OPERATION/INSTALLATION MANUAL
Trimble
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OPERATION/INSTALLATION MANUAL

TRI 20 Digital Indicator
TRI 30 Analog Indicator
TRI 40 Digital Indicator
TRA 3000 Radar Altimeter Unit

OCTOBER 28, 1996
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T-1
SECTION I

DESCRIPTION, SPECIFICATIONS AND ACCESSORIES

1.1. INTRODUCTION

This manual contains information relative to the installation and operation of the TRI 20 DIGITAL INDICATOR, TRI 30 ANALOG INDICATOR, TRI 40 DIGITAL INDICATOR and TRA 3000 RADAR ALTIMETER UNIT manufactured by Trimble of Austin, Texas.

1.2. DESCRIPTION OF EQUIPMENT

The TRA 3000 Radar Altimeter unit provides AGL altitude information from 40 feet up to 2500 feet maximum. The system consists of a single TRA 3000 receiver/transmitter/antenna unit and one of the three available indicators, TRI 20, TRI 30 or TRI 40. Each indicator utilizes the same TRA 3000 receiver/transmitter/antenna unit.

1.3. SPECIFICATIONS

The technical characteristics of the TRA 3000 receiver/transmitter/antenna, TRI 20, TRI 30 and TRI 40 are listed in Tables 1.3-1, 1.3-2, 1.3-3 and 1.3-4.

TABLE 1.3-1

<table>
<thead>
<tr>
<th>TRA 3000 TECHNICAL CHARACTERISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type: Single antenna, FMCW</td>
</tr>
<tr>
<td>Altitude Range: 40 to 2500 feet</td>
</tr>
<tr>
<td>System Accuracy: 40 to 100 feet ±5 feet</td>
</tr>
<tr>
<td>100 to 500 feet ±5%</td>
</tr>
<tr>
<td>500 to 2500 feet ±7%</td>
</tr>
<tr>
<td>Frequency Range: 100 MHz sweep within 4200 to 4400 GHZ range</td>
</tr>
<tr>
<td>Input Voltage: Approx 20 volts DC from indicator</td>
</tr>
<tr>
<td>Input Current: 600 ma</td>
</tr>
<tr>
<td>Altitude Output: Digital</td>
</tr>
<tr>
<td>Self-test: Ground or flight, initiated at indicator</td>
</tr>
<tr>
<td>Transmitter/receiver/antenna: All solid-state, microstrip antenna, 1&quot;H x 5&quot;W x 7.625&quot;L, 1.5 pounds</td>
</tr>
<tr>
<td>Environment: -40 deg. C to + 70 deg. CAltitude 45,000 ft.</td>
</tr>
</tbody>
</table>
1.3. SPECIFICATIONS (Continued)

TABLE 1.3-2

TRI 20 DIGITAL INDICATOR TECHNICAL CHARACTERISTICS

**Power supply:** Input voltage - 13.75 +10%, -20% VDC  
Power - 10 Watts nominal (includes T/R/A unit power)

**Environment:** -20 deg. C to +55 deg. C

**Physical:** Size - 7 1/2" long x 3 1/2" wide x 1 3/8" high  
Weight - 3/4 pound

**Mounting:** Front panel mounting, requires one-half of a 3" ATI indicator mounting space

**Functional characteristics**

**Altitude Range:** 40 ft. to 2500 ft.

**Digital display resolution:**
- 5 ft. from 40 ft. to 100 ft.
- 10 ft. from 100 ft. to 300 ft.
- 20 ft. from 300 ft. to 1000 ft.
- 50 ft. from 1000 ft. to 2500 ft.

**Display hysteresis:** Less than half the above resolutions

**Display update rate:** 2 times/second minimum

**Unlock display:** Display blanks in unlock

**Decision height:** Set in 100 ft. increments, 0 ft. to 900 ft.

**Aural DH alert:** Audio tone, 1 Khz, available externally

**Visual DH alert:** Front panel DH lights, external DH light control is available at rear connector

**Self-test:** When test button is pressed, the display will read the test altitude of the R/T unit and hold for approximately 25 seconds. If the altitude descends through the selected decision height, the DH visual and aural alert will energize

**Displays:** Type - LED, red seven segment

**Dimming:** automatic control

**Data entry/controls:** Decision height knob, enters desired DH in 100 ft. increments, 0 to 900 ft. Self-test button, energizes TEST mode when pressed

TABLE 1.3-3

TRI 30 INDICATOR TECHNICAL CHARACTERISTICS

**Power supply:** Input voltage - 27.5 VDC +20%  
Power - 16 Watts nominal (includes power to T/R/A unit)

**Environment:** Temperature -20 deg.C to +55 deg.C

**Physical:** Size - 3.25" H x 3.25" W x 4.0" L  
Weight - 1 pound

**Mounting:** Front panel mounting; requires a 3" ATI mounting space.
1.3. SPECIFICATIONS (CONTINUED)

Functional Characteristics

Altitude range: 40 ft. to 2500 ft. (linear); (enlarged linear 40-500 ft.)
Analog display: Servo, pointer and dial type
Unlock display: Needle will go off scale on the high end
Decision height: Bug, continuous setting from 40 to 2500 ft.
Display update rate: Continuous
Analog output: 2.5 mv/ft., 100 mv = 40 ft.
Display disable: One strut switch input, ground to enable
Altitude accuracy:
40 ft. to 100 ft. ±5 ft.
100 ft. to 500 ft. ±5%
500 ft. to 2500 ft. ±7%
Aural DH alert: Decision height alert - 1 KHz tone for 2 seconds (500 ohms)
adjustable audio level
Self-test: Indicates 40 ft; DH operates normally
Visual alert: Amber lamp with automatic adjustable intensity; internal
LED standard; external lamp operation available.

TABLE 1.3-4

TRI 40 DIGITAL INDICATOR TECHNICAL CHARACTERISTICS

Power supply: Input voltage - 27.5 VDC ±20%
Power - 10 Watts nominal (includes power to R/T unit)
Environment: -20 deg. C to +55 deg. C
Physical: Size - 7 1/2" long x 3 1/2" wide x 1 3/8" high, weight - 3/4 pound
Mounting: Front panel mounting, requires one-half of a 3" ATI mounting space

Functional Characteristics

Altitude range: 40 ft. to 2500 ft.
Digital display resolution: 5 ft. from 40 ft. to 100 ft.
10 ft. from 100 ft. to 300 ft.
20 ft. from 300 ft. to 1000 ft.
50 ft. from 1000 ft. to 2500 ft.
Display hysteresis: Less than half the above resolutions
Unlock display: “U” when unlocked or displaying test altitude
Decision height: Set in 50 ft. increments from 0 ft. (OFF) to 600 ft., plus 700 ft., 800 ft. and 900 ft.
Display update rate: 2 times/second minimum
Gear warning: Aural and visual alert at 100 ft. when gear is up and aircraft is descending. May be disabled for fixed gear aircraft.
Analog outputs: A. 2.5 mv/ft., 0 volts = 0 ft., 3000 ohm max load, 0 ft. to 2500 ft. range
1.3. SPECIFICATIONS (CONTINUED)

B. 20 mv/ft., 0.4 volts = 0 ft., 3000 ohm max load, 0 ft. to 500 ft. range

Preset trip points: Eight open collector outputs provide preset decision height trip points every 100 ft. from 100 ft. to 800 ft.

Display disable: Two inputs, ground or 28 volt DC disable signal, for use with strut switch or airspeed switch, optional use.

Aural alerts: Decision height alert - 1 KHz tone for 1 second Gear warning - 1 KHz tone modulated at 100 KHz, for 1 second

Self-test: Display all 8’s for 2 seconds, DH lights for first second with DH aural alert, and adds GEAR WARN with aural for next second. During next period test altitude is displayed with farthest left digit showing “U”. DH and GEAR light function normally during this period as do all outputs except preset DH trips remain open.

Displays: Type - LED, red seven segment Dimming - automatic control

Data entry/controls: DECISION HEIGHT knobs, enters desired DH as read on right side of display. SELF-TEST button energizes TEST mode when pushed.

1.4. SYSTEM COMPONENTS AND ACCESSORIES

The TRA 3000 system components are shown in the following item listing.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TRIMBLE P/N</th>
<th>TRA 3000 SYSTEM</th>
<th>TRI 20</th>
<th>TRI 30</th>
<th>TRI 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRI 20 Indicator</td>
<td>1901-3020-00</td>
<td>1</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TRI 20 Install. kit</td>
<td>1901-3021-00</td>
<td>1</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TRI 30 Indicator</td>
<td>1901-3030-00</td>
<td>none</td>
<td>1</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TRI 30 Install. kit</td>
<td>1901-3032-00</td>
<td>none</td>
<td>1</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>TRI 40 Indicator</td>
<td>1901-3040-00</td>
<td>none</td>
<td>none</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TRI 40 Install. kit</td>
<td>1901-3041-00</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>1</td>
</tr>
<tr>
<td>TRA 3000 unit</td>
<td>1901-3000-00</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TRA 3000 Install. kit</td>
<td>1901-3001-00</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The TRI 20 installation kit (1901-3021-00) includes:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TRIMBLE P/N</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slidelock</td>
<td>9-2190-185-10</td>
<td>1</td>
</tr>
<tr>
<td>Connector, 9 pin female w/hood</td>
<td>9-2190-185-00</td>
<td>1</td>
</tr>
<tr>
<td>Screw 4-40 x 3/8 blk. oxi.</td>
<td>9-2804-068-10</td>
<td>4</td>
</tr>
</tbody>
</table>
1.4. SYSTEM COMPONENTS AND ACCESSORIES (CONTINUED)

The TRI 30 installation kit (1901-3032-00) includes:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TRIMBLE P/N</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slidelock</td>
<td>9-2190-185-10</td>
<td>1</td>
</tr>
<tr>
<td>Connector, 9 pin female w/hood</td>
<td>9-2190-185-00</td>
<td>1</td>
</tr>
<tr>
<td>Connector BNC UG 88/u</td>
<td>9-2122-102-00</td>
<td>1</td>
</tr>
</tbody>
</table>

The TRI 40 installation kit (1901-3041-00) includes:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TRIMBLE P/N</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector, 25 pin female</td>
<td>9-2190-188-10</td>
<td>1</td>
</tr>
<tr>
<td>Hood W/L lever</td>
<td>9-2190-188-20</td>
<td>1</td>
</tr>
<tr>
<td>Screw; 4-40 x 3/8 blk. oxi.</td>
<td>9-2804-068-10</td>
<td>4</td>
</tr>
</tbody>
</table>

The TRA 3000 installation kit (1901-3001-00) includes:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TRIMBLE P/N</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector BNC UG 88/u</td>
<td>9-2122-102-00</td>
<td>1</td>
</tr>
<tr>
<td>8-32 x 1&quot; cap screw</td>
<td>9-2808-130-00</td>
<td>8</td>
</tr>
</tbody>
</table>

1.5. ACCESSORIES REQUIRED, BUT NOT SUPPLIED

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TRIMBLE P/N</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>RG58 A/U coax, 50 ohms</td>
<td>9-6026-103-00</td>
<td>A/R</td>
</tr>
<tr>
<td>Circuit Breaker, 2 Amp</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

1.6. ACCESSORIES OPTIONAL, BUT NOT SUPPLIED

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TRIMBLE P/N</th>
<th>TRI 20 TRA 3000</th>
<th>TRI 30 TRA 3000</th>
<th>TRI 40 TRA 3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>DH light assembly</td>
<td>0136-0020-00</td>
<td>none</td>
<td>1</td>
<td>none</td>
</tr>
<tr>
<td>*14 VDC to</td>
<td>N/A</td>
<td>none</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>28 VDC converter</td>
<td>N/A</td>
<td>none</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*If TRI 30/TRA 3000 or TRI 40/TRA 3000 system is installed in a 14 VDC aircraft, a 14 VDC to 28 VDC converter must be used.
SECTION II

2. OPERATION

2.1. FUNCTIONAL OPERATION TRA 3000 RECEIVER/TRANSMITTER/ANTENNA

The TRA 3000 Radar Altimeter system utilizes a solid-state voltage controlled oscillator (VCO) for its transmitter. This low power, low voltage device is the ultimate in reliability and simplicity. This technology allows Trimble to continue to offer small, lightweight, reliable equipment.

The TRA 3000 receiver/transmitter/antenna weighs only 1.5 pounds.

The system provides dependable altitude data from 40 feet to a maximum of 2500 feet above ground level. The maximum altitude is dependent upon the ground reflectivity and may be slightly less than 2500 feet, (water giving the best return and sand giving the poorest).

The TRA 3000 system monitors above ground altitude from 40 feet to the maximum range of the instrument. The pilot may select a decision height altitude with the DH set and be alerted automatically when the aircraft drops below that altitude.

When flying with the TRA 3000 system, the unit may occasionally unlock for intermittent periods of time at altitudes between 1500 and 2500 feet as a result of unfavorable reflectivity of terrain below the aircraft. Highly unfavorable terrain may be generally described as dry, loose soil, e.g., tilled dry ground or sand.

The TRA 3000 system may also be observed to unlock when the aircraft is banked or in an attitude of pitch. The antenna beam width of the TRA 3000 system provides for bank angles of 30 degrees when below 1500 feet; this angle decreases to 20 degrees above 1500 feet. In cases of rapid descent or climb, the pitch of the aircraft may reduce the sensitivity of the TRA 3000 system, particularly between 1500 feet and 2500 feet.

In cases of extremely rapid descent, both the response time of the system and pitch of the aircraft may prevent lock-on and normal operation. At a descent rate of 500 feet/minute, the TRA 3000 system will provide normal lock-on below 2500 feet.

When flying the TRA 3000 system over terrain which changes abruptly, e.g., a cliff or ravine, the system is limited by response time of the unit. The TRA 3000 system surveys ground directly below the aircraft, and cannot be relied on as a forward looking or warning device.
2.2. FUNCTIONAL OPERATION TRI 20 DIGITAL INDICATOR

The TRI 20 is a half-height 3” ATI LED digital and DH indicator, 13.75 +10%, -20% VDC. The TRI 20 weighs only .6 pounds for a total system weight of 2.1 lbs.

The half-height panel indicator features a highly visible yellow seven segment display.

Indicator numerals are automatically dimmed with changes in cockpit lighting. Display resolution varies from five feet at 30 to 100 feet and up to 50 feet at 1000 feet to 2500 feet. The display update rate is two times per second minimums. The DH (decision height) can be set in 100 foot increments, 0 to 900 feet.

A push to test button permits checking the system’s readiness, either in flight or on the ground. A complete DH alerting program includes an audio tone, 1 KHz supplied externally, plus a front panel DH light.

When the TRI 20 is turned on the unit goes into self-test mode. The display will read the test altitude of the R/T unit and hold for approximately 25 seconds. If the altitude descends through the selected decision height, the DH visual and aural alert will energize. Following completion of the self-test period, the AGI readout will go blank unless self-test was initiated in flight between 40 and 2500 feet AGL, in which case the AGL display will give the actual altitude.

When on the ground below 40 feet altitude or in any condition of unlock, the TRI 20 is designed to blank out the ALG display. However, when taxiing, the ALG display may wander up and down scale due to reflections from buildings, etc.

2.3. FUNCTIONAL OPERATION TRI 30 ANALOG INDICATOR

The TRI 30 is a standard 3 inch ATI analog indicator with built-in DH, 28 VDC. The TRI 30 weighs only 1 pounds for a total system weight of 2.5 pounds.

The TRI 30 indicator has been improved by adding an internal DH indication. This rugged servo indicator has been designed to meet the extreme environmental conditions that may be encountered in today’s aircraft. The 3” panel indicator features a highly visible yellow needle that travels across large white numerals for easier interpretation during instrument scan.

Indicator numerals are arranged in a split-linear display that gives an enlarged scale from 500 feet down to 40 feet for additional precision on final approach. The DH (decision height) bug can be set anywhere on the scale; thus providing altitude alerting in a range from 40 feet to 2500 feet. A push to test button permits checking the system’s readiness either in flight or on the ground. A complete DH alerting program includes a 3 second aural alert with adjustable audio level, plus an internal amber lamp visual alert with automatic adjustable light intensity.

When the TRI 30 is turned on the unit goes into self-test mode. The needle will move to the corresponding red dot below 40 feet on the indicator. The DH light comes on and the audio alert sounds as the needle passes through the DH setting. Self-test verifies that the system is
2.3. FUNCTIONAL OPERATION TRI 30 ANALOG INDICATOR (CONTINUED)

The TRI 30 is operational and capable of providing accurate altitude information. The self-test period lasts approximately 20 seconds. Following completion of the self-test period, the needle will go off scale on the high end unless self-test was initiated in flight between 40 and 2500 feet AGL, in which case the needle will go to the actual altitude. If the strut switch is used, the self-test mode will not work while on the ground. To counteract this, use a strut switch with an override switch. (See installation wiring diagram.)

When on the ground and not equipped with a strut switch, or below 40 feet altitude, or in any condition of unlock, the TRI 30 is designed to indicate completely off scale at the high end of the scale. However, when taxiing the needle may wander up and down scale due to reflections from buildings, etc. The strut switch eliminates the false readings while on the ground.

2.4. FUNCTIONAL OPERATION TRI 40 DIGITAL INDICATOR

The TRI 40 is a half-height 3 inch ATI LED digital and DH indicator, 28 VDC. The TRI 40 weighs only .75 pounds for a total system weight of 2.25 pounds.

The half-height panel indicator features a highly visible yellow seven segment display. Indicator numerals are automatically dimmed with changes in cockpit lighting. Display resolution varies from 5 feet between 40 feet to 100 feet up to 50 feet between 1000 feet to 2500 feet. The display update rate is two times per second minimum. The DH (decision height) can be set in 50 foot increments between 0 foot to 600 feet, plus 700, 800 and 900 feet.

A push to test button permits checking the system’s readiness either in flight or on the ground. A complete DH alerting program includes an audio tone, 1 KHz supplied externally, plus a front panel DH light.

In addition the TRI 40 has a Gear Warning Aural Alert which is a 1 KHz tone modulated at 100 Hz for one second plus a visual alert gear light on the front panel.

When the TRI 40 is turned on the unit goes into self-test mode. The display will read all 8’s for 2 seconds; DH lights for the first second with DH aural alert and adds Gear Warn with aural for the next second. During the next period test altitude is displayed with farthest left digit showing “U”. DH and Gear Light function normally during this period, as do all outputs except preset DH trips remain open.

When on the ground, below 40 feet altitude or in any condition of unlock, TRI 40 is designed to blank out the AGL display. However, when taxiing the AGL display may wander up and down scale due to reflections from buildings, etc. The strut switch eliminates the false readings while on the ground.
SECTION III

3. INSTALLATION

3.1. GENERAL INFORMATION

This section contains suggestions and factors to consider before installing a TRA 3000 radar altimeter into an aircraft. Adherence to the suggestions will assure satisfactory performance from the system.

3.2. UNPACKING AND INSPECTING EQUIPMENT

Exercise extreme care when unpacking each unit. Make a visual inspection of each unit for evidence of damage incurred during shipment. If a claim for damage is to be made, save the shipping container to substantiate the claim. When all equipment and the installation kit has been inspected, save the packing material and container in case the unit is to be stored or reshipped. See 1.4 for equipment and parts supplied.

3.3. EQUIPMENT INSTALLATION TRA 3000

The optimum installation would have the antenna mounted in an area on the belly of the aircraft centerline which is entirely free of extraneous protrusions and with the plane of the antenna parallel to the ground. Viewing angle: the antenna should be mounted so that no protrusion is visible to the antenna with a ± 45 degree conic area below the aircraft.

**NOTE:**
The antenna shall always be mounted with the BNC connector positioned to the front of the aircraft as shown in Figure 4-1. The radome must be parallel to the ground in flight attitude ± 6 deg. maximum.

DO NOT mount the antenna closer than three (3) feet to a DME, transponder, ADF, or VHF antenna.
Do not bend the TRA 3000; shim if necessary to fit radius of aircraft.

Avoid locations near high heat sources or where fuel, oil or excessive moisture may collect. Bond and shield all parts of the aircraft electrical system such as generators and ignition systems.

Route cable from antenna to indicator away from circuits carrying high current, pulse transmitting equipment, 400 Hz circuits and other sources of interference. Do not route with ADF antenna cables. It is recommended that the cable from the antenna to the indicator be routed by itself away from other cables.

TRA 3000 T/R/A unit installation layout is shown in Figure 4-1.
3.4. EQUIPMENT INSTALLATION TRI 20
One recommended location for the TRI 20 indicator is in the top two rows of the instrument panel with the other primary instruments. This allows full utilization of the radar altimeter during the critical approach phase when the pilot must go from instrument to visual with the least amount of eye movement.

3.4.1 Modify panel per cutout dimensions on the TRI 20 outline drawing, Figure 4-2. TRA 3000/TRI 20 wiring diagrams are shown in Figure 4-5.

3.5. EQUIPMENT INSTALLATION TRI 30
One recommended location for the TRI 30 indicator is in the top two rows of the instrument panel with the other primary instruments. This allows full utilization of the radar altimeter during the critical approach phase when the pilot must go from instruments to visual with the least amount of eye movement.

3.5.1 Open up the lower left mounting hole for the “DH” set shaft. Use 9/32” drill so shaft will not bind. Feel the TRI 30 knob torque before and after installation to make sure the shaft is not binding.
3.5.2 Determine the correct lighting voltage and select the proper bulb by removing the rear cover and unscrewing the plastic rod (with yellow wire). The TRI 30 is shipped with a 28 volt bulb installed, (No. 327). 5 volts = No. 328; 14 volts = No. 330.
3.5.3 Connect DH audio to an unswitched headphone input on the audio panel if possible. Some isolation amplifiers require a D.C. return to operate properly. This requires the use of a small 500 ohm transformer on the output of the TRI 30 as its output is capacitor coupled.
3.5.4 The audio output level may be adjusted to suit the pilot by inserting a small screwdriver through the upper right mounting hole.

TRI 30 indicator and optional external DH lamp assembly dimensions are shown in Figure 4-3. TRA 3000/TRI 30 wiring diagrams are shown in Figure 4-6.

3.6. EQUIPMENT INSTALLATION TRI 40
One recommended location for the TRI 40 indicator is in the top two rows of the instrument panel with the other primary instruments. This allows full utilization of the radar altimeter during the critical approach phase when the pilot must go from instruments to visual with the least amount of eye movement.

3.6.1 Modify panel per cutout dimensions on the TRI 40 outline drawing.
3.6.2 Connect DH audio to an unswitched headphone input on the audio panel if possible. Some isolation amplifiers require a D.C. return to operate properly. This requires the use of small 500 ohm transformer on the output of the TRI 40 as its output is capacitor coupled.
3.6.3 The audio output level may be adjusted to suit the pilot by inserting a small screwdriver through the hole on the top cover of the TRI 40.

TRI 40 Outline Drawing and Installation Wiring Diagram are shown in Figures 4-4 and 4-7.
NOTE:
Aircraft which exhibit electrical noise on the airframe or have surfaces or panels which are not properly bonded can cause the altimeter to attempt to "relock" above 2500 feet AGL. This can cause erratic altitude displays and/or DH aural and visual alerts when the crew least expects them.

Thorough bonding of all control surfaces, gear doors, access panels, etc. should cure the symptoms, but in certain extreme circumstances it may be necessary to install an on/off switch to disable the unit above 2500 feet AGL. Wiring diagrams for the TRI-20, TRI-30 and TRI-40 all reflect this optional switch.

This condition will only be noticeable above 2500 feet AGL and will not degrade altimeter performance below 2500 feet AGL.
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SECTION IV

4. INSTALLATION DRAWINGS

1880 MTG. HOLES. USE B-32 CAP SCREWS FURNISHED IN INSTALLATION KIT. SEE SHEET 2 OF THIS DRAWING FOR HOLE & CUTOUT LOCATION.

GASKET

2.65

7.91 MAX.

3.90

5.29 MAX.

1.00 MAX.

1.70 MAX

1.20 MAX

NOTES:
1) SEE SHEET 2 OF THIS DRAWING FOR MOUNTING HOLE FOOT PRINT.

Figure 4-1 (Sheet 1 of 2)
TRA3000 Outline Dimension/Mounting Drill Schedule
NOTES:
1. ALL DIMENSIONS IN INCHES.
2. DO NOT MOUNT WITHIN THREE FEET OF ANY OTHER ANTENNAS, RADOMES, DRAIN TUBES, OR HOLES IN SKIN. LOCATING TOO CLOSE TO A DME, ADF, OR TRANSFONDER ANTENNA MAY CAUSE INTERFERENCE.
3. KEEP UNIT OUT OF EXHAUST BLAST AND OIL LEAKAGE.
4. DO NOT RUN CABLE IN WITH OTHER CABLES.
5. ATTEMPT TO MOUNT THE TRA 3000 ON A FLAT SURFACE THAT IS PARALLEL TO GROUND UNDER NORMAL CRUISE CONFIGURATION.
6. DO NOT BEND THE TRA3000. SHIM IF NECESSARY TO FIT RADIUS OF AIRCRAFT.
7. TIGHTEN ANTENNA IN PLACE AND SEAL THE JUNCTION AREA WITH AIRCRAFT MANUFACTURER APPROVED SEALANT TO PREVENT MOISTURE ENTRANCE.
8. DO NOT PAINT RADOME.

Figure 4-1 (Sheet 2 of 2)
TRA3000 Outline Dimension/Mounting Drill Schedule
Figure 4-2
TRI-20 Outline Drawing

NOTES:
1. AUDIO OUTPUT ADJUSTMENT.
2. PANEL MOUNTING SCREWS INCLUDED IN INSTALLATION KIT, PLUS REAR MATING CONNECTOR.
NOTES:
1. AUDIO OUTPUT ADJUSTMENT.
2. PANEL MOUNTING SCREWS INCLUDED ON UNIT, PANEL THROUGH HOLES
   NEED TO BE 0.177 MIN ON 3.500 BOLT CIRCLE.
3. MOUNTING PANEL NEEDS A 0.281 HOLE INSTEAD OF 0.177 FOR THE SHAFT.
4. FRONT PANEL MOUNTING, REQUIRES A 3" ATI MOUNTING SPACE.
5. ALLOW 6" BEHIND PANEL FOR THE UNIT.

Figure 4-3
TRI-30 Outline Drawing
Figure 4-4
TRI-40 Outline Drawing
NOTES:
1. EXTERNAL DH LIGHT OPTIONAL. AVAILABLE FROM FACTORY WITHOUT BULB, USE 14 OR 28 VOLT BULB. IF EXTERNAL DH IS NOT USED LEAVE PIN 4 OPEN.

2. AUDIO OUTPUT PROVIDES 50mW INTO 600 ohms. AUDIO VOLUME CAN BE ADJUSTED THROUGH HOLE ON COVER OF TRI-20.

3. AIRCRAFT GROUND CAN BE CONNECTED TO PIN 5 OR PIN 9 OR BOTH.

Figure 4-5
TRI-20/TRA3000 Installation Wiring Diagram
NOTES:
1. EXTERNAL DH LIGHT OPTIONAL. IF NOT USED, LEAVE PIN 2 OPEN.
2. 28V LAMP FACTORY INSTALLED. IF DIFFERENT VOLTAGE REQUIRED, SEE MANUAL FOR INSTRUCTIONS.
3. UNIT ACTIVATED WHEN GROUND IS CONNECTED TO PIN 1. UNIT IS DEACTIVATED WHEN PIN 1 IS OPEN. IF STRUT SWITCH IS NOT USED, CONNECT PIN 1 TO PIN 7 (A/C GROUND) IN HARNESS. THE STRUT SWITCH MAY BE OVERRIDDEN BY CONNECTING A SPST SWITCH FROM THE STRUT SWITCH LINE TO GROUND TO ALLOW SELF TEST TO OPERATE GROUND.

Figure 4-6
TRI-30/TRA3000 Installation Wiring Diagram
ON/OFF SWITCH
(Optional)

1. POWER GROUND
2. TO BU.1 EXPANDER CONDENSER OR BU.2 EXP.
3. BU.3 VOLTAGE IN -
4. BU.4 EXPANDER
5. BU.5 EXPANDER GROUND

NOTES:
1. STRUT SWITCH INPUT WILL DISABLE UNIT ON GROUND, IF DESIRED.
   USE EITHER PIN 4 OR 5, NOT BOTH. IF STRUT SWITCH IS NOT USED,
   CONNECT PIN 4 TO PIN 1.

2. GEAR INPUT WILL DISABLE GEAR WARNING AT 100 FT. USE
   EITHER PIN 11 OR 12, NOT BOTH.

3. ALL FIXED TRIP POINTS ARE OPEN COLLECTOR DARLINGTON
   PAIRS WHICH SWITCH LOW AT DESIGNATED ALTITUDE. LIMITS
   OF CURRENT ARE 40mA PER OUTPUT (MAX).

4. D- AND GEAR WARNING LIGHT OUTPUTS ARE OPEN COLLECTOR NPN TRANSISTORS,
   EACH WILL SINK A MAXIMUM OF 300mA ON AND BLOCK A MAXIMUM OF 30VDC OFF.

5. AUDIO OUTPUT PROVIDES 50mV INTO 600 OHMS.

6. INSTALLATION MUST COMPLY WITH THE STANDARDS SET FORTH
   IN FAA AIRCRAFT INSPECTION AND REPAIR DOCUMENTS
   AC 42:13.2, CHAPTER 3.

Figure 4-7
TRI-40/TRA3000 Installation Wiring Diagram
SECTION V

5. TESTING

5.1. PRE-FLIGHT TESTING

5.1.1. PRE-FLIGHT CHECK LIST - TRA 3000/TRI 20

5.1.1.1. Turn on power (after starting engine).
5.1.1.2. Verify that the display will read the test altitude of the R/T unit and hold for approximately 25 seconds.
5.1.1.3. After the 25 second test mode, verify the AGL read out will go blank.
5.1.1.4. Set DH selector to desired altitude.

NOTE: If the aircraft is within or near a hangar, reflections may create a signal return causing self-test not to operate properly

5.1.2. PRE-FLIGHT CHECK LIST - TRA 3000/TRI 30

5.1.2.1. Turn on power (after starting engine).
5.1.2.2. Verify needle goes to 40 feet and DH light blinks for approximately 3 seconds and then stays lighted while needle is below DH bug. Verify DH audio sounds while DH light is blinking.
5.1.2.3. After the 20 second test mode, verify needle goes out of view at high end of scale.
5.1.2.4. Set DH bug to desired altitude.

NOTE: If aircraft is equipped with strut switch, the test mode will not operate on the ground unless the strut switch is disabled.

5.1.3. PRE-FLIGHT CHECK LIST - TRA 3000/TRI 40

5.1.3.1. Turn on power (after starting engines).
5.1.3.2. Verify the display will read all 8’s for two seconds; DH lights for first second with DH aural alert and adds Gear Warn with aural for next second.
5.1.3.3. During next period test altitude is displayed with farthest left digit showing “U”. DH and Gear light function normally during this period as do all outputs except preset DH trips remain open.
5.1.3.4. After the self-test mode, the display will show an unlocked mode.
5.1.3.5. Set DH selector to desired altitude.

NOTE: If aircraft is equipped with strut switch the test mode will not operate on the ground unless the strut switch is disabled.
5.2. FINAL INSTALLATION CHECKOUT

5.2.1. FINAL TESTING TRA 3000/TRI 20

**NOTE:** With the aircraft at 4,000 feet AGL or in open area:

5.2.1.1. With the system powered, AGL display should be blank.
5.2.1.2. Check unit accuracy at 40 feet by activating SELF TEST (momentarily press red button on TRI 20). Reading should be 40 feet ± 5 feet.

5.2.2. FINAL TESTING TRA 3000/TRI 30

**NOTE:** With the aircraft at 4,000 feet AGL or in open area:

5.2.2.1. With the system powered the needle should read above 2500 feet.
5.2.2.2. A red “OFF” flag at the left center of the indicator is displayed when no power is applied to the system.
5.2.2.3. Check unit accuracy at 40 feet by activating SELF TEST (momentarily press red button on TRI 30). Reading should be 40 feet ± 5 feet.
5.2.2.4. “DH” checks:
   a. Rotate “DH” bug with knob on TRI 30. Range of bug movement should be 2500 feet to 40 feet.
   b. Set “DH” bug to 200 feet.
   c. Momentarily press SELF TEST button.
   d. The “DH” light should flash for 3 seconds and then stay on. The aural alarm should sound for 3 seconds through the aircraft audio system when the needle descends (CCW) through the 200 foot bug setting.

5.2.3. FINAL TESTING TRA 3000/TRI 40

**NOTE:** With the aircraft at 4,000 feet AGL or in open area.

5.2.3.1. With the system powered, AGL display should have a “U” in the farthest left digit.
5.2.3.2. Check unit accuracy at 40 feet by activating SELF TEST (momentarily press red button on TRI 40). Reading should be 40 feet ± 5 feet.
5.2.3.3. “DH” checks:
   a. Set DH reading with knob on TRI 40. Range of setting should be 0 to 600 feet in 50 ft. increments plus 700, 800 and 900 ft.
   b. Set “DH” to 200 feet.
   c. Momentarily press SELF TEST button.
   d. The “DH” and GEAR light should flash for 3 seconds and then stay on. The aural alarm should sound for 3 seconds through the aircraft audio system.
THREE YEAR UNLIMITED WARRANTY TRIMBLE

What does your warranty cover?
Any defect in materials or workmanship of Terra by Trimble equipment.
This warranty applies only to equipment sold after January 1, 1993.

How does your warranty become effective?
Your warranty does not become effective unless you mail your completed Warranty Registration card to us within 15 days after installation of your Terra by Trimble equipment.

For how long?
Three years from date of original installation of the equipment, but not more than four years from date of purchase.
If you receive repair or replacement of equipment under this warranty, the warranty remains in effect on the repaired or replaced equipment for the remainder of the original three-year term.

What will we do to correct problems?
Repair any equipment found to be defective in materials or workmanship.
If we choose, we may replace the equipment rather than repairing it.
We will be responsible for the cost of labor and materials for repair or replacement of any equipment found to be defective in materials or workmanship.

How do you make a warranty claim?
Contact your nearest Authorized Terra by Trimble dealer for repair or replacement of any equipment defective in materials or workmanship.
If directed by your Authorized Terra by Trimble dealer, or if you are unable to contact a Terra by Trimble dealer, send the equipment to our factory:
Properly pack your equipment, we recommend using the original container and packing materials.
Include in the package a copy of the sales receipt or other evidence of date of original purchase and installation. If the equipment was a gift, provide a statement specifying the date received and installed. Also note your name, address, daytime telephone number, and a description of the defect.
Ship the equipment UPS or equivalent. You must prepay the shipping charges. Ship to:
Trimble
2105 Donley Dr.
Austin, TX 78758
(512) 432-0400 Phone (512) 836-9413 FAX
We will pay surface shipping charges to return the equipment to you.

What does your warranty not cover
Terra by Trimble equipment purchased “As New” from other than an Authorized Terra by Trimble Dealer or Distributor.
Malfunctions or failures resulting from the way the equipment was installed or from installation not in accordance with factory instructions.
Certificated Aircraft: Installation by other than an FAA Repair Station (USA), approved installation facility (non-USA) and/or without
— Appropriate air-worthiness approval(s) as required by governing aviation authority;
— Form 337;
— Logbook entry.
Experimental Category Aircraft: Installation without
— Appropriate air-worthiness approval(s) as required by governing aviation authority;
— Form, 8130-(x).
— Logbook entry.
Fuses and batteries.
Use of equipment for purposes other than those for which is was designed.
Accidental or deliberate damage, alterations of any kind, inadequate storage or maintenance.
Warranty repair by anyone other than Trimble or Terra by Trimble Authorized Dealer with factory approval.
For conditions not covered by this warranty, you will receive an estimate of costs before the repair is initiated. Repairs will be billed to you at the normal repair rates of the facility that performs the repairs.

Are there any other limitations or exclusions?
Any implied warranties are in effect only as long as this warranty is in effect.
This warranty does not cover incidental or consequential damage such as damage to other equipment or to your aircraft that results from defects covered by this warranty.
Some states do not allow limitations on how long an implied warranty lasts, or allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

How does state law relate to this warranty?
This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.