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Installation Manual and Operating Instructions

Model MD32 Series
Remote Magnetometer
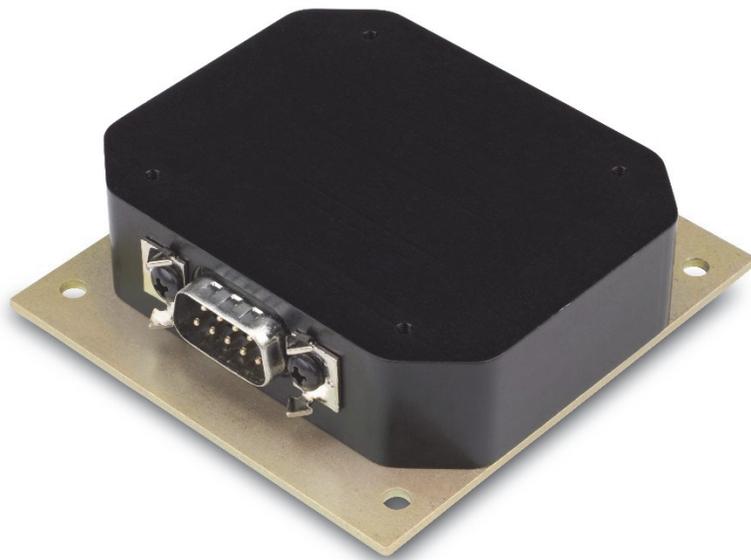
FOREWORD

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
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Wichita, KS 67226 USA
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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 reference and the page number. Send your comments to:

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All products produced by Mid-Continent Instrument, Co., Inc., are designed and manufactured in Wichita, KS, USA.

REVISION DETAIL

Revision	Date	Approved	Detail
A	03/02/2018	CAS	Initial release
B	03/21/2018	CAS	1) Provided additional details in 2.4 regarding limitations and deviations 2) Added description for wire shield terminations 3) Updated Environmental Qualification Statement in 3.2 4) Removed reference to EASA qualification 5) Miscellaneous clerical corrections.
C	03/30/2018	BAW	Removed reference to magnetic field strength deviation, Section 2.4, Limitations.

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SECTION 1   GENERAL DESCRIPTION

1.1   INTRODUCTION

The model MD32 Remote Magnetometer, part number series 6420032-( ), extends the functionality of the MD302 Standby Attitude Module to a full air data, attitude and heading reference system (ADAHRS) solution. By providing magnetic heading data, the MD32 enables the MD302 to independently meet the gyro-stabilized heading indication requirements of TSO-C6e as part of the integrated cockpit display, or as a remote data source.

The MD32 provides ARINC 429 data by way of a simple 4-wire shielded cable connecting data and power to the MD302. As an added benefit, the backup battery integral to the MD302 is also capable of supporting the MD32 Remote Magnetometer in the case of aircraft power loss (MD302 Mod 2 versions or greater).

The MD32 option for the MD302 is suitable for certified aircraft in 14 CFR, Part 23, 25, 27, or 29. The MD32 series Remote Magnetometer is FAA certified to TSO-C6e, with embedded software designed to RTCA/DO-178C, Design Assurance Level A (DAL A), and tested to the rigorous environmental standards of RTCA/DO-160G.

Highlighted features include: all solid-state components, easy and flexible installation, on-aircraft calibration, and a small, light-weight housing appropriate for installations in a wing or tail location.

1.2   TECHNICAL SPECIFICATIONS

1.2.1   Electrical Attributes

Input Voltage:	7 – 32 VDC
Input Power:	0.56 watts
Output Data:	ARINC 429 (proprietary format)

Table 1.1

1.2.2   Physical Attributes

Weight:	3.0 ounces (.085 kg)
Dimensions: (not including connector mate)	3.0 inches x 2.75 inches x 0.81 inches (LxWxH)
Mating Connector:	MCI P/N 8017287
Mounting:	Base mount – any orientation

Table 1.2

1.2.3   Performance Limits

Heading Accuracy vs. Latitude:	Within +/-2° up to 55°N or 45°S; increasing error towards the magnetic N and S poles
Altitude:	+55,000 feet
Temperature:	-55°C to +70°C (-67°F to +158°F)

Table 1.3

1.2.4   Qualifications

Certification:	FAA TSO-C6e
Environmental Qualification:	RTCA/DO-160G Environmental Category; See Section 3.2
Software Qualification:	RTCA/DO-178C, Design Assurance Level A

Table 1.4

SECTION 2   INSTALLATION

2.1   GENERAL INFORMATION

This section contains interconnect diagrams, mounting dimensions and other information pertaining to the installation of the MD32 Remote Magnetometer. After installation of cabling and before installation of the equipment, ensure that power is applied only to the appropriate pins.

2.2   PARTS LIST

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:

Item Description	MCIA Part Number
a. MD32 Magnetometer	6420032-( )
b. Installation Manual	9019050
c. Connector Kit	9019092-1

2.3   EQUIPMENT LOCATION

To support the ease of installation, the MD32 is designed to be capable of mounting in any orientation. Using four (4) #4 or #6 machine screws, secure the baseplate of the unit to a secure/stable portion of the airframe. The MD32 Remote Magnetometer is recommended to be installed in the wing or similar location away from large concentrations of ferrous materials or potential electromagnetic interference to produce the most accurate results.

2.4   LIMITATIONS

The MD32 Remote Magnetometer is certified to TSO-C6e as part of a system (i.e. "incomplete system"). It must be installed in conjunction with an MD302 Standby Attitude Module, MCIA part number 6420302-( ), to provide complete heading functionality. The MD302 must have software version 1.1.0 or higher installed to support the function of the MD32. Limitations associated with accuracy and performance of the heading indication are listed in Section 1.2.

The conditions and tests for TSO approval of this article are minimum performance standards. Those installing this article, either on or within a specific type or class of aircraft must determine that the aircraft installation conditions are within the TSO standards which include any accepted integrated non-TSO functions. TSO articles and any accepted integrated non-TSO function(s) 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. This is an incomplete system intended to provide the following functions: magnetic direction sensing data presented to an MD302 Standby Attitude Module.

The TSO requires that the article must meet the minimum performance specifications (MPS) within SAE/AS8013 Revision A. The MD32 complies with the requirements of Sections 4 and 5 of AS8013A. Performance requirements were evaluated using a system comprised of the MD32 and the MD302, demonstrating that the MD32 provided sufficiently accurate sensor data. The

general requirements in Section 3 are not addressed by the MD32 since the MD302 provides the indication/display and user interface portion of the system.

The conditions for TSO approval include the following granted deviations:
- RTCA/DO-160G was used in lieu of RTCA/DO-160E for environmental qualification
- RTCA/DO-178C was used in lieu of RTCA/DO-178B for software qualification

2.5   MODIFICATIONS

Each model MD32 (part number 6420032-( )) has a nameplate that identifies the manufacturer, part number, description, certifications and technical specifications of the unit. It also includes the "MOD" or modification number representing notable changes in the hardware design of the unit. Software revisions are reflected in the software version displayed on the MD302 Review Configuration screen. The following are descriptions of the current modification releases of the MD32 Remote Magnetometer.

MOD 0
Modification (MOD) 0 is identified on the nameplate by the lack of marking on the MOD numbers shown as blocks 1 through 9 (i.e. 1-9 are visible).

Mod 0 is the initial release of the MD32 Remote Magnetometer.

2.6   CABLE HARNESS

2.6.1   Wire Gauge Selection

M27500-22TG2T14 (or equivalent) shielded twisted pair for both power/ground and data lines. The ground wire should be attached to the airframe as close to the power source as practicable.

2.6.2   Pin Assignment Information

The MD32 is intended to connect directly to the MD302, requiring a single-point modification to the installed cable harness. MD302 units updated with MOD 2 provide additional connection options to allow for backup power to the MD32 from the internal battery, and to accommodate a second ARINC 429 input so that the first input may remain connected to an existing EFIS or ARINC data source.

Pin 1 – Ground. One option is to make a tee connection to Pin 6 of the MD302.

Pin 5 – Power connects to aircraft power (7-32 VDC). One option is to make a tee connection to Pin 1 of the MD302. Another option is to connect to Pin 11 of a MOD 2 MD302 for backup power from the internal battery.

Pin 6 – ARINC Out B connects to MD302 Pin 13. Optionally, it may connect to the second ARINC input Pin 4 of a MOD 2 MD302.

Pin 7 – ARINC Out A connects to MD302 Pin 12. Optionally, it may connect to the second ARINC input Pin 9 of a MOD-2 MD302.

Mating connector backshell – ground shield(s) from the shielded twisted pair should be terminated to the mating connector backshell (case ground).

Pin #	Description
1	Ground
2	Not Used
3	Reserved
4	Reserved
5	Power
6	ARINC Out B
7	ARINC Out A
8	Not Used
9	Not Used

Table 2.1
Connector Pinout

2.7   INSTALLATION COMPLETION

The system must be calibrated after installation. Calibration is done through access to the MD302 Configuration Menu. MD302 software version 1.1.0 or greater is required. Note that MOD 2 is not required for the MD302, but it may make installation easier as noted above in 2.6.2. See MD302 installation manual for additional details.
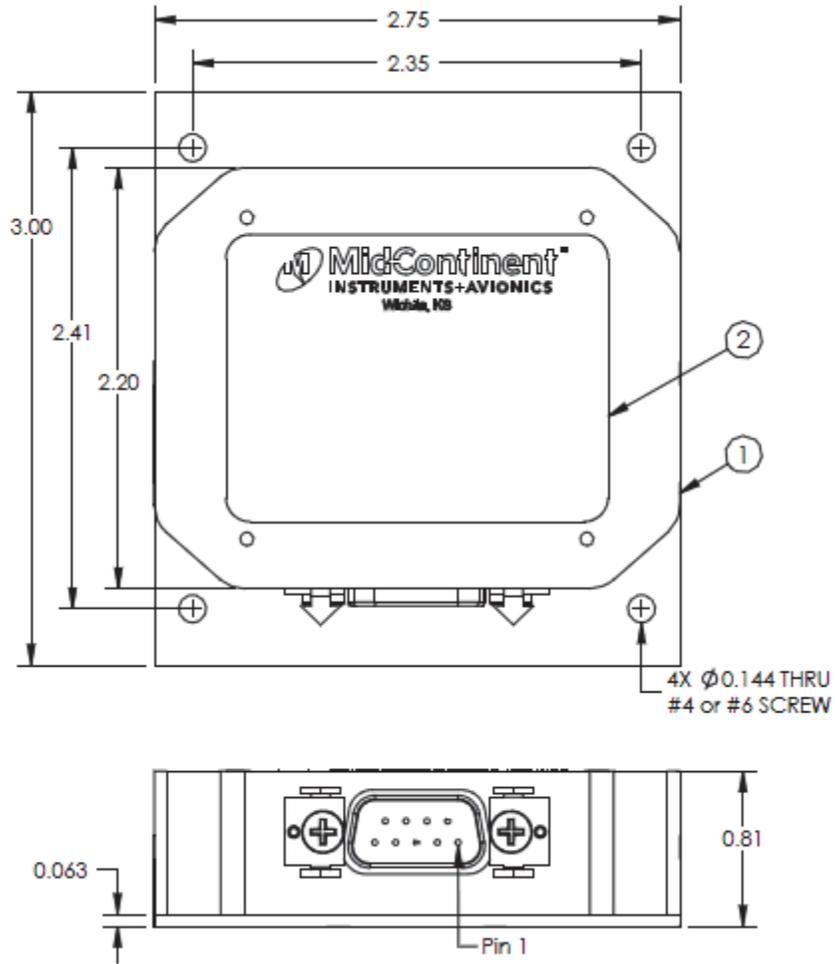
Figure 2.1
MD32 Outline Drawing

SECTION 3   CONFORMANCE

3.1   INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

No periodic scheduled maintenance or calibration is necessary for continued airworthiness of the MD32 Remote Magnetometer.

If the unit fails to perform to specifications, or if the magnetic environment of the aircraft installation changes over time, recalibration may be performed as noted in Section 2.7. If recalibration does not resolve the issue, the unit must be removed and serviced by Mid-Continent Instruments and Avionics or their authorized designee.

3.2 ENVIRONMENTAL QUALIFICATION STATEMENT

NOMENCLATURE: Remote Magnetometer   **TSO APPROVAL:** C6e
MODEL NUMBER: MD32   **PART NUMBER:** 6420032-( ) series
MANUFACTURER: Mid-Continent Instrument Co., Inc.
MANUFACTURERS SPECIFICATIONS: Test Specification (TS) 715, Test Data Sheet (TDS) 715
QUALIFICATION STANDARD: RTCA/DO-160G, dated 12/08/10

CONDITIONS	SECTION	DESCRIPTION OF TEST

Temperature and Altitude
   Low Temperature
   High Temperature
   Altitude
	4
	4.5.2
	4.5.4
	4.6.1
		Category F2
		Operating Low Temp = -55C
		Operating High Temp = +70C
		Altitude = +55,000 ft.

Temperature Variation	5	Category S2
Humidity	6	Category B
Operational Shock and Crash Safety	7	Category B
Vibration	8	Category R; Curves E, E1 [REE1]
Explosion	9	Category X
Waterproofness	10	Category W
Fluids	11	Category X
Sand and Dust	12	Category X
Fungus	13	Category X
Salt Fog	14	Category S
Magnetic Effect	15	Category Z
Power Input	16	Category Z
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 M
Lightning Induced Transient Susceptibility	22	Category B3 (pin injection) Category K3L3 (cable bundle) [B3K3L3]
Lightning Direct Effects	23	Category X
Icing	24	Category X
ESD	25	Category A
Flammability	26	Category X

REMARKS:
   Sections 20: Radiated susceptibility complies with Category G from 100-400MHz and Category F from 400-18,000MHz.