

GARMIN®

GTX™ 35R/45R Installation Manual (Non-Certified Aircraft)



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RECORD OF REVISIONS

Revision	Revision Date	Description
1	10/23/17	Initial Release
2	01/03/25	Updated rack installation info
3	11/04/25	Added GTX 45R w/GPS unit info, various updates

CURRENT REVISION DESCRIPTION

Revision	Page Number(s)	Section Number	Description of Change
3	1-1	1.2	Updated Table 1-1 GTX™ 35R/45R Units
	1-2	1.3	Updated list of abbreviations and acronyms
	1-4	1.4.2	Updated ADS-B In info
	1-5	1.5	Updated FIS-B Capabilities info
	1-6	1.7	Updated Table 1-2 Interface Summary
	1-6	1.8	Updated Table 1-3 Physical Characteristics
	1-8	1.11	Updated Table 1-6 GPS Receiver Specifications
	1-9	1.13 , 1.14	Updated Power Specifications and Certification sections
	1-10	1.15 , 1.16	Updated License Requirements and Reference Documents sections
	3-1	3.2 , 3.3	Updated Unit Configurations and Accessories Supplied sections
	3-2, 3-3	3.4.1 , 3.5	Updated GPS Antenna and Installation Materials sections
	3-6	3.8	Updated GPS Antenna Requirements section
	3-7	3.9	Updated Minimum Systems Configuration section
	4-7	4.2	Added Figure 4-4
	5-1, 5-2	5.1	Updated pin names for the P3251 Connector
	5-5	5.3	Updated Power section
	5-11	5.10	Added Section 5.10 Time Mark
	6-3	6.4	Updated GAE Calibration section
	6-3	6.5	Updated Software Installation Procedure section
	7-1	7	Updated Continued Airworthiness section
	A-2	A	Updated Figure A-2
	B-1, B-2	B	Updated Tables B-1 & B-2
	C-2, C-4, C-8	C	Updated Figure C-1 , Figure C-3 , and added Figure C-9 , Figure C-10 , and Figure C-11

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DEFINITIONS OF WARNINGS, CAUTIONS, AND NOTES



WARNING

A warning means injury or death is possible if the instructions are not obeyed.



CAUTION

A caution means that damage to the equipment is possible.



NOTE

A note gives more information.



WARNING

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



WARNING

*Perchlorate Material – special handling can apply.
Refer to www.dtsc.ca.gov/hazardouswaste/perchlorate.*



NOTE

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1 SYSTEM OVERVIEW

1.1 Scope

This manual is intended to provide mechanical and electrical information for use in the planning and design of an installation of the GTX™ 35R/45R into an aircraft. This manual 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 may compromise your safety and is not recommended.

1.2 Equipment Description

The GTX 35R/45R models include Mode S/ES transponders. These units are controlled through the GDU™ displays in a G3X™ system.

Table 1-1 GTX 35R/45R Units

Feature	GTX 35R	GTX 45R	GTX 45R w/GPS
Mode S/ES	X	X	X
ADS-B In with Alerting (UAT and 1090 MHz)		X	X
Connex® (through Bluetooth) [1]		X	X
FIS-B In		X	X
TIS Traffic	X		
ADS-B In and TAS/TCAS Traffic Integration		X	X
Pressure sensor module (optional) [2]	X	X	X
Internal GPS/BAS Receivers			X

[1] Supports Bluetooth Low Energy (BLE) ADS-B Software v3.00 and later.

[2] Requires Main Software v2.65 and later.

1.3 Definitions and Abbreviations

Definitions

References made to GTX 35R/45R apply to all GTX 35R/45R models, except when noted.

The term squitter refers to a burst or broadcast of aircraft-tracking data that is periodically transmitted by a Mode S transponder without radar interrogation. The GTX 35R/45R Mode S/ES models transmit ADS-B Out ES. These transmissions contain additional aircraft information that includes GPS based location information.

Abbreviations

These abbreviations and acronyms are used in this document.

AC	Advisory Circular
ADF	Automatic Direction Finder
ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-R	Automatic Dependent Surveillance-Rebroadcast
AFMS	Aircraft Flight Manual Supplement
AIRMET	Airmen Meteorological Information
API	Appliance Project Identifier
ATAS	ADS-B Traffic Advisory System
CDTI	Cockpit Display of Traffic Information
ATCRBS	Air Traffic Control Radar Beacon System
CFR	Code of Federal Regulations
CG	Center of Gravity
CONUS	Continental United States
CSA	Conflict Situational Awareness
DC	Direct Current
DME	Distance Measuring Equipment
EQF	Environmental Qualification Form
ES	Extended Squitter
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FCU	Flight Control Unit
FIS-B	Flight Information Services-Broadcast
FMS	Flight Manual Supplement
GAE	Garmin Altitude Encoder
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GTX	Garmin Transponder
HSDB	High Speed Data Bus
LAT	Latitude
LON	Longitude
MCP	Mode Control Panel
METAR	Meteorological Aviation Report
MFD	Multifunction Display
MSR	Message Success Rate
NOTAM	Notice to Airmen

NEXRAD	Next Generation Radar
PED	Portable Electronic Device
PIREP	Pilot Weather Report
POH	Pilot Operating Handbook
RAIM	Receiver Autonomous Integrity Monitoring
RFMS	Rotorcraft Flight Manual Supplement
SATCOM	Satellite Communications
SBAS	Satellite-Based Augmentation System
SIGMET	Significant Meteorological Information
SIL	Source Integrity Level
SPI	Special Position Indicator
SUA	Special Use Airspace
TAF	Terminal Area Forecast
TAS	Traffic Advisory System
TCAS	Traffic Collision Avoidance System
TIS	Traffic Information Service
TIS-B	Traffic Information Service-Broadcast
TSO	Technical Standard Order
UAT	Universal Access Transceiver
UHF	Ultra-High Frequency
USB	Universal Serial Bus
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
WAAS	Wide Area Augmentation System

1.4 ADS-B Capabilities

1.4.1 ADS-B Out

The GTX 35R/45R include ADS-B Out capabilities when installed with a GPS position source that meets the TSO performance requirements specified in 14 CFR 91.227

1.4.1.1 Garmin Altitude Encoder

In most installations, the GTX 35R/45R receives pressure altitude data from the G3X system. An optional GAE sensor module is available for installations requiring pressure altitude data that meets the requirements of TSO-C88b. The sensor module connects to the aircraft static system. The module attaches to the rear connector plate with two screws, and has short, unshielded wires to connect to the GTX 35R/45R unit through the rear D-sub connector.



NOTE

The GAE sensor does not need to be disconnected if the GTX 35R/45R is removed from the mounting rack.

1.4.2 ADS-B In

The GTX 45R includes receivers for both the 978 MHz (UAT) and the 1090 MHz frequency bands for all ADS-B In data reception capabilities. The GTX 45R receives ADS-B transmissions from other ADS-B Out equipped aircraft, ADS-R, and TIS-B information from ground stations. The GTX 45R supplies ADS-B data to G3X Touch™ displays, certain Garmin panel-mount navigators, and certain portable devices using Bluetooth.

1.4.3 Installation Approval for ADS-B Systems

The conditions and tests necessary for TSO approval of the GTX 35R/45R are minimum performance standards. It is the responsibility of the installer to determine if the aircraft installation conditions are within the TSO standards.

All GTX 35R/45R unit functions are design-approved under the TSO. Changes or modifications to any unit that are not approved can void the compliance to necessary regulations and authorization for continued equipment usage.

It is the installer's responsibility to make sure the ADS-B Out system installation is compliant with 14 CFR 91.227.

1.5 FIS-B Capabilities

The GTX 45R receives FIS-B information from UAT ground stations in the United States. A direct line-of-sight between the ground station and aircraft is necessary to receive FIS-B data. The GTX 45R supplies FIS-B data to G3X Touch displays, certain Garmin panel-mount navigators, and certain portable devices using Bluetooth. Supported FIS-B data includes:

- NOTAM (includes TFR, D, and FDC)
- AIRMET
- SIGMET
- METAR
- TAF
- PIREP
- Winds/Temps Aloft
- Regional NEXRAD
- CONUS NEXRAD
- Lightning
- Cloud Tops
- Icing
- Turbulence
- CWA
- G-AIRMET

FIS-B information, including weather information, NOTAMs, and TFR areas, are intended to assist in long- and near-term planning decision making. The system lacks sufficient resolution and updating capability necessary for aerial maneuvering associated with immediate decisions.

1.6 TIS-A System Capabilities

The GTX 35R supplies information about nearby traffic through the FAA provided radar based TIS-A service. Advisory traffic information is shown on G3X/G3X Touch displays, and compatible Garmin panel-mount navigators.

1.7 Interface Summary

Table 1-2 Interface Summary

Interface Description	Input/Output	GTX 35R Qty	GTX 45R Qty
RS-232	I/O	3	4
ARINC 429	O	1	1
	I	2	2
HSDB	I/O	N/A	2
RS-422	I or O	N/A	1
Suppression Bus	I/O	1	1
1PPS [2]	O	1	1
GAE Module Interface [1]	I/O	1	1
USB interface	I/O	1	1

[1] Requires main software v2.65 and later

[2] Applicable only to GTX 45R with internal GPS.

1.8 General Specifications

Table 1-3 Physical Characteristics

Characteristic	Specification
Height, standard mount	1.7 inches (43 mm)
Width, standard mount	6.3 inches (160 mm)
Length, standard mount (unit, mount, and connector backshells)	9.9 inches (252 mm)
GTX 35R weight (unit only)	1.9 lb (0.86 kg)
GTX 45R weight (unit only)	2.2 lb (1.00 kg)
GTX 45R with GPS weight (unit only)	2.3 lb (1.04 kg)
GTX 35R weight with standard mounting tray, backplate, and connectors	2.7 lb (1.22 kg)
GTX 45R weight with standard mounting tray, backplate, and connectors	3.0 lb (1.36 kg)
GTX 45R with GPS weight with standard mounting tray, backplate, and connectors	3.2 lb (1.45 kg)
Operating temperature range	-40°F to 158°F (-40°C to + 70°C) For more details refer to the EQF.
Maximum operating altitude	55,000 feet
Humidity	95% non-condensing
Cooling	External cooling not necessary

1.9 Transponder Specifications

Table 1-4 Transponder Specifications

Characteristic	Specification
Transmitter frequency	1090 MHz $\pm$ 1 MHz
Transmitter power	125 W min at antenna, with max 2dB cable loss 250 W nominal at unit
Receiver frequency	1030 MHz $\pm$ 0.01 MHz
Receiver sensitivity	-74 dBm nominal for 90% replies
External suppression input	$\geq$ 10 VDC to suppress
External suppression output	$\geq$ 18 VDC with 300 ohm load, 28 VDC typical with no load

1.10 UAT Receiver Specifications (GTX 45R Only)

Table 1-5 UAT Receiver Specifications

Characteristic	Specification
Frequency	978 MHz $\pm$ 20 ppm
Modulation	Continuous phase FSK, h = 0.6, raised cosine shaping, a = 0.5
Data rate	1.04 Mbps
Sensitivity	-96 dBm for 90% MSR

1.11 GPS Receiver Specifications

Table 1-6 GPS Receiver Specifications

Characteristic	Specification
Number of channels	15 (12 GPS and 3 GPS/SBAS)
Frequency	1575.42 MHz L1, C/A code
Sensitivity (acquisition, no interference)	-134.5 dBm GPS -135.5 dBm SBAS
Sensitivity (drop lock)	-144 dBm
Dynamic range	>20 dB
LAT/LON position accuracy	<1.25 meter RMS horizontal, <2 meter vertical, with SBAS
Velocity	1000 knots maximum (above 60,000 ft)
TTFF (Time To First Fix)	1:45 min. typical with current almanac, position, and time
Reacquisition	10 seconds typical
Position update interval	0.2 sec (5 Hz)
1PPS (Pulse Per Second)	$\pm$ 275 nsec of UTC second
Datum	WGS-84
SATCOM compatibility	SATCOM compatibility is dependent on antenna selection
Antenna power supply	35 mA typical, 40 mA max at 4.7 VDC

1.12 1090 MHz Receiver Specifications

Table 1-1 1090 MHz Receiver Specifications

Characteristic	Specification
Frequency	1090 MHz $\pm$ 1 MHz
Modulation	Binary pulse-position
Data rate	1 Mbps
Sensitivity	-81 dBm for 90% MSR

1.13 Power Specifications

GTX 35R/45R units require an input voltage of between 9 VDC and 33 VDC. The maximum input power and current is based upon maximum reply rates.

Table 1-2 Power Specifications

Unit	Characteristic	Specification	
		14 VDC	28 VDC
GTX 35R	Power input	8 W typical, 15 W maximum	
	Input current, typical	0.57 A	0.29 A
	Input current, maximum	0.86 A	0.43 A
GTX 45R	Power input	10 W typical, 18 W maximum	
	Input current, typical	0.72 A	0.36 A
	Input current, maximum	1.30 A	0.65 A
GTX 45R, GPS [1]	Power input	12 W typical, 20 W maximum	
	Input current, typical	1.07 A	0.54 A
	Input current, maximum	1.43 A	0.72 A
	KEEP ALIVE input current, typical	65 µA	20 µA
	KEEP ALIVE input current, maximum	85 µA	40 µA

[1] KEEP ALIVE input only applies to a unit that has an internal GPS.

1.14 Certification

The GTX 35R/45R meets compliance with the TSO(s) when interfaced with equipment and installed in accordance with the requirements and limitations as outlined in this manual.

Refer to the GTX 35R/45R Transponder TSO Installation Manual (190-01499-04) for TSO compliance information (including applicable part numbers, appliance approvals, design assurance levels, deviations, and non-TSO functions).

1.14.1 Transmitter Grant of Equipment Authorization

Table 1-1 Equipment Authorization

Model	FCC ID
GTX 35R	IPH-02133
GTX 45R (-00 units)	IPH-02256
GTX 45R (-01 units)	IPH-0225611

1.15 License Requirements



CAUTION

The UHF transmitter in this equipment is guaranteed to meet Federal Communications Commission acceptance over the operating temperature range. Modifications not expressly approved by Garmin could invalidate the license and make it unlawful to operate the equipment.



NOTE

For non-US installations consult the local spectrum management agency for requirements.

The Telecommunications Act of 1996, effective February 8, 1996, provides the FCC discretion to eliminate radio station license requirements for aircraft and ships. The GTX 35R/45R installation must obey current transmitter licensing requirements. In the US, to find out the specific details on whether a particular installation is exempt from licensing, visit the FCC website <https://www.fcc.gov/wireless/bureau-divisions/mobility-division/aviation-radio-services>.

If an aircraft license is necessary, apply for a license on FCC Form 404, *Application for Aircraft Radio Station License*. The FCC also has a fax-on-demand service to supply forms by fax. The GTX 35R/45R owner accepts all responsibility for obtaining the proper licensing before using the transponder.

1.16 Reference Documents

These documents are additional sources of information to install the GTX 35R/45R. The technician should read all related reference materials along with this manual before unit installation.

Table 1-2 Garmin Reference Documents

Document	P/N
Antenna Minimum Performance Specification for Garmin's GPS/WAAS Receiver System	004-00287-00
G3X/G3X Touch Installation Manual	190-01115-01
14 CFR 91.227 ADS-B Out Compatible Equipment	190-01533-00

Table 1-3 Reference Documents

Document	Document ID
Aerospace Systems Electrical Bonding and Grounding for Electromagnetic Compatibility and Safety	SAE ARP 1870
Application for Aircraft Radio Station License	FCC Form 404
FAA Advisory Circular, Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair	FAA AC 43.13-1B
FAA Advisory Circular, Acceptable Methods, Techniques, and Practices – Aircraft Alterations	FAA AC 43.13-2B

2 LIMITATIONS

The GTX™ 35R/45R meets the minimum performance and quality control standards that are necessary by the TSOs.

3 INSTALLATION OVERVIEW

3.1 Introduction

Equipment information to install the GTX™ 35R/45R and optional accessories is in this section. Cabling is made by the installer to fit each particular aircraft. Always follow permitted avionics installation procedures as outlined in AC 43.13-1B and AC 43.13-2B or later FAA approved revisions.

3.2 Unit Configurations

Table 3-1 GTX 35R/45R Configurations

Model	Mount	GPS	ADS-B In	Unit P/N	Unit Only Kit	Standard Kit	Mount Type
GTX 35R	Remote			011-04286-00	010-01756-00	010-01756-01	Standard
GTX 45R	Remote		X	011-04287-00	010-01757-00	010-01756-01	Standard
GTX 45R	Remote		X	011-04287-01 [1]	010-01757-05	010-01757-06	Standard
GTX 45R, GPS	Remote	X	X	011-04287-41	010-01757-45	010-01757-46	Standard

[1] Requires main software v2.50 or later and ADS-B software v3.00 or later

3.3 Accessories Supplied

Table 3-2 Accessories Supplied

Unit	Kit P/N	Item	P/N
GTX 35R, Standard Mount	010-01756-01	Install rack	115-01771-00
		Backplate assembly	011-02976-00
		Connector kit	011-02977-00
		Product information kit	K00-00598-07
GTX 45R, Standard Mount	010-01757-01	Install rack	115-01771-00
		Backplate assembly	011-02976-00
		Connector kit	011-02977-01
		Product information kit	K00-00598-08
GTX 45R, Standard Mount	010-01757-06	Install rack	115-01771-01
		Backplate assembly	011-02976-00
		Connector kit	011-02977-01
		Product information kit	K00-00598-08
GTX 45R, GPS, Standard Mount	010-01757-46	Install rack	115-01771-00
		Backplate assembly	011-02976-01
		Connector kit	011-02977-01
		Product information kit	K00-00598-08

3.4 Optional Accessories

3.4.1 GPS Antenna

A GPS antenna is necessary for the GTX 45R with the internal GPS option. For information about antenna selection and part numbers, refer to [Section 3.8](#).

GA 35S Antenna

The antenna includes four 8-32 UNC-2A x 1.00" SS 303 mounting screws and one O-ring.

If it is necessary to use an antenna doubler refer to the applicable antenna installation data.

Use four #8 washers and four #8 self-locking nuts to attach the antenna. Applicable nut plates can be attached to the doubler. Torque the four supplied 8-32 stainless steel screws 12-15 in-lbs. Apply torque equally across all mounting screws to avoid deformation of the mounting area.

Use a TNC plug to connect the GPS antenna coax cable.

Table 3-3 GA 35S P/N 010-02639-00

Description	P/N	QTY
GA 35S antenna, white	011-05754-00	1
Install kit, GA 35S, thru-mount	011-05759-00	1

Table 3-4 Install Kit P/N 011-05759-00

Description	P/N	QTY
Screw, 8-32x1.00, PHP, SS/P	211-60209-20	4
O-ring, AS568-118, 70 Durometer, Nitrile	251-20118-00	1

GA 35 Antenna

The antenna includes four 8-32 UNC-2A x 1.00" SS 303 mounting screws and one O-ring.

If it is necessary to use an antenna doubler refer to the applicable antenna installation data.

Use four #8 washers and four #8 self-locking nuts to attach the antenna. Applicable nut plates can be attached to the doubler. Torque the four supplied 8-32 stainless steel screws 12-15 in-lbs. Apply torque equally across all mounting screws to avoid deformation of the mounting area. Use a TNC plug to connect the GPS antenna coax cable.

GA 36 Antenna

The antenna includes four 10-32 UNF-2A x 1.00" SS 303 mounting screws and one O-ring.

If it is necessary to use an antenna doubler refer to the applicable antenna installation data.

Attach the antenna with four #10 washers and four #10 self-locking nuts. Applicable nut plates can be attached to the doubler. Torque the four supplied 10-32 stainless steel screws 20-25 in-lbs. Apply torque equally across all mounting screws to avoid deformation of the mounting area.

Use a TNC plug to connect the GPS antenna coax cable.

GA 37 Antenna

The antenna includes four 10-32 UNF-2A x 1.00" SS 303 mounting screws and one O-ring.

If it is necessary to use an antenna doubler refer to the applicable antenna installation data.

Attach the antenna with four #10 washers and four #10 self-locking nuts. Applicable nut plates can be attached to the doubler. Torque the four supplied 10-32 stainless steel screws 20-25 in-lbs. Apply torque equally across all mounting screws to avoid deformation of the mounting area.

Use a TNC plug to connect the GPS antenna coax cable.

A33W Antenna

The antenna includes four 6-32 UNC-2A x 1.00" SS 303 mounting screws and one O-ring.

If it is necessary to use an antenna doubler refer to the applicable antenna installation data.

Attach the antenna with four #6 washers and four self-locking nuts. Applicable nut plates can be attached to the doubler. Torque the four supplied 6-32 stainless steel screws 3-5 in-lbs. Apply torque equally across all mounting screws to avoid deformation of the mounting area.

Use a TNC plug to connect the GPS antenna coax cable.

3.4.2 GAE

The GTX 35R/45R uses an optional GAE module as a transponder pressure altitude input. The GAE module directly attaches to the GTX 35R/45R rear backplate and connects to the aircraft static pressure system. When installing the pressure sensor module, use the supplied cable assembly. Do not lengthen.

Table 3-5 Pressure Sensor Module

Item	P/N
Pressure Sensor Module	011-03080-00

3.5 Necessary Installation Materials and Accessories Not Supplied

The GTX 35R/45R is installed with standard aviation materials. The following items are necessary for installation, but not supplied.

- Wire (MIL-W-22759/16 or equivalent)
- Shielded wire (MIL-C-27500 or equivalent)
- Aircraft grade category 5 Ethernet cable or MIL-27500 shielded twisted-pair cable is necessary for installations utilizing the HSDB interfaces (GTX 45R to GTN™ and/or GTS™ installations only)
- Mounting hardware
- Circuit breaker of applicable rating
- Tie wraps and/or lacing cord
- Ring terminals for grounding
- Coaxial cable (RG-400 or equivalent)
- Coax connectors – BNC connectors for the transponder antenna
- TNC connectors for the GPS antenna

3.6 Necessary Special Tools



NOTE

Insertion/extraction tools from ITT Cannon are all plastic. The others are plastic with metal tips.

Some connectors use crimp contacts. Use crimp tools in Table 3-6 to make sure reliable crimp contact connections for the rear D-sub connectors are correct.

Table 3-6 Recommended Crimp Tools

Manufacturer	Hand Crimping Tool	22-28 AWG (P3251, P3252)	
		Positioner	Insertion/Extraction Tool
Military PN	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

3.7 Transponder Antenna



NOTE

For the GTX 45R some types of transponder antennas that utilize thin radiator elements are only intended for use at 1030 and 1090 MHz. These types of antennas should be evaluated on a model-by-model basis to find their suitability for UAT receivers.

The GTX 35R/45R must have an UHF antenna. The antennas in Table 3-7 are approved for use with the GTX 35R/45R. Other antennas are permitted if they meet these specifications:

- Standard 50 ohm vertically polarized antenna with a VSWR $\leq 1.7:1$ at 978 MHz and $\leq 1.5:1$ at 1090 MHz
- TSO-C66(), TSO-C74(), or TSO-C112() antennas that also meet the VSWR specification

Table 3-7 Acceptable UAT/1090 Antennas

Manufacturer	P/N	Model/Description	Connector Type	Notes
Aero Antenna	AT130-16	DME Transponder	TNC	DC Grounded
Comant	CI-100	DME Transponder	BNC	Open Circuit
	CI-100-2	DME Transponder	TNC	Open Circuit
	CI-105	DME Transponder	BNC	Open Circuit
	CI-105-3	DME Transponder	BNC	Open Circuit
	CI-105-16	DME Transponder	BNC	Open Circuit
	CI-110-40-30	DME Transponder	C	Open Circuit
	CI-110-41-30	DME Transponder	C	DC Grounded
	CI-110-60-30	DME Transponder	C	Open Circuit
	CI-110-61-30	DME Transponder	C	DC Grounded
Dayton-Granger	L10-611-()	L-Band Blade	C	DC Grounded
Garmin	590-0052 or 013-00219-00	A-40	TNC	Open Circuit
	590-0051 or 013-00174-00	A-41	TNC	DC Grounded

3.8 GPS Antenna Requirements

Use an antenna in Table 3-8 to get the best performance with the GTX 45R, GPS with internal GNSS receiver. The antennas meet specifications in the document *Antenna Minimum Performance Specification for Garmin's GPS/WAAS Receiver System*.

Table 3-8 GNSS Receiver Antennas

Model/Description	Connect or Type	Manufacturer	P/N	Garmin Order Number
GA 35S, GPS/WAAS [1]	TNC	Garmin	011-05754-00	010-02639-00
GA 35, GPS/WAAS [1]	TNC	Garmin	013-00235-()	013-00235-()
		Aero Antenna	AT575-93G()-TNCF-000-RG-27-NM	N/A
GA 36, GPS/WAAS	TNC	Garmin	013-00244-()	013-00244-()
		Aero Antenna	AT575-126G()-TNCF-000-RG-27-NM	N/A
GA 37, GPS/WAAS/XM	TNC	Garmin	013-00245-()	013-00245-()
		Aero Antenna	AT2300-126G()-TNCF-000-RG-27-NM	N/A
A33W, WAAS Antenna	TNC	Garmin	013-00261-()	013-00261-()
		Aero Antenna	AT575-332G()-TNCF-000-RG-27-NM	N/A
GPS/VHF Antenna [2]	TNC/BNC	Comant	CI-2580-200	N/A
GPS/VHF Antenna [2]	TNC/BNC	Comant	CI-2728-200	N/A
GPS/XM/VHF Antenna [3]	TNC/TNC/BNC	Comant	CI-2580-410	N/A
GPS/XM/VHF Antenna [3]	TNC/TNC/BNC	Comant	CI-2728-410	N/A
GPS/WAAS Antenna	TNC	Comant	CI-428-200	N/A
GPS/XM Antenna	TNC/TNC	Comant	CI-428-410	N/A

[1] Same mounting hole pattern as GA 56, except GA 35S and GA 35 have a physically larger footprint.

[2] The GPS antenna connector is a TNC and the VHF connector is BNC.

[3] The GPS antenna connector is a TNC connector, the XM connector is TNC, and the VHF connector is BNC.

Table 3-9 GA 35S P/N 010-02639-00

Item Description	P/N	Qty
GA 35S antenna, white	011-05754-00	1
Install kit, GA 35S, thru-mount	011-05759-00	1

3.9 Minimum Systems Configuration

Refer to Table 3-11 for compatible ADS-B traffic/FIS-B displays. When installing a model in Table 3-10, each item marked with an X on the same row is necessary.

Table 3-10 Minimum System Configuration

Model	Transponder Antenna	External GPS/SBAS Position Source	GPS/SBAS Antenna
GTX 35R	X	X	
GTX 45R	X	X	
GTX 45R w/GPS	X		X

Table 3-11 Compatible ADS-B Traffic/FIS-B Displays

Display	FIS-B Source Format	ADS-B Traffic Source Format
GTN 6XX/7XX	HSDB	HSDB
G3X™	RS-232 Connex® Format 1	RS-232 Connex Format 1

3.10 GTX Pressure Altitude Input

In most installations, the GTX 35R/45R receives pressure altitude data from the G3X system. An optional GAE sensor module is available for installations requiring pressure altitude data that meets the requirements of TSO-C88b. When a GAE is installed and configured, the GTX 45R/45R will prioritize pressure altitude from by the GAE over altitude data from the G3X system. Configuration and calibration of the GAE requires the use of the dealer-only software tool described in [Section 6.4](#).

Table 3-12 Pressure Altitude Setting Source Priority

Priority	Source
1	GAE altitude encoder module (if installed)
2	G3X ADAHRS

3.11 ADS-B In Considerations (GTX 45R Only)

The GTX 45R provides ADS-B In data regardless of the state of the transponder. HSDB ADS-B In displays cannot connect to more than one ADS-B In source.



NOTE

Do not install with a GDL® 88.

3.12 Bluetooth Considerations (GTX 45R Only)

For optimal connectivity with a GTX 45, the Bluetooth antenna must point towards the passenger area of the aircraft. This is identifiable by the Garmin logo sticker. Bluetooth performance may be limited by aircraft obstructions.

3.13 Antenna Considerations

Mounting location considerations for the antenna(s) are provided in this section.

3.13.1 Transponder Antenna



NOTE

Ground planes must be considered for installations on composite aircraft. Conductive wire mesh, radials, or thin aluminum sheets embedded in the composite material supply the ground plane to maximize the antenna pattern (gain). This can improve transponder performance.

The antenna mounting must use the aircraft manufacturer's type certificated antenna location and style. The antenna must be installed in accordance with manufacturer instructions and/or AC 43.12-2A Chapter 3.

Transponder antenna considerations help the installer to select the best location for the antenna. The antenna should:

- Be attached away from major protrusions, such as engines, nacelles, propellers, and antenna masts.
- Be as far as practical from landing gear doors, access doors, or other openings that could affect its radiation pattern.
- Be vertically attached on the bottom of the aircraft.
- Not be attached within three feet of the ADF sense antenna or any other communication antenna.
- Not be attached within six feet of a DME antenna.
- Be attached to a minimum of three feet of cable from the GTX 35R/45R to prevent RF interference.

3.13.2 GPS Antenna



NOTE

When attaching a combination antenna, the recommended distance of two feet or more is not applicable to the distance between the antenna elements of the combination antenna (ex. GPS and COM, GPS and XM) provided the combination antenna is TSO authorized and has been tested to meet Garmin's minimum performance standards. For approved antennas refer to [Table 3-8](#).

If twelve inch spacing is not practical, the maximum center-to-center spacing must be used, but never less than nine inches. Spacing less than nine inches results in unacceptable antenna pattern degradation. The installation guidelines meet the intent of AC 20-138A section 16. The greater the deviation from these guidelines, the greater the chance of decreased signal quality and availability. It is possible that all of the installation guidelines cannot be met. These guidelines are listed in order of importance to get the best performance. The installer should use best judgment to balance the installation guidelines. The GPS antenna should:

1. Be installed as near to level as possible with respect to the normal cruise flight attitude of the aircraft.
2. Be installed in a location to minimize the effects of airframe shadowing during typical maneuvers.
3. Be installed a minimum of two feet from any VHF COM antenna or any other antenna which may emit harmonic interference at the L1 frequency of 1575.42 MHz.
4. Be installed a minimum of two feet from any antennas emitting more than 25 watts.

5. Be installed a minimum of nine inches (center to center) from other antennas, including passive antennas such as another GPS or XM antenna.
6. Be installed a minimum of three inches from the windscreen.
7. Have a twelve inch center to center spacing between GPS antennas.

The recommended antenna locations are shown in Figure 3-1.

An aircraft EMC check can find the source of GPS degradation in the presence of interference signals. If an EMC check shows unacceptable interference, either insert a GPS notch filter in line with the offending VHF COM or the (re-radiating) ELT transmitter, or select a different GPS antenna location.

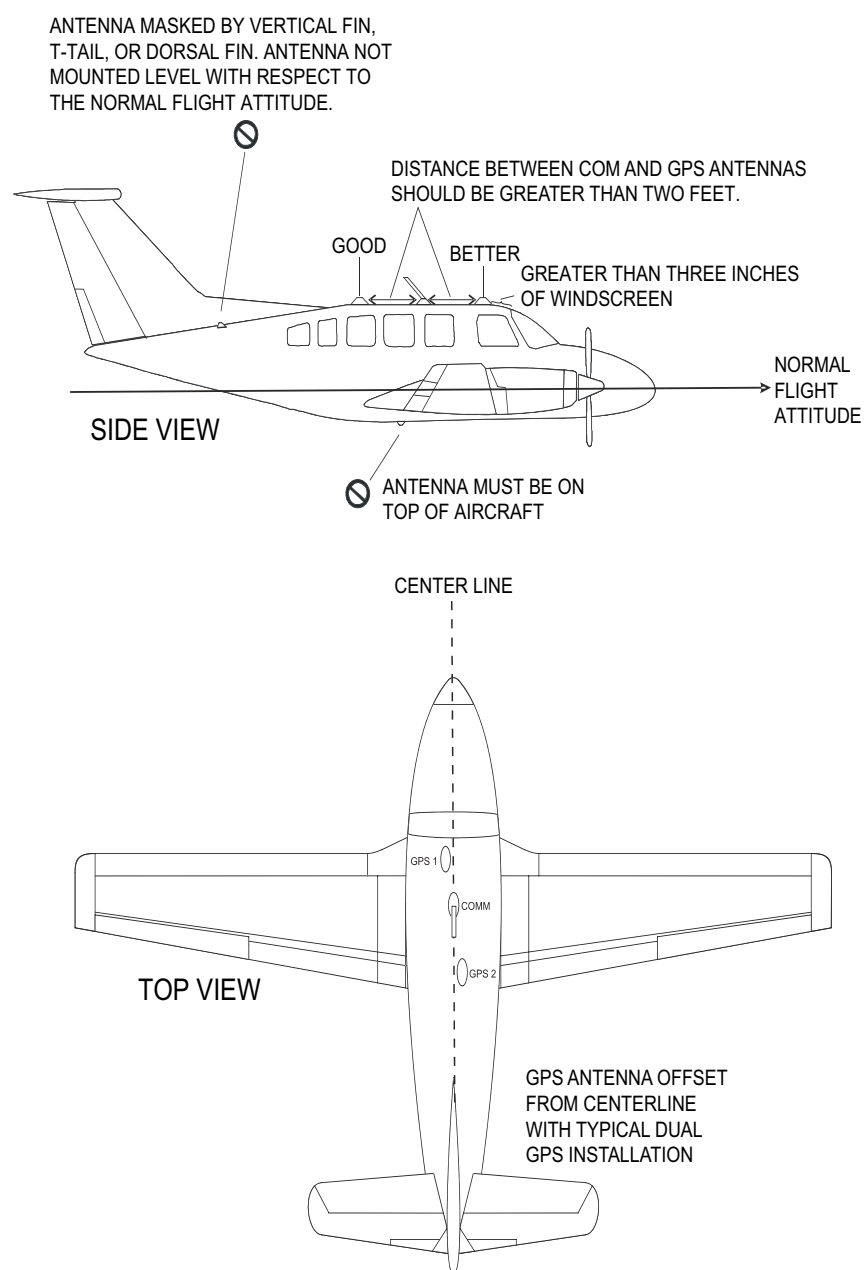


Figure 3-1 GPS Locations of Antennas

3.14 Electrical Bonding

Make sure the transponder antennas are electrically bonded to the aircraft.

3.15 Cabling and Wiring

Use AC 43.13-1B chapter 11, sections 8 through 13 to install wiring. The considerations are as follows:

- It should not be possible for the cable harness to be exposed to wire chafing.
- The cable harness should not be located near flight control cables, high capacity electrical lines (e.g., DC electric motor cables), or fuel lines.
- Do not put cables near high energy sources (e.g., DC motors, high heat sources).
- Wiring that must be shielded must be done as shown in [Appendix C](#).
- Shield pigtail lengths must be less than 3.0 inches.

3.16 Electrical Bonding Considerations

Bond electrical equipment, supporting brackets, and racks to the aircraft's main structure. Refer to SAE ARP 1870 section 5 when surface preparation is necessary to get an electrical bond. Use a calibrated milliohm meter to measure the resistance of the bond between the equipment and the adjacent aircraft structure. The bond must have a DC resistance no more than 2.5 milliohms.

3.17 Cooling Requirements and Considerations

There are no cooling requirements or considerations for the GTX 35R/45R. The chassis has provisions for a fan, however one is not necessary or provided.

4 INSTALLATION PROCEDURE

4.1 Wire Harness Installation

All electrical connections, except for the antenna(s) and shield grounds, are made through the D-sub connectors on the rear of the unit. The shield grounds terminate to the connector backshells.

For additional information:

- Refer to [Section 5](#) for rear connector pinout and descriptions of interface connections
- Refer to [Appendix C](#) for interconnect diagrams
- Refer to [Section 3.6](#) for special tools

Give sufficient space for installation of cables and connectors. The installer supplies and assembles all cables. Cable lengths are dependent upon the installation.

To install pins into connectors and build a wire harness:

1. Remove 0.17 inches of insulation from wires going to the connectors.
2. Put the wire into the pin and crimp with one of the recommended (or equivalent) crimping tools.
3. Put the pin into the connector housing location as specified by the interconnect drawings in [Appendix C](#).
4. Gently pull on the wire to make sure the pin is properly engaged into the connector.
5. Route and attach the cable run from the GTX™ 35R/45R to the other units. Refer to [Section 3.15](#).

4.2 Backshell Assembly Parts

The GTX 35R/45R connector kits include backshell assemblies and ground adapter assemblies. Use the shield block ground kit to terminate shield grounds to the backshell housing. Garmin part numbers for the D-sub connectors and the backshell assemblies are in table 4-1.

Table 4-1 Backshell Assembly

Refer to Figure 4-3	Description	Garmin P/N	Notes
1	Backshell (P3251) Backshell (P3252)	125-00084-00 125-00081-00	[1]
2	Shield block (P3251) Shield block (P3252)	117-00147-01 117-00147-00	[2]
3	Screw, 4-40 x.250, FLHP100°, SS/P, nylon	211-63234-08	[2]
6	Screw, 4-40x.375, PHP, SS/P, with nylon	211-60234-10	[1]
7	Strain relief (P3251) Strain relief (P3252)	115-00499-03 115-00499-00	[1]
8	Cover (P3251) Cover (P3252)	115-00500-03 115-00500-00	[1]
9	Screw, 4-40x.187, FLHP100, SS/P, with nylon	211-63234-06	[1]
10	Connector, D-sub, HD, 62-pin (P3251) Connector, D-sub, HD, 15-pin (P3252)	330-00185-62 330-00185-15	[3]
11	Multiple conductor shielded cable	As necessary	[4]
12	Shield terminator	As necessary	[4] [5]
13	Wire, insulated, 20-22 AWG (3 inches maximum length)	As necessary	[4] [5]
14	Pin contacts, #22D	336-00021-00	[3]
15	Ring terminal, #8, insulated, 18-22 AWG, 14-16 AWG	MS25036-149, MS25036-153, MS25036-156	[4] [6]
16	Screw, PHP, 8-32 x .312", stainless or cad plated steel	MS51957-42, MS35206-242	[4] [6]
17	Split washer, #8, (.045" compressed thickness) stainless or cad-plated steel	MS35338-137, MS35338-42	[4] [6]
18	Flat washer, #8, .032" thick, .174" ID, .375" OD, stainless or cad plated steel	NAS1149CN832R, NAS1149FN832P	[4] [6]
19	Silicone fusion tape	249-00114-00	[4]

Notes:

- [1] Supplied as part of backshell kits, P/N 011-00950-03 (P3251), and P/N 011-00950-00 (P3252). These are included in the connector kits, P/N 011-02977-().
- [2] Supplied as part of ground adapter kits P/N 011-01169-01 (P3251) and P/N 011-01169-00 (P3252). These are included in the connector kits, P/N 011-02977-().
- [3] Supplied as part of GTX connector kit P/N 011-02977-00 (GTX 35R), and P/N 011-02977-01 (GTX 45R).
- [4] Not supplied – must be purchased separately.
- [5] Solder sleeve with pre-installed shield drain wire may be used instead of items 12 and 13.
- [6] Not a Garmin part number.

4.3 Shielded Cable Preparation


NOTE

Solder sleeves with pre-installed shield drains can be used instead of separate shield terminators (12) and individual wires (13). A preferred solder sleeve is M83519/2-X series with a pre-installed shield drain.

Prepare all of the shielded cables using one of the methods shown in [Figure 4-1](#) or [Figure 4-2](#). Refer to [Figure 4-3](#) for details of the shield termination to the connector backshell.

1. At the end of the shielded cable (11), strip back a 2.5" maximum length of the jacket to expose the braid.
2. Remove the exposed braid.
3. Carefully score the jacket 1/4" to 5/16" from the end of the previously removed jacket and remove it to expose the braid.
4. Connect a 20 or 22 AWG wire (13) to the exposed shield of the prepared cable assembly. Refer to [Figure 4-1](#) or [Figure 4-2](#). AC 43.13 maybe a helpful reference for termination techniques.
5. Slide a shield terminator (12) onto the prepared cable assembly (11) and connect the shield wire (13) to the shield using a heat gun approved for use with solder sleeves.
6. Crimp contacts (14) onto the cable wires. Refer to Section 4.1.
7. Repeat steps 1 through 6 as necessary for the remaining shielded cables.
8. Install a ring terminal (15) onto the cable shield termination wires (13).
9. Group wires as applicable for the connector. Refer to Section 4.4.

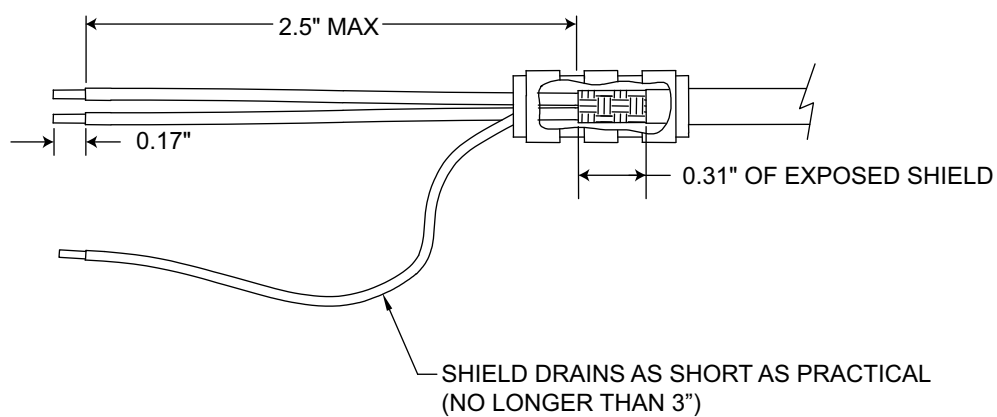


Figure 4-1 Preferred Method

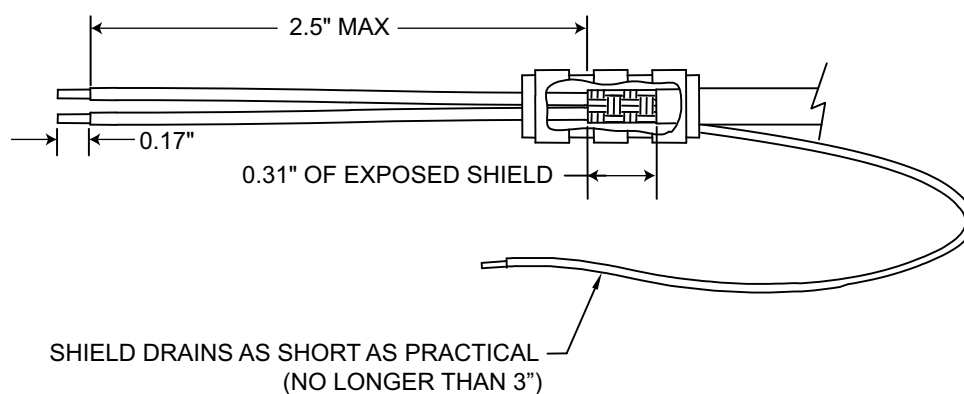


Figure 4-2 Alternate Method

4.4 Connector and Backshell Assembly



CAUTION

Do not place the concave side of the strain relief clamp (9) across the cable bundle. The cable bundle can be damaged.



NOTE

Each tapped hole on the backshell (1) will only take two ring terminals (15). It is recommended to terminate a maximum of two wires (13) per ring terminal. This necessitates the use of a ring terminal, #8, insulated, 14-16 AWG (MS25036-153). If only a single wire is left or if only a single wire is necessary for this connector, a ring terminal, #8, insulated, 18-22 AWG (MS25036-149) can be used. If more wires exist for the connector than two per ring terminal, it is permitted to terminate three wires per ring terminal.

Refer to Figure 4-3 and for this procedure.

1. Insert flathead screws (3) through holes on the shield block (2).
2. Attach to the backshell (1).
3. Insert the crimped wire harness contacts (14) in the D-sub connector (10). Refer to [Appendix C](#) for the chosen contact location.
4. Group wires as applicable for the connector.
5. Wrap the cable bundle with silicone fusion tape (19) so the backshell strain relief and cast housing touches the cable bundle.
6. Place the backshell around the connector and wire harness so it rests against the front of the backshell.
7. Place the smooth side of the backshell strain relief clamp (7) across the cable bundle.
8. Attach with three 4-40 x 0.375" pan head screws (6).
9. Attach the cover (8) to the backshell using two screws (9).
10. On the pan head screw (16) place in order:
 - Split washer (17)
 - Flat washer (18)
 - First ring terminal (15)
 - If necessary, second ring terminal
11. Insert the assembled pan head screw (16) into the tapped holes on the shield block (2).

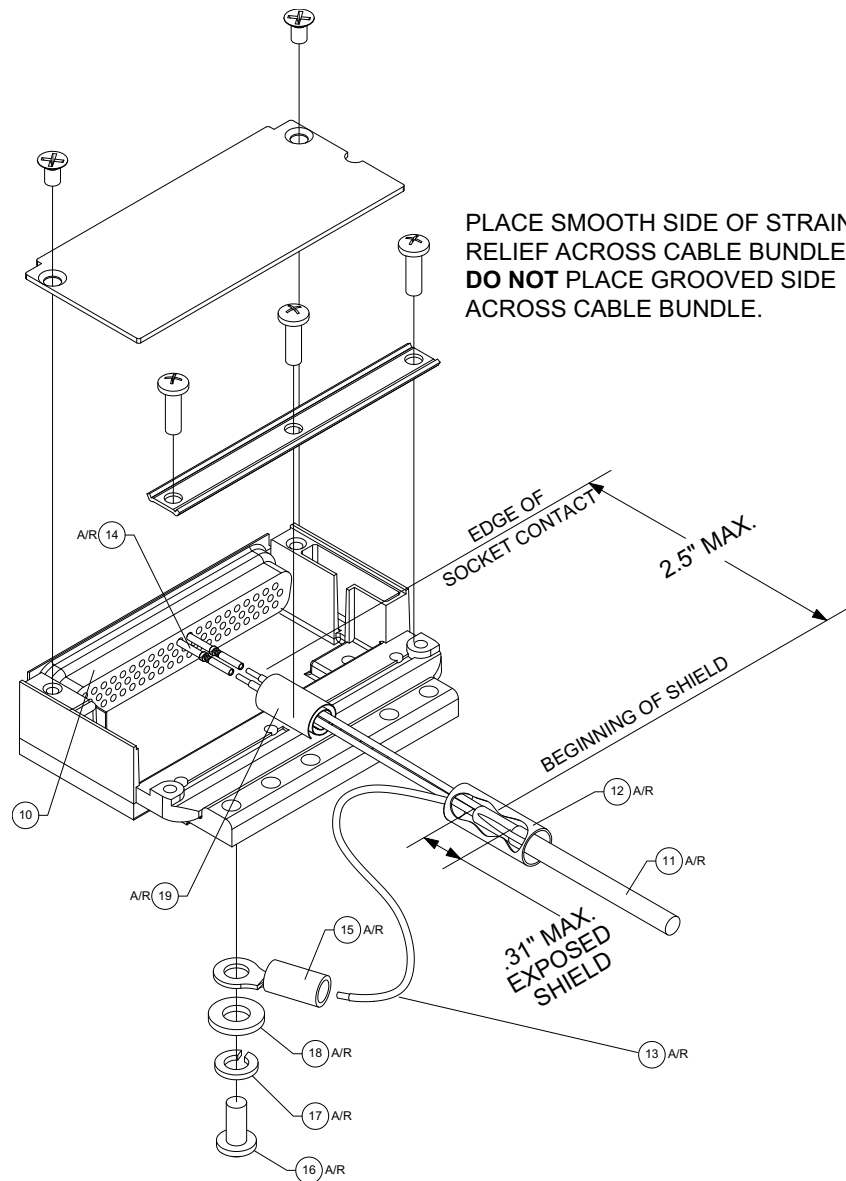


Figure 4-3 Shield Termination on Backshell Assembly

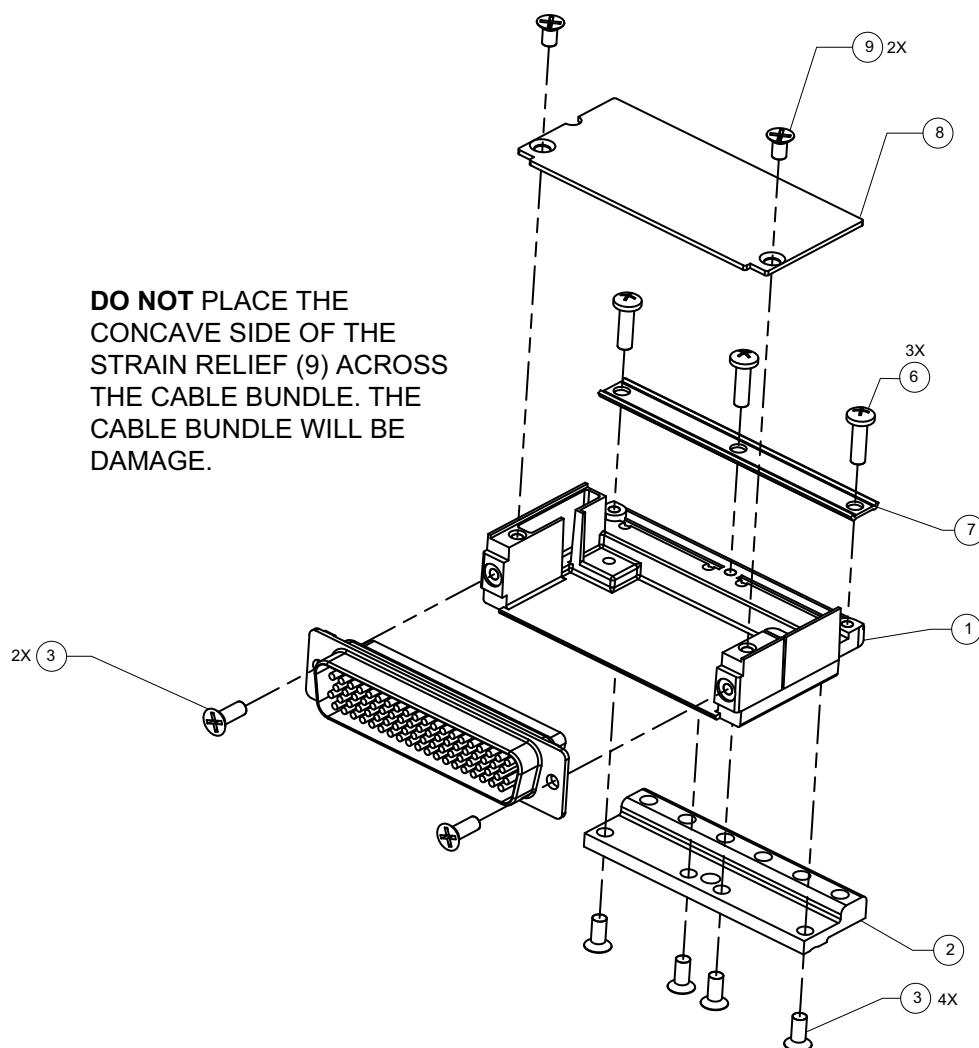


Figure 4-4 Connector and Backshell Assembly

4.5 Coaxial Cable Installation



NOTE

Make sure the length is set for the necessary cable loss. Some antennas have minimum cable loss specifications, that may need a cable longer than the physical run in the aircraft.

Follow the steps below for installation of the coaxial cables.

1. Route the coaxial cable to the radio rack location keeping in mind the recommendations of [Section 3.15](#).
2. Attach the cable in accordance with AC 43.13-1B chapter 11, section 11.
3. Trim the coaxial cable to the applicable length.
4. Install the coaxial connectors per the manufacturer's instructions.

4.6 GAE Installation (optional)

Installation of the optional Garmin Altitude Encoder requires connection to the aircraft static pressure source.



NOTE

The GAE can remain connected to the aircraft static system if the GTX 35R/45R is removed.

The GAE has 1/8-27 ANPT female connection port. Added static line connections to the GAE must:

- Use line and fitting identical to those specified in model specific illustrated parts catalog and purchased from aircraft manufacturer. Lines and fittings must be clear from fluid, sealant, or particles, and have no leaks when installed. Added line must be labeled near the GAE unit.
- Be routed away from moving parts of the control system and high temperature lines and avoid sharp bends. The GAE must not be the low point in the added line to avoid moisture collection at or near the unit.
- Not change the effectiveness of existing drains, alternate static source selector switch (if applicable), or the independence of dual static systems (if applicable).
- Not modify the static port surface or aircraft surface near the static port, and introduce changes that would affect static system calibration.

Connection of the GAE four conductor wire harness is shown in [Figure A-4](#). Drawings in [Appendix A](#) detail the installation of the GAE to the GTX 35R/45R backplate assembly.

Table 4-2 Garmin Altitude Encoder Kit, P/N 011-03080-00

Description	P/N	QTY
Sub-assembly, Garmin altitude encoder, unit only	011-03080-01	1
Screw, 4-40 x .250, PHP, SS/P with nylon	211-60234-08	2
Screw, 4-40 x .250, FLHP 100, SS/P, nylon	211-63234-08	2
Harness, 4 cond, GAE 12	325-00421-00	1

4.7 Equipment Rack Installation

4.7.1 Standard Remote Mount Units

The GTX 35R/45R standard remote mount racks can be mounted in any orientation as long as all six mounting screws are attached to a mounting bracket. Design the mounting bracket(s) for the GTX 35R/45R unit with the dimension shown in [Figure A-2](#).

Attach the connectors and optional GAE, if used, to the connector backplate (refer to Appendix A).

Install the rack using #6-32 flat head screws and self-locking nuts. The screws are inserted from the inside through the holes in the sides of the rack.

4.8 Unit Installation and Removal



CAUTION

The application of hex drive tool torque more than 8 in-lbs can damage the locking mechanism.



NOTE

When a unit is installed make sure it successfully starts up. Refer to [Section 6](#) for configuration procedures.



NOTE

Before placing the unit in the rack, in order to make sure the position of the retention mechanism is correct, it can be necessary to insert the hex drive tool into the access hole and turn the hex drive tool counterclockwise until it fully stops.

Insertion

1. Slide unit in 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. Push on the left side of the unit face and turn hex drive tool clockwise and apply 8 in-lbs of torque.

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.

5 CONNECTOR PINOUT INFORMATION

5.1 Main Board Connector - P3251

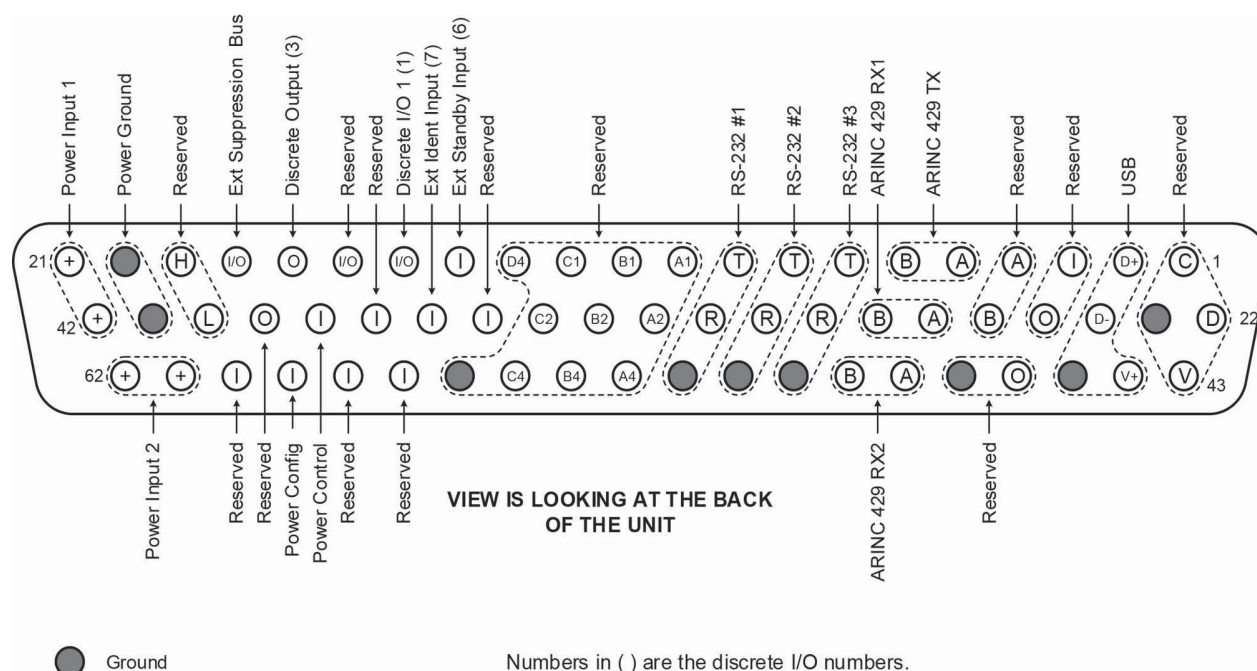


Table 5-1 P3251 Connector

Pin	Pin Name	I/O
1	ALT ENCODER CLOCK	I/O
2	USB DATA HI	I/O
3	RESERVED	--
4	TIME MARK A [1]	O
5	ARINC 429 OUT A	O
6	ARINC 429 OUT B	O
7	RS-232 OUT 3	O
8	RS-232 OUT 2	O
9	RS-232 OUT 1	O
10	RESERVED	--
11	RESERVED	--
12	RESERVED	--
13	RESERVED	--
14	EXTERNAL STANDBY SELECT*	I
15	TIS-A SELECT (GTX™ 35R Only)*	I/O

*Active-Low discrete requiring a ground to activate. If there is no asterisk, the signal is Active-High.

[1] Applicable only to GTX 45R with internal GPS.

Pin	Pin Name	I/O
16	RESERVED	--
17	XPDR FAIL 1*	O
18	EXTERNAL SUPPRESSION	I/O
19	RESERVED	--
20	AIRCRAFT GROUND	I
21	AIRCRAFT POWER 1	I
22	ALT ENCODER DATA	I/O
23	ALT ENCODER GND	O
24	USB DATA LO	I/O
25	RESERVED	--
26	TIME MARK B [1]	I/O
27	ARINC 429 IN 1A	I
28	ARINC 429 IN 1B	I
29	RS-232 IN 3	I
30	RS-232 IN 2	I
31	RS-232 IN 1	I
32	RESERVED	--
33	RESERVED	--
34	RESERVED	--
35	RESERVED	--
36	EXTERNAL IDENT SELECT*	I
37	RESERVED	--
38	POWER CONTROL*	I
39	RESERVED	--
40	RESERVED	--
41	AIRCRAFT GROUND	--
42	AIRCRAFT POWER 1	I
43	ALT ENCODER POWER	O
44	USB VBUS POWER	I
45	USB GND	--
46	RESERVED	--
47	RESERVED	--
48	ARINC 429 IN 2A	I

*Active-Low discrete requiring a ground to activate. If there is no asterisk, the signal is Active-High.

[1] Applicable only to GTX 45R with internal GPS.

Pin	Pin Name	I/O
49	ARINC 429 IN 2B	I
50	RS-232 GND 3	--
51	RS-232 GND 2	--
52	RS-232 GND 1	--
53	RESERVED	--
54	RESERVED	--
55	RESERVED	--
56	RESERVED	--
57	RESERVED	--
58	RESERVED	--
59	POWER CONFIG*	I
60	GPS KEEP ALIVE [1]	I
61	AIRCRAFT POWER 2	I
62	AIRCRAFT POWER 2	I

*Active-Low discrete requiring a ground to activate. If there is no asterisk, the signal is Active-High.

[1] Applicable only to GTX 45R with internal GPS.

5.2 ADS-B Board Connector – P3252 (GTX 45R Only)

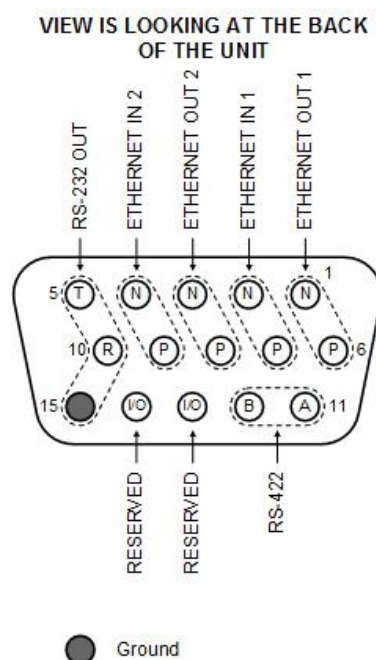


Table 5-2 P3252 Connector

Pin	Pin Name	I/O
1	ETHERNET OUT 1B	O
2	ETHERNET IN 1B	I
3	ETHERNET OUT 2B	O
4	ETHERNET IN 2B	I
5	RS-232 OUT 4	O
6	ETHERNET OUT 1A	O
7	ETHERNET IN 1A	I
8	ETHERNET OUT 2A	O
9	ETHERNET IN 2A	I
10	RS-232 IN 4	I
11	RS-422 A	O
12	RS-422 B	O
13	RESERVED	--
14	RESERVED	--
15	RS-232 GND 4	--

5.3 Power

The GTX 35R/45R is compatible with 14 VDC and 28 VDC aircraft electrical systems. The AIRCRAFT POWER 2 input is diode-isolated from AIRCRAFT POWER 1 and is used for connecting to an alternate power source, such as on an aircraft with two electrical buses.

The GPS KEEP ALIVE input is optional. The input supplies continuous battery power to the internal GPS clock of the GTX 45R with GPS. With the continuous battery power, it decreases the GPS satellite acquisition time during system power up.

Table 5-3 Power Pins

Pin Name	Connector	Pin	I/O
AIRCRAFT POWER 1	P3251	21	I
AIRCRAFT POWER 1	P3251	42	I
AIRCRAFT POWER 2	P3251	61	I
AIRCRAFT POWER 2	P3251	62	I
AIRCRAFT GROUND	P3251	20	--
AIRCRAFT GROUND	P3251	41	--
GPS KEEP ALIVE [1]	P3251	60	I

[1] Applicable only to the GTX 45R with internal GPS.

5.3.1 Power Configuration and Control Inputs

The POWER CONFIG input must be connected to ground.

The POWER CONTROL input can be used as a remote power on/off control. In most installations, POWER CONTROL is connected to ground, which causes the unit to automatically power on when power is applied.

Table 5-4 Power Configuration and Control Inputs

Pin Name	Connector	Pin	I/O
POWER CONFIG	P3251	59	I
POWER CONTROL	P3251	38	I

Table 5-5 Power Configuration and Power Control Functions

POWER CONFIG	POWER CONTROL	Description
Ground	Open	Power off
Ground	Ground	Power on

5.4 Altitude Inputs

The GTX 35R/45R uses pressure altitude inputs from several different sources:

- G3X™ ADAHRS (RS-232)
- The optional GAE module (Garmin P/N 011-03080-00)

Refer to [Section 3.10](#) for altitude source priorities. The Mode S transponder transmits altitude reporting in 25-foot resolution to ground stations and other aircraft.

5.4.1 Pressure Sensor Module

The optional GAE module (Garmin P/N 011-03080-00) is used for the GTX 35R/45R pressure altitude input in installations requiring pressure altitude data that meets the requirements of TSO-C88.

5.5 Discrete I/O

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

Each is an open drain output capable of sinking 250 milliamp when active.

Table 5-6 Discrete Inputs and Outputs

Pin Name	Connector	Pin	I/O
EXTERNAL STANDBY SELECT*	P3251	14	I
XPDR FAIL 1*	P3251	17	O
EXTERNAL IDENT SELECT*	P3251	36	I
TIS-A SELECT (GTX 35R only)*	P3251	15	I/O

5.6 Serial Data Interfaces

5.6.1 RS-232

The RS-232 outputs are compatible with EIA Standard RS-232C with an output voltage swing of at least ± 5 V when driving a standard RS-232 load. RS-232 ports 2 through 4 can be configured for different functions depending on the installation. Pins P3252-5, -10, and -15 are on the GTX 45R only.

In a G3X system, RS-232 IN/OUT 1 are always connected to the #1 ADAHRS LRU.

Table 5-7 RS-232 Inputs and Outputs

Pin Name	Connector	Pin	I/O
RS-232 OUT 1	P3251	9	O
RS-232 IN 1	P3251	31	I
RS-232 GND 1	P3251	52	O
RS-232 OUT 2	P3251	8	O
RS-232 IN 2	P3251	30	I
RS-232 GND 2	P3251	51	--
RS-232 OUT 3	P3251	7	O
RS-232 IN 3	P3251	29	I
RS-232 GND 3	P3251	50	--
RS-232 OUT 4	P3252	5	O
RS-232 IN 4	P3252	10	I
RS-232 GND 4	P3252	15	O

5.6.2 ARINC 429

The ARINC 429 output conforms to the ARINC 429 electrical specification when loaded with up to five standard ARINC 429 receivers. The ARINC 429 inputs and outputs are automatically configured for different functions depending on the installation.

Table 5-8 ARINC 429 Inputs and Outputs

Pin Name	Connector	Pin	I/O
ARINC 429 OUT A	P3251	5	O
ARINC 429 OUT B	P3251	6	O
ARINC 429 IN 1A	P3251	27	I
ARINC 429 IN 1B	P3251	28	I
ARINC 429 IN 2A	P3251	48	I
ARINC 429 IN 2B	P3251	49	I

5.6.3 HSDB

The HSDB interface uses Ethernet wiring to communicate with certain Garmin panel-mount navigators and active traffic systems.

Table 5-9 Ethernet Inputs and Outputs

Pin Name	Connector	Pin	I/O
ETHERNET OUT 1A	P3252	6	O
ETHERNET OUT 1B	P3252	1	O
ETHERNET IN 1A	P3252	7	I
ETHERNET IN 1B	P3252	2	I
ETHERNET OUT 2A	P3252	8	O
ETHERNET OUT 2B	P3252	3	O
ETHERNET IN 2A	P3252	9	I
ETHERNET IN 2B	P3252	4	I

5.6.4 RS-422

The RS-422 interface conforms to the electrical specifications of EIA standard RS-422.

Table 5-10 RS-422 Outputs

Pin Name	Connector	Pin	I/O
RS-422 A	P3252	11	O
RS-422 B	P3252	12	O

5.7 Suppression Bus

The EXTERNAL SUPPRESSION is intended for connection to other L-band equipment, such as a DME or UAT. The output is active whenever the GTX 35R/45R transmits. When driven by another source, the GTX 35R/45R transponder receiver and transmitter functions will be suppressed.

The EXTERNAL SUPPRESSION output is driven to ≥ 18 VDC when the GTX 35R/45R transmits. An input voltage of ≥ 10 VDC will suppress the GTX 35R/45R.

Table 5-11 External Suppression Bus Pin

Pin Name	Connector	Pin	I/O
EXTERNAL SUPPRESSION	P3251	18	I/O

5.8 Garmin Altitude Encoder

The optional GAE altitude encoder module (Garmin P/N 011-03080-00) is used only in installations requiring pressure altitude data that meets the requirements of TSO-C88.

The GAE module kits includes a wire harness for connection to the GTX 35R/45R D-sub connector. Connect using the wire colors shown in Table 5-12.

Table 5-12 Altitude Encoder Module Inputs and Outputs

Pin Name	Color	Connector	Pin	I/O
ALT ENCODER CLOCK	White	P3251	1	O
ALT ENCODER DATA	Yellow	P3251	22	I/O
ALT ENCODER POWER	Red	P3251	43	O
ALT ENCODER GROUND	Black	P3251	23	O

5.9 USB Interface



CAUTION

Use the USB cable shipped with the unit. Do not lengthen or tie up in bundles with other electrical wires. Potential damage or interference due to coupling with other cables will occur.

USB interface is only used for software updates and service while the aircraft is on the ground. Do not use during normal operation or when airborne.

Figure 5-1 USB Inputs and Outputs

Pin Name	Connector	Pin	I/O
USB DATA HI	P3251	2	I/O
USB DATA LO	P3251	24	I/O
USB VBUS POWER	P3251	44	I
USB GND	P3251	45	O

5.10 Time Mark

A GTX 45R with internal GPS uses TIME MARK as an output to provide 1PPS to other equipment in the aircraft.

Figure 5-2 Time Mark Outputs

Pin Name	Connector	Pin	I/O
TIME MARK A	P3251	4	O
TIME MARK B	P3251	26	O

6 POST INSTALLATION CONFIGURATION AND CHECKOUT

6.1 System Configuration Overview

The required GTX™ 35R/45R configuration and checkout procedures are as follows:

- Complete the installation checks.
- Configure the GTX 35R/45R for the specified installation.
- Complete ground checks to make sure it interfaces to external equipment.

6.2 Mounting, Wiring, and Power Checks

Examine the wire harness to make sure the connection to aircraft systems and avionics equipment is correct before the unit is energized. Point-to-point continuity must be examined to expose any faults such as shorting to ground or wiring discrepancies. All faults or discrepancies must be corrected before continuing.

Before and during the installation make sure:

- All cables are properly attached.
- Shields are connected to connector shield blocks.
- Movement of the flight and engine controls through the full range of motion do not touch cabling and control systems.
- Wire is installed as described in [Section 3.15](#).

Make sure these items are completed after the installation or a continuity check.

- Power and ground checks.
- Faults and discrepancies are corrected.
- Installation rack is correctly attached.
- Unit is correctly seated in the installation rack.

6.3 Configuration Mode and Settings

Except as noted in this section, all configuration of the GTX 35R/45R is performed using the displays in the G3X™ system.

Refer to the G3X Installation Manual (190-01115-01) for transponder configuration guidance.

6.3.1 ARINC 429 Ports

ARINC 429 ports are automatically configured by the G3X system as follows:

Table 6-1 ARINC 429 Automatic Configuration

ARINC 429 Port	Configuration
ARINC 429 IN 1	GTX 45R with GTS™ interfaced configured: "Traffic Format 1" format, high speed - for connection to GTS, otherwise not used
ARINC 429 IN 2	Not Used
ARINC 429 OUT	GTX 45R: "Traffic" format, high speed - for ADS-B traffic data output to GNS™ GTX 35R with TIS-A data enabled: "Garmin TIS-A" format, high speed - for TIS-A traffic data output to GNS GTX 35R with TIS-A data disabled: "Garmin + Garmin TAS" format, high speed - for connection to GTS

6.4 GAE Calibration (Garmin Dealers Only)

The GTX 35R/45R Installation Tool is used by Garmin dealers to perform calibration of the optional GAE altitude encoder module. All other configuration is performed using the displays in the G3X system. Please refer to the GTX 35R/45R Transponder TSO Installation Manual (190-01499-04) for more info.

6.5 Software Installation Procedure



CAUTION

Do not turn off the unit until “Update Complete” is shown next to all selected items. Failure to do so could result in equipment damage.

Use the GTX 3X5 Software Loading Tool through the USB port to install software on the unit.

1. Download and launch the latest GTX 3X5 Software Loading Tool and the GTX 35R/45R Field Update software from the Garmin website.
2. Under “Step 1 - Select a File,” select the **Browse** key and locate the Field Update software file containing the GTX 35R/45R software previously downloaded.
3. Under “Step 2 - “Auto-Select” to select images that require an update.
4. Under “Step 3 - Start Upload,” select the **Upload** key.
5. Wait for the upload to complete. Individual files will be marked as complete as they are installed.
6. After successful completion of the update, make sure the correct software versions and part numbers show in the “On Unit” column. If any software items did not load, select those items and attempt to upload again.

The screenshot shows the GTX 3X5 Software Loading Tool window. It has a menu bar with 'GTX' and 'Help'. The main area is divided into three steps:

- Step 1 - Select a File:** A text box shows the file path 'C:\GTX 3x5 Update\006-B2466-0G_0A.gca' with a 'Browse...' button next to it.
- Step 2 - Select items to upload from the file:** This section contains a table with two columns: 'In File' and 'On Unit'. The table lists various software components like Boot Block, System, Audio, FPGA, Remote Config XHTML, ADS-B Boot Block, ADS-B System, ADS-B FPGA, GPS, and GPS Loader. Each row has checkboxes for selection and a status bar showing the part number (PN) and version (VER). The 'On Unit' column shows the current status, with green bars indicating successful installation.
- Step 3 - Start Upload:** A note states 'Software upload may take some time, do not reset the unit.' and an 'Upload' button.

At the bottom, there is a 'Connection Status' section showing 'Port: USB' and 'Unit Online' with a 'Disconnect' button. To the right is a 'Unit Mode' section showing 'Normal' and 'Normal Mode' with a 'Set' button.

Figure 6-1 Software Upload Page

7 CONTINUED AIRWORTHINESS

Other than for regulatory periodic functional checks, maintenance of the GTX™ 35R/45R is “on condition” only. Periodic maintenance of the GTX 35R/45R is not required.

Test the transponder according to Title 14 CFR 91.411 and 91.413 as well as Part 43 Appendix F. Test for ADS-B Out compliance according to Title 14 CFR 91.227.



NOTE

The GTX 35R/45R will not reply to Mode S/A/C All Calls when not "Airborne." The GTX 35R/45R can be placed in a temporary Airborne state using the G3X™ system. The GTX will be in Ground Test mode for one power cycle and override the air/ground determination to transmit as if the GTX is airborne.

The GTX 35R/45R transponders are compliant with RTCA/DO-181D, which specifies the selection of transponder ALT and GND modes may not be controlled by the pilot. To allow the transponder to be operated in ALT mode while on the ground, for the purposes of performing periodic testing in accordance with the requirements of 14 CFR Part 91.413, the G3X™ system provides a special transponder ground maintenance test mode. Refer to the G3X installation manual (190-01115-01) for information.

APPENDIX A GTX™ X5 MECHANICAL DRAWINGS

STANDARD KIT	UNIT PN	UNIT DESC	CONNECTOR KIT	RACK	Backplate Assy	Mount Type	Dim A inch (mm)	Dim B inch (mm)	Dim C inch (mm)
010-01756-01	011-04286-00	Sub-Assy, GTX35R	011-02977-00	115-01771-00	011-02976-00	REMOTE	4.8 (120)	3.3 (84)	0.8 (20)
010-01757-01	011-04287-00	Sub-Assy, GTX45R	011-02977-01	115-01771-01	011-02976-00	REMOTE	5.0 (127)	3.0 (76)	0.8 (20)

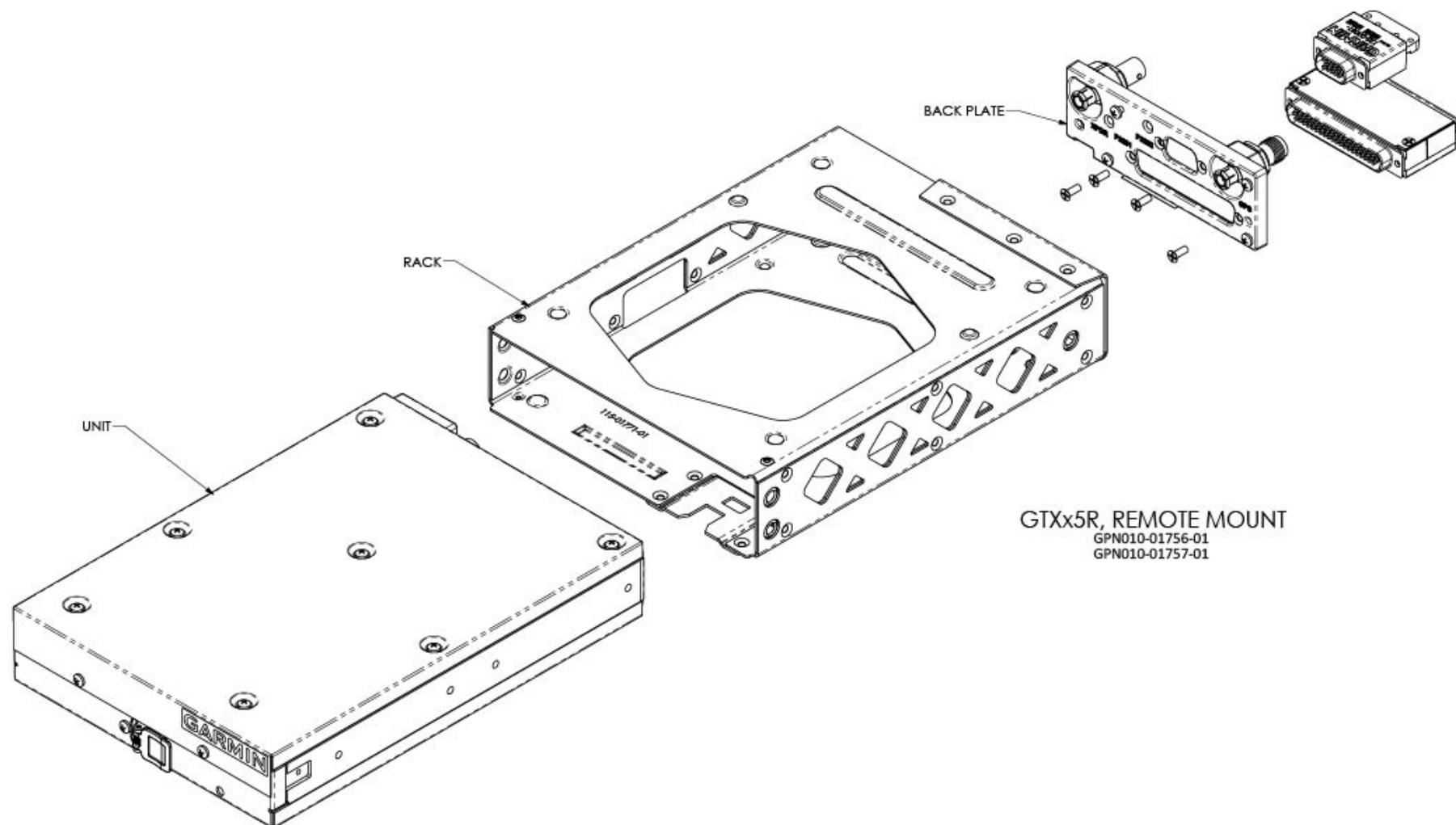


Figure A-1 GTX 35R/45R Standard Remote Mount Assembly Shown

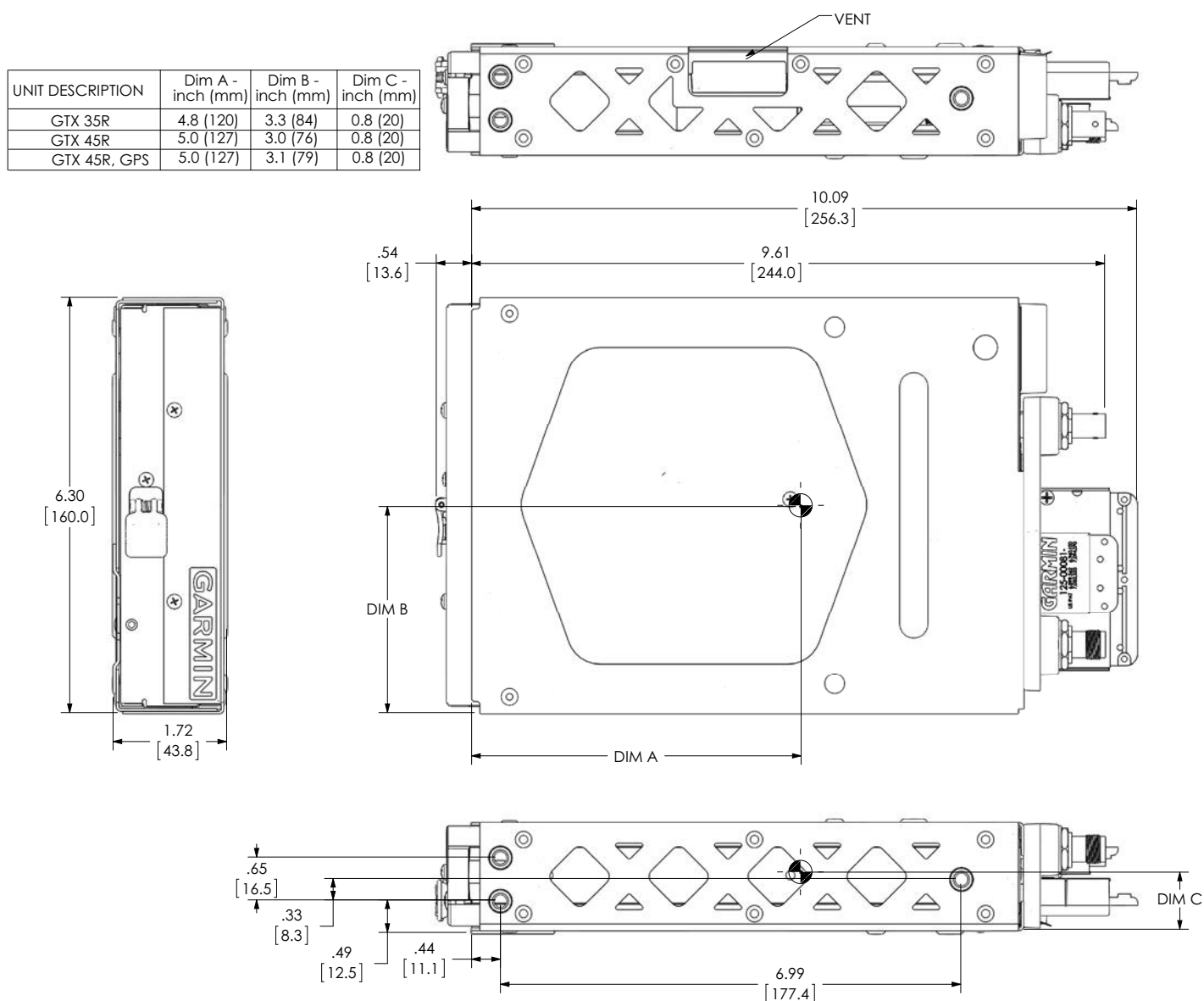


Figure A-2 GTX 35R/45R Standard Remote Mount Dimensions and CG Shown

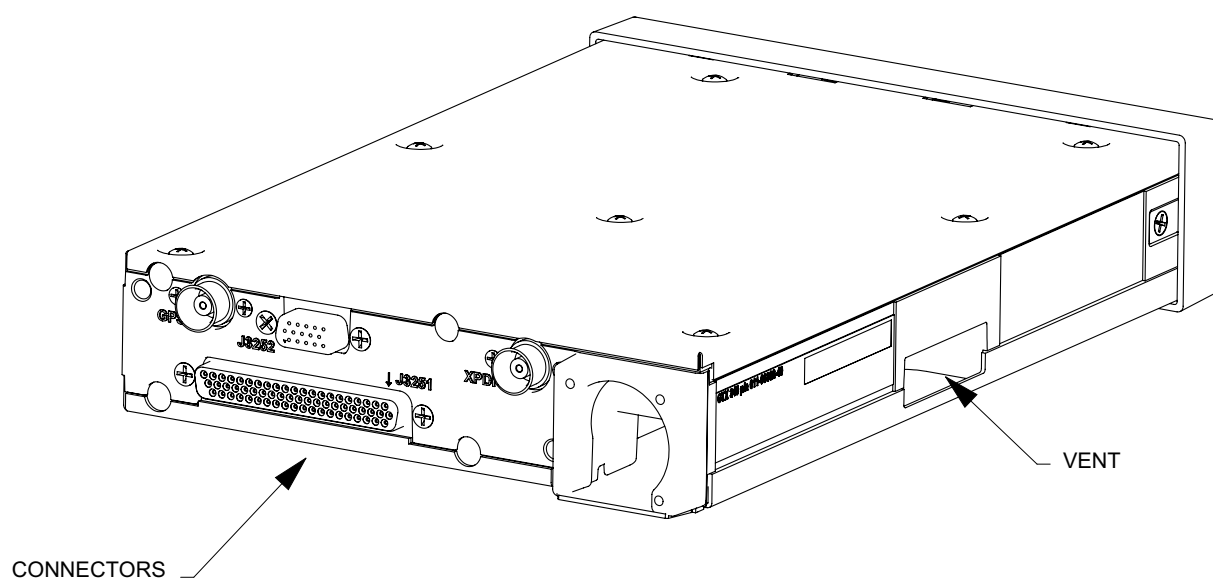


Figure A-3 GTX 35R/45R Connector and Vent Locations

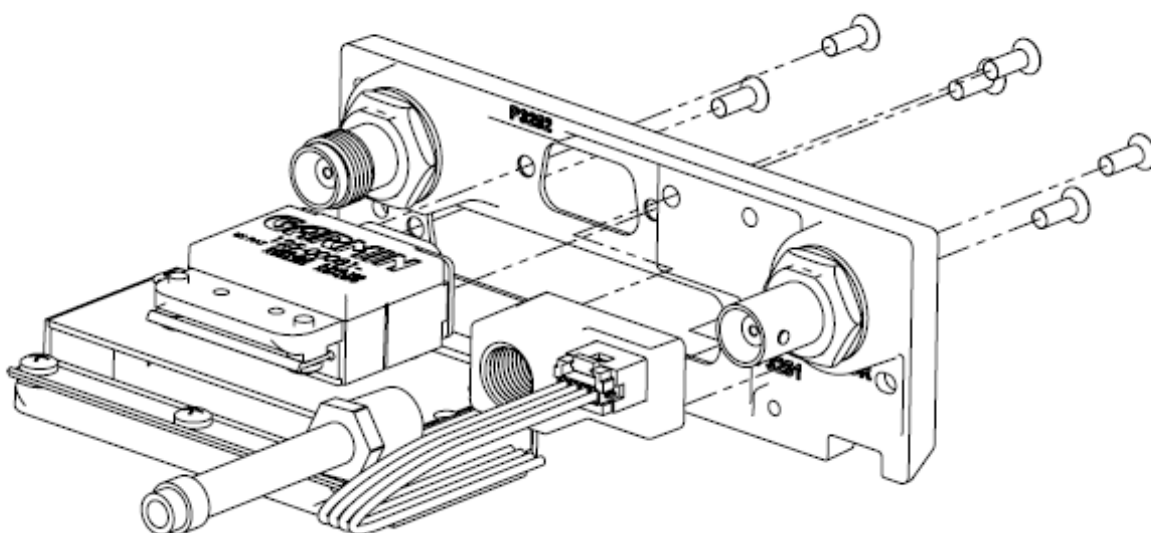


Figure A-4 Optional Garmin Altitude Encoder

APPENDIX B EQUIPMENT COMPATIBILITY AND CONFIGURATION

B.1 ADS-B In Displays (GTX™ 45R Only)

Table B-1 ADS-B In Display

Manufacturer	Model	Data Format	Interface Configuration	GTX 45R Configuration Setting	Notes
Garmin	G3X™	RS-232	Connex® 57600 Baud	Connex Format 1	
	GNS™ 400W/500W Series ¹	RS-232	ADSB TFC	GNS	Supports traffic only (also includes GPS data from the GNS 400W/500W).
			ADSB TFC WX	GNS	Supports both traffic and weather (also includes GPS data from the GNS 400W/500W)
		ARINC 429	ADSB TFC	N/A	Supports ADS-B traffic without TAS/TCAS.
			ADSB TFC w/TCAS	N/A	Supports ADS-B traffic w/ TAS/TCAS correlation.
	GTN™ 6XX/7XX	HSDB	ADS-B In Source: GTX	Navigator - Present	Supports both traffic and weather (also includes GPS data from the GTN 6XX/7XX)
	GPS 175	HSDB	ADS-B SRC - GTX	Navigator - Present	
	GNC® 355	HSDB	ADS-B SRC - GTX	Navigator - Present	
	GI 275	HSDB	ADS-B SRC - GTX	SFD - Present	

Notes:

[1] The GNS 400W/500W interface requires the combination of one RS-232 and one ARINC 429 interface.

B.2 GPS Sources

Table B-2 GPS Source

Manufacturer	Model	Data Format	Interface Configuration	GTX 35R/45R Configuration	Notes
Garmin	G3X	RS-232	N/A	Transponder Format 1	The G3X position source is not AC 20-165B compliant.
	Internal	N/A	N/A	Refer to Section 6.3	
	GTN 6XX/7XX	RS-232	ADS-B OUT +	ADS-B + FMT 1	In GTN software v6.20 and later, ADS-B+ Format 2 is available and recommended, with GTX 3X5 ADS-B+ FMT 2.
		HSDB	ADS-B In Source: GTX	Navigator - Present	Applicable to GTX 45R installations only.
	GNS 400W/500W	RS-232	ADSB TFC	GNS	Applicable to GTX 45R only (main software v2.10 and earlier), or GTX 35R/45R (main software v2.11 and later). The primary purpose of this interface is for ADS-B In Data, however this format also includes GPS data. Refer to table . When interfacing with a GNS, the GNS format is preferred over the ADS-B+ FMT 1 format.
			ADSB TFC WX		
			ADS-B OUT +	ADS-B + FMT 1	Supports GPS data only.
	GNS 480 (CNX80)	RS-232	ADS-B OUT +	ADS-B + FMT 1	
	GPS 175	RS-232	ADS-B + Format 2	ADS-B + FMT 2	
	GPS 175	HSDB	ADS-B SRC - GTX	Navigator - Present	
	GNC 355	RS-232	ADS-B + Format 2	ADS-B + FMT 2	
	GNC 355	HSDB	ADS-B SRC - GTX	Navigator - Present	

APPENDIX C INTERCONNECT DRAWINGS

This section contains wiring interconnect details and examples for the connections necessary for the installation of the GTX™ 35R/45R Series transponders.

Each figure contained in this section has notes that must be followed. These general notes apply to all of the figures contained in this section.

- Unless specified differently, all wires are 24 AWG or larger.
- Power and ground connections are 22 AWG wire for run lengths less than 10 feet, if not, use 18 AWG.
- Use oversize contacts in the connector kit for wire sizes greater than 22 AWG.
- In 14 VDC installations, use two power pins and two ground pins for power and ground connections.
- In 28 VDC installations, use only one wire for power and ground connections.
- Antennas and associated cables are shown for reference only.
- If practical, power and ground wires should be routed separately for each transponder.
- Route grounds and wire separately to improve safety if there is a wiring or grounding system failure.
- Designations for ground connections:

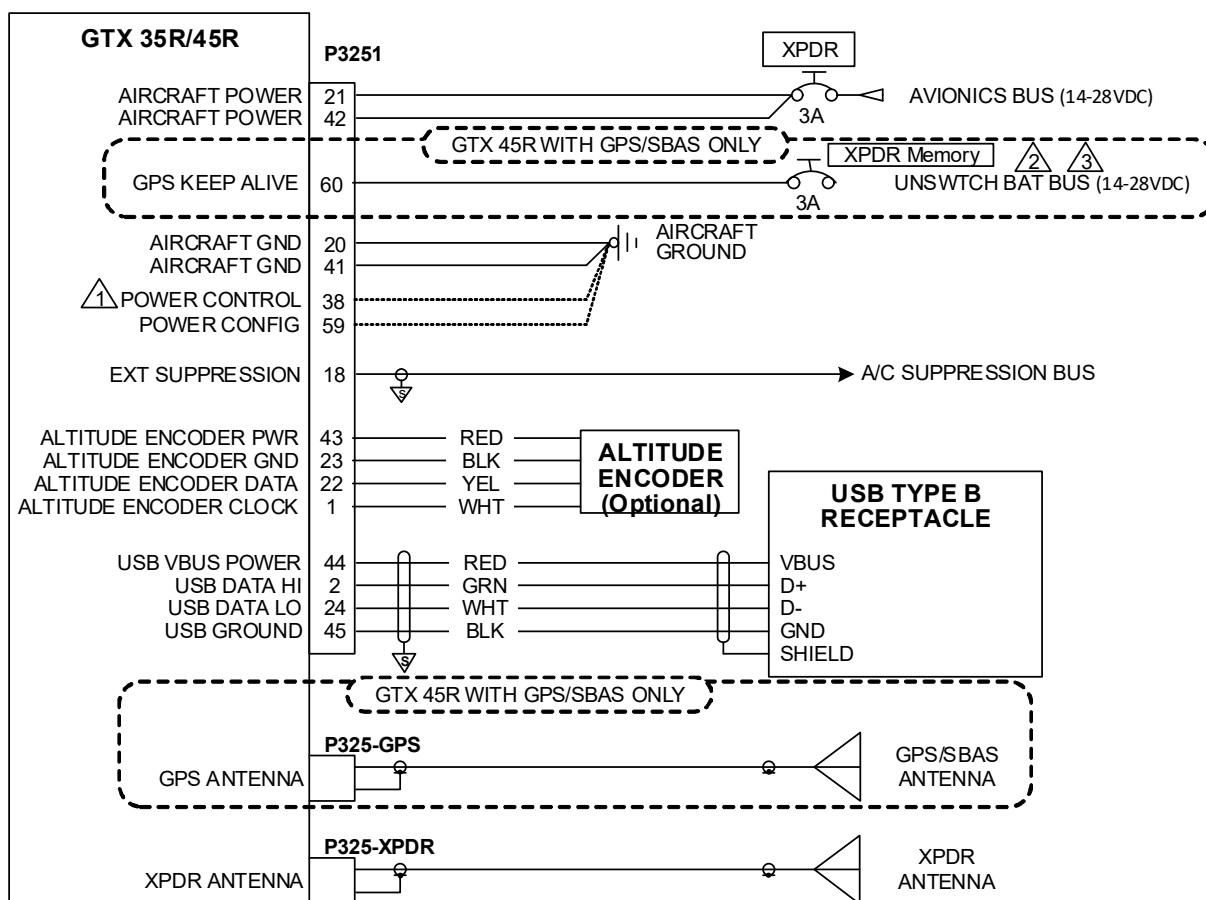
 Shield Block Ground
  Airframe Ground

- Shield ground terminations to the connector backshell must be 3.0 inches or less in length.
- Ground terminations of interfaced equipment can vary. Refer to the manufacturer's installation manual for information.
- HDSB Ethernet wiring may use 22 AWG or 24 AWG aircraft grade category 5 Ethernet cable:

Manufacturer	P/N
PIC Wire and Cable	10424
Carlisle IT	39204

Or MIL-C-27500 shielded twisted-pair cable.

- Installations can require alternate port configurations and are acceptable provided the equipment interfaces and data formats are available on alternate ports.



NOTES



FOR DETAILS REFER TO [SECTION 5.3.1](#).



GPS KEEP ALIVE IS RECOMMENDED FOR GPS INSTALLS. IF NOT CONNECTED GPS MAY TAKE UP TO 5 MINUTES TO OBTAIN A GPS FIX.



GPS KEEP ALIVE MUST BE CONNECTED TO THE UNSWITCHABLE BATTERY BUS (BUS DIRECTLY CONNECTED TO THE BATTERY).

Figure C-1 GTX 35R/45R Power and Antenna Interconnect

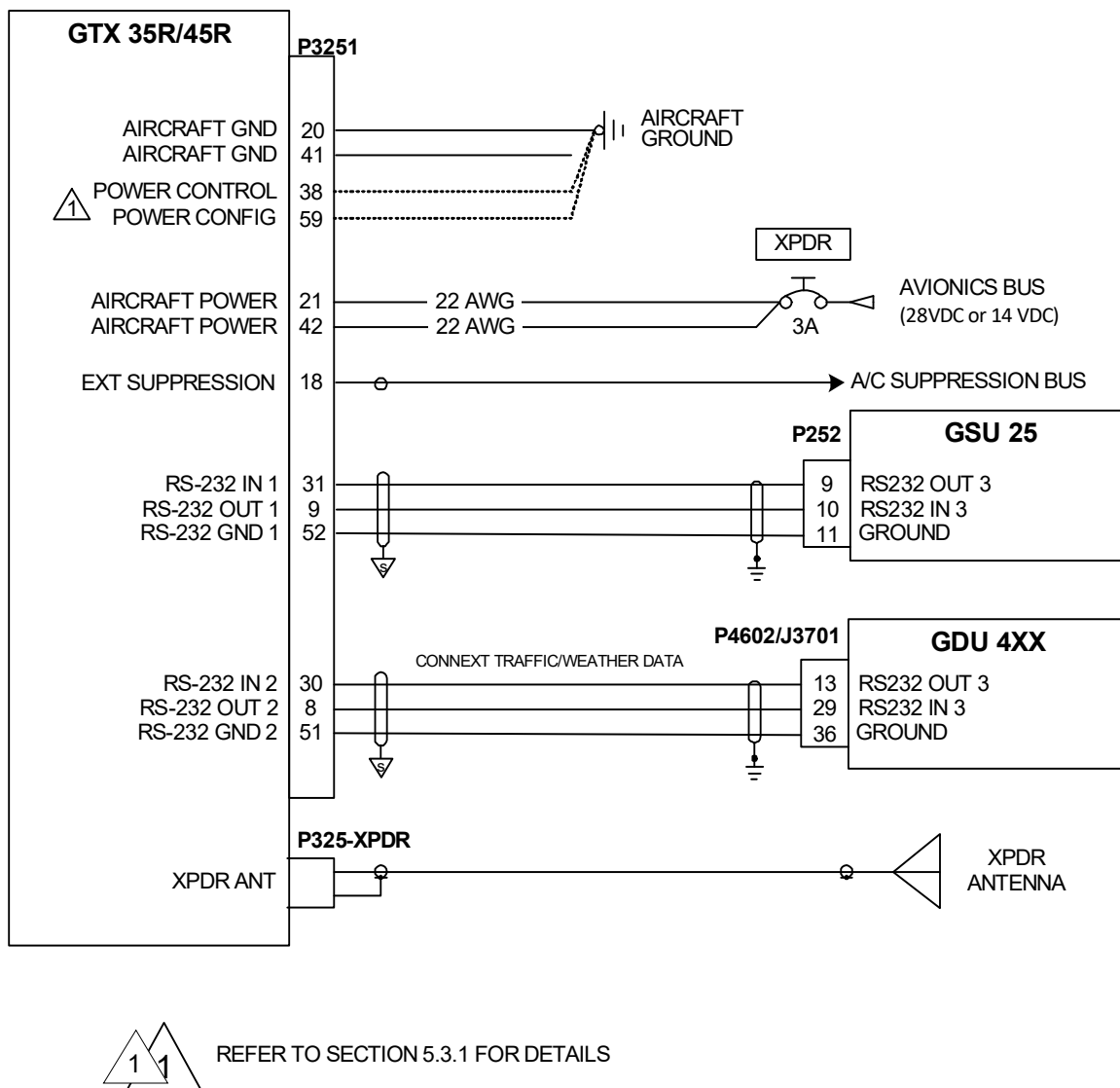
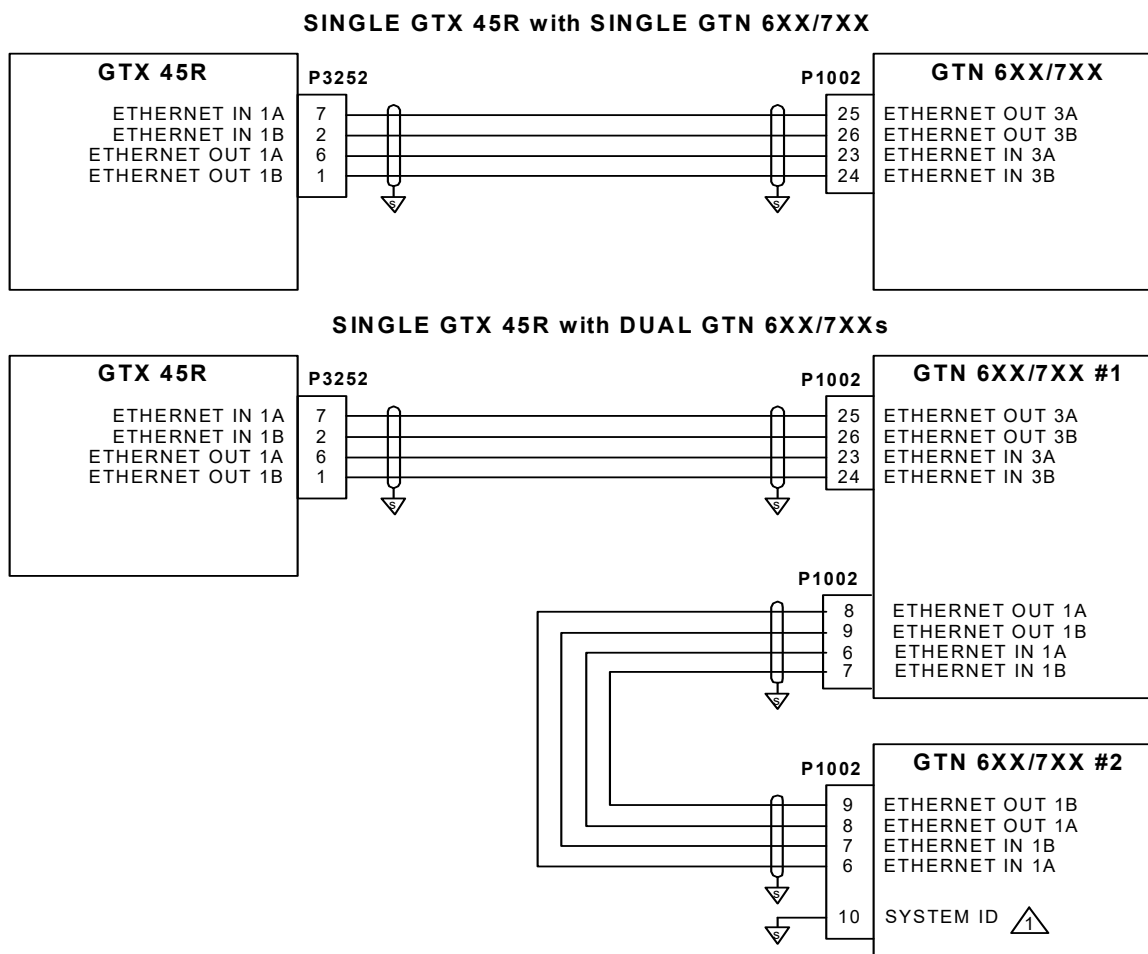


Figure C-2 GTX 35R/45R Typical Interconnect

Refer to the G3X™ Installation manual for a complete wiring diagram.



1

WHEN GTN 6XX/7XX IS THE ONLY INSTALLED GPS NAVIGATOR, OR GPS NAVIGATOR #1 IN A DUAL GPS NAVIGATOR INSTALLATION, CONFIGURE GTN 6XX/7XX AS GTN #1 BY LEAVING SYSTEM ID (P1002-10) NOT CONNECTED. WHEN THE GTN 6XX/7XX IS GPS NAVIGATOR #2 IN A DUAL GPS INSTALLATION, CONFIGURE GTN #2 BY GROUNDING SYSTEM ID (P1002-10) TO THE SHIELD BLOCK.

Figure C-3 GTX 45 - Single/Dual GTN™ 6XX/7XX Interconnect

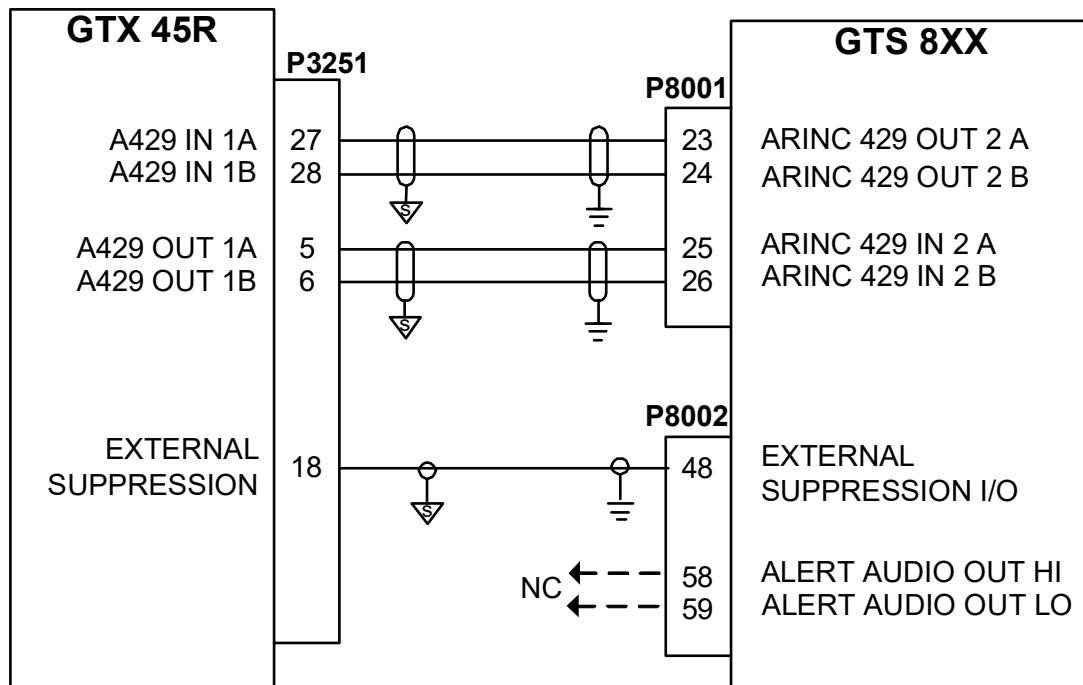


Figure C-4 GTX 45R - GTS™ 8XX Interconnect

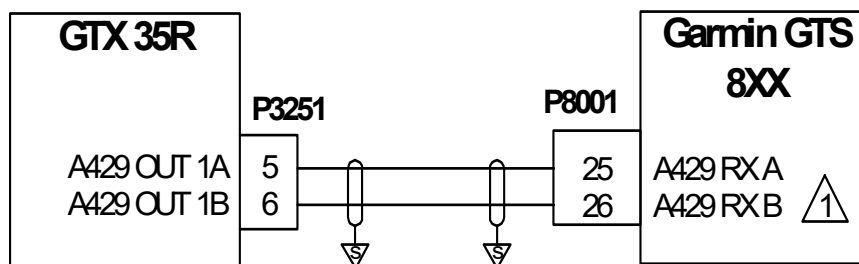
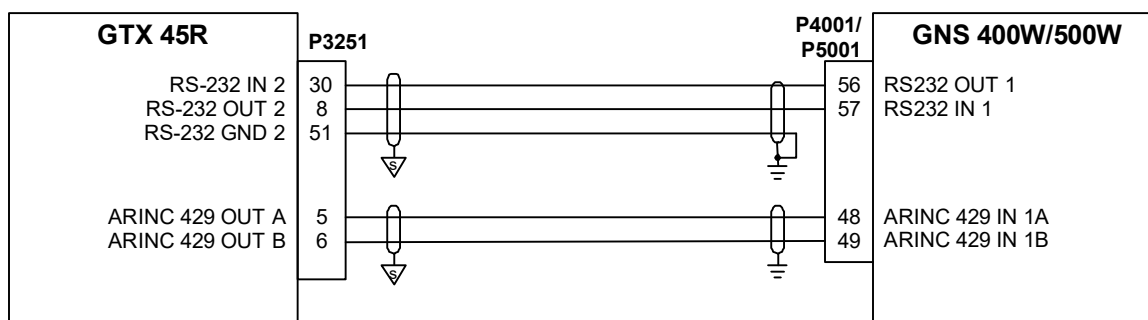


Figure C-5 GTX 35R - GTS 8XX Interconnect

SINGLE GNS 400W/500W SERIES



DUAL GNS 400W/500W SERIES

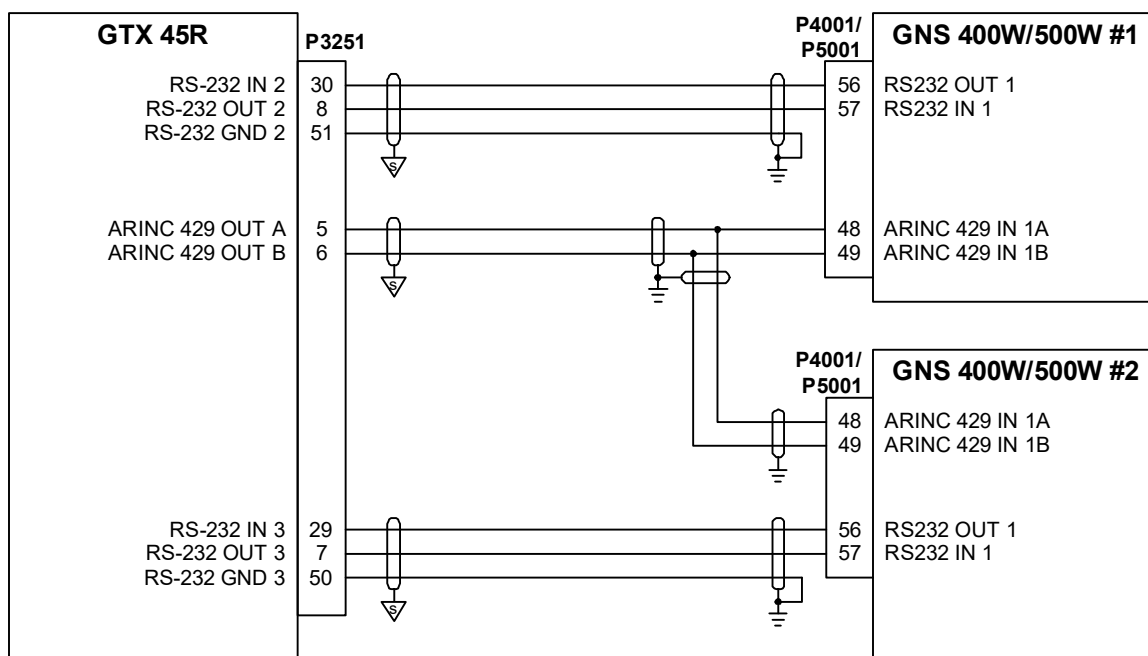


Figure C-6 GTX 45 - Single and Dual 400W/500W Series Interconnect

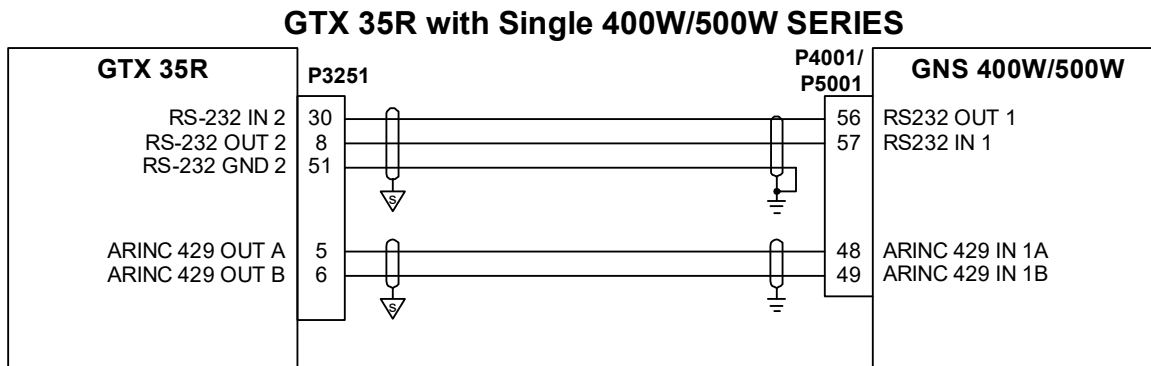


Figure C-7 GTX 35R - GNS™ 400W/500W Series Interconnect

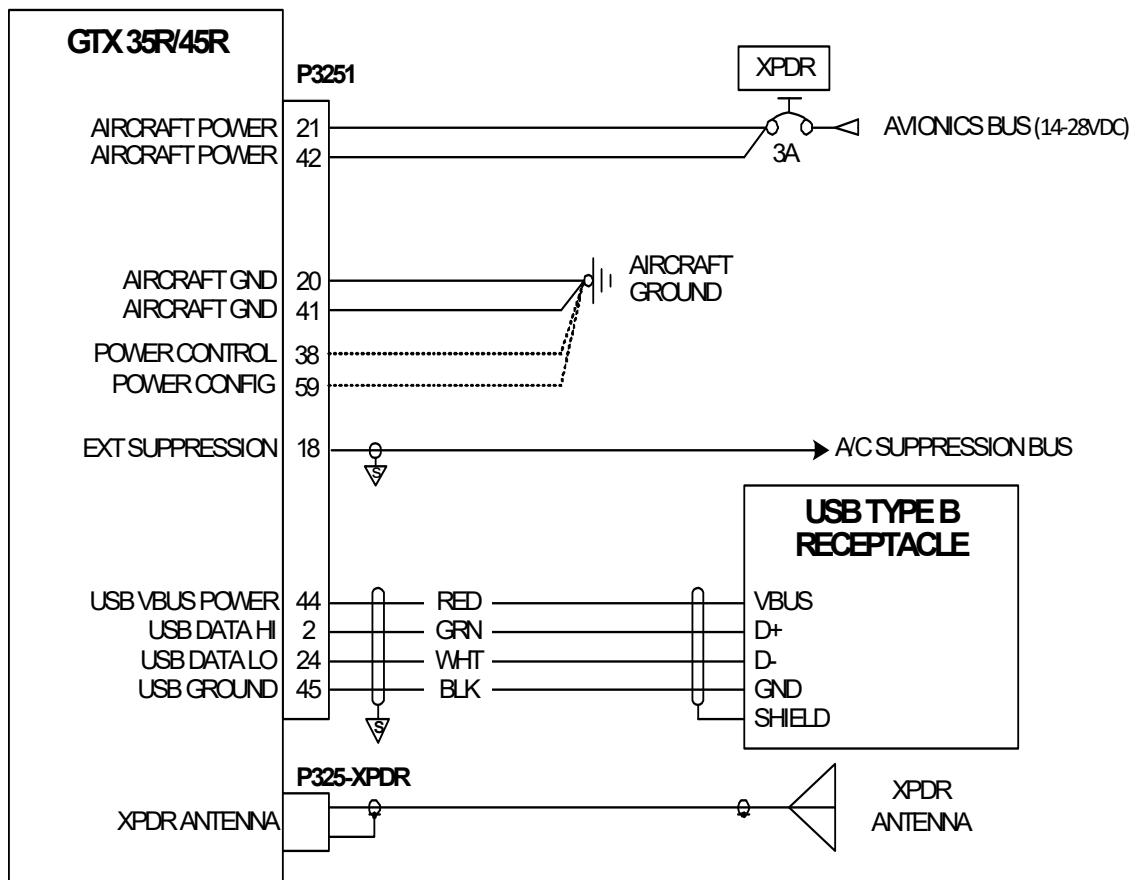
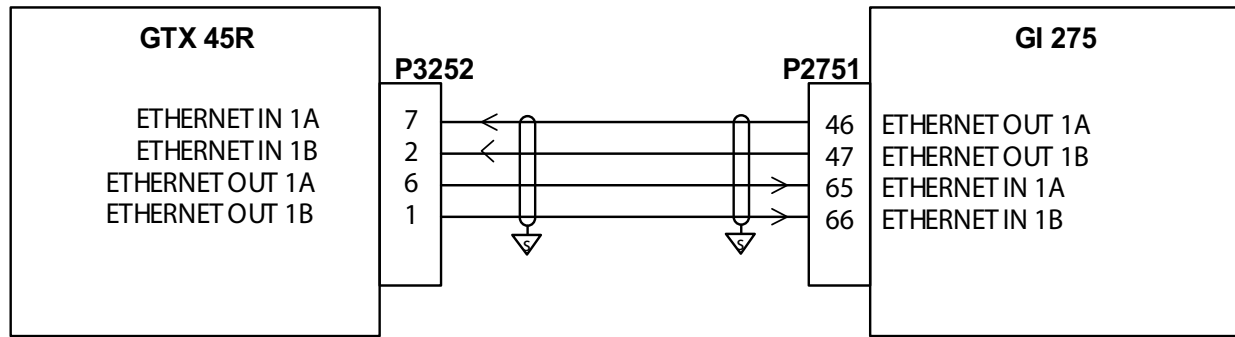


Figure C-8 USB Programming Interface



NOTES

1. FOR PINS IDENTIFIED WITH GND, CONNECT WIRE TO GROUND AT THE REAR OF THE UNIT.
2. SPLICES AT THE NAVIGATOR MAY BE REQUIRED FOR RS-232 AND ARINC 429 LINES.

Figure C-9 GTX 45R - GI 275 Interconnect

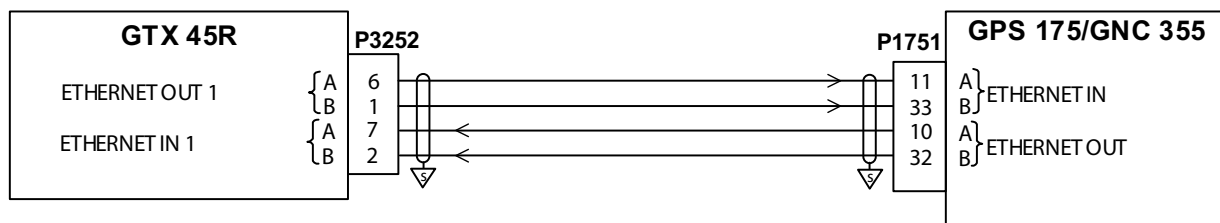


Figure C-10 GTX 45R - GPS 175/GNC® 355 Interconnect

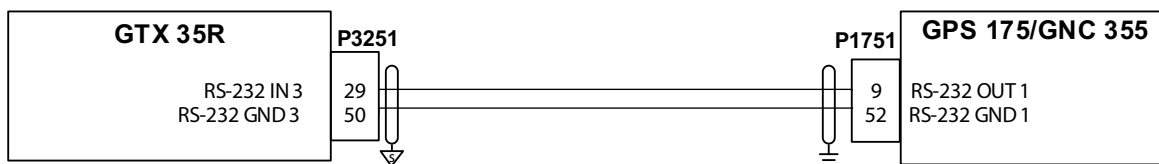


Figure C-11 GTX 35R - GPS 175/GNC 355 Interconnect

GARMIN®