GARMIN

GTR 205/GNC 215
TSO Installation Manual

190-02766-01 January 2025 Revision 6

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Refer to Garmin's website for aviation product support.

Revision Record

REVISION	REVISION DATE	CHANGE DESCRIPTION
1	09/14/23	Initial release of document.
2	12/08/23	Added GTR 205 information.
3	01/23/24	Added software v2.10 functionality.
4	02/28/24	Added software v2.11 functionality.
5	06/03/24	Minor edits to document.
6	01/28/25	Added software v2.22 functionality.

Current Revision Change Description

Listed changes are marked by change bars in the manual.

SECTION	CHANGE DESCRIPTION
1.2.1	Added Bluetooth information. Also, added "CAN interfaces," "ICS/Audio," "Bluetooth media controls," and "Bluetooth phone controls" to features list.
1.2.2	Added "CAN interfaces," and "Intercom system" to features list.
1.4	Added "Recommended 25%" to 16W specification in table 1-4 "COM Transmitter Specifications."
1.4	Added "Speaker audio output" characteristic to table 1-5 COM Receiver Specifications."
4.9	Added information to step 8 of shield termination procedure.
4.9	Added "Configuration Module Assembly with Potted PCB" section.
5.1.1	Updated pin names in table 5-1 "GNC 215 Pins."
5.1.2	Updated pin connector image and pin names in table 5-2 "GTR 205 Pins."
5.2.4	Added "NMEA Format" section.
5.2.6	Added "Speaker Output" section.
5.2.9	Added "Pilot ICS Key*" section.
5.2.9	Added "Copilot ICS Key*" section.
5.2.14	Added "AUX Pins" section.
5.2.15	Added "CAN Bus Pins" section.
5.2.16	Added "Ethernet (HSDB) section.
5.2.17	Added "Headset Outputs" section.
5.2.18	Added "Discrete Outputs" section.
6	Updated figure 6-1 "GTR 205/GNC 215 System Configuration Map" to reflect software v2.22 functionality.
6.4	Updated figure 6-2 "Controls in Configuration Mode" for clarity.
6.4.1	Updated bulleted list in "SYS INFO" section to reflect v2.22 software functionality.
6.4.1	Updated figure 6-3 "SYS Info Page."
6.4.1	Updated figure 6-4 "SW Upload Page."
6.4.1	Added information the tail number is used as the file name when saving to an SD card.
6.4.1	Added definitions of red padlock and green padlock icons to "Enablement" section.
6.4.2	Added "Database," "ICS/Audio (GTR 205)," and "Intercom (GNC 215)" to bulleted list in section.
6.4.2	Added "Database" section.
6.4.2	Added "ICS/Audio (GTR 205)" section.
6.4.2	Added "Intercom (GNC 215)" section.
6.4.2	Added "COM Squelch Functionality," COM RX Squelch," and "COM Carrier Squelch" sections.
6.4.2	Updated figure 6-17 "COM Options Page."
6.4.2	Added "Filtered LOC/GS" selection to table 6-14 "NAV Page Selections."
6.4.3	Added "CAN Bus" to bulleted list in section.
6.4.3	Added "CAN Bus" section.
6.4.3	Added "Pilot ICS Key" and "Copilot ICS Key" to table 6-19 "Discrete In Selections."
6.4.5	Added "Test (GTR 205)" section.

SECTION	CHANGE DESCRIPTION
6.4.7	Added "Digital" and "Discrete" to table 6-22 "Diagnostics Selections."
6.4.7	Updated figure 6-29 "Diagnostics" page.
6.4.7	Rearranged "Digital" section to reflect software v2.22 functionality.
6.4.7	Rearranged "Discrete" section to reflect software v2.22 functionality.
6.6.1	Added "TX Interlock In*," "Pilot ICS Key*," and "Copilot ICS Key*" to table 6-23 "Discrete Input Pins."
9.2.2	Changed bytes from "25" to "100" in information under table 9-7 "Message Formats."
9.2.3	Added "Radial from Standby VOR" to table 9-8 "Message Definitions."
9.2.4	Added "Frequency Types" section.
9.2.4	Added "20" and "24" to definition for "ii" character of table 9-10 "Message Format (GNC NAV Requests)."
9.2.4	Added "10" to definition for "ii" character of table 9-11 "Message Format (GTR/GNC COM Requests)."
9.2.4	Rewrote second note in section for clarity.
9.2.4	Added note for character "n" in table 9-14 "COM Level and Audio Control Message Format."
9.2.4	Added "Remote Airport Identifier Name" section.
9.2.4	Added "Remote Airport Frequency Input" section.
9.2.4	Added "Set Active COM Frequency with Identifier" section.
9.2.4	Added "Set Standby COM Frequency with Identifier" section.
9.2.4	Added "Set COM Frequency Lookup Table Entry" section.
9.2.4	Added "Remove COM Frequency Lookup Table Entry" section.
9.2.4	Rewrote message example definition for clarity in table 9-23 "Active NAV Frequency Message Format."
9.2.4	Added "Remote VOR Input" section.
9.2.4	Added "Remote List Trailer" section.
9.2.4	Added "Remote Localizer List Header" section.
9.2.4	Added "Remote Localizer List Entry" section.
9.2.4	Added character "a" to table 9-28 "Standby NAV Frequency Message Format."
9.2.4	Rewrote "Set NAV Audio Mode" section for clarity.
9.2.4	Added character "a" to table 9-29 "NAV Audio Mode Message Format."
9.2.4	Rewrote last sentence of section for clarity.
9.2.4	Added "M" to character "p" in table 9-32 "NAV Keypad Input Message Format."
9.2.4	Rewrote character "s" description in table 9-33 "COM Transceiver Status Message Format" for clarity.
9.2.4	Changed character "h" in table 9-36 "GTR/GNC COM Message Format" to "'0' Reserved'."
9.2.4	Updated message example description in table 9-36 "GTR/GNC COM Message Format"
9.2.4	Updated message example and description in table 9-37 "Unit Display Information Message Format."
9.2.4	Added "Radial From Standby VOR" section.
9.2.4	Added character "s" to table 9-46 "NAV Receiver Status Message Format."
9.2.4	Added C04, C05, C15, C16, C17, C18, V20, V21, V22, and V23 to table 9-49 "Input Message Summary."
9.2.4	Added V24 to table 9-50 "Output Message Summary."

SECTION	CHANGE DESCRIPTION
10	Added information for helicopter installations in figure 10-4 “Mounting Rack Installation.”
11	Updated pin number for GNX 375 and added note 9 to figure 11-6 “GTR 205/GNC 215 GPS Interconnect.”
11	Updated NAV audio pin numbers for GMA 245 in figure 11-7 “Audio Panel Interconnect.”
11	Added note 15 to figure 11-8 “GTR 205/GNC 215 EFIS Interconnect.”
11	Added figure 11-9 “Switches Interconnect.”

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NOTE

Garmin recommends installation of the GTR 205 and GNC 215 by a Garmin authorized installer. To the extent allowable by law, Garmin will not be liable for damages resulting from improper or negligent installation. Refer to Garmin's website for aviation product support.

Acronyms

A	
AFM	Aircraft Flight Manual
ADF	Automatic Direction Finder
AGC	Automatic Gain Control
B	
BNC	Bayonet Neill-Concelman
C	
CAN	Controller Area Network
CDI	Course Deviation Indicator
CFR	Code of Federal Regulation
D	
DC	Direct Current
DDM	Difference in Depth of Modulation
DF	Direction Finder
E	
EAR	Export Administration Regulations
EFIS	Electronic Flight Instrument System
ELT	Emergency Locator Transmitter
ETSO	European Technical Standard Order
EQF	Environmental Qualification Form
F	
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
G	
GDU	Garmin Display Unit
GNC	Garmin NAV/COM
GNS	Garmin Navigation System
GPS	Global Positioning System
GS	Glideslope
GTN	Garmin Touchscreen Navigator
GTR	Garmin Transceiver Radio
H	
HSDB	High Speed Data Bus
I	
ICAO	International Civil Aviation Organization
ICS	Intercom System
ILS	Instrument Landing System

L	
LCD	Liquid Crystal Display
LOC	Localizer
LRU	Line Replaceable Unit
N	
NAVAID	Navigational Aid
NVIS	Night Vision Imaging System
O	
OBS	Omni-Bearing Selector
P	
P/N	Part Number
S	
SBAS	Satellite-Based Augmentation System
SD	Secure Digital (Card)
SDI	Source Destination Identification
T	
TNC	Threaded Neill-Concelman
TSO	Technical Standard Order
U	
UNICOM	Universal Communications
V	
VDI	Vertical Deviation Indicator
VLOC	VOR/Localizer
VOR	Very High Frequency Omni-directional Range
VSWR	Voltage Standing Wave Ratio

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1 Declaration of Design & Performance

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1.1 Introduction

The Declaration of Design and Performance section contains the definition and statement of compliance of the GTR 205 and GNC 215. The section is written in accordance with European Aviation Safety Agency (EASA) Commission Regulation (EU) No 748/2012 date 3 August 2012. Physical, mechanical, and electrical information for use in the planning and design of installations of the GTR/GNC into an aircraft is provided in this manual. It is not a substitute for an approved airframe-specific maintenance manual, installation design drawing, or complete installation data package. Attempting to install equipment by reference to this manual alone and without first planning or designing an installation specific to your aircraft is not recommended. The content of this manual assumes use by competent and qualified avionics engineering personnel and/or avionics installation specialists using standard aviation maintenance practices in accordance with Title 14 of the Code of Federal Regulations and other relevant accepted practices. Refer to section 2, for additional information and other considerations.

1.2 Equipment Description

The GTR 205 and GNC 215 units are 1.35" panel mounted NAV/COM products. Both feature a high-resolution LCD display, dual encoder knob, and a microSD card slot. Unless specified otherwise, GTR/GNC refers to the GTR 205 and GNC 215.

Table 1-1 Models Available

Model	P/N	NAV Receiver	TX Power (Watt) [1]	8.33 kHz Spacing	25 kHz Spacing	NVIS [2]
GTR 205	011-05287-00	No	10	Yes	Yes	Yes
GNC 215	011-05289-00	Yes	10	Yes	Yes	Yes

[1] 16W requires software enablement card.

[2] NVIS requires software enablement card.

1.2.1 GTR 205

The GTR 205 has a COM transceiver with 10W COM transmit power. A software enablement is available to allow for NVIS and 16W COM transmit power. The COM radio has pilot-controlled options of 8.33 kHz or 25 kHz channel spacing. Built-in Bluetooth® wireless technology allows pairing up to eight Bluetooth-enabled devices. Only one active device connection is permitted at a time.

Features

- HSDB interfaces
- RS-232 interfaces
- Reverse frequency lookup
- CAN interfaces
- ICS/Audio
- Bluetooth media controls
- Bluetooth phone controls

1.2.2 GNC 215

The GNC 215 has a COM transceiver with 10W COM transmit power and a NAV receiver. A software enablement is available to allow for NVIS and 16W COM transmit power. The COM radio has pilot-controlled options of 8.33 and 25 kHz channel spacing. The GNC 215 displays VLOC data including CDI and, when coupled with a GPS navigator, distance to the active NAVAID. A summary of system functions are listed in table 1-11.

Features

- HSDB interfaces
- ARINC 429 interfaces
- RS-232 interfaces
- Reverse frequency lookup
- CAN interfaces
- Intercom system

1.3 General Specifications

Table 1-2 Physical Specifications

Characteristics	Specifications
Bezel height	1.35" (34.29 mm)
Bezel width	6.25" (158.8 mm)
Rack height (dimple-to-dimple)	1.375" (34.93 mm)
Rack width	6.30" (160 mm)
Depth behind panel with connectors (measured from face of aircraft panel to rear of connector backshells)	10.32" (262.1 mm)
GTR 205 weight (unit only)	2.2 lbs. (1.0 kg)
GTR 205 installed with rack and connectors	2.8 lbs. (1.4 kg)
GNC 215 weight (unit only)	2.3 lbs. (1.0 kg)
GNC 215 installed with rack and connectors	3.1 lbs. (1.4 kg)
Operating temperature range	-20°C to +55°C For more details refer to the environmental qualification forms at Garmin's Dealer Resource Center. Refer to section 8 for EQF part numbers.
Humidity	95% non-condensing
Altitude range	-1,500 ft to 55,000 ft
Input voltage range (main connector)	9 to 33 VDC
Current draw	Refer to table 1-9.
Superflag power requirements (GNC 215)	320 mA maximum per superflag output
Environmental testing	For more details refer to the environmental qualification forms at Garmin's Dealer Resource Center. Refer section 8 for EQF part numbers.

Table 1-3 Display Specifications

Characteristics	Specifications
Display size	3.2" diagonal
Active area	Width: 3.06" (77.76 mm) Height: 0.79" (20.0 mm)
Resolution	480 x 124 pixels
Viewing angles (Direction of pilot's viewing angle)	Left: 45° Right: 45° From Top: 30° From Bottom: 10°

1.4 COM Specifications

Table 1-4 COM Transmitter Specifications

Characteristics	Specifications
Classes	4, 6, 3, 5
Microphone input	Two inputs, standard carbon or dynamic mic with integrated preamp providing minimum 70 mVRMS into 600 Ω load.
Modulation capability	Nominal 90% with 40 to 1500 mVRMS microphone input at 1000 Hz
Modulation	AM double sided Emission designator: 6K00A3E (118 - 136.975 MHz) 5K60A3E (118 - 136.992 MHz)
Frequency range	118.000 to 136.975 MHz, 25 kHz channel spacing 118.000 to 136.992 MHz, 8.33 kHz channel spacing
Frequency tolerance	±2 ppm from -40°C to +70°C
Output power	10 watt mode: 10 watts minimum 16 watt mode: 16 watts minimum
Duty cycle	10 W: 100% 16 W: Recommended 25% (5 seconds on/15 seconds off, 15 seconds on/45 seconds off, etc.)
Carrier noise level	At least 35 dB (SNR)
Stuck mic time-out	30 seconds time-out, reverts to receive
Demodulated audio distortion	Less than 5% distortion when the transmitter is at 90% modulation at 350 to 2500 Hz.

Table 1-5 COM Receiver Specifications

Characteristics	Specifications
Classes	C, E, H1, and H2
Frequency range	118.000 to 136.975 MHz, 25 kHz channel spacing 118.000 to 136.992 MHz, 8.33 kHz channel spacing
Headset audio output	Up to 65 mW into a 500 Ω load.
Speaker audio output	Up to 12 W into a 4 Ω load.
Audio response	Less than 6 dB of variation between 350 Hz and 2500 Hz.
Audio distortion	Less than 12% at rated output power.
AGC characteristics	Less than 3 dB of variation in the audio output from -93 to -13 dBm (power absorbed by a 50 Ω load).
Sensitivity	SINAD on all channels is greater than 6 dB when the RF level is -107 dBm (power absorbed by a 50 Ω load) modulated 30% at 1000 Hz at rated audio output power.
Squelch	Automatic squelch with manual override.
Selectivity	6 dB BW is greater than ±8 kHz for 25 kHz channeling. 60 dB BW is less than ±25 kHz for 25 kHz channeling. 6 dB BW is greater than ±2.78 kHz for 8.33 kHz channeling. 60 dB BW is less than ±7.37 kHz for 8.33 kHz channeling.

1.5 VOR Specifications (GNC 215)

Table 1-6 VOR Specifications

Characteristics	Specifications
Receiver audio sensitivity	At -103.5 dBm (S+N)/N is not less than 6 dB.
Bearing accuracy	-103.5 dBm or less for ± 2.0 degrees of bearing error.
Flag	The VOR course deviation flag indicates in the event of any of the following conditions: • Level of a standard VOR deviation signal produces less than 50% of standard deflection • RF signals are absent • The 9960 Hz modulation is absent • Either one of the two 30 Hz modulations are absent
AGC characteristics	From -99 dBm to -13 dBm input of a Standard Audio Test Signal, audio output level does not vary more than 3 dB.
Spurious response	Greater than 60 dB
VOR bearing accuracy	The bearing information as presented to the pilot does not have an error in excess of 2.7° with 99.7% probability.
Audio output	Up to 65 mW into a 500 Ω load.
Audio response	Less than 6 dB of variation between 350 and 2500 Hz. In voice mode, an IDENT tone of 1020 Hz is attenuated at least 20 dB.
Audio distortion	Less than 10% at all audio output levels up to 65 mW.
FM immunity	Meets FM interference immunity performance requirements of ICAO annex 10, volume I, paragraph 3.3.8.

1.6 LOC Specifications (GNC 215)

Table 1-7 LOC Specifications

Characteristics	Specifications
Receiver audio sensitivity	At -103.5 dBm (S+N)/N is not less than 6 dB.
Course deviation sensitivity	At -103.5 dBm, deviation output is not to be less than 60% of standard deflection when a LOC deviation test signal is applied.
Flag	The LOC course deviation flag indicates in the event of any of the following conditions: • Level of a standard LOC deviation test signal produces 50% or less of standard deflection of the deviation indicator • 150 Hz modulation is absent • 90 Hz modulation is absent • 90 Hz and 150 Hz modulation are both absent • RF signals are absent
AGC characteristics	From -99 dBm to -13 dBm input of a Standard Audio Test Signal, audio output level does not vary more than 3 dB.
Selectivity	6 dB BW is greater than ±15 kHz 43 dB BW is less than ±50 kHz
Standard deflection	With a standard deflection FLY LEFT condition (150 Hz dominant), the output is +90 mV ± 9 mV. With a standard deflection FLY RIGHT condition (90 Hz dominant), the output is -90 mV ± 9 mV.
Spurious response	Greater than 60 dB.
Centering accuracy	0 ±0.01023 DDM or 0 ±9.9 mV
Audio output	Up to 65 mW into a 500 Ω load
Audio response	Less than 6 dB of variation between 350 and 2500 Hz. In voice mode, an IDENT tone of 1020 Hz is attenuated at least 20 dB.
Audio distortion	Less than 10% at all audio output levels up to 65 mW.
FM immunity	Meets FM interference immunity performance requirements of ICAO annex 10, volume I, paragraph 3.1.4.

1.7 Glideslope Specifications (GNC 215)

Table 1-8 Glideslope Specifications

Characteristic	Specifications
Sensitivity	-87 dBm or less for 60% of standard deflection.
Centering accuracy	0 ±0.01183 ddm or 0 ±10.14 mV
Selectivity	6 dB BW is greater than ±17 kHz 60 dB BW is less than ±126.33 kHz
Standard deflection	With a standard deflection FLY DOWN condition (90 Hz dominant), the output is -78 mV ±7.8 mV. With a standard deflection FLY UP condition (150 Hz dominant), the output is +78 mV ±7.8 mV.
Flag	The vertical deviation flag indicates in the event of any of the following conditions: • Level of a standard glideslope deviation test signal produces 50% or less of standard deflection of the deviation indicator • 150 Hz modulation is absent • 90 Hz modulation is absent • 90 Hz and 150 Hz modulations are both absent • RF signals are absent
Spurious response	Greater than 60 dB.

1.8 Current Draw Specifications

Table 1-9 Current Draw Specifications

LRU	TX Power Level	14 Volt Current Draw		28 Volt Current Draw	
		Typical [1]	Maximum	Typical [1]	Maximum
GTR 205	10 W	0.84 A	3.62 A	0.44 A	1.73 A
	16 W		4.98 A		2.20 A
GNC 215	10 W	1.26 A	3.83 A [2]	0.65 A	1.82 A [2]
	16 W		5.22 A [2]		2.31 A [2]

[1] The specified current draw is with the display backlight set to 100%.

[2] If superflags are connected, their current draw must be added in addition to the specified current. The superflags supply up to 320 mA each regardless of the input voltage.

1.9 License Requirements

CAUTION

THE VHF TRANSMITTER IN THIS EQUIPMENT IS GUARANTEED TO MEET FCC ACCEPTANCE OVER THE OPERATING TEMPERATURE RANGE. MODIFICATIONS NOT EXPRESSLY APPROVED BY GARMIN COULD INVALIDATE THE LICENSE AND MAKE IT UNLAWFUL TO OPERATE THE EQUIPMENT.

The Telecommunications Act of 1996, effective February 8, 1996, provides the FCC discretion to eliminate radio station license requirements for aircraft and ships. Unit installations must obey current transmitter licensing requirements.

In the US, visit the FCC website https://www.fcc.gov/wireless/bureau-divisions/mobility-division/aviation-radio-services to find out the specific details on whether a particular installation is exempt from licensing.

If an aircraft license is necessary, apply for a license using FCC Form 605, *Quick-Form Application for Authorization in the Ship, Aircraft, Amateur, Restricted and Commercial Operator, and General Mobile Radio Services*. The FCC also has a fax-on-demand service to supply forms by fax. If outside of the US, contact the responsible telecommunication authority. The owner of the GTR/GNC accepts all responsibility for obtaining the proper licensing before using the transceiver. The maximum transmitting power, modulation identification, and frequency band information may be required for licensing and are detailed in table 1-4.

1.10 Certification

The GTR/GNC has been shown to meet compliance with the claimed TSO(s) when interfaced with the equipment defined in this installation manual, and installed in accordance with the requirements and limitations as defined in this installation manual.

The conditions and tests required for approval of this article are minimum performance standards. Those installing this article either on or within a specific type or class of aircraft must determine that the aircraft installation conditions are within the standards which include any accepted integrated functions not specified by the standards. TSO articles, articles approved with 14 CFR 21.8(d), and any accepted integrated function(s) not specified in the standards, must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR part 43 or the applicable airworthiness requirements. This is an incomplete system intended to provide the functions in table 1-10, and when installed according to the installation manual.

The installer must verify that non-Garmin devices to be interfaced meet the installation requirements identified in this manual to assure the installed system will comply with the Garmin TSO/ETSO Authorization. Garmin installation requirements will usually specify that the interfaced device has appropriate TSO/ETSO authorization, and in some cases, such as for TSO-C144 antennas, may also require that the non-Garmin device meet additional Garmin specifications.

The Appliance Project Identifier (API) for the GTR/GNC is GMN-02481. The API is used for project identification with the FAA.

Table 1-10 TSO/ETSO Compliance

GTR 205	GNC 215	Function	TSO and ETSO	Class/Type	Applicable SW P/Ns
	✓	ILS Glide Slope Receiving Equipment Operating Within the Radio Frequency Range of 328.6-335.4 MHz	TSO-C34e ETSO-2C34f		006-B3895-0( ) Boot Loader 006-B3896-0( ) Application
	✓	Airborne ILS Localizer Receiving Equipment Operating Within the Radio Frequency Range of 108-112 MHz	TSO-C36e ETSO-2C36f	A	006-B3895-0( ) Boot Loader 006-B3896-0( ) Application
	✓	VOR Radio Receiving Equipment Operating Within the Radio Frequency Range of 108-117.95 MHz	TSO-C40c ETSO-2C40c		006-B3895-0( ) Boot Loader 006-B3896-0( ) Application
✓	✓	Equipment That Prevents Blocked Channels Used in Two-Way Radio Communications Due to Unintentional Transmissions	TSO-C128a ETSO-2C128		006-B3895-0( ) Boot Loader 006-B3896-0( ) Application
✓	✓	VHF Radio Communications Transceiver Equipment Operating Within Radio Frequency Range 117.975 to 137.000 MHz	TSO-C169a ETSO-2C169a	C, E, H1 [1], H2 [2], 4, 6, 3, 5	006-B3895-0( ) Boot Loader 006-B3896-0( ) Application

[1] H1 is applicable only to ETSO-2C169a.

[2] H2 is applicable only to ETSO-2C169a.

Table 1-11 System Functions

System Function	DO-178B Level
VHF communication	C
VOR/ILS navigation (GNC 215)	C
Navigation station Morse code identifier (GNC 215)	C
DME tuning (GNC 215)	C
Pilot audio control	C
Flight timer	C
Frequency information display	C
Utilization of database	C
NVIS compatibility	C

1.10.1 Non-TSO Functions

There are no non-TSO functions.

1.10.2 TSO Deviations

Table 1-12 Standard TSO/ETSO Deviations

TSO/ETSO	Deviation
All TSOs	1. Garmin was granted a deviation from the TSO to use RTCA DO-178B as the standard for Software Qualification.
	2. Garmin was granted a deviation from the TSO to use RTCA DO-160G as the standard for Environmental Qualification and Test Procedures of Airborne Equipment.
All TSOs/ETSOs	1. Garmin was granted a deviation from the TSO and ETSO to include only product name, part number, serial number, and a statement "TSO-C169a, ETSO-2C169a. See IM for Add'l Approvals" on the exterior of the unit.

Table 1-13 TSO/ETSO Deviations

TSO/ETSO	Deviation
ETSO-2C36f	1. Garmin was granted a deviation from ETSO-2C36f to use ED-46B amendment 2 in addition to ED-46B with amendment 1.
ETSO-2C40c	1. Garmin was granted a deviation from EUROCAE ED-22B section 5.2.9 to use the deflection response limits of 0.5 to 2.7 seconds instead of 0.5 to 2 seconds.
TSO-C169a	1. Garmin was granted a deviation from RTCA/DO-186B paragraph 2.4.7 to interpret Waterproofness testing as "When Required."
	2. Garmin was granted a deviation from RTCA/DO-186B paragraphs 2.4.8 and 2.5.8 to interpret Fluids Susceptibility testing as "When Required."

1.10.3 FCC Grant of Equipment Authorization

Table 1-14 FCC Grant of Equipment Authorization

Model	FCC ID	IC ID
GTR 205	IPH-04074 CONTAINS FCC ID: 2ADHKBM83SM1	1312A-04074 CONTAINS IC: 20266-BM83SM1
GNC 215	IPH-04075	1312A-04075

1.11 GTR/GNC Database

The GTR/GNC has a database of frequencies for airports and VORs. Users update the frequency database by purchasing database subscription updates from Garmin or Jeppesen. The frequency database is stored internally and uses a micro-SD card to transfer the database into the unit. Refer to the applicable GTR/GNC pilot's guide or go to flyGarmin.com for more information and instructions. Contact Jeppesen at (866) 498-0213 or www.jeppesen.com.

Garmin requests that the flight crew report any observed discrepancies related to database information. These discrepancies can come in the form of an incorrect frequency, incorrectly identified airport, VOR, or other station, or any other displayed item used for navigation or communication in the air or on the ground. Go to flyGarmin.com to report database errors.

For information on certification compliance of databases, refer to "RTCA DO-200A/B List of Applicable Avionics Systems" at flyGarmin.com.

2 Limitations

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2.1.1 Filtered LOC/GS Output (GNC 215)....2-1
2.2 Aircraft Radio....2-1

2.1 Installation

To mitigate against the loss of navigation and communication, installation of a second navigation and/or communication system may be required.

The unit does not claim waterproofness or fluids susceptibility on the EQF. As a result, the unit must not be installed in areas where water or fluid contamination could be commonly encountered.

2.1.1 Filtered LOC/GS Output (GNC 215)

Use the Filtered LOC/GS output when interference, such as rotor modulation, causes the LOC/GS deviation to undesirably oscillate. The filtering should smooth oscillations caused by interference. If the Filtered LOC/GS output is used, the GNC does not meet the course deviation current response requirements of TSO-C34e, TSO-C36e, ETSO-2C34f, and ETSO-2C36f.

2.2 Aircraft Radio

An aircraft radio station license is not required when operating in U.S. airspace, but may be required when operating internationally.

As required by TSO-C169a, the quantitative safety objective for the VHF COM radio in the unit is 1×10^{-4} per flight hour for Class I Part 23 airplanes, and 1×10^{-5} per flight hour for all other Part 23 and Part 27 aircraft. To meet requirements for Part 23 Class II, Class III and Class IV, and Part 27 aircraft, it may be necessary to install a second VHF communications radio.

3 Installation Overview

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3.1 Introduction

Always follow acceptable avionics installation practices per AC 43.13-1B, AC 43.13-2B, or later FAA approved revisions of these documents. The communications installation instructions have been prepared to meet the guidance material defined by AC 20-67B, *Airborne VHF Communications Equipment Installations*.

3.2 Antenna Considerations

Considerations for the mounting location of the antennas required for the GTR/GNC are provided in this section. For mounting the COM and NAV antennas, refer to the aircraft manufacturer's data.

3.2.1 COM Antenna Location

NOTE

Canadian installations are required to meet Industry Canada specifications for maximum radiation as documented in Radio Specifications Standard 102 (RSS-102). For more information about RF exposure and related Canadian regulatory compliance, contact:

Manager, Radio Equipment Standards
Industry Canada
365 Laurier Avenue
Ottawa, Ontario
K1A 0C8

In accordance with Canadian Radio Specifications Standard 102 (RSS 102), RF field strength exposure to persons from an antenna connected to this device should be limited to 51 V/m for controlled environment and 22 V/m for uncontrolled environment.

NOTE

The COM transceiver antenna(s) of the device is (are) intended to be mounted along the fuselage of the aircraft and accessible only to aircraft maintenance personnel. To reduce RF exposure, avoid installation of antenna(s) in areas of the aircraft that provide crew or passengers direct exposure to antenna radiation. For installations that may provide direct exposure, the limits specified by FCC regulations 47 CFR 1.1310 should be referenced by the installer.

The COM antenna should be installed away 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" square, minimum). The antenna should be mounted a minimum of six feet from any DME or other COM antennas, and four feet from any ADF sense antennas. The COM antenna should also be mounted as far apart as practical from the ELT antenna. Some ELTs have exhibited re-radiation problems that cause interference with other radios, including GPS. This can happen when the COM is transmitting on certain frequencies such as 121.15 or 121.175 MHz, that may cause the ELT output circuit to oscillate from the signal coming in on the ELT antenna coax.

If simultaneous use of two COM transceivers is desired (split-COM or simul-COM), the COM antennas should be spaced for maximum isolation. A configuration of one topside antenna and one bottom side antenna is recommended. In installations with minimal COM to COM antenna isolation, interference may be observed during split COM operations. Using the transmit interlock may be necessary in such installations to prevent interference during simultaneous operation.

3.2.2 Interference of GPS

On some installations, VHF COM transceivers, ELT antennas, and DF receiver antennas can re-radiate through the GPS antenna. Placement of the GPS antenna relative to a COM transceiver and COM antenna (including the unit COM antenna), ELT antenna, and DF receiver antenna is critical.

Use the following guidelines, in addition to others in this document, when locating the GTR/GNC and its antennas.

- Locate the unit as far as possible from all GPS antennas
- Locate the COM antenna as far as possible from all GPS antennas

If a COM antenna is found to be the problem, a 1.57542 GHz notch filter (refer to table 4-4) may be installed in the VHF COM coax, as close to the COM as possible. This filter is not required for the GTR/GNC transmitter.

If a COM is found to be radiating, the following can be done:

- Replace or clean VHF COM rack connector to ensure good coax ground
- Place a grounding brace between the GTR/GNC, VHF COM, and ground
- Shield the VHF COM wiring harness

3.3 Mounting Considerations

The unit is designed to mount in the avionics stack in the aircraft instrument panel within view and reach of the pilot. The primary unit location should minimize pilot head movement when transitioning between looking outside of the cockpit and viewing/operating the unit. The location should be such that the unit is not blocked by the glare shield on top, or by the throttles, control yoke, etc., on the bottom. If aircraft has a throw-over yoke, be sure the yoke does not interfere with the unit.

3.4 Cabling and Wiring Considerations

NOTE

Pigtail lengths should be less than 3.0". Wiring which is required to be shielded must be shielded per section 11.

Wiring should be installed in accordance with AC 43.13-1B Chapter 11. For dual unit installations, care should be taken to ensure separation between wires of redundant systems to reduce the possibility of loss of navigation due to a single event. When wire separation cannot be achieved, the following issues should be addressed:.

- It should not be possible for a cable harness to be exposed to wire chafing in a manner that both units fail simultaneously;
- The cable harness should not be located near flight control cables and controls, high voltage lines or fuel lines;
- The cable harness should be located in a protected area of the aircraft (e.g., isolated from engine rotor burst); and
- Do not route cable near high voltage sources.

Refer to section 4.4.2 and section 4.5 for connector and tooling information.

Refer to section 4.6 for recommended coax cable.

Refer to section 11 for the appropriate wiring connections to assemble the wiring connector.

Once the cable assemblies have been made, attach the cable connectors to the rear connector plate. After installing the mounting tube, attach the assembled connector plate. Route the wiring bundle as appropriate. Use 22 or 24 AWG wire for all connections. For power and ground, use the wire gauge specified in the interconnect drawing, then 22 AWG for the short length from the splice to the connector. Avoid sharp bends.

3.5 Air Circulation and Cooling

The unit meets all requirements without external cooling. However, as with all electronic equipment, lower operating temperatures extend equipment life.

Units packed tightly in the avionics stack heat each other through radiation, convection, and sometimes by direct conduction. Even a single unit operates at a much higher temperature in still air than in moving air.

3.6 Compass Safe Distance

After reconfiguring the avionics in the cockpit panel, if the unit is mounted less than twelve inches from the compass, recalibrate the compass and make the necessary changes for noting correction data.

4 Installation Procedures

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4.1 Unit and Accessories

For description of units refer to table 1-1.

Table 4-1 Catalog P/Ns

Model	Unit P/N	Unit Only Kit	Standard Kit	Helicopter Standard Kit
GTR 205	011-05287-00	010-02480-00	010-02480-01	010-02480-02
GNC 215	011-05289-00	010-02481-00	010-02481-01	010-02481-02

Table 4-2 Standard Kit Accessories

Model	Item	P/N
GTR 205	Configuration module kit	011-00979-03
	Connector kit	011-05779-10
	Backplate assembly	011-05691-00 [1] 011-05691-01 [2]
	Mounting rack	115-03651-00 [2] 115-04497-00
	Product information kit	K00-01298-00
GNC 215	Configuration module kit	011-00979-03
	Connector kit	011-05779-10
	Backplate assembly	011-05691-10 [1] 011-05691-11 [2]
	Mounting rack	115-03651-00 [2] 115-04497-00
	Product information kit	K00-01298-00

[1] Included in non-helicopter standard kits.

[2] Included in helicopter standard kits.

Table 4-3 Replaceable Parts

Item	P/N
Knob replacement kit	K00-01439-00

4.2 Miscellaneous Options

Table 4-4 Miscellaneous Options

Item	Garmin P/N	Manufacturer P/N
GPS 1.57542 GHz notch filter	330-00067-00	N/A
Connector, TNC, straight, crimp	N/A	031-4452 [1]

[1] This part is not available from Garmin.

Vendor Contact Information (provided for convenience only):

Amphenol RF, Four Old Newtown Road, Danbury, CT 06810 Phone: (800) 627-7100

4.3 Reference Documents

Table 4-5 Federal Aviation Administration Documents

DOCUMENT	P/N
Advisory Circular, Airworthiness Approval of Positioning and Navigation Systems	AC 20-138D
FAA Advisory Circular,Acceptable Methods, Techniques, and Practices - Aircraft Alterations	AC 43.13-2B
FAA Advisory Circular, Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair	AC 43.13-1B
FAA Advisory Circular, Development Assurance for Airborne Electronic Hardware	AC 20-152A
FAA Advisory Circular, System Safety Analysis and Assessment for Part 23 Airplanes	AC 23.1309-1E
FAA Advisory Circular, System Design and Analysis	AC 25.1309-1B
FAA Advisory Circular, Certification of Normal Category Rotorcraft	AC 27-1B

Table 4-6 Industry Standards

DOCUMENT	P/N
Guidelines for Conducting the Safety Assessment Process on Civil Aircraft, Systems, and Equipment	SAE ARP4761A
Design Assurance Guidance For Airborne Electronic Hardware	RTCA/DO-254
Software Considerations in Airborne Systems and Equipment Certification	RTCA/DO-178B

Table 4-7 Optional Reference Material

DOCUMENT	P/N
GTR 205/GNC 215 Pilot's Guide	190-02766-02

4.4 Installation Materials Required but Not Supplied

4.4.1 Accessories Required but Not Supplied

Table 4-8 Accessories Required but Not Supplied

Item	Requirements
COM antenna	• Meets TSO-C37( ) and -C38( ) or TSO-C169( ) • 50 Ω, vertically polarized with coaxial cable
NAV antenna	Meets TSO-C40( ) and C36( ). 50 Ω, horizontally polarized with coaxial cable If the NAV antenna is a combined VOR/LOC/GS antenna, it must meet TSO-C40( ), -C36( ), and -C34( )
Glideslope antenna	Meets TSO-C34( ). 50 Ω, horizontally polarized with coaxial cable or low-loss splitter used with the VOR/LOC antenna
Headphones	500 Ω nominal impedance
Microphone	Low impedance, carbon or dynamic, with transistorized pre-amp

4.4.2 Materials Required but Not Supplied (New Installations Only)

The GTR/GNC is intended for use with the standard aviation accessories. The following items are required for installation, but not supplied.

- Wire (MIL-W-22759/16 or equivalent)
- Shielded wire (MIL-C-27500 or equivalent)
- Hardware
    - #6-32 x 100° flat head SS screw (MS24693, AN507R or other approved fastener (6 ea.))
    - #6-32 self-locking nut (MS21042 or other approved fastener (6 ea.))
    - #8-32 x .312" screw, PHP, stainless or cadmium plated steel
    - #8 split washer, (.045" compressed thickness) stainless or cadmium plated steel
    - #8 -.032" Flat washer, thick, .174" ID, .375" OD, stainless or cadmium plated steel
- Push/pull (manually resettable) circuit breakers
- Tie wraps or lacing cord
- Ring terminals (for grounding)
- Coaxial cable (RG-400, RG-142B or equivalent. Refer to section 4.8 for additional information)
- Aircraft grade category 5 Ethernet cable (required only if HSDB interface is used)
- Shield terminator
- Silicone fusion tape

4.5 Special Tools Required

NOTE

Insertion/extraction tools from ITT Cannon are all plastic; others are plastic with metal tip.

Some of the connectors use crimp contacts. The table below identifies crimp tools required to ensure consistent, reliable crimp contact connections for the rear D-sub connectors.

Table 4-9 Recommended Crimp Tools (or Equivalent)

Manufacturer	Hand Crimping Tool	22 – 28 AWG (P1)	
		Positioner	Insertion/ Extraction Tool
Military P/N	M22520/2-01	M22520/2-09	M81969/14-01 M81969/1-04
Positronic	9507-0-0-0	9502-4-0-0	M81969/1-04
ITT Cannon	995-0001-584	995-0001-739	000849490 274-7048-000MIL
AMP	601966-1	601966-6	91067-1 2031838-1
Daniels	AFM8	K42	M81969/14-01 M81969/1-04
Astro	615717	615725	M81969/14-01 M81969/1-04

Table 4-10 Socket Contact P/Ns

Wire Gauge	P1
	22-28 AWG
Garmin P/N	336-00021-00
Military P/N	M39029/58-360 [1]

[1] Non-Garmin part numbers shown are not maintained by Garmin and are subject to change without notice.

4.6 Coaxial Cable Installation

Follow the steps below to install coaxial cables.

1. Route the coaxial cable to the radio rack location considering the recommendations listed in section 3.2.
2. Secure the cable in accordance with AC 43.13-1B chapter 11, section 11.
3. Trim the coaxial cable to the desired length.
4. Install the coaxial connectors per the manufacturer's instructions.

4.7 Equipment Mounting

CAUTION

THE APPLICATION OF HEX DRIVE TOOL TORQUE EXCEEDING 15 IN-LBS CAN DAMAGE THE LOCKING MECHANISM.

NOTE

Prior to placing the unit in the rack, in order to ensure correct position of the retention mechanism, it may be necessary to insert the hex drive tool into the access hole and turn the drive tool counterclockwise until it completely stops.

4.7.1 Installation

Panel Mount

Use the dimensions shown in figure 10-1 to prepare the mounting holes for the GTR/GNC. The mounting rack may be used as a template for drilling the mounting holes.

1. Install the rack in a rectangular 6.32" x 1.40" hole (or gap between units) in the instrument panel. The lower-front lip of the rack should be flush with, or extend slightly beyond, the finished aircraft panel.

NOTE

Rack deformations will hinder unit installation and removal. The unit may not fully engage if the front lip of the mounting rack is behind the instrument panel, or if screw heads and other obstructions impede unit connectors (section 6.3). For mounting rack details refer to figure 10-5.

2. Install the rack in the aircraft panel using six #6-32 flat head screws and six self-locking nuts. The screws are inserted from the inside through the holes in the sides of the rack.
3. To attach the backplate to the rack, align the backplate so that the backplate screw heads pass through the keyed holes in the back of the rack.
4. Slide the backplate down (viewing from cockpit) until it sits into place.
5. Hold the backplate to prevent rotation and secure the backplate by tightening the four #4-40 screws.

Insertion

1. Slide the unit into the rack straight until it stops, approximately 3/8 inch short of the final position.
2. Insert a 3/32" hex drive tool into the access hole at the bottom of the unit face.
3. Turn the hex tool clockwise while pressing on the left side of the bezel until the unit is seated in the rack.

Removal

1. Insert the hex drive tool into the access hole on the unit face.
2. Turn hex drive tool counterclockwise until the hex drive tool stops.
3. Pull the unit from the rack.

Unit Replacement

Whenever the unit is reinstalled, verify the unit powers up successfully.

4.8 Antenna Installation and Connections

4.8.1 COM Antenna

The GTR/GNC unit requires a standard 50 Ω vertically polarized antenna. Follow the antenna manufacturer's installation instructions for mounting the antenna.

The antenna should be mounted on a metal surface or a ground plane with a minimum area of 18 inches by 18 inches. Refer to section 3.2.1 for installation location considerations.

The antenna coax cable should be made of RG-142B, RG-400 or a comparable quality 50 Ω coax.

Check for insertion loss and VSWR. VSWR should be checked with an in-line type VSWR/wattmeter inserted in the coaxial transmission line between the transceiver and the antenna. The VSWR meter should be inserted as close to the transceiver as possible. When rack and harness buildup is performed in the shop, the coax termination may be provisioned by using a 6" in-line BNC connection. This would be an acceptable place to insert the VSWR meter. Any problem with the antenna installation is most likely seen as high reflected power. A VSWR of 3:1 may result in up to a 50% loss in transmit power.

4.8.2 NAV Antenna (GNC 215)

The NAV antenna is a standard 50 Ω horizontally polarized VOR/localizer/glideslope antenna. Depending on the type of aircraft, the glideslope may be a separate antenna. The NAV antenna receives:

- VOR frequencies between 108 MHz and 117.95 MHz
- Localizer frequencies between 108 MHz and 112 MHz
- Glideslope frequencies between 328.6 MHz and 335.4 MHz

Follow the antenna manufacturer's installation instructions for mounting antennas. RG-142B, RG-400, or equivalent 50 Ω coax is recommended for the NAV antenna(s).

4.9 Electrical Installation Procedure

CAUTION

CHECK CONNECTIONS FOR ERRORS BEFORE INSERTING THE UNIT INTO THE RACK. INCORRECT WIRING COULD CAUSE COMPONENT DAMAGE.

CAUTION

THE SCREWS (13) USED TO GROUND THE SHIELDS TO THE SHIELD BLOCK SHOULD PENETRATE TWO TO FOUR THREADS PAST THE SHIELD BLOCK. IF SCREWS ARE TOO LONG, THEY COULD POTENTIALLY DAMAGE THE WIRES GOING INTO THE BACKSHELL.

NOTE

It is preferred only two wires (10) be terminated per ring terminal, and only two ring terminals be installed on each shield block terminal location. Up to three shields or wires may be terminated within the MS25036-153 ring terminal (12). A maximum of three ring terminals may be installed on each shield block terminal location. Each tapped hole on the backshell can accommodate two ring terminals (12). Use ring terminal MS25036-153 for two wires. If only a single wire is left or needed for the connector, use MS25036-149 ring terminal.

The installation kit for the GTR/GNC includes connectors and crimp contacts. Refer to:

- Table 4-9 for crimp tool
- Section 4.4.2 for the type of wire
- Section 5 for pinout information
- Section 11 for pin connections

Route the wire harness, avoiding sharp bends and providing adequate space.

The connector kit includes the backshell assembly. Table 4-11 lists part numbers for the D-sub connectors and the backshell assembly.

Table 4-11 Backshell Assembly

Figure	Item #	Description	Garmin P/N	Notes
4-3	1	Backshell (P1)	125-00568-10	[1]
4-3	2	Screw, 4-40 x .250, FLHP100°, SS/P, nylon	211-63234-08	[2]
4-3	3	Screw, 4-40 x .375,PHP,SS/P, with nylon	211-60234-10	[1]
4-3	4	Strain relief (P1)	115-00499-03	[1]
4-3	5	Cover (P1)	115-00500-03	[1]
4-3	6	Screw,4-40x.187, FLHP100,SS/P, w/nylon	211-63234-06	[1]
4-2	7	Connector, D-sub, HD, 62-pin (P1)	330-00366-62	[2]
4-2	8	Multiple conductor shielded cable	As Required	[3]
4-1 4-2	9	Shield terminator	As Required	[3] [4]

Figure	Item #	Description	Garmin P/N	Notes
4-1 4-2	10	Wire, insulated (20-22 AWG), 3" max length	As Required	[3] [4]
4-2	11	Pin contacts, #22D	336-00021-00	[2]
4-2	12	Ring terminal, #8, insulated, 18-22 AWG, 14-16 AWG, 12-10 AWG	MS25036-149 MS25036-153 MS25036-156	[3] [5]
4-2	13	Screw, PHP, 8-32 x .312", stainless or cadmium plated steel	MS51957-42 MS35206-242	[3] [5]
4-2	14	Split washer, #8, (.045" compressed thickness) stainless or cadmium plated steel	MS35338-137 MS35338-42	[3] [5]
4-2	15	Flat washer, #8, .032" thick, .174"ID, .375" OD, stainless or cadmium plated steel	NAS1149CN832RN AS1149FN832P	[3] [5]
4-2	16	Silicone fusion tape	249-00114-00	[3]

[1] Supplied as part of P1 backshell kit.

[2] Supplied as part of connector kit, P/N 011-05779-10.

[3] Not supplied - must be purchased separately.

[4] Solder sleeve with pre-installed shield drain wire may be used instead of items 9 and 10.

[5] Not a Garmin part number.

Prepare all shielded cables as shown in figure 4-1.

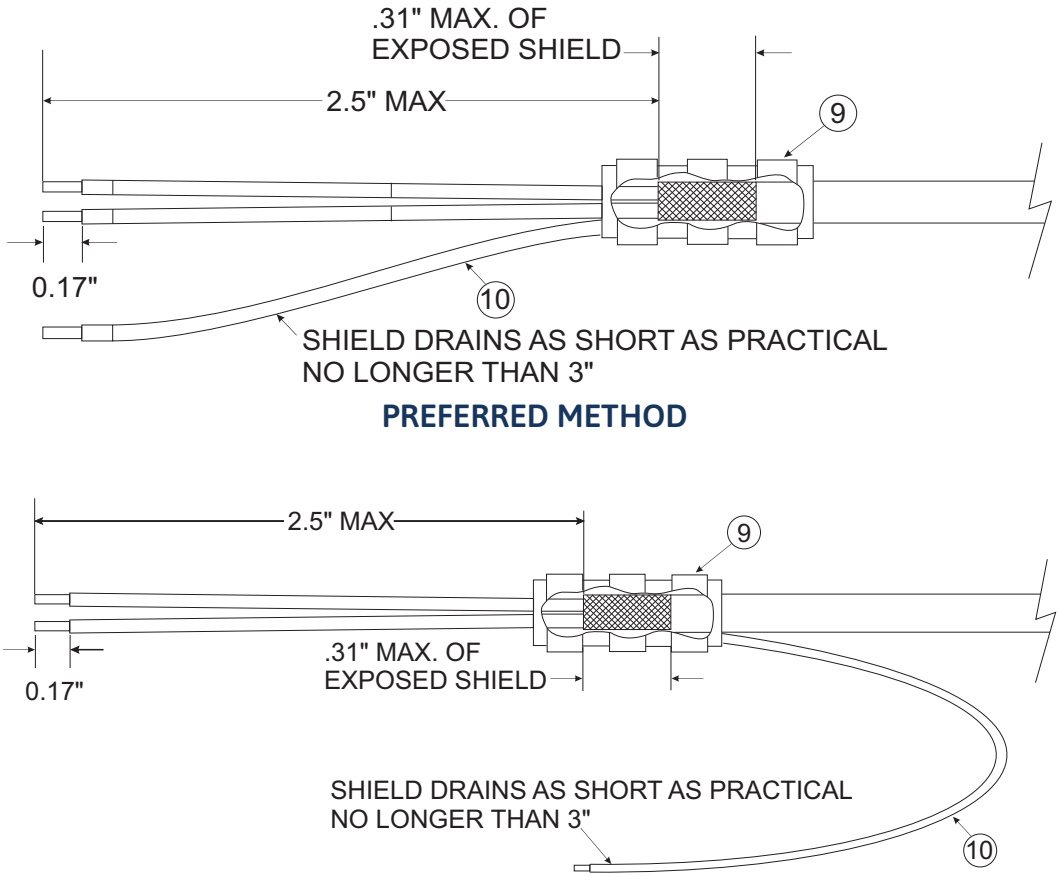

Figure 4-1 Shielded Cable Preparation

Figure 4-2 provides details for terminating the shield to the connector backshell. Skip to step 8 for wires without shielding.

1. At the end of the shielded cable (8), strip back a 2.5" maximum length of the jacket to expose the braid.
2. Remove exposed braid.
3. Carefully score the jacket 1/4" to 5/16" from the end and remove the jacket to leave the braid exposed.
4. Connect a 20 or 22 AWG wire (10) to the exposed shield of the prepared cable assembly.

NOTE

Alternatively, use a Raychem S-2 series solder sleeve with the thermochromic temperature indicator. These solder sleeves come with a pre-installed lead and effectively take the place of items 9 and 10. For detailed instructions on product use, refer to Raychem installation procedure.

5. Slide a shield terminator (9) onto the prepared cable assembly (8).
6. Connect the wire (10) to the shield using a heat gun approved for use with solder sleeves. The chosen size of solder sleeve must accommodate both the number of conductors present in the cable and the wire to be attached.
7. For the remaining shielded cables, repeat steps 1 through 6 as needed.
8. Strip wire going to the connectors at least 0.17". It is the responsibility of the installer to determine the proper length of insulation to be removed.
9. Insert the wire (10) into the pin (11).
10. Crimp pins (11) onto the wire.
11. Insert the pin into the connector (7) in accordance with wiring diagrams in section 11.
12. Verify that the pin is properly engaged into the connector by gently tugging on the wire.

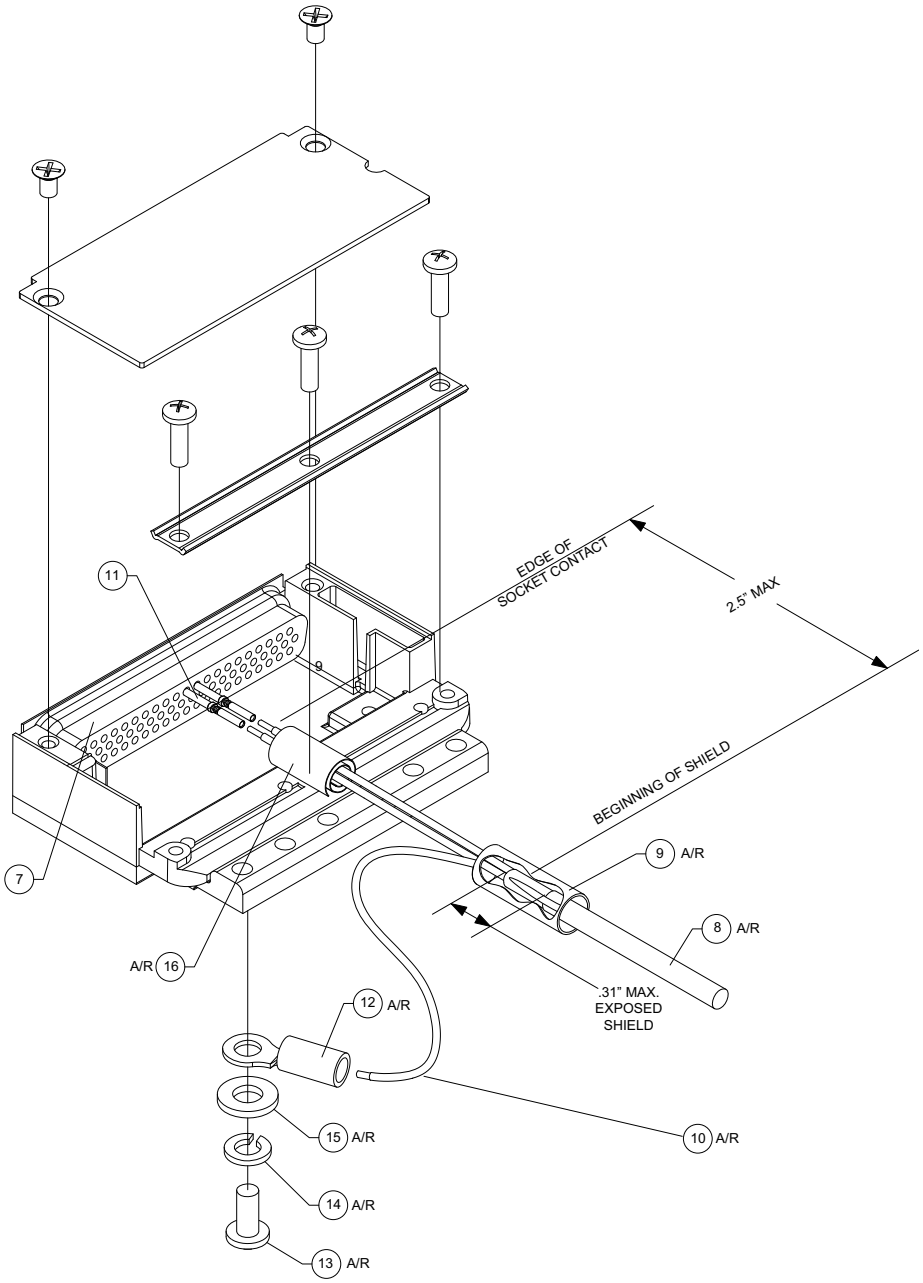

Figure 4-2 Preferred Method of Shield Termination on Backshell Assembly

Complete the following steps to assemble the backshell onto the connector. Refer to figure 4-2 and figure 4-3.

CAUTION

PLACING THE GROOVED SIDE OF THE STRAIN RELIEF (4) ACROSS THE WIRE HARNESS MAY DAMAGE WIRES.

1. Wrap the wire harness with silicone fusion tape (16 or a similar version) at the point where the backshell strain relief and cast housing will contact the wire harness.
2. Place the smooth side of the backshell strain relief (4) across the wire harness. As practical, each half of the strain relief bar should support half of the wire harness.
3. Use screws (3) to secure strain relief (4).
4. Attach the cover (5) to the backshell with two screws (6).
5. Install ring terminals (12) onto the 3" maximum shield drain wires (10), grouping wires as appropriate for the connector.
6. Terminate the ring terminals to the backshell (1) by placing items on the pan head screw (13) as shown in figure 4-2.
    a) split washer (14)
    b) flat washer (15)
    c) first ring terminal (12)
    d) second ring terminal, if needed
7. Insert the screw (13) into the tapped holes on the backshell.
8. Insert the assembled connector into the backplate.
9. Secure the connector (7) into the backplate with screws (2).

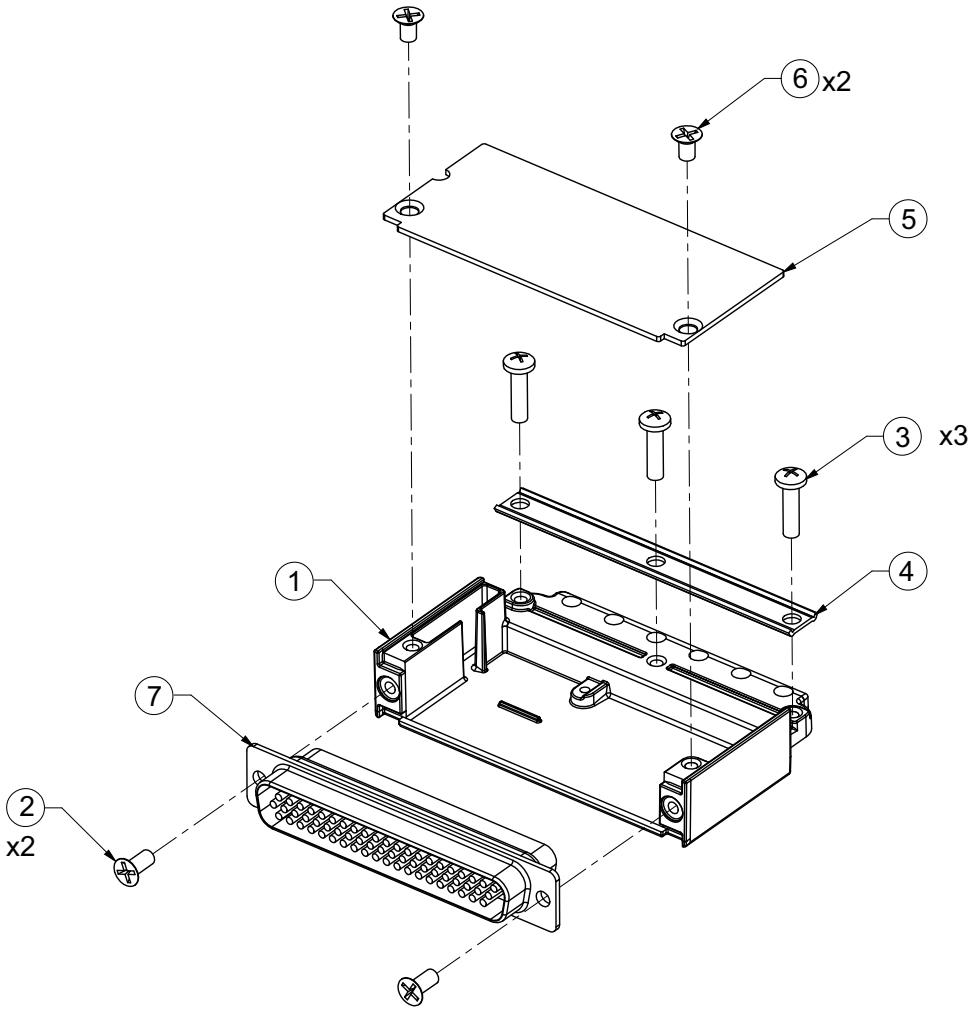

Figure 4-3 Connector and Backshell Assembly

Configuration Module Assembly with Potted PCB (GTR 205/GNC 215)

1. Strip at least 0.17 inches of insulation from each wire prior to crimping. It is the responsibility of the installer to determine the proper length of insulation to be removed.
2. Crimp pins (3) onto each wire of the 4-conductor wire harness (2).
3. Insert the newly crimped pins and wires into the appropriate connector housing (4) location shown in figure 4-4.
4. Plug the 4-conductor wire harness into the connector on the PCB (1).
5. Insert the PCB into the backshell (5) recess.
6. Attach cover (6) to backshell using screws (7).

Table 4-12 Configuration Module Kit 011-00979-03

Refer to Figure 4-4	Description	Garmin P/N
1	Configuration module, PCB board assembly w/EEPROM	011-02178-00
2	4-conductor harness	325-00122-00
3	Pin contact, crimp, #22D	336-00021-00

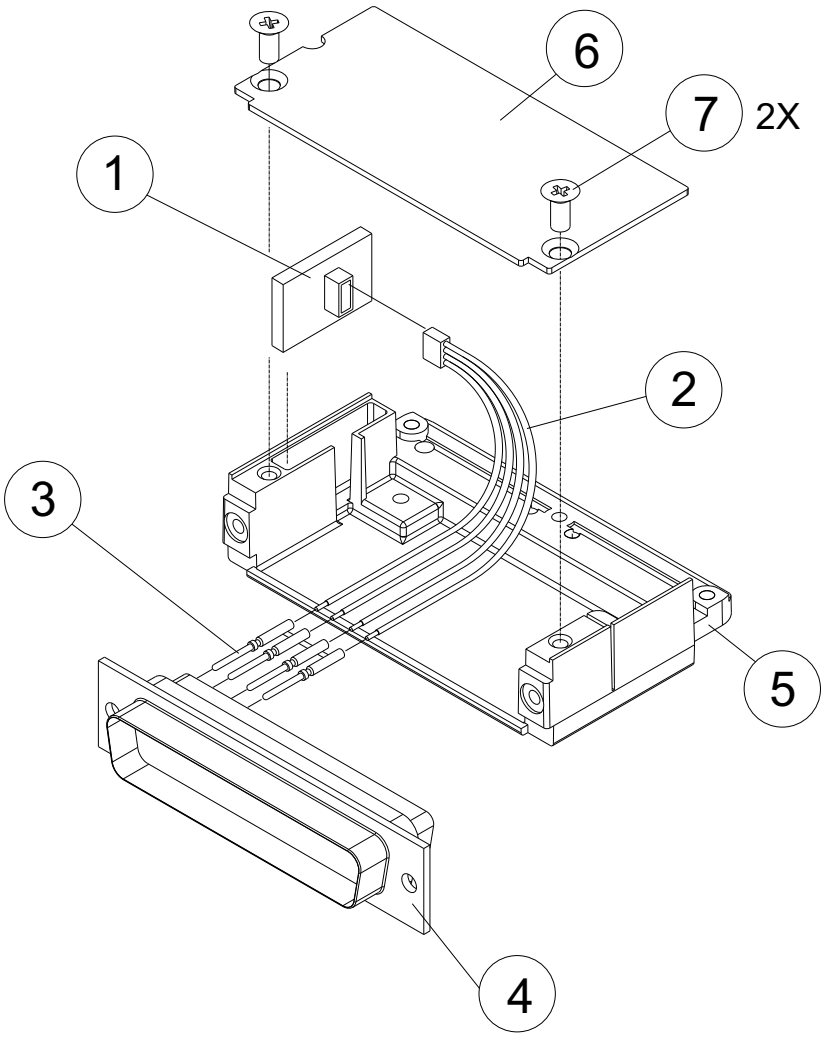

Figure 4-4 Backshell Assembly (Potted Configuration Module)

5 Connector Pinout Information

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5.1 Pin Function List

5.1.1 GNC 215

(View looking at rear of unit)

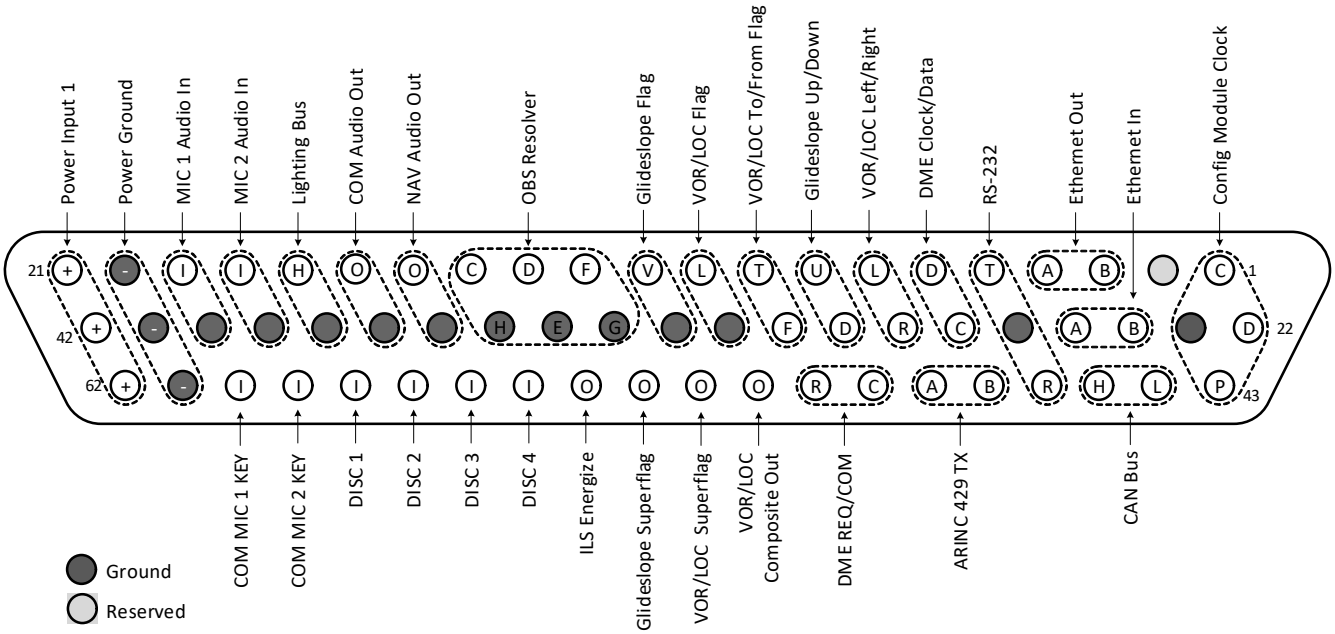

Table 5-1 GNC 215 Pins

Pin	Pin Name	I/O
1	CONFIG MODULE CLOCK	Out
2	RESERVED	--
3	ETHERNET OUT 1B	Out
4	ETHERNET OUT 1A	Out
5	RS-232 OUT	Out
6	SERIAL DME DATA	In
7	VOR/LOC +LEFT	Out
8	GLIDESLOPE +UP	Out
9	VOR/LOC +TO	Out
10	VOR/LOC +FLAG	Out
11	GLIDESLOPE +FLAG	Out
12	VOR OBS STATOR F	In
13	VOR OBS STATOR D	In
14	VOR OBS ROTOR C	Out
15	NAV AUDIO OUT HI	Out

Pin	Pin Name	I/O
16	COM AUDIO OUT HI	Out
17	LIGHTING BUS HI	In
18	MIC 2 AUDIO IN HI	In
19	MIC 1 AUDIO IN HI	In
20	AIRCRAFT GROUND	--
21	AIRCRAFT POWER	In
22	CONFIG MODULE DATA	I/O
23	CONFIG MODULE GROUND	--
24	ETHERNET IN 1B	In
25	ETHERNET IN 1A	In
26	RS-232 GND	--
27	SERIAL DME CLOCK	In
28	VOR/LOC +RIGHT	Out
29	GLIDESLOPE +DOWN	Out
30	VOR/LOC +FROM	Out
31	VOR/LOC -FLAG	Out
32	GLIDESLOPE -FLAG	Out
33	VOR OBS STATOR G (GND)	--
34	VOR OBS STATOR E (GND)	--
35	VOR OBS ROTOR H (GND)	--
36	NAV AUDIO OUT LO	Out
37	COM AUDIO OUT LO	Out
38	LIGHTING BUS LO	In
39	MIC 2 AUDIO IN LO	In
40	MIC 1 AUDIO IN LO	In
41	AIRCRAFT GROUND	--
42	AIRCRAFT POWER	In
43	CONFIG MODULE POWER	Out
44	CAN BUS LO	I/O
45	CAN BUS HI	I/O
46	RS-232 IN	In
47	ARINC 429 OUT B	Out
48	ARINC 429 OUT A	Out

Pin	Pin Name	I/O
49	SERIAL DME COMMON	In
50	SERIAL DME CH REQ	In
51	VOR/LOC COMPOSITE OUT	Out
52	VOR/LOC SUPERFLAG	Out
53	GLIDESLOPE SUPERFLAG	Out
54	ILS ENERGIZE*	Out
55	DISC 4*	In
56	DISC 3*	In
57	DISC 2*	In
58	DISC 1*	In
59	COM MIC 2 KEY*	In
60	COM MIC 1 KEY*	In
61	AIRCRAFT GROUND	--
62	AIRCRAFT POWER	In

An asterisk (*) following a signal name denotes that the signal is an Active-Low, requiring a ground to activate. If there is no asterisk, the signal is an Active-High.

5.1.2 GTR 205

(View looking at rear of unit)

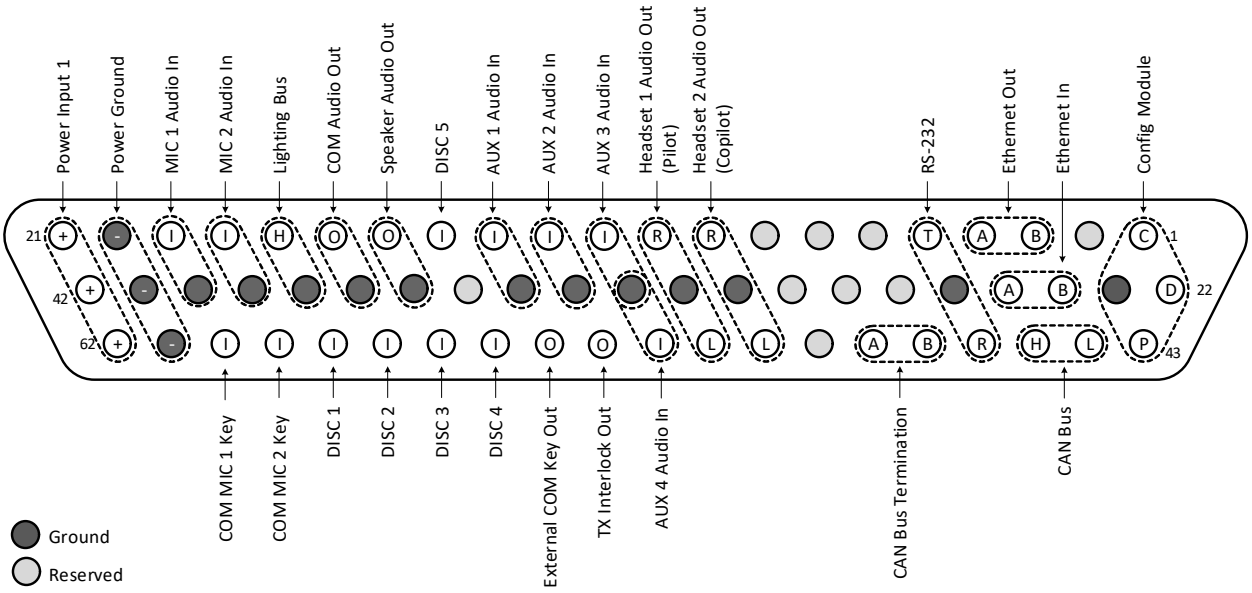

Table 5-2 GTR 205 Pins

Pin	Pin Name	I/O
1	CONFIG MODULE CLOCK	Out
2	RESERVED	--
3	ETHERNET OUT 1B	Out
4	ETHERNET OUT 1A	Out
5	RS-232 OUT	Out
6	RESERVED	--
7	RESERVED	--
8	RESERVED	--
9	HEADSET 2 AUDIO OUT RIGHT	Out
10	HEADSET 1 AUDIO OUT RIGHT	Out
11	AUX 3 AUDIO IN HI	In
12	AUX 2 AUDIO IN HI	In
13	AUX 1 AUDIO IN HI	In
14	DISC 5*	In
15	SPEAKER AUDIO OUT HI	Out
16	COM AUDIO OUT HI	Out
17	LIGHTING BUS HI	In

Pin	Pin Name	I/O
18	MIC 2 AUDIO IN HI	In
19	MIC 1 AUDIO IN HI	In
20	AIRCRAFT GROUND	--
21	AIRCRAFT POWER	In
22	CONFIG MODULE DATA	I/O
23	CONFIG MODULE GROUND	--
24	ETHERNET IN 1B	In
25	ETHERNET IN 1A	In
26	RS-232 GROUND	--
27	RESERVED	--
28	RESERVED	--
29	RESERVED	--
30	HEADSET 2 AUDIO OUT LO	Out
31	HEADSET 1 AUDIO OUT LO	Out
32	AUX 3/4 AUDIO IN LO	In
33	AUX 2 AUDIO IN LO	In
34	AUX 1 AUDIO IN LO	In
35	RESERVED	--
36	SPEAKER AUDIO OUT LO	Out
37	COM AUDIO OUT LO	Out
38	LIGHTING BUS LO	In
39	MIC 2 AUDIO IN LO	In
40	MIC 1 AUDIO IN LO	In
41	AIRCRAFT GND	--
42	AIRCRAFT POWER	In
43	CONFIG MODULE POWER	Out
44	CAN BUS LO	I/O
45	CAN BUS HI	I/O
46	RS-232 IN	In
47	CAN BUS TERM B	--
48	CAN BUS TERM A	--
49	RESERVED	--
50	HEADSET 2 AUDIO OUT LEFT	Out

Pin	Pin Name	I/O
51	HEADSET 1 AUDIO OUT LEFT	Out
52	AUX 4 AUDIO IN HI	In
53	TX INTERLOCK OUT	Out
54	EXTERNAL COM KEY OUT	Out
55	DISC 4*	In
56	DISC 3*	In
57	DISC 2*	In
58	DISC 1*	In
59	COM MIC 2 KEY*	In
60	COM MIC 1 KEY *	In
61	AIRCRAFT GROUND	--
62	AIRCRAFT POWER	In

An asterisk (*) following a signal name denotes that the signal is an Active-Low, requiring a ground to activate. If there is no asterisk, the signal is an Active-High.

5.2 Functional Descriptions

Information about power input requirements, lighting bus input, and antenna connections for the GTR/GNC is provided in this section. Refer to section 11 for interconnect information.

5.2.1 Power and Ground Pins

Power inputs P1-21, P1-42, and P1-62 provide power for the COM radio. All three pins must be connected.

Table 5-3 Power and Ground Pins

Pin Name	Pin	I/O
AIRCRAFT POWER	21	In
AIRCRAFT POWER	42	In
AIRCRAFT POWER	62	In
AIRCRAFT GROUND	20	--
AIRCRAFT GROUND	41	--
AIRCRAFT GROUND	61	--

5.2.2 Lighting Bus

CAUTION

CONNECTION OF THE LIGHTING BUS TO INCORRECT PINS CAN CAUSE DAMAGE TO THE UNIT THAT WILL REQUIRE RETURN TO THE FACTORY FOR REPAIR. ENSURE THAT THE LIGHTING BUS IS CONNECTED TO THE CORRECT PINS AND DOES NOT SHORT TO ANY ADJACENT PINS PRIOR TO APPLYING POWER TO THE UNIT, INCLUDING THE LIGHTING BUS.

Table 5-4 Lighting Pins

Pin Name	Pin	I/O
LIGHTING BUS HI	17	In
LIGHTING BUS LO	38	In

5.2.3 Antennas

Antennas use BNC coaxial connectors on the connector backplate.

Table 5-5 Antenna Pins

Pin Name	I/O
COM ANTENNA	I/O
NAV ANTENNA	In

5.2.4 Serial Data – RS-232

Table 5-6 RS-232 Pins

Pin Name	Pin	I/O
RS-232 OUT	5	Out
RS-232 IN	46	In
RS-232 GND	26	--

Aviation Out Type 1 and 2 Format

NOTE
Aviation RS-232 data may be transmitted with or without the current GPS altitude in feet. Refer to section 9.

The GTR/GNC is capable of interfacing with other aviation instruments by receiving Aviation Out Type 2 data on the RS-232 port. Refer to section 9.1 for a detailed data format description. The data consists of the following information.

- Current latitude and longitude
- Magnetic variation

NMEA Format

NMEA Inputs

- Active/standby NAV frequency
- Active/standby COM frequency
- NAV audio mode
- OBS value
- NAV volume level
- COM volume level
- Squelch override
- NAV monitor mode
- COM monitor mode
- Remote airport ident/frequency list
- Active/standby COM frequency with ident
- COM frequency lookup table
- Remote VOR list
- Remote LOC list

NMEA Outputs

- CDI/VDI deflection
- CDI/VDI flags
- Decoded OBS setting
- Radial form active/standby VOR
- Decoded station ident
- NAV audio mode
- NAV volume level
- COM volume level
- NAV receiver status (active/standby frequency)
- COM transceiver status (active/standby frequency)
- Software version
- GTR/GNC status

5.2.5 COM Audio

COM Audio Function

Activation of COM MIC 1 TRANSMIT enables MIC 1 AUDIO IN HI and causes the transceiver to transmit.

Activation of COM MIC 2 TRANSMIT enables MIC 2 AUDIO IN HI and causes the transceiver to transmit.

500 Ω COM AUDIO is a 65 mW audio output that is intended to drive a headset or an audio panel.

COM Audio Electrical Characteristics

COM MIC AUDIO

MIC 1 and MIC 2 are standard carbon or dynamic mic inputs with integrated preamps providing minimum 70 mVrms into a 600 Ω load.

MIC 1 and MIC 2 are set in the factory so that 500 mVrms modulates the transmitter to 90% nominally at 1000 Hz. The microphone gain adjustment is made through configuration mode.

Table 5-7 MIC 1 and MIC 2 Audio Pins

Pin Name	Pin	I/O
MIC 1 AUDIO IN HI	19	In
MIC 2 AUDIO IN HI	18	In
MIC 1 AUDIO IN LO	40	In
MIC 2 AUDIO IN LO	39	In

COM AUDIO

COM AUDIO supplies 65 mW into a 500 Ω load. This is a balanced output and the LO output must be connected.

COM AUDIO is the summation of the COM receiver audio, COM sidetone audio, and intercom audio.

Table 5-8 COM Audio Pins

Pin Name	Pin	I/O
COM AUDIO OUT HI	16	Out
COM AUDIO OUT LO	37	Out

5.2.6 Speaker Output (GTR 205)

The speaker output is 12 W into a 4 Ω load.

Table 5-9 Speaker Output

Pin Name	Pin	I/O
SPEAKER AUDIO OUT HI	15	Out
SPEAKER AUDIO OUT LO	36	Out

5.2.7 COM Discrete Inputs

Active-Low discrete inputs are considered active if either the voltage to ground is ≤ 3.5 VDC or the resistance to ground is ≤ 375 Ω. These inputs are considered inactive if the voltage to ground is 6.5-33 VDC or the resistance to ground is > 100 kΩ.

Active-High discrete inputs are considered active if the voltage to ground is > 6.5 VDC. These inputs are considered inactive if the voltage to ground is ≤ 3.5 VDC or the resistance to ground is ≤ 375 Ω.

COM MIC 1 KEY*

COM MIC 1 KEY* discrete input, when pulled low, allows the audio that is present on the MIC 1 AUDIO IN HI (P1-19) to be transmitted over the radio.

COM MIC 2 KEY*

COM MIC 2 KEY* discrete input, when pulled low, allows the audio that is present on the MIC 2 AUDIO IN HI (P1-18) to be transmitted over the radio.

Table 5-10 COM Discrete Inputs

Pin Name	Pin	I/O
COM MIC 1 KEY*	60	In
COM MIC 2 KEY*	59	In

An asterisk (*) following a signal name denotes that the signal is an Active-Low, requiring a ground to activate. If there is no asterisk, the signal is an Active-High.

5.2.8 NAV Audio Out (GNC 215)

NAV AUDIO OUT HI supplies 65 mW into a 500 Ω load. It is a balanced output and the NAV AUDIO OUT LO output must be connected.

Table 5-11 NAV Audio Out Pins

Pin Name	Pin	I/O
NAV AUDIO OUT HI	15	Out
NAV AUDIO OUT LO	36	Out

5.2.9 Configurable Discrete Inputs

Configurable discrete inputs are considered active if either the voltage to ground is ≤ 3.5 VDC or the resistance to ground is ≤ 375 Ω. This input is considered inactive if the voltage to ground is 11-33 VDC or the resistance to ground is > 100 kΩ. The default setting is Off for all discrete inputs.

COM REMOTE TRANSFER*

The COM REMOTE TRANSFER* discrete input is used to flip-flop between the active and standby COM frequencies. A momentary low on this pin will load the standby COM frequency into the active COM frequency field.

The COM REMOTE TRANSFER* input is used for emergency operation of the COM transmitter. If the switch is depressed for two seconds, the active COM frequency changes to 121.500 MHz.

COM REMOTE TUNE UP*

The COM REMOTE TUNE UP* discrete input is used to scroll through a list of preset COM frequencies. A momentary low on this pin will load the next preset frequency in the list into the standby COM frequency field.

COM REMOTE TUNE DOWN*

The COM REMOTE TUNE DOWN* discrete input is used to scroll through a list of preset COM frequencies. A momentary low on this pin will load the previous preset frequency in the list into the standby COM frequency field.

COM STANDBY MONITOR*

The COM STANDBY MONITOR* discrete input is used to monitor standby COM frequency audio. A momentary low on this pin will toggle the COM standby monitor ON and OFF.

TX INTERLOCK*

The TRANSMIT INTERLOCK* discrete input desensitizes the receiver of the COM radio. In dual COM installations, the discrete input prevents interference from the second radio.

VLOC REMOTE TRANSFER* (GNC 215)

The VLOC REMOTE TRANSFER* discrete input is used to flip-flop between the active and standby NAV frequencies. A momentary low on this pin will load the standby NAV frequency into the active NAV frequency field.

PILOT ICS KEY*

The PILOT ICS KEY* discrete input activates the pilot's microphone for the ICS. When active, the unit bypasses MIC 1 intercom squelch.

COPILOT ICS KEY*

The COPILOT ICS KEY* discrete input activates the pilot's microphone for the ICS. When active, the unit bypasses MIC 2 intercom squelch.

Table 5-12 Configurable Discrete Input Pins

Pin Name	Pin	I/O
DISC 1*	58	In
DISC 2*	57	In
DISC 3*	56	In
DISC 4*	55	In
DISC 5* (GTR 205)	14	In

An asterisk (*) following a signal name denotes that the signal is an Active-Low, requiring a ground to activate.

5.2.10 VOR/ILS Indicator (GNC 215)

VOR/ILS indicator displays both lateral and vertical, To/From indications, lateral and vertical flags, and superflags. Connector P1 outputs the VOR/Localizer/Glideslope navigation information.

VOR/LOC COMPOSITE OUT is a standard VOR/localizer composite output signal which may be used to drive Left/Right, To/From, and Flag indications of certain navigation indicators that contain an internal converter.

ILS ENERGIZE output becomes active (low) when VOR/LOC frequency is set to a localizer channel.

VOR/ILS Indicator Electrical Characteristics

Superflags

The output supplies not less than 320 mA with the output voltage not less than (AIRCRAFT POWER -2 VDC) when the flag is to be OUT OF VIEW. The output voltage with respect to ground is 0 +/-250 mVDC when the flag is to be IN VIEW.

Table 5-13 Superflag Pins (GNC 215)

Pin Name	Pin	I/O
VOR/LOC SUPERFLAG*	52	Out
GLIDESLOPE SUPERFLAG*	53	Out

Deviation

Deviation outputs are each capable of driving up to three 1000 Ω loads with ± 150 mVDC ± 15 mVDC for full-scale deflection, 0 mVDC ± 4.5 mVDC when centered. The drive circuit provides for more than full-scale deflection with a maximum course deviation output voltage of ± 300 mVDC ± 30 mVDC.

Table 5-14 Deviation Pins (GNC 215)

Pin Name	Pin	I/O
VOR/LOC +LEFT	7	Out
VOR/LOC +RIGHT	28	Out
GLIDESLOPE +UP	8	Out
GLIDESLOPE +DOWN	29	Out

TO/FROM

TO/FROM output is capable of driving up to three 200 Ω loads. When indicating TO, the output is +225 ± 75 mVDC. When indicating FROM, output is -225 ± 75 mVDC. When invalid information is present (Flag IN VIEW) the TO/FROM output is 0 ± 10 mVDC.

Table 5-15 TO/FROM Pins (GNC 215)

Pin Name	Pin	I/O
VOR/LOC +TO	9	Out
VOR/LOC +FROM	30	Out

Flag

Table 5-16 Flag Pins (GNC 215)

Pin Name	Pin	I/O
VOR/LOC +FLAG	10	Out
GLIDESLOPE +FLAG	11	Out
VOR/LOC -FLAG	31	Out
GLIDESLOPE -FLAG	32	Out

OBS

VOR OBS ROTOR C and H are a buffered 400 Hz output that is intended to drive the OBS rotors.
VOR OBS STATOR D and VOR OBS STATOR F are each amplitude shifted versions of the
VOR ROTOR C output. Each pair is intended to read one of the two windings of the indicator's OBS stator.

Table 5-17 OBS Pins (GNC 215)

Pin Name	Pin	I/O
VOR OBS STATOR F	12	In
VOR OBS STATOR D	13	In
VOR OBS ROTOR C	14	Out
VOR OBS STATOR G (GND)	33	--
VOR OSB STATOR E (GND)	34	--
VOR OBS ROTOR H (GND)	35	--

VOR/LOC COMPOSITE

With a standard VOR test signal applied, VOR/LOC COMPOSITE OUT is 0.5 ± 0.1 V_{RMS} into a 10 kΩ load. With a standard Localizer centering test signal applied, VOR/LOC COMPOSITE OUT is 0.350 ± 0.05 V_{RMS} into a 10 kΩ load.

Table 5-18 VOR/LOC Composite (GNC 215)

Pin Name	Pin	I/O
VOR/LOC COMPOSITE OUT	51	Out

NAV ILS ENERGIZE

The driver output voltage is not more than 1.0 V when sinking 20 mA. The maximum off state leakage current with respect to GND is less than 10 mA.

Table 5-19 NAV ILS Energize Pin (GNC 215)

Pin Name	Pin	I/O
ILS ENERGIZE*	54	Out

5.2.11 ARINC 429 NAV Outputs (GNC 215)

Table 5-20 ARINC 429 NAV Output Pins (GNC 215)

Pin Name	Pin	I/O
ARINC 429 OUT B	47	Out
ARINC 429 OUT A	48	Out

5.2.12 Configuration Module

Table 5-21 Configuration Module

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

5.2.13 Serial DME (GNC 215)

When SERIAL DME DATA or SERIAL DME CLOCK is asserted high and driving a 360 Ω load, the driver output voltage is not less than 8 V, and when asserted low is not greater than 10 mV.

DME COMMON is considered active if either the voltage to ground is less than 1.9 V or the resistance to ground is less than 375 Ω. The input is considered inactive if the voltage to ground is 11-33 VDC.

DME COMMON must be pulled low to indicate to the GTR/GNC that it is the device channeling the DME. Pins 6, 27, and 49 are configured for Serial DME tuning.

Table 5-22 Serial DME

Pin Name	Pin	I/O
SERIAL DME DATA	6	Out
SERIAL DME CLOCK	27	Out
SERIAL DME COMMON	49	In
SERIAL DME CH REQ	50	In

5.2.14 AUX Pins (GTR 205)

AUX 1 HI and AUX 2 HI are limited to 5 V_{RMS} and AUX 3 Hi and AUX 4 Hi are limited to 1.5 V_{RMS}.

Table 5-23 AUX Pins

Pin Name	Pin	I/O	MAX V_{RMS}
AUX 1 AUDIO IN HI	13	In	5
AUX 2 AUDIO IN HI	12	In	5
AUX 3 AUDIO IN HI	11	In	1.5
AUX 4 AUDIO IN HI	52	In	1.5
AUX 1 AUDIO IN LO	34	In	--
AUX 2 AUDIO IN LO	33	In	--
AUX 3/4 AUDIO IN LO	32	In	--

5.2.15 CAN Bus Pins

The GTR should only be terminated if it is located at the end of the CAN bus. To terminate the CAN bus at the GTR, short pins 47 and 48 together. This creates a 120 Ω termination internal to the GTR LRU. If installed, the jumper between pins 47 and 48 should be 3" or less and contained completely within the connector backshell.

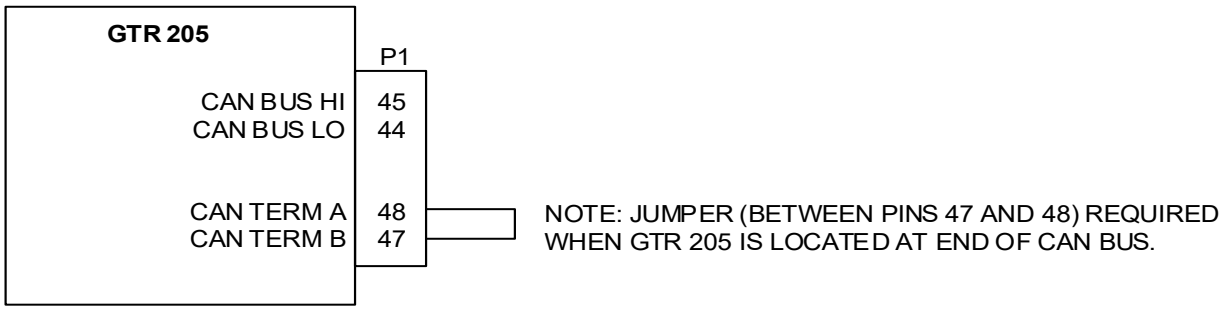

Table 5-24 CAN Bus Pins

Pin Name	Pin	I/O
CAN BUS LO	44	I/O
CAN BUS HI	45	I/O
CAN TERM A	47	--
CAN TERM B	48	--

5.2.16 Ethernet (HSDB)

Ethernet based HSDB meets the hardware aspects of IEEE standard 802.3 for 10 base T Ethernet communications.

Table 5-25 GTR/GNC Ethernet (HSDB) Pins

Pin Name	Pin	I/O
ETHERNET IN 1A	25	In
ETHERNET IN 1B	24	In
ETHERNET OUT 1A	4	Out
ETHERNET OUT 1B	3	Out

5.2.17 Headset Outputs (GTR 205)

Table 5-26 Headset Output Pins

Pin Name	Pin	I/O
HEADSET 2 AUDIO OUT RIGHT	9	Out
HEADSET 1 AUDIO OUT RIGHT	10	Out
HEADSET 2 AUDIO OUT LO	30	Out
HEADSET 1 AUDIO OUT LO	31	Out
HEADSET 2 AUDIO OUT LEFT	50	Out
HEADSET 1 AUDIO OUT LEFT	51	Out

5.2.18 Discrete Outputs (GTR 205)

The TX INTERLOCK OUT* will be pulled low when the GTR 205 is transmitting. EXTERNAL COM KEY OUT* activates when the MIC key is triggered.

Table 5-27 Discrete Output Pins

Pin Name	Pin	I/O
TX INTERLOCK OUT*	53	Out
EXTERNAL COM KEY OUT*	54	Out

6 System Configuration

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System at a Glance

This section provides complete instructions for configuring GTR/GNC functionality. Screenshots are for reference only.

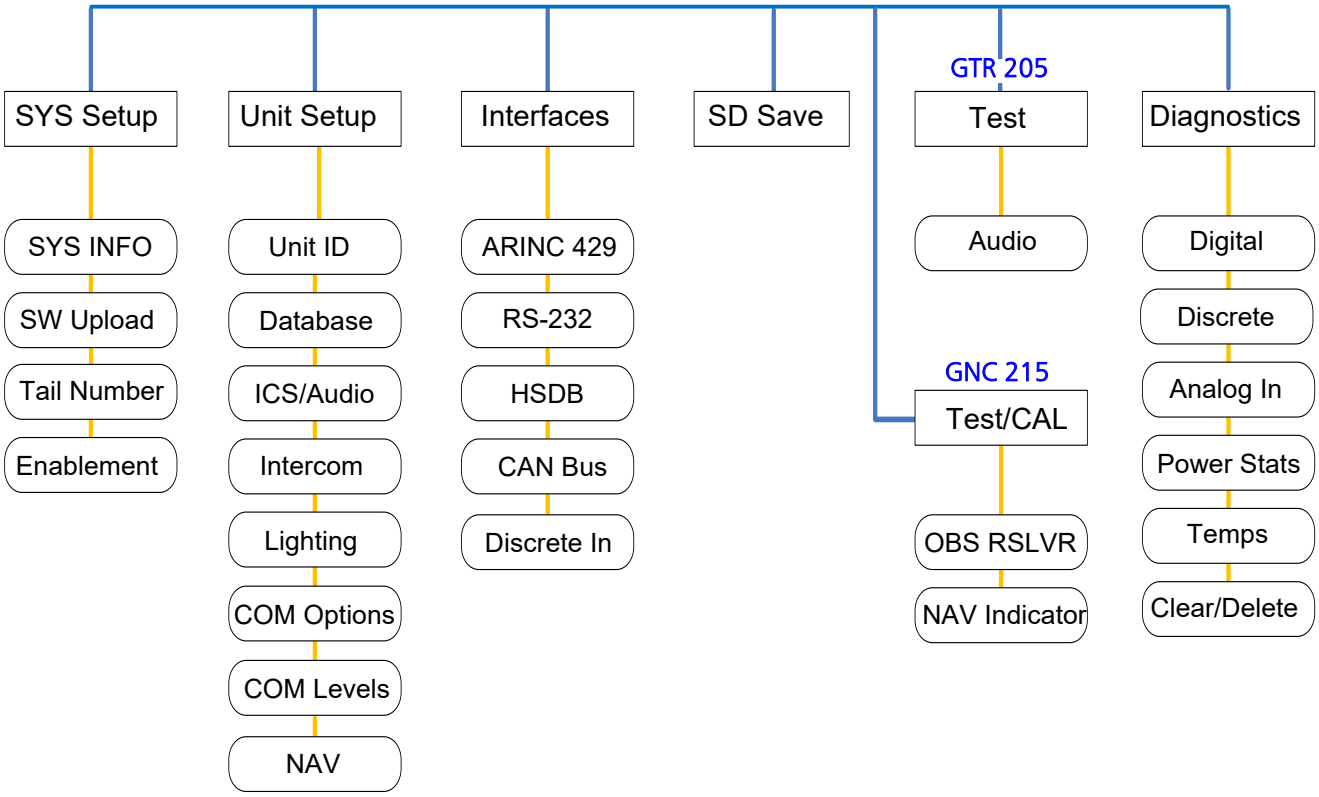


Figure 6-1 GTR 205/GNC 215 System Configuration Map

6.1 System Configuration Overview

Checkout and configuration instructions for the GTR/GNC is provided in this section.

- Configure the GTR/GNC for the specific installation
- Perform the installation checks
- Perform ground checks to verify the interfaces to external sensors
- Perform the specified flight checks

6.2 Mounting, Wiring, and Power Checks

CAUTION

CONNECTION OF THE POWER OR LIGHTING BUS TO INCORRECT PINS CAN CAUSE DAMAGE TO THE UNIT, WHICH WILL REQUIRE RETURN TO THE FACTORY FOR REPAIR. ALWAYS START TESTS WITH THE DIMMING BUS AT THE LOWEST SETTING, AND SLOWLY INCREASE THE BRIGHTNESS. VERIFY THE WIRING IS CORRECT IF IT IS NOTICED THE LIGHTING LEVEL ON THE GTR/GNC DOES NOT INCREASE AS THE LIGHTING BUS INPUT IS INCREASED IN BRIGHTNESS.

Verify that all cables are properly secured and shields are connected to the backshell of the connectors. Check the movement of the flight and engine controls to verify there is no interference between the cabling and control systems. Ensure that all wiring is installed as described in section 3.4.

Prior to powering up the GTR/GNC, the wiring harness must be checked for proper connections to the aircraft systems and other avionics equipment. Point to point continuity must be checked to expose any faults such as shorting to ground. Any faults or discrepancies must be corrected before proceeding.

After accomplishing a continuity check, perform power and ground checks to verify proper power distribution to the GTR/GNC. Any faults or discrepancies should be corrected at this time. Remove power from the aircraft upon completion of the harness checkout.

The GTR/GNC can be installed after completion of the continuity and power checks. The GTR/GNC should be installed into the rack and secured appropriately, as described in section 4.7.1. The GTR/GNC must be connected to the wiring harness and antennas.

6.3 Connector Engagement Check

Check the connector engagement prior to configuration and checkout of the GTR/GNC.

1. Turn on the avionics master switch (if installed).
2. Place the GTR/GNC in the rack and engage the cam mechanism.
3. Turn the Allen screw of the locking cam (located on the lower right side of the unit) slowly clockwise until the GTR/GNC just powers on. A T-handle can be used for this, but ensure that the screw is not over-tightened.
4. Count the number of complete revolutions the Allen screw can be turned until it cannot turn any more. Do not over-tighten. Three turns is the minimum for proper installation. If fewer than three turns are possible, the mounting rack should be moved aft (toward the pilot) such that the aircraft panel does not obstruct the unit from properly engaging in the rack.

6.4 Configuration Mode Operations

The configuration pages shown in this section reflect main software v2.22. Some differences in operation may be observed when comparing the information in this manual to other software versions.

Configuration mode is used to configure settings for each specific installation.

To access configuration mode:

1. Remove power from the unit.
2. Press and hold the right inner knob.
3. Apply power to the unit by turning the COM volume knob.
4. When "Garmin" appears on the screen release knob.

The first page displayed is the Configuration Mode Home page.

- SYS Setup
- Unit Setup
- Interfaces
- SD Save
- Test (GTR 205)
- Test/CAL (GNC 215)
- Diagnostics

Navigating Configuration Mode

There are four to five tabs, each containing multiple items. Each item launches a page.

- Turn outer knob to scroll tabs
- Turn inner knob to access items
- Press inner knob to access page

Press the inner knob to:

- Confirm a selection
- Enable or disable a feature - A green bar indicates the feature is enabled

Press **Home** to return to SYS Setup tab.

Press **Back** to go back to a previous page. The flip-flop key has the same function as **Back**.

Press **Menu** to go to the active tab.

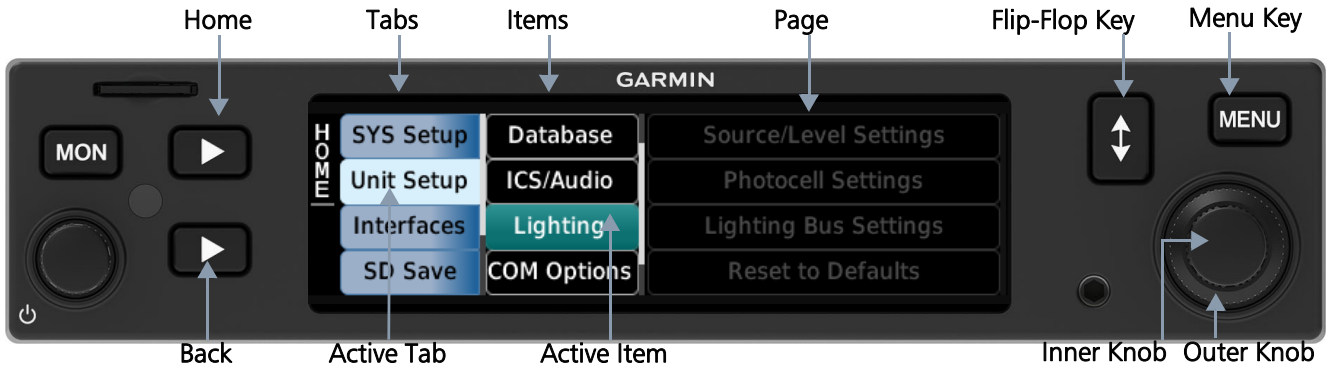


Figure 6-2 Controls in Configuration Mode

6.4.1 SYS Setup

The SYS Setup includes:

- SYS INFO
- SW Upload
- Tail Number
- Enablement

SYS INFO

The SYS INFO page displays information of the installed unit. There are no configurable items.

- Unit type
- Serial number
- System ID
- Software version
- Software part number
- Description
- Bluetooth version (GTR 205)
- Bluetooth part number (GTR 205)
- Software key version
- Software key part number
- Database key version
- Database key part number
- Boot block lock version
- Boot block part number
- Hardware version

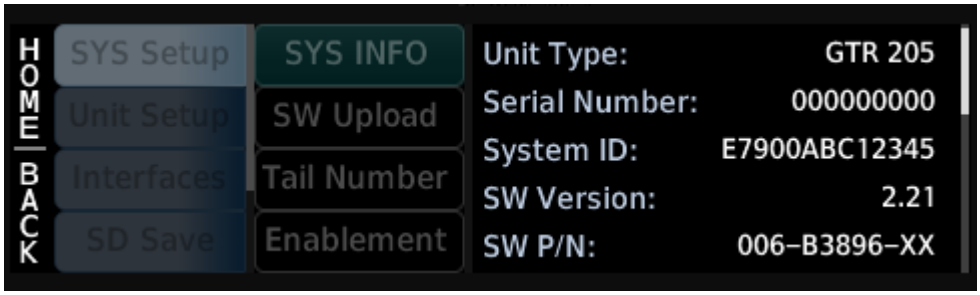


Figure 6-3 SYS Info Page

SW Upload

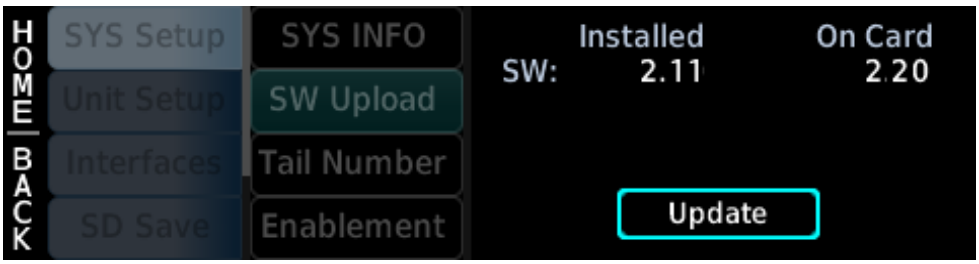


Figure 6-4 SW Upload Page

Tail Number

The tail number is used as the file name when saving to an SD card.

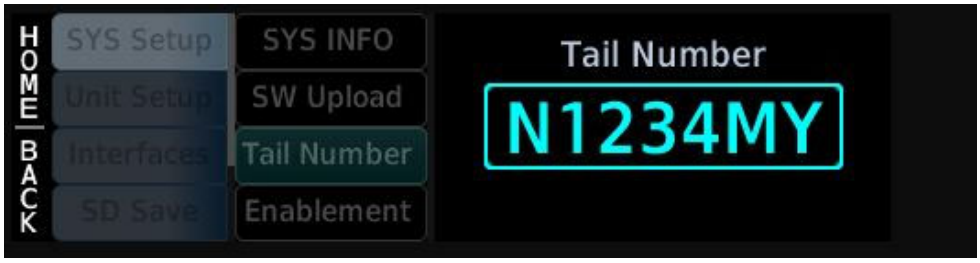


Figure 6-5 Tail Number Page

Enablement

An enablement card is necessary to enable Night Vision and 16W COM Transmit features. A green bar displays when the feature is enabled.

A red padlock icon indicates the feature is locked and needs an enablement card. If the key to the right of the padlock is available, an enablement card has been detected.

A green padlock icon indicates the feature is unlocked. The enablement card does not need to be reinserted to enable the feature again. Push the inner knob to enable or disable the feature. The feature remains unlocked as long as a configuration module is attached.

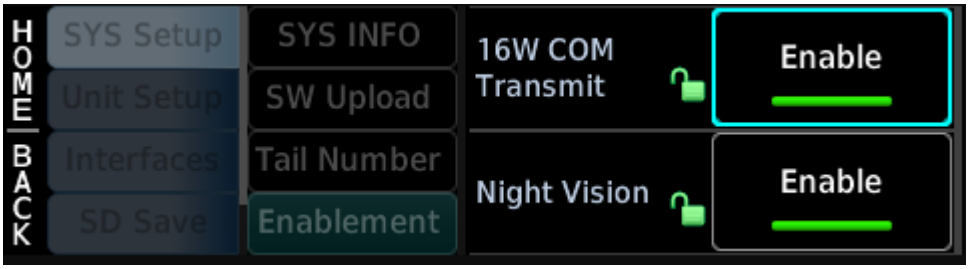


Figure 6-6 Enablement Page

6.4.2 Unit Setup

The Unit Setup includes:

- Unit ID
- Database
- ICS/Audio (GTR 205)
- Intercom (GNC 215)
- Lighting
- COM Options
- COM Levels
- NAV (GNC 215)

Unit ID

Unit ID sets the unit as GTR/GNC 1 or GTR/GNC 2.

Table 6-1 Unit ID Selections

Selection	Setting	Description
Unit ID	GTR/GNC 1 (Default)	COM or NAV/COM #1
	GTR/GNC 2	COM or NAV/COM #2

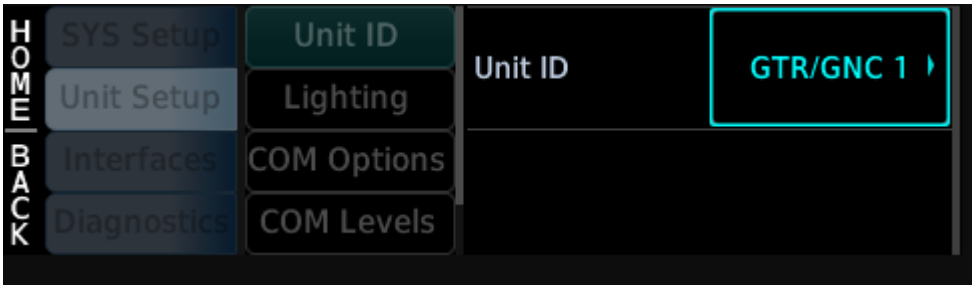


Figure 6-7 Unit ID Page

Database

Database sets the location of database.

Table 6-2 Database Selections

Selection	Setting	Description
Database	Internal	The navigation database is installed locally.
	External	The navigation database is installed on an interfaced device.

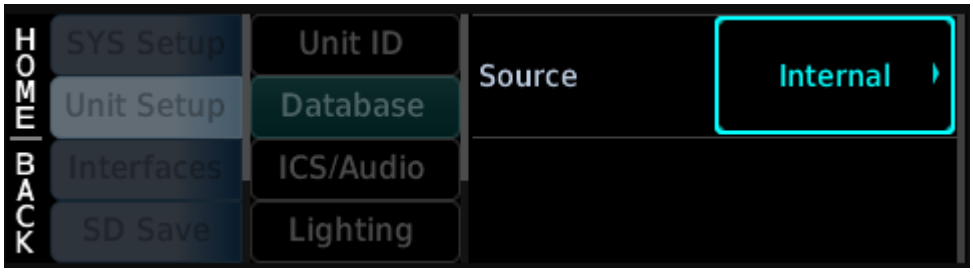


Figure 6-8 Database Page

ICS/Audio (GTR 205)

ICS/Audio can be internal or external. No configuration is necessary if the ICS/audio is external.

Table 6-3 Internal ICS/Audio Selections

Selection	Setting	Description
ICS/Audio	Internal ICS	Intercom and audio features are controlled on the unit.
	External	Intercom and audio features are controlled by another unit.
Pilot Position	Left	The pilot is seated on the left side of the cockpit.
	Right	The pilot is seated on the right side of the cockpit.
Aux Audio Inputs	Refer to table 6-4 "AUX Audio Input Selections."	
Speaker	Connected	Speaker is connected if a green bar displays.
	Not Connected	Speaker is disconnected if a green bar does not display.
Speaker Volume	0% to 100%	Adjusts the volume output of the speaker. Default: 50%
Bluetooth	Enable	Bluetooth is enabled if a green bar displays.
	Disable	Bluetooth is disabled.

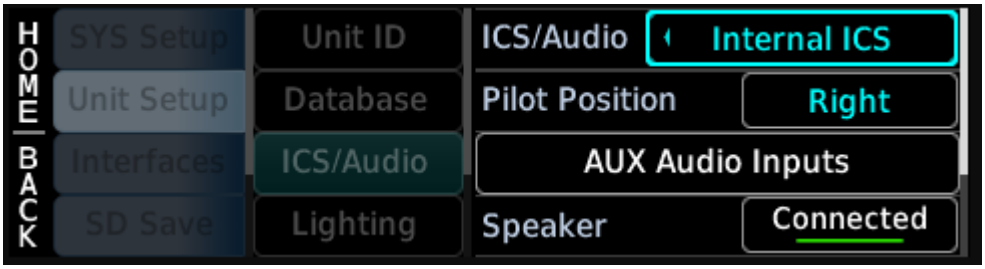


Figure 6-9 ICS/Audio Page

Table 6-4 AUX Audio Input Selections

Selection	Setting	Option	Label	Volume
AUX Input	AUX 1	Disable	N/A	N/A
		Pilot Control	[1]	0% to 100% Default: 50%
		Unswitched	N/A	0% to 100% Default: 50%
	AUX 2	Disable	N/A	N/A
		Pilot Control	[1]	0% to 100% Default: 50%
		Unswitched	N/A	0% to 100% Default: 50%
	AUX 3	Disable	N/A	N/A
		Pilot Control	[1]	0% to 100% Default: 50%
		Unswitched	N/A	0% to 100% Default: 50%
		Stereo Right	[1]	N/A
	AUX 4	Disable	N/A	N/A
		Pilot Control	[1]	0% to 100% Default: 50%
		Unswitched	N/A	0% to 100% Default: 50%
		Stereo Left	[1]	N/A
AUX Squelch	0% to 100% Default: 25%	N/A	N/A	N/A

[1] Customize to desired four character label.

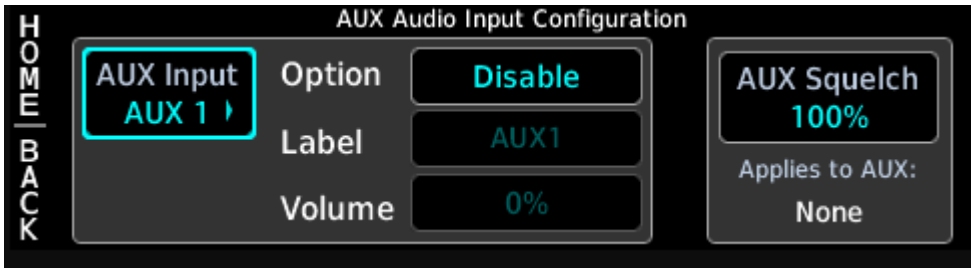


Figure 6-10 AUX Audio Input Configuration Page

Intercom (GNC 215)

The intercom panel can be internal or external.

Table 6-5 Intercom Selections

Selection	Setting	Description
Intercom	Internal	Intercom features are controlled on the unit.
	External	Intercom features are controlled by another unit.

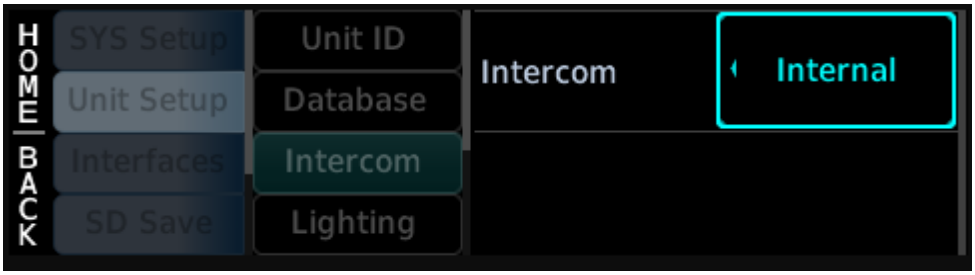


Figure 6-11 Intercom Page

Lighting

The Lighting tab accesses the page to set the lighting source and configure the lighting bus and photocell.

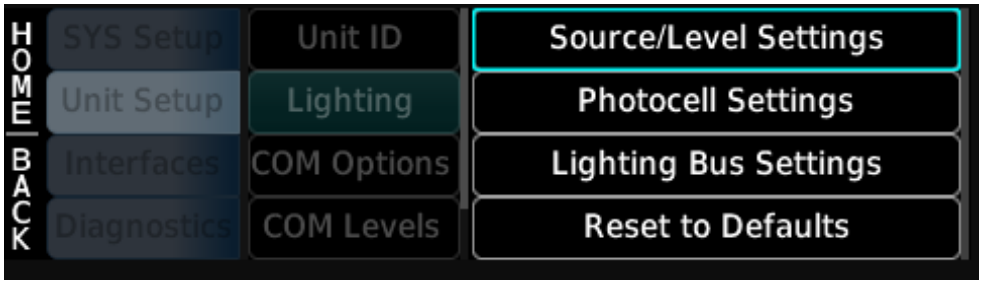


Figure 6-12 Unit Lighting Page

Source/Level Configuration

Table 6-6 Display and Keys Selections

Selection	Setting	Description
Source	Photocell	Photocell on unit bezel controls backlight level.
	Lighting Bus	Lighting bus controls backlight.
Min Level	0% - 100%	Minimum backlight brightness setting.

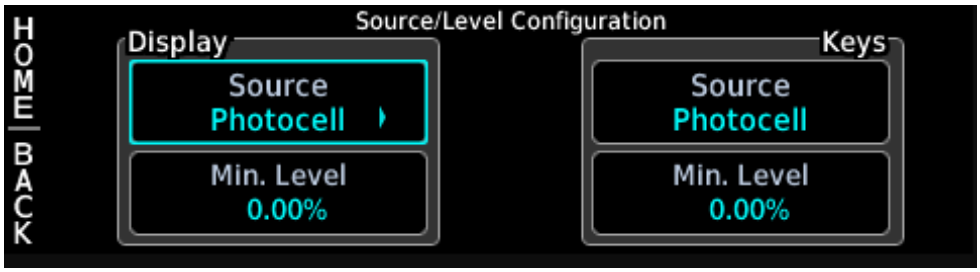


Figure 6-13 Source/Level Configuration Page

Photocell Settings

Table 6-7 Photocell Selections

Selection	Setting	Description
Photocell Configuration		
Response Time	2 (Default) - 7 seconds	Sets the speed with which the brightness responds to the input level (bus voltage or ambient light) changes. The higher the number the slower the display responds.
Slope	0 - 100 (Default is 50)	Sets the sensitivity the brightness of the display has to changes in the input level. The higher the number, the brighter the display for a given increase in the input level.
Offset	0 - 100 (Default is 50)	Adjusts the lighting level up or down for any given input level. This field is set to 50. At 50, there is no offset. This can be used to match lighting curves with other equipment in the panel.
Photocell Override		
Key Backlight Cutoff	0% - 100% (Default is 80%)	This parameter configures the point when key backlighting is switched off in bright light. For example, a value of 70% means the key backlight will be off at photocell source input levels above 70%.
Photocell Transition	5 - 50 (Default is 25)	This parameter sets the lighting bus input level where the lighting bus input will be ignored and the photocell will be used to control the unit display backlight. The photocell transition is a percentage of the maximum lighting bus input level.

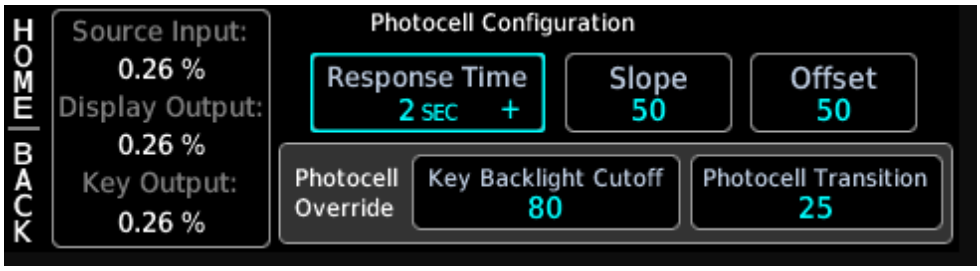


Figure 6-14 Photocell Configuration Page

Lighting Bus Configuration

Table 6-8 Lighting Bus Configuration Selections

Selection	Setting	Description
Response Time	2 (Default) - 7 seconds	Sets the speed with which the brightness responds to the input level (bus voltage or ambient light) changes. The higher the number the slower the display responds.
Slope	0 - 100 (Default is 50)	Sets the sensitivity the brightness of the display has to changes in the input level. The higher the number, the brighter the display for a given increase in the input level.
Offset	0 - 100 (Default is 50)	Adjusts the lighting level up or down for any given input level. This field is set to 50. At 50, there is no offset. This can be used to match lighting curves with other equipment in the panel.
Lighting Bus Input	14V DC	Select the lighting bus source voltage.
	28V DC (Default)	
	5V DC	
	5V AC	

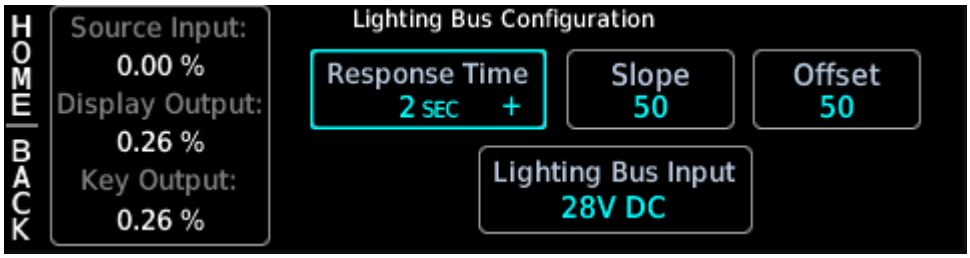


Figure 6-15 Lighting Bus Configuration Page

Reset to Defaults

Selecting Reset to Defaults displays the prompt to acknowledge the resetting of lighting settings to default values.

Table 6-9 Reset to Default Selections

Selection	Description
Reset	Resets all lighting settings to default values.
Cancel	Exits the prompt and keeps the current lighting settings.

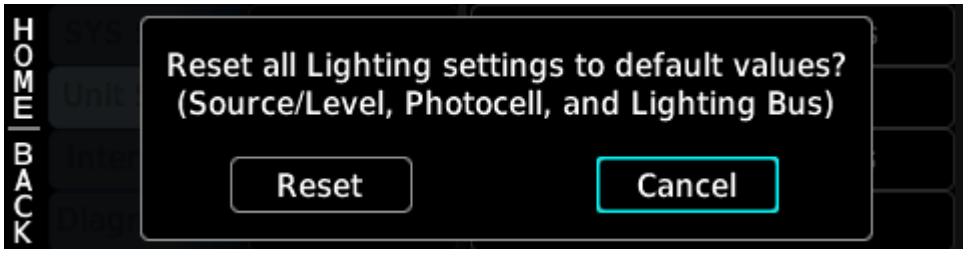


Figure 6-16 Reset to Defaults Page

COM Options

Table 6-10 COM Options Selections

Selection	Setting	Description
RX Squelch Pilot Control	Green Bar	Allows the pilot to adjust the squelch.
	No Green Bar	Uses installer-configured settings for squelch control.
COM Sidetone Pilot Control	Green Bar	Allows the pilot to adjust COM sidetone offset and provides an option to link COM sidetone to COM volume.
	No Green Bar	Uses installer-configured settings for COM sidetone only.
COM Sidetone Source	External (Default)	The COM sidetone audio the pilot hears is the filtered audio being sent to the transmitter.
	Internal	The COM sidetone audio the pilot hears is the audio signal from the headset microphone before it is filtered for transmission.

Figure 6-17 COM Options Page

COM Levels

COM Squelch Functionality

RX squelch silences the received audio when there is no signal detected above a specific power threshold. RX Squelch is the primary squelch and functions by calculating the ratio of the signal power to the background noise power then compares it to the set threshold. If other aircraft equipment generates noise that consists of pure tones, those tones may be interpreted as signals and used for the calculation. As a result, the squelch breaks when the corresponding channel is selected. In this case, increase the RX squelch percentage or isolate the noise source until the squelch breaks no longer occur.

Carrier Squelch is the secondary squelch and functions by calculating the signal power only and comparing it to the set threshold. If other aircraft equipment is generating noise of a more random nature (wideband), the combined power may cause squelch breaks on many channels. In this case, increase the carrier squelch percentage or isolate the noise source until the squelch breaks no longer occur.

COM RX Squelch

NOTE
The COM RX Squelch settings allows adjustment of the noise signal strength required to break squelch for the COM receiver.

The COM RX Squelch setting configures the RX squelch for all frequencies. The default setting is 50%. 0% is the most sensitive (i.e., the weakest signal level necessary to break squelch). Decreasing the value will allow the squelch to be broken with low signal levels. Increasing the value will require higher signal levels to break squelch.

Table 6-11 contains the approximate levels when the auto squelch opens for various COM RX squelch settings. Installations of GTRs/GNCs will generally use a COM RX squelch setting of 50 or higher.

Table 6-11 COM RX Auto Squelch Settings

COM RX Squelch Setting (%) [1]	RX Squelch Open Approximation (dBm)
0	-107
25	-103.5
50 (Default)	-100
75	-96.5
100	-93

[1] The COM RX squelch range (0-100) is a linear response.

COM Carrier Squelch

NOTE

COM carrier squelch settings allow adjustment of the carrier signal strength required to break squelch for the COM receiver.

The COM carrier squelch level adjustment reduces the sensitivity of the COM receiver. Elevated, ambient RF interference levels in certain flight environments, such as low-flying rotorcraft operating over metropolitan areas or aircraft with equipment installed that interferes with the COM radio, may require adjustment of the COM carrier squelch to reduce undesired squelch breaks.

Table 6-12 COM Carrier Squelch Settings

COM Carrier Squelch Setting (%) [1]	Carrier Squelch Open Approximation (dBm)
0	-93
25	-89.5
43 (Default)	-87
50	-86
75	82.5
100	-79

[1] The COM Carrier range (0-100) is a linear response.

Table 6-13 COM Levels Selections

Selection	Setting	Description
RX Squelch	0 - 100 (Default is 50)	For more detail, refer to table 6-11.
Carrier Squelch	0 - 100 (Default is 43)	For more detail, refer to table 6-12.
COM Sidetone Volume	0 - 100 (Default is 50	Adjusts pilot/copilot microphone volume sent to headset (sidetone) during COM transmit.
TX MIC 1 Gain	0 - 10 (Default is 4)	Adjusts the headset microphone #1 input volume transmitted via COM radio.
TX MIC 2 Gain	0 - 10 (Default is 4)	Adjusts the headset microphone #2 input volume transmitted via COM radio.
Reset to Defaults	Yes	Resets squelch, sidetone volume, and TX MIC gain settings to default values.
	No	Exits the prompt and keeps the current settings.

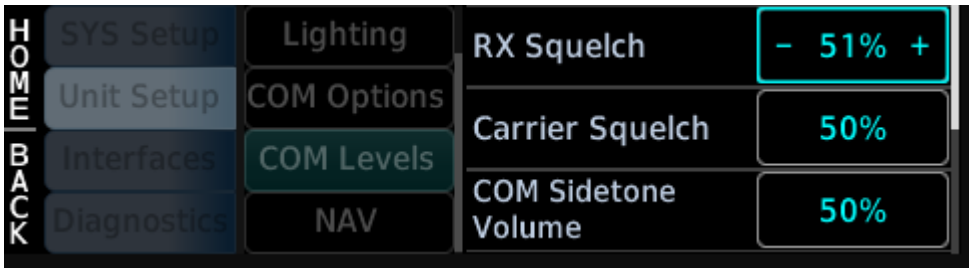


Figure 6-18 COM Levels Page

NAV (GNC 215)

Table 6-14 NAV Page Selections

Selection	Setting	Description
Filtered LOC/GS	Enabled	When enabled, the output is filtered to prevent the LOC/GS deviation from oscillating more than desired. For more detail, refer to section 2.1.1.
	No Green Bar	No filtering occurs.
Composite Indicator	Installed	The VOR/LOC composite output is enabled.
	No Green Bar	The VOR/LOC composite output is disabled.

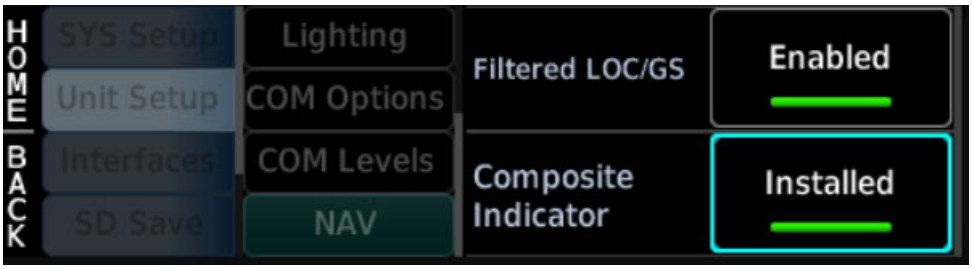


Figure 6-19 NAV Page

6.4.3 Interfaces

Interfaces include:

- ARINC 429 (GNC 215)
- RS-232
- HSDB (Ethernet)
- CAN Bus
- Discrete In

ARINC 429 (GNC 215)

The following labels are output on the VOR/ILS ARINC 429 OUT port.

Table 6-15 ARINC 429 Labels

Label #	Parameter Name
034G	VOR/ILS Frequency (BCD)
035G	DME Frequency (BCD)
100G	Selected Course #1
173	Localizer Deviation
174	Glideslope Deviations
222	VOR Omnibearing
371G	Specific Equipment ID
377	Equipment Hex ID Code

Table 6-16 ARINC 429 Page Selections

Selection	Setting	Description
Speed	Low	Standard low-speed ARINC 429 (nominally 12.5 kilobits per second)
	High	High-speed ARINC 429 (nominally 100 kilobits per second)
SDI Selection	Common	Generates all 429 outputs with SDI = 0
	Use Unit ID	Generates all output labels with SDI based on selected Unit ID (SDI = 1 or 2)

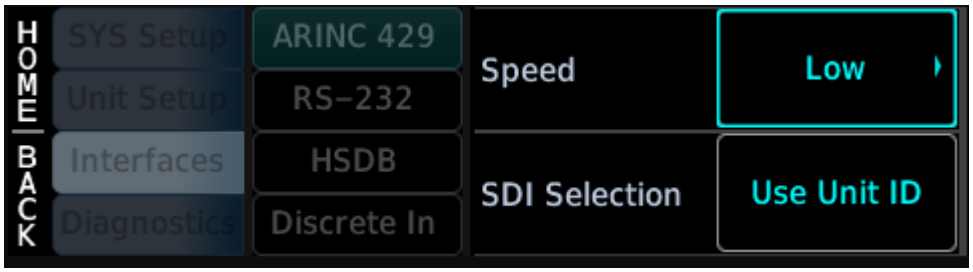


Figure 6-20 ARINC 429 Page

RS-232

Table 6-17 RS-232 Page Selections

Selection	Setting	Description
Format	None	No format selected.
	Aviation	Serial port will receives "RS-232 Aviation" format input data, as defined in section 9.1. There is no serial data output from the GTR/GNC with this selection.
	NMEA 1	Serial data "RS-232 NMEA" input/output as defined in section 9.2 (for example, with G500/G600, GPSMap, Aera Series, XL Series, or G3X Touch).

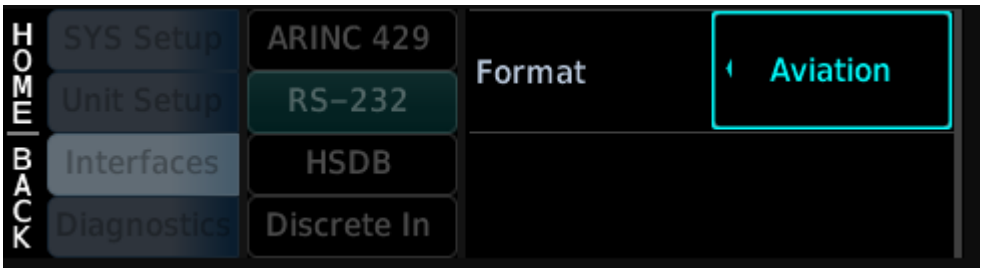


Figure 6-21 RS-232 Page

HSDB

HSDB (Ethernet) Settings

NOTE

Refer to the LRU installation manual for compatibility information. Visit Garmin's Dealer Resource Center and search by product name.

Table 6-18 HSDB Setting Selections

Selection	Setting	Description
GPS Navigator	Present	Configure if a GPS navigator such as GPS 175 or GTN Xi is present on the HSDB (Ethernet) network.
	Not Present	
GDU (TXi)	Present	Configure if a GDU TXi such as G500 TXi is present on the HSDB (Ethernet) network.
	Not Present	
GI 275	Present	Configure if a GI 275 is present on the HSDB (Ethernet) network.
	Not Present	

Figure 6-22 HSDB Settings Page

CAN Bus

CAN Bus Settings

Tap **Present** if a G3X Touch is installed.

Figure 6-23 CAN Bus Settings Page

Discrete In

NOTE
Discrete 5 is available only on the GTR 205.

Table 6-19 Discrete In Selections

Selection	Description
Discrete Off	No discrete selected.
COM Remote Transfer	Used to flip-flop between active and standby COM frequencies. It may also be used tune the emergency COM frequency 121.500MHz.
COM Remote Tune Up	May be used to scroll up through the list of User COM frequencies.
COM Remote Tune Down	May be used to scroll down through the list of User COM frequencies.
COM Standby Monitor	Toggles COM standby monitor functions.
TX Interlock In	Desensitizes the receiver of the COM radio.
Pilot ICS Key	Activates the pilot's microphone for the ICS.
Copilot ICS Key	Activates the copilot's microphone for the ICS.
VLOC Remote Transfer (GNC 215)	Used to flip-flop between active and standby NAV frequencies.

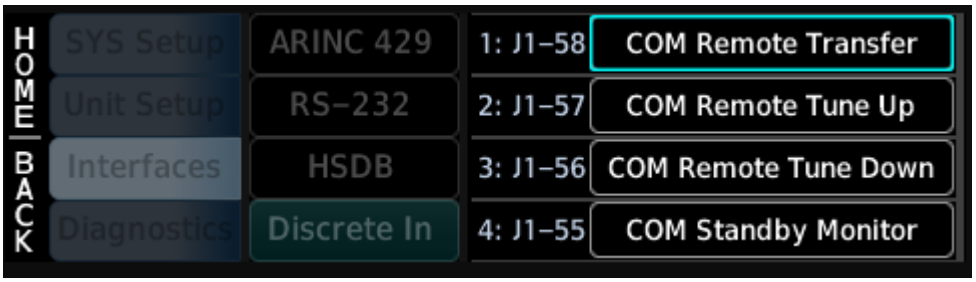


Figure 6-24 Discrete In Selections

6.4.4 SD Save

SD Save > SD Save > Save Config and Logs to SD transfers configuration information and maintenance logs to an SD card.

Saving to an SD card allows information to display on a PC, emailed, or printed. The saved information includes:

- Printable summary of all configuration settings (HTML)
- Printable maintenance log
- Error log

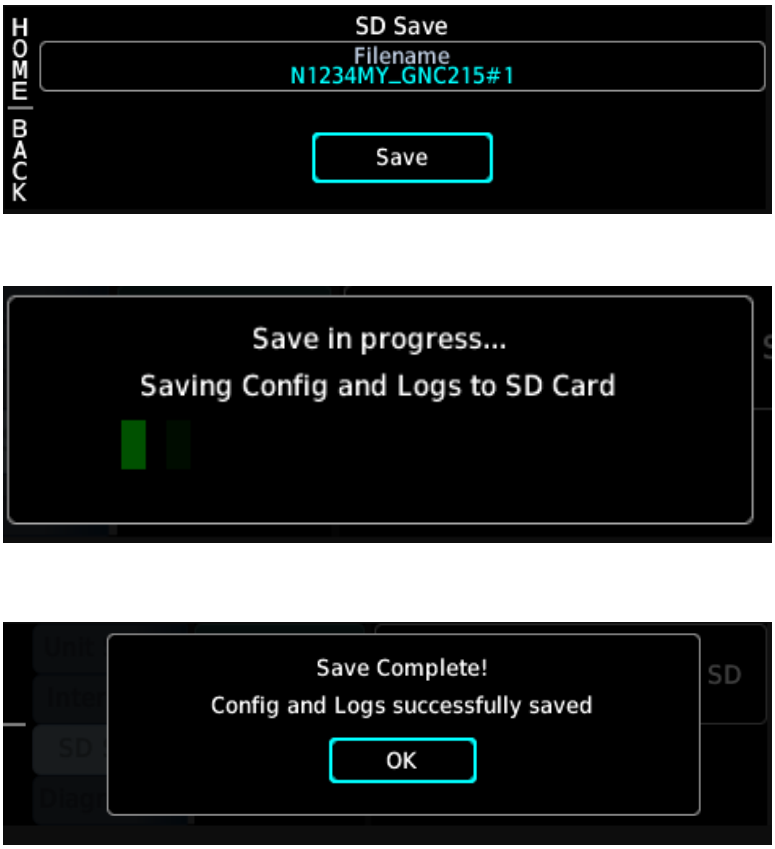


Figure 6-25 SD Save Pages

6.4.5 Test (GTR 205)

Audio

Test > Audio > View Headset Test Page displays the Headset Test page.

Set "Test Tone" to the desired channel to hear audio tone test through the headset.

Headset short status indication:

- Green: No Short
- Red: Short

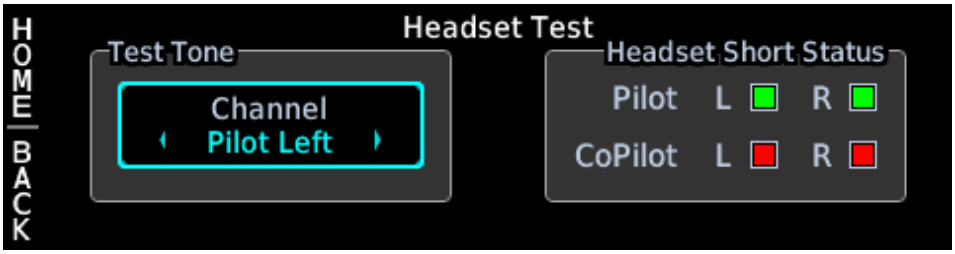
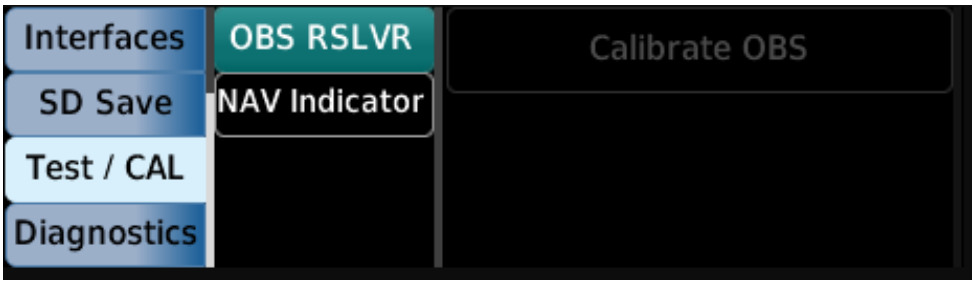


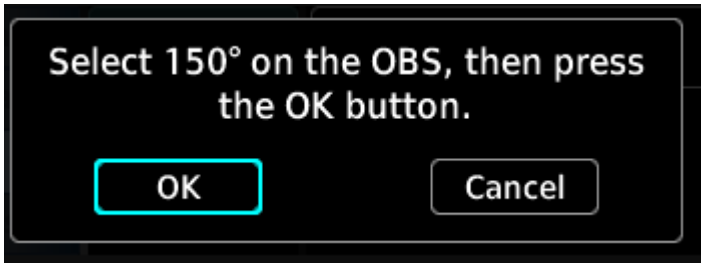
Figure 6-26 Headset Test Page

6.4.6 Test/CAL (GNC 215)

OBS RSLVR

Test/CAL > OBS RSLVR > Calibrate OBS > OK calibrates the OBS resolver. Select OK when calibration is complete.





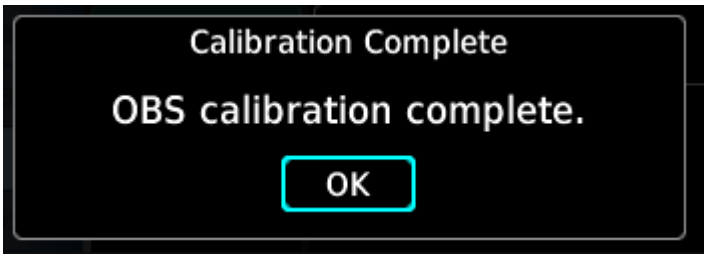


Figure 6-27 Test/CAL Pages - OBS RSLVR

NAV Indicator

Test/CAL> NAV Indicator > View NAV Indicator allows the choice of three test modes: Analog, Composite ILS, and Composite VOR.

Analog and Composite ILS

Table 6-20 Analog and Composite ILS Test Selections

Mode	Setting	Selections
Analog Composite ILS	Lateral	Dev Out • Max Left • Full Left • Center • Full Right • Max Right
		Flag • Invalid • Valid
		To/From • From • Hidden • To
	Vertical	Dev Out • Max Up • Full Up • Center • Full Down • Max Down
		Flag • Invalid • Valid

Composite VOR

Table 6-21 Composite VOR Test Selections

Mode	Setting	Selections
Composite VOR	Composite VOR	VOR Radial • Value between 0 and 360
		NAV Flag • Invalid • Valid

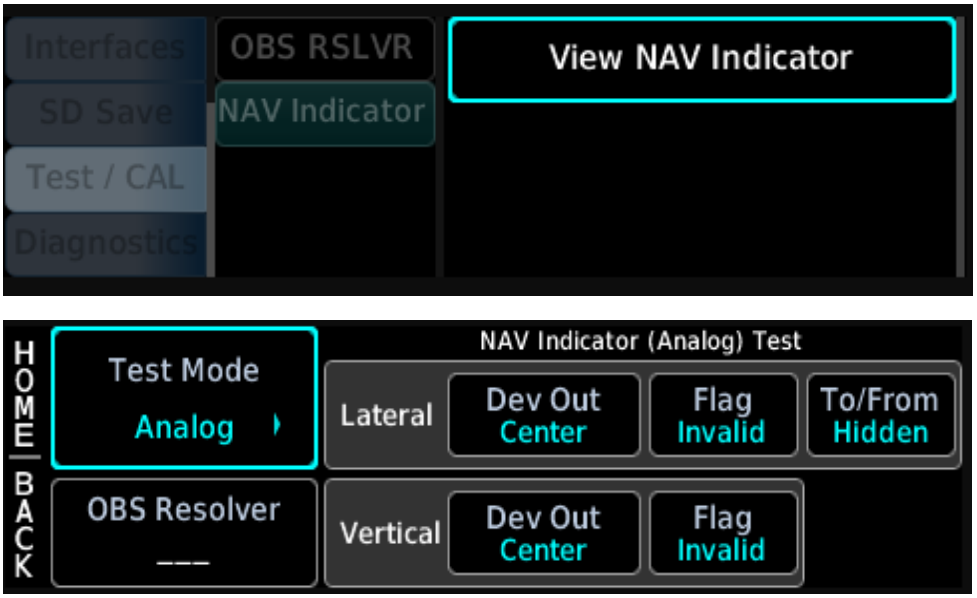


Figure 6-28 Test/CAL Pages- NAV Indicator (Analog) Test

6.4.7 Diagnostics

Table 6-22 Diagnostics Selections

Selection	Description
Digital	Allows access to view RS-232 inputs, status of HSDB and CAN Bus.
Discrete	Allows access to view the function and state of discrete inputs and outputs.
Analog In	Displays Analog In items.
Power Stats	Displays total power ups and operating hours.
Temps	Displays temperature of main board, LED board, and COM transmitter.
Clear/Delete	Allows the clearing of the maintenance log, configuration settings, and deleting the database.

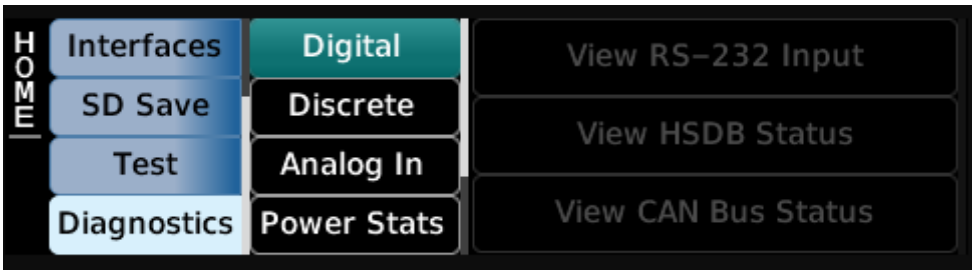


Figure 6-29 Diagnostics Page

Digital

View RS-232 Input

Diagnostics > Digital > View RS-232 Input displays the RS-232 data stream. Select Pause to stop the stream. To clear the information, select Clear Log.

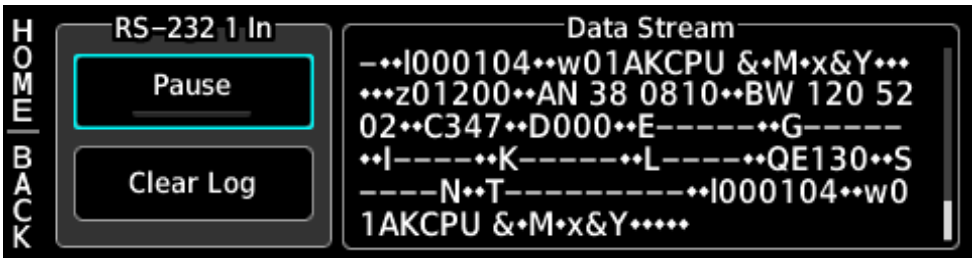


Figure 6-30 RS-232 Diagnostic Page

View HSDB Status

Diagnostics > Digital > View HSDB Status displays the status of the Ethernet Port.

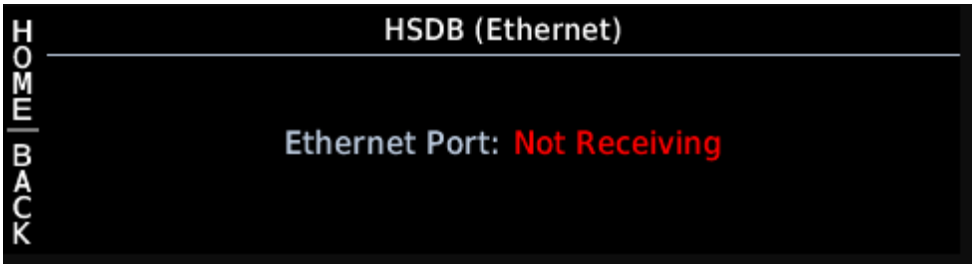


Figure 6-31 HSDB (Ethernet) Diagnostic Page

View CAN Bus Status

Diagnostics > Digital > View CAN Bus Status displays the status of the network bus.

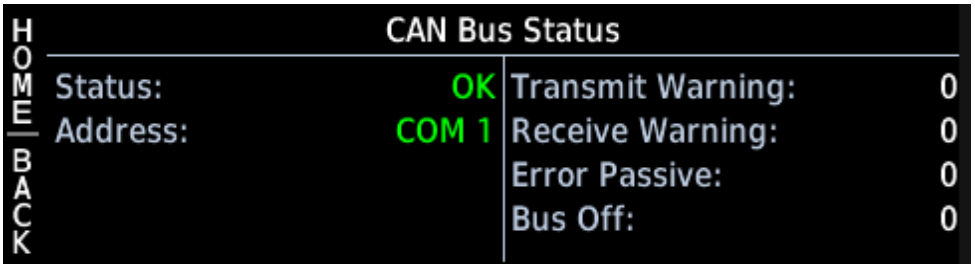


Figure 6-32 CAN Bus Diagnostic Page

Discrete

Discrete In

Diagnostics > Discrete > View Discrete Inputs displays the status of discrete inputs.

Figure 6-33 Discrete In Page

Discrete Out

Diagnostics > Discrete > View Discrete Outputs allows the viewing and setting the state of discrete outputs.

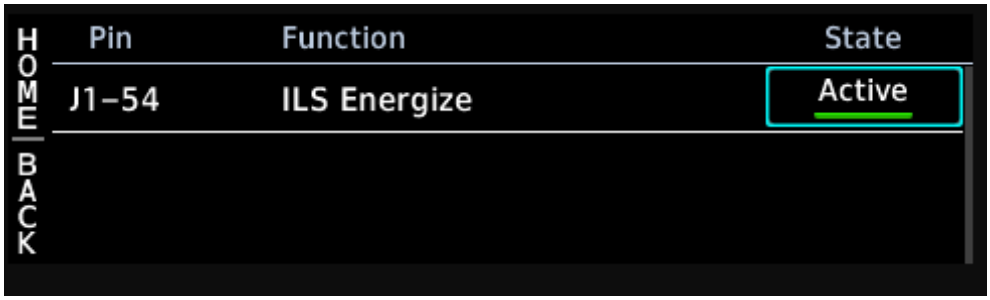


Figure 6-34 Discrete Out Page

Analog In

Diagnostics > Analog In displays the bus setting and input voltage.

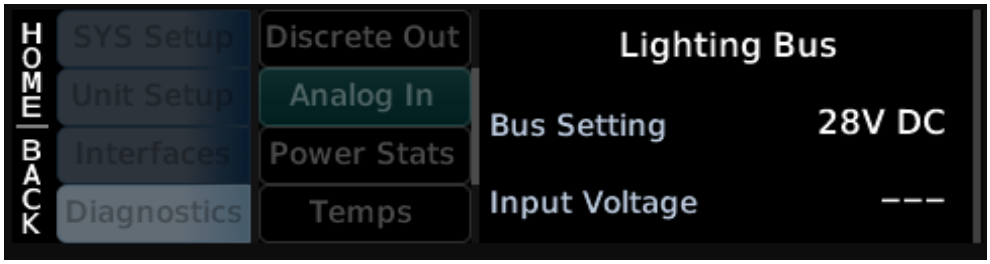


Figure 6-35 Analog In Pages

Power Stats

Diagnostics > Power Stats displays the number of Total Power-ups and Operating Hours.

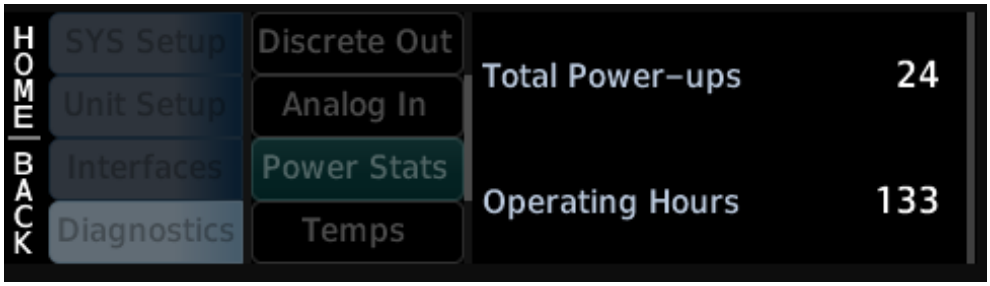


Figure 6-36 Power Stats Page

Temps

Diagnostics > Temps displays the temperatures of Main Board, LED board, and COM Transmitter.

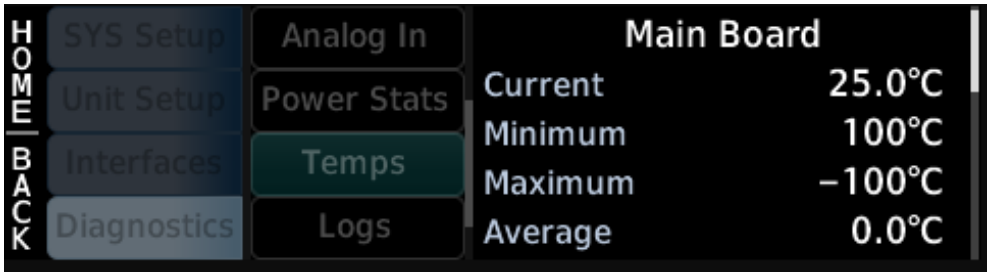


Figure 6-37 Temps Page

Clear/Delete

Diagnostics > Clear/Delete clears the maintenance log, configuration settings, and delete databases.

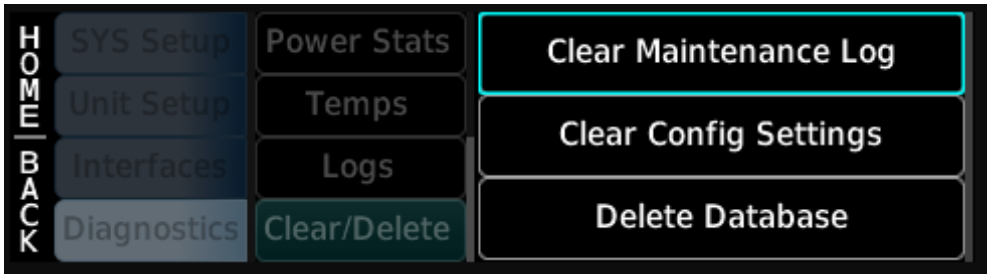


Figure 6-38 Clear/Delete Pages

Selecting Clear Maintenance Log prompts a warning prior to deleting. Select Yes or No to proceed.

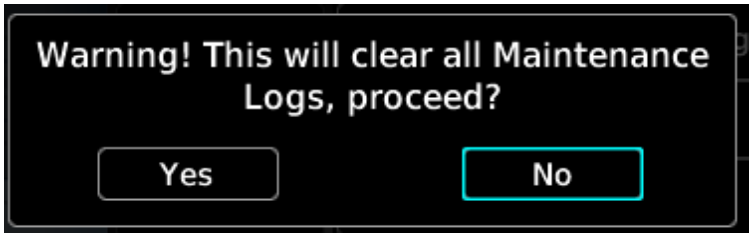


Figure 6-39 Maintenance Log Warning

"Clear Complete" prompt displays when logs are cleared.

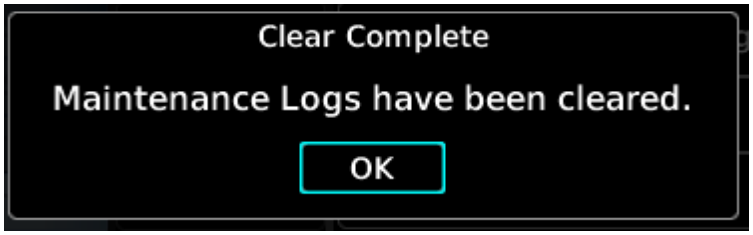


Figure 6-40 Clear Complete Prompt

Selecting **Clear Config Settings** prompts a warning. Select **Yes** or **No** to proceed.

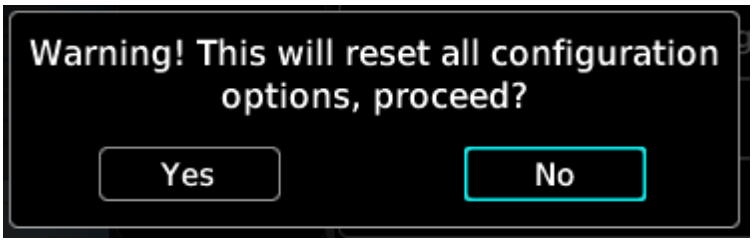


Figure 6-41 Configuration Options Warning

If **Yes** is selected, a unit restart is necessary.

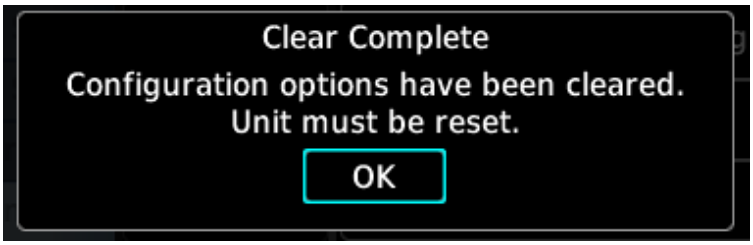


Figure 6-42 Configuration Options Reset

Selecting **Delete Database** prompts a warning. Select **Yes** or **No** to proceed.

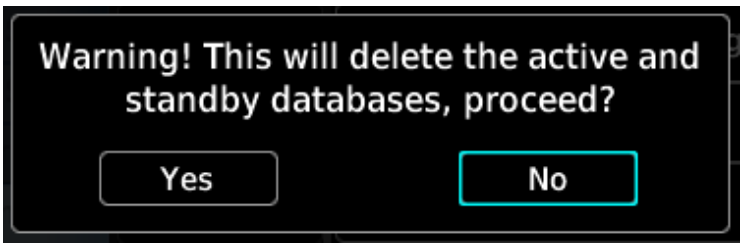


Figure 6-43 Warning of Deleting Databases

6.5 Ground Checks (Configuration Mode)

6.5.1 Lighting Bus Interface Check

CAUTION

WHEN 14 VDC OR 28 VDC LIGHTING BUSES ARE CONNECTED TO THE GTR/GNC , CONNECTION OF THE AIRCRAFT LIGHTING BUS TO THE INCORRECT INPUT PINS CAN CAUSE DAMAGE TO THE GTR/GNC . ALWAYS START THIS TEST WITH THE DIMMING BUS AT THE LOWEST SETTING, AND SLOWLY INCREASE THE BRIGHTNESS. IF THE BRIGHTNESS LEVEL ON THE GTR/GNC DISPLAY DOES NOT INCREASE AS THE LIGHTING IS INCREASED IN BRIGHTNESS, VERIFY THAT THE WIRING IS CORRECT BEFORE PROCEEDING.

The display and bezel key backlighting on the GTR/GNC tracks an external lighting/dimmer bus input and uses it to vary the display and bezel key backlight levels accordingly. This check verifies the interface.

1. Ensure the lighting bus is set to its minimum setting.
2. Slowly vary the lighting bus level that is connected to the GTR/GNC.
3. Verify the display brightness tracks the lighting bus setting.
4. Continue to maximum brightness and verify operation.

6.6 Ground Checks (Normal Mode)

6.6.1 Discrete Input Checkout

Table 6-23 Discrete Input Pins

PIN NAME	DESCRIPTION
COM REMOTE TRANSFER*	Flip-flops the active and standby COM frequencies.
COM REMOTE TUNE UP*	Scrolls up through the preset COM frequencies in the standby frequency field.
COM REMOTE TUNE DOWN*	Scrolls down through the preset COM frequencies in the standby frequency field
VLOC REMOTE TRANSFER* (GNC 215)	Flip-flops the active and standby NAV frequencies.
COM STANDBY MONITOR*	Activates and deactivates the standby COM monitor.
TX INTERLOCK IN*	Desensitizes the receiver of the COM radio.
PILOT ICS KEY*	Activates the pilot's microphone for the ICS.
COPILOT ICS KEY*	Activates the copilot's microphone for the ICS.

6.6.2 VHF NAV Checkout (GNC 215)

Check the VOR reception with ground equipment, operating VOT or VOR, and verify audio and Morse code ID functions, if possible. Tune a localizer frequency and verify the CDI needle, NAV flag, VDI needle and GS flag operation.

6.6.3 NAV Audio Check (Audio Panel Installations) (GNC 215)

Ensure the audio panel is powered on and perform the following steps.

1. Plug in a headset at pilot and copilot position.
2. Tune the GNC NAV receiver to a local VOR station.
3. Select NAV audio on the audio panel.
4. Ensure the Morse code identifier is being received over the crew headsets.
5. Verify the wiring connections to the audio panel, if the audio is not heard.
6. Ensure the audio volume is sufficient for all anticipated cockpit noise conditions.

6.6.4 VHF COM

Antenna Check

If desired, the antenna VSWR can be checked using an inline wattmeter in the antenna coaxial using frequencies near both ends of the band. The VSWR should be less than 2:1. A VSWR of 2:1 will cause a drop in output power of approximately 12%.

Receiver/Transmitter Check

1. Tune the unit to a local VHF frequency.
2. Verify the receiver output produces a clear and understandable audio output.
3. Verify the transmitter functions properly by contacting another station and getting a report of reliable communications.

6.6.5 Database Check

NOTE
Databases are optional on the unit and may not be current.

Check the frequency database to ensure it is current.

1. Cycle power on the GTR/GNC and let the start-up sequence complete.
2. Press MENU.
3. Turn the outer knob to "System."
4. Turn the inner knob to "Database."
5. Press knob
6. Verify the frequency database date has not lapsed.

6.6.6 Serial Interface Checks

The interfaces to RS-232 equipment such as the GTN 6XX/7XX or GNS 400W/500W series GPS sources should be checked as follows.

1. Operate the connected GPS source and the GTR/GNC in normal mode.
2. Ensure the aircraft has a clear view of the sky for this check. This check should not be performed in a hangar.
3. Verify the connected GPS source has a valid GPS satellite fix.
4. Press FIND.
5. Turn the outer knob to NEAREST APT.
6. Verify the wiring between the GPS source and the GTR/GNC if the unit displays "No GPS Position."

6.7 Flight Checks

After the installation is complete, a flight check is recommended to ensure satisfactory performance.

6.7.1 COM Flight Check

To check the communications transceiver, maintain an appropriate altitude and contact a ground station facility at a range of at least 50 nautical miles.

1. Contact a ground station in close proximity.
2. Press the COM volume knob to select manual squelch.
3. Listen for any unusual electrical noise, which would increase the squelch threshold.
4. If possible, verify the communications capability on both the high, low, and mid bands of the VHF COM band. It may be required by the governing regulatory agency to verify operation of the COM transmitter and receiver at the extents of a ground facility's service volume (e.g., FAA AC 23-8A).

6.7.2 VOR Flight Check (GNC 215)

1. Tune a local VOR station within 50 miles.
2. Verify the audio IDENT and voice quality and verify that no objectionable electrical interference such as magneto noise is present.
3. Verify the Morse code decoder IDs the station (95% probability).
4. Fly to and from the station.
5. Verify NAV flag, TO/FROM flag, and CDI are operational.

It may be required by the governing regulatory agency to verify operation of the VOR receiver at the extents of a ground facility's service volume (e.g., FAA AC 23-8A).

6.7.3 ILS Flight Check (GNC 215)

1. Tune an ILS at a local airport.
2. Verify the audio IDENT and audio quality and verify that no objectionable electrical interference such as magneto noise is present.
3. Verify the Morse code decoder IDs the station (95% probability).
4. Fly the approach.
5. Verify NAV flag, GS flag, and CDI and VDI are operational.

6.8 Software Loading

The unit comes pre-loaded with software. It is recommended software from a current GTR/GNC Downloadable Software microSD Card, P/N 006-B4483-XX, be loaded into the unit. Visit Dealer Resource Center and search by product name. For dual installations the software loading procedures below must be carried out on each unit. Refer to section 6.4 for instructions pertaining to entering configuration mode.

1. Power off the unit with power knob.
2. Remove the database SD card.
3. Insert the correct loader card into the SD card slot.
4. Restore power to the unit. The unit should power on in configuration mode.
5. Select **Sys Setup** > **SW Upload** to display the available software updates. The page displays the version installed on the unit and version installed on the loader card.
6. Select **Update**.
7. Select **OK**.
8. Power off the unit.
9. Remove the software loader card.
10. Reinsert the database card into the SD card slot.

Figure 6-44 Software Upload Page

6.9 Screenshots

NOTE

To save screenshots, a microSD card in the FAT32 format with a capacity between 8 GB and 32 GB is necessary.

Images are automatically saved to a folder named "Print" in the microSD card root directory. Eject the microSD card from the unit to view images on a computer.

To save images to microSD card.

1. Insert microSD card into slot.
2. Go to page of interest.
3. Push and hold MON.
4. Push and release to top soft key.

When the screenshot is successful, a camera icon briefly displays in the annunciator bar.

Figure 6-45 Screenshots

7 Continued Airworthiness

Maintenance of the GTR 205 and GNC 215 is “on condition” only. For regulatory periodic functional checks, refer to approved aircraft maintenance manuals or manual supplements for actual aircraft maintenance requirements.

8 Environmental Qualification Form

Visit Garmin's Dealer Resource Center for RTCA/DO-160G EQFs and search by product name.

The GTR 205 and GNC 215 have the same EQF, P/N 005-01450-30.

9 Data Format

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9.1 RS-232 Aviation Format

9.1.1 Electrical Interface

I/O signals are compatible with RS-232C. Data generates at 9600 baud with a word length of 8 bits, one stop bit, and no parity.

9.1.2 General Aviation Output Format

The GTR/GNC RS-232 data has the following general format.

Table 9-1 General Aviation Output Format

CHARACTER	DEFINITION
STX	ASCII start-of-text character (02 hex)
t1s	Type 1 output sentences
t2s	One or more type 2 output sentences
ETX	ASCII end-of-text character (03 hex)

9.1.3 Aviation Output Sentence Type 1

The Type 1 output sentences have the following general format.

Table 9-2 Aviation Output Sentence Type 1

CHARACTER	DEFINITION
id	item designator (single ASCII alphabetic character
dddd	item data (1 to 10 printable ASCII characters)
CR	ASCII carriage return character (0D hex)
LF	ASCII line feed character (0A hex) [1]

[1] The line feed character is not output if the RS-232 port is configured as “Aviation Output 2.”

Each Type 1 sentence is output by the GTR/GNC approximately once every second.

The track, desired track and bearing to waypoint angles, and the magnetic variation are output according to the current mode of the GTR/GNC (automatic magnetic heading, magnetic variation computed at last known position; true heading, magnetic variation of E00.0°; or user-defined magnetic heading, magnetic variation as entered by user).

Table 9-3 describes the Type 1 output sentence item designator (id) and item data (dddd) fields. If data for these sentences is invalid or unavailable, dashes ("-") are used to fill in all non-blank character positions.

Table 9-3 Aviation Output Sentence Format

IDENT (1 BYTE)	DATA (10 BYTES)										DESCRIPTION
	1	2	3	4	5	6	7	8	9	0	
z	a	a	a	a	a						Current GPS altitude in feet *
A	s		d	d		m	m	h	h		Current latitude, where: s N (north) or S (south) dd degrees mm minutes hh hundredths of minutes
B	s		d	d	d		m	m	h	h	Current longitude, where: s E (east) or W (west) ddd degrees mm minutes hh hundredths of minutes
C	d	d	d								Track in whole degrees
D	s	s	s								Ground speed in knots
E	d	d	d	d	d						Distance to waypoint in tenths of nautical miles
G	s	n	n	n	n						Cross track error, where: s L (left) or R (right) of course nnnn error in hundredths of nautical miles
I	d	d	d	d							Desired track in tenths of degrees
K	c	c	c	c	c						Active waypoint identifier (will be blank filled on right if less than 5 characters in identifier)
L	d	d	d	d							Bearing to active waypoint in tenths of degrees
Q	s	d	d	d							Magnetic variation, where: s E (east) or W (west) ddd tenths of degrees
S	-	-	-	-	f						NAV valid flag status, where: f - N (NAV flagged) or - (NAV valid)
T	-	-	-	-	-	-	-	-	-		Warnings status, only data transmitted are dashes (-). Used to indicate end of Type 1 sentences.
l (lower case Lima)	d	d	d	d	d	d					Distance to destination waypoint in tenths of nautical miles.

9.1.4 Aviation Output Sentence Type 2

The GTR/GNC Type 2 aviation output sentence has the following general format.

Table 9-4 Aviation Output Sentence Type 2

CHARACTER	DESCRIPTION
id	item designator (3 ASCII characters)
seq	sequence number (1 binary byte)
wpt	waypoint identifier (5 ASCII characters)
lat	waypoint latitude (3 binary bytes)
lon	waypoint longitude (4 binary bytes)
mvar	magnetic variation at waypoint (2 binary bytes)
CR	ASCII carriage return character (0D hex)
LF	ASCII line feed character (0A hex)

Each waypoint in the route being navigated by the interfacing equipment has a Type 2 sentence output by the interfacing navigation equipment approximately once every second.

If no route is being navigated by the interfacing navigation equipment (i.e., the active route is empty), the following Type 2 sentence is output approximately once every second.

Table 9-5 Aviation Output Sentence Type 2 - No Route

CHARACTER	DESCRIPTION
id	item designator (3 ASCII characters; route sequence number is “01”)
seq	sequence number (1 binary byte; last waypoint flag is set; route sequence number is 1)
CR	ASCII carriage return character (0D hex)
LF	ASCII line feed character (0A hex)

Table 9-6 describes the Type 2 aviation output sentence item designator (id), sequence number (seq), waypoint identifier (wpt), waypoint latitude (lat), waypoint longitude (lon), and magnetic variation at waypoint (mvar) fields.

Table 9-6 Type 2 Aviation Output Sentence Format

FIELD	BYTE	FORMAT 7	6	5	4	3	2	1	0	DESCRIPTION
id	1 2-3									ASCII character "w" (77 hex) Two ASCII numeric characters representing route sequence number of waypoint (01 to 31)
seq	1	x	l	a	n	n	n	n	n	x undefined l 1 if last waypoint in route a 1 if active to waypoint nnnnn route sequence number of waypoint (unsigned binary)
wpt	1-5									Destination waypoint identifier (will be blank filled on right if less than 5 characters in identifier)
lat	1	s	d	d	d	d	d	d	d	s 0 (north) or 1 (south) ddddddd latitude degrees (unsigned binary)
	2	x	x	m	m	m	m	m	m	xx undefined mmmmmm latitude minutes (unsigned binary)
	3	x	h	h	h	h	h	h	h	x undefined hhhhhhh hundredths of latitude minutes (unsigned binary)
lon	1	s	x	x	x	x	x	x	x	s 0 (east) or 1 (west) xxxxxxx undefined
	2	d	d	d	d	d	d	d	d	ddddddd longitude degrees (unsigned binary)
	3	x	x	m	m	m	m	m	m	xx undefined mmmmmm latitude minutes (unsigned binary)
	4	x	h	h	h	h	h	h	h	x undefined hhhhhhh hundredths of latitude minutes (unsigned binary)
mvar	1-2									Two's complement binary in 16ths of degrees. Easterly variation is positive. MSB output first.

9.2 RS-232 NMEA Data Format

9.2.1 Electrical Interface

I/O signals are compatible with RS-232C. Data is generated at 9600 baud with a word length of 8 bits, one stop bit, and no parity.

The data format for the serial communication is:

Baud rate 9600
Data bits 8
Stop bits 1
Parity None

9.2.2 Message Formats

All messages conform to the NMEA 0183 proprietary message format as follows. All characters will be standard ASCII characters. No binary data characters are used.

Table 9-7 Message Formats

CHARACTER	DEFINITION
"$"	Start of message character, ASCII "$" (024h).
"P"	Proprietary message identifier.
"GRM"	Garmin company identifier.
c	Message class identifier; Identifies a message as either a COM or NAV message. The GTR and COM portion of the GNC use "C", while message for the NAV portion of the GNC use "V".
nn	Message identifier, two-digit number in ASCII characters.
d.....d	Message data characters defined for each message.
chksum	Message checksum, including message identifier (nn) through data characters (d.....d). The two-digit checksum is generated by adding all values of valid characters together, ignoring carry (if any). This value is converted into two encoded hex characters (30h-3Fh). [1]
<CR>	ASCII carriage return (0Dh).
<LF>	ASCII line feed (0Ah).

The maximum message length, including the start of message character ("$") and the end of message <CR><LF> sequence, is 100 bytes.

[1] Encoded hex: each character consists of 4 bits of data placed in the low order nibble +30h. For example, the 8-bit value 5Fh would be encoded as two characters with values of 35h and 3Fh, which map to the ASCII characters "5" and "?", respectively.

9.2.3 Message Output Rate

The GTR/GNC will output the following messages at the specified rates.

Table 9-8 Message Definitions

MESSAGE	RATE
CDI	10Hz (high rate)
VDI	
Flags	
Decoded OBS Setting	
Radial from Active VOR	
Decoded Station Identifier	1Hz (low rate)
NAV Receiver Status	
COM Transceiver Status	
Radial from Standby VOR	

9.2.4 Message Definitions

Frequency Types

Table 9-9 Frequency Types

CHARACTER	DESCRIPTION
0	Tower
1	Ground
2	Automatic Terminal Information Service or ATIS
3	Air Traffic Frequency
4	Approach
5	Arrival
6	Automatic Weather Observing Station
7	Clearance/Delivery
8	Common Traffic Advisory Frequency
9	Departure
:	Flight Service Station
;	Remote Flight Service Station
<	UNICOM
=	Mandatory Frequency
>	No type specified
?	Undefined
@	Center
A	Automated Surface Observing Station
B	Class B
C	Class C
D	Radio
E	En route
F	En route Flight Advisory Service or Flight Watch
G	Gate
H	Helicopter
I	Information
J	Weather
K	Terminal
L	Pilot controlled lighting

CHARACTER	DESCRIPTION
M	Multicom
N	Radar
O	Operations
P	Ramp
Q	Reserved - Undefined

Input Messages

Request Data Output

NOTE

The GTR/GNC flags the specified message for output when it receives the request. There will be a lag between the time the message is flagged for output and the time it is actually output. If another request for the same message is received in this period, then the previous request will be lost. The amount of lag depends on the number of messages that are consecutively flagged for output.

NOTE

Use of unsupported output identifiers will not generate a Communication Error message.

This input command is used to request an output message to be sent by the GTR/GNC. Message data may be specified.

Table 9-10 Message Format (GNC NAV Requests)

CHARACTER	DEFINITION
"V"	Message class. This is a GNC NAV request.
"24"	Message identifier.
ii	Output identifier of requested message, two ASCII characters. 20 = Request Legacy GNC Reset Status 24 = Request NAV Standby VOR Radial 29 = Request NAV Audio 40 = Request NAV Volume 41 = Request GNC Status
"000"	Reserved.
MESSAGE EXAMPLE	
$PGRMV2429000<chksm><CR><LF> Request the GNC to send the current NAV Audio configuration.	

Table 9-11 Message Format (GTR/GNC COM Requests)

CHARACTER	DEFINITION
"C"	Message class. This is a GTR/GNC COM request.
"06"	Message identifier.
ii	Output identifier of requested message, two ASCII characters. 00 = Request Legacy COM Reset Status 02 = Request COM Audio Volume 03 = Request COM Software Version 13 = Request GTR Status 14 = Request Unit Display Information.
d	Message sub-id; set to (ASCII) 1 for Request COM Audio Volume, 0 otherwise.
"00"	Reserved.
MESSAGE EXAMPLE	
$PGRMC0613000<chksm><CR><LF> Request the GTR/GNC to send the current COM status.	

Set Active COM Frequency and Transceiver Function

NOTE
The GTR/GNC will check input frequencies for validity. An RS-232 serial error message output will be generated if the frequency is invalid.

NOTE
The GTR/GNC will generate a COM data error message if this message is received while transmitting on the active COM frequency.

This message is used to set the Active COM frequency as well as the COM transceiver function.

Table 9-12 Active COM Frequency and Transceiver Message Format

CHARACTER	DEFINITION
"C"	Message class. This is a GTR/GNC COM message.
"00"	Message identifier.
mk	Active COM Frequency: m = desired frequency in MHz in hexadecimal, where m = desired frequency - 30h, with desired frequency in range of 118 to 136 MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 975 kHz in 25 kHz steps.
a	Transceiver function: N = normal, M = monitor, 0 = unchanged.
o	8.33 kHz Offset: (ASCII) 0 = 25 kHz frequency (.000) 1 = first 8.33 kHz channel offset (.005) 2 = second 8.33 kHz channel offset (.010) 3 = third 8.33 kHz channel offset (.015)
MESSAGE EXAMPLE	
$PGRMC00G4N0<chksm><CR><LF> This example command would set the active COM frequency to 119.100 MHz and place the COM radio in Normal receive mode. This is interpreted by noting that the ASCII "G" corresponds with 47h, +30h = 77h, converted to decimal equals 119 for the MHz portion. The kHz portion converts ASCII "4" to 34h, -30h yields 4h, x 25 kHz steps = 100 kHz, with no 8.33 kHz channel offsets.	

Set Standby COM Frequency and Transceiver Function

NOTE
The GTR/GNC will check input frequencies for validity. An RS-232 serial error message output will be generated if the frequency is invalid.

This message is used to set the standby COM frequency as well as the COM transceiver function.

Table 9-13 Standby COM Frequency and Transceiver Message Format

CHARACTER	DEFINITION
"C"	Message class. This is a GTR/GNC COM message.
"01"	Message identifier.
mk	Standby COM Frequency m = desired frequency in MHz in hexadecimal, where m = desired frequency - 30h, with desired frequency in range of 118 to 136MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 975 kHz in 25 kHz steps.
a	Transceiver function: N = normal M = monitor 0 = unchanged.
o	8.33 kHz offset: (ASCII) 0 = 25 kHz frequency (.000) 1 = first 8.33 kHz channel offset (.005) 2 = second 8.33 kHz channel offset (.010) 3 = third 8.33 kHz channel offset (.015)
MESSAGE EXAMPLE	
$PGRMC01KFM3<chksm><CR><LF> This example command would set the standby COM frequency to 123.565MHz and place the COM radio in Monitor mode. This is interpreted by noting that the ASCII "K" corresponds with 4Bh, +30h = 7Bh, converted to decimal equals 123 for the MHz portion. The kHz portion converts ASCII "F" to 46h, -30h yields 16h, x25 kHz steps = 550 kHz, add 3 8.33 channels = 565 kHz.	

Set COM Volume Level and Audio Control Parameters

This input is used to set the volume level for the headphone output, and various audio controls parameters.

Table 9-14 COM Level and Audio Control Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"02"	Message ident.
n	Data type: (ASCII) 1 = headphone 4 = sidetone level 9 = RF squelch. Note: Only the headphone volume level can be changed using this message. The sidetone and squelch messages will be accepted without error and ignored.
vv	Volume level: 00-FFh; two encoded hex characters (30h-3Fh).
MESSAGE EXAMPLE	
$PGRMC0211=<chksm><CR><LF> Set the headphone output volume to 1Dh out of FFh ("=" = 3Dh, -30h = Dh).	

Select Squelch Override

This input is used to turn the manual squelch on and off.

Table 9-15 Squelch Override Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"03"	Message ident.
n	Squelch test: (ASCII) 0 = automatic 1 = manual override (displays "SQ")
MESSAGE EXAMPLE	
$PGRMC030<chksm><CR><LF> Set the squelch to automatic operation.	

Remote Airport Identifier Name

This input adds an airport identifier to a remote airport frequency list.

Table 9-16 Remote Airport Identifier Name Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"04"	Message ident.
t	List type "0" through "9."
aaaa	Airport Identifier. Allowable ASCII characters are A-Z, 0-9, and trailing spaces. All four characters can be spaces. Leading spaces and spaces inserted between alphanumeric characters are not allowed.
MESSAGE EXAMPLE	
$PGRMC044K34<sp><chksm><CR><LF> Set the list airport name at index 4 to K34<sp>.	

Remote Airport Frequency Input

This input adds a frequency to a remote airport frequency list.

Table 9-17 Remote Airport Frequency Input Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"05"	Message ident.
t	List type "0" through "9."
f	Frequency type. Refer to table 9-9.
mk	Airport COM Frequency: m = desired frequency in MHz in hexadecimal, where m = desired frequency - 30h, with desired frequency in range of 118 to 136 MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 975 kHz in 25 kHz steps.
o	8.33 kHz offset: (ASCII) (Only applies to GRM messages) 0 = 25 kHz frequency (.000) 1 = first 8.33 kHz channel offset (.005) 2 = second 8.33 kHz channel offset (.010) 3 = third 8.33 kHz channel offset (.015)
MESSAGE EXAMPLE	
$PGRMC054<JP0<chksm><CR><LF> Append 122800 to the end of the airport frequency list at index 4 with a frequency type of UNICOM.	

Set Active COM Frequency with Identifier

This input sets the active COM frequency to the given frequency, along with the transceiver mode, and the text to be displayed with the frequency.

Table 9-18 Active COM Frequency with Identifier Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"15"	Message ident.
mk	Active COM Frequency: m = desired frequency in MHz in hexadecimal, where m = desired frequency - 30h, with desired frequency in range of 118 to 136 MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 975 kHz in 25 kHz steps.
a	Transceiver function: N = normal M = monitor 0 = unchanged
o	8.33 kHz offset: (ASCII) (Only applies to GRM messages) 0 = 25 kHz frequency (.000) 1 = first 8.33 kHz channel offset (.005) 2 = second 8.33 kHz channel offset (.010) 3 = third 8.33 kHz channel offset (.015)
iiii	Identifier string. Allowable ASCII characters are A-Z, 0-9, and trailing spaces. All four characters can be spaces. Leading spaces and spaces inserted between alphanumeric characters are not allowed.
f	Frequency type. Refer to table 9-9.
MESSAGE EXAMPLE	
$PGRMC15F0N0ABC I<chksm><CR><LF> Set the active COM frequency to 118.000 MHz, the transceiver to normal (not monitor) mode, and the displayed text to ABC<sp> along with the Information frequency type.	

Set Standby COM Frequency with Identifier

This input sets the standby COM frequency to the given frequency, along with the transceiver mode, and the text to be displayed with the frequency.

Table 9-19 Standby COM Frequency with Identifier Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"16"	Message ident.
mk	Standby COM Frequency: m = desired frequency in MHz in hexadecimal, where m = desired frequency - 30h, with desired frequency in range of 118 to 136 MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 975 kHz in 25 kHz steps.
a	Transceiver function: N = normal M = monitor 0 = unchanged
o	8.33 kHz offset: (ASCII) (Only applies to GRM messages) 0 = 25 kHz frequency (.000) 1 = first 8.33 kHz channel offset (.005) 2 = second 8.33 kHz channel offset (.010) 3 = third 8.33 kHz channel offset (.015)
iiii	Identifier string. Allowable ASCII characters are A-Z, 0-9, and trailing spaces. All four characters can be spaces. Leading spaces and spaces inserted between alphanumeric characters are not allowed.
f	Frequency type. Refer to table 9-9.
MESSAGE EXAMPLE	
$PGRMC16F0N0ABC I<chksm><CR><LF> Set the standby COM frequency to 118.000 MHz, the transceiver to normal (not monitor) mode, and the displayed text to ABC<sp> along with the Information frequency type.	

Set COM Frequency Lookup Table Entry

This input adds a frequency, identifier, and frequency type to the remote frequency lookup table at the given index.

Table 9-20 Set COM Frequency Lookup Table Entry Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"17"	Message ident.
nnn	Frequency index ("000" to "299")
mk	Standby COM Frequency: m = desired frequency in MHz in hexadecimal, where m = desired frequency - 30h, with desired frequency in range of 118 to 136 MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 975 kHz in 25 kHz steps.
o	8.33 kHz offset: (ASCII) (Only applies to GRM messages) 0 = 25 kHz frequency (.000) 1 = first 8.33 kHz channel offset (.005) 2 = second 8.33 kHz channel offset (.010) 3 = third 8.33 kHz channel offset (.015)
iiii	Identifier string. Allowable ASCII characters are A-Z, 0-9, and trailing spaces. All four characters can be spaces. Leading spaces and spaces inserted between alphanumeric characters are not allowed.
f	Frequency type. Refer to table 9-9.
MESSAGE EXAMPLE	
$PGRMC17000F00GHI I<chksm><CR><LF> Set the frequency lookup table entry at index 0 to 118.000 MHz with the GHI<sp> as the identifier string and information as the frequency type.	

Remove COM Frequency Lookup Table Entry

This input removes entries from the COM frequency lookup table starting at the given index for the given number of entries.

Table 9-21 Remove COM Frequency Lookup Table Entry Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"18"	Message ident.
nnn	Frequency index ("000" to "299")
sss	Number of sequential frequencies to delete (minimum "001" to "300")
MESSAGE EXAMPLE	
$PGRMC18000010<chksm><CR><LF> Delete ten entries from the COM frequency lookup table starting at index 0.	

COM Keypad Input

This input is used to press keys as though the display was on the main COM screen.

Table 9-22 COM Keypad Input Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"19"	Message identifier.
p	Key press: F = Flip-Flop key; M = MON key.
MESSAGE EXAMPLE	
$PGRMC19M<chksm><CR><LF> Toggle the standby frequency monitor mode.	

Set Active NAV Frequency

NOTE

The GNC will check input frequencies for validity. An RS-232 serial error message output will be generated if the frequency is invalid.

This message is used to set the active NAV frequency.

Table 9-23 Active NAV Frequency Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"27"	Message identifier.
mk	Active VOR/LOC Frequency m = desired frequency in MHz in hexadecimal, where m = desired frequency - 30h, with desired frequency in range of 108 to 117MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 950 kHz in 50 kHz steps, or the even numbers from 30h to 56h.
a	Receiver function: N = normal M = monitor 0 = unchanged
MESSAGE EXAMPLE	
$PGRMV27E4N<chksm><CR><LF> Set the active VOR frequency to 117.100 MHz. This can be interpreted by noting that the ASCII 'E' corresponds with 45h, +30h = 75h, converted to decimal equals 117 for the MHz portion of the command. The kHz portion converts ASCII '4' to 34h, -30h = 4h, x 25 kHz steps = 100 kHz. Set the receiver function to normal (monitor mode off).	

Remote VOR Input

This input is used to add a VOR entry to the NAV remote database.

Table 9-24 Remote VOR Input Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"20"	Message identifier.
vvvv	VOR station identifier Allowable ASCII characters are A-Z, 0-9, and trailing spaces. All four characters can be spaces. Leading spaces and spaces inserted between alphanumeric characters are not allowed.
mk	VOR Frequency m = desired frequency in MHz in hexadecimal, where m = desired frequency - 30h, with desired frequency in range of 108 to 117 MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 950 kHz in 50 kHz steps, or the even numbers from 30h to 56h and for frequencies between 108 and 111.950 MHz the 100 kHz value is not odd (reserved for localizer frequencies)..
MESSAGE EXAMPLE	
$PMRRV20UBG<Sp>E@<chksm><CR><LF> VOR station identifier is "UBG ", VOR frequency is 117.400 MHz.	

Remote VOR List Trailer

This input command marks the end of a VOR list sent by a remote device.

Table 9-25 Remote VOR List Trailer Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"21"	Message identifier.
MESSAGE EXAMPLE	
$PMRRV21<chksm><CR><LF> Indicates the end of a remote VOR list.	

Remote Localizer List Header

This input command marks the beginning of a Localizer list sent by a remote device. It specifies the four character airport identifier associated with the localizer frequencies in the list.

Table 9-26 Remote Localizer List Header Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"22"	Message identifier.
aaaa	Airport identifier. Allowable ASCII characters are A-Z, 0-9, and trailing spaces. All four characters can be spaces. Leading spaces and spaces inserted between alphanumeric characters are not allowed.
MESSAGE EXAMPLE	
$PMRRV22SLE<Sp><chksm><CR><LF> Indicates the start of a remote localizer list associated with the airport "SLE ".	

Remote Localizer List Entry

This input command adds a localizer to the remote localizer frequencies list.

Table 9-27 Remote Localizer List Entry Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"23"	Message identifier.
iiii	Station or runway identifier. Allowable ASCII characters are A-Z, 0-9, and trailing spaces. All four characters can be spaces. Leading spaces and spaces inserted between alphanumeric characters are not allowed.
mk	LOC Frequency m = desired frequency in MHz in hexadecimal, where m = desired frequency - 30h, with desired frequency in range of 108 to 111 MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 950 kHz in 50 kHz steps, or the even numbers from 30h to 56h and for frequencies between 108 and 111.950 MHz the 100 kHz value is odd (reserved for localizer frequencies).
MESSAGE EXAMPLE	
$PMRRV2331<Sp><Sp>><<chksm><CR><LF> Identifier is "31 ", indicating a runway, and the localizer frequency is 110.300 MHz.	

Set Standby NAV Frequency

NOTE
The GNC will check input frequencies for validity. An RS-232 serial error message output will be generated if the frequency is invalid.

This message is used to set the standby NAV frequency.

Table 9-28 Standby NAV Frequency Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"28"	Message identifier.
mk	Standby VOR/LOC frequency:
	m = desired frequency in MHz in hexadecimal, where m = desired frequency - 30h, with desired frequency in range of 108 to 117MHz.
	k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 950 kHz in 50 kHz steps, or the even numbers from 30h to 56h.
a	Receiver function: N = normal M = monitor 0 = unchanged
MESSAGE EXAMPLE	
$PGRMV28?P0<chksm><CR><LF> This example command would set the standby VOR frequency to 111.800MHz. This is interpreted by noting that the ASCII "?" corresponds with 3Fh, +30h = 6Fh, converted to decimal equals 111 for the MHz portion. The kHz portion converts ASCII "P" to 50h, -30h yields 20h, x 25 kHz steps = 800 kHz. The receiver function to remain unchanged.	

Set NAV Audio Mode

This message is used to change the current NAV audio mode. There are two possible settings for this mode. The first is "Voice with ident," which will allow both the voice and the Morse Code station identifier portions of the NAV audio signal to be heard. (Unit will display "ID" in the upper left corner of the NAV page.) The second choice is "Voice without ident," which will deemphasize the Morse Code station identifier portion of the NAV audio signal. (Unit will not display "ID" in the upper left corner of the NAV page.)

This message is available in both normal and test modes.

Table 9-29 NAV Audio Mode Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"31"	Message identifier.
a	NAV audio mode. "0" = Leave current audio mode unchanged "I" = Voice with ident "V" = Voice without ident
MESSAGE EXAMPLE	
$PGRMV31I<chksm><CR><LF> Set the current NAV Audio mode to IDENT.	

Set Omni-Bearing Select (OBS) Value

This message is used to set the OBS value used by the GNC as the selected radial for computing the course deviation from a VOR. This message will have no effect if the GNC is configured to have a composite indicator installed.

Table 9-30 Omni-Bearing Select Value Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"34"	Message identifier.
vvv	OBS Value in degrees, ranging from "000" to "359."
MESSAGE EXAMPLE	
$PGRMV34310<chksm><CR><LF> Set the OBS value to 310 degrees.	

Set NAV Volume Level

This input is used to set the volume level for the NAV audio.

Table 9-31 NAV Volume Level Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"43"	Message identifier.
vv	Volume level: 00-FFh; two encoded hex characters (30h-3Fh).
MESSAGE EXAMPLE	
$PGRMV431=<chksm><CR><LF> Set the NAV volume to 1Dh out of FFh ("=" = 3Dh, -30h = Dh).	

NAV Keypad Input

This input is used to press keys as though the display was on the main NAV screen.

Table 9-32 NAV Keypad Input Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"44"	Message identifier.
p	Key press: "F" = Flip-Flop key. "M" = Monitor key
MESSAGE EXAMPLE	
$PGRMV44F<chksm><CR><LF> Flip-flops the NAV active and standby frequencies.	

Output Messages

COM Transceiver Status

NOTE
This message is output at a nominal one second rate, or faster whenever the transceiver function or status changes.

This message is used to output the current status of the GTR/GNC COM. It will be output at the configured message rate (1 Hz) or whenever the status changes.

Table 9-33 COM Transceiver Status Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"01"	Message identifier.
mk	Active frequency: m = MHz, where m = desired MHz frequency - 30h, ranging from 118 to 136 MHz k = (kHz offset / 25 kHz) + 30h, ranging from 000 to 975 kHz in 25 kHz steps.
mk	Standby frequency: m = MHz, where m = desired MHz frequency - 30h, ranging from 118 to 136 MHz k = (kHz offset/25 kHz) + 30h, ranging from 000 to 975 kHz in 25 kHz steps.
a	Transceiver status: I = Default when none of the following statuses are applicable. R = Normal receive M = Monitor receive T = Transmit active S = Stuck mic F = COM failure
s	Squelch and monitor mode setting: (ASCII) 0 = Squelch manual override off, Monitor mode off; 1 = Squelch manual override on, Monitor mode off 2 = Squelch manual override off, Monitor mode on 3 = Squelch manual override on, Monitor mode on
hh	COM channel spacing: (ASCII) 25 = 25 kHz mode; 83 = 8.33 kHz mode.
o	Active frequency 8.33 kHz offset: (ASCII) 0 = 25 kHz frequency (.000) 1 = first 8.33 kHz channel offset (.005) 2 = second 8.33 kHz channel offset (.010) 3 = third 8.33 kHz channel offset (.015).
o	Standby frequency 8.33 kHz offset: (ASCII) 0 = 25 kHz frequency (.000) 1 = first 8.33 kHz channel offset (.005) 2 = second 8.33 kHz channel offset (.010) 3 = third 8.33 kHz channel offset (.015)
MESSAGE EXAMPLE	
$PGRMC01G4LFR08303<chksm><CR><LF> Active frequency is 119.100MHz, the standby frequency is 124.565MHz, unit is receiving, squelch is automatic, and the unit is in 8.33 kHz mode.	

COM Volume Level

This message is used to output the COM volume level.

Table 9-34 COM Volume Level Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"02"	Message identifier.
"1"	Headphone Volume.
vv	Volume level: 00-FFh; use encoded hex (30h-3Fh).
MESSAGE EXAMPLE	
$PGRMC02130<chksm><CR><LF> The headphone volume level is 30h out of FFh.	

COM Software Version

This message is used to output the COM module software version.

Table 9-35 COM Software Version Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"03"	Message identifier.
vvvv	Software version in ASCII.
MESSAGE EXAMPLE	
$PGRMC030100<chksm><CR><LF> COM Software version is 01.00.	

GTR/GNC COM Status

This message is used to output the GTR/GNC COM Status.

Table 9-36 GTR/GNC COM Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"13"	Message identifier.
a	COM needs service; (ASCII) 0 = OK, 1 = COM transmit capabilities not reliable.
b	COM status; (ASCII) 0 = OK, 1 = COM functions not available.
c	Push-to-Talk key stuck; (ASCII) 0 = OK, 1 = Stuck.
d	Remote Transfer stuck; (ASCII) 0 = OK, 1 = Stuck.
e	Remote Tune Up stuck; (ASCII) 0 = OK, 1 = Stuck.
f	Remote Tune Down stuck; (ASCII) 0 = OK, 1 = Stuck.
g	COM TX Power Limited; (ASCII) 0 = OK, 1 = Transmit power limited.
h	"0" Reserved
MESSAGE EXAMPLE	
$PGRMC1300100000<chksm><CR><LF> GTR/GNC is running and ready to accept serial input and Push-to-Talk is stuck on.	

Unit Display Information

This message is used to output information about the GTR/GNC display head.

Table 9-37 Unit Display Information Message Format

"C"	Message class. This is a GTR/GNC COM message.
"14"	Message identifier.
name	Product name.
","	Delimiter.
pnum	Display product number.
","	Delimiter.
(v)v.vv	Display application software version, including ASCII decimal, with no leading zero for software versions less than 10.00.
MESSAGE EXAMPLE	
$PGRMC14GTR 205,006-B3896-00,2.22<chksm><CR><LF> A GTR 205 with software product number 006-B3896-00, software version 2.22.	

GNC Status

This message is sent to indicate to the host that the GNC is running and ready to accept data on the serial port, along with the current status of alerts. It will be sent once upon startup, when requested by the host, and when an alert status changes.

This message is only available in normal mode.

Table 9-38 GNC Status Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"41"	Message identifier.
a	VLOC needs Service; (ASCII) 0 = OK, 1 = Lateral course guidance not reliable.
b	VLOC Status; (ASCII) 0 = OK, 1 = VLOC and Glideslope course guidance not available.
c	Glideslope needs service; (ASCII) 0 = OK, 1 = Vertical course guidance not reliable.
d	Glideslope Status; (ASCII) 0 = OK, 1 = Glideslope course guidance not available.
e	NAV remote transfer stuck; (ASCII) 0 = OK, 1 = stuck.
MESSAGE EXAMPLE	
$PGRMV4100010<chksm><CR><LF> GNC is running and ready to accept serial input, and glideslope guidance is unavailable.	

CDI, VDI, and Related Flags

This message outputs the current values of the CDI, VDI, and their related flags.

Table 9-39 CDI, VDI, and Related Flags Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"21"	Message identifier.
cc	CDI deflection. An eight bit value indicating the amount of deflection of the CDI needle, represented as two encoded hex digits. [1] The CDI deflection is a twos complement signed integer in the range of –120 to 120. –100 indicates full left deflection, 0 indicates no deflection, and 100 indicates full right deflection. +/-120 indicates max left/right deflection.
gg	VDI deflection. An eight bit value indicating the amount of deflection of the VDI needle, represented as two encoded hex digits. The VDI deflection is a twos complement signed integer in the range of –120 to 120. –100 indicates full deflection upwards, 0 indicates no deflection, and 100 indicates full deflection downwards. +/-120 indicates max up/down deflection.
ff	Flags. Eight bits for HNAV and VNAV related flags, represented as two encoded hex digits.
Bit 1 (lsb)	Reserved
Bit 2	Localizer detect (1 = using localizer)
Bit 3	FROM flag (1 = From)[2]
Bit 4	TO flag (1 = To)
Bit 5	GSI superflag (1 = hidden)
Bit 6	GSI valid (1 = valid)
Bit 7	NAV superflag (1 = hidden)
Bit 8 (msb)	NAV valid (1 = valid)
MESSAGE EXAMPLE	
$PGRMV219<64?:<chksm><CR><LF> This message indicates a full left CDI deflection (-100), a full down VDI deflection (100), both the GSI and NAV flags/superflags are valid, TO flag set, FROM flag not set, using a localizer.	

[1] Encoded hex: each character consists of 4 bits of data placed in the low order nibble +30h. For example, the 8-bit value 5Fh would be encoded as two characters with values of 35h and 3Fh, which map to the ASCII characters "5" and "?", respectively.

[2] The TO and FROM flag can not both be 1, indicating that they are both valid. They can both be zero, indicating that neither is valid. This situation will occur whenever the receiver determines that it is within the "cone of confusion" directly over a VOR, or when no signal is being received.

Decoded OBS Setting

This message outputs the current OBS setting, which may be read from the NAV's internal resolver, the last valid value received over serial, or from user input to the front panel.

Table 9-40 Decoded OBS Setting Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"22"	Message identifier.
v	Valid flag. "0" (zero) = OBS invalid/not present "V" = OBS setting is valid.
ddd	Three digit OBS setting, in degrees. Values are in the range of "000" to "359."
MESSAGE EXAMPLE	
$PGRMV22V170<chksm><CR><LF> A valid OBS setting of 170 degrees.	

Radial From Active VOR

This message outputs the current bearing from the active VOR station.

Table 9-41 Radial From Active VOR Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"23"	Message identifier.
v	Valid flag. "0" = bearing not valid "V" = bearing is valid.
dddf	Bearing to a resolution of 1/10th of a degree. ddd = three digit bearing in degrees, ranging from "000" to "359." f = 1/10th of a degree.
MESSAGE EXAMPLE	
$PGRMV23V1654<chksm><CR><LF> A valid bearing of 165.4 degrees FROM the active VOR station.	

Radial From Standby VOR

This message outputs the current bearing from the standby VOR station when the NAV radio is monitoring the standby frequency.

Table 9-42 Radial From Standby VOR Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"24"	Message identifier.
v	Valid flag "0" = bearing not valid "V" = bearing is valid.
dddf	Bearing to a resolution of 1/10th of a degree. ddd = three digit bearing in degrees, ranging from "000" to "359". f = 1/10th of a degree, ranging from "0" to "9". Note: Invalid bearings will be all zeros ("0000").
MESSAGE EXAMPLE	
$PGRMV24V1234<chksm><CR><LF> A valid bearing of 123.4 degrees from the standby VOR station.	

Decoded Station Identifier

This message outputs the decoded station identifier received on the NAV voice channel. This message will be output even if the station identifier has not been decoded yet. In this case, the message will be flagged as invalid. Note that the validity of this message does not depend on the current NAV audio mode. The decoding is done automatically regardless of this setting.

Table 9-43 Decoded Station Identifier Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"25"	Message identifier.
v	Valid flag. "0" = identifier is not valid, "V" = decoded station identifier is valid.
iiiii	Decoded station identifier, five characters long. If the decoded identifier is less than five characters in length, then the trailing characters will be filled in with spaces. Identifiers are restricted to using ASCII character 0-9 and A-Z.
MESSAGE EXAMPLE	
$PGRMV25VISLE<Sp><chksm><CR><LF> The decoded station identifier is valid and is "ISLE "	

Communications Error

This message is used to indicate a communication error.

Table 9-44 GNC NAV Error Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"27"	Message identifier.
e	Error code: (ASCII) "0" = input message checksum error. "1" = unknown message. "2" = error or mismatch in message data.
MESSAGE EXAMPLE	
$PGRMV271<chksm><CR><LF> Received an unknown NAV message.	

Table 9-45 GTR/GNC COM Error Message Format

CHARACTER	DESCRIPTION
"C"	Message class. This is a GTR/GNC COM message.
"05"	Message identifier.
e	Error code: (ASCII) "0" = input message checksum error. "1" = unknown message. "2" = error or mismatch in message data.
MESSAGE EXAMPLE	
$PGRMC050<chksm><CR><LF> Received a COM message with an invalid checksum.	

NAV Receiver Status

This message is used to output the current status of the NAV receiver. It will be output at the configured rate, and will output faster than the configured rate when the NAV receiver status changes.

Table 9-46 NAV Receiver Status Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"28"	Message identifier.
mk	Active NAV frequency: m = MHz, where m + 30h = desired MHz frequency in the range of 108 to 117MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 950 kHz. Note that valid NAV frequencies only lie on 50 kHz boundaries (i.e. 108.00, 108.05, 108.10, etc.).
mk	Standby NAV frequency: m = MHz, where m + 30h = desired MHz frequency in the range of 108 to 117MHz. k = desired frequency in kHz, where k = (desired frequency / 25 kHz) + 30h, with desired frequency in range of 000 to 950 kHz. Note that valid NAV frequencies only lie on 50 kHz boundaries (i.e. 108.00, 108.05, 108.10, etc.).
s	Standby frequency monitor mode: "N" = not monitored "M" = monitored
MESSAGE EXAMPLE	
$PGRMV28E4?PN<chksm><CR><LF> Active NAV frequency is 117.100 MHz, Standby NAV frequency is 111.800 MHz and standby frequency monitor mode is off.	

NAV Audio Mode

This message is used to output the current NAV audio mode. There are two possible settings for this mode. The first is "IDENT" which will not suppress the Morse Code station identifier (unit will display "ID" in the upper-left corner of the NAV page). The second choice is "VOICE" which will suppress the Morse Code station identifier.

Table 9-47 NAV Audio Mode Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"29"	Message identifier.
a	NAV audio mode. "I" = IDENT, "V" = VOICE
MESSAGE EXAMPLE	
$PGRMV29I<chksm><CR><LF> The current NAV Audio mode is "IDENT."	

NAV Volume Level

This message is used to output the NAV volume level.

Table 9-48 NAV Volume Level Message Format

CHARACTER	DESCRIPTION
"V"	Message class. This is a GNC NAV message.
"40"	Message ident.
vv	Volume level: 00-FFh; use encoded hex (30h-3Fh).
MESSAGE EXAMPLE	
$PGRMV4030<chksm><CR><LF> The headphone volume level is 30h out of FFh (19%).	

Summary of Messages

Table 9-49 Input Message Summary

CLASS	IDENT	DESCRIPTION	RESPONSE
C	00	Set Active COM Frequency and Transceiver Function	COM Transceiver Status
C	01	Set Standby COM Frequency and Transceiver Function	COM Transceiver Status
C	02	Set COM Audio Items	COM Audio Status
C	03	Select Squelch Override	COM Transceiver Status
C	04	Remote Airport Identifier Name	N/A
C	05	Remote Airport Frequency Input	N/A
C	06	Request COM data	Various Messages
C	15	Set Active COM Frequency With Identifier	COM Transceiver Status
C	16	Set Standby COM Frequency With Identifier	COM Transceiver Status
C	17	Set COM Frequency Lookup Table Entry	N/A
C	18	Remove COM Frequency Lookup Table Entries	N/A
C	19	COM Keypad Input	COM Transceiver Status
V	20	Remote VOR Input	N/A
V	21	Remote VOR List Trailer	N/A
V	22	Remote Localizer List Header	N/A
V	23	Remote Localizer List Entry	N/A
V	24	Request NAV Data	Various Messages
V	27	Set Active VOR/LOC Frequency and Receiver Function	NAV Receiver Status

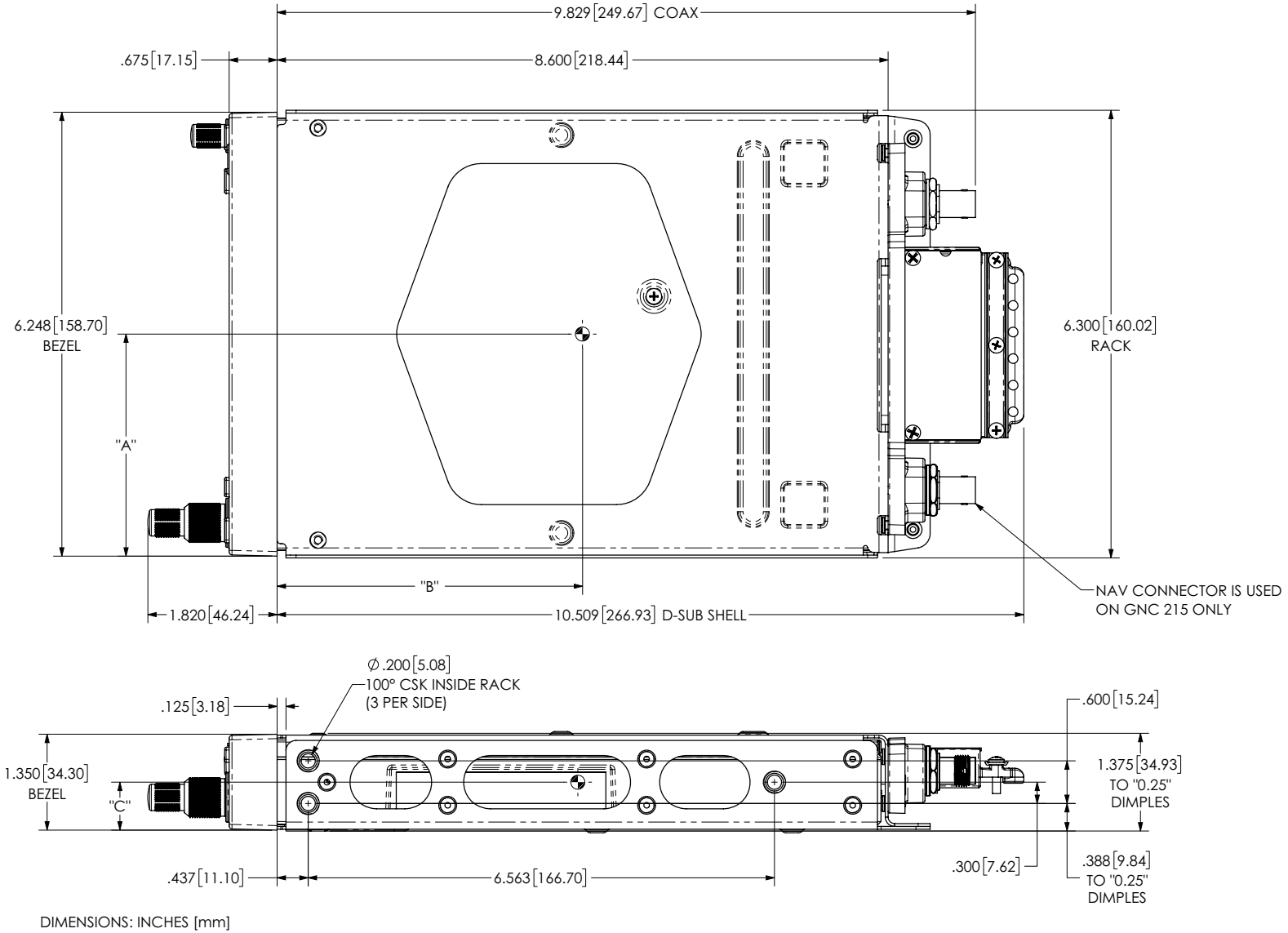
CLASS	IDENT	DESCRIPTION	RESPONSE
V	28	Set Standby VOR/LOC Frequency and Receiver Function	NAV Receiver Status
V	31	Set NAV Audio Mode	NAV Audio Mode
V	34	Set OBS Value	N/A
V	43	Set NAV Volume Level	NAV Volume
V	44	NAV Keypad Input	NAV Receiver Status
Notes	Class: "C" = GTR/GNC COM message, "V" = GNC NAV message.		

Table 9-50 Output Message Summary

CLASS	IDENT	DESCRIPTION	OUTPUT RATE
C	01	COM Transceiver Status	Status Change / Low
C	02	COM Volume Level	Upon Request / Status Change
C	03	COM Software Version	Upon Request
C	05	COM Communications Error	When Error Detected
C	13	COM Radio Status	At Startup / Upon Request / Status Change
C	14	Unit Display Information	Upon Request
V	21	CDI, VDI, and Flags	High
V	22	Decoded OBS Setting	High
V	23	Radial From Active VOR	High
V	24	Radial From Standby VOR	Low
V	25	Decoded Station Identifier	Status Change / Low /Upon Request
V	27	NAV Communications Error	When Error Detected
V	28	NAV Receiver Status	Status Change / Low
V	29	NAV Audio Mode	Status Change
V	40	NAV Volume Level	Upon Request / Status Change
V	41	GNC NAV Status	Upon Request / Status Change

10 Mechanical Drawings

Figure 10-1 GTR/GNC Dimensions and Center of Gravity 10-2
Figure 10-2 Rear Connector Layout Detail 10-3
Figure 10-3 Panel Cutout Detail 10-4
Figure 10-4 Mounting Rack Installation 10-5
Figure 10-5 Mounting Rack 10-6



PRODUCT	"A"	"B"	"C"
GTR 205	3.25 [82.6]	4.47 [113.5]	0.50 [12.7]
GNC 215	3.13 [79.4]	4.59 [116.7]	0.63 [15.9]

Figure 10-1 GTR/GNC Dimensions and Center of Gravity

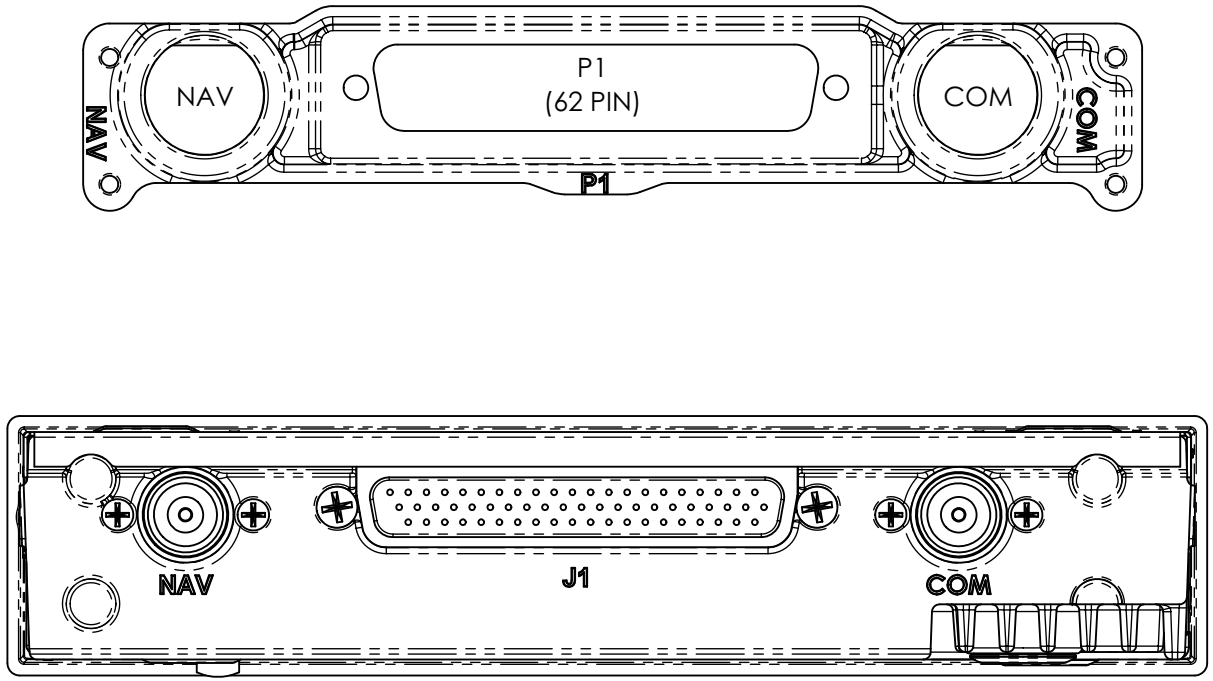
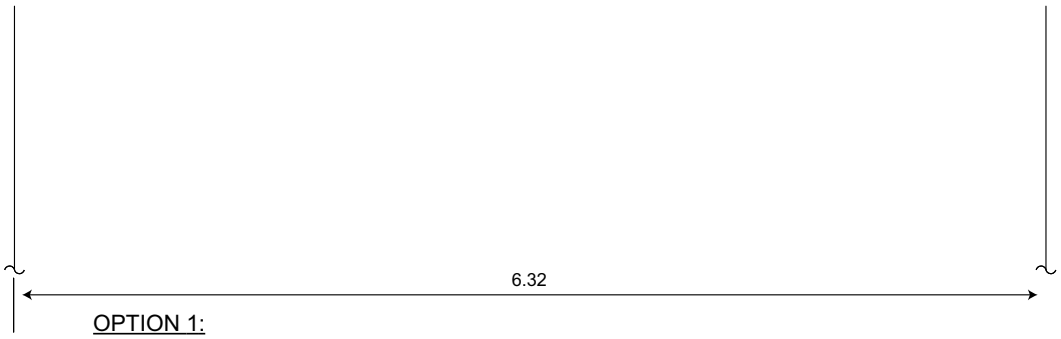
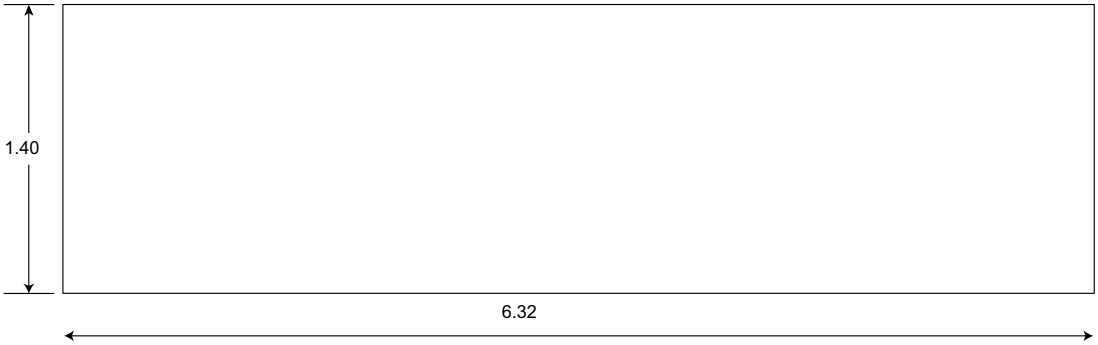


Figure 10-2 Rear Connector Layout Detail



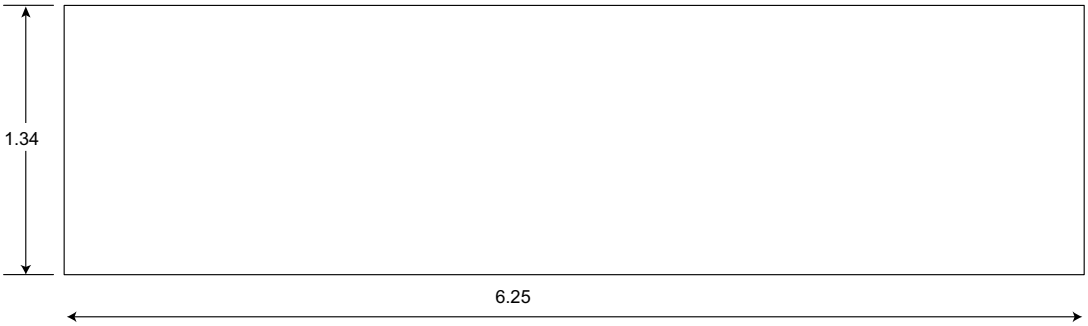
OPTION 1:

STACK CUTOUT (RACK INSTALLED FROM FRONT OF AIRCRAFT PANEL)



OPTION 2:

RADIO CUTOUT (RACK INSTALLED FROM FRONT OF AIRCRAFT PANEL)



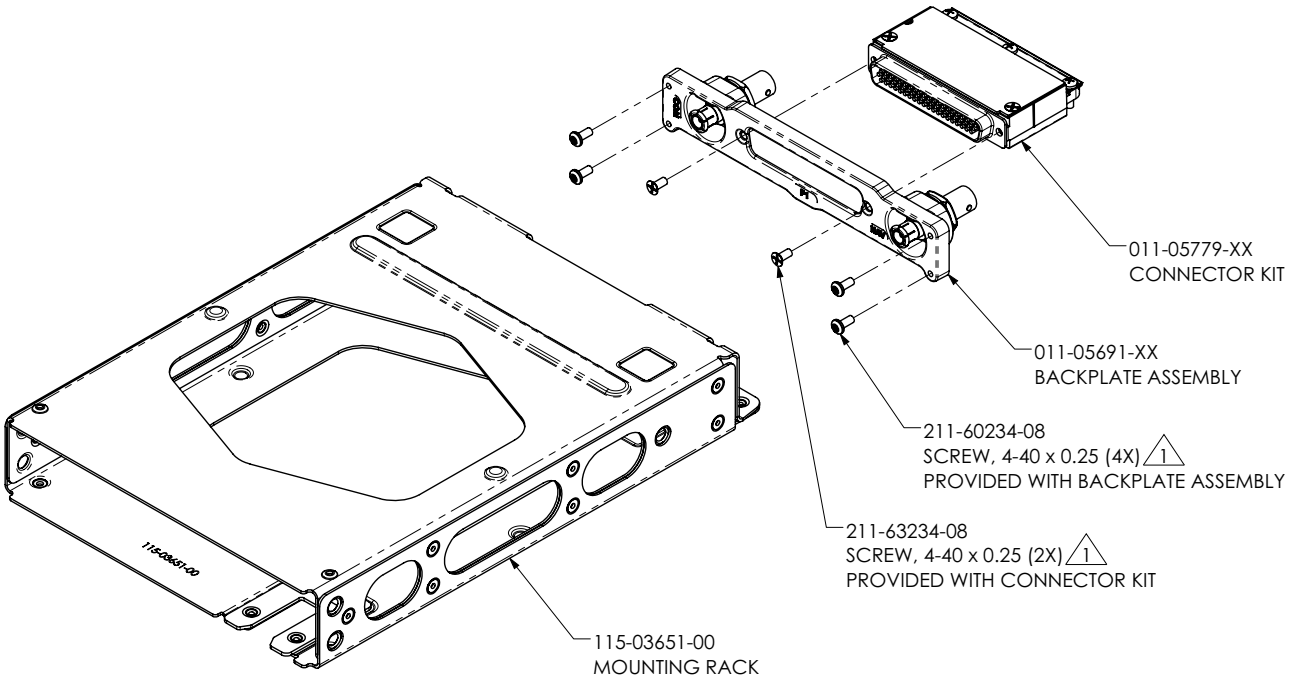
OPTION 3:

RADIO CUTOUT (RACK INSTALLED FROM BACK OF AIRCRAFT PANEL ONLY) MAXIMUM AIRCRAFT PANEL THICKNESS IS .125".

NOTES, ALL OPTIONS:

1. DIMENSIONS ARE IN INCHES.
2. IF THE FRONT LIP OF THE MOUNTING RACK IS BEHIND THE SURFACE OF THE AIRCRAFT INSTRUMENT PANEL, THE UNIT CONNECTORS MAY NOT FULLY ENGAGE.
3. TOLERANCE: ±0.03" .

Figure 10-3 Panel Cutout Detail



1 TORQUE TO 8±1 IN-LB

EXPLODED VIEW OF BACKPLATE ASSEMBLY

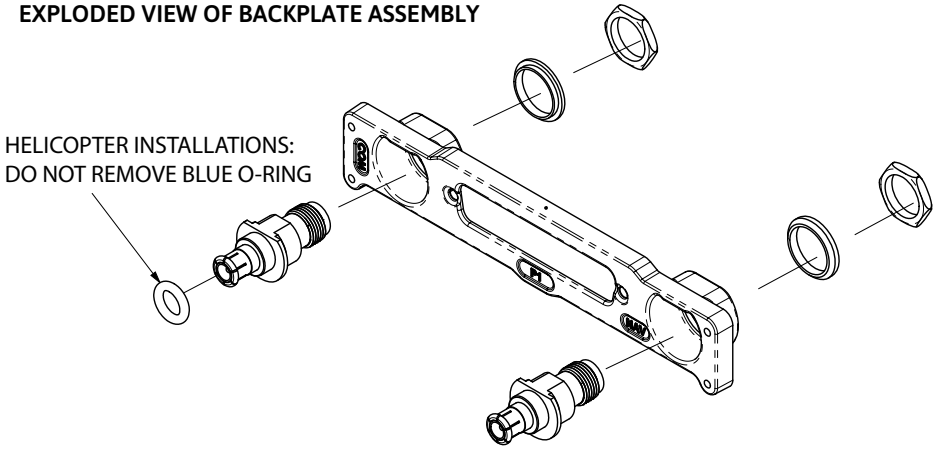


Figure 10-4 Mounting Rack Installation

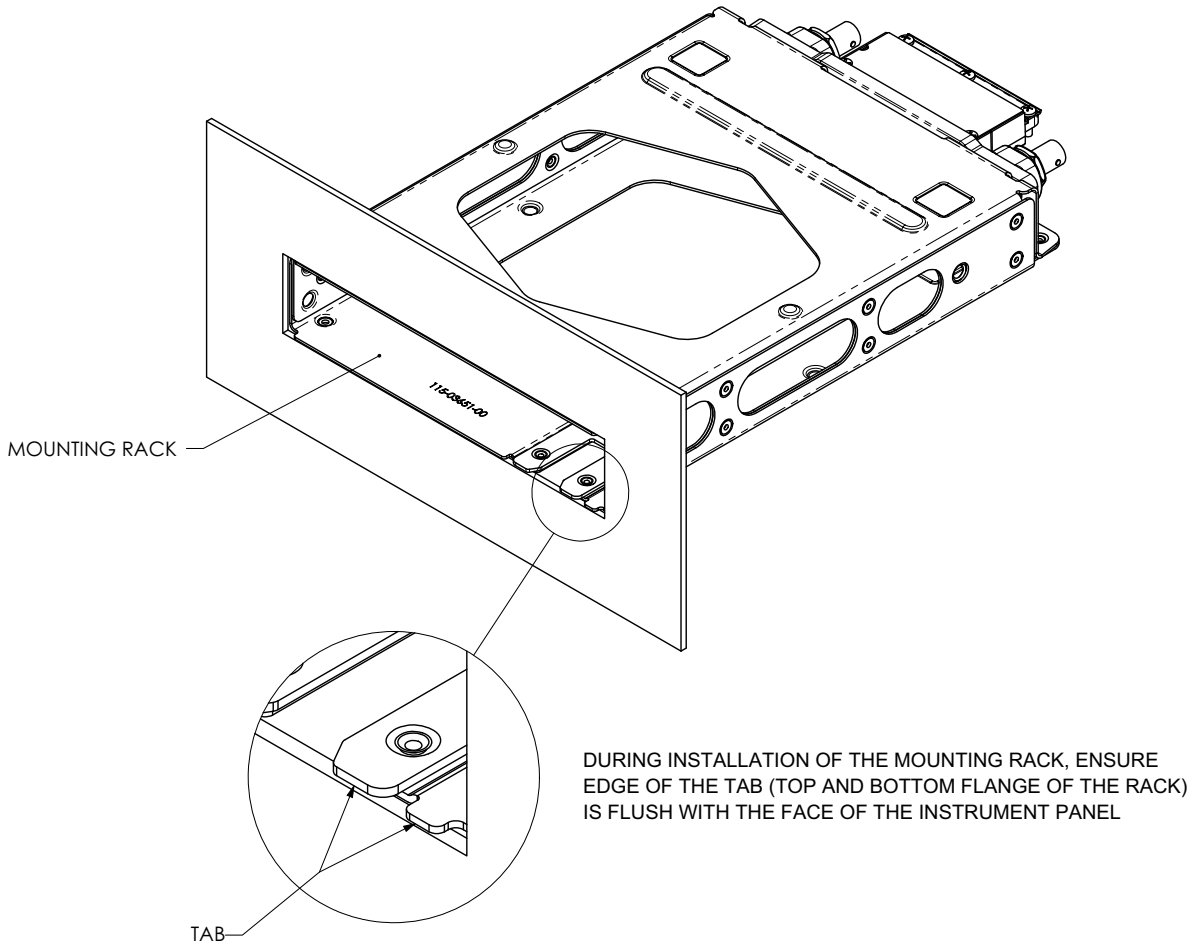


Figure 10-5 Mounting Rack

11 Interconnect Diagrams

Figure 11-1 GTR 205/GNC 215 Typical Installation 11-3
Figure 11-2 GNC 215 MIC Headsets Interconnect 11-5
Figure 11-3 GTR 205 MIC Headsets Interconnect 11-6
Figure 11-4 GNC 215 VOR/ILS Indicator Interconnect 11-7
Figure 11-5 Power Lighting Configuration Interconnect 11-8
Figure 11-6 GTR 205/GNC 215 GPS Interconnect 11-9
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Figure 11-9 Switches Interconnect 11-15
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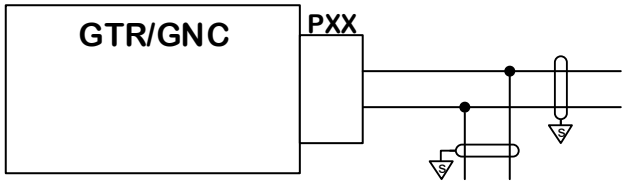
Figure 11-11 GTR 205/GNC 215 Antenna Interconnect 11-18

Each figure contains notes that must be followed. General notes apply to all figures in this section.

General Notes

- Power and ground connections must use 20 AWG on 28V systems and 18 AWG on 14V systems. 22AWG may be used to splice into D-sub, and splices must be less than 3.0".
- Connect shield grounds to backshell at the unit. Shield leads must be less than 3.0". Connect all other shield grounds to aircraft ground with as short a conductor as practical.
- Connect all aircraft power pins when using a 14 V aircraft bus.
- Connect all aircraft power pins when using a 28 V aircraft bus.
- Connections marked with "x" OR "X" indicate that there is no recommended connection. Any available port or pin is acceptable.
- Refer to manufacturer's documentation for complete pinout and interconnect information.
- Pinouts of other units shown for reference only.
- If a splice is necessary, it must be performed at the unit's connector-end of the wire. Splice as shown:



- Designations for ground connections:

  Shield Block Ground Airframe Ground

- ~ indicates any available similar functioning port or pin may be used. Ports or pins without ~ must be connected as shown.
- * indicates an active low pin.
- † indicates an active high pin.

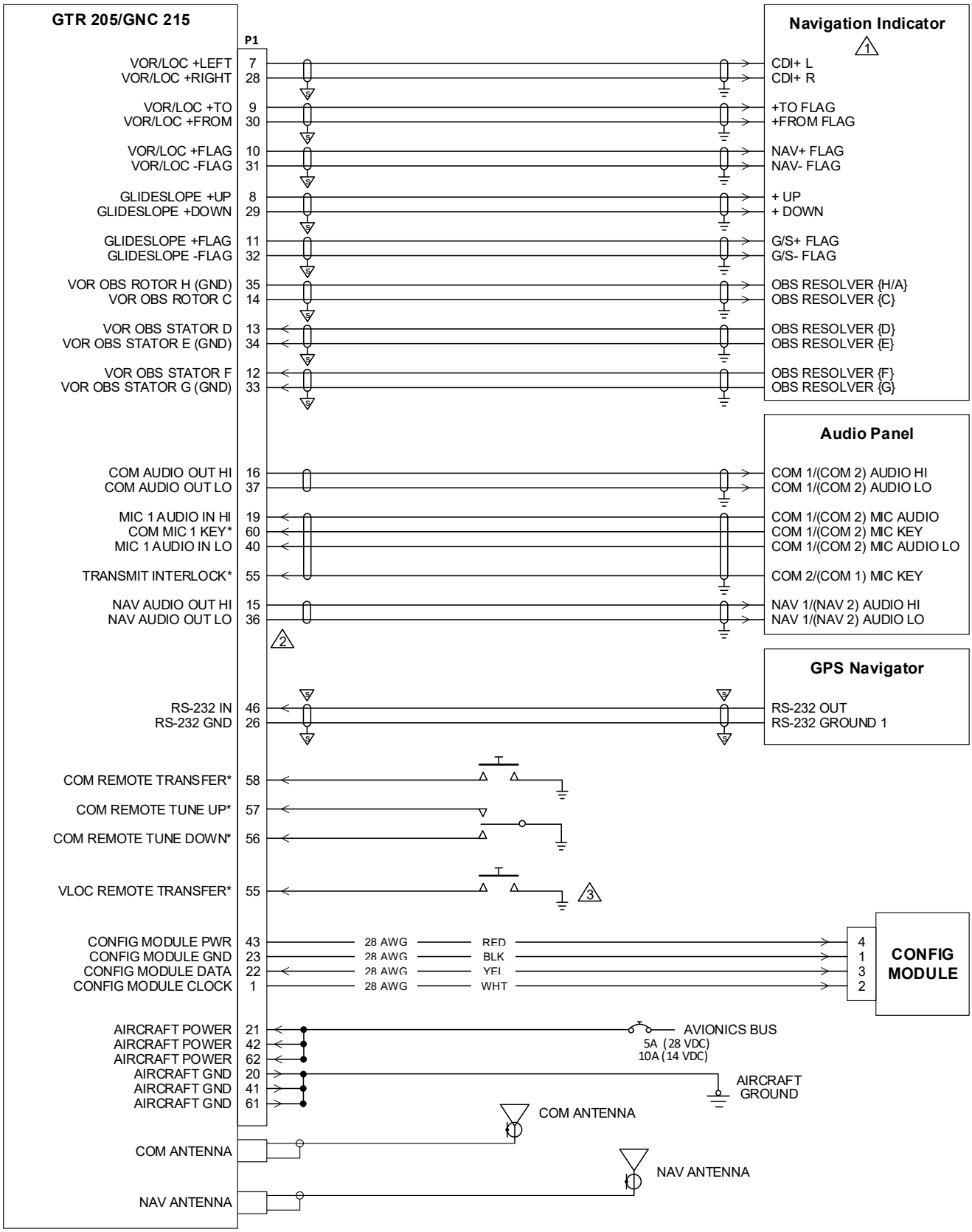


Figure 11-1 GTR 205/GNC 215 Typical Installation
Sheet 1 of 2

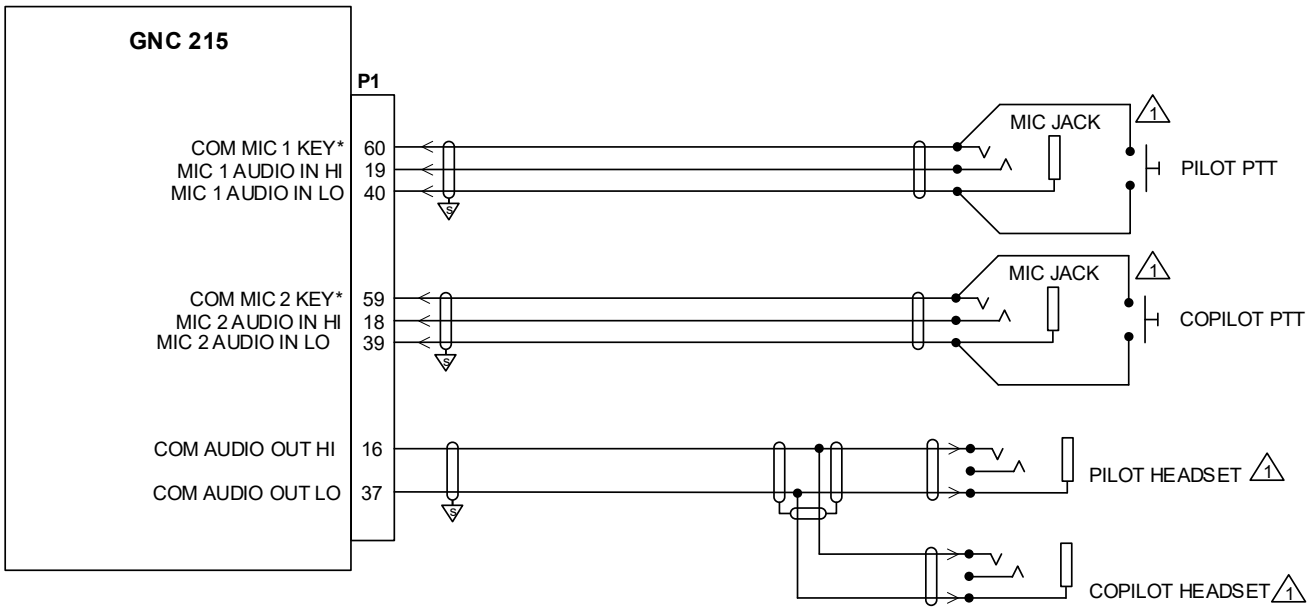
NOTES

1. NAVIGATION INDICATOR APPLIES TO GNC 215 ONLY. REFER TO MANUFACTURER'S DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION.

2. THE NAV AUDIO OUTPUT APPLIES TO GNC 215 ONLY.

3. VLOC REMOTE TRANSFER APPLIES TO GNC 215 ONLY.

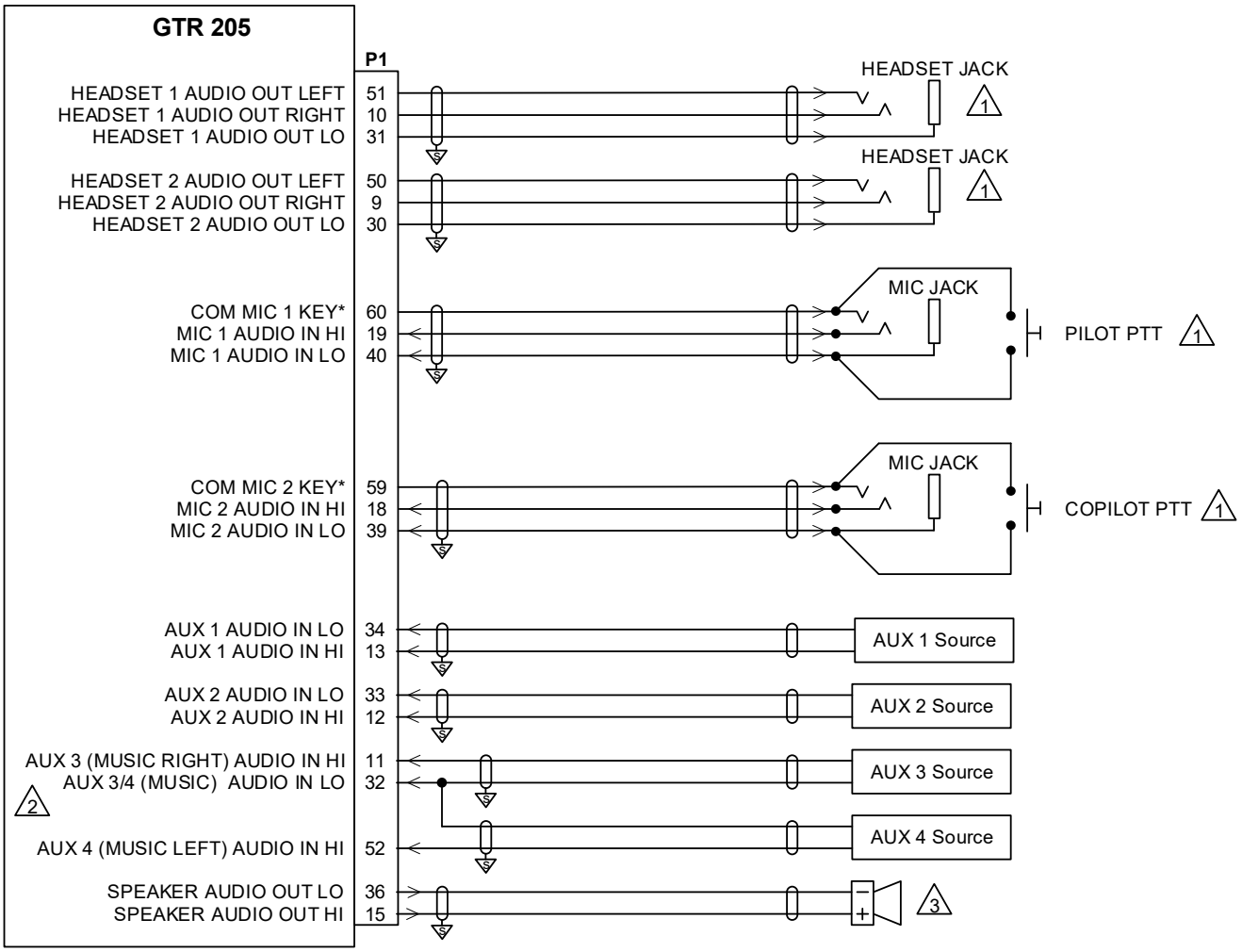
Figure 11-1 GTR 205/GNC 215 Typical Installation
Sheet 2 of 2



NOTES

1. ALL HEADSET AND MICROPHONE PLUGS MUST BE ELECTRICALLY ISOLATED FROM GROUND. THIS MAY REQUIRE THE USE OF INSULATING WASHERS WHEN MOUNTING THE PHONE PLUGS.

Figure 11-2 GNC 215 MIC Headsets Interconnect



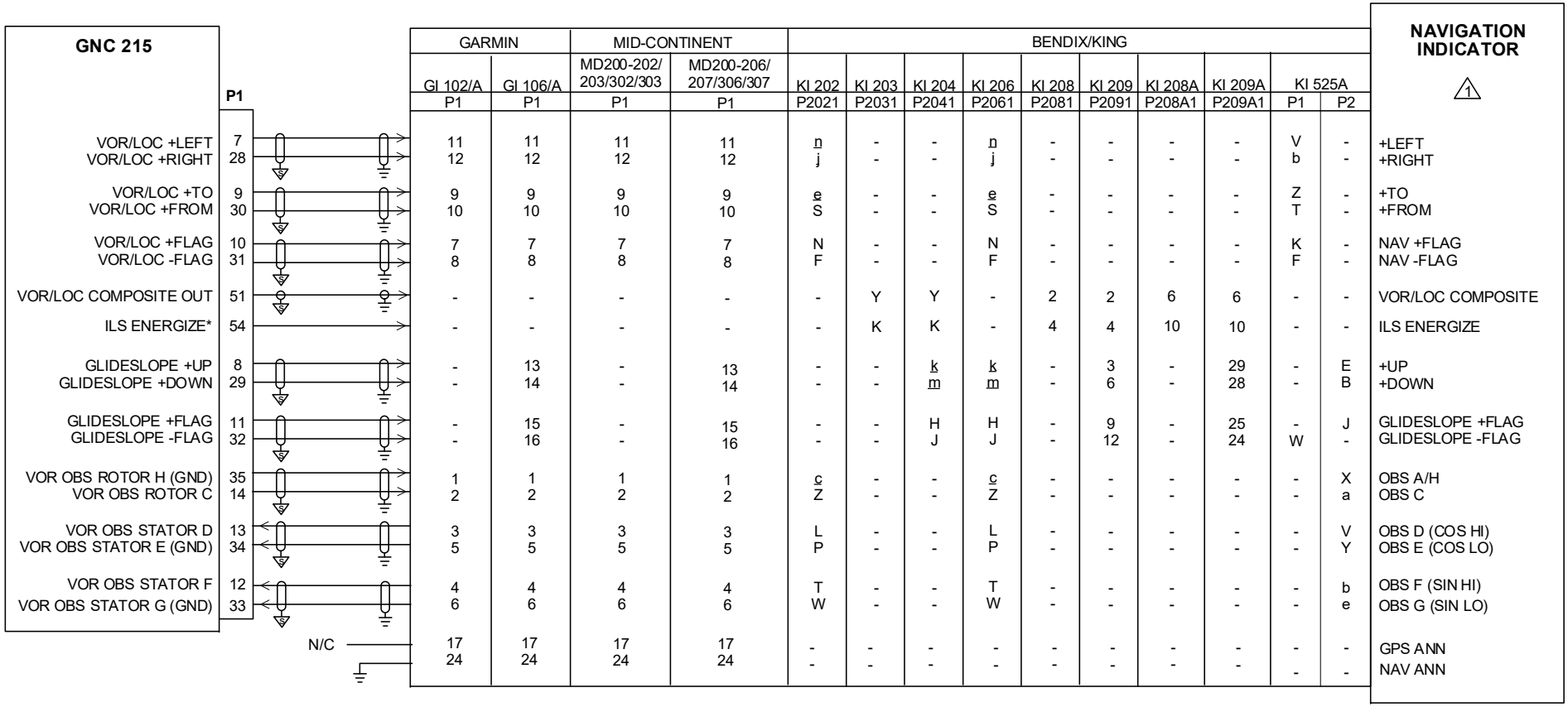
NOTES

1. ALL HEADSET AND MICROPHONE PLUGS MUST BE ELECTRICALLY ISOLATED FROM GROUND. THIS MAY REQUIRE THE USE OF INSULATING WASHERS WHEN MOUNTING THE PHONE PLUGS.

2. IF CONFIGURED FOR STEREO IN, AUX 3 WILL ACT AS STEREO LEFT, AND AUX 4 WILL ACT AS STEREO RIGHT.

3. DO NOT CONNECT THE SPEAKER GROUND RETURN TO THE AIRCRAFT CHASSIS. THE GROUND RETURN MUST GO TO THE GTR.

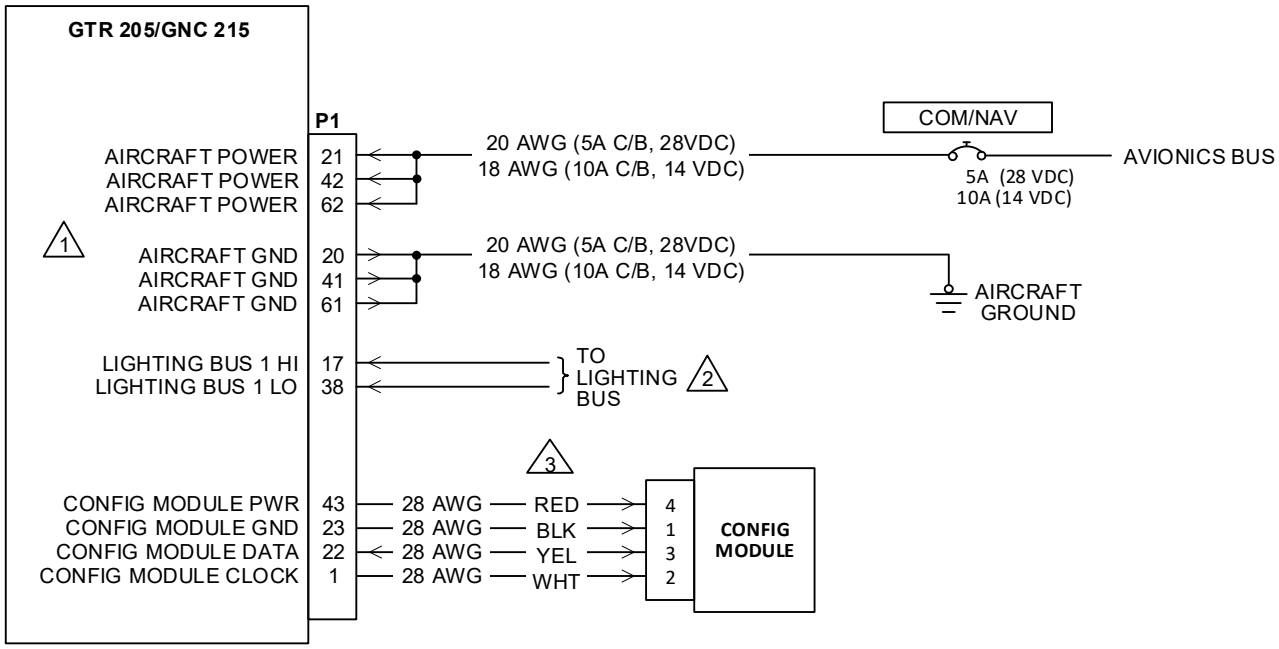
Figure 11-3 GTR 205 MIC Headsets Interconnect



NOTES

1. REFER TO MANUFACTURER'S DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION. PINOUTS OF OTHER UNITS SHOWN FOR REFERENCE ONLY.

Figure 11-4 GNC 215 VOR/ILS Indicator Interconnect



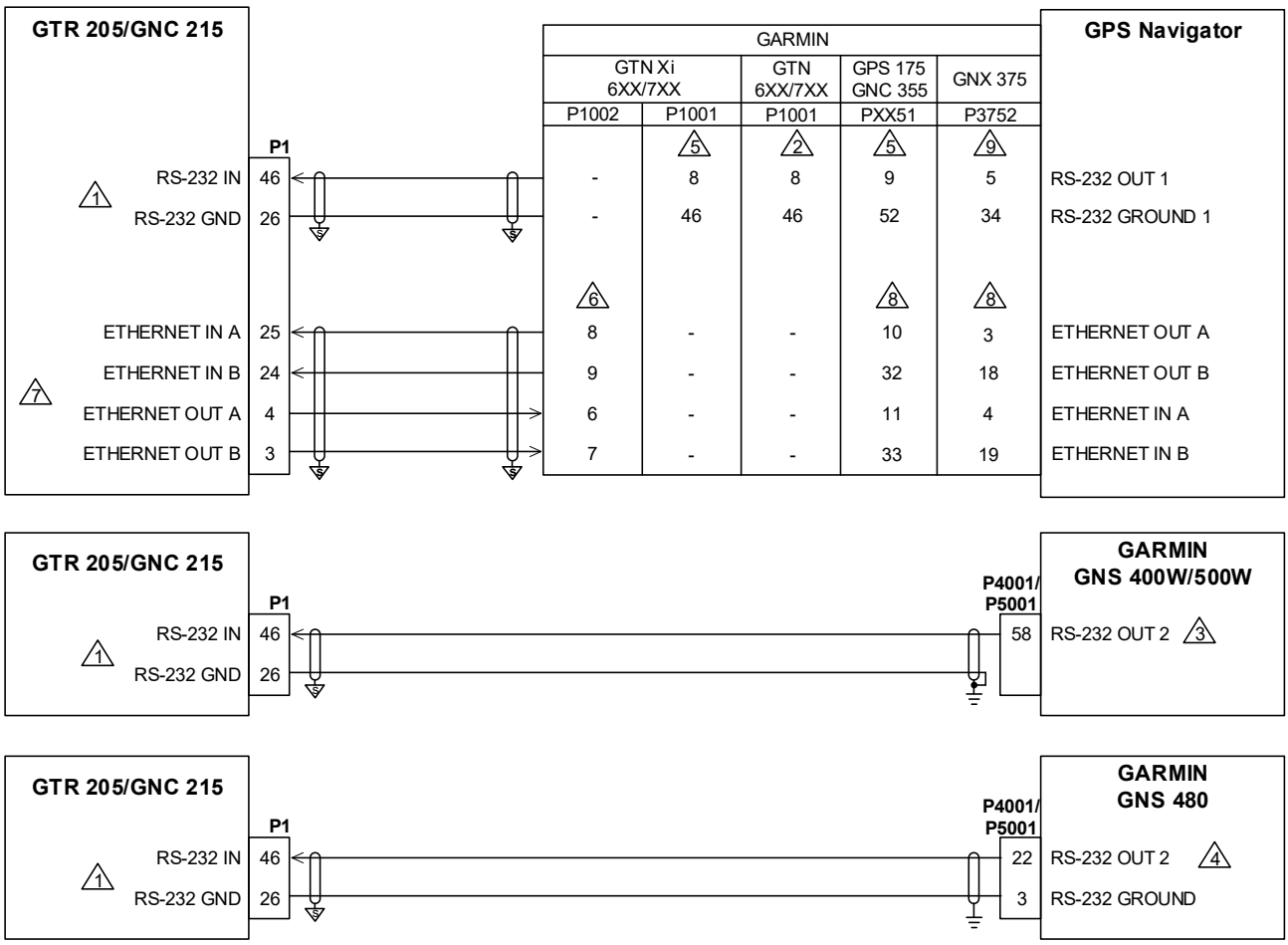
NOTES

1. ALL POWER LEADS AND GROUND LEADS ARE REQUIRED. 20 OR 22 AWG WIRE CAN BE USED FOR THE SPLICE. USE APPROPRIATE HEAT-SHRINK TUBING TO PROVIDE SUFFICIENT INSULATION FROM SURROUNDING CONTACTS.

2. OPTIONAL CONNECTION. LIGHTING CAN BE CONTROLLED BY THE INTEGRATED PHOTOCELL OR A SINGLE LIGHTING BUS.

3. THE SUPPLIED CONFIGURATION MODULE HARNESS USES 28 AWG WIRE. USE THE CONTACTS SUPPLIED WITH THE CONFIGURATION MODULE.

Figure 11-5 Power Lighting Configuration Interconnect



NOTES

1. CONFIGURE GTR/GNC SERIAL PORT FOR “AVIATION.”

2. CONFIGURE RS-232 OUTPUT TO “AVIATION FORMAT 1” FORMAT. ANY AVAILABLE RS-232 OUTPUT PORT MAY BE USED.

3. CONFIGURE RS-232 OUTPUT TO “AVIATION” FORMAT. ANY AVAILABLE RS-232 OUTPUT PORT MAY BE USED.

4. CONFIGURE RS-232 OUTPUT TO “MAPCOM” FORMAT. RS-232 OUTPUT PORT 1 OR PORT 5 MAY BE USED.

5. CONFIGURE RS-232 OUTPUT TO “AVIATION OUTPUT 1" FORMAT. ANY AVAILABLE RS-232 OUTPUT PORT MAY BE USED.

Figure 11-6 GTR 205/GNC 215 GPS Interconnect
Sheet 1 of 2

NOTES

6. USE EITHER HSDB OR RS-232, NOT BOTH. HSDB IS THE PREFERRED CONNECTION. HSDB PORT 1 SHOWN. ANY AVAILABLE HSDB PORT MAY BE USED.

7. CONFIGURE GTR/GNC GPS NAVIGATOR STATUS TO “PRESENT.”

8. USE EITHER HSDB OR RS-232, NOT BOTH. HSDB IS THE PREFERRED CONNECTION. IF THE NAVIGATOR HSDB PORT IS UNAVAILABLE, USE RS-232. FOR DUAL GTR/GNC INSTALLATIONS, CONNECT RS-232 IN PARALLEL FROM GPS NAVIGATOR 1 TO BOTH GTR/GNC UNITS.

9. ONLY RS232 PORT 1 AND 2 OUT CAN BE CONFIGURED FOR AVIATION FORMAT.

Figure 11-6 GTR 205/GNC 215 GPS Interconnect
Sheet 2 of 2

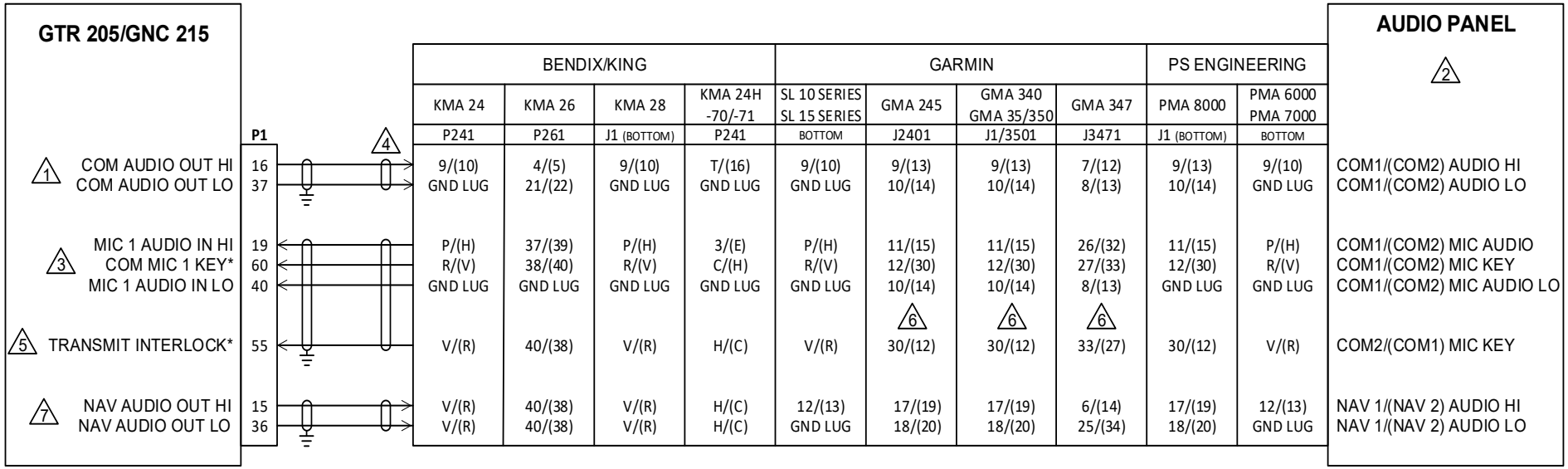


Figure 11-7 Audio Panel Interconnect
Sheet 1 of 2

NOTES

1. THE AUDIO OUTPUTS ARE BALANCED OUTPUTS, AND THE LO OUTPUTS NEED TO BE CONNECTED. IF THE AUDIO PANEL DOES NOT HAVE A LO INPUT, THE LO OUTPUT SHOULD BE CONNECTED TO A GROUND LUG AT THE AUDIO PANEL.

2. REFER TO MANUFACTURER'S DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION. PINOUTS OF OTHER UNITS SHOWN FOR REFERENCE ONLY.

3. CONNECTING TWO MICROPHONES TO MIC AUDIO HI/LO AT THE SAME TIME MAY RESULT IN WEAK OR DISTORTED AUDIO. MIC ISOLATION RELAYS ARE RECOMMENDED SO THAT ONLY ONE MIC IS ACTIVE AT A TIME.

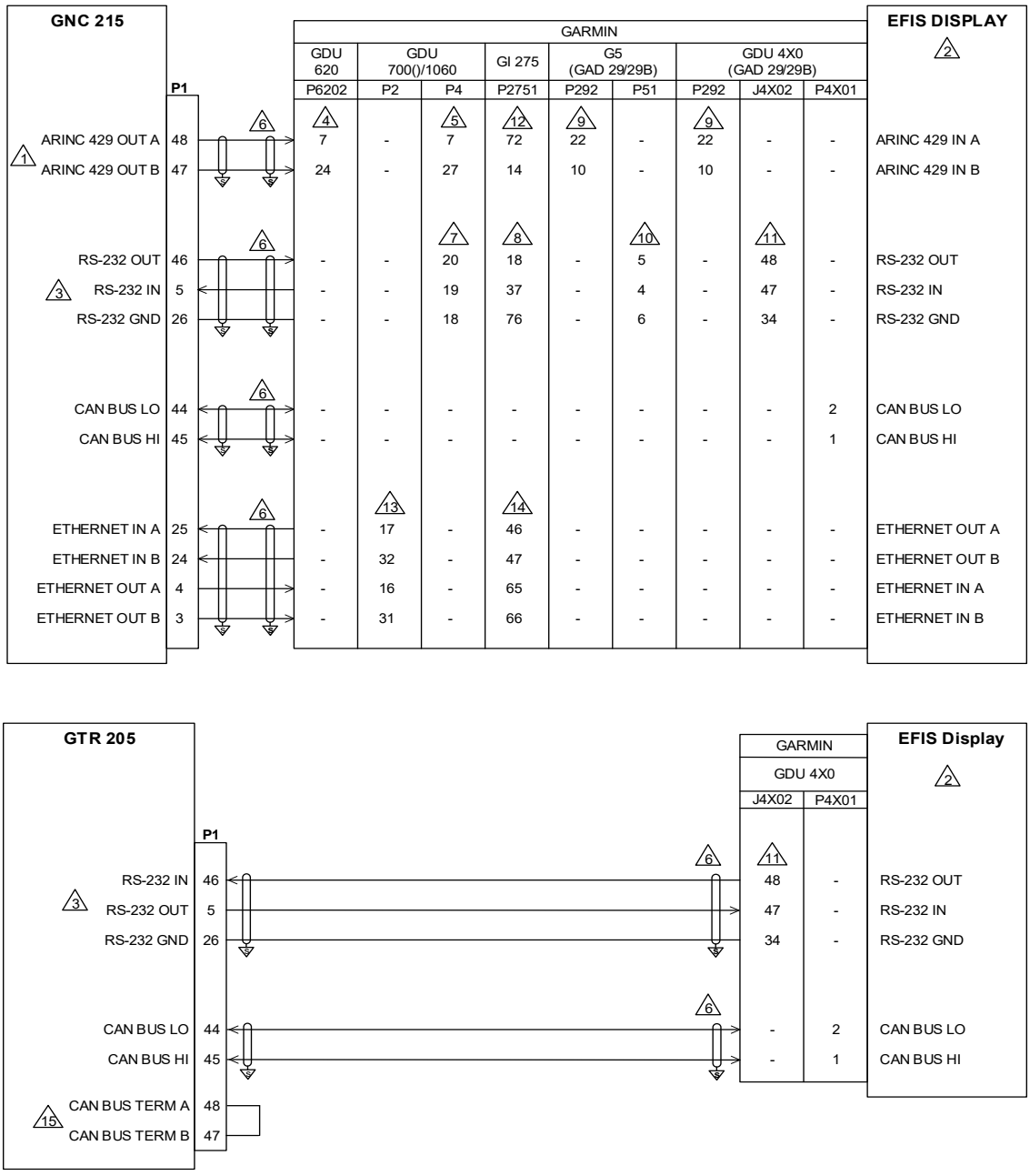
4. SHIELDS FOR AUDIO CABLES SHOULD BE GROUNDED AT ONE END (WITH LEADS LESS THAN 3.0") AND LEFT FLOATING AT THE OTHER END. IF SHIELDED AUDIO CABLE IS CARRIED THROUGH A DISCONNECT, CARRY THE SHIELD GROUND THROUGH THE DISCONNECT ON A SEPARATE PIN.

5. CONFIGURABLE DISCRETE INPUT 4 SHOWN. ANY AVAILABLE CONFIGURABLE DISCRETE INPUT MAY BE USED.

6. SPLICE COM AUDIO LO AND MIC AUDIO IN LO TOGETHER INTO THE SAME PIN ON AUDIO PANEL.

7. THE NAV AUDIO OUTPUT IS ONLY APPLICABLE TO THE GNC MODEL.

Figure 11-7 Audio Panel Interconnect
Sheet 2 of 2



NOTES

1. CONFIGURE ARINC 429 TX TO LOW SPEED AND SDI SELECTION TO USE UNIT ID (TO MATCH NAV 1 OR NAV 2 INPUT ON EFIS DISPLAY).

2. REFER TO INSTALLATION DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION FOR INTERFACING EQUIPMENT.

3. CONFIGURE GTR/GNC SERIAL PORT FOR “NMEA 1.”

Figure 11-8 GTR 205/GNC 215 EFIS Interconnect
Sheet 1 of 2

NOTES

4 ARINC 429 INPUT PORT 4 FOR GDU 620 SHOWN.

5 ARINC 429 INPUT PORT 7 FOR GDU 700()/1060 SHOWN. ANY AVAILABLE ARINC 429 INPUT PORT MAY BE USED.

6 USE ONLY CAN, RS-232, ARINC 429, OR HSDB, NOT MORE THAN ONE. HSDB IS THE PREFERRED CONNECTION. IF NOT CONNECTED FOR HSDB, CAN IS THE PREFERRED CONNECTION. IF NOT CONNECTED FOR CAN, RS-232 IS THE PREFERRED CONNECTION. USE THE ARINC 429 CONNECTION IN AIRCRAFT THAT HAVE THE GNC RS-232 CONNECTED TO A GPS NAVIGATOR.

7 RS-232 PORT 5 FOR GDU 700()/1060 SHOWN. ANY AVAILABLE RS-232 PORT MAY BE USED.

8 RS-232 PORT 2 FOR GI 275 SHOWN. ANY AVAILABLE RS-232 PORT MAY BE USED.

9 ARINC 429 INPUT PORT 2 FOR GAD 29/29B SHOWN AS #1 NAVIGATOR. FOR #2 NAVIGATOR, USE ARINC 429 INPUT PORT 4.

10 CONFIGURE RS-232 INPUT AND OUTPUT FORMAT TO “GARMIN VHF NAV RADIO.”

11 RS-232 PORT 1 FOR GDU 4X0 SHOWN. ANY AVAILABLE PORT MAY BE USED. THE #1 NAV/COM MUST BE ON A LOWER NUMBERED RS-232 PORT ON THE GDU. CONFIGURE RS-232 PORT FOR “GARMIN VHF NAV/COM.”

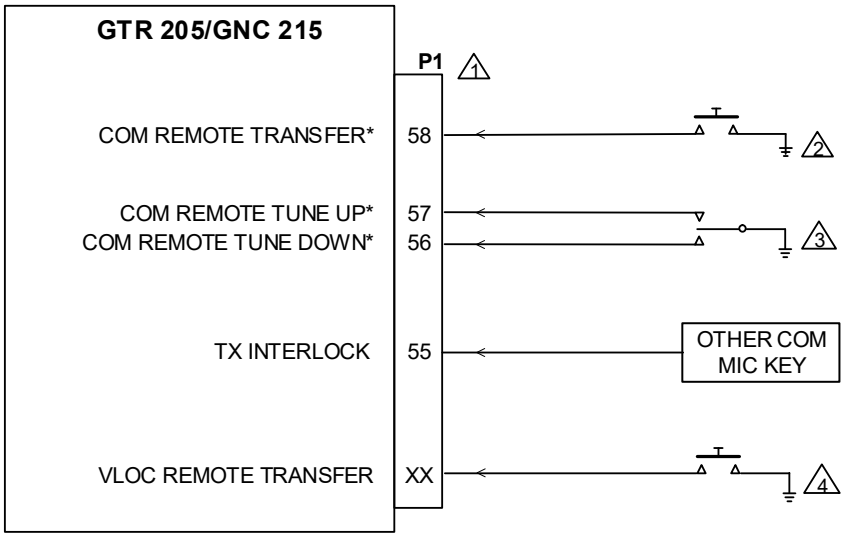
12 ARINC 429 INPUT PORT 2 FOR GI 275 SHOWN. ANY AVAILABLE ARINC 429 INPUT PORT MAY BE USED.

13 HSDB PORT 1 DEPICTED FOR GDU 700()/1060 SHOWN. ANY AVAILABLE HSDB PORT MAY BE USED. CONFIGURE GNC GDU (TXI) STATUS TO “PRESENT.”

14 HSDB PORT 1 FOR GI 275 SHOWN. ANY AVAILABLE HSDB PORT MAY BE USED. CONFIGURE GNC GI 275 STATUS TO “PRESENT.”

15 ONLY USE CAN BUS TERMINATION PINS IF THE GTR IS LOCATED AT THE END OF THE CAN BUS. REFER TO SECTION 5.2.15.

Figure 11-8 GTR 205/GNC 215 EFIS Interconnect
Sheet 2 of 2



NOTES

1. PIN NUMBERS ARE FOR EXAMPLE ONLY. ANY AVAILABLE CONFIGURABLE DISCRETE INPUT MAY BE USED FOR ANY AVAILABLE FUNCTION.

2. COM REMOTE TRANSFER MAY BE USED TO TRANSFER THE STANDBY COM FREQUENCY TO THE ACTIVE COM FREQUENCY VIA REMOTE SWITCH.

3. COM REMOTE TUNE UP AND COM REMOTE TUNE DOWN MAY BE USED TO SCROLL THROUGH A LIST OF PRESET COM FREQUENCIES.

4. THIS FUNCTION APPLIES TO GNC 215 ONLY.

Figure 11-9 Switches Interconnect

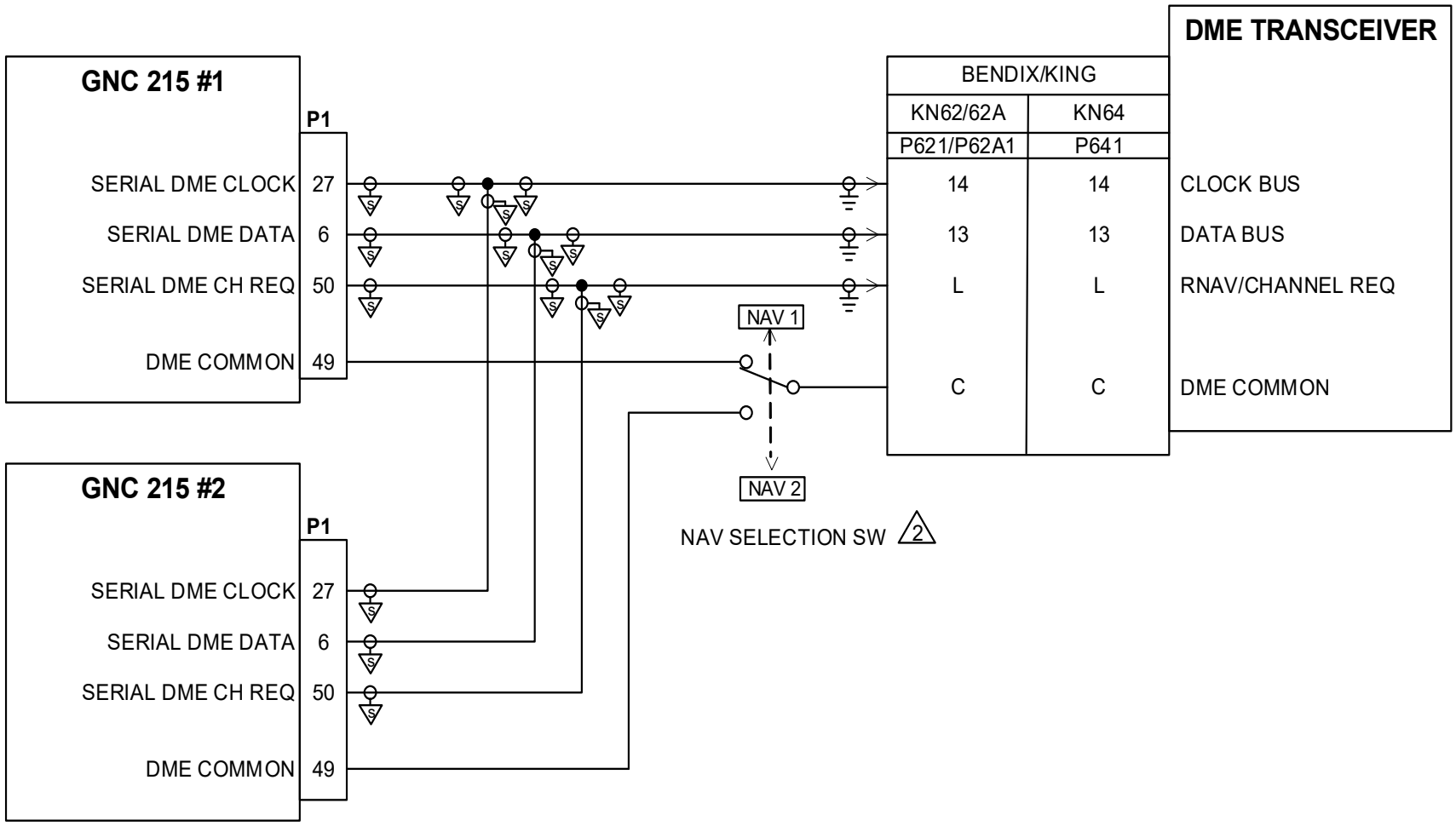
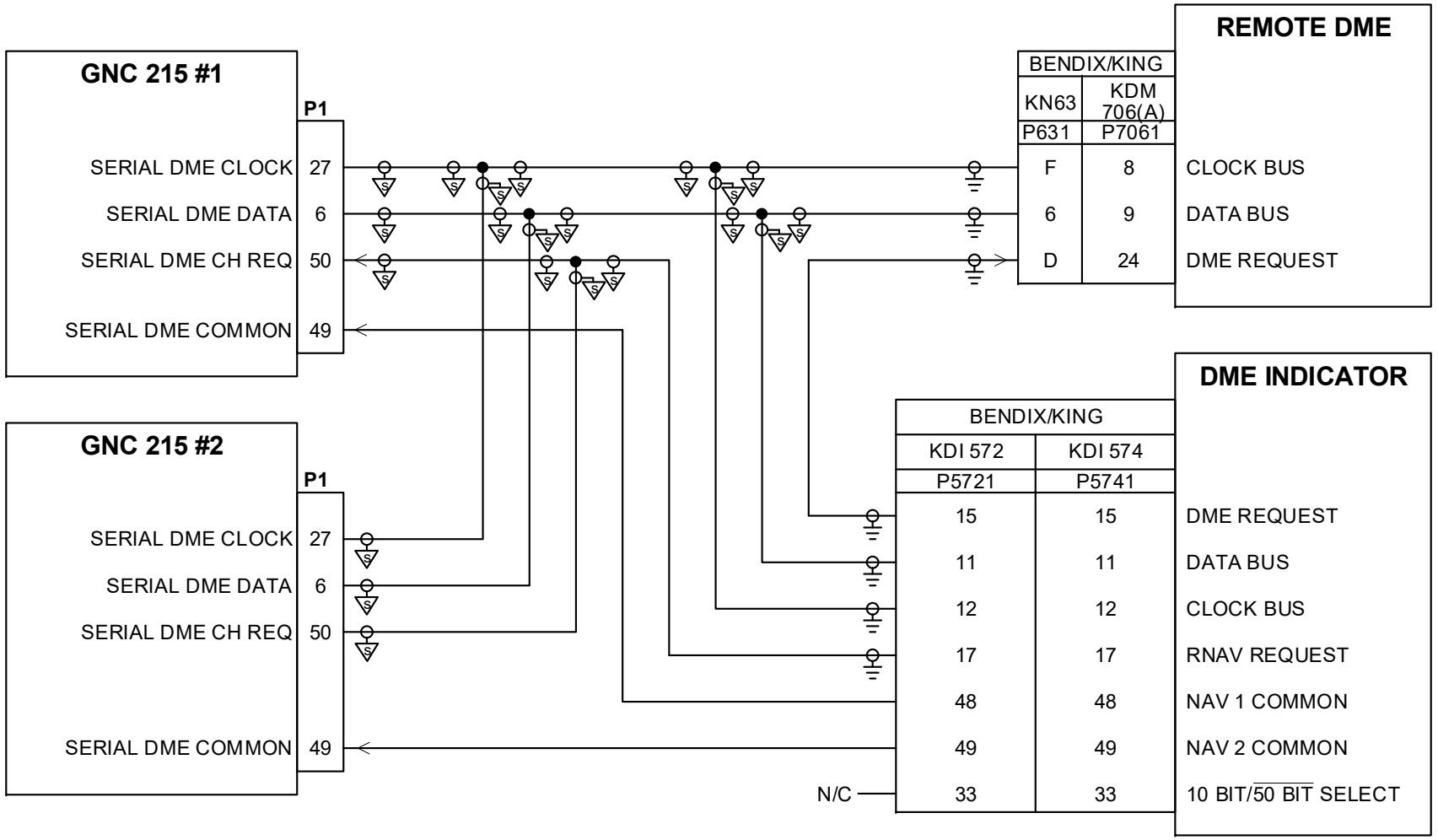


Figure 11-10 GNC 215 - Serial DME Interconnect
Sheet 1 of 2



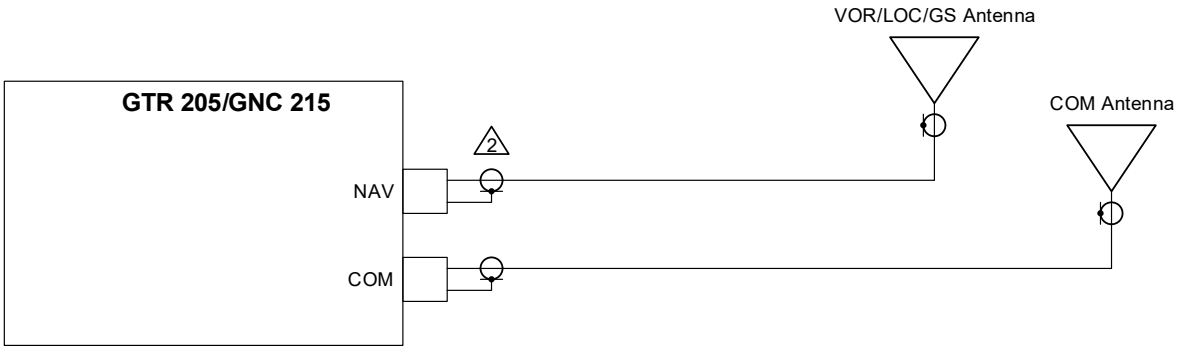
NOTES

1 FOR SINGLE GNC INSTALLATIONS, WIRE AS SHOWN FOR GNC #1.

2 THE NAV SELECTION SWITCH IS ONLY REQUIRED IF TWO GNCs ARE INSTALLED. FOR SINGLE GNC INSTALLATIONS, WIRE AS SHOWN FOR GNC #1. LABEL AS SHOWN.

Figure 11-10 GNC 215 - Serial DME Interconnect
Sheet 2 of 2

SINGLE GTR/GNC INSTALLATION ⚠1



DUAL GTR/GNC INSTALLATION ⚠1

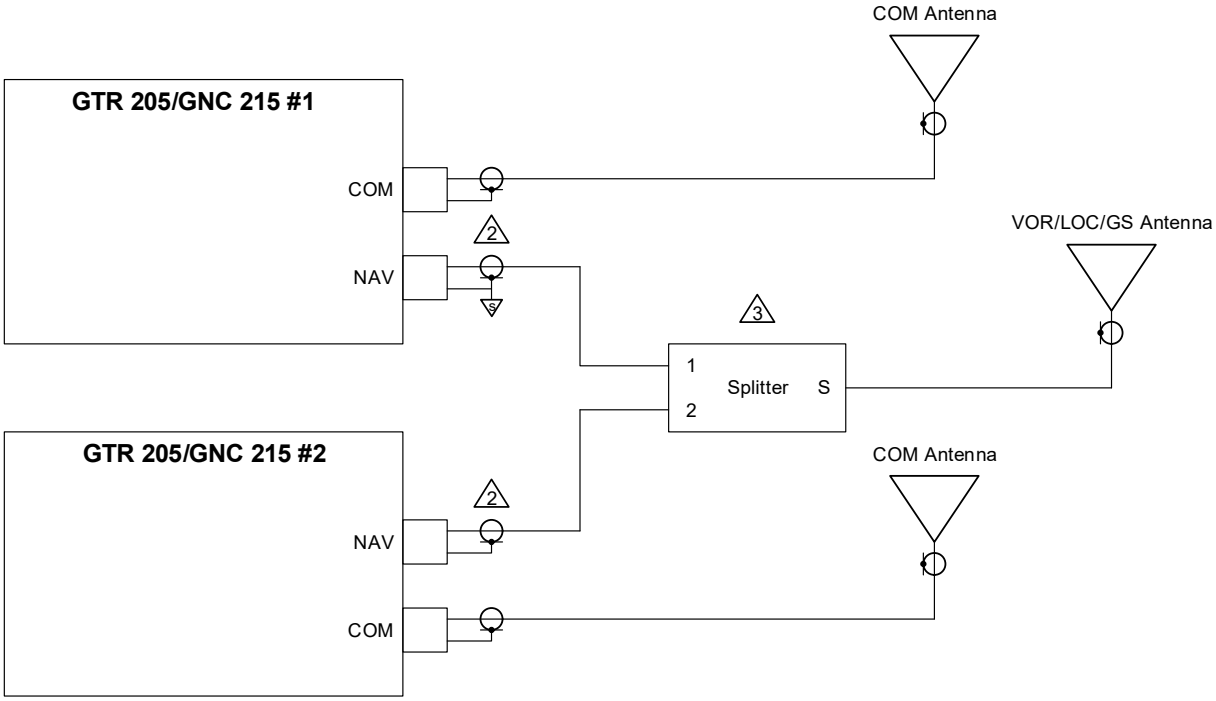
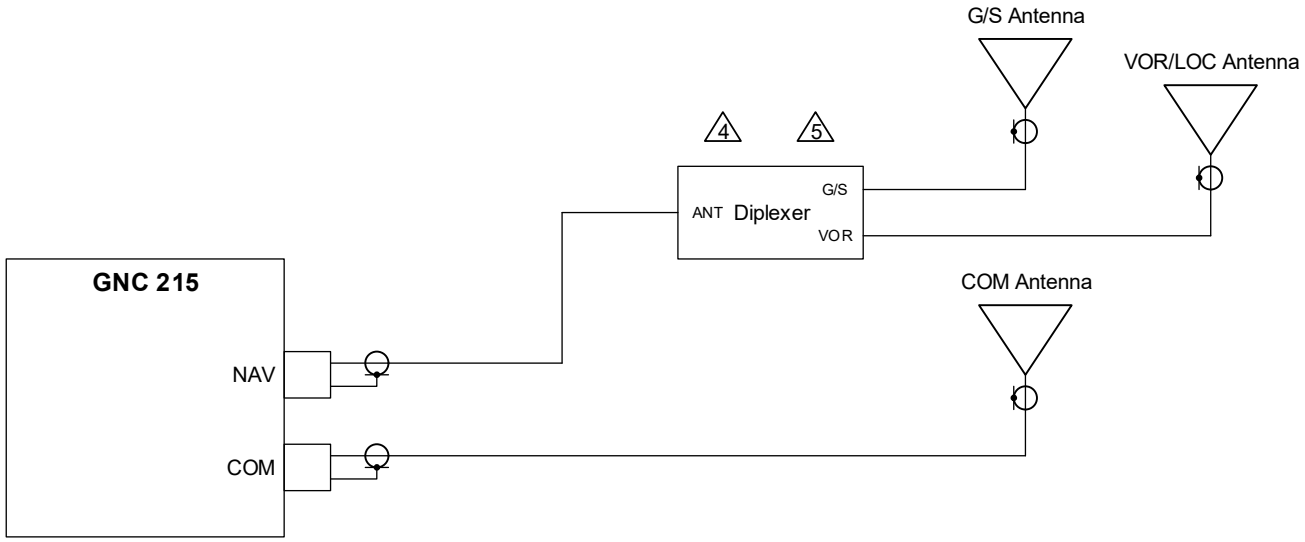


Figure 11-11 GTR 205/GNC 215 Antenna Interconnect
Sheet 1 of 4

SINGLE GNC/DUAL NAV ANTENNA INSTALLATION ⚠1



DUAL GNC/DUAL NAV ANTENNA INSTALLATION ⚠1

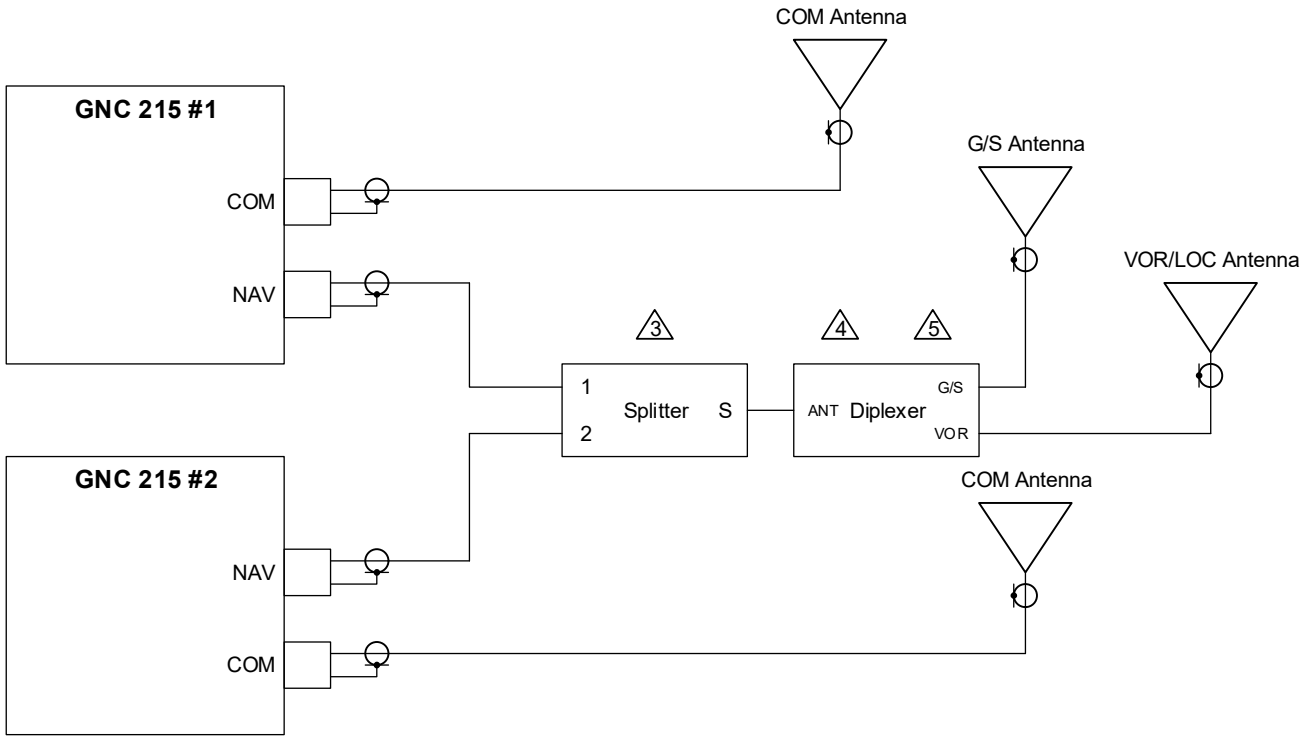
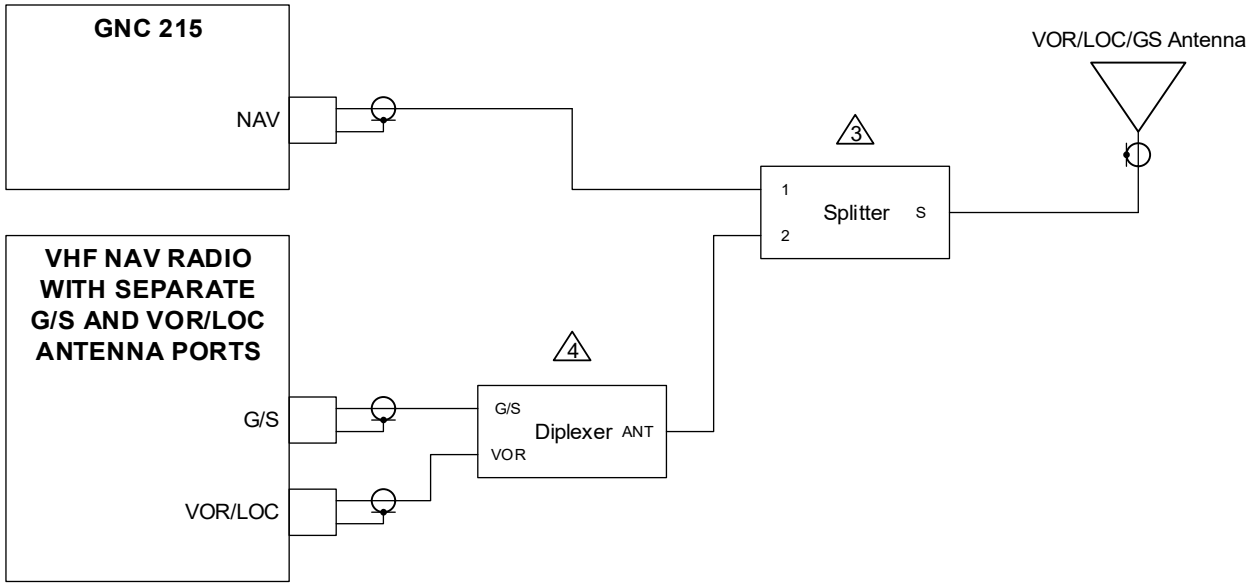


Figure 11-11 GTR 205/GNC 215 Antenna Interconnect
Sheet 2 of 4

SINGLE GNC, OTHER RADIO, AND SINGLE ANTENNA



SINGLE GNC, OTHER RADIO, AND DUAL ANTENNAS

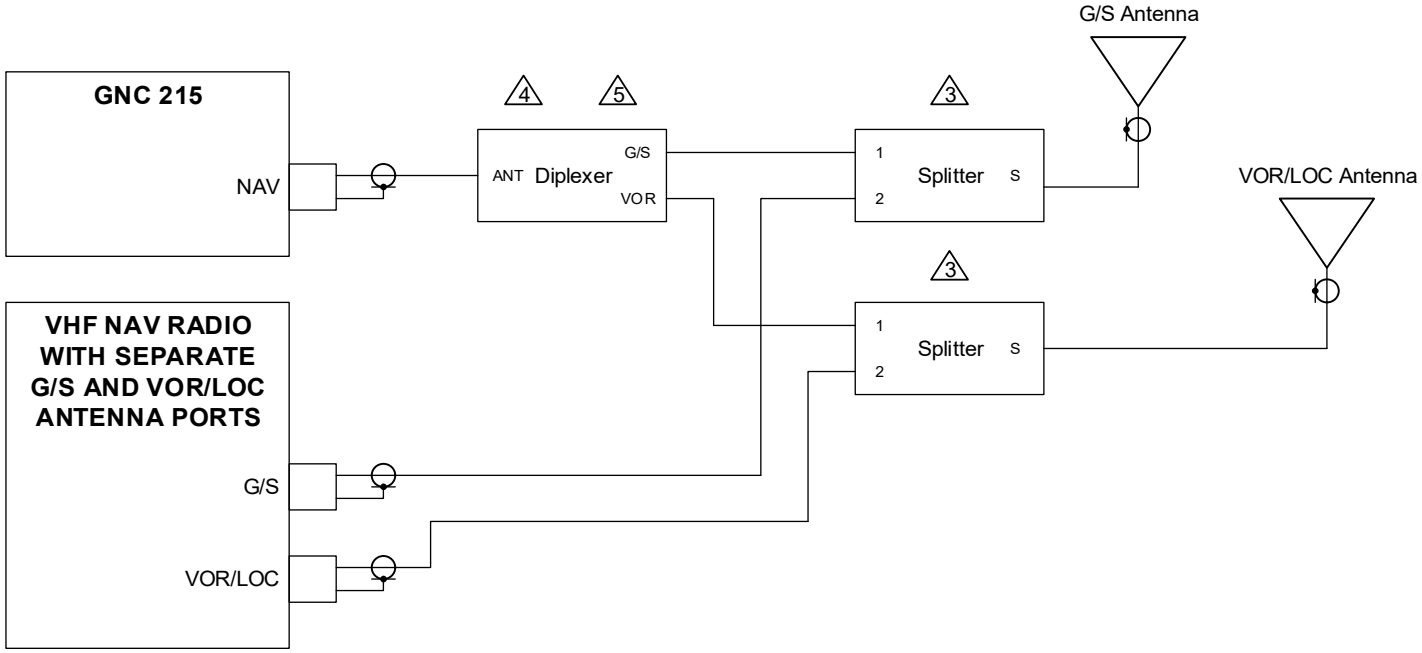


Figure 11-11 GTR 205/GNC 215 Antenna Interconnect
Sheet 3 of 4

NOTES

1. REFER TO SECTION 3 AND SECTION 4 FOR ANTENNA CABLE SPECIFICATIONS.

2. NAV ANTENNA PORT IS ONLY APPLICABLE TO THE GNC 215.

3. GARMIN P/N 013-00112-00 (MINI-CIRCUITS SPLITTER P/N ZFSC-2-1B+) OR EQUIVALENT SHOULD BE USED.

4. COMANT DIPLEXER P/N CI 507 MAY BE USED.

5. THE DIPLEXER IS INSTALLED BACKWARDS FROM TRADITIONAL APPLICATIONS. WHEN A G/S AND VOR/LOC ANTENNA IS INSTALLED, IT IS REQUIRED TO JOIN THE SIGNALS OF BOTH ANTENNAS WITH THE CI 507 DIPLEXER.

Figure 11-11 GTR 205/GNC 215 Antenna Interconnect
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GARMIN