Theta/300–400

Converter Indicator

MAINTENANCE MANUAL

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SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

This service manual contains all of the information normally required to install, operate, and maintain the Genave THETA/300 & 400 Converter/Indicators.

1-2. DESCRIPTION

The THETA/300 and THETA/400 were designed to be companion equipment to the Genave ALPHA/600 NAV/COM transceiver. Both models are panel mounted converter-indicators. The THETA/300 displays VOR/LOC information only while the THETA/400 displays VOR/LOC plus glideslope information.

The THETA/300 utilizes 11 integrated circuits and 8 silicon transistors while the THETA/400 utilizes 15 integrated circuits and 13 silicon transistors in solid state computer circuitry designs which provide easily recognized course information. Both models feature VOR/LOC press-to-test, no-ambiguity TO-FROM-OFF lamps, left/right course deviation indicator, indicator backlighting, and a full visibility OBS dial. The THETA/400 also features glideslope deviation indication and definitive glideslope operational warning lights. Both converter-indicators incorporate a self-contained regulated power supply. Backlight dimming is provided in both models. TO-OFF-FROM indicator lamp dimming is controlled by the special dimmer circuitry incorporated in the ALPHA/600. Left/Right autopilot outputs are provided by both units. The THETA/400, in addition, provides Up/Down autopilot outputs.

THETA/300
CONVERTER INDICATOR

Front Panel Size: Standard 3.125" round instrument hole
Depth Behind Panel: 8.125"
Weight: 2 lbs.
VOR Acc: ± 3° (meets RTCA DO-114, Paragraph 2, 1, a)
LOC Acc: ½ dot
VOR Lamp Sensitivity: 5 uv min. (meets RTCA DO-114, Paragraph 2.4)
LOC Lamp Sensitivity: 20 uv for 60% of standard deflection (meets RTCA DO-131, Paragraph 2.11)
Autopilot Outputs: 150 mv for full scale deflection (standard)
LOC Deflection: 500 uv, 3 dot ± ½ dot at ± 4 db
VOR Self Test Accuracy: 2° at 0°

ENVIRONMENTAL

Temperature: Operating temperature range — 15° C to + 55° C
Storage: — 40° C to + 71° C
Altitude: 30,000 feet operating
Vibration: Constant total excursion 0.1" from 5 to 55 Hz with a maximum acceleration of 1.5 G. Constant acceleration of 0.25 G from 55 to 2,000 Hz. (RTCA DO-138, catagory P)

THETA/400
CONVERTER INDICATOR

Front Panel Size: Standard 3.125" round instrument hole
Depth Behind Panel: 8.125"
Weight: 2 lbs.
VOR Acc: ± 3° (meets RTCA DO-114, Paragraph 2.1.a)
LOC Acc: ± ½ dot
VOR Lamp Sensitivity: 5 uv min. (meets RTCA DO-114, Paragraph 2.4)
LOC Lamp Sensitivity: 20 uv for 60% of standard deflection (meets RTCA DO-131, Paragraph 2. 11)
Glide Slope Sensitivity: 30 uv for 60% of standard deflection (meets RTCA DO-132, Paragraph 2.7) Applicable to Genave PHI/20
Glide Slope Deflection: 500 uv 2 dots ± ½ dot at ± 2 db
Autopilot Outputs: 150 mv for full scale deflection (standard)
LOC Deflection: 500 uv 3 dot ± ½ dot at ± 4 db
VOR Self Test Accuracy: ± 2° at 0°

ENVIRONMENTAL

Temperature: Operating temperature range — 15° C to + 55° C
Storage: — 40° C to + 71° C
Altitude: 30,000 feet operating
Vibration: Constant total excursion 0.1" from 5 to 55 Hz with a maximum acceleration of 1.5 G. Constant acceleration of 0.25 G from 55 to 2,000 Hz. (RTCA DO-138, catagory P)

1-4. EQUIPMENT SUPPLIED

a. 1—THETA/300 or THETA/400 Converter-Indicator

1-5. EQUIPMENT REQUIRED, BUT NOT SUPPLIED

a. 1—ALPHA/600 NAV/COM Transceiver
b. 1—Glideslope Receiver, THETA/400 only (If glideslope presentation is desired.)

SECTION II

INSTALLATION MANUAL

The following Section

is reproduced

and included with every

THETA/300–400

Converter-Indicator

It is made a part of

this manual

for your permanent

reference

Genave®

GENERAL AVIATION ELECTRONICS, INC.
4141 KINGMAN DRIVE, INDIANAPOLIS, INDIANA 46226

INSTALLATION MANUAL

Theta/300 and Theta/400

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.

Warranty

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

When properly adjusted and competently operated according to factory specifications and instructions, General Aviation Electronics, Inc. unconditionally guarantees and warrants all parts and bench service labor for one (1) full year from the date of the original installation of the unit.

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

GENERAL AVIATION ELECTRONICS, INC.

By

Elmore W. Rice, III, President

The Company offers no other guarantees or warranties expressed or implied

Proper Installation Will Assure Quality

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

Proper installation of the unit into your customer's aircraft is essential to complete the quality assurance program under which the unit was manufactured.

Specifications:

THETA/400

CONVERTER INDICATOR

Front Panel Size: Standard 3.125" round instrument hole
Depth Behind Panel: 8.125"
Weight: 2 lbs.
VOR Acc: ± 3° (meets RTCA DO-114, Paragraph 2.1.a)
LOC Acc: ± ½ dot
VOR Lamp Sensitivity: 5 uv min. (meets RTCA DO-114, Paragraph 2.4)
LOC Lamp Sensitivity: 20 uv for 60% of standard deflection (meets RTCA DO-131, Paragraph 2. II)
Glide Slope Sensitivity: 30 uv for 60% of standard deflection (meets RTCA DO-132, Paragraph 2.7) Applicable to Genave PHI/20
Glide Slope Deflection: 500 uv 2 dots ± ½ dot at ± 2 db
Autopilot Outputs: 150 mv for full scale deflection (standard)
LOC Deflection: 500 uv 3 dot ± ½ dot at ± 4 db
VOR Self Test Accuracy: ± 2° at 0°

ENVIRONMENTAL

Temperature: Operating temperature range — 15° C to + 55° C
Storage: — 40° C to + 71° C
Altitude: 30,000 feet operating
Vibration: Constant total excursion 0.1" from 5 to 55 Hz with a maximum acceleration of 1.5 G. Constant acceleration of 0.25 G from 55 to 2,000 Hz. (RTCA DO-138, catagory P)

Unpacking

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

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

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

Installation Planning

THE LOCATION of the Unit in the aircraft should be carefully selected with due consideration to the following:

1. The unit generates only a very small amount of heat and, as such, does not require any type of 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 UNIT 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 placement of the unit should be such that all controls are easily accessible.

Installation

1. The aircraft panel cutout for the THETA/300 and THETA/400 is the standard round instrument hole shown in this manual.
2. Install the indicator in the aircraft panel, using #6-32 Binder head screws and lock-washers.
3. Connect the power cable to the ALPHA/600 Nav-Com. Mechanically secure the cable at appropriate support points.
4. Update the appropriate logs and papers of the aircraft.
5. Fill out and return the bottom section of the warranty card.
6. Give the remainder of the warranty card 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.

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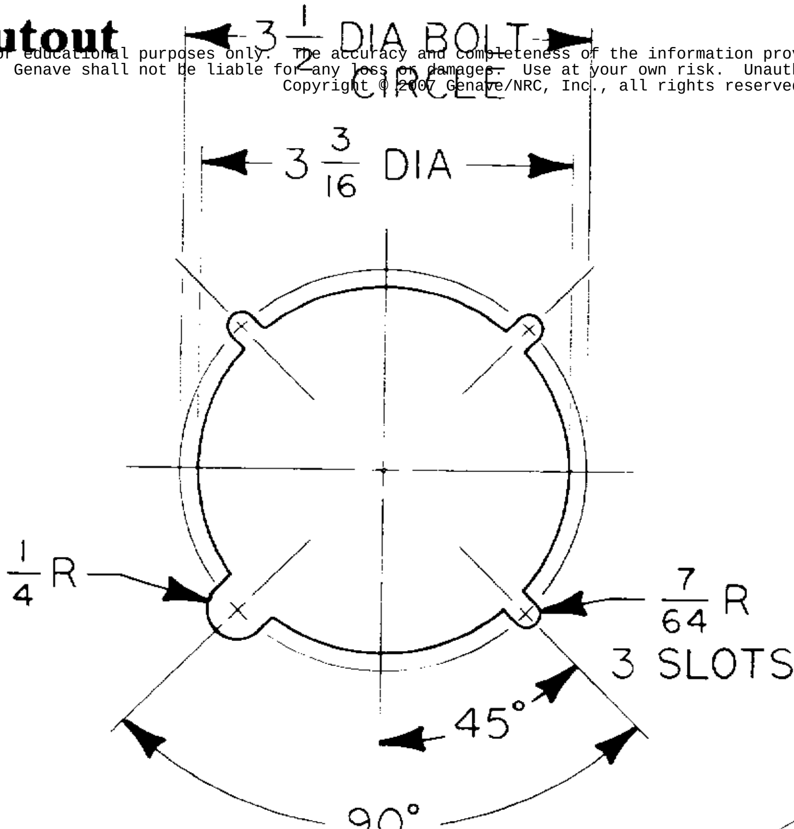
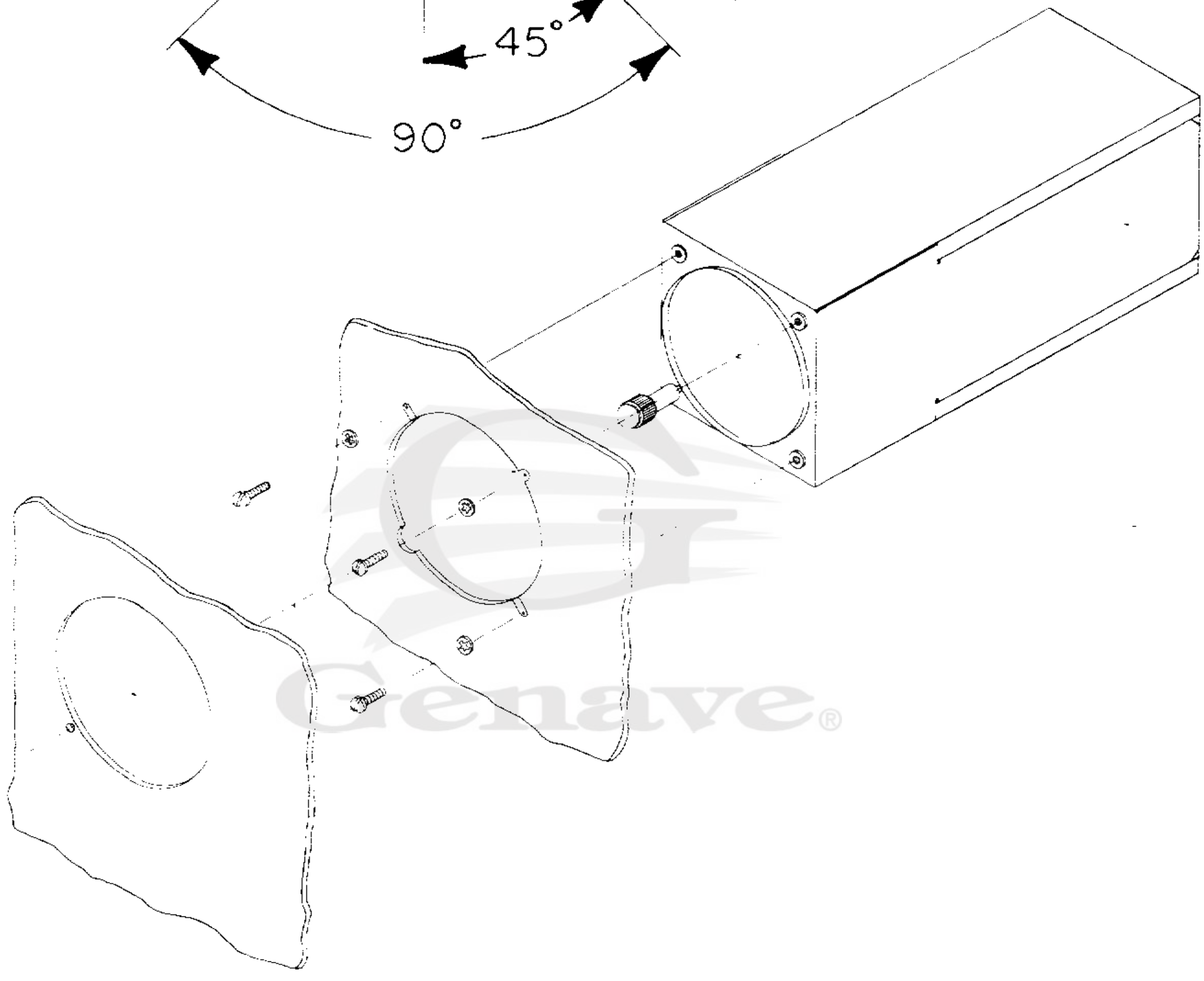
Panel Cutout

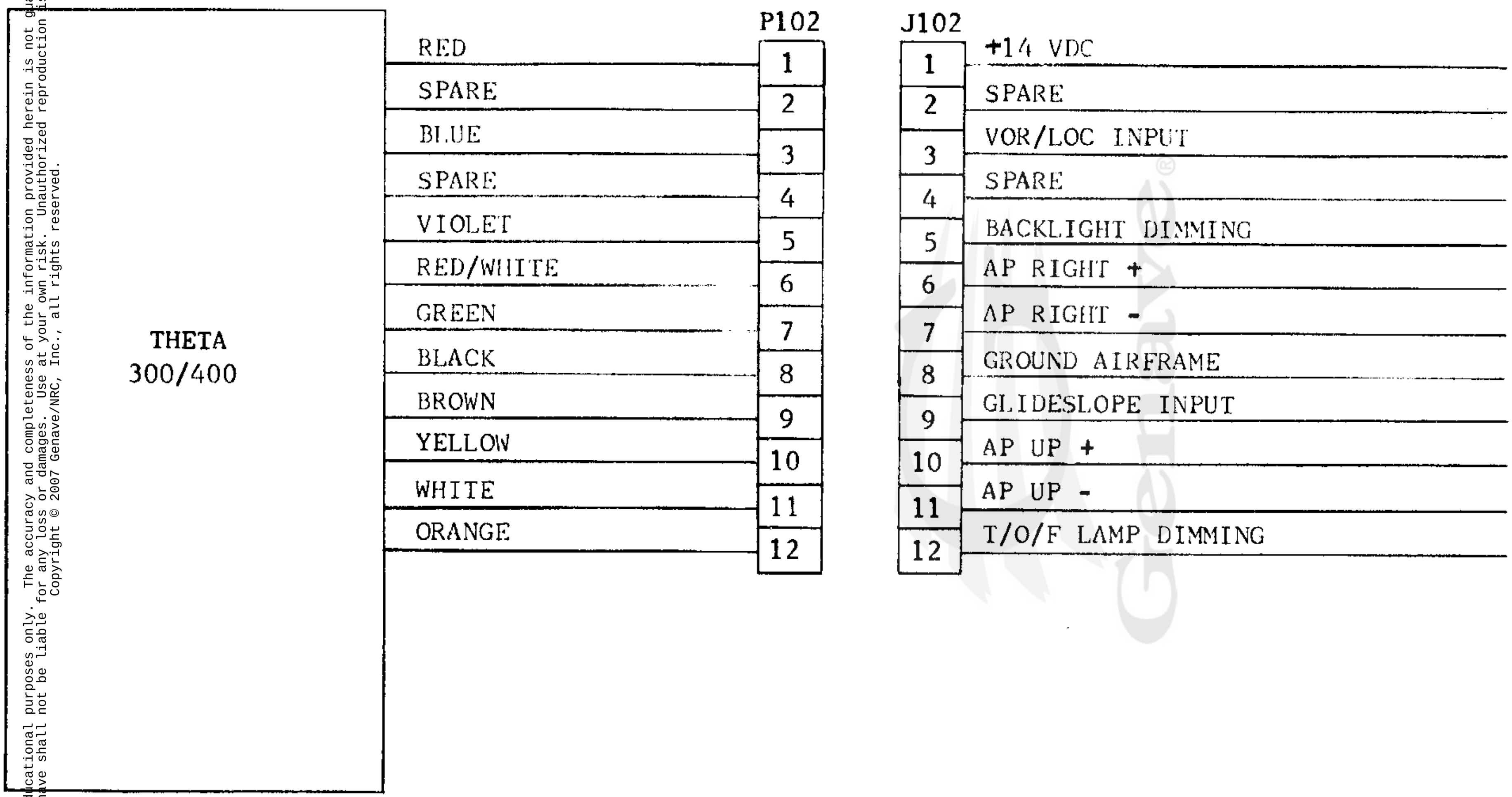


Unit



Post Installation Check

UPON COMPLETION of the installation, a flight test is desirable to insure that the unit is operating properly.

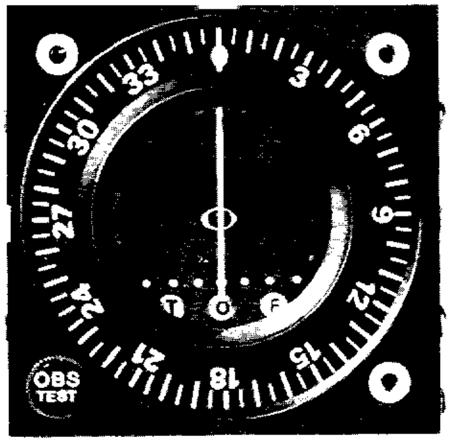


NOTES:

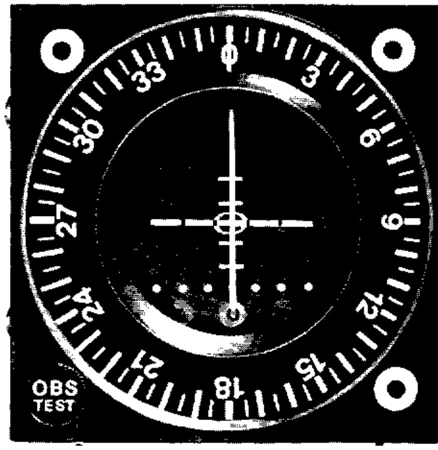
1. PIN 5 IS DIMMER LINE FOR OBS DIAL AND METER FACE.
2. PIN 12 IS DIMMER FOR INDICATOR T/O/F LAMPS AND GLIDESLOPE ON/OFF LAMPS. THIS DIMMER LEVEL IS SET BY THE "DIMMER" CONTROL ON ALPHA/600 PANEL.

SECTION III

OPERATING MANUAL



THETA/300



THETA/400

3-1. OPERATING CONTROLS AND INDICATORS

NOTE: The THETA 300 and THETA/400 are identical with the exception of the glideslope display capability of the THETA 400.

The 14 VDC primary power for the converter-indicator is usually supplied by means of the Nav Com receiver's switched A– ; therefore, the Nav Com receiver must be "On" in order to operate the converter-indicator.

The THETA 400 has five operating controls and indicators, while the THETA 300 has only three operating controls and indicators. These controls and indicators are as follows:

1. Omni Bearing Selector (OBS)

Adjusts Omni to desired radial and tests Omni system.

Turn knob clockwise or counterclockwise to desired bearing, displayed at the vertical hairline at the top of the compass rose.

To test the Omni system, depress the OBS knob. The needle will indicate the system accuracy and the "TO" light should appear. From needle center to the first dot is approximately two degrees and each dot thereafter is approximately two more degrees.

2. TO-OFF-FROM Lights

The To-Off-From lights provide the pilot with information concerning the validity of the displayed information and the position of the selected Omni radial with respect to the Omni station.

GREEN: (to) Illuminates when an 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 the aircraft is located.

Illuminates when the Localizer signal of the frequency shown in the Nav Frequency Readout window is of adequate strength.

Illuminates when the TEST function is executed.

YELLOW: (from) Illuminates when an 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 microphone button is depressed.
Illuminates when the Omni or 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 the Off Light (RED) is partially or fully illuminated.

3. Omni/Localizer Needle.

Solid white bar which indicates a "fly-left" or "fly-right" condition to make good the desired Omni or Localizer course.

4. Glide Slope Needle (On THETA/400 Only).

Dashed white and black bar which indicates a "fly-up" or "fly-down" condition to make good the desired Glide Slope course.

5. Glide Slope ON-OFF Lights (On THETA/400 Only).

GREEN: (on) Illuminates when G/S signal is of adequate strength.
RED: (off) Illuminates when G/S signal is unreliable.

In addition to these controls and indicators on the THETA/300 or THETA/400, additional controls mounted external to the converter-indicator may be used. Dimming of the To-Off-From lamps and the On-Off lamps (THETA/400 Only) can be adjusted utilizing the Dimmer pot on the front panel of the ALPHA/600 (Refer to Section III, ALPHA/600 Maintenance Manual). The back lighting level (Dial Illumination) may also be adjusted utilizing the aircraft panel light dimming control or a separate back light dimming control, if this feature was provided at the time of equipment installation.

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SECTION IV

MAINTENANCE MANUAL

4-1. INTRODUCTION

This section provides the basic information required for electronic testing, alignment, and repair of the THETA/300 and THETA/400 converter-indicators. It is assumed that the person working on the unit has a reasonable familiarity with the principles and terminology of avionics.

4-2. THEORY OF OPERATION

1. General

The 11 integrated circuits and 8 silicon transistors of the THETA/300, and the 15 integrated circuits and 13 silicon transistors of the THETA/400 are employed in a solid state computer circuitry design to provide high accuracy navigational information. Both units operate on +14 VDC which is usually switched by the Nav/Com transceiver. An internal regulated power supply is employed in both converter-indicators.

The converter-indicator circuitry is unique in design due to 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 "Bridge-T" circuits in the design which eliminates one of the major sources of aging error prevalent in most converter-indicators.

For the purpose of discussion the converter-indicator circuitry will be broken down into the following major circuit groups:

A. Omni Circuitry

B. Localizer Circuitry

C. Omni/Loc Low-Pass Amplifiers

D. Omni/Loc Metering Circuitry

E. Omni/Loc Lamp Circuitry

F. Glideslope Circuitry (THETA/400 Only)

G. Glideslope Low-Pass Amplifiers (THETA/400 Only)

H. Glideslope Metering Circuitry (THETA/400 Only)

I. Glideslope Lamp Circuitry (THETA/400 Only)

J. Regulated Power Supply

2. Detailed Theory

A. *Omni Circuitry*—When an omni or localizer signal is fed to the converter-indicator it is first applied to an adjustable gain amplifier stage comprised of IC201A and associated circuitry. R204, the Sensitivity Adjust, allows the incoming signal to be set to the proper input level. The normal omni signal level at Pin 1 of IC201A is approximately 430 mvolts RMS with a standard 0° omni modulated RF input signal to the receiver of 500 microvolts. The normal localizer signal level at Pin 1 of IC201A is approximately 425 mvolts RMS with a standard center course modulated localizer RF input signal of 500 microvolts to the receiver.

The Omni/Loc input signal from IC201A is applied through the OBS Test Switch, SW201, to the omni and localizer circuits. The omni input signal is fed to the two separate channels of the omni circuitry. One channel is the AM channel while the other is the FM channel.

The AM channel consists of a phase correction network, a 30 Hz band-pass active filter, a unity-gain phase inverter, a 90° phase shifting network, a unity-gain non-inverting amplifier, a unity-gain phase inverter, the OBS Potentiometer, and a unity-gain non-inverting amplifier. R208, the Phase Correction Adjust, is used to correct for any incidental phase shifting that takes place in the omni circuitry.

The 30 Hz band-pass active filter consisting of IC201B, R209, C202, and C203 removes the 30 Hz AM component of the 9960 Hz subcarrier. The low-pass filter provides one output 180° out-of-phase and the following inverting amplifier provides one output in-phase with the input signal.

These two outputs are applied to the 180° and 0° terminals of the OBS potentiometer, respectively, and to an RC phase shifting network consisting of R212, R213, and C204. R212 allows the phase shift to be set at exactly 90°.

Outputs from the 90° phase shifting network are applied to a unity-gain non-inverting amplifier, IC202B. This amplifier provides one output in-phase and inverting amplifier IC203A provides one output 180° out-of-phase with the signal from the 90° phase shifting network. These two outputs are applied to the 90° and 270° terminals of the OBS potentiometer, respectively. The wiper on the OBS potentiometer, R290, will provide a 30 Hz AM signal whose phase may be selected.

This selectable phase signal is applied to the non-inverting unity-gain amplifier of IC203B. The output of IC203B is applied to each of the Omni/Loc summing amplifiers.

The FM channel consists of one 9960 Hz amplifier/limiter, a Schmitt trigger, a slope detector, a low-pass active filter, and a variable-gain inverting amplifier.

The Omni input is first applied to the 9960 Hz LC amplifier consisting of IC204A and associated circuitry. This amplifier/limiter is tuned to 9960 Hz by means of L201 and C206.

IC204B is used as a Schmitt trigger to "square" and limit the 9960 Hz input. This technique reduces the possibility of any residual AM interference on the FM signal. The slope detector converts the FM signal to an AM signal and recovers the 30 Hz reference modulation. CR204 is used to reduce forward currents through CR203 and L202.

The 30 Hz band-pass active filter consisting of IC205A, R223, R224, C209, and C210 provides an output 180° out-of-phase while the variable gain inverting amplifier of IC204B and associated circuitry provide an output in-phase with the demodulated signal. These two outputs are applied to the Omni low-pass amplifiers. R227, the FM Balance Adjust, is used to set the output level of IC205B thereby equalizing the FM channel outputs.

When the Omni Test Switch, SW201, is moved to the test position, one of the FM reference channel outputs is applied through the omni test phase adjustment network of R230, R231, and C212 to the input of the AM channel.

CR201 and CR202 provide blocking of the omni circuitry signals when localizer signals are being received.

B. *Localizer Circuitry*—The localizer circuitry consists of a 90 Hz channel, a 150 Hz channel, and a common threshold detection amplifier which operates two FET switches. One of these FET switches is in the output circuit of each channel and therefore determines whether the localizer outputs will be applied to their appropriate summing amplifier.

The localizer signal is fed to the 90 Hz active band-pass filter of IC206A and associated circuitry and the 150 Hz active band-pass filter of IC206B and associated circuitry. The outputs from these filters are applied to the FET switches and to a detector circuit.

In the 90 Hz channel the band-pass filter output is applied to Q201, an FET switch, and CR205, the detector diode. The detected DC level is then applied to the threshold detection amplifier of IC207B via CR206.

In the 150 Hz channel the band-pass filter output is applied to Q202, the corresponding FET switch, and CR209, the detector diode. The detected DC level from CR209 is applied to the threshold detection amplifier via CR210.

When the detected negative DC level from either localizer channel reduces the bias on Pin 6 of IC207 below the threshold level as determined by R239 (approximately 4.8 volts) the output of IC207B is driven to approximately +9 VDC. This action turns on both FET switches, applies a control signal to the lamp circuitry via CR208 and R270, and blocks the input path to the omni circuitry as previously discussed.

R267, the Localizer Balance potentiometer, in the drain circuit of Q202, is used to equalize the localizer output signals which are applied to the low-pass amplifiers.

C. *Omni/Loc Low-Pass Amplifiers*—The low-pass amplifiers are used to convert the processed omni or localizer signal to a directional signal.

During omni operation, three signals from the omni circuitry are applied to the low-pass amplifiers. The output of the omni AM channel is applied to both summing amplifiers via R242, the AM Balance Adjust, and R269. Two FM channel outputs each 180° apart are applied to the low-pass amplifiers via R228 and R272. The low-pass amplifiers are comprised of IC208B and IC208A and their associated circuitry.

When receiving localizer signals the low-pass amplifiers function as signal amplifiers. The circuitry of IC208B amplifies the 90 Hz component of the localizer signal while the circuitry of IC208A amplifies the 150 Hz component of the localizer signal.

The summing amplifier outputs are applied to the metering and lamp circuitry.

D. *Omni/Loc Metering Circuitry*—The Omni/Loc metering circuits convert the directional signals from the low-pass amplifiers to a left-right visual indication which is displayed on M1, the course deviation indicator.

The low-pass amplifier outputs are rectified by means of CR207 and CR211. CR207 functions as a positive half-wave rectifier while CR211 functions as a negative half-wave rectifier.

The rectifier outputs, varying DC levels, are summed and applied to a low-pass active filter comprised of IC209B, C220, R249, and R250. The cutoff frequency of the low-pass filter is 1 Hz (RC = 1 sec.) and thus the meter is prevented from responding to transients. The low-pass active filter inverts the summed input signals.

The low-pass active filter output is applied to the meter driver circuitry of IC209A. If the filter output is negative, current will flow from the output of IC209A into the meter. If the filter output is positive, current will flow into the output of IC209A and therefore out of the meter. This action will cause current flow through the meter and therefore a meter deflection.

R256, the DC Balance Adjust, sets the DC level on Pin 3 of IC209A, therefore adjusting the relative positive and negative levels necessary to cause meter deflection.

E. *Omni/Loc Lamp Circuitry*—Two fixed 90° phase shift networks; R246 and C229, and R247 and C218; are connected to the outputs of the two low-pass amplifiers. The outputs of these networks have the same dependence upon the relative phase of the input signals as the summing amplifier outputs except that the amplitude response is shifted 90°. A positive output from IC208B causes Q203 to turn-on, increasing the output voltage at the junction of R275 and R276. A positive output from IC208B causes Q204 to turn-on, thereby reducing the voltage at the junction of R275 and R276.

IC210A and IC201B are used to switch the TO and FROM lamp drivers. When the voltage at the junction of R275 and R276 increases, IC201A provides a positive output which turns-on Q205 and turns-off Q206 via CR212 and IC211A. A negative voltage at the junction of R275 and R276 provides a positive output from IC210B which turns-on Q207 and turns-off Q206 via CR213 and IC211A. R285 is used to preferentially bias the input to IC211A to provide a positive output thereby turning-on Q206 when no input signal is present.

When a localizer signal is being received the localizer threshold detection amplifier applies a control signal to the junction of R275 and R276 via CR208 and R270. This positive control voltage is used to turn-on the ON lamp.

F. *Glideslope Circuitry (THETA/400 Only)*—The glideslope circuitry consists of a 90 Hz channel, a 150 Hz channel, and a common threshold detection amplifier which operates two FET switches. One of these FET switches is in the output circuit of each channel and therefore determine whether the glideslope outputs will be applied to their appropriate low-pass amplifier.

The glideslope signal is fed to the 90 Hz active bandpass filter of IC801A and associated circuitry and the 150 Hz active bandpass filter of IC801B and associated circuitry. The outputs from these filters are applied to the FET switches and to a detector circuit.

In the 90 Hz channel the bandpass filter output is applied to Q801, an FET switch, and CR800, the detector diode. The detected DC level is then applied to the threshold detection amplifier of IC802B via CR801.

In the 150 Hz channel the bandpass filter output is applied to Q802, the corresponding FET switch, and CR803, the detector diode. The detected DC level from CR803 is applied to the threshold detection amplifier via CR804.

When the detected negative DC level from either glideslope channel reduces the bias on Pin 6 of IC802B below the threshold level as determined by R828 (Approximately 4.8 volts) the output of IC802B is driven to approximately +9VDC. This action turns-on both FET switches and applies a control signal to the glideslope lamp circuitry.

R832, the Glideslope Balance Adjust, in the drain circuit path of Q802, is used to equalize the glideslope output signals applied to the glideslope low-pass amplifiers.

G. *Glideslope Low-Pass Amplifiers (THETA/400 Only)*—The low-pass amplifiers of IC803A and IC803B amplify the glideslope signals and apply them to the metering and lamp circuits. IC803A and associated circuitry is the 90 Hz low-pass amplifier whle IC803B and associated circuitry comprise the 150 Hz low-pass amplifier.

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C804 and R811 of IC803A and C813 and R834 of IC803B are used to rolloff noise on the glideslope signal.

H. *Glideslope Metering Circuitry (THETA/400 Only)*—The glideslope metering circuitry converts the directional signals from the low-pass amplifiers to an UP-DOWN visual indication, which is displayed on M2 the glideslope indicator.

The low-pass amplifier outputs are rectified by means of CR802 and CR805. CR802 functions as a positive half-wave rectifier while CR805 functions as a negative half-wave rectifier.

The rectifier outputs, varying DC levels, are summed and applied to a low-pass active filter comprised of IC804B, C806, and R814. The cutoff frequency of the low-pass filter is 1 Hz (RC = 1 sec.) and thus the meter is prevented from responding to transients. The low-pass active filter inverts the summed input signals.

The low-pass active filter output is applied to the meter driver circuitry of IC804A. If the filter output is negative, current will flow from the output of IC804A into the meter. If the filter output is positive, current will flow into the output of IC804A and therefore out of the meter. This action will cause current flow through the meter and therefore a meter deflection.

R822, the Glideslope DC Balance control, sets the DC level on Pin 3 of IC804A, therefore adjusting the relative positive and negative levels necessary to cause meter deflection.

I. *Glideslope Lamp Circuitry (THETA/400 Only)*—The OFF lamp is preferentially biased on by means of the application of +5 VDC to Pin 2 of IC802A which causes its output to draw current through Q804 and Q805 thereby turning-on Q805 and its associated lamp.

When an adequate glideslope signal is obtained by the glideslope threshold detection circuit a positive control voltage is applied to Pin 3 of IC802A. This positive control voltage causes current to flow through Q803 thereby illuminating the ON lamp.

J. *Regulated Power Supply*—All circuitry within the THETA/300 and THETA/400 converter-indicators are operated from the internal regulated power supply consisting of Q101, IC211B, IC207A, and associated circuitry. CR102 determines the reference voltage of IC211B. The output level of the regulator, 10.00VDC, is set by R106, which determines the other input of the differential amplifier, IC211B. The differential amplifier applies regulating current to Q101. R102 is used to supply a portion of the load current, allowing Q101 to operate well within its dissipation characteristics.

IC207A functions as a shunt regulator to provide the +5 VDC output. The output level of this regulator is set by R108 and R109.

CR109, although not a direct part of the regulated supply, limits the maximum input to the supply to about 20 volts. This protects the supply from over-voltage spikes on the input line.

4-3. TEST EQUIPMENT REQUIRED

a. Genave ALPHA/600 Nav/Com Transceiver

b. Genave Glideslope Receiver (THETA/400 Alignment Only)

c. Nav/Com Generator or Simulator
Tel-Instruments T-12A with T-12-1A Head or ARC H-14 or Equivalent

d. Glideslope Generator or Simulator
Tel-Instrument T-12A with T-12-2A Head or Equivalent (For G/S alignment)

e. Power Supply 14.00 VDC @ 3 amps, filtered

f. VOM

4-4. ALIGNMENT PROCEDURES

General

1. Connect an accurate VOM or VTVM to the output of the regulated 10.0 VDC power supply.
2. Adjust R107, 10.0 VDC ADJUST, for an out-output of 10.0 VDC.

A. *Omni Alignment*

1. Connect the converter-indicator to the Alignment and Test Setup shown in figure 4-4-2.

2. Connect an ohmmeter between TP-1 and TP-2 (270° and wiper terminals of OBS pot). See figure 4-4-4.

3. Set the ohmmeter to Rx1 and adjust the OBS knob to produce a minimum resistance reading. The resistance will be less than 10 ohms. The minimum should occur within ½ degree of the 270° mark 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 270° with a minimum resistance reading on the ohmmeter. Tighten the set screw. Disconnect the ohmmeter.

4. Set the Omni/Localizer simulator to a convenient Omni frequency. Adjust the RF output to 1000 microvolts. Set the course selector for Omni modulation at 90°. Adjust modulation of the carrier to the proper level.

5. Turn-on the Nav/Com receiver. Tune the radio to the frequency selected in step 4. Set the OBS dial to 90°.

6. Adjust Omni/Loc Simulator to remove Omni modulation from the carrier. Adjust DC Balance Pot (R256) for a centered needle indication on the meter.

7. Adjust Omni/Loc Simulator to 500 microvolts of output and 60% modulation.

8. Delete the 30 Hz modulation and adjust the FM Balance Pot (R227) for a centered needle.

9. Reapply the 30 Hz modulation and delete the 9960 Hz modulation. Adjust the AM Balance control (R242) for a centered needle. (It may be necessary to increase Omni/Loc Simulator output level to 2000 microvolts to obtain a steady needle indication.)

10. Reapply the 9960 Hz and 30 Hz modulation and adjust the Phase Correct Pot (R208) to center the indicator needle.

11. With 90° still set on the OBS dial, adjust the Omni/Loc Simulator to produce 270° modulation. Adjust the Phase Correct Pot. (R208) for one-half the indicated error.

12. Adjust the OBS dial to read 270° and adjust the Phase Correct Pot. (R208) to reduce the indicated error by one-half.

13. Set OBS dial and Omni/Loc Simulator to 0° and adjust the Phase Shift Pot. (R212) for a centered needle indication.

14. Set the Omni/Loc Simulator to 180° modulation and adjust the Phase Shift Pot. (R212) to reduce the indicated error by one-half.

15. Set OBS dial to 180° and adjust the Phase Shift Pot. (R212) for one-half the indicated error if any.

16. Check each 45° point and adjust the Phase Shift or Phase Correct Pots as necessary to obtain optimum accuracy.

17. Set Omni/Loc Simulator to any heading and OBS dial to 0°. Depress OBS TEST knob and adjust the Test Adjust Pot. (R231) for a centered needle.

B. *Localizer Alignment*

1. Adjust Omni/Loc Simulator to produce localizer modulation on an appropriate localizer frequency. Set Omni/Loc Simulator to 0 db modulation at 500 microvolts. Adjust Nav receiver to same localizer channel as Simulator.

2. Adjust Localizer Balance Pot. (R267) for a centered Needle indication.

3. Set Localizer Simulator to +4 db and adjust the Localizer Sensitivity Pot. (R204) to produce a 3-dot deflection of the indicator needle.

4. Recheck centering at 0 db modulation.

5. Verify 3-dot deflections at both +4 db and − 4 db modulation levels.

C. *Glideslope Alignment* (THETA/400 Only)

1. Connect glideslope receiver to Glideslope Simulator.

2. Adjust Glideslope simulator to produce an unmodulated 1,000 microvolt signal on an appropriate glideslope frequency.

3. Set Nav receiver to the appropriate paired localizer frequency (This action selects the proper glideslope receiver frequency.).

4. Adjust the Glideslope DC Balance Pot. (R822) to center the glideslope needle.

5. Adjust the Glideslope Simulator to apply 0 db glideslope modulation to the 1,000 microvolt signal and adjust the Glideslope Centering Pot. (R832) to center the glideslope needle.

6. Set the Glideslope Simulator modulation to -2 db and adjust the Glideslope Gain Pot. (R800) to produce a 2-dot deflection of the indicator needle.

7. Recheck the glideslope centering at 0 db modulation.

8. Verify 2-dot deflections at both +2 db and −2 db modulation levels.

SPECIALIZED PROCEDURES

A. *Indicator Lamp Replacement*—The "To-Off-From" lamps, the G/S "Off-On" lamps (THETA/400 only), and the meter backlights are designed for field replacement. To perform a field replacement proceed as follows:

1. Remove top and bottom converter-indicator panels.
2. Remove setscrews from OBS-TEST knob and remove OBS-TEST knob from OBS drive shaft.
3. Remove the four (4) meter assembly retaining screws in the side panels and remove the meter head assembly. The OBS shaft will become detached from the unit. Be careful not to lose any of the OBS shaft spacers or bearings.
4. To replace the defective lamp it is only necessary to unsolder the defective lamp's leads from the meter terminal board, remove the old lamp from its holder, press a new lamp into the holder, and resolder the new lamp leads to the appropriate points on the meter terminal board (See Figure 4-4-7).
5. To reassemble, reverse steps 1, 2, and 3 above.

B. *Meter Assembly Removal*—The meters within the meter assembly are not recommended for field repair and replacement is the suggested repair method. To remove the meter assembly so that it may be returned to the factory proceed as follows:

1. Remove top and bottom converter-indicator panels.
2. Remove setscrews from OBS/TEST knob and remove OBS/TEST knob from OBS shaft.
3. Remove the four (4) meter assembly retaining screws in the side panels and remove the meter head assembly. The OBS shaft will become detached from the unit. Be careful not to lose any of the OBS shaft spacers or bearings.
4. Unsolder the leads from the meter terminal board.
5. Press the front OBS shaft bearing out of the converter-indicator front panel.

   CAUTION: Breaking the seal between the meter housing and the dial lense may allow dust particles to enter the meter cavity and promote future meter failure.

6. To install a new meter head assembly reverse the above steps. When reassembling be sure that the insulating washer is reinstalled between the OBS drum and meter head assembly and that no slack exists in the meter head assembly leads between the back of the meter head assembly and the OBS drum.

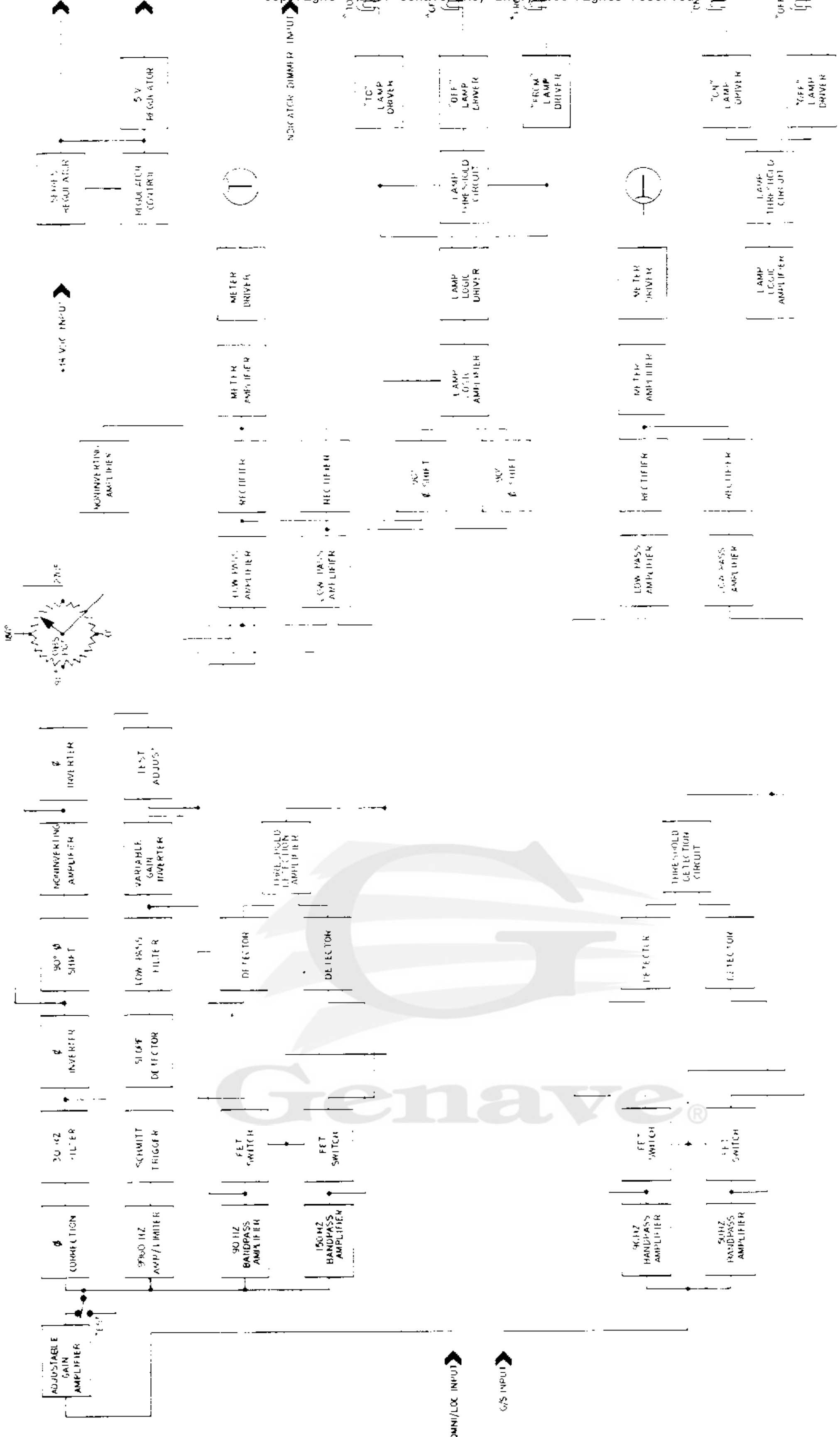

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Figure 4-4-1
THETA/300—400 BLOCK DIAGRAM

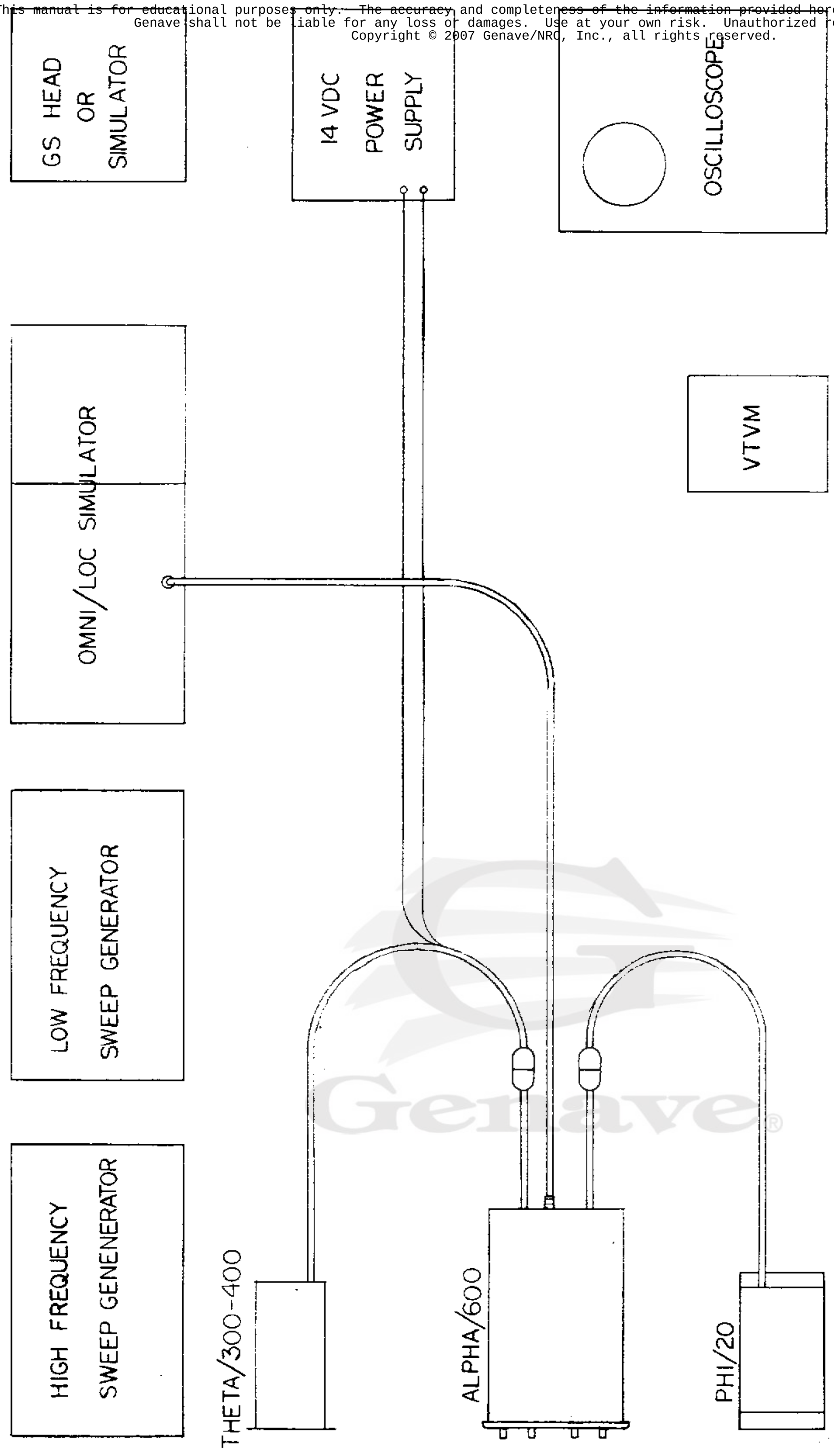

Figure 4-4-2
ALIGNMENT AND TEST SETUP

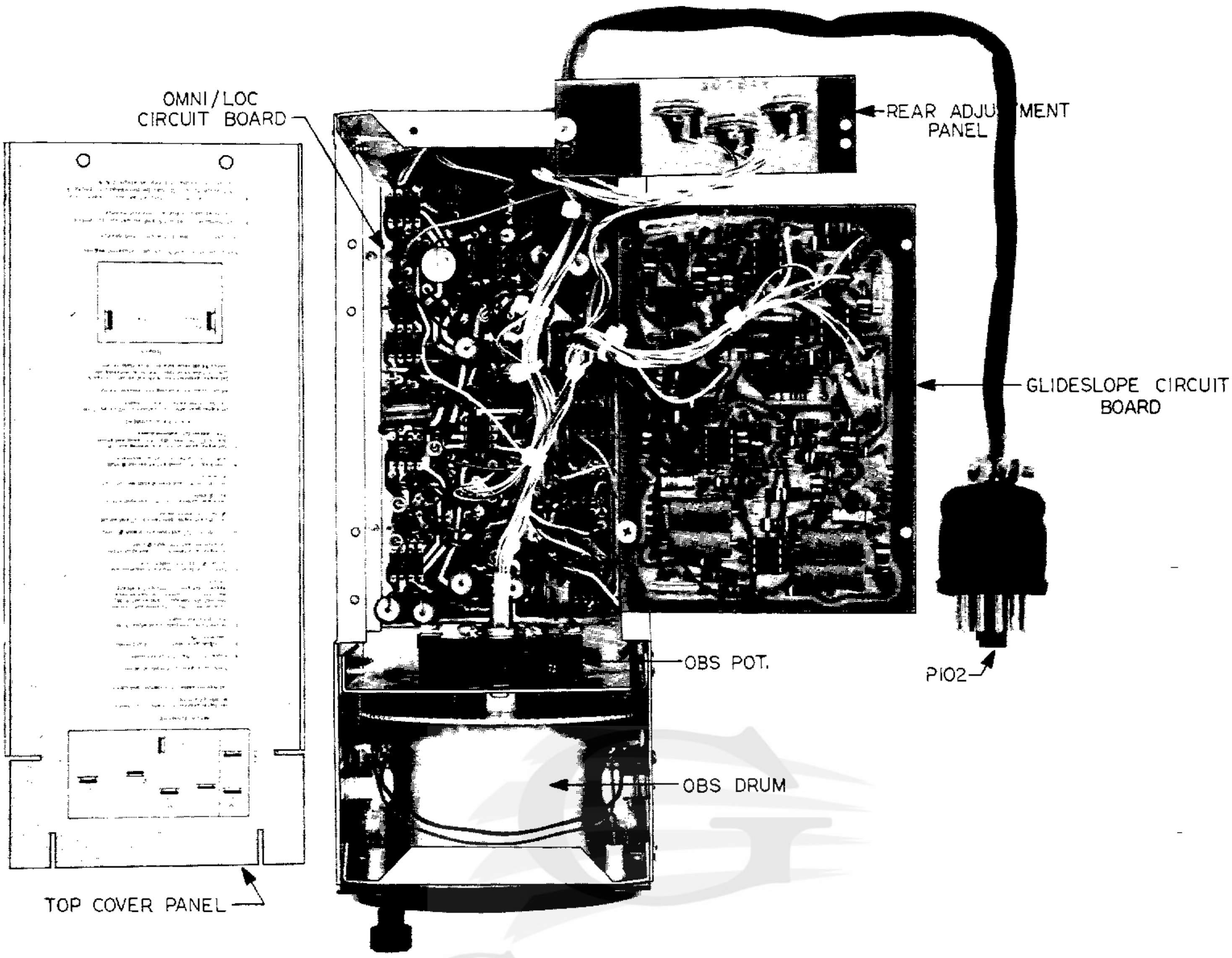

Figure 4-4-3
TOP VIEW

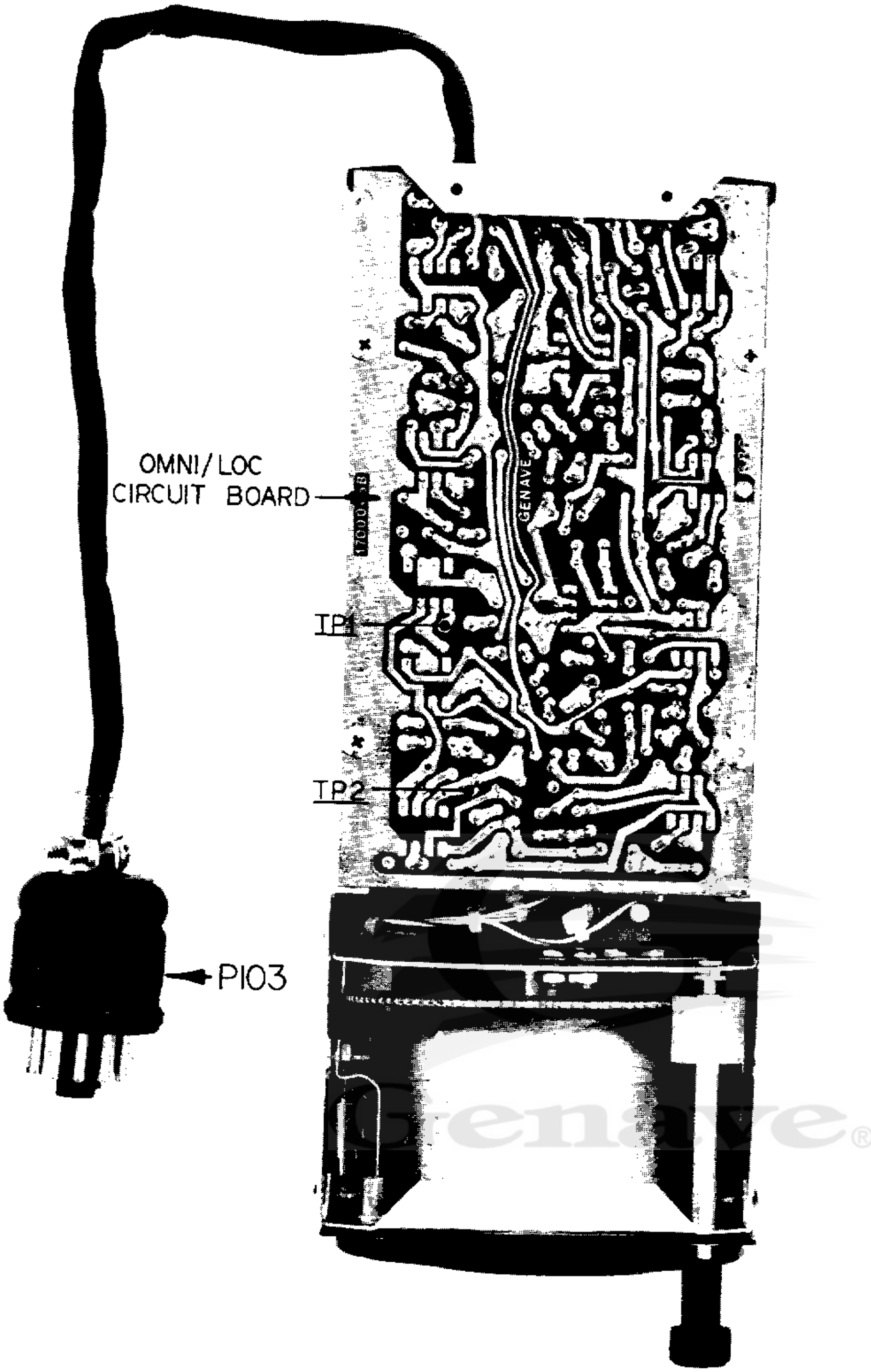

Figure 4-4-4
BOTTOM VIEW

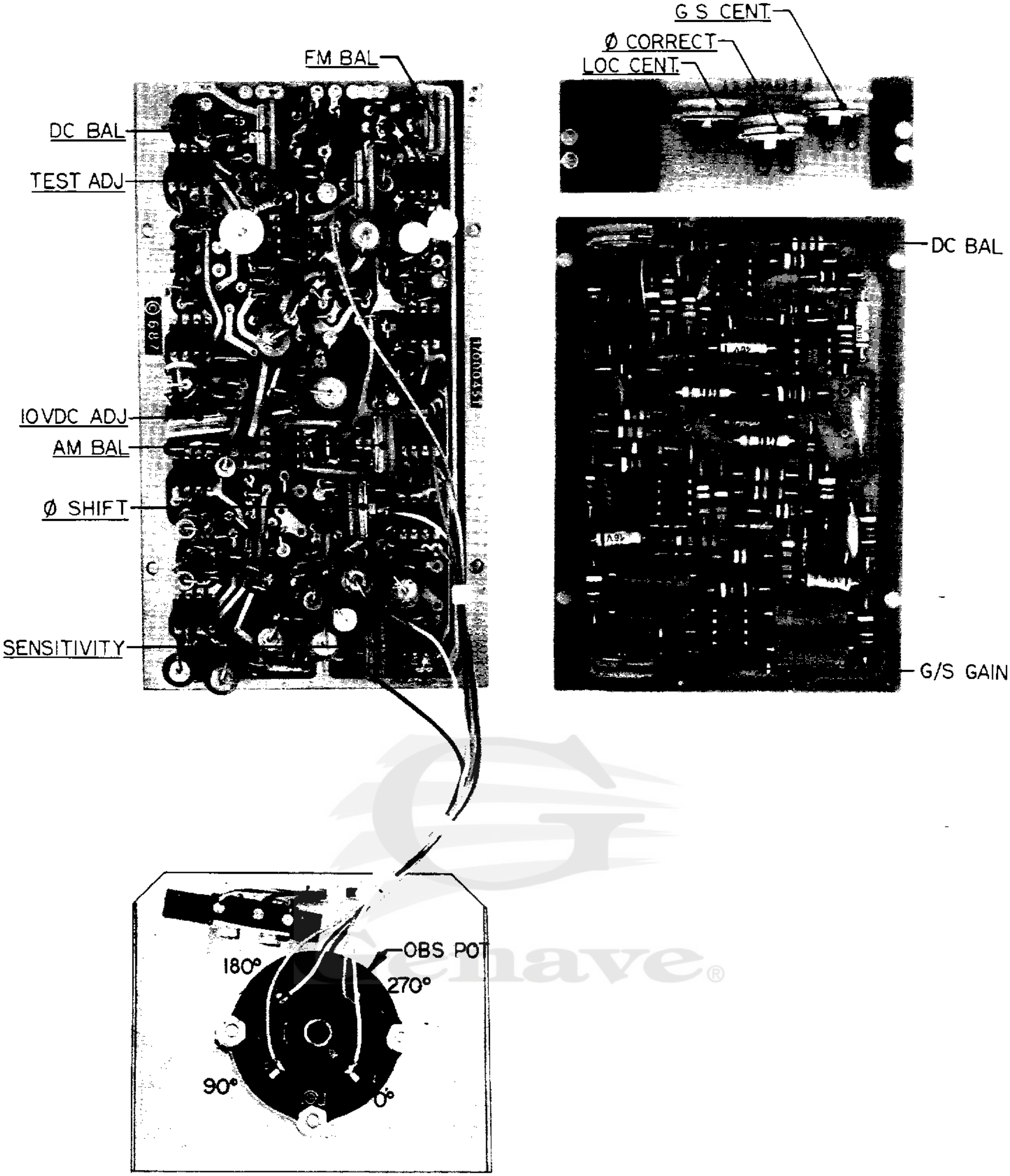

Figure 4-4-5
ALIGNMENT ADJUSTMENTS

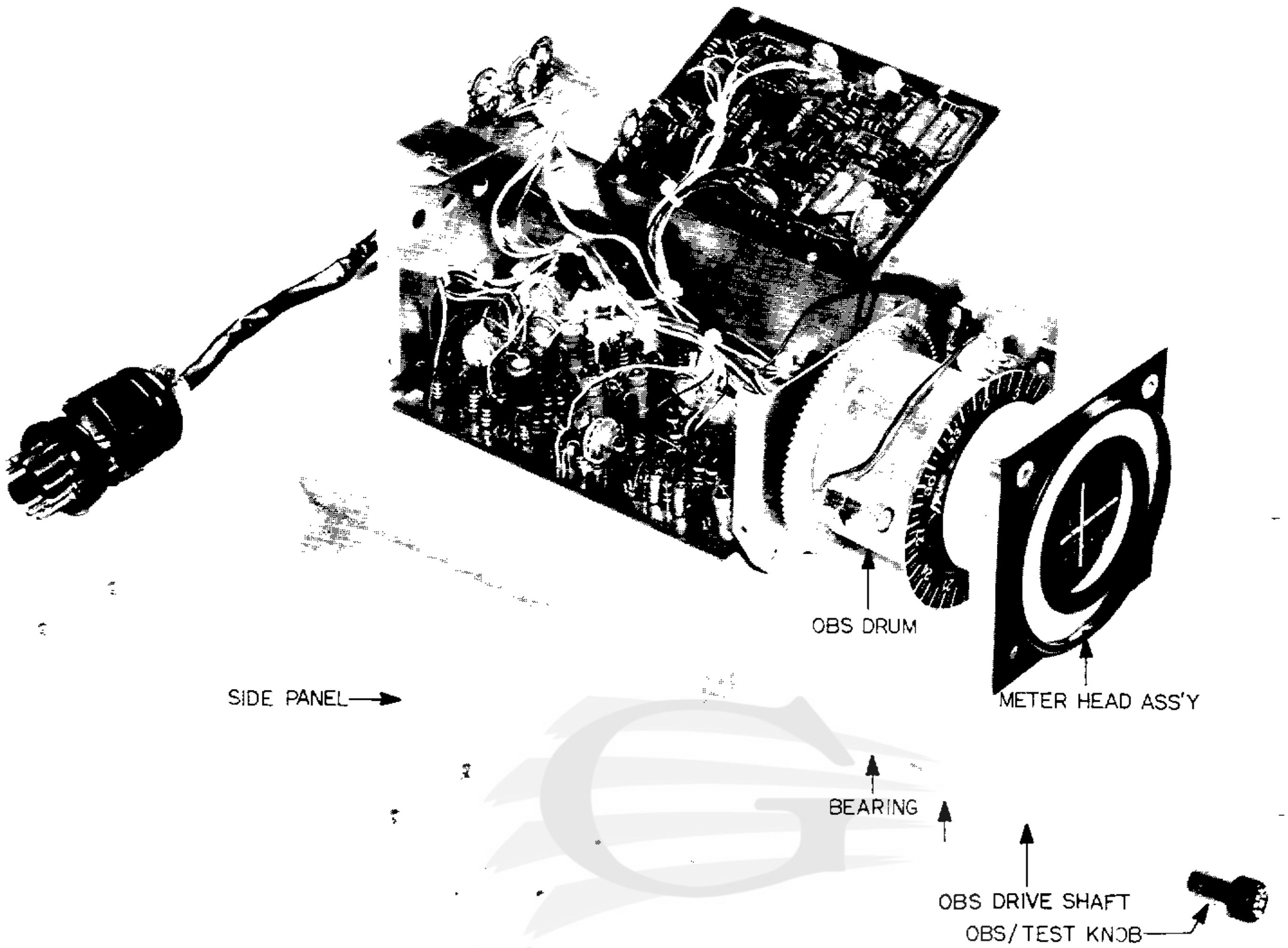

Figure 4-4-6
EXPANDED VIEW

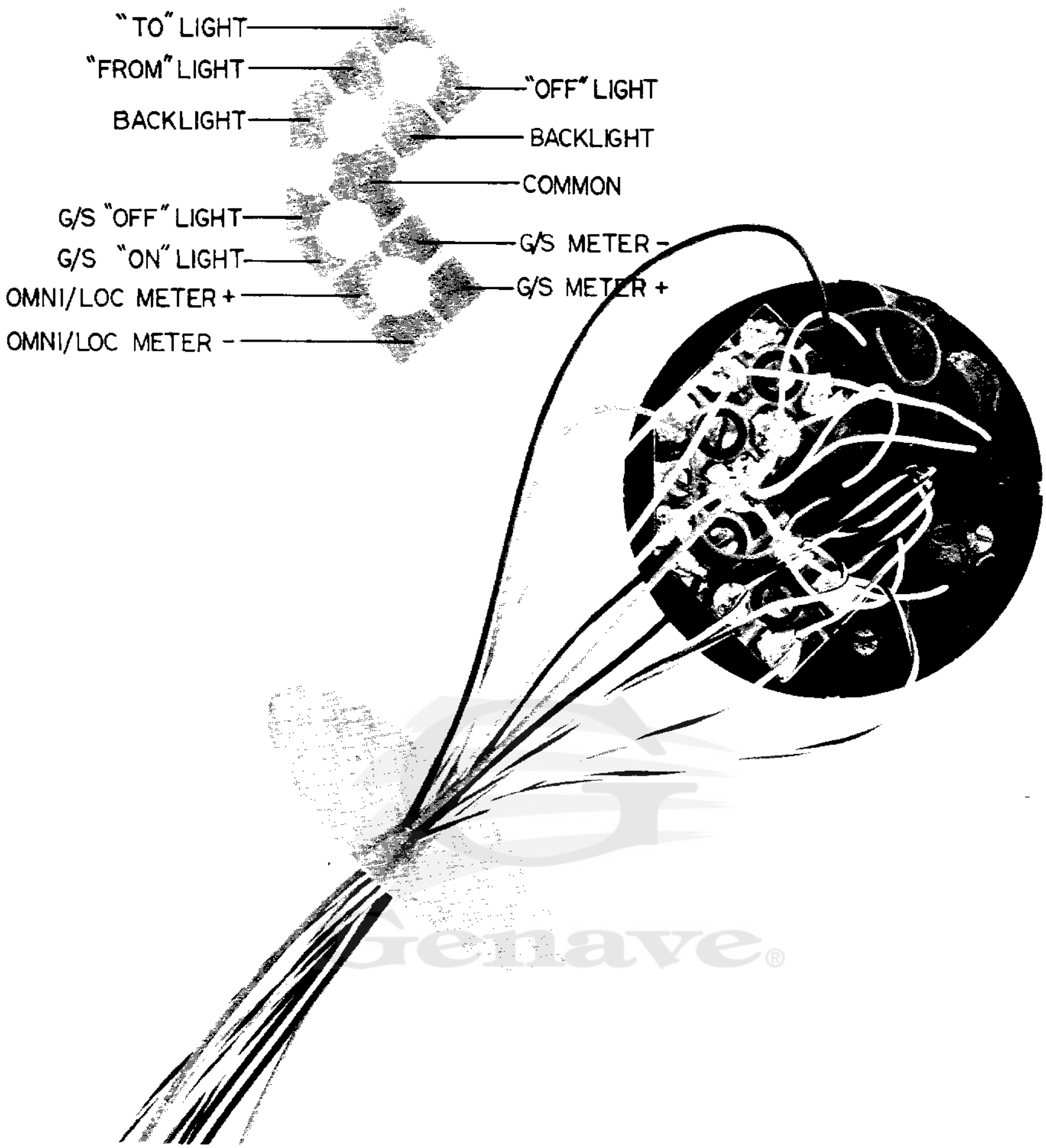

Figure 4-4-7
METER ASSEMBLY WIRING

4-5. TROUBLESHOOTING INFORMATION

A. 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 solid-state 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 unit are the DC Voltage Measurements given in figure 4-5-1; the Omni Waveforms given in figures 4-5-2 through 4-5-13; the Localizer Waveforms given in figures 4-5-14 through 4-5-18; the Glideslope Waveforms given in figures 4-5-19 through 4-5-23; the Schematic Diagrams of figures 4-5-24 and 4-5-25; the Omni/Loc Board Parts/Track Map, figure 4-5-26; and the Glideslope Board Parts/Track Map, figure 4-5-27.

B. Table of Figures

1. DC Voltage Measurements
   - 4-5-1 DC Voltage Measurements

2. Waveform Photos
   - 4-5-2 through 4-5-13 Omni Waveforms
   - 4-5-14 through 4-5-18 Localizer Waveforms
   - 4-5-19 through 4-5-23 Glideslope Waveforms

3. Schematic Diagrams
   - 4-5-24 THETA/300-400 Omni/Loc Board Schematic
   - 4-5-25 THETA/400 Glideslope Board Schematic

4. Parts/Track Maps
   - 4-5-26 THETA/300-400 Omni/Loc Board Parts/Track Map
   - 4-5-27 THETA/400 Glideslope Board Parts/Track Map

Figure 4-5-1
DC VOLTAGE MEASUREMENTS

All voltages shown in this table must be measured with a VTVM. The input voltage to the converter-indicator should be set at 13.75 VDC and the 10.00 VDC supply should be set to 10.00 VDC. A variation of ±20% of the measured voltages from those listed may be considered normal. All measurements were taken with a 500 microvolt signal on appropriate frequency with Omni "TO" modulation except as noted.

Ref. No.	Pin. No. 1	2	3	4	5	6	7	8	Notes
IC201	5.0	5.0	5.0	0	5.0	5.0	5.0	10.0	
IC202	5.0	5.0	5.0	0	5.0	5.0	5.0	10.0	
IC203	5.0	5.0	5.0	0	5.0	5.0	5.0	10.0	
IC204	5.0	5.0	5.0	0	5.0	5.0	5.0	10.0	
IC205	5.0	5.0	5.0	0	5.0	5.0	5.0	10.0	
IC206	5.0	5.0	5.0	0	5.0	5.0	5.0	10.0	Localizer Centering Modulation
IC207	5.0	5.0	5.0	0	5.0	5.0	0.5	10.0	
	5.0	5.0	5.0	0	5.0	4.5	9.0	10.0	Localizer Centering Modulation
IC208	5.0	5.0	5.0	0	5.0	5.0	5.0	10.0	
IC209	5.0	5.0	5.0	0	5.0	5.0	5.0	10.0	
IC210	11.0	5.0	6.2	0	5.0	6.2	0.2	12.5	
	0.2	5.0	5.0	0	5.0	5.0	11.0	12.5	Omni "From" Modulation
	0.2	5.0	3.8	0	5.0	3.8	0.2	12.5	Omni Modulation Deleted
IC211	0.2	10.6	5.0	0	4.3	4.3	11.7	12.5	
	11.0	0	5.0	0	4.3	4.3	11.7	12.5	Omni "From" Modulation
	0.2	10.6	5.0	0	4.3	4.3	11.7	12.5	Omni Modulation Deleted
IC801	5.0	5.0	5.0	0	5.0	4.5	9.0	10.0	Glideslope Centering Modulation

Ref. No.	E	B	C	Notes
Q203	6.8	4.7	10.0	
	5.0	5.0	10.0	Omni Modulation Deleted
	4.2	4.8	10.0	Omni "From" Modulation
Q204	5.5	4.8	0	
	5.0	5.0	0	Omni Modulation Deleted
	3.5	4.8	0	Omni "From" Modulation
Q205	0	0.8	0	
	0	0	8.7	Omni Modulation Deleted
	0	0	8.7	Omni "From" Modulation
Q206	0	0	8.7	
	0	0.8	0	Omni Modulation Deleted
	0	0	8.7	Omni "From" Modulation
Q207	0	0	8.7	
	0	0	8.7	Omni Modulation Deleted
	0	0.8	0	Omni "From" Modulation
Q101	12.5	11.7	10.0	
Q803	0	0	8.8	
	0	0.8	0	Glideslope Centering Modulation
Q804	1.2	0.5	0.8	
	8.8	8.5	0	Glideslope Centering Modulation
Q805	0	0.8	0	
	0	0	12.5	Glideslope Centering Modulation

WAVEFORM INFORMATION

Omni Waveforms

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° (except for figure 4-5-7)
Horizontal Sweep: 30 Hz reference modulation from Omni generator.

Localizer Waveforms

The Localizer waveform photographs were taken under the following conditions:
Frequency: Any Localizer channel
RF Input: 500 Microvolts
Modulation: Standard Localizer centering signal, except as noted.

Glideslope Waveforms

The glideslope waveform photographs were taken under the following conditions:
Frequency: Any Glideslope channel
RF Input: 500 microvolts
Modulation: Standard Localizer centering signal, except as noted.

Figure 4-5-2
OMNI INPUT, IC201A Pin 1

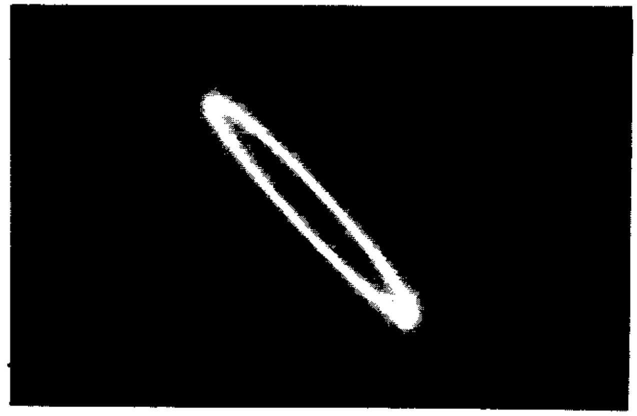

Figure 4-5-3
LOW PASS ACTIVE FILTER OUTPUT, IC201B Pin 7

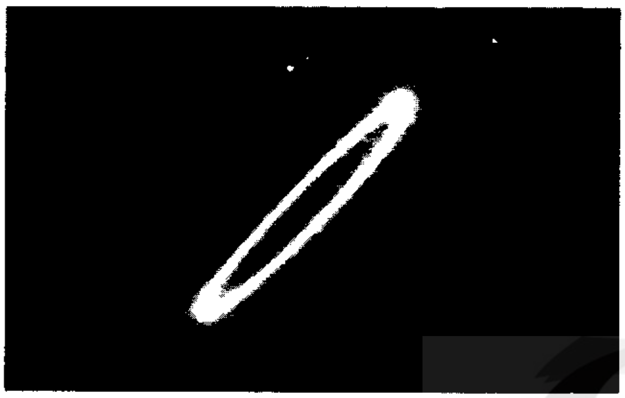

Figure 4-5-4
1st UNITY GAIN PHASE INVERTER OUTPUT, IC202A Pin 1

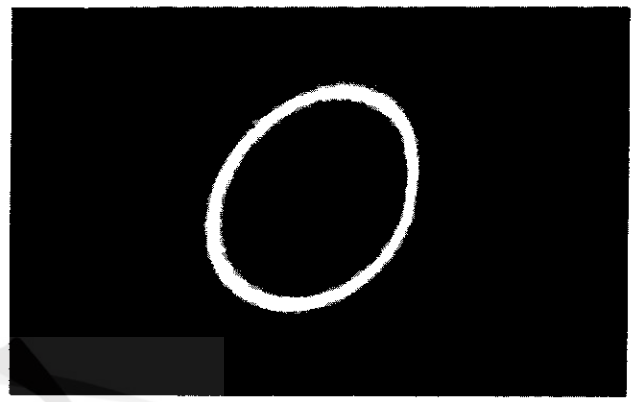

Figure 4-5-5
UNITY GAIN AMPLIFIER OUTPUT IC202B Pin 7

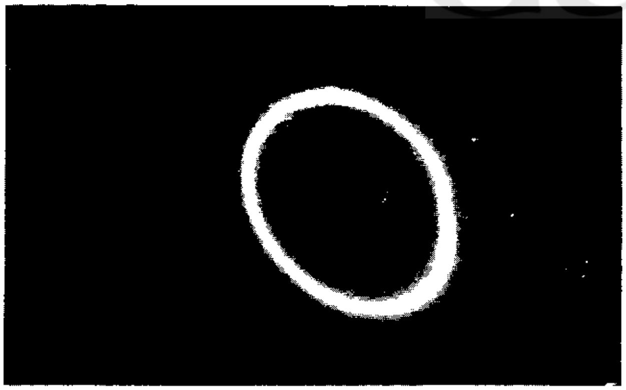

Figure 4-5-6
2nd UNITY GAIN PHASE INVERTER OUTPUT, IC203A Pin 1

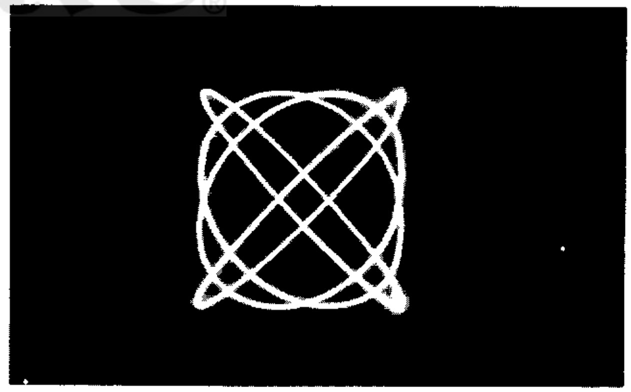

Figure 4-5-7
OBS OUTPUT AT 0°, 90°, 180°, AND 270°; IC203B Pin 7

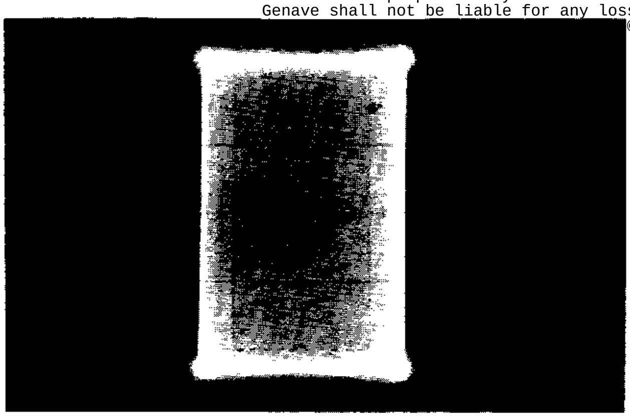

Figure 4-5-8
9960 Hz AMP/LIMITER OUTPUT
IC204A Pin 1

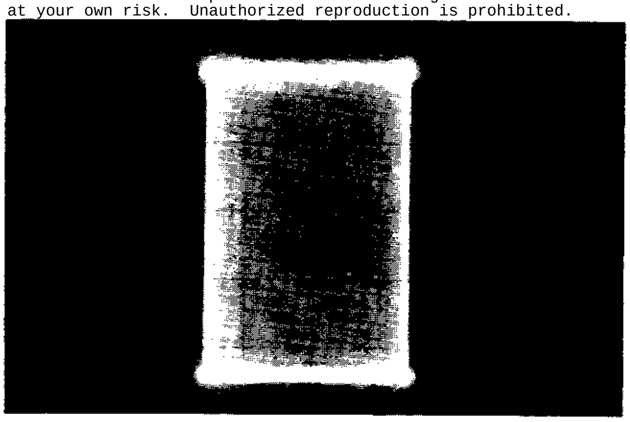

Figure 4-5-9
SCHMITT TRIGGER OUTPUT
IC204B Pin 7

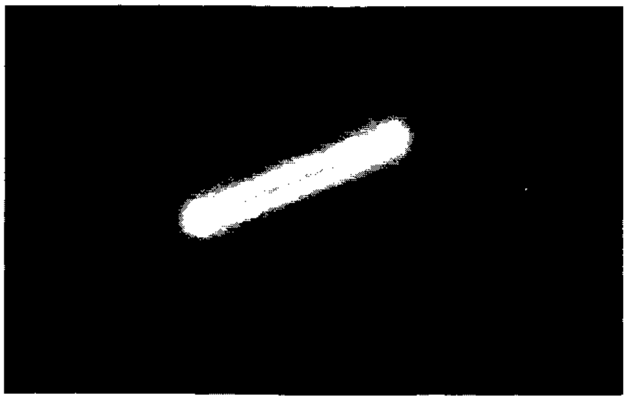

Figure 4-5-10
30 Hz ACTIVE BANDPASS FILTER
OUTPUT, IC205A Pin 1

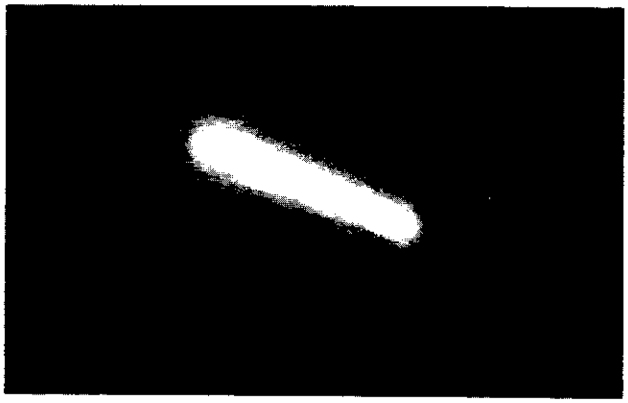

Figure 4-5-11
VARIABLE GAIN INVERTING AMP
OUTPUT, IC205B Pin 7

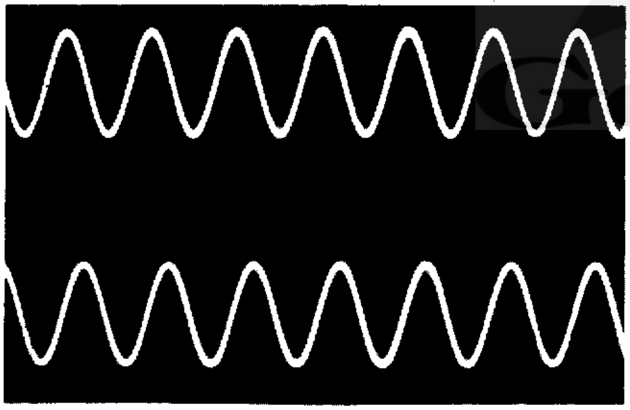

Figure 4-5-12
LOW-PASS AMPLIFIER OUTPUTS
BALANCED, IC208 Pins 1 & 7

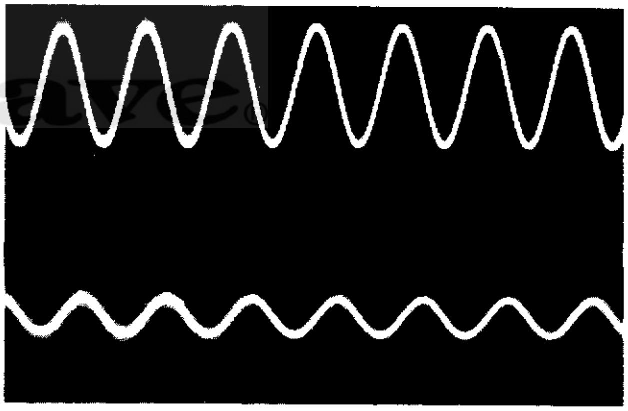

Figure 4-5-13
LOW-PASS AMPLIFIER OUTPUTS
UNBALANCED 1C208 PINS 1 & 7

LOCALIZER WAVEFORMS

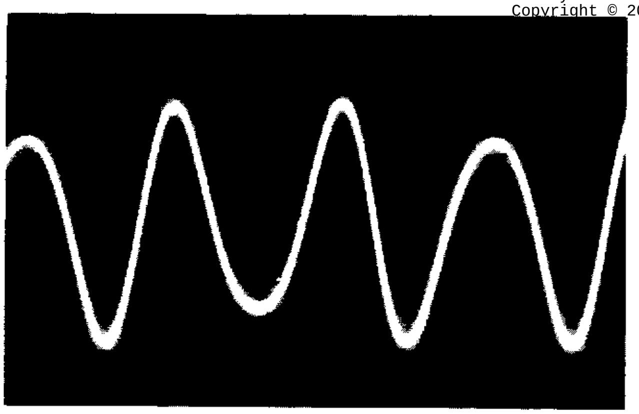

Figure 4-5-14
90Hz BANDPASS AMPLIFIER OUTPUT, IC206A Pin 1

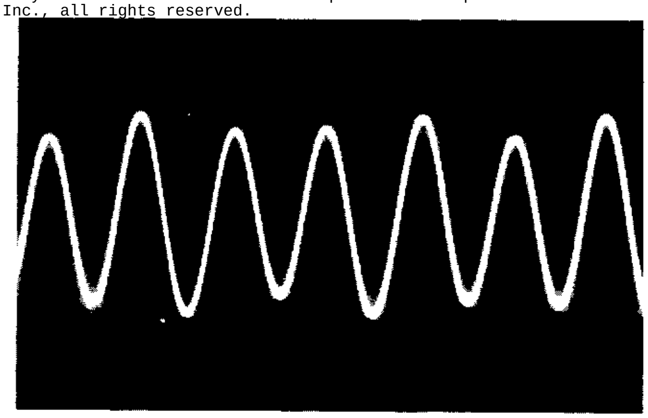

Figure 4-5-15
150 Hz BANDPASS AMPLIFIER OUTPUT, IC206B Pin 7

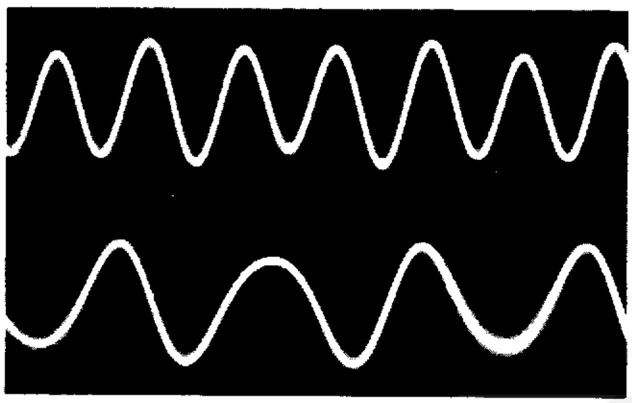

Figure 4-5-16
LOW-PASS AMPLIFIER OUTPUTS BALANCED, IC208 Pins 1 & 7

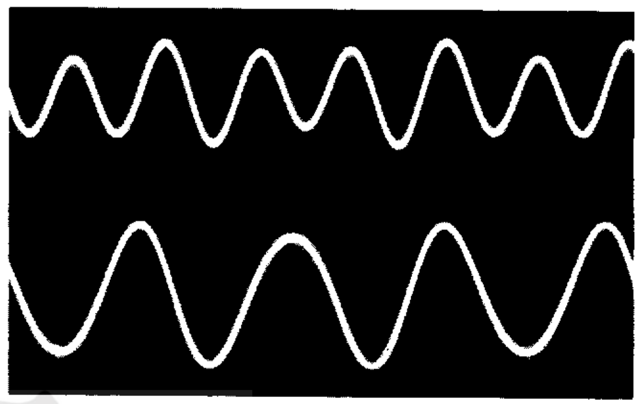

Figure 4-5-17
LOW-PASS AMPLIFIER OUTPUTS UNBALANCED −4 db, IC208 Pins 1 & 7

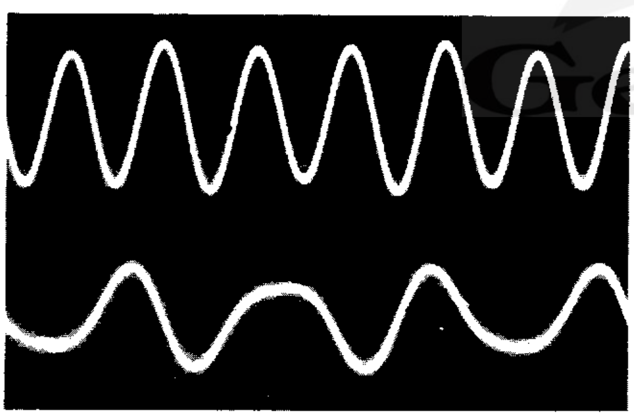

Figure 4-5-18
LOW-PASS AMPLIFIER OUTPUTS UNBALANCED +4 db, IC208 Pins 1 & 7

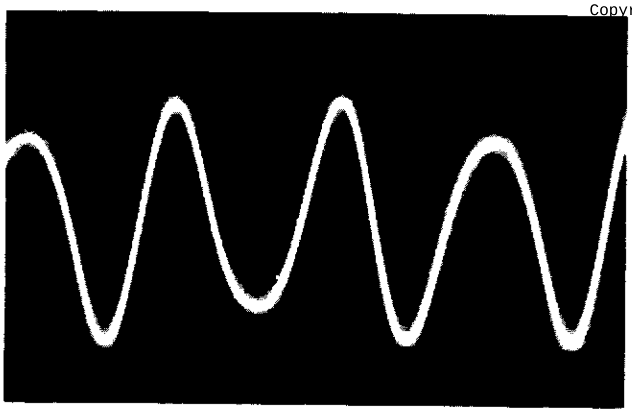

Figure 4-5-19
90 Hz BAND-PASS AMPLIFIER OUTPUT, IC801A Pin 1

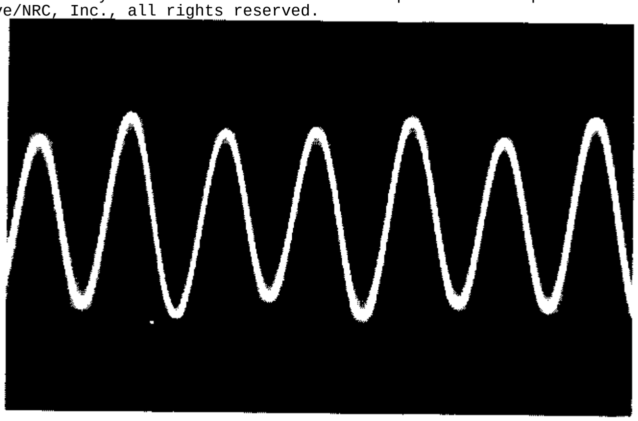

Figure 4-5-20
150 Hz BAND-PASS AMPLIFIER OUTPUT, IC801B Pin 7

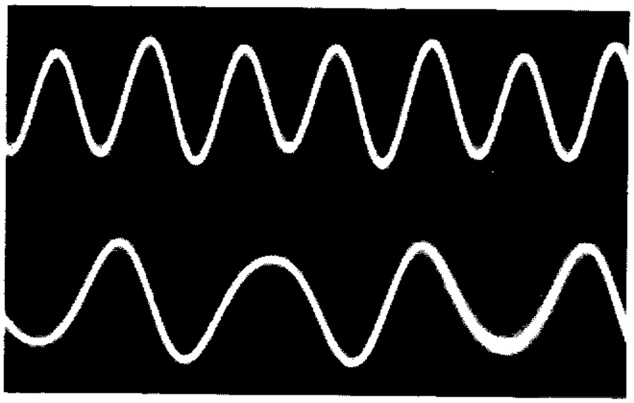

Figure 4-5-21
LOW-PASS AMPLIFIER OUTPUTS BALANCED, IC803 Pins 1 & 7

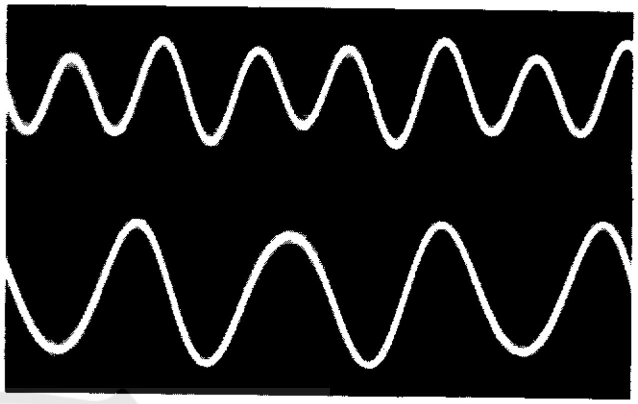

Figure 4-5-22
LOW-PASS AMPLIFIER OUTPUTS UNBALANCED −4 db, IC803 Pins 1 & 7

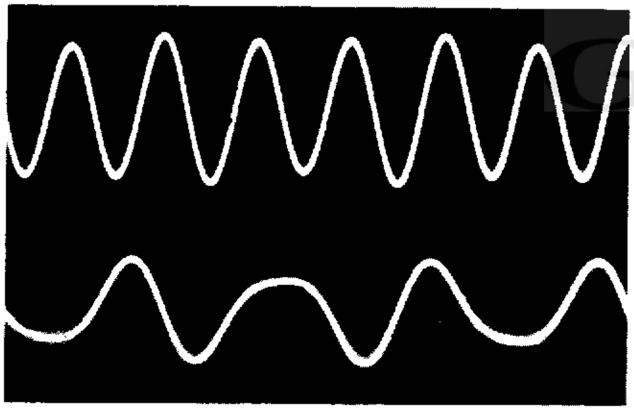

Figure 4-5-23
LOW-PASS AMPLIFIER OUTPUTS UNBALANCED +4 db, IC803 Pins 1 & 7

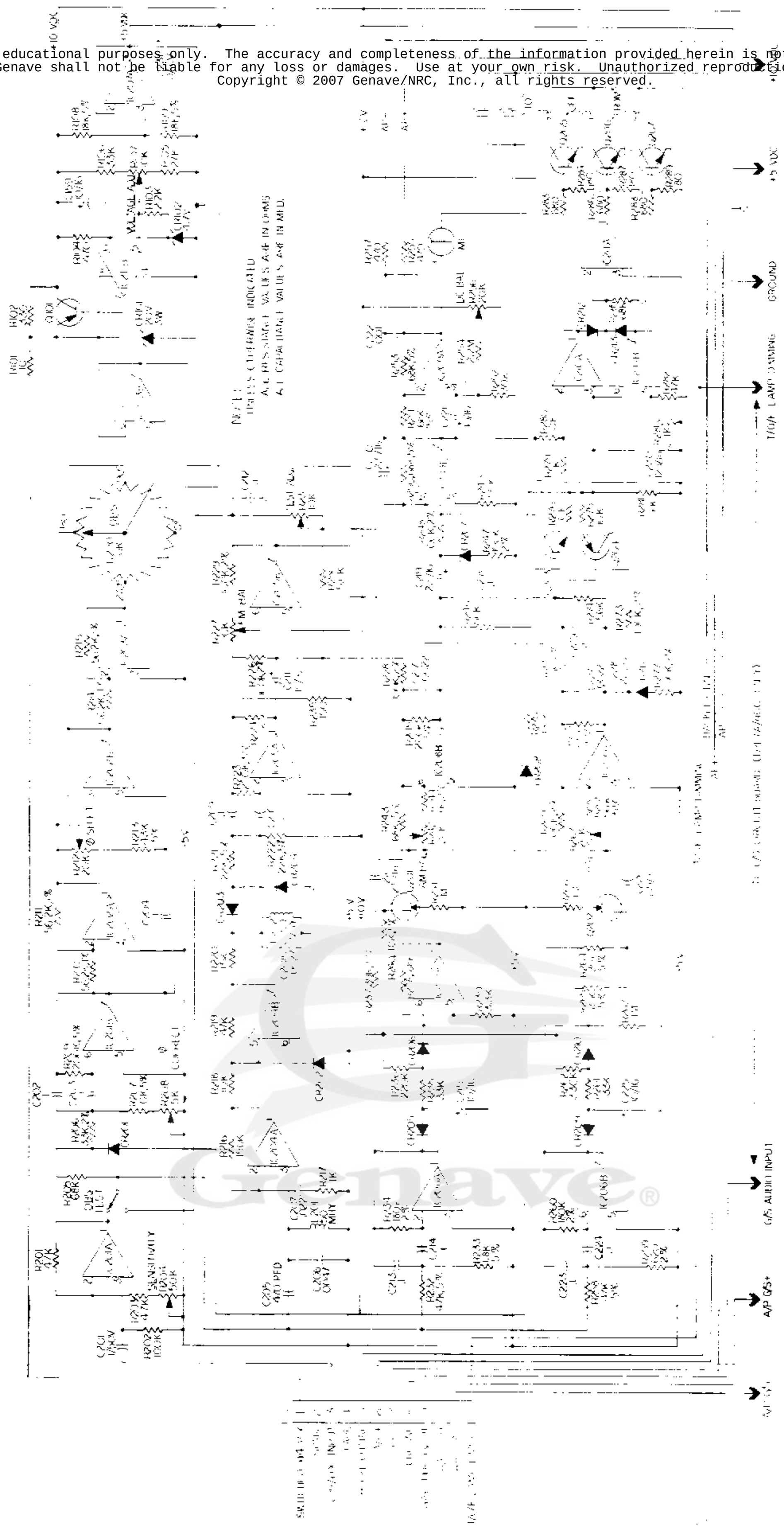

Figure 4-5-24
THETA/300—400 OMNI/LOC BOARD SCHEMATIC

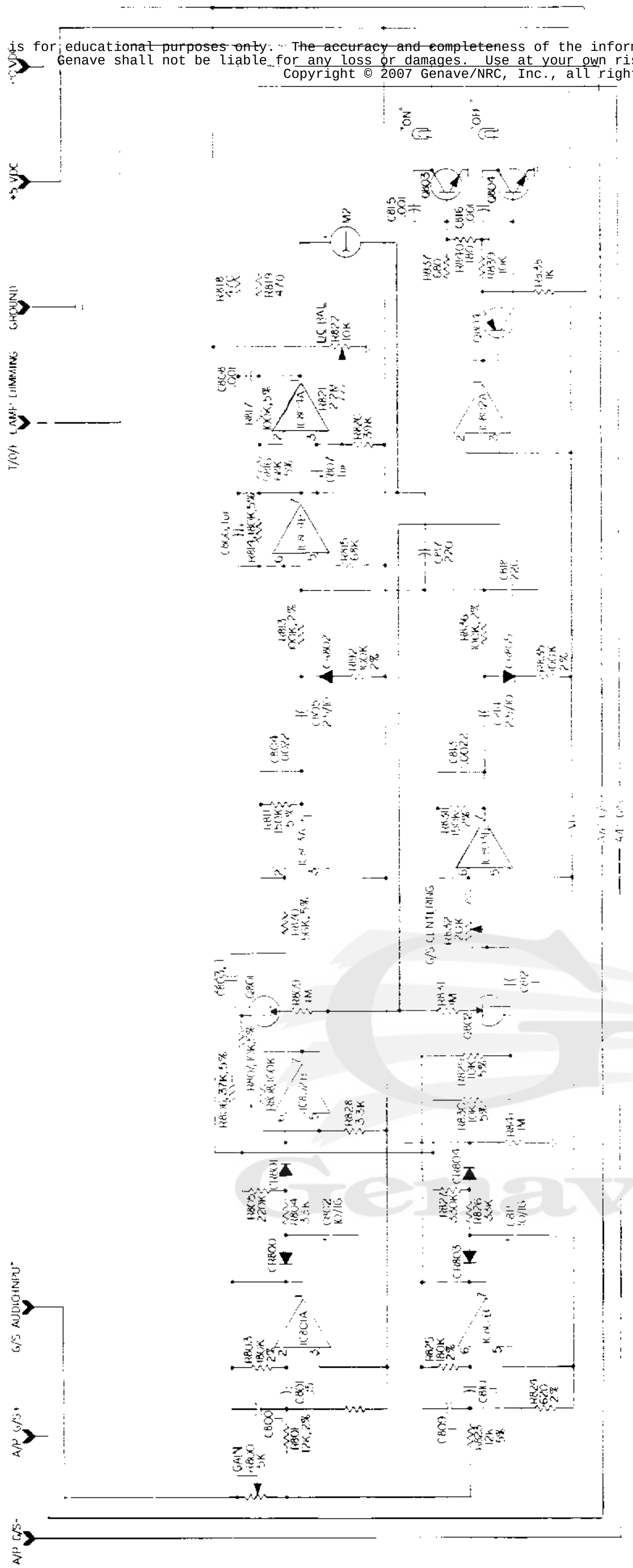

Figure 4-5-25
THETA/400 GLIDESLOPE BOARD SCHEMATIC

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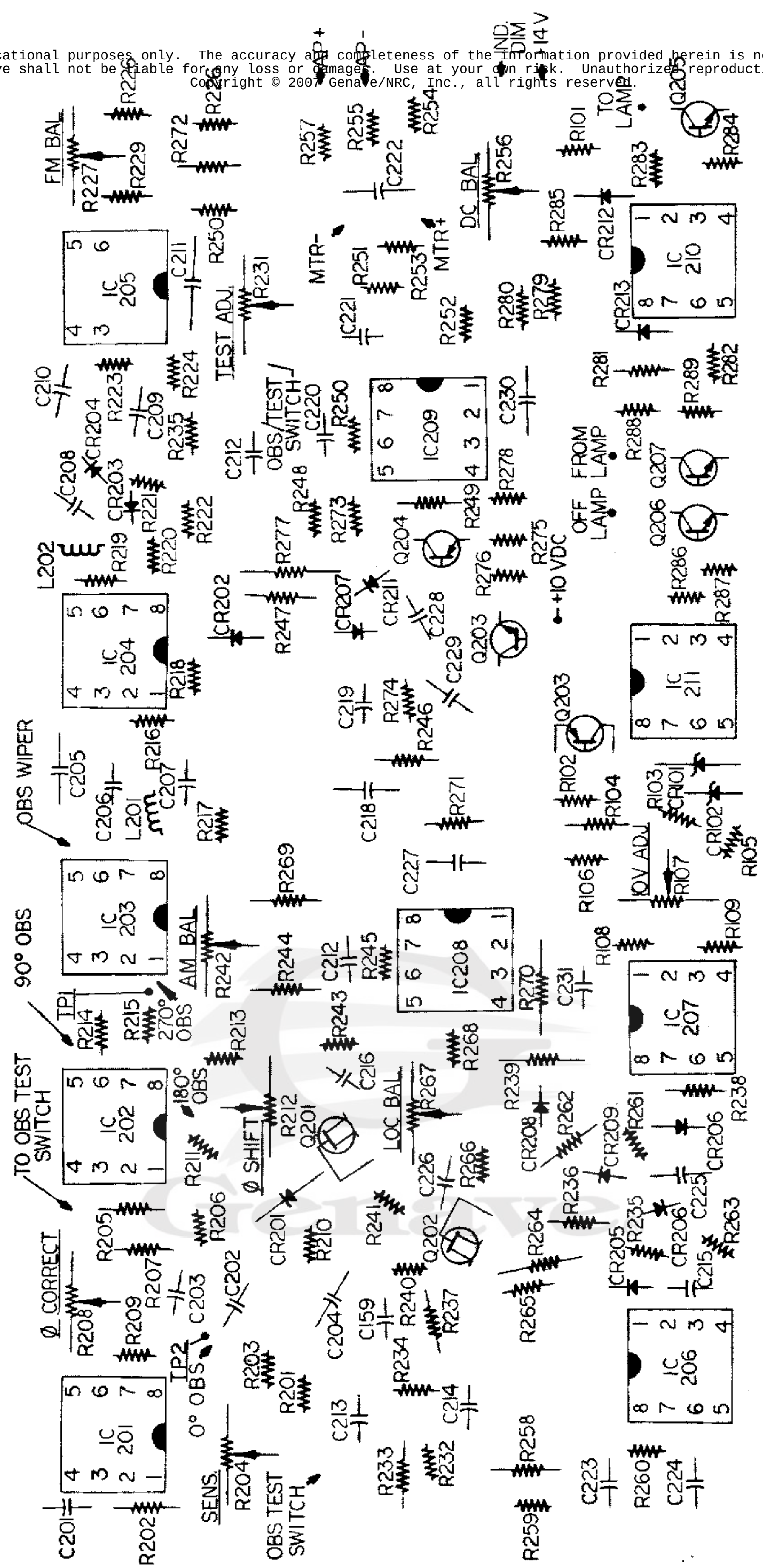

Figure 4-5-26
THETA/300—400 OMNI/LOC BOARD PARTS/TRACK MAP

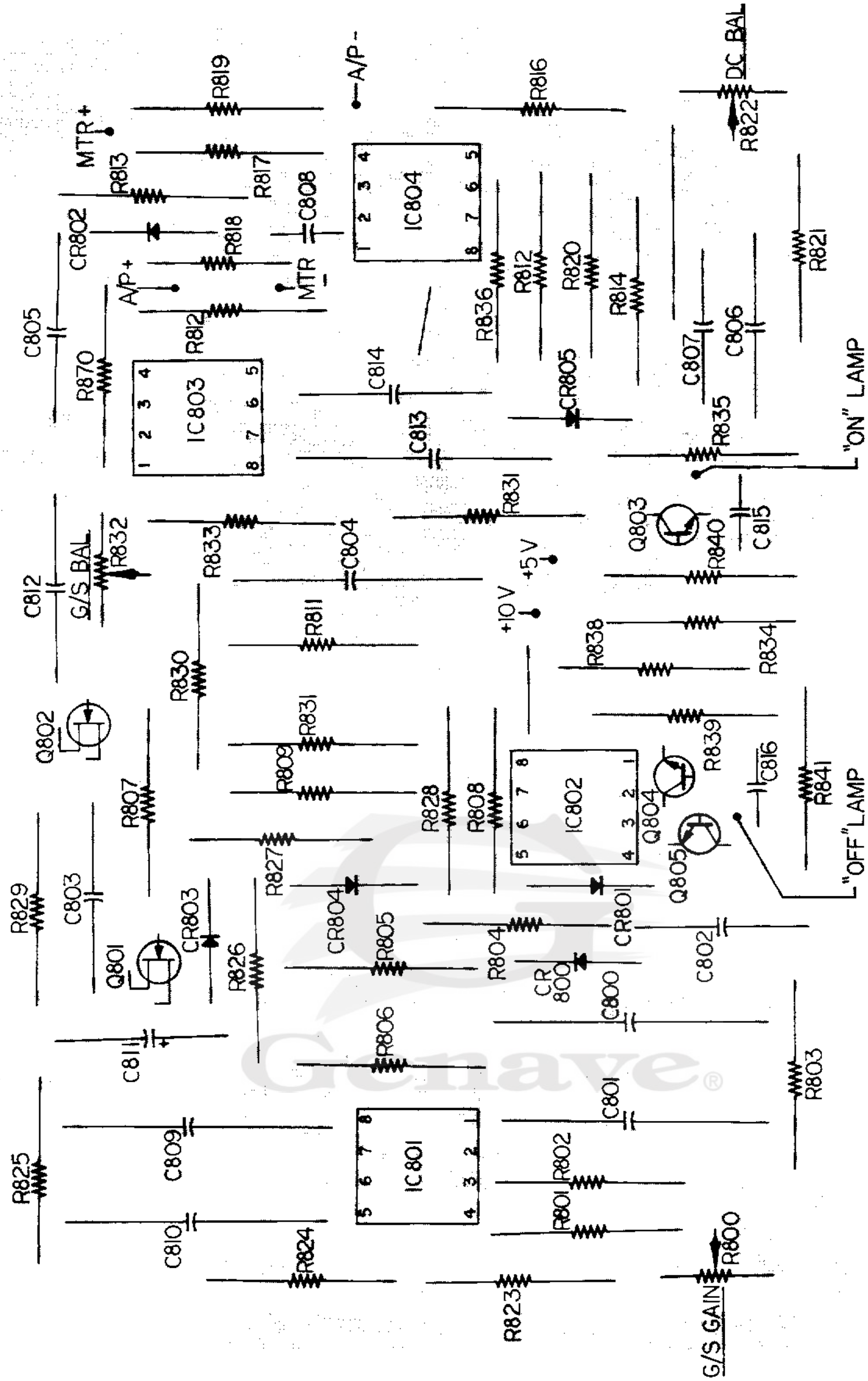

Figure 4-5-27
THETA/400 GLIDESLOPE
BOARD PARTS/TRACK MAP

SECTION V

THETA/300 PARTS LIST

Ref. No.	Genave Part No.	DESCRIPTION
		CAPACITORS
C201	1550002	Tantalum, 1 mfd, ±20%, 35V
C202	1500039	Mylar, 0.1 mfd, ±5%
C203	1500039	Mylar, 0.1 mfd, ±5%
C204	1500060	Metalized Polycarb. .1 mfd, ±5%
C205	1520040	Z5F Disc, 470 pfd, ±10%
C206	1500012	Mylar, .0047 mfd, ±10%
C207	1500024	Mylar, 0.022 mfd, ±10%
C208	1500011	Mylar, .0027 mfd, ±10%
C209	1500039	Mylar, 0.1 mfd, ±5%
C210	1500039	Mylar, 0.1 mfd, ±5%
C211	1540014	Electrolytic, 10 mfd, 16V
C212	1500039	Mylar, 0.1 mfd, ±5%
C213	1500039	Mylar, 0.1 mfd, ±5%
C214	1500039	Mylar, 0.1 mfd, ±5%
C215	1540014	Electrolytic, 10 mfd, 16V
C216	1540005	Electrolytic, 2.5 mfd, 16V
C217	1500008	Mylar, .0022 mfd, ±10%
C218	1500039	Mylar, 0.1 mfd ±5%
C219	1540005	Electrolytic, 2.5 mfd, 16V
C220	1540005	Electrolytic, 2.5 mfd, 16V
C221	1540014	Electrolytic, 10 mfd, 16V
C222	1520048	Z5F Disc, 1000 pfd, ±20%
C223	1500039	Mylar, 0.1 mfd, ±5%
C224	1500039	Mylar, 0.1 mfd, ±5%
C225	1540014	Electrolytic, 10 mfd, 16V
C226	1540005	Electrolytic, 2.5 mfd, 16V
C227	1500008	Mylar, .0022 mfd, ±10%
C228	1540005	Electrolytic, 2.5 mfd, 16V
C229	1500039	Mylar, 0.1 mfd, ±5%
C230	1540024	Electrolytic, 125 mfd, 16V
C231	1540014	Electrolytic, 10 mfd, 16V
C232	1540046	Electrolytic, 47 mfd, 25V
C233		Unassigned
C234		Unassigned
		DIODES
CR101	4810010	Zener, 20V, ±20%, 3W, 1N5357
CR102	4810024	Zener, 4.7V, ±10%, 1W
CR103		Unassigned
CR201	4810017	High Frequency Switching, FD1936
CR202	4810017	High Frequency Switching, FD1936
CR203	4810017	High Frequency Switching, FD1936
CR204	4810017	High Frequency Switching, FD1936
CR205	4810017	High Frequency Switching, FD1936
CR206	4810017	High Frequency Switching, FD1936
CR207	4810017	High Frequency Switching, FD1936
CR208	4810017	High Frequency Switching, FD1936
CR209	4810017	High Frequency Switching, FD1936
CR210	4810017	High Frequency Switching, FD1936
CR211	4810017	High Frequency Switching, FD1936
CR212	4810017	High Frequency Switching, FD1936
CR213	4810017	High Frequency Switching, FD1936
CR214		Unassigned
		LAMPS
DS101	3900004	Backlight, 14V, 80ma, Lunar White
DS102	3900004	Backlight, 14V, 80ma, Lunar White
DS201	3900016	Indicator Lamp, Brown Lead, 14V, 80ma, Clear
DS202	3900017	Indicator Lamp, Red Lead, 14V, 80ma, Clear
DS203	3900018	Indicator Lamp, Green Lead, 14V, 80ma, Clear
DS204	3900024	Backlight, 14V, 80ma, Lunar White
		COILS
L201	1800033	50 mhy, Choke
L202	1800033	50 mhy, Choke
		INTEGRATED CIRCUITS
IC201	3130012	Dual Op-Amp, MC1458P1
IC202	3130012	Dual Op-Amp, MC1458P1
IC203	3130012	Dual Op-Amp, MC1458P1
IC204	3130012	Dual Op-Amp, MC1458P1
IC205	3130012	Dual Op-Amp, MC1458P1
IC206	3130012	Dual Op-Amp, MC1458P1
IC207	3130012	Dual Op-Amp, MC1458P1
IC208	3130012	Dual Op-Amp, MC1458P1
IC209	3130012	Dual Op-Amp, MC1458P1
IC210	3130012	Dual Op-Amp, MC1458P1
IC211	3130012	Dual Op-Amp, MC1458P1
		TRANSISTORS
Q101	4800023	Silicon, PNP, MPS-U52
Q201	4805458	Silicon, N-Channel, J-FET, 2N5458
Q202	4805458	Silicon, N-Channel, J-FET, 2N5458

Ref. No.	Genave Part No.	DESCRIPTION
Q203	4800033	Silicon, NPN, MPS-5172
Q204	4800043	Silicon, PNP, Black, 2N5227
Q205	4800042	Silicon, NPN, 2N5220
Q206	4800042	Silicon, NPN, 2N5220
Q207	4800042	Silicon, NPN, 2N5220
		RESISTORS
R101	4700003	10 ohm, ½W, 10%
R102	4700019	330 ohm, ½W, 10%
R103	4700029	2.2K, ½W, 10%
R104		Unassigned
R105	4700042	27K, ½W, 10%
R106	4700043	33K, ½W, 10%
R107	4760019	Trimmer, 10K
R108	4720029	18K, ½W, 10%
R109	4720029	18K, ½W, 10%
R110		Unassigned
R201	4700045	47K, ½W, 10%
R202	4700049	100K, ½W, 10%
R203	4700033	4.7K, ½W, 10%
R204	4760021	Trimmer, 50K
R205	4720038	68K, ½W, 5%
R206	4720031	33K, ½W, 5%
R207	4720027	10K, ½W, 5%
R208	4760018	Trimmer, 5K
R209	4720042	200K, ½W, 5%
R210	4720078	Precision, 56.2K, ½W, 1%
R211	4720078	Precision, 56.2K, ½W, 1%
R212	4760020	Trimmer, 20K
R213	4720033	43K, ½W, 5%
R214	4720078	Precision, 56.2K, ½W, 1%
R215	4720078	Precision, 56.2K, ½W, 1%
R216	4700051	150K, ½W, 10%
R217	4700025	1K, ½W, 10%
R218	4700037	10K, ½W, 5%
R219	4700045	47K, ½W, 10%
R220	4700039	15K, ½W, 10%
R221	4720030	22K, ½W, 5%
R222	4720030	22K, ½W, 5%
R223	4720042	200K, ½W, 5%
R224	4700025	1K, ½W, 10%
R225	4700013	100 ohm, ½W, 10%
R226	4720021	Precision, 100K, ¼W, 2%
R227	4760019	Trimmer, 10K
R228	4720021	Precision, 100K, ¼W, 2%
R229	4720021	Precision, 100K, ¼W, 2%
R230	4700034	5.6K, ½W, 10%
R231	4720019	Trimmer, 10K
R232	4720034	47K, ½W, 5%
R233	4720018	1.8K, ½W, 10%
R234	4720023	Precision, 180K, ½W, 2%
R235	4700043	33K, ½W, 10%
R236	4700053	220K, ½W, 10%
R237	4700032	39K, ½W, 10%
R238	4700047	68K, ½W, 10%
R239	4700031	3.3K, ½W, 10%
R240	4720027	10K, ½W, 5%
R241	4700058	1 Meg, ½W, 10%
R242	4760020	Trimmer, 20K
R243	4720038	68K, ½W, 5%
R244	4720020	Precision, 91K, ¼W, 2%
R245	4720042	200K, ½W, 5%
R246	4700046	56K, ½W, 10%
R247	4720021	Precision, 100K, ¼W, 2%
R248	4720021	Precision, 100K, ¼W, 2%
R249	4700051	150K, ½W, 10%
R250	4720038	68K, ½W, 5%
R251	4720038	68K, ½W, 5%
R252	4700044	39K, ½W, 10%
R253	4720038	68K, ½W, 5%
R254	4700060	2.2 Meg., ½W, 10%
R255	4700021	470 ohm, ½W, 10%
R256	4760020	Trimmer, 20K
R257	4720021	470 ohm, ½W, 10%
R258	4720034	47K, ½W, 5%
R259	4720024	Precision, 620 ohm, ¼W, 2%
R260	4720023	Precision, 180K, ½W, 2%
R261	4700043	33K, ½W, 10%
R262	4700055	330K, ½W, 10%
R263	4700058	1 Meg., ½W, 10%
R264	4700032	39K, ½W, 5%
R265	4720027	10K, ½W, 5%
R266	4700058	1 Meg., ½W, 10%
R267	4760020	Trimmer, 20K
R268	4720036	56K, ½W, 5%
R269	4720021	Precision, 100K, ¼W, 2%
R270		Unassigned
R271	4720042	200K, ½W, 5%
R272	4720021	Precision, 100K, ½W, 2%
R273	4720021	Precision, 100K, ½W, 2%
R274	4700046	56K, ½W, 10%

Ref. No.	Genave Part No.	DESCRIPTION
R275	4700037	10K, ½W, 10%
R276	4700037	10K, ½W, 10%
R277	4720021	Precision, 100K, ¼W, 2%
R278	4700045	47K, ½W, 10%
R279	4700025	1K, ½W, 10%
R280	4700037	10K, ½W, 10%
R281	4700025	1K, ½W, 10%
R282	4700045	47K, ½W, 10%
R283	4700023	680 ohm, ½W, 10%
R284	4700016	180 ohm, ½W, 10%
R285		Unassigned
R286	4700023	680 ohm, ½W, 10%
R287	4700016	180 ohm, ½W, 10%
R288	4700023	680 ohm, ½W, 10%
R289	4700016	180 ohm, ½W, 10%
R290	4760011	Potentiometer, OBS, 10K
R291		Unassigned
R292		Unassigned
		METER
MIA	2507980	Meter Replacement Head Assembly

Ref. No.	Genave Part No.	DESCRIPTION
		MISCELLANEOUS
	6070010	Clip, Spring, Lamp
	5100048	Switch, OBS Test
	2505342-C	Panel, Side
	2503502-B	Cover
	2500661-B	Panel, Rear
	2503761-B	Panel, Switch
	2501322-A	Shaft, Drive
	2503602-A	Knob, OBS
	2504321-B	Drum Assembly, OBS
	2501351-A	Gear, OBS Drum, Large
	2504701-A	Gear, Spur, Small
	2501731-A	Spring, Leaf, Test Switch
	3510000	Bearing, OBS Drive Shaft
	2840015	Grommet, Rubber, ⁵⁄₁₆ in. I.D.
	2100013	Connector, 12 pin, Male
	2100010	Connector, 12 pin, Female
	2100018	Cover, Connector
	6070013	Clamp, Cable
	1700039	Printed Circuit Board, Meter Lamp Terminal
	1090400	Manual, Pilots Information, THETA/300 & 400
	1090401	Manual, Installation, THETA/300 & 400
	1090402	Manual, Maintenance, THETA/300 & 400

Specifications Subject To Change Without Notice

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THETA/400 PARTS LIST

CAPACITORS

Ref. No.	Genave Part No.	DESCRIPTION
C201	1550002	Tantalum, 1 mfd, ±20%, 35V
C202	1500039	Mylar, 0.1 mfd, ±5%
C203	1500039	Mylar, 0.1 mfd, ±5%
C204	1500060	Metalized Polycarb, .1 mfd, ±10%
C205	1520040	Z5F Disc, 470 pfd, ±10%
C206	1500012	Mylar, .0047 mfd, ±10%
C207	1500024	Mylar, .022 mfd, ±10%
C208	1500011	Mylar, .0027 mfd, ±10%
C209	1500039	Mylar, 0.1 mfd, ±5%
C210	1500039	Mylar, 0.1 mfd, ±5%
C211	1540014	Electrolytic, 10 mfd, 16V
C212	1500039	Mylar, 0.1 mfd, ±5%
C213	1500039	Mylar, 0.1 mfd, ±5%
C214	1500039	Mylar, 0.1 mfd, ±5%
C215	1540014	Electrolytic, 10 mfd, 16V
C216	1540004	Electrolytic, 2.5 mfd, 16V
C217	1500008	Mylar, .0022 mfd, ±10%
C218	1500039	Mylar, 0.1 mfd, ±5%
C219	1540004	Electrolytic, 2.5 mfd, 16V
C220	1540004	Elecrtolytic, 2.5 mfd, 16V
C221	1540014	Electrolytic, 10 mfd, 16V
C222	1520048	Z5P Disc, .001 mfd, ±20%
C223	1500039	Mylar, 0.1 mfd, ±5%
C224	1500039	Mylar, 0.1 mfd, ±5%
C225	1540014	Electrolytic, 10 mfd, 16V
C226	1540004	Electrolytic, 2.5 mfd, 16V
C227	1500008	Mylar, .0022 mfd, ±10%
C228	1540004	Electrolytic, 2.5 mfd, 16V
C229	1500039	Mylar, 0.1 mfd, ±5%
C230	1540024	Electrolytic, 125 mfd, 16V
C231	1540014	Electrolytic, 10 mfd, 16V
C232	1540046	Electrolytic, 47 mfd, 25V
C233		Unassigned
C234		Unassigned
C800	1500039	Mylar, 0.1 mfd, ±5%
C801	1500039	Mylar, 0.1 mfd, ±5%
C802	1540014	Electrolytic, 10 mfd, 16V
C803	1520055	Disc, .1 mfd, +80 −20%, 12V
C804	1500008	Mylar, .0022 mfd, ±10%
C805	1540004	Electrolytic, 2.5 mfd, 16V
C806	1550002	Tantalum, 1 mfd, ±20%, 35V
C807	1550002	Tantalum, 1 mfd, ±20%, 35V
C808	1550002	Tantalum, 1 mfd, ±20%, 35V
C809	1500039	Mylar, 0.1 mfd, ±5%
C810	1500039	Mylar, 0.1 mfd, ±5%
C811	1540014	Electrolytic, 10 mfd, 16V
C812	1520055	Disc, .1 mfd, +80 −20%, 12V
C813	1500008	Mylar, .0022 mfd, ±10%
C814	1540004	Electrolytic, 2.5 mfd, 16V
C815		Unassigned
C816		Unassigned
C817	1520033	Z5F Disc, 220 pfd, ±10%, 10V
C818	1520033	Z5F Disc, 220 pfd, ±10%, 10V
C819		Unassigned
C820		Unassigned

DIODES

Ref. No.	Genave Part No.	DESCRIPTION
CR101	4810010	Zener, 20V ±20%, 3W, 1N5357
CR102	4810024	Zener, 4.7V, ±10%, 1W
CR103		Unassigned
CR201	4810017	High Frequency Switching, FD 1936
CR202	4810017	High Frequency Switching, FD 1936
CR203	4820017	High Frequency Switching, FD 1936
CR204	4810017	High Frequency Switching, FD 1936
CR205	4810017	High Frequency Switching, FD 1936
CR206	4810017	High Frequency Switching, FD 1936
CR207	4810017	High Frequency Switching, FD 1936
CR208	4810017	High Frequency Switching, FD 1936
CR209	4810017	High Frequnecy Switching, FD 1936
CR210	4810017	High Frequency Switching, FD 1936
CR211	4810017	High Frequency Switching, FD 1936
CR212	4810017	High Frequency Switching, FD 1936
CR213	4810017	High Frequency Switching, FD 1936
CR214		Unassigned
CR800	4810017	High Frequency Switching, FD 1936
CR801	4810017	High Frequency Switching, FD 1936
CR802	4810017	High Frequency Switching, FD 1936
CR803	4810017	High Frequency Switching, FD 1936
CR804	4810017	High Frequency Switching, FD 1936
CR805	4810017	High Frequency Switching, FD 1936
CR806		Unassigned

LAMPS

Ref. No.	Genave Part No.	DESCRIPTION
DS101	3900004	Back light, 14V, 80ma, Lunar White
DS102	3900004	Backlight, 14V, 80ma, Lunar White
DS201	3900016	Indicator lamp, Brn Lead, 14V, 80ma, Clear
DS202	3900017	Indicator lamp, Red Lead, 14V, 80ma, Clear
DS203	3900018	Indicator lamp, Grn Lead, 14V, 80ma, Clear
DS204	3900024	Backlight, 14V, 80ma, Lunar White
DS801	3900015	Indicator lamp, Blk Lead, 14V, 80ma, Clear
DS802	3900019	Indicator lamp, Yel Lead, 14V, 80ma, Clear

COILS

Ref. No.	Genave Part No.	DESCRIPTION
L201	1800033	50 mhy, choke
L202	1800033	50 mhy, choke

INTEGRATED CIRCUITS

Ref. No.	Genave Part No.	DESCRIPTION
IC201	3130012	Dual Op-Amp, MC1458P1
IC202	3130012	Dual Op-Amp, MC1458P1
IC203	3130012	Dual Op-Amp, MC1458P1
IC204	3130012	Dual Op-Amp, MC1458P1
IC205	3130012	Dual Op-Amp, MC1458P1
IC206	3130012	Dual Op-Amp, MC1458P1
IC207	3130012	Dual Op-Amp, MC1458P1
IC208	3130012	Dual Op-Amp, MC1458P1
IC209	3130012	Dual Op-Amp, MC1458P1
IC210	3130012	Dual Op-Amp, MC1458P1
IC211	3130012	Dual Op-Amp, MC1458P1
IC801	3130012	Dual Op-Amp, MC1458P1
IC802	3130012	Dual Op-Amp, MC1458P1
IC803	3130012	Dual Op-Amp, MC1458P1
IC804	3130012	Dual Op-Amp, MC1458P1

TRANSISTORS

Ref. No.	Genave Part No.	DESCRIPTION
Q101	4800023	Silicon, PNP, MPS-U52
Q201	4805458	Silicon, N-Channel, J-FET, 2N5458
Q202	4805458	Silicon, N-Channel, J-FET, 2N5458
Q203	4800033	Silicon, NPN, MPS-5172
Q204	4800043	Silicon, PNP, Black, 2N5227
Q205	4800042	Silicon, NPN, 2N5220
Q206	4800042	Silicon, NPN, 2N5220
Q207	4800042	Silicon, NPN, 2N5220
Q801	4805458	Silicon, N-Channel, J-FET, 2N5458
Q802	4805458	Silicon, N-Channel, J-FET, 2N5458
Q803	4800042	Silicon, NPN, 2N5220
Q804	4800043	Silicon, PNP, Black, 2N5227
Q805	4800042	Silicon, NPN, 2N5220

RESISTORS

Ref. No.	Genave Part No.	DESCRIPTION
R101	4700003	10 ohm, ½W, 10%
R102	4700019	330 ohm, ½w, 10%
R103	4700029	2.2K, ½W, 10%
R104		Unassigned
R105	4700042	27K, ½W, 10%
R106	4700043	33K, ½W, 10%
R107	4760019	Trimmer, 10K
R108	4720029	18K, ½W, 10%
R109	4720029	18K, ½W, 10%
R110		Unassigned
R201	4700045	47K, ½W, 10%
R202	4700049	100K, ½W, 10%
R203	4700033	4.7K, ½W, 10%
R204	4760021	Trimmer, 50K
R205	4720038	68K, ½W, 5%
R206	4720031	33K, ½W, 5%
R207	4720027	10K, ½W, 5%
R208	4760018	Trimmer, 5K
R209	4720042	200K, ½W, 5%
R210	4720078	Precision, 56.2K, ½W, 1%
R211	4720078	Precision, 56.2K, ½W, 1%
R212	4760020	Trimmer, 20K
R213	4720033	43K, ½W 5%
R214	4720078	Precision, 56.2K, ½W, 1%
R215	4720078	Precision, 56.2K, ½W, 1%
R216	4700051	150K, ½W, 10%
R217	4700025	1K, ½W, 10%
R218	4700037	10K, ½W, 5%
R219	4700045	47K, ½W, 10%
R220	4700039	15K, ½W, 10%
R221	4720030	22K, ½W, 5%
R222	4720030	22K, ½W, 5%
R223	4720042	200K, ½W, 5%
R224	4700025	1K, ½W, 10%
R225	4700013	100 ohm, ½W, 10%
R226	4720021	Precision, 100K, ¼W, 2%
R227	4760019	Trimmer, 10K
R228	4720021	Precision, 100K, ¼W, 2%
R229	4720021	Precision, 100K, ¼W, 2%
R230	4700034	5.6K, ½W, 10%
R231	4760019	Trimmer, 10K
R232	4720034	47K, ½W, 5%
R233	4720018	1.8K, ½W, 10%
R234	4720023	Precision, 180K, ½W, 2%
R235	4700043	33K, ½W, 10%
R236	4700053	220K, ½W, 10%
R237	4700032	39K, ½W, 5%
R238	4700047	68K, ½W, 10%
R239	4700031	3.3K, ½W, 10%
R240	4720027	10K, ½W, 5%
R241	4700058	1 Meg., ½W, 10%
R242	4760020	Trimmer, 20K
R243	4720038	68K, ½W, 5%

Ref. No.	Genave Part No.	DESCRIPTION
R244	4720020	Precision, 91K, ¼W, 2%
R245	4720042	200K, ½W, 5%
R246	4700046	56K, ½W, 10%
R247	4720021	Precision, 100K, ¼W, 2%
R248	4720021	Precision, 100K, ¼W, 2%
F249	4700051	150K, ½W, 10%
R250	4720038	68K, ½W, 5%
R251	4720038	68K, ½W, 5%
R252	4700044	39K, ½W, 10%
R253	4720038	68K, ½W, 5%
R254	4700060	2.2 Meg., ½W, 10%
R255	4700021	470 ohm, ½W, 10%
R256	4760020	Trimmer, 20K
R257	4700021	470 ohm, ½W, 10%
R258	4720034	47K, ½W, 5%
R259	4720024	Precision, 620 ohm, ¼W, 2%
R260	4720023	Precision, 180K, ½W, 2%
R261	4700043	33K, ½W, 10%
R262	4700055	330K, ½W, 10%
R263	4700058	1 Meg., ½W, 10%
R264	4700032	39K, ½W, 5%
R265	4720027	10K, ½W, 5%
R266	4700058	1 Meg., ½W, 10%
R267	4760020	Trimmer, 20K
R268	4720036	56K, ½W, 5%
R269	4720021	Precision, 100K, ¼W, 2%
R270		Unassigned
R271	4720042	200K, ½W, 5%
R272	4720021	Precision, 100K, ¼W, 2%
R273	4720021	Precision, 100K, ¼W, 2%
R274	4700046	56K, ½W, 10%
R275	4700037	10K, ½W, 10%
R276	4700037	10K, ½W, 10%
R277	4720021	Precision, 100K, ¼W, 2%
R278	4700045	47K, ½W, 10%
R279	4700025	1K, ½W, 10%
R280	4700037	10K, ½W, 10%
R281	4700025	1K, ½W, 10%
R282	4700045	47K, ½W, 10%
R283	4700023	680 ohm, ½W, 10%
R284	4700016	180 ohm, ½W, 10%
R285		Unassigned
R286	4700023	680 ohm, ½W, 10%
R287	4700016	180 ohm, ½W, 10%
R288	4700023	680 ohm, ½W, 10%
R289	4700016	180 ohm, ½W, 10%
R290	4760011	Potentiometer, OBS, 10K
R291		Unassigned
R292		Unassigned
R800	4760018	Trimmer, 5K
R801	4720028	12K, ½W, 5%
R802	4720018	Precision, 1.8K, ¼W, 2%
R803	4720023	Precision, 180K, ½W, 2%
R804	4700043	33K, ½W, 10%
R805	4700053	220K, ½W, 10%
R806	4720032	39K, ½W, 5%
R807		Unassigned
R808	4700049	100K, ½W, 10%
R809	4700058	1 Meg., ½W, 10%
R810	4720036	56K, ½W, 5%
R811	4720022	Precision, 150K, ¼W, 2%
R812	4720021	Precision, 100K, ¼W, 2%
R813		Unassigned
R814	4720023	180K, ½W, 5%
R815	4700047	68K, ½W, 10%
R816	4720038	68K, ½W, 5%
R817		Unassigned
R818	4700021	470 ohm, ½W, 10%
R819	4700021	470 ohm, ½W, 10%
R820		Unassigned
R821	4700060	2.2 Meg., ½W, 10%
R822	4760019	Trimmer, 10K
R823	4720028	12K, ½W, 5%
R824	4720024	Precision, 680 ohm, ¼W, 2%
R825	4720023	Precision, 180K, ½W, 2%
R826	4700043	33K, ½W, 10%
R827	4700055	330K, ½W, 10%
R828	4700031	3.3K, ½W, 10%
R829	4720032	39K, ½W, 5%
R830		Unassigned
R831	4700058	1 Meg., ½W, 10%
R832	4760020	Trimmer, 20K
R833	4720032	39K, ½W, 5%
R834	4720022	Precision, 150K, ¼W, 2%
R835	4720021	Precision, 100K, ¼W, 2%
R836		Unassigned
R837	4700023	680 ohm, ½W, 10%
R838	4700025	1K, ½W, 10%
R839	4700037	10K, ½W, 10%
R840	4700016	180 ohm, ½W, 10%
R841	4700058	1 Meg., ½W, 10%

METER

M1B	2507990	Meter Replacement Head Assembly

MISCELLANEOUS

	6070010	Clip, Spring, Lamp
	5100048	Switch, OBS Test
	2505342-C	Panel, Side
	2503502-B	Cover
	2500661-B	Panel, Rear
	2503761-B	Panel, Switch
	2501322-A	Shaft, Drive
	2503602-A	Knob, OBS
	2504321-B	Drum Assembly, OBS
	2501351-A	Gear, OBS Drum, Large
	2504701-A	Gear, Spur, Small
	2501731-A	Spring, Leaf, Test Switch
	3510000	Bearing, OBS Drive Shaft
	2840015	Grommet, Rubber, 5/16 in. I.D.
	2100013	Connector, 12 pin, Male
	2100010	Connector, 12 pin, Female
	2100018	Cover, Connector
	6070013	Clamp, Cable
	1700039	Printed Circuit Board, Meter Lamp Terminal
	1090400	Manual, Pilots Information, THETA/300 & 400
	1090401	Manual, Installation, THETA/300 & 400
	1090402	Manual, Maintenance, THETA/300 & 400

Specifications Subject To Change Without Notice

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Service Bulletin

GENERAL AVIATION ELECTRONICS INC.
Genave
4141 KINGMAN DRIVE
INDIANAPOLIS, IND. 46226
AREA 317 - 546-1111

SB7306 July 24, 1973

SUBJECT: THETA/300 and THETA/400 Localizer Signal Dropout and Meter Needle Jitter

Localizer Signal Dropout

Some reports have been received from the field concerning localizer signal dropout in the THETA/300 and THETA/400. The problem can be resolved by selecting a value for R263 which is lower than the 1 meg installed at the factory. Reducing the value to approximately 500K will reduce the amount of localizer signal needed to achieve "lockup". The following procedure can be used to select the correct value for R263.

1. Connect the THETA/300 or THETA/400 under test to a Tel-Instruments T-12A NAV/COM Generator or equivalent. (Refer to test setup in THETA/300-400 Maintenance Manual).

2. Apply a standard localizer signal to the unit for a centered needle indication. Generator output should be 500µV at approximately 40% modulation with 90Hz and 150Hz modulating signals.

3. Delete either the 90Hz or 150Hz modulation and check for an "OFF" light indication.

4. Turn-on both modulating signals with 40% modulation. Reduce modulation until the "OFF" light is activated. At this point the percentage of modulation should be 10% or less.

5. If the "OFF" light comes on at 15% or 20% modulation, solder a 1 meg resistor across the existing 1 meg resistor (R263).

6. Again apply both modulating signals to the unit at 40% modulation. Reduce the total percentage of modulation to 10%. If the "OFF" light is activated by 10% modulation, no further modifications are required.

   NOTE: If the "OFF" light comes on before the modulation is reduced to 10% it will be necessary to decrease the value of the shunt resistor. At 10% or less modulation the "OFF" light should be activated.

7. Apply the modulating signals to the unit at 40% modulation. Delete either the 90 Hz or the 150 Hz modulating signals. The "TO" light should drop out with either signal deleted. This completes the modification and test procedures.

Meter Needle Jitter

There have been reports from the field of occasional meter needle "pegging" or jitter about the centered needle position. The meter can be stabilized by installing a .003 mfd capacitor between pins 2 and 3 of IC209. (See Figure 1.)

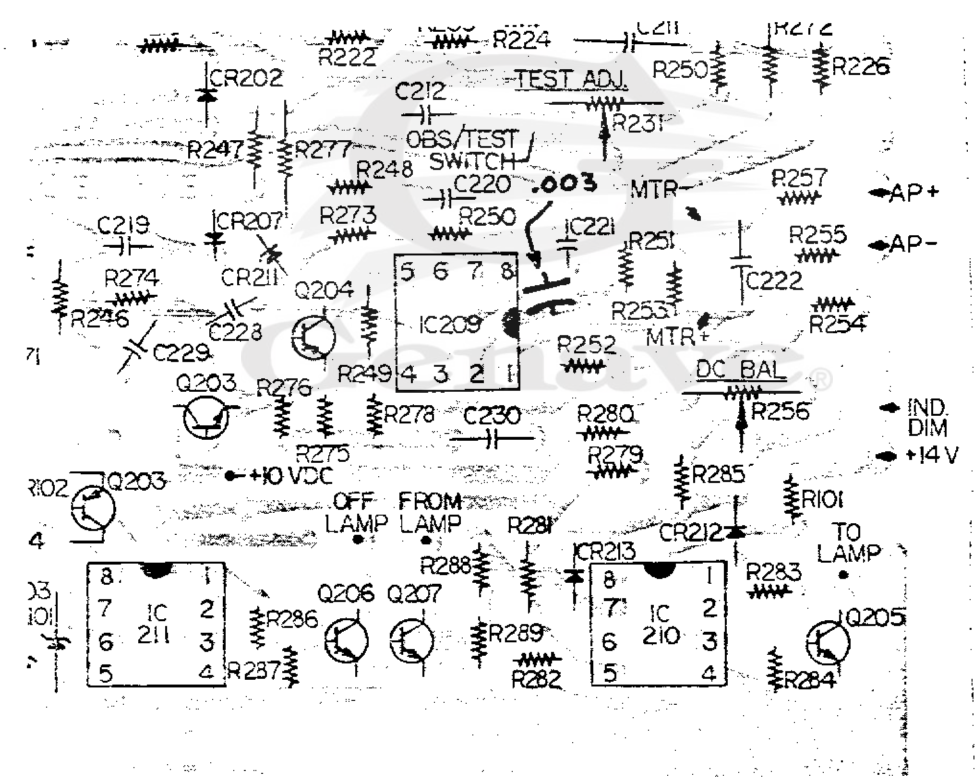

FIGURE 1

GENERAL AVIATION ELECTRONICS INC.

Genave

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

CB1011 April 12, 1973

The following changes should be noted in the THETA/300-400 Maintenance Manual prior to its use.

The following changes have been made to THETA/300's after Serial No. 31-60 and THETA/400's after Serial No. 41-25. These changes have been made to (A) prevent "off-course" dropout in the ILS mode and (B) reduce susceptibility to transmitter interference.

Ref. No.	New Value	New Part No.
(A) R841	Selected	--
(A) R263	Selected	--
(B) R262	270K, ½W, 10%	4700054
(B) C216	.1 mfd, disc, 12 V	1520055
(B) C226	.1 mfd, disc, 12 V	1520055
(B) C219	.1 mfd, mylar, 100 V	1500039
(B) C228	.1 mfd, mylar, 100 V	1500039
(B) R248	100K, 2%, metalized film	4720021
(B) R273	100K, 2%, metalized film	4720021
(B) R243	100K, ½W, 10%	4700049
(B) R268	82K, ½W, 10%	4700048
(B) R232	33K, 5%, metalized film	4720031
(B) R258	33K, 5%, metalized film	4720031

The following additional bypassing capacitors have been added:

New Ref. No.	New Value	New P/N	From	To
C233	220 pfd	1520034	IC206A 1	IC206A 2
C234	220 pfd	1520034	IC206B 5	IC206B 6
C235	220 pfd	1520034	IC207B 6	Ground
C236	220 pfd	1520034	IC207B 5	IC207B 7

C237	220 pfd	1520034	IC209A 3	IC209B 6
C238	.0033 mfd	1520030	IC209A 1	Ground
C815	220 pfd	1520034	Wiper R800	Ground
C816	220 pfd	1520034	IC801B 8	+ve lead C811

Due to differences in inductance values of parts used for L201 and L202, C206 and C208 may be of different values than those specified in the Maintenance Manual. The gray color banded coils (47,000 uhy) require a higher tuning capacitance than the tan colored coils (50,000 uhy). The information contained in the maintenance manual applies to the tan colored coils, therefore, if the grey color banded coils are used the following capacitance values will apply.

Ref. No.	Value	Part No.
C206	.0068 mfd.	1500016
C208	.0047 mfd.	1500012

The additional page enclosed with this correction bulletin is to be inserted into the maintenance manual in front of the waveform photographs of Section 4. This page which is labeled "ADDITIONAL WAVEFORM INFORMATION" lists the corresponding waveform amplitude information.