

GDL 59

Data Link

Installation Manual



© Copyright 2010
Garmin Ltd. or its subsidiaries
All Rights Reserved

Except as expressly provided herein, no part of this manual may be reproduced, copied, transmitted, disseminated, downloaded or stored in any storage medium, for any purpose without the express prior written consent of Garmin. Garmin hereby grants permission to download a single copy of this manual and of any revision to this manual onto a hard drive or other electronic storage medium to be viewed and to print one copy of this manual or of any revision hereto, provided that such electronic or printed copy of this manual or revision must contain the complete text of this copyright notice and provided further that any unauthorized commercial distribution of this manual or any revision hereto is strictly prohibited.

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Telephone: 913.397.8200
Aviation Panel-Mount Technical Support Line (Toll Free) 1.888.606.5482
www.garmin.com

Garmin (Europe) Ltd.
Liberty House, Bulls Copse Road
Hounsdown Business Park
Southampton, SO40 9RB U.K.
+44/ (0) 870.8501241

Garmin AT, Inc.
2345 Turner Rd., SE
Salem, OR 97302 USA
Telephone: 503.581.8101

RECORD OF REVISIONS

Revision	Revision Date	Description
A	04/09/08	Initial Release
B	07/06/09	Corrected interconnect drawing and added ETSO info
C	08/17/10	Added Flight Data Services activation information

DOCUMENT PAGINATION

Section	Page Range
Table of Contents	i–iv
Section 1	1-1–1-8
Section 2	2-1–2-2
Section 3	3-1–3-6
Section 4	4-1–4-6
Appendix A	A-1–A-8
Appendix B	B-1–B-2

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

This document may contain information which is subject to the Export Administration Regulations ("EAR") issued by the United States Department of Commerce (15 CFR, Chapter VII, Subchapter C) and which may not be exported, released, or disclosed to foreign nationals inside or outside of the United States without first obtaining an export license. The preceding statement is required to be included on any and all reproductions in whole or in part of this manual.

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

Perchlorate Material – special handling may apply, See www.dtsc.ca.gov/hazardouswaste/perchlorate.

CURRENT REVISION DESCRIPTION

Revision	Page Number(s)	Section Number	Description of Change
C	1-5	1.4.5	Added new Wi-Fi info
	1-7	1.5.3	Added 802.11 info to Table 1-9
	3-6	3.8	Added Flight Data Services activation info

TABLE OF CONTENTS

PARAGRAPH	PAGE
1. GENERAL DESCRIPTION	1-1
1.1 Introduction.....	1-1
1.2 Equipment Description	1-1
1.3 Interface Summary.....	1-2
1.4 Technical Specifications	1-3
1.5 Certification	1-5
1.6 Reference Documentation.....	1-7
1.7 Limited Warranty.....	1-8
2. INSTALLATION	2-1
2.1 Introduction.....	2-1
2.2 Installation Materials	2-1
2.3 Equipment Available	2-1
2.4 Cabling and Wiring.....	2-1
2.5 Cooling Air	2-2
2.6 Mounting Requirements	2-2
3. INSTALLATION PROCEDURE	3-1
3.1 Unpacking Unit.....	3-1
3.2 Wiring Harness Installation	3-1
3.3 Wi-Fi Antenna Installation	3-2
3.4 Coaxial Cable Installation.....	3-4
3.5 Backshell Assembly and Installation.....	3-5
3.6 Final Installation	3-5
3.7 Post Installation Configuration and Checkout	3-6
3.8 Activation of Garmin Flight Data Services	3-6
3.9 Continued Airworthiness	3-6
4. SYSTEM INTERCONNECTS	4-1
4.1 Pin Function List.....	4-1
4.2 Power Functions	4-3
4.3 Installation Selection Pins.....	4-3
4.4 Serial Data	4-4
4.5 Audio Connections	4-6

APPENDIX A OUTLINE AND INSTALLATION DRAWINGS

APPENDIX B INTERCONNECT DRAWING

LIST OF ILLUSTRATIONS

FIGURE	PAGE
1-1 GDL 59 Unit View	1-1
1-2 GDL 59 Block Diagram.....	1-2
2-1 GDL 59 Modular Unit Rack	2-2
3-1 TNC Connector Installation.....	3-4
A-1 GDL 59 Modular Rack Outline Drawing (Sheet 1 of 2).....	A-1
A-1 GDL 59 Modular Rack Outline Drawing (Sheet 2).....	A-3
A-2 GDL 59 Stand-alone Rack Outline Drawing (Sheet 1 of 2)	A-5
A-2 GDL 59 Stand-alone Rack Outline Drawing (Sheet 2)	A-7
B-1 GDL 59 Example Interconnect.....	B-1

LIST OF TABLES

TABLE	PAGE
1-1 Unit with Modular Rack	1-3
1-2 Unit with Stand-alone Rack	1-4
1-3 Input Voltage	1-4
1-4 Maximum Current Specifications	1-4
1-5 General Specifications	1-4
1-6 Wi-Fi Antenna Minimum Requirements	1-5
1-7 TSO/ETSO Authorizations	1-6
1-8 TSO/ETSO Deviations	1-6
1-9 Non-TSO Functions	1-7
1-10 Referenced Publications	1-7
2-1 Unit Part Number.....	2-1
2-2 Accessories	2-1
3-1 Pin Contact Part Numbers.....	3-1
3-2 Recommended Crimp Tools	3-1

GDL 59 HARDWARE MOD LEVEL HISTORY

The following table identifies hardware modification (Mod) Levels for the GDL 59. 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.

MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION

1 GENERAL DESCRIPTION

1.1 Introduction

This manual presents mechanical and electrical installation requirements for installing the GDL 59 as part of the Garmin Integrated Flight Deck. The GDL 59 can be integrated into a variety of airframes under an appropriate TC or STC. Each installation may vary. Use only approved (type or supplemental type) data for specific installation instructions in a particular aircraft.



Figure 1-1. GDL 59 Unit View

1.2 Equipment Description

The GDL 59 provides a POTS (plain old telephone service) phone interface, a flight parameter data logger, and a high speed data link between the aircraft systems and ground computers while the aircraft is on the ground using the IEEE 802.11g (“Wi-Fi”) protocol. The GDL 59 also provides two interfaces to an optional GSR 56, which adds airborne low speed data link and voice communication capability.

1.3 Interface Summary

The GDL 59 unit interfaces to the Garmin Integrated Flight Deck using HSDB. The GDL 59 can be installed with zero, one, or two GSR 56 units. Installation will vary between airframes.

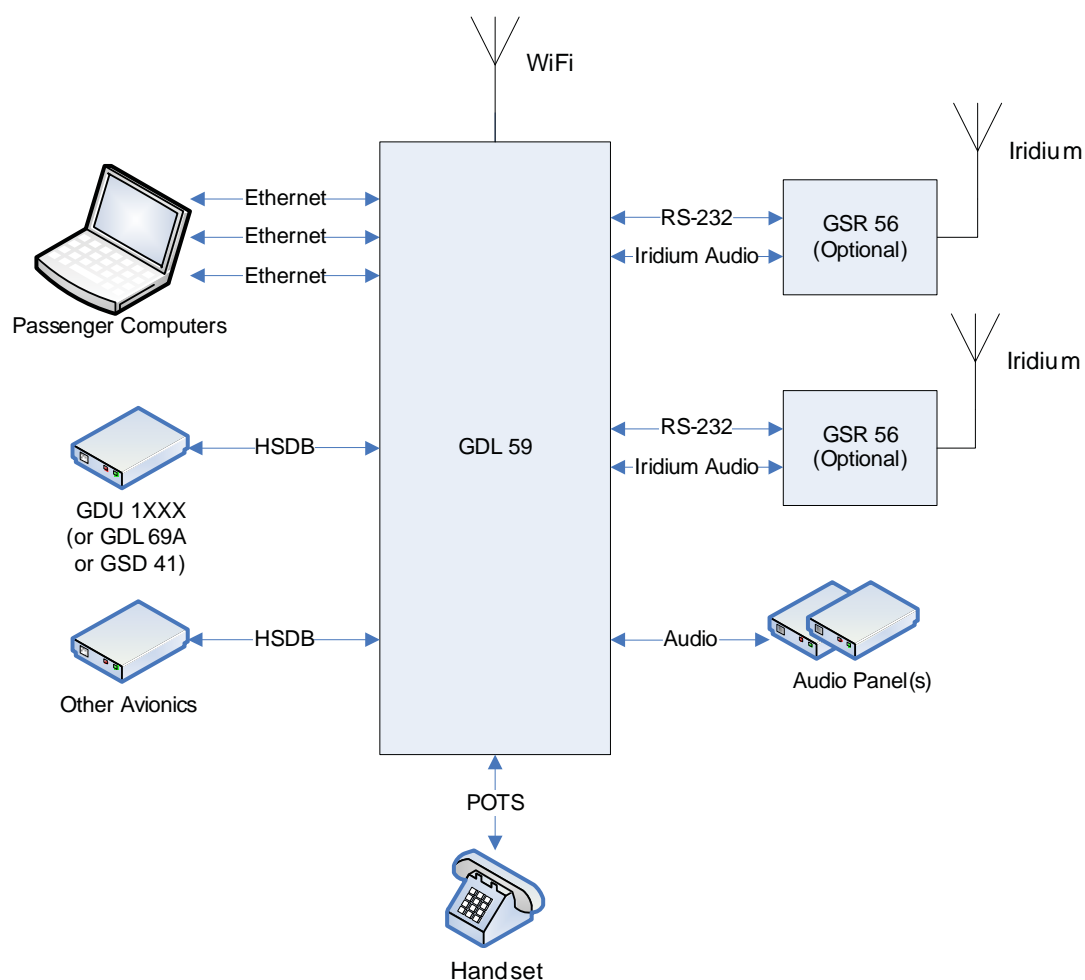


Figure 1-2. GDL 59 Block Diagram

1.3.1 I/O

The GDL 59 supports the following I/O:

- **Audio Panel I/O:** The GDL 59 provides one differential audio I/O channel for interfacing to the audio panel(s).
- **Avionics HSDB:** The GDL 59 provides two HSDB ports. One port must be used to connect the GDL 59 to the core Garmin Integrated Flight Deck system via a spare GDU 1XXX, GSD 41, or GDL 69A HSDB port. The other port is available for possible future avionics expansion.
- **Iridium Audio I/O:** The GDL 59 provides two differential audio I/O channels to carry Iridium telephone audio to and from the GSR 56 Iridium transceiver(s).
- **Analog POTS Interface:** The GDL 59 provides a POTS (plain old telephone service) interface that allows a standard analog telephone to interface to the GDL 59. Up to two POTS telephones can be connected to this interface in parallel.

NOTE

To simplify operation of the telephone, Garmin recommends using a POTS telephone that does not have a Hold button.

- **RS-232 I/O:** The GDL 59 has two RS-232 ports. RS-232 is the primary communication path between the GDL 59 and the GSR 56 units.
- **Ethernet Ports:** The GDL 59 provides three 10/100 Base T Ethernet ports that are compliant with IEEE 802.3 standards. These ports can be used to provide connection to an Electronic Flight Bag (EFB), or for other future options.

1.4 Technical Specifications

It is the responsibility of the installing agency to obtain the latest revision of the GDL 59 Environmental Qualification Form. This form is available directly from Garmin under the following part number:

GDL 59 Environmental Qualification Form, Garmin part number 005-00431-10

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

1.4.1 Physical Characteristics

Table 1-1. Unit with Modular Rack

Characteristic	Specification
Width	1.23 inches (3.12 cm)
Height	6.30 inches (16.00 cm)
Depth (Rack w/ Connectors)	9.07 inches (23.04 cm)
Unit Weight (GDL 59)	1.5 lb (0.68 kg)
Unit (GDL 59) and Modular Rack Weight	2.3 lb (1.04 kg)

Table 1-2. Unit with Stand-alone Rack

Characteristic	Specification
Width	1.47 inches (3.73 cm)
Height	6.91 inches (17.55 cm)
Depth (Rack w/ Connectors)	9.13 inches (23.19 cm)
Unit Weight (GDL 59)	1.5 lb (0.68 kg)
Unit (GDL 59) and Stand-alone Rack Weight	2.7 lb (1.22 kg)

1.4.2 Power Requirements

Table 1-3. Input Voltage

Characteristic	Specification
Input Voltage	14/28 Vdc See the Environmental Qualification Form for details on surge ratings and minimum/maximum operating voltages.

Table 1-4. Maximum Current Specifications

Unit Status	Max Current @ 28 Vdc	Max Current @ 14 Vdc
Off*	0.100 A	0.100 A
On	0.572 A	1.15 A

*DATA LINK REMOTE PWR OFF in active state

NOTE

The GDL 59 is not certified for use on the emergency power bus.

NOTE

During the first five seconds of unit power-up, current is slightly higher due to backup capacitors being charged. Estimate initial power-up current to be ~150 mA @ 28 Vdc higher or ~300 mA @ 14 Vdc higher than the above figures.

1.4.3 General Specifications

Table 1-5. General Specifications

Characteristics	Specifications
Operating Temperature Range	-55 to +70 °C. For more details see Environmental Qualification Form
Humidity	95% non-condensing
Altitude Range	-1,500 ft to 55,000 ft
Software Compliance	RTCA/DO-178B Level D and E
Maximum Average Power Input from Antenna	+15 dBm
Maximum Peak Power (1% Duty Cycle) Input from Antenna	+30 dBm

1.4.4 General Antenna Requirements

Garmin recommends the Wi-Fi antenna specifications shown in Table 1-6. These antenna specifications are approved with the certification of the GDL 59. Any Wi-Fi antenna with specifications listed in the following table should work with the GDL 59.

Table 1-6. Wi-Fi Antenna Minimum Requirements

Characteristics	Specifications
Frequency Range	2412 to 2484 MHz
Gain (Typical)	<5 dB*
Nominal Output Impedance	50 ohms
Operating Temperature Gain	-50 to +85°C**

*For each 1 dB gain over 5 dB, add 1 dB of attenuation into the antenna cable path between the antenna and the GDL 59.

**STC/Installation dependent

1.4.5 Wi-Fi Network Requirements

To ensure compatibility with the GDL 59, the Wi-Fi network must comply with the below requirements.

- Fully IEEE 802.11g compatible
- All access points must be coupled to a DHCP server
- The network shall support data transfer via HTTP and HTTPS and allow outgoing connections to the internet on port 80 and port 443
- Networks that include web proxies, captive portals, or other elements that require user credentials, including a username and password or a redemption or access code; or require action such as accepting a user agreement, are not supported for data transfer from the GDL 59
- The access point must be capable of receiving at a rate of 18 Mbps
- The Wi-Fi network shall be compatible with WEP64, WEP128, WPA-PSK, or WPA2-PSK encryption formats, and with all of those formats associated encryption combinations and options; or compatible to be used with no encryption. WPA-Enterprise and WPA2-Enterprise are not supported
- If WPA-PSK or WPA2-PSK are used, the access point must not be set to auto-select between them.

1.5 Certification

The conditions and tests required for the 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 installation in an aircraft. The article may be installed only if performed under 14 CFR part 43 or the applicable airworthiness requirements.

The GDL 59 system is limited to communication to the cockpit and cabin for convenience only.

1.5.1 TSO/ETSO Compliance

The GDL 59 shall carry the TSO/ETSO authorizations listed in Table 1-7.

Table 1-7. TSO/ETSO Authorizations

Function	TSO/ETSO	Applicable LRU Software Part Numbers
Aircraft Audio Systems and Equipment	TSO-C139	006-B0735-1() 006-B0736-1() 006-D1112-1() 006-D1232-1()
Audio Selector Panels and Amplifier	ETSO-C50c	006-B0735-1() 006-B0736-1() 006-D1112-1() 006-D1232-1()

1.5.2 TSO/ETSO Deviations

The GDL 59 shall carry the TSO/ETSO deviations listed in Table 1-8.

Table 1-8. TSO/ETSO Deviations

TSO/ETSO	Deviation
TSO-C139	1. Garmin was granted a deviation from TSO-C139 subpart 3b to consider failure of the intended function of the GDL59, defined in the stated paragraph of TSO-C139, as minor.
	2. Garmin was granted a deviation from TSO-C139 to use the environmental qualification form as part of RTCA DO-160E instead of the form required as part of DO-160D.
	3. Garmin was granted a deviation from TSO-C139 subpart 7a which requires furnishing each person receiving a GDL 59 copy of the data listed in paragraph 5l of TSO-C139.
	4. Garmin was granted a deviation from TSO-C139 subpart 7b which requires furnishing each person receiving a GDL 59 a copy of the data in paragraphs 5l, 5m, and 5n of TSO-C139.
ETSO-C50c	1. Garmin was granted a deviation from ETSO-C50c § 3.1.2 to use EUROCAE ED-14E/ RTCA DO-160E instead of ED-14D/ RTCA DO-160D as the environmental test standard.
	2. Garmin was granted a deviation from ETSO-C50c § 3.1.1 to use RTCA DO-214 instead of EUROCAE ED-18/RTCA DO-170 as the Minimum Performance Standard.

1.5.3 Non-TSO Functions

The non-TSO functions listed in Table 1-9 were tested to RTCA/DO-160E environmental qualifications.

Table 1-9. Non-TSO Functions

Function	Design Assurance	Applicable LRU Software Part Numbers
802.11 Radio Data Link	RTCA/DO-178B Level E	006-B0736-1() 006-D1112-1()
802.11 Radio Data Link	RTCA/DO-178B Level D	006-B0735-1() 006-D1232-1()
Data Link Radio Controller	RTCA/DO-178B Level E	006-B0736-1() 006-D1112-1()
Data Link Radio Controller	RTCA/DO-178B Level D	006-B0735-1() 006-D1232-1()
Flight Data Logger	RTCA/DO-178B Level D	006-B0735-1() 006-D1232-1()

1.6 Reference Documentation

The publications listed in Table 1-10 are sources of additional information for installing the GDL 59. Before installing the GDL 59, the technician should read all referenced materials applicable to the installation along with this manual.

Table 1-10. Referenced Publications

Part Number	Document
005-00431-10	GDL 59 Environmental Qualification Form
190-00303-00	G1000 System Installation Manual
190-00303-04	G1000 Line Maintenance and Configuration Manual

1.7 Limited Warranty

This Garmin product is warranted to be free from defects in materials or workmanship for two years from the date of purchase. Within this 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 cover failures due to abuse, misuse, accident or unauthorized alteration or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR 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 THIS 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 the unit 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.

To obtain warranty service, contact your local Garmin Authorized Service Center. For assistance in locating a Service Center near you, call Garmin Customer Service at one of the numbers shown below.

Products sold through online auctions are not eligible for rebates or other special offers from Garmin. 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.

Garmin International, Inc.
1200 East 151st Street
Olathe, Kansas 66062, U.S.A.
Phone: 913/397.8200
FAX: 913/397.0836

Garmin (Europe) Ltd.
Liberty House, Bulls Copse Road
Hounslow Business Park
Romsey, SO40 9RB, U.K.
Phone: +44/ (0) 870.8501241
FAX: +44/ (0) 870.8501251

2 INSTALLATION

2.1 Introduction

This section provides hardware equipment information for installing the GDL59 and related hardware. Installation of the GDL 59 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 43.13-2A, 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.

2.2 Installation Materials

The GDL 59 is available only as a single unit under the following part number:

Table 2-1. Unit Part Number

Item	Garmin Catalog Part Number
GDL 59 Unit (011-01746-00)	010-00666-00

2.3 Equipment Available

Each of the following accessories are provided separately for the GDL 59.

Table 2-2. Accessories

Item	Garmin Catalog Part Number
GDL 59 Unit Rack, Modular	115-00411-00 (preferred)
GDL 59 Unit Rack, Stand-alone	115-00658-00
G1000 Rack Nutplate Kit	011-00915-00 (preferred) or 011-01148-00
GDL 59 Back Plate ('C' Keyplate)	011-00796-02
GDL 59 Connector Kit	011-01760-00

2.4 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. 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 or RF/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.

2.5 Cooling Air

No cooling air is needed for the GDL 59.

2.6 Mounting Requirements

The GDL 59 mounting surface should be capable of providing a sufficient electrical bond to the aircraft to minimize radiated EMI and provide protection from High-Intensity Radiation Fields (HIRF). The GDL 59 can be mounted using the G1000 main system (modular) rack, or the unit may be mounted remotely if desired. Figure 2-1 shows the GDL 59 modular unit rack.

The unit rack is fastened to the main system rack using the nutplate kit listed in Section 2.3. Refer to the Figure A-1 GDL 59 Modular Rack Outline Drawing for nutplate placement locations.

The stand-alone rack is available for remote mounting. The installer must provide any additional remote mounting equipment.

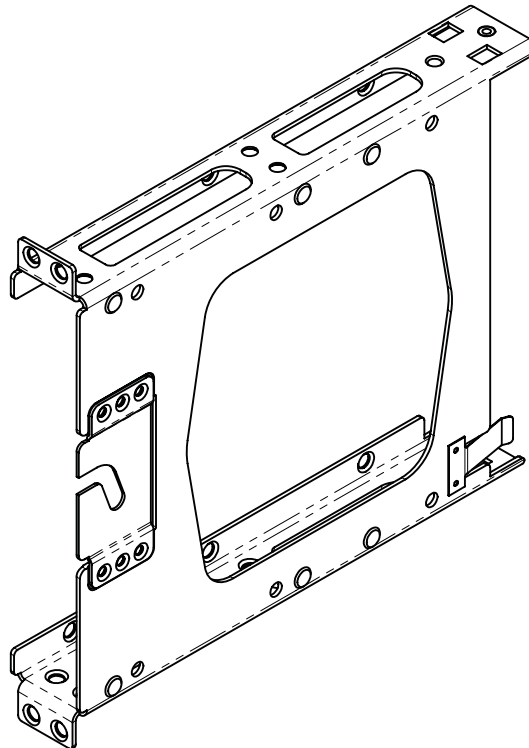


Figure 2-1. GDL 59 Modular Unit Rack

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. Electrical connections are made through a 78-pin D-Subminiature connector and a TNC coaxial connector.

Section 4 defines the electrical characteristics of all input and output signals. Required connectors and associated hardware are supplied with the connector kit (refer to Section 2.3). See Appendix B for examples of interconnect wiring diagrams. Construct the actual harnesses in accordance with aircraft specific approved interconnect diagrams.

Table 3-1. Pin Contact Part Numbers

Manufacturer	78 pin D-Subminiature connector (P591)		
	16 AWG (Power and Power Ground Only)	18-20 AWG (Power and Power Ground Only)	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	9502-4	M81969/1-04
ITT Cannon	995-0001-584	N/A	N/A	M22520/2-09	274-7048-000
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

NOTE

1. Non-Garmin part numbers shown are not maintained by Garmin and consequently are subject to change without notice.
2. Extracting the #16, #18 and #20 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 Wi-Fi Antenna Installation

For use with the GDL 59, Wi-Fi antennas have an operating within a frequency range of 2412-2484 MHz. Minimum antenna requirements are listed in Section 1.4.4.

NOTE

It is the installer's responsibility to ensure that their choice of antenna meets FAA certification standards according to the specific installation. This installation manual suggests the antenna specifications listed in Section 1.4.4. Other antennas may be acceptable but their installation is not covered by this manual.

There are several critical factors to take into consideration before installing an antenna for the GDL 59, these factors are addressed in the following sections.

3.3.1 Antenna Mounting

For installation mounting of the Wi-Fi antenna, follow the manufacturer's instructions and the instructions in this Section (Section 3.3). It is not required to mount the Wi-Fi antenna on the outside of the aircraft.

3.3.2 Antenna Grounding

NOTE

Improper grounding of the antenna can cause poor signal reception.

It is very important to have good conductivity between the coaxial shield and the ground plane. This is ensured when all the fasteners properly ground the antenna base to the skin of the aircraft. The resistance between the antenna and the skin of the aircraft should be less than 10 milliohms.

3.3.3 Wi-Fi Antenna Location

Observe the following during the antenna installation:

1. Maintain approximately 3 feet from heater, ignition, autopilot, and other control surface actuators and motors. Maintain approximately 5 feet from fluorescent lamps, related ballast, air conditioners, blowers, strobe lights, and power supplies.
2. The minimum distances to be observed when selecting an antenna location are as follows:
 - 1.5 inches from any passive (receive only) antenna such as GPS, XM, or another Wi-Fi.
 - 20 cm is maintained between the antenna and all persons in the aircraft.
 - 5 inches from a VHF active antenna such as COM or ACARS.
 - 5 inches from an active radar altimeter (4 GHz).
 - 12 inches from a UHF/Microwave transmitting antenna such as a transponder, DME, active TCAS, UAT, SATCOM, or Flitephone.

3.3.4 Wi-Fi Antenna to Receiver Signal Requirements

Observe the following antenna requirements:

- (1) Wi-Fi antenna maximum gain is 5 dB.
- (2) Wi-Fi antenna must be omni-directional.
- (3) The interconnect and antenna gain/loss component must be between +6dB and -4dB. If the interconnect and antenna gain/loss component is outside this range, additional gain or loss must be added between the antenna and the GDL 59 RF input.
- (4) Antenna input cannot exceed Maximum Power Input levels listed in Section 1.4.3.

3.4 Coaxial Cable Installation

1. Choose the correct coax: RG-400/U has good characteristics for loss, size, and flexibility.

NOTE

It is critical to the performance of the GDL 59 to keep the cable loss of the antenna cable to a minimum through the use of appropriate coax cable and proper connector installation.

2. Trim the coaxial cable to the desired length and install TNC connectors at each end per the cabling instructions listed in Figure 3-1. For routing convenience, one end of the coaxial run can be terminated prior to installation.
3. With the GDL 59 receiver and antenna installed, route and clamp the coaxial cable in position. Secure cable in accordance with AC 43.13-1B, Chapter 11.

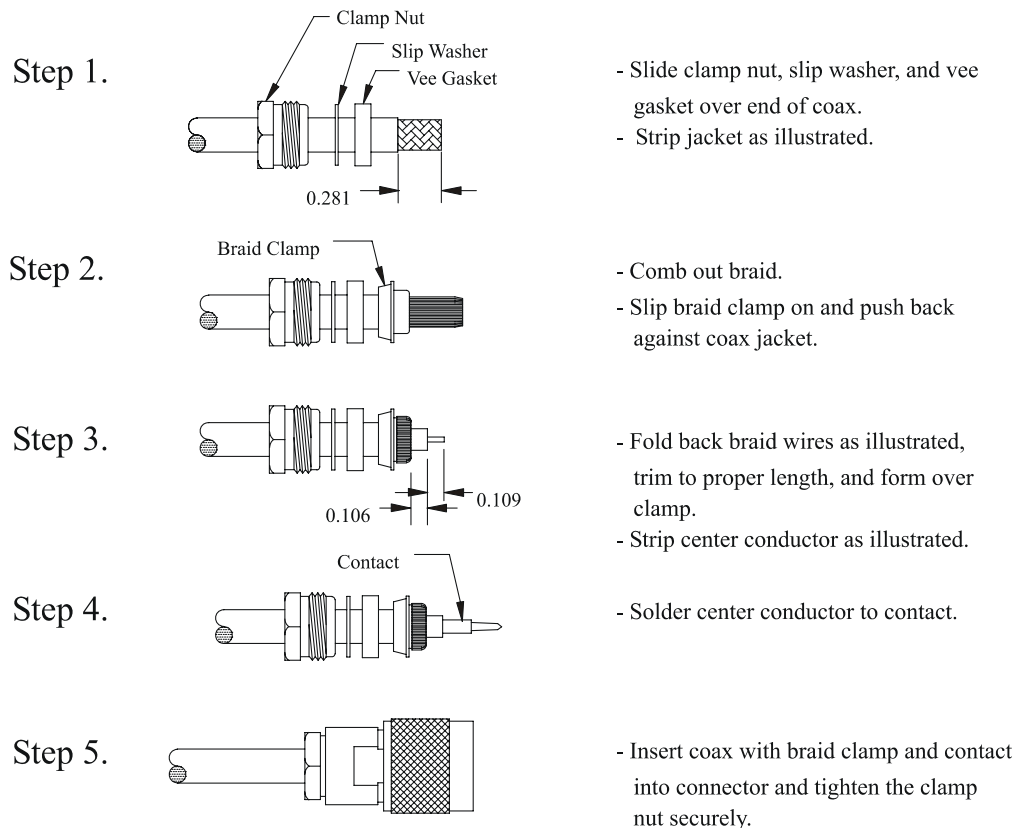


Figure 3-1. TNC Connector Installation

3.5 Backshell Assembly and Installation

The GDL 59 connector kit includes a Garmin backshell assembly. Garmin's backshell also gives the installer the ability to easily terminate shield grounds at the backshell housing using the Shield Block method. To assemble the backshell refer to instructions provided in the G1000 System Installation Manual (190-00303-00) and Shield Block Installation Instructions (190-00313-09).

3.6 Final Installation

For final installation and assembly, refer to the outline and installation drawings shown in Appendix A of this manual.

1. Assemble the connector backshells as described in Section 3.5.
2. Connect both connectors to the rear plate using the screws provided in the connector kit.
3. Mount the unit rack to the main system rack or other suitable mounting location using the provided nutplates.
4. Assemble the rear plate into the GDL 59 unit rack.
5. Insert the GDL 59 into the rack, noting proper orientation as shown on the installation drawings in Appendix A.

CAUTION

Do not use excessive force when inserting the GDL 59 into the rack. This may cause damage to occur to the connectors, unit, and/or unit rack. If heavy resistance is felt during installation, stop! Remove the GDL 59 and identify the source of resistance. The rear plate is designed to float in the unit rack. Check to ensure the rear plate is not bound by the connector harness.

6. Lock the GDL 59 in place using the lever-locking handle. Fasten the handle to the GDL 59 body using the provided Phillips screw.

CAUTION

Start the handle screw into the hole carefully to avoid cross-threading. Do not apply torque in excess of 14 in-lbs to the handle screw. The application of torque exceeding 14 in-lbs to this screw will damage the LRU case and/or retaining hardware.

3.7 Post Installation Configuration and Checkout

NOTE

The GDL 59 does not provide valid outputs until the aircraft post installation configuration procedures are completed.

The GDL 59 must be installed with a Garmin Integrated Flight Deck system and have FAA approved configuration data. Configuration data is loaded to the GDL 59 from an aircraft-specific SW Loader Card. GDL 59 settings are predetermined for a specific aircraft and are typically contained within the file named 'GDL59'.

The PFD serves as the graphic user interface to the installer configuring the system. 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.

3.8 Activation of Garmin Flight Data Services

In order to activate the GDL 59 for Garmin Flight Data Services, please contact Garmin Product Support at one of the following numbers (M-F, 7:00 a.m. to 7:00 p.m. Central Standard Time, - Central USA):

- 1.866.739.5687 (toll free in USA)
- +1.913.440.1135 (worldwide)

Please have the following information ready prior to calling:

- If activating services for a GDL59-only installation
 - Aircraft tail number, serial number, manufacturer, and model
 - GDL 59 serial number
 - G1000 system ID number
- If activating services for a GDL59 and GSR 56 installation
 - Aircraft tail number, serial number, manufacturer, and model
 - Serial number(s) of all GSR 56 units installed in aircraft
 - G1000 system ID number
 - Name of aircraft owner and contact information
 - Credit card information

3.9 Continued Airworthiness

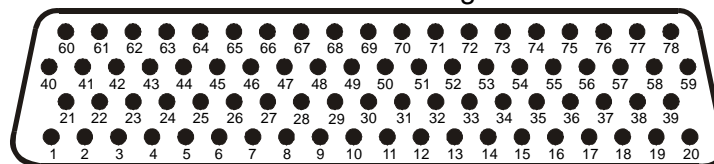
Maintenance of the GDL 59 is “on condition” only. For regulatory periodic functional checks, refer to approved aircraft maintenance manuals or manual supplements for actual aircraft maintenance requirements.

4 SYSTEM INTERCONNECTS

4.1 Pin Function List

4.1.1 P591 Connector

View of J591 connector looking at rear of unit.



Pin	Pin Name	I/O
1	USER ETHERNET OUT 5 A	Out
2	USER ETHERNET IN 5 A	In
3	AVIONICS ETHERNET OUT 2 A	Out
4	AVIONICS ETHERNET IN 2 A	In
5	USER ETHERNET OUT 3 A	Out
6	USER ETHERNET IN 3 A	In
7	USER ETHERNET OUT 4 A	Out
8	USER ETHERNET IN 4 A	In
9	AVIONICS ETHERNET OUT 1 A	Out
10	AVIONICS ETHERNET IN 1 A	In
11	SIGNAL GROUND	--
12	SPARE	--
13	IRIDIUM AUDIO IN 2 HI	In
14	IRIDIUM AUDIO OUT 2 HI	Out
15	IRIDIUM AUDIO IN 1 HI	In
16	IRIDIUM AUDIO OUT 1 HI	Out
17	AUDIO SYSTEM 2 AUDIO IN HI	In
18	AUDIO SYSTEM 2 AUDIO OUT HI	Out
19	AUDIO SYSTEM 1 AUDIO IN HI	In
20	AUDIO SYSTEM 1 AUDIO OUT HI	Out
21	USER ETHERNET OUT 5 B	Out
22	USER ETHERNET IN 5 B	In
23	AVIONICS ETHERNET OUT 2 B	Out
24	AVIONICS ETHERNET IN 2 B	In
25	USER ETHERNET OUT 3 B	Out
26	USER ETHERNET IN 3 B	In
27	USER ETHERNET OUT 4 B	Out
28	USER ETHERNET IN 4 B	In
29	AVIONICS ETHERNET OUT 1 B	Out
30	AVIONICS ETHERNET IN 1 B	In
31	SIGNAL GROUND	--
32	IRIDIUM AUDIO IN 2 LO	In
33	IRIDIUM AUDIO OUT 2 LO	Out
34	IRIDIUM AUDIO IN 1 LO	In
35	IRIDIUM AUDIO OUT 1 LO	Out
36	AUDIO SYSTEM 2 AUDIO IN LO	In
37	AUDIO SYSTEM 2 AUDIO OUT LO	Out
38	AUDIO SYSTEM 1 AUDIO IN LO	In

* Denotes Active Low (Ground to activate)

Connector P591, continued		
Pin	Pin Name	I/O
39	AUDIO SYSTEM 1 AUDIO OUT LO	Out
40	RESERVED	I/O
41	RESERVED	--
42	RESERVED	--
43	RESERVED	--
44	SIGNAL GROUND	--
45	SIGNAL GROUND	--
46	SIGNAL GROUND	--
47	RESERVED	--
48	AIRCRAFT POWER 2	In
49	AIRCRAFT POWER 2	In
50	RESERVED	--
51	SIGNAL GROUND	--
52	POWER GROUND	--
53	POWER GROUND	--
54	POWER GROUND	--
55	POWER GROUND	--
56	IRIDIUM 1 STATUS DISCRETE 1* IN	In
57	SPARE	--
58	RESERVED	--
59	POTS HANDSET RING	I/O
60	RESERVED	I/O
61	RESERVED	In
62	RESERVED	--
63	RS232 OUT 1	Out
64	RS232 IN 1	In
65	RS232 OUT 2	Out
66	RS232 IN 2	In
67	RESERVED	--
68	RESERVED	--
69	RESERVED	--
70	RESERVED	--
71	AIRCRAFT POWER 1	In
72	AIRCRAFT POWER 1	In
73	IRIDIUM 1 REMOTE POWER ON*	Out
74	IRIDIUM 2 REMOTE POWER ON*	Out
75	DATA LINK REMOTE POWER OFF	In
76	IRIDIUM 2 STATUS DISCRETE* IN	In
77	RESERVED	--
78	POTS HANDSET TIP	I/O

* Denotes Active Low (Ground to activate)

4.2 Power Functions

4.2.1 Aircraft Power

The GDL 59 has four inputs pins for the two Aircraft Power busses of 14/28VDC. For 28V systems, only one pin from each Aircraft Power input (pin 71 or 72 for Aircraft Power 1, and pin 48 or 49 for Aircraft Power 2) is required, plus the same number of Power Ground pins. For 14V systems, both pins from each Aircraft Power (1 & 2) input are required, plus the same number of Power Ground pins.

Pin Name	Connector	Pin	I/O
AIRCRAFT POWER 1	P591	71	In
AIRCRAFT POWER 1	P591	72	In
AIRCRAFT POWER 2	P591	48	In
AIRCRAFT POWER 2	P591	49	In
POWER GROUND	P591	52	--
POWER GROUND	P591	53	--
POWER GROUND	P591	54	--
POWER GROUND	P591	55	--

AIRCRAFT POWER 1 and AIRCRAFT POWER 2 are “diode ORed” to provide power redundancy.

4.2.2 Remote Power Off

The GDL 59 powers down upon receiving the remote power-off signal. DATA LINK REMOTE PWR OFF is a non-configurable discrete input conforming to:

- a) Low: $0 \text{ VDC} \leq V_{in} \leq 3.5 \text{ VDC}$, OR $R_{in} \geq 100k \text{ ohms}$ (inactive)
- b) High: $8 \text{ VDC} \leq V_{in} \leq 36 \text{ VDC}$ (active)

Pin Name	Connector	Pin	I/O
DATA LINK REMOTE POWER OFF	P591	75	In

4.3 Installation Selection Pins

4.3.1 Iridium Status Inputs

Pin Name	Connector	Pin	I/O
IRIDIUM 1 STATUS DISCRETE* IN	P591	56	In
IRIDIUM 2 STATUS DISCRETE* IN	P591	76	In

4.3.2 Remote Power On

These outputs are used to power on or off GSR 56 units used in the installation.

DISCRETE OUT* pins:

INACTIVE: Floating (can be pulled up to externally sourced V_{out} in the range $0 \leq V_{out} \leq 33\text{VDC}$)

Leakage current in the INACTIVE state is typically $\leq 10\text{ uA}$ to ground

ACTIVE: $V_{out} \leq 0.5\text{VDC}$ with $\leq 20\text{ mA}$ sink current

Sink current must be externally limited to 20 mA max

Pin Name	Connector	Pin	I/O
IRIDIUM 1 REMOTE POWER ON*	P591	73	Out
IRIDIUM 2 REMOTE POWER ON*	P591	74	Out

- Denotes Active Low (Ground to activate)

4.4 Serial Data

4.4.1 Avionics Ethernet HSDB

The GDL 59 has two Ethernet based high speed data busses (HSDB) that are used to interface with other LRUs in the Garmin Integrated Flight Deck system. These busses meet the hardware aspects of IEEE standard 802.3 for 10/100 Base T Ethernet communications.

Pin Name	Connector	Pin	I/O
AVIONICS ETHERNET IN 1 A	P591	10	In
AVIONICS ETHERNET IN 1 B	P591	30	In
AVIONICS ETHERNET OUT 1 A	P591	9	Out
AVIONICS ETHERNET OUT 1 B	P591	29	Out
AVIONICS ETHERNET IN 2 A	P591	4	In
AVIONICS ETHERNET IN 2 B	P591	24	In
AVIONICS ETHERNET OUT 2 A	P591	3	Out
AVIONICS ETHERNET OUT 2	P591	23	Out

4.4.2 User Ethernet

The GDL 59 has three Ethernet data busses that meet the hardware aspects of IEEE standard 802.3 for 10/100 Base T Ethernet communications.

NOTE

Garmin recommends leaving USER ETHERNET 3 unconnected, as it may be used for other functions in the future.

Pin Name	Connector	Pin	I/O
USER ETHERNET IN 3 A	P591	6	In
USER ETHERNET IN 3 B	P591	26	In
USER ETHERNET OUT 3 A	P591	5	Out
USER ETHERNET OUT 3 B	P591	25	Out
USER ETHERNET IN 4 A	P591	8	In
USER ETHERNET IN 4 B	P591	28	In
USER ETHERNET OUT 4 A	P591	7	Out
USER ETHERNET OUT 4 B	P591	27	Out
USER ETHERNET IN 5 A	P591	2	In
USER ETHERNET IN 5 B	P591	22	In
USER ETHERNET OUT 5 A	P591	1	Out
USER ETHERNET OUT 5 B	P591	21	Out

4.4.3 RS-232 Serial Input/Output

The RS-232 outputs conform to EIA/TIA-232C with an output voltage swing of at least ± 5 V when driving a standard RS-232 load. RS-232 Channels 1 and 2 are to be used for communication with optional GSR 56 units (if installed).

Pin Name	Connector	Pin	I/O
RS-232 OUT 1	P591	63	Out
RS-232 IN 1	P591	64	In
RS-232 OUT 2	P591	65	Out
RS-232 IN 2	P591	66	In

4.4.4 Handset POTS (Plain Old Telephone Service) Input/Output

The POTS interface shall:

- 1) Be capable of detecting a hook-switch flash signal where the on-hook time is 200ms.
- 2) Be capable of detecting an on-hook condition where on-hook is represented by a load of 10K Ω or greater between the tip and ring leads.
- 3) Deliver an on-hook voltage between -42 and -56 VDC into a 1M Ω or greater load.
- 4) Be capable of delivering a power ring signal with a frequency between 15 Hz and 68 Hz and amplitude between 40 and 120 Vrms into a 2.3K Ω +/- 10% load.
- 5) Maintain a source current of 25mA +/- 5% into an off-hook load.

Up to two analog POTS handsets may be connected to these lines.

Pin Name	Connector	Pin	I/O
POTS HANDSET RING	P591	59	I/O
POTS HANDSET TIP	P591	78	I/O

4.5 Audio Connections

4.5.1 Iridium Audio Channels

The Iridium Audio channels interface with the GSR 56 units. See Appendix B for sample interconnect drawing.

Pin Name	Connector	Pin	I/O
IRIDIUM AUDIO IN 1 HI	P591	15	In
IRIDIUM AUDIO IN 1 LO	P591	34	In
IRIDIUM AUDIO OUT 1 HI	P591	16	Out
IRIDIUM AUDIO OUT 1 LO	P591	35	Out
IRIDIUM AUDIO IN 2 HI	P591	13	In
IRIDIUM AUDIO IN 2 LO	P591	32	In
IRIDIUM AUDIO OUT 2 HI	P591	14	Out
IRIDIUM AUDIO OUT 2 LO	P591	33	Out

4.5.2 Audio System Channels

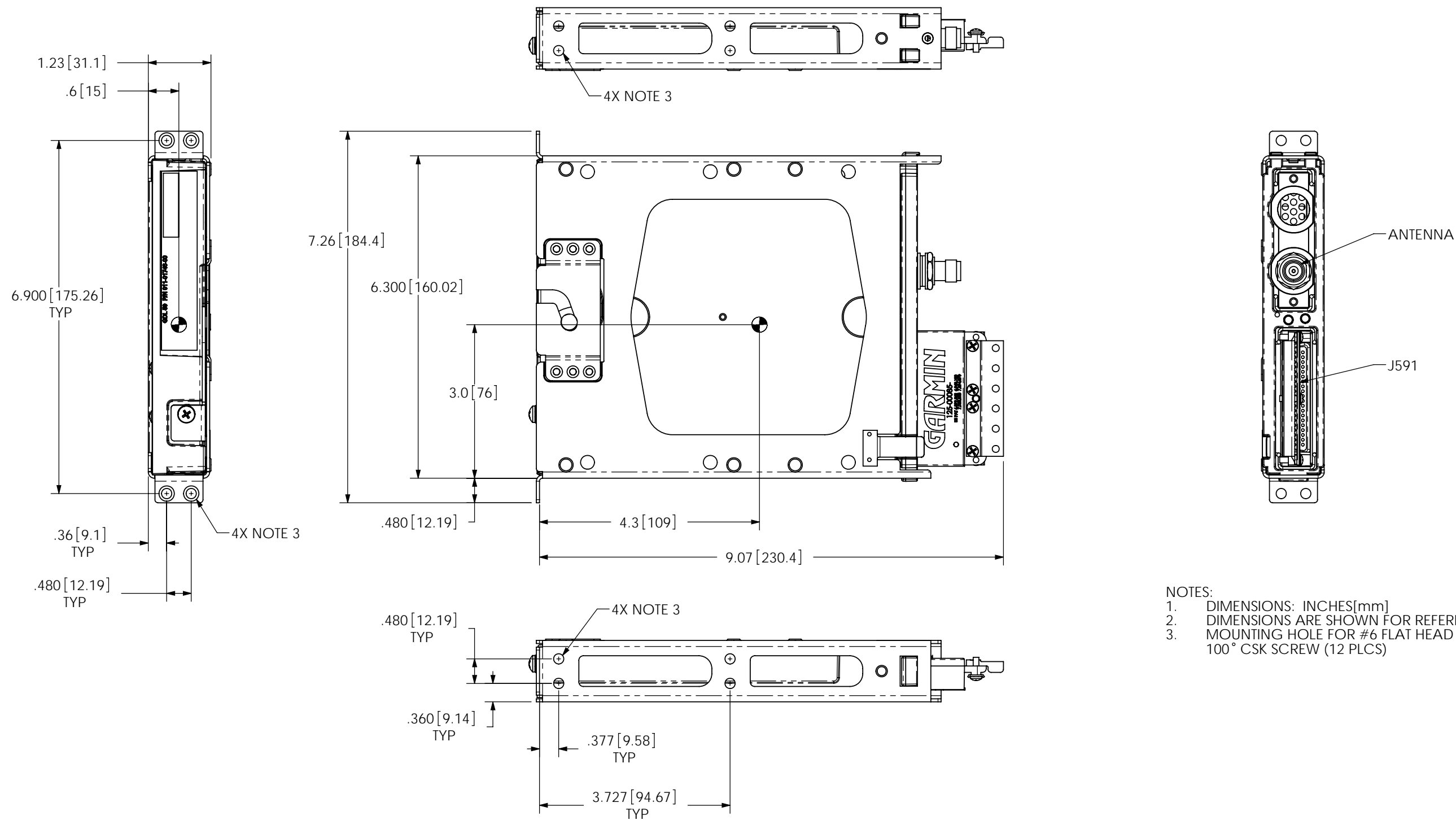
The Audio System channels connect to other LRUs, such as the GMA Audio Panel.

Pin Name	Connector	Pin	I/O
AUDIO SYSTEM 1 AUDIO IN HI	P591	19	In
AUDIO SYSTEM 1 AUDIO IN LO	P591	38	In
AUDIO SYSTEM 1 AUDIO OUT HI	P591	20	Out
AUDIO SYSTEM 1 AUDIO OUT LO	P591	39	Out
AUDIO SYSTEM 2 AUDIO IN HI	P591	17	In
AUDIO SYSTEM 2 AUDIO IN LO	P591	36	In
AUDIO SYSTEM 2 AUDIO OUT HI	P591	18	Out
AUDIO SYSTEM 2 AUDIO OUT LO	P591	37	Out

NOTE

For best noise immunity, it is recommended to connect AUDIO SYTEM 2 AUDIO OUT (pins 18 and 37) to a differential input only.

MODULAR INSTALLATION



- NOTES:
1. DIMENSIONS: INCHES[mm]
 2. DIMENSIONS ARE SHOWN FOR REFERENCE ONLY.
 3. MOUNTING HOLE FOR #6 FLAT HEAD 100° CSK SCREW (12 PLCS)

Figure A-1. GDL 59 Modular Rack Outline Drawing (Sheet 1 of 2)

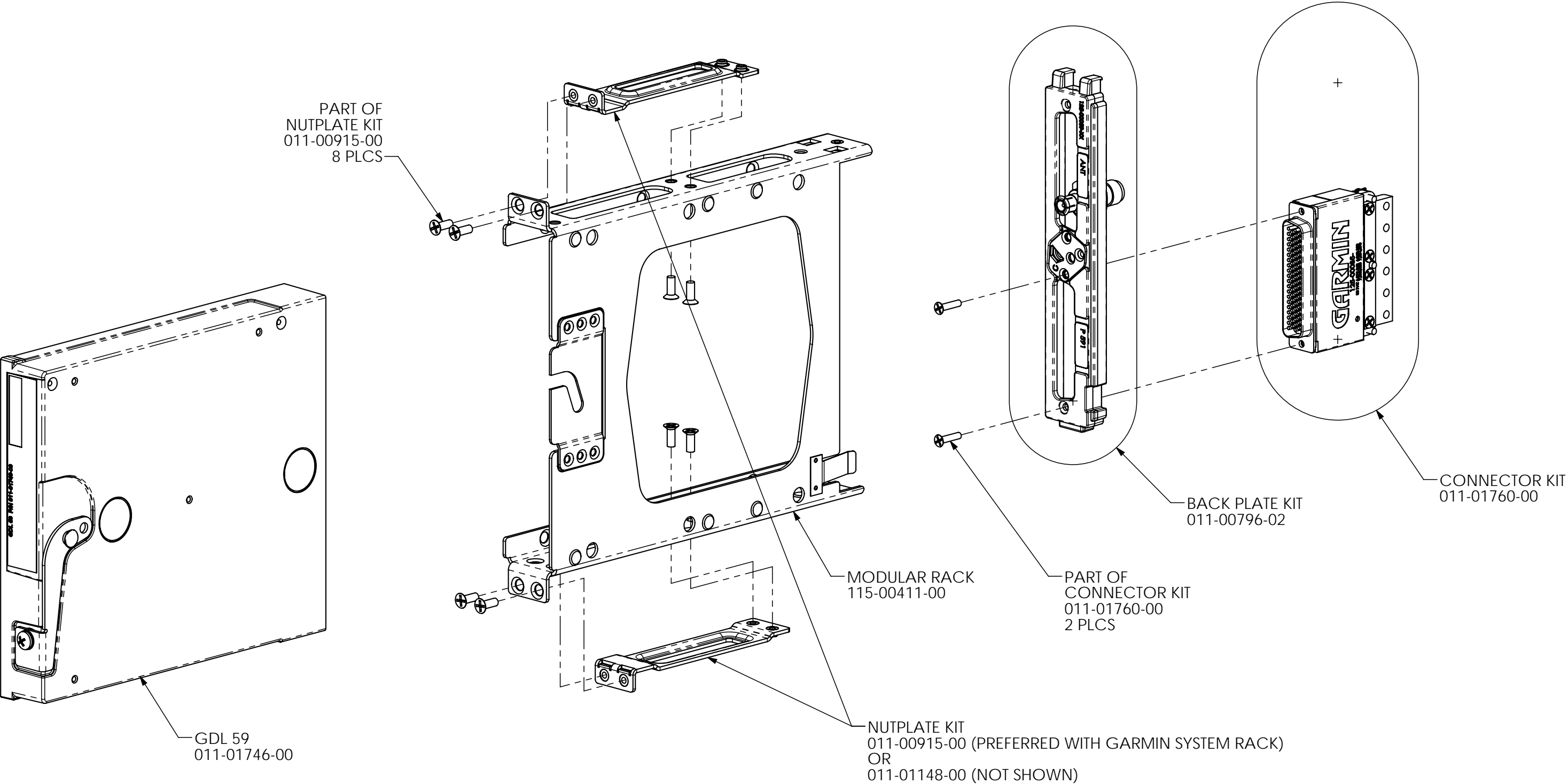


Figure A-1. GDL 59 Modular Rack Outline Drawing (Sheet 2)

STANDALONE INSTALLATION

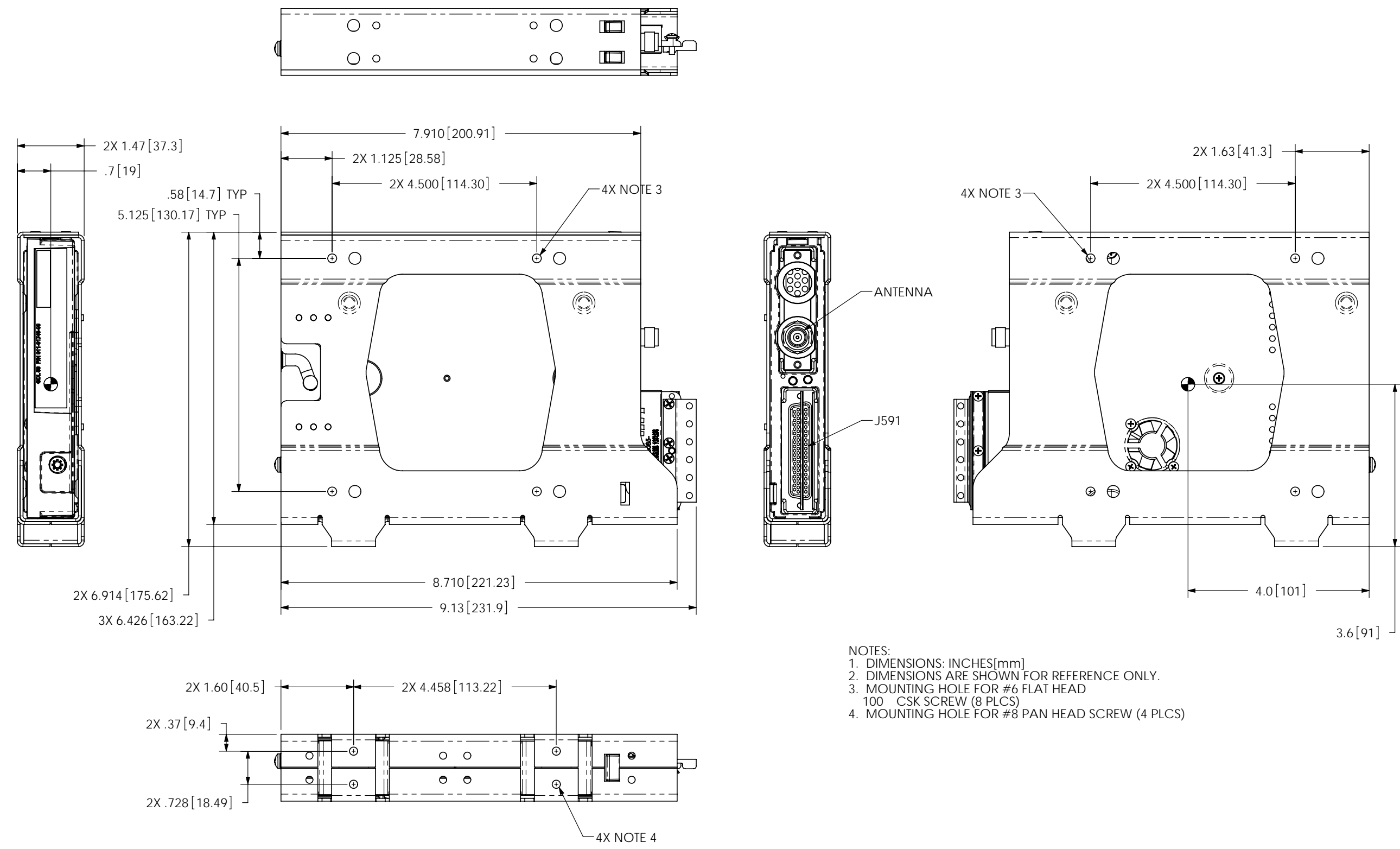


Figure A-2. GDL 59 Stand-alone Rack Outline Drawing (Sheet 1 of 2)

STANDALONE INSTALLATION

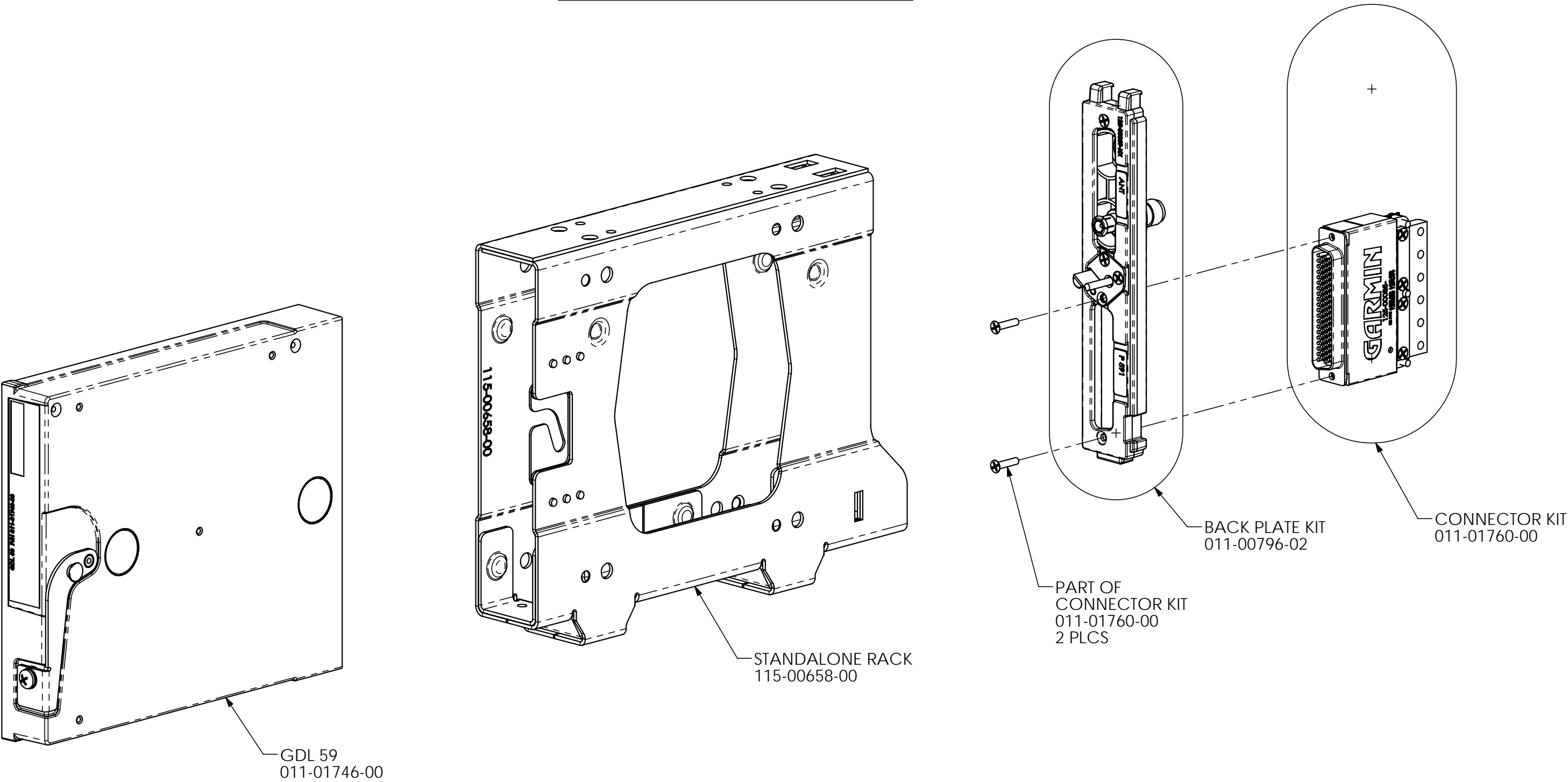
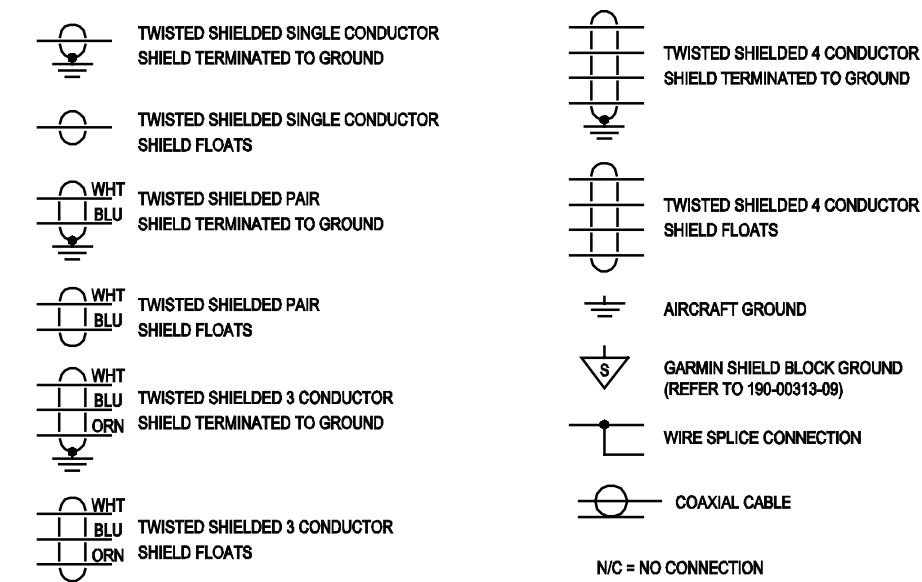


Figure A-2. GDL 59 Stand-alone Rack Outline Drawing (Sheet 2)

NOTES:

- 1. UNLESS OTHERWISE NOTED, ALL STRANDED WIRE MUST CONFORM TO MIL-W-22759/16 OR EQUIVALENT
- 2. UNLESS OTHERWISE NOTED, ALL SHIELDED WIRE MUST CONFORM TO MIL-C-27500 OR EQUIVALENT
- 3. UNLESS OTHERWISE NOTED, ALL WIRES ARE 22 GAUGE MINIMUM.
- 4. SYMBOL DESIGNATIONS



- 5. 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.
- 6. WIRE COLORS ARE NOTED FOR ADVISORY PURPOSES ONLY, EXCEPT FOR THE GTP 59.
- 7. USE AIRCRAFT GRADE CATEGORY 5 ETHERNET CABLE.

MANUFACTURER	P/N
PIC WIRE AND CABLE	E10422 (22 GAUGE)
ELECTRONIC CABLE SPECIALIST	922204 (22 GAUGE)
PIC WIRE AND CABLE	E10424 (24 GAUGE)
ELECTRONIC CABLE SPECIALIST	922404 (24 GAUGE)

- 8. OPTIONAL EQUIPMENT: IF APPLICABLE, THEN IMPLEMENTATION PER PROGRAM AGREEMENT.

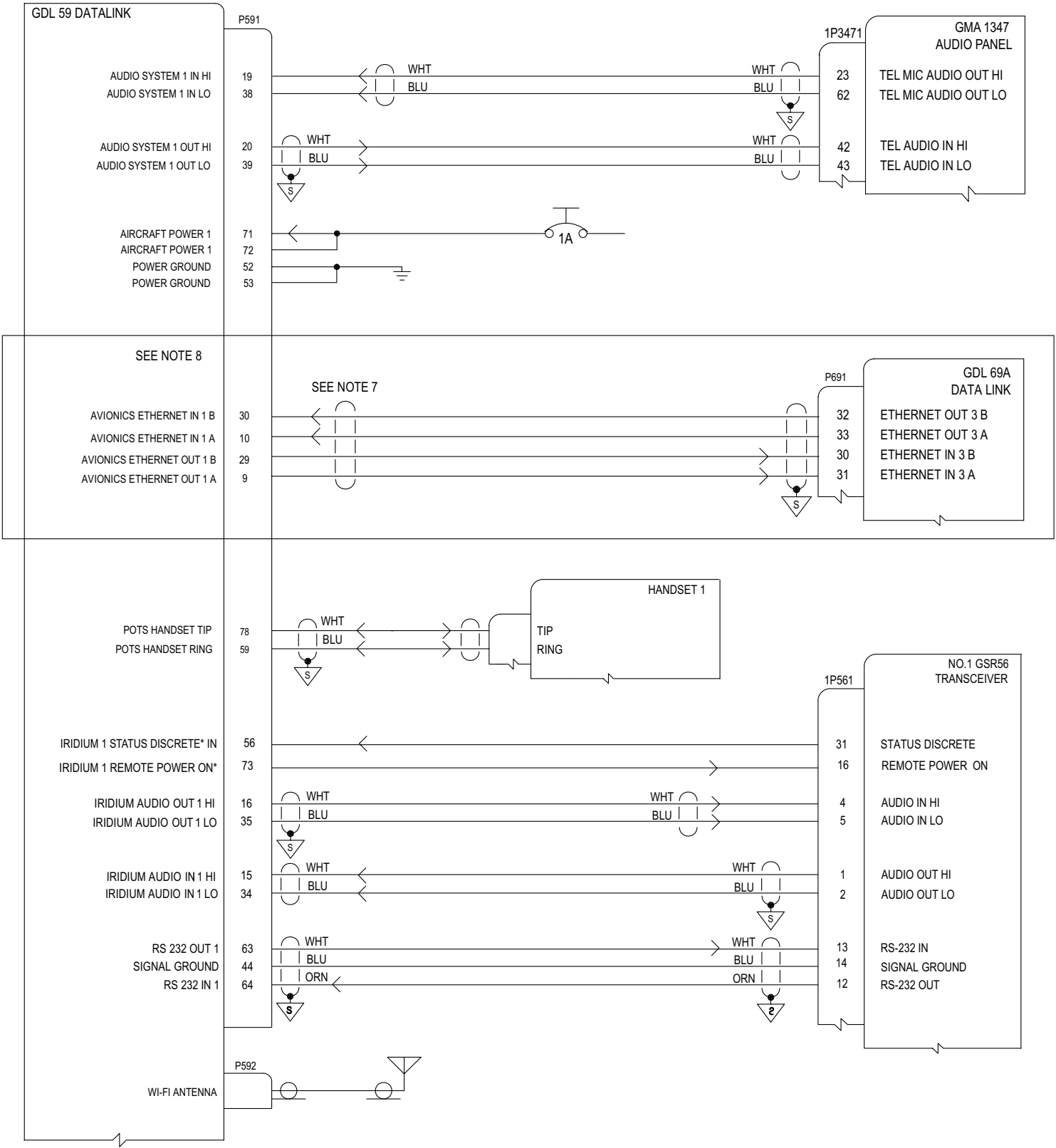


Figure B-1. GDL 59 Example Interconnect