INSTALLATION MANUAL AND OPERATING INSTRUCTIONS

MD41-151X Series
Annunciation Control Unit
For Garmin GPS Systems

MD41-1510	28vdc	Horizontal Mount
MD41-1511	28vdc	Vertical Mount
MD41-1512	14vdc	Horizontal Mount
MD41-1513	14vdc	Vertical Mount
MD41-1514	28vdc	Horizontal Mount, 5vdc lighting
MD41-1515	28vdc	Vertical Mount, 5vdc lighting

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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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REVISION DETAIL

ECO	Rev.	Date	Detail
	A	02/21/11	Initial release.
6051	B	10/28/13	Updated Technical Specifications to include compatible Garmin GPS Systems.

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SECTION 1 GENERAL DESCRIPTION

1.1 INTRODUCTION

The MD41-151X series products are compact, self-contained Annunciation and Control Units (ACUs). The fully integrated control unit provides annunciation and mode selection for Global Positioning System (GPS) / Satellite-Based Augmentation System (SBAS) navigators. This series of the MD41 product family is specifically designed to work with the Garmin GTN 6XX/7XX series WAAS navigator systems and derivatives with equivalent functionality. It combines the necessary functions and annunciations required to interface with an approved system and provide regulatory compliance with GPS/SBAS minimum performance specifications.

Highlighted features include long-life LEDs used for all lighting, internally backlit selection switches, dead-front inactive annunciations, and the installation option for manual or automatic dimming. An external annunciation dimming adjustment is provided for balancing low-level light conditions.

1.2 TECHNICAL SPECIFICATIONS

1.2.1 MODELS

Unit Configurations			
	MD41-1510	**MD41-1512**	**MD41-1514**
Orientation	Horizontal	Horizontal	Horizontal
Power Input	28VDC	14VDC	28VDC
Lighting Input	28VDC	14VDC	5VDC
	MD41-1511	**MD41-1513**	**MD41-1515**
Orientation	Vertical	Vertical	Vertical
Power Input	28VDC	14VDC	28VDC
Lighting Input	28VDC	14VDC	5VDC

Table 1.1

1.2.2 PHYSICAL ATTRIBUTES

Characteristics:	
Weight:	0.26 pounds
Dimensions: (not including connector or mate)	3.2 inches long 3.25 inches wide 0.8 inches high
Mating Connector:	Positronic RD25S10JVL0 or equivalent (MCI P/N 7014517)
Instrument Panel Mounting:	Rear mount

Table 1.2

1.2.3 PERFORMANCE

Specifications:	
Qualification:	FAA TSO-C129
Environmental Qualification:	RTCA DO-160D Environmental Category F2CAB(SM/UG)XXXXXXZBABA(TT)M[A3C3]XXA* * Sections 16, 20, 21, and 22 comply with DO-160C, Section 8 (UG) complies with DO-160F
Power Requirement:	0.20 A max

Table 1.3

SECTION 2 PRE-INSTALLATION CONSIDERATIONS

2.1 COOLING

No direct cooling is required. As with any electronic equipment, overall reliability may be increased if the unit is not located near a high heat source or crowded next to other equipment. Means of providing some airflow would be considered beneficial.

2.2 EQUIPMENT LOCATION

The MD41-151X series ACU must be mounted as close to the pilot's field of view as possible. Please reference the GPS/SBAS installation manual for approved locations. The unit depth, with connector attached, must also be taken into consideration when selecting an appropriate location. Allow at least 3 inches of space behind the unit for connector attachment and removal.

2.3 ROUTING OF CABLES

Care must be taken not to bundle the MD41 series ACU logic and low level signal lines with any high energy sources. Examples of these sources include 400 HZ AC, Comm, DME, HF and transponder transmitter coaxial cables. Always use shielded wire when shown on the installation print.

Avoid sharp bends in cabling and routing near aircraft control cables. Also avoid proximity and contact with aircraft structures, avionics equipment, or other obstructions that could chafe wires during flight and cause undesirable effects.

2.4 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. 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.

Note that this product is part of an incomplete system. It is designed to be installed with other applicable equipment to provide functionality for global positioning /satellite-based augmentation systems.

2.5 TECHNICAL SPECIFICATIONS

Mid-Continent Instruments Co., Inc. certifies that the model MD41-( ) series, Annunciation Control Unit has been tested to and meets or exceeds the functional and environmental requirements of the following FAA Technical Standard Order (TSO):

- FAA/TSO-C151a: TERRAIN AWARENESS AND WARNING SYSTEM

We also certify we meet the requirements of Part 21, Subpart 0 of the Code of Federal Regulations.

The MD41-( ) series, Annunciation Control Unit conforms to all pertinent documented design and internal manufacturing standards. This includes, but is not limited to: component drawings, specifications, testing criteria, inspection requirements, quality processes, manufacturing instructions, and handling procedures.

It shall be manufactured in accordance with Mid-Continent Instruments FAA-approved Production Approval Holder-Quality System Manual, Revision M, dated April 14, 2011 or later.
The MD41-151X series complies with the manufacturers' specifications and has been verified and approved for use with the following systems:

Mid-Continent Instruments and Avionics Model Number(s):	**Designed for use with GPS System:**	
MD41-1510 MD41-1511 MD41-1512 MD41-1513 MD41-1514 MD41-1515	Manufacturer: Model(s):	Garmin 650/750 CDI/HIS Annunciators

SECTION 3 INSTALLATION PROCEDURES

3.1 GENERAL INFORMATION

This section contains interconnect diagrams, mounting dimensions and other information pertaining to the installation of the MD41 series ACU. 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 this equipment, make a visual inspection for evidence of any damage that may have incurred during shipment. The following parts should be included:

a. GPS ACU – MCI P/N MD41-151X series
b. J1 Connector Kit (25 pin) – MCI P/N 7014517
c. Installation Manual – MCI P/N 9017211

3.3 CABLE HARNESS

The MD41 cable harness should be made using 24 AWG wire or larger for all connections. Construct the cable harness with regards to the instructions below and using the Connector Pinout of Figure 3.3, Schematic Pinout of Table 3.3, and Wiring Diagram of Figure 3.5.

Refer to Section 2: Pre-Installation Considerations in regards to routing precautions.

3.3.1 LIGHTING CONTROL

Button backlighting (pin 5) is powered (5vdc, 14vdc, or 28vdc) from the aircraft's panel lighting bus. This will allow manual dimming control of the button brightness using the aircraft's panel lighting control dimmer.

There are three options for annunciation brightness control. The annunciations options can be configured in the following ways:

- Full bright when active
  - connect aircraft power (same as pin 13 input) to pin 6
- Manual control using the aircraft's panel lighting control
  - connect the aircraft lighting bus power output (same as pin 5 input) to pin 6
  - (not available for aircraft with 5V lighting bus)
- Automatically dimming using the internal photocell of the unit
  - connect pin 23 ("Annun Bright/Dim Output") to pin 6

3.3.2 POWER AND SIGNALS

Wire aircraft power and aircraft ground according to the associated ACU pins in the Pinout Diagram. Annunciation signals should be wired from the appropriate system inputs and outputs to the associated ACU pins in the Pinout Diagram.

3.3.3 HARNESS VERIFICATION

With the MD41 ACU disconnected, turn on the avionics master switch and use an ohm-meter to verify that aircraft power and panel lighting bus power is on the appropriate pin(s) with appropriate voltage. Also verify that aircraft ground is applied to the appropriate pins.

3.4 MOUNTING

Refer to Section 2: Pre-Installation Considerations in regards to equipment location.

The MD41 ACU is designed for rear panel mounting only. A cutout should be made in the panel in accordance with Figure 3.4 for the unit bezel and two mounting holes. A cutout template is available from Mid-Continent Instruments and Avionics (reference p/n 8014458) upon request.

Prior to completing the mounting of the unit in the aircraft, make sure to set the Annunciator Dim Adjustment if automatic dimming is configured for the annunciations. Ideally this procedure is best performed in a dark cockpit to simulate low-light/night time conditions. Connect the unit to the cable harness and turn on master power to the instrument panel and lighting bus. Use a small flat-bladed screwdriver to access the adjustment screw inside the hole on the bottom of the unit. Adjust the screw to increase or decrease the annunciator lighting brightness to a level appropriate with the rest of the panel instrument lighting.

Secure the indicator to the panel with two #4-40 x 3/8 flat head phillips screws.

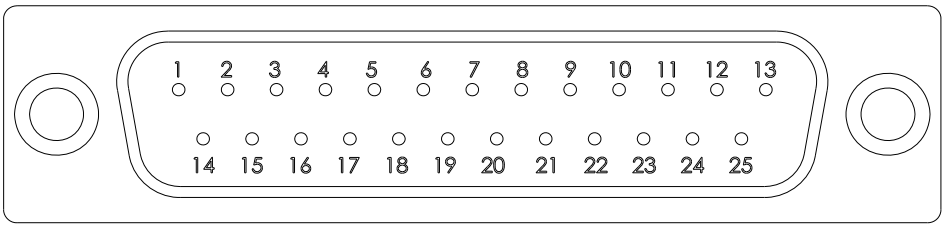
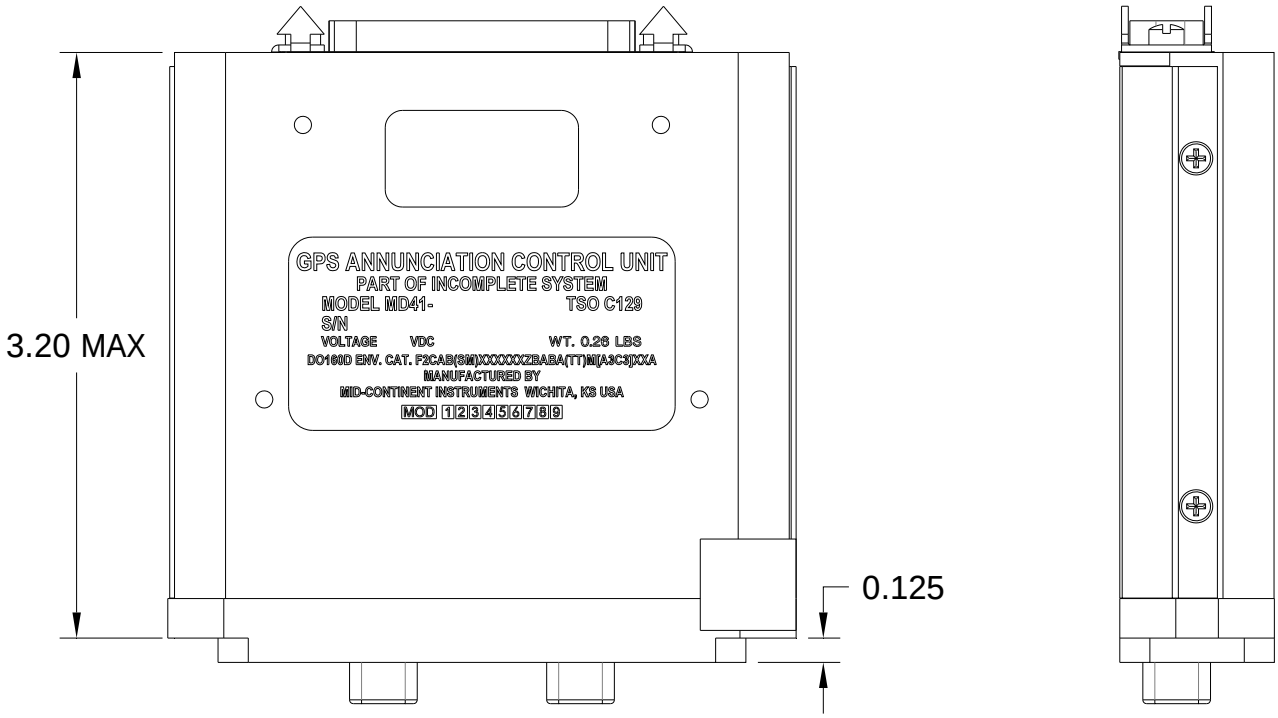
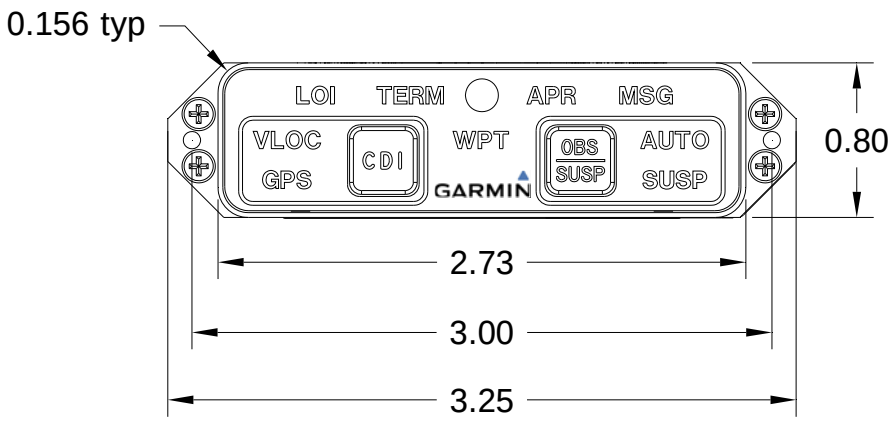


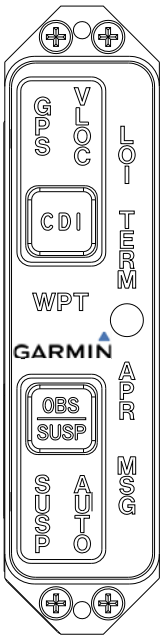
FIGURE 3.3
REAR VIEW OF 25-PIN D-SUB CONNECTOR (J1)

Connector Pinout				
Pin #			Pin #	
1	Annun. GPS input		14	Reserved
2	Annun. VLOC input		15	Reserved
3	Annun. TERM input		16	Reserved
4	CDI Switch output		17	Reserved
5	Bright/Dim Button Backlight input		18	Reserved
6	Annun. Bright/Dim input		19	Reserved
7	Light Test		20	Annun. LOI input
8	Annun. WPT input		21	Reserved
9	Annun. APR input		22	Reserved
10	Annun. MSG input		23	Annun. Bright/Dim output
11	OBS input		24	Annun. SUSP input
12	OBS/SUSP Switch output		25	Ground
13	Aircraft Power (+14V/+28V)			

TABLE 3.3
SCHEMATIC PINOUT







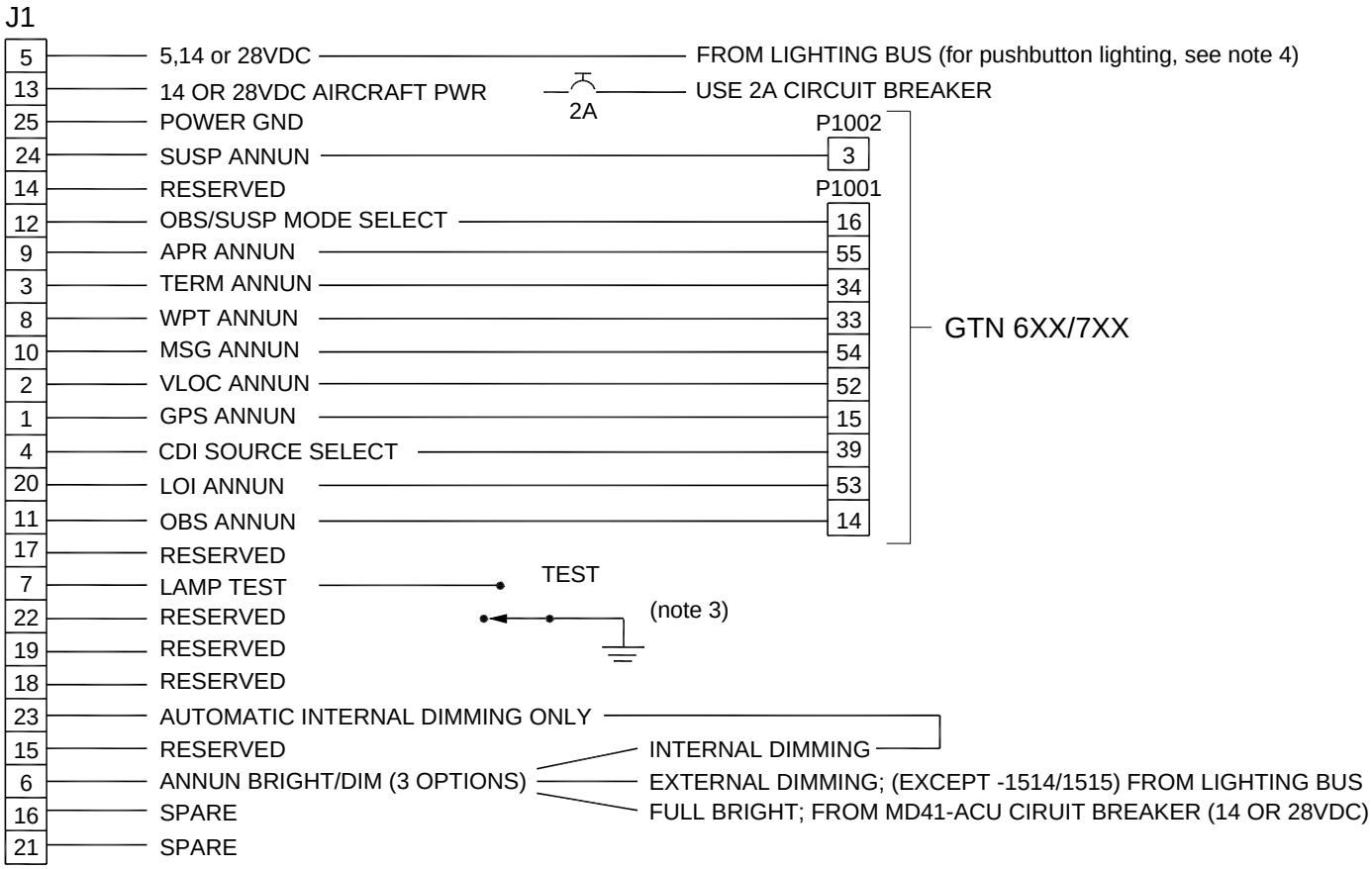
MD41-1510
MD41-1512
MD41-1514

MD41-1511
MD41-1513
MD41-1515

Note: Use two 4-40 X 3/8” Flat Head Phillips Screws for Mounting

FIGURE 3.4
OUTLINE DRAWING

MD41-151X Series ACU



NOTES:
1) REFER TO GARMIN GTN 6XX/7XX INSTALLATION MANUAL FOR ACTUAL INSTALLATION.
2) ALL WIRING SHALL BE 24 AWG UNLESS OTHERWISE NOTED.
3) MOMENTARY SWITCH FOR TEST. (optional connection)
4) 5 VOLT FOR MD41-1514/1515, 14 VOLT FOR MD41-1512/1513, AND 28 VOLT FOR MD41-1510/1511.

FIGURE 3.5
WIRING DIAGRAM

SECTION 4 OPERATION

4.1 FRONT PANEL CONTROLS AND ANNUNCIATIONS

4.1.1 CONTROLS

CDI — Momentary Switch, when pressed, will select VLOC, or GPS presentation on HSI/CDI

OBS/SUSP — Momentary switch, when pressed, will select OBS, or SUSP. In OBS MODE, this will enable OBS selection input from a remote HSI/CDI indicator. In SUSP mode, this will suspend automatic waypoint sequencing in the active flight plan.

All button/switch controls are white backlit. Refer to the operation manual of the GPS/SBAS System equipment manufacturer for additional operational and functional interface details.

4.1.2 ANNUNCIATIONS

LOI	(AMBER)	Loss of Integrity: WAAS/GPS detects a position error or unable to calculate integrity of position
TERM	(GREEN)	Terminal: Indicates aircraft is navigating within 30 miles of the departure or arrival airport
APR	(GREEN)	Approach: Indicates the approach is active
MSG	(WHITE)	Message: Indicates message(s) is active
VLOC	(GREEN)	VOR/Localizer: NAV/ILS information presented on the HSI or CDI
GPS	(WHITE)	GPS information presented on the HSI or CDI
WPT	(WHITE)	Waypoint: Indicates reaching the arrival waypoint
AUTO	(WHITE)	Automatic sequencing of waypoints is active
SUSP	(WHITE)	Suspended: Automatic sequencing of waypoints has been suspended

FIGURE 4.1 FRONT PANEL

4.2 LIGHTING BEHAVIOR

Lighting behavior can be controlled in multiple ways. Button lighting is controlled manually using the aircraft's panel lighting bus controller. Annunciations can be configured to automatically dim using the internal photocell, configured to be on full bright, or controlled manually with external dimming (excluding -1514, -1515) using the aircraft's panel lighting bus controller when activated.

If using the internal dimming feature for the annunciations, the Annunciator Dim Adjust on the outside of the unit can be used to set the brightness at their dimmest level for best night-time viewing.

SECTION 5 CONFORMANCE

5.1 CONTINUED AIRWORTHINESS STATEMENT

No periodic scheduled maintenance or calibration is necessary for continued airworthiness of the MD41 series ACU. If the unit fails to perform to specifications, the unit must be removed and serviced by Mid-Continent Instruments and Avionics or their authorized designee.

5.2 ENVIRONMENTAL QUALIFICATION STATEMENT

NOMENCLATURE: GPS Annunciator Control Unit (ACU)
MODEL NUMBER: MD41-151X series **TSO NUMBER:** C129
MANUFACTURERS SPECIFICATIONS:
Minimum Performance Specifications: Test Specification (TS) 187, Test Data Sheet (TDS) 444
QUALIFICATION STANDARD: RTCA DO-160D (* denotes qualification to RTCA DO-160C)
(** denotes qualification to RTCA DO-160F)

CONDITIONS	SECTION	DESCRIPTION OF TEST
Temperature and Altitude Low Temperature High Temperature Decompression Overpressure	4 4.5.1 4.5.2 4.6.2 4.6.3	Category F2 Operating Low Temp = -55C 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, Curve M Category U, Curve G** (SM/UG)
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
Voltage Spike	17	Category A
Audio Frequency Conducted Susceptibility	18	Category B
Induced Signal Susceptibility	19	Category A
Radio Frequency Susceptibility*	20	Category T (conducted) Category T (radiated) [TT]
Emission of Radio Freq Energy*	21	M
Lightning Induced Transient Susceptibility*	22	Category A3 (pin injection) Category C3 (cable bundle) [A3C3]
Lightning Direct Effects	23	Category X
Icing	24	Category X
ESD	25	Category A