



Installation Manual and Operating Instructions

Model MD200-706/707 Series Course Deviation Indicator



Mid-Continent Instrument Co., Inc.
dba Mid-Continent Instruments and Avionics®
9400 E. 34th Street N.
Wichita, KS 67226
ph (800) 821-1212 fx (316) 630-0723

Manual Number 9018582
Revision A, January 26, 2016

FOREWORD

This manual provides information intended for use by persons who, in accordance with current regulatory requirements, are qualified to install this equipment. If further information is required, please contact:

Mid-Continent Instruments and Avionics
Attn: Customer Service Dept.
9400 E. 34th Street N.
Wichita, KS 67226 USA
PH (316) 630-0101
FX (316) 630-0723
www.mcico.com

We welcome your comments concerning this manual. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the manual part number, the paragraph/figure/table reference and the page number. Send your comments to:

Mid-Continent Instruments and Avionics
Attn: Technical Publications
9400 E. 34th Street N.
Wichita, KS 67226 USA
PH (316) 630-0101
FX (316) 630-0723
ks.customerservice@mcico.com

All products produced by Mid-Continent Instrument Co., Inc., including those identified as Mid-Continent Instruments and Avionics or True Blue Power, are designed and manufactured in Wichita, KS, USA.

REVISION HISTORY

Revision	Date	Approved	Detail
A	01/26/2016	BAW	Initial Release; MD200-7XX series supersedes MD200-3XX series

TABLE OF CONTENTS

FORWARD	2
REVISION HISTORY	3
FORWARD 2.....	4
REVISION HISTORY 3.....	4
SECTION 1 GENERAL DESCRIPTION	5
1.1 Introduction	5
1.2 Technical specifications	6
1.2.1 Electrical Attributes	6
1.2.2 Physical Attributes.....	6
1.2.3 Qualifications.....	6
SECTION 2 PRE-INSTALLATION	7
2.1 General Information	7
2.2 Unpacking and inspecting equipment.....	7
2.3 Equipment Location	7
2.4 Cable Harness	8
2.4.1 Wire Gauge Selection	8
2.5 Limitations	9
SECTION 3 INSTALLATION	10
3.1 General	10
3.2 Mounting	10
3.3 Installation Completion.....	10
SECTION 4 OPERATION	12
4.1 Pre-Installation Tests	12
4.2 Annunciator Dimming Adjustment.....	12
4.3 Operating Instructions.....	12
4.3.1 VOR Operation.....	12
4.3.2 Localizer Operation	13
4.3.3 Glideslope Operation	13
SECTION 5 CONFORMANCE	13
5.1 Instructions for Continued Airworthiness	13
5.1.1 Maintenance.....	13
5.2 ENVIRONMENTAL QUALIFICATION STATEMENT	14

SECTION 1 GENERAL DESCRIPTION

1.1 INTRODUCTION

The Mid-Continent Instruments and Avionics MD200-706 and MD200-707 Course Deviation Indicator is designed to operate with VHF and GPS navigational equipment to provide OMNI (VOR), GPS, Localizer (VLOC), and Glideslope (GS) information.

The MD200-706/707 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, VLOC, 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.

When GPS is selected for display, the MD200-() receives inputs from compatible GPS/Navigation receivers or Flight Management Systems to provide a visual presentation to the pilot. All information presented on the navigation indicator is generated from this external receiver.

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°). Additional course datum output information is offered on the MD200-707 version as well, with the electrical zero defined when the compass card is set to 090°.

The MD200 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.

1.2 TECHNICAL SPECIFICATIONS

1.2.1 ELECTRICAL ATTRIBUTES

Characteristics:	
Input Voltage:	12-32 VDC
Input Current: (maximum)	0.2 amps
Unit Lighting Input:	5, 14, or 28VDC
Annunciator Lighting:	Automatic dimming control via internal photocell (adjustable)
Interface Specifications:	
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 sensitivity: 260 mV ±10% to display pointers
To/From Indicator:	Input impedance: 200Ω ±10% Annunciator sensitivity: 40mV ±15%
Course Datum Output:	Standard ARINC X, Y, Z; 11.8V _{RMS} (400 Hz)

1.2.2 PHYSICAL ATTRIBUTES

Characteristics:	
Dimensions: (without connectors, mates & knob)	Bezel: 3-1/8" diameter Chassis: 3.25" x 3.25" x 4.75" (HxWxD)
Weight:	MD200-706: 1.3 pounds (0.59 kg) MD200-707: 1.4 pounds (0.64 kg)
Cover Glass:	HEA (anti-reflective) coated per MIL-C-14806
Mating Connectors:	25-pin D-Sub, MCIA p/n 7014517 9-pin D-Sub, MCIA p/n 8017287 (-707 only)
Mounting:	Rear mount, see panel cutout; Figure 3.1 and Figure 3.2
Lighting:	Light emitting diodes (LEDs)

1.2.3 QUALIFICATIONS

Specifications:	
Qualification:	FAA TSO-C34e, C36e, C40c EASA ETSO C34e, C36e, 2C40c
Environmental Qualification:	RTCA DO-160B/G (details listed in Section 5.2)

SECTION 2 PRE-INSTALLATION

2.1 GENERAL INFORMATION

This section contains information and considerations required to prepare for the MD200 CDI installation, including provided equipment, panel location, wiring and other information.

2.2 UNPACKING AND INSPECTING EQUIPMENT

When unpacking this equipment, make a visual inspection for evidence of any damage that may have incurred during shipment. The following parts should be included:

- | | | |
|-------------------------------|----------|-----------|
| a. Course Deviation Indicator | MCIA P/N | MD200-7XX |
| b. Connector Kit | MCIA P/N | 7014517 |
| c. Connector Kit (-707 only) | MCIA P/N | 8017287 |
| d. Installation Manual | MCIA P/N | 9018582 |

Equipment Not Provided

- | | |
|----------------------|------------------------------------|
| a. Wire, 22AWG | (see 2.4.1) |
| b. Mounting Hardware | (3) #6 UNC screws, 1.0" max length |

2.3 EQUIPMENT LOCATION

The MD200-() course deviation indicator 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, 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 MD200-() is not located near any high heat source or crowded next to other equipment.

The MD200 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.

2.4 CABLE HARNESS

Construct the cable harness in accordance with the instructions/diagrams located within this document and using industry-accepted practices regarding aircraft wiring and applicable regulatory requirements and guidance.

See Tables 2.1 and 2.2 for connector pinout.

Refer to Section 2.3: Equipment Location for routing precautions.

2.4.1 WIRE GAUGE SELECTION

Wire gauge should be 24 AWG or larger (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.

J1 (25 PIN D-SUB) Pinout					
Pin	Pin Description		Pin	Pin Description	
1	OBS Resolver H		14	+ Down	(GS common ref)
2	OBS Resolver C		15	+ Glide Slope Valid	
3	OBS Resolver D		16	- Glide Slope Valid	(GS common ref)
4	OBS Resolver F		17	GPS Annunciator	(gnd = active)
5	OBS Resolver E	(NAV common ref)	18	VLOC Annunciator	(gnd = active)
6	OBS Resolver G	(NAV common ref)	19	+12-32 VDC	(or pin 20)*
7	+ VOR/LOC Valid		20	+12-32 VDC	(or pin 19)*
8	- VOR/LOC Valid	(NAV common ref)	21	Power Ground	
9	+ To		22	+28 V Lighting	
10	+ From	(NAV common ref)	23	+14 V Lighting	
11	+ Left		24	NAV Annunciator	(gnd = active)
12	+ Right	(NAV common ref)	25	+5 V Lighting	
13	+ Up				

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

J2 (9 PIN D-SUB) Pinout MD200-707 only	
Pin	Pin Description
1	Course Datum H
2	Course Datum C
3	Course Datum X
4	Course Datum Y
5	Course Datum Z
6	Spare
7	Spare
8	Spare
9	Spare

Tables 2.1 and 2.2
Connector Pinout

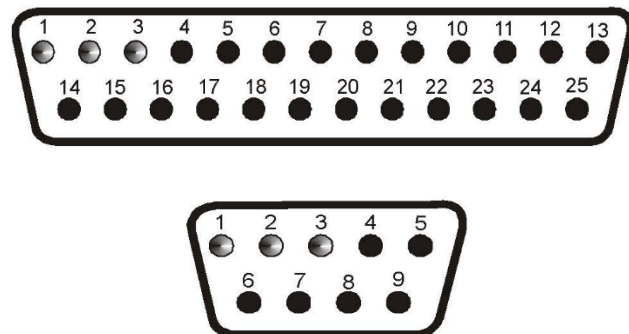


Figure 2.1
Connector Views; J1 and J2

2.5 LIMITATIONS

The conditions and tests for TSO approval of this article are minimum performance standards. Those installing this article 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 article, and deviations listed below. TSO articles must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR Part 43 or the applicable airworthiness requirements.

REQUIREMENTS FOR TSO'D VOR/ILS SYSTEM:

1. The navigation receiver shall be certified to FAA TSO C40a/b/c or TSO C36c/d/e or later.
2. VOR phase error shall not exceed 1.5°.
3. Variation in VOR composite output not to exceed ± 3 dB from .500 VRMS as the RF input level of a standard VOR test signal to the receiver is varied from 10 μ V to 10,000 μ V.
4. Variation in the LOC composite output not to exceed ± 2 dB from .333 VRMS as the RF input level of a standard localizer test signal to the receiver is varied from 50 μ V to 10,000 μ V.
5. A control line (ILS Energize) must be provided as a low impedance to ground when an ILS frequency is selected.

REQUIREMENTS FOR TSO'D GLIDESLOPE SYSTEM:

1. The glideslope receiver/converter shall be certified to the standards of TSO C34c/d/e or later.
2. Deviation current with a 700 μ V standard glideslope deviation signal applied to the receiver input shall be 78 μ A $\pm 10\%$ into a 1000 ohm load. Deviation current shall not change more than 15% as the RF level of a standard glideslope deviation signal is varied from 100 μ A to 10,000 μ A. Deviation current shall be proportional within 5% to the difference in depth of modulation of the 90 Hz and 150 Hz tones.
3. Warning signal output shall be a DC current less than 125 μ A into a 1000 ohm load in order to drive the pointer out of the viewing area. For the pointer to be fully in view and operational, the warning/valid signal shall be a DC current of 260 μ A minimum into a 1000 ohm load.

SECTION 3 INSTALLATION

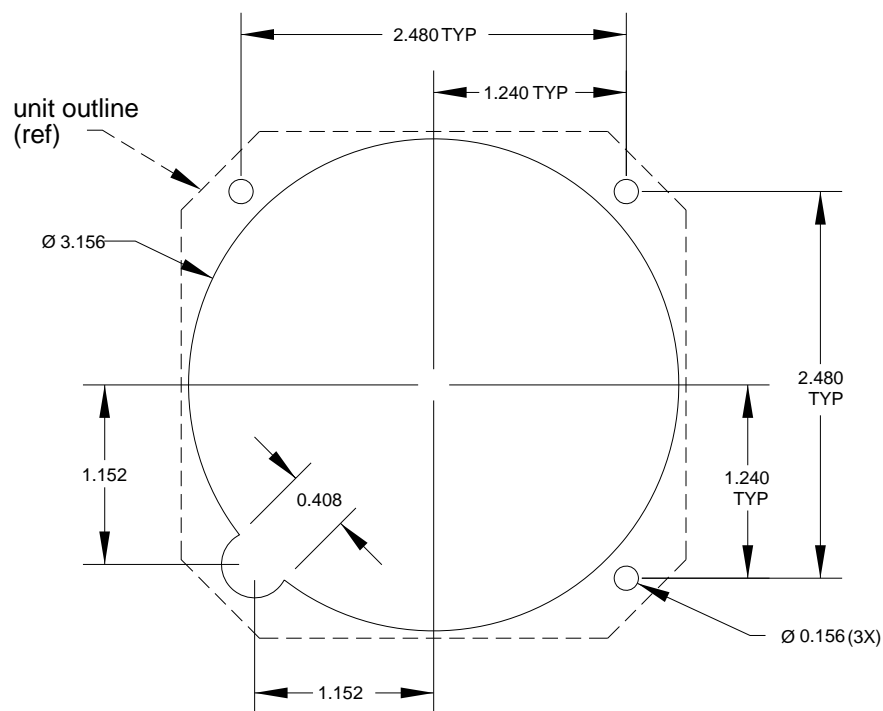
3.1 GENERAL

This section contains interconnect diagrams, mounting dimensions and other information pertaining to the installation of the MD200 Course Deviation Indicator. After installation of cabling and before installation of the equipment, ensure that power is applied only to the pins specified in the interconnect diagram.

3.2 MOUNTING

Install the MD200 CDI within the aircraft in accordance with the aircraft manufacturer's instructions and the following steps:

1. Verify that the instrument panel cutout meets the requirements of Figure 3.1
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 3.1
Panel Cutout**

3.3 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.

3X 6-32 UNC -2B
on Ø3.500 B.C.,
equally spaced

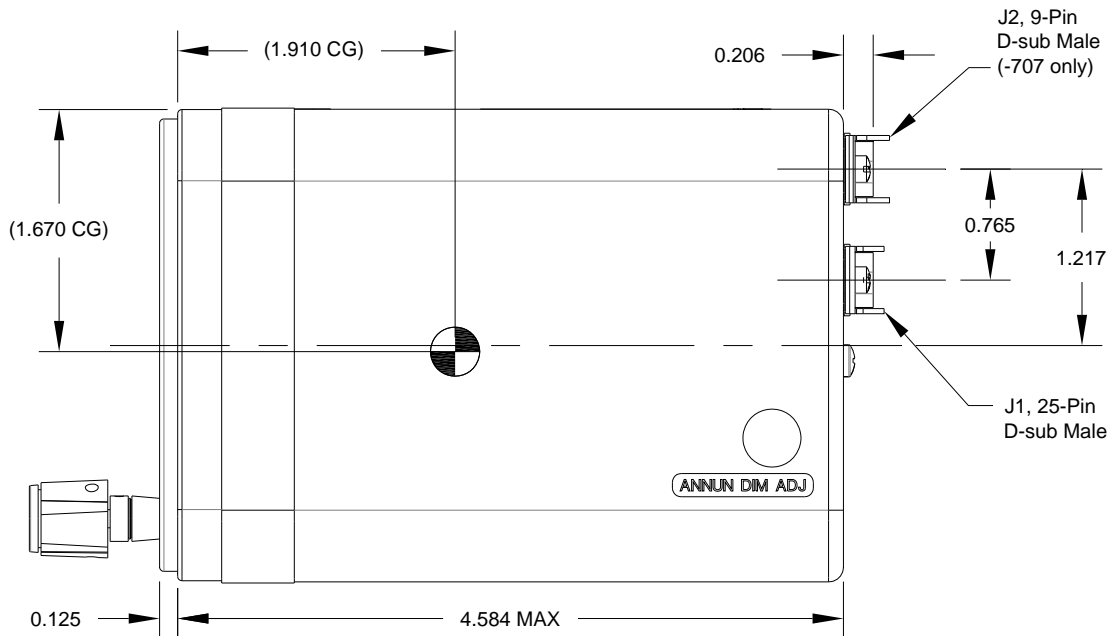
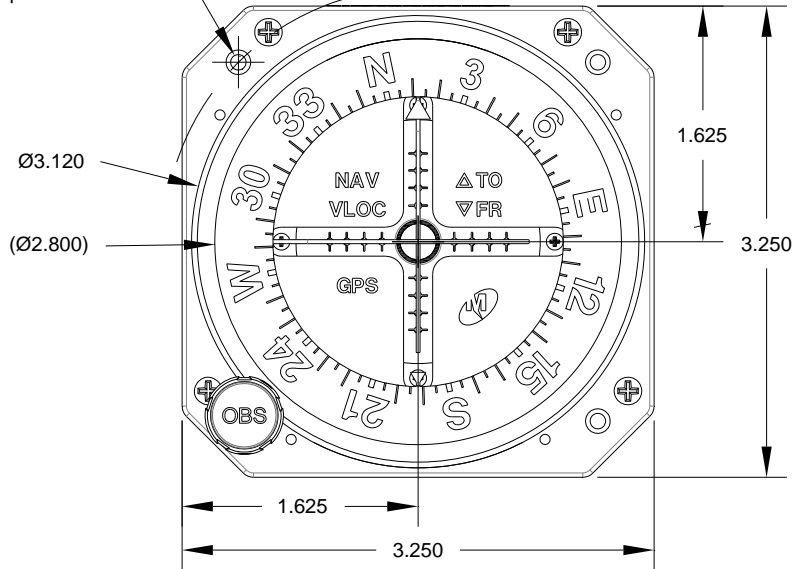


Figure 3.2
Outline Drawings

SECTION 4 OPERATION

4.1 PRE-INSTALLATION TESTS

With the MD200-() indicator 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.

4.2 ANNUNCIATOR DIMMING ADJUSTMENT

Following installation of the MD200-() CDI, check the brightness of the annunciations (GPS, NAV, VLOC, 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 MD200-() unit, and is labeled "ANNUN DIM ADJ".

4.3 OPERATING INSTRUCTIONS

All controls required to operate the MD200-() course deviation indicator are located on the unit's front panel and on the front panel of the related navigation receiver.

4.3.1 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 center 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 centered. If the aircraft moves off course, the deviation indicator will move away from the center 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. Maneuver 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 (center) to prevent excessive course bracketing.

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

4.3.3 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 again intercept the glide path and center the pointer. If the pointer deflects downward the aircraft is above the glide path and the pilot must descend to again intercept the glide path and center the pointer. When the pointer is centered the aircraft is on the glide path.

SECTION 5 CONFORMANCE

5.1 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

5.1.1 MAINTENANCE

There is no scheduled maintenance required for the MD200 CDI. If the unit fails to perform within operational specifications, the unit must be removed and serviced by Mid-Continent Instruments and Avionics.

The MD200 contains no field replaceable parts.

5.2 ENVIRONMENTAL QUALIFICATION STATEMENT

NOMENCLATURE: 3-inch Course Deviation Indicator
MODEL NUMBER: MD200 Series **PART NUMBER:** MD200-()
TSO NUMBERS: C34e, C36e, C40c **ETSO NUMBERS:** C34e, C36e, 2C40c

MANUFACTURERS SPECIFICATIONS: 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, dtd 12/08/10 **DATES TESTED:** 09/2015 – 11/2015

CONDITIONS	SECTION	DESCRIPTION OF TEST
Temperature and Altitude Low Temperature High Temperature Altitude Overpressure	4	Category F2 Short-time and Normal Operating Low Temp = -55C Short-time and Normal Operating High Temp = +70C Altitude = 55K -15,000 ft
Temperature Variation	5	Category B
Humidity	6	Category A
Operational Shock and Crash Safety	7	Category B
Vibration	8	Category S, Curves M Category S, Curve N*
Explosion	9	Category X
Waterproofness	10	Category X
Fluids	11	Category X
Sand and Dust	12	Category X
Fungus	13	Category X
Salt Spray	14	Category X
Magnetic Effect	15	Category Z
Power Input	16	Category B(XX)
Voltage Spike	17	Category B
Audio Frequency Conducted Susceptibility	18	Category B
Induced Signal Susceptibility	19	Category BC(X)
Radio Frequency Susceptibility	20	Category B*
Emission of Radio Freq Energy	21	Category B*
Lightning Induced Transient Susceptibility	22	Category X
Lightning Direct Effects	23	Category X
Icing	24	Category X
ESD	25	Category X
Fire, Flammability	26	Category X

REMARKS:
 * Per RTCA DO-160B