

## INSTALLATION MANUAL AND OPERATING INSTRUCTIONS

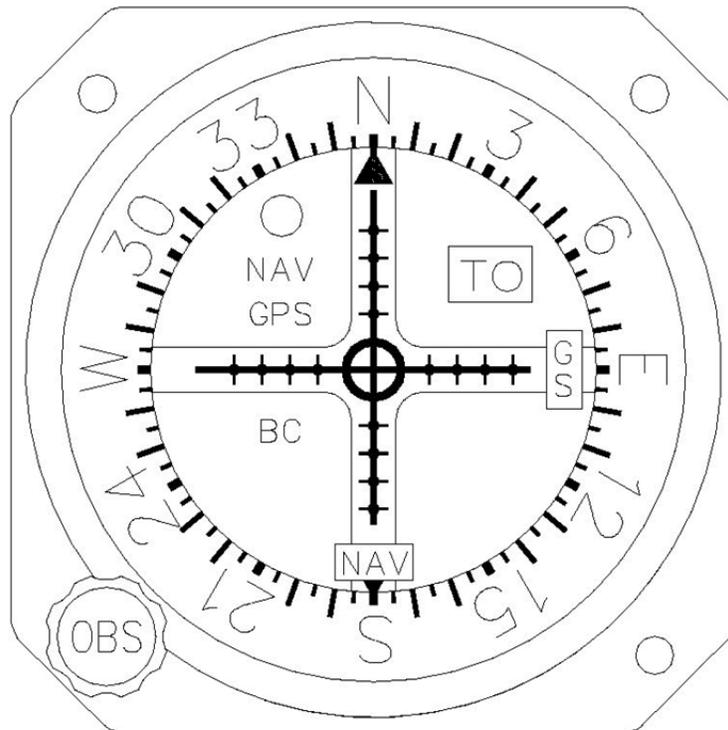
### MD200-3XX SERIES COURSE DEVIATION INDICATOR

**MFG. P/N: MD200-302/-302(5V)**

**MFG. P/N: MD200-303/-303(5V)**

**MFG. P/N: MD200-306/-306(5V)**

**MFG. P/N: MD200-307/-307(5V)**



## **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:

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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 number, and the page number. Send your comments to:

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**Revisions**

<b>Rev.</b>	<b>Date</b>	<b>Approved</b>	<b>Description of Change</b>
A	08/11/00		Corrected typographical errors, added section 4.2 Annunciator Dimming Adjustment
B	04/11/02		Added MD200-302(5V)/-303(5V)/-306(5V)/-307(5V) indicators. These units have 5 volt bezel lighting.
C	12/15/03		Corrected 5 volt lighting connections to J1.
D	11/21/13	MKN/BMC	Updated to standardized formatting, added Foreword, added ETSO info, corrected course datum synchro wiring diagrams, corrected environmental qualification form.
E	06/03/14	MKN/SchH	Corrected figures 3-4 and 3-5 by changing Pin 18 label from VLOC to BC.

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## SECTION 1: GENERAL DESCRIPTION

### 1.1 INTRODUCTION

The Mid-Continent Instruments and Avionics MD200-302/-303/-306/-307 Nav Indicator is designed to operate with VHF and GPS navigational equipment to provide OMNI (VOR), GPS, Localizer (LOC), and Glideslope (GS) information.

The MD200-302/-303 is designed to accept DC Left/Right, To/From, and Nav warn flag signals from a remote mounted VOR converter. Additionally, the MD200-306/-307 will accept DC signals from a glideslope receiver which will drive the Up/Down needle along with a GS warn meter. Both units incorporate NAV, GPS, and BC annunciation with photocell dimming.

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.

Course datum information is offered on the MD200-303/-307 versions. The course resolver is zeroed (ORZ) to industry standard 300°.

5 volt bezel lighting is offered with the MD200-302(5V)/-303(5V)/-306(5V)/-307(5V) indicators.

### 1.2 SPECIFICATIONS, TECHNICAL

#### 1.2.1 PHYSICAL CHARACTERISTICS

Display Size:	3 1/8 Inch Round
Mounting:	Panel
Width:	3.25 Inches
Height:	3.25 Inches
Depth:	4.75 Inches max
Weight:	MD200-302/-306      1.4 lbs. MD200-303/-307      1.5 lbs.

#### 1.2.2 ENVIRONMENTAL CHARACTERISTICS

TSO Compliance:	TSO: C34e, C36e, C40c
ETSO Compliance:	ETSO: C34e, C36E, 2C40c
Applicable Documents:	RTCA: DO-160B, DO-192, DO-195, DO-196
Operating Temperature Range:	-55°C to +70°C
Humidity:	95% Non-Condensing
Altitude Range:	0 to 55,000 ft.
Vibration:	Cat. M and N
Operational Shock:	Rigid Mounting, 6 G Operational 15 G Crash Safety

1.2.3 SPECIFICATIONS, ELECTRICAL

1.2.3.1 GENERAL

DESIGN: All Solid State  
OPERATING CURRENT: All units 0.30 Amps

1.2.3.2 VOR/LOC/GPS

OBS RESOLVER: Electrical zero: 300° ±1° ORZ.  
DEVIATION: Input impedance: 1K ohms ±10%.  
Deflection sensitivity: + and -150 mV ±10%  
for full scale deflection.  
VALID FLAG: Input impedance: 1K ohms ±10%.  
Flag sensitivity: 125 mV +10% for flag to leave  
stop. 260 mV ±10% flag fully concealed.  
TO/FROM FLAG: 200 ohms ±10%. + and -40 mV ±15% flag  
fully in view.  
COURSE DATUM: Standard ARINC X, Y, Z, 11.8 VRMS, (MD200-  
303/-307 only) 0.030 Amp. 400 Hz.

1.2.3.3 GLIDESLOPE (MD200-306/-307 only)

DEVIATION: Input impedance: 1K ohms ±10%.  
Deflection sensitivity: + and -150 mV ±10%  
for full scale deflection.  
VALID FLAG: Input impedance: 1K ohms ±10%.  
Flag sensitivity: 125 mV +10% for flag to leave  
stop. 260 mV ±10% flag fully concealed.

1.2.4 FRONT PANEL CONTROLS

OBS: Used to select appropriate inbound or  
outbound bearing to a VOR station or  
waypoint.

1.2.5 INTERFACE

NAV/LOC/GPS: Receives vertical, lateral deviation, warn flags,  
To/From, and OBS resolver information from  
the GPS/NAV receiver.  
GLIDESLOPE: Receives GS up-down and warn flag input from  
glideslope receiver.

### 1.2.6 EQUIPMENT LIMITATIONS

#### REQUIREMENTS FOR TSO'D VOR/ILS SYSTEM:

1. The navigation receiver shall be certified to the standards of TSO C40a/b/c or TSO C36c/d/e.
2. VOR phase error shall not exceed 1.5°.
3. Variation in VOR composite output not to exceed  $\pm 3$  dB from .500 VRMS as the RF input level of a standard VOR test signal to the receiver is varied from 10  $\mu$ V to 10,000  $\mu$ V.
4. Variation in the LOC composite output not to exceed  $\pm 2$  dB from .333 VRMS as the RF input level of a standard localizer test signal to the receiver is varied from 50  $\mu$ V to 10,000  $\mu$ 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.
2. The centering error as presented to the pilot shall not exceed 13% of standard deflection with a 95% probability under all combinations of the service conditions listed in RTCA document DO-192.
3. Deviation current with a 700  $\mu$ V standard glideslope deviation signal applied to the receiver input shall be 78  $\mu$ 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  $\mu$ A to 10,000  $\mu$ A. Deviation current shall be proportional within 5% to the difference in depth of modulation of the 90 Hz and 150 Hz tones.
4. Warning signal output shall be a DC current less than 125  $\mu$ A into a 1000 ohm load for a warning flag to be fully visible. Warning signal for a fully concealed warning flag shall be a DC current of 260  $\mu$ A minimum into a 1000 ohm load.

### 1.2.7 MAJOR COMPONENTS

The system is comprised of one major component, the MD200-( ) Course Deviation Indicator.

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## **SECTION 2: INSTALLATION CONSIDERATIONS**

### 2.1 COOLING

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.

### 2.2 EQUIPMENT LOCATION

The MD200-( ) course deviation indicator must be mounted as close to the pilot's field of view as possible. The unit depth, with connector attached, must also be taken into consideration.

### 2.3 ROUTING OF CABLES

Care must be taken not to bundle the MD200-( ) logic and low level signal lines with any high energy sources. Examples of these sources include 400 Hz AC, COM, DME, HF, and transponder transmitter coax. Always use shielded wire when shown on the installation print. Avoid sharp bends in cabling and routing near aircraft control cables.

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### **SECTION 3: INSTALLATION PROCEDURES**

#### **3.1 GENERAL INFORMATION**

This section contains interconnect diagrams, mounting dimensions, and other information pertaining to the installation of the MD200-( ). 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 UNPACKING AND INSPECTING EQUIPMENT**

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

1. MD200-( ) Series Course Deviation Indicator
2. Connector Kit (9 pin) MCI P/N 8017287 (-303/-307 w/course datum only)
3. Connector Kit (25 pin) MCI P/N 7014517
4. Installation Manual MCI P/N 8017972

#### **3.3 MOUNTING THE MD200-( ) INDICATOR**

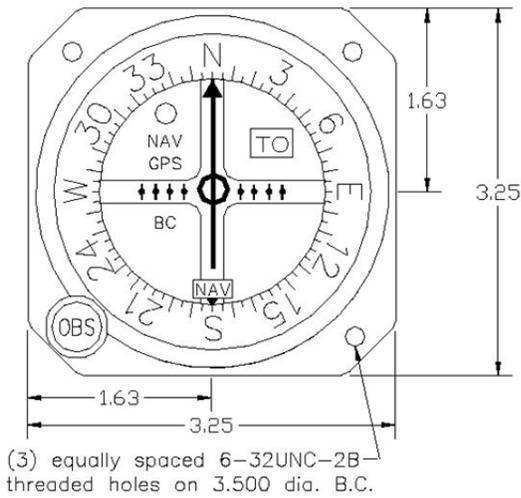
Plan a location in the aircraft for the MD200-( ) course deviation indicator to be mounted as close to the pilot's field of view as possible. Avoid mounting close to heater vents or other high heat sources. Allow a clearance of at least 3 inches from back of unit for plug removal.

The indicator is secured in place behind the panel since it is designed for rear mount only. Make a panel cutout as shown in Figure 3.2. Secure the indicator in place with three 6-32 x 1.0" flat head phillips screws

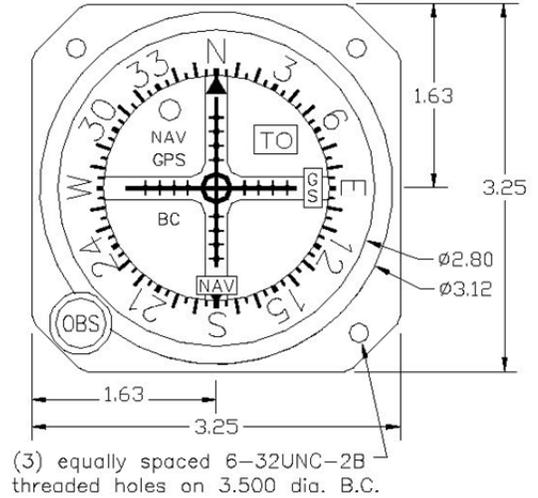
#### **3.4 INSTALLATION LIMITATIONS**

Wire the aircraft harness according to the appropriate figure. Use at least 24 AWG wire for all connections. You **MUST** use shielded wire where shown by the receiver manufacturer. Avoid sharp bends and routing cables near high energy sources. Care must be taken to tie the harness away from aircraft controls and cables.

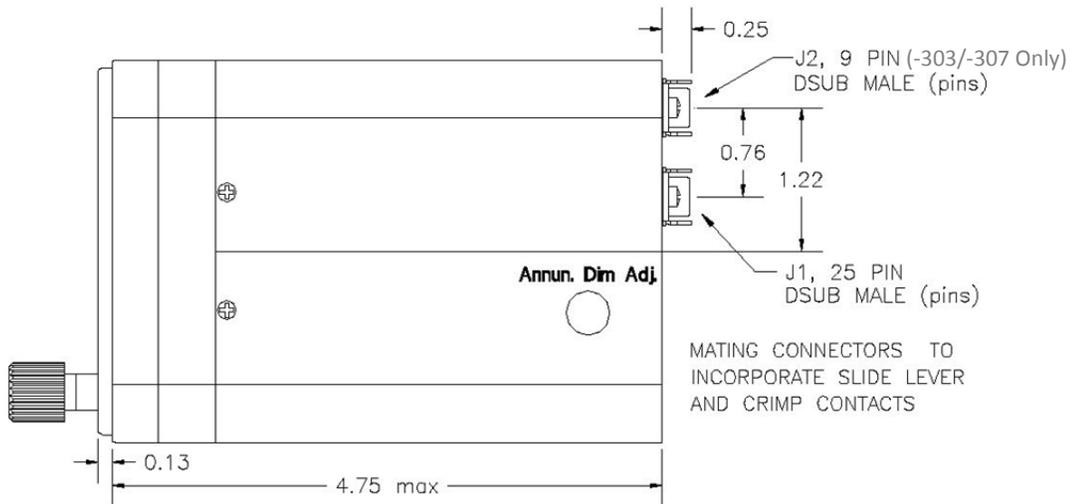




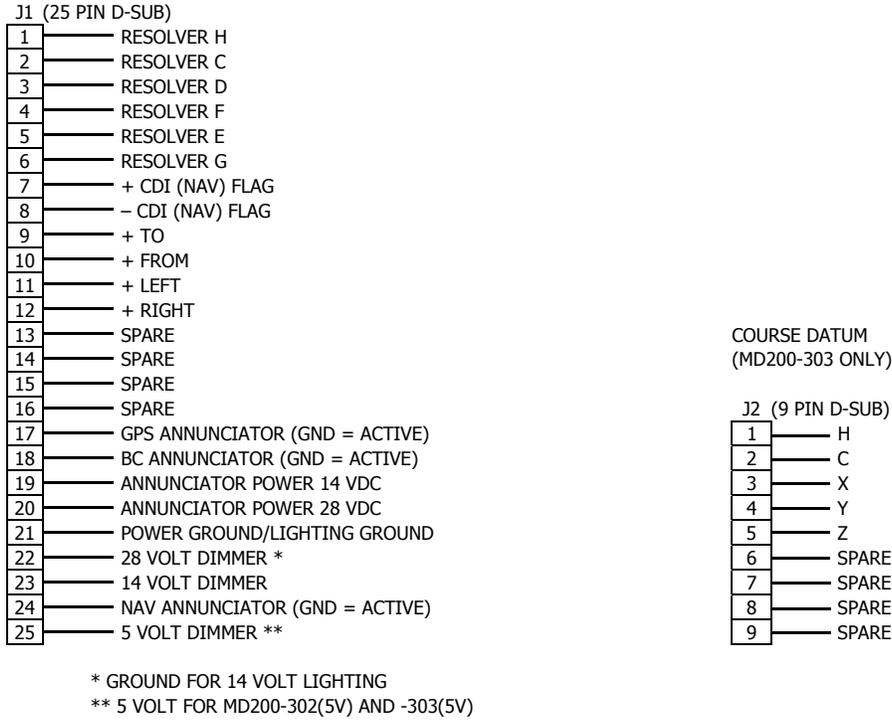
**MD200-302/303**



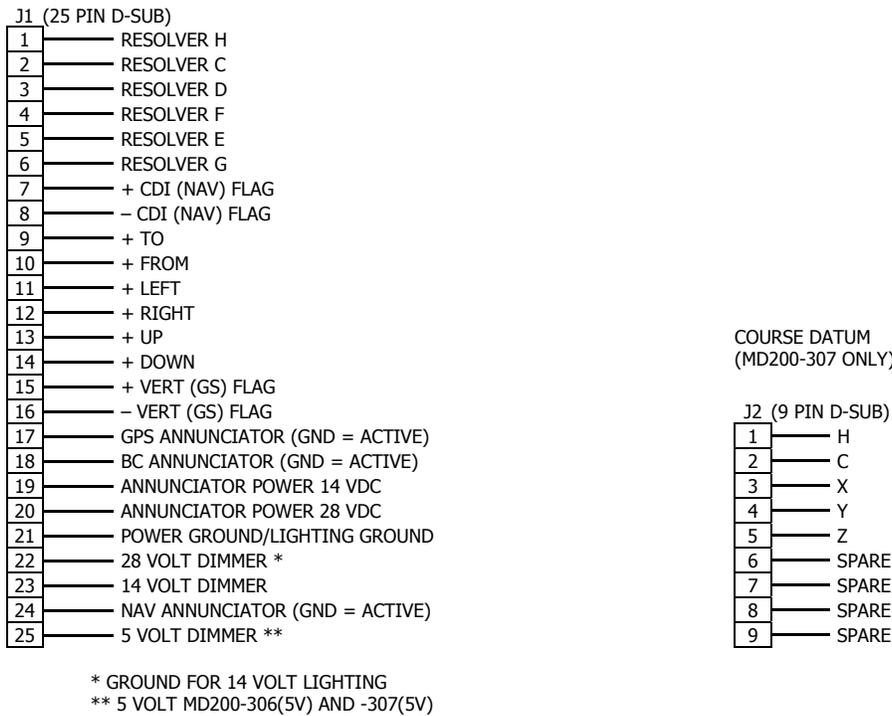
**MD200-306/307**



**FIGURE 3-3: OUTLINE DRAWING**



**FIGURE 3-4: WIRING DIAGRAM, MD200-302/-303**



**FIGURE 3-5: WIRING DIAGRAM, MD200-306/-307**

## **SECTION 4: POST INSTALLATION CHECK**

### **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 is 14 VDC or pin 20 is 28 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 GPS, NAV, and BC annunciations 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 warning flag is out of view.

Flying inbound to a VOR station is accomplished by first rotating the OBS knob to center the deviation indicator, and determining the To/From meter is in the "To" condition. 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 re-intercept the 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 "From" indication to appear with the pointer centered.

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 needle approaches an on course condition (center) to prevent excessive course bracketing.

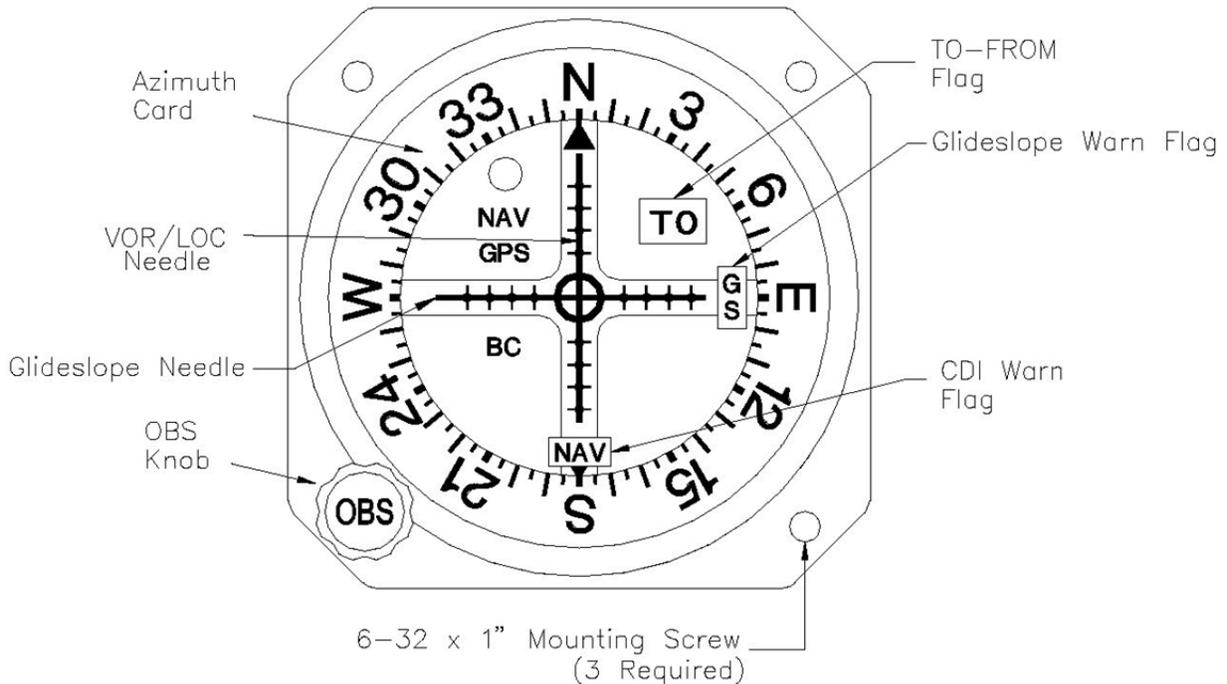
### 4.3.2 LOCALIZER OPERATION

Select the desired localizer frequency and observe that the localizer warning flag is concealed. The To/From flag is not functional for localizer operation. When flying on the front course or outbound on the back course make corrections toward the localizer (vertical) needle 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 needle 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) needle provides the pilot with vertical steering information during ILS approaches. The glideslope circuitry is energized when the associated localizer frequency is selected on the navigation receiver. Observe that the glideslope warning flag is concealed. The glideslope needle deflects towards the direction the pilot must fly to remain on the glide path.

If the glideslope needle deflects upward the aircraft is below the glide path and the pilot must climb to again intercept the glide path and center the needle. If the needle deflects downward the aircraft is above the glide path and the pilot must descend to again intercept the glide path and center the needle. When the needle is centered the aircraft is on the glide path.



**ENVIRONMENTAL QUALIFICATION FORM**  
RTCA / DO160B

NOMENCLATURE: MD200-( ) COURSE DEVIATION INDICATOR  
MODEL NO.: MD200-( )

TSO NO.: C34e, C36e, C40c  
ETSO NO.: C34e, C36e, 2C40c  
MPS 8014565

MANUFACTURER TEST SPECIFICATIONS

MANUFACTURER: Mid-Continent Instruments and Avionics  
9400 E. 34<sup>th</sup> Street N.  
Wichita, KS 67226  
Phone (316) 630-0101

Conditions	Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Categories F2 except as noted
Low Temperature	4.5.1	
High Temperature	4.5.2 & 4.5.3	
Altitude		
Decompression	4.6.1	Not Tested
Overpressure	4.6.2	Not tested
	4.6.3	
Temperature Variation	5.3	Equipment tested to Category B
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested per DO-160B
Operational	7.2.1	
Crash Safety	7.3.1	
Vibration	8.0	Equipment tested without shock mounts to Categories M and N (Table 8-1)
Explosion	9.0	Equipment identified as Category X, no test required
Waterproofness	10.0	Equipment identified as Category X, no test required
Fluids Susceptibility	11.0	Equipment identified as Category X, no test required
Sand and Dust	12.0	Equipment identified as Category X, no test required
Fungus	13.0	Equipment identified as Category X, no test required
Salt Spray	14.0	Equipment identified as Category X, no test required
Magnetic Effect	15.0	Equipment tested to Class Z
Power Input	16.0	Equipment tested to Category B
Voltage Spike	17.0	Equipment tested to Category B
Audio Frequency Susceptibility	18.0	Equipment tested to Category B
Induced Signal Susceptibility	19.0	Equipment tested to Category B
Radio Frequency Susceptibility	20.0	Equipment tested to Category B
Radio Frequency Emissions	21.0	Equipment tested to Category B
Lighting Induced Transient Susceptibility	22.0	Equipment identified as Category X, no test required
Lighting Direct Effects	23.0	Equipment identified as Category X, no test required
Icing	24.0	Equipment identified as Category X, no test required