Trig TI106 Course Deviation Indicator
Installation Manual

02179-00-AA

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1. Preface

1.1 Purpose

This document describes the system descriptions, and technical specification, as well as the installation, electrical and physical characteristics, limitations, environmental qualification, periodic maintenance procedures and corrective maintenance procedures for the TI106 Course Deviation Indicator (CDI).

1.2 Scope

This document applies to the Trig TI106 CDI.

1.3 Changes from Previous Issue

This is the first issue.

1.4 Terms and Definitions

BC	Back Course
CDI	Course Deviation Indicator
DC	Direct Current
DME	Distance Measurement Equipment
FAA	Federal Aviation Administration
GPS	Global Positioning System
ILS	Instrument Landing System
LED	Light Emitting Diode
OBS	Omni Bearing Selector
ORZ	Omni Range Zeroed
RF	Radio Frequency
TSO	Technical Standard Order
VHF	Very High Frequency
VOR	VHF Omnidirectional Range

2. Introduction

2.1 General Description

The TI106 CDI is designed to operate with VHF and GPS navigational equipment to provide OMNI (VOR), GPS, Localizer and Glideslope information.

The TI106 is designed to accept DC signals for Left/Right and Up/Down pointer deviation and Valid/Invalid ("flag") status from a remote mounted VOR converter. It also provides annunciations for NAV, BC, and GPS indication of the incoming source or mode and a TO or FR (from) annunciation to indicate direction of the ground signal or course waypoint from the aircraft.

The Omni Bearing Selector (OBS) course resolver provides the compass card position as an electrical output (a phase reference signal which is ORZ zeroed to an industry standard 300°).

The TI106 CDI uses white LED unit lighting to illuminate the dial and pointers. It can be brightened or dimmed with an external lighting bus voltage for 5, 14 or 28V systems. Additionally, the backlit LED annunciators are automatically adjusted for appropriate brightness using a built-in photocell sensor which can be calibrated at the time of installation.

2.2 Technical Specification

Characteristics	Parameter	Specification
Electrical Characteristics	Input Voltage	12 – 32 VDC
	Input Current (Maximum)	0.2 Amps
	Lighting Input	5, 14, or 28 VDC
	Annunciator Lighting	Auto dimming control via internal photocell (Adjustable)
OBS Resolver	Electrical Zero	300° ±1° ORZ
Pointer Deviation	Input Impedance	1kΩ ±10%
	Deflection Sensitivity	150mV ±10% full scale deflection
Valid Signal	Input Impedance	1kΩ ±10%
	Valid Signal	260 mV ±10% to display pointers
To/From Indicator	Input Impedance	200Ω ±10%
	Annunciator Sensitivity	40mV ±15%
Physical Attributes	Dimensions (Bezel)	3-1/8" (80mm) diameter
	Dimensions (Chassis - HxWxD)	3.25" x 3.25" x 4.75" (82.5mm x 82.5mm x 120.6mm)
	Weight	1.3 pounds (0.59 kg)
	Cover Glass	HEA (anti-reflective) coated per MIL-C-14806
	Mating Connectors	25-pin D-Sub
	Mounting	Rear mount, see panel cut-out Section 4.1.
	Lighting	Light emitting diodes (LEDs)

2.3 Qualification

Specifications	
Qualification	FAA TSO-C34e, C36e, C40c EASA ETSO-C34e, C36e, 2C40c
Environmental Qualification	RTCA DO-160B/G (Details listed in Appendix-A)

3. Pre-Installation

3.1 General Information

This section contains information and considerations required to prepare for the TI106 CDI installation, including provided equipment, panel location, wiring and other information.

3.2 Unpacking and Inspecting Equipment

When unpacking this equipment, make a visual inspection for evidence of any damage that may have occurred during shipment.

3.2.1 Materials Supplied

Unit Description	Quantity	Trig Part Number
TI106 CDI	1	01913-00
TI106 Connector Kit	1	02121-00
Installation Manual	1	02179-00

3.2.2 Materials not supplied

Unit Description	Quantity	Specification
#6 UNC Screws	3	Max Length: 1.0”
Wire	As Required	22 AWG. (**See Section 3.4**)

3.3 Equipment Location

The TI106 CDI should be mounted as close to the pilot’s field of view as possible.

Consideration should be given to the depth behind the panel where the unit will be installed. Clearance for the unit as well as its electrical connections and routing must be allowed. Be aware of routing cables near other electronics or with other wire bundles that may contain high energy flow. Examples of these sources could include 400 Hz AC or COM, DME, HF and transponder transmitter coax.

Use of shielded wire may be useful in isolating the low-level signals that drive the CDI from other interference. Avoid sharp bends in cabling and routing near aircraft control cables. Also, avoid proximity and contact with aircraft structures, avionics equipment, heat sources or other obstructions that could chafe or damage wires during flight and cause undesirable effects.

No direct cooling is required. As with any electronic equipment, overall reliability may be increased if the TI106 is not located near any high heat source or crowded next to other equipment.

The TI106 CDI is designed primarily to be installed in the instrument panel of the aircraft. However, within the limitations of the environmental qualifications, other locations may be acceptable when considered within the context of the specific application and with the appropriate installation certification.

3.4 Cable Harness

Construct the cable harness in accordance with the guidance detailed in Section 3.4.1 using industry-accepted practices regarding aircraft wiring and applicable regulatory requirements and guidance.

Refer to Section 3.3: Equipment Location for routing precautions.

3.4.1 Wire Gauge Selection

Wire gauge should be 24 AWG or thicker (smaller AWG; 22, 20, etc.). Use of PTFE, ETFE, TFE, Teflon, or Tefzel insulated wire is recommended for aircraft use per MIL-DTL-16878 or equivalent. Shielded twisted pair wiring per M27500 or equivalent is recommended for any signal wires which may be exposed to sources interfering with the integrity of the signal.

3.4.2 Interface Pinout

Pin	Signal	Direction
1	OBS Resolver H	Input
2	OBS Resolver C	Input
3	OBS Resolver D	Output
4	OBS Resolver F	Output
5	OBS Resolver E (NAV Common Ref)	Output
6	OBS Resolver G (NAV Common Ref)	Output
7	+ VOR/Localizer Valid	Input
8	- VOR/ Localizer Valid (NAV Common Ref)	Input
9	+ To	Input
10	+ From	Input
11	+ Left	Input
12	+ Right (NAV Common Ref)	Input
13	+ Up	Input
14	+ Down (Glideslope Common Ref)	Input
15	+ Glideslope Valid	Input
16	- Glideslope Valid (Glideslope Common Ref)	Input
17	GPS Annunciator	Input
18	BC Annunciator	Input
19	+ 12-32 VDC (Or pin 20) *	Input
20	+ 12-32 VDC (Or pin 19) *	Input
21	Power Ground	Input
22	+ 28V Lighting	Input
23	+ 14V Lighting	Input
24	NAV Annunciator	Input
25	+ 5V Lighting	Input

* Only one power input line required on either pin 19 or 20.

The following diagram shows the connector orientation as viewed from the wiring side.

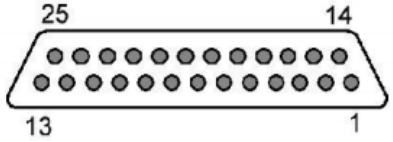

Figure 1: J1 Connector View

3.5 Limitations

The conditions and tests for TSO approval of this device are minimum performance standards. Those installing on or in a specific type or class of aircraft must determine that the aircraft installation conditions are within the TSO standards, specification of the TI106 CDI, and deviations listed below. TSO devices must have separate approval for installation in an aircraft. The TI106 CDI may be installed only according to 14 CFR Part 43 or the applicable airworthiness requirements.

3.6 Requirements for TSO'd VOR/ILS System

For a TSO'd VOR/ILS system the navigation receiver shall be certified to FAA TSO-C40a/b/c or TSO-C36c/d/e or later.

3.7 Requirements for TSO'd Glideslope System

For a TSO'd glideslope the glideslope receiver/converter shall be certified to the standards of TSO-C34c/d/e or later.

4. Installation

This section contains interconnect diagrams, mounting dimensions and other information pertaining to the installation of the TI106 CDI. After installation of cabling and before installation of the equipment, ensure that power is applied only to the pins specified in the interconnect diagram.

4.1 Mounting

Install the TI106 CDI within the aircraft in accordance with the aircraft manufacturer's instructions and the following steps:

1. Verify that the instrument panel cut-out meets the requirements of Figure 2.
2. Secure the indicator to the instrument panel using the proper mounting hardware.
3. Connect the electrical connector(s) to the connector on the back of the unit.

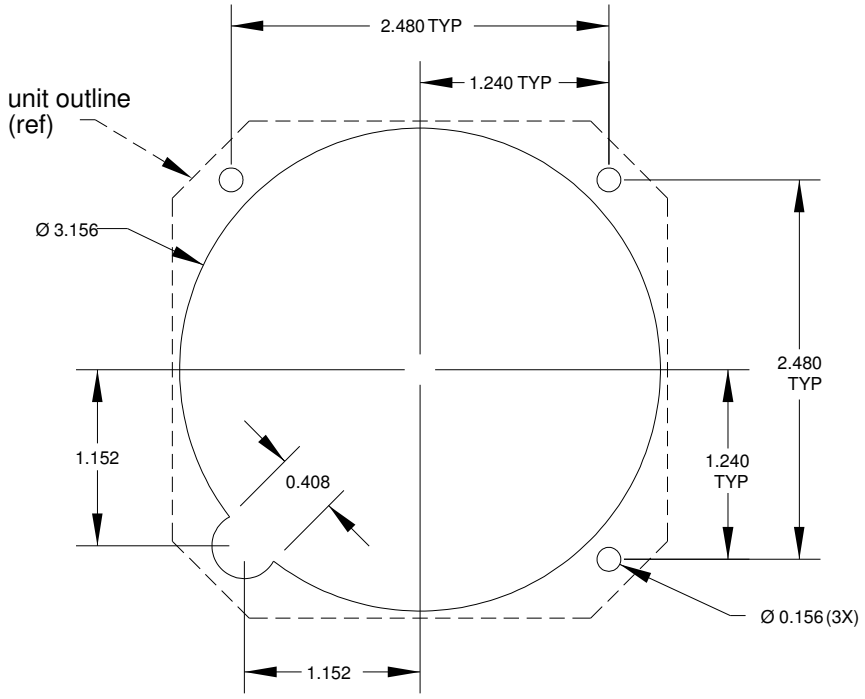

Figure 2: Panel Cut-out (Inches)

4.2 Installation Completion

Prior to flight, verify the basic operation of the unit, interface with other equipment, lighting performance in various conditions, and general expected performance.

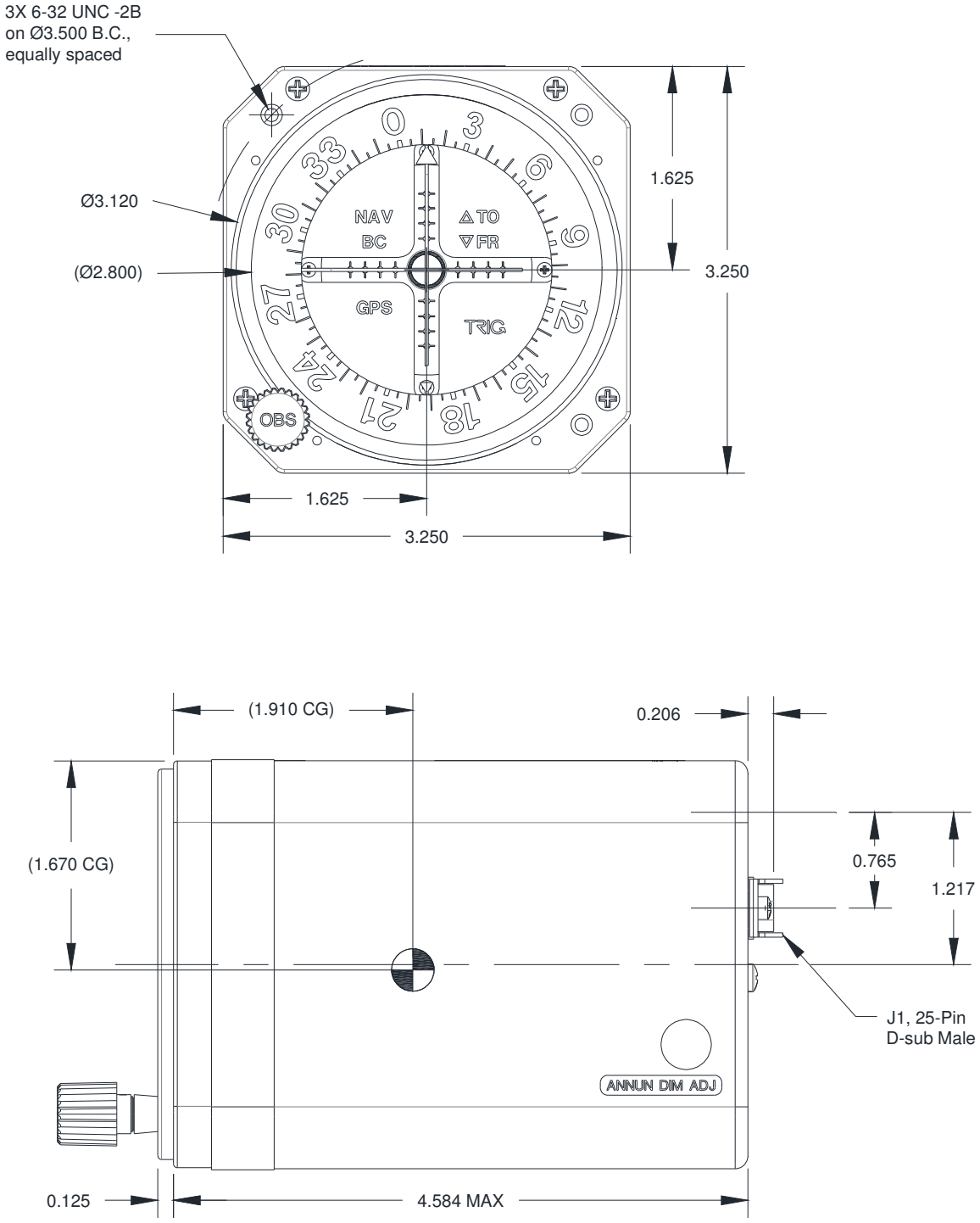

Figure 3: Outline Drawings (Inches)

5. Operation

5.1 Pre-Installation Tests

With the TI106 CDI disconnected, turn on the avionics master switch and verify that aircraft power on J1 pin 19 or pin 20 is 12-32 VDC. Using an ohmmeter, verify pin 21 is aircraft ground.

5.2 Annunciator Dimming Adjustment

Following installation of the TI106 CDI, check the brightness of the annunciations (GPS, NAV, BC, TO, FR) as necessary with the ambient and aircraft panel lighting levels set to simulate minimum-light operations. If required, the dimming adjustment is located on the side of the TI106 unit, labelled “ANNUN DIM ADJ”.

5.3 Operating Instructions

All controls required to operate the TI106 CDI are located on the unit’s front panel and on the front panel of the related navigation receiver.

5.3.1 VOR Operation

Channel the NAV receiver to the desired VOR frequency and positively identify the station by listening to received audio. Determine the NAV/VOR (vertical) pointer is in the viewing area of the dial.

Flying inbound to a VOR station is accomplished by first rotating the OBS knob to centre the deviation indicator, and determining the TO annunciator is lit. The aircraft is then turned to a magnetic heading, which is the same as the selected course with proper allowance for wind correction. When the aircraft is on course, the vertical pointer will be centred. If the aircraft moves off course, the deviation indicator will move away from the centre position and flying in the direction of pointer deflection (left or right) is required to intercept the appropriate course.

The procedure for flying outbound from a VOR station is the same as flying inbound, except the OBS knob is first rotated to cause a FR (“From”) annunciator to be active/lit.

To intercept a selected VOR radial (from the station) and fly outbound, turn the OBS control to set the desired radial under the top indicator index. Manoeuvre the aircraft to fly the selected radial magnetic heading plus 45° intercept angle which will provide a sufficient intercept angle. The intercept angle should be reduced as the deviation pointer approaches an on-course condition (centre) to prevent excessive course bracketing.

5.3.2 Localizer Operation

Select the desired localizer frequency and observe that the localizer (vertical) pointer is fully in view. The To / From annunciator is not functional for localizer operation. When flying on the front course make corrections toward the localizer pointer deflection. The localizer path narrows as the approach end of the runway becomes closer.

When flying inbound on the back course or outbound on the front course, the corrections are made away from the direction of pointer deflection unless your localizer receiver has a back-course function. When paired with a Trig TX56 family receiver or other receivers with back course capability the back course mode can be enabled and the “BC” light will be displayed on the TI106. In this mode the localizer pointer will operate in the conventional sense and corrections should be made towards the pointer.

A helpful hint when flying the localizer is to set the localizer heading on the OBS dial under the lubber line for quick reference.

5.3.3 Glideslope Operation

The glideslope (horizontal) pointer provides the pilot with vertical steering information during ILS, LPV, or GLS approaches. The glideslope circuitry is energized when the associated localizer frequency is selected on the navigation receiver. Observe that the glideslope pointer is in view. The glideslope pointer deflects towards the direction the pilot must fly to remain on the glide path.

If the glideslope pointer deflects upward the aircraft is below the glide path and the pilot must climb to intercept the glide path and centre the pointer. If the pointer deflects downward the aircraft is above the glide path and the pilot must descend to intercept the glide path and centre the pointer. When the pointer is centred the aircraft is on the glide path.

6. Continued Airworthiness

6.1 Maintenance

There is no scheduled maintenance required for the TI106 CDI. If the unit fails to perform within operational specifications, the unit must be removed and serviced by Trig Avionics.

The TI106 contains no field replaceable parts.

7. Limited Warranty

Trig Avionics warrants our products to be free from defects in materials and workmanship for a period of two (2) years from the date of installation by an authorised dealer.

This warranty covers repair and/or replacement at our option, of any parts found to be defective, provided such defects in our opinion are due to faulty material or workmanship and are not caused by tampering, abuse, or normal wear.

All warranties are F.C.A.

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Trig Avionics will not accept or pay for any charges for warranty work performed outside our factory without prior written consent.

This warranty applies only to products in normal use. It does not apply to units or circuit boards defective due to improper installation, physical damage, tampering, lightning or other electrical discharge, units with altered serial numbers, or units repaired by unauthorised persons or in violation of Trig Avionics service procedures.

Trig Avionics assumes no responsibility for any consequential losses of any nature with respect to any products or services sold, rendered, or delivered.

Appendix A – Environmental Qualification Statement

Nomenclature	3-inch Course Deviation Indicator	
Model Number	MD200 Series	
Part Number	MD200-( )	
ETSO (TSO)	C34e, C36e, 2C40c (C34e, C36e, C40c)	
Minimum Performance Specifications	TS361	
Manufacturer	Mid-Continent Instrument Co., Inc.	
Address	9400 E. 34th St. North, Wichita, KS 67226, USA	
RTCA DO-160	Rev G	
Dates Tested	09/2015 – 11/2015	
Conditions	**Section**	**Description of Conducted Tests**
Temperature and Altitude	4	Category F2
Low Temperature	4	Short-time and Normal Operating Low Temp = -55C
High Temperature	4	Short-time and Normal Operating High Temp = +70C
Altitude	4	55,000 feet
Overpressure	4	-15000 feet
Temperature Variation	5	Equipment tested to Category B
Humidity	6	Equipment tested to Category A
Operational Shocks	7	Equipment tested to Category B
Crash Safety	7	Equipment tested to Category B
Vibration	8	Category S - Curves M Category S - Curve N (Per RTCA DO-160B)
Explosion	9	Equipment identified as Category X – no test required
Waterproofness	10	Equipment identified as Category X – no test required
Fluids Susceptibility	11	Equipment identified as Category X – no test required
Sand and Dust	12	Equipment identified as Category X – no test required
Fungus	13	Equipment identified as Category X – no test required
Salt Spray	14	Equipment identified as Category X – no test required
Magnetic Effect	15	Equipment tested to Category Z
Power Input	16.	Equipment tested to Category BXX
Voltage Spike	17.	Equipment tested to Category B
Audio frequency conducted susceptibility	18.	Equipment tested to Category B
Induced signal susceptibility	19	Equipment tested to Category BC(X)
Radio frequency susceptibility	20	Equipment tested to Category B (Per RTCA DO-160B)
Radio frequency emission	21	Equipment tested to Category B (Per RTCA DO-160B)
Lightning induced transient susceptibility	22	Equipment identified as Category X – no test required
Lightning direct effects	23	Equipment identified as Category X – no test required
Icing	24	Equipment identified as Category X – no test required
Electrostatic Discharge	25	Equipment identified as Category X – no test required
Fire, Flammability	26	Equipment identified as Category X – no test required