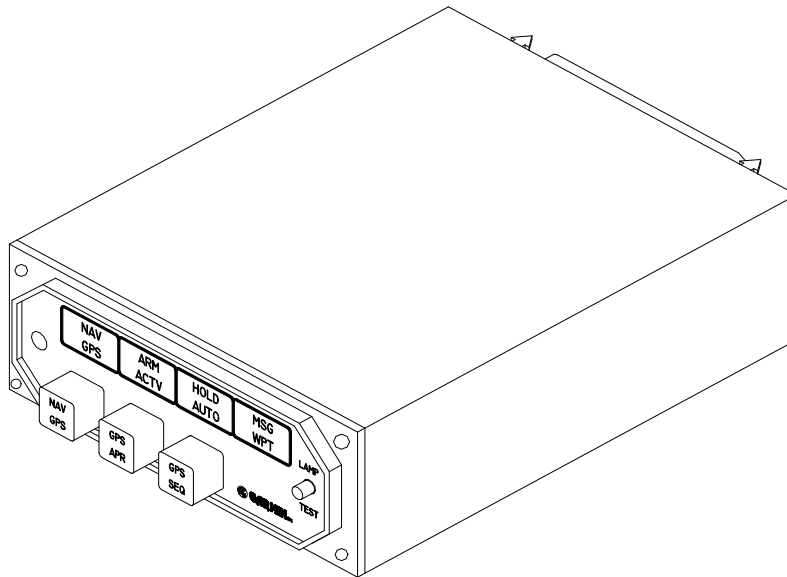




INSTALLATION MANUAL AND OPERATING INSTRUCTIONS

MD41-() Series GPS ANNUNCIATION CONTROL UNIT FOR GARMIN GPS 155/165

MFG. P/N: MD41-428	28VDC	GARMIN P/N: 013-00029-00	Horizontal Mount
MFG. P/N: MD41-424	14VDC	GARMIN P/N: 013-00029-01	Horizontal Mount
MFG. P/N: MD41-438	28VDC	GARMIN P/N: 013-00029-05	Vert. Mount (shown on page 13)
MFG. P/N: MD41-434	14VDC	GARMIN P/N: 013-00029-06	Vert. Mount (shown on page 13)



Mid-Continent Instruments and Avionics
9400 E. 34th Street N., Wichita, KS 67226 USA
Phone 316-630-0101 • Fax 316-630-0723

Manual Number 7015555
REV. F Mar. 5, 2013

MANUAL REVISION AND HISTORY

MANUAL: MD41-424, -434, -428, -438
REVISION: JUNE 14, 1995 REV. 1
MANUAL NUMBER: 7015555

Remove programming wakeup requirements shown on installation drawings.

REVISION: AUGUST 31, 1995 REV. 2

Add MD41-434, -438 vertical mount versions.

REVISION: NOVEMBER 6, 1995 REV. 3

Add MD41-428(5V)/438(5V) These part numbers have 5 volt push-button lighting.

REVISION: JANUARY 24, 1996 REV. 4

Added GPS annunciation interlock.

REVISION: JANUARY 09, 1997 REV. 5

Revised DO160C section 4.0 environmental test data. Test D1 is now F2

REVISION: MARCH 5, 2013 REV. F

Updated relay board schematic diagram on page 11. Relay board updated due to "End of Life" of 4 pol relays. All 4 pol relays changed for dual 2 pol relays.

TABLE OF CONTENTS

SECTION 1	GENERAL DESCRIPTION
1.1	INTRODUCTION
1.2	SPECIFICATIONS, TECHNICAL
1.2.1	PHYSICAL CHARACTERISTICS
1.2.2	ENVIRONMENTAL CHARACTERISTICS
1.2.3	SPECIFICATIONS, ELECTRICAL
1.2.4	FRONT PANEL CONTROLS AND ANNUNCIATIONS
1.2.4.1	CONTROLS
1.2.4.2	ANNUNCIATIONS
1.2.5	INTERFACE
1.2.6	EQUIPMENT LIMITATIONS
1.2.7	MAJOR COMPONENTS
SECTION 2	INSTALLATION CONSIDERATIONS
2.1	COOLING
2.2	EQUIPMENT LOCATION
2.3	ADDITIONAL ANNUNCIATIONS
2.4	ADDITIONAL RELAYS
2.5	ROUTING OF CABLES
SECTION 3	INSTALLATION PROCEDURE
3.1	GENERAL INFORMATION
3.2	UNPACKING AND INSPECTING
3.3	MOUNTING THE MD41-()
3.4	INSTALLATION LIMITATIONS
SECTION 4	POST INSTALLATION CHECKOUT
4.1	PRE-INSTALLATION TEST
4.2	OPERATING INSTRUCTIONS
FIGURE NO.	LIST OF ILLUSTRATIONS
3.1	SCHEMATIC PINOUT, 25 PIN DSUB
3.2	SCHEMATIC PINOUT, 50 PIN DSUB
3.3	CUTOUT DIMENSION FOR PANEL MOUNTING
3.4	OUTLINE DRAWING
3.5	WIRING DIAGRAM, MD41-424/434 (14V)
3.6	WIRING DIAGRAM, MD41-428/438/428(5V)/438(5V) (28V)
	APPENDIX
	ENVIRONMENTAL QUALIFICATION FORM

SECTION 1 GENERAL DESCRIPTION

1.1 INTRODUCTION

The MD41-() is a self-contained GPS Annunciation and Control unit. It combines all the necessary functions required for switching HSI/CDI data inputs between a conventional VOR receiver and the Garmin GPS 155/165 approach-certified GPS receiver. In addition, the MD41-() contains several GPS status annunciations used to indicate modes selected by the front panel switches and various inputs from the GPS receiver.

A special ILS override feature has been incorporated to cause the MD41-() to automatically switch to the NAV (VOR) mode when the VOR receiver is tuned to an ILS frequency. Other features include dual, 16,000 hour lamps used for all annunciations, internally lighted selection switches, automatic photocell dimming, and built-in annunciation self test. A external annunciation dimming adjustment is provided for balancing low level light conditions.

A 16 pole relay assembly is included within the MD41-() to simplify installation of the switching between NAV (VOR), GPS and the associated HSI/CDI. All relays have gold plated contacts and are nitrogen filled for high reliability.

Two versions are available that will allow the lighted selection buttons to operate from a 5 volt instrument dimming bus. These part numbers are as follows: MD41-428(5V) and MD41-438(5V).

A MD156 adapter plate is available for front mount installations. Also a MD155 punch is available for instrument hole cutout.

1.2 SPECIFICATIONS, TECHNICAL

1.2.1 PHYSICAL CHARACTERISTICS

Mounting:	Panel
Width:	3.50 Inches
Height:	1.350 Inches
Depth:	4.625 Inches
Weight:	0.75 lbs.

1.2.2 ENVIRONMENTAL CHARACTERISTICS

TSO Compliance:	TSO C129
Applicable Documents:	RTCA DO-160C, DO-208
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

Design	All Solid State
MD41-424/434 (14VDC)	0.65 Amps
MD41-428/438 (28VDC)	0.40 Amps
MD41-428(5V)/438(5V) (28VDC)	0.40 Amps
Relay contact current rating:	2 Amps DC
Available relay poles (spdt)	16

1.2.4 FRONT PANEL CONTROLS AND ANNUNCIATIONS

1.2.4.1 CONTROLS

NAV/GPS	Alternate action switch, when pressed, will select NAV (VOR) or GPS presentation on HSI/CDI.
GPS/APR	Alternate action switch, when pressed, will arm GPS Approach Mode.
GPS/SEQ	Alternate action switch, when pressed, will select between AUTO and HOLD modes.
LAMP TEST	Momentary switch for testing annunciation lamps. Note: Screwdriver adjustable control located on right side of case sets annunciation low dimming level.

1.2.4.2 ANNUNCIATIONS

NAV	NAV (VOR) information presented on the HSI or CDI.
GPS	GPS information presented on the HSI or CDI.
ARM	GPS is armed for automatic transition to approach mode.
ACTV	GPS is actively engaged in the approach mode.
HOLD	This will activate the course selector and also disable the automatic GPS waypoint sequencing.
AUTO	This will disable the course selector input to the GPS and will enable automatic GPS waypoint sequencing.
MSG	GPS message alert, from GPS receiver.
WPT	GPS waypoint alert, from GPS receiver.

1.2.5 INTERFACE (cont.)

GPS Approach Select (ARM) J1 Pin 24	Provides a logic low to the GPS receiver when approach arm is selected.
GPS Sequence Select J1 Pin 9	Provides a logic low to the GPS receiver when HOLD is selected.
GPS APR ACTV J1 Pin 8	Receives a logic low from the GPS receiver when a transition is made from arm to active.
ILS Override JI Pin 14	Receives a logic low from the NAV (VOR) receiver when tuned to an ILS frequency. This will force the MD41-() into NAV mode regardless of the NAV/GPS selection. This connection is optional.
GPS Annunciation	A logic low will cause the appropriate annunciation to illuminate. GPS receiver must be able to accept 80ma.

1.2.6 EQUIPMENT LIMITATIONS

The MD41-() series control units contain specific dash numbers to be used with various GPS receivers. The installer must match the correct controller part number with the GPS receiver being installed.

The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. The article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the Administrator.

The MD41-424/428/434/438/428(5V)/438(5V) is TSO'D and certified for use with the Garmin GPS 155/165 systems. Any attempts to install the MD41-424/428/434/438/428(5V)/438(5V) in a installation other than the Garmin GPS 155/165 is prohibited. **This will void the TSO.**

NOTE: Anytime the MD41-() is disconnected or removed from the aircraft, the HSI/CDI will be inoperative in both NAV (VOR) and GPS.

1.2.7 MAJOR COMPONENTS

The system is comprised of one major component, the MD41-() GPS Annunciation Control Unit.

SECTION 2 INSTALLATION CONSIDERATIONS

2.1 COOLING

No direct cooling is required. As with any electronic equipment, overall reliability may be increased if the MD41-() is not located near any high heat source or crowded next to other equipment. Means of providing a gentle air flow will be a plus.

2.2 EQUIPMENT LOCATION

The MD41-() must be mounted as close to the pilot's field of view as possible. The preferable location is near the HSI/CDI that will be displaying the GPS information. The unit depth, with connector attached, must also be taken into consideration. A MD156 adapter plate is available for front mounting.

2.3 ADDITIONAL ANNUNCIATIONS

Depending upon the installation and approving agency, you may be required to provide additional NAV Source Select external enunciators near the HSI/CDI. Spare relay contacts on the MD41-() J2 connector may be used for this purpose.

2.4 ADDITIONAL RELAYS

The MD41-() contains 16 relay poles. Some installations may require more than 16 poles due to data lines, superflags etc. If this should occur, you may use one spare relay pole to switch additional relays. In cases where it may be more desirable to have all the relay switching done at a remote location, (i.e.: remote mounted equipment) one relay pole on the MD41-() may be used for switching this bank of relays. Please note that the maximum relay contact rating for the MD41-() is 2 amps DC.

2.5 ROUTING OF CABLES

Care must be taken not to bundle the MD41-() 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 coax. Always use shielded wire when shown on the installation print. Avoid sharp bends in cabling and routing near aircraft control cables.

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-(). 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. MD41-424 (14V) or MD41-428 (28V) Horiz. Mount
MD41-434 (14V) or MD41-438 (28V) Vert. Mount
MD41-428(5V) (28volt) 5 volt button lighting Horiz. Mount
MD41-438(5V) (28volt) 5 volt button lighting Vert. Mount
2. J1 Connector Kit (25 pin). MCI PN 7014517
3. J2 Connector Kit (50 pin). MCI PN 7014509
4. Installation Manual. MCI PN 7015555
5. 4-40 x 1.0" Mounting Screws, 4ea MCI PN 7016165

3.3 MOUNTING THE MD41-()

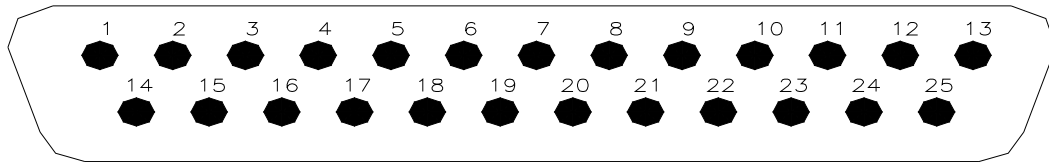
Plan a location in the aircraft for the MD41-() to be mounted as close to the pilot's field of view as possible. The preferable location is near the HSI/CDI that will be displaying the GPS information. Avoid mounting close to heater vents or other high heat sources. Allow a clearance of at least 3 inches 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 3-3. Secure the indicator in place with four 4-40 x 3/8 to 1.0" flat head phillips screws. A MD156 adapter plate is available for front mount installations. Also a MD155 punch is available for hole cutout.

3.4 INSTALLATION LIMITATIONS

Wire the aircraft harness according to figure 3-5 or 3-6. Use at least 24 AWG wire for all connections. You MUST use shielded wire where shown. Avoid sharp bends and routing cable near high energy sources. Care must be taken to tie the harness away from aircraft controls and cables. Normal installation techniques should be applied.

J1 CONNECTOR

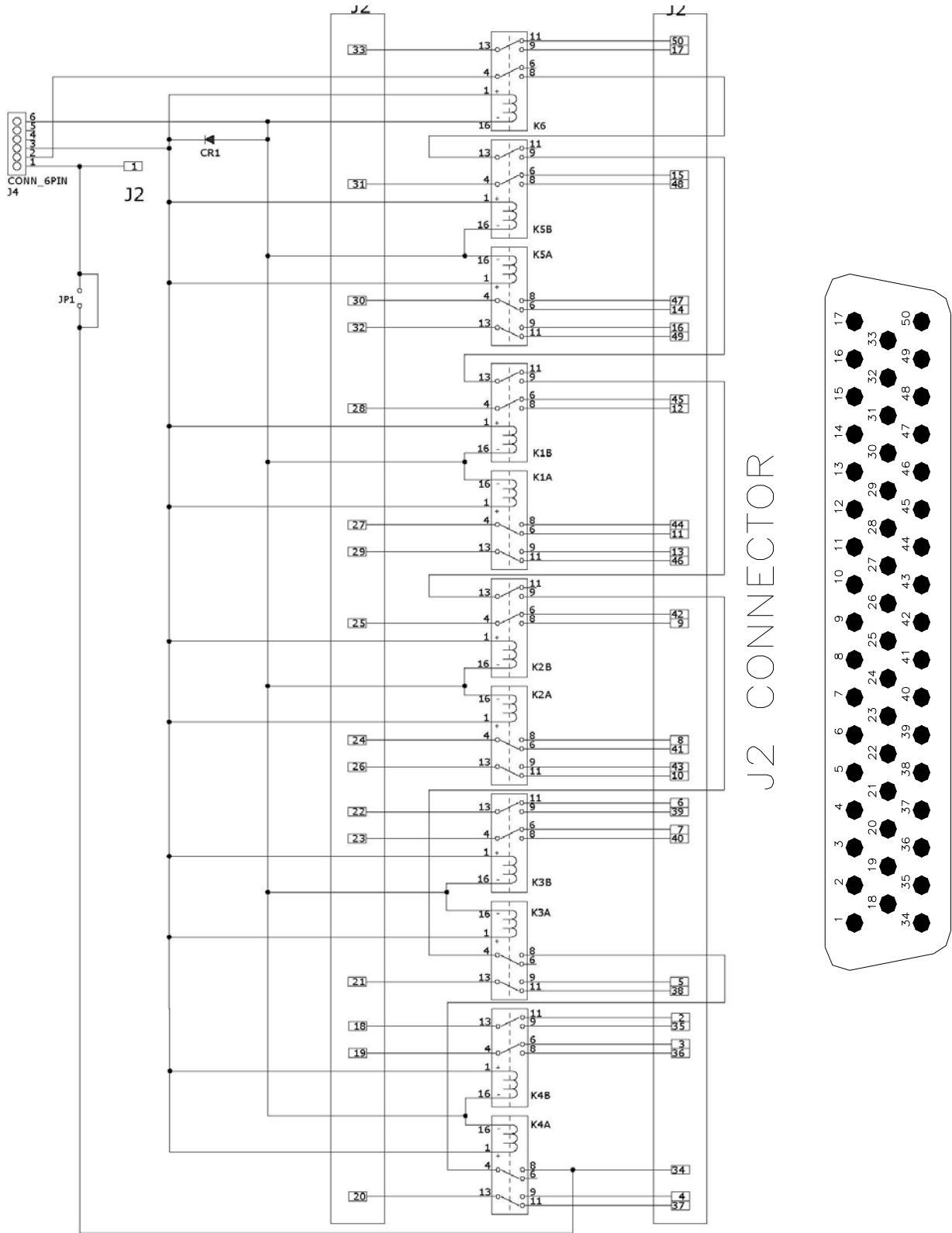


REAR VIEW OF J1 (bottom) CONNECTOR

J1
PIN NO.

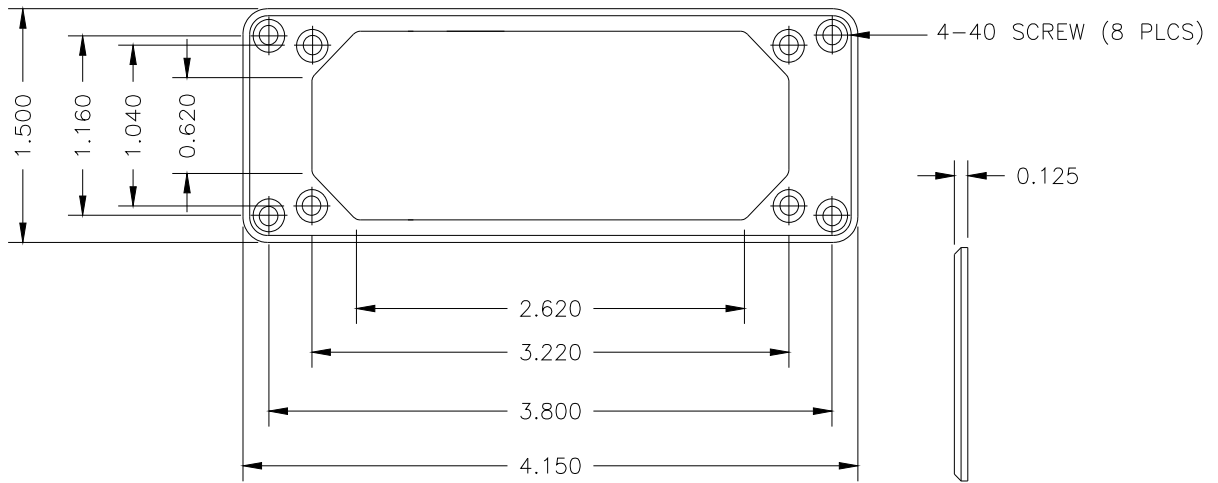
1 -----	SPARE
2 -----	SPARE
3 -----	SPARE
4 -----	SPARE
5 -----	SPARE
6 -----	SPARE
7 -----	SPARE
8 -----	GPS APR ACTV ANNUNCIATION
9 -----	GPS SEQ HOLD (logic low to GPS)
10 -----	MSG ANNUNCIATION
11 -----	WPT ANNUNCIATION
12 -----	14 VDC UNIT PWR -424/434 ONLY
13 -----	28 VDC UNIT PWR -428/438/428(5V)/438(5V) ONLY
14 -----	ILS FROM NAV(VOR) RECEIVER (for ILS override)(optional)
15 -----	SPARE
16 -----	SPARE
17 -----	SPARE
18 -----	SPARE
19 -----	SPARE
20 -----	DIM LOW (to lighting bus)(for push-button dimming)
21 -----	DIM HIGH (to lighting bus)(for push-button dimming)
22 -----	SPARE
23 -----	TO NAV CIRCUIT BREAKER (for fault monitoring)
24 -----	GPS ARM SELECT (logic low to GPS)
25 -----	POWER GROUND

FIGURE 3-1 SCHEMATIC PINOUT, 25 PIN DSUB

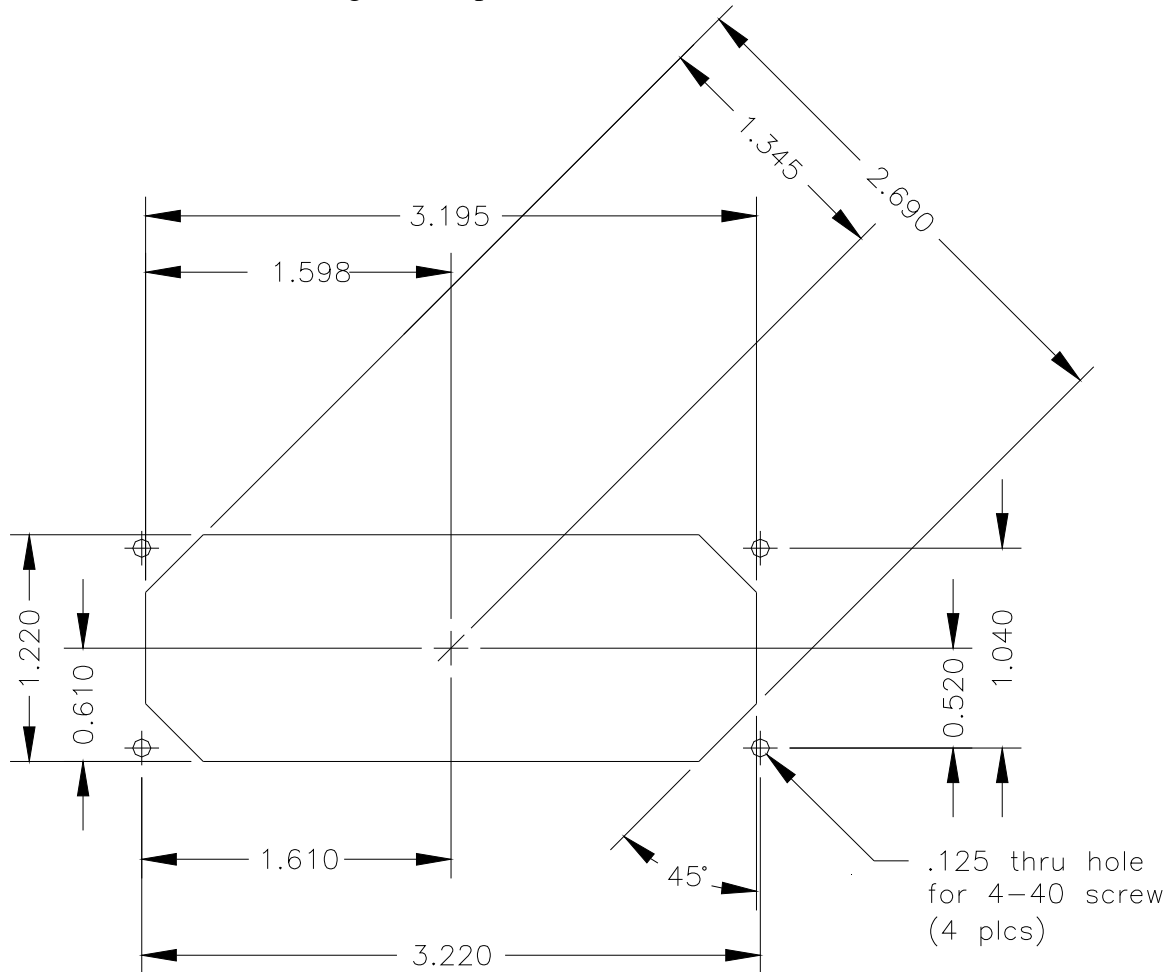


Note 1: All relays shown in NAV position.
FIGURE 3-2 SCHEMATIC PINOUT, 50 PIN DSUB

REAR VIEW OF J2 (top) CONNECTOR



MD156 Front Mounting Plate. Optional, must be ordered from Mid- Continent Inst.



ACTUAL SIZE

Note 1: Use four 4-40 X 3/8 to 1.0" Flat Head Phillips Screws for Mounting, MCI PN 7016165 (supplied). MD155 punch is available for hole cutout.

FIGURE 3-3 CUTOUT DIMENSIONS FOR PANEL MOUNTING

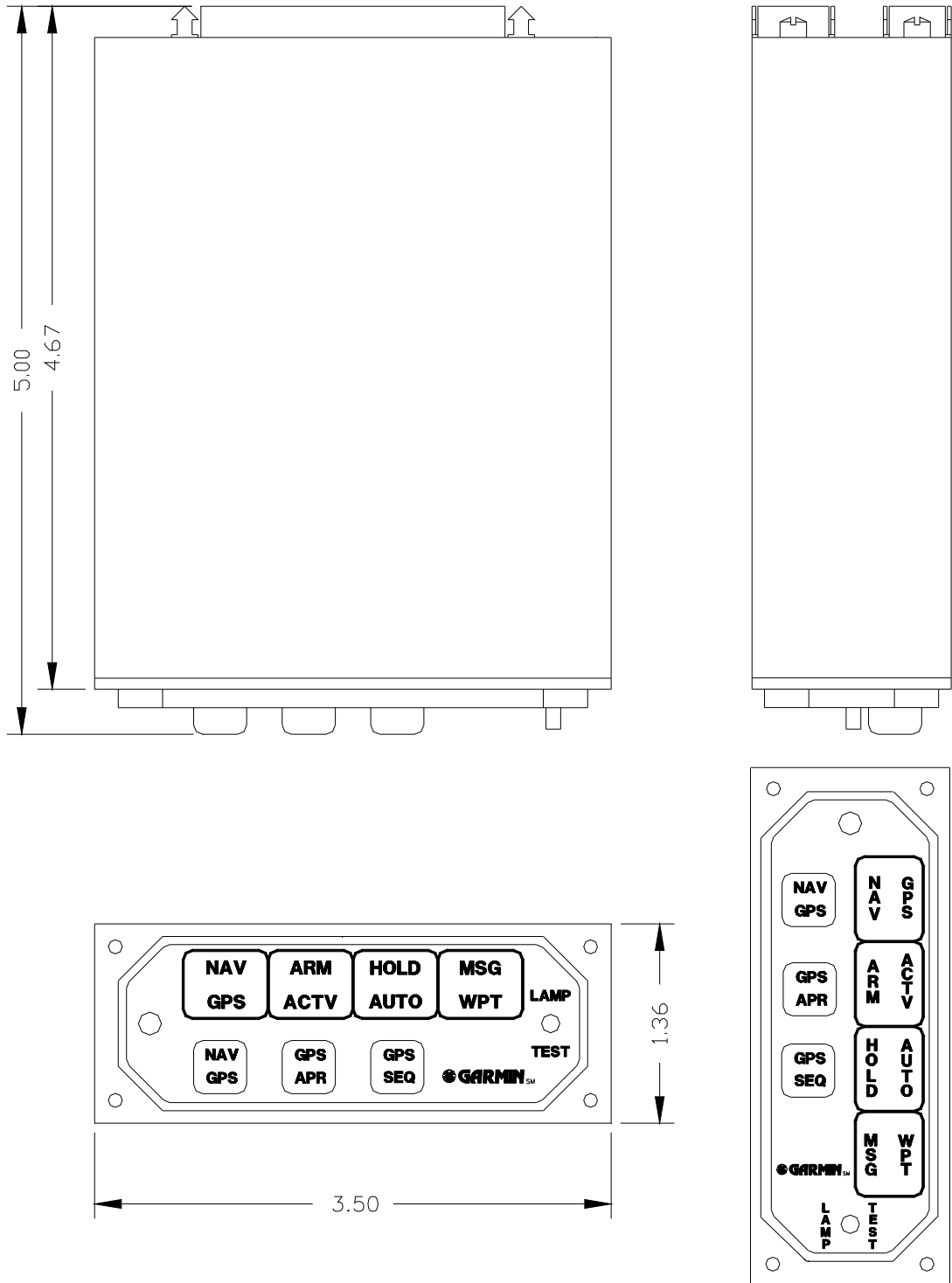
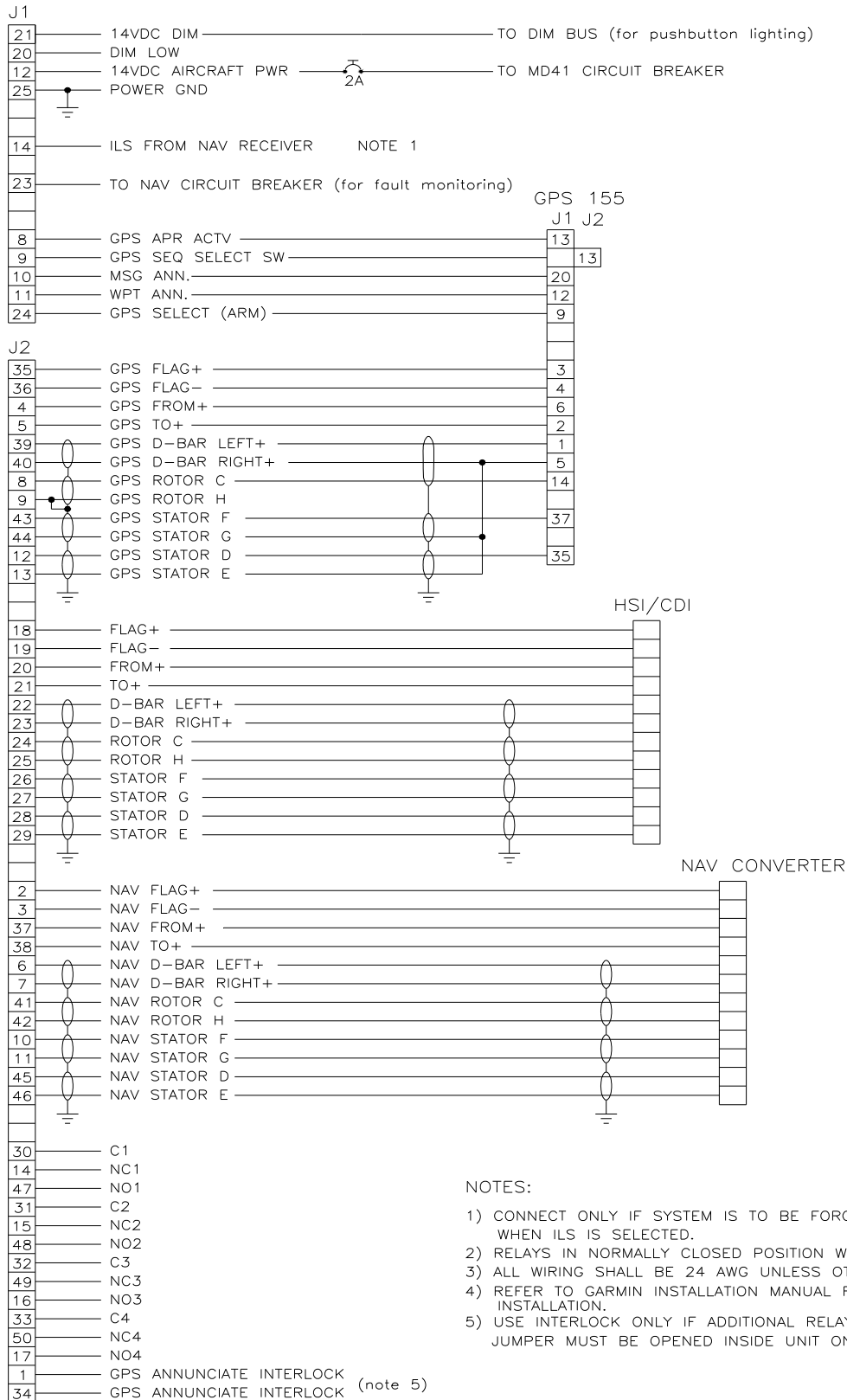


FIGURE 3-4 OUTLINE DRAWING

MD41

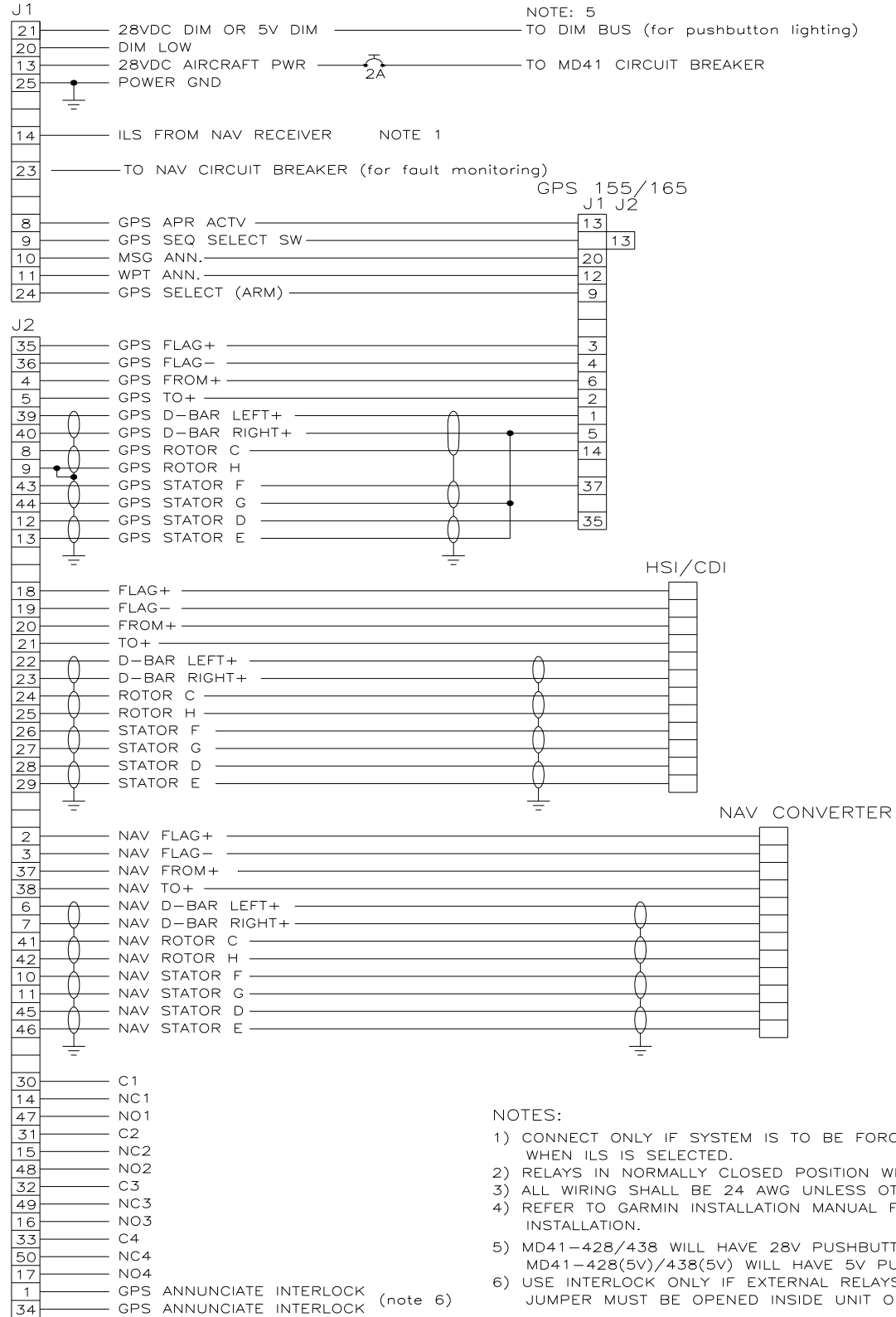


NOTES:

- 1) CONNECT ONLY IF SYSTEM IS TO BE FORCED TO NAV MODE WHEN ILS IS SELECTED.
- 2) RELAYS IN NORMALLY CLOSED POSITION WITH NAV SELECTED.
- 3) ALL WIRING SHALL BE 24 AWG UNLESS OTHERWISE NOTED.
- 4) REFER TO GARMIN INSTALLATION MANUAL FOR ACTUAL INSTALLATION.
- 5) USE INTERLOCK ONLY IF ADDITIONAL RELAYS ARE TO BE ADDED. JUMPER MUST BE OPENED INSIDE UNIT ON RELAY BOARD.

FIGURE 3-5 WIRING DIAGRAM, MD41-424/434 GPS 155/165 (14V)

MD41



WIRING DIAGRAM, MD41-428/438/428(5V)/438(5V) GPS 155/165 (28V)

SECTION 4 POST INSTALLATION CHECKOUT

4.1 PRE INSTALLATION TESTS

With the MD41-() disconnected, turn on the avionics master switch and verify that aircraft power is on pin 12 for 14VDC systems and pin 13 for 28VDC systems. Using an ohm meter, verify pin 25 is aircraft ground.

4.2 OPERATING INSTRUCTIONS

Turn off the avionics master switch and connect the mating connector to the MD41-(). Turn on the avionics master switch and the MD41-() should come on with the following annunciation's.

1. NAV or GPS
2. HOLD or AUTO
3. MSG and/or WPT may be flashing depending on the status of the GPS receiver.

Press the lamp test button, all annunciation's should light. Continue pressing the lamp test button and cover the photocell window located on the left side of the front panel. All annunciation's should dim.

Annunciation brightness at the minimum dimming level may be adjusted by rotation of the dimmer control located on the right side of the MD41-() case. CW rotation lowers the dimming level.

Select NAV using the NAV/GPS button. The presentation on the HSI/CDI will now be information from the NAV receiver. Using a VOR test generator or equivalent VOR signal, verify that the presentation and operation of the HSI/CDI is correct. This will include course resolver, left-right meter, to-from meter and nav warn flag. Now select GPS on the MD41-() and tune the VOR receiver to an ILS frequency. The MD41-() will be forced to NAV mode and ILS information will be displayed on the HSI/CDI. **NOTE**, this feature will not work if "ILS Energize" was not connected at the time of installation.

Next, verify that HOLD and AUTO annunciations will cycle alternately when pressing the GPS/SEQ button two times. Press the GPS/APR button and the ARM annunciation will illuminate. ARM can be canceled by pressing the GPS/APR button a second time, or by ACTV input from the GPS receiver. Please refer to section 4.0 of the Garmin installation manual for the remaining system tests.

No periodic maintenance or calibration is necessary for continued airworthiness of the MD41-().

ENVIRONMENTAL QUALIFICATION FORM

RTCA / DO160C

NOMENCLATURE: MD41-() GPS ANNUNCIATION CONTROL UNIT

MODEL NO: MD41-()

TSO NO: C129

CLASS A1

MANUFACTURER TEST SPECIFICATION:

MPS 7015613

MANUFACTURER: Mid-Continent Instruments and Avionics

9400 E. 34th Street N.

Wichita, KS 67226

Phone (316)-630-0101 • FAX: (316)-630-0101

Conditions	Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Categories A1 & F2 except as noted Cooling air not required Not Tested
Low Temperature	4.5.1	
High Temperature	4.5.2 & 4.5.3	
In-Flight Loss of Cooling	4.5.4	
Altitude	4.6.1	
Decompression	4.6.2	
Overpressure	4.6.3	
Temperature Variation	5.0	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested per DO-160C Par. 7.2.1
Operational	7.2	
Crash Safety	7.3	
Vibration	8.0	Equipment tested without shockmounts 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

Environmental Qualification (cont.)

Conditions	Section	Description of Conducted Tests
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 A
Audio Frequency Susceptibility	18.0	Equipment tested to Category B
Induced Signal Susceptibility	19.0	Equipment tested to Category A
Radio Frequency Susceptibility	20.0	Equipment tested to Category T
Radio Frequency Emissions	21.0	Equipment tested to Category Z
Lightning Induced Transient Susceptibility	22.0	Equipment identified as Category X, no tests required
Lightning Direct Effects	23.0	Equipment identified as Category X, no tests required
Icing	24.0	Equipment identified as Category X, no test required