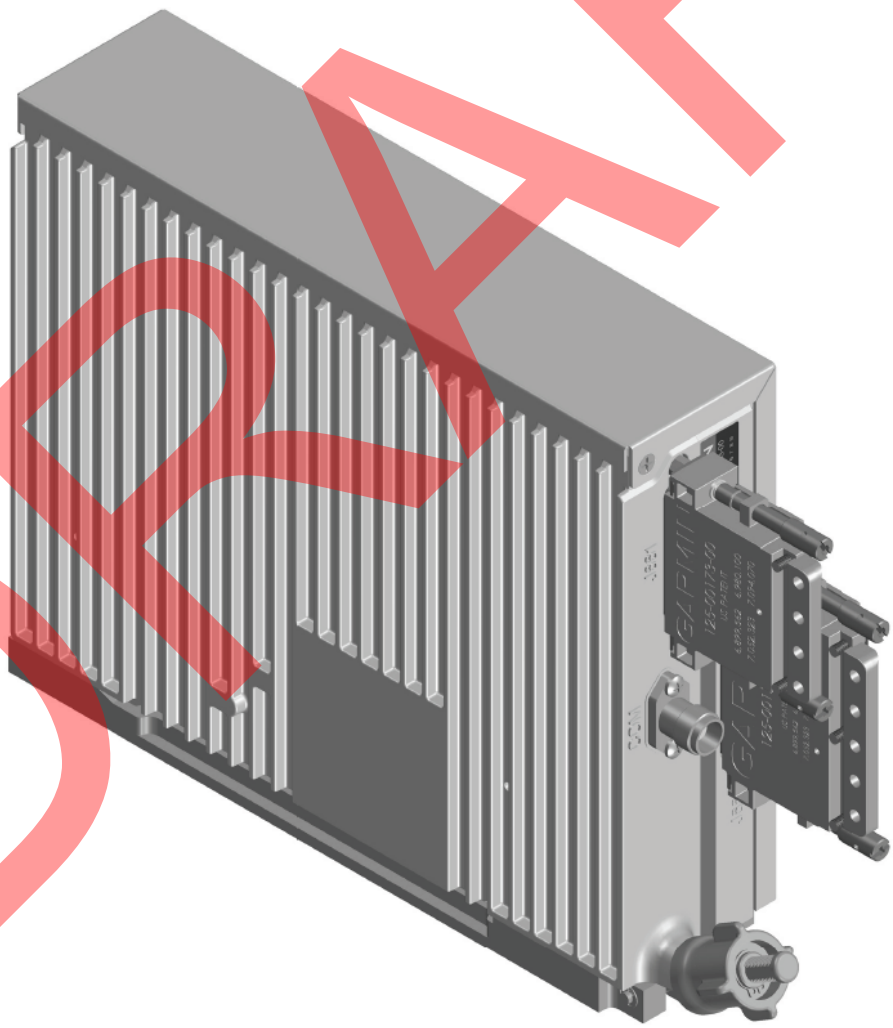
GARMIN

GDR 66

Transceiver Installation Manual



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RECORD OF REVISIONS

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CURRENT REVISION DESCRIPTION

Revision	Page Number(s)	Section Number	Description of Change
A	All	All	Initial release

DOCUMENT PAGINATION

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1 GENERAL DESCRIPTION

1.1 Introduction

This manual presents mechanical and electrical installation requirements for installing the GDR 66 as part of a Garmin Integrated Flight Deck. The GDR 66 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 GDR 66 is a remote mounted digital communications transceiver. The GDR 66 operates in the following modes in the 118.000 to 137.000 MHz VHF aviation communications band:

- **Analog Voice Mode (ARINC 716 Voice):** Voice communications using DSB-AM modulation with 8.33 and 25 kHz channel spacing.
- **VDL Mode 0/A (ARINC 716 Data):** ACARS using DSB-AM modulation with a 2.4 kbps data rate and 25 kHz channel spacing.
- **VDL Mode 2 (ARINC 750 Data):** Data link using D8PSK modulation with a 31.5 kbps data rate and 25 kHz channel spacing.

1.3 Interface Summary

The GDR 66 provides the following interfaces:

- 2 RS-422 inputs
- 2 RS-422 outputs
- 1 RS-232 input
- 1 RS-232 output
- 5 configurable ARINC 429 inputs
- 2 configurable ARINC 429 outputs
- 8 configurable active low discrete inputs
- 5 active low discrete inputs: COM MIC KEY*, COM REMOTE TRANSFER*, GDR SYSTEM ID PROGRAM* 1, GDR SYSTEM ID PROGRAM* 2, GDR SYSTEM ID PROGRAM* 3
- 1 active high discrete input: COM REMOTE POWER OFF
- 1 active low discrete outputs: KEY EVENT OUT*
- 1 analog microphone audio input
- 1 analog audio output
- 1 SELCAL audio/ACARS analog data output
- 2 aircraft power bus inputs

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 GDR 66 Environmental Qualification Form. This form is available directly from Garmin under the following part number:

GDR 66 Environmental Qualification Form, Garmin part number 005-00548-01

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

Table 1-1 list the physical characteristics for the GDR 66 unit, rack, and connectors. Please refer to Appendix A for additional information.

Table 1-1 Physical Characteristics

Characteristics	Specifications
Width (w/out Rack)	2.06 inches (5.23 cm)
Height (w/out Rack)	6.46 inches (16.4 cm)
Depth (w/out Rack)	8.78 inches (22.3 cm)
Width (with Rack)	2.06 inches (5.23 cm)
Height (with Rack)	6.62 inches (16.8 cm)
Depth (with Rack & Connectors)	10.1 inches (25.8 cm)
Unit Weight	4.2 lbs. (1.9 kg)
Rack Weight	0.36 lbs. (0.16 kg)
Connector Weight	0.33 lbs. (0.15 kg)

1.4.3 General Specifications

For detailed specifications, see the Environmental Qualification Form.

Table 1-2 General Specifications

Characteristics	Specifications
Operating Temperature Range	-55°C 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 C, EUROCAE/ED-12B Level C
Environmental Conditions	RTCA/DO-160E, EUROCAE/ED-14E

1.4.4 Power Requirements

Table 1-3 Power Requirements

Characteristics	Specifications	
Input Voltage	14/28 Vdc. See the Environmental Qualification Form for details on surge ratings and minimum/maximum operating voltages.	
14V	Receive (AM or VDL)	Maximum 3.0A
	Transmit (AM or VDL)	Maximum 9.0A
28V	Receive (AM or VDL)	Maximum 1.5A
	Transmit (AM or VDL)	Maximum 8.0A

1.4.5 Transmitter Power Versus Aircraft Bus Voltage

Table 1-4 TX Power (into 50Ω load) vs Bus Voltage

Aircraft Power Bus Voltage (V)	Tx Power AM Mode	Tx Power VDL Mode
V ≥ 22.0 V	16 W minimum 20 W Typical	15 W minimum 20 W Typical
22.0 > V ≥11.0	8 W minimum 10 W Typical	7.5 W minimum 10 W Typical
11.0 > V ≥10.25	4 W minimum 5 W Typical	4 W minimum 5 W Typical

NOTE

GDR 66 does not claim Emergency Operation as defined by RTCA DO-160E, Section 16

1.4.6 COM Transceiver Specifications

The GDR 66 Transceiver minimally meets the requirements of DO-186B and ED-23B. Refer to Table 1-5 for detailed specifications.

Table 1-5 Transceiver Specifications

Characteristics	Specifications
Audio Outputs	Received Audio: 40 mW minimum into a 600Ω load SELCAL/Data: 10.4 mW minimum into a 600Ω load
Audio Response	Less than 6 dB of variation between 300 and 2500 Hz Greater than 40dB rejection above 3750 Hz
Audio Distortion	Not greater than 20.0% across the band from 300 Hz to 2500 Hz with a 90% modulated signal. No greater than 7.5% with a 30% modulated signal
Receiver Dynamic Range	-107 dBm to +10 dBm typical
Sensitivity	(S+N)/N on all channels shall be greater than 6 dB when the RF level is -107dBm modulated 30% at 1000 Hz
Squelch	Selectable between 0 to 20 dB SNR. Squelch hysteresis is selectable up to 15 dB
Spurious Response	74 dB minimum (-33 dBm signal produces no more output than desired signal producing 6 dB (S+N)/N)
Multi-Carrier Operation	Meets multi-carrier sensitivity, distortion, and audio output level requirements of ED-23C for Class C and Class H2 reveivers.
Transmitter Power	See Section 1.4.5
Transmitter Duty Cycle	10% maximum, thermally limited, 30 second limit per transmission
Modulation Capability	The modulation shall not be less than 70% with a standard modulator signal applied to the transmitter
Carrier Noise Level	Shall be at least 45 dB (S+N)/N
Frequency Stability	+ / - 5ppm (-55ºC to +70ºC with a 5-minute warmup at -55ºC)
Demodulated Audio Distortion	Less than 10% distortion when the transmitter is modulated at least 70%
Sidetone	1.4 Vrms into a 600Ω load
Transmit Modulation Fidelity	Shall be less than 6 dB when the audio input frequency is varied from 350 to 2500 Hz
Microphone Sensitivity	See Section 4.5.1.1
Spurious Emissions - Global Navigation Satellite System Band	Harmonic Emission products in the band extending from 1559 to 1610 Mhz shall be no greater than -60dBm

1.4.7 Digital Transceiver Characteristics

The GDR 66 Transceiver minimally meets the requirements of DO-281A. Refer to Table 1-6 for detailed specifications.

Table 1-6 Digital Transceiver Characteristics

Characteristics	Specifications
Dynamic Range	+10dBm to -98dBm typical
Sensitivity	Uncorrected BER of no more than 0.001 at -98 dBm
Transmitter Power	See Section 1.4.5
Transmitter Duty Cycle	20% maximum, thermally limited
Modulation Capability	D8PSK
Frequency Stability	+ / - 5ppm (-55ºC to +70ºC with a 5-minute warmup at -55ºC)
Transmit Symbol Constellation Error	EVM of less than 6%
Spurious Emissions - Global Navigation Satellite System Band	Harmonic Emission products in the band extending from 1559 to 1610 Mhz shall be no greater than -60dBm

1.4.8 License Requirements

The Telecommunications Act of 1996, effective February 8, 1996, provides the FCC discretion to eliminate radio station license requirements for aircraft and ships. The GDR 66 installation must comply with current transmitter licensing requirements. To find out the specific details on whether a particular installation is exempt from licensing, please visit the FCC web site http://wireless.fcc.gov/aviation.

Table 1-7 License Requirements

Characteristic	Specification
Transmitter Description:	Aviation-band VHF transceiver with 25 and 8.33 kHz channel spacing.
Antenna Characteristics:	Broad band, 50 ohm, vertically polarized.
Rated Power:	20 Watts
Emission Type (Voice):	6K00A3E (25 kHz Channel Spacing Mode) 5K60A3E (8.33 kHz Channel Spacing Mode)
Emission Type (Data):	13K0A2D (VDL Mode A, ACARS) 14K0G1D (VDL Mode 2)
Frequency of Operation:	118.000 – 136.975 MHz in 25 KHz AM or VDL Mode 118.000 – 136.99166 MHz in 8.3 KHz AM Mode

If an aircraft license is required, make application for a license on FCC form 404, Application for Aircraft Radio Station License. The FCC also has a fax-on-demand service to provide forms by fax. The GDR 66 owner accepts all responsibility for obtaining the proper licensing before using the transmitter.

International transmitter license procedures vary by country. Contact the local spectrum agency for license requirements.

NOTE

The VHF transmitter in this equipment is guaranteed to meet federal communications commission acceptance over the operating temperature range. Modifications not expressly approved by Garmin could invalidate the license and make it unlawful to operate the equipment.

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.

The Appliance Project Identifier (API) for the GDR 66 is GMN-00832. Documents submitted to the FAA, EASA and other regulatory agencies on behalf of this project will be filed under and referred to by this number.

1.5.1 TSO/ETSO Compliance

Table 1-8 TSO/ETSO Compliance

Function	TSO/ETSO/ RTCA/EUROCAE	Category	Applicable LRU SW Part Numbers
VHF COM Transceiver from 117.975 – 137.000 MHz	TSO-C169a ETSO-2C37e ETSO-2C38e RTCA/DO-186B EUROCAE/ED-23B	TX – 3,4,5,6 RX – C,E	006-B1055-(_) 006-B1056-(_)
VDL Mode 2 Communications Equipment	TSO-C160 RTCA/DO-281A EUROCAE/ED-92A	TX – 7,8 RX – F Architecture – Y	006-B1055-(_) 006-B1056-(_)
Equipment that prevents blocked channels due to unintentional transmissions	TSO-C128A ETSO-2C128 RTCA/DO-207 EUROCAE/ED-67	N/A	006-B1055-(_) 006-B1056-(_)

1.5.2 TSO/ETSO Deviations

Table 1-9 TSO/ETSO Deviations

TSO/ETSO	Deviation
TSO-C169a	1. Garmin was granted a deviation from TSO-C169a paragraph 4.a.2 to allow the unit to be permanently and legibly marked with a serial number and not the date of manufacture. The justification for this deviation is per FAA Memorandum "FAA Order 8150.1B, Technical Standard Order Program, Policy Clarification" which states that the date of manufacture must be used in lieu of the optional serial number when that information is critical for maintenance and/or inspections. An equivalent level of safety is provided since the date of manufacture is not critical for maintenance and/or inspections of this appliance. The appliance will be marked with a serial number.
ETSO-2C37e	1. Garmin was granted a deviation from ETSO-2C37e to use DO-160E instead of DO-160D. Equivalent Level of Safety (ELOS) is provided by use of a later revision requirement document.
	2. Garmin was granted a deviation from ETSO-2C37e to use ED-23B amendment 3 in addition to ED-23B. ELOS is provided by use of a later revision requirement document.
ETSO-2C38e	1. Garmin was granted a deviation from ETSO-2C38e to use DO-160E instead of DO-160D. ELOS is provided by use of a later revision requirement document.
	2. Garmin was granted a deviation from ETSO-2C38e to use ED-23B amendment 3 in addition to ED23B. ELOS is provided by use of a later revision requirement document.
ETSO-2C128	1. Garmin was granted a deviation from ETSO-2C128 to use DO-160E instead of DO-160D. ELOS is provided by use of a later revision requirement document.

1.6 Reference Documents

The following publications are sources of additional information for installing the GDR 66. Before installing the GDR 66, the technician should read all referenced materials along with this manual.

Table 1-10 Reference Documents

Part Number	Document
190-00303-00	G1000 System Installation Manual
190-00303-04	G1000 Line Maintenance and Configuration Manual
190-00313-11	Jackscrew Backshell Installation Instructions
190-00313-50	Garmin Integrated Avionics System Thermal Management Plan
190-00313-51	Garmin Integrated Avionics System Thermal Validation Procedure

1.7 Aviation Limited Warranty

All Garmin avionics products are warranted to be free from defects in materials or workmanship for: one 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.

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2 INSTALLATION OVERVIEW

2.1 Introduction

This section provides hardware equipment information for installing the GDR 66, related hardware, and antennas. Installation of the GDR 66 must 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 Appendix A for rack drawings and dimensions.

2.2 Installation Materials

The GDR 66 is only available as a single unit under the following part number:

Table 2-1 Available Units

Item	Garmin P/N
GDR 66 Unit Only, (011-02303-00)	010-00832-00

2.2.1 Equipment Available

Each of the following accessories are provided separately from the GDR 66 and are required for installation.

Table 2-2 Equipment Available

Item	Garmin P/N
GDR 66 Standalone Install Rack	011-02477-00
GDR 66 Connector Kit	011-02304-00

2.2.2 Additional Equipment Required

The following installation accessories are required but not provided:

Table 2-3 Additional Equipment Required

Characteristic	Specification
COM Antenna	Shall meet TSO-C37(), C38(), and C-169(). Broad band, 50 Ω, vertically polarized with coaxial cable
Headphones*	500 Ω nominal impedance
Microphone*	Low impedance, carbon or dynamic, with transistorized pre-amp
Hardware**	#10 pan head or hex head fastener (qty 4)

* Only required for voice mode

** Used for mounting unit rack to airframe

2.3 Installation Considerations

Fabrication of a wiring harness is required. Sound mechanical and electrical methods and practices are required for installation of the GDR 66.

2.3.1 Antenna Considerations

Antenna installations on pressurized cabin aircraft require FAA approved installation design and engineering substantiation data whenever such antenna installations incorporate alteration (penetration) of the cabin pressure vessel by connector holes and/or mounting arrangements. For needed engineering support pertaining to the design and approval of such pressurized aircraft antenna installations, it is recommended that the installer proceed according to any of the following listed alternatives:

1. Obtain approved antenna installation design data from the aircraft manufacturer.
2. Obtain an FAA approved STC, pertaining to, and valid for the antenna installation.
3. Contact the FAA Aircraft Certification Office in the appropriate Region and request identification of FAA Designated Engineering Representatives (DERs) who are authorized to prepare and approve the required antenna installation engineering data.
4. Obtain FAA Advisory Circular AC-183C and select (and contact) a DER from the roster of individuals listed in it.
5. Contact an aviation industry organization such as the Aircraft Electronics Association for assistance.

2.3.2 Com Antenna Location

The GDR 66 COM antenna should be well removed from all projections, engines and propellers. The ground plane surface directly below the antenna should be a flat plane over as large an area as possible (18 inches square, minimum). The antenna should be mounted a minimum of three feet from any DME antennas, three feet from any GPS antennas, and as far as practical from the ELT antenna. Some ELTs have exhibited re-radiation problems generating harmonics which may interfere with other signals.

In addition, the COM antenna must have at least 16 dB of isolation from other COM antennas to prevent damage to the GDR 66 COM receiver. For COM antennas mounted on the same side of the fuselage, 16 dB of isolation can be achieved by a physical separation of approximately 3 feet (0.9 meters).

If simultaneous use of two or more COM transceivers is desired the COM antennas must be spaced for maximum isolation. For a two COM installation, one COM antenna should be mounted on the top of the fuselage and the other antenna should be mounted on the bottom of the fuselage. For installations with three COM's, one COM antenna should be mounted on the top of the fuselage and the other two antennas should be mounted on the bottom of the fuselage and physically separated from each other as much as possible.

The recommended minimum isolation between COM antennas for simultaneous use of two or more COM's is 40 dB. Separating the COM antennas between the top and bottom of the fuselage typically provides 35 – 45 dB of isolation for metal skin aircraft. For COM antennas mounted on the same side of the fuselage, 40 dB of isolation can be achieved by a physical separation of approximately 60 feet (18.3 meters). Receiver sensitivity could be significantly reduced during the transmission of a co-located COM for installations with less than 40 dB of isolation between the COM antennas. For installations with less than 23 dB of isolation between COM antennas, cross modulation (bleed-through) could also be experienced during the transmission of a co-located COM. For COM antennas mounted on the same side of the fuselage, 23 dB of isolation can be achieved by a physical separation of approximately 9 feet (2.7 meters).

Simultaneous COM performance varies significantly across installations and is affected by both the isolation between the COM antennas and the separation of the tuned frequencies. Each installation should be individually examined to determine the expected performance of simultaneous COM.

2.4 Cabling and Wiring

Refer to the interconnect examples in Appendix B for wire gauge guidance.

The power connection can be run with three AWG #18 wires back to the breaker or can be spliced near the unit to one AWG #16 or larger wire. Special thin-wall heat shrink tubing is also provided to insulate the extended barrels inside the backshell. If using AWG #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.

Coaxial cable with 50Ω nominal impedance and meeting applicable aviation regulations should be used for the installation.

NOTE

RTCA DO-224A assumes 3dB of cable loss in its VDL Typical Uplink Power Budget. Losses greater than 3dB can reduce transceiver range.

Cabling for the GDR 66 should not be routed near components or cabling which are sources of electrical noise. Route the GPS, VOR/LOC, and Glideslope antenna cables as far as possible away from all COM transceivers and antenna cables.

2.5 Cooling Air

Dedicated cooling is not required for the GDR 66 to meet indicated EQF categories. Thermal analysis must be performed to verify that high temperature limits implied by the indicated EQF categories for the GDR 66 are not exceeded during normal operation of the aircraft. Guidance can be found in the Garmin Integrated Avionics System Thermal Management Plan document (GPN 190-00313-50) and the Garmin Integrated Avionics System Thermal Validation Procedure (GPN 190-00313-51).

Contact Garmin for additional cooling guidance.

2.6 Mounting Requirements

The GDR 66 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). Bonding resistance measured between the GDR 66 standalone install rack and the airframe should be less than 2.5 mlliOhms. The GDR 66 must be mounted in the vertical position using the GDR 66 standalone rack. Approximately one inch of clearance should be provided on the left side of the GDR 66 to allow for cooling of the heat sink. Refer to Appendix A for outline and installation drawings.

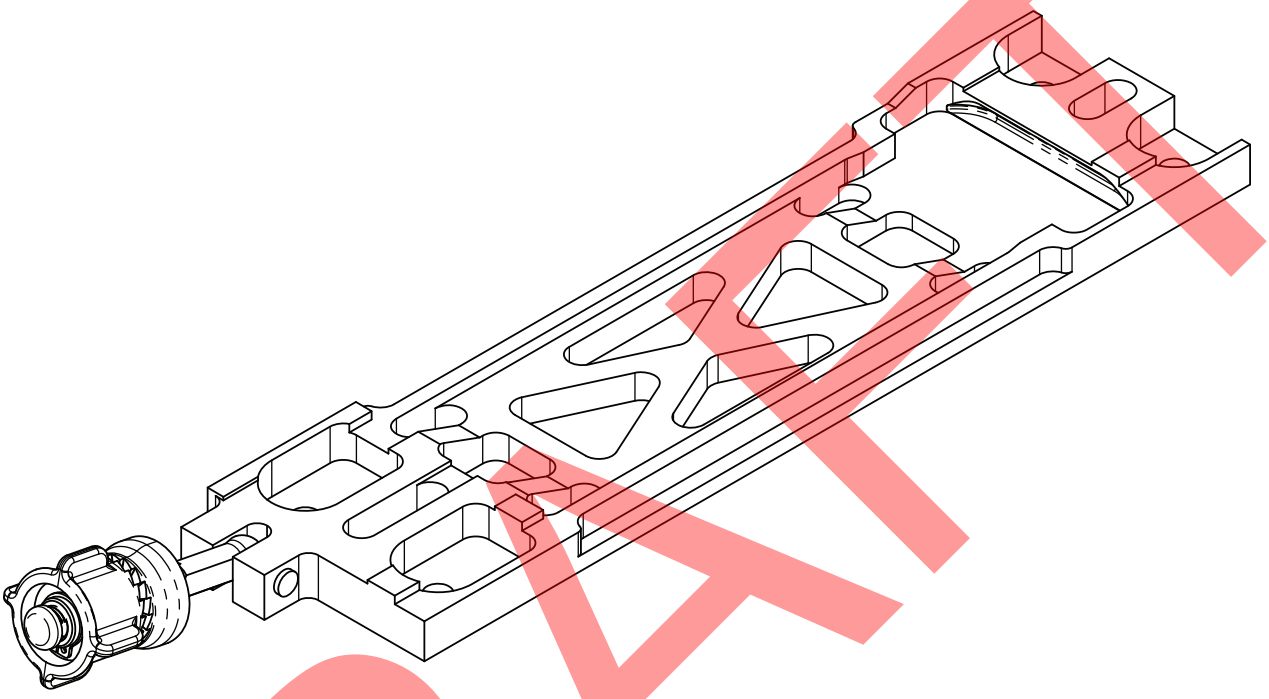


Figure 2-1: GDR 66 Standalone Rack

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. All electrical connections are made through 44 and 62-pin D-subminiature connectors. 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 harnesses in accordance with aircraft manufacturer authorized interconnect standards.

Contacts for the 62 and 44 pin connectors must be crimped onto the individual wires of the aircraft wiring harness. Tables 3-1 and 3-2 list contact part numbers (for reference) and recommended crimp tools.

Table 3-1: Pin Contact Part Numbers

Manufacturer	62 pin connector (P662), 44 pin connector (P661)	
	18-20 AWG (Power Only)	22-28 AWG
Garmin P/N	336-00044-00	336-00021-00
Military P/N	N/A	M39029/58-360
AMP	N/A	204370-2
Positronic	N/A	MC8522D
ITT Cannon	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 #18 or #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.

3.3 Antenna Installation

Follow the manufacturers' instructions for installation of the COM antenna.

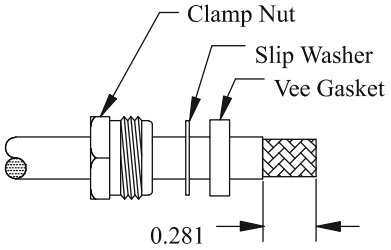
CAUTION

Do not use construction grade RTV sealant or sealants containing acetic acid. These sealants may damage the electrical connections to the antenna. Use of these type sealants may void the antenna warranty.

3.4 Cable Installation

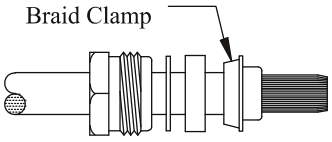
1. Route the coaxial cable to the rack location keeping in mind the recommendations of Section 2. Secure the cable in accordance with good aviation practice.
2. Trim the coaxial cable to the desired length and install the TNC connector per the cabling instructions on Figure 3-1. If the connector is provided by the installer, follow the connector manufacturer's instructions for cable preparation.

Step 1.



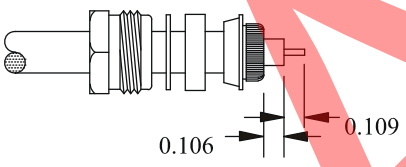
- Slide clamp nut, slip washer, and vee gasket over end of coax.
- Strip jacket as illustrated.

Step 2.



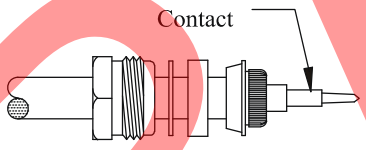
- Comb out braid.
- Slip braid clamp on and push back against coax jacket.

Step 3.



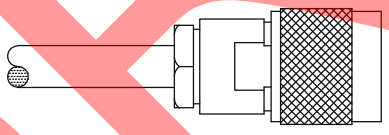
- Fold back braid wires as illustrated, trim to proper length, and form over clamp.
- Strip center conductor as illustrated.

Step 4.



- Solder center conductor to contact.

Step 5.



- Insert coax with braid clamp and contact into connector and tighten the clamp nut securely.

Figure 3-1 TNC Connector Installation

3.5 Backshell Assembly

The GDR 66 connector kit includes two Garmin backshell assemblies. Garmin's backshell gives the installer the ability to easily terminate shield grounds at the backshell housing. Refer to the Jackscrew Backshell Installation Instructions (Garmin part number 190-00313-11) for backshell assembly instructions.

3.6 Final Installation

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

3.7 Post Installation Configuration & Checkout

The GDR 66 must be installed as part of a Garmin Integrated Flight Deck and have FAA approved configuration data. Configuration data is loaded to the GDR 66 from an aircraft-specific Garmin SW Loader Card. GDR 66 settings are predetermined for a specific aircraft.

For aircraft installation/checkout, use only aircraft manufacturer approved checkout procedures.

3.8 Continued Airworthiness

Maintenance of the GDR 66 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 P661 (COM)

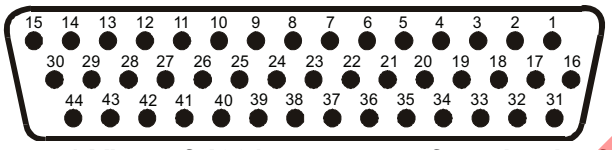


Figure 4-1 View of J661 connector, from back of unit

Table 4-1 P661 Connector

Pin	Pin Name	I/O
1	SPARE	--
2	SPARE	--
3	SPARE	--
4	COM MIC KEY*	In
5	SPARE	--
6	SPARE	--
7	COM MIC AUDIO IN HI	In
8	COM MIC AUDIO IN LO (GROUND)	--
9	COM 600 OHM AUDIO OUT HI	Out
10	COM 600 OHM AUDIO OUT LO	Out
11	RESERVED	--
12	COM REMOTE TRANSFER*	In
13	RESERVED	--
14	RESERVED	--
15	SIGNAL GROUND	--
16	COM REMOTE POWER OFF	In
17	SPARE	--
18	RESERVED	--
19	SPARE	--
20	GDR SYSTEM ID PROGRAM* 1	In
21	SPARE	--
22	GDR SYSTEM ID PROGRAM* 2	In
23	SPARE	--
24	GDR SYSTEM ID PROGRAM* 3	In
25	SPARE	--
26	SIGNAL GROUND	--
27	SPARE	--
28	RESERVED	--
29	SIGNAL GROUND	--
30	SIGNAL GROUND	--
31	SIGNAL GROUND	--
32	RS-232 OUT 1	Out
33	RS-232 IN 1	In
34	RESERVED	--
35	KEY EVENT OUT*	Out

*Denotes Active Low (Ground to activate).

Table 4-1 P661 Connector, continued

36	RESERVED	--
37	SPARE	--
38	SPARE	--
39	RESERVED	--
40	RESERVED	--
41	SELCAL AUDIO AND DATA OUT HI	Out
42	SELCAL AUDIO AND DATA OUT LO	Out
43	SIGNAL GROUND	--
44	SIGNAL GROUND	--

*Denotes Active Low (Ground to activate).

4.1.2 P662 (Main)

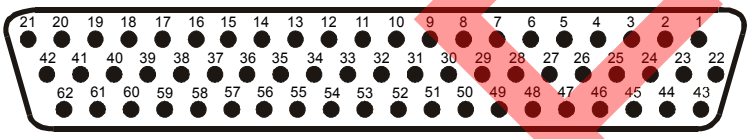


Figure 4-2 View of J662 connector, from back of unit

Table 4-2 P662 Connector

Pin	Pin Name	I/O
1	POWER GROUND	--
2	RS-422 IN 1 B	In
3	RS-422 IN 1 A	In
4	RS-422 OUT 1 B	Out
5	RS-422 OUT 1 A	Out
6	RS-422 IN 2 B	In
7	RS-422 IN 2 A	In
8	RS-422 OUT 2 B	Out
9	RS-422 OUT 2 A	Out
10	DISCRETE IN* 1	In
11	DISCRETE IN* 2	In
12	DISCRETE IN* 3	In
13	DISCRETE IN* 4	In
14	DISCRETE IN* 5	In
15	DISCRETE IN* 6	In
16	DISCRETE IN* 7	In
17	DISCRETE IN* 8	In
18	ARINC 429 OUT 1 A	Out
19	ARINC 429 OUT 1 B	Out
20	ARINC 429 OUT 2 A	Out
21	ARINC 429 OUT 2 B	Out
22	SPARE	--

*Denotes Active Low (Ground to activate).

Table 4-2 P662 Connector, continued

23	SPARE	--
24	POWER GROUND	--
25	SPARE	--
26	POWER GROUND	--
27	SPARE	--
28	AIRCRAFT POWER 1	In
29	SPARE	--
30	AIRCRAFT POWER 1	In
31	SPARE	--
32	AIRCRAFT POWER 1	In
33	SPARE	--
34	AIRCRAFT POWER 2	In
35	SPARE	--
36	AIRCRAFT POWER 2	In
37	SPARE	--
38	AIRCRAFT POWER 2	In
39	SPARE	--
40	POWER GROUND	--
41	SPARE	--
42	POWER GROUND	--
43	POWER GROUND	--
44	SPARE	--
45	SIGNAL GROUND	--
46	SPARE	--
47	SIGNAL GROUND	--
48	SPARE	--
49	ARINC 429 IN 1 A	In
50	ARINC 429 IN 1 B	In
51	ARINC 429 IN 2 A	In
52	ARINC 429 IN 2 B	In
53	ARINC 429 IN 3 A	In
54	ARINC 429 IN 3 B	In
55	ARINC 429 IN 4 A	In
56	ARINC 429 IN 4 B	In
57	ARINC 429 IN 5 A	In
58	ARINC 429 IN 5 B	In
59	SPARE	--
60	SIGNAL GROUND	--
61	SIGNAL GROUND	--
62	RESERVED	--

4.2 Power Functions

4.2.1 Aircraft Power

The GDR 66 provides two aircraft power bus inputs. Pins 28, 30, and 32 of P662 are internally connected to form AIRCRAFT POWER 1. Pins 34, 36, and 38 of P662 are internally connected to form AIRCRAFT POWER 2. AIRCRAFT POWER 1 and AIRCRAFT POWER 2 are "diode ORed" to provide power redundancy. Use of three AIRCRAFT POWER pins (either AIRCRAFT POWER 1 or AIRCRAFT POWER 2) and three POWER GROUND pins is recommended for all installations.

Table 4-3 Aircraft Power

Pin Name	Connector	Pin	I/O
AIRCRAFT POWER 1	P662	28	In
AIRCRAFT POWER 1	P662	30	In
AIRCRAFT POWER 1	P662	32	In
AIRCRAFT POWER 2	P662	34	In
AIRCRAFT POWER 2	P662	36	In
AIRCRAFT POWER 2	P662	38	In
POWER GROUND	P662	1	--
POWER GROUND	P662	24	--
POWER GROUND	P662	26	--
POWER GROUND	P662	40	--
POWER GROUND	P662	42	--
POWER GROUND	P662	43	--

4.2.2 Remote Power Off

The GDR 66 powers down when the COM REMOTE POWER OFF input is active. COM REMOTE POWER OFF is a non-configurable discrete input conforming to:

Low: 0 VDC < Vin < 3.5 VDC, OR Rin > 100k ohms (inactive)
High: 8 VDC < Vin < 36 VDC (active)

Table 4-4 Remote Power Off

Pin Name	Connector	Pin	I/O
COM REMOTE POWER OFF	P661	16	In

4.2.3 GDR System ID Program

The GDR 66 determines it's unit number based on the status of three GDR SYSTEM ID PROGRAM* non-configurable discrete inputs conforming to:

Low: 0 VDC < Vin < 3.5 VDC, OR Rin < 375 ohms (active)
High: 8 VDC < Vin < 36 VDC, OR Rin > 100k ohm (inactive)

Table 4-5 System ID Program

Pin Name	Connector	Pin	I/O
GDR SYSTEM ID PROGRAM* 1	P661	20	In
GDR SYSTEM ID PROGRAM* 2	P661	22	In
GDR SYSTEM ID PROGRAM* 3	P661	24	In

The unit number is determined by the table below:

Table 4-6 Unit Number Configuration

GDR SYSTEM ID PROGRAM* 1	GDR SYSTEM ID PROGRAM* 2	GDR SYSTEM ID PROGRAM* 3	UNIT NUMBER
Open	Open	Open	#1
Ground	Open	Open	#2
Open	Ground	Open	#3
Ground	Ground	Open	#4
Open	Open	Ground	#5
Ground	Open	Ground	#6
Open	Ground	Ground	#7
Ground	Ground	Ground	INVALID, DO NOT USE

4.3 Serial Data

4.3.1 RS-422

The GDR 66 provides two RS-422 inputs and two RS-422 outputs conforming to TIA/EIA/ANSI-422-B. RS-422 is the only interface between the GDR 66 and the rest of the Garmin system.

Table 4-7 RS-422

Pin Name	Connector	Pin	I/O
RS-422 IN 1 B	P662	2	In
RS-422 IN 1 A	P662	3	In
RS-422 OUT 1 B	P662	4	Out
RS-422 OUT 1 A	P662	5	Out
RS-422 IN 2 B	P662	6	In
RS-422 IN 2 A	P662	7	In
RS-422 OUT 2 B	P662	8	Out
RS-422 OUT 2 A	P662	9	Out

4.3.2 RS-232

The GDR 66 provides one RS-232 input and one RS-232 output. The RS-232 output conforms to EIA Standard RS-232C with an output voltage swing of at least ± 5V when driving a standard RS-232 load. The RS-232 port is used for testing and as a back up tuning port.

Table 4-8 RS-232

Pin Name	Connector	Pin	I/O
RS-232 OUT 1	P661	32	Out
RS-232 IN 1	P661	33	In

4.3.3 ARINC 429

The GDR 66 provides five configurable ARINC 429 inputs and two configurable ARINC 429 outputs conforming to ARINC Specifications 429P1-17, 429P2-16 and 429P3-18. The ARINC 429 outputs conform to ARINC 429 specifications when loaded with up to five standard ARINC 429 receivers. The speed of the ARINC 429 outputs can be configured for low speed (14.29 kHz) or high speed (100 kHz).

Table 4-9 ARINC 429

Pin Name	Connector	Pin	I/O
ARINC 429 IN 1 A	P662	49	In
ARINC 429 IN 1 B	P662	50	In
ARINC 429 IN 2 A	P662	51	In
ARINC 429 IN 2 B	P662	52	In
ARINC 429 IN 3 A	P662	53	In
ARINC 429 IN 3 B	P662	54	In
ARINC 429 IN 4 A	P662	55	In
ARINC 429 IN 4 B	P662	56	In
ARINC 429 IN 5 A	P662	57	In
ARINC 429 IN 5 B	P662	58	In
ARINC 429 OUT 1 A	P662	18	Out
ARINC 429 OUT 1 B	P662	19	Out
ARINC 429 OUT 2 A	P662	20	Out
ARINC 429 OUT 2 B	P662	21	Out

4.4 Discrete I/O

4.4.1 Active Low Discrete Inputs

The GDR 66 provides 8 configurable discrete inputs conforming to:

Low: 0 VDC < Vin < 3.5 VDC, OR Rin < 375 ohms (active)
High: 8 VDC < Vin < 36 VDC, OR Rin > 100k ohm (inactive)

Table 4-10 Discrete Inputs

Pin Name	Connector	Pin	I/O
DISCRETE IN* 1	P662	10	In
DISCRETE IN* 2	P662	11	In
DISCRETE IN* 3	P662	12	In
DISCRETE IN* 4	P662	13	In
DISCRETE IN* 5	P662	14	In
DISCRETE IN* 6	P662	15	In
DISCRETE IN* 7	P662	16	In
DISCRETE IN* 8	P662	17	In

4.4.2 Key Event Out

The GDR 66 provides one output to signal when the GDR 66 is transmitting, regardless of what mode the radio is in. KEY EVENT OUT* can be used as needed to decrease the sensitivity of other COM receivers on the aircraft when the GDR 66 is transmitting. KEY EVENT OUT* is a non-configurable discrete output conforming to:

Active: 0 VDC < Vout < 1.0 VDC with < 20 mA sink current; sink current must be externally limited to 20 mA max.

Inactive: Open circuit, can be pulled up to an externally sourced Vout in the range 3.3 VDC < Vout < 36 VDC; leakage current is typically <10 uA to ground.

Table 4-11 Key Event Out

Pin Name	Connector	Pin	I/O
KEY EVENT OUT*	P661	35	Out

4.5 Audio

When the GDR 66 is in analog voice mode (ARINC 716 Voice), audio from the microphone and audio to the headset can be transferred to/from the GDR 66 as analog audio or digital audio. If analog audio is used, the COM MIC KEY* discrete input must be used. If digital audio is used all of this information is transferred in the digital audio stream.

4.5.1 Analog Audio

4.5.1.1 Com Mic Audio

The GDR 66 provides one microphone audio input. COM MIC AUDIO has a 150 ohm AC input impedance and supplies the microphone with a 12 V bias through 400Ω +/– 20%. COM MIC AUDIO is set in the factory for 250 mVrms to modulate the transmitter at 90% nominally. The microphone gain is adjustable during installation to increase the sensitivity to 20 mVrms or decrease the sensitivity to 2.5 Vrms.

Table 4-12 Com Mic Audio

Pin Name	Connector	Pin	I/O
COM MIC AUDIO IN HI	P661	7	In
COM MIC AUDIO IN LO (GROUND)	P661	8	--

4.5.1.2 Com Audio Out

The GDR 66 provides one audio output that is intended to drive a headset or an audio panel. The rated output is 4.90 Vrms into a 600 ohm load (40 mWavg). A volume control is available during flight to reduce the output by at least 40 dB to 49 mVrms. COM 600 OHM AUDIO OUT is the summation of the COM receiver audio and COM sidetone audio.

Table 4-13 Com Audio Out

Pin Name	Connector	Pin	I/O
COM 600 OHM AUDIO OUT HI	P661	9	Out
COM 600 OHM AUDIO OUT LO	P661	10	Out

4.5.1.3 Com Mic Key

The GDR 66 transmits the audio from the microphone (COM MIC AUDIO IN) when the COM MIC KEY* input is active. The COM MIC KEY* should be connected to the microphones PTT output. COM MIC KEY* is a non-configurable discrete input conforming to:

Low: 0 VDC < Vin < 3.5 VDC, OR Rin < 375 ohms (active)
High: 8 VDC < Vin < 36 VDC, OR Rin > 100k ohm (inactive)

Table 4-14 Com Mic Key

Pin Name	Connector	Pin	I/O
COM MIC KEY*	P661	4	In

4.5.1.4 Com Remote Transfer

The GDR 66 provides one COM REMOTE TRANSFER* input which allows the COM Emergency State to be entered or exited. When the GDR 66 enters Emergency State, it automatically switches to AM COM mode and tunes to the emergency channel, 121.500 MHz. When in Emergency State, the GDR 66 ignores inputs from the front panel controls for COM selections and cannot be used for digital data link.

The COM REMOTE TRANSFER* input controls Emergency State via one of two modes: "Hold-to-Acitvate" mode and "On/Off" mode. A GDR 66 aircraft configuration parameter selects the mode as well as the activation time for Hold-to-Acitvate mode. In Hold-to-Acivate mode, the Emergency State is entered when the COM REMOTE TRANSFER* input is held active for the configured time, and is exited immediately when the COM REMOTE TRANSFER* input becomes active after having been inactive. In On/Off mode, COM REMOTE TRANSFER* acts as an on/off switch for Emergency State, which is entered immediately when COM REMOTE TRANSFER* becomes active, and is exited immediately when COM REMOTE TRANSFER* becomes inactive.

Low: 0 VDC < Vin < 3.5 VDC, OR Rin < 375 ohms (active)
High: 8 VDC < Vin < 36 VDC, OR Rin > 100k ohm (inactive)

Table 4-15 Com Remote Transfer

Pin Name	Connector	Pin	I/O
COM REMOTE TRANSFER*	P661	12	In

4.5.2 ACARS/SELCAL

4.5.2.1 SELCAL Audio and ACARS Data Out

The GDR 66 provides one SELCAL audio/ACARS data output that can either be used for SELCAL or VDL Mode 0 (ARINC 716 Data). The rated output is 2.45 Vrms into a 600 ohm load (10 mWavg). The gain is adjustable during installation to decrease the output by at least 40 dB to 24.5 mVrms. A gain setting of -7.0 dB (1.2 Vrms minimum) is recommended. Refer to EQF for certification considerations for this output.

Table 4-16 SELCAL Audio and ACARS Data Out

Pin Name	Connector	Pin	I/O
SELCAL AUDIO AND DATA OUT HI	P661	41	Out
SELCAL AUDIO AND DATA OUT LO	P661	42	Out

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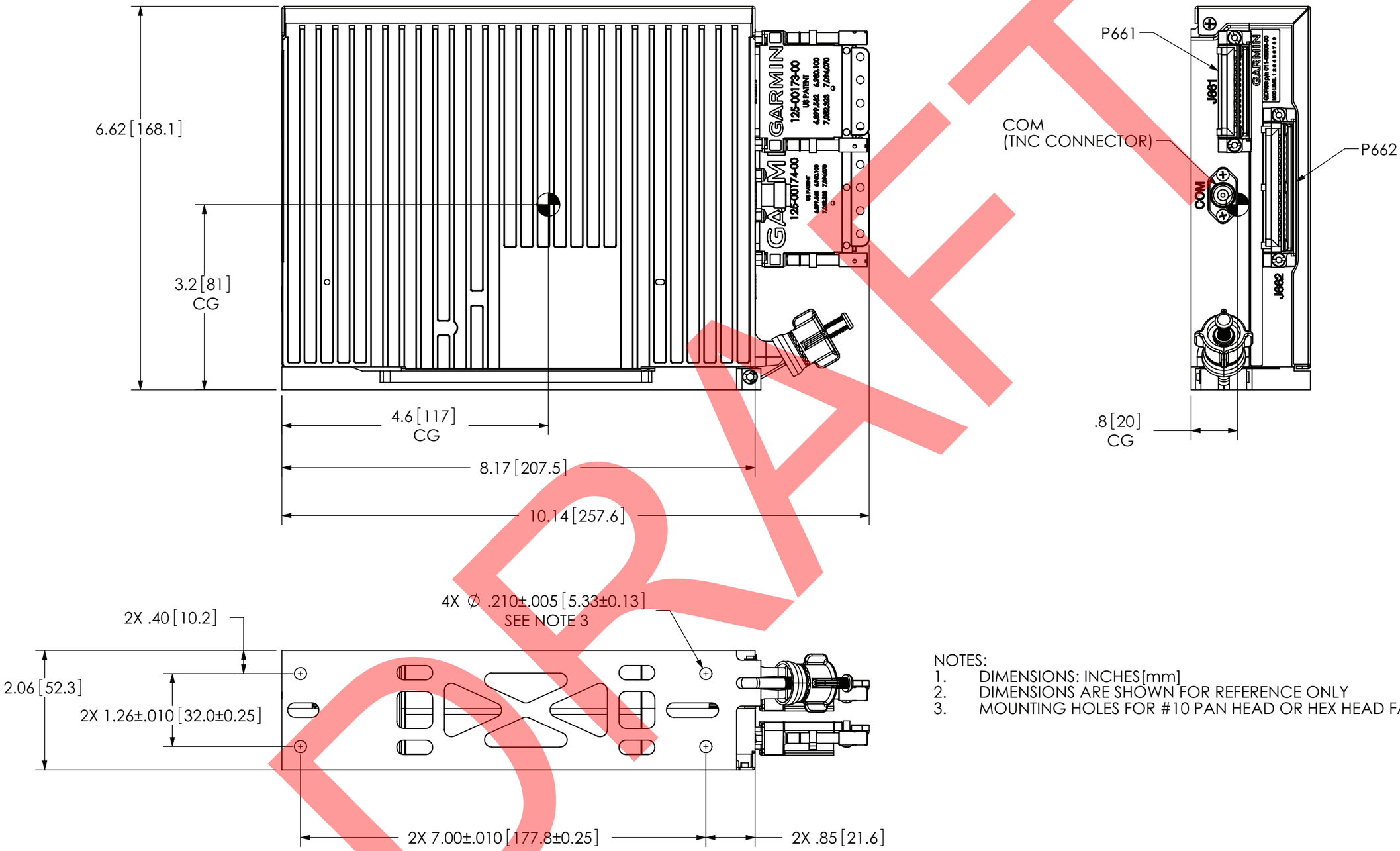
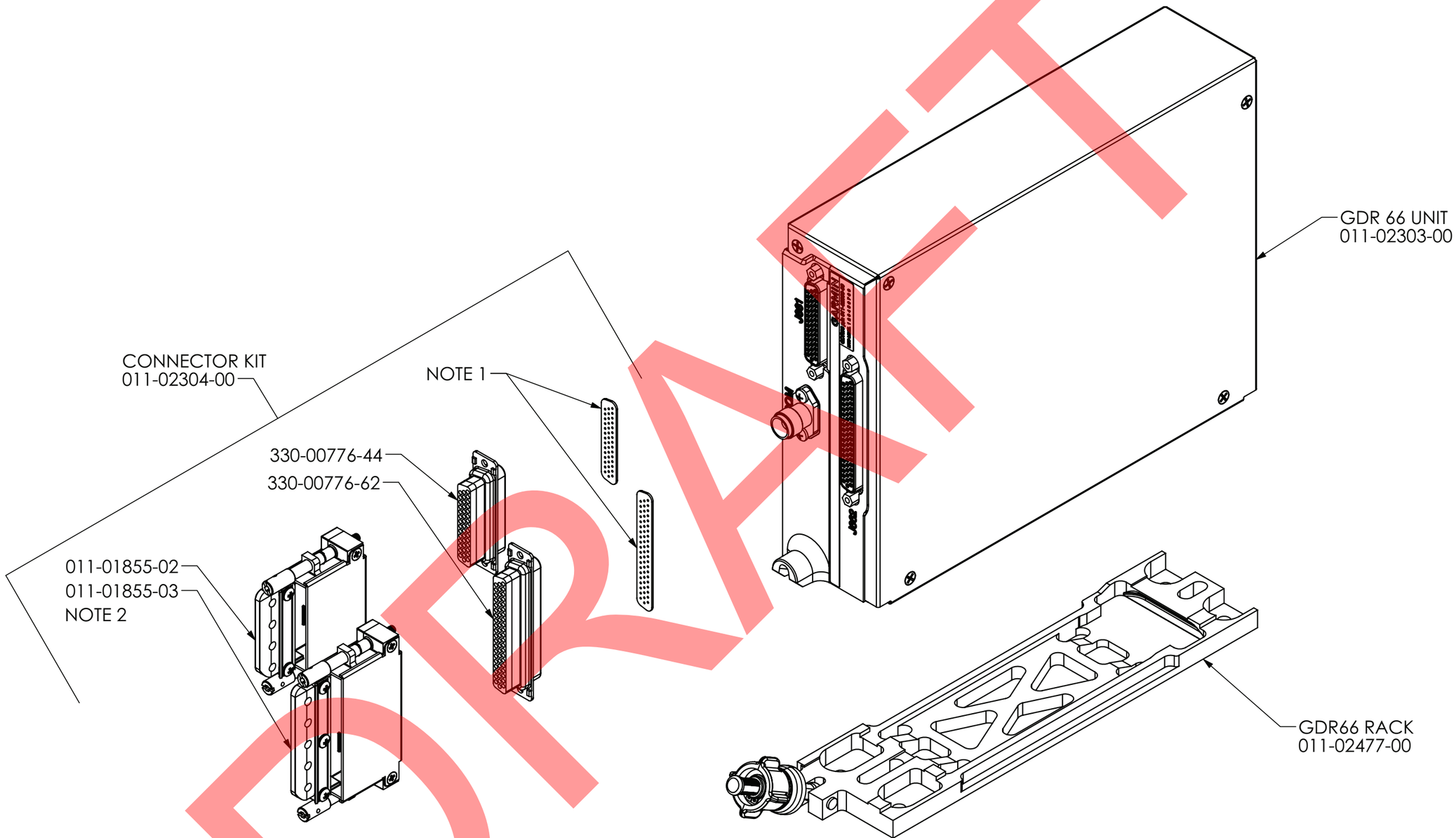


NOTES:
1. DIMENSIONS: INCHES[mm]
2. DIMENSIONS ARE SHOWN FOR REFERENCE ONLY
3. MOUNTING HOLES FOR #10 PAN HEAD OR HEX HEAD FASTENERS (4 PLACES)

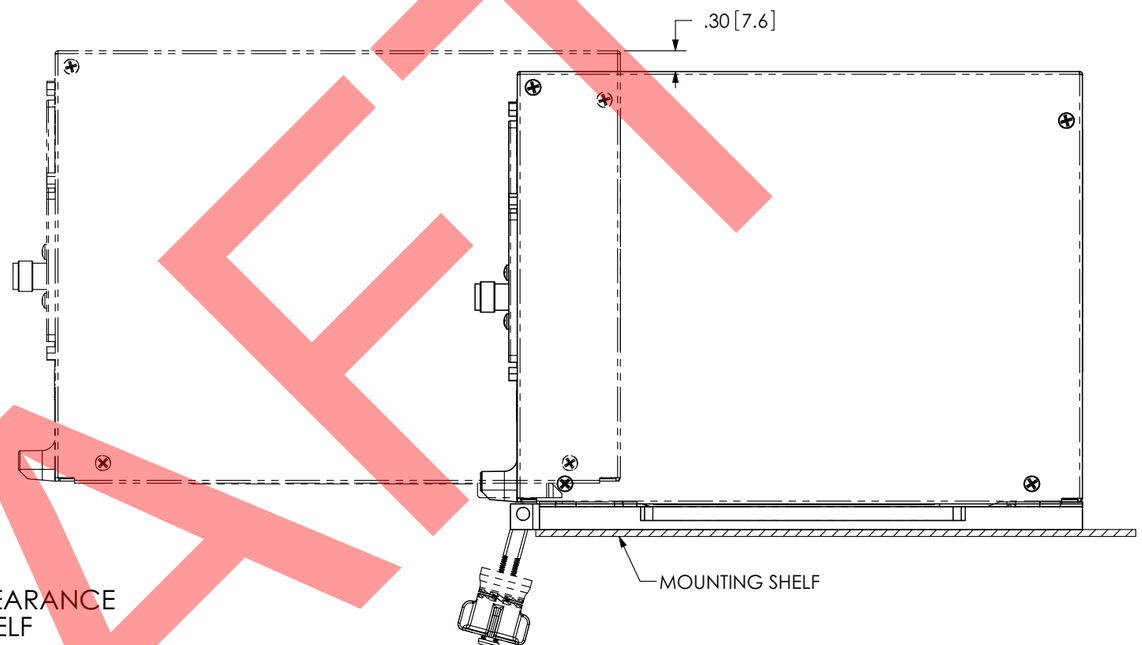
Figure A-1 GDR 66 Outline Drawing



NOTES:
1. GASKETS ARE PART OF 330-00776-44 AND 330-00776-62. INSTALL GASKETS OVER PINS.
2. REFER TO 190-00313-11 FOR ADDITIONAL PARTS LISTS.

Figure A-2 GDR 66 Connector/Rack Assembly Drawing

MINIMUM RECOMMENDED INSTALLATION AND REMOVAL CLEARANCE
WITH LOCKDOWN OVERHANGING MOUNTING SHELF



MINIMUM RECOMMENDED INSTALLATION AND REMOVAL CLEARANCE
WITH LOCKDOWN NOT OVERHANGING MOUNTING SHELF

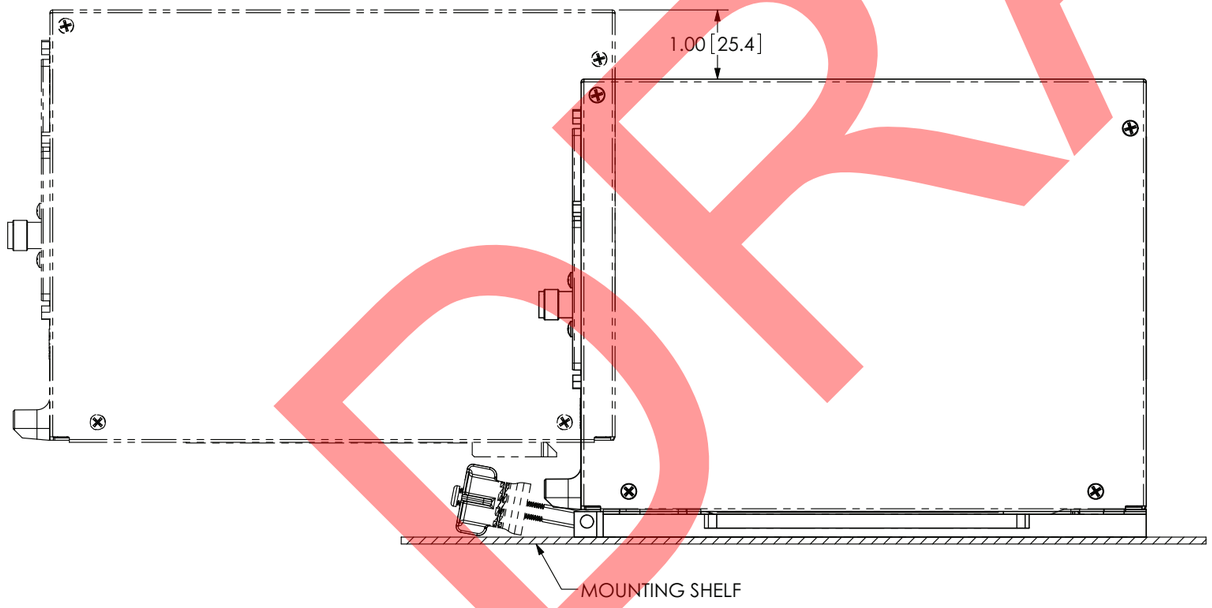
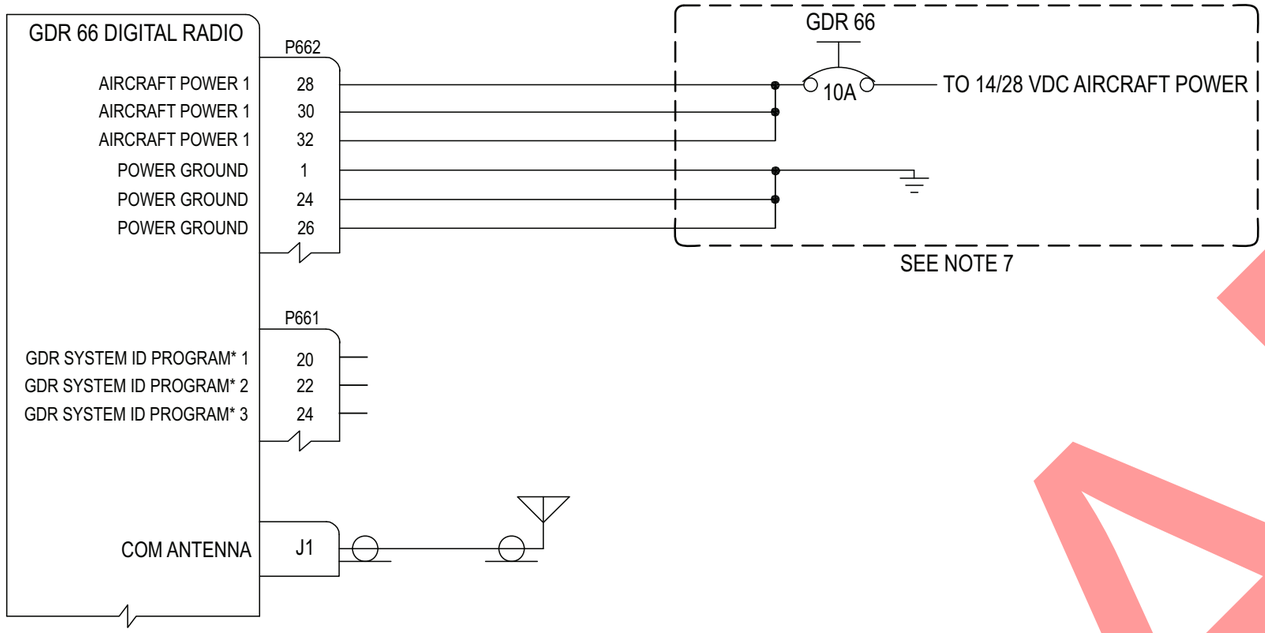
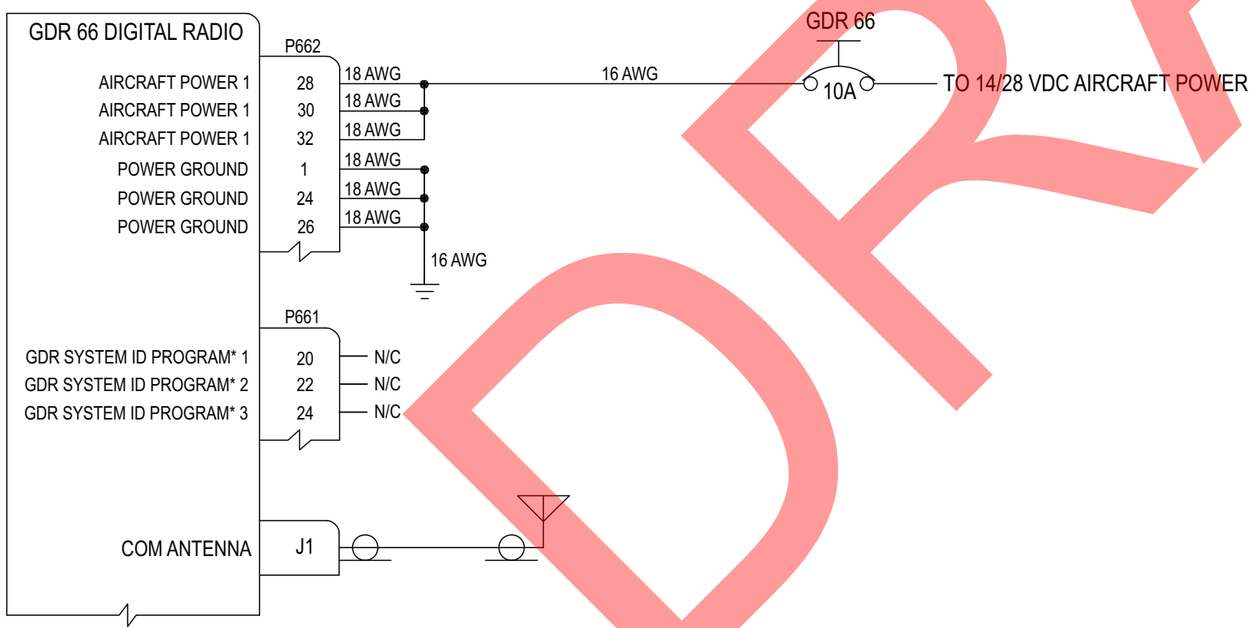


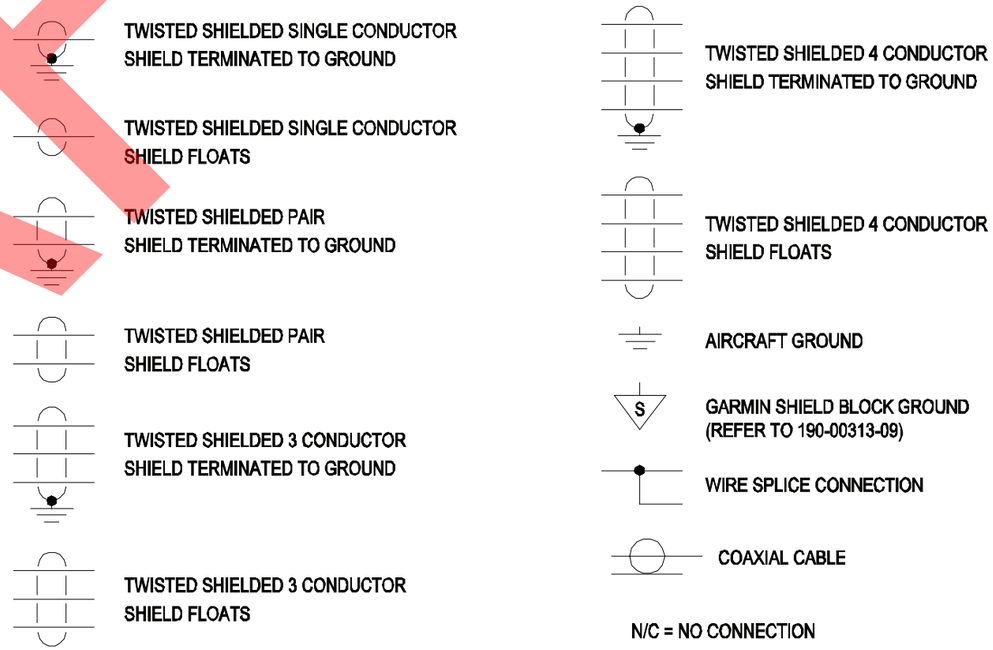
Figure A-3 GDR 66 Minimum Installation/Removal Clearance





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. TO MINIMIZE VHF DIGITAL TRANSMISSION INTERFERENCE (ACARS/CPDLC) WITH RECEPTION OF VHF VOICE COMMUNICATION, IT IS RECOMMEDED THAT GIA 63W -40 UNITS SHOULD BE USED IN ALL INSTALLATIONS USING A GDR 66.
7. GIA 63W -00 AND -01 UNITS CANNOT BE USED WITH THE GDR 66.

Figure B-1 GDR 66 Power and Antenna Interconnect Example

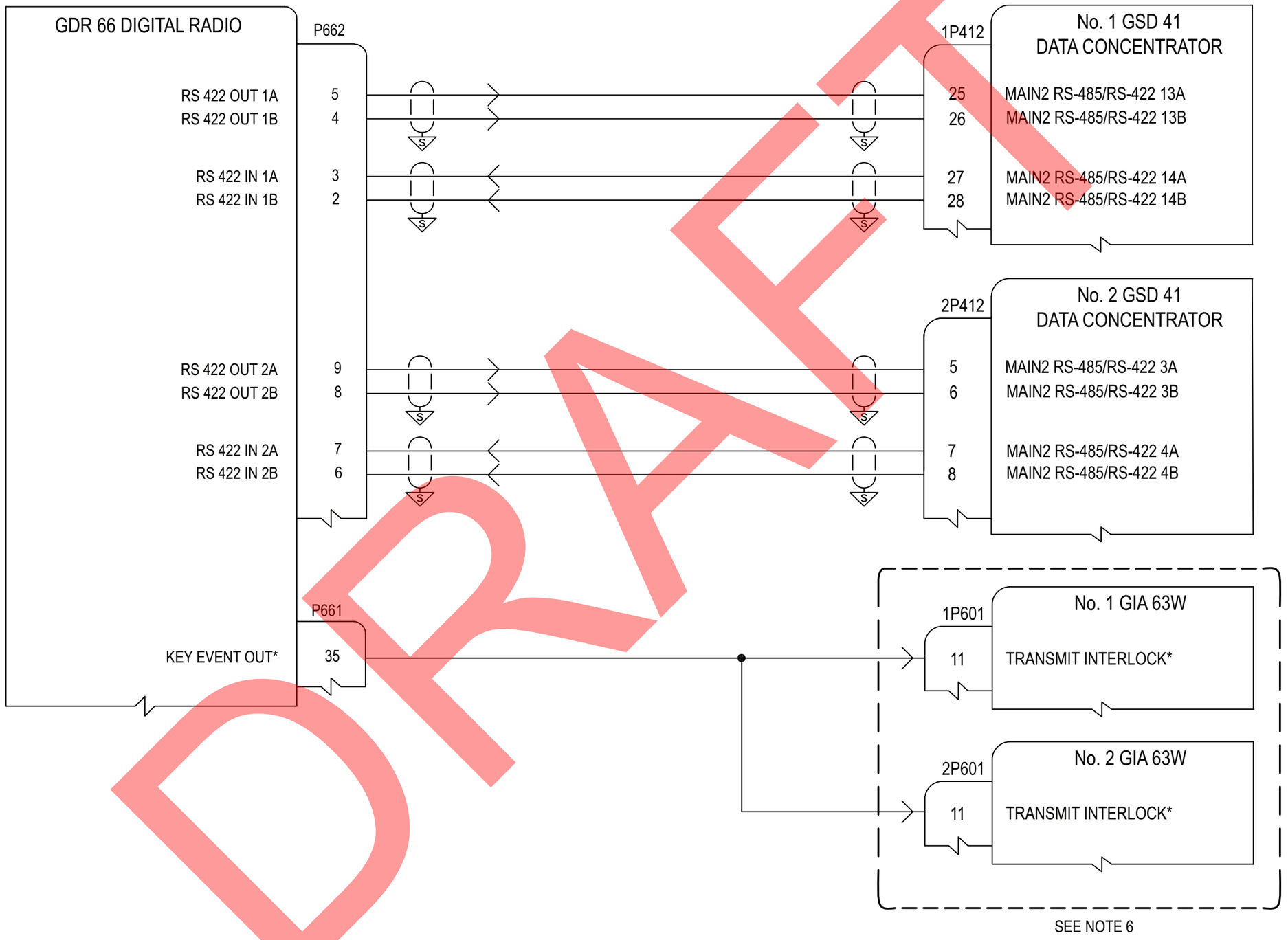


Figure B-2 GDR 66 VDL Mode 2 Interconnect Example

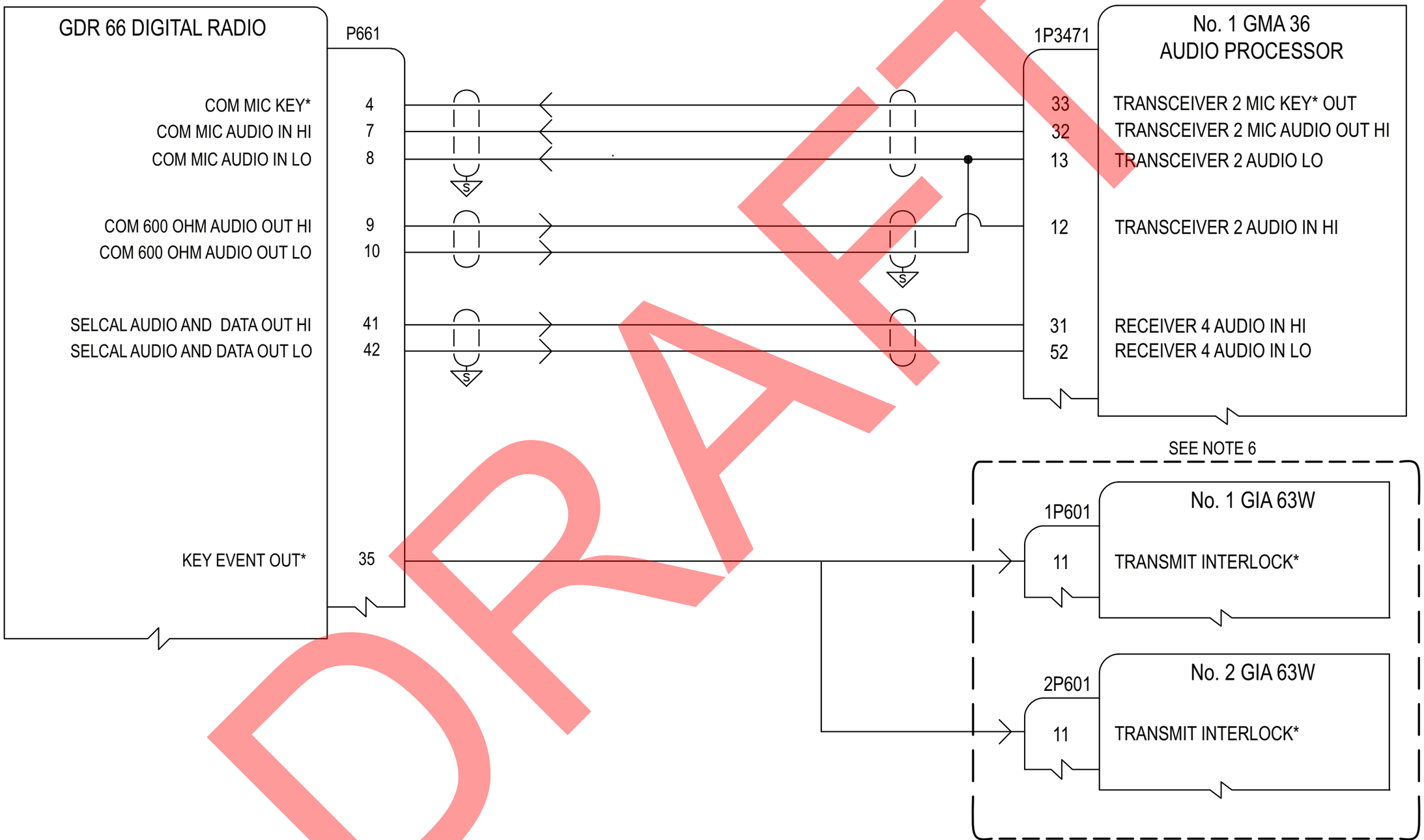


Figure B-3 GDR 66 Analog Voice Mode Interconnect Example