

GDU 1500

Installation Manual



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RECORD OF REVISIONS

Revision	Revision Date	Description
A	6/12/06	Production Release
B	1/17/07	Added TSO-C87 and TSO-C118
C	4/11/07	Revised ICA
D	8/08/07	Revised ICA
E	9/28/07	Revised ICA
F	2/7/08	Revised ICA and added TSO information for 9.00
G	3/26/08	Added installation restrictions per certification agency
H	8/1/08	Added ETSO information
J	7/13/09	Added TCAS II and TAWS Class A
K	8/18/09	Added new part numbers
L	9/11/09	Added DO-178B Level A and DO-254 Level A
M	8/16/10	Added Electrical Bonding and ICA

CURRENT REVISION DESCRIPTION

Revision	Page Number(s)	Section Number	Description of Change
M	1-3	1.4.5	Added display viewing angles
	1-13	1.5.2	Added TSO-C87 deviations
	1-20 – 1-23	1.5.5	Added AFM/AFMS/POH Considerations section
	1-25	1.7	Revised warranty statement
	2-1	2.1	Updated AC reference
	2-2 – 2-3	2.4	Added HIRF/Lightning Protection and Electromagnetic Compatibility (EMC) section
	2-4	2.6	Added rivet guidance
	3-9	3.7.1	Added Power Interrupt heading
	3-10	3.7.2	Added Electrical Bonding section

DOCUMENT PAGINATION

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This manual reflects the operation of software version 11.00. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions.

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

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JavaScript Engine

The GDU 1500 uses the JavaScript engine located at <http://www.mozilla.org/js/spidermonkey/>. The source is available upon request or can be downloaded from the website under the Mozilla Public License Version 1.1.

AES Encryption

The GDU 1500 uses AES encryption and decryption routines initially written by Dr. Brian Gladman. The source code for these routines is available under an open source BSD or GPL license from http://fp.gladman.plus.com/cryptography_technology/fileencrypt/ on Dr. Gladman's web site.

WARNING

This product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This Notice is being provided in accordance with California's Proposition 65. If you have any questions or would like additional information, please refer to our web site at www.garmin.com/prop65.

WARNING

The GDU 1500 lamps contain mercury and must be recycled or disposed of according to local, state, or federal laws. If you have any questions or would like additional information, please refer to our web site at www.garmin.com/aboutGarmin/environment/disposal.jsp.

CAUTION

The GDU 1500 lens is coated with a special anti-reflective coating which is very sensitive to skin oils, waxes and abrasive cleaners. **CLEANERS CONTAINING AMMONIA WILL HARM THE ANTI-REFLECTIVE COATING.** It is very important to clean the lens using a clean, lint-free cloth and an eyeglass lens cleaner that is specified as safe for anti-reflective coatings.

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GDU 1500 HARDWARE MOD LEVEL HISTORY

The following table identifies hardware modification (Mod) Levels for the GDU 1500. Mod Levels are listed with the associated service bulletin number, service bulletin date, and the purpose of the modification. The table is current at the time of publication of this manual (see date on front cover) and is subject to change without notice. Authorized Garmin Sales and Service Centers are encouraged to access the most up-to-date bulletin and advisory information on the Garmin Dealer Resource web site at www.garmin.com using their Garmin-provided user name and password.

APPLICABLE LRU PART NUMBER	MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION
011-01108-00	1	N/A	N/A	More robust capacitors installed in the power supply backup circuit.
	2	N/A	N/A	Added clear chromate conversion coating on the GDU rivets that provide significantly lower and more consistent electrical bonding resistance.
011-01108-10	1	N/A	N/A	Added clear chromate conversion coating on the GDU rivets that provide significantly lower and more consistent electrical bonding resistance.

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1 GENERAL DESCRIPTION

1.1 Introduction

This manual presents mechanical and electrical installation requirements for installing the GDU 1500 as part of the Garmin Integrated Flight Deck. The GDU 1500 can be integrated into a variety of airframes under an appropriate TC or STC. Each airframe installation may vary. Use only approved (type or supplemental type) data for specific installation instructions in a particular aircraft.

1.2 Equipment Description

The GDU 1500 provides a central display and user interface for the Garmin Integrated Flight Deck. The display is mounted flush to the aircraft instrument panel using six ¼ turn fasteners. A GDU 1500 can be configured as either a Multi Function Display (MFD) or Primary Flight Display (PFD). The GDU 1500 provides the following functions:

1.2.1 Flight Instrument Functions

- Display of attitude (pitch and roll), rate of turn, slip/skid, heading, airspeed, altitude, and vertical speed information (PFD or reversionary modes only)
- Display of engine and airframe instrumentation (MFD or reversionary modes only)
- Display of the AFCS flight director command bars and modes (PFD or reversionary modes only)

1.2.2 Navigation Instrument Functions

- Display of position and ground speed for use by the pilot/flight crew
- Display of stored navigation and map databases for use by the pilot/flight crew
- Display of the HSI, Selected Heading and Selected Course (PFD or reversionary modes only)
- Area navigation functions using the determined position/velocity and stored navigation data
- Approach navigation functions and associated databases
- Baro-altitude Vertical Navigation

1.2.3 System Interface Functions

- Interfacing with the GCU 475, GMC 710, GDL 69/69A, and GDU 104Xs
- Display of dual communications transceivers operating in the 118.00 to 136.975 MHz range in 8.33 kHz or 25 kHz frequency spacing
- Control and display of weather information along with satellite radio audio channel and volume
- Display of dual VOR/ILS receivers tuning from 108.00 to 117.95 MHz in 50 kHz increments
- Control and display of transponder(s) GTX 32 or 33

1.3 Interface Summary

The GDU 1500 is designed as an open architecture system that uses typical ARINC 429, RS-232, and Ethernet communications interfaces. The following list represents some of the possible LRUs that the GDU 1500 communicates with:

- GDU 104Xs
- GMA 1347/1347D Audio Panel
- GCU 47X
- GMC 710
- GDL 69/69A Data Link
- GIA 63/63W IAU

1.4 Technical Specifications

1.4.1 Environmental Qualification Form

It is the responsibility of the installing agency to obtain the latest revision of the GDU 1500 Environmental Qualification Form. This form is available directly from Garmin under the following part number:

GDU 1500 Environmental Qualification Form, Garmin part number 005-00150-21

To obtain a copy of this form, see the dealer/OEM portion of the Garmin web site (www.garmin.com).

1.4.2 Physical Characteristics

Characteristics	Specifications
Width	14.90 inches (37.85)
Height	10.74 inches (27.28 cm)
Depth from front of panel to connector	4.45 inches (11.30 cm)
Unit Weight w/out Connector Kit	8.40 lbs. (3.8 kg)
Unit Weight with Connector Kit	8.61 lbs. (3.9 kg)

1.4.3 General Specifications

The table below contains general environmental specifications. For detailed specifications, see the Environmental Qualification Form.

Characteristics	Specifications
Operating Temperature Range	-40°C to +55°C.
Humidity	95% non-condensing
Altitude Range	-1,500 ft to 55,000 ft
Software Compliance	RTCA/DO-178B levels A, B, C, and D*
Hardware Compliance	RTCA/DO-254 Level A
Environmental Compliance	RTCA/DO-160E
Power Requirements	28 Vdc. See the Environmental Qualification Form for details on surge ratings and minimum/maximum operating voltages.

*RTCA/DO-178B level A is only supported through use of GDU software part numbers 006-B0319-9(_). All other GDU software part numbers support RTCA/DO-178B levels B, C, and D only.

1.4.4 Power Consumption

Ambient temperature above -15°C:

	28V (Maximum)	28V (Typical)
GDU 1500	55W	50W

Ambient temperature at or below -15°C:

	28V (Maximum)	28V (Typical)
GDU 1500	90W	85W

The GDU 1500 includes an internal heater, the heater will be on for approximately 15 minutes in air at -40°C that is circulated by a typical avionics fan across the units heat sink.

1.4.5 Display Viewing Angles

The table below contains a list of maximum suggested viewing angles for GDU 1500 display when viewed from a distance of 12 to 30 inches from the front face of the display.

Edge of Display	Viewing Angle
Left	45°
Right	45°
Upper	45°
Lower	10°

1.5 Certification

The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those installing 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. TSO articles must have separate approval for installation in an aircraft. The article may be installed only if performed under 14 CFR part 43 or the applicable airworthiness requirements. At the time of publication, installations of this TSO approved article are only approved when installed in an aircraft as part of a Garmin Integrated Flight Deck under an appropriate TC or STC. Determination regarding suitability for Part 25, 27, and 29 installations has not been made at the time of this publication.

The following table provides a list of applicable TSO/ETSOs for the GDU 1500.

1.5.1 TSO/ETSO Compliance

The GDU 1500 must be installed with a GCU 475/GCU 476 and GMC 710 to meet control requirements of all TSO/ETSO's. See the respective installation manuals for control functions included in each unit.

Function	TSO/ETSO/SAE/ RTCA/EUROCAE	Category	Applicable LRU SW Part Numbers	Applicable Custom Logic Device Part Numbers
Airborne Multipurpose Electronic Displays	TSO-C113* ETSO-C113 SAE AS8034	Type I, II, and III	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Airspeed Instruments	TSO-C2d ETSO-C2d SAE AS8019A	Type C Range : 20 to 999 kts	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Turn and Slip Instrument	TSO-C3d ETSO-C3d SAE AS8004	Type II	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Bank and Pitch Instruments	TSO-C4c ETSO-C4c SAE AS8001	Turn Error, Category B	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Direction (Heading) Instrument, Magnetic	TSO-C6d ETSO-C6d SAE AS8013A		006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Vertical Velocity Instruments (Rate-Of-Climb)	TSO-C8d ETSO-C8d SAE AS8016A	Type C Range : -9950 to 9950 ft/min	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Automatic Pilots	TSO-C9c ETSO-C9c SAE AS402B		006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Altimeter, Pressure Actuated, Sensitive Type	TSO-C10b ETSO-C10b SAE AS8009A	Range : -1000 to 99,980 ft	006-B0319-42 through 006-B0319-64	006-C0035-0() 006-C0036-0()
		Range : -1999 to 99,980 ft	006-B0319-65 through 006-B0319-9()	

TSO/ETSO Compliance, continued				
Function	TSO/ETSO/SAE/ RTCA/EUROCAE	Category	Applicable LRU SW Part Numbers	Applicable Custom Logic Device Part Numbers
ILS Glide Slope Receiving Equipment Operating Within The Radio Frequency Range of 328.6-335.4 Megahertz (MHz)	TSO-C34e ETSO-2C34f RTCA DO-192		006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Airborne Radio Marker Receiving Equipment	TSO-C35d ETSO-2C35d RTCA DO-143	Category A	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Airborne ILS Localizer Receiving Equipment Operating Within The Radio Frequency Range of 108-112 Megahertz	TSO-C36e ETSO-2C36f RTCA DO-195	Class A	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
VHF Radio Communications Transmitting Equipment Operating Within The Radio Frequency Range 117.975 to 137.000 Megahertz	TSO-C37d* ETSO-2C37e RTCA DO-186A	Class 3 Class 5 200nm 25 kHz 8.33 kHz	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
VHF Radio Communications Receiving Equipment Operating Within The Radio Frequency Range 117.975 to 137.000 Megahertz	TSO-C38d* ETSO-2C38e RTCA DO-186A	Class C Class E 200nm 25 kHz 8.33 kHz	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
VOR Receiving Equipment Operating Within The Radio Frequency Range Of 108-117.95 Megahertz (MHz)	TSO-C40c ETSO-2C40c RTCA DO-196		006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Airborne Automatic Direction Finding Equipment (ADF)	TSO-C41d ETSO-2C41d RTCA DO-179	Class A	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Temperature Instruments	TSO-C43c ETSO-C43c SAE AS8005A	Class IIIb	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Fuel Flowmeters	TSO-C44b ETSO-C44b SAE AS407C	Type I and II	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Manifold Pressure Instruments	TSO-C45a ETSO-C45a SAE AS8042	Type II Range : See Note Below	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()

TSO/ETSO Compliance, continued

Function	TSO/ETSO/SAE/ RTCA/EUROCAE	Category	Applicable LRU SW Part Numbers	Applicable Custom Logic Device Part Numbers
Pressure Instruments - Fuel, Oil, and Hydraulic	TSO-C47 ETSO-C47 SAE AS408C	Type II Range : See Note Below	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Electric Tachometer: Magnetic Drag (Indicator and Generator)	TSO-C49b ETSO-C49b SAE AS404C	Range : See Note Below	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Flight Director Equipment	TSO-C52b ETSO-C52b SAE AS8008		006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Fuel and Oil Quantity Instruments (Reciprocating Engine Aircraft)	TSO-C55 ETSO-C55 SAE AS405C	Range : See Note Below	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Airborne Weather and Ground Mapping Pulsed Radars	TSO-C63c ETSO-2C63c RTCA DO-173	Class 7	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Distance Measuring Equipment Operating Within the RF Range of 960-1215 MHz (DME)	TSO-C66c ETSO-2C66b RTCA DO-189		006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Airborne ATC Transponder Equipment	TSO-C74c ETSO-C74d		006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Airborne Low-Range Radio Altimeter	TSO-C87* ETSO-2C87		006-B0319-60 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Airborne Ground Proximity Warning Equipment	TSO-C92c* RTCA DO-161A		006-B0319-80 through 006-B0319-9()	006-C0035-0() 006-C0036-0()

TSO/ETSO Compliance, continued				
Function	TSO/ETSO/SAE/ RTCA/EUROCAE	Category	Applicable LRU SW Part Numbers	Applicable Custom Logic Device Part Numbers
Airborne Passive Thunderstorm Equipment	TSO-C110a ETSO-C110a RTCA DO-191		006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/Mode S) Airborne Equipment	TSO-C112 ETSO-2C112b RTCA DO-181C		006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Traffic Alert and Collision Avoidance System (TCAS) Airborne Equipment, TCAS I	TSO-C118 ETSO-C118 RTCA DO-197A		006-B0319-60 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Traffic Alert and Collision Avoidance System (TCAS) Airborne Equipment, TCAS II	TSO-C119b* RTCA DO-185A		006-B0319-80 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS)	TSO-C129a* ETSO-C129a RTCA DO-208	Class A1	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Stand-alone Airborne Navigation Equipment Using the Global Position System Augmented by the Wide Area Augmentation System	TSO-C146a* ETSO-C146 RTCA DO-229C	Class 3	006-B0319-50 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Traffic Advisory System (TAS) Airborne Equipment	TSO-C147 ETSO-C147 RTCA DO-197A	Class A	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Terrain Awareness and Warning System	TSO-C151b* RTCA DO-161A ETSO-C151a	Class B	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
Terrain Awareness and Warning System	TSO-C151b* RTCA DO-161A	Class A	006-B0319-80 through 006-B0319-9()	006-C0035-0() 006-C0036-0()
VHF Radio Communications – Transceiver Equipment	TSO-C169* RTCA DO-186A	Class 3 Class 5 Class C Class E	006-B0319-50 through 006-B0319-9()	006-C0035-0() 006-C0036-0()

Note : The range for these engine gauges is configurable and will vary with aircraft type.

*Refer to Section 1.5.4 for installation considerations.

1.5.2 TSO/ETSO Deviations

TSO/ETSO	Deviation
TSO-C2d	1. Garmin was granted a deviation from TSO-C2d to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.
	2. Garmin was granted a deviation from TSO-C2d to use SAE AS 8019A instead of SAE AS 8019 as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	3. Garmin was granted a deviation from TSO-C2d to use RTCA DO-160E instead of RTCA DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	4. Garmin was granted a deviation from TSO-C2d to eliminate the requirement 3.2.3 in SAE AS 8019A that requires “the instrument face to be marked with ‘Airspeed’ or ‘IAS’ and also with the applicable units of measure.”
	5. Garmin was granted a deviation from TSO-C2d to modify the requirement 3.2.5 in SAE AS 8019A that requires “The indicating means to be visible from all points on a surface defined as making an angle of 30 degrees with the perpendicular.”
ETSO-C2d	1. Garmin was granted a deviation from ETSO-C2d to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
	2. Garmin was granted a deviation from ETSO-C2d to use SAE AS 8019A instead of SAE AS 8019 as the Minimum Performance Standard.
	3. Garmin was granted a deviation from ETSO-C2d to eliminate the requirement 3.2.3 in SAE AS 8019A
	4. Garmin was granted a deviation from ETSO-C2d to modify the requirement 3.2.5 in SAE AS 8019A
TSO-C3d	1. Garmin was granted a deviation from TSO-C3d to use RTCA DO-160E instead of RTCA DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	2. Garmin was granted a deviation from TSO-C3d to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.
	3. Garmin was granted a deviation from TSO-C3d to modify the requirement 3.7 in SAE AS 8004 that requires “The indicating means to be visible from all points on a surface defined as making an angle of 30 degrees with the perpendicular.”
ETSO-C3d	1. Garmin was granted a deviation from ETSO-C3d to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
	2. Garmin was granted a deviation from ETSO-C3d to modify the requirement 3.7 in SAE AS 8004.
TSO-C4c	1. Garmin was granted a deviation from TSO-C4c to use SAE AS 8001 instead of SAE AS 396B for Minimum Performance Standards and Environmental Standards.
	2. Garmin was granted a deviation from SAE Aerospace Standard AS 8001 to use RTCA DO-160E instead of RTCA DO-138 as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	3. Neither TSO-C4c nor SAE Aerospace Standard AS 8001 specifies use of a standard for software development; Garmin intends to use RTCA DO-178B as the standard for Software Considerations in Airborne Systems and Equipment Certification.
ETSO-C4c	1. Garmin was granted a deviation from ETSO-C4c to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
	2. Garmin was granted a deviation from ETSO-C4c to use SAE AS 8001 instead of SAE AS 396B for Minimum Performance Standards and Environmental Standards.
	3. Garmin was granted a deviation from SAE Aerospace Standard AS 8001 to use RTCA DO-160E instead of RTCA DO-138 as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	4. Neither ETSO-C4c nor SAE Aerospace Standard AS 8001 specifies use of a standard for software development; GARMIN intends to use RTCA DO-178B as the standard for Software Considerations in Airborne Systems and Equipment Certification.

TSO/ETSO Deviations, continued	
TSO/ETSO	Deviation
TSO-C6d	1. Garmin was granted a deviation from TSO-C6d to use RTCA DO-160E instead of RTCA DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	2. Garmin was granted a deviation from TSO-C6d to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.
	3. Garmin was granted a deviation from TSO-C6d to use SAE AS 8013A instead of SAE AS 8013 as the Minimum Performance Standard.
	4. Garmin was granted a deviation from TSO-C6d to modify the requirement 3.10.2 in SAE AS 8013A that requires "The indicating means to be visible from all points on a surface defined as making an angle of 30 degrees with the perpendicular."
ETSO-C6d	1. Garmin was granted a deviation from ETSO-C6d to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
	2. Garmin was granted a deviation from ETSO-C6d to use SAE AS 8013A instead of SAE AS 8013 as the Minimum Performance Standard.
	3. Garmin was granted a deviation from ETSO-C6d to modify the requirement 3.10.2 in SAE AS 8013A.
TSO-C8d	1. Garmin was granted a deviation from TSO-C8d to use RTCA DO-160E instead of RTCA DO-160C as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	2. Garmin was granted a deviation from TSO-C8d to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.
	3. Garmin was granted a deviation from TSO-C8d to use SAE AS 8016A instead of SAE AS 8016 as the Minimum Performance Standard.
	4. Garmin was granted a deviation from TSO-C8d to modify the requirement 3.2.4 in SAE AS 8016A that requires "The indicating means to be visible from all points on a surface defined as making an angle of 30 degrees with the perpendicular."
ETSO-C8d	1. Garmin was granted a deviation from ETSO-C8d to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
	2. Garmin was granted a deviation from ETSO-C8d to use SAE AS 8016A instead of SAE AS 8016 as the Minimum Performance Standard.
	3. Garmin was granted a deviation from ETSO-C8d to modify the requirement 3.2.4 in SAE AS 8016A.
TSO-C9c	1. Garmin was granted a deviation from AS-402B paragraph 4.4.1 to limit autopilot engagement to attitudes considered safe for the certified aircraft.
	2. Garmin was granted a deviation from TSO-C9c to use SAE AS-402B instead of AS-402A. The justification for this deviation is to use the latest accepted environmental standards.
	3. Garmin was granted a deviation from TSO-C9c to use DO-160E instead of specified environmental tests. The justification for this deviation is to use the latest accepted environmental standards.
	4. Garmin was granted a deviation from TSO-C9c subpart A (c), which requires marking the weight of the unit on the unit. Garmin will provide this information in the installation manual in lieu of marking on the serial tag. Garmin does not currently list the weight on other avionics units.
	5. Garmin was granted a deviation from AS402B paragraph 4.3.2 to not provide servo effort indications when the automatic pilot is not engaged.
ETSO-C9c	1. Garmin was granted a deviation from ETSO-C9c to use RTCA DO-160E instead of SAE AS 402A as the Environmental Standard.
	2. Garmin was granted a deviation from AS-402B paragraph 4.4.1 to limit autopilot engagement to attitudes considered safe for the certified aircraft.
	3. Garmin was granted a deviation from ETSO-C9c to use SAE AS-402B instead of AS-402A.
	4. Garmin was granted a deviation from AS402B paragraph 4.3.2 to not provide servo effort indications when the automatic pilot is not engaged.

TSO/ETSO Deviations, continued	
TSO/ETSO	Deviation
TSO-C10b	<p>1. Garmin was granted a deviation from TSO-C10b to use SAE AS 8009A instead of SAE AS 392C as the Minimum Performance Standard.</p> <p>2. Garmin was granted a deviation from TSO-C10b to use RTCA DO-160E instead of RTCA DO160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.</p> <p>3. Garmin was granted a deviation from TSO-C10b to modify the requirement 3.7 in SAE AS 8009A that requires "Pointers and dial markings shall be visible from any point within the frustrum of a cone; the side of which makes an angle of 30 degrees with the perpendicular to the dial and the small diameter of which is the aperture the instrument case."</p> <p>4. Garmin was granted a deviation from SAE AS 8009A Section 3.11 to not display ALTITUDE or ALT next to the tape indicating altitude.</p>
ETSO C10b	<p>1. Garmin was granted a deviation from ETSO-C10b to use RTCA DO-160E instead of SAE AS 8009A as the Environmental Standard.</p> <p>2. Garmin was granted a deviation from ETSO-C10b to use SAE AS 8009A instead of SAE AS 392C as the Minimum Performance Standard.</p> <p>3. Garmin was granted a deviation from ETSO-C10b to modify the requirement 3.7 in SAE AS 8009A.</p> <p>4. Garmin was granted a deviation from SAE AS 8009A Section 3.11 to not display ALTITUDE or ALT next to the tape indicating altitude.</p>
TSO-C34e	<p>1. Garmin was granted a deviation from TSO-34e to use RTCA DO-160E instead of RTCA DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.</p> <p>2. Garmin was granted a deviation from TSO-C34e to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.</p>
ETSO-2C34f	<p>1. Garmin was granted a deviation from ETSO-2C34f to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p>
TSO-C35d	<p>1. Garmin was granted a deviation from TSO-C35d to use RTCA DO-160E instead of RTCA DO-138 as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.</p> <p>2. Garmin was granted a deviation from TSO-C35d to use FAR §21.607(d) instead of FAR §37.7 as the general rules governing holders of the TSO authorizations.</p> <p>3. Garmin was granted a deviation from TSO C-35d which calls out RTCA DO-143 Section 2.15 to allow the visual indication of the Standard Test Signal to not flash synchronized with the keying.</p>
ETSO-2C35d	<p>1. Garmin was granted a deviation from ETSO-2C35d to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p> <p>2. Garmin was granted a deviation from ETSO-2C35d which calls out EUROCAE 1/WG7 Section 3.16 to allow the visual indication of the Standard.</p>
TSO-C36e	<p>1. Garmin was granted a deviation from TSO36e to use RTCA DO-160E instead of RTCA DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.</p> <p>2. Garmin was granted a deviation from TSO-C36e to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.</p>
ETSO-2C36f	<p>1. Garmin was granted a deviation from ETSO-2C36f to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p>
TSO-C37d	<p>1. Garmin was granted a deviation from TSO-C37d to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.</p> <p>2. Garmin was granted a deviation from TSO-C37d to use RTCA DO-160E instead of RTCA DO-160C as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.</p> <p>3. Garmin was granted a deviation from TSO-C37d paragraph (a)(1) to allow using RTCA document DO-186a instead of RTCA document DO-186 to specify minimum performance standards.</p> <p>4. Garmin was granted a deviation from TSO-C37d paragraph (a)(5) to allow 8.33 kHz spacing in addition to the 25 kHz spacing.</p> <p>5. Garmin was granted a deviation from TSO-C37d paragraph (b)(1) to allow the marking to call out 8.33 kHz spacing in addition to the 25 kHz spacing.</p>
ETSO-2C37e	<p>1. Garmin was granted a deviation from ETSO-2C37e to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p>

TSO/ETSO Deviations, continued	
TSO/ETSO	Deviation
TSO-C38d	1. Garmin was granted a deviation from TSO-C38d to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.
	2. Garmin was granted a deviation from TSO-C38d to use RTCA DO-160E instead of RTCA DO-160C as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	3. Garmin was granted to deviate from TSO-C38d paragraph (a)(1) to allow using RTCA document DO-186a instead of RTCA document DO-186 to specify minimum performance standards.
	4. Garmin was granted a deviation from TSO-C38d paragraph (a)(5) to allow 8.33 kHz spacing in addition to the 25 kHz spacing.
ETSO-2C38e	1. Garmin was granted a deviation from ETSO-2C38e to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
TSO-C40c	1. Garmin was granted a deviation from TSO-C40c to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.
	2. Garmin was granted a deviation from TSO-C40c to use RTCA DO-160E instead of RTCA DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
ETSO-2C40c	1. Garmin was granted a deviation from ETSO-2C40c to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
TSO-C41d	1. Garmin was granted a deviation from TSO-C41d to use RTCA DO-178B instead of RTCA DO-178 to demonstrate compliance for the verification and validation of the computer software.
	2. Garmin requests a deviation from TSO-C41d to use RTCA DO-160E instead of RTCA DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
ETSO-2C41d	1. Garmin was granted a deviation from ETSO-2C41d to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
TSO-C43c	1. Garmin was granted a deviation from TSO-C43c to use RTCA DO-160E instead of RTCA DO-160C as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	2. Garmin was granted a deviation from TSO-C43c to use SAE AS 8005A instead of SAE AS 8005 as the Minimum Performance Standard
ETSO-C43c	1. Garmin was granted a deviation from ETSO-C43c to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard
	2. Garmin was granted a deviation from ETSO-C43c to use SAE AS 8005A instead of SAE AS 8005 as the Minimum Performance Standard.
TSO-C44b	1. Garmin was granted a deviation from TSO-C44b section a.3 to use DO-160E for the Environmental Standard.
	2. Garmin was granted a deviation from TSO-C44b section b.1 to not display the software part number on the outside of the unit.
	3. Garmin was granted a deviation from TSO-C44b to use SAE AS 407C instead of SAE AS 407B to demonstrate compliance for Fuel Flowmeters.
	4. Garmin was granted a deviation from TSO-C44b to modify the requirement 4.2.5 in SAE AS 407C that requires "The indicating means to be visible from all points on a surface defined as making an angle of 30 degrees with the perpendicular."
	5. Garmin was granted a deviation from TSO-C44b to modify the requirement 4.1.1 in SAE AS 407C that requires "Type I Instruments: Rotating pointer with fixed graduated dial or counter type indication. Clockwise pointer motion shall indicate increasing rate of flow."
	6. Garmin was granted a deviation from TSO-C44b to use analog scales that have graduations that exceed 10% of full scale value when the analog scale is accompanied by a digital readout.
ETSO-C44b	1. Garmin was granted a deviation from ETSO-C44b to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
	2. Garmin was granted a deviation from ETSO-C44b to use RTCA DO-160E instead of SAE AS 407B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	3. Garmin was granted a deviation from ETSO-C44b to use SAE AS 407C instead of SAE AS 407B to demonstrate compliance for Fuel Flowmeters.
	4. Garmin was granted a deviation from ETSO-C44b to modify the requirement 4.2.5 in SAE AS 407C
	5. Garmin was granted a deviation from ETSO-C44b to modify the requirement 4.1.1 in SAE AS 407C

TSO/ETSO Deviations, continued	
TSO/ETSO	Deviation
TSO-C45a	<p>1. Garmin was granted a deviation from TSO-45a to use RTCA DO-160E instead of RTCA DO-160C as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.</p> <p>2. Garmin was granted a deviation from TSO-45a SAE 8042 3.10.5 to use MAN as abbreviation instead of MANIFOLD PRESSURE or MANIF PRESS.</p> <p>3. Garmin was granted a deviation from TSO-C45a to modify the requirement 3.10.9 in SAE AS 8042 that requires "The indicating means to be visible from all points on a surface defined as making an angle of 30 degrees with the perpendicular."</p>
ETSO-C45a	<p>1. Garmin was granted a deviation from ETSO-C45a to use RTCA DO-160E instead of SAE AS 411 as the Environmental Standard.</p> <p>2. Garmin was granted a deviation from ETSO-C45a to use SAE AS 8042 instead of SAE AS 411 for Minimum Performance Standards.</p> <p>3. Garmin was granted a deviation from ETSO-C45a SAE 8042 3.10.5 to use MAN as abbreviation instead of MANIFOLD PRESSURE or MANIF PRESS.</p> <p>4. Garmin was granted a deviation from ETSO-C45a to modify the requirement 3.10.9 in SAE AS 8042.</p>
TSO-C47	<p>1. Garmin was granted a deviation from TSO-C47 to use SAE AS 408C instead of SAE AS 408A for Minimum Performance Standards and Environmental Standards.</p> <p>2. Garmin was granted a deviation from TSO-C47 to modify the requirement 4.1.5 in SAE AS 408C that requires "The indicating means to be visible from all points on a surface defined as making an angle of 30 degrees with the perpendicular."</p> <p>3. Garmin was granted a deviation from TSO-C47 to use RTCA DO-160E instead of AS 408C as the standard for Environmental Standards.</p>
ETSO-C47	<p>1. Garmin was granted a deviation from ETSO-C47 to use RTCA DO-160E instead of SAE AS 408C as the Environmental Standard.</p> <p>2. Garmin was granted a deviation from ETSO-C47 to use SAE AS 408C instead of SAE AS 408A for Minimum Performance Standards and Environmental Standards.</p> <p>3. Garmin was granted a deviation from ETSO-C47 to modify the requirement 4.1.5 in SAE AS 408C.</p>
TSO-C49b	<p>1. Garmin was granted a deviation from TSO-C49b to use SAE AS 404C instead of SAE AS 404B for Minimum Performance Standards and Environmental Standards.</p> <p>2. Garmin was granted a deviation from TSO-C49b to modify the requirement 4.1.2 in SAE AS 404C that requires "The indicating means to be visible from all points on a surface defined as making an angle of 30 degrees with the perpendicular."</p> <p>3. Garmin was granted a deviation from TSO-C49b, SAE AS 404C requirement 4.1.3.2, second sentence which states, "The increment between graduations shall not exceed 2-1/2% of full scale, above 600 RPM."</p> <p>4. Garmin was granted a deviation from TSO-C49b to use DO-160E instead of SAE AS 407B as the Environmental Standard.</p>
ETSO-C49b	<p>1. Garmin was granted a deviation from ETSO-C49b to use RTCA DO-160E instead of SAE AS 404B as the Environmental Standard.</p> <p>2. Garmin was granted a deviation from ETSO-C49b to use SAE AS 404C instead of SAE AS 404B for Minimum Performance Standards and Environmental Standards.</p> <p>3. Garmin was granted a deviation from ETSO-C49b to modify the requirement 4.1.2 in SAE AS 404C</p> <p>4. Garmin was granted a deviation from ETSO-C49b, SAE AS 404C requirement 4.1.3.2</p>

TSO/ETSO Deviations, continued	
TSO/ETSO	Deviation
TSO-C52b	<p>1. Garmin was granted a deviation from AS-8008 paragraph 3.6 to limit flight director operation to attitudes considered safe for the certified aircraft.</p> <p>2. Garmin was granted a deviation from TSO-52b to use RTCA DO-160E instead of RTCA DO-160C as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.</p>
ETSO-C52b	<p>1. Garmin was granted a deviation from ETSO-C52b to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p> <p>2. Garmin was granted a deviation from AS-8008 paragraph 3.6 to limit flight director operation to attitudes considered safe for the certified aircraft.</p>
TSO-C55	<p>1. Garmin was granted a deviation from TSO-C55 to use SAE AS 405C instead of SAE AS 405B to demonstrate compliance for Fuel and Oil Quantity Instruments.</p> <p>2. Garmin was granted a deviation from TSO-C55 to modify the requirement 4.2.5 in SAE AS 405C that requires "The indicating means to be visible from all points on a surface defined as making an angle of 30 degrees with the perpendicular."</p> <p>3. Garmin was granted a deviation from TSO-C55 to modify the requirement 4.2.4 in SAE AS 405C to allow "FUEL QTY" to be used to abbreviate "Fuel Quantity".</p> <p>4. Garmin was granted a deviation to use RTCA/DO-160E for the Environmental Standard. Other members of the GDU 1XXX family, specifically the GDU 10XX units, were previously tested to RTCA/DO-160D.</p>
ETSO-C55	<p>1. Garmin was granted a deviation from ETSO-C55 to use RTCA DO-160E instead of SAE AS 405B as the Environmental Standard.</p> <p>2. Garmin was granted a deviation from ETSO-C55 to use SAE AS 405C instead of SAE AS 405B to demonstrate compliance for Fuel and Oil Quantity Instruments.</p> <p>3. Garmin was granted a deviation from ETSO-C55 to modify the requirement 4.2.5 in SAE AS 405C.</p> <p>4. Garmin was granted a deviation from ETSO-C55 to modify the requirement 4.2.4 in SAE AS 405C to allow "FUEL QTY" to be used to abbreviate "Fuel Quantity".</p>
TSO-C63c	<p>1. Garmin was granted a deviation from TSO-63c to use RTCA DO-160E instead of RTCA DO-160A as the standard Environmental Conditions and Test Procedures for Airborne Equipment.</p> <p>2. Garmin was granted a deviation from TSO-63c to use RTCA DO-178B instead of RTCA DO-178 to demonstrate compliance for the verification and validation of the computer software.</p>
ETSO-2C63c	<p>1. Garmin was granted a deviation from ETSO-2C63c to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p>
TSO-C66c	<p>1. Garmin was granted a deviation from TSO-C66c to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.</p> <p>2. Garmin was granted a deviation from TSO-C66c to use RTCA DO-160E instead of RTCA DO-160C as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.</p>
ETSO-2C66b	<p>1. Garmin was granted a deviation from ETSO-2C66b to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p>
TSO-C74c	<p>1. Garmin was granted a deviation from TSO-C74c section (c) Marking to allow the environmental categories to be left off of the S/N Tag.</p> <p>2. Garmin was granted a deviation to use RTCA/DO-160E for the Environmental Standard. Other members of the GDU 1XXX family, specifically the GDU 10XX units, were previously tested to RTCA/DO-160D.</p>
ETSO-C74d	<p>1. Garmin was granted a deviation from ETSO-C74d to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p>
TSO-C87	<p>1. Garmin was granted a deviation from TSO-C87 paragraph b.1 to not display the environmental categories on the outside of the appliance.</p> <p>2. Garmin was granted a deviation from TSO-C87 to use EUROCAE/ED-30 "Minimum Performance Specification for Airborne Low-Range Radio (Radar) Altimeter Equipment" in lieu of the Minimum Performance Standards for Airborne Low-Range Radio Altimeters, contained within TSO-C87.</p>
ETSO-2C87	<p>1. Garmin was granted a deviation from ETSO-2C87 to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p>
TSO-C92c	<p>1. Garmin was granted a deviation from TSO-C92c paragraph b.(2) to not include the software version as part of the part number.</p> <p>2. Garmin was granted a deviation from TSO-C92c paragraph b.(2) to not include the modification status as part of the part number.</p> <p>3. Garmin was granted a deviation from TSO-C92c paragraph a.(4) to use RTCA/DO-160E instead of RTCA/DO-160C as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.</p>

TSO/ETSO Deviations, continued	
TSO/ETSO	Deviation
TSO-C110a	1. Garmin was granted a deviation from TSO-C110a to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.
	2. Garmin was granted a deviation from TSO-C110a to use RTCA DO-160E instead of RTCA DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
ETSO-C110a	1. Garmin was granted a deviation from ETSO-C110a to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
TSO-C112	1. Garmin was granted a deviation from TSO-C112 to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.
	2. Garmin was granted a deviation from TSO-C112 to use Section 2 of RTCA DO-181C to meet the minimum performance standard instead of the revisions DO-181 revisions and changes listed. DO-181C contains all the revisions listed by the TSO.
	3. Garmin was granted a deviation from TSO-C112 to use RTCA DO-160E instead of RTCA DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
ETSO-2C112b	1. Garmin was granted a deviation from ETSO-2C112b to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
TSO-C113	1. Garmin was granted a deviation from TSO-C113 to use RTCA DO-178B instead of RTCA DO-178A to demonstrate compliance for the verification and validation of the computer software.
	2. Garmin was granted a deviation from TSO-C113 to use RTCA DO-160E instead of RTCA DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
ETSO-C113	1. Garmin was granted a deviation from ETSO-C113 to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
TSO-C118	1. Garmin was granted a deviation from TSO-C118 to use RTCA/DO-178B sections 2 through 11 instead of RTCA/DO-178A to demonstrate compliance for the verification and validation of the computer software.
	2. Garmin was granted a deviation from TSO-C118 to use RTCA/DO-160E instead of RTCA/DO-160B as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	3. Garmin was granted a deviation from TSO-C118 to use RTCA/DO-197A instead of RTCA/DO-197 as the Minimum Operational Performance Standards.
ETSO-C118	1. Garmin was granted a deviation from ETSO-C118 to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.
	2. Garmin was granted a deviation from ETSO-C118 to use RTCA/DO-197A instead of RTCA/DO-197 as the Minimum Performance Standard.
TSO-C119b	1. Garmin was granted a deviation from TSO-C119b, RTCA/DO-185A subparagraph 2.2.6.1.2.1.1 to use an off-white own aircraft symbol and white proximate and other traffic symbols.
	2. Garmin was granted a deviation from TSO-C119b, RTCA/DO-185A subparagraph 2.2.6.2.(a) and 2.2.6.3.(a) to display "TCAS STBY" as an advisory (level 1) annunciation in amber instead of as an information (level 0) annunciation in white, when the own aircraft is airborne and the TCAS is in Standby.
	3. Garmin was granted a deviation from TSO-C119b paragraph 3.(c) to use RTCA/DO-160E instead of RTCA/DO-160D as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.

TSO/ETSO Deviations, continued	
TSO/ETSO	Deviation
TSO-C129a	<p>1. Garmin was granted a deviation from TSO-C129a to use DO-160E instead of DO-160C for the environmental standard.</p> <p>2. Garmin was granted a deviation from TSO-C129a to eliminate the annunciation for pending CDI scale change 3.0 NM from the FAF.</p> <p>3. Garmin was granted a deviation from TSO-C129a involving the use of GPS calibrated altitude in approach mode.</p> <p>4. Garmin was granted a deviation from TSO-C129a to extend automatic CDI sensitivity changes to non-approach mode navigation.</p> <p>5. Garmin was granted a deviation from TSO-C129a to eliminate the requirement in (a)(3)(xi)1.b.ii to “alert the pilot of the need to manually insert the barometric pressure”.</p> <p>6. Garmin was granted a deviation from TSO-C129a to modify the requirement (a)(3)(xii)(3) to allow the approach mode to be deselected by performing a direct-to action on the unit.</p> <p>7. Garmin was granted a deviation from TSO-C129a to eliminate the requirement in (a)(3)(xv)4.b to provide a “means to manually identify a satellite that is expected to be unavailable at the destination (for scheduled maintenance as identified in FAA Notice to Airmen) shall be provided” for the RAIM prediction process.</p> <p>8. Garmin was granted a deviation from TSO-C129a to change the requirement in paragraph (a)(7)(ii) to match the WAAS TSO-C145a and DO-229 requirements for Power input testing.</p>

TSO/ETSO Deviations, continued	
TSO/ETSO	Deviation
TSO-C146a	<p>1. Garmin was granted a deviation from RTCA/DO-229C 2.2.1.1.4.3 which states, "They [all displays] shall be fully readable up to a vertical viewing angle of 20 degrees from normal to the face of the display screen."</p> <p>2. Garmin was granted a deviation from RTCA/DO-229C 2.2.1.4.9.c which states, "BRG to or from a VOR: The bearing is based on the true-to-magnetic conversion at the waypoint location, using the same magnetic conversion as used to define the path."</p> <p>3. Garmin was granted a deviation from RTCA/DO-229C 2.2.4.2.3 which states, "If the aircraft is past the FPAP - (length offset), and the pilot has not already activated the missed approach, the receiver shall automatically transition to missed approach guidance."</p> <p>4. Garmin was granted a deviation from RTCA/DO-229C 2.2.4.6.4 and 2.2.5.6.4 pertaining to the low altitude alerting function.</p> <p>5. Garmin was granted a deviation to use RTCA/DO-160E for the Environmental Standard. Other members of the GDU 1XXX family, specifically the GDU 10XX units, were previously tested to RTCA/DO-160D.</p> <p>6. Garmin was granted a deviation from TSO-C146a 5.c(2) which states, " If the appliance accomplishes any additional functions beyond that described in paragraphs 3 and 3a of this TSO or covered by another TSO authorization, then a copy of the data and information specified in paragraphs 5a(13) and (14) must also go to each person receiving for use one or more articles manufactured under this TSO."</p> <p>TSO-C146a 5.a(13) primarily states "A list of all drawings and processes, including revision level, necessary to define the article's design."</p> <p>TSO-C146a 5.a(14) primarily states "If the article includes software: Plan for Software Aspects of Certification (PSAC); Software Configuration Index; and Software Accomplishment Summary."</p> <p>Garmin requests a deviation to not furnish each person receiving a GDU 1500 copies of the above data for the following reasons:</p> <ul style="list-style-type: none"> • This data is primarily concerned with defining design information necessary to manufacture and certify, not operate or install, the equipment. • The information in this data is considered proprietary and is not generated with the intent for use by customers who intend to operate or install the equipment. • Garmin adequately documents the other TSO authorizations and non-TSO functions provided by the GDU 1500 in the Installation Manual that is provided to installers for use in determining its certification basis and suitability for a particular installation. <p>Newer TSOs, such as TSO-C169, do not have a similar requirement to furnish this data to customers.</p> <p>7. RTCA/DO-229C 2.2.1.1.6 states: "If a function is implemented as a discrete action, the equipment shall use the labels or messages in the Table". The table (TABLE 2-5 LABELS AND MESSAGES), states that the function "Indication that there is a message" shall be labeled as "MSG" or "M".</p> <p>Garmin was granted a deviation to use the terms "ADVISORY" and "ALERTS" in addition to "MSG" depending upon the installation.</p>

TSO/ETSO Deviations, continued	
TSO/ETSO	Deviation
ETSO-C146	<p>1. Garmin was granted a deviation from ETSO-C146 to use RTCA/DO-229C instead of RTCA/DO-229B.</p> <p>2. Garmin was granted a deviation from ETSO-C146 to modify the requirement 2.2.1.1.4.3 in RTCA/DO-229C.</p> <p>3. Garmin was granted a deviation from ETSO-C146 to modify the requirement 2.2.1.4.9.c in RTCA/DO-229C.</p> <p>4. Garmin was granted a deviation from ETSO-C146 to eliminate the requirement 2.2.4.2.3 in RTCA/DO-229C.</p> <p>5. Garmin was granted a deviation from ETSO-C146 to modify the requirements 2.2.4.6.4 and 2.2.5.6.4 in RTCA/DO-229C.</p> <p>6. Garmin was granted a deviation from ETSO-C146 to modify the requirement 2.2.1.1.6 in RTCA/DO-229C.</p>
TSO-C147	<p>1. Garmin was granted a deviation to use RTCA/DO-160E for the Environmental Standard. Other members of the GDU 1XXX family, specifically the GDU 10XX units, were previously tested to RTCA/DO-160D.</p>
ETSO-C147	<p>1. Garmin was granted a deviation from ETSO-C147 to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p>
TSO-C151b	<p>1. Garmin was granted a deviation from TSO-C151b 5.c(2) which states, " If the appliance accomplishes any additional functions beyond that described in paragraphs 3 and 3a of this TSO, than [sic] a copy of the data and information specified in paragraphs 5a(11) through (13) must also go to each person receiving for use one or more articles manufactured under this TSO."</p> <p>TSO-C151b 5.a(11) states "An environmental qualification form as described in RTCA/DO-160D or the most current revision for each component of the TAWS equipment."</p> <p>TSO-C151b 5.a(12) primarily states "A list of all drawings and processes, including revision level, necessary to define the article's design."</p> <p>TSO-C151b 5.a(13) primarily states "If the article includes software: Plan for Software Aspects of Certification (PSAC); Software Configuration Index; and Software Accomplishment Summary."</p> <p>Garmin was granted a deviation to not furnish each person receiving a GDU 1XXX copies of the data in 5.a(12) and 5.a(13) for the following reasons:</p> <ul style="list-style-type: none"> • This data is primarily concerned with defining design information necessary to manufacture and certify, not operate or install, the equipment. • The information in this data is considered proprietary and is not generated with the intent for use by customers who intend to operate or install the equipment. • Garmin adequately documents the other TSO authorizations and non-TSO functions provided by the GDU 1XXX in the Installation Manual that is provided to installers for use in determining its certification basis and suitability for a particular installation. <p>Newer TSOs, such as TSO-C169, do not have a similar requirement to furnish this data to customers.</p> <p>2. Garmin was granted a deviation to use RTCA/DO-160E for the Environmental Standard. Other members of the GDU 1XXX family, specifically the GDU 10XX units, were previously tested to RTCA/DO-160D.</p>
ETSO-C151a	<p>1. Garmin was granted a deviation from ETSO-C151a to use RTCA DO-160E instead of RTCA DO-160D as the Environmental Standard.</p>
TSO-C169	<p>1. Garmin was granted a deviation to TSO-C169, paragraph 4.e requirement to mark (DEV) after the TSO number on the equipment. Garmin will mark as follows, as TSO-C169 is not the primary TSO and the Install Manual contains all of the TSO-C169 information including deviations. TSO-C113 See Install Manual for additional TSO's</p> <p>2. Garmin was granted a deviation to use RTCA/DO-160E for the Environmental Standard. Other members of the GDU 1XXX family, specifically the GDU 10XX units, were previously tested to RTCA/DO-160D.</p>

1.5.3 Non-TSO Functions

These functions were tested to RTCA/DO-160E environmental qualifications and were demonstrated only when the GDU 1500 is installed as a component of a Garmin Integrated Flight Deck.

Function	Design Assurance	Applicable LRU SW Part Numbers	Applicable Custom Logic Device Part Numbers
<p>Traffic Information Service (TIS) The GDU contains a subset of the TIS function. The Minimum Operational Performance Specifications (MOPS) for TIS are contained in RTCA/DO-239. The GDU 1500 has been demonstrated to meet these MOPS only when installed as a component in a Garmin Integrated Flight Deck, using a GTX 33/GTX 33D transponder.</p>	<p>RTCA/DO-178B Level D RTCA/DO-254 Level A</p>	<p>006-B0319-42 through 006-B0319-9()</p>	<p>006-C0035-0() 006-C0036-0()</p>
<p>Configurable Alerting System Configurable alerts can provide alert information both audibly and visually. These alerts are airframe specific, and are defined during the airframe specific software upload process. The Configurable Alerting System function provides the logic to support the generation of alerts up to "Catastrophic" level of critically, however the criticality of each alert configured with this function is considered separately and is consistent with the data used by the function to generate the alert or the capability of the display function to communicate it to the pilot/crew. Each alert provided by this function is at a criticality level that is appropriate for that alert.</p>	<p>RTCA/DO-178B Level A/B/C* RTCA/DO-254 Level A</p>	<p>006-B0319-42 through 006-B0319-9()</p>	<p>006-C0035-0() 006-C0036-0()</p>
<p>En Route and Terminal Baro-altitude Vertical Navigation (BARO VNAV) Guidance based on specified altitudes at waypoints in the active flight plan or the direct-to waypoint is provided. The Minimum Operational Performance Specifications (MOPS) for BARO VNAV are based on RTCA/DO-236B and RTCA/DO-283A. It includes vertical path guidance to a descending path, which is provided to the flight crew as a linear deviation from the desired path. The desired path is defined by a line joining two waypoints with specified altitudes or as a vertical angle from a specified waypoint/altitude. The desired vertical path is pilot selectable. The vertical waypoints are integrated into the active flight plan display and thus accessible by a single press of the FPL key. A vertical direct-to function similar to the lateral direct-to feature is provided. Both manual and autopilot-coupled guidance are supported. Compensation of altitudes at extreme cold temperatures is not provided. No performance management related capability, such as speed control, is provided.</p>	<p>RTCA/DO-178B Level C RTCA/DO-254 Level A</p>	<p>006-B0319-50 through 006-B0319-9()</p>	<p>006-C0035-0() 006-C0036-0()</p>

*Depending on airframe configuration, this function can be achieved at more than one RTCA/DO-178B level. The required RTCA/DO-178B level is established via configuration for each airframe that uses this function. For alerts displayed on the Primary Flight Display, the design assurance is RTCA/DO-178B Level A for GDU software part numbers 006-B0319-9() and Level B for all other GDU software part numbers. For alerts displayed on the Engine Indication System (EIS), the RTCA/DO-178B level is the same as the RTCA/DO-178B level for the EIS. The optional aural alerting associated with the Configurable Alerting System complies with RTCA/DO-178B Level B for all software part numbers.

Function	Design Assurance	Applicable LRU SW Part Numbers	Applicable Custom Logic Device Part Numbers
<p>Synthetic Vision System The display of a computer-generated image of the external scene topography from the pilot's perspective. The image is derived from aircraft attitude (or state), a high-precision navigation solution, and a database of terrain, obstacles, and relevant cultural features. The synthetic vision system and pathways provide additional awareness of the aircraft position with respect to terrain and the intended flight path. The synthetic vision system and pathways consist of depictions of terrain, traffic, obstacles, and the predicted position of the aircraft, as well as depictions of the flight plan. The performance requirements for the Synthetic Vision System function are based on FAA Advisory Circular 23-26, "Synthetic Vision and Pathway Depictions on the Primary Flight Display". At the time of publication, the Synthetic Vision System function has been approved for installation on a Part 23 Class I aircraft.</p>	<p>RTCA/DO-178B Level B RTCA/DO-254 Level A</p>	<p>006-B0319-70 through 006-B0319-9()</p>	<p>006-C0035-0() 006-C0036-0()</p>
<p>Pathways Pathways are the depiction of the selected or programmed navigation path to pilots using a perspective view of the path through the airspace. The synthetic vision system and pathways provide additional awareness of the aircraft position with respect to terrain and the intended flight path. The synthetic vision system and pathways consist of depictions of terrain, traffic, obstacles, and the predicted position of the aircraft, as well as depictions of the flight plan. The performance requirements for the Pathways function are based on FAA Advisory Circular 23-26, "Synthetic Vision and Pathway Depictions on the Primary Flight Display". At the time of publication, the Pathways function has been approved for installation on a Part 23 Class I aircraft.</p>	<p>RTCA/DO-178B Level B RTCA/DO-254 Level A</p>	<p>006-B0319-70 through 006-B0319-9()</p>	<p>006-C0035-0() 006-C0036-0()</p>
<p>Display of Auxiliary Video Information Display of auxiliary video information enhance situational awareness, provide entertainment, and/or allow for visual monitoring of the inside or outside of the airplane. The display is pilot-selectable on the MFD.</p>	<p>RTCA/DO-178B Level C RTCA/DO-254 Level A</p>	<p>006-B0319-70 through 006-B0319-9()</p>	<p>006-C0035-0() 006-C0036-0()</p>

1.5.4 Installation Considerations

TSO-C37d, TSO-C38d, and TSO-C129a apply only when installed with a GIA 63 (non-WAAS unit).

TSO-C87 applies only when installed with a Bendix/King KRA-405B.

TSO-C92c applies only when the system is configured for TAWS-A (Class A TAWS as defined by TSO-C151b).

To ensure TSO-C119b compliance, the TC, STC, ATC, or ASTC applicant must make a human factors assessment of the installed equipment when the installation included TCAS II. The assessment is to ensure that the use of amber for the “TCAS STBY” and “STANDBY” standby annunciations (in lieu of white as specified by RTCA/DO-185A paragraphs 2.2.6.6.2.(a) and 2.2.6.6.3.(a)) in the applicants aircraft is compatible with the alerting and annunciation philosophy of the aircraft manufacturer. That philosophy must comply with 14 CFR 2x.1322, and should be consistent with related policy and guidance for electronic displays such as AC 23.1311-1B and AC 25-11A.

TSO-C146a and TSO-C169 apply only when installed with a GIA 63W (WAAS unit).

The GDU 1500 meets the requirements of TSO-C113 and SAE AS8034, and additional requirements from SAE ARP4256A.

TSO-C151b applies only when the system is configured for TAWS-A (Class A TAWS) or TAWS-B (Class B TAWS).

1.5.5 AFM/AFMS/POH Considerations

The following information may be published in the approved AFM, AFMS, and/or POH provided the system is installed in accordance with AC 20-138A and is comprised of two TSO-C145a Class 3 approved Garmin GIA 63Ws, two/three TSO-C146a Class 3 approved Garmin GDU 1XXX Display Units, Garmin GA36 and GA37 antennas, and GPS software version 3.2 or later approved version:

NOTE

Text contained in brackets “[]” is meant to serve as an example and will need to be modified in order to reflect the actual installation.

GARMIN GNSS (GPS/SBAS) NAVIGATION SYSTEM EQUIPMENT APPROVALS

The Garmin GNSS navigation system installed in this aircraft is a GPS system with a Satellite Based Augmentation System (SBAS) comprised of [two TSO-C145a Class 3 approved Garmin GIA 63Ws, TSO-C146a Class 3 approved Garmin GDU 1XXX Display Units, Garmin GA36 and GA37 antennas, and GPS software version 3.2 or later approved version]. The Garmin GNSS navigation system in this aircraft is installed in accordance with AC 20-138A.

The Garmin GNSS navigation system as installed in this aircraft complies with the requirements of AC 20-138A and is approved for navigation using GPS and SBAS (within the coverage of a Satellite Based Augmentation System complying with ICAO Annex 10) for IFR en route, terminal area, and non-precision approach operations (including those approaches titled “GPS”, “or GPS”, and “RNAV (GPS)” approaches). The Garmin GNSS navigation system installed in this aircraft is approved for approach procedures with vertical guidance including “LPV” and “LNAV/VNAV”, within the U.S. National Airspace System.

The Garmin GNSS navigation system as installed in this aircraft complies with the equipment requirements of AC 90-105 and meets the equipment performance and functional requirements to conduct RNP terminal departure and arrival procedures and RNP approach procedures without RF (radius to fix) legs. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval from the FAA.

The Garmin GNSS navigation system as installed in this aircraft complies with the equipment requirements of AC 90-100A for RNAV 2 and RNAV 1 operations. In accordance with AC 90-100A, Part 91 operators (except subpart K) following the aircraft and training guidance in AC 90-100A are authorized to fly RNAV 2 and RNAV 1 procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval from the FAA.

The Garmin GNSS navigation system as installed in this aircraft has been found to comply with the requirements for primary means of Class II navigation in oceanic and remote navigation (RNP-10) without time limitations in accordance with AC 20-138A and FAA Order 8400.12A. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. This does not constitute an operational approval.

The Garmin GNSS navigation system as installed in this aircraft has been found to comply with the navigation requirements for primary means of Class II navigation in oceanic and remote navigation (RNP-4) in accordance with AC 20-138A and FAA Order 8400.33. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. Additional equipment may be required to obtain operational approval to utilize RNP-4 performance. This does not constitute an operational approval.

The Garmin GNSS navigation system as installed in this aircraft complies with the accuracy, integrity, and continuity of function, and contains the minimum system functions required for PRNAV operations in accordance with JAA Administrative & Guidance Material Section One: General Part 3: Temporary Guidance Leaflets, Leaflet No 10 (JAA TGL-10 Rev 1). The GNSS navigation system has [two ETSO-145 / TSO-C145a Class 3 approved Garmin GIA 63Ws, and ETSO-146 / TSO-C146a Class 3 approved Garmin GDU 1XXX Display Units]. The Garmin GNSS navigation system as installed in this aircraft complies with the equipment requirements for PRNAV and BRNAV operations in accordance with AC 90-96A and JAA TGL-10 Rev 1. This does not constitute an operational approval.

Garmin International holds an FAA Type 2 Letter of Acceptance (LOA) in accordance with AC 20-153 for database integrity, quality, and database management practices for the Navigation database. Pilots and operators can view the LOA status at www.garmin.com > Aviation Databases > Type 2 LOA Status.

Navigation information is referenced to WGS-84 reference system.

GARMIN GNSS (GPS/SBAS) NAVIGATION SYSTEM LIMITATIONS

The pilot must confirm at system initialization that the Navigation database is current.

Navigation database is expected to be current for the duration of the flight. If the AIRAC cycle will change during flight, the pilot must ensure the accuracy of navigation data, including suitability of navigation facilities used to define the routes and procedures for flight. If an amended chart affecting navigation data is published for the procedure, the database must not be used to conduct the procedure.

GPS/SBAS based IFR enroute, oceanic, and terminal navigation is prohibited unless the pilot verifies and uses a valid, compatible, and current Navigation database or verifies each waypoint for accuracy by reference to current approved data.

Discrepancies that invalidate a procedure must be reported to Garmin International. The affected procedure is prohibited from being flown using data from the Navigation database until a new Navigation database is installed in the aircraft and verified that the discrepancy has been corrected. Contact information to report Navigation database discrepancies can be found at www.garmin.com > Support > Contact Garmin Support > Aviation. Pilots and operators can view navigation data base alerts at www.garmin.com > In the Air > NavData Alerts.

For flight planning purposes, in areas where SBAS coverage is not available, the pilot must check RAIM availability. Within the United States, RAIM availability can be determined using the Garmin WFDE Prediction program, [part number 006-A0154-01 (included in G1000 trainer software) version 3.00 or later approved version with GARMIN GA36 and GA37 antennas selected], or the FAA's en route and terminal RAIM prediction website: www.raimprediction.net, or by contacting a Flight Service Station. Within Europe, RAIM availability can be determined using the Garmin WFDE Prediction program or Europe's AUGER GPS RAIM Prediction Tool at <http://augur.ecacnav.com/augur/app/home>. For other areas, use the Garmin WFDE Prediction program. This requirement is not necessary if SBAS coverage is confirmed to be available along the entire route of flight. The route planning and WFDE prediction program may be downloaded from the Garmin website on the internet. For information on using the WFDE Prediction Program, refer to Garmin WAAS FDE Prediction Program, part number 190-00643-01, 'WFDE Prediction Program Instructions'.

For flight planning purposes, operations within the U.S. National Airspace System on RNP and RNAV procedures when SBAS signals are not available, the availability of GPS integrity RAIM shall be confirmed for the intended route of flight. In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended route of flight, the flight should be delayed, canceled, or re-routed on a track where RAIM requirements can be met.

For flight planning purposes for operations within European B-RNAV and P-RNAV airspace, if more than one satellite is scheduled to be out of service, then the availability of GPS integrity RAIM shall be confirmed for the intended flight (route and time). In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended flight, the flight should be delayed, canceled, or re-routed on a track where RAIM requirements can be met.

For flight planning purposes, operations where the route requires Class II navigation the aircraft's operator or pilot-in-command must use the Garmin WFDE Prediction program to demonstrate that there are no outages on the specified route that would prevent the Garmin GNSS navigation system to provide primary means of Class II navigation in oceanic and remote areas of operation that requires (RNP-10 or RNP-4) capability. If the Garmin WFDE Prediction program indicates fault exclusion (FDE) availability will exceed 34 minutes in accordance with FAA Order 8400.12A for RNP-10 requirements, or 25 minutes in accordance with FAA Order 8400.33 for RNP-4 requirements, then the operation must be rescheduled when FDE is available.

Both Garmin GPS navigation receivers must be operating and providing GPS navigation guidance to their respective PFD for operations requiring RNP-4 performance.

North Atlantic (NAT) Minimum Navigational Performance Specifications (MNPS) Airspace operations per AC 91-49 and AC 120-33 require both GPS/SBAS receivers to be operating and receiving usable signals except for routes requiring only one Long Range Navigation sensor. Each display computes an independent navigation solution based on the on-side GPS sensor. However, either display will automatically revert to the cross-side sensor if the on-side sensor fails or if the cross-side sensor is determined to be more accurate. [On G1000 installations a "BOTH ON GPS1" or "BOTH ON GPS2" message does not necessarily mean that one GPS has failed. Refer to the MFD AUX-GPS STATUS page to determine the state of the unused GPS].

Whenever possible, RNP and RNAV routes including Standard Instrument Departures (SIDs) and Obstacle Departure Procedures (ODPs), Standard Terminal Arrival (STAR), and enroute RNAV “Q” and RNAV “T” routes should be loaded into the flight plan from the database in their entirety, rather than loading route waypoints from the database into the flight plan individually. Selecting and inserting individual named fixes from the database is permitted, provided all fixes along the published route to be flown are inserted. Manual entry of waypoints using latitude/longitude or place/bearing is prohibited.

“GPS”, “or GPS”, and “RNAV (GPS)” instrument approaches using the Garmin navigation systems are prohibited unless the pilot verifies and uses the current Navigation database. GPS based instrument approaches must be flown in accordance with an approved instrument approach procedure that is loaded from the Navigation database.

Not all published Instrument Approach Procedures (IAP) are in the Navigation database. Pilots planning on flying an RNAV instrument approach must ensure that the Navigation database contains the planned RNAV Instrument Approach Procedure and that approach procedure must be loaded from the Navigation database into the FMS flight plan by its name.

IFR non-precision approach approval using the GPS/SBAS sensor is limited to published approaches within the U.S. National Airspace System. Approaches to airports in other airspace are not approved unless authorized by the appropriate governing authority.

The navigation equipment required to join and fly an instrument approach procedure is indicated by the title of the procedure and notes on the IAP chart. Use of the Garmin GPS/SBAS receivers to provide navigation guidance during the final approach segment of an ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for “or GPS” navigation is prohibited. When using the Garmin VOR/LOC/GS receivers to fly the final approach segment, VOR/LOC/GS navigation data must be selected and presented on the CDI of the pilot flying.

Navigation information is referenced to WGS-84 reference system, and should only be used where the Aeronautical Information Publication (including electronic data and aeronautical charts) conform to WGS-84 or equivalent.

1.6 Reference Documents

The following publications are sources of additional information for installing the GDU 1500. Before installing the GDU 1500, the technician should read all referenced materials along with the manual.

Part Number	Document
190-00303-00	G1000 System Installation Manual
190-00303-04	G1000 Line Maintenance and Configuration Manual
190-00303-70	GMC 710 Installation Manual
190-00303-75	GCU 47X Installation Manual

1.7 Limited Warranty

All Garmin avionics products are warranted to be free from defects in materials or workmanship for: two years from the date of purchase for new Remote-Mount and Panel-Mount products; one year from the date of purchase for new portable products and any purchased newly-overhauled products; six months for newly-overhauled products exchanged through a Garmin Authorized Service Center; and 90 days for factory repaired or newly-overhauled products exchanged at Garmin in lieu of repair. Within the applicable period, Garmin will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost. This warranty does not apply to: (i) cosmetic damage, such as scratches, nicks and dents; (ii) consumable parts, such as batteries, unless product damage has occurred due to a defect in materials or workmanship; (iii) damage caused by accident, abuse, misuse, water, flood, fire, or other acts of nature or external causes; (iv) damage caused by service performed by anyone who is not an authorized service provider of Garmin; or (v) damage to a product that has been modified or altered without the written permission of Garmin. In addition, Garmin reserves the right to refuse warranty claims against products or services that are obtained and/or used in contravention of the laws of any country.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL GARMIN BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

Garmin retains the exclusive right to repair or replace (with a new or newly-overhauled replacement product) the product or software or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

Online Auction Purchases: Products purchased through online auctions are not eligible for warranty coverage. Online auction confirmations are not accepted for warranty verification. To obtain warranty service, an original or copy of the sales receipt from the original retailer is required. Garmin will not replace missing components from any package purchased through an online auction.

International Purchases: A separate warranty may be provided by international distributors for devices purchased outside the United States depending on the country. If applicable, this warranty is provided by the local in-country distributor and this distributor provides local service for your device. Distributor warranties are only valid in the area of intended distribution. Devices purchased in the United States or Canada must be returned to the Garmin service center in the United Kingdom, the United States, Canada, or Taiwan for service.

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2 INSTALLATION OVERVIEW

2.1 Introduction

This section provides hardware equipment information for installing the GDU 1500 and related hardware. Installation of the GDU 1500 should follow the aircraft TC or STC requirements. Cabling is fabricated by the installing agency to fit each particular aircraft. The guidance of FAA advisory circulars AC 43.13-1B and AC 43.13-2B, where applicable, may be found useful for making retro-fit installations that comply with FAA regulations. Refer to the G1000 System Installation manual, Garmin part number 190-00303-00, for further details on the mechanical aspects.

2.1.1 Unit Configurations

The GDU 1500 is only available as a single unit under the following part numbers:

NOTE

All units are black, unless otherwise noted.

Item	Applicable LRU SW Part Numbers	Applicable Custom Logic Device Part Numbers	Garmin P/N
GDU 1500 Unit Only, (011-01108-00)	006-B0319-42 through 006-B0319-9()	006-C0035-0() 006-C0036-0()	010-00387-00
GDU 1500 Unit Only, HTT, Video (011-01108-10)	006-B0319-44 through 006-B0319-9()	006-C0035-0() 006-C0036-0()	010-00387-10

2.1.2 Required Accessories

Each of the following accessories is provided separately from the GDU 1500 unit and is required to install the unit.

Item	Garmin P/N
GDU 10XX Connector Kit w/SPIDER	011-00820-00
GDU 10XX Connector Kit w/Shield Block	011-00820-01
GDU 1500 Mounting Hardware	011-01175-XX (See Section 2.5)

2.2 Installation Considerations

Fabrication of a wiring harness is required. Sound mechanical and electrical methods and practices are required for installation of the GDU 1500.

2.3 Cabling and Wiring

Use AWG #24 or larger wire for all connections unless otherwise specified by the aircraft manufacturer or Garmin. The standard pin contacts supplied in the connector kit are compatible with up to AWG #22 wire. In cases where some installations have more than one unit sharing a common circuit breaker, sizing and wire gauge is based on aircraft circuit breaker layout, length of wiring, current draw of units, and internal unit protection characteristics. Do not attempt to combine more than one unit on the same circuit breaker unless it is specified on aircraft manufacturer approved drawings.

In some cases, a larger gauge wire such as AWG #16, #18, or #20 may be needed for power connections. The provided connector kit supplies extended barrel contacts for AWG #16 and #18 wire, if required. Special thin-wall heat shrink tubing is also provided to insulate the extended barrels inside the backshell. If using #16 or #18 barrel contacts, ensure that no two contacts are mounted directly adjacent to each other. This minimizes the risk of contacts touching and shorting to adjacent pins and to ground. Ensure that routing of the wiring does not come in contact with sources of heat, RF or EMI interference. Check that there is ample space for the cabling and mating connectors. Avoid sharp bends in cabling and routing near aircraft control cables.

2.4 HIRF/Lightning Protection and Electromagnetic Compatibility (EMC)

In order to maintain HIRF/Lightning protection and Electromagnetic Compatibility (EMC) between equipment, the electrical equipment, supporting brackets, and racks shall be electrically bonded to the aircraft's main structure. Refer to SAE ARP 1870 section 5 when surface preparation is required to achieve electrical bond. Techniques used to provide electrical bond should be robust so that the electrical bond for the installed equipment is repeatable. The electrical bond between equipment and local airframe structure should achieve direct current (DC) resistance less than or equal to 20 milliohms (40 milliohms for ICA maintenance intervals) from local structure to the equipment.

NOTE

The milliohm meter probe should be placed on areas free of non-conductive finish. The front of the GDU 1500 is made of non-conductive finish and should not be used to perform the electrical bonding measurement.

Compliance should be verified by measurement using a calibrated milliohm meter (that is capable of accurately measuring the bonding requirement) or equivalent four wire method. Multi-meters are not acceptable for making these measurements. There may be OEM-specific reasons for electrically isolating equipment or having a higher bond resistance. These reasons should be rationalized upon installation approval. In general, Garmin recommends that all Garmin Integrated Avionics System equipment be electrically bonded.

The mounting allows the equipment to be electrically bonded, however additional bonding mechanisms may be provided at the installation level with use of bonding straps or EMI fingerstock. The installation design should be checked to verify that the electrical bond between the equipment being installed and airframe is achieved. Remote equipment interfacing to the GDU 1500 should also be electrically bonded, unless there are OEM-specific reasons for electrically isolating the remote equipment.

NOTE

The electrical bonding requirement for remote equipment electrically bonded to the GDU 1500 shall not be greater than the GDU 1500 electrical bonding requirement.

Electrical bonding check must be made with the harness disconnected during the test so that the chassis bond is not masked by the bond provided by the shielded harness. It is preferable to disconnect the harness without removing the unit from the mount. Perform the following procedure if the unit is required to be removed due to access constraints:

NOTE

The front of the GDU 1500 is made of non-conductive finish and should not be used to perform the electrical bonding measurement.

1. Remove the unit from the mount.
2. Disconnect the harness from the unit.
3. Install the unit to the mount.
4. Perform electrical bond measurement.
5. If electrical bond is acceptable then reconnect the harness/install the unit. No additional electrical bond checks are required after it is re-installed with the harness connected. If the bond check was unacceptable then improve or re-work the installation so that the bond check is compliant.

An equivalent OEM procedure may also be substituted for the above. An electrical bonding check may be required on every installation or less frequently (e.g. every 5 aircraft), as determined by the OEM based on their methods and control for implementing electrical bonds.

2.5 Cooling Requirements

Refer to the G1000 System Installation manual, Garmin part number 190-00303-00, for information on cooling requirements.

2.6 Mounting Requirements

The GDU 1500 mounting hardware is designed to accommodate various sheet metal panel thickness (see the following table).

GDU Mounting Hardware P/N	Sheet Metal Panel Thickness
011-01175-00	0.080" \pm 0.005
011-01175-01	0.125" \pm 0.005
011-01175-02	0.090" \pm 0.005
011-01175-03	0.100" \pm 0.005

The locking socket (See Figure 2-1) can be attached by using a rivet or screw. If using rivets, the rivet should be a 1/8" flat head 100° countersunk solid rivet. A rivet with chromate conversion coating is recommended. If using screws, the screw should be #4-40 flat head 100° countersunk screws with standard hex nuts on the back. If screws are used, thread locking compound (Loctite or equivalent) or a self locking nut with a nylon locking feature should be used. The specified screws and rivets are designed to provide a flush front surface. See Figure B-1 for the GDU Panel Cutout.

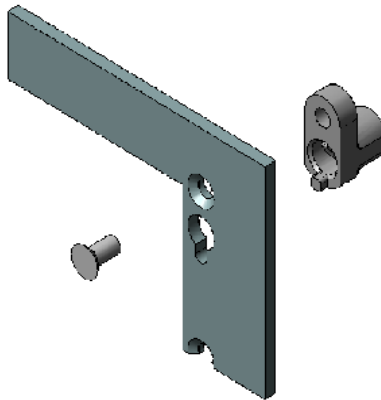


Figure 2-1. GDU 1500 Locking Socket

3 INSTALLATION PROCEDURE

3.1 Unpacking Unit

Carefully unpack the equipment and make a visual inspection of the unit for evidence of damage incurred during shipment. If the unit is damaged, notify the carrier and file a claim. To justify a claim, save the original shipping container and all packing materials. Do not return the unit to Garmin until the carrier has authorized the claim. Retain the original shipping containers for storage. If the original containers are not available, a separate cardboard container should be prepared that is large enough to accommodate sufficient packing material to prevent movement.

3.2 Wiring Harness Installation

Allow adequate space for installation of cables and connectors. The installer shall supply and fabricate all of the cables. All electrical connections are made through a single 62-pin high-density D subminiature connector. Section 4 defines the electrical characteristics of all input and output signals. Required connectors and associated hardware are supplied with the connector kit.

See Appendix B for examples of interconnect wiring diagrams. Construct the actual harness in accordance with aircraft manufacturer authorized interconnect standards.

Table 3-1. Pin Contact Part Numbers

Manufacturer	62 pin D-Subminiature connector (P10001)		
	16 AWG (Power Only)	18-20 AWG	22-28 AWG
Garmin P/N	336-00044-01	336-00044-00	336-00021-00
Military P/N	N/A	N/A	M39029/58-360
AMP	N/A	N/A	204370-2
Positronic	N/A	N/A	MC8522D
ITT Cannon	N/A	N/A	030-2042-000

Table 3-2. Recommended Crimp Tools

Manufacturer	Hand Crimping Tool	18-20 AWG		22-28 AWG	
		Positioner	Insertion/ Extraction Tool (note 2)	Positioner	Insertion/ Extraction Tool
Military P/N	M22520/2-01	N/A	M81969/1-04	M22520/2-09	M81969/1-04
Positronic	9507	9502-11	M81969/1-04	9502-3	M81969/1-04
ITT Cannon	995-0001-584	N/A	N/A	995-0001-739	N/A
AMP	601966-1	N/A	91067-1	601966-6	91067-1
Daniels	AFM8	K774	M81969/1-04	K42	M81969/1-04
Astro	615717	N/A	M81969/1-04	615725	M81969/1-04

NOTES

1. Non-Garmin part numbers shown are not maintained by Garmin and consequently are subject to change without notice.
2. Extracting the #16 and #18 contact requires that the expanded wire barrel be cut off from the contact. It may also be necessary to push the pin out from the face of the connector when using an extractor due to the absence of the wire. A new contact must be used when reassembling the connector.
3. For applications using 16 AWG wire, contact Garmin for information regarding connector crimp positioner tooling.

3.3 Backshell Assemblies

The GDU 10XX connector kit includes one Garmin backshell assembly. The backshell assembly houses the configuration module/temperature sensor, if applicable. Garmin's backshell also gives the installer the ability to easily terminate shield grounds at the backshell housing using one of two methods available (SPIDER or Shield Block). To assemble the backshell, configuration module, and grounding system, refer to instructions provided in the G1000 System Installation Manual (190-00303-00), as well as the SPIDER Installation Instructions (190-00313-03) and Shield Block Installation Instructions (190-00313-09).

NOTE

Information about the SPIDER grounding system is provided in support of existing installations. All new installations shall use the SHIELD BLOCK grounding system.

3.4 Video Cable Installation

The GDU 1500 (011-01108-10) is capable of receiving two baseband analog video inputs from external sources. Table 3-3 and 3-4 provide a list of parts needed to assemble and install a video cable. Some parts for this installation are included in the Garmin GDU 10XX Connector Kit (011-00820-01). All other parts are to be supplied by the installer.

Figures 3-1, 3-2, and 3-3 illustrate acceptable methods for terminating the video coax cable. Figure 3-4 illustrates the video cable installation into the backshell.

Table 3-3. Video Cable Assembly (See Figure 3-1)

Figure Reference	Description	Quantity	Garmin Part Number or Military Specification
1	75 Ohm Coax Cable (installer supplied)	As Required	Recommend M17/94-RG179, PIC Wire & Cable p/n V75268 or V76261, Electronic Cable Specialists (ECS) p/n 442501 or equivalent
2	22 AWG Wire (installer supplied)	As Required	Recommend M22759/16-22-X or equivalent
3	Polyolefin Heat Shrinkable Tubing (various sizes, installer supplied)	As Required	Recommend M23053/5-X-Y
4	Braid, Flat (<i>19-20 AWG equivalent, tinned plated copper strands 36 AWG, Circular Mil Area 1000 -1300</i>)	As Required	ASTMB33
5	Ring terminal, #8, insulated, 18-22 AWG	As Required	MS25036-149
6	Solder Sleeve Termination for Shield with Braid	As Required	Recommend Tyco/Raychem p/n S03-03-R-9035-100
7	Coaxial Solder Sleeve Termination	As Required	Recommend Tyco/Raychem p/n B-040-22-N

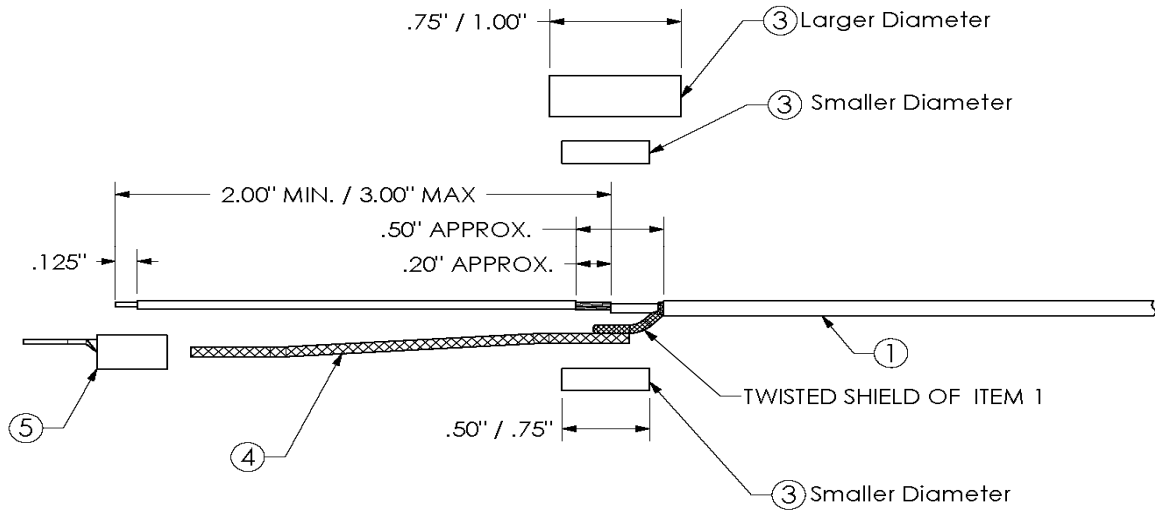


Figure 3-1. Video Cable Assembly – Method A

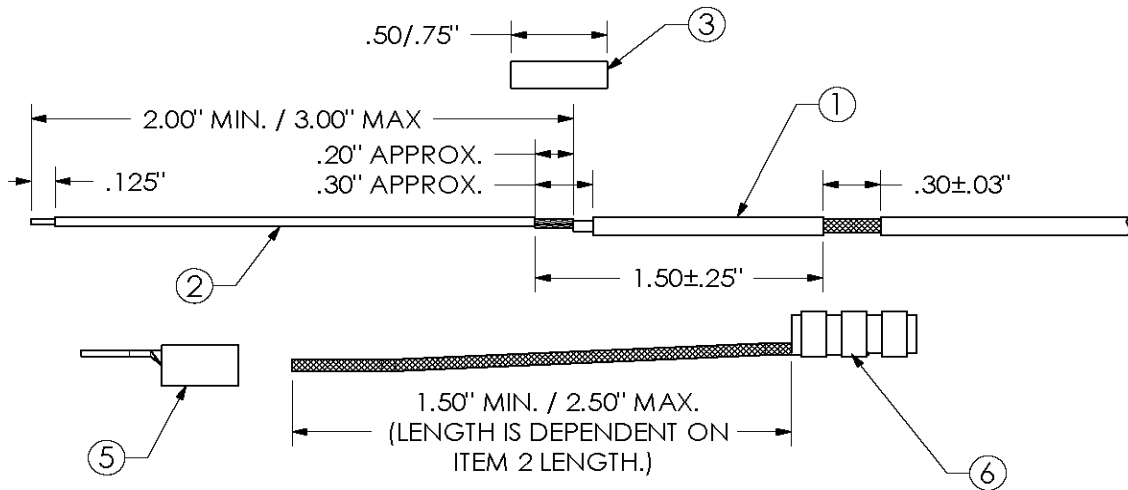


Figure 3-2. Video Cable Assembly – Method B

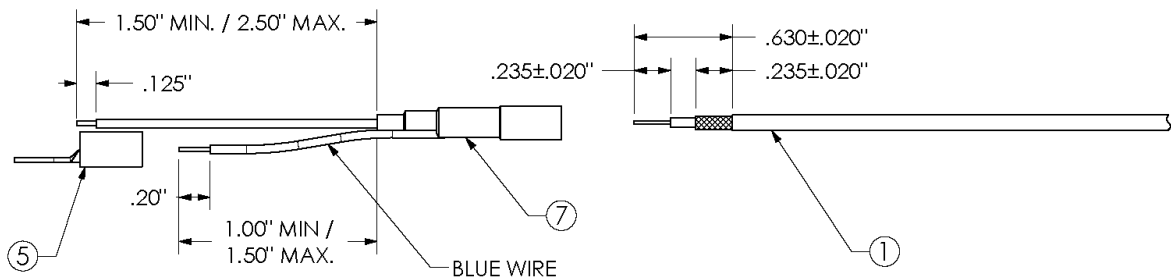


Figure 3-3. Video Cable Assembly – Method C

Table 3-4. Parts needed for Video Cable Installation (See Figure 3-4)

Figure Reference	Description	Garmin Part Number or Military Specification
1	Cast Housing*	125-00084-00
2	Lid*	115-00500-03
3	Pins*	336-00021-00
4	Video Cable Assembly	See Figure 3-1, 3-2, or 3-3
5	Strain Relief*	115-00499-03
6	Screw, 4-40x.375, PHP, SS/P, w/Nylon*	211-60234-10
7	Screw, 4-40x.187, FLHP100, SS/P, w/Nylon*	211-63234-06
8	Silicone Fusion Tape	249-00114-00 or equivalent
9	Screw, PHP, 8-32x.312 inches, Stainless	MS51957-42
	Screw, PHP, 8-32x.312 inches, Cad Plated Steel	MS35206-242
10	Split Washer, #8, (.045 inches compressed thickness) Stainless	MS35338-137
	Split Washer, #8, (.045 inches compressed thickness) Cad-plated steel	MS35338-42
11	Flat Washer, Stainless, #8, .032 inches thick, .174 inch inside diameter, .375 inch outside diameter	NAS1149CN832R
	Flat washer, Cad-plated Steel, #8, .032 inches thick, .174 inch inside diameter, .375 inch outside diameter	NAS1149FN832P

* Supplied in the GDU 10XX Connector Kit (011-00820-01).

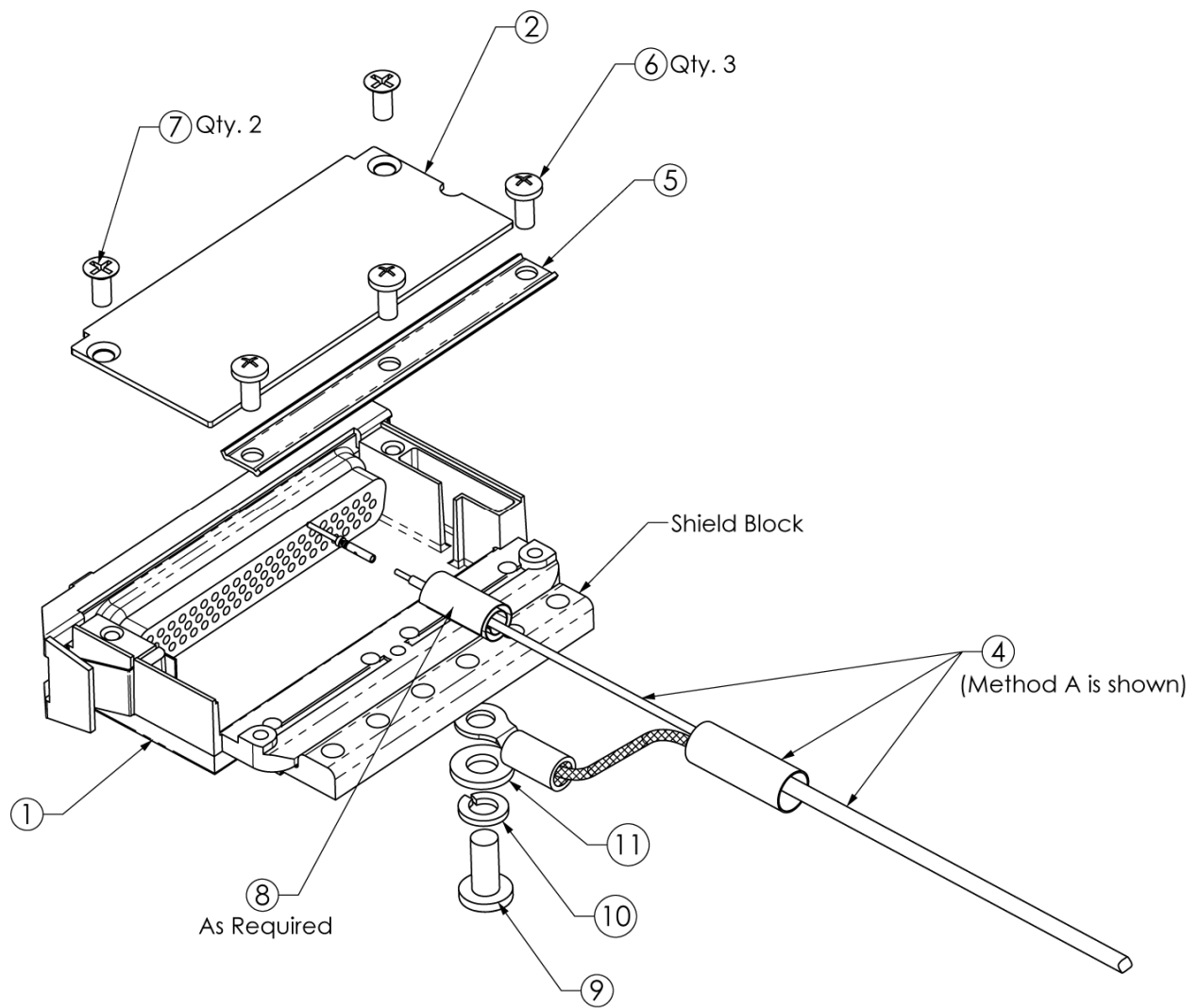


Figure 3-4. Video Cable Installation into a Backshell

3.4.1 Video Cable Termination Technique

Method A - Refer to Figure 3-1

1. Strip the outer jacket of the video coax cable (item 1) approximately 0.50 inches from the end of the cable.
2. Comb and twist the coax shield braid into a bundle.
3. Strip the dielectric from the end of the coax center conductor approximately 0.20 inches from the end of the cable.
4. Solder a 22 AWG wire (item 2) of proper length (per Figure 3-1) to the exposed coax center conductor.
5. Solder a flat braid (item 4) of proper length (per Figure 3-1) to the twisted coax shield.
6. Install and shrink heat shrinkable tubing (item 3) approximately centered over each of the solder joints.
7. Install and shrink a larger piece of heat shrinkable tubing (item 3) approximately centered over the previously installed heat shrinkable tubing.
8. Strip approximately 0.125 inches from the end of the 22 AWG wire.
9. Crimp a ring terminal (item 5) on the end of the braid.
10. Proceed to Step 11.

Method B – Refer to Figure 3-2

1. Cut a window (per Figure 3-2) in the jacket of the video coax cable (item 1) to expose the shield.
2. Install a solder sleeve shield terminator with flat braid (item 6) and center over the window. Braid must exit towards the connector as shown.
3. Heat the solder sleeve per the manufacturer's recommendation to melt and flow the solder preforms and shrink the tubing around the coax cable.
4. Strip the outer jacket of the video coax cable (item 1) and remove the shield approximately 0.30 inches from the end of the cable
5. Strip the dielectric from the end of the coax center conductor approximately 0.20 inches from the end of the cable.
6. Solder a 22 AWG wire (item 2) of proper length (per Figure 3-2) to the exposed coax center conductor.
7. Install and shrink heat shrinkable tubing (item 3) approximately centered over the solder joint.
8. Strip approximately 0.125 inches from the end of the 22 AWG wire.
9. Cut the item 6 braid to the proper length (per Figure 3-2) and crimp a ring terminal (item 5) on the end of the braid.
10. Proceed to Step 11.

Method C - Refer to Figure 3-3

1. Strip the outer jacket and inner dielectric and cut the shield of the video coax cable (item 1) as shown in Figure 3-2.
2. Insert and align a solder sleeve terminator (item 4) over the prepared end of the coax cable.
3. Heat the solder sleeve per the manufacturer's recommendation to melt and flow the solder preforms and shrink the tubing around the coax cable.
4. Trim the wires to the proper length (per Figure 3-3).
5. Strip approximately 0.125 inches from the end of the white wire.
6. Strip approximately 0.20 inches from the end of the blue wire.
7. Crimp a ring terminal (item 5) on the end of the blue wire.
8. Proceed to Step 11.

Refer to Figure 3-4

11. Crimp a pin (item 3) to the 22 AWG wire attached to the center conductor of the coax.
12. Insert the pin into the appropriate connector housing location as specified by the installation wiring diagram.
13. Terminate the ring terminal to the Shield Block by placing items on the Pan Head Screw (item 9) in the following order: Split Washer (item 10), Flat Washer (item 11), Ring Terminal, before finally inserting the screw into the tapped holes on the Shield Block.

-
14. Wrap the wire with Silicone Fusion Tape (item 8) (Garmin part number 249-00114-00 or a similar version) at the point where the backshell strain relief and cast housing will contact the wire.

NOTE

It is recommended to wrap the wire with Silicone Fusion Tape, however choosing to use this tape is at the discretion of the installer.

15. Place the smooth side of the backshell strain relief (item 5) across the wire and secure using the three screws (item 6).

CAUTION

Placing the raised grooved side of the strain relief across the wire may risk damage to wires.

16. Attach the cover (item 2) to the backshell (item 1) using the two screws (item 7).

3.5 Unit Installation

The GDU 1500 is installed by holding the unit flush with the instrument panel. The locking studs should be oriented with the alignment marks in the vertical position for installation. A 3/32" hex drive tool is then used to turn each of the four locking sockets ¼ turn clockwise. When locked, the alignment marks are in the horizontal position.

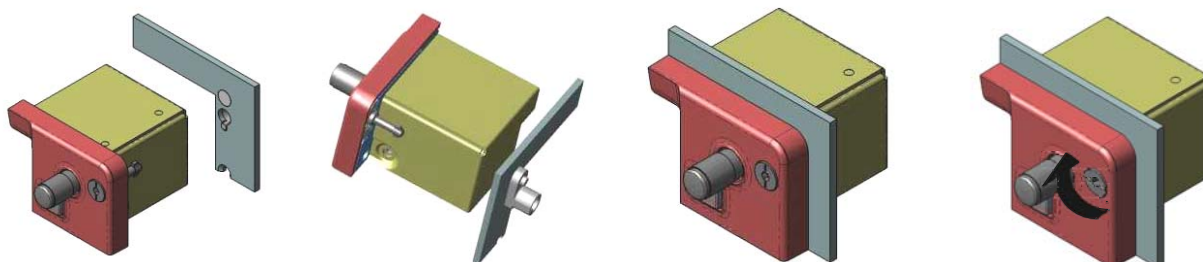


Figure 3-5. GDU 1500 ¼ Turn Fastener

3.6 Post Installation Configuration & Checkout

NOTE

The GDU 1500 does not provide valid outputs until the aircraft post installation configuration procedures are completed.

The GDU 1500 must be installed with a Garmin Integrated Flight Deck and have FAA approved configuration data. Configuration data is loaded to the GDU 1500 from an aircraft-specific Garmin Integrated Flight Deck SW Loader Card. GDU 1500 settings are predetermined for a specific aircraft and are typically contained within the file names:

- 'AIRFRAME'
- 'SYSTEM'
- 'MANIFEST'
- 'PFD1'
- 'MFD1'
- 'PFD2' (Dual PFD installation only)

For basic configuration information, refer to the G1000 Line Maintenance and Configuration Manual, Garmin Part Number 190-00303-04. For actual aircraft installation/checkout, use only aircraft manufacturer approved checkout procedures.

3.7 Continued Airworthiness

3.7.1 Power Interrupt

For all units that comply with the mod status level listed in Table 3-5, maintenance of the GDU 1500 is “on condition” only.

For all units that do **not** comply with the mod status level listed in Table 3-5, and require Category A or Category B power interrupt compliance, perform the power interrupt annual inspection as described in the applicable airframe specific maintenance manual.

If Category A or Category B power interrupt compliance is not required, maintenance of the GDU 1500 is “on condition” only.

Table 3-5. Long Term Power Interrupt Category A (200 mS) Mod Status

Unit	Unit Part Number	Long Term Power Interrupt Category A (200 mS)* Mod Status
GDU 1500	011-01108-00	1
	011-01108-10	0 (no mod status marked)

*Per RTCA DO-160E Section 16

3.7.2 Electrical Bonding

There are regulatory requirements, at the aircraft level, that specify continued airworthiness for HIRF and lightning protection ref, 14CFR 2X.1529, AC20-136A section 8, AC20-158 section 11. Therefore aircraft maintenance and inspection must take into account that the HIRF and lightning protection continues to be effective throughout the service of the aircraft. The following should be considered for the aircraft maintenance and inspection requirements to maintain HIRF/lightning protection and general EMC for Garmin Integrated Aviations System installations. The inspection interval should be decided by the OEM based on their processes and methods to achieve the protection. Intervals coinciding with other scheduled maintenance will have the least impact.

For a typical metallic aircraft, the electrical bonding maintenance requirement for the GDU 1500 is 40 milliohms. This value may be different for aircraft constructed of composite material.

1. Conduct a visual inspection (look for signs of wear, deterioration, and damage) to check that grounding and shielding integrity is maintained. Check for:
 - a. Integrity of shield terminations, wiring, wire attachments, grounding mechanism (terminal lugs, ground studs, ground blocks, etc.), connectors, and backshells
 - b. Signs of corrosion on equipment, racks, aircraft structure relied upon for ground, and connectors, backshells, and wire attachment
2. Electrical bonding may deteriorate over time with environmental conditions like vibration, humidity, etc.. and may not be visually evident. In order to maintain installation HIRF and lightning immunity requirements, verify the integrity of the electrical bond by performing electrical bonding test for each appliance, per Section 2.4. If the resistance is higher, re-work equipment racks/appliance and complete electrical bonding test based on installation requirements. Interfacing equipment should also be checked for the appropriate electrical bond.

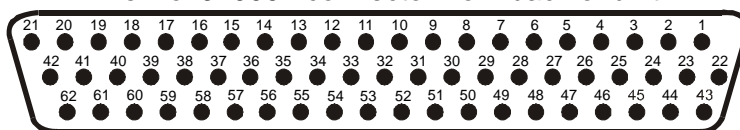
Any appliances that are intentionally isolated for protection should be checked to ensure this isolation is maintained.

4 SYSTEM INTERCONNECTS

4.1 Pin Function List

4.1.1 P10001 Connector

View of J10001 connector from back of unit



Pin	Pin Name	I/O
1	CONFIG MODULE GROUND	Out
2	ETHERNET OUT 1 A	Out
3	ETHERNET OUT 1 B	Out
4	ETHERNET IN 1 A	In
5	ETHERNET IN 1 B	In
6	ETHERNET OUT 2 A	Out
7	ETHERNET OUT 2 B	Out
8	ETHERNET IN 2 A	In
9	ETHERNET IN 2 B	In
10	ETHERNET OUT 3 A	Out
11	ETHERNET OUT 3 B	Out
12	ETHERNET IN 3 A	In
13	ETHERNET IN 3 B	In
14	FAN MONITOR VALID*	In
15	REVERSIONARY MODE SELECT 2	In
16	ARINC 429 IN 2 A	In
17	ARINC 429 IN 2 B	In
18	ARINC 429 IN 1 A	In
19	ARINC 429 IN 1 B	In
20	RESERVED	--
	LIGHTING BUS 2 HI**	In
21	RESERVED	--
	LIGHTING BUS 2 LO**	In
22	CONFIG MODULE DATA	I/O
23	CONFIG MODULE POWER OUT	Out
24	RESERVED	--
25	RESERVED	--
26	SIGNAL GROUND	--
27	POWER GROUND	--
28	RESERVED	--
	COMPOSITE VIDEO IN 1 HI**	In
29	POWER GROUND	--
30	SIGNAL GROUND	--
31	POWER GROUND	--
32	SIGNAL GROUND	--
33	POWER GROUND	--
34	SIGNAL GROUND	--

Connector P10001, continued		
Pin	Pin Name	I/O
35	AIRCRAFT POWER 1	In
36	SIGNAL GROUND	--
37	AIRCRAFT POWER 1	In
38	SIGNAL GROUND	--
39	AIRCRAFT POWER 2	In
40	SIGNAL GROUND	--
41	AIRCRAFT POWER 2	In
42	SIGNAL GROUND	--
43	CONFIG MODULE CLOCK	Out
44	RS-232 OUT 1	Out
45	RS-232 IN 1	In
46	RS-232 OUT 2	Out
47	RS-232 IN 2	In
48	RESERVED	--
	ETHERNET OUT 4 A**	Out
49	RESERVED	--
	ETHERNET OUT 4 B**	Out
50	RESERVED	--
	ETHERNET IN 4 A**	In
51	RESERVED	--
	ETHERNET IN 4 B**	In
52	UNIT 1 REMOTE POWER OFF	Out
53	RESERVED	--
54	DEMO MODE SELECT*	In
55	CDU SYSTEM ID PROGRAM* 1	In
56	CDU SYSTEM ID PROGRAM* 2	In
57	CDU SYSTEM ID PROGRAM* 3	In
58	REVERSIONARY MODE SELECT 1	In
59	LIGHTING BUS HI	In
60	LIGHTING BUS LO	In
61	RESERVED	--
62	RESERVED	--
	COMPOSITE VIDEO IN 2 HI**	In

* Indicates Active Low

** Only available on GDU 1500 (011-01108-10) with GDU software part numbers 006-B0319-80 through 006-B0319-9(_) and CLD part numbers 006-C0036-0(_) except -00 through -03.

Power

4.1.2 Power Functions

This section covers the power input requirements.

4.1.2.1 Aircraft Power

Pin Name	Connector	Pin	I/O
AIRCRAFT POWER 1	P10001	35	In
AIRCRAFT POWER 1	P10001	37	In
AIRCRAFT POWER 2	P10001	39	In
AIRCRAFT POWER 2	P10001	41	In
POWER GROUND	P10001	27	--
POWER GROUND	P10001	29	--
POWER GROUND	P10001	31	--
POWER GROUND	P10001	33	--

Pins 35 and 37 are internally connected to form AIRCRAFT POWER 1. Pins 39 and 41 are internally connected to form AIRCRAFT POWER 2. AIRCRAFT POWER 1 and AIRCRAFT POWER 2 are “diode ORed” to provide aircraft power redundancy.

4.1.2.2 Remote Power

Pin Name	Connector	Pin	I/O
UNIT 1 REMOTE POWER OFF	P10001	52	Out

Used to control power of a remote sub-system. 28 Volts DC turns the remote unit off. Ground/Open turns the remote unit on.

4.2 Configuration

4.2.1 CDU System ID Program

CDU SYSTEM ID PROGRAM 1 (P10001, Pin 55)	CDU SYSTEM ID PROGRAM 2 (P10001, Pin 56)	CDU SYSTEM ID PROGRAM 3 (P10001, Pin 57)	DISPLAY
Open	Open	Ground	MFD
Open	Open	Open	PFD1
Ground	Open	Open	PFD2

These inputs determine if the GDU 1500 is an MFD or PFD.

4.2.2 Configuration Module

Pin Name	Connector	Pin	I/O
CONFIG MODULE GROUND	P10001	1	Out
CONFIG MODULE DATA	P10001	22	I/O
CONFIG MODULE POWER OUT	P10001	23	Out
CONFIG MODULE CLOCK	P10001	43	Out

4.2.3 Reversionary Mode

Pin Name	Connector	Pin	I/O
REVERSIONARY MODE SELECT 1	P10001	58	In
REVERSIONARY MODE SELECT 2	P10001	15	In

These inputs determine whether to place the system in reversionary mode.

4.2.4 Demo Mode

Pin Name	Connector	Pin	I/O
DEMO MODE SELECT*	P10001	54	In

This is an active low input that places the unit in demo mode. This input is not to be used in aircraft installations.

4.3 Serial Data

4.3.1 RS-232

Pin Name	Connector	Pin	I/O
RS-232 OUT 1	P10001	44	Out
RS-232 IN 1	P10001	45	In
RS-232 OUT 2	P10001	46	Out
RS-232 IN 2	P10001	47	In

The RS-232 outputs conform to EIA Standard RS-232C with an output voltage swing of at least $\pm 5V$ when driving a standard RS-232 load.

4.3.2 ARINC 429

Pin Name	Connector	Pin	I/O
ARINC 429 IN 2 A	P10001	16	In
ARINC 429 IN 2 B	P10001	17	In
ARINC 429 IN 1 A	P10001	18	In
ARINC 429 IN 1 B	P10001	19	In

The ARINC 429 inputs conform to ARINC 429 electrical specifications when loaded with up to 2 standard ARINC 429 transmitters.

4.3.3 Ethernet

Pin Name	Connector	Pin	I/O
ETHERNET OUT 1 A	P10001	2	Out
ETHERNET OUT 1 B	P10001	3	Out
ETHERNET IN 1 A	P10001	4	In
ETHERNET IN 1 B	P10001	5	In
ETHERNET OUT 2 A	P10001	6	Out
ETHERNET OUT 2 B	P10001	7	Out
ETHERNET IN 2 A	P10001	8	In
ETHERNET IN 2 B	P10001	9	In
ETHERNET OUT 3 A	P10001	10	Out
ETHERNET OUT 3 B	P10001	11	Out
ETHERNET IN 3 A	P10001	12	In
ETHERNET IN 3 B	P10001	13	In
ETHERNET OUT 4 A**	P10001	48	Out
ETHERNET OUT 4 B**	P10001	49	Out
ETHERNET IN 4 A**	P10001	50	In
ETHERNET IN 4 B**	P10001	51	In

** Only available on GDU 1500 (011-01108-10) with GDU software part numbers 006-B0319-80 through 006-B0319-9() and CLD part numbers 006-C0036-0() except -00 through -03.

This Ethernet based HSDB (High Speed Data Bus) meets the hardware aspects of IEEE standard 802.3 for 10 base T Ethernet communications.

4.4 Lighting

Pin Name	Connector	Pin	I/O
LIGHTING BUS HI	P10001	59	In
LIGHTING BUS LO	P10001	60	In
LIGHTING BUS 2 HI**	P10001	20	In
LIGHTING BUS 2 LO**	P10001	21	In

** Only available on GDU 1500 (011-01108-10) with GDU software part numbers 006-B0319-80 through 006-B0319-9() and CLD part numbers 006-C0036-0() except -00 through -03.

The GDU 1500 display and keys can be configured to track 28 Vdc, 14 Vdc, 5 Vdc, or 5 Vac lighting busses using these inputs. Alternatively, the GDU 1500 can be configured to automatically adjust for ambient lighting conditions based on the photocell. See the G1000 Line Maintenance and Configuration manual, Garmin part number 190-00303-04, for more information.

4.5 Fan Monitor

Pin Name	Connector	Pin	I/O
FAN MONITOR VALID*	P10001	14	In

An active low input that monitors the status of the cooling fan.

4.6 Composite Video (011-01108-10 Only)

Pin Name	Connector	Pin	I/O
COMPOSITE VIDEO IN 1 HI**	P10001	28	In
COMPOSITE VIDEO IN 2 HI**	P10001	62	In

** Only available on GDU 1500 (011-01108-10) with GDU software part numbers 006-B0319-80 through 006-B0319-9() and CLD part numbers 006-C0036-0() except -00 through -03.

The GDU 1500 (011-01108-10) supports the following composite video input formats:

- NTSC “National Television Standards Committee” (J,M,4,43)
- PAL “Phase Alternating Line” (B,D,G,H,I,M,N,Nc,60)
- SECAM “Sequential Color with Memory” (B,D,G,K,K1,L)

Composite video is a one-wire format with intensity, color, and timing information transferred together. Video signals are transferred using a 75 ohm coaxial cable, see Table 3-3 for approved types of coaxial cable.

NOTE

Particular attention must be taken in routing the coaxial cable through the aircraft to avoid potential radiated interference sources in addition to minimizing the cable bend radii. Concerns about interference sources may necessitate the use of coaxial cable with a higher noise rejection rating.

NTSC (M), also called RS-170A, is the most common video format supported by the GDU 1500 (011-01108-10). NTSC has the following characteristics:

- 59.94 Hz vertical interlaced refresh rate
- 15.75 kHz horizontal line frequency
- 525 scan lines
- 29.97 frame per second update rate
- Luminance or luma (black and white) also called “monochrome NTSC” or RS-170, is the standard black and white format which contains both image and timing information.
- Chrominance or chroma (color) encoding system

APPENDIX A OUTLINE & INSTALLATION DRAWINGS

NOTES:
 1. DIMENSIONS: INCHES[mm]
 2. TOLERANCES: INCHES mm
 .XX±0.02 .X±0.5
 .XXX±0.010 .XX±0.25

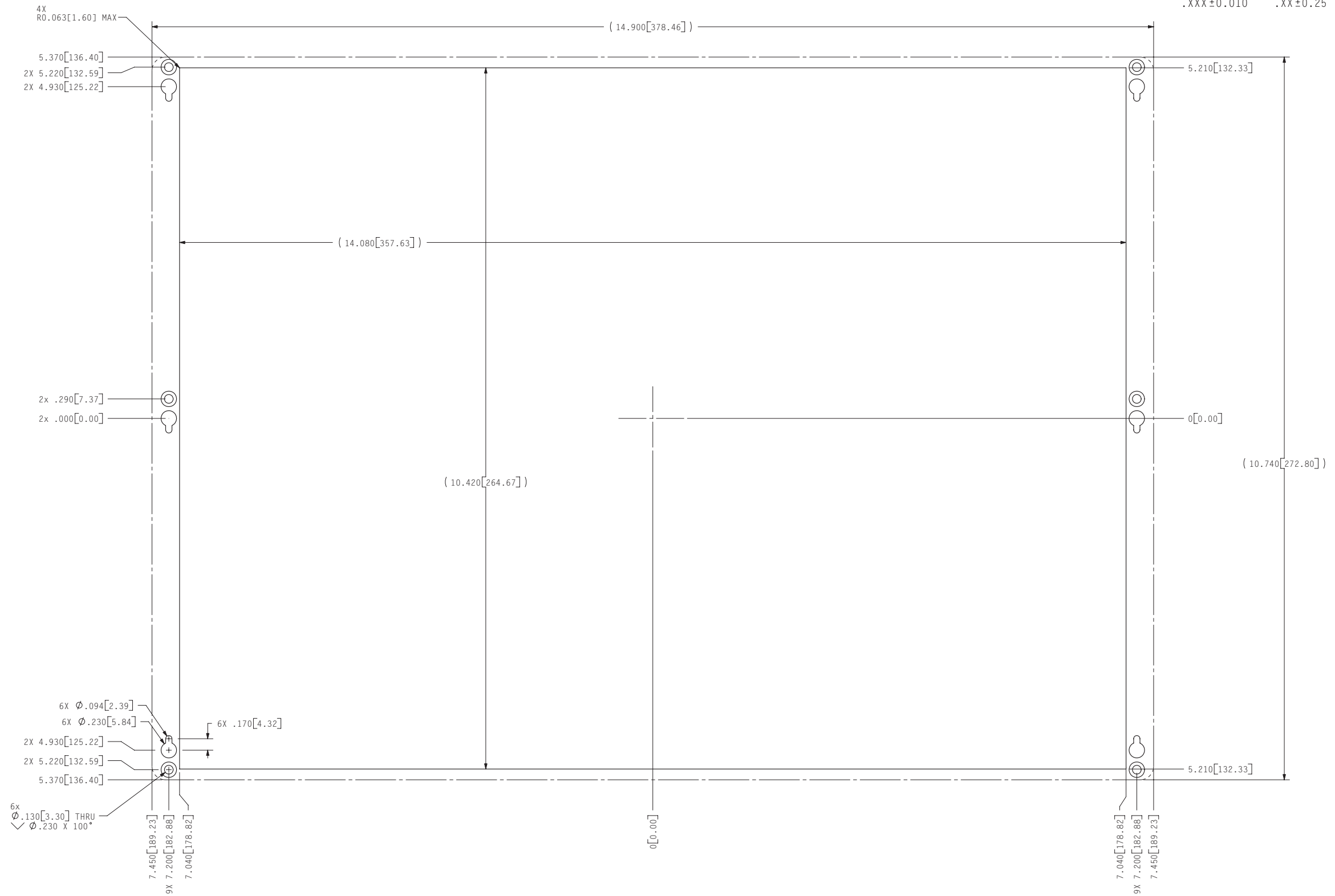
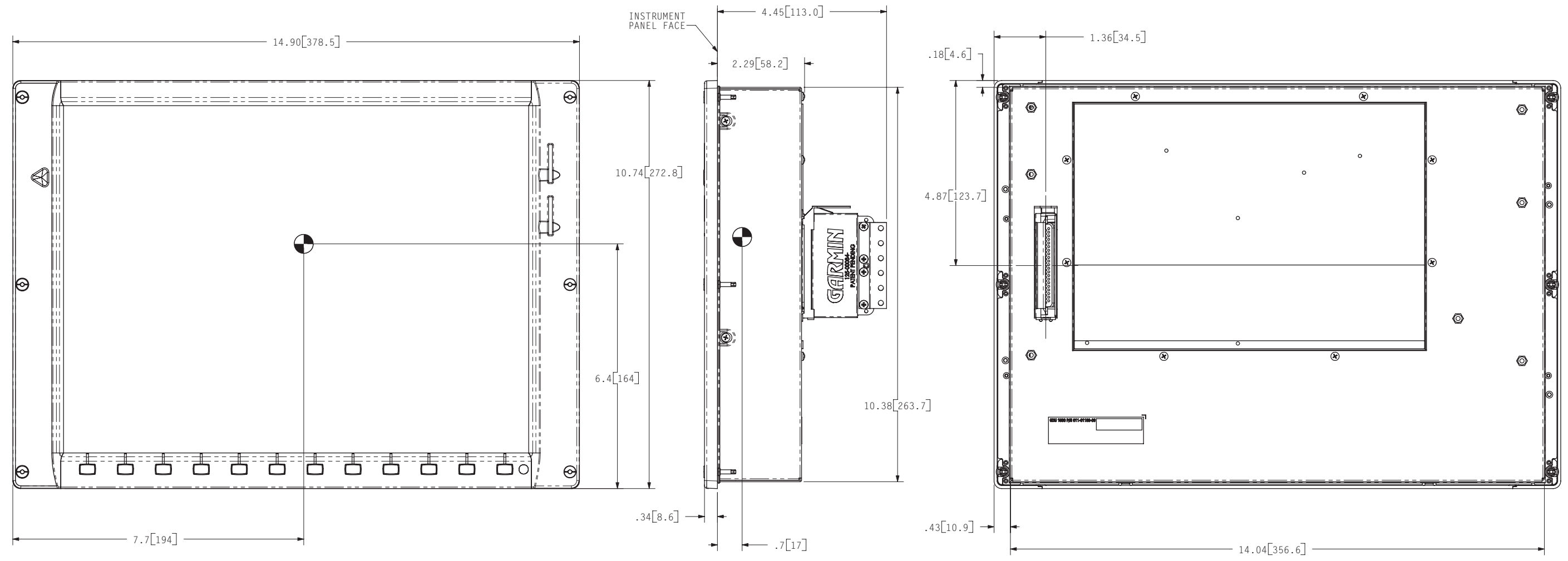


Figure A-1. GDU 1500 Cutout Drawing (Not To Scale)

APPENDIX A OUTLINE & INSTALLATION DRAWINGS



NOTES:
 1. DIMENSIONS: INCHES[mm].
 2. DIMENSIONS ARE SHOWN FOR REFERENCE ONLY.

Figure A-2. GDU 1500 Outline Drawing

APPENDIX A OUTLINE & INSTALLATION DRAWINGS

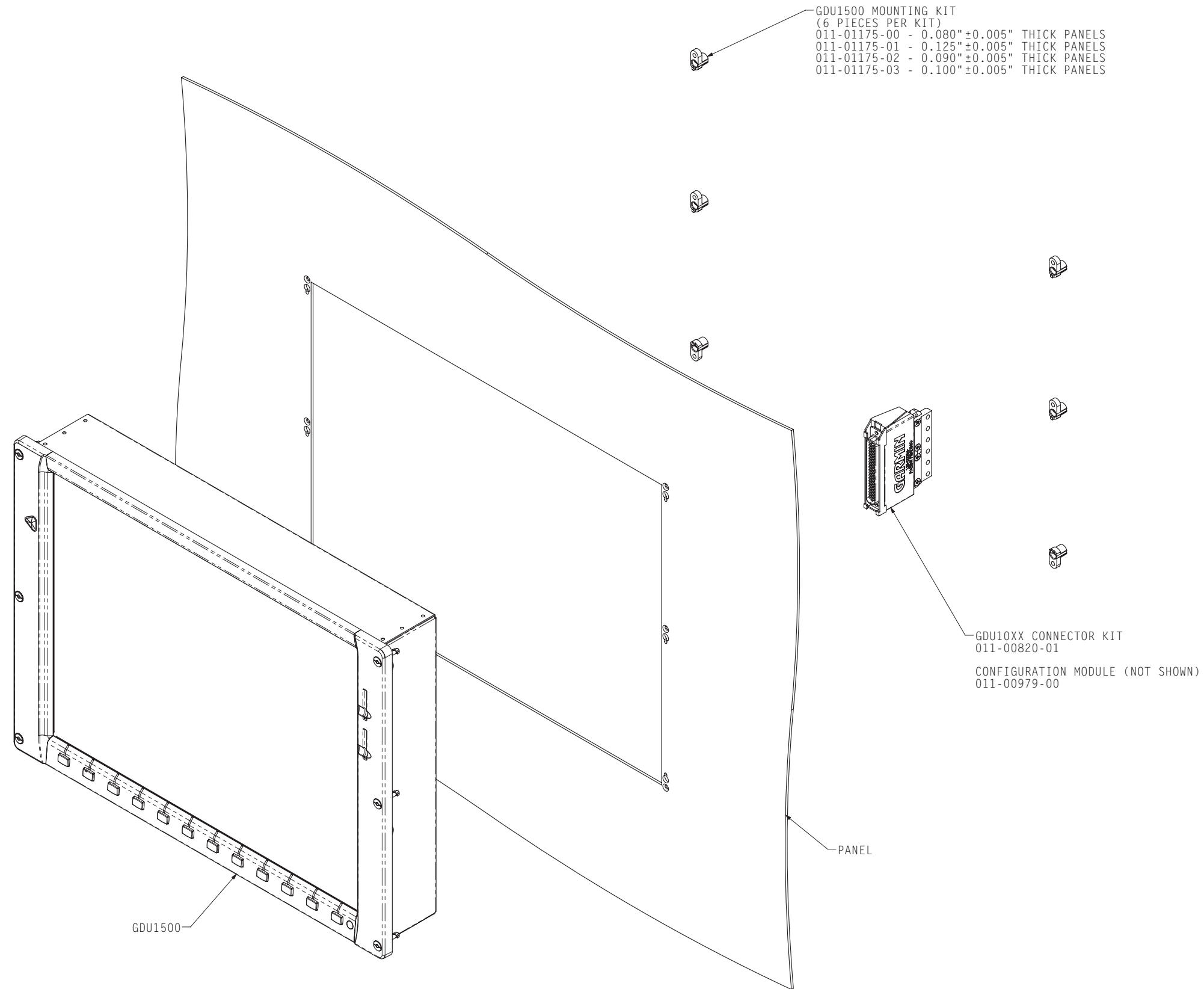
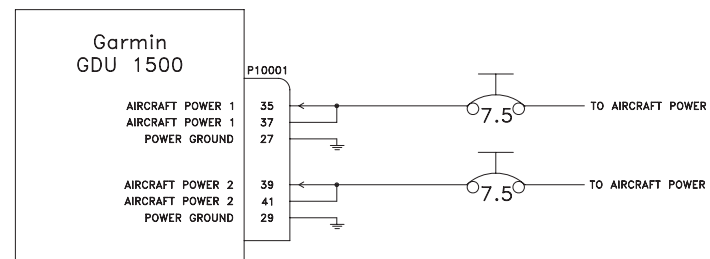
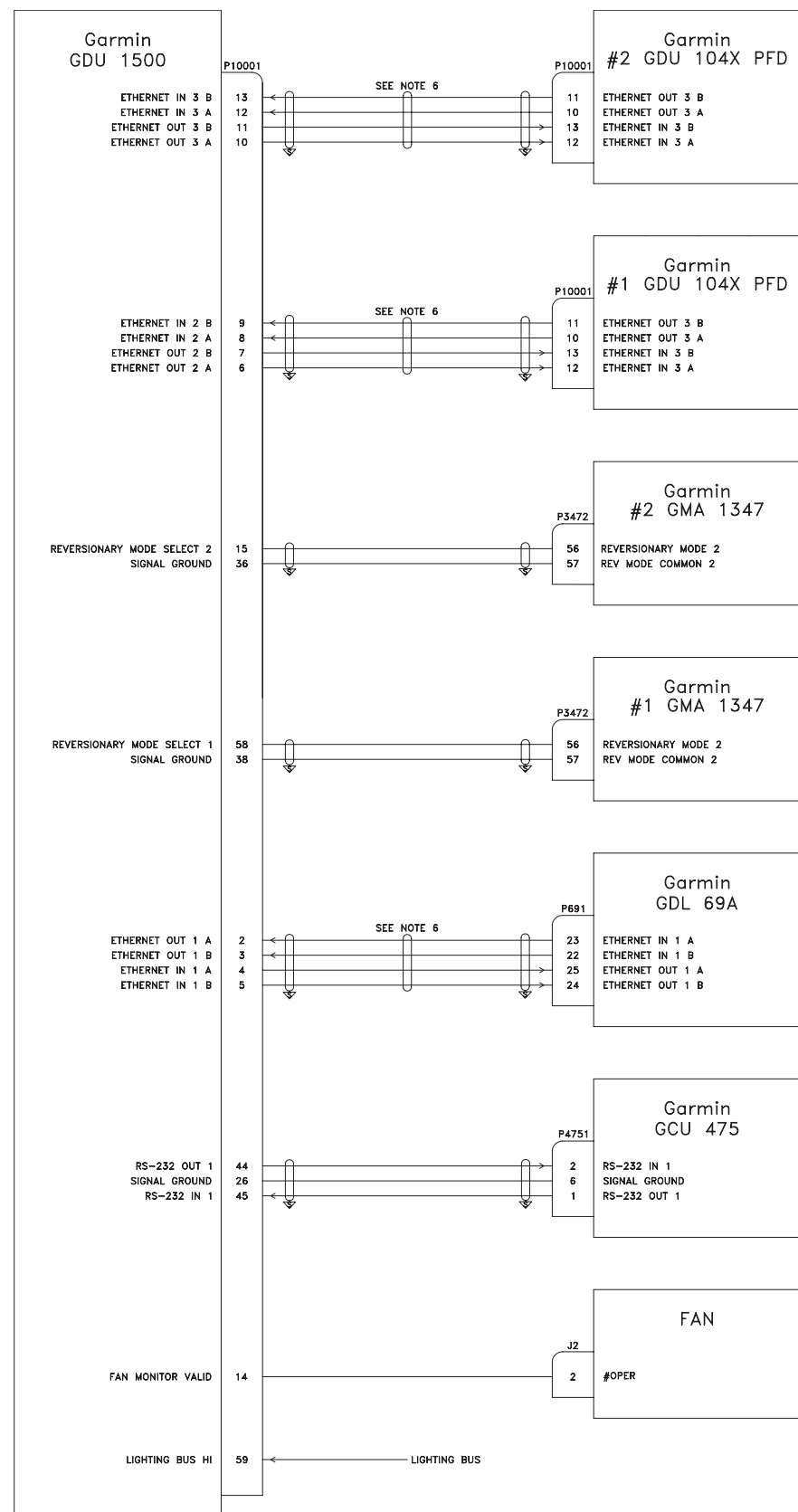


Figure A-3. GDU 1500 Installation Drawing

Appendix B INTERCONNECT EXAMPLE



NOTES:

- UNLESS OTHERWISE NOTED, ALL STRANDED WIRE MUST CONFORM TO MIL-W-22759/16 OR EQUIVALENT
- UNLESS OTHERWISE NOTED, ALL SHIELDED WIRE MUST CONFORM TO MIL-C-27500 OR EQUIVALENT
- UNLESS OTHERWISE NOTED, ALL WIRES ARE 24 GAUGE MINIMUM.
- SYMBOL DESIGNATIONS

<p> TWISTED SHIELDED SINGLE CONDUCTOR SHIELD TERMINATED TO GROUND TWISTED SHIELDED SINGLE CONDUCTOR SHIELD FLOATS TWISTED SHIELDED PAIR SHIELD TERMINATED TO GROUND TWISTED SHIELDED PAIR SHIELD FLOATS TWISTED SHIELDED 3 CONDUCTOR SHIELD TERMINATED TO GROUND TWISTED SHIELDED 3 CONDUCTOR SHIELD FLOATS </p>	<p> TWISTED SHIELDED 4 CONDUCTOR SHIELD TERMINATED TO GROUND TWISTED SHIELDED 4 CONDUCTOR SHIELD FLOATS AIRCRAFT GROUND GARMIN (SHIELD BLOCK) GROUND PLEASE REFER TO 190-00313-09 WIRE SPLICE CONNECTION COAXIAL CABLE N/C = NO CONNECTION </p>
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- UNLESS OTHERWISE NOTED, ALL SHIELD GROUNDS MUST BE MADE TO THE RESPECTIVE UNIT BACKSHELLS. ALL OTHER GROUNDS SHOULD BE TERMINATED TO AIRCRAFT GROUND AS CLOSE TO THE RESPECTIVE UNIT AS POSSIBLE.
- USE AIRCRAFT GRADE CATEGORY 5 ETHERNET CABLE. THESE INCLUDE ELECTRONIC CABLE SPECIALIST P/N 392404.

MANUFACTURER	P/N
PIC WIRE AND CABLE	E10422 (22 GAUGE)
PIC WIRE AND CABLE	E10424 (24 GAUGE)
ELECTRONIC CABLE SPECIALIST	392404 (24 GAUGE)

Figure B-1. GDU 1500 Example Interconnect