TERRA
BY TRIMBLE

TRI NAV

COURSE DEVIATION INDICATOR

OPERATION/INSTALLATION MANUAL

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

PRINTED IN U.S.A.

PUBLICATION NUMBER 1900-0220-00

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SECTION I

1. INTRODUCTION

1.1. SCOPE

This manual provides installation and operating instructions for the TRI NAV Course Deviation Indicator manufactured by Trimble of Austin, Texas.

1.2. DESCRIPTION

The TRI NAV ECDI is a micro-processor based navigation instrument. It receives standard navigation and glide slope signals from single or dual navigation receivers and one glide slope receiver. It processes these signals into a gas discharge display for pilot information. Electrical output for an autopilot coupler is also provided.

VOR bearings are calculated from the NAV inputs and displayed in numeric form. A selected OMNI bearing may be compared to the OBS input. The result of this comparison is a bar type display indicating course deviation.

In the ILS mode localizer signals are received from the NAV receiver and glide slope signals from the glide slope receiver. These are decoded and the bar display indicates left-right and/or up-down corrections required to center the aircraft in the approach beam.

1.3. SPECIFICATIONS

Mechanical Specifications

Size:	ARINC 3 ATI 4 5/8" long
Weight:	1.25 lbs.

Electrical Specifications

Supply Voltage:	11-32 VDC
Supply Current:	600 mA max at 13.75V 300 mA max at 27.5V
NAV Input Impedance:	1 megohm
NAV Input Level:	50 mV to 10vrms

1.4. PERFORMANCE

Performance

VOR

Accuracy:	±2°
Max. Deflection:	10° = 14 bar deflection

1.4. PERFORMANCE (CONTINUED)

VOR/LOC Composite:	(In LOC mode) Factory preset to .18Vrms for Terra by Trimble Tri Nav Indicator
LOCALIZER	
Deflection:	7 bars ±1 bar deflection for 0.093 ddm
Centering Error:	±1 bar
GLIDE SLOPE	
Flag Input	250 uA
Deflection:	8 bars ±2 bars deflection for 78uA
Centering Error:	±1 bar
Input:	1000 ohm

1.5. EQUIPMENT SUPPLIED

The TRI NAV is shipped with the following equipment:

Description	Qty	Number
Connector, Receptacle	1	9-2190-171-00
Lockarm	1	9-2190-172-00
Screw, 6-32 x 5/8 Truss hd.	3	9-2806-110-00

SECTION II

2. OPERATION

2.1. DESCRIPTION

The TRI NAV is an Electronic Course Deviation Indicator (ECDI) that presents VOR and ILS navigation information in a dynamic display. The ECDI is unique and very easy to use. It gives vivid and dynamic presentation of deviation from VOR, localizer and glide slope course centerline. The display clearly shows the deviation from the desired flight path. You will find the Terra by Trimble TRI NAV ECDI reads easily and appears readily in your peripheral vision.

2.2. OPERATION

The OBS course selector is a small knob on the lower left of the instrument. The OBS course selector is bi-directional two speed continuous control used to set the desired course. The slow speed rate is approximately one degree per half turn and high speed is 10 degrees per half turn. This control has no effect on localizer operation other than to provide a reminder of the desired course or possibly the missed approach VOR bearing.

The course display is a three digit electronic display which indicates the selected course, bearing “TO” or radial “FROM” the VOR station. Courses from 000 to 359 may be selected in one degree increments.

The TO/OBS/FR/BC selector switch is normally positioned in the OBS position which allows the OBS course selector to be active. The TO position causes the course display to automatically change to give a continuous bearing “TO” the VOR station and the course deviation bar will not be illuminated. The FROM position causes the course display to change automatically to indicate continuously the radial “FROM” the VOR station and the course deviation bar will not be illuminated. During ILS operation, BC may be selected for making a Back Course Localizer instrument landing.

The mode display is in the upper left quadrant of the display. In VOR, the mode display indicates “T” for a bearing TO the VOR station and “F” for a radial FROM the VOR station. When making an instrument approach where only a localizer is present, the mode display will display an “L” for localizer. When both a glide slope and localizer are present, the mode display will exhibit an “I” for ILS. Should a back course localizer approach be desired, the TO/OBS/FR/BC switch shall be set to “FR/BC”, the mode will display a “b” for back course. When invalid information or no signal is present, the mode display will display an “o” for OFF.

The course Deviation Bar indicates deviation from the selected course. The ends of the display bars have arrows to point direction to fly to stay on course. The more display bars that are illuminated, left or right, up or down, the greater the deviation from course. The deviation bar is cabable of indicating a full 10degree error left or right. There are 14 light bars each side of center in the deviation scale; therefore, each bar represents approximately 0.7 degree deviation in the VOR mode. When exactly on course, indication will be by two vertical bars in the VOR/LOC mode.

2.2. OPERATION (CONTINUED)

The display has no meter movements and is entirely electronic. The actual VOR and localizer course widths at full scale are the same as conventional needle-type instruments; however, since the scale is larger, smaller off-course indications can be seen which means that corrections can begin sooner without over-correcting.

The course is displayed in light bar increments or digitally.

The indicator also features two automatic modes that continuously present the radial "FROM" or bearing "TO" the VOR station.

A switch for TO-FROM control is provided. The TRI NAV has options to include display of two VOR's simultaneously. A remote switch is necessary to switch NAV 2 into the NAV 1 position on the display.

The Glide Slope Deviation Bar indicates deviation from the glide slope center line. A flagged indication for glide slope is no vertical bar(s) illuminated. Also, the mode indicator will revert to "L" for localizer instead of "I" for ILS.

In the lower right quadrant a second VOR bearing or radial may be digitally displayed. This allows two different NAV receivers to be displayed on a single indicator. Typically, NAV 1 would be displayed on the OBS deviation bar and NAV 2 would be displayed on the NAV 2 digital radial display. The lower right toggle switch allows you to change the digital window radial reading "TO" the station bearing TO the VOR station. Selecting FR allows you to select the "FROM" radial from the VOR station. The lack of a second or NAV 2 signal will cause the window to read OFF. A remote switch can be installed to transfer NAV 2 to the NAV 1 position. A digit numeral 2 will light below the OBS/NAV window to indicate this mode.

When the lower right switch is positioned in the center position a 0 to 10 minute timer is activated to aid in standard rate turns, etc. The time can be reset by switching up or down and moving back to center. Time will immediately be restarted from zero and will count minutes and seconds.

A push-button to the right of the NAV 2 TO/TIME/FR switch has two functions. When the NAV 1 TO/OBS/FR/BC switch is in the TO or FR position and the OBS/TEST button is momentarily pushed **and then** the NAV 1 switch is moved to the OBS position, the unit will automatically center, putting you right on course center line TO or FROM the VOR station. This feature saves rotating the OBS knob to find the radial TO or FROM the VOR.

2.2. OPERATION (CONTINUED)

When the OBS/TEST push-button is pushed with the NAV 1 switch in the OBS position, the unit tests all light bars and digital segments. During test, the light bars are strobbed and 8's are displayed in each of the digit windows.

2.3. FLYING THE ECDI

A. Finding Aircraft Position

1. Tune desired NAV frequency and identify.
2. Set TO/OBS/FR/BC selector FR.
3. Course display shows radial aircraft is on from the VOR.

B. Tracking Direct to the VOR Station

1. Tune desired NAV frequency and identify.
2. Set TO/OBS/FR/BC selector switch to "TO".
3. Push OBS/TEST button and immediately switch TO/OBS/FR/BC switch to OBS; display will center, turn aircraft toward arrow and maintain aircraft on course "TO" the VOR.
4. Keep course deviation bar centered by making small aircraft heading changes.

NOTE: Turn aircraft in direction of arrows, i.e., if bar is going left, left arrow will light, turn left to get back on course.

C. Flying a VOR Airway

1. Tune desired NAV frequency and identify.
2. Determine aircraft position (see A above).
3. Set TO/OBS/FR/BC selector to OBS.
4. Select desired radial with OBS course selector knob.
5. Set up intercept and fly to course radial.
6. When deviation bar centers, turn on course.

D. ILS Approaches

1. Tune desired NAV frequency and identify.
2. Display shows deviation from localizer and glide slope center. That is, if the deviation bar indicates deviation up, then you need to fly up to return to glide slope center.
3. The course display may be set to the localizer course as a reminder.

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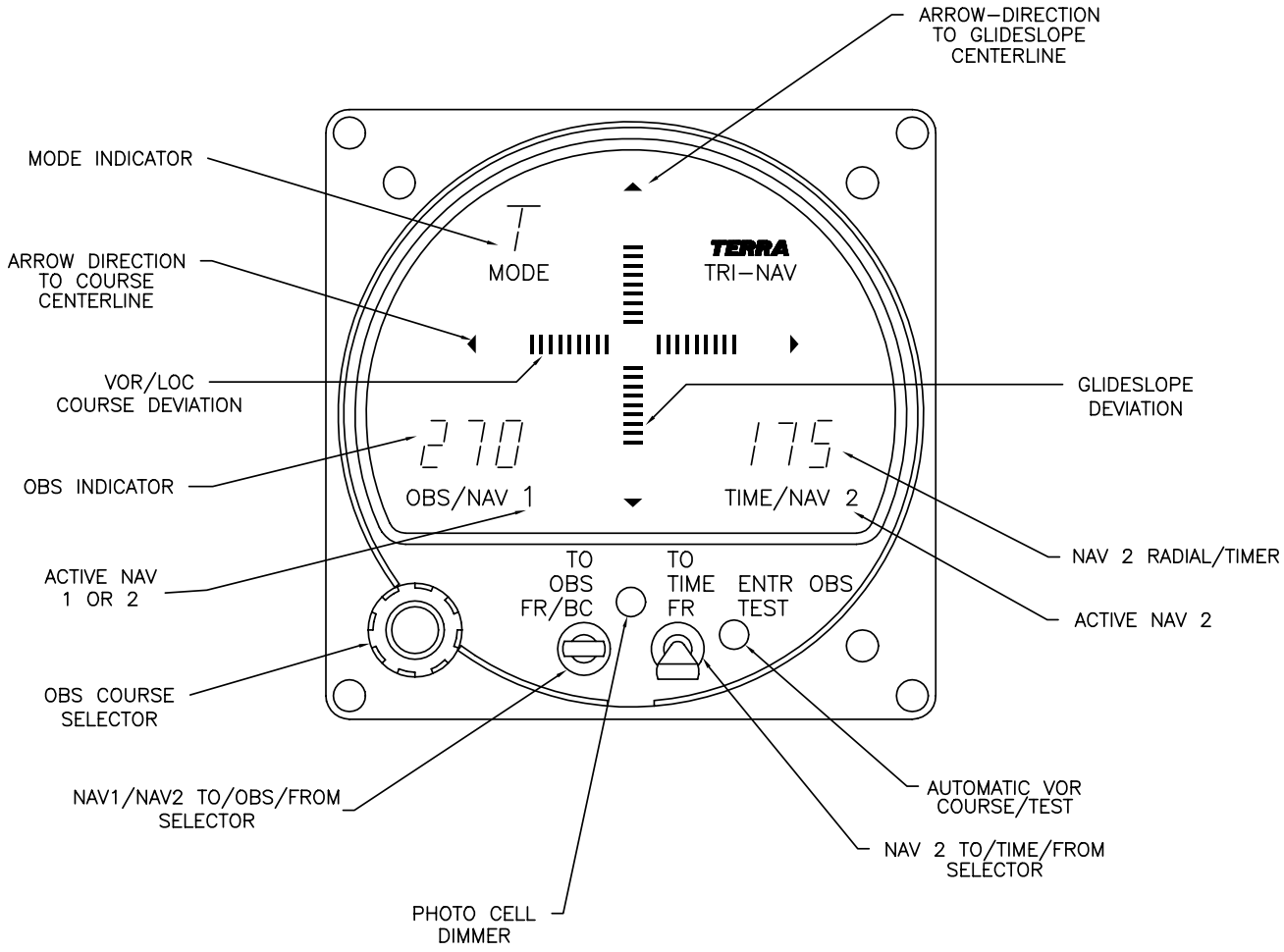

Figure 2-1
TRI NAV Display

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SECTION III

3. INSTALLATION

3.1. GENERAL

This section contains all necessary installation instructions and check-out procedures for the Terra by Trimble TRI NAV Course Deviation Indicator. For the installer with little or no experience of installing avionics, Section 3.3 provides important information. Trimble recommends reading this section before continuing with installation.

3.2. PREPARATION FOR USE

Every precaution has been taken to protect the TRI NAV 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 accepted for shipment. Do NOT return the unit 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.

3.3 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.

3.3.1 COAXIAL CABLES AND CONNECTORS

Improper installation of coaxial cables and connectors create many of the problems encountered during avionics installations. 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.

3.3.2 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 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 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.**

3.3.3 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.

3.3 GENERAL INSTALLATION INSTRUCTIONS FOR AVIONICS (Continued)

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

3.3.4 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.

3.3 GENERAL INSTALLATION INSTRUCTIONS FOR AVIONICS (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 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.

3.3.5 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.

3.4. MECHANICAL INSTALLATION

The TRI NAV will mount in either a standard 3 1/8" panel hole or a 3ATI instrument mount. Do not use mounting screws longer than 5/8 inch. Failure to comply will result in internal damage to the unit.

3.5. ELECTRICAL INSTALLATION

The TRI NAV connector diagram is shown on Page 11. SWITCHED POWER from receiver 1 is wired to Pin 1. SWITCHED POWER from receiver 2 is wired to Pin 2. The TRI NAV will operate directly on 11 to 32 volts DC.

The COMPOSITE SIGNAL from radio 1 is attached to Pin 8. The COMPOSITE SIGNAL from radio 2 is wired to Pin 15.

A standard glide slope receiver (± 150 uV full scale up, down deflection and a 250 uA full scale on flag deflection) is attached to Pins 4, 12, 13 and 14 as shown in Figure 3-2. The internal resistance of both up-down and on-off inputs is 1000 ohms.

TRI NAV MOD 4 and below, when using Terra by Trimble's TN 200, TN 200D, and other similarly phased composite outputs, pins 6 and 7 are grounded to pin 9 for proper phase programming. **No other source of ground for pin 7 should be used.** On Nav receivers with composite signals 180 degrees out, pin 6 and 7 are left open.

TRI NAV MOD 5 and above, when using Terra by Trimble's TN 200, TN 200D, and other similarly phased composite outputs, pins 6 and 7 are internally grounded (factory installed) for proper phase programming. On Nav receivers with composite signals 180 degrees out, cut the jumpers shown on Figure 3-1.

Pin 3 output to an autopilot's coupler. The output level is 15 millivolts per degree of VOR course error, or 90 millivolts for a .093 DDM localizer signal. The autopilot output will drive any coupler with an input impedance greater than 100 ohms.

Grounding Pin 5, NAV 1 Fail, causes information from the NAV 2 receiver to be channeled to the NAV1 display. This pin can be wired to an external switch for use in case of a receiver failure or to transfer NAV 2's VOR/LOC information instantaneously to displayed flight information. This capability is only available with dual NAV installations. It is also used during calibration.

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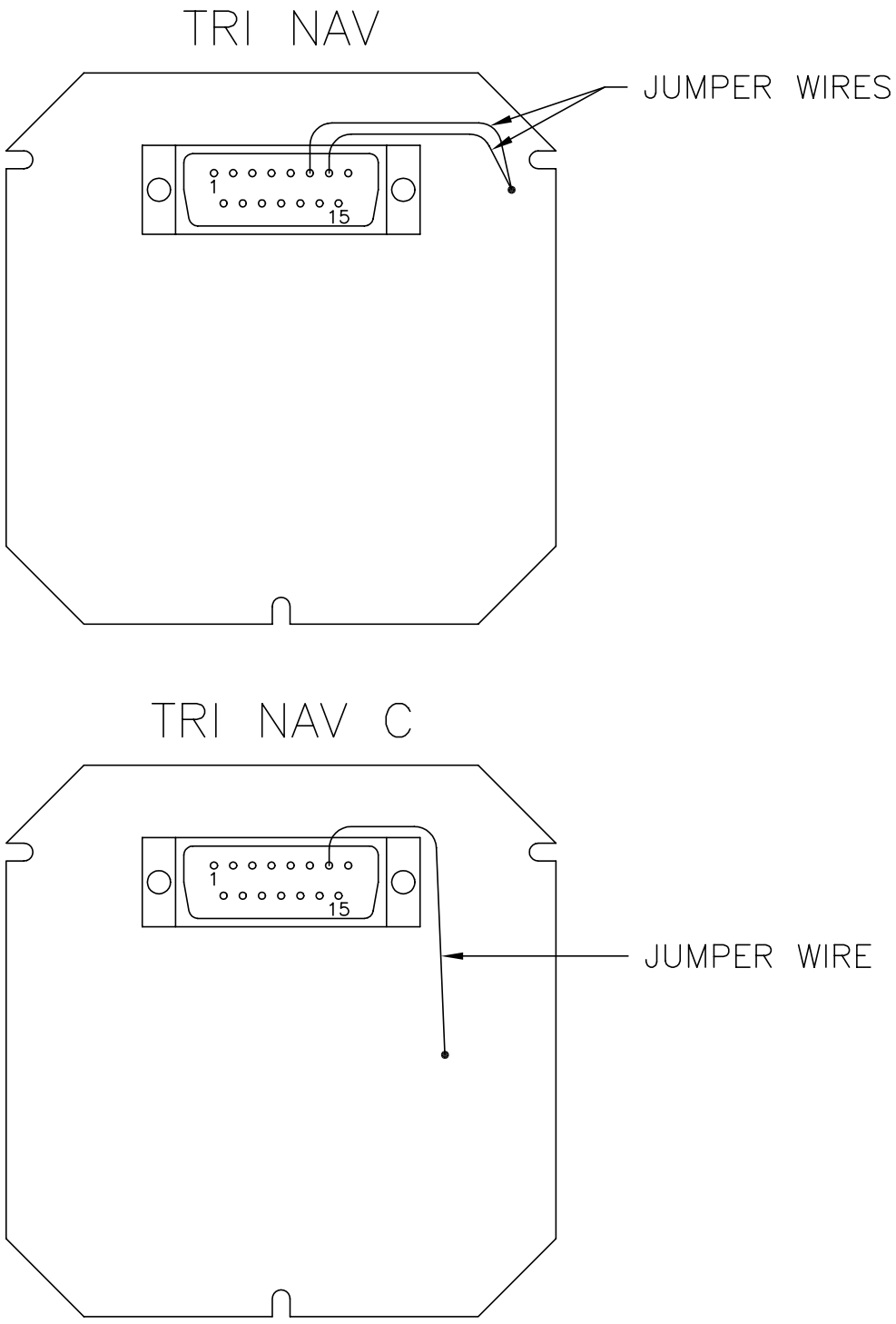

Figure 3-1
TRI NAV/TRI NAV C Jumper Wire Location

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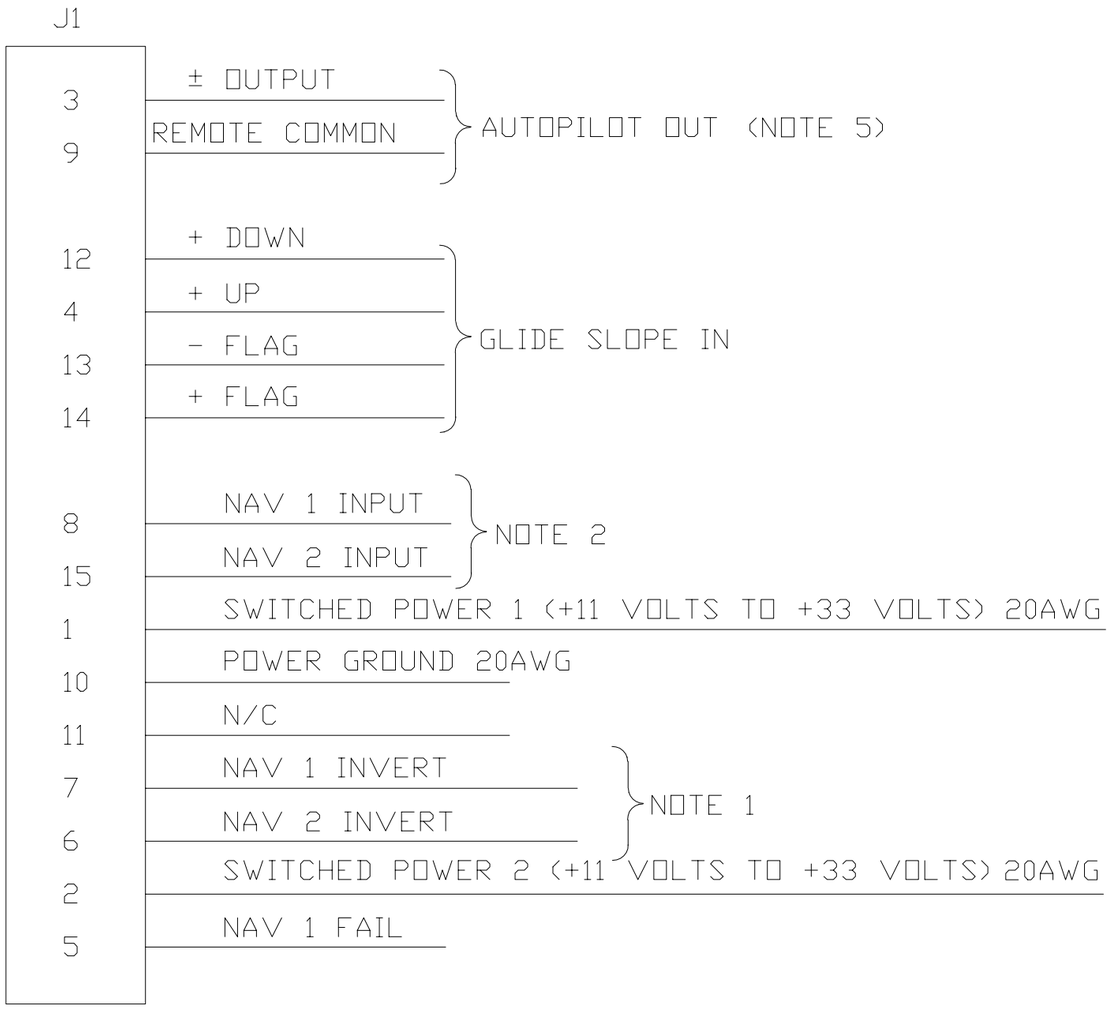

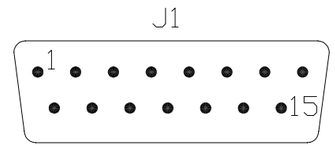

15 PIN "D" CONNECTOR

NOTES:

1. TRI NAV MOD 4 AND BELOW, WHEN USING TERRA'S TN 200, TN 200D, AND OTHER SIMMILARLY PHASED COMPOSITE OUTPUTS, PINS 6 AND 7 ARE GROUNDED TO PIN 9 FOR PROPER PHASE PROGRAMMING. NO OTHER SOURCE OF GROUND SHOULD BE USED. ON NAV RECEIVERS WITH COMPOSITE SIGNALS 180 DEGREES OUT, PINS 6 AND 7 ARE LEFT OPEN.

   TRI NAV MOD 5 AND ABOVE, WHEN USING TERRA'S TN 200, TN 200D, AND OTHER SIMILARLY PHASED COMPOSITE OUTPUTS, PINS 6 AND 7 ARE INTENTIONALLY GROUNDED (FACTORY INSTALLED) FOR PROPER PHASE PROGRAMMING. ON NAV RECEIVERS WITH COMPOSITE SIGNALS 180 DEGREES OUT, CUT THE JUMPERS SHOWN ON FIGURE 3-1.

2. FOR SINGLE SYSTEM INSTALLATION, NAV 2'S INPUT (PIN 15) CAN BE CONNECTED TO NAV 1'S INPUT (PIN 8) TO DISPLAY THE SELECTED OBS SETTING IN NAV 1'S DISPLAY AND SIMULTANEOUSLY, NAV 1'S DIGITAL RADIAL IN NAV 2'S DISPLAY.
3. WIRE SIZE: 22AWG UNLESS OTHERWISE SPECIFIED.
   WIRE TYPE: TEFZEL WIRE MIL-22759 OR EQUIVALENT.
4. LEAVE ADEQUATE LENGTH TO THE HARNESS TO ALLOW A SERVICE LOOP.
5. AUTOPILOT OUTPUT LEVEL IS 15 MILLIVOLTS PER DEGREE OF VOR COURSE ERROR, OR 90 MILLIVOLTS FOR A .093 DDM LOCALIZER SIGNAL. THE AUTOPILOT OUTPUT WILL DRIVE ANY COUPLER WITH AN OUT PUT IMPEDENCE THAN 100 OHMS.

Figure 3-2
Tri-Nav Interconnect Diagram

3.6. ADJUSTMENTS

Figure 3-3 shows the location of the adjusting pots on the back of the TRI NAV.

When setting the TRI NAV level, remember correct level is VERY important. A too low level will reduce range and reduce localizer deflection sensitivity; a too high level will cause instability when flying near a VOR or Localizer facility.

Inject a “Standard Localizer Deviation Signal” at 1000 microvolts into the NAV receivers. This is a signal in which the difference in the depth of modulation of the 90 and 150 Hz signals is 0.093 ±.002 DDM. With Pin 5, NAV 1 fail, open, set the LEVEL ONE control such that eight bars of deflection are showing on the Localizer display. To set the VOR/LOC level control, first rotate the adjustment fully counter clockwise, the bars will blank at this point. SLOWLY rotate the VOR/LOC level control clockwise until eight bars are illuminated. Inject a localizer centering signal. Adjust the LOC 1 center control until the bars are centered. Repeat the level adjustment with the "Standard Localizer Deviation Signal" set to the opposite mid scale.

With Pin 5 grounded, repeat this procedure while adjusting the localizer center and level 2 controls. Setting the Localizer level automatically sets the VOR level. The bar display will blank if the setting is either too high or too low.

Using a 1000 uV VOR RF signal, adjust the PHASE pots for a zero degree VOR error. After each adjustment is made allow eight seconds for the TRI NAV to settle down. Phase is adjusted with both function switches in the UP (to) position.

Using a 1000 uV “Standard Glide Slope Centering” signal, adjust the Glide Slope Centering pot until the two center glide slope bars are on. While adjusting the glide slope, the NAV inputs should be either Localizer of OFF.

After the unit has been calibrated, check the Localizer function at Left Standard Deviation, Center, and Right Standard Deflection. There should be no error; that is Left and Right deflections should have eight bars activated, Center should have the two Center bars on.

The VOR function should be checked at 45°, 90°, 135°, 180°, 225°, 270°, 315°, and 360°. Maximum error should be ±1°.

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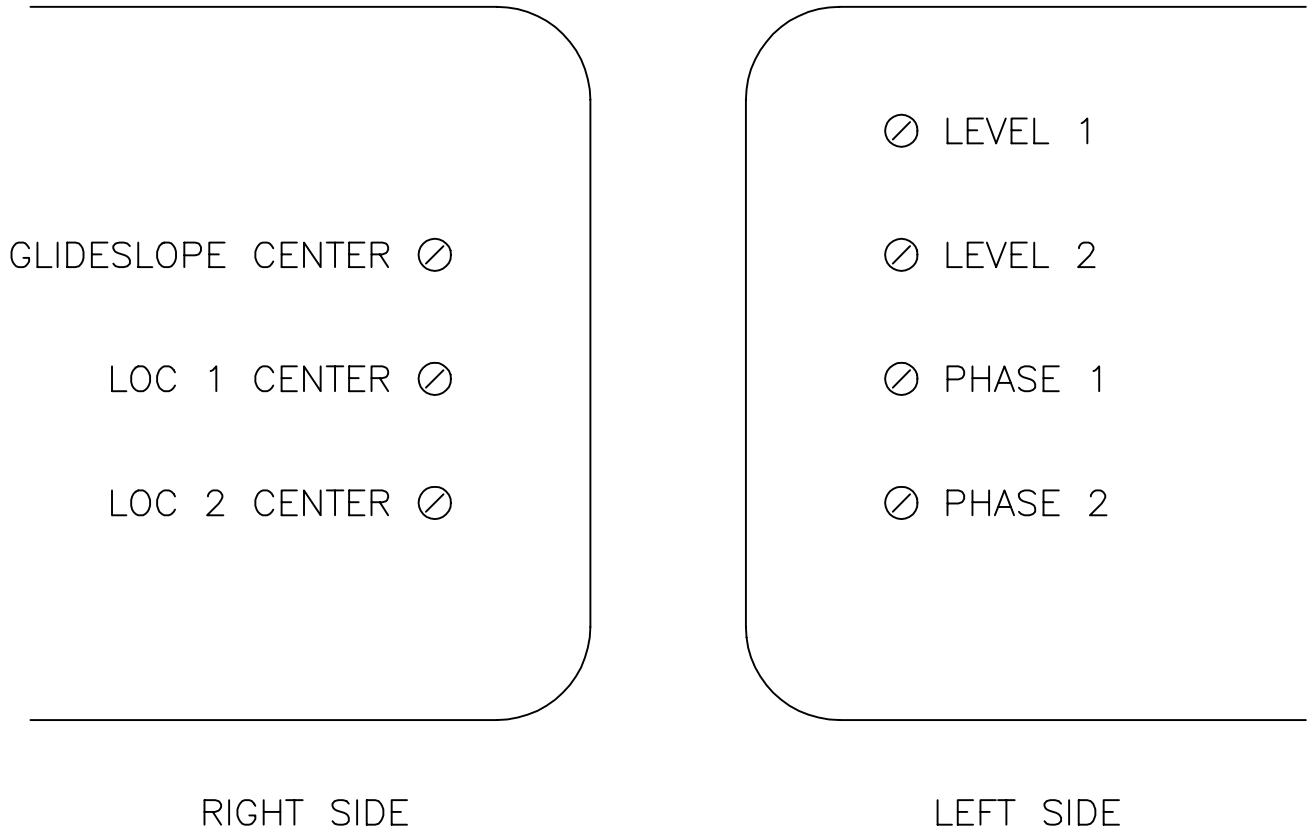

Figure 3-3
TRI NAV ADJUSTMENT

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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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