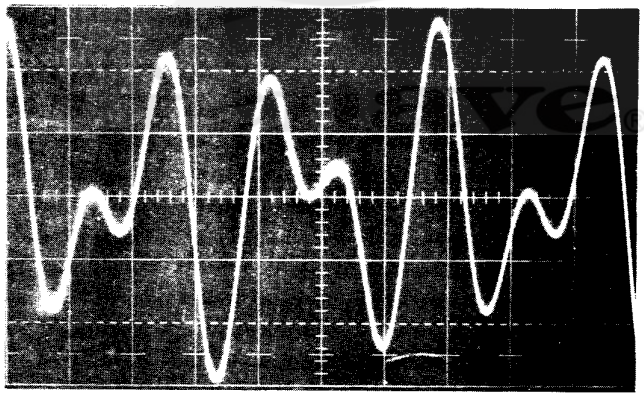


Figure 4-5-21

EMITTER, Q217

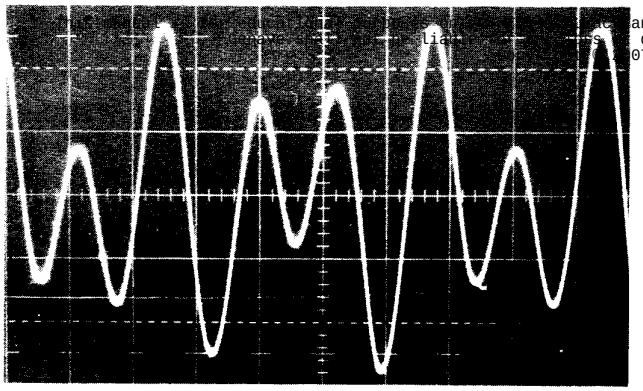


Figure 4-5-22

EMITTER, Q219

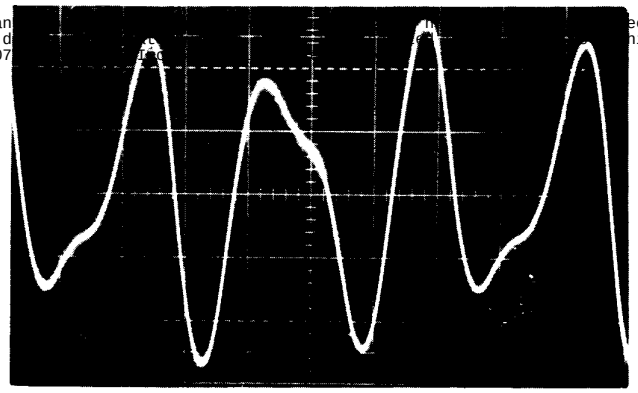


Figure 4-5-23

EMITTER, Q221

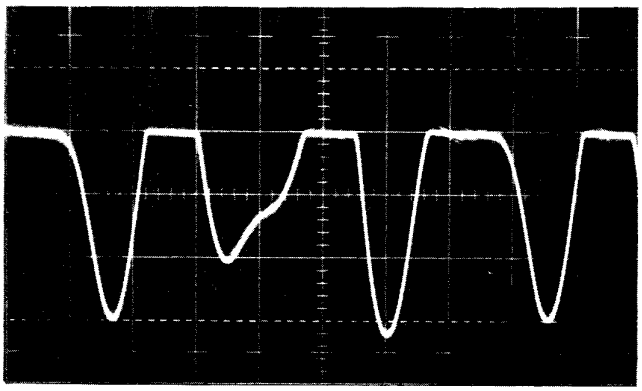


Figure 4-5-24

EMITTER, Q222

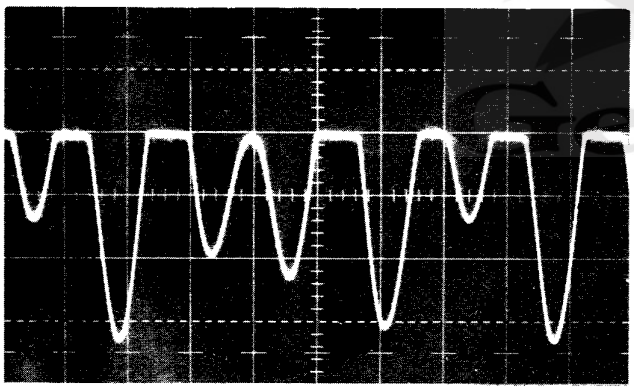


Figure 4-5-25

EMITTER, Q223

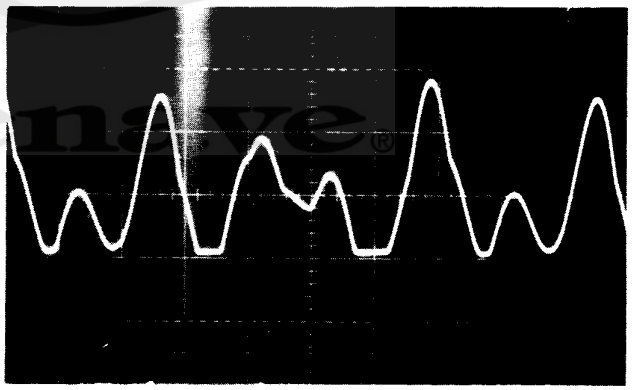
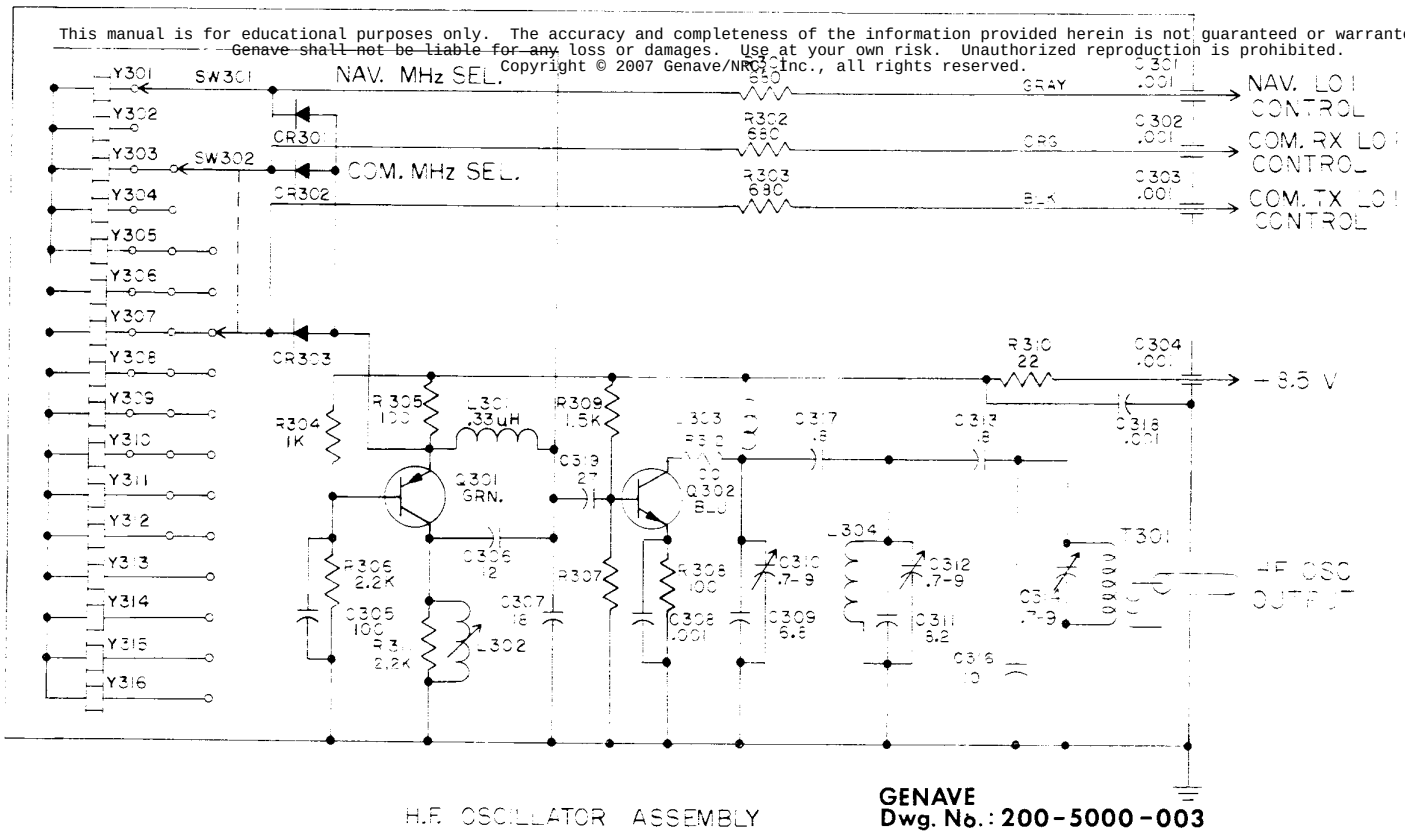


Figure 4-5-26

COLLECTORS, Q222 & Q223

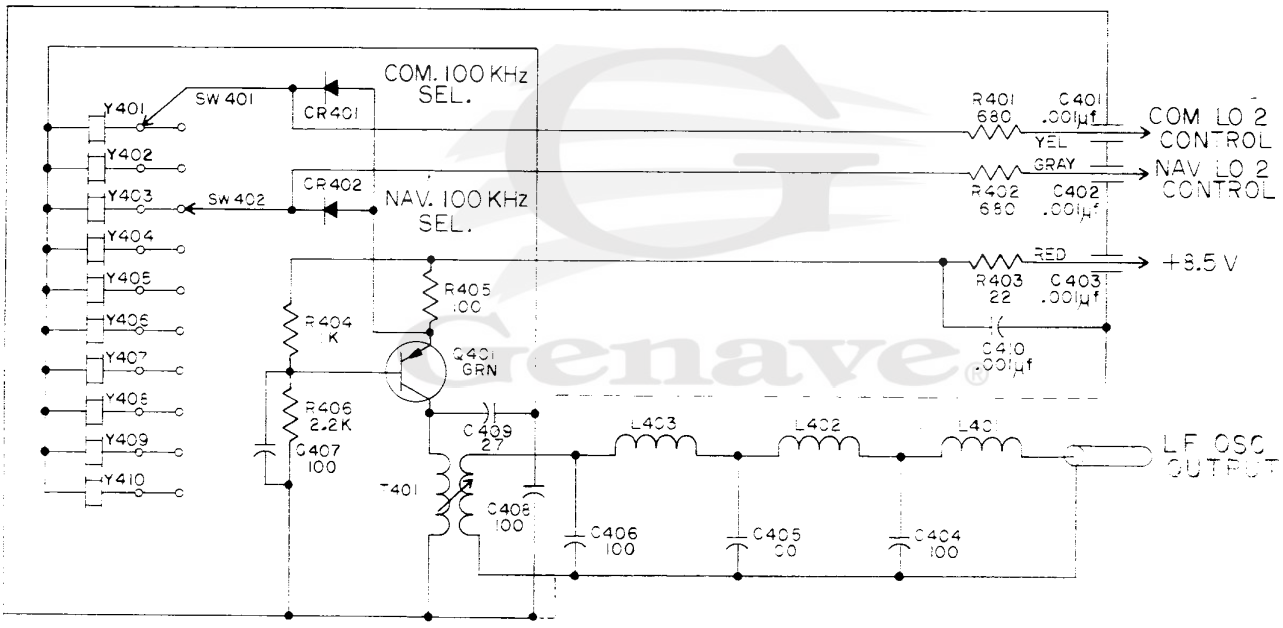


H.F. OSCILLATOR ASSEMBLY

GENAVE
Dwg. No.: 200-5000-003

Figure 4-5-29

SCHEMATIC, HIGH FREQUENCY OSCILLATOR



LF OSCILLATOR ASSEMBLY

GENAVE
Dwg. No.: 200-5000-004

Figure 4-5-30

Model: ALPHA/200

SCHEMATIC, LOW FREQUENCY OSCILLATOR

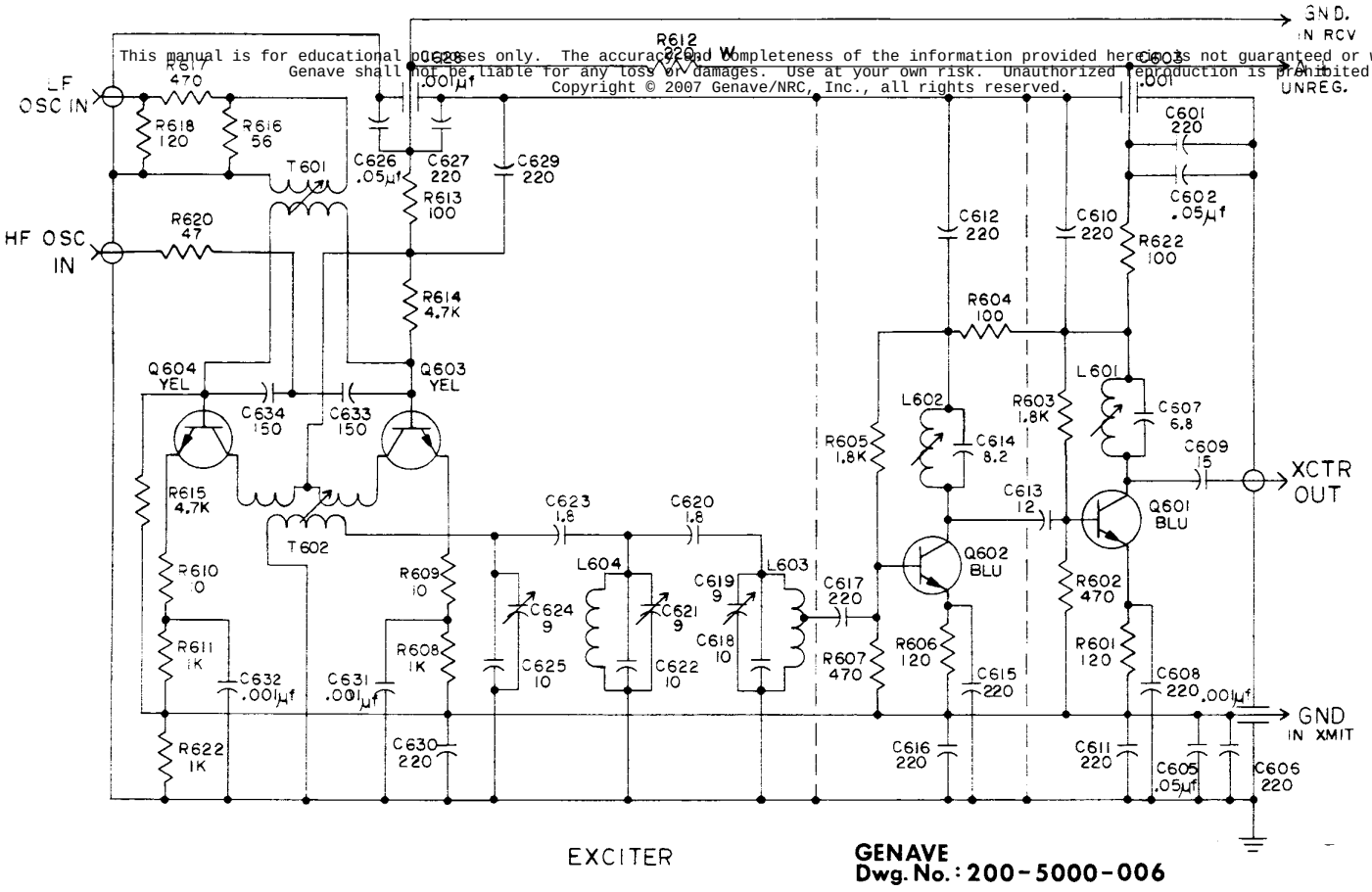


Figure 4-5-31

SCHEMATIC, EXCITER

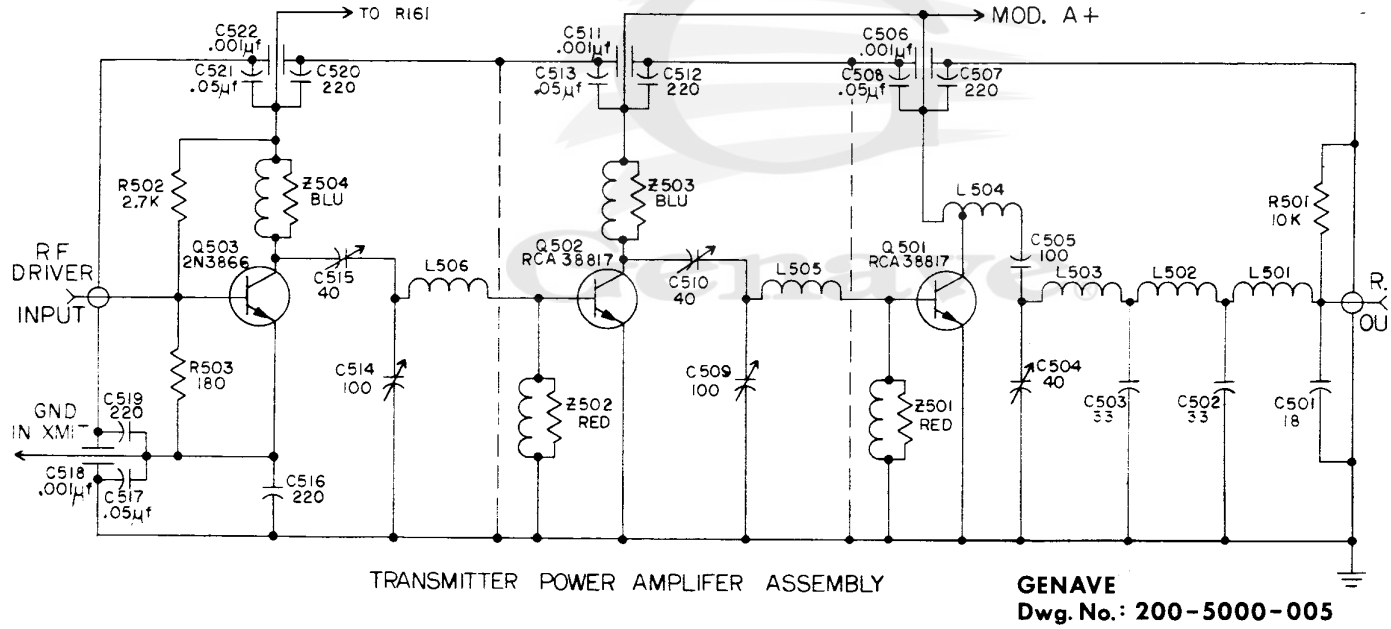


Figure 4-5-32

SCHEMATIC, TRANSMITTER **Model: ALPHA/200**

Figure 4-5-33
MATCHED COMPONENTS

Part	Mate	Matching Criterion
C221	C227	Capacitance to ± 2%
C222	C228	Capacitance to ± 2%
C224	C229	Capacitance to ± 2%
C227	C221	Capacitance to ± 2%
C228	C222	Capacitance to ± 2%
C229	C221	Capacitance to ± 2%
CR205	CR206	Forward voltage at 20 ma to ± .05 VDC
CR206	SR205	Forward voltage at 20 ma to ± .05 VDC
Q218	Q220	DC Beta at + 6V and 0.1 ma to ± 10%
Q219	Q221	DC Beta at − 6V and 4 ma to ± 10%
Q220	Q218	DC Beta at + 6V and 0.1 ma to ± 10%
Q221	Q219	DC Beta at − 6V and 4 ma to ± 10%
Q222	Q223	DC Beta at − 6V and 4 ma to ± 10%
Q223	Q222	DC Beta at − 6V and 4 ma to ± 10%
Q224	Q225	DC Beta at − 6V and 4 ma to ± 10%
Q225	Q224	DC Beta at − 6V and 4 ma to ± 10%
Q228	Q229	DC Beta at − 6V and 4 ma to ± 10%
Q229	Q228	DC Beat at − 6V and 4 ma to ± 10%

Figure 4-5-34
SEMICONDUCTOR EQUIVALENTS

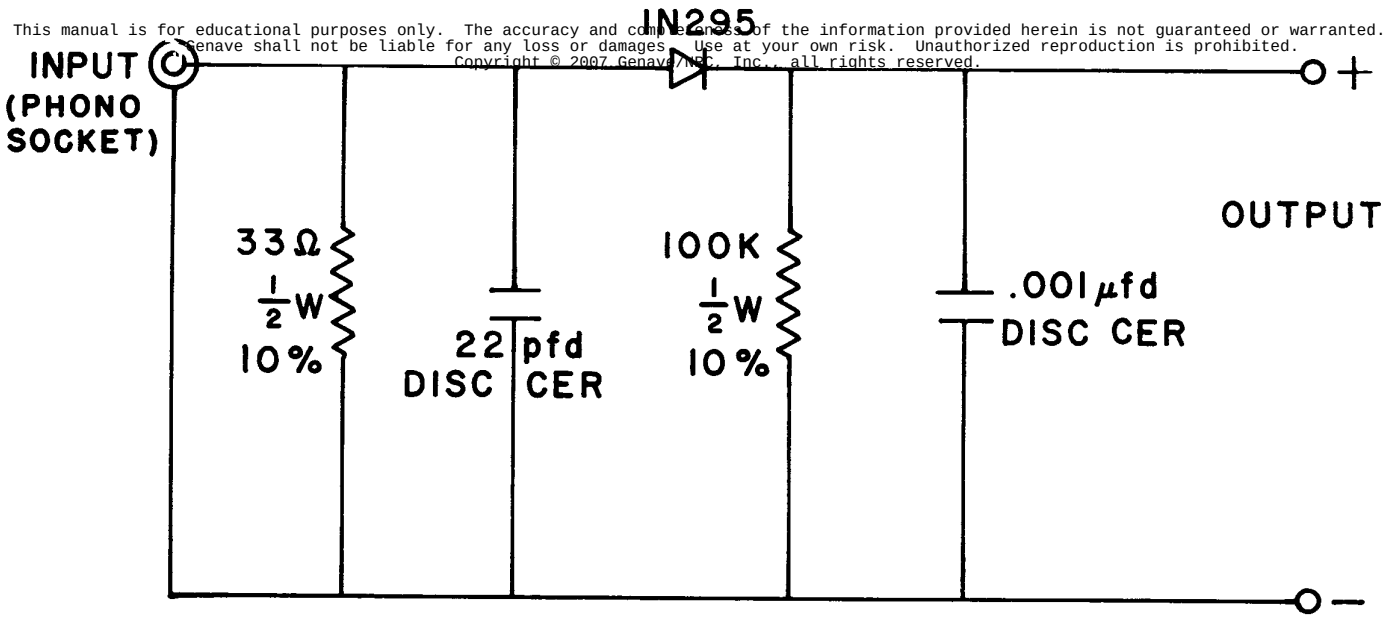
Genave Type	Fairchild	Philco	RCA	Motorola	TI	GE	Notes
White Dot	2N3693	2N3693	———	MPS3693	———		
Green/None Dot	2N4249	2N4249	———	2N3906	2N4062	———	LF & HF Oscillator Green Dots MUST be 2N4916 or 2N4121.
Blue Dot	2N3563	2N3563	———	MPS3563	———	2N3663	
Yellow Dot	SE5025	———	———	MPS6568	———	———	
Red Dot	2N3565	2N3565	———	MPS2925	2N3711	2N3391	Selected for Beta greater than 200 at 100 microamps and +6VDC.
Orange Dot	2N3566	2N3566	40397	2N3904	2N3711	2N3392	Checked for Beta greater than 120 at 1 milliamp and + 6VDC.
Brown Dot	2N3569	PET8251	40397	2N4401	2N3704	2N3415	Checked for Beta greater than 80 at 80 milliamps and + 2VDC.
A-200-66	———	———	40309	2N2405	2N2219	2N2017	
A-200-65	———	———	40464	2N3055	———	———	
A-200-63	———	———	2N3866	2N3866	———	———	
A-200-64	———	———	40290	2N3553	———	———	
A-200-52	———	———	———	———	———	———	Any manufacture 1N 34A.
A-200-53	FDH666	———	———	———	1N251	1N914A	
A-200-54	———	———	1N3193	1N4001	TI-53	A14F	

SELECTED TROUBLESHOOTING PROBLEMS

PROBLEM	POSSIBLE SOLUTION
Unit inoperative on some channels, operative on others.	Check RF output of both oscillators using the high impedance detector and VTVM or VOM. Retune oscillators if necessary.
Extreme insensitivity on all channels.	Check all coaxial cables & input connector for opens or shorts. Check that antenna(s) are properly connected.
Unit inoperative in one mode, operative in another.	Check switching signals to oscillator assembly.
Severe changes in Omni accuracy with changes in RF input level.	Check for proper grounding signal to C133 from Nav/Com switch. Check or replace C133.
Transmitter inoperative.	Check RF output of both oscillators using the high impedance detector and a VTVM. Check output of exciter assembly using the Low Impedance Detector (*see figure 4-5-36*) and VTVM. Output should be 0.6 VDC or greater from exciter.

Figure 4-5-35

SELECTED TROUBLESHOOTING PROBLEMS



LOW IMPEDANCE DETECTOR

Figure 4-5-36

Model: ALPHA/200 **LOW IMPEDANCE DETECTOR**

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SECTION V
PARTS LIST

Ref. No.	Genave Part No. A-200-	Description
		CAPACITORS
C101	43	Trimmer, 0.8-6 pfd
C102	43	Trimmer, 0.8-6 pfd
C103	3	NPO Gimmick, 0.68 pfd ±10%
C104	17	NPO Gimmick, 0.47 pfd ±10%
C105	17	NPO Gimmick, 0.47 pfd ±10%
C106	18	NPO Gimmick, 1.0 pfd ±10%
C107	43	Trimmer, 0.8-6 pfd
C108	43	Trimmer, 0.8-6 pfd
C109	43	Trimmer, 0.8-6 pfd
C110	35	Disc, 220 pfd,±10%, 500VDC
C111	13	NPO Disc, 27 pfd., ±10%
C112	13	NPO Disc, 27 pfd., ±10%
C113	19	Disc, .001 mfd, Z5F, 100 VDC
C114	19	Disc, .001 mfd, Z5F, 100 VDC
C115		Unassigned
C116	32	Disc, .05 mfd, +80%—20%, 100 VDC
C117	19	Disc, .001 mfd, Z5F, 100 VDC
C118	13	NPO Disc, 27 pfd., ±10%
C119	13	NPO Disc, 27 pfd., ±10%
C120	32	Disc, .05 mfd, +80%—20%, 100 VDC
C121	19	Disc, .001, mfd, Z5F, 100 VDC
C122	19	Disc, .001, mfd, Z5F, 100 VDC
C123	32	Disc, .05 mfd, +80%—20%, 100 VDC
C124	32	Disc, .05 mfd, +80%—20%, 100 VDC
C125	32	Disc, .05 mfd, +80%—20%, 100 VDC
C126	32	Disc, .05 mfd, +80%—20%, 100 VDC
C127	32	Disc, .05 mfd, +80%—20%, 100 VDC
C128	32	Disc, .05 mfd, +80%—20%, 100 VDC
C129	32	Disc, .05 mfd, +80%—20%, 100 VDC
C130	32	Disc, .05 mfd, +80%—20%, 100 VDC
C131	15	N 1500 Disc, 100 pfd, ±10%
C132	39	Aluminum Electrolytic, 64 mfd, 10 VDC
C133	39	Aluminum Electrolytic, 64 mfd, 10 VDC
C134	39	Aluminum Electrolytic, 64 mfd, 10 VDC
C135		Unassigned
C136	19	Disc, .001 mfd, Z5F, 100 VDC
C137	38	Aluminum Electrolytic, 2.5 mfd, 16 VDC
C138	40	Aluminum Electrolytic, 125 mfd, 10 VDC
C139	30	Mylar, .022 mfd, ±10%, 100 VDC
C140	30	Mylar, .022 mfd, ±10%, 100 VDC
C141	30	Mylar, .022 mfd, ±10%, 100 VDC
C142	33	Mylar, .10 mfd, ±10%, 100 VDC
C143	19	Disc, .001 mfd, Z5F, 100 VDC
C144	39	Aluminum Electrolytic, 64 mfd, 10 VDC
C145	26	Polyester, .0047 mfd, ±10%, 100 VDC
C146	35	Disc, 220 pfd, ±10%, 500 VDC
C147	19	Disc, .001 mfd, Z5F, 100 VDC
C148	32	Disc, .05 mfd, +80%—20%, 100 VDC
C149	38	Aluminum Electrolytic, 2.5 mfd, 16 VDC
C150	32	Disc, .05 mfd, +80%—20%, 100 VDC
C151	1	NPO Gimmick, 0.56 pfd., ±10%
C152	13	NPO Disc, 27 pfd., ±10%
C153	13	NPO Disc, 27 pfd., ±10%
C154	19	Disc, .001 mfd, Z5F, 100 VDC
C155		Unassigned
C156	32	Disc, .05 mfd., +80%—20%, 100 VDC
C201	34	Mylar, .047 mfd ±10%, VDC
C202	19	Disc, .001 mfd, Z5F, 100 VDC
C203	28	Polyester, .01 mfd ±10%, 100 VDC
C204	50	Polycarbonate, 0.1 mfd ±10%, 100 VDC
C205	19	Disc, .001 mfd, Z5F, 100 VDC
C206	30	Mylar, .022 mfd ±10%, 100 VDC
C207	36	Polyester, .0056 mfd ±10%, 100 VDC
C208	25	Polyester, .0033 mfd ±10%, 100 VDC
C209	16	N1500 Disc, 150 pfd ±10%
C210	26	Polyester, .0047 mfd ±10%, 100 VDC
C211	21	Polyester, .0015 mfd ±10%, 100 VDC
C212	33	Mylar, .10 mfd ±10%, 100 VDC
C213	28	Polyester. .01 mfd ±10%, 100 VDC
C214	27	Polyester, .0068 mfd ±10%, 100 VDC
C215	31	Mylar, .033 mfd ±10%, 100 VDC
C216	27	Polyester, .0068 mfd ±10%, 100 VDC
C217	31	Mylar, .033 mfd ±10%, 100 VDC
C218	30	Mylar, .022 mfd ±10%, 100 VDC
C219	22	Polyester, .0022 mfd ±10%, 100 VDC
C220	29	Mylar, .01 mfd ±10%, 100 VDC
C221	34	Mylar, .047 mfd ±10%, 100 VDC
C222	34	Mylar, .047 mfd ±10%, 100 VDC
C223	30	Mylar, .022 mfd ±10%, 100 VDC
C224	28	Polyester, .0082 mfd ±10%, 100 VDC
C225	30	Mylar, .022 mfd ±10%, 100 VDC
C226	29	Mylar, .01 mfd ±10%, 100 VDC
C227	34	Mylar, .047 mfd ±10%, 100 VDC
C228	34	Mylar, .047 mfd ±10%, 100 VDC
C229	28	Polyester, .0082 mfd ±10%, 100 VDC
C230	40	Aluminum Electrolytic, 125 mfd, 10 VDC
C231	41	Aluminum Electrolytic, 4000 mfd, 2.5 VDC
C232	40	Aluminum Electrolytic, 125 mfd, 10 VDC
C233	37	Mylar, .22 mfd ±10%, 75 VDC
C234	33	Mylar, .10 mfd ±10%, 100 VDC
C235	33	Mylar, .10 mfd ±10%, 100 VDC
C236	40	Aluminum Electrolytic, 125 mfd, 10 VDC
C237	40	Aluminum Electrolytic, 125 mfd, 10 VDC
C238	15	Disc, 100 pfd ±10%
C239		Unassigned
C240	19	Disc, .001 mfd, Z5F, 100 VDC
C241	19	Disc, .001 mfd, Z5F, 100 VDC
C242		Unassigned
C243		Unassigned
C244		Unassigned
C245		Unassigned
C301	23	Feedthrough, .001 mfd, GMV
C302	23	Feedthrough, .001 mfd, GMV
C303	23	Feedthrough, .001 mfd, GMV
C304	23	Feedthrough, .001 mfd, GMV
C305	15	Disc, 100 pfd ±10%
C306	8	NPO Disc, 12 pfd ±10%
C307	11	NPO Disc, 18 pfd ±10%
C308	19	Disc, .001 mfd, Z5F, 100 VDC
C309	5	NPO Disc, 6.8 pfd ±10%
C310	44	Trimmer, 0.7-9 pfd
C311	6	NPO Disc, 8.2 pfd ±10%
C312	44	Trimmer, 0.7-9 pfd
C313	47	NPO Gimmick, 1.8 pfd ±10%
C314	44	Trimmer, 0.7-9 pfd
C315		Unassigned
C316	7	NPO Disc, 10 pfd ±10%
C317	47	NPO Gimmick, 1.8 pfd ±10%
C318	19	Disc, .001 mfd, Z5F, 100 VDC
C319	13	NPO Disc, 27 pfd ±10%
C320		Unassigned
C321		Unassigned
C401	23	Feedthrough, .001 mfd, GMV
C402	23	Feedthrough, .001 mfd, GMV
C403	23	Feedthrough, .001 mfd, GMV
C404	15	Disc, 100 pfd ±10%
C405	15	Disc, 100 pfd ±10%
C406	15	Disc, 100 pfd ±10%
C407	15	Disc, 100 pfd ±10%
C408	15	Disc, 100 pfd ±10%
C409	13	NPO Disc, 27 pfd ±10%
C410	19	Disc, .001 mfd, Z5F, 100 VDC
C411		Unassigned
C501	11	NPO Disc, 18 pfd ±10%
C502	14	NPO Disc, 33 pfd ±10%
C503	14	NPO Disc, 33 pfd ±10%
C504	49	Variable, 4-40 pfd
C505	15	Disc, 100 pfd ±10%
C506	23	Feedthrough, .001 mfd, GMV
C507	35	Disc, 220 pfd ±10%, 500 VDC
C508	32	Disc, .05 mfd, +80%—20%. 100 VDC
C509	45	Variable, 7-100 pfd
C510	49	Variable, 4-40 pfd
C511	23	Feedthrough, .001 mfd, GMV
C512	35	Disc, 220 pfd ± 10%, 500 VDC
C513	32	Disc, .05 mfd, +80%—20%. 100 VDC
C514	45	Variable, 7-100 pfd
C515	49	Variable, 4-40 pfd
C516	35	Disc, 220 pfd ±10%, 500 VDC
C517	32	Disc, .05 mfd, +80%—20%. 100 VDC
C518	23	Feedthrough, .001 mfd, GMV
C519	35	Disc, 220 pfd ±10%, 500 VDC
C520	35	Disc, 220 pfd ±10%, 500 VDC
C521	32	Disc, .05 mfd, +80%—20%. 100 VDC
C522	23	Feedthrough, .001 mfd, GMV
C523		Unassigned
C601	35	Disc, 220 pfd ±10%, 100 VDC
C602	32	Disc, .05 mfd, +80%—20%. 100 VDC
C603	23	Feedthrough, .001 mfd, GMV
C604	23	Feedthrough, .001 mfd, GMV
C605	32	Disc, .05 mfd, +80% —20%, 100 VDC
C606	35	Disc, 220 pfd ±10%, 100 VDC
C607	5	NPO Disc, 6.8 pfd ±10%
C608	35	Disc, 220 pfd ±10%, 100 VDC
C609	9	NPO Disc, 15 pfd ±10%
C610	35	Disc, 220 pfd ±10%, 100 VDC
C611	35	Disc, 220 pfd ±10%, 100 VDC
C612	35	Disc, 220 pfd ±10%, 100 VDC
C613	8	NPO Disc, 12 pfd ±10%
C614	6	NPO Disc, 8.2 pfd ±10%
C615	35	Disc, 220 pfd ±10%, 100 VDC
C616	35	Disc, 220 pfd ±10%, 100 VDC
C617	35	Disc, 220 pfd ±10%, 100 VDC
C618	9	NPO Disc, 15 pfd ±10%
C619	44	Trimmer, 0.7-9 pfd
C620	47	NPO Gimmick, 1.8 pfd ±10%
C621	44	Trimmer, 0.7-9 pfd
C622	7	NPO Disc, 10 pfd ±10%
C623	47	NPO Gimmick, 1.8 pfd ±10%
C624	44	Trimmer, 0.7-9 pfd
C625	7	NPO Disc, 10 pfd ±10%
C626	32	Disc, .05 mfd, +80% —20%, 100 VDC
C627	35	Disc, 220 pfd ±10%, 100 VDC
C628	23	Feedthrough, .001 mfd, GMV
C629	35	Disc, 220 pfd ±10%, 500 VDC

Ref. No.	Genave Part No. A-200-	Description
C630	35	Disc, 220 pfd ±10%, 500 VDC
C631	19	Disc, .001 mfd, Z5F, 100 VDC
C632	19	Disc, .001 mfd, Z5F, 100 VDC
C633	16	N1500 Disc, 150 pfd ±10%
C634	16	N1500 Disc, 150 pfd ±10%
C635	23	Feedthrough, .001 mfd, GMV
C636		Unassigned
C637		Unassigned
		DIODES
CR101	54	Silicon, General Purpose, Power, 25V, 200 ma
CR102	52	Germanium, General Purpose, 1N34A
CR103	53	Silicon, High Frequency, Switching
CR104	53	Silicon, High Frequency, Switching
CR105	53	Silicon, High Frequency, Switching
CR106	54	Silicon, General Purpose, Power, 25V, 200 ma
CR107	55	Silicon, Zener, 24 VDC, 10%, 1 Watt
CR108	55	Silicon, Zener, 24 VDC, 10%, 1 Watt
CR109	53	Silicon, High Frequency, Switching
CR110	53	Silicon, High Frequency, Switching
CR111	54	Silicon, General Purpose, Power, 25 V, 200 ma
CR112		Unassigned
CR113		Unassigned
CR201	53	Silicon, High Frequency, Switching
CR202	53	Silicon, High Frequency, Switching
CR203	53	Silicon, High Frequency, Switching
CR204	53	Silicon, High Frequency, Switching
CR205	52	Germanium, General Purpose, 1N34A
CR206	52	Germanium, General Purpose, 1N34A
CR207	52	Germanium, General Purpose, 1N34A
CR208		Unassigned
CR209		Unassigned
CR301	53	Silicon, High Frequency, Switching
CR302	53	Silicon, High Frequency, Switching
CR303	53	Silicon, High Frequency, Switching
CR304		Unassigned
CR305		Unassigned
CR401	53	Silicon, High Frequency, Switching
CR402	53	Silicon, High Frequency, Switching
CR403		Unassigned
CR404		Unassigned
		LAMPS
DS101	157	Clear, 14 VDC, 80 ma, 50,000 Hour
DS102	157	Clear, 14 VDC, 80 ma, 50,000 Hour
DS201	160	Green, 14 VDC, 80 ma, 50,000 Hour
DS202	158	Red, 14 VDC, 80 ma, 50,000 Hour
DS203	159	Amber, 14 VDC, 80 ma, 50,000 Hour
		COILS
L101	80	Coil, Input Filter
L102	80	Coil, Input Filter
L103	80	Coil, Input Filter
L104	80	Coil, Input Filter
L105	81	Coil, Input Filter
L106	70	Coil, Mixer
L107		Unassigned
L108		Unassigned
L201	86	50 mhy ±10%
L202		Unassigned
L203		Unassigned
L301	69	.33 mhy ±15%
L302	68	HF Oscillator
L303	70	HF Doubler
L304	70	HF Doubler
L305		Unassigned
L401	74	LF Filter
L402	73	LF Filter
L403	73	LF Filter
L404		Unassigned
L501	75	Transmitter Filter
L502	76	Transmitter Filter
L503	75	Transmitter Filter
L504	77	Matching Coil
L505	79	Matching Coil
L506	79	Matching Coil
L507		Unassigned
L508		Unassigned
L601	82	Exciter Tuning
L602	82	Exciter Tuning
L603	85	Exciter Filter
L604	75	Exciter Filter
L605		Unassigned
L606		Unassigned
		TRANSISTORS
Q101	58	Silicon NPN, Blue Dot
Q102	58	Silicon NPN, Blue Dot
Q103	57	Silicon NPN, White Dot
Q104	57	Silicon NPN, White Dot
Q105	57	Silicon NPN, White Dot
Q106	57	Silicon NPN, White Dot
Q107	61	Silicon PNP, Green/None Dot
Q108	60	Silicon NPN, Orange Dot
Q109	61	Silicon PNP, Green/None Dot
Q110	60	Silicon NPN, Orange Dot
Q111	66	Silicon NPN, Medium Power
Q112	61	Silicon PNP, Green/None Dot
Q113	61	Silicon PNP, Green/None Dot
Q114	60	Silicon NPN, Orange Dot
Q115	60	Silicon NPN, Orange Dot
Q116	67	Silicon NPN, Brown Dot
Q117		Unassigned
Q118		Unassigned
Q119		Unassigned
Q120		Unassigned
Q121	65	Silicon NPN, Audio Power
Q201	56	Silicon NPN, Red Dot
Q202	60	Silicon NPN, Orange Dot
Q203	61	Silicon PNP, Green/None Dot
Q204	56	Silicon NPN, Red Dot
Q205	61	Silicon PNP, Green/None Dot
Q206	61	Silicon PNP, Green/None Dot
Q207	61	Silicon PNP, Green/None Dot
Q208	61	Silicon PNP, Green/None Dot
Q209	61	Silicon PNP, Green/None Dot
Q210	61	Silicon PNP, Green/None Dot
Q211	61	Silicon PNP, Green/None Dot
Q212	56	Silicon NPN, Red Dot
Q213	61	Silicon PNP, Green/None Dot
Q214	61	Silicon PNP, Green/None Dot
Q215	61	Silicon PNP, Green/None Dot
Q216	56	Silicon NPN, Red Dot
Q217	61	Silicon PNP, Green/None Dot
Q218	56	Silicon NPN, Red Dot
Q219	61	Silicon PNP, Green/None Dot
Q220	56	Silicon NPN, Red Dot
Q221	61	Silicon PNP, Green/None Dot
Q222	61	Silicon PNP, Green/None Dot
Q223	61	Silicon PNP, Green/None Dot
Q224	61	Silicon PNP, Green/None Dot
Q225	61	Silicon PNP, Green/None Dot
Q226	60	Silicon NPN, Orange Dot
Q227	61	Silicon PNP, Green/None Dot
Q228	61	Silicon PNP, Green/None Dot
Q229	61	Silicon PNP, Green/None Dot
Q230	67	Silicon NPN, Brown Dot
Q231	67	Silicon NPN, Brown Dot
Q232	67	Silicon NPN, Brown Dot
Q233		Unassigned
Q234		Unassigned
Q301	61a	Silicon PNP, Green Dot ONLY
Q302	58	Silicon NPN, Blue Dot
Q303		Unassigned
Q401	61a	Silicon PNP, Green Dot ONLY
Q402		Unassigned
Q501	64	Silicon NPN, RF Power
Q502	64	Silicon NPN, RF Power
Q503	63	Silicon NPN, RF Power
Q504		Unassigned
Q601	58	Silicon NPN, Blue Dot
Q602	58	Silicon NPN, Blue Dot
Q603	59	Silicon NPN, Yellow Dot
Q604	59	Silicon NPN, Yellow Dot
Q605		Unassigned
		RESISTORS
R101		Unassigned
R102	111	1K, 10%, ½ W
R103	111	1K, 10%, ½ W
R104	124	15K, 10%, ½ W
R105	117	4.7K, 10%, ½ W
R106	124	15K, 10%, ½ W
R107	111	1K, 10%, ½ W
R108	111	1K, 10%, ½ W
R109	101	100 ohms, 10%, ½ W
R110	111	1K, 10%, ½ W
R111	104	220 ohms, 10%, ½ W
R112	122	10K, 10%, ½ W
R113	104	220 ohms, 10%, ½ W
R114	111	1K, 10%, ½ W
R115	104	220 ohms, 10%, ½ W
R116	104	220 ohms, 10%, ½ W
R117	122	10K, 10%, ½ W
R118	114	2.2K, 10%, ½ W
R119	111	1K, 10%, ½ W
R120	106	470 ohms, 10%, ½ W
R121	122	10K, 10%, ½ W
R122	114	2.2K, 10%, ½ W
R123	111	1K, 10%, ½ W
R124	106	470 ohms, 10%, ½ W
R125	102	120 ohms, 10%, ½ W
R126	122	10K, 10%, ½ W
R127	114	2.2K, 10%, ½ W
R128	117	4.7K, 10%, ½ W

Ref. No.	Genave Part No. A-200-	Description
R129		Unassigned
R130	106	470 ohms, 10%, ½ W
R131		Unassigned
R132	152	Variable, 25K, ±20%
R133	111	1K, 10%, ½ W
R134	122	10K, 10%, ½ W
R135	111	1K, 10%, ½ W
R136	130	100K, 10%, ½ W
R137	117	4.7K, 10%, ½ W
R138	114	2.2K, 10%, ½ W
R139	124	15K, 10%, ½ W
R140	151	Variable, 25K ±20%, With Switch
R141	106	470 ohms, 10%, ½ W
R142	104	220 ohms, 10%, ½ W
R143	114	2.2K, 10%, ½ W
R144	147	Trimmer, 1K, 20%
R145	114	2.2K, 10%, ½ W
R146	109	680 ohms, 10%, ½ W
R147	126	22K, 10%, ½ W
R148	126	22K, 10%, ½ W
R149	144	1.8K, 10%, ½ W
R150	125	18K, 10%, ½ W
R151	114	2.2K, 10%, ½ W
R152	101	100 ohms, 10%, ½ W
R153	101	100 ohms, 10%, ½ W
R154	134	220K, 10%, ½ W
R155	111	1K, 10%, ½ W
R156	117	4.7K, 10%, ½ W
R157	106	470 ohms, 10%, ½ W
R158	136	0.47 ohms, 10%, 2 W
R159	137	10 ohms, 10%, 2 W
R160	104	220 ohms, 10%, ½ W
R161	155	68 ohms, 10%, 1 W
R162	102	120 ohms, 10%, ½ W
R163	106	470 ohms, 10%, ½ W
R164		Unassigned
R165	106	470 ohms, 10%, ½ W
R166	111	1K, 10%, ½ W
R167	101	100 ohms, 10%, ½ W
R168	101	100 ohms, 10%, ½ W
R169	111	1K, 10%, ½ W
R170	101	100 ohms, 10%, ½ W
R201	145	150K, 1%, ¼ W
R202	130	100K, 10%, ½ W
R203	134	220K, 10%, ½ W
R204	111	1K. 10%, ½ W
R205	146	464K, 1%, ¼ W
R206	138	221 ohms, 1%, ¼ W
R207	138	221 ohms, 1%, ¼ W
R208	140	47.5K, 1%, ¼ W
R209	148	Trimmer, 10K ±20%
R210	111	1K, 10%, ½ W
R211	138	221 ohms, 1%, ¼ W
R212	138	221 ohms, 1%, ¼ W
R213	150	Variable, 10K±10%, OBS Pot
R214	122	10K, 10%, ½ W
R215	130	100K, 10%, ½ W
R216	111	1K, 10%, ½ W
R217	111	1K, 10%, ½ W
R218	117	4.7K, 10%, ½ W
R219	130	100K, 10%, ½ W
R220	130	100K, 10%, ½ W
R221	111	1K, 10%, ½ W
R222	111	1K, 10%, ½ W
R223	122	10K, 10%, ½ W
R224	130	100K, 10%, ½ W
R225	130	100K, 10%, ½ W
R226	122	10K, 10%, ½ W
R227	122	10K, 10%, ½ W
R228	122	10K, 10%, ½ W
R229	111	1K, 10%, ½ W
R230	156	Trimmer, 50K ±20%
R231	140	47.5K, 1%, ¼ W
R232	127	39K, 10%, ½ W
R233	124	15K, 10%, ½ W
R234	146	464K, 1%, ¼ W
R235	139	1K, 1%, ¼ W
R236	139	1K, 1%, ¼ W
R237	149	Trimmer, 20K±20%
R238	125	18K, 10%, ½ W
R239	130	100K, 10%, ½ W
R240	122	10K, 10%, ½ W
R241	125	18K, 10%, ½ W
R242	130	100K, 10%, ½ W
R243	122	10K, 10%, ½ W
R244	130	100K, 10%, ½ W
R245	127	39K, 10%, ½ W
R246	124	15K, 10%, ½ W
R247	135	470K, 10%, ½ W
R248	111	1K, 10%, ½ W
R249	111	1K, 10%, ½ W
R250	145	150K, 1%, ¼ W
R251	130	100K, 10%, ½ W
R252	149	Trimmer, 20K±20%
R253	142	140K, 1%, ¼ W
R254	117	4.7K, 10%, ½ W
R255	141	56.2K, 1%, ¼ W
R256	146	464K, 1%, ¼ W
R257	122	10K, 10%, ½ W
R258	109	680 ohms, 10%, ½ W
R259	149	Trimmer, 20K±20%
R260	142	140K, 1%, ¼ W
R261	130	100K, 10%, ½ W
R262	145	150K, 1%, ¼ W
R263	141	56.2K, 1%, ¼ W
R264	146	464K, 1%, ¼ W
R265	122	10K, 10%, ½ W
R266	109	680 ohms, 10%, ½ W
R267	122	10K, 10%, ½ W
R268	138	221 ohms, 1%, ¼ W
R269	138	221 ohms, 1%, ¼ W
R270	138	221 ohms, 1%, ¼ W
R271	138	221 ohms, 1%, ¼ W
R272	122	10K, 10%, ½ W
R273	128	47K, 10%, ½ W
R274	128	47K, 10%, ½ W
R275	130	100K, 10%, ½ W
R276	122	10K, 10%, ½ W
R277	122	10K, 10%, ½ W
R278	122	10K, 10%, ½ W
R279	122	10K, 10%, ½ W
R280	129	82K, 10%, ½ W
R281	116	3.3K, 10%, ½ W
R282	122	10K, 10%, ½ W
R283	122	10K, 10%, ½ W
R284	122	10K, 10%, ½ W
R285	111	1K, 10%, ½ W
R286		Unassigned
R287		Unassigned
R288		Unassigned
R301	109	680 ohms, 10%, ½ W
R302	109	680 ohms, 10%, ½ W
R303	109	680 ohms, 10%, ½ W
R304	111	1K, 10%, ½ W
R305	101	100 ohms, 10%, ½ W
R306	114	2.2K, 10%, ½ W
R307	104	220 ohms, 10%, ½ W
R308	101	100 ohms, 10%, ½ W
R309	113	1.5K, 10%, ½ W
R310	98	22 ohms, 10%, ½ W
R311	114	2.2K, 10%, ½ W
R312	101	100 ohms, 10%, ½ W
R313		Unassigned
R314		Unassigned
R401	109	680 ohms, 10%, ½ W
R402	109	680 ohms, 10%, ½ W
R403	98	22 ohms, 10%, ½ W
R404	111	1K, 10%, ½ W
R405	101	100 ohms, 10%, ½ W
R406	114	2.2K, 10%, ½ W
R407		Unassigned
R408		Unassigned
R501	122	10K, 10%, ½ W
R502	115	2.7K, 10%, ½ W
R503	143	180 ohms, 10%, ½ W
R504		Unassigned
R505		Unassigned
R601	102	120 ohms, 10%, ½ W
R602	106	470 ohms, 10%, ½ W
R603	144	1.8K, 10%, ½ W
R604	101	100 ohms, 10%, ½ W
R605	144	1.8K, 10%, ½ W
R606	102	120 ohms, 10%, ½ W
R607	106	470 ohms, 10%, ½ W
R608	111	1K, 10%, ½ W
R609	97	10 ohms, 10%, ½ W
R610	97	10 ohms, 10%, ½ W
R611	111	1K, 10%, ½ W
R612	133	220 ohms, 10%, 1 W
R613	101	100 ohms, 10%, ½ W
R614	117	4.7K, 10%, ½ W
R615	117	4.7K, 10%, ½ W
R616	100	56 ohms, 10%, ½ W
R617	106	470 ohms, 10%, ½ W
R618	102	120 ohms, 10%, ½ W
R619		Unassigned
R620	99	47 ohms, 10%, ½ W
R621		Unassigned
R622	101	100 ohms, 10%, ½ W
R623	111	1K, 10%, ½ W
R624		Unassigned
R625		Unassigned

TRANSFORMERS

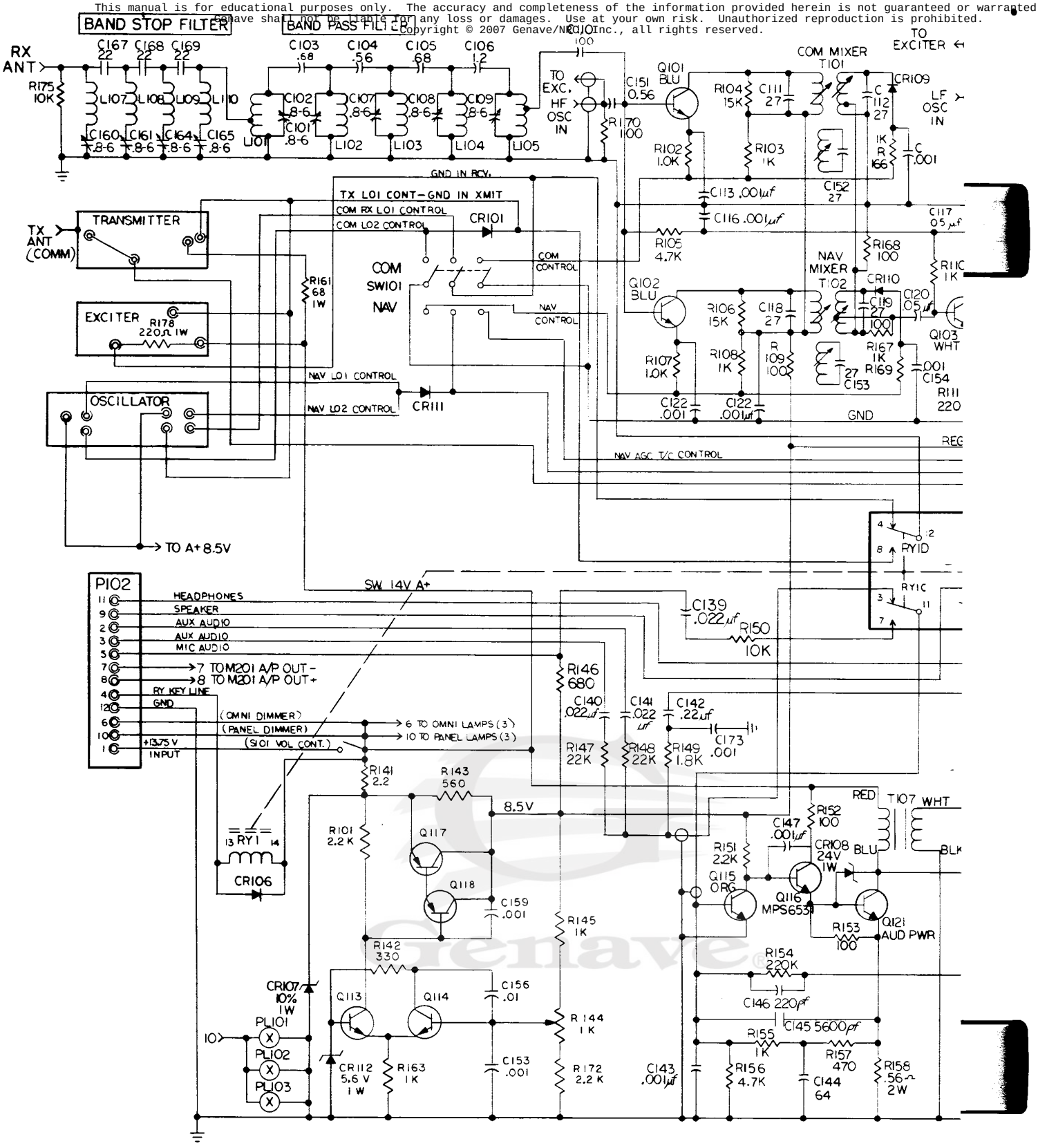
T101	90	Communications, First IF
T102	91	Navigation, First IF
T103	92	4 mHz IF
T104	92	4 mHz IF
T105	92	4 mHz IF
T106	92	4 mHz IF
T107	89	Audio Output
T108		Unassigned
T301	71	HF Oscillator Output
T302		Unassigned
T401	87	LF Oscillator Tuning
T402		Unassigned

Section V Parts List (Continued)

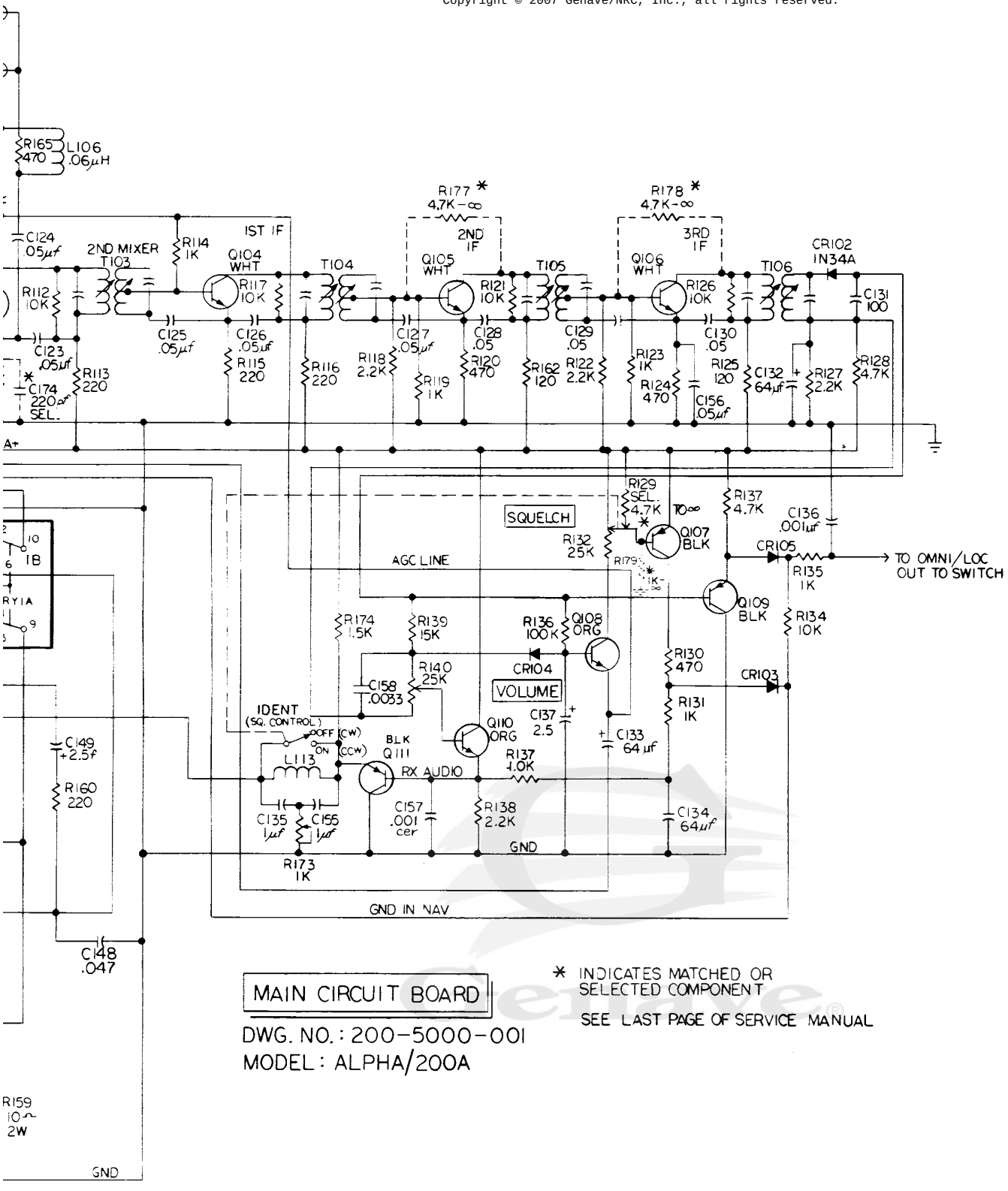
Ref. No.	Genave Part No. A-200-	Description
T601	93	Balanced Mixer, LF Input
T602	94	Balanced Mixer, Output
T603		Unassigned
		CRYSTALS
Y301	313	69.470 mHz
Y302	314	69.960 mHz
Y303	315	70.470 mHz
Y304	316	70.970 mHz
Y305	317	71.470 mHz
Y306	318	71.970 mHz
Y307	331	72.470 mHz
Y308	332	72.970 mHz
Y309	333	73.470 mHz
Y310	334	73.970 mHz
Y311	337	74.470 mHz
Y312	338	74.970 mHz
Y313	339	75.470 mHz
Y314	340	75.970 mHz
Y315	341	76.470 mHz
Y316	342	76.970 mHz
Y317		Unassigned
Y318		Unassigned
Y401	319	26.940 mHz
Y402	320	26.840 mHz
Y403	321	26.740 mHz
Y404	322	26.640 mHz
Y405	325	26.540 mHz
Y406	326	26.440 mHz
Y407	327	26.340 mHz
Y408	328	26.240 mHz
Y409	329	26.140 mHz
Y410	330	26.040 mHz
		SWITCHES
SW101	162	Nav/Com, Rocker, 3PDT
		CHOKES
Z501	88	Bias Choke, Red
Z502	88	Bias Choke, Red
Z503	95	Bias Choke, Blue
Z504	95	Bias Choke, Blue
Z505		Unassigned

Ref. No.	Genave Part No. A-200-	Description
		MISCELLANEOUS
M201	153	Meter, Course, 500-0-500 microamp
RY101	154	Relay, 4PDT, 12 VDC
HS101	166	Heat Sink, TO-5
HS102	191	Heat Sink, TO-3
P101	179	Connector, Phono Plug, Short Shank
P102	170	Connector, Amphenol, 12-pin, Male
P502	173	Connector, Phono Plug, Long Shank
P501	179	Connector, Phono Plug, Short Shank
J101	172	Connector, Phono Socket, Hex Nut Mount
J102	169	Connector, Amphenol, 12-pin, Female
J501	174	Connector, Socket, Phono, Solder-in
J502	174	Connector, Socket, Phono, Solder-in
CV101	171	Cover, Connector (Part of J102 & P102)
		HARDWARE
G101	181	Gear, Spur
G102	182	Gear, Spur
G103	183	Gear, Mitre
	184	Bushing, Internal
	186	Bearing, OBS Drum
	187	Bracket, OBS Potentiometer
	188	Clip, Radio Mounting
	189	Coupler, Shaft, 1/8" to ¼", Steel
	192	Shaft, Dial, 1/8" x .6", knurled
	193	Drum, Nylon, mHz
	194	Drum, Nylon, kHz
	195	Drum, OBS
	196	Screw, Retaining #8-32 x 12¾"
	197	Shaft, Extension 1/8"
	198	Shaft, OBS Drive
	199	Shaft, Frequency Drum, ⅛" x .9", knurled
	202	Panel, Trim
	203	Spring, Oscillator Grounding
	204	Spring, Shaft Grounding
	205	Panel, Rear
	206	Panel, Sub
	207	Panel, Top
	208	Panel, Side (Left or right)
	209	Rack, Mounting
	214	Decal, Navigation mHz
	217	Decal, Communication mHz
	218	Decal, kHz
	219	Decal, OBS
	221	Knob, Black, 1/8" Round Shaft
	222	Knob, Black, 1/8" Flatted Shaft
	240	Coupler, 1/8" to ¼" shaft, Delrier

Specifications subject to change without Notice



Model: ALPHA/200A



MAIN CIRCUIT BOARD

DWG. NO.: 200-5000-001

MODEL: ALPHA/200A

* INDICATES MATCHED OR SELECTED COMPONENT

SEE LAST PAGE OF SERVICE MANUAL

Fig 3-5-1

SCHEMATIC, MAIN CIRCUIT BOARD

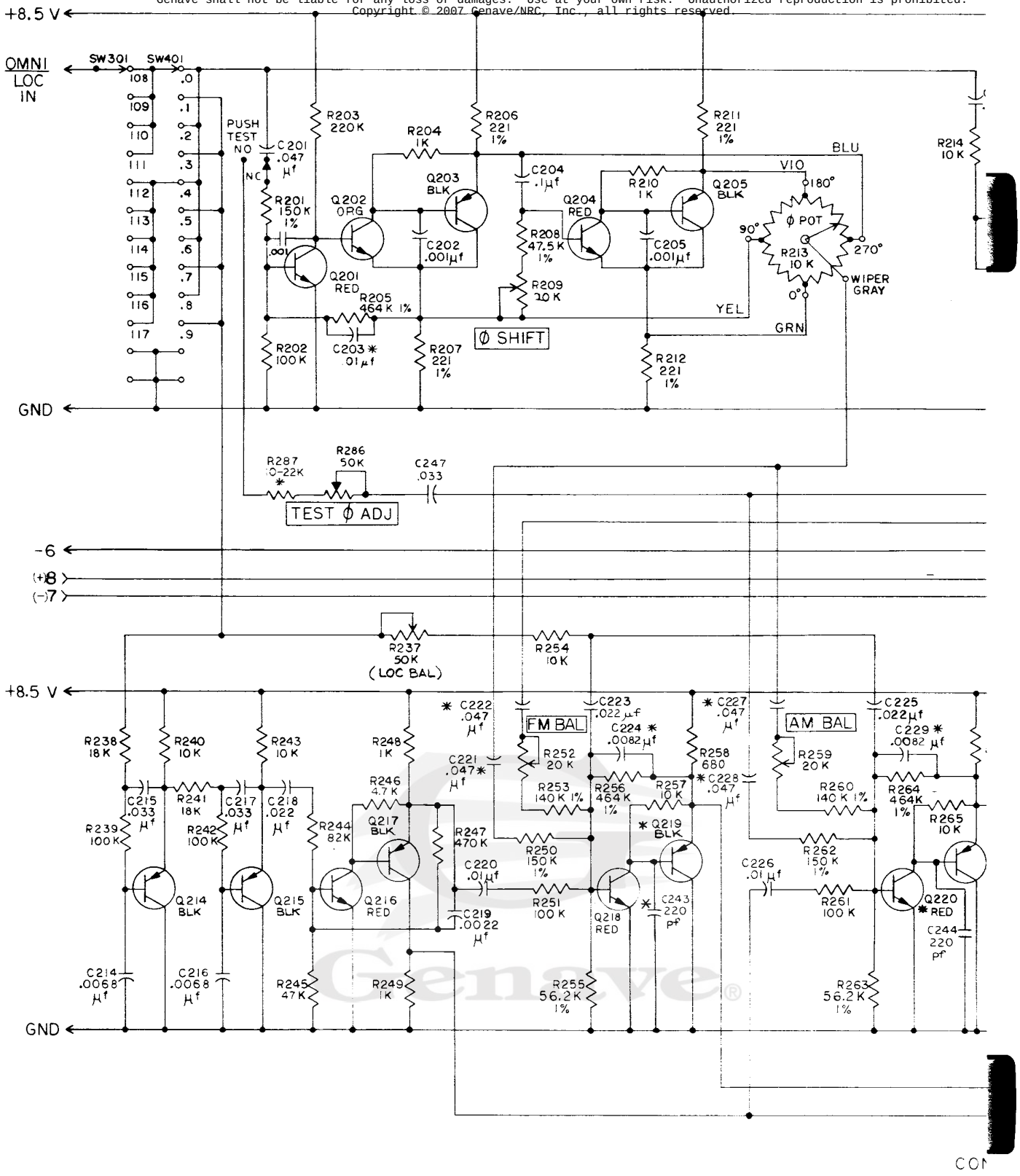
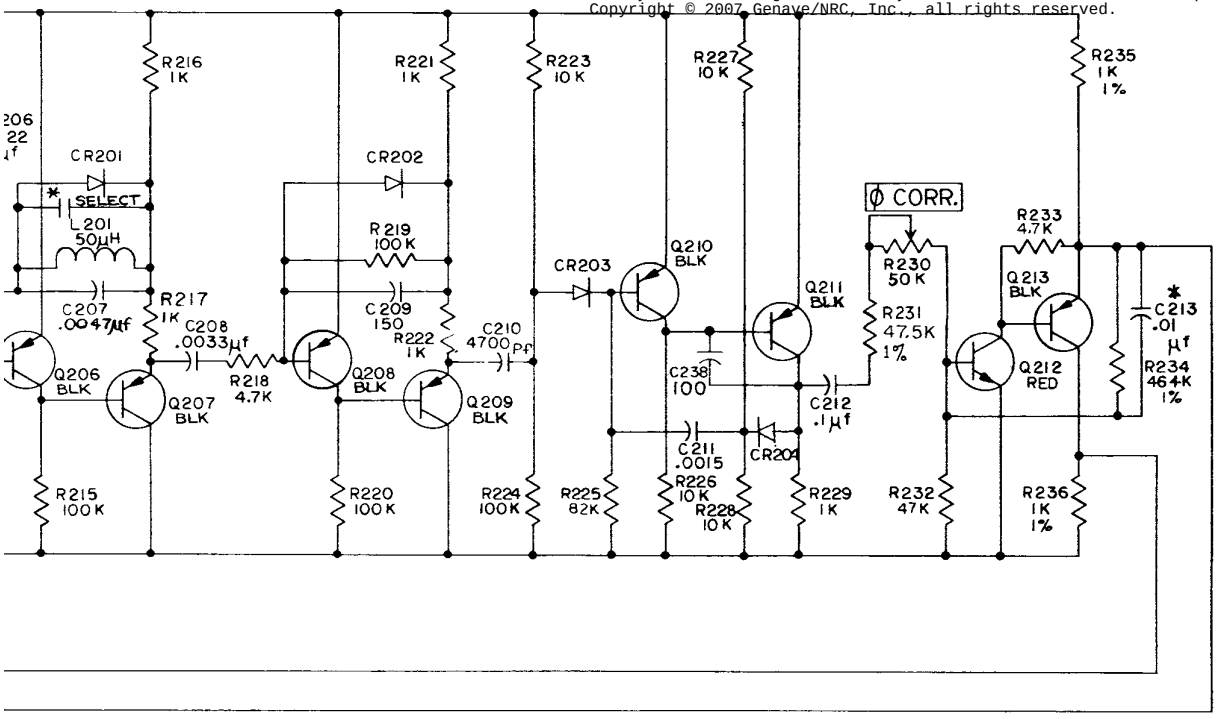


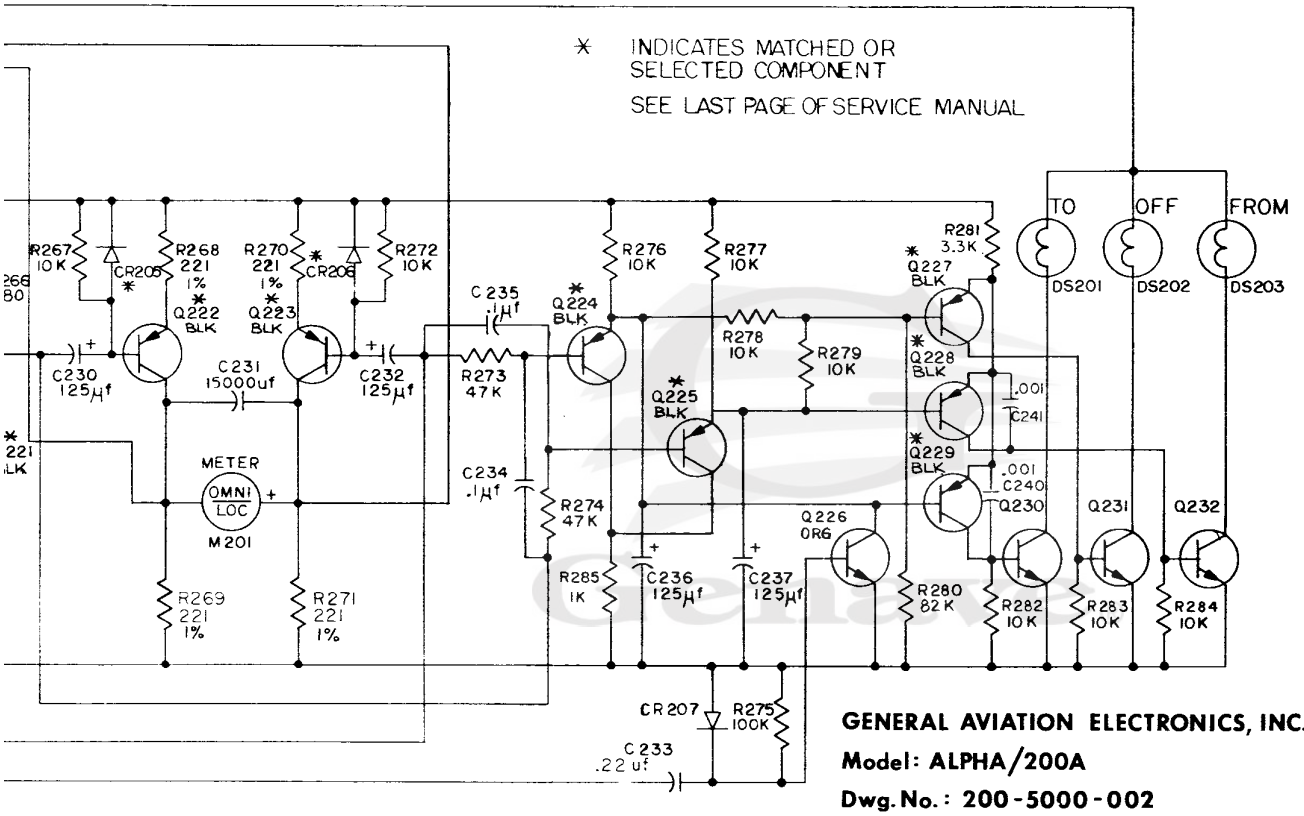
Figure 3-5-2

SCHEMATIC, CONVERTER INDICATOR



✳ INDICATES MATCHED OR SELECTED COMPONENT

SEE LAST PAGE OF SERVICE MANUAL



GENERAL AVIATION ELECTRONICS, INC.
Model: ALPHA/200A
Dwg. No.: 200-5000-002

VERTER INDICATOR

Model: ALPHA/200A

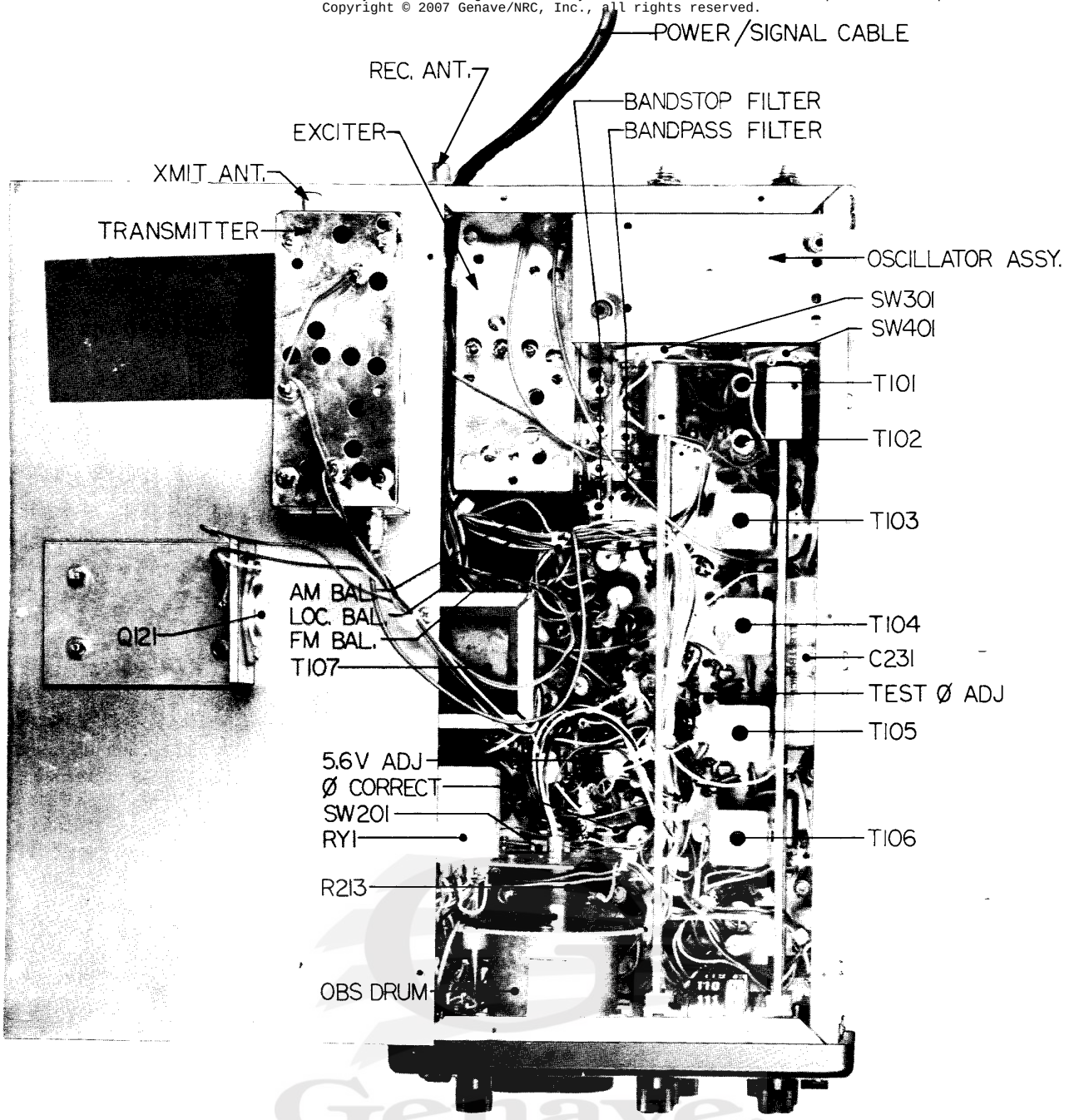


Figure 3-5-3

Model: ALPHA/200A

RADIO, TOP VIEW

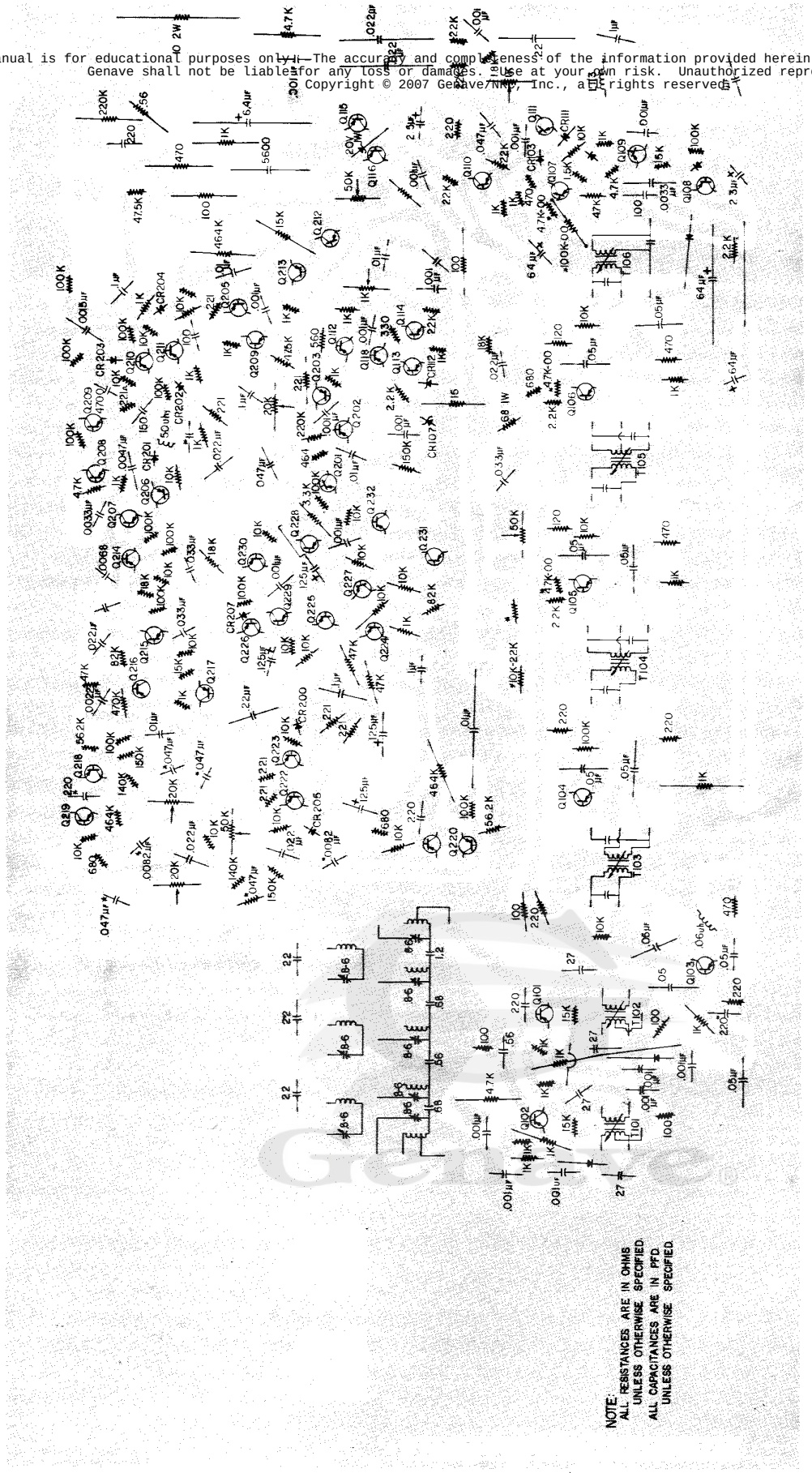


Figure 3-5-4

Parts/Track map

Model: ALPHA/200A

SECTION IV
PARTS LIST

Ref. No.	Genave Part No.	Description
		CAPACITORS
C101	1570004	0.8-6 pfd, Trimmer
C102	1570004	0.8-6 pfd, Trimmer
C103	1510009	0.68 pfd, 10%, NPO
C104	1510008	0.56 pfd, 1%, NPO
C105	1510009	0.68 pfd, 10%, NPO
C106	1510012	1.2 pfd, 10%, NPO
C107	1570004	0.8-6 pfd, Trimmer
C108	1570004	0.8-6 pfd, Trimmer
C109	1570003	0.7-3 pfd, Trimmer
C110	1520033	220 pfd, 10%, Z5F, 500V
C111	1520012	27 pfd, 10%, NPO
C112	1520012	27 pfd, 10%, NPO
C116	1520054	0.05 mfd, 25V, M25, +80%−20%
C117	1520054	0.05 mfd, 25V, M25, +80%−20%
C118	1520012	27 pfd, 10%, NPO
C119	1520012	27 pfd, 10%, NPO
C123	1520054	0.05 mfd, 25V, M25, +80%−20%
C124	1520054	0.05 mfd, 25V, M25, +80%−20%
C125	1520054	0.05 mfd, 25V, M25, +80%−20%
C126	1520054	0.05 mfd, 25V, M25, +80%−20%
C127	1520054	0.05 mfd, 25V, M25, +80%−20%
C128	1520054	0.05 mfd, 25V, M25, +80%−20%
C129	1520054	0.05 mfd, 25V, M25, +80%−20%
C130	1520054	0.05 mfd, 25V, M25, +80%−20%
C131	1520024	100 pf, 10%, N15
C132	1520024	64 mfd, 10V, ELT
C133	1540022	64 mfd, 10V, ELT
C134	1540022	64 mfd, 10V, ELT
C135	1500044	1 mfd, 10%, 50V, Mylar
C137	1540005	2.5 mfd, 16V, ELT
C138	1540024	125 mfd, 16V, ELT
C139	1500024	.022 mfd, 100V, Tub Mylar, 600UE
C140	1500024	.022 mfd, 100V, Tub Mylar, 600UE
C141	1500024	.022 mfd, 100V, Tub Mylar, 600UE
C142	1500038	.22 mfd, 75V,
C144	1550005	47 mfd, 10%, 15V, K47E15
C145	1500015	.0056 mfd, 200V
C146	1500027	.047 mfd, 10%, 100V, Mylar, 600UE
C147	1540005	2.5 mfd, 16V, ELT
C148	1500027	.047 mfd, 10%, 100V, Mylar, 600VE
C147	1540005	2.5 mfd, 16V, ELT
C150	1520054	0.05 mfd, 25V, M25 Disc, +80%−20%
C151	1510008	0.56 pf, 10%, NPO Gimmick
C152	1520012	27 pf, 10%, NPO Disc
C153	1520048	.001 mfd, 10%, Z5P Disc, 1000V
C155	1500044	1 mfd, 10%, 50V, Mylar
C156	1500018	0.01 mfd, 10%, 100V, Mylar, 600UE
C157	1520048	.001 mfd, 10%, Z5P Disc, 1000V
C158	1520050	.003 mfd, 10%, Z5P Disc
C159	1520048	.001 mfd, 10%, Z5P Disc
C160	1570004	0.8-6.0 pf, Trimmer
C161	1570004	0.6-6.0 pf, Trimmer
C164	1570004	0.8-6.0 pf, Trimmer
C165	1570004	0.8-6.0 pf, Trimmer
C167	1520011	22 pf, 10%, NPO Disc
C168	1520011	22 pf, 10%, NPO Disc
C169	1520011	22 pf, 10%, NPO Disc
C173	1520048	.001 mfd, 10%, Z5P Disc, 1000V
C174	1520033	220 pf, 10%, Z5F Disc, 500V
C201	1500027	.047 mfd, 10%, 100V, Mylar, 600UE
C203	1500018	0.01 mfd, 10%, 100V, Mylar, 600UE
C204	1500032	0.1 mfd, 40V, Poly Carb
C206	1500024	.022 mfd, 100V, Mylar
C207	1500013	.0047 mfd, 10%, 100V, Mylar
C208	1500010	.0033 mfd, 10%, 100V, Mylar
C209	1520029	150 pf, 10%, N1500 Disc
C210	1500013	.0047 mfd, 10%, Mylar
C211	1500005	.0015 mfd, 100V, Mylar
C212	1500035	0.1 mfd, 10%, 100V, Mylar
C213	1500018	0.01 mfd, 10%, 100V, Mylar
C214	1500016	.0068 mfd, 10%, 100V, Mylar
C215	1500025	.033 mfd, 10%, 100V, Mylar
C216	1500016	.0068 mfd, 10%, 100V, Mylar
C217	1500025	.033 mfd, 10%, 100V, Mylar
C218	1500024	.022 mfd, 100V, Tub Mylar
C219	1500008	.0022 mfd, 10%, 100V, Mylar
C220	1500018	.01 mfd, 10%, 100V, Mylar
C221	1500027	.047 mfd, 10%, 100V, Mylar
C222	1500027	.047 mfd, 10%, 100V, Mylar
C223	1500024	.022 mfd, 100V, Tub Mylar
C224	1500017	.0082 mfd, 10%, 100V, Mylar
C225	1500024	.022 mfd, 100V, Tub Mylar
C226	1500018	0.01 mfd, 10%, 100V, Mylar
C227	1500027	.047 mfd, 10%, 200V, Mylar
C228	1500027	.047 mfd, 10%, 100V, Mylar
C229	1500017	.0082 mfd, 10%, 100V
C230	1540024	125 mfd, 16V, ELT
C231	1540043	15000 mfd, 1V, ELT
C232	1540024	125 mfd, 16V, ELT
C233	1500037	.22 mfd, 50V, Mylar, 600UE
C234	1500035	0.1 mfd, 10%, 100V, Mylar, 600UE
C235	1500035	0.1 mfd, 10%, 100V, Mylar, 600UE
C236	1540024	125 mfd, 16V, ELT

Ref. No.	Genave Part No.	Description
C237	1540024	125 mfd, 16V, ELT
C238	1520024	100 pf, 10%, N1500 Disc
C239	1520054	0.05 mfd, 25V, M25 Disc, +80%−20%
C242	1500025	.033 mfd, 10%, 100V, Mylar, 600UE
C243	1520033	220 pfd, 10%, Z5F Disc, 500V
C244	1520033	220 pfd, 10%, Z5F Disc, 500V
C245	1520048	.001 mfd, 10%, Z5P Disc, 1000V
C246	1520040	470 pfd, 10%, Z5F Disc
C301	1520058	.001 mfd, Feedthrough
C302	1520058	.001 mfd, Feedthrough
C303	1520058	.001 mfd, Feedthrough
C304	1520058	.001 mfd, Feedthrough
C305	1520024	100 pfd, 10%, N1500 Disc
C306	1520008	12 pfd, 10%, NPO Disc
C307	1520010	18 pfd, 10%, NPO Disc
C308	1520048	.001 mfd, 10%, Z5P Disc, 1000V
C309	1520005	6.8 pfd, 10.., NPO Disc
C310	1570005	0.7-9 pfd, Trimmer
C311	1520006	8.2 pfd, 10%, NPO Disc
C312	1570005	0.7-9 pfd, Trimmer
C318	1510014	18 pfd, 10%
C314	1570005	0.7-9 pfd, Trimmer
C316	1520007	10 pfd, 10%, NPO Disc
C317	1510014	1.8 pfd, 10%, NPO Gimmick
C318	1520048	.001 mfd, 10%, Z5P Disc, 1000V
C319	1520012	27 pfd, 10%, NPO Disc
C401	1520058	.001 mfd, Feedthrough
C402	1520058	.001 mfd, Feedthrough
C403	1520058	.001 mfd, Feedthrough
C404	1520024	100 pfd, 10%. N1 00 Disc
C405	1520024	100 pfd, 10%, N1500 Disc
C406	1520024	100 pfd, 10%, N1500 Disc
C407	1520024	100 pfd, 10%, N1500 Disc
C408	1520024	100 pfd, 10%, N1500 Disc
C409	1520012	27 pfd, 10%, NPO Disc
C410	1520048	.001 mfd, 10%, Z5P Disc, 1000V
C501	1520010	18 pfd, 10%, NPO Disc
C502	1520013	33 pfd, 10%, NPO Disc
C503	1520013	33 pfd, 10%, NPO Disc
C504	1560001	4-40 pfd, Mica Trimmer
C505	1520024	100 pfd, 10%, N1500 Disc
C506	1520058	.001 mfd, Feedthrough
C507	1520033	220 pfd, 10%, Z5F Disc, 500V
C508	1520054	0.05 mfd, 25V, M25 Disc, +80%−20%
C509	1560002	7-100 pfd, Mica Trimmer
C510	1560001	4-40 pfd, Mica Trimmer
C511	1520058	.001 mfd, Feedthrough
C512	1520033	220 pfd, 10%, Z5F Disc, 500V
C513	1520054	0.05 mfd, 25V, M25 Disc, +80%−20%
C514	1560002	7-100 pfd, Mica Trimmer
C515	1560001	4-40 pfd, Mica Trimmer
C516	1520033	220 pfd, 10%, Z5F Disc, 500V
C517	1520054	0.05 mfd, 25V, M25 Disc, +80%−20%
C518	1520058	.001 mfd, Feedthrough
C519	1520033	220 pfd, 10%, Z5F Disc, 500V
C520	1520033	220 pfd, 10%, Z5F Disc, 500V
C521	1520054	0.05 mfd, 25V, M25 Disc, +80%−20%
C522	1520058	.001 mfd, Feedthrough
C601	1520033	220 pfd, 10%, Z5F Disc, 500V
C602	1520054	0.05 mfd, 25V, M25 Disc, +80%−20%
C603	1520058	.001 mfd, Feedthrough
C604	1520058	.001 mfd, Feedthrough
C605	1520054	0.05 mfd, 25V, M25 Disc, +80%−20%
C606	1520033	220 pfd, 10%, Z5F Disc, 500V
C607	1520005	6.8 pfd, 10%, NPO Disc
C608	1520033	220 pfd, 10%, Z5F Disc, 500V
C609	1520009	15 pfd, 10%, NPO Disc
C610	1520033	220 pfd, 10%, Z5F Disc, 500V
C611	1520033	220 pfd, 10%, Z5F Disc, 500V
C612	1520033	220 pfd, 10%, Z5F Disc, 500V
C613	1520008	12 pfd, 10%, NPO Disc
C614	1520006	8.2 pfd, 10%, NPO Disc
C615	1520033	220 pfd, 10%, Z5F Disc, 500V
C616	1520033	220 pfd, 10%, Z5F Disc, 500V
C617	1520033	220 pfd, 10%, Z5F Disc, 500V
C618	1520009	15 pfd, 10%, NPO Disc
C619	1570005	0.7-9 pfd, Trimmer
C620	1510013	1.5 pfd, 10%, NPO Gimmick
C621	1570005	0.7-9 pfd, Trimmer
C622	1520007	10 pfd, 10%, NPO Disc
C623	1510011	1.0 pfd, 10%, NPO Gimmick
C624	1570005	0.7-9 pfd, Trimmer
C625	1520007	10 pfd, 10%, NPO Disc
C626	1520054	0.05 mfd, 25V, M25 Disc, +80%−20%
C627	1520033	220 pfd, 10%, Z5F Disc, 500V
C628	1520058	.001 mfd, Feedthrough
C629	1520033	220 pfd, 10%, Z5F Disc, 500V
C630	1520033	220 pfd, 10%, Z5F Disc, 500V
C631	1520048	.001 mfd, 10%, Z5P Disc, 1000V
C632	1520048	.001 mfd, 10%, Z5P Disc, 1000V
C633	1520029	150 pfd, 10%, N1500 Disc
C634	1520029	150 pfd, 10%, N1500 Disc

Section IV Parts List (continued)

Ref. No.	Genave Part No.	Description
		DIODES
CR101	4810013	SD-1 General Purpose, 100V
CR102	4810021	1N34A, General Purpose, Germanium
CR103	4810017	FD 1936, Silicon, Switching
CR104	4810017	FD 1936, Silicon, Switching
CR106	4810013	SD-1 General Purpose, 100V
CR107	4810009	14V, Zener, 1W, 10%, ZS14A
CR108	4810011	24V, Zener, 1W, 10%, ZS24A
CR109	4810017	FD 1936, Silicon, Switching
CR110	4810017	FD 1936, Silicon, Switching
CR112	4810006	5.6V, Zener, ½W, 5%, ZS5.6B
CR201	4810017	FD 1936, Silicon, Switching
CR202	4810017	FD 1936, Silicon, Switching
CR203	4810017	FD 1936, Silicon, Switching
CR204	4810017	FD 1936, Silicon, Switching
CR205	4810021	1N34A, General Purpose, Germanium
CR206	4810021	1N34A, General Purpose, Germanium
CR207	4810021	1N34A, General Purpose, Germanium
CR301	4810017	FD 1936, Silicon, Switching
CR302	4810017	FD 1936, Silicon, Switching
CR303	4810017	FD 1936, Silicon, Switching
CR401	4810017	FD 1936, Silicon, Switching
CR402	4810017	FD 1936, Silicon, Switching
		LAMPS
DS101	3900022	Clear, 14V, 80Ma
DS102	3900022	Clear, 14V, 80Ma
DS201	3900006	Green, 14V, 80Ma
DS202	3900005	Red, 14V, 80Ma
DS203	3900007	Amber, 14V, 80Ma
		COILS
L101	1800024	Input Filter
L102	1800009	Input Filter
L102	1800009	Input Filter
L104	1800009	Input Filter
L105	1800026	Input Filter
L107	1800017	Band Stop Filter
L108	1800017	Band Stop Filter
L109	1800017	Band Stop Filter
L110	1800017	Band Stop Filter
L113	1800029	Ident. Filter
L201	1800033	50 MH
L301	1800030	.33MH. 15%
L302	1800013	HF Oscillator
L303	1800014	HF Doubler
L304	1800014	HF Doubler
L401	1800016	
L402	1800017	
L403	1800017	
L501	1800012	
L502	1800018	
L503	1800012	
L504	1800019	
L505	1800020	
L506	1800020	
L601	1800010	
L602	1800010	
L603	1800011	
L604	1800012	
		TRANSISTORS
Q101	4800024	MPS3563-SPS1528, Blue, NPN, Silicon RF
Q102	4800024	MPS3563-SPS1528, Blue, NPN, Silicon RF
Q103	4800026	MPS3693S-SPS1429, White, NPN, Silicon RF
Q104	4800026	MPS3693S-SPS1429, White, NPN, Silicon RF
Q105	4800026	MPS3693S-SPS1429, White, NPN, Silicon RF
Q106	4800026	MPS3693S-SPS1429, White, NPN, Silicon RF
Q107	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q108	4800029	MPS6514S-SPS1427 Orange, NPN, Sil Gp Aud
Q109	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q110	4800029	MPS6514S-SPS1427, Orange, NPN, Sil Gp Aud
Q111	4800008	2N5086-SPS-1426, Black, PNP, Sil Gp Aud
Q112	4800023	MPSU52, PNP, Sil Aud, 6W
Q113	4800015	MPSA10, NPN, Sil Gp Aud
Q114	4800015	MPSA10, NPN, Sil Gp Aud
Q115	4800029	MPS6514S-SPS1427, Orange, NPN, Sil Gp Aud
Q116	4800002	MPS6531, NPN, Gp Aud Sil
Q118	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q121	4800001	2N3055, NPN, Aud Pwr Sil
Q201	4800028	MPS6513S-SPS1425, Red, NPN, Sil Gp Aud
Q202	4800029	MPS6514-SPS1427, Orange, NPN, Sil Gp Aud
Q203	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q204	4800028	MPS6513S-SPS1425, Red, NPN, Sil Gp Aud
Q205	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q206	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q207	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q208	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q209	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q210	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q211	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q212	4800028	MPS6513S-SPS1426, Red, NPN, Sil Gp Aud
Q213	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q214	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q215	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q216	4800028	MPS6513S-SPS1425, Red, NPN, Sil Gp Aud
Q217	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q218	4800028	MPS6513S-SPS1425, Red, NPN, Sil Gp Aud
Q219	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q220	4800028	MPS6513S-SPS1425, Red, NPN, Sil Gp Aud
Q221	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q222	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q223	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q224	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q225	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q226	4800029	MPS6514S-SPS1427, Orange, NPN, Sil Gp Aud
Q227	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q228	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q229	4800008	2N5086-SPS1426, Black, PNP, Sil Gp Aud
Q230	4800040	39940, NPN, Sil Sw
Q231	4800040	39940, NPN, Sil Sw
Q232	4800040	39940, NPN, Sil Sw
Q301	4800030	MPS6519-SPS1428, Green, PNP, Sil SF
Q302	4800024	MPS3563-SPS1528, Blue, NPN, Sil RF
Q401	4800030	MPS6519-SPS1428, Green, PNP, Sil RF
Q501	4800039	38817, NPN, Sil RF Pwr
Q502	4800039	38817, NPN, Sil RF Pwr
Q503	4800036	PT4133A, NPN, Sil RF Pwr
Q601	4800024	MPS3563-SPS1528, Blue, NPN, Sil RF
Q602	4800024	MPS3563-SPS1528, Blue, NPN, Sil RF
Q603	4800031	MPS6544-SPS1424, Yellow, RF Sil, NPN
Q604	4800031	MPS6544-SPS1424, Yellow, RF Sil, NPN
		RESISTORS
R101	4700029	2.2K, ½ W, 10%
R102	4700025	1K, ½ W, 10%
R103	4700025	1K, ½ W, 10%
R104	4700039	15K, ½ W, 10%
R105	4700033	4.7K, ½ W, 10%
R106	4700039	15K, ½ W, 10%
R107	4700025	1K, ½ W, 10%
R108	4700025	1K, ½ W, 10%
R109	4700013	100 ohm, ½ W, 10%
R110	4700025	1K, ½ W, 10%
R111	4700017	220 ohm, ½ W, 10%
R112	4700037	10K, ½ W, 10%
R113	4700017	220 ohm, ½ W, 10%
R114	4700025	1K, ½ W, 10%
R115	4700017	220 ohm, ½ W, 10%
R116	4700017	220 ohm, ½ W, 10%
R117	4700037	10K, ½ W, 10%
R118	4700029	2.2K, ½ W, 10%
R119	4700025	1K, ½ W, 10%
R120	4700021	470 ohm, ½ W, 10%
R121	4700037	10K, ½ W, 10%
R122	4700029	2.2K, ½ W, 10%
R123	4700025	1K, ½ W, 10%
R124	4700021	470 ohm, ½ W, 10%
R125	4700014	120 ohm, ½ W, 10%
R126	4700037	10K, ½ W, 10%
R127	4700033	4.7K, ½ W, 10%
R128	4700029	2.2K, ½ W, 10%
R129		Selected Value
R130	4700021	470 ohm, ½ W, 10%
R131	4700025	1K, ½ W, 10%
R132	4760009	25K, 30%, Pot
R133	4700025	1K, ½ W, 10%
R134	4700037	10K, ½ W, 10%
R135	4700025	1K, ½ W, 10%
R136	4700049	100K, ½ W, 10%
R137	4700033	4.7K, ½ W, 10%
R138	4700029	2.2K, ½ W, 10%
R139	4700039	15K, ½ W, 10%
R140	4760007	27 ohm, ½ W, 10%
R141	4700029	2.2K, ½ W, 10%
R142	4700019	330 ohm, ½ W, 10%
R143	4700022	560 ohm, ½ W, 10%
R144	4760015	1K, 20%, Pot 74-0200
R145	4700025	1K, ½ W, 10%
R146	4700023	680 ohm, ½ W, 10%
R147	4700041	22K ½ W, 10%
R148	4700041	22K, ½ W, 10%
R149	4700024	820 ohm, ½ W, 10%
R150	4700037	10K, ½ W, 10%
R151	4700029	2.2K, ½ W, 10%
R152	4700013	100 ohm, ½ W, 10%
R153	4700013	100 ohm, ½ W, 10%
R154	4700053	220K, ½ W, 10%
R155	4700025	1K, ½ W, 10%
R156	4700053	4.7K, ½ W, 10%
R157	4700021	470 ohm, ½ W, 10%
R158	4740002	0.56 ohm, 2 W, 10%
R159	4740003	10 ohm, 2 W, 10%
R160	4700017	220 ohm, ½ W, 10%
R161	4700011	68 ohm, ½ W, 10%
R162	4700014	120 ohm, ½ W, 10%
R163	4700025	1K, ½ W, 10%
R164		Unassigned
R165	4700017	220 ohm, ½ W, 10%

Section IV Parts List (continued)

Ref. No.	Genave Part No.	Description
R166	4700025	1K, ½ W, 10%
R167	4700013	100 ohm, ½ W, 10%
R168	4700013	100 ohm, ½ W, 10%
R169	4700025	1K, ½ W, 10%
R170	4700013	100 ohm, ½ W, 10%
R171		Unassigned
R172	4700029	2.2K, ½ W, 10%
R173	4760015	150 ohm, ½ W, 10%
R174	4700027	1.5K, ½ W, 10%
R175	4700037	10K, ½ W, 10%
R176		Unassigned
R177	4700033	4.7K, ½ W, 10%
R178	4700033	4.7K, ½ W, 10%
R179		Selected Value
R201	4720014	150K, ¼ W, 1%
R202	4700049	100K, ½ W, 10%
R203	4700053	220K, ½ W, 10%
R204	4700025	1K, ½ W, 10%
R205	4720015	464 K, ¼ W, 1%
R206	4720002	221 ohm, ¼ W, 1%
R207	4720002	221 ohm, ¼ W, 1%
R208	4720010	47.5K, ¼ W, 1%
R209	4760020	20K, 30%, Pot
R210	4700025	1K, ½ W, 10%
R211	4720002	221 ohm, ¼ W, 1%
R212	4720002	221 ohm, ¼ W, 1%
R213	4760011	10K, 20%, OBS Pot
R214	4700037	10K, ½ W, 10%
R215	4700049	100K, ½ W, 10%
R216	4700025	1K, ½ W, 10%
R217	4700025	1K, ½ W, 10%
R218	4700033	4.7 ohm, ½ W, 10%
R219	4700049	100K, ½ W, 10%
R220	4700049	100K, ½ W, 10%
R221	4700025	1K, ½ W, 10%
R222	4700025	1K, ½ W, 10%
R223	4700037	10K, ½ W, 10%
R224	4700049	100K, ½ W, 10%
R225	4700048	82K, ½ W, 10%
R226	4700037	10K, ½ W, 10%
R227	4700037	10K, ½ W, 10%
R228	4700037	10K, ½ W, 10%
R229	4700025	1K, ½ W, 10%
R230	4760021	50K, 20%, Pot
R231	4720010	47.5K, ¼ W, 1%
R232	4720053	43K, ½ W, 5%
R233	4700033	4.7K, ½ W, 10%
R234	4720015	464K, ¼ W, 1%
R235	4720005	1K, ¼ W, 1%
R236	4720005	1K, ¼ W, 1%
R237	4760021	50K, 20%, Pot
R238	4700040	18K, ½ W, 10%
R239	4700049	100K, ½ W, 10%
R240	4700037	10K, ½ W, 10%
R241	4700040	18K, ½ W, 10%
R242	4700049	100K, ½ W, 10%
R243	4700037	10K, ½ W, 10%
R244	4700049	100K, ½ W, 10%
R245	4720053	43K, ½ W, 5%
R246	4700033	43K, ½ W, 5%, Metal Glaze
R247	4700057	62K, ¼ W, 2%, Metal Film
R248	4700025	1K, ½ W ,10%
R249	4700025	1K, ½ W, 10%
R250	4720014	150K, ¼ W, 1%
R251	4700049	1 Meg ohm, ¼ W, 5%
R252	4760020	20K, 30%, Pot
R253	4720013	140K, ½ W, 1%
R254	4700037	10K, ½ W, 10%
R255	4760006	10K, Pot
R256	4720015	464 K, ¼ W, 1%
R257	4700037	10K, ½ W, 10%
R258	4700023	680 ohm, ½ W, 10%
R259	4760020	20K, 30%, Pot
R260	4720013	140K, ½ W, 1%
R261	4700049	100K, ½ W, 10%
R262	4720014	150K, ¼ W, 1%
R263	4720011	56.2K, ¼ W, 1%
R264	4720015	464K, ¼ W, 1%
R265	4700037	62K, ½ W, 5%, Metal Glaze
R266	4700023	680 ohm, ½ W, 10%
R267	4700037	10K, ½ W, 10%
R268	4720002	221 ohm, ¼ W, 1%
R269	4720002	221 ohm, ¼ W, 1%
R270	4720002	221 ohm, ¼ W, 1%
R271	4720002	221 ohm, ¼ W, 1%
R272	4700037	10K, ½ W, 10%
R273	4700045	47K, ½ W, 10%
R274	4700045	47K, ½ W, 10%
R275	4700049	100K, ½ W, 10%
R276	4700037	10K, ½ W, 10%
R277	4700037	10K, ½ W, 10%
R278	4700037	10K, ½ W, 10%
R279	4700037	10K, ½ W, 10%
R280	4700048	82K, ½ W, 10%
R281	4700031	3.3K, ½ W, 10%
R282	4700037	10K, ½ W, 10%
R283	4700037	10K, ½ W, 10%
R284	4700037	10K, ½ W, 10%
R285	4700025	1K, ½ W, 10%
R286	4700021	50K, 20%, Pot
R287		Unassigned
R288		Unassigned

Ref. No.	Genave Part No.	Description
R301	4700023	680 ohm, ½ W, 10%
R302	4700023	680 ohm, ½ W, 10%
R303	4700023	680 ohm, ½ W, 10%
R304	4700025	1K, ½ W, 10%
R305	4700013	100 ohm, ½ W, 10%
R306	4700029	2.2 K, ½ W, 10%
R307		Unassigned
R308	4700013	100 ohm, ½ W, 10%
R309	4700027	1.5K, ½ W, 10%
R310	4700006	22 ohm, ½ W, 10%
R311	4700029	2.2 K, ½ W, 10%
R312	4700013	100 ohm, ½ W, 10%
R401	4700023	680 ohm, ½ W, 10%
R402	4700023	680 ohm, ½ W, 10%
R403	4700006	22 ohm, ½ W, 10%
R404	4700025	1K, ½ W, 10%
R405	4700013	100 ohm, ½ W, 10%
R406	4700029	2.2K, ½ W, 10%
R407		Unassigned
R408		Unassigned
R501	4700037	10K, ½ W, 10%
R502	4700030	2.7K, ½ W, 10%
R503	4700016	180 ohm, ½ W, 10%
R504		Unassigned
R505		Unassigned
R506		Unassigned
R601	4700014	120 ohm, ½ W, 10%
R602	4700021	470 ohm, ½ W, 10%
R603	4700028	1.8K, ½ W, 10%
R604	4700013	100 ohm, ½ W, 10%
R605	4700028	1.8K, ½ W, 10%
R606	4700014	120 ohm, ½ W, 10%
R607	4700021	470 ohm, ½ W, 10%
R608	4700025	1K, ½ W, 10%
R609	4700003	10 ohm, ½ W, 10%
R610	4700003	10 ohm, ½ W, 10%
R611	4700025	1K, 1 W, 10%
R612	4730009	220 ohm, 1 W, 10%
R613	4700013	100 ohm, ½ W, 10%
R614	4700033	4.7 ohm, ½ W, 10%
R615	4700033	4.7 ohm, ½ W, 10%
R616	4700010	56 ohm, ½ W, 10%
R617	4700017	220 ohm, ½ W, 10%
R618	4700014	120 ohm, ½ W, 10%
R619		Unassigned
R620	4700009	47 ohm, ½ W, 10%
R621		Unassigned
R622	4700013	100 ohm, ½ W, 10%
R623	4700025	1K, ½ W, 10%
R624		Unassigned
		TRANSFORMERS
T101	5600022	Com 1st IF
T102	5600023	Nav 1st IF
T103	5600009	4 MHz, IF
T104	5600009	4 MHz, IF
T105	5600009	4 MHz, IF
T106	5600009	4 MHz, IF
T107	5600006	Audio Output
T108		Unassigned
T301	5600027	HF Osc Tuning
T302		Unassigned
T401	5600026	LF Osc. Tuning
T402		Unassigned
T601	5600024	Balanced Mixer, IF Input
T602	5600025	Balanced Mixer, Output
T603		
		CRYSTALS
Y301	2300015	69.470 MHz
Y302	2300016	69.960 MHz
Y303	2300017	70.470 MHz
Y304	2300018	70.970 MHz
Y305	2300019	71.470 MHz
Y306	2300020	71.970 MHz
Y307	2300021	72.470 MHz
Y308	2300022	72.970 MHz
Y309	2300023	73.470 MHz
Y310	2300024	73.970 MHz
Y311	2300025	74.470 MHz
Y312	2300026	74.970 MHz
Y313	2300027	75.470 MHz
Y314	2300028	75.970 MHz
Y315	2300029	76.470 MHz
Y316	2300030	76.970 MHz
Y317		Unassigned
Y318		Unassigned
Y401	2300014	26.940 MHz
Y402	2300013	26.840 MHz
Y403	2300012	26.740 MHz
Y404	2300011	26.640 MHz
Y405	2300010	26.540 MHz
Y406	2300009	26.440 MHz
Y407	2300008	26.340 MHz
Y408	2300007	26.240 MHz
Y409	2300006	26.140 MHz
Y410	2300004	26.040 MHz

Section IV Parts List (continued)

Ref. No.	Genave Part No.	Description
		SWITCHES
S101		On/Off, Part of R140
S102		Ident/Off, Part of R132
SW101	5100020	3PDT Nav/Com
SW201	5100021	Omni Test
		CHOKES
Z501	1800021	Choke, Red
Z502	1800021	Choke, Red
Z503	1800022	Choke, Blue
Z504	1800022	Choke, Blue
Z505	1870004	Ceramic Bead
		MISCELLANEOUS
M201	2900003	Meter 500-0-500 uA, MM1
RY101	4500001	Relay 4PDT, 12V
HS101	5300001	Heat Sink TO5
HS102	5300003	Heat Sink Thermalloy
P101	2100023	Conn, Phono Plug (Long Shank)
P102	2100013	Conn, 12 Pin Plug
P501	2100024	Conn, Phono Plug (Long)
P502	2100023	Conn, Phono Plug (Long Shank)
J101	2100021	Conn, Phono Socket
J102	2100010	Conn, 12 Pin Socket
J501	2100020	Conn, Phono Socket
J502	2100020	Conn, Phono Socket
CV101	2100018	Conn, Cover
G101	2500440	Gear Spur
G102	3500004	Gear Spur
G103	3500001	Gear Mitre Molded
	2500405	Int Bearing
	2500400	OBS Drum Bushing
	2501255	Drum Bearing
	2500357	Bracket
	2500415	Clip
	2500385	Steel Shaft Coupler
	2500375	OBS Dial
	2500335	Large Frequency Drum
	2500345	Dial Shaft
	2500425	Shaft Extension
	2500410	OBS Drive Shaft
	2500335	Large Frequency Drum
	2500340	Small Frequency Drum
	2500445	Spring Osc Gnd
	2500450	Spring Osc Gnd
	2500523	Trim Panel
	2500512	Rear Panel
	2500740	Lo End
	2500497	Top Panel
	2500767	Side Panel
	2500572	Mtg Rack
	2400015	Decal 108-117 Nav MHz
	2400016	Decal 118-127 Com MHz
	2400014	Decal 0-9 KHz
	2501162	Knob
	2501152	Knob
	2500253	Knob
	2500380	200-2500-013A
	3900021	Lamp Shield Blk Nylon

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