Installation Manual and Operating Instructions

Model MD215 Series
Hybrid Counterdrum Altimeter

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Manual Number 9018501
Revision C, October 11, 2017

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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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	10/30/2015	BAW	Initial Release.
B	01/19/2016	BAW	Updates for TSO application.
C	10/11/2017	MKN	Updated Figure 3.1 with notch.

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SECTION 1 GENERAL DESCRIPTION

1.1 INTRODUCTION

The model MD215-( ) series two-inch Electric Hybrid Counterdrum Altimeter is a pressure actuated, encoding, sensitive altimeter built to meet or exceed standards set forth in FAA TSO-C10b, C88b, C106, C179a. The unit provides critical altitude data to the pilot and crew and offers features that enhance usability, reliability and convenience.

The MD215 provides a needle pointer and two rotating counter drums to indicate altitude up to 55,000 feet and includes an adjustable barometric pressure correction. The user interface features a simple push-and-turn knob to change the barometric pressure adjustment and address other features. The flexibility of the MD215 also allows user-configurability to meet a variety of altitude requirements, including altitude units in both feet and meters and barometric pressure units in both inches of mercury (in Hg) and millibars (mBar).

The MD215 is designed to be installed in an aircraft cockpit instrument panel and has available options for either a standard 2-inch ARINC-style front mount or round, bezel-mounted rear mount. Anti-reflective glass maximizes contrast ratio and provides a clear, efficient display.

The primary input is a pneumatic connection to the aircraft's static pressure system. Additionally, power is provided by any input between 10 and 32 volts DC, allowing operation with 14 or 28V aircraft electrical buses. The configurable lighting input powers an LED backlit display and can accept 5, 14 or 28V lighting systems.

The MD215 offers excellent reliability based on its solid-state pressure sensor and servo-driven display, far exceeding the expected life of traditional mechanical altimeters. Versions of the unit are also available that include an integral and rechargeable Nanophosphate® lithium-ion battery that can power the unit for one hour if main aircraft power is lost.

The unit has enhanced outputs and communication that provide information to and from the aircraft via a single ARINC 429 receive bus and an ARINC 429 transmit bus. The input function can receive ARINC data from the primary flight display system to automatically synchronize the baro adjustment with that system without redundant pilot intervention. The data outputs provide altitude, baro and other data that make the unit useful as an independent source of this information as needed on the aircraft. Traditional encoding outputs (Gillham code) may also be connected to a mode-C transponder or similar legacy equipment.

The operation and certification of the MD215 make it a great fit for Part 23 and 25 fixed-wing applications as well as Part 27 and 29 rotorcraft.

1.2 TECHNICAL SPECIFICATIONS

1.2.1 Electrical Attributes

Characteristics:	
Input Voltage:	10-32 VDC
Input Power: (nominal)	3 watts (0.11A @ 28VDC)
(maximum)	9 watts max (when charging)
Battery Capacity (if installed):	3.3 watt-hours
Lighting Input:	5, 14, or 28VDC or automatic photocell control
Input Data:	ARINC 429 (see Section 1.2.4)
Output Data:	ARINC 429 (see Section 1.2.4); Gillham encoded data (see Section 1.2.5) Valid discrete signal to ground; invalid signal is open (pin 2)

1.2.2 Physical Attributes

Characteristics:	
Range (altitude):	-1,500 feet to 55,000 feet (-450 to 16,900 meters)
Range (baro):	28.00 to 31.00 IN HG (948 to 1050 MBAR)
Weight:	2.0 pounds (0.91 kg)
Dimensions: (without connectors, mates & knob)	Bezel: 2.27” x 2.27” x 0.23” (HxWxD) Chassis: 2.18” x 2.18” x 4.63” (HxWxD)
Cover Glass:	HEA (anti-reflective) coated per MIL-C-14806
Mating Connectors:	9/16-18 UNJF-3B per MS33649-06 pneumatic fitting (MCI P/N NY-400-1-6ST) 26-pin D-Sub, MCIA p/n 9018118 (Installation Kit)
Mounting:	Front or rear mount, see panel cutout; Figure 3.1 and Figure 3.2
Lighting:	Internally lit with white LEDs

1.2.3 Qualifications

Specifications:	
Qualification:	FAA TSO-C10b, C88b, C106, C179a
Environmental Qualification:	RTCA DO-160G (details listed in Section 5.2)
Complex Hardware Qualification:	RTCA DO-254, Design Assurance Level A

1.2.4 ARINC data labels

All labels are defined as Equipment ID 006 in BNR format.

ARINC 429 Output (Transmit)		Speed	
Label	Description	High	Low
203	Pressure Altitude	X	
204	Baro Corrected Altitude	X	
212	Altitude Rate	X	
217	Static Pressure, Corrected	X	
234	Baro Correction (mbar)	X	
235	Baro Correction (in Hg)	X	
350	Hardware Version (custom)	X	
377	Equipment ID (006)	X	

ARINC 429 Input (Receive)		Speed	
Label	Description	High	Low
203	Pressure Altitude	X	X
204	Baro Corrected Altitude	X	X
234	Baro Correction (mbar)	X	X
235	Baro correction (in Hg)	X	X

Table 1.1
ARINC Data Labels

1.2.5 Gillham Code (Encoding Altimeter output)

Gillham output data (10 bits plus enable) is provided to be consistent with a legacy encoding altimeter. These outputs are traditionally connected to an ATC Transponder, although they could be used for other purposes.

The data format is described in the International (ICAO) Standard Code for S.S.R. Pressure Altitude Transmission contained in ICAO International Standards and Recommended Practices; Aeronautical Telecommunications, Annex 10, Volume I, Part I, Equipment and Systems. This document is referenced by SAE AS8003, as required by FAA TSO C88b.

The enable bit (TRANSMIT_ENABLE_N pin 25 listed in the pinout Table 2.1) must be connected to GND (pin 2 or equivalent) in order to actively update the outputs for normal operation.

Specifications:	
Output voltage tolerance	0 – 40V
Current per output	0 – 150mA
Output impedance	Modeled as FET in series with 15 ohms to GND
Output voltage	Dependent on supply, self-limiting to 150mA
Leakage current	250uA
Maximum rate of change for coded altitude	20,000 ft/min
Maximum switching rate for transmit enable	100 KHz

Table 1.2
Gillham Output Data Specifications

SECTION 2 PRE-INSTALLATION

2.1 GENERAL INFORMATION

This section contains information and considerations required to prepare for the MD215 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.	Hybrid Counterdrum Altimeter	MCI P/N	6420215-( )
b.	Installation Kit	MCI P/N	9018105
i.	Electrical Connector Kit	MCI P/N	9018118
ii.	Pneumatic Fitting	MCI P/N	NY-400-1-6ST
iii.	Screw, #6-32x3/8″	MCI P/N	90-612-10011
c.	Installation Manual	MCI P/N	9018501

Equipment Not Provided

a.	Wire, 22AWG	(see 2.4.1)
b.	Mounting Hardware (Front Mount Installation)	
i.	ATI2 Instrument Clamp	MSP 9962B or similar
ii.	Washer, Lock, #6 (optional)	Qty (3)

2.3 EQUIPMENT LOCATION

The MD215 Hybrid Counterdrum Altimeter 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.

Additionally, consider what equipment is behind the panel which may impede the installation of the MD215. Clearance for the unit as well as its electrical and pneumatic connections and routing must be allowed. Be aware of routing cables near other electronics or with other wire bundles that may be susceptible to high energy flow. Avoid sharp bends in cabling or hoses 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 or hoses during flight and cause undesirable effects.

2.4 CABLE HARNESS

Construct the cable harness in accordance with the instructions below (see Figure 2.1). Installers should follow industry-accepted practices regarding aircraft wiring and applicable regulatory requirements and guidance. The instructions for constructing the cable harness as listed within this manual were also used to construct the harness during environmental and electrical testing. Alterations may invalidate environmental qualification and/or performance results. Refer to Section 2.3: Equipment Location for routing precautions.

2.4.1 Wire Gauge Selection

Wire gauge should be 22 AWG. Use of PTFE, ETFE, TFE, Teflon, or Tefzel insulated wire is recommended for aircraft use per MIL-DTL-16878 or equivalent. Additionally, for data signals associated with ARINC 429 inputs and outputs, shielded twisted pair wiring per M27500 or equivalent is recommended (pin pairs 3 & 4 and 10 & 11).

2.4.2 Cable Harness Assembly

To assemble the aircraft cable harness and Configuration Module refer to the following instructions and Figure 2.1:

1. Install a pin/socket as supplied in the Connector Kit using an appropriate crimping tool for each wire in the aircraft cable harness. Be sure to make the harness long enough to remove the unit from the front of the panel without stressing the harness (approx. 8” longer than required to reach the unit connector).
2. Braids from shielded wires should be separated from the wire conductors and pulled back from the pin/socket termination approximately 2” and gathered together.
3. Route the aircraft wire harness bundle (excluding shield braids) through the appropriate size strain relief (item #10). The smaller end should extend toward the pins.
4. Insert the pins (Item 4) of the cable harness into the rear of the 26-pin D-Sub connector (Item 3) per Table 2.1 and Figure 2.1 using an appropriate pin insertion tool.
5. Install the D-Sub connector with cable harness attached into the Backshell (Item 6) and secure with (2) screws (Item 11) and (2) nuts (item #9). Leave screws loose until step 7 has been completed.
6. Place the D-Sub Slide Lock (Item #2) over the D-Sub connector as shown.
7. Install the D-Sub connector using (2) screws (Item #1), through the D-Sub Backshell (Item #6), (2) Clamp Shims (Item #5), (2) lock washers (Item #7) and (2) nuts (item #8). Move the Slide Lock back and forth to verify free movement.
8. Bundle the exposed shield braids and secure them in a ring terminal (not included). Ensure the right terminal selected will fit the ground lug on the MD215.
9. The completed assembly should look as shown. Verify that the Slide Lock operates freely and that no wires are pinched, nicked, or otherwise damaged.
10. Verify that power and ground signals are installed appropriately before connecting to the unit.

Item	Qty.	Description
1	2	#2 Latch Screw
2	1	Slide Latch
3	1	D-Sub Connector
4	26	Connector Pin
5	2	Clamp Shim
6	1	D-Sub Backshell
7	2	#2 Lock Washer
8	2	#2 Nut
9	2	#4 Nut
10	1	Strain Relief
11	2	#4 Screw

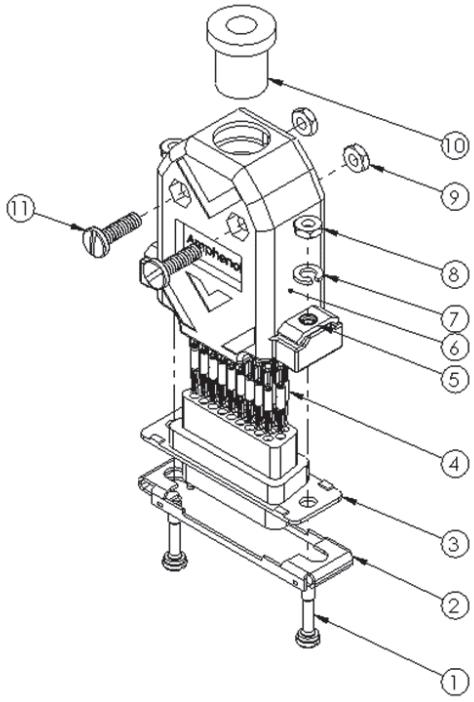

Figure 2.1
Cable Harness

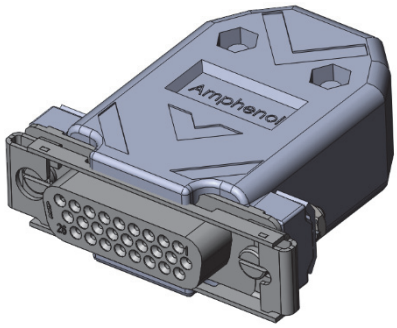

Figure 2.2
Assembled Cable Harness

26 Pin External Connector			
Pin	Pin Description	Pin	Pin Description
1	+10-32 VDC Input Power	14	Reserved
2	Power Return / GND	15	A2 (Gillham Code)
3	ARINC Out 1B	16	B1 (Gillham Code)
4	ARINC Out 1A	17	B4 (Gillham Code)
5	A1 (Gillham Code)	18	C2 (Gillham Code)
6	A4 (Gillham Code)	19	Lighting Bus Input
7	B2 (Gillham Code)	20	Valid Signal Out
8	C1 (Gillham Code)	21	Reserved
9	C4 (Gillham Code)	22	Reserved
10	ARINC In 1B	23	Reserved
11	ARINC In 1A	24	Reserved
12	Weight on Wheels	25	Transmit Enable (Gillham Code)
13	Reserved	26	D4 (Gillham Code)

Table 2.1
Connector Pinout

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.

Additionally, Mid-Continent Instruments and Avionics submitted for and received a deviation to FAA TSO C179a with respect to the lithium-ion function of the MD215. In lieu of the MPS requirements in Section 3 of the TSO which requires compliance to RTCA DO-311, Mid-Continent tested and complies with the more recent, RTCA DO-347.

When installed, the battery operation will be affected by ambient temperature. If ambient temperatures are cold enough to limit capacity below the unit's minimum requirement for one hour of operation, insufficient capacity will be indicated by an initial power-on test (see Section 4.3.1.5). Additionally, charging of the battery is inhibited below -20°C.

SECTION 3 INSTALLATION

3.1 GENERAL

IMPORTANT: READ THIS ENTIRE SECTION PRIOR TO STARTING INSTALLATION!

This section contains interconnect diagrams, mounting dimensions and other information pertaining to the installation of the MD215 Hybrid Counterdrum Altimeter. 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

Note that front and rear mount options require different versions of the unit. Please order accordingly.

Note that electrical bonding to the airframe is acceptable but not required in order to meet the environmental qualifications listed in Section 5.2.

3.2.1 Rear Mount Installation

Install the MD215 Altimeter within the aircraft in accordance with the aircraft manufacturer's instructions and the following steps:

1. Ensure the available instrument panel cutout meets the requirements of the indicator. See Figure 3.1
2. Secure the indicator to the instrument panel using the screws included in the Installation Kit, Section 2.2 (or equivalent).
3. Connect static line tube to the pressure port on the back of the altimeter.
4. Connect the electrical connector to the connector on the back of the altimeter.

CAUTION: INSTALL FITTING IN PORT WITH NO MORE THAN 100 IN-LBS OF TORQUE. IF TORQUE IS NOT SUFFICIENT TO MAINTAIN A SEAL THREAD SEALANT MUST BE USED.

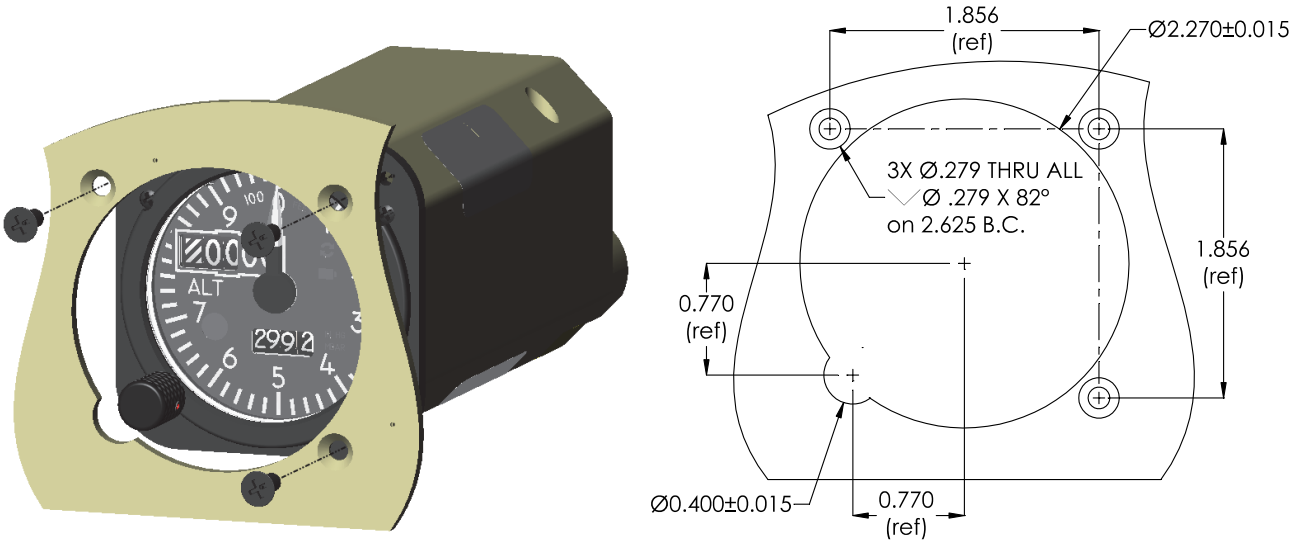

Figure 3.1
Rear Mount Installation

3.2.2 Front Mount Installation

Install the MD215 Altimeter within the aircraft in accordance with the aircraft manufacturer's instructions and the following steps:

1. Ensure the available instrument panel cutout meets the requirements of the indicator. See Figure 3.2.
2. Secure the instrument clamp to the instrument panel using the screw included with the clamp.
3. Connect static line tube to the pressure port on the back of the altimeter.
4. Connect the electrical connector to the connector on the back of the altimeter.
5. Slide the instrument into the instrument clamp until the front bezel is seated against the instrument panel.
6. Tighten the clamp adjustment screws.

CAUTION: INSTALL FITTING IN PORT WITH NO MORE THAN 100 IN-LBS OF TORQUE. IF TORQUE IS NOT SUFFICIENT TO MAINTAIN A SEAL THREAD SEALANT MUST BE USED.

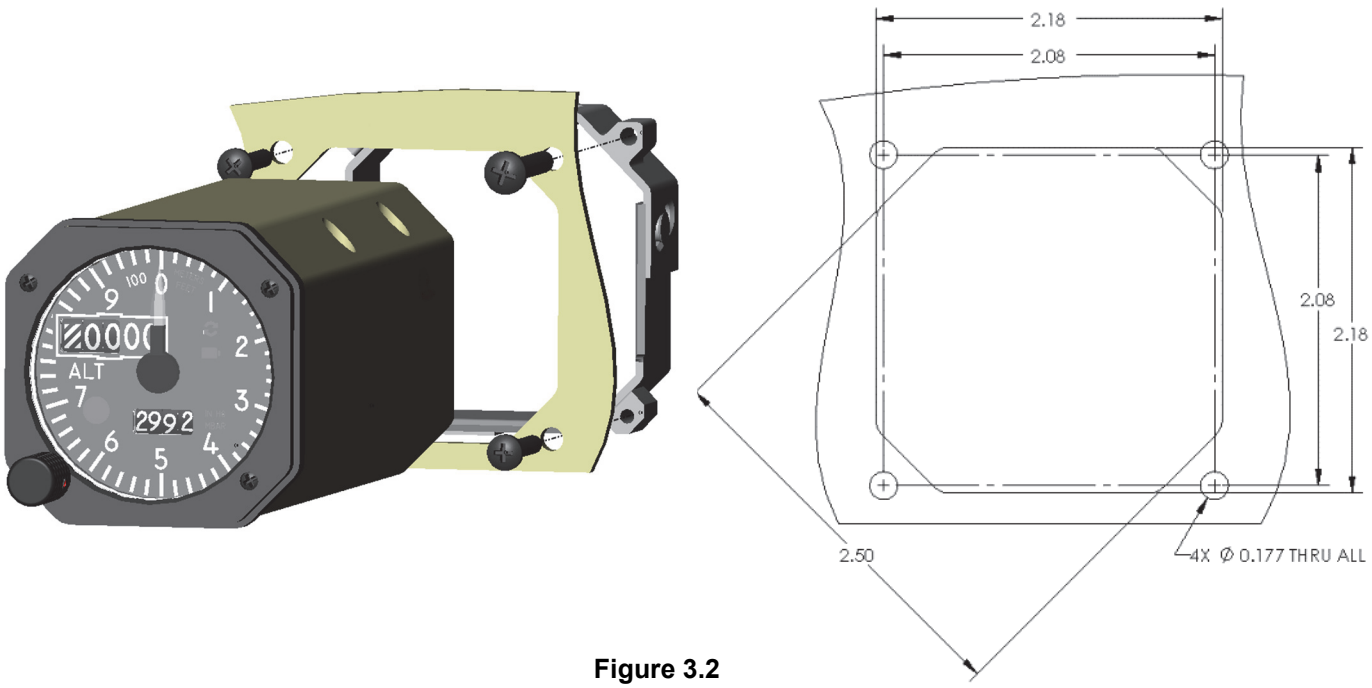

Figure 3.2
Front Mount Installation

3.3 INSTALLATION COMPLETION

Prior to operating the unit in the aircraft, verify the basic operation of the unit and conduct a standard leak check of the pitot/static system per the aircraft maintenance manual or industry practice.

SECTION 4 OPERATION

4.1 DESCRIPTION

The MD215 Hybrid Counterdrum Altimeter is a stand-alone standby instrument, designed for a 2” standard opening with available front or rear mounting options. The MD215 features a counterdrum and needle pointer display with options for feet or meters. Additionally, the manual or synchronized barometric pressure adjustment can be selected by the user to display either inches of mercury (IN HG) or millibars/hectopascals (MBAR). The MD215 also features backlit LED lighting with multiple input formats including 5V, ratiometric (10-32V), or automatic dimming using the internal photocell. The MD215 will operate with aircraft power of 10-32VDC and has an optional internal rechargeable lithium-ion battery for emergency operation. The MD215 display, features and modes of operation are further described in the following section.

4.2 USER INTERFACE

The user interface is comprised of:

- Altitude Display and Units
- Pointer
- Baro Setting and Units
- Push-button rotary knob
- Annunciations
- Invalid (INOP) Flag

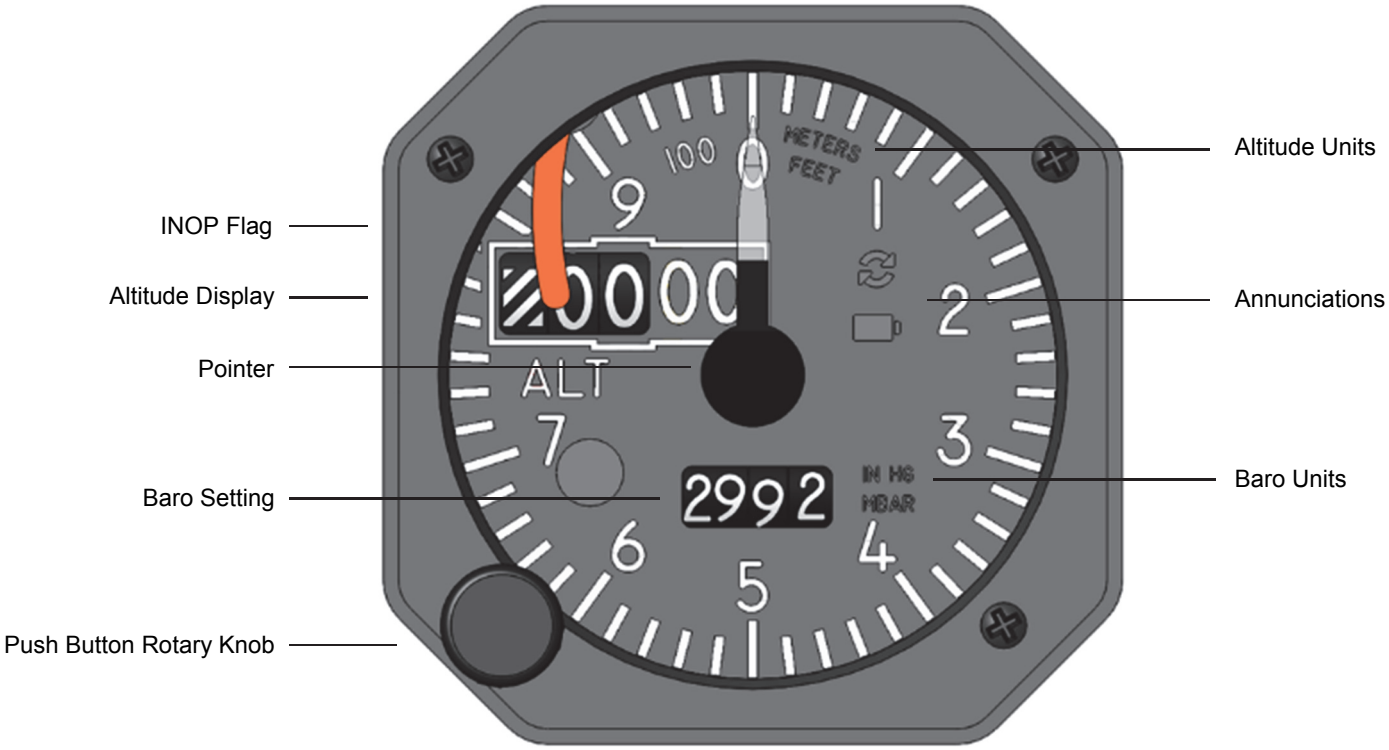

Figure 4.1
User Interface

4.2.1 Altitude Display and Units

The Altitude display is comprised of three rotating drums and two static zero digits. The static enumeration for single and tens remain at zero at all times. The hundreds and thousands digits, from 0 to 9, display the active altitude in conjunction with the ten-thousandths digit. The left-most, ten-thousandths digit also will display a diagonal black and white cross-hatch when the altitude is between 0 and 9,999. When the altitude is below zero, the left-most digit will display a red and white cross-hatch symbol.

The units of the numerical display are indicated with a backlit, white LED annunciation in the top right of the unit display, next to the zero graduation. The altitude units cannot be changed in flight and must be configured appropriately during installation and/or setup. See Section 4.3.3 for more information.

4.2.2 Pointer

The pointer performs 360° infinite revolutions and provides resolution beyond the hundreds digit display of the rotating altitude counterdrum. Each numbered major graduation represents 100 units and corresponds to the hundreds digit of the altitude display. Each minor graduation denotes twenty units (feet or meters).

The pointer is backlit with white LED lighting.

4.2.3 Baro Setting and Units

The adjustable barometric pressure display is comprised of two single digit and one dual digit rotating drums. The baro setting allows the user to calibrate the measured static pressure with respect to the current barometric pressure conditions to accurately display the appropriate altitude. The baro setting can be made by simply turning the knob clockwise or counterclockwise.

The units of the barometric pressure setting are indicated with a backlit, white LED annunciation just to the right of the rotating digits. The baro setting units can be changed in flight by simply pushing the knob and selecting the appropriate units. See Section 4.3 for more detailed information.

4.2.4 Push-button Rotary Knob (Flight Mode)

The push-button rotary knob performs multiple functions. When in flight mode, rotating the knob adjusts the baro setting. Pushing the knob allows the user to change the baro setting units.

In configuration mode, the knob has multiple functions. See Section 4.3.3 for more details.

4.2.5 Push-button Rotary Knob (Configuration Mode)

- Press knob while applying power to enter Configuration Mode
  - Sync/Update symbol turns blue
  - Continue hold (5+ seconds), blinks blue
  - Release, blinks white to indicate Config Mode
- Rotate right/left to select altitude units
  - Right/clockwise = feet
  - Left/counterclockwise = meters
  - Press knob to confirm FEET or METERS when text blinks
- Rotate right/left to select lighting input
  - Right/clockwise = 5V input
  - Left/counterclockwise = 14/28V ratiometric
- Remove power to exit Config Mode

4.2.6 INOP Flag

The invalid or “INOP” flag appears in the display when the unit has lost all power (external and internal), when an internal error has occurred, or during a transition between IN HG and MBAR. When the INOP flag is in view, the information on the altimeter should not be considered accurate or available for reference. All digital outputs are discontinued when the INOP flag is in view.

4.2.7 Annunciations (Flight Mode)

There are two status annunciators on the unit, the Synchronization (sync) Symbol and the battery symbol. The Sync Symbol is white when valid ARINC data is being received by the unit and the baro setting is synchronized with the external data source. The Sync Symbol is off when the baro setting is in manual mode.

The battery symbol indicates the internal battery status, if installed. It can be green, amber, red or white. See Section 4.3 for more details.

4.3 MODES OF OPERATION

The MD215 has three modes of operation. They are:

- Flight Mode
- Emergency Mode (Battery Operation)
- Configuration Mode

4.3.1 Flight Mode

The unit will automatically start up in flight mode unless one or more error conditions are present. No actions are required to initialize or prepare the unit for flight. Once the INOP flag is lifted, the unit is ready to fly.

4.3.1.1 INOP flag

If the orange INOP flag is visible, one or more errors are present and the altitude display should be considered invalid.

4.3.1.2 Barometric Pressure Setting

The barometric setting is changed by rotating the knob while in flight mode. Turning the knob clockwise will increment the value, while turning counter-clockwise will decrement the value.

4.3.1.3 Barometric Pressure Units Setting

The barometric units may be changed by pressing the front knob for more than 1 second and less than 5 seconds, until the units indicator (MBAR or IN HG) starts blinking. The knob can then be rotated clockwise or counter-clockwise to select the desired unit. Pressing the knob again will confirm the selection. The orange INOP flag will drop (for approximately 15 seconds) while the counter drum updates to the new value.

4.3.1.4 Baro Synchronization (optional)

This feature is enabled by connecting the ARINC 429 input to a source providing labels 203 and 204, or 234 or 235. The Sync Symbol (Figure 4.3) will illuminate solid white when the barometric setting is synchronized to the external reference. Adjusting the baro setting manually with the knob while synchronized will override the external synchronization. The external synchronization will again resume if/when the external reference changes again.

4.3.1.5 Battery Symbol (for battery-installed units only)

Upon initial power on, the unit will run a diagnostic and capacity test on the battery to determine its status. If the battery is healthy and one-hour of operation is available, the battery symbol will remain off. If low capacity is detected, the battery symbol will blink amber. The user can press the knob to acknowledge low-capacity and continue into Flight Mode. Or, if not acknowledged, the unit will still be available for Flight Mode and will continue to attempt to charge the battery. If it is sufficiently charged to provide one-hour of operation, the battery symbol will transition to off.

If the aircraft power is lost or interrupted to the unit, the unit will enter Emergency Mode. See Section 4.3.2 for more details.

4.3.2 Emergency Mode (for battery-installed units only)

When aircraft power to the instrument has been lost, it will enter Emergency Mode (battery units only) and be indicated by a green battery annunciation. Internal battery power will be supplied immediately, without intervention, to maintain normal Flight Mode operation. If power is restored, the battery symbol will turn off and begin charging battery.

4.3.2.1 Battery Indication

During battery operation, the battery icon is displayed green if more than 10 minutes of power is available. The battery icon will transition to amber when the available power drops below 10 minutes. See Table 4.1 for a full list of possible battery conditions.

An over-temperature indication (blinking red) means that the battery temperature has exceeded internal temperature limits. Battery power will be unavailable until the unit has cooled and power has been cycled off.

An error indication (solid red) means that the battery system is not working properly. Battery power will be permanently unavailable until the unit is factory serviced.

Figure 4.2
Battery Symbol

Color	Indication
OFF	Non-Battery Unit, Battery Off, or normal operation
Blink AMBER	Low capacity after power-on test
Solid GREEN	On Battery Power (>10 minutes)
Solid AMBER	On Battery Power + Low Battery (<10 minutes)
Blink RED	Battery Over-Temperature
Solid RED	Battery Error Detected
Blink WHITE	On Battery Power and WoW detected

Table 4.1
Battery Mode Annunciations

4.3.2.2 Battery power off

When aircraft power is removed, the unit will transition to Emergency Mode, including during normal landing and aircraft shut-down procedures. When the unit is on battery (green symbol), the battery can be manually turned off by pushing the knob and holding it for five (5) seconds. The battery symbol will then blink white for five (5) seconds. If the knob is released while the symbol blinks white, the battery will turn off.

The battery can be automatically turned off if a weight-on-wheels (WoW) or ‘squat’ switch input is provided to the unit (ground signal for WoW active). If the WoW signal is present during battery operation, the battery symbol will blink white for ten (10) seconds and automatically turn off. Pressing the knob during this 10 second delay will transition the symbol back to green, and the battery will remain on until it is depleted or power is restored.

4.3.3 Configuration Mode

In Configuration Mode, an authorized installer can change and set the appropriate configuration values that are specific to the aircraft. These also include user preferences and certain maintenance functions that are not available during flight. Battery functions are not available in configuration mode. See Table 4.2 for the descriptions of the Sync Symbol status and definitions.

4.3.3.1 Entering Configuration Mode

The unit can be placed into configuration mode by simultaneously pressing the knob and applying external power. The sync symbol will illuminate blue and the knob must be held in until the sync symbol blinks blue (~5 seconds). Upon releasing the button, the sync symbol will blink white, indicating that the unit is in configuration mode.

4.3.3.2 Field Update

When entering the configuration mode, if a USB flash drive with a valid firmware file is present in the USB port on the rear of the unit, the unit will attempt to update the internal firmware. The Sync Symbol indicator will blink magenta while updating. Upon successful update, the sync symbol will change to blinking green. If the update has failed, the sync symbol will change to blinking orange.

4.3.3.3 Altitude Units configuration

Rotating the knob clockwise will select “FEET” as the units. Rotating the knob counter-clockwise will select “Meters” as units. Pressing the knob once will confirm the highlighted selection and change the unit to 5V vs Ratiometric Lighting selection.

4.3.3.4 5V vs Ratiometric Lighting

After selecting the altitude units, the configuration mode will automatically transition to the Lighting selection option. Rotating the knob clockwise will select 5V dimming. Rotating the knob counter-clockwise will select Ratiometric dimming (0.6 to 14 volts or 1.2 to 28 volts, depending on aircraft bus voltage). Note: Voltage less than the minimum voltage listed will keep the unit in photocell dimming in both cases. Pressing the knob once will confirm the selection and change the unit back to Feet/Meters selection.

If the lighting pin on the unit connector is left open or is disconnected, the unit will default to automatic dimming control based on the internal photocell and current ambient lighting conditions.

4.3.3.5 Exiting Configuration Mode

Remove external power to reset the unit. When power is restored, the unit will again boot into Flight Mode.

Figure 4.3
Sync Symbol

Color	Indication
OFF	Power Off
FLIGHT MODE	
Solid WHITE	Flight Mode – Baro Sync
OFF	Flight Mode – No Baro Sync
CONFIGURATION MODE	
Solid **BLUE**	Power On + Knob Pressed (hold for 5 seconds)
Blink **BLUE**	Release Knob to enter Config Mode (between 5 and 10 seconds)
Blink **MAGENTA**	Update – Running
Blink **ORANGE**	Update – Failure
Blink **GREEN**	Update – Success
Blink WHITE	Config Mode active

Table 4.2
Sync Symbol Annunciation Definitions

SECTION 5 CONFORMANCE

5.1 INSTRUCTIONS FOR CONTINUED AIR-WORTHINESS

5.1.1 Pressure System and Altimeter Verification

Per federal regulation 14 CFR 91.411, it is required that each static pressure system and each altimeter have been tested and inspected within the last twenty-four (24) months. The unit must be sent to the factory for calibration and maintenance.

5.1.2 Maintenance

The MD215 contains no field replaceable parts. If the unit fails to perform within operational specifications, the unit must be removed and serviced by Mid-Continent Instruments and Avionics.

5.1.3 Firmware Updates

Mid-Continent will have, on occasion, the need to update the firmware of the MD215 to maintain, improve and/or enhance functionality or performance.

With the MD215 easy field-upgrade option, the unit does not have to be returned to the factory, and in some cases, may not have to be removed from the panel. Field update instructions can be found in Section 4.3.3.

Firmware updates are typically communicated to the public via Service Bulletins issued by Mid-Continent Instruments and Avionics and can be found at www.mcico.com.

5.1.4 Storage Information (for battery-installed units only)

In normal use, the MD215 utilizes the aircraft power to maintain full charge of the battery. Although the battery chemistry exhibits an extremely low relative self-discharge rate, all batteries will slowly self-discharge if left unused for long periods. In addition, self-discharge rates are directly related to the storage temperature. Higher storage temperatures will result in faster self-discharge rates. Recommended maximum storage temperature is 30°C (86°F).

5.1.5 Battery Maintenance and End of Life (for battery-installed units only)

The MD215 battery is designed for on-condition maintenance via the power-on test feature. If the battery indication consistently shows blinking amber (see Table 4.1) after providing input power for a sufficient charging time, the battery capacity has diminished below one hour of operation and the unit must be factory serviced.

Estimated life for the battery in the MD215 is expected to exceed six (6) years. The designed useful life is up to ten (10) calendar years.

5.1.6 Battery Disposal (for battery-installed units only)

NOTE: All lithium ion batteries are classified by the United States government as non-hazardous waste and are safe for disposal as normal municipal waste. However, these batteries do contain recyclable materials and recycling options available in your local area should be considered when disposing of this product. Dispose of in accordance with local and federal laws and regulations. Do not incinerate.

5.1.7 Shipping (for battery-installed units only)

The lithium-ion battery is designed to comply with all applicable shipping regulations as prescribed by industry and regulatory standards. This includes compliance with the UN recommendations on the Transport of Dangerous Goods, IATA Dangerous Goods Regulations, and applicable U.S. DOT regulations for the safe transport of lithium-ion batteries and the International Maritime Dangerous Goods Code.

5.2 ENVIRONMENTAL QUALIFICATION STATEMENT

NOMENCLATURE: 2-inch Hybrid Counterdrum Altimeter
MODEL NUMBER: MD215 Series **PART NUMBER:** 6420215-( )
TSO NUMBERS: C10b, C88b, C106, C179a
MANUFACTURERS SPECIFICATIONS:
Minimum Performance Specifications: TDS558, TS558
Qualification Test Reports: QTR2201, QTR2203-QTR2208, QTR2215-QTR2218
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:** 5/28/15 – 10/20/15

CONDITIONS	SECTION	DESCRIPTION OF TEST
Temperature and Altitude Low Temperature High Temperature Altitude Decompression Overpressure	4 4.5.1 4.5.2 4.6.1 4.6.2 4.6.3	Category F1 Short-time Operating Low Temp = -40C Normal Operating Low Temp = -20C Short-time Operating High Temp = +70C Normal Operating High Temp = +55C Altitude = 55K -15,000 ft
Temperature Variation	5	Category S2
Humidity	6	Category A
Operational Shock and Crash Safety	7	Category B
Vibration	8	Category R, Curves B, B1 [(RBB1)]
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 A
Power Input	16	Category Z(XX)
Voltage Spike	17	Category A
Audio Frequency Conducted Susceptibility	18	Category Z
Induced Signal Susceptibility	19	Category ZC
Radio Frequency Susceptibility	20	Category W (conducted) Category F (radiated) [WF]
Emission of Radio Freq Energy	21	Category MM
Lightning Induced Transient Susceptibility	22	[(B3K3L3)] Category B3 (pin injection) Category K3L3 (cable bundle)
Lightning Direct Effects	23	Category X
Icing	24	Category X
ESD	25	Category A
Fire, Flammability	26	Category X

REMARKS: