

**TERRA**  
BY TRIMBLE



# TRT 250D

## TRANSPONDER

### OPERATION/INSTALLATION MANUAL

Trimble  
2105 Donley  
Austin, Texas 78758  
(512) 432-0400

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## SECTION I

## 1. INTRODUCTION

## 1.1 SCOPE

This manual provides installation and operation instructions for the Terra by Trimble Model TRT 250D ATC Radar Transponder designed and manufactured by Trimble, Austin, Texas.

## 1.2 DESCRIPTION

The Terra by Trimble TRT 250D Transponder is designed for mounting in the instrument panel or radio panel of General Aviation aircraft and functions in the environment of the Air Traffic Control Radar Beacon System (ATCRBS). In response to interrogations from the ground based secondary radar transmitter, the TRT 250D is capable of replying with coded Mode A and/or Mode C transmissions that are received and processed at the Air Traffic Control Center. The aircraft's position relative to the airway route structure is displayed on the Air Traffic Controller's radarscope and, if the Center is equipped with ARTS-III computers, the aircraft's discrete assigned identification is also displayed. If the aircraft is equipped with an altitude/encoder, the aircraft Mode C altitude is also displayed in 100 foot increments on the ground radarscope.

The TRT 250D Transponder is entirely solid state in construction. It uses a small number of integrated circuits and one microprocessor to accomplish the many steps in the decode-encode process involved in detecting interrogations and generating the proper reply codes. Front panel controls permit selection of four-digit reply codes in response to ATC instructions, selection of OFF, ON, or ALTitude as well as automatic VFR squawk. In the ALT mode, the TRT 250D responds to interrogations for both identification and altitude replies; this is known as mode A/C. In the ON mode, only the identification is transmitted (mode A).

Because of its solid-state design, the TRT 250D begins operating immediately after being switched to ON or ALT. A "T" illuminates each time the unit replies to an interrogation. When the ID switch is depressed, it causes the unit to develop the SPIP (IDENT) pulse for a period of 20 seconds. The display is dimmed by a photocell to compensate for ambient light conditions.

The TEST switch initiates a complete internal interrogate/response cycle, performing a test of all circuits within the unit and verifying readiness for use. The "T" will come on if the unit is operating satisfactorily. This feature will verify the operational readiness of the unit prior to every flight.

## 1.3 SPECIFICATIONS

The following are pertinent specifications for the FCC type-accepted Terra by Trimble Model TRT 250D Transponder. The Terra by Trimble Model TRT 250D Transponder is approved by the Federal Aviation Administration under the Technical Standard Order (TSO)

### 1.3 SPECIFICATIONS (CONTINUED)

C74c of Part 37 of its Rules and Regulations. It may, therefore, be installed and operated in civil aircraft of United States registry and in aircraft of other countries that accept FAA TSO approval.

#### 1.3.1 MECHANICAL SPECIFICATIONS

Mounting:	Mounted in the avionics panel using the mounting tray or ATI-3 adapter as provided.
Overall Dimensions:	12.80" long, 3.125" wide, 1.625" high (32.512 cm long, 7.938 cm wide, 4.128 cm high).
Mounting Dimensions:	11.45" long, 3.125" wide, 1.625" high (29.083 cm long, 7.938 cm wide, 4.128 cm high).
Panel Cutout:	3.03" wide, 1.54" high (7.696 cm wide, 3.912 cm high).
Weight:	1.84 lb. (.835 kg.)
Connectors:	Antenna input/output; BNC Interconnect; 25 pin "D" type

#### 1.3.2 POWER REQUIREMENTS

The Terra by Trimble Model TRT 250D is designed for 11-33 volt DC input at .75 amps maximum load condition.

#### 1.3.3 ENVIRONMENTAL SPECIFICATIONS

##### Maximum Operating Conditions

Altitude: To 55,000 feet

##### Environmental

Category: DO-160A Env. Cat.  
A1F1/A/PKS/XXXXXX/BBBA

#### 1.3.4 ELECTRICAL SPECIFICATIONS

##### Frequency Range

Transmit: 1090 MHZ +3 MHZ

Receive: 1030 MHZ +3 MHZ

Sensitivity: -72 dBm nominal

Power Output: 200 watts nominal

#### 1.3.5 LIMITATIONS

The TRT 250D, when subjected to power interruptions below 9 V for less than 20 milliseconds, will blank the display and may give erroneous channeling. When this occurs it is necessary only to turn the TRT 250D off and then back on to reset the unit. After reset the operator must re-channel the correct code previously assigned by ATC.

## 1.4 EQUIPMENT SUPPLIED

The equipment supplied will depend upon the “system” you have ordered. The part numbers and descriptions listed below indicate the equipment supplied with the TRT 250D only. If a system other than those listed below was ordered, additional equipment will have been supplied and listed in another manual.

### 0990-5304-00 TRT 250D, Single System

1. 1 ea. Transponder, Terra by Trimble TRT 250D  
P/N 0900-0250-30
2. 1 ea. Mounting Tray, Single  
P/N 1900-0366-00
3. 1 ea. Antenna Kit, TRT 250D  
P/N 1901-0730-00
4. 1 ea. Installation Kit  
P/n 1901-2671-10
5. 1 ea. Operation/Installation Manual  
TRT 250D P/N 1910-0009-01
6. 1 ea. Warranty Card
7. 1 ea. FCC Form 404

### 0990-5314-00 TRT 250D, 3" System

1. 1 ea. Transponder, Terra by Trimble TRT 250D  
P/N 0900-0250-30
2. 1 ea. 3" Mod. Kit for TRT 250D  
P/N 1901-5312-00
3. 1 ea. Operation/Installation Manual  
TRT 250D P/N 1910-0009-01
4. 1 ea. Warranty Card
5. 1 ea. FCC Form 404

#### 1.4.1 OPTIONAL EQUIPMENT

Encoding Altimeter or Terra by Trimble AT 3000 Blind Encoder P/N 0900-4099-01

## 1.5 ADDITIONAL EQUIPMENT REQUIRED

1. Sufficient antenna cable to reach from the transponder to the antenna. The cable types and lengths which are permissible are listed in Figure 3-5, Note 2.
2. Connector for antenna end of the cable. Again, the permissible types are listed in Figure 3-5, Note 2.

## 1.6 LICENSE REQUIREMENTS

The owner of the aircraft in which the Terra by Trimble TRT 250D is installed is required by the FCC to hold an Aircraft Station License. This license may be obtained by filing an FCC Form 404. The transponder should be identified as CCX8G1TRT250 under Type Acceptance Number, frequency is 1090 MHZ and the power output at 200 watts peak. If a copy of the filed Form 404 is kept in the aircraft, the TRT 250D may be operated up to 30 days while awaiting the formal license. Although an Aircraft Radio Station License may currently be in effect, the FCC rules require that when a transponder is installed, the aircraft owner must apply for modification of his/her license.



## SECTION II

## 2. INSTALLATION

## 2.1 GENERAL

This section contains all necessary installation instructions and check-out procedures for the Terra by Trimble TRT 250D Transponder.

## 2.2 PREPARATION FOR USE

Every precaution has been taken to protect the TRT 250D during shipment. Upon receipt of the equipment, perform the following inspection:

1. Remove the unit from the shipping container and visually inspect for damage.
2. Check controls and switches to determine if they may have been damaged.
3. Make sure that all hardware and connectors listed in Section I, under "Equipment Supplied" are present.

If the unit is damaged, notify the carrier and file a claim. The carrier assumes title of the unit when accepted for shipment. DO NOT return the unit to Trimble or its representative until the carrier has authorized the claim. It is suggested that the package be retained for inspection by the carrier in the case of damage or for future use should it be necessary to ship the unit for service or to transfer to another location.

## 2.3 GENERAL INSTALLATION INSTRUCTIONS FOR AVIONICS

The following paragraphs contain pertinent hints, advice, and guidance intended for use by installers of avionics equipment. These have been drafted to address common problems encountered during the installation process. Specific questions may be addressed to Trimble for technical assistance by calling 1-800-487-4662 and requesting Technical Assistance.

## 2.3.1 COAXIAL CABLES AND CONNECTORS

Improper installation of coaxial cables and connectors create many of the problems encountered during avionics installations. Refer to Figure 3-4 for instructions about connecting coax cable to the BNC connector(s) mounted at the rear of Terra by Trimble mounting trays. Problems to avoid include twisted, chafed, or pinched cables, sharp bends in cables, open or shorted center conductors or shield braid, and improper grounding of shields. Also, proper termination of antenna coaxial cables at the antenna should be carefully checked. After installing connectors, pull firmly to ensure good mechanical bonding (particularly if you use crimp-on connectors) and use your ohmmeter to insure good electrical connection with no shorting. Be sure that coax lengths and types follow the avionics manufacturer's recommendations.

### 2.3.2 ANTENNAS

The three cardinal points for antenna installation are location, mounting and electrical characteristics.

#### Antenna Location:

Select a location that provides an adequate ground plane, a continuous unbroken surface of metal. Provide an area where shadowing of the antenna will not occur (e.g. blocking of the signal by other parts of the aircraft). Remember that at VHF frequencies and above, direct line of sight signals are required from ground stations to the antenna and vice-versa for maximum effective range. Consider that close proximity of an antenna to other antennas or noise sources may create interference problems. Read carefully and follow closely the recommendations of the avionics manufacturer about antenna location.

Serious problems are often encountered in aircraft which include composite materials or fabric surfaces and in many cases ground plane should be added if normal range is to be achieved.

#### Antenna Mounting:

Proper attachment of any antenna to the aircraft surface is of primary importance. Carefully clean all paint and corrosion off the mounting surface and apply an anti-corrosion treatment. Do the same to the inside surface if a backing or nut plate is to be used. Mount the antenna securely per the antenna manufacturer's recommendations and check carefully to insure good electrical bonding. Do not mount any antenna to doors, hatches, inspection plates or other moveable surfaces because proper bonding to the aircraft surface cannot be accomplished. After proper mounting and bonding is achieved, a bead of high quality RTV around the junction of the antenna base and the aircraft surface will prevent water seepage and corrosion between the antenna base and aircraft surface.

#### Antenna Electrical Characteristics:

Use the antenna supplied with the avionics equipment, or if not supplied, the antenna(s) recommended by the avionics manufacturer.

Simple antenna problems such as shorting or open circuit problems can be determined by use of an ohmmeter, although certain types of antennas may require use of ramp test equipment to check radiation. But, by far, the most common antenna problems are diagnosed to be coax or connectors, antenna bonding, or signal splitters. **Never paint an aircraft antenna.**

### 2.3.3 WIRING AND HARNESSING

Construct the installation wiring harness carefully from the avionics manufacturer's wiring diagram. Be extremely careful to note recommended wire sizes, the need for shielded wiring (if any), and decide upon any optional wiring to be included. Measure carefully and plan the harness layout to avoid interference of cable harness with existing avionics, instruments or controls.

Remove the connector plates from the rear of the trays. Connect all wires to the proper pin of each connector, checking as you go to insure that no loose strands cause shorting to adjacent pins or to ground surfaces. Be particularly careful with the shield braids of shielded wires. Do not expose any more of the conductor than is absolutely necessary and keep the braid connection as short as possible. Remember that on shielded wires only one ground point is recommended. Follow manufacturer's recommendation about where the ground point should be located. **After completing all connections, check wiring with an ohmmeter again to ascertain that all connections are as desired and that no undesired shorting to ground or other pins has occurred.** Visually double check to see that braids on shields are not creating shorting, that no insulator melting has occurred during soldering and pull firmly on all connections to insure good mechanical bond.

Install the harness and connectors/connector plates in the aircraft with very loose dress only.

Solder all connections to power and ground and install panel components/controls and safety devices (e.g. fuses or breakers). It is desirable at this point to insert all equipment in trays and perform preliminary check-out. Following a satisfactory check-out, and with all equipment in the properly installed location, complete the final dressing and routing of the harness and secure in place.

**Note:**

**It is extremely important that units should be installed in trays while final dress and bundling of the harness is accomplished to assure proper alignment of connectors between tray and unit. Failure to do this may cause problems when unit is initially inserted into tray due to misalignment of connectors!**

The final step is to perform a complete check of all avionics operations and insure that free movement of all cockpit controls is available.

The typical airframe is a small and imperfect platform for providing all of the antenna ground planes and power sources and inter-wiring required for avionics operations, particularly for a low noise and interference free expectation. This subject is far too broad and complex to address in detail in a few paragraphs. However, an approach to categorizing and defining the problem can be outlined.

Noise and/or interference are usually heard in the audio systems, although it may also be detected as an interference to indicator operation. Unless a strong suspicion of the exact source is suspected, it is best to begin a process of elimination, in the following order:

#### 2.3.4 NOISE AND INTERFERENCE

1. Power Source: Check for low voltage when the avionics load is applied. A high resistance battery cell in the A/C can cause numerous problems. View the avionics power line at the avionics master and at the affected unit for noise on the power line. If present, try to categorize the frequency (e.g. alternator whine, which may be caused by one or more bad alternator diodes, or if interference is present only when a communication unit is transmitting, etc.). If the noise is present or worse at the affected unit than at the avionics master, investigate the harness for noise coupling between wires. If necessary, disconnect the affected unit power from the aircraft power source and connect to an external power supply or battery.
2. Power Ground: View the power ground line at the avionics master and the affected unit. If noise is discerned at the master source, ground strapping may be corroded or partially broken. If only at unit, a larger wire size or wire re-routing may be required.
3. Interference: Both noise and interference may be either conducted or radiated, and in some cases electromagnetically coupled between units. If it is determined that the noise or interference is eliminated whenever another avionics unit is not transmitting, first investigate the radiated alternative. Insure complete and proper bonding of antennas to the aircraft surface, and check the coaxial cable and all shield connections and connectors. Review the manufacturer's recommendations for antenna separations. Be aware that antenna radiation directly to conductors at the rear of mounting trays or units may occur if shields are stripped too far back from the connector or are improperly grounded. Disconnecting the interfering antenna and substituting an external dummy load may assist diagnosis. Conducted interference usually occurs through paths which are shared by the avionics equipment such as power lines, ground points, audio equipment, or induced interference between adjacent wires or harnesses. Review the manufacturer's recommendations for shielded wiring and ground points, and for separation of specific wires. Measure ground points for a small but perceptible resistance to true ground and view power lines with an oscilloscope, turning each unit on and off to detect changes. Recheck common or adjacent connections to jacks, plugs, or shared equipment such as power converters, breakers, or audio panels.

#### 2.3.4 NOISE AND INTERFERENCE (Continued)

4. Compromise: In some cases noise or interference may be subdued but not eliminated. With the inefficient and imperfect platform provided by the aircraft for antennas and power source, etc, complete elimination of the problem may be very expensive or impossible (e.g. if there is simply not enough space to provide ground plane or antenna separation as recommended). Or, the aircraft strobe noise is audible but not objectionable, etc. These problems should be discussed early and thoroughly with the customer.

#### 2.3.5 SUMMARY

The paragraphs above are not intended to be highly technical, completely thorough, or extensive, but serve as a reminder for certain precautionary or follow-up procedures for general avionics installations. Trimble is prepared to assist at any point with additional information, hints, or literature. Simply call 1-800-487-4662 and ask for technical assistance.

## 2.4 INSTALLATION

Installation of any equipment in an aircraft requires that the work be performed by a Certificated Radio Repair Station with appropriate ratings. The installing agency must complete an FAA Form 337 and compute a new weight and balance for the aircraft for insertion in the Aircraft Flight Manual. Unless the mechanic is the designated inspector for a Certificated Radio Repair Station or holds an Inspection Authorization, the work is subject to inspection and approval of an FAA inspector.

The following items and suggestions should be considered prior to the installation of the Terra by Trimble TRT 250D Transponder:

1. Discuss the location of the transponder with the customer, preferably in a position that provides ease of operation. The location of the TRT 250D in relation to the pilots viewing angle is very important. Due to the small size of the TRT 250D, the vertical viewing angle for the display should not exceed 30 degrees.
2. Avoid installing the TRT 250D near heat sources. If unavoidable, insure that additional cooling is provided.
3. Insure that adequate clearance exists behind the panel for connectors and cable bends, and additional cooling if required.
4. Refer to Terra by Trimble TRT 250D outline drawings for panel cut-out details and mounting dimensions as well as pertinent notes.
5. Remove the transponder from the mounting tray and place the tray in the panel radio rack in the desired location. Make allowances for required spacing from other equipment, air circulation, and for the height of the transponder panel, which is greater than that of the mounting tray. Remove the tray and drill the angles (number 27 drill) along their centerline where intersected by the marks made from the tray.
6. All electrical connections, except for the antenna, are made through a single, 25 pin, D connector furnished as a part of the mounting hardware kit. If routing the wires from the transponder requires that they be bent in close proximity to the connector, individual wires must have  $^{\circ}$  inch minimum bend radius.

If the harness is bent as a unit, the bend radius should be a minimum of 1  $^{\circ}$  inches. The power input and power ground should be No. 20 AWG, all other interconnect wiring can be 24 AWG, of a type approved for use in aircraft installations.

ALTITUDE INPUTS (Pins 2-5, 9, 14-18) - Standard TTL input characteristics with 4.7 K OHM internal pull-up resistors and negative logic: i.e., low level (1 V or less) is recognized as a "1" (not diode isolated).

SWITCHED POWER (Pins 8, 20) - May be used to power encoder if total current drain is less than 0.4 ampere. The TRT 250D is compatible with all currently manufactured aircraft encoding altimeters utilizing gray code. The encoding altimeter manufacturer designates the connector pin numbers for his equipment's control lines (A2, A1, D2 etc).

## 2.4 INSTALLATION (Continued)

**EXTERNAL SUPPRESSION IN (Pin 6)** - Accepts standard (ARINC) suppression pulses from DME. Interference may be noted when the transponder is turned on with the DME tuned to certain frequencies. Though such interference is rare, a suppression circuit is included in the TRT 250D. When connected to the DME suppression output, this circuit will suppress the transponder at appropriate times to eliminate the interference. Input characteristics of the DME suppression circuit are in accordance with ARINC standards.

**POWER INPUT (Pin 7, 19)** - 11-33 VDC. A circuit breaker or fuse not greater than 2-ampere must be installed between the aircraft's electrical buss and the TRT 250D. Do not connect other equipment to the same circuit protector. The circuit protector must be labeled.

**GROUND (Pins 11,21)** - Power Ground. Do not rely upon the mechanical attachment of the mounting tray for an electrical ground. It is necessary that a ground wire be installed on the connector. The other end must be properly bonded to the aircraft structure.

7. Install the tray in the rack using 6-32 flat head screws, flat washers, lock washers and hex nuts. Alternately, flat washers and AN 365-6 nuts may be used.
8. If using the 3" mounting kit, the transponder unit is mounted behind the instrument panel. The unit is screw mounted in place through the front of the panel using the 3 1/8" round hole. The unit can also be front mounted in an ATI-3 hole with the use of a mooring plate.

**CAUTION:** If additional hardware is to be installed determine that it will not interfere with the installation of the TRT 250D in the tray. Slip the TRT 250D into place and lock it by turning the recessed Allen head screw to the right. Do not over-tighten. The TRT 250D is removed from the instrument panel in the following manner: loosen the Allen head screw and slide the unit out of its mounting tray. This removal also disconnects the power, encoding altimeter, and antenna connections. Replacement is accomplished in the reverse manner.

## 2.5 ANTENNA INSTALLATION

The antenna should be mounted on the underside of the aircraft as far removed from the DME and ADF antennas as possible, keeping the cable length between the TRT 250D and the antenna as short as possible to minimize signal losses. The antenna should be clear of antenna masts, landing gear doors, and other major protrusions that could alter its radiation pattern or present a major obstruction between it and the ground-radar antenna. The antenna must be mounted so that its polarization axis (vertical) lies within an angle of 15 degrees from the true vertical in level flight altitude.

The antenna lead should be routed separately from any other antenna leads or electrical wires or cables, particularly those associated with the ADF.

## 2.5 ANTENNA INSTALLATION (Continued)

**CAUTION:** Before drilling any mounting hole for the antenna, determine that there is adequate clearance inside the fuselage for the antenna and its cable connector.

**NOTE:** To protect the aircraft skin from damage, install a 2 inch square or circular doubler of the same thickness as the aircraft skin on the inside of the aircraft skin. Attach with rivets of type and quantity as required by current FAA regulations.

To ensure that a good electrical connection exists between the antenna and the skin of the aircraft, all paint or protective coatings should be removed from the aircraft skin prior to installation of the antenna and the doubler. The doubler should not be painted before installation. Tighten the nut securely to insure that the lock washer completes the electrical connection between the antenna assembly and the aircraft skin.

The antenna cable is critical if the requirements under which the unit was TSO approved are to be maintained. Permissible types of connectors and cable types are listed in Figure 3-5. See Figure 3-4 for coax connector instructions as necessary. Because of the high frequencies at which the transponder operates, antenna-cable losses can materially affect the overall performance of the system if an excessively long cable or a cable of the wrong type is used.

**NOTE:** It is crucial to make the antenna lead a maximum of 9 feet, unless using RG8 A/U or equivalent.

## 2.6 OPERATIONAL CHECK-OUT

1. Rotate function/power knob in a clockwise manner to turn the unit on. Selections are OFF, ON, and ALT.
2. Rotate "Code Selector" knob to obtain the desired code in the right-hand window. Verify that the faster the knob is rotated, the faster the code changes with each detent. Verify that when the Test switch is depressed and held for three seconds, a complete receive, decode, encode, and transmit cycle is checked. A "T" indicator is confirmation of a valid test.
3. Press the "<—>" (TRANSFER) button and verify that the two codes "swap" sides in the display.

## 2.7 FINAL INSPECTION

1. Insure that all wiring is properly routed and secure. Dress harnessing neatly and secure in place with cable ties. Check connector integrity and locking devices. Insure locking devices are functioning properly and are secured. Verify cabling is not "clotheslined" and provisions have been made for service loops. Pull yoke to its maximum travel. While slowly returning yoke to its normal position, rotate yoke left and right to insure all cabling is routed and tied up properly. Cycle rudder pedals and verify that they are free and cables are unobstructed. Install gust locks; perform complete check-out of all avionics including dimmers. Secure aircraft power and all master switches.



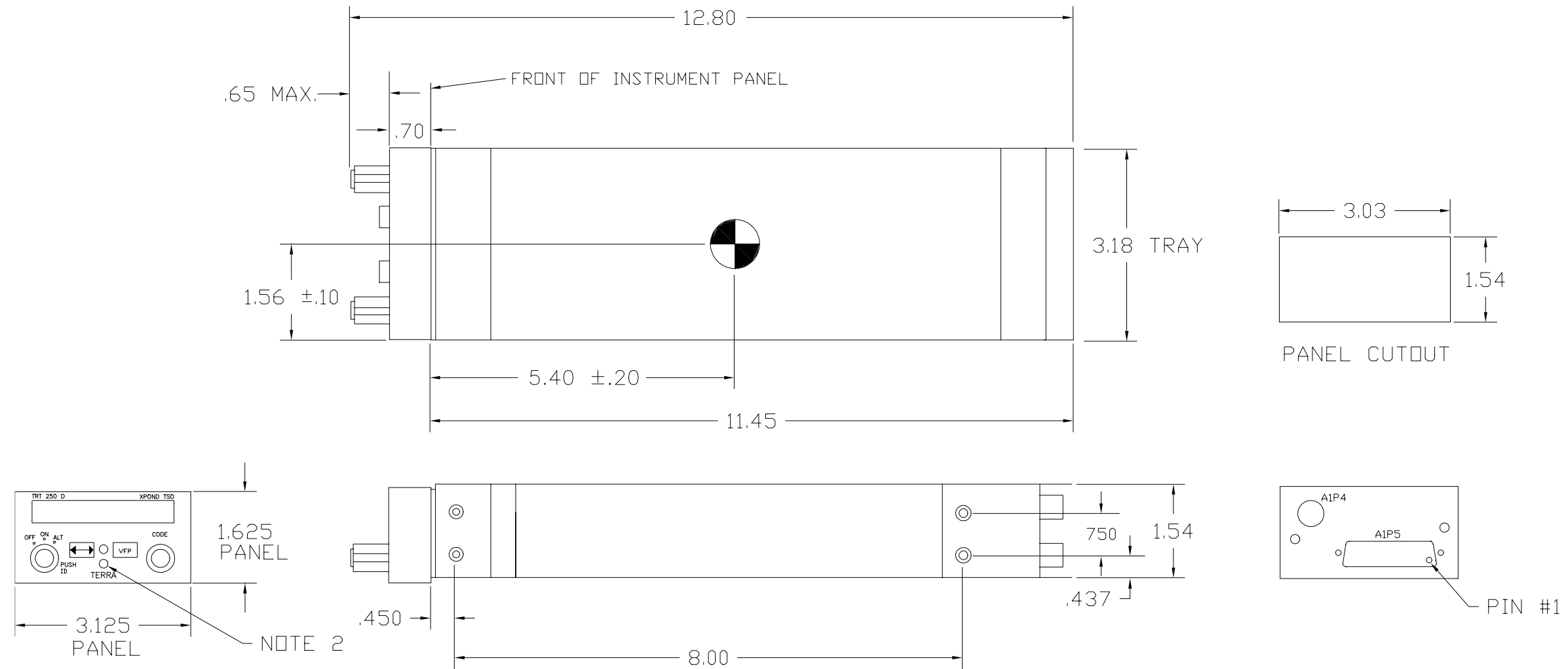
2.7 FINAL INSPECTION (Continued)

2. Have installation inspected by someone authorized under Federal Aviation Regulation Part 65.
3. Add the Terra by Trimble TRT 250D to the aircraft equipment list, including serial number. Complete FAA Form 337 and make required airframe logbook entries. A weight and balance change will be required.
4. Complete FCC Form 404 as required and file. The Type Acceptance Number for the application is CCX8GITRT250.
5. Complete warranty card and return to Trimble.
6. A correspondence check is also required to insure the altimeter, encoder, and transponder are generating the same data. See current FARS for required compliance.

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SECTION III

3 . INSTALLATION DRAWINGS



NOTE:  
 1.) WEIGHT WITH TRAY-2.45 LBS.  
 2.) LOCK SCREW USES 7/64" HEX KEY.

Figure 3-1  
Outline Dimensions



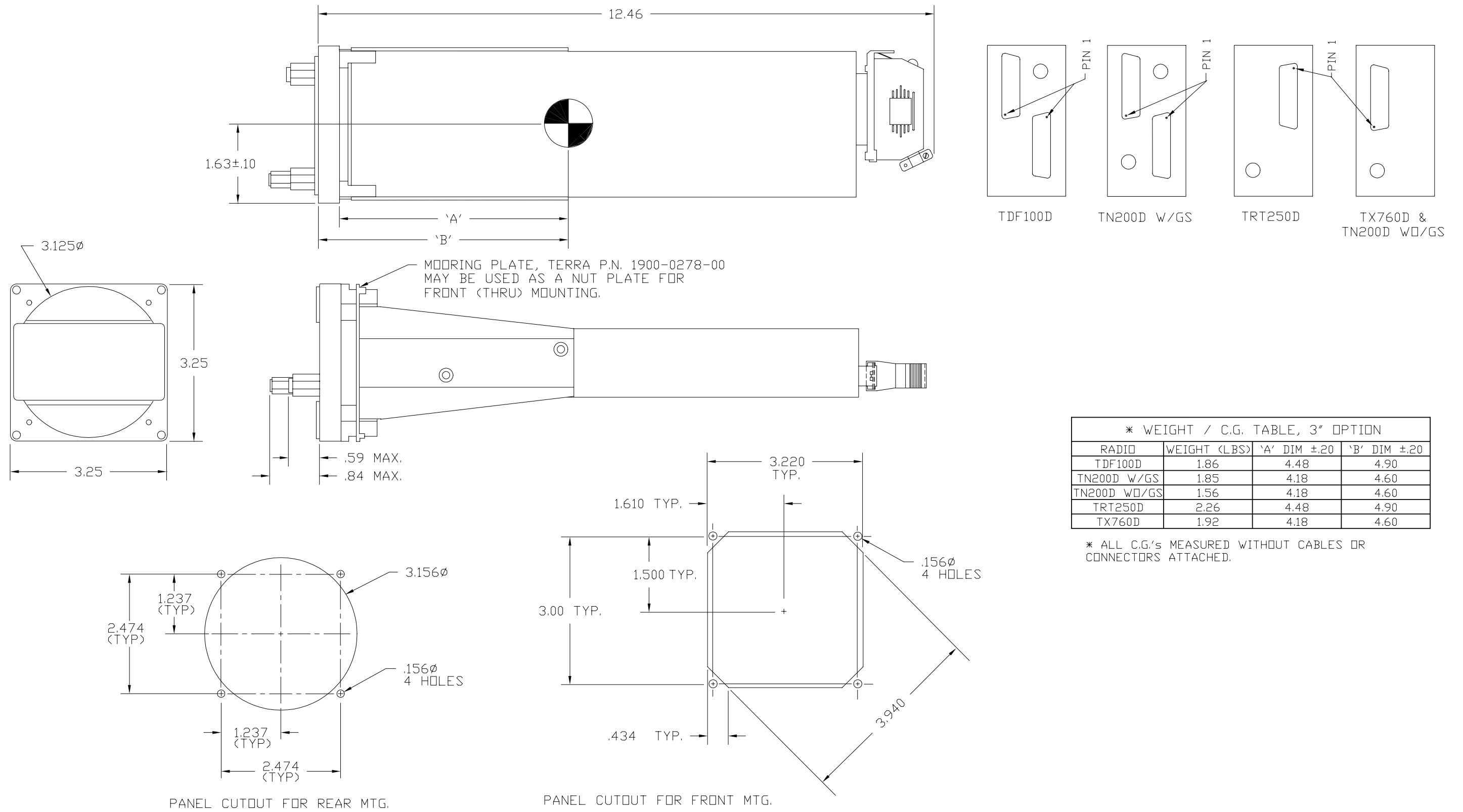
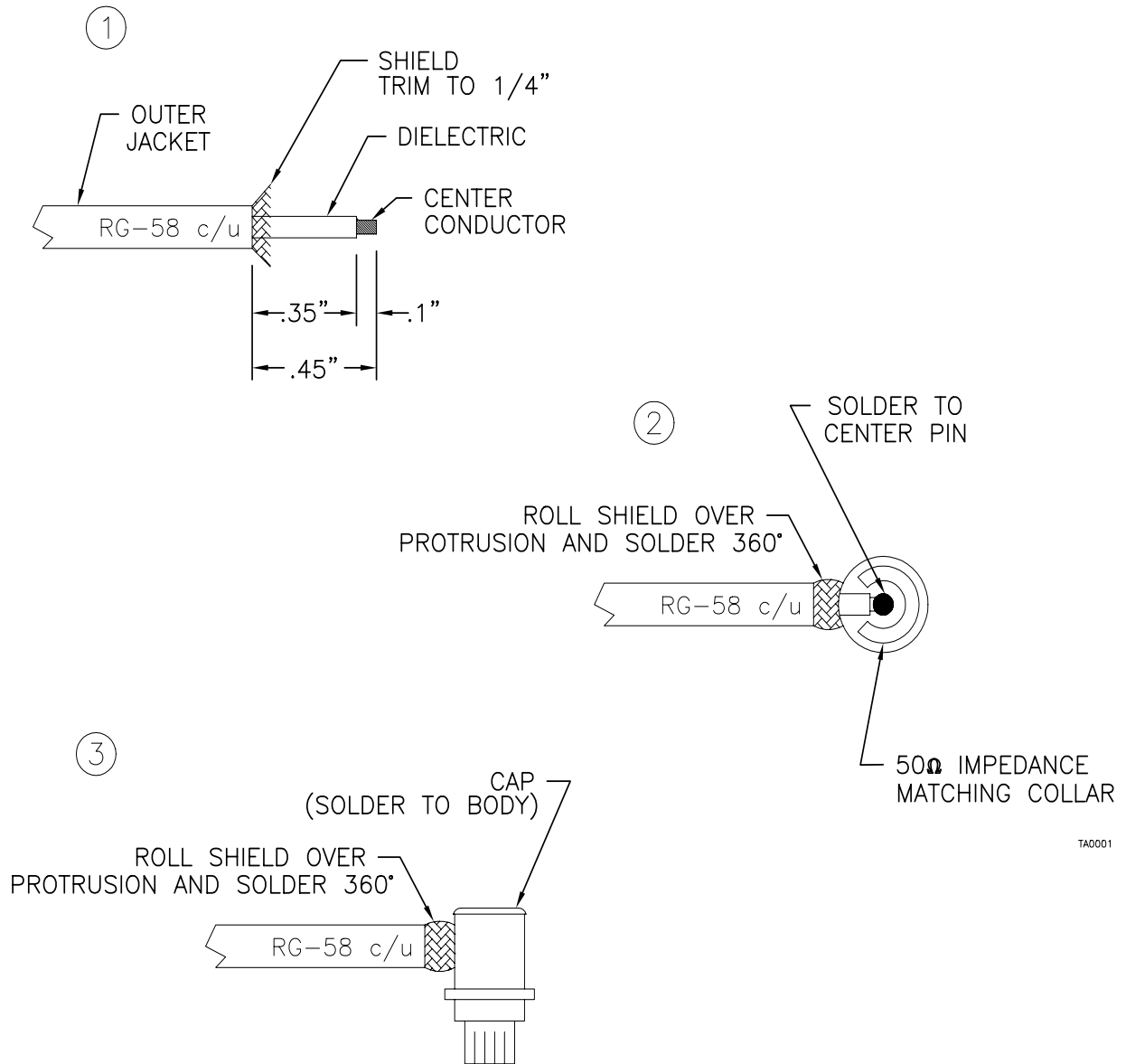


Figure 3-3  
Outline Dimensions

RF CONNECTOR: TRIMBLE PART NUMBER 9-2122-151-00

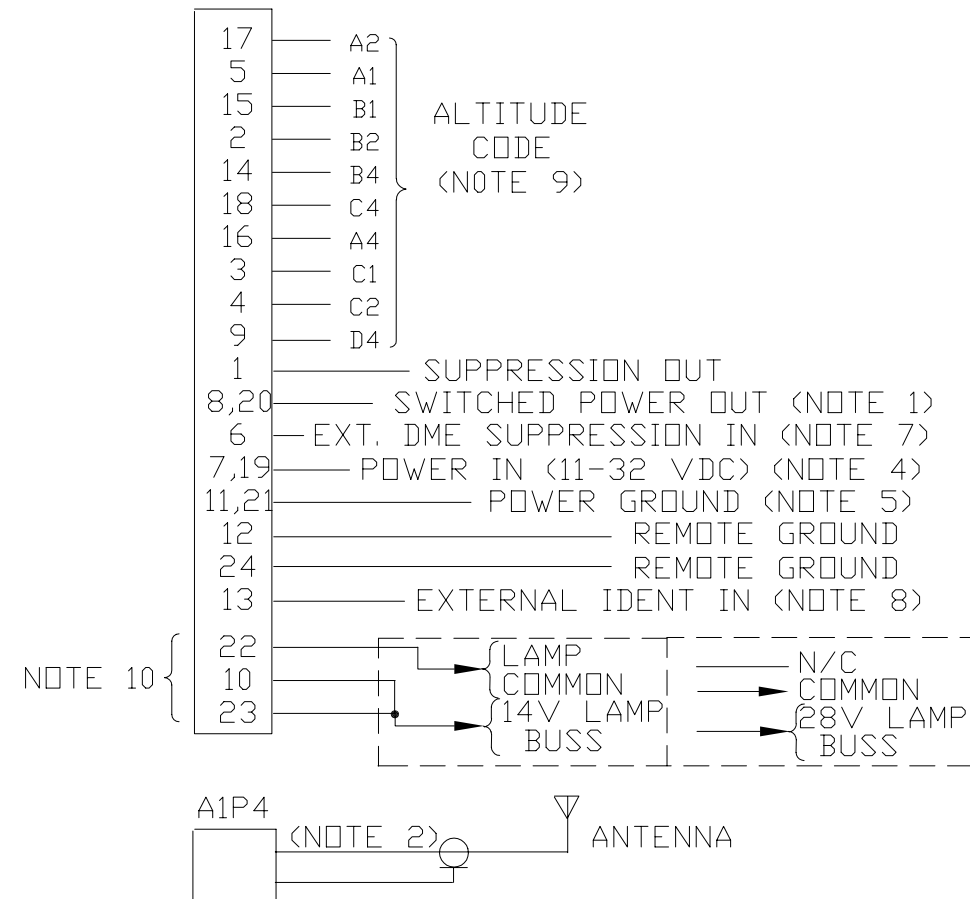


TA0001

Figure 3-4  
Coax Connector Instructions

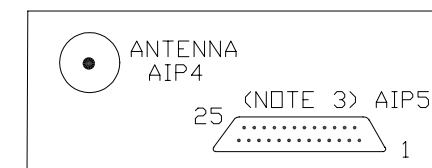
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(NOTE 3)  
TRT250  
TRANSPONDER  
AIP5

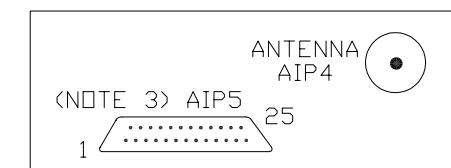


NOTES:

1. .5 AMPS
2. SELECT 1 EACH TYPE CABLE AND CONNECTOR FROM THOSE LISTED  
CABLE LENGTHS:  
RG-58A/U 9FT. MAX.  
RG-8A/U 17FT. MAX.
- CONNECTORS:  
RG-88A/U: UG-88C,UG-88D,UG-88E, AMPHENOL 31-320,31-357,36775  
RG-8A/U: UG-959, AMPHENOL 6775
3. CONNECTOR - 25 PIN "D" TYPE (ITT CANNON TYPE DB-25S OR EQUIVALENT)
4. PINS 7,19 MUST BOTH BE CONNECTED THROUGH A COMMON 2 AMP CIRCUIT BREAKER
5. PINS 11,21 MUST BOTH BE GROUNDED
6. WIRE SIZE: 20 AWG FOR POWER INPUT AND POWER GROUND  
24 AWG FOR ALL OTHERS
7. MUST BE CONNECTED TO APPROPRIATE PIN ON DME IF USED, OTHERWISE NO CONNECTIONS ARE MADE
8. USE ONLY MOMENTARY SWITCH TO GROUND TO ENABLE IDENT. FUNCTION
9. IF TWO OR MORE DEVICES ARE TIED TO THE ENCODER, DIODE ISOLATION FOR EACH UNIT MUST BE UTILIZED. SEE FIGURE "A"
10. PINS 10,22,& 23 ARE NOT CONNECTED FOR TRT250D



REAR OF TRT250  
AND TRAY



FRONT VIEW OF TRAY

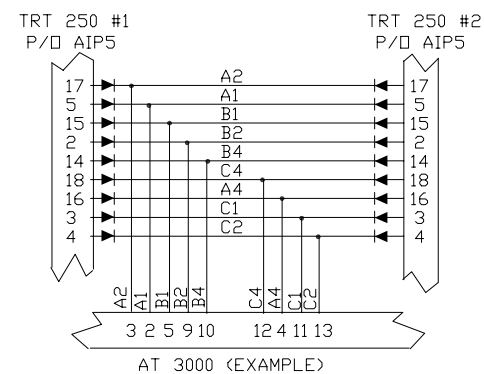


FIGURE "A"  
(NOTE 9)

Figure 3-5  
Interconnect Drawing



## SECTION IV

## 4. OPERATION

## 4.1 SCOPE

This section is to instruct the owner/operator in the proper use and care of their new Terra by Trimble TRT 250D Transponder with a Mod level of 2 or below. If your TRT 250D is a Mod level 3 or above use section 4A for operation instructions.

## 4.2 OPERATION

**NOTE:** See Figure 4-1 for locations and descriptions of Front Panel Controls.

The TRT 250D Transponder is designed to operate in the environment of the Air Traffic Control Radar Beacon System (ATCRBS). The secondary radar system interrogates transponders such as the TRT 250D. They in turn reply with discrete coded signals that can identify the aircraft from all others in the same area if the ground facility has ARTS-III equipment installed. Additionally, if an encoding device is installed in the aircraft, the air traffic controller is supplied with the altitude of the aircraft on his radarscope along with the primary position and identification information.

The TRT 250D is useful to pilots, though they may not be instrument rated, in that it permits the center to identify their aircraft and furnish radar advisories on conflicting traffic. There is a proliferation of Class B Airspace around the United States and it is necessary that all aircraft entering these areas be equipped with radar transponders. Transponders are also required in Class C Airspace. For the instrument pilot, the need for a radar transponder is as great as the instrument rating itself. Few flights operate under Instrument Flight Rules without a functioning transponder. It eliminates the need for identifying turns as the aircraft is immediately identified by its discrete code or by response to "IDENT" from the controller.

**CAUTION:** Insure your new TRT 250D is turned off until after engine start-up procedures are completed. This simple precaution will greatly improve the lifetime of all of your avionics as well as the TRT 250D.

## 4.3 SQUAWK MODE

The function control should not be turned to ON or ALT while the aircraft is on the ground before take-off except when performing a ramp check. Such operation will produce confusing returns on the radarscope if the radar transponder is within range of the radar.

The function control should be turned to ON after take-off clearance has been received. To turn the power on, turn the function control knob (located on the left hand side) in a clockwise direction. If an encoding device is installed, the function control should be turned to ALT after take-off clearance is received.

#### 4.3 SQUAWK MODE (Continued)

Left to right, the following will be displayed in the window:

8888T 8888

After 5 seconds the display will revert to:

1200 0000

Enter your desired code by turning the code knob on the right-hand side. The faster the knob is turned the faster the code changes for each detent.

After the desired code is obtained, simply press the <—> (TRANSFER) button to move the code into the left-hand or “active” window.

**NOTE:** Upon power down or power interruption, the TRT 250D will reset the codes to 1200 and 0000. If this situation occurs, you must reset the code previously assigned by ATC.

#### 4.4 NORMAL OPERATION

If the flight is to be conducted under Visual Flight Rules, select code 1200 with the Code selector switch or the VFR button. If the aircraft climbs to 10,000 feet MSL or above, current FAR/AIM procedures should be utilized. If the flight is to be conducted under Instrument Flight Rules, the code will be assigned by ATC in the clearance delivery. As the flight progresses, ATC will assign different codes which are then selected by the pilot.

Care should be taken in selecting codes so that codes 0000, 7777, or 7700 are never momentarily transferred to the active (left) window while changing from one assigned code to another. 7700 is the emergency or distress code.

The “T” indicator comes on each time the TRT 250D replies to a ground-radar interrogation, indicating to the pilot that he is being “seen” on the radarscope.

On occasion, the controller will request “IDENT”. The correct response is to depress and then release the ID button (left hand knob). This starts a timer that runs for 15-30 seconds. During this period, the SPIP pulse is added to the normal reply information and produces a “bloom” at a point on the radarscope corresponding to the position of the aircraft.

If the aircraft is equipped with an encoder and you are using the ALT position, the controller may request “stop altitude squawk” indicating that he does not desire to see the altitude information. The function selector should then be turned from ALT to ON until requested to “squawk altitude”.

#### 4.4 NORMAL OPERATION (Continued)

There are two occasions when the TEST switch (right hand knob) is used. First, it is advisable to turn the TRT 250D unit to ON briefly during a ramp check and depress the TEST switch. The “T” indicator should come on indicating that the unit is operational. The second occasion will occur when the “T” indicator has not come on for sometime. Depressing the TEST switch determines whether the unit is or is not functioning. Periodically, the aircraft will be out of range of radar. Depressing the TEST switch and obtaining verification that the unit is working can be very reassuring.

#### 4.5 CODE TRANSFER

As previously described in Section 4.3, simply pressing this button will “swap” codes between active and standby windows.

#### 4.6 TO CHOOSE VFR MODE

Depress the VFR button and the code displayed in the standby window automatically is changed to 1200. Use the transfer button to bring 1200 to the active window.

#### 4.7 EMERGENCY OPERATION

In the event of an actual emergency, consult the FAR/AIM manual for codes to be utilized.

#### 4.8 FAILURE MODE OPERATION

In the unlikely event of complete sudden display failure, the following procedure can be used:

Turn the unit power OFF. Wait 5 seconds then turn unit power back ON. The left hand side of the display will automatically revert to 1200, the right hand side will be 0000. By turning the code selector slowly one click at a time and pausing between each click, the desired standby code can be obtained by “counting clicks”. Then simply press the <—> button to transfer the code to the active window.

## SECTION IV(A)

### 4A. OPERATION

#### 4.1A SCOPE

This section is to instruct the owner/operator in the proper use and care of their new Terra by Trimble TRT 250D Transponder with a Mod level 3 or above.

#### 4.2A OPERATION

**NOTE:** See Figure 4-1 for locations and descriptions of Front Panel Controls.

The TRT 250D Transponder is designed to operate in the environment of the Air Traffic Control Radar Beacon System (ATCRBS). The secondary radar system interrogates transponders such as the TRT 250D. They in turn reply with discrete coded signals that can identify the aircraft from all others in the same area if the ground facility has ARTS-III equipment installed. Additionally, if an encoding device is installed in the aircraft, the air traffic controller is supplied with the altitude of the aircraft on his radarscope along with the primary position and identification information.

The TRT 250D is useful to pilots, though they may not be instrument rated, in that it permits the center to identify their aircraft and furnish radar advisories on conflicting traffic. There is a proliferation of Class B Airspace around the United States and it is necessary that all aircraft entering these areas be equipped with radar transponders. Transponders are also required in Class C Airspace. For the instrument pilot, the need for a radar transponder is as great as the instrument rating itself. Few flights operate under Instrument Flight Rules without a functioning transponder. It eliminates the need for identifying turns as the aircraft is immediately identified by its discrete code or by response to "IDENT" from the controller.

**CAUTION:** Insure your new TRT 250D is turned off until after engine start-up procedures are completed. This simple precaution will greatly improve the lifetime of all of your avionics as well as the TRT 250D.

#### 4.3A SQUAWK MODE

The function control should not be turned to ON or ALT while the aircraft is on the ground before take-off except when performing a ramp check. Such operation will produce confusing returns on the radarscope if the radar transponder is within range of the radar.

The function control should be turned to ON after take-off clearance has been received. To turn the power on, turn the function control knob (located on the left hand side) in a clockwise direction. If an encoding device is installed, the function control should be turned to ALT after take-off clearance is received.

#### 4.3A SQUAWK MODE (Continued)

Left to right, the following will be displayed in the window:

8888T 8888

After 5 seconds the display will revert to:

*ZZZZ*      *XXXX*

*ZZZZ* represents the VFR code that is programmed into the VFR memory. *XXXX* is the code that was in the active window when the unit was powered down.

Enter your desired code by one of the following methods:

1) The code can be selected by simply turning the code knob on the right-hand side. The faster the knob is turned the faster the code changes for each detent. However, if the knob is turned too fast, a “debounce” routine in the software will ignore the input.

2) The second method is to press and release the code knob; the left hand digit in the standby window will start to flash. Then the code knob can be turned to increase or decrease the value of that digit. Pressing the code knob again will cause the second digit from the left to blink. This digit can now be selected. Digits can be passed over by simply pressing the knob without changing the digit. When the code is correct simply press the knob until all digits are not blinking, let the blinking stop, or transfer the code to the active window.

After the desired code is obtained, press the <—> (TRANSFER) button to move the code into the left-hand or “active” window.

**NOTE:** Upon power down or power interruption, the TRT 250D will reset the codes to *ZZZZ* and *XXXX*. If this occurs, press the transfer (<—>) button to transfer the code previously assigned by ATC.

#### 4.4A NORMAL OPERATION

If the flight is to be conducted under Visual Flight Rules, select code 1200 with the Code selector switch or the VFR button. NOTE: The VFR Code can be user programmed as described in Section 4.6A. If the aircraft climbs to 10,000 feet MSL or above, current FAR/ AIM procedures should be utilized. If the flight is to be conducted under Instrument Flight Rules, the code will be assigned by ATC in the clearance delivery. As the flight progresses, ATC will assign different codes which are then selected by the pilot.

Care should be taken in selecting codes so that emergency or distress codes are never momentarily transferred to the active (left) window while changing from one assigned code to another.

The “T” indicator comes on each time the TRT 250D replies to a ground-radar interrogation, indicating to the pilot that he is being “seen” on the radarscope.

#### 4.4A NORMAL OPERATION (Continued)

On occasion, the controller will request “IDENT”. The correct response is to depress and then release the ID button (left hand knob). This starts a timer that runs for 15-30 seconds. During this period, the SPIP pulse is added to the normal reply information and produces a “bloom” at a point on the radarscope corresponding to the position of the aircraft.

If the aircraft is equipped with an encoder and you are using the ALT position, the controller may request “stop altitude squawk” indicating that he does not desire to see the altitude information. The function selector should then be turned from ALT to ON until requested to “squawk altitude”.

There are two occasions when the TEST switch (right hand knob) is used. First, it is advisable to turn the TRT 250D unit to ON briefly during a ramp check and depress the TEST switch for at least three seconds. The “T” indicator should come on indicating that the unit is operational. The second occasion will occur when the “T” indicator has not come on for sometime. Depressing the TEST switch, for at least three seconds, determines whether the unit is or is not functioning. Periodically, the aircraft will be out of range of radar. Depressing the TEST switch and obtaining verification that the unit is working can be very reassuring.

#### 4.5A CODE TRANSFER

As previously described in Section 4.3A, simply pressing this button will “swap” codes between active and standby windows.

#### 4.6A TO CHOOSE VFR MODE

Depress the VFR button and the code displayed in the standby window automatically is changed to 1200 or a user programmed VFR code. To program the VFR code, press and hold the VFR button. Using either method of tuning described above in section 4.3A, select the code desired for VFR. Release the VFR button and the code is programmed into memory as the VFR Code. Use the transfer button to bring the VFR code to the active window.

#### 4.7A EMERGENCY OPERATION

In the event of an actual emergency, consult the FAR/AIM manual for codes to be utilized.

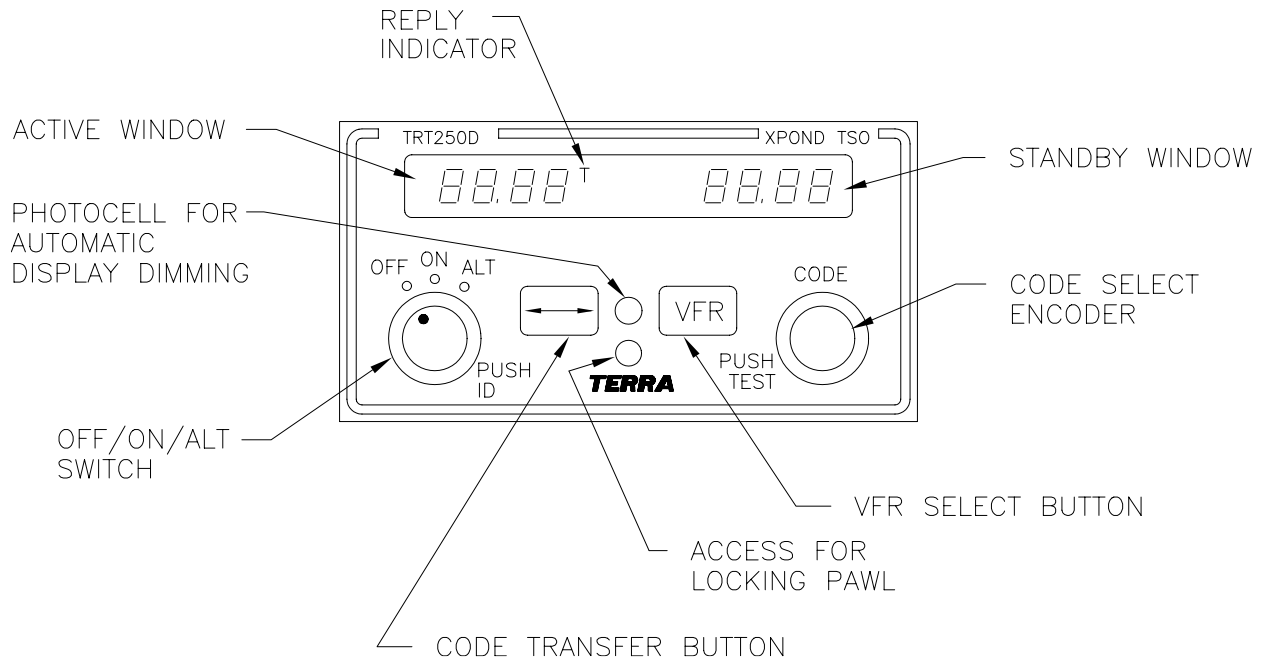


Figure 4-1  
Front Panel Controls

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## 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.

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