

TERRA
BY TRIMBLE



TN 200D

NAVIGATIONAL RECEIVER

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 TN 200D Navigational Receiver manufactured by Trimble of Austin, Texas.

1.2 DESCRIPTION

The Terra by Trimble TN 200D is a small, lightweight, all solid state navigational receiver available with and without a glideslope receiver. The digital frequency synthesizer provides 200 channels with 50 KHz spacing from 108.00 to 117.95 MHz. The receiver provides VOR/LOC information to navigational converters while the glideslope receiver completes the ILS capability and supplies remote DME channeling.

The TN 200D features microprocessor controlled frequency synthesizers that employ phase lock loop circuits to generate local oscillator frequencies. Other features include a user programmable 10 location memory, active and standby frequencies displayed on a planar gas discharge display, an Ident-voice switch to filter station Ident from receiver audio and a rotary frequency selector.

The receiver can be mounted in three different configurations: in a single tray, in a double tray or in a 3" ATI hole using the 3" adapter. With tray mounted units, all power and control connections are made to a 15 pin "D" type connector installed in the rear of the mounting tray. A standard BNC male chassis connector is supplied on the tray for antenna connections. For the 3" option a locking, hooded, 15 pin "D" type connector and standard BNC male connector are used respectively for power/control and antenna interfacing. The TN 200D is secured by means of a positive locking cam, accessible through the front panel. The 3" option is mounted with a minimum of 3 screws through the instrument panel.

Weighing only 1.14 lb. (.517 kg) without the glideslope option and 1.43 lb (.649 kg) with glideslope, the TN 200D measures 11.450" long, 3.125" wide and 1.625" high (29.083 cm x 7.938 cm x 4.128 cm). Panel cutout is a mere 3.03" x 1.54" (7.70 cm x 3.91 cm) and the overall length of the unit is only 12.80" (32.50 cm) including the mounting tray.

Pulling only 300 mA of current without the glideslope receiver and 600 mA with the glideslope option, the TN 200D operates at 13.75 VDC. Operation at 27.5 VDC is possible by utilizing an optional Terra by Trimble MLC 28-5 power converter P/N 0900-3219-12. The TN 200D is designed to work with standard aircraft auxiliary audio amp systems as per wiring diagram, or a high impedance headset.

1.3 SPECIFICATIONS

The following are pertinent specifications for the FCC type accepted Terra by Trimble TN 200D Navigational Receiver.

1.3.1 MECHANICAL

Mounting:	Panel mounted using mounting tray or 3" adapter as provided
Overall Dimensions:	12.80" long, 3.125" wide, 1.625" high (32.50 cm long, 7.938 cm wide, 4.128 cm high)
Mounting Dimensions:	11.450" behind panel, 3.125" wide, 1.625" high (29.083 cm behind panel, 7.938 cm wide, 4.128 cm high)
Panel Cutout:	3.03" x 1.54" (7.70cm x 3.91 cm)
Weight:	1.14 lbs (.52 kg) without G.S., 1.43 lbs (.649 kg) with G.S.
Connectors:	Antenna input; BNC Interconnect cable; 15 pin "D" type

1.3.2 POWER REQUIREMENTS

The Terra by Trimble TN 200D navigational receiver requires 13.75 VDC input +10%, -20% at 0.6 amps under maximum load conditions.

1.3.3 ENVIRONMENTAL SPECIFICATIONS

Maximum Operating Conditions

Altitude:	To 30,000 ft (9,150 meters)
Humidity:	To 95% at 50oC (122oF)
Operating Temperature Range:	-20oC (-4oF) to +55oC (+131oF)
Vibration:	0.5 G from 5 to 500 Hz

1.3.4 ELECTRICAL SPECIFICATIONS

VOR/LOC Receiver

Frequency Range:	108.00 to 117.95 MHz, 200 channels in 50 KHz steps
Sensitivity:	1.0uV for 6dB S+N/N ratio
Selectivity:	Typically 6dB at ± 17 KHz and 50dB at ± 50 KHz

VOR/LOC Composite In LOC mode factory preset to .18Vrms for Terra by Trimble TRI NAV/C Indicator

Audio Output: 100mW into a 500 ohm load

1.3 SPECIFICATIONS (CONTINUED)

Glideslope Receiver

Frequency Range: 329.150 to 335.00 MHz, 40 channels in 150 KHz steps
Sensitivity: 20uV hard
DME Channeling: 2 x 5 code

External Glideslope Meter

Loading

Capabilities: Flag - 1K ohm load Up/down - 1K ohm load

Note:

For TN200D units with G.S. serial numbers below 1100 the internal load may be removed to drive two 1 K loads (two TRI NAV's).

1.4 EQUIPMENT SUPPLIED

The equipment supplied will depend upon the "system" you have ordered. The part numbers and description listed below indicate the equipment supplied with each "system".

0990-5300-00 TN 200D with G.S. Single System

1. 1ea Nav Receiver with G.S. Terra by Trimble TN 200D
P/N 1900-0350-00
2. 1ea Mounting Tray, Single
P/N 1900-0357-00
3. 1ea Installation Kit
TN 200D P/N 1901-2671-10
4. 1ea Operation/Installation Manual
P/N 1910-0007-01
5. 1ea Warranty Card

0990-5301-00 TN 200D without G.S. Single System

1. 1ea Nav Receiver without G.S. Terra by Trimble TN 200D
P/N 1900-0350-10
2. 1ea Mounting Tray, Single
P/N 1900-0357-10
3. 1ea Installation Kit
P/N 1901-2671-10
4. 1ea Operation/Installation Manual
TN 200D P/N 1910-0007-01
5. 1ea Warranty Card

1.4 EQUIPMENT SUPPLIED

0990-5316-00 TN 200D with G.S. 3" System

1. 1ea Nav Receiver with G.S. Terra by Trimble TN 200D
P/N 1900-0350-00
2. 1ea Mod Kit TN 200D with G.S.
P/N 1901-5312-20
3. 1ea Operation/Installation Manual
TN 200D P/N 1910-0007-01
4. 1ea Warranty Card

0990-5317-00 TN 200D without G.S. 3" System

1. 1ea Nav Receiver without G.S. Terra by Trimble TN 200D
P/N 1900-0350-10
2. 1ea Mod Kit TN 200D without G.S.
P/N 1901-5312-30
3. 1ea Operation/Installation Manual
TN 200D P/N 1910-0007-01
4. 1ea Warranty Card

1.4.1 OPTIONAL EQUIPMENT

Voltage converter 27.50 to 13.75 V Model MLC 28-5, Terra by Trimble P/N 0900-3219-12.

1.5 ADDITIONAL EQUIPMENT REQUIRED

1. Sufficient RG 58A/U 50 ohm coaxial antenna cable to reach from the receiver to the antenna. BNC coaxial fittings as required for the particular installation.
2. MIL 22759 or equivalent wire sufficient to make the harness.
3. Circuit breaker rated at 3 amps.
4. 50 ohm navigational antenna rated at top speed of aircraft.

1.6 LICENSE REQUIREMENTS

Not applicable

SECTION II

2. INSTALLATION

2.1 GENERAL

This section contains all necessary installation instructions and checkout procedures for the Terra by Trimble TN 200D Navigational Receiver.

2.2 PREPARATION FOR USE

Every precaution has been taken to protect the TN 200D during shipment. Upon receipt of the equipment, perform the following inspections:

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, a claim must be filed with the carrier. The carrier assumes title of the unit when it accepts it for shipment. Do not return it to Trimble or its representatives.

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 it 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 3-1 for guidance of typical BNC connector assembly. Refer to Figure 3-2 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:

Provide an area where shadowing of the antenna will not occur (eg. 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 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 antenna manufacturer about antenna location.

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 from forming 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. If no specific antenna is recommended, choose an antenna which provides good service for the frequency range and the service conditions of the aircraft (eg. speed, altitude, etc.). If a signal splitter is to be used, compare the specifications carefully to the application. Many installation problems are encountered with improper application of signal splitters! If in doubt, test the power and frequency characteristics of the splitter on the bench to be sure.

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 allow an aircraft antenna to be painted.**

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 the 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. We recommend tubing be placed over each soldered pin connection to prevent wire strands from touching adjacent connections. 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 (eg. 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.

2.3.4 NOISE AND INTERFERENCE

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.

2.3.3 NOISE AND INTERFERENCE (CONTINUED)

Noise and/or interference is 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:

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 (eg. 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.
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

2.3.3 WIRING AND HARNESSING (CONTINUED)

elimination of the problem may be very expensive or impossible (eg. 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 or the holder of an Inspection Authorization.

The following items and suggestions should be considered prior to installation of your Terra by Trimble TN 200D Navigational Receiver.

1. Discuss the location of this receiver with your customer, preferably in a position that provides ease of operation.
2. Avoid installing the TN 200D near heat sources. If unavoidable, insure additional cooling is provided.
3. Insure that adequate clearance exists behind the panel for sleeve, connectors, and additional cooling if required. A minimum of 14.00" (35.56 cm) is recommended.
4. Refer to Terra by Trimble TN 200D Outline Drawings for panel cut-out details and mounting dimensions as well as pertinent notes.
5. Install the sleeve assembly in the instrument panel. Insure compliance with standards set forth in the FAA Aircraft Inspection and Repair Document AC 43.13-2A.

Note:

Insure that the sleeve is installed with the large opening toward the top.

6. The 15 pin "D" connector assembly supplied with the Terra by Trimble TN 200D must be wired correctly to the aircraft avionics systems or severe damage may result to the Terra by Trimble TN 200D or other systems. The interconnecting wiring for the 15 pin "D" connector is shown in Figure 3-6 (without glideslope) and Figure 3-7 (with glideslope). Comply with standards set forth in FAA Aircraft Inspection and Repair Document AC 43.13-1A Section 7 and other pertinent FAR's as required. Insure MIL-SPEC wire is utilized for all interconnects.

2.4 INSTALLATION (CONTINUED)

CAUTION: The operating voltage of this Terra by Trimble TN 200D is 13.75 V nominal for direct connection to an aircraft 12-14 volt electrical system. If the aircraft electrical system supply is 24-28 volt, it will be necessary to employ a converter to reduce the 28 volts to 13.75 volts for the Terra by Trimble TN 200D. Terra by Trimble can supply an optional converter specifically designed for this purpose. It is Terra by Trimble P/N 0900-3219-12, Model MLC 28-5.

7. Install the TN 200D in the mounting tray assembly. Use caution as the rear connectors mate. After the float mounts are positioned correctly (a little twisting at the front panel may be necessary), the unit will fully engage the connectors with light to medium pressure on the front panel.

CAUTION: DO NOT PUSH UNIT INTO TRAY WITH THUMBS ON LENS AS DISPLAY DAMAGE MAY RESULT!

Insert a 7/64" Allen wrench in the front panel hole and engage the locking screw. Turn clockwise until the cam has engaged itself in the tray and is moderately tightened. Use caution to prevent stripping the threads on the locking cam or screw. To remove the unit from the mounting tray, insert the 7/64" Allen wrench in the locking screw and turn counterclockwise. The cam will move the unit outward about 1/4" and disengage the connectors. The unit may now be pulled out of the mounting tray by hand.

8. The connector bracket is mounted from the front side of the sleeve with two Phillips head screws and lock washers. As viewed from the front of the unit, pin 1 of the connector is top right and pin 15 is bottom left.

2.5 ANTENNA INSTALLATION

A 50 ohm horizontally polarized navigational antenna is recommended. Insure tested speed of the antenna matches top speed of the aircraft. Connect the antenna to the Terra by Trimble TN 200D using standard 50 ohm coaxial cable such as RG 58A/U. Terminate the cable with BNC coaxial connectors as required. Ohm out the coax to insure no shorts are present. Select a location providing a clear line of sight and symmetrical to the centerline of the aircraft. Insure proper bonding of the antenna to the aircraft.

2.6 OPERATIONAL CHECKOUT

1. Rotate OFF/ON/VOLUME/IDENT (left side) knob clockwise past the detent to turn receiver on. This will also supply power to the indicator if it is connected to switched power out.
2. Rotate TUNE (right side) knob to obtain the desired frequency in the right hand window. Verify that the faster the knob is rotated the more the frequency changes with each detent.
3. Press the "<—>" (TRANSFER) button and verify that the two frequencies "swap" sides in the display.
4. Rotate the ON/OFF/VOLUME/IDENT knob clockwise and verify white noise on the audio out. If a VOR station is within range, verify that whenever the left knob is depressed the ident is eliminated from the audio output and with the knob pulled out all the received audio is applied to the audio output.

2.7 FINAL INSPECTION

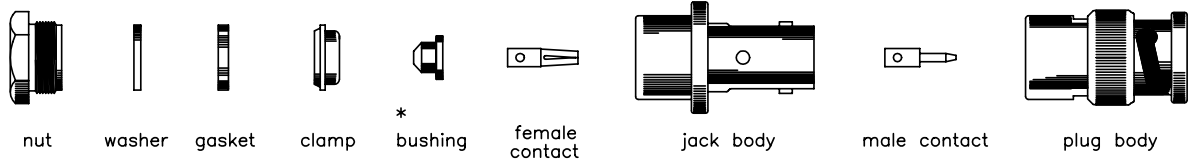
1. Insure that all wiring is properly routed and secure. Dress harnessing neatly and secure in place with cable ties. Check connector integrity and locking devices. Insure locking devices are functioning properly and are secured. Verify cabling is not “clotheslined” and provisions have been made for 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 checkout of all avionics including dimmers. Secure aircraft power and all master switches.
2. Have installation inspected by someone authorized under Federal Aviation Regulation Part 65.
3. Add the Terra by Trimble TN 200D to the aircraft equipment list, including serial number. Complete FAA Form 337 if required, and make required airframe logbook entries. A weight and balance change may be required, depending on the type of aircraft.
4. Complete warranty card and return to Trimble.

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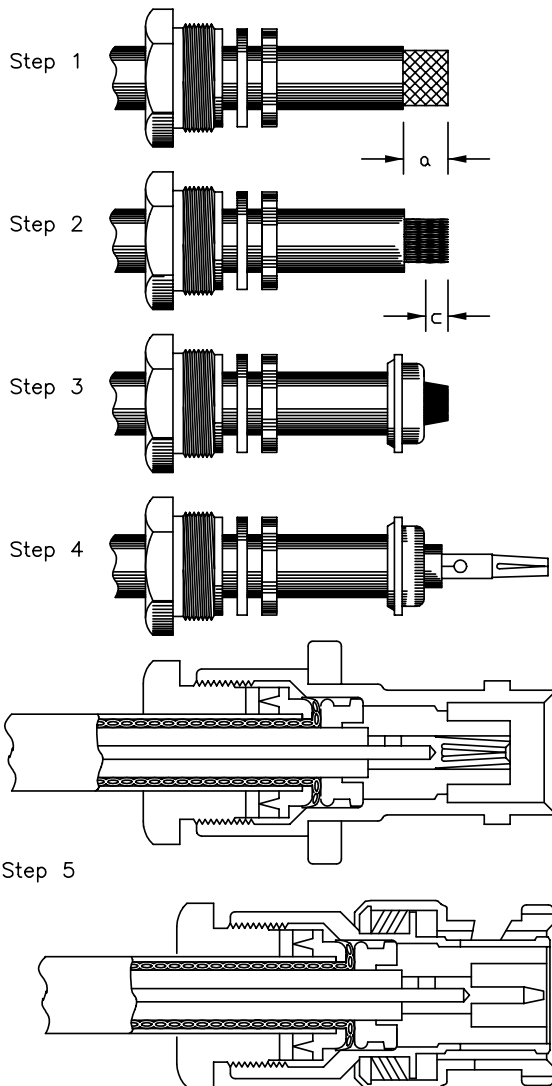
SECTION III

3. INSTALLATION DRAWINGS

CLAMP TYPES



* This part is used only with RG-62 cable



Amphenol Number	Connector Type	Cable RG-/U	Stripping Dims. Inches (Millimeters)	
			a	c
31-2	BNC Plug	58	.312(7.9)	.094(2.4)
31-202			.250(6.4)	.094(2.4)
31-204	BNC Angle Plug	55,58,141,142,223,400	.281(7.1)	.109(2.8)
31-205	BNC Jack	55,58,141,142,223,400	.297(7.5)	.109(2.8)
31-206	BNC Bulkhead Jack			
31-207	BNC Bulkhead Jack	59,62,140,210		
31-212	BNC Plug	59,62	.250(6.4)	.094(2.4)
31-215	BNC Jack	59,62,140,210	.297(7.5)	.109(2.8)
31-71003	75 OHM BNC Plug	59,62,140,210	.250(6.4)	.156(4.0)
6775-75	75 OHM BNC Plug	11	.490(12.4)	.200(5.1)
8575	BNC Angle Plug	59,62,140,210	.297(7.5)	.094(2.4)
84975	BNC Plug	122,B8218	.281(7.1)	.172(4.4)
86225	BNC Angle Plug	59,62,140,210	.281(7.1)	.141(3.6)

Step 1 Place nut, washer and gasket over cable and strip to dimension 'a' shown in table above.

Step 2 Comb out braid and fold out. Trim insulation off center conductor to dimension 'c' shown in table above. [For RG-62, 71 and 210/U cable, trim an additional .032" (0.8mm) of insulation off center conductor and add bushing.] Tin center conductor.

Step 3 Pull braid wires forward and taper toward center conductor. Place clamp over braid and push back against cable jacket.

Step 4 Fold back braid wires as shown, trim to proper length [.125" (3.2mm) long] ▲ and form over clamp as shown. Solder contact to center conductor.

Step 5 Insert cable and parts into connector body. Make sure sharp edge of clamp seats properly in gasket. Tighten nut.

▲ for 6775-75, trim braid to be .290" (7.4mm) long; for 31-71003, trim braid to be .219" (5.5mm) long.

Figure 3-1
Coax Connector Instructions

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1. Cut Outer Jacket Back 0.5"
2. Comb Shield Back and Separate into 2 Pigtails.
3. Cut Dielectric and Center Conductor 0.26" From Shield
4. Trim off Dielectric Exposing 0.1" of Center Conductor.
5. Solder Exposed Center Conductor to Center Pin of Connector.
6. Snap Slotted Cover over Dielectric.(Large Slot Fits Over Dielectric)
7. Fold Shield Pigtails Forward Around Connector and Solder to Body.
Caution: Use Extreme Care While Soldering Shield to Support Coax.
High Temperatures Will Cause the Dielectric to Melt, Shorting the Center Conductor Against the Connector Body.
8. Connector: Terra Part Number 9-2131-107-00

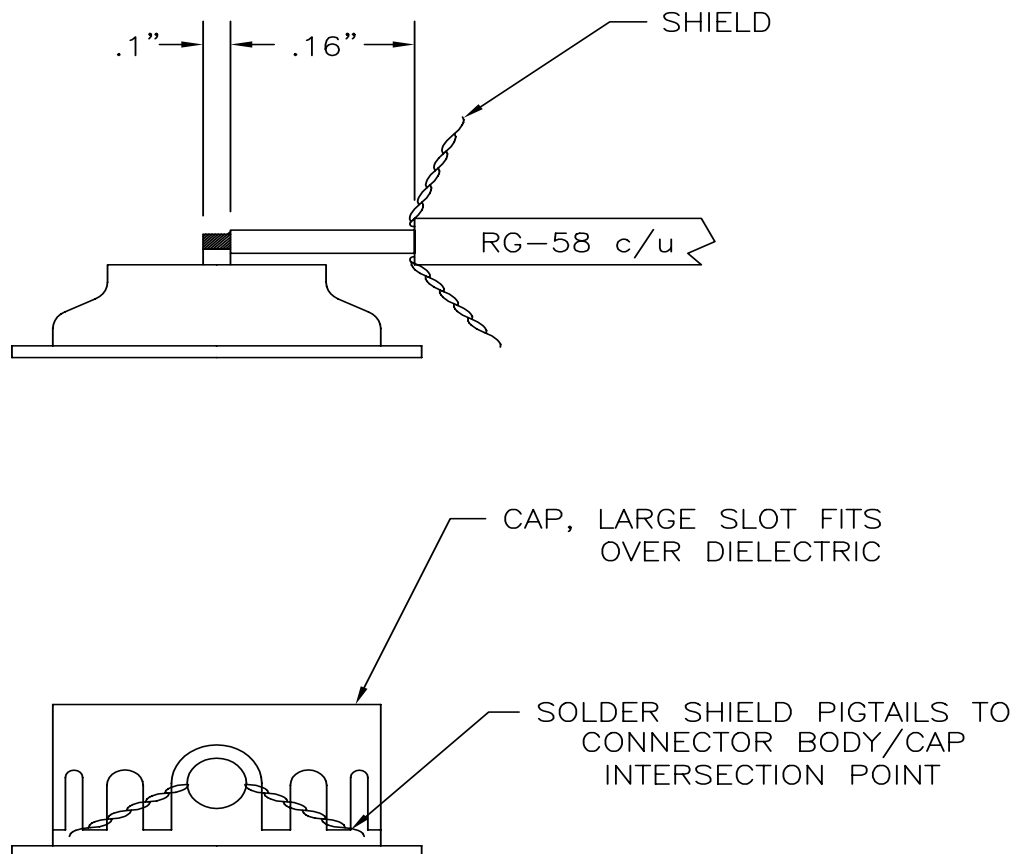
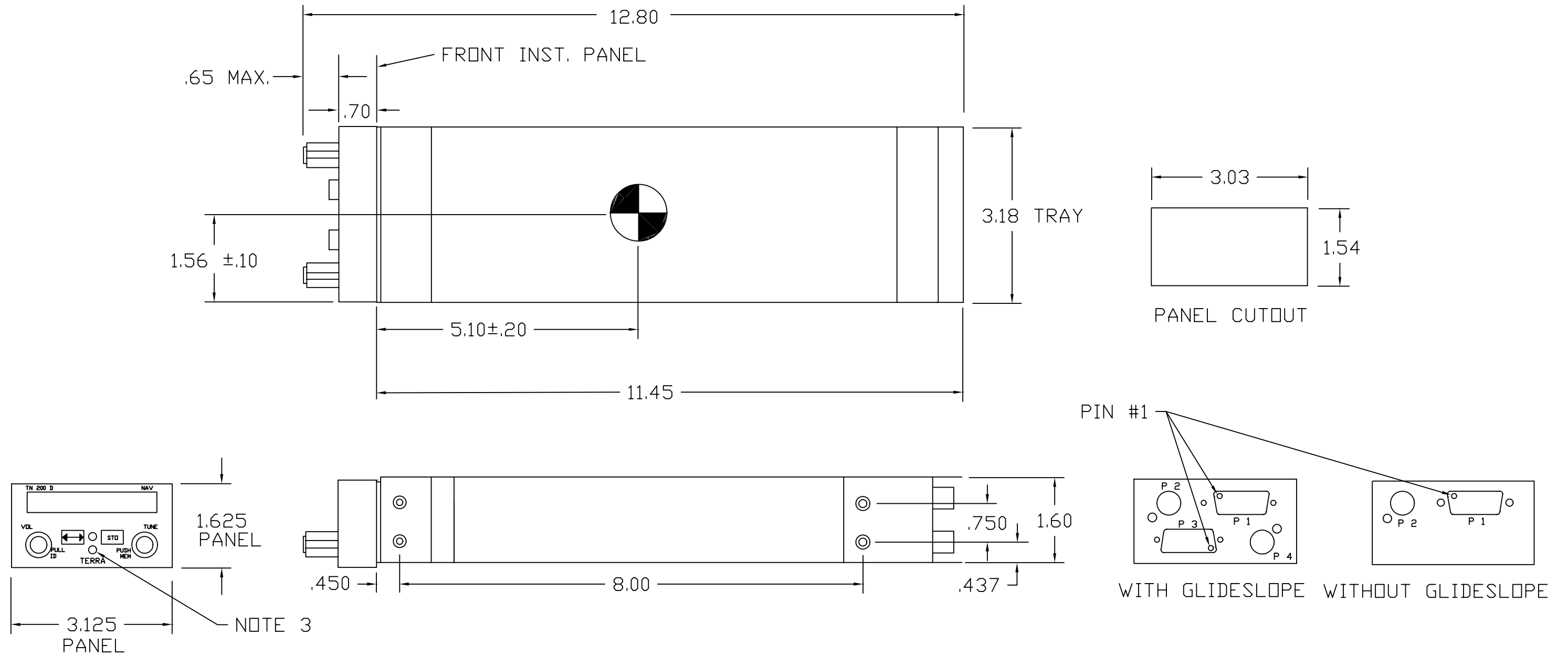


Figure 3-2
Coax Connector Instructions

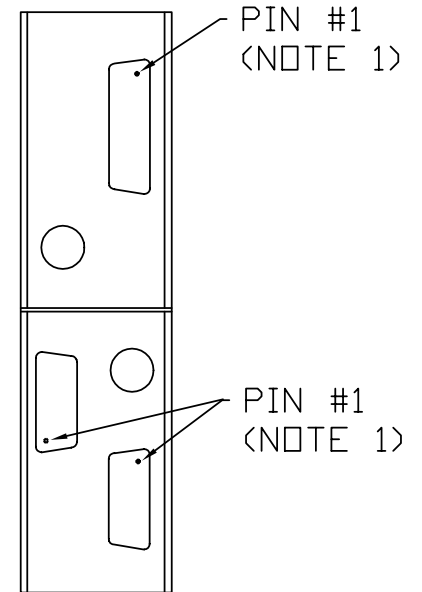
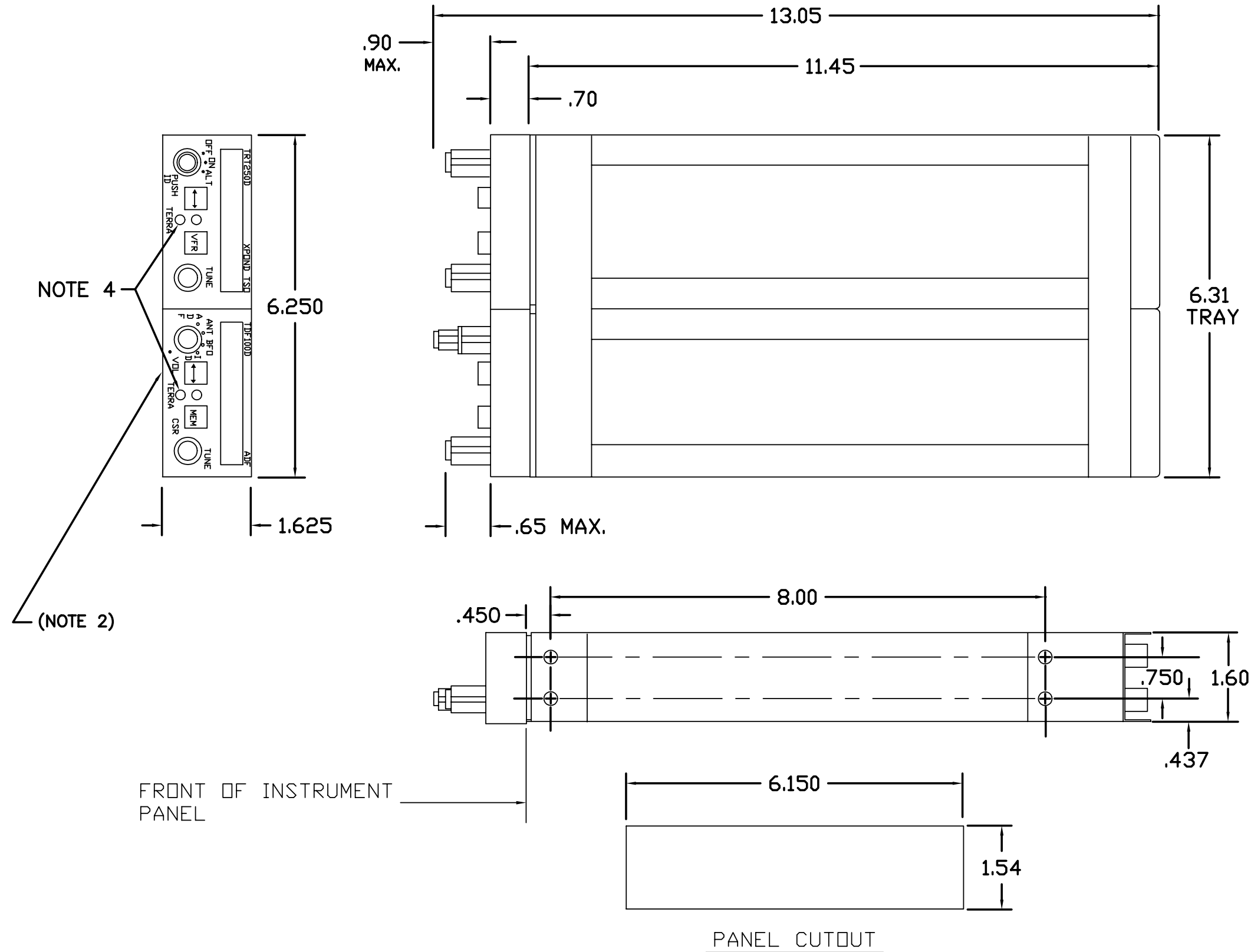
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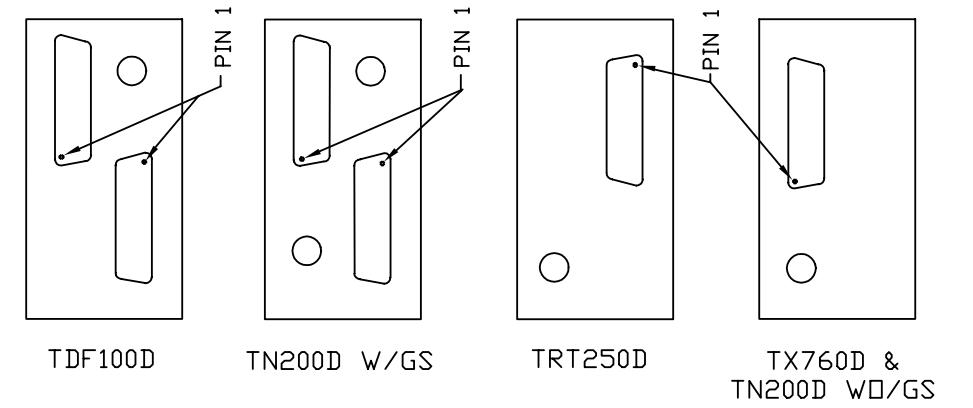
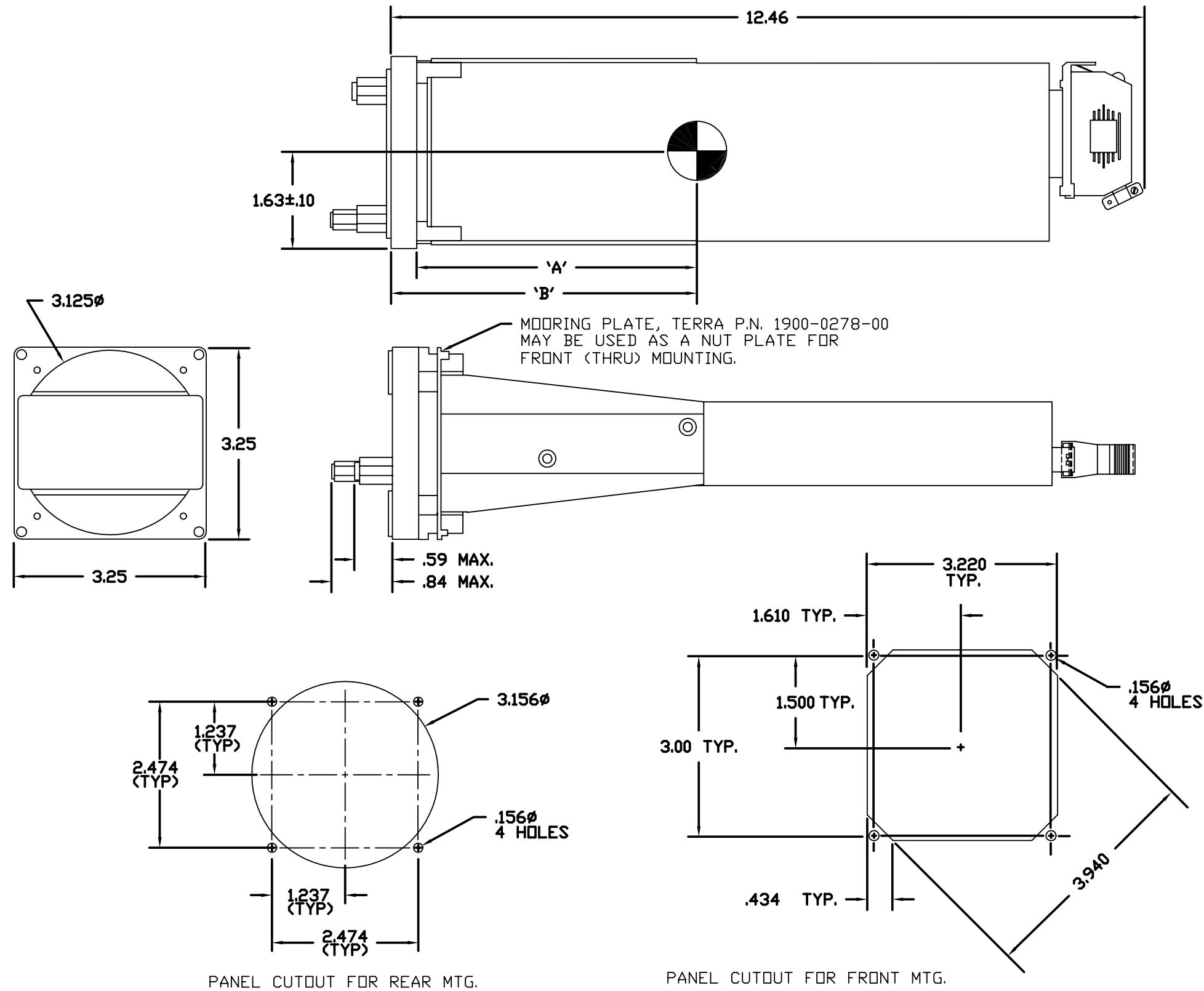
- 1.) WEIGHT W/GS & WITH TRAY - 2.04 LBS.
- 2.) WEIGHT WD/GS & WITH TRAY - 1.75 LBS.
- 3.) LOCK SCREW USES 7/64" HEX KEY.

Figure 3-3
TN 200D Outline Dimensions



- NOTES:**
1. SEE MANUALS FOR INDIVIDUAL RADIOS TO DETERMINE PIN & CONNECTOR LOCATIONS. DRAWING SHOWS ONLY ONE OF MANY POSSIBLE COMBINATIONS.
 2. FRONT PANEL VIEWS SHOW ONLY ONE OF MANY POSSIBLE COMBINATIONS, SEE MANUALS FOR INDIVIDUAL RADIOS.
 3. CENTER OF GRAVITY SHOULD BE DETERMINED BY REFERING TO MANUALS FOR INDIVIDUAL RADIOS.
 4. LOCK SCREW USES 7/64" HEX KEY.

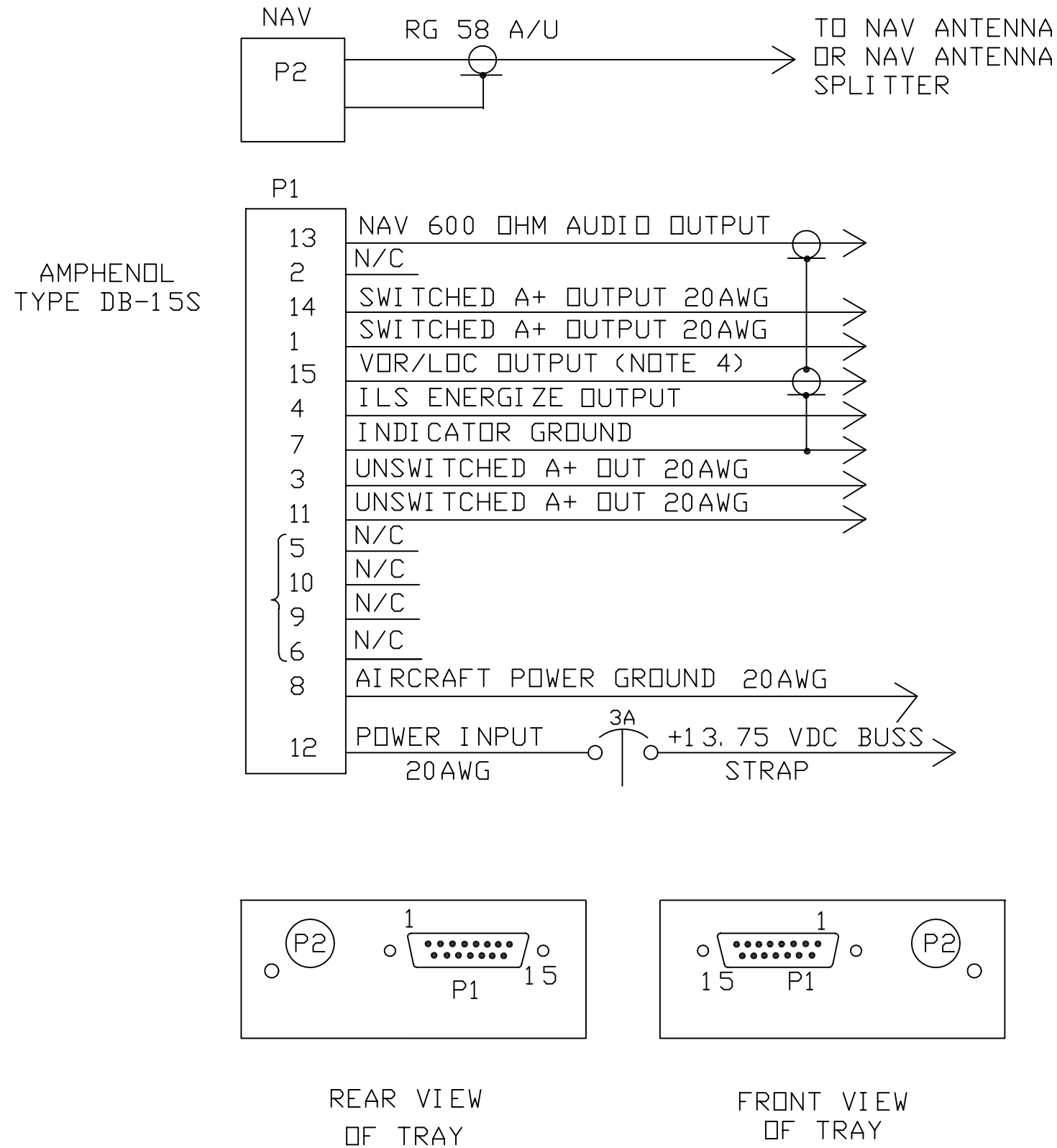
Figure 3-4
Typical Outline Drawing, Dual Tray



* WEIGHT / C.G. TABLE, 3" OPTION			
RADIO	WEIGHT (LBS)	'A' DIM ±.20	'B' DIM ±.20
TDF100D	1.86	4.48	4.90
TN200D W/GS	1.85	4.18	4.60
TN200D WD/GS	1.56	4.18	4.60
TRT250D	2.26	4.48	4.90
TX760D	1.92	4.18	4.60

* ALL C.G.'s MEASURED WITHOUT CABLES OR CONNECTORS ATTACHED.

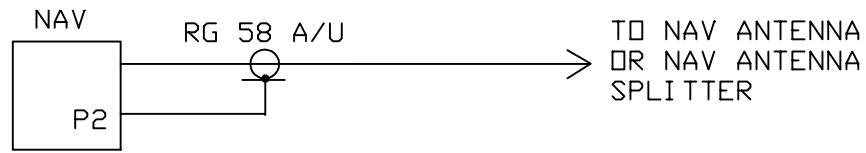
Figure 3-5
Outline Drawing, 3" Option



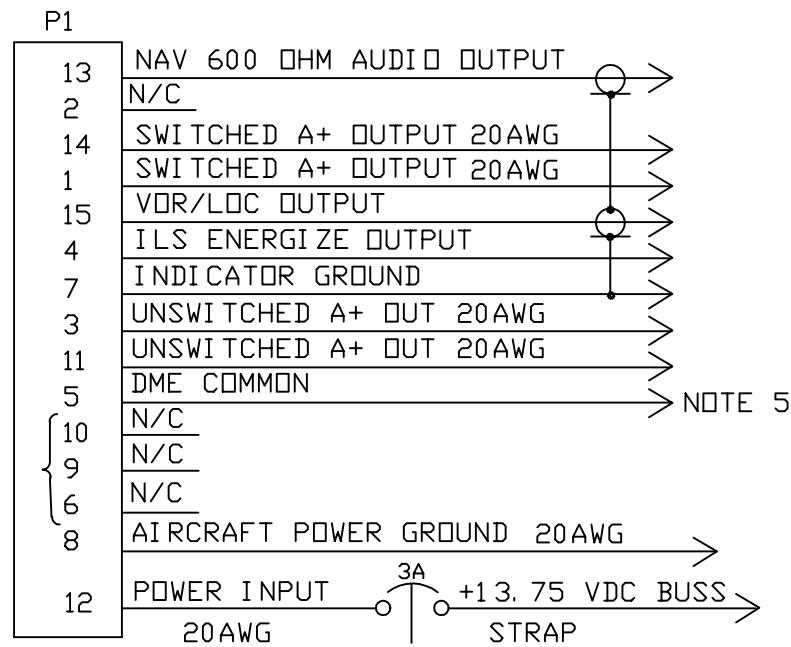
NOTES:

1. UNLESS OTHERWISE SPECIFIED, USE AWG #22 WIRE.
2. UTILIZE MIL 22759/16 WIRE OR EQUIVALENT.
3. ALLOW FOR SERVICE LOOP AS REQUIRED.
4. VOR/LOC COMPOSITE (IN LOC MODE) FACTORY PRESET TO .18 Vrms FOR TERRA TRI NAV/C INDICATOR.

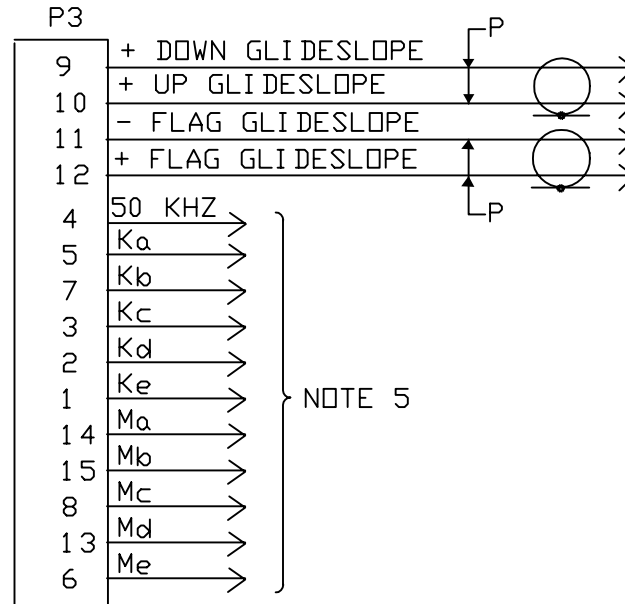
Figure 3-6
Interconnect Drawing, TN 200D Without Glideslope



AMPHENOL TYPE DB-15S

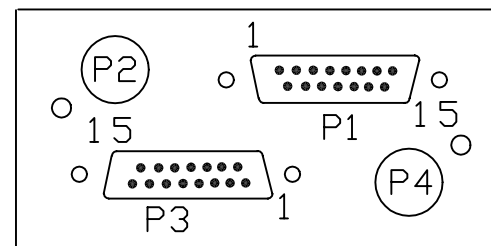
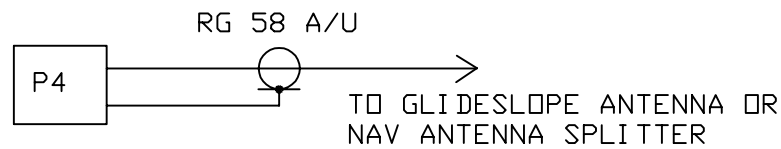


AMPHENOL TYPE DB-15S

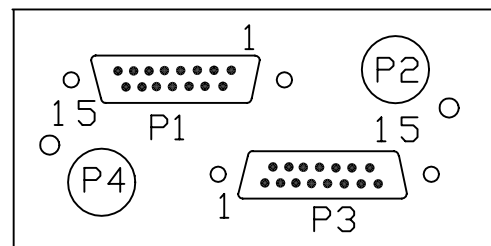


NOTES:

1. DME COMMON IS ON P1 AND DME CHANNELING ON P3.
2. UNLESS OTHERWISE SPECIFIED, USE AWG #22 WIRE.
3. UTILIZE MIL 22759/16 WIRE OR EQUIVALENT.
4. ALLOW FOR SERVICE LOOP AS REQUIRED.
5. WHEN CONNECTING DUAL GLIDESLOPE RECEIVERS, DME COMMON MUST BE TOGGLED BETWEEN THE TWO RECEIVERS, AND ISOLATION DIODES MUST BE CONNECTED TO P3 PINS 1-8 AND 13-15.



REAR VIEW
OF TRAY



FRONT VIEW
OF TRAY

Figure 3-7
Interconnect Diagram, TN 200D With Glideslope

SECTION IV

4. OPERATION
(BELOW MOD 2 WITHOUT GLIDESLOPE; BELOW MOD 3 WITH GLIDESLOPE)

4.1 SCOPE

This section is to instruct the owner/operator in the proper “care and feeding” of their new Terra by Trimble TN 200D Navigational Receiver.

4.2 OPERATION

See Figure 4-1 on page 29 for locations and descriptions of the TN 200D Front Panel Controls.

CAUTION!

Insure your new TN 200D is turned off until after engine start-up procedures are completed. This precaution will greatly improve the lifetime of all of your avionics as well as your TN 200D.

4.3 FREQUENCY MODE

To turn power on, rotate the left knob clockwise. A slight detent will be felt. The following will be displayed in the window:

188.88 8 M 188.88

After 5 seconds the displays will revert back to the last used frequencies.

Enter your desired frequency into the standby (right hand) window, by turning the tune knob on the right-hand side. The faster this knob is rotated the more the frequency changes with each detent. Clockwise tuning increases the frequency and counterclockwise tuning decreases the frequency. At the upper and lower limits of the frequency band, i.e., 108.00 and 117.95, the frequency will “wrap around”. This allows faster tuning from one end of the band to the other.

After the desired frequency is obtained, simply press the <—> (TRANSFER) button to move the frequency into the left-hand or “active” window and your previously used frequency to the right-hand or “standby” window.

4.4 IDENT OPERATION

Whenever the left hand knob is depressed the ident is eliminated from the audio output and only voice is heard. With the knob pulled out the voice and ident are heard.

4.5 ILS AND DME CHANNELING OPERATION

If your TN 200D is equipped with the glideslope receiver, anytime an ILS frequency is selected in the active window the glideslope receiver is automatically channeled to the appropriate frequency. At all times DME channeling is being produced on the glideslope board.

4.6 FREQUENCY TRANSFER

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

As will be covered in the next section, depressing this button also cancels the channel memory display.

The transfer button must be used in order for the last used frequencies to be displayed after a power interruption. For example, say you are tuned to 108.00 in the active display and 116.60 in the standby display. Pressing the transfer button will insure that the unit will display 116.60 108.00 after any power interruptions. Failure to do this transfer will cause the unit to come up with 108.00 in the active display and the last transferred frequency in the standby display.

4.7 TO PLACE FREQUENCIES IN MEMORY

The TN 200D has a 10 user programmable memories. To place frequencies in memory, push the tune knob in. In between the active and standby window, “O” will be displayed. After rotating the tune knob 1 detent from “O” an “M” will appear in the display beside the number. Rotating the tune knob, while holding it in, will increment or decrement the channel number from 0 through 9 or vice-versa. After you obtain the desired channel number, simply release the knob and rotate the tune knob to your desired storage frequency. Press the “STO” (STORE) button and that frequency is now entered in the indicated channel memory.

EXAMPLE:

At your airport, the following frequencies are used:

VOR	113.20
ILS Approach	110.30

For simplicity, lets assign channel numbers in this same order. To enter these in memory, follow these steps:

Push tune knob:	XXX.XX 0	XXX.XX
Hold in and rotate:	XXX.XX 1m	XXX.XX
Release and tune:	XXX.XX 1	113.20
Press “STO”:	XXX.XX 1m	113.20
Push tune knob and hold:	XXX.XX 1m	113.20

4.7 TO PLACE FREQUENCIES IN MEMORY (CONTINUED)

Rotate tune knob:	XXX.XX	2m	XXX.XX
Release and tune:	XXX.XX	2	110.30
Press "STO":	XXX.XX	2m	110.30

Continue until all frequencies that are desired are "loaded in". After the frequencies are loaded, you are ready to recall them at any time.

4.8 MEMORY/CHANNEL MODE

Cycle power to the TN 200D, after initialization push tune knob and rotate to "1m". Press transfer button and 113.20 moves to the active window. The previously displayed frequency moves to the standby window, and 1m is cleared from the display. To gain access to any channel, simply push the tune button in, rotate to desired channel, press the transfer button, and you are on your desired channel.

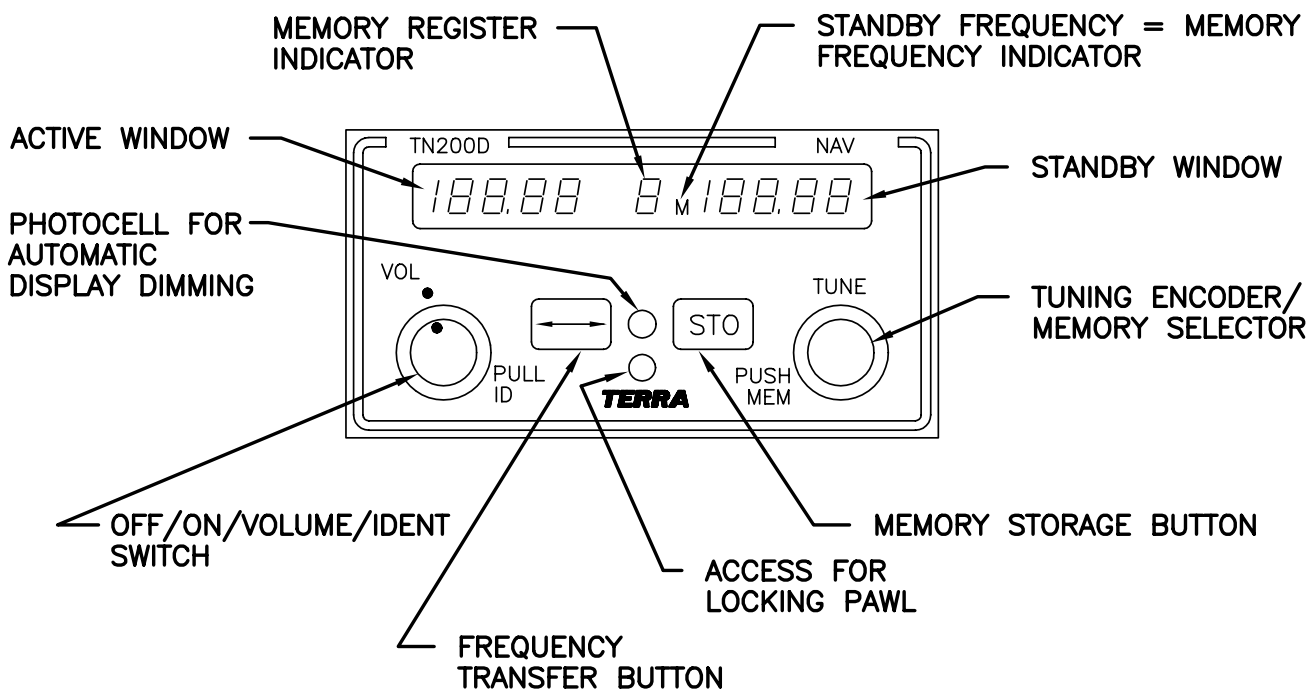


Figure 4-1
TN 200D Front Panel Controls
Below Mod 2 without Glideslope; Below Mod 3 with Glideslope

SECTION IVA

4A. OPERATION (MOD 3 AND ABOVE WITH GLIDESLOPE; MOD 2 AND ABOVE WITHOUT GLIDESLOPE)

4.1A SCOPE

This section is to instruct the owner/operator in the proper “care and feeding” of their new Terra by Trimble TN 200D Navigational Receiver.

4.2A OPERATION

See Figure 4-2 on page 33 for locations and descriptions of the TN 200D Front Panel Controls.

CAUTION!

Insure your new TN 200D is turned off until after engine start-up procedures are completed. This precaution will greatly improve the lifetime of all of your avionics as well as your TN 200D.

4.3A NAV TUNING KNOB OPERATION

Pushing the tuning knob in for approximately one-third of a second will cause the last two digits of the MHz (Example 1 XX.XX) standby display to blink. The leading 1 remains solid since it never changes.

Rotating the knob will now tune the MHz. Scrolling past the end of the frequency range (up or down) will cause the frequency to “wrap around” to the other end of the range (e.g., scrolling up past 117, wraps to 108).

Pushing the knob again for approximately one-third of a second will shift the cursor control from MHz to kHz (Example 1XX.XX) causing the MHz digits to light steady and the kHz digits to blink.

In the same manner as above, rotating the knob will now tune kHz.

Pushing the knob again for approximately one-third of a second will cause all digits to display steady.

Notes:

1. Pushing the button at any time during the tuning sequence will cause the frequency in the standby display to switch to active and the active to standby as well as canceling the cursor tuning, if activated.
2. The software will not let the user select an invalid frequency i.e., below 108.000 or above 117.950.
3. Tuning with the continuous mode is still available without utilizing the cursor.

4.4A IDENT OPERATION

Whenever the left hand knob is depressed the ident is eliminated from the audio output and only voice is heard. With the knob pulled out the voice and ident are heard.

4.5A ILS AND DME CHANNELING OPERATION

If your TN 200D is equipped with the glideslope receiver, anytime an ILS frequency is selected in the active window the glideslope receiver is automatically channeled to the appropriate frequency. At all times DME channeling is being produced on the glideslope board.

4.6A MEMORY OPERATION

Pressing the MEM button will call up the last used or programmed memory position. Repeatedly pushing the MEM button will cycle upwards through the memory positions. Alternately, holding the MEM button in will cause the unit to cycle through the memory positions at a rate of one position every one-third of a second.

4.7A TO PROGRAM NEW FREQUENCIES IN MEMORY

Press MEM to select the desired memory position. The "M" will illuminate between active and standby frequencies. Tune the new frequency using either the continuous or cursor programming method. As soon as the frequency value changes from the stored frequency, the "M" light goes out.

Press MEM again to store the new frequency. The "M" relights to confirm storage. Use the button to move the new memory frequency to active side and repeat these steps to store additional frequencies in memory.

Note:

If the button is pressed before storing the new frequency into memory; the radio will drop out of program mode and the new frequency will not be stored.

4.8A DISPLAY BLANKING OPERATION
(RECOMMENDED FOR GLIDERS AND BATTERY-POWERED A/C ONLY)

Press the tuning knob first and then the MEM button. Hold both in for approximately four seconds. The display will go into a blank condition.

If the display has blanked, moving the tuning control, pressing the button, or pressing the MEM button will restore the display. Specifically, the first press of the button, the first “click,” or first push of the tuning knob will restore the display with no changes (e.g., the frequency will not transfer or change). Once the display has relit, the unit will function normally. However, pressing the MEM button will restore the display and recall the last Memory position to the standby display.

If no tuning control (button, MEM button, or tuning knob) is moved for a period of 15 seconds, the frequency displays (both active and standby) will blank.

To cancel blanking operation, turn function knob to “off” then turn back on. The unit will then operate in normal mode.

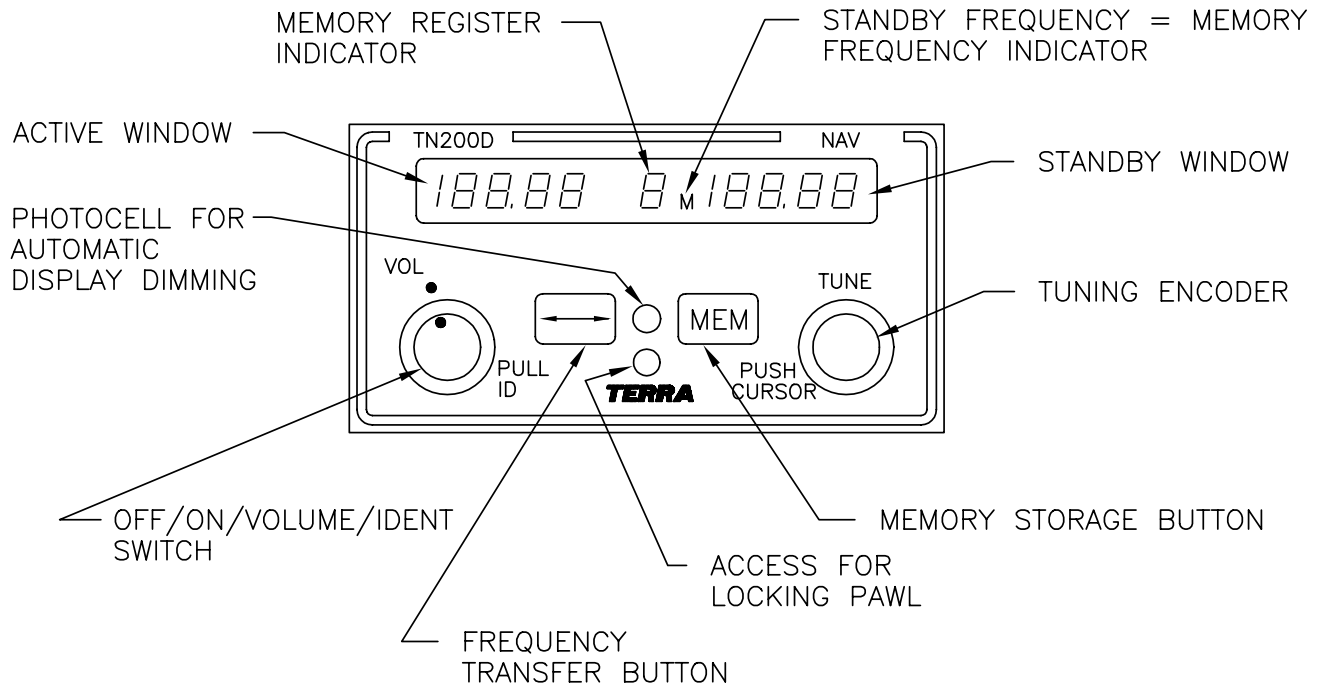


Figure 4-2
TN 200D Front Panel Controls
Mod 2 and above without glideslope; Mod 3 and above with glideslope

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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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SECTION VI

6. INSTALLATION BULLETINS/NOTES

6.1 INSTALLATION BULLETINS

Place any installation bulletins after this page and record below:

<u>DATE</u>	<u>BULLETIN NUMBER</u>	<u>DESCRIPTION</u>	<u>ENTERED BY</u>
-------------	------------------------	--------------------	-------------------

6.2 INSTALLATION NOTES