



GTX 3X5 Transponder TSO Installation Manual



© 2015-2017 Garmin International, Inc. or its subsidiaries
All Rights Reserved

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

©2017 Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Garmin is under license. Other trademarks and trade names are those of their respective owners.

Garmin® is a registered trademark of Garmin International or its subsidiaries.

All other product or company names that may be mentioned in this publication are trade names, trademarks, or registered trademarks of their respective owners.

At Garmin, we value your opinion. For comments about this guide, please e-mail Techpubs.Salem@garmin.com.

For comments about Garmin aviation products, email Avionics@garmin.com.

For information about the [Aviation Limited Warranty](#) refer to Garmin's website.

For aviation product support, refer to flyGarmin.com.

RECORD OF REVISIONS

Revision	Revision Date	Subject
9	06/29/17	Added NV unit part numbers, updated unit weights, and other minor edits.
8	06/12/17	Added v2.11 functionality.
7	10/13/16	Added v2.10 functionality.
6	08/04/16	Updated for v2.05 and changed standard rack P/N.
5	03/07/16	Updated part numbers in figure B-1.
4	02/26/16	Added information for vertical remote mount and other minor edits. Refer to current revision description.
3	02/11/16	Removed GTX 325.
2	12/14/15	Reorganized manual.
1	05/08/15	Experimental release.

REVISION 9 CHANGE DESCRIPTION




SECTION	CHANGE DESCRIPTION
1.2	Added GTX 345 NV and GTX 345 NV w/GPS to table 1-2 "GTX 3X5 Units."
1.8	Updated weights for GTX 335 and GTX 345 units in table 1-4 "Physical Characteristics - Panel Mount Units."
	Updated weights for GTX 335 and GTX 345 units in table 1-5 "Physical Characteristics - Remote Mount Units."
	Updated Main and ADS-B boot block part numbers in table 1-14 "Applicable P/Ns."
3.2	Added GTX 345 NV and GTX 345 NV w/GPS to table 3-1 "GTX 3X5 Configurations."
3.3	Added GTX 345 NV and GTX 345 NV w/GPS to table 3-2 "Accessories Supplied."
3.10	Added "Roll Angle" and "Mach" to figure 3-1 "Air Data Discrete Priority Order."
	Moved Altitude Sources 1 question above Air Data Select question of figure 3-2 "Pressure Altitude Priority Order."
	Updated table 3-29 "Density Altitude Source Priority."
	Added table 3-35 "EHS Roll Angle Source Priority."
	Added table 3-36 "Mach Source Priority."
	Added table 3-37 "Inertial Vertical Rate Source Priority."
6.2	Updated figure 6-1 "Audio Group."

SECTION	CHANGE DESCRIPTION
6.5	Updated figure 6-5 "Interface Group."
	Added G1000 NXi to description of REMOTE FMT 1 and REMOTE FMT 2 in table 6-1 "RS-232 Channel 1 through 3 Selections."
	Added AVIATION FORMAT 2 to table 6-1 "RS-232 Channel 1 through 3 Selections."
	Added note [4] and note [5] to table 6-1 "RS-232 Channel 1 through 3 Selections."
	Added "P3251 or P3252" to pin selection of ALT ALERT function in table 6-8 "Discrete Outputs."
6.6	Added "or P3252" to pin selection of TRFC STBY, TRFC TEST, and ADS-B OUT function in table 6-8 "Discrete Outputs."
	Updated figure 6-13 "Unit Group."
6.6	Updated information in "Enhanced Surveillance" section for clarity.
6.7	Added figure 6-23 "Keypad Backlight and Minimum Level Page."
	Added figure 6-24 "Photocell Transition, Slope, and Offset Page."
	Added figure 6-25 "Lighting Bus Input Voltage Page."
	Added figure 6-26 "Default Backlight and Contrast Offset Page."
6.9	Updated figure 6-36 "ADS-B Group."
	Added "Acft Stall Method" and "Acft Stall Speed" sections.
Appendix B	Added GTX 345 NV and GTX 345 NV w/GPS to figure B-1 "GTX 3X5 GPS Panel Mount Assembly."
C.1	Updated notes for GNS 400W/500W Series RS-232 data format in table C-1 "ADS-B In Display."
C.2	Updated notes for GNS 400W/500W Series RS-232 data format in table C-2 "GPS Source."

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

This document may contain information which is subject to the Export Administration Regulations (EAR) issued by the United States Department of Commerce (15 Code of Federal Regulations (CFR), Chapter VII, Subchapter C) and which may not be exported, released, or disclosed to foreign nationals inside or outside of the United States without first obtaining an export license.

DEFINITIONS OF WARNINGS, CAUTIONS, AND NOTES

	WARNING <i>A WARNING MEANS INJURY OR DEATH IS POSSIBLE IF THE INSTRUCTIONS ARE NOT FOLLOWED.</i>
	CAUTION <i>A CAUTION MEANS THAT DAMAGE TO THE EQUIPMENT IS POSSIBLE.</i>
	NOTE <i>A note provides more information.</i>



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, 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

All screen shots used in this document are current at the time of publication. Screen shots are intended to provide visual reference only. All information depicted in screen shots, including software file names, versions, and part numbers, are subject to change.

1	SYSTEM OVERVIEW	1-1
1.1	Scope	1-1
1.2	Equipment Description	1-2
1.3	Definitions and Abbreviations	1-3
1.4	ADS-B Capabilities	1-4
1.5	FIS-B Capabilities	1-5
1.6	TIS System Capabilities	1-5
1.7	Interface Summary	1-6
1.8	General Specifications	1-8
1.9	Transponder Specifications	1-10
1.10	UAT Receiver Specifications (GTX 345 Only)	1-11
1.11	1090 MHz Receiver Specifications	1-11
1.12	GPS Specifications (Units with Internal GPS Only)	1-11
1.13	Power Specifications	1-12
1.14	Certification	1-13
1.15	License Requirements	1-16
1.16	Reference Documents	1-17
2	LIMITATIONS	2-1
2.1	HSDB Packet Forwarding	2-1
2.2	ARINC 429 Data Concentrator Function	2-1
3	INSTALLATION OVERVIEW	3-1
3.1	Introduction	3-1
3.2	Unit Configurations	3-2
3.3	Accessories Supplied	3-3
3.4	Optional Accessories	3-7
3.5	Necessary Installation Materials and Accessories Not Supplied	3-9
3.6	Necessary Special Tools	3-9
3.7	Transponder Antenna	3-10
3.8	GPS Antenna Requirements	3-11
3.9	Minimum Systems Configuration	3-12
3.10	GTX Input Source Priority	3-13
3.11	ADS-B In Considerations	3-22
3.12	Bluetooth Considerations (GTX 345R Only)	3-23
3.13	Field Enablements	3-23
3.14	GPS/SBAS Parameters	3-23
3.15	Antenna Considerations	3-24
3.16	Electrical Bonding	3-27
3.17	Cabling and Wiring	3-27
3.18	Electrical Bonding Considerations	3-27
3.19	Cooling Requirements and Considerations	3-27
4	INSTALLATION PROCEDURE	4-1
4.1	Wire Harness Installation	4-1
4.2	Backshell Assembly Parts	4-2
4.3	Shielded Cable Preparation	4-3
4.4	Connector and Backshell Assembly	4-5
4.5	Configuration Module Installation	4-8
4.6	Coax Cable Installation	4-10
4.7	Equipment Rack Installation	4-10
4.8	Panel and Standard Remote Mount Unit Installation and Removal	4-13
4.9	Vertical Remote Mount Unit Installation and Removal	4-14
5	CONNECTOR PINOUT INFORMATION	5-1

5.1	Main Board Connector - J3251	5-2
5.2	ADS-B Board Connector - J3252 (GTX 345 Only)	5-5
5.3	Power	5-6
5.4	Lighting Bus	5-7
5.5	Altitude Inputs	5-7
5.6	Discrete I/O	5-8
5.7	Serial Data Interfaces	5-9
5.8	Suppression Bus	5-11
5.9	OAT Input	5-11
5.10	Audio Output	5-11
5.11	Time Mark	5-11
5.12	Configuration Module	5-12
5.13	USB Interface	5-12
6	POST INSTALLATION CONFIGURATION & CHECKOUT	6-1
6.1	System Configuration Overview	6-1
6.2	Mounting, Wiring, and Power Checks	6-1
6.3	Configuration Mode and Settings	6-2
6.4	Audio Settings	6-3
6.5	Interfaces	6-5
6.6	Unit Settings	6-14
6.7	Display Pages	6-17
6.8	Sensors	6-21
6.9	ADSB	6-27
6.10	Diagnostics	6-32
6.11	Remote Unit Configuration	6-33
6.12	Ground Check - GPS Reception Check	6-33
6.13	Ground Check - Transponder	6-34
6.14	Software Installation Procedure	6-34
7	CONTINUED AIRWORTHINESS	7-1
APPENDIX A	DATA FORMATS	A-1
A.1	RS-232 Air Data Input Format	A-1
A.2	ARINC 429 Input Formats	A-5
A.3	ARINC 429 Output Formats	A-9
APPENDIX B	GTX 3X5 MECHANICAL DRAWINGS	B-1
APPENDIX C	EQUIPMENT COMPATIBILITY AND CONFIGURATION	C-1
C.1	ADS-B In Displays	C-2
C.2	GPS Sources	C-4
C.3	Altitude Sources	C-5
C.4	Audio Panels	C-7
C.5	Radar Altimeters	C-7
C.6	Heading Reference Sources	C-8
C.7	Traffic Sensors (GTX 345 Only)	C-10
C.8	Bluetooth	C-11
C.9	Remote Control	C-12
C.10	TIS-A Display	C-13
APPENDIX D	INTERCONNECT DRAWINGS	D-1
APPENDIX E	CS-ACNS COMPLIANCE MATRIX	E-1
E.1	Elementary Surveillance (ELS)	E-1
E.2	Enhanced Surveillance (EHS)	E-7
E.3	ADSB	E-9

Figure 3-1	Air Data Discrete Priority Order	3-13
Figure 3-2	Pressure Altitude Priority Order	3-14
Figure 3-3	Garmin Label on Remote Unit.....	3-23
Figure 3-4	GPS Locations of Antennas	3-26
Figure 4-1	Shielded Cable Preparation	4-4
Figure 4-2	Shield Termination on Backshell Assembly	4-6
Figure 4-3	Connector and Backshell Assembly	4-7
Figure 4-4	Configuration Module Installation.....	4-9
Figure 4-5	GAE Assembly	4-12
Figure 6-1	Audio Group	6-3
Figure 6-2	Audio Page.....	6-3
Figure 6-3	Audio Page 2	6-4
Figure 6-4	Audio Page 3	6-4
Figure 6-5	Interface Group	6-5
Figure 6-6	RS-232 Interface Page.....	6-7
Figure 6-7	RS-422 Output Page	6-8
Figure 6-8	A429 In Page.....	6-9
Figure 6-9	A429 Output Page.....	6-10
Figure 6-10	HSDB Interface Page	6-11
Figure 6-11	Discrete In Page	6-12
Figure 6-12	Discrete Out Page	6-13
Figure 6-13	Unit Group	6-14
Figure 6-14	FIS-B Processing Page.....	6-14
Figure 6-15	Altitude and Temperature Units Page.....	6-15
Figure 6-16	Installation and VFR ID Page.....	6-15
Figure 6-17	Altitude Alert Deviation and Restore Page.....	6-16
Figure 6-18	Flash Message Indicator Page.....	6-16
Figure 6-19	Bluetooth Page	6-16
Figure 6-20	EHS Page	6-16
Figure 6-21	Display Group.....	6-17
Figure 6-22	Display Backlight and Minimum Level Page	6-18
Figure 6-23	Keypad Backlight and Minimum Level Page	6-18
Figure 6-24	Photocell Transition, Slope, and Offset Page	6-19
Figure 6-25	Lighting Bus Input Voltage Page	6-19
Figure 6-26	Default Backlight and Contrast Offset Page	6-20
Figure 6-27	Sensor Group	6-21
Figure 6-28	Sensor Page.....	6-22
Figure 6-29	Altitude Source Page	6-22
Figure 6-30	Source, Integrity, and Offset Page.....	6-24
Figure 6-31	Internal Alt Encoder Page.....	6-24
Figure 6-32	Internal Alt Encoder Adjustment Page.....	6-24
Figure 6-33	Setting the Yaw Angle.....	6-25
Figure 6-34	Internal AHRS Orientation Page	6-25
Figure 6-35	Internal AHRS Calibration Page	6-26
Figure 6-36	ADS-B Group.....	6-27
Figure 6-37	Aircraft Category and Max Airspeed Page.....	6-28
Figure 6-38	Aircraft Stall Method and Stall Speed Page	6-28
Figure 6-39	Aircraft Length and Width Page.....	6-29
Figure 6-40	1090ES Out Control and UAT Out Remote Control Page	6-29
Figure 6-41	1090ES In Capable and UAT In Capable Page	6-29
Figure 6-42	ADS-B In Processing Page	6-30
Figure 6-43	Aircraft Tail Number and Address Page	6-30
Figure 6-44	Allow Pilot to Edit Flight ID Page	6-30
Figure 6-45	Default Flight ID and Flight ID Prefix Page	6-31

Figure 6-46	Diagnostics Group	6-32
Figure 6-47	Diagnostics Page.....	6-33
Figure B-1	GTX 3X5 GPS Panel Mount Assembly	B-2
Figure B-2	GTX 3X5 GPS Panel Mount Dimensions and Center of Gravity	B-3
Figure B-3	GTX 3X5R GPS Standard Remote Mount Assembly	B-4
Figure B-4	GTX 3X5R GPS Standard Remote Mount Dimensions and Center of Gravity.....	B-5
Figure B-5	GTX 3X5 Vertical Remote Mount	B-6
Figure B-6	GTX 3X5 Vertical Remote Mount Dimensions and Center of Gravity	B-7
Figure B-7	GTX 3X5R GPS G1000 Mount Rack Assembly	B-8
Figure B-8	GTX 3X5R GPS G1000 Mounting Rack Dimensions and Center of Gravity.....	B-9
Figure B-9	GTX 3X5 Panel Cutout Detail	B-10
Figure B-10	GTX 3X5 Connector and Vent Locations	B-11
Figure B-11	Optional Garmin Altitude Encoder	B-11
Figure D-1	GTX 3X5 Power Configuration Typical Interconnect	D-3
Figure D-2	GTX 345 - G1000 Interconnect.....	D-5
Figure D-3	GTX 335 - G1000 Interconnect.....	D-7
Figure D-4	GTX 3X5 - GNS 480 (CNX80) Interconnect	D-8
Figure D-5	GTX 335 - GTN 6XX/7XX Typical Interconnect	D-9
Figure D-6	Single/Dual GTX 335 - Single GTN 6XX/7XX Interconnect	D-10
Figure D-7	GTX 345 - GTN 6XX/7XX Typical Interconnect	D-11
Figure D-8	GTX 345 - Single/Dual GTN 6XX/7XX Interconnect.....	D-13
Figure D-9	GTX 335/345 - GDL 88 Interconnect.....	D-14
Figure D-10	GTX 345 - Traffic Sensor Interconnect.....	D-15
Figure D-11	GTX 345 - Single and Dual 400W/500W Series	D-19
Figure D-12	GTX 3X5 - Audio Interconnect	D-20
Figure D-13	GTX 3X5 - Radio Altimeter Interconnect	D-21
Figure D-14	GTX 3X5 - AHRS/Heading Source.....	D-22
Figure D-15	GTX 3X5 - Switches and OAT Probe Interconnect	D-23
Figure D-16	GTX 3X5 - Altitude Source Interconnect.....	D-24
Figure D-17	GTX 335 - GNS 400W/500W Series Interconnect	D-26
Figure D-18	GTX 345/345R - Flight Stream Interconnect	D-27
Figure D-19	GTX 345 - MX20/GMX 200 Interconnect	D-28
Figure D-20	GTX 335 - GDU 620 Interconnect.....	D-28

Table 1-1	GTX 3X5 Units	1-2
Table 1-2	Interface Summary	1-6
Table 1-3	BDS Registers	1-7
Table 1-4	Physical Characteristics - Panel Mount Units	1-8
Table 1-5	Physical Characteristics - Remote Mount Units	1-9
Table 1-6	Display Specifications	1-10
Table 1-7	GAE Specifications	1-10
Table 1-8	Transponder Specifications	1-10
Table 1-9	UAT Receiver Specifications	1-11
Table 1-10	1090 MHz Receiver Specifications	1-11
Table 1-11	GPS Receiver Specifications	1-11
Table 1-12	Power Specifications	1-12
Table 1-13	TSO Compliance	1-13
Table 1-14	Applicable P/Ns	1-14
Table 1-15	TSO/ETSO Deviations	1-14
Table 1-16	Software Design Assurance Levels	1-15
Table 1-17	Complex Hardware Design Assurance Levels	1-15
Table 1-18	Equipment Authorization	1-16
Table 1-19	Garmin Reference Documents	1-17
Table 1-20	Additional Reference Documents	1-17
Table 3-1	GTX 3X5 Configurations	3-2
Table 3-2	Accessories Supplied	3-3
Table 3-3	Pressure Sensor Module	3-7
Table 3-4	GX000 System Rack	3-7
Table 3-5	GTX 3X5 Vertical Remote Mount Kits	3-7
Table 3-6	Recommended Crimp Tools	3-9
Table 3-7	Acceptable UAT/1090 Antennas	3-10
Table 3-8	GNSS Receiver Antennas	3-11
Table 3-9	Minimum System Configuration	3-12
Table 3-10	Compatible ADS-B Traffic/FIS-B Displays	3-12
Table 3-11	Air Data Select Source Priority	3-14
Table 3-12	Barometric Vertical Rate Source Priority	3-15
Table 3-13	Indicated Airspeed Source Priority	3-15
Table 3-14	True Airspeed Source Priority	3-15
Table 3-15	Barometric Pressure Setting Source Priority	3-16
Table 3-16	MCP/FCU Selected Altitude Source Priority	3-16
Table 3-17	Magnetic Heading Source Priority	3-17
Table 3-18	True Heading Source Priority	3-17
Table 3-19	Static Air Temperature Source Priority	3-17
Table 3-20	Total Air Temperature Source Priority	3-18
Table 3-21	Pressure Altitude Source Selection #1	3-18
Table 3-22	Pressure Altitude Source Priority Order #1	3-18
Table 3-23	Pressure Altitude Source Priority Order #12	3-19
Table 3-24	Baro-Corrected Altitude Source Selection #1	3-19
Table 3-25	Baro-Corrected Altitude Source Priority Order #1	3-19
Table 3-26	Baro-Corrected Altitude Source Priority Order #2	3-19
Table 3-27	AHRS Source Priority	3-20
Table 3-28	Airport Reference Points Source Priority	3-20
Table 3-29	Density Altitude Source Priority	3-20
Table 3-30	Height Above Terrain Source Priority	3-20
Table 3-31	Radio Altitude Source Priority	3-21
Table 3-32	Selected Course and Joystick Waypoint Source Priority	3-21
Table 3-33	FMS Selected Altitude Priority	3-21
Table 3-34	Magnetic Variation Source Priority	3-21

Table 3-35 EHS Roll Angle Source Priority 3-22

Table 3-36 Mach Source Priority 3-22

Table 3-37 Inertial Vertical Rate Source Priority 3-22

Table 4-1 Backshell Assembly 4-2

Table 4-2 Configuration Module Kit, P/N 011-00979-03 4-9

Table 5-1 J3251 Connector 5-2

Table 5-2 J3252 Connector 5-5

Table 5-3 Power Pins 5-6

Table 5-4 Power Configuration and Control Inputs 5-6

Table 5-5 Power Configuration and Power Control Functions 5-6

Table 5-6 Lighting Bus Pins 5-7

Table 5-7 Altitude Inputs 5-8

Table 5-8 Discrete Inputs and Outputs 5-8

Table 5-9 RS-232 Inputs and Outputs 5-9

Table 5-10 ARINC 429 Inputs and Outputs 5-10

Table 5-11 Ethernet Inputs and Outputs 5-10

Table 5-12 RS-422 Outputs 5-10

Table 5-13 External Suppression Bus Pin 5-11

Table 5-14 OAT Input and Output 5-11

Table 5-15 Audio Inputs and Outputs 5-11

Table 5-16 Time Mark Outputs 5-11

Table 5-17 Configuration Module Inputs and Outputs 5-12

Table 5-18 USB Inputs and Outputs 5-12

Table 6-1 RS-232 Channel 1 through Channel 3 Selections 6-6

Table 6-2 RS-232 Channel 4 Selections 6-7

Table 6-3 RS-422 Selections 6-8

Table 6-4 ARINC 429 Inputs 6-9

Table 6-5 ARINC 429 Outputs 6-10

Table 6-6 HSDB Formats 6-11

Table 6-7 Discrete Inputs 6-12

Table 6-8 Discrete Outputs 6-13

Table A-1 AHRS Inputs A-5

Table A-2 ADC Inputs A-5

Table A-3 ARINC 743A Inputs A-6

Table A-4 EFIS Air Data A-7

Table A-5 Flight Control A-7

Table A-6 Heading A-8

Table A-7 Transponder Control Format 1 A-8

Table A-8 Radio Altitude A-8

Table A-9 Traffic Inputs A-9

Table A-10 GPS Data Formats A-9

Table A-11 Garmin Labels A-10

Table A-12 TAS Output Labels A-10

Table A-13 TIS-A Output Labels A-11

Table A-14 Transponder Control Format 1 Labels A-11

Table A-15 Traffic Labels A-12

Table C-1 ADS-B In Display C-2

Table C-2 GPS Source C-4

Table C-3 Altitude Sources C-5

Table C-4 Audio Panels C-7

Table C-5 Radar Altimeters C-7

Table C-6 Heading Reference Source C-8

Table C-7 Traffic Sensors C-10

Table C-8 Bluetooth C-11

Table C-9	Remote Control	C-12
Table C-10	TIS-A Displays	C-13
Table E-1	ELS	E-1
Table E-2	EHS.....	E-7
Table E-3	ADS-B.....	E-9

1 System Overview

1.1	Scope	1-1
1.2	Equipment Description.....	1-2
1.3	Definitions and Abbreviations	1-3
1.4	ADS-B Capabilities	1-4
1.4.1	ADS-B Out	1-4
1.4.2	ADS-B In	1-4
1.4.3	Installation Approval for ADS-B Systems	1-4
1.5	FIS-B Capabilities	1-5
1.6	TIS System Capabilities.....	1-5
1.7	Interface Summary.....	1-6
1.8	General Specifications.....	1-8
1.9	Transponder Specifications	1-10
1.10	UAT Receiver Specifications (GTX 345 Only).....	1-11
1.11	1090 MHz Receiver Specifications.....	1-11
1.12	GPS Specifications (Units with Internal GPS Only)	1-11
1.13	Power Specifications	1-12
1.14	Certification.....	1-13
1.14.1	Non-TSO Functions.....	1-15
1.14.2	Design Assurance Levels	1-15
1.14.3	Transmitter Grant of Equipment Authorization	1-16
1.15	License Requirements	1-16
1.16	Reference Documents.....	1-17

1.1 Scope



NOTE

Garmin recommends installation of the GTX 3X5 by a Garmin–authorized installer. Garmin will not be liable for damages that result from improper or negligent installation of the GTX 3X5 to the extent permitted by law.

Mechanical and electrical information to install the GTX 3X5 into an aircraft is provided in this manual. It is not equivalent to an approved airframe-specific maintenance manual, installation design drawing, or installation data package. The content of this manual assumes use by competent and qualified avionics engineering personnel and/or avionics installation specialist using standard maintenance procedures in accordance with Title 14 of the Code of Federal Regulation and other related accepted procedures.

1.2 Equipment Description

The GTX 3X5 models include Mode S/ES transponders. Mode S/ES models have an optional internal GPS/SBAS receiver. Model names with an R indicate remote mount units. These units do not include a display or keypad.

Table 1-1 GTX 3X5 Units

Feature	GTX 335	GTX 335 NV	GTX 335 w/GPS	GTX 335R	GTX 335R w/GPS	GTX 345	GTX 345 w/GPS	GTX 345R	GTX 345R w/GPS	GTX 345 NV	GTX 345 NV w/GPS
Mode S/ES	X	X	X	X	X	X	X	X	X	X	X
ARINC 429 data concentrator	X	X	X	X	X	X	X	X	X	X	X
ADS-B In with alerting (UAT and 1090 MHz)						X	X	X	X	X	X
Connex (via Bluetooth)						X	X	X	X	X	X
FIS-B						X	X	X	X	X	X
TIS traffic	X	X	X	X	X						
ADS-B In and TAS/TCAS traffic integration						X	X	X	X	X	X
HSDB forwarding						X	X	X	X	X	X
Pressure sensor module (optional)	X	X	X	X	X	X	X	X	X	X	X
Flight timers	X	X	X			X	X			X	X
Audio output	X	X	X	X	X	X	X	X	X	X	X
Interface to Garmin display products	X	X	X	X	X	X	X	X	X	X	X
Shows pressure altitude, outside air temperature, and density altitude	X	X	X			X	X			X	X
Night vision goggle compatibility		X								X	X
Altitude monitor	X	X	X			X	X			X	X

1.3 Definitions and Abbreviations

Definitions

References made to GTX 3X5 apply to all GTX 3X5 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 3X5 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
ATCRBS	Air Traffic Control Radar Beacon System
BDS	Comm-B Data Selector
CDTI	Cockpit Display of Traffic Information
CFR	Code of Federal Regulations
CG	Center of Gravity
CONUS	Continental United States
CS-ACNS	Certification Specification and Acceptable Means of Compliance for Airborne Communication, Navigation and Surveillance
CSA	Conflict Situational Awareness
DC	Direct Current
DME	Distance Measuring Equipment
ELS	Elementary Surveillance
EHS	Enhanced Surveillance
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
OAT	Outside Air Temperature
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 335 and GTX 345 include ADS-B Out capabilities when installed with an approved internal or external GPS position source.

1.4.2 ADS-B In

For all ADS-B In data reception capabilities, the GTX 345 includes receivers for both the UAT and the 1090 MHz frequency bands. The GTX 345 receives ADS-B transmissions from other ADS-B Out equipped aircraft, ADS-R, and TIS-B information from ground stations. Traffic information received from these transmissions supply compatible ADS-B In data to CDTIs to show the pilot.

1.4.3 Installation Approval for ADS-B Systems

The conditions and tests necessary for TSO approval of the GTX 3X5 are minimum performance standards. It is the responsibility of the installer to determine if the aircraft installation conditions are within the TSO standards. TSO units must have separate approval to install in an aircraft. The GTX 3X5 can be installed only in compliance with 14 CFR Part 43 or the applicable airworthiness requirements.

All GTX 3X5 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 and to make sure compatibility between the GTX 3X5 and the ADS-B Out equipment. For compatible equipment that is applicable for 14 CFR 91.227-compliant installations in accordance with AC 20-165A refer to Garmin ADS-B Out Compatible Equipment. FIS-B information is for pilot-planning and pilot near-term decisions. The information shown are areas of inclement weather that are out of visual range or are not easily seen.

1.5 FIS-B Capabilities

The GTX 345 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 data is not available at ground level in some locations. The GTX 345 supplies the data to compatible displays. Depending on the CDTI it can show:

- NOTAM (includes TFRs)
- AIRMET
- SIGMET
- SUA
- METAR
- TAFs
- PIREP
- Winds/Temps Aloft
- Regional NEXRAD
- CONUS NEXRAD

1.6 TIS System Capabilities

The GTX 335 supplies information about nearby traffic through the FAA provided radar based TIS. Advisory traffic information is shown on a compatible Garmin display. Garmin units capable to show TIS traffic include:

- GNS 480 (CNX80)
- GTN 6XX/7XX
- GMX 200
- MX20 MFD
- GNS 400W/500W Series
- GDU 620
- GDU 1040

1.7 Interface Summary

Table 1-2 Interface Summary

Interface Description	Input/ Output	GTX 335 Qty	GTX 345 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
Discrete I/O	I [3]	15	15
	O	1	1
	I/O [1]	2	4
Gray code altitude input [3]	I [3]	1	1
Suppression bus	I/O	1	1
1PPS	O	1	1
OAT input	I	1	1
Audio output	O	1	1
Configuration module, GAE module interface [2]	I/O	1	1
USB interface	I/O	1	1
Lighting bus input	I	1	1
Switched power output	O	1	1

[1] Can be configured to be either input or output on a per-discrete basis.

[2] Use for either the configuration module or combination configuration module/GAE.

[3] The Gray code altitude input pins can be used for other functions when not used for Gray code.

Table 1-3 BDS Registers

BDS	Description	Extended Squitter	Enhanced Surveillance	General Transponder/Elementary Surveillance
0, 0	Comm-B Broadcasts			X
0, 5	Airborne Position Message	X		
0, 6	Surface Position Message	X		
0, 7	Extended Squitter Status	X		
0, 8	Airborne Identification Message	X		
0, 9	Airborne Velocity Message	X		
1, 0	Data Link Capability Report			X
1, 7	Common Usage GICB Capability Report			X
1, 8	MSSS GICB Capability Report (1 of 5)			X
1, 9	MSSS GICB Capability Report (2 of 5)			X
1, A	MSSS GICB Capability Report (3 of 5)			X
1, B	MSSS GICB Capability Report (4 of 5)			X
1, C	MSSS GICB Capability Report (5 of 5)			X
1, D	MSSS MSP Capability			X
2, 0	Aircraft Identification			X
2, 1	Aircraft Registration			X
4, 0	Selected Vertical Intention		X	
5, 0	Track and Turn Report		X	
6, 0	Heading and Speed Report		X	
6, 1	Aircraft Status Message, Subtype 1	X		
6, 2	Target State and Status Message	X		
6, 5	Operational Status Message	X		
E, 3	Transponder Type/Part Number			X
E, 4	Transponder Software Revision Number			X

1.8 General Specifications

It is the responsibility of the installing agency to obtain EQF necessary for the GTX 3X5. The form, P/N 005-00752-02, is available at the [Dealer Resource Center](#).

Table 1-4 Physical Characteristics - Panel Mount Units

Characteristic	Specification
Bezel height	1.65 in. (42 mm)
Bezel width	6.25 in. (159 mm)
Rack height (dimple to dimple)	1.68 in. (43 mm)
Rack width	6.30 in. (160 mm)
Depth behind panel with connectors (measured from face of aircraft panel to rear of connector backshells)	10.07 inches (256 mm)
GTX 335 weight (unit only)	2.1 lb (0.95 kg)
GTX 335 with GPS weight (unit only)	2.2 lb (1.00 kg)
GTX 335 with rack, backplate, and connectors	2.9 lb (1.32 kg)
GTX 335 with GPS with rack, backplate, and connectors	3.0 lb (1.36 kg)
GTX 345 weight (unit only)	2.3 lb (1.04 kg)
GTX 345 with GPS weight (unit only)	2.5 lb (1.13 kg)
GTX 345 with rack, backplate, and connectors	3.2 lb (1.45 kg)
GTX 345 with GPS with rack, backplate, and connectors	3.4 lb (1.54 kg)
Operating temperature range	-40°F to 158°F (-40°C to +70°C) For additional details, refer to the EQF.
Maximum operating altitude	55,000 feet
Humidity	95% non-condensing
Cooling	External cooling not necessary

Table 1-5 Physical Characteristics - Remote Mount Units

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)
Height, unit and vertical remote mount	6.6 inches (167 mm)
Width, unit and vertical remote mount	1.8 inches (46 mm)
Length, unit and vertical remote mount (unit, mount, connector backshell(s))	12.7 inches (321 mm)
GTX 335R weight (unit only)	1.9 lb (0.86 kg)
GTX 335R with GPS weight (unit only)	2.0 lb (0.91 kg)
GTX 335R weight with standard mounting tray, backplate, and connectors	2.7 lb (1.22 kg)
GTX 335R with GPS weight with standard mounting tray, backplate, and connectors	2.8 lb (1.27 kg)
GTX 335R weight with vertical remote mount, backplate, and connectors	3.1 lb (1.41 kg)
GTX 335R with GPS weight with vertical remote mount, backplate, and connectors	3.3 lb (1.50 kg)
GTX 335R weight with GX000 remote mount, nut plates, backplate, and connectors	2.7 lb (1.22 kg)
GTX 335R with GPS weight with GX000 remote mount, nut plates, backplate, and connectors	2.9 lb (1.32 kg)
GTX 345R weight (unit only)	2.2 lb (1.00 kg)
GTX 345R with GPS (unit only)	2.3 lb (1.04 kg)
GTX 345R weight with standard mounting tray, backplate, and connectors	3.0 lb (1.36 kg)
GTX 345R with GPS with standard mounting tray, backplate, and connectors	3.2 lb (1.45 kg)
GTX 345R weight with vertical remote mount, connector backplate, and connectors	3.5 lb (1.59 kg)
GTX 345R with GPS weight with vertical remote mount, connector backplate, and connectors	3.6 lb (1.63 kg)
GTX 345R weight with GX000 remote mount, nut plates, backplate, and connectors	3.1 lb (1.41 kg)
GTX 345R with GPS weight with GX000 remote mount, nut plates, backplate, and connectors.	3.2 lb (1.45 kg)
Operating temperature range	-49°F to 158°F (-45°C to +70°C) For additional details, refer to the EQF.
Maximum operating altitude	55,000 feet
Humidity	95% non-condensing
Cooling	External cooling not necessary

The GTX 3X5 display is a sunlight readable LCD display.

Table 1-6 Display Specifications

Characteristic	Specification
Display size	Width: 3.46 inches (87.88 mm) Height: 0.843 inches (21.4 mm)
Active area	Width: 2.95 inches (74.98 mm) Height: 0.486 inches (12.36 mm)
Resolution	200 x 33 pixels
Viewing angle	Left: 45° Right: 45° From top: 30° From bottom: 10°

Table 1-7 GAE Specifications

Characteristic	Specification
Dimensions	1.12 x 0.62 x 0.57 inches (28.4 x 15.7 x 14.5 mm)
Weight	0.8 ounces (with mounting hardware and harness)
Operating Temperature	-40°F to +158°F (-40°C to +70°C)
Altitude	30,000 feet maximum
Voltage	Supplied by GTX 3X5 transponder
Current	Supplied by GTX 3X5 transponder
Resolution	1 foot

1.9 Transponder Specifications

Table 1-8 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 345 Only)

Table 1-9 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 1090 MHz Receiver Specifications

Table 1-10 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

1.12 GPS Specifications (Units with Internal GPS Only)

Table 1-11 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

1.13 Power Specifications

GTX 3X5 units require an input voltage of between 9 VDC and 33 VDC. The maximum input power and current is based upon maximum reply rates. Input power and current does not include the switched power output.

Table 1-12 Power Specifications

Unit	Characteristic	Specification	
		14 VDC	28 VDC
GTX 335	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 335, GPS	Power input	10 W typical, 17 W maximum	
	Input current, typical	0.72 A	0.36 A
	Input current, maximum	1.22 A	0.61 A
GTX 345	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 345, GPS	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
GTX 3X5, GPS [1]	KEEP ALIVE input current, typical	65 uA	20 uA
	KEEP ALIVE input current, maximum	85 uA	40 uA

[1] KEEP ALIVE input only applies to units that have an internal GPS.

1.14 Certification

The GTX 3X5 meets compliance with the TSO(s) when interfaced with equipment and installed in accordance with the requirements and limitations as outlined in this manual.

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.

The Appliance Project Identifier (API) for the GTX 3X5 is GMN-01216. The API is used for project identification with the FAA. To identify appliance approvals refer to applicable hardware and software part numbers.

Table 1-13 TSO Compliance

GTX 335	GTX 345	TSO	Class and Level	Function
X [2]	X [2]	TSO-C88b	--	Automatic Pressure Altitude Reporting Code-Generating Equipment
X	X	TSO-C112e	Class 1 Level 2ens [3]	Air Traffic Control Radar Beacon System / Mode Select (ATCRBS/Mode S) Airborne Equipment
X [1]	X [1]	TSO-C145d	Class B2	Airborne Navigation Sensors Using the Global Positioning System Augmented by the Satellite Based Augmentation System
	X	TSO-C154c	Class A1S	Universal Access Transceiver (UAT) Automatic Dependent Surveillance – Broadcast (ADS-B) Equipment Operating on Frequency of 978 MHz
	X	TSO-C157a	Class 1	Aircraft Flight Information Services – Broadcast (FIS-B) Data Link System and Equipment
X		TSO-C166b	Class B1S	Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Service – Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz)
	X		Class A1S	
	X	TSO-C195a	Class C1, C2, C3, C5	Avionics Supporting Automatic Dependent Surveillance – Broadcast (ADS-B) Aircraft Surveillance Applications (ASA)

[1] With internal GPS.

[2] With optional GAE module.

[3] For software v2.05 or earlier, the units are Level 2 els.

Table 1-14 Applicable P/Ns

Description	P/Ns
Main software	006-B1607-0()
ADS-B software	006-B1797-0()
GPS software	006-B1827-0()
Main boot block	006-B1607-BA through -BZ
ADS-B boot block	006-B1797-BA through -BZ
GPS boot block	006-B1827-B()
Main CLD	006-C0153-22 through -2()
ADS-B CLD	006-C0157-21 through -2()

Table 1-15 TSO/ETSO Deviations

TSO	Deviation
TSO-C88b	1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit.
	2. Garmin is granted a deviation from the TSO to use RTCA DO-160G instead of earlier versions of RTCA/DO-160 as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
TSO-C145d	1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit.
	2. Garmin is granted a deviation from TSO-C145d section 7.a that requires "...provide one copy or on-line access to the data in paragraphs...5.f through 5.h of this TSO."
	3. Garmin is granted a deviation from RTCA/DO-229D Change 1 section 2.1.1.10 to use GPS antennas that meet Garmin Minimum Performance Specifications (Document No. 004-00287-00).
TSO-C154c	1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit.
TSO-C157a	1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit.
	2. Garmin is granted a deviation from RTCA DO-267A section 3.6.2.3 to use Product File Identifier in addition to APDU Number when reconstructing a Product File from linked APDUs as specified by Aerodrome and Airspace FIS-B Product Definitions, v4.00, dated May 2009.
TSO-C166b	1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit.
	2. Garmin is granted a deviation from the TSO-C166b not to process ADS-R as required by RTCA/DO-260B section 2.2.18.
	3. Garmin is granted a deviation from RTCA/DO-260B section 2.1.10 to meet the transponder function requirements of RTCA/DO-181E instead of RTCA/DO-181D.
TSO-C195a	1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit.

1.14.1 Non-TSO Functions

The following are declared non-TSO functions, these non-TSO functions as defined in this manual have been evaluated with the TSO functions. The design data for these non-TSO functions has been accepted by the FAA when these non-TSO functions are installed in accordance with the guidance and limitations provided in this manual.

The GTX 3X5 includes the following non-TSO functions.

- TIS-A (GTX 335)
- Wireless data conversion (Bluetooth interface) (GTX 345)

1.14.2 Design Assurance Levels

Table 1-16 Software Design Assurance Levels

System Function	DO-178B Level
Mode S transponder functionality	C
Display of TIS-A traffic data	C
Flight information data (FIS-B, including weather information) processing and output to display	D
Display of outside air temperature (static)	C
Flight timers	C
1090 ADS-B transmission	C
1090/UAT ADS-B reception	B
Correlation of TCAS traffic with ADS-B, ADS-R, and TIS-B traffic	B
Conflict Situational Awareness (CSA) including visual and aural alerts	B
External UAT ADS-B control	C
Internal GPS/SBAS	B
Pressure sensor module	C
Altitude monitor/alerting	C
Flight ID	C
Bluetooth output	E
HSDB packet forwarding	B
Data concentrator	C

Table 1-17 Complex Hardware Design Assurance Levels

Function	DO-254
Main board, transponder, and I/O	C
ADS-B board, 978 MHz and 1090 MHz receivers	C
GPS receiver	B [1]

[1] Developed to DO-178B level B equivalent process.

1.14.3 Transmitter Grant of Equipment Authorization

Table 1-18 Equipment Authorization

Model	FCC ID
GTX 335	IPH-02133
GTX 335R	
GTX 345	IPH-02256
GTX 345R	

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 3X5 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 <http://wireless.fcc.gov/aviation>.

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 3X5 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 3X5. The technician should read all related reference materials along with this manual before unit installation. The documents in table 1-19 are found at Garmin's [Dealer Resource Center](#).

Table 1-19 Garmin Reference Documents

Document	P/N
<i>14 CFR 91.227 ADS-B Out Compatible Equipment</i>	190-01533-00
<i>Antenna Minimum Performance Specification for Garmin's GPS/WAAS Receiver System</i>	004-00287-00
<i>G1000 System Installation Manual</i>	190-00303-00
<i>GTX 3X5 Environmental Qualification Form</i>	005-00752-02
<i>GTX 3X5 Mode A/C Lock Enablement Guide</i>	190-01499-21
<i>GTX 3X5 Pilot's Guide</i>	190-01499-00
<i>GTX 3X5 Series Transponder G1000 Pilot's Guide</i>	190-01499-01
<i>GTX 3X5 Transponder Control Enablement Guide</i>	190-01499-22
<i>GTX 3X5 Transponder Installation Tool Guide</i>	190-01499-30

Table 1-20 Additional Reference Documents

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

2 Limitations

2.1 HSDB Packet Forwarding 2-1
 2.2 ARINC 429 Data Concentrator Function..... 2-1

The GTX 3X5 meets the minimum performance and quality control standards that are necessary by the TSOs in section 1.14. Installation of the GTX 3X5 requires separate approval.

2.1 HSDB Packet Forwarding

The GTX 345 HSDB interface is not approved for forwarding data whose failure condition for loss or malfunction is classified as hazardous or catastrophic.

2.2 ARINC 429 Data Concentrator Function

ARINC 429 data from the GTX 3X5 must not be used for any function whose associated failure is classified as hazardous or catastrophic.

3 Installation Overview

3.1	Introduction.....	3-1
3.2	Unit Configurations	3-2
3.3	Accessories Supplied.....	3-3
3.4	Optional Accessories.....	3-7
3.4.1	GAE	3-7
3.4.2	GX000 System Rack	3-7
3.4.3	GTX 3X5 Vertical Remote Mount.....	3-7
3.4.4	GPS Antenna.....	3-8
3.5	Necessary Installation Materials and Accessories Not Supplied	3-9
3.6	Necessary Special Tools.....	3-9
3.7	Transponder Antenna	3-10
3.8	GPS Antenna Requirements	3-11
3.9	Minimum Systems Configuration	3-12
3.10	GTX Input Source Priority.....	3-13
3.11	ADS-B In Considerations	3-22
3.12	Bluetooth Considerations (GTX 345R Only)	3-23
3.13	Field Enablements.....	3-23
3.14	GPS/SBAS Parameters	3-23
3.15	Antenna Considerations	3-24
3.15.1	Transponder Antenna.....	3-24
3.15.2	GPS Antenna.....	3-25
3.16	Electrical Bonding	3-27
3.17	Cabling and Wiring.....	3-27
3.18	Electrical Bonding Considerations	3-27
3.19	Cooling Requirements and Considerations.....	3-27

3.1 Introduction

Equipment information to install the GTX 3X5 and optional accessories is in this section. Cabling is made by the installing agency 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 3X5 Configurations

Model	Mount	GPS	ADS-B In	Unit P/N	Unit Only Kit	Standard Kit [1]	Mount Type
GTX 335	Panel			011-03300-00	010-01214-00	010-01214-01	
GTX 335 NV	Panel			011-03300-20	010-01214-20	010-01214-21	
GTX 335, GPS	Panel	X		011-03300-40	010-01214-40	010-01214-41	
GTX 335R	Remote			011-03301-00	010-01215-00	010-01215-01	Standard
GTX 335R	Remote			011-03301-00	010-01215-00	010-01215-02	Vertical
GTX 335R	Remote			011-03301-00	010-01215-00	010-01215-03	G1000
GTX 335R, GPS	Remote	X		011-03301-40	010-01215-40	010-01215-41	Standard
GTX 335R, GPS	Remote	X		011-03301-40	010-01215-40	010-01215-42	Vertical
GTX 335R, GPS	Remote	X		011-03301-40	010-01215-40	010-01215-43	G1000
GTX 345	Panel		X	011-03302-00	010-01216-00	010-01216-01	
GTX 345 NV	Panel		X	011-03302-20	010-01216-20	010-01216-21	
GTX 345, GPS	Panel	X	X	011-03302-40	010-01216-40	010-01216-41	
GTX 345 NV, GPS	Panel	X	X	011-03302-60	010-01216-60	010-01216-61	
GTX 345R	Remote		X	011-03303-00	010-01217-00	010-01217-01	Standard
GTX 345R	Remote		X	011-03303-00	010-01217-00	010-01217-02	Vertical
GTX 345R	Remote		X	011-03303-00	010-01217-00	010-01217-03	G1000
GTX 345R, GPS	Remote	X	X	011-03303-40	010-01217-40	010-01217-41	Standard
GTX 345R, GPS	Remote	X	X	011-03303-40	010-01217-40	010-01217-42	Vertical
GTX 345R, GPS	Remote	X	X	011-03303-40	010-01217-40	010-01217-43	G1000

[1] Includes unit, install rack, connector backplate, connector kit, and configuration module.

3.3 Accessories Supplied

Table 3-2 Accessories Supplied

Unit	Kit P/N	Item	P/N	Notes
GTX 335	010-01214-01	Install rack	115-01771-01	[1]
		Backplate assembly	011-02976-00	
		Connector kit	011-02977-00	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-01	
GTX 335NV	010-01214-21	Install rack	115-01771-01	[1]
		Backplate assembly	011-02976-00	
		Connector kit	011-02977-00	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-01	
GTX 335 w/GPS	010-01214-41	Install rack	115-01771-01	[1]
		Backplate assembly	011-02976-01	
		Connector kit	011-02977-00	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-01	
GTX 335R, standard mount	010-01215-01	Install rack	115-01771-01	[1]
		Backplate assembly	011-02976-00	
		Connector kit	011-02977-00	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-02	
GTX 335R, vertical mount	010-01215-02	Install rack, vertical	011-03762-00	
		Backplate assembly	011-02976-10	
		Connector kit	011-02977-00	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-02	
GTX 335R, G1000 mount	010-01215-03	Install rack, G1000	115-02250-00	
		Backplate assembly	011-02976-00	
		Connector kit	011-02977-00	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-05	

Unit	Kit P/N	Item	P/N	Notes
GTX 335R w/GPS, standard mount	010-01215-41	Install rack	115-01771-01	[1]
		Backplate assembly	011-02976-01	
		Connector kit	011-02977-00	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-02	
GTX 335R w/GPS, vertical mount	010-01215-42	Install rack, vertical	011-03762-00	
		Backplate assembly	011-02976-11	
		Connector kit	011-02977-00	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-02	
GTX 335R w/GPS, G1000 mount	010-01215-43	Install rack, G1000	115-02250-00	
		Backplate assembly	011-02976-01	
		Connector kit	011-02977-00	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-05	
GTX 345	010-01216-01	Install rack	115-01771-01	[1]
		Backplate assembly	011-02976-00	
		Connector kit	011-02977-01	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-03	
GTX 345 w/GPS	010-01216-41	Install rack	115-01771-01	[1]
		Backplate assembly	011-02976-01	
		Connector kit	011-02977-01	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-03	
GTX 345R, standard mount	010-01217-01	Install rack	115-01771-01	[1]
		Backplate assembly	011-02976-00	
		Connector kit	011-02977-01	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-04	

Unit	Kit P/N	Item	P/N	Notes
GTX 345R, vertical mount	010-01217-02	Install rack, vertical	011-03762-00	
		Backplate assembly	011-02976-10	
		Connector kit	011-02977-01	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-04	
GTX 345R, G1000 mount	010-01217-03	Install rack, G1000	115-02250-00	
		Backplate assembly	011-02976-00	
		Connector kit	011-02977-01	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-06	
GTX 345R w/GPS, standard mount	010-01217-41	Install rack	115-01771-01	[1]
		Backplate assembly	011-02976-01	
		Connector kit	011-02977-01	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-04	
GTX 345R w/GPS, vertical mount	010-01217-42	Install rack, vertical	011-03762-00	
		Backplate assembly	011-02976-11	
		Connector kit	011-02977-01	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-04	
GTX 345R w/GPS, G1000 mount	010-01217-43	Install rack, G1000	115-02250-00	
		Backplate assembly	011-02976-01	
		Connector kit	011-02977-01	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-06	
GTX 345 NV	010-01216-21	Install rack	115-01771-01	
		Backplate assembly	011-02976-00	
		Connector kit	011-02977-01	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-03	

Unit	Kit P/N	Item	P/N	Notes
GTX 345 NV w/GPS	010-01216-61	Install rack	115-01771-01	
		Backplate assembly	011-02976-01	
		Connector kit	011-02977-01	
		Configuration module	011-00979-03	
		Product information kit	K00-00598-03	

[1] The standard rack, P/N 115-01771-01, is the functional equivalent of P/N 115-01771-00.

3.4 Optional Accessories

3.4.1 GAE

The GTX 3X5 uses an optional GAE module as a transponder pressure altitude input. The GAE module directly attaches to the GTX 3X5 rear backplate and connects to the aircraft static pressure system. The GAE module replaces and functions the same as the configuration module.

Table 3-3 Pressure Sensor Module

Item	P/N
Pressure sensor module	011-03080-00

3.4.2 GX000 System Rack

The GTX 3X5 has an optional mount and hardware for GX000 installations.

Table 3-4 GX000 System Rack

Item	P/N
GTX 3X5 remote rack, G1000	115-02250-00
G1000 nut plate kit, three-position	011-00915-01

3.4.3 GTX 3X5 Vertical Remote Mount

The GTX 3X5 vertical remote mount is available as separate components. The base kit mounts to the aircraft. The shoe kit mounts to the GTX 3X5.

Table 3-5 GTX 3X5 Vertical Remote Mount Kits

Item	P/N
GTX 3X5 vertical remote mount	011-03762-00
GTX 3X5 vertical remote mount, base kit	011-03762-10
GTX 3X5 vertical remote mount, shoe kit	011-03762-20

3.4.4 GPS Antenna

A GPS antenna is necessary for the GTX 335 and GTX 345 with the internal GPS option. For information about antenna selection and part numbers, refer to section 3.8.

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.

3.5 Necessary Installation Materials and Accessories Not Supplied

The GTX 3X5 is installed with standard aviation materials. The following items are necessary for installation, but not supplied.

1. Wire (MIL-W-22759/16 or equivalent)
2. Shielded wire (MIL-C-27500 or equivalent)
3. Aircraft grade category 5 Ethernet cable is necessary for installations utilizing the HSDB interfaces
4. Mounting hardware
5. Circuit breaker of applicable rating
6. Tie wraps and/or lacing cord
7. Ring terminals for grounding
8. Coaxial cable (RG-400 or equivalent)
9. BNC connectors for the transponder antenna
10. TNC connectors for the GPS antenna
11. Approved pressure altitude source

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 345 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 determine their suitability for UAT receivers.

The GTX 3X5/3X5R must have an UHF antenna. The antennas in table 3-7 are approved for use with the GTX 3X5/3X5R. 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
Dayton-Granger	L10-611-()	L-Band Blade	C	DC Grounded
	590-0052 or 013-00219-00	A-40	TNC	Open Circuit
Garmin	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 3X5 with internal GNSS receiver. The antennas in table 3-8 meet specifications in the document *Antenna Minimum Performance Specification for Garmin's GPS/WAAS Receiver System*.

Table 3-8 GNSS Receiver Antennas

Model/Description	Connector Type	Manufacturer	P/N	Garmin Order Number
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 35 has 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.

3.9 Minimum Systems Configuration

For compatible ADS-B traffic/FIS-B displays refer to table 3-10. GTN 6XX/7XX, GNS 480 (CNX80), and G1000 displays are compatible control panels. When installing a model in table 3-9, each item marked with an X on the same row is necessary.

Table 3-9 Minimum System Configuration

Model	Transponder Antenna	Altitude Source	External GPS/SBAS Position Source	GPS/SBAS Antenna	Control Panel	ADS-B Traffic/FIS-B Display or Traffic Light	Audio Panel
GTX 335	X	X	X				
GTX 335R	X	X	X		X		
GTX 335 w/GPS	X	X		X			
GTX 335R w/GPS	X	X		X	X		
GTX 345	X	X	X			X	X
GTX 345R	X	X	X		X	X	X
GTX 345 w/GPS	X	X		X		X	X
GTX 345R w/GPS	X	X		X	X	X	X

Table 3-10 Compatible ADS-B Traffic/FIS-B Displays

Display	FIS-B Source Format	ADS-B Traffic Source Format
GTN 6XX/7XX	HSDB	HSDB
GDU 620	HSDB	HSDB
GMX 200	RS-422: MX Format 1	MX Format 1
GNS 400W/500W Series	RS-232: GNS	ARINC 429: Traffic
G1000	RS-422: MX Format 1	RS-232: Legacy Traffic
MX20	RS-422: MX Format 2	RS-422 MX Format 2

3.10 GTX Input Source Priority

The GTX 3X5 accepts data from multiple sources. If multiple sources supply data to the unit, only valid data from the highest priority source is used. Source priorities are shown from highest to the lowest.

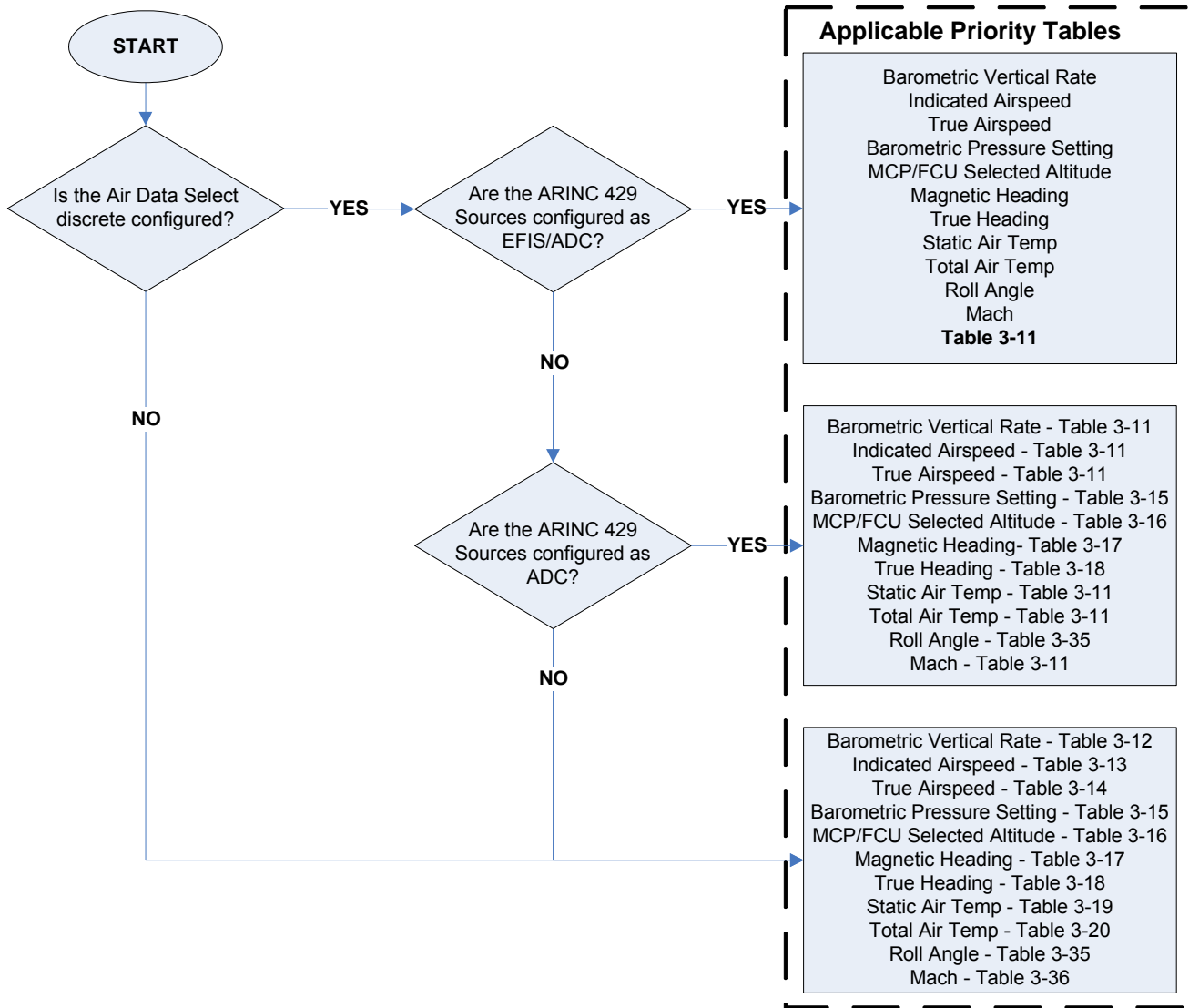


Figure 3-1 Air Data Discrete Priority Order

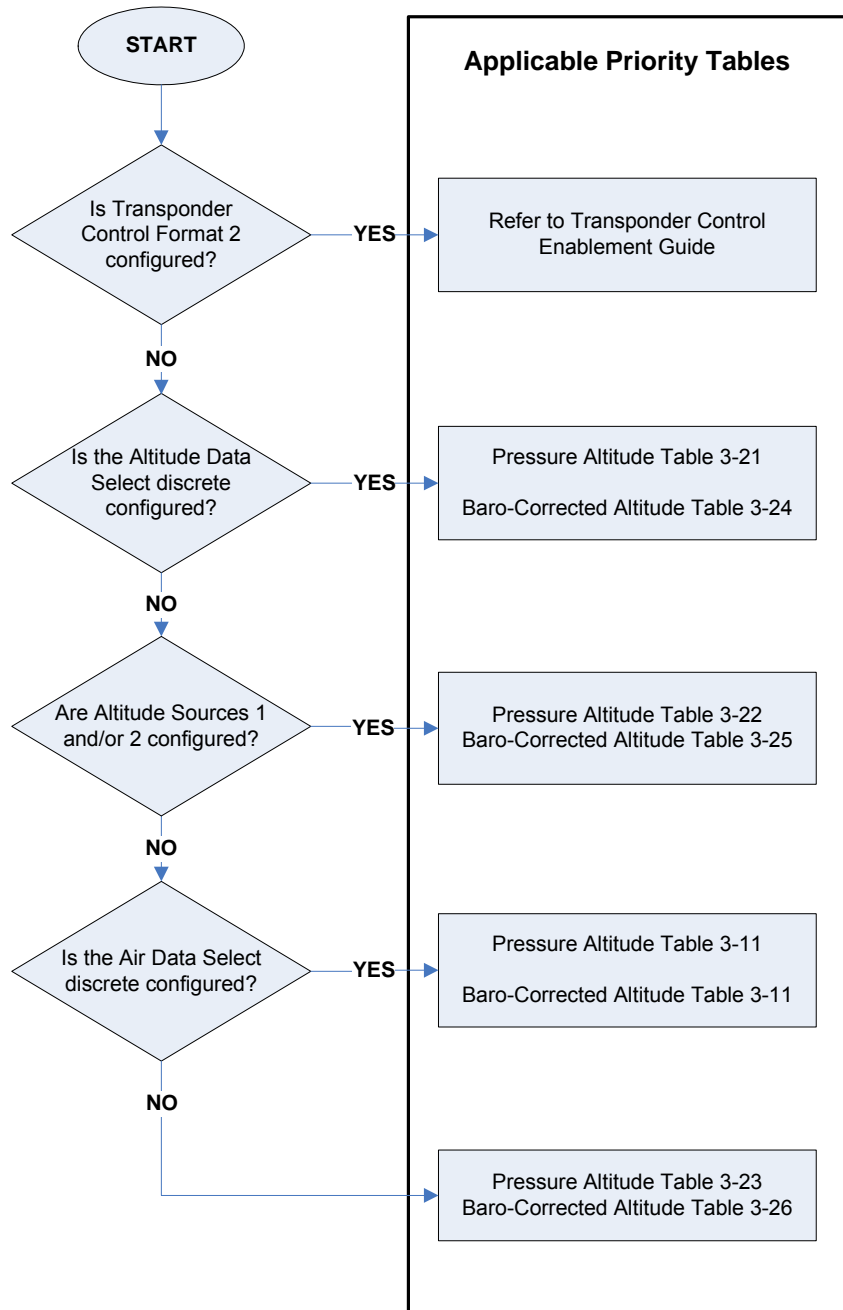


Figure 3-2 Pressure Altitude Priority Order

Table 3-11 Air Data Select Source Priority

Air Data Select Discrete	Source
Open	Configured port 1 ARINC 429 EFIS ADC/ADC input
Ground	Configured port 2 ARINC 429 EFIS ADC/ADC input

Table 3-12 Barometric Vertical Rate Source Priority

Priority	Source
1	ARINC 429 label 212 from an ADC
2	ARINC 429 label 212 from an EFIS/ADC
3	RS-232 from an ADC
4	RS-232 from a remote control panel
5	HSDB barometric vertical rate from a GX000
6	HSDB barometric vertical rate from GDU 620 #1
7	HSDB barometric vertical rate from GDU 620 #2

Table 3-13 Indicated Airspeed Source Priority

Priority	Source
1	ARINC 429 label 206 from an ADC
2	ARINC 429 label 206 from an EFIS/ADC
3	RS-232 from an ADC
4	RS-232 from a remote control panel
5	HSDB indicated airspeed from a GX000
6	HSDB indicated airspeed from GDU 620 #1
7	HSDB indicated airspeed from GDU 620 #2

Table 3-14 True Airspeed Source Priority

Priority	Source
1	ARINC 429 label 210 from an ADC
2	ARINC 429 label 210 from an EFIS/ADC
3	RS-232 from an ADC
4	RS-232 from a remote control panel
5	HSDB true airspeed from a GX000
6	HSDB true airspeed from GDU 620 #1
7	HSDB true airspeed from GDU 620 #2

Table 3-15 Barometric Pressure Setting Source Priority**NOTE**

If the Air Data Select discrete input is configured and the source is EFIS/Air Data, Label 235 will have priority over Label 234.

Priority	Source
1	ARINC 429 label 235 from an EFIS/ADC
2	ARINC 429 label 234 from an EFIS/ADC
3	ARINC 429 label 235 from an AFCS
4	ARINC 429 label 234 from an AFCS
5	RS-232 from an ADC
6	RS-232 from a remote control panel
7	HSDB barometric pressure setting from a GX000
8	HSDB barometric pressure setting from GDU 620 #1
9	HSDB barometric pressure setting from GDU 620 #2

Table 3-16 MCP/FCU Selected Altitude Source Priority

Priority	Source
1	ARINC 429 label 102 from an AFCS
2	ARINC 429 label 102 from an EFIS/ADC
3	RS-232 from a remote control panel
4	HSDB selected altitude from a GX000
5	HSDB selected altitude from GDU 620 #1
6	HSDB selected altitude from GDU 620 #2

Table 3-17 Magnetic Heading Source Priority

Priority	Source
1	ARINC 429 label 320 from a heading source
2	ARINC 429 label 320 from an AHRS
3	ARINC 429 label 320 from an EFIS/ADC
4	RS-232 from an ADC
5	RS-232 from a remote control panel
6	HSDB magnetic heading from GTN #1
7	HSDB magnetic heading from GTN #2
8	HSDB magnetic heading from a GX000
9	HSDB magnetic heading from GDU 620 #1
10	HSDB magnetic heading from GDU 620 #2

Table 3-18 True Heading Source Priority

Priority	Source
1	ARINC 429 label 314 from a heading source
2	ARINC 429 label 314 from an AHRS
3	ARINC 429 label 314 from an EFIS/ADC
4	RS-232 from a remote control panel
5	HSDB true heading from a GX000

Table 3-19 Static Air Temperature Source Priority

Priority	Source
1	ARINC 429 label 213 from an ADC
2	ARINC 429 label 213 from an EFIS/ADC
3	RS-232 from an ADC
4	RS-232 from a remote control panel
5	HSDB static air temperature from a GX000
6	HSDB static air temperature from GDU 620 #1
7	HSDB static air temperature from GDU 620 #2

Table 3-20 Total Air Temperature Source Priority

Priority	Source
1	ARINC 429 label 211 from an ADC
2	ARINC 429 label 211 from an EFIS/ADC
3	RS-232 from an ADC
4	RS-232 from a remote control panel
5	HSDB total air temperature from a GX000
6	HSDB total air temperature from GDU 620 #1
7	HSDB total air temperature from GDU 620 #2
8	Outside air temperature sensor if OAT sensor installed and is active

Table 3-21 Pressure Altitude Source Selection #1

Altitude Data Select Discrete	Source
Open	Source specified in altitude source configuration 1
Ground	Source specified in altitude source configuration 2

Table 3-22 Pressure Altitude Source Priority Order #1

Priority	Source
1	Source specified in altitude source configuration 1
2	Source specified in altitude source configuration 2

Table 3-23 Pressure Altitude Source Priority Order #12

Priority	Source
1	ARINC 429 label 203 from an ADC
2	ARINC 429 label 203 from an EFIS/ADC
3	RS-232 from an ADC
4	RS-232 from a 25 ft resolution altitude source
5	RS-232 from a remote control panel
6	Optional GAE module
7	HSDB pressure altitude from GTN #1
8	HSDB pressure altitude from GTN #2
9	HSDB pressure altitude from a GX000
10	HSDB pressure altitude from GDU 620 #1
11	HSDB pressure altitude from GDU 620 #2
12	Gray code altitude
13	RS-232 from a 100 ft resolution altitude source

Table 3-24 Baro-Corrected Altitude Source Selection #1

Altitude Data Select Discrete	Source
Open	Source specified in altitude source configuration 1
Ground	Source specified in altitude source configuration 2

Table 3-25 Baro-Corrected Altitude Source Priority Order #1

Priority	Source
1	Source specified in altitude source configuration 1
2	Source specified in altitude source configuration 2

Table 3-26 Baro-Corrected Altitude Source Priority Order #2

Priority	Source
1	ARINC 429 label 204 from an ADC
2	ARINC 429 label 204 from an EFIS/ADC
3	RS-232 from an ADC

Table 3-27 AHRS Source Priority

Priority	Source
1	ARINC 429 labels 270, 324, 325, 332, 333, and 340 from an AHRS.
2	RS-232 from a remote control panel
3	HSDB AHRS data from a GX000
4	HSDB AHRS data from GDU 620 #1
5	HSDB AHRS data from GDU 620 #2
6	AHRS data from the internal AHRS

Table 3-28 Airport Reference Points Source Priority

Priority	Source
1	RS-232 from a remote control panel
2	HSDB runway information from GTN #1
3	HSDB runway information from GTN #2
4	HSDB runway information from a GX000
5	HSDB runway information from GDU 620 #1
6	HSDB runway information from GDU 620 #2

Table 3-29 Density Altitude Source Priority

Priority	Source
1	RS-232 from an ADC
2	RS-232 from a remote control panel
3	HSDB density altitude from a GX000
4	Internally calculated from pressure altitude and static air temperature

Table 3-30 Height Above Terrain Source Priority

Priority	Source
1	RS-232 from a remote control panel
2	RS-232 from a GNS
3	HSDB height above terrain from GTN #1
4	HSDB height above terrain from GTN #2
5	HSDB height above terrain from a GX000
6	HSDB height above terrain from GDU 620 #1
7	HSDB height above terrain from GDU 620 #2

Table 3-31 Radio Altitude Source Priority

Priority	Source
1	ARINC 429 label 164 from a radar altimeter
2	ARINC 429 label 164 from an EFIS/ADC
3	RS-232 from a remote control panel
4	HSDB radio height from GTN #1
5	HSDB radio height from GTN #2
6	HSDB radio height from a GX000
7	HSDB radio height from GDU 620 #1
8	HSDB radio height from GDU 620 #2

Table 3-32 Selected Course and Joystick Waypoint Source Priority

Priority	Source
1	ARINC 429 labels 100, 306, and 307 from an EFIS/ADC

Table 3-33 FMS Selected Altitude Priority

Priority	Source
1	RS-232 from a remote control panel
2	HSDB FMS vertical navigation data from a GX000
3	HSDB FMS vertical navigation data from GDU 620 #1
4	HSDB FMS vertical navigation data from GDU 620 #2

Table 3-34 Magnetic Variation Source Priority

Priority	Source
1	HSDB magnetic variation from a GX000
2	HSDB magnetic variation from GDU 620 #1
3	HSDB magnetic variation from GTN #1
4	HSDB magnetic variation from GTN #2
5	HSDB magnetic variation from GDU 620 #2
6	RS-232 from a GNS

Table 3-35 EHS Roll Angle Source Priority

Priority	Source
1	ARINC 429 label 325 from an AHRS
2	ARINC 429 label 325 from an EFIS/ADC
3	RS-232 from a remote control panel
4	HSDB AHRS data from a GX000
5	HSDB AHRS data from GDU 620 #1
6	HSDB AHRS data from GDU 620 #2

Table 3-36 Mach Source Priority

Priority	Source
1	ARINC 429 label 205 from an ADC
2	ARINC 429 label 205 from an EFIS/ADC
3	RS-232 from an ADC
4	RS-232 from a remote control panel
5	HSDB Mach data from a GX000

Table 3-37 Inertial Vertical Rate Source Priority

Priority	Source
1	ARINC 429 label 365 from an AHRS
2	RS-232 from a remote control panel

3.11 ADS-B In Considerations

The GTX 345 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. If a GTX 345 is in a system that contains a GDL 88, ADS-B In must be disabled in the GTX 345. In dual GTX 345 installations that connect through HSDB, one GTX 345 must have ADS-B In disabled.

3.12 Bluetooth Considerations (GTX 345R Only)

For optimal connectivity with a GTX 345R, the Bluetooth antenna must point towards the passenger area of the aircraft. This is identifiable by the Garmin label. Due to aircraft obstructions, Bluetooth performance may be limited. To obtain ideal Bluetooth performance, use a Flight Stream 110/210.

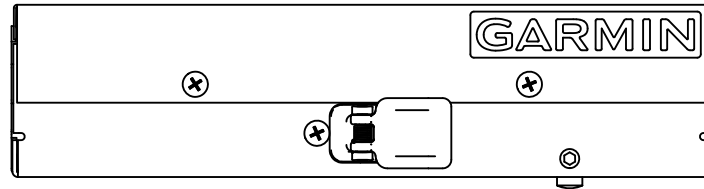


Figure 3-3 Garmin Label on Remote Unit

3.13 Field Enablements

Transponder Control and Mode A/C Lock field enablements are available with software v2.05 or later. For more information refer to *GTX 3X5 Mode A/C Lock Enablement Guide* and *GTX 3X5 Transponder Control Enablement Guide*.

3.14 GPS/SBAS Parameters

The GTX 3X5 receives the following information from internal and external GPS receivers.

- Latitude
- Longitude
- Height above ellipsoid
- Horizontal and vertical position accuracy data
- Horizontal position integrity data
- North/south velocity
- East/west velocity
- Up/down velocity
- Ground speed
- Horizontal velocity accuracy
- Ground track
- Geometric vertical rate
- SIL and SIL supplement
- RAIM alarm
- Geoid altitude
- Time
- Date

3.15 Antenna Considerations

Mounting location considerations for the antenna(s) are provided in this section. The recommended antenna locations are shown in figure 3-4.

3.15.1 Transponder Antenna

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:

1. Be attached away from major protrusions, such as engines, nacelles, propellers, and antenna masts.
2. Be as far as practical from landing gear doors, access doors, or other openings that could affect its radiation pattern.
3. Be vertically attached on the bottom of the aircraft.
4. Not be attached within three feet of the ADF sense antenna or any other communication antenna.
5. Not be attached within six feet of a DME antenna.
6. Be attached a minimum of three feet from the GTX 3X5 to prevent RF interference.

3.15.2 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 1-12.

**NOTE**

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.

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.

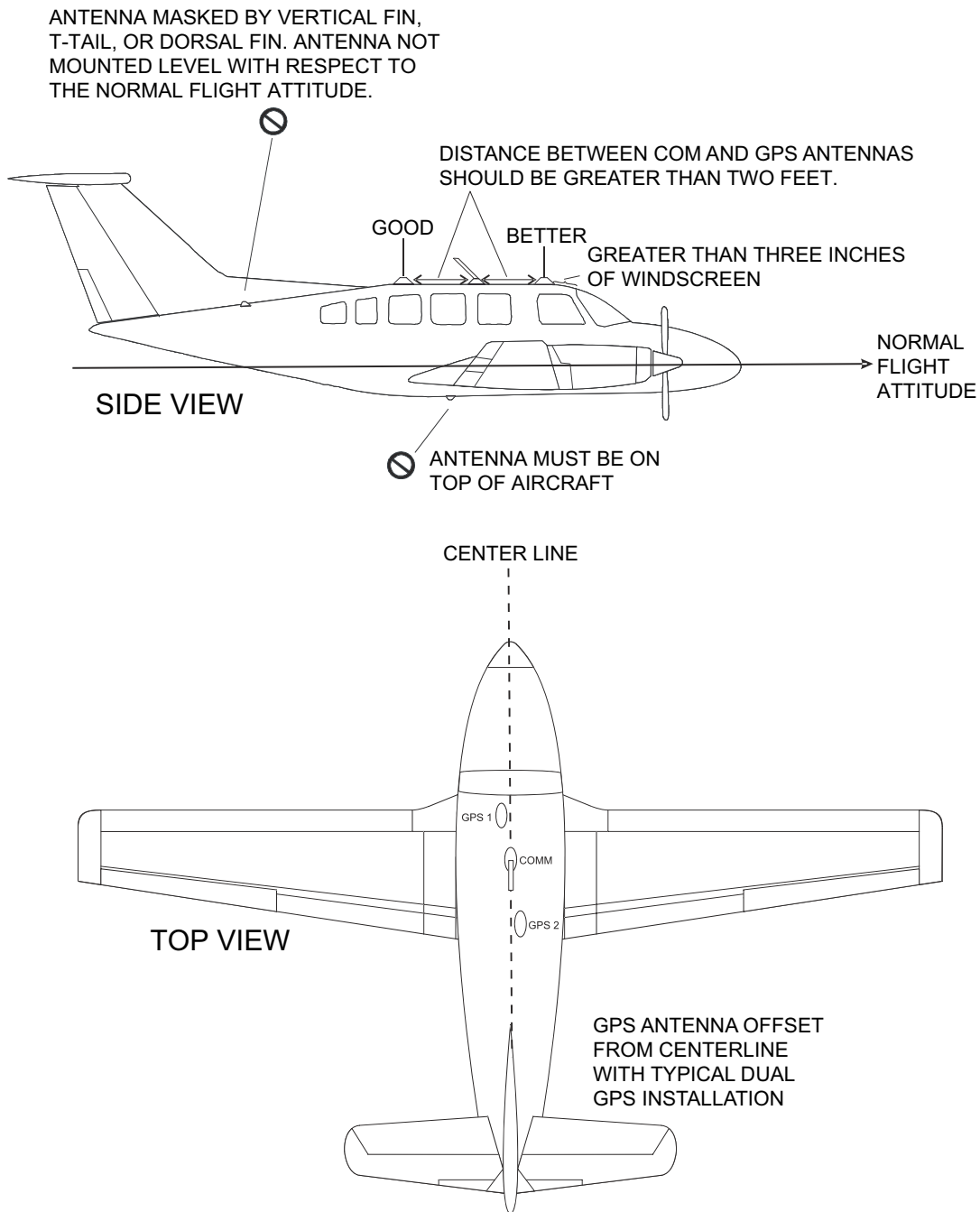


Figure 3-4 GPS Locations of Antennas

3.16 Electrical Bonding

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

3.17 Cabling and Wiring

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

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

3.18 Electrical Bonding Considerations

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

3.19 Cooling Requirements and Considerations

There are no cooling requirements or considerations for the GTX 3X5. The chassis has provisions for a fan, however, one is not necessary or provided.

4 Installation Procedure

4.1	Wire Harness Installation.....	4-1
4.2	Backshell Assembly Parts.....	4-2
4.3	Shielded Cable Preparation.....	4-3
4.4	Connector and Backshell Assembly.....	4-5
4.5	Configuration Module Installation.....	4-8
4.6	Coax Cable Installation.....	4-10
4.7	Equipment Rack Installation.....	4-10
4.7.1	Panel Mount Units.....	4-10
4.7.2	Standard Remote Mount Units.....	4-11
4.7.3	Vertical Remote Mount Units.....	4-11
4.7.4	GX000 Integrated Flight Decks.....	4-11
4.7.5	GAE Installation.....	4-11
4.8	Panel and Standard Remote Mount Unit Installation and Removal.....	4-13
4.9	Vertical Remote Mount Unit Installation and Removal.....	4-14

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:

- For rear connector pinout and descriptions of interface connections refer to section 5
- For interconnect diagrams, refer to appendix D
- For special tools, refer to section 3.15

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 D.
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 3X5 to the other units. Refer to section 3.17.

4.2 Backshell Assembly Parts

The GTX 3X5 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

Figure 4-2 through Figure 4-4	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]

[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 335), and P/N 011-02977-01 (GTX 345).
- [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

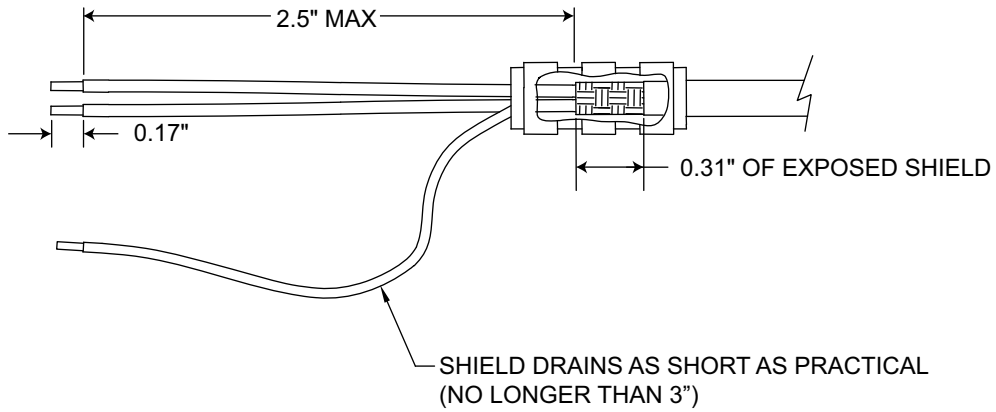


NOTE

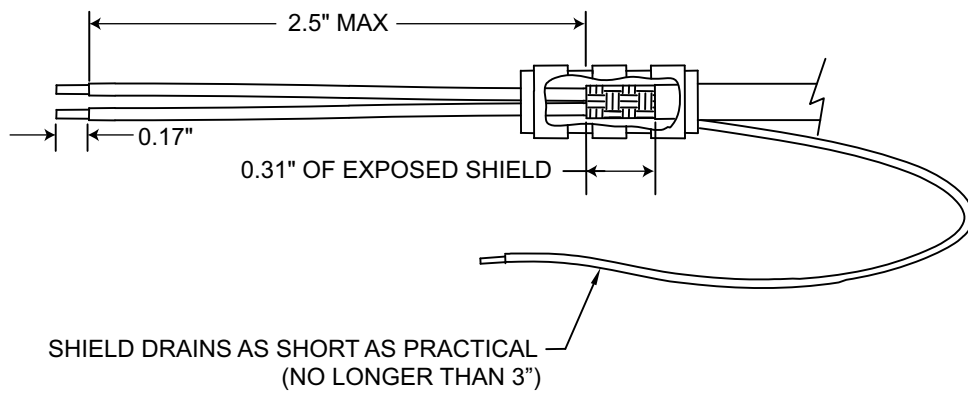
Solder sleeves with pre-installed shield drains can be used instead of separate shield terminators (12) and individual wires (13). A preferred solder sleeve is M83519/2-X series with a pre-installed shield drain.

Prepare all of the shielded cables using one of the methods shown in figure 4-1. For details of the shield termination to the connector backshell refer to figure 4-2.

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 and remove the jacket to leave the braid exposed.
4. Connect a 20 or 22 AWG wire (13) to the exposed shield of the prepared cable assembly. Refer to figure 4-1. For termination techniques refer to AC 43.13-1B.
5. Slide a shield terminator (12) onto the prepared cable assembly (11).
6. Connect the shield wire (13) to the shield using a heat gun approved for use with solder sleeves.
7. Crimp contacts (14) onto the cable wires. Refer to section 4.1.
8. For the remaining shielded cables, repeat steps 1 through 7 as necessary.
9. Install a ring terminal (15) onto the cable shield termination wires (13).
10. Group wires as applicable for the connector. Refer to section 4.4.



Preferred Method



Alternate Method

Figure 4-1 Shielded Cable Preparation

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

The configuration module and GAE use the same connector pin locations and cannot be used at the same time.



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.

For this procedure refer to figure 4-2 and figure 4-3.

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). For the chosen contact location, refer to appendix D.
4. Install the configuration module or GAE wires into the connector if a configuration module or GAE is used. Refer to section 4.5.
5. Group wires as applicable for the connector.
6. Wrap the cable bundle with silicone fusion tape (19) so the backshell strain relief and cast housing touches the cable bundle.
7. Place the backshell around the connector and wire harness so it rests against the front of the backshell.
8. Place the smooth side of the backshell strain relief clamp (7) across the cable bundle.
9. Attach with three 4-40 x 0.375" pan head screws (6).
10. Attach configuration module. Refer to section 4.5 and figure 4-4.
11. Attach the cover (8) to the backshell using two screws (9).
12. On the pan head screw(16) place in order:
 - a. Split washer (17)
 - b. Flat washer (18)
 - c. First ring terminal (15)
 - d. If necessary, second ring terminal
13. Insert the assembled pan head screw (16) into the tapped holes on the shield block (2).

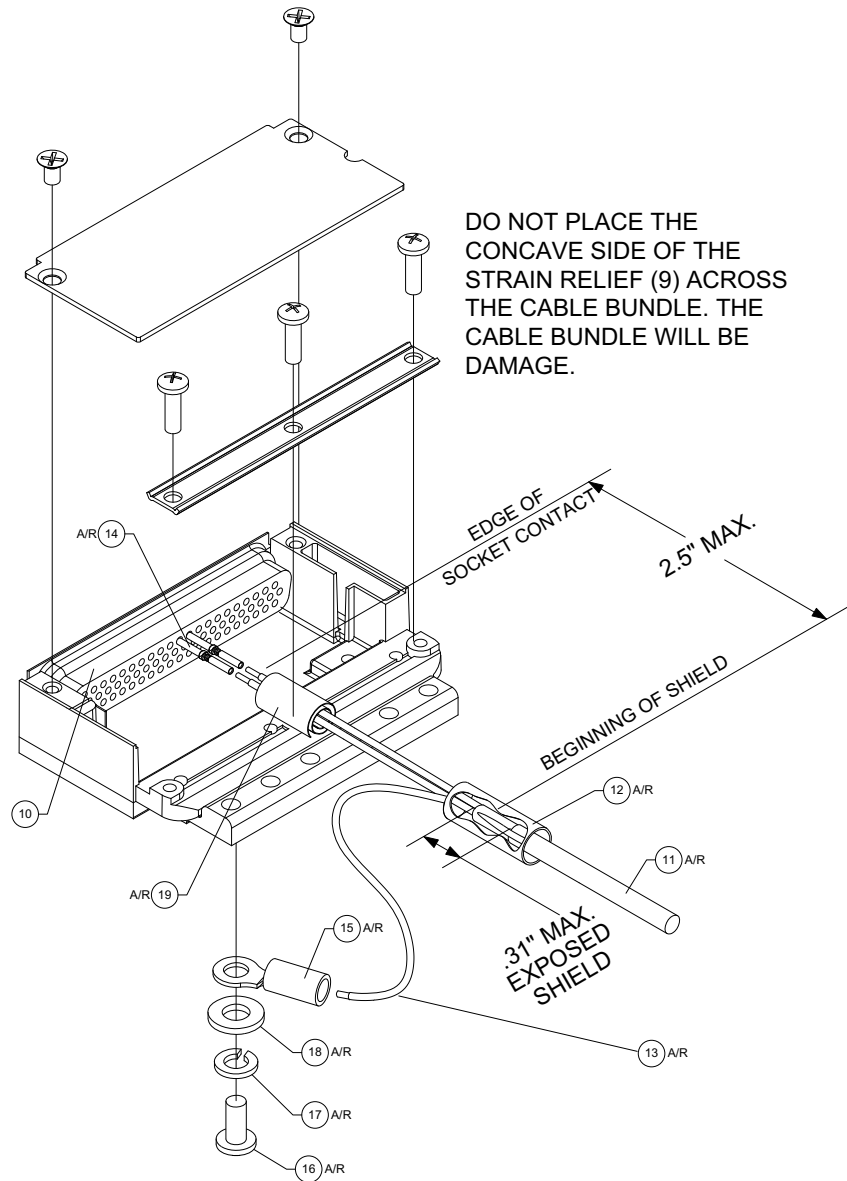


Figure 4-2 Shield Termination on Backshell Assembly

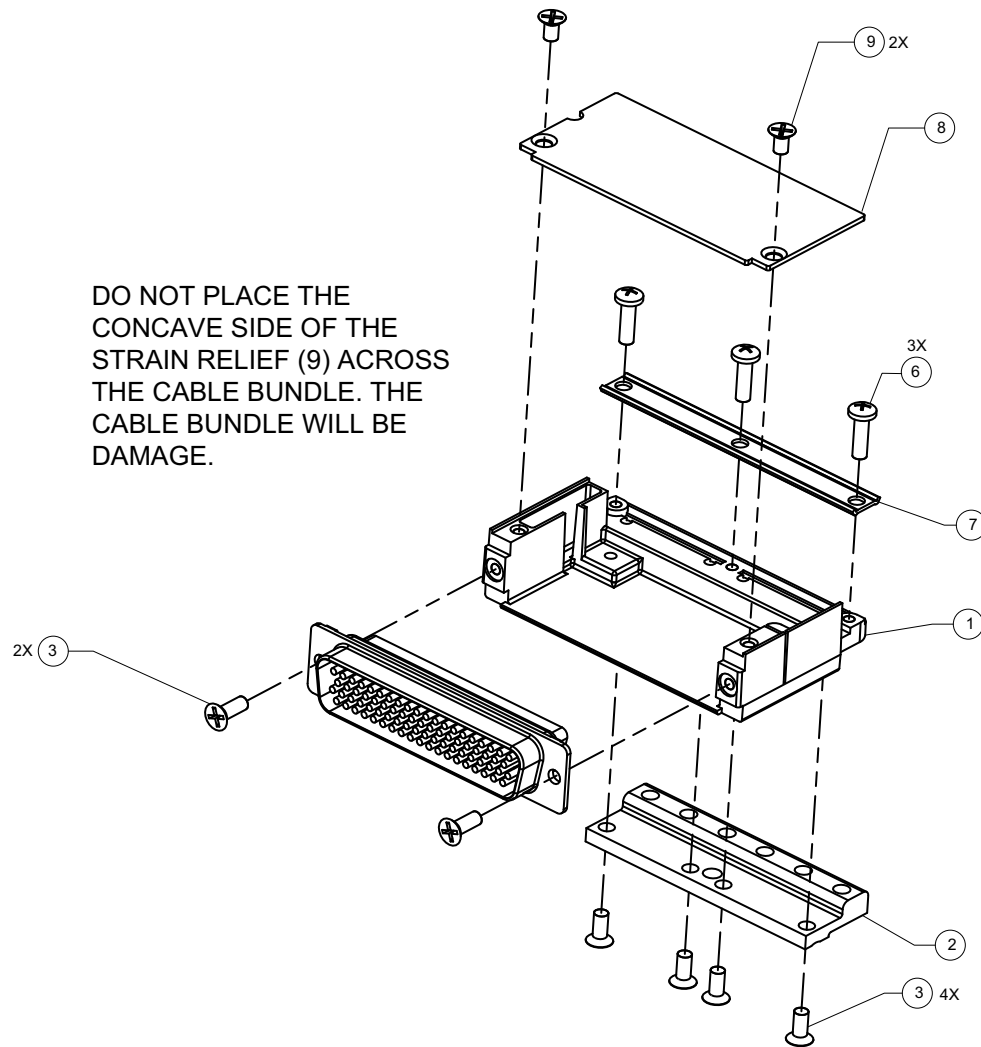


Figure 4-3 Connector and Backshell Assembly

4.5 Configuration Module Installation



NOTE

Installations with an optional GAE module do not require a configuration module.



NOTE

The configuration module stores unit configuration data. This lets the installer remove and replace the GTX without loss of configuration data. Installation of the module is part of the aircraft harness.

GTX 335 and GTX 345 standard kits include a configuration module. Garmin recommends to use the configuration module with these models, but it is not required.

Do not install the configuration module in the connector backshell when the GAE is installed on the connector backplate. The GAE module has a built-in configuration data storage device and interfaces to the GTX 3X5 through the same pins as the configuration module.

The GAE wire harness is routed out the back of the backshell and plugged into the GAE when the backplate is assembled. Refer to section 5.12 and figure B-11.

For this procedure refer to figure 4-4 and figure D-1.

1. Remove 0.17 inches of insulation from the end of each wire (2).
2. Crimp socket contacts (3) onto each wire of the four-conductor wire harness (2).
3. Insert crimped socket contacts (3) and wires (2) into the applicable connector housing location. Refer to figure D-1.
4. Plug the four-conductor wire harness (2) into the connector on the configuration module (1).
5. Insert configuration module (1) into the backshell recess.
6. Point the connector housing so the inserted four conductor wire harness (2) is on the same side of the backshell as the configuration module (1).

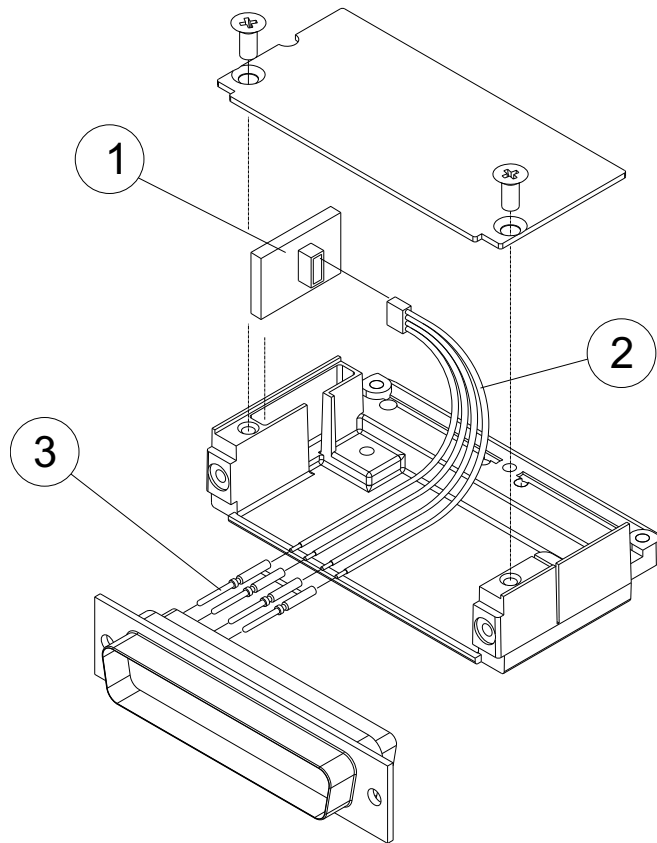


Figure 4-4 Configuration Module Installation

Table 4-2 Configuration Module Kit, P/N 011-00979-03

Figure 4-4	Description	Garmin P/N
1	Sub-assembly, potted configuration module, with EEPROM	011-02178-00
2	4-conductor harness	325-00122-00
3	Socket contact, crimp #22D	336-00021-01

4.6 Coax 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.

To install coaxial cables:

1. Route the cable to the radio rack location keeping in mind the recommendations of section 3.17.
2. Attach the cable in accordance with AC 43.13-1B chapter 11, section 11.
3. Trim the cable to the applicable length.
4. Install the connectors to the cable per the manufacturer's instructions.

4.7 Equipment Rack Installation

4.7.1 Panel Mount Units



CAUTION

EXERCISE CAUTION WHEN INSTALLING THE RACK IN THE INSTRUMENT PANEL. DEFORMATION OF THE RACK WILL MAKE IT DIFFICULT TO INSTALL AND REMOVE THE GTX 3X5.



NOTE

If the front lip of the mounting rack is behind the surface of the aircraft panel, the GTX 3X5 connectors may not fully engage. For more information refer to appendix B.



NOTE

Make sure no screw heads or other obstructions prevent the unit from fully engaging in the rack. For drawing dimensions necessary to prepare the cutouts for the GTX 3X5 unit, refer to figure B-9. For drilling the mounting holes, the GTX 3X5 mounting rack may be used as a template.



NOTE

Step 3 can be done before or after the wire harness is installed in the aircraft.

1. Install the rack in a rectangular hole (or gap between units) in the instrument panel, typically in the radio stack. The lower front lip of the rack should be flush with, or extend slightly beyond, the finished aircraft panel.
2. Use six #6-32 flat head screws and self-locking nuts to install the rack in the aircraft panel. The screws are inserted from the inside through holes in the sides of the rack.
3. Use provided screws to attach the connector(s) to the backplate.
4. Use two #4-40 flat head screws to attach the GAE to the backplate, if used. Refer to figure B-11.
5. Align the backplate so the backplate screw heads pass through the keyed holes in the back of the rack.
6. Connect the wire harness to the GAE, if used. Refer to figure B-9.
7. Slide the backplate to the left (viewing from the front of the unit) until an audible click is heard.
8. Attach the backplate by tightening the four #4-40 screws.

4.7.2 Standard Remote Mount Units

The GTX 3X5 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 3X5 unit with the dimension shown in figure B-4.

Attach the connectors and optional GAE, if used, to the connector backplate the same way as panel mount units. Refer to section 4.7.1.

4.7.3 Vertical Remote Mount Units

The GTX 3X5 vertical remote mount base is installed in the vertical orientation with six #10-32 100° flat-head screws and locking nuts. For mounting hole spacing dimensions refer to figure B-6. To mark or drill the mounting holes, the base may be used as a template.

To install the vertical mount shoe:

1. Point the wedge-shaped end of the vertical remote mount shoe to the back of the unit.
2. Attach the vertical remote mount shoe to the unit with the four screws provided.
3. Torque screws to 15-16 in-lbs.
4. Attach the connectors and optional GAE, if used, to the connector backplate the same way as panel mount units. Refer to section 4.7.1.

4.7.4 GX000 Integrated Flight Decks

The GTX 3X5 G1000 rack is mounted to the main system rack with the nutplate kit listed in section 3.4.2. At least eight screws are required to secure the rack as shown in figure B-7. Refer to *G1000 System Installation Manual*. Attach the connectors and optional GAE, if used, to the connector backplate the same way as panel mount units. Refer to section 4.7.1.

4.7.5 GAE Installation

1. Crimp pin contacts onto each wire of the four-conductor wire harness. Strip 0.17" of insulation from each wire prior to crimping.
2. Insert newly crimped pin contacts and wires into the correct locations in the connector housing.
3. Mount the GAE to the backplate using two countersunk screws as shown in figure 4-5.
4. Torque screws to 8 in-lbs.
5. Plug the four-conductor wire harness into the connector on the GAE. Refer to figure D-1.

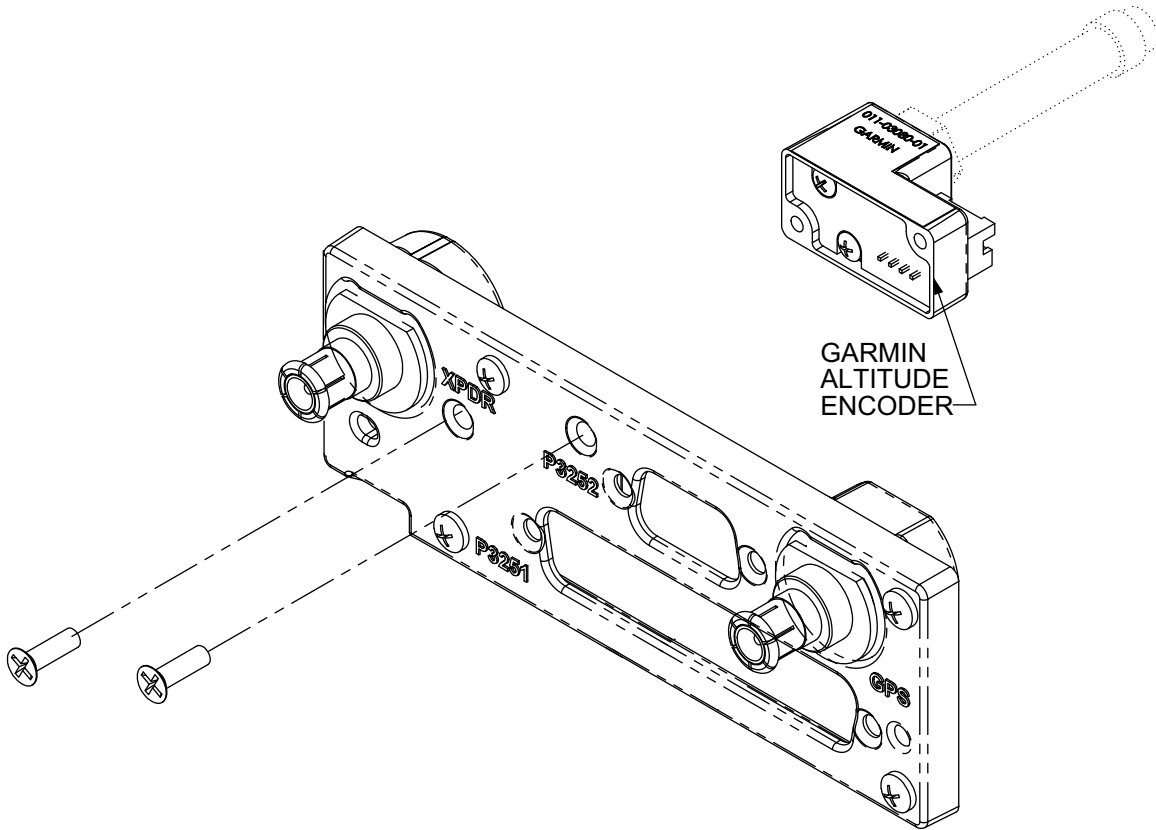


Figure 4-5 GAE Assembly

4.8 Panel and Standard Remote Mount 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 powers up. For configuration procedures refer to section 6.



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 bezel 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.

4.9 Vertical Remote Mount Unit Installation and Removal

**NOTE**

When a unit is installed make sure it successfully powers up. For configuration procedures refer to section 6.

**NOTE**

The connector backplate can be attached/detached before or after the installation/removal of the GTX 3X5 onto the base. Refer to figure B-5.

Insertion

1. Insert the toe of the GTX 3X5 shoe into the base at an angle.
2. Make sure the unit is fully engaged and in line with the base.
3. Rotate the GTX 3X5 down flat onto the base.
4. Rotate the base locking mechanism up and place the cup over the shoe.
5. Rotate the knob clockwise until tight.
6. Directly attach the connector backplate to the GTX 3X5 with two screws using a 3/32" hex tool.

Removal

1. On the base, pull the knob back.
2. Rotate knob counter-clockwise.
3. Remove the cup off of the shoe.
4. Lift the end of the GTX 3X5 from the base and remove the unit.
5. Detach the connector backplate from the GTX 3X5 with a 3/32" hex tool.

5 Connector Pinout Information

5.1	Main Board Connector - J3251	5-2
5.2	ADS-B Board Connector - J3252 (GTX 345 Only)	5-5
5.3	Power	5-6
5.3.1	Power Configuration and Control Inputs	5-6
5.4	Lighting Bus.....	5-7
5.5	Altitude Inputs.....	5-7
5.5.1	Pressure Sensor Module	5-7
5.5.2	Gray Code Altitude Input	5-8
5.6	Discrete I/O.....	5-8
5.7	Serial Data Interfaces	5-9
5.7.1	RS-232	5-9
5.7.2	ARINC 429	5-10
5.7.3	HSDB	5-10
5.7.4	RS-422	5-10
5.8	Suppression Bus.....	5-11
5.9	OAT Input.....	5-11
5.10	Audio Output	5-11
5.11	Time Mark	5-11
5.12	Configuration Module	5-12
5.13	USB Interface.....	5-12

5.1 Main Board Connector - J3251

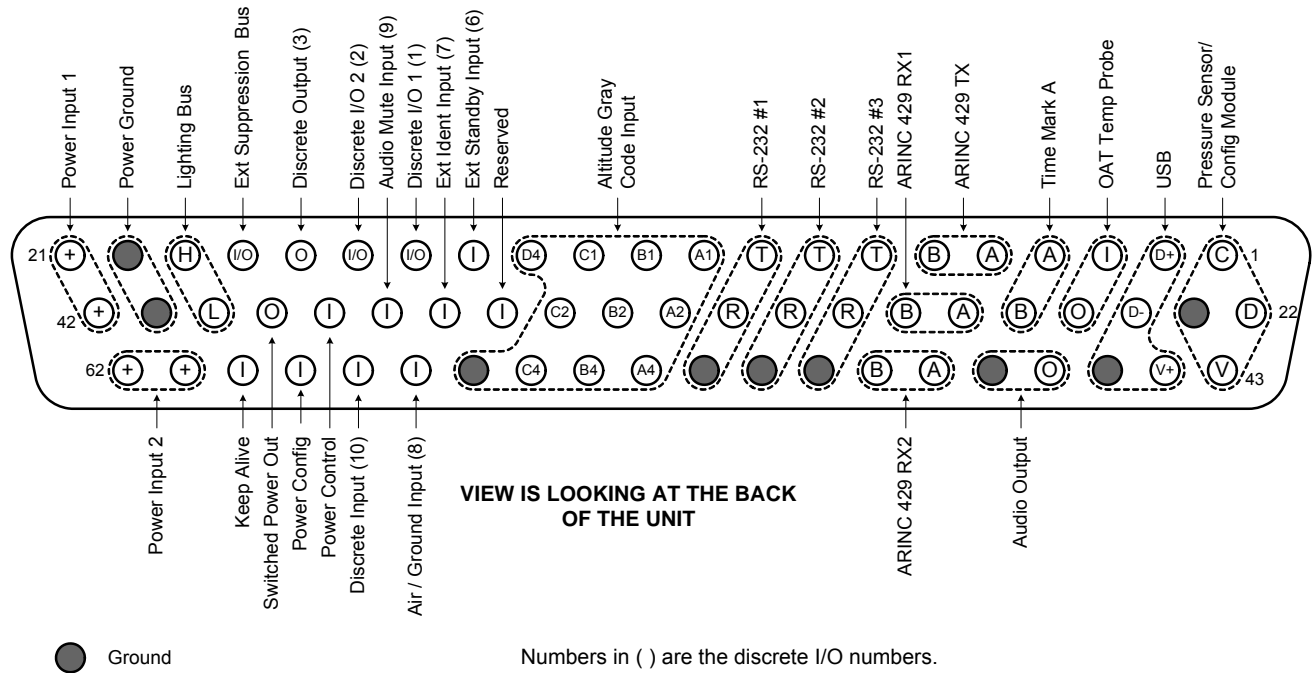


Table 5-1 J3251 Connector

Pin	Pin Name	I/O
1	ALT ENCODER/CONFIG MODULE CLOCK	I/O
2	USB DATA HI	I/O
3	TEMP PROBE IN	I
4	TIME MARK A	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	ALTITUDE A1* or CONFIGURABLE*	I
11	ALTITUDE B1* or CONFIGURABLE*	I
12	ALTITUDE C1* or CONFIGURABLE*	I
13	ALTITUDE D4* or CONFIGURABLE*	I
14	EXTERNAL STANDBY SELECT* or CONFIGURABLE*	I
15	CONFIGURABLE DISCRETE 1*	I/O
16	CONFIGURABLE DISCRETE 2*	I/O
17	XPDR FAIL 1* or CONFIGURABLE*	O
18	EXTERNAL SUPPRESSION	I/O

Pin	Pin Name	I/O
19	LIGHTING BUS HI	I
20	AIRCRAFT GROUND	I
21	AIRCRAFT POWER 1	I
22	ALT ENCODER/CONFIG MODULE DATA	I/O
23	ALT ENCODER/CONFIG MODULE GND	O
24	USB DATA LO	I/O
25	TEMP PROBE OUT	O
26	TIME MARK B	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	ALTITUDE A2* or CONFIGURABLE*	I
33	ALTITUDE B2* or CONFIGURABLE*	I
34	ALTITUDE C2* or CONFIGURABLE*	I
35	RESERVED	I
36	EXTERNAL IDENT SELECT* or CONFIGURABLE*	I
37	AUDIO INHIBIT 2* or CONFIGURABLE*	I
38	POWER CONTROL	I
39	SWITCHED POWER OUT	O
40	LIGHTING BUS LO	I
41	AIRCRAFT GROUND	--
42	AIRCRAFT POWER 1	I
43	ALT ENCODER/CONFIG MODULE POWER	O
44	USB VBUS POWER	I
45	USB GND	--
46	AUDIO OUT HI	O
47	AUDIO OUT LO	O
48	ARINC 429 IN 2A	I
49	ARINC 429 IN 2B	I
50	RS-232 GND 3	--
51	RS-232 GND 2	--

Pin	Pin Name	I/O
52	RS-232 GND 1	--
53	ALTITUDE A4* or CONFIGURABLE*	I
54	ALTITUDE B4* or CONFIGURABLE*	I
55	ALTITUDE C4* or CONFIGURABLE*	I
56	ALTITUDE GROUND	O
57	SQUAT SWITCH* or CONFIGURABLE*	I
58	AIR DATA SELECT* or CONFIGURABLE*	I
59	POWER CONFIG	I
60	GPS KEEP ALIVE	I
61	AIRCRAFT POWER 2	I
62	AIRCRAFT POWER 2	I

An asterisk (*) following a signal name denotes the signal is an Active-Low discret.

5.2 ADS-B Board Connector - J3252 (GTX 345 Only)

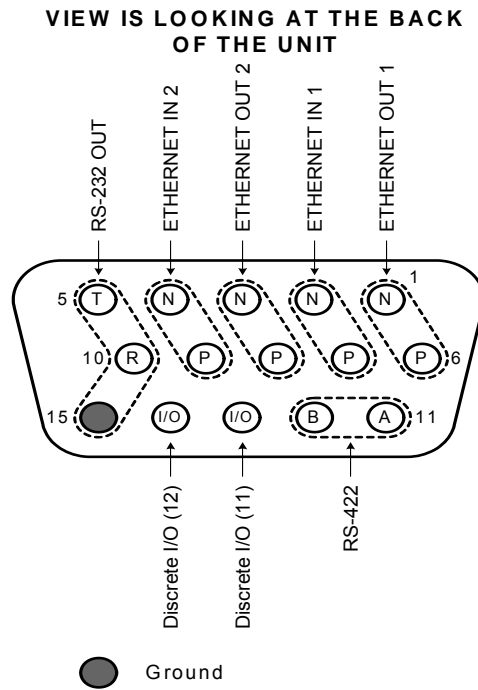


Table 5-2 J3252 Connector

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	CONFIGURABLE DISCRETE 11*	I/O
14	CONFIGURABLE DISCRETE 12*	I/O
15	RS-232 GND 4	--

An asterisk (*) following a signal name denotes the signal is an Active-Low discret.

5.3 Power

The GTX 3X5 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.

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	--
SWITCHED POWER OUT	P3251	39	O
GPS KEEP ALIVE [1]	P3251	60	I

[1] Applicable to the GTX 335 and GTX 345 with internal GPS only.

The SWITCHED POWER OUT pin is a switched power output source, typically used for powering devices such as a remote altitude encoder module. It is active when the GTX 3X5 power is on, and has a 1 ampere max rating.

On models with built-in GPS/SBAS, the GPS KEEP ALIVE input is optional. Continuous battery input power maintains the internal GPS clock and decreases initial GPS satellite acquisition time during system power-up.

5.3.1 Power Configuration and Control Inputs

The power control inputs are for remote power on/off and enabling the power auto on feature.

The POWER CONFIG input controls the remote on/off feature. The POWER CONFIG input connects to ground for remote unit installation. The input is left open for panel mount unit installation.

The POWER CONTROL connection controls the POWER CONTROL input. This is used as a remote power on/off control or to use the power auto on feature when the avionics master is turned on.

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	Unit Type	Description
Open	Open	Panel mount	Auto on disabled
Open	Ground	Panel mount	Auto on enabled
Ground	Open	Remote	Power off
Ground	Ground	Remote	Power on

5.4 Lighting Bus

The lighting bus input controls the front panel display and keypad brightness of panel mount units using the aircraft panel lighting bus. The GTX 3X5 can also be configured to adjust the display and keypad brightness for ambient lighting conditions using an internal photo sensor.

The lighting bus input is configured for 5 VDC, 14 VDC, 28 VDC, or 5 VAC inputs.

Use both the LIGHTING BUS HI and LIGHTING BUS LO inputs to connect the lighting bus input to a 5 VAC bus.

Use the LIGHTING BUS HI input to connect the light bus input to a DC input. The return is the unit ground connection. LIGHTING BUS LO should be left open.

Table 5-6 Lighting Bus Pins

Pin Name	Connector	Pin	I/O
LIGHTING BUS HI	P3251	19	I
LIGHTING BUS LO	P3251	40	I

5.5 Altitude Inputs

The GTX 3X5 uses pressure altitude inputs from several different sources:

- Gray code inputs
- RS-232 serial inputs
- ARINC 429 inputs
- The optional GAE module (Garmin P/N 011-03080-00)
- HSDB

For altitude source priorities refer to section 3.10. With the proper encoder, the Mode S transponder transmits altitude reporting in 25-foot resolution to ground stations and other aircraft. The unit must receive altitude from an applicable altitude reporting device or from the optional GAE module. A parallel Gray code encoder provides altitude in 100 foot resolution.

For altitude encoders that supply both a serial interface and the parallel Gray code input, such as the GAE 43 (P/N 013-00066-00), connect one or the other interfaces, but not both. The serial interface is preferred.

5.5.1 Pressure Sensor Module

The optional GAE module (Garmin P/N 011-03080-00) is used for the GTX 3X5 pressure altitude input. It uses the same interface as the configuration module and also includes the configuration module functionality.

5.5.2 Gray Code Altitude Input

The GTX 3X5 accepts ten Gray code altitude discrete inputs.

The Gray code inputs are pulled down for active, or open for inactive.

The GTX 3X5 includes internal isolation diodes on the Gray code inputs to prevent the unit from pulling the encoder lines to ground when the transponder is turned off.

Table 5-7 Altitude Inputs

Pin Name	Connector	Pin	I/O
ALTITUDE A1* or CONFIGURABLE*	P3251	10	I
ALTITUDE A2* or CONFIGURABLE*	P3251	32	I
ALTITUDE A4* or CONFIGURABLE*	P3251	53	I
ALTITUDE B1* or CONFIGURABLE*	P3251	11	I
ALTITUDE B2* or CONFIGURABLE*	P3251	33	I
ALTITUDE B4* or CONFIGURABLE*	P3251	54	I
ALTITUDE C1* or CONFIGURABLE*	P3251	12	I
ALTITUDE C2* or CONFIGURABLE*	P3251	34	I
ALTITUDE C4* or CONFIGURABLE*	P3251	55	I
ALTITUDE D4* or CONFIGURABLE*	P3251	13	I
ALTITUDE GROUND	P3251	56	O

5.6 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.

The GTX 3X5 has discrete outputs that are configurable. Each is an open drain output capable of sinking 250 milliamp when active. For discrete input and output configuration refer to table 6-7 and table 6-8.

Table 5-8 Discrete Inputs and Outputs

Pin Name	Connector	Pin	I/O
EXTERNAL STANDBY SELECT* or CONFIGURABLE*	P3251	14	I
XPDR FAIL 1* or CONFIGURABLE*	P3251	17	O
EXTERNAL IDENT SELECT* or CONFIGURABLE*	P3251	36	I
AUDIO INHIBIT 2* or CONFIGURABLE*	P3251	37	I
SQUAT SWITCH* or CONFIGURABLE*	P3251	57	I
AIR DATA SELECT* or CONFIGURABLE*	P3251	58	I
CONFIGURABLE DISCRETE 1*	P3251	15	I/O
CONFIGURABLE DISCRETE 2 *	P3251	16	I/O
CONFIGURABLE DISCRETE 11*	P3252	13	I/O
CONFIGURABLE DISCRETE 12*	P3252	14	I/O

5.7 Serial Data Interfaces

5.7.1 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. The RS-232 inputs and outputs can be configured for different functions depending on the installation. Refer to section 6.5. Pins P3252-5, -10, and -15 are on the GTX 345 only.

Table 5-9 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

5.7.2 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 can be configured for different functions depending on the installation. Refer to section 6.5.

Table 5-10 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

5.7.3 HSDB

Table 5-11 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

5.7.4 RS-422

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

Table 5-12 RS-422 Outputs

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

5.8 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 3X5 transmits. When driven by another source, the GTX 3X5 transponder receiver and transmitter functions will be suppressed.

The EXTERNAL SUPPRESSION output is driven to ≥ 18 VDC when the GTX 3X5 transmits. An input voltage of ≥ 10 VDC will suppress the GTX 3X5.

Table 5-13 External Suppression Bus Pin

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

5.9 OAT Input

The GTX 3X5 includes an OAT input, used for OAT and density altitude displays.

TEMP PROBE IN uses a current sensor type probe, such as the EDMO P/N 655-PROBE or the Davtron P/N C307PS. The temperature input specification is 1 microamp per degree Kelvin ($1\mu A/^{\circ}K$). Connect the probe positive wire to pin 25 and negative wire to pin 3. For wire designations refer to the manufacturer's specifications.

Table 5-14 OAT Input and Output

Pin Name	Connector	Pin	I/O
TEMP PROBE OUT	P3251	25	O
TEMP PROBE IN	P3251	3	I

5.10 Audio Output

The audio output is used to provide aural traffic alerts. The output is capable of 100 mW into a 500 ohm load.

Table 5-15 Audio Inputs and Outputs

Pin Name	Connector	Pin	I/O
AUDIO OUT HI	P3251	46	O
AUDIO OUT LO	P3251	47	O

5.11 Time Mark

Table 5-16 Time Mark Outputs

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

With either a GTX 335 or GTX 345 with internal GPS, the TIME MARK can be used as an output to provide 1PPS to other equipment in the aircraft.

5.12 Configuration Module

The configuration module interface is used for connection to either a configuration module or an optional GAE module.

The configuration and GAE module kits include a wire harness for connection to the GTX 3X5 D-sub connector. Connect using The wire colors are shown in table 5-17.

The configuration module stores the specified aircraft installation configuration settings.

The optional GAE module is used to provide the pressure altitude for the transponder. The GAE module also includes configuration memory function to store the installation configuration. When used, A separate configuration module is not necessary.

Table 5-17 Configuration Module Inputs and Outputs

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

5.13 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.

Only use the USB interface for unit configuration, software updates, and service while the aircraft is on the ground. Do not use during normal operation or when airborne.

Table 5-18 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

6 Post Installation Configuration & Checkout

6.1	System Configuration Overview	6-1
6.2	Mounting, Wiring, and Power Checks.....	6-1
6.3	Configuration Mode and Settings	6-2
6.4	Audio Settings.....	6-3
6.5	Interfaces.....	6-5
6.6	Unit Settings.....	6-14
6.7	Display Pages.....	6-17
6.8	Sensors.....	6-21
6.9	ADSB.....	6-27
6.10	Diagnostics.....	6-32
6.11	Remote Unit Configuration.....	6-33
6.12	Ground Check - GPS Reception Check.....	6-33
6.13	Ground Check - Transponder.....	6-34
6.14	Software Installation Procedure.....	6-34

6.1 System Configuration Overview

The required GTX 3X5 configuration and checkout procedures are as follows:

1. Complete the installation checks.
2. Configure the GTX 3X5 for the specified installation.
3. Complete ground checks to make sure it interfaces to external equipment.

For additional checkout procedures, refer to *GTX 3X5 Mode A/C Lock Enablement Guide*.

6.2 Mounting, Wiring, and Power Checks



CAUTION

MAKE SURE ALL LIGHTING BUSES ARE TURNED TO THEIR LOWEST ADJUSTMENT BEFORE APPLYING POWER TO THE UNIT. THE LOWEST ADJUSTMENT PREVENTS DAMAGE TO THE UNIT IF THERE ARE ANY WIRING ERRORS.

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:

1. All cables are properly attached.
2. Shields are connected to connector shield blocks.
3. Movement of the flight and engine controls through the full range of motion do not touch cabling and control systems.
4. Wire is installed as described in section 3.17.

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

1. Power and ground checks.
2. Faults and discrepancies are corrected.
3. Installation rack is correctly attached.
4. Unit is correctly seated in the installation rack.

6.3 Configuration Mode and Settings



NOTE

Screenshots are for illustrative purposes only. They do not imply the shown setting(s) should be used in any installation.

System and interface settings are shown in configuration mode and are unique to the GTX 3X5 installation. The configuration settings are stored in internal memory. If connected, the configuration module stores configuration settings. The optional GAE module operates as a configuration module. In this section, configuration instructions are for panel mount units. To configure remote units refer to section 6.11.

To enter configuration mode on a panel mount unit, push and hold **ENT** and apply power.

- Push and hold **OFF** until the unit powers off to exit configuration mode.
- Push **FUNC** to cycle through the group pages.
- Push **8** or **9** to scroll up or down on the page without an active field selected.
- Push **CRSR** to access items on the page.
- Push **8** or **9** to cycle through the selections of an item on the page.
- Push **ENT** to move within the page with a field highlighted or to accept setting.
- Push **CLR** to move to previous selection on the page.
- Push **FUNC** to exit the page.

6.4 Audio Settings

Configures the audio output, volume, and alert types.

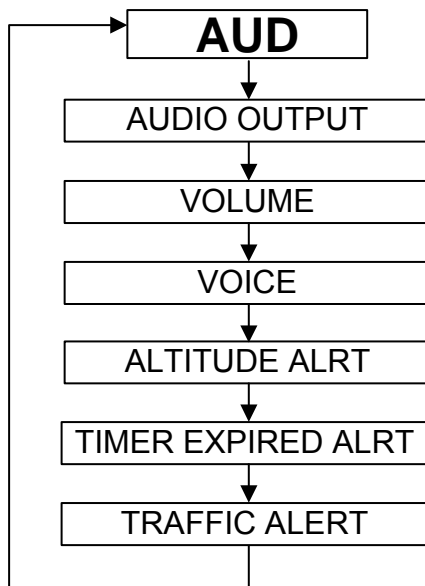


Figure 6-1 Audio Group

Audio Output

To use the audio output of the transponder, select XPDR. If installing a GTX 345 in a GX000 system, select HSDB.

Volume

To raise the volume of the transponder audio, push **8**. To lower the volume, push **9**. The range is 0 to 100.

Voice

Set the voice type to MALE or FEMALE.

Test Audio

The test audio files are used to set the volume level of the transponder. Selections are:

- NONE
- TONE
- MSG 1
- MSG 2
- MSG 3

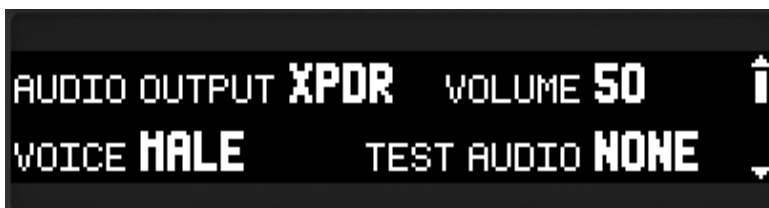


Figure 6-2 Audio Page

Altitude Alrt (Panel Mount Units Only)

Configures altitude alerting type. Selections are:

- OFF
- MESSAGE
- MSG W/CHIME (GTX 335 ONLY)

Timer Expired Alrt (Panel Mount Units Only)

Configures timer expired alert type. Selections are:

- OFF
- MESSAGE
- MSG W/CHIME



Figure 6-3 Audio Page 2

Traffic Alert



NOTE

A chime is heard if the GTX 335 is configured for TIS-A traffic alerts.

Configures the traffic alerting type. Selections are:

- OFF
- MESSAGE
- MSG W/CHIME (GTX 335 ONLY)



Figure 6-4 Audio Page 3

6.5 Interfaces

Configures inputs and outputs of RS-232, ARINC 429, discretes, and HSDB interfaces.

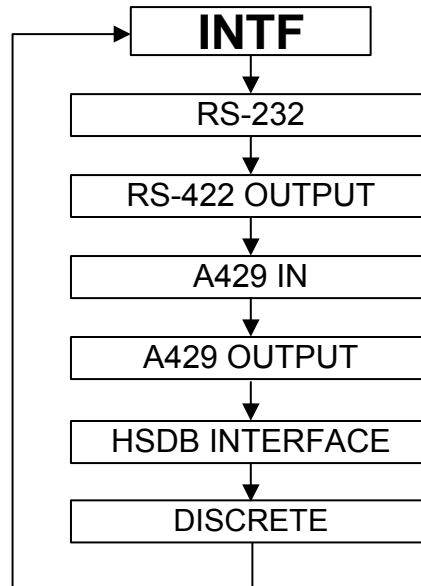


Figure 6-5 Interface Group

RS-232 - Channel 1 through Channel 3

Configures the input and output format for channel 1, channel 2, and channel 3 of RS-232 interfaces. For data format information refer to appendix A.

Table 6-1 RS-232 Channel 1 through Channel 3 Selections

Input/Output	Selection	Description	Unit Applicability	Notes
Input/Output	Off	No information is received or transmitted.	All	
Input/Output	XPDR FMT 1	Supports transponder interface to GX000.	All	
Input/Output	XPDR FMT 2	Supports transponder interface and TIS-A traffic to GX000.	GTX 335 only	
Input or Output	ADS-B+ FMT 1	Receives or transmits necessary ADS-B GPS data at 9600 baud.	All	[1]
Input or Output	ADS-B+ FMT 2	Receives or transmits necessary ADS-B GPS data at 38400 baud.	All	[1]
Input/Output	REMOTE FMT 1	Supports transponder interface to GTN, GNS 480 (CNX80), and G1000 NXi.	All	
Input/Output	REMOTE FMT 2	Supports transponder interface and TIS traffic to GTN, GNS 480 (CNX80), and G1000 NXi.	GTX 335 only	
Input/Output	GDL	Supports GDL 88 interface	All	[2]
Input/Output	GNS	Supports GNS 400W/500W Series ADS-B In weather (GTX 345 only). Traffic is supported over ARINC 429. Supplies GPS and HAT data.	GTX 345	[1]
			All	[4]
Input/Output	CONNEXT FMT 1	Supports G3X for ADS-B In weather and traffic.	GTX 345 only	
Input	CONNEXT FMT 3	Supports input from a Flight Stream 110/210.	GTX 345 only	
Input	ALT FMT 1 25ft	Supports Sandia/Icarus/ACK altitude format with 25 ft or lower encoding.	All	
Input	ALT FMT 1 100ft	Supports Sandia/Icarus/ACK altitude format with a parallel Gray source or 100 ft encoding.	All	
Input	ALT FMT 3 25ft	Supports Shadin altitude format with 25 ft or lower encoding.	All	
Input	ALT FMT 3 100ft	Supports Shadin altitude format with a parallel Gray code source or 100 ft encoding.	All	
Input	ADC FMT 1	Supports Shadin G/S/Z ADC formats.	All	
Input/Output	LGCY REMOTE 1	Supports transponder interface to G1000.	All	
Input/Output	LGCY REMOTE 2	Supports transponder interface and TIS-A traffic to G1000.	GTX 335 only	

Input/Output	Selection	Description	Unit Applicability	Notes
Output	ALT FMT 1	Transmits pressure altitude in 1 to 100 ft resolution depending on the source of the data.	All	
Output	TIS-A OUT FMT	Transmits TIS-A traffic for non-certified displays: GPSMAP 396/496/695/696, G3X, G300.	GTX 335 only	
Output	LGCY TRAFFIC	Supports GDL 90 traffic interface to G1000.	GTX 345 only	
Output	MAPMX	Supports Garmin AHRS units.	All	[1] [3]
Input	AVIATION FMT 2	Provides internal GPS data to the GTR.	All	[5]

[1] Output available only on GTX 335 with GPS and GTX 345 with GPS.

[2] Not supported by GDL 88 software v3.32 and earlier.

[3] Available in software v2.10 and later.

[4] Only available in software v2.11 and later.

[5] Only available in software v2.12 and later.

RS-232 - Channel 4 (GTX 345 Only)

Configures the input and output format for channel 4 of RS-232 interfaces. For data format information, refer to appendix A.

Table 6-2 RS-232 Channel 4 Selections

Input/Output	Selection	Description
Input/Output	OFF	Information is not received or transmitted.
Input/Output	GNS	Supports GNS 400W/500W Series ADS-B In weather. Traffic is supported over ARINC 429. Supplies GPS information.
Input/Output	CONNEXT FMT 1	Supports G3X for ADS-B In weather and traffic.
Input	CONNEXT FMT 3	Supports input from Flight Stream 110/210.
Input/Output	TRAFFIC FMT 4	Supports Ryan TCAD.
Output	LGCY TRAFFIC	Supports GDL 90 enhanced traffic interface to G1000.



Figure 6-6 RS-232 Interface Page

RS-422 Output (GTX 345 Only)

RS-422 supports ADS-B In traffic and weather to the GMX 200 and MX20. Either format also provides weather to a G1000 installation.

Table 6-3 RS-422 Selections

Channel	Input/Output	Selection	Description	Notes
RS-422	Output	OFF	Information is not transmitted.	
		CONNEXT FMT 3	Supports output to Flight Stream 210.	
		MX FMT 1	Supports GMX 200.	
		MX FMT 2	Supports MX20.	
		OPT LGCY ADSB	Supports third-party display of ADS-B In information.	[1]

[1] Supported with software v2.05 or later.



Figure 6-7 RS-422 Output Page

A429 In

Table 6-4 ARINC 429 Inputs

Channel/Speed	Format	Description	Notes
CH1/CH2 High/Low	OFF	Information is not received.	
	AHRS	Receives heading, roll, pitch, and yaw information from systems with AHRS.	
	ADC	Receives altitude, airspeed, and altitude rate information from air data systems.	
	ARINC 743A	Receives GPS information from ARINC 743A.	
	EFIS AIR DATA	Receives altitude, airspeed, altitude rate, and heading information from EFIS and ADC systems.	
	FLIGHT CONTROL	Receives selected altitude, barometric setting, and non-standard pitch discrete data for Bendix King KFC 225.	
	HEADING	Receives heading information.	
	RADIO ALTITUDE	Receives radar altitude information.	
	TRAFFIC 1	Receives traffic information from Garmin GTS 800, GTS 820, and GTS 850 systems.	[1]
	TRAFFIC 2	Receives traffic information from L-3 Comm SKY497 Skywatch and SKY899 Skywatch HP.	[1]
	TRAFFIC 5	Receives traffic information from KTA 870 (KTA 810), KTA 970 (KTA 910), KMH 880 (KMH 820), and KMH 980 (KMH 920).	[1]

[1] Applicable to GTX 345 only.

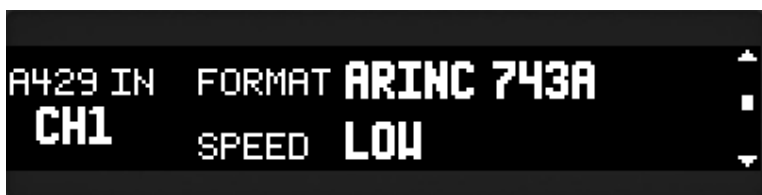


Figure 6-8 A429 In Page

A429 Output

Table 6-5 ARINC 429 Outputs

Format	Description	Notes
OFF	Information is not transmitted.	
FORMAT 1	Transponder Control Format 1	[1]
FORMAT 2	Garmin	
FORMAT 3	Garmin + Transponder Control Format 1	[1] [2]
FORMAT 4	Garmin TAS and GPS data	[3]
FORMAT 5	Garmin concentrator, Garmin TAS, and GPS data	[3]
FORMAT 6	Transponder Control Format 1 + Garmin TAS + GPS Data	[3]
FORMAT 7	Garmin + Transponder Control Format 1 + Garmin TAS + GPS Data	[2] [3]
FORMAT 8	Garmin TIS-A	[3]
FORMAT 9	Garmin concentrator and Garmin TIS-A	[3]
FORMAT 10	Transponder Control Format 2	[3]
FORMAT 11	Transponder Control Format 1 + Garmin TIS-A	[3] [5]
FORMAT 12	Transponder Control Format 1 + Garmin + Garmin TIS-A	[3] [5]
FORMAT 13	Transponder Control Format 1 + Traffic Output	[3] [6]
TRAFFIC	ADS-B traffic output for GNS 400W/500W Series units	[4]

[1] Supported by the GTX 335/345 only.

[2] When Garmin and Transponder Control Format 1 output formats are combined, the Garmin format is used.

[3] Supported by the GTX 335 only.

[4] Supported by the GTX 345 only.

[5] When Garmin TIS-A and Transponder Control Format 1 outputs are combined, the Garmin TIS-A format is used.

[6] When Transponder Control Format 1 and Traffic Output outputs are combined, the Traffic Output format is used.



Figure 6-9 A429 Output Page

HSDB Interface (GTX 345 Only)

Configures the presence of specified HSDB devices interfaced to the GTX 345. Selections are YES, NO.

Table 6-6 HSDB Formats

Interface	Description
G500/G600	Controls HSDB communication with the GDU 620, GTN 6XX/7XX, GTS 8X5, and GX000.
GTN	
GTS	
GX000	
Indirect A429 TCAS	The GTX receives traffic inputs from the GIA instead of TAS/TCAS in GX000 installations where TAS/TCAS is connected to a GIA, This interface is not shown on the display.



Figure 6-10 HSDB Interface Page

Discrete In

For pinout information, refer to section 5.



NOTE

The source priority is based upon the selections made during configuration. Refer to section 3.10.

Table 6-7 Discrete Inputs

Function	Selection	Description
AUD MUTE	All discrete inputs	The audio output will be muted until the discrete is opened. This is connected to a higher priority audio such as TAWS.
AUD CNCL	Off P3251-37	When this discrete is grounded by a momentary switch, audio alerts are canceled.
IDENT	Off P3251-36	When this discrete is grounded by a momentary switch, the SPI activates.
STANDBY	Off P3251-14	When this discrete is grounded, the unit will go into standby mode. Ensure standby select is not configured if a transponder control format (remote or transponder formats) is used to control the transponder.
SQUAT	Off P3251-57	This input determines the on-ground status of the aircraft. It is active low, and a ground on this input can be configured to mean On Ground or In Air.
AIR DATA	Off P3251-58	Switches between two ARINC 429 ADC sources or two EFIS ADC sources. Source 1 and 2 are set during configuration. Source 1 is used when the discrete is open and Source 2 is used when the discrete is grounded.
ALT DATA	All discrete inputs	Selects between two pressure altitude sources.
ID SLCT	All discrete inputs on main board (P3251)	Selects the system ID and overrides configuration setting. GTX 1 system ID is selected when this discrete is open. GTX 2 system ID is selected when the discrete is grounded.
GILLHAM	On, Off	Activates all ten Gillham/Gray code inputs. If set to OFF, the input pins are available for configuration to other discrete input functions.
TIS-A (GTX 335 Only)	All discrete inputs	When this discrete is momentarily grounded, TIS-A will toggle between operate/standby.



Figure 6-11 Discrete In Page

Discrete Out

Table 6-8 Discrete Outputs

Function	Pin Selection	Description	Notes
ALT ALERT	Off All discrete outputs on P3251 or P3252	When this discrete is grounded, it indicates a deviation from the preset altitude setting.	
FAIL 1	Off P3251-17	Failure of transponder causes discrete to ground.	
FAIL 2	Off All discrete outputs on P3251 or P3252	Failure of transponder causes discrete to open.	
RPLY ACTV	Off All discrete outputs on P3251 or P3252	Discrete grounds when transponder sends replies to interrogations.	
EQUIP STS	Off All discrete outputs on P3251 or P3252	If the unit needs service soon, this discrete will switch between open and ground for the first 30 seconds after power up. If after 30 seconds, there is no detection of ADS-B In/Out failures the discrete opens. The discrete will ground if any ADS-B In/Out failures are detected after 30 seconds.	
TRFC STBY	Off All discrete outputs on P3251 or P3252	Commands TAS/TCAS standby/operate. Discrete output operation automatically sets through TAS/TCAS input configuration. GTX 345 only.	
TRFC TEST	Off All discrete outputs on P3251 or P3252	Commands TAS/TCAS into test mode. GTX 345 only.	
TRFC ALRT	Off All discrete outputs on P3251 or P3252	When a traffic alert is active, this discrete will ground. GTX 345 only.	
TCAD SL	Off All discrete outputs on P3251 or P3252	Supports automatic control and integration with Ryan TCAD and Avidyne TAS600 Series traffic systems. GTX 345 only.	
XPDR ACTV	Off All discrettes outputs on P3251	Discrete grounds when transponder is not in standby.	[1]
ADS-B OUT	Off All discrete outputs on P3251 or P3252	Discrete grounds when ADS-B Out is on and the unit does not have a valid GPS position.	[1]

[1] Available in system software v2.10 or later.



Figure 6-12 Discrete Out Page

6.6 Unit Settings

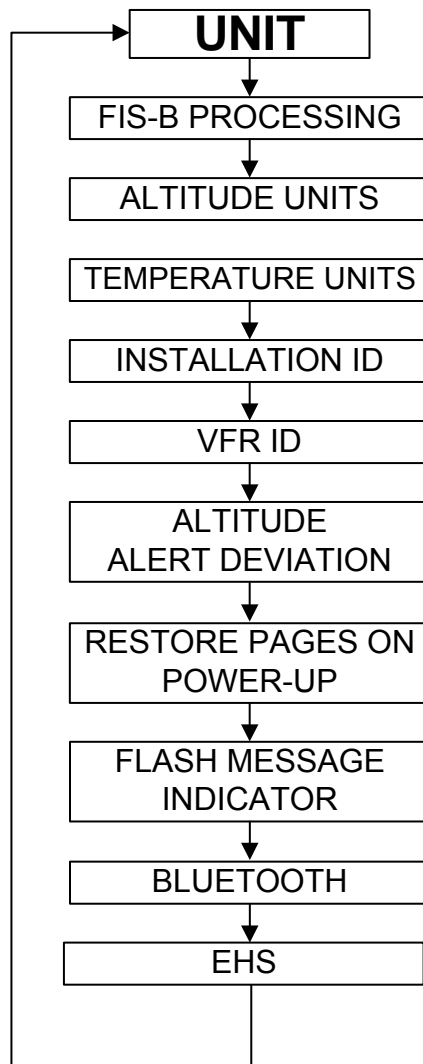


Figure 6-13 Unit Group

FIS-B Processing (GTX 345 Only)

To receive ADS-B weather data, select ENABLED.



Figure 6-14 FIS-B Processing Page

Altitude Units (Panel Mount Units Only)

Configures pressure and density altitude units. Selections are:

- FLIGHT LVL
- FEET
- METERS

Temperature Units (Panel Mount Units Only)

Configures temperature display units. Selections are:

- CELSIUS
- FAHRENHEIT



Figure 6-15 Altitude and Temperature Units Page

Installation ID



NOTE

The Installation ID Select discrete overwrites the configuration setting.

Selects the ID number for the transponder. Set the Installation ID to 1 in single installations. Set the primary transponder Installation ID to 1, and the secondary transponder to 2 in dual installations.

VFR ID

Configures the VFR squawk code for your country. Range in octal is 0000-7777.

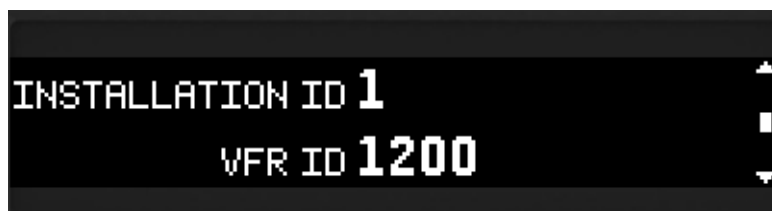


Figure 6-16 Installation and VFR ID Page

Altitude Alert Deviation (Panel Mount Units Only)

This field determines the amount of altitude difference from selected altitude to generate an altitude alert. Range is 200 ft to 999 ft.

Restore Pages On Power-up (Panel Mount Units Only)

To save the selected pages set in normal operating mode as the new default page settings next time the unit is power up, select YES.



Figure 6-17 Altitude Alert Deviation and Restore Page

Flash Message Indicator (Panel Mount Units Only - Software v2.05 and Later)

To have “MSG” flash when a new alert occurs, select YES. If No is selected, the MSG indicator is visible when an alert is active but does not flash.



Figure 6-18 Flash Message Indicator Page

Bluetooth (GTX 345 Only)

To transmit information to a PED using Bluetooth, select ENABLED.



Figure 6-19 Bluetooth Page

Enhanced Surveillance

Enhanced surveillance provides additional data available for interrogation by ground stations. To enable replies with additional data, select ENABLED.



Figure 6-20 EHS Page

6.7 Display Pages



NOTE

Make sure the brightness levels match the lighting levels of other equipment in the panel under night conditions.

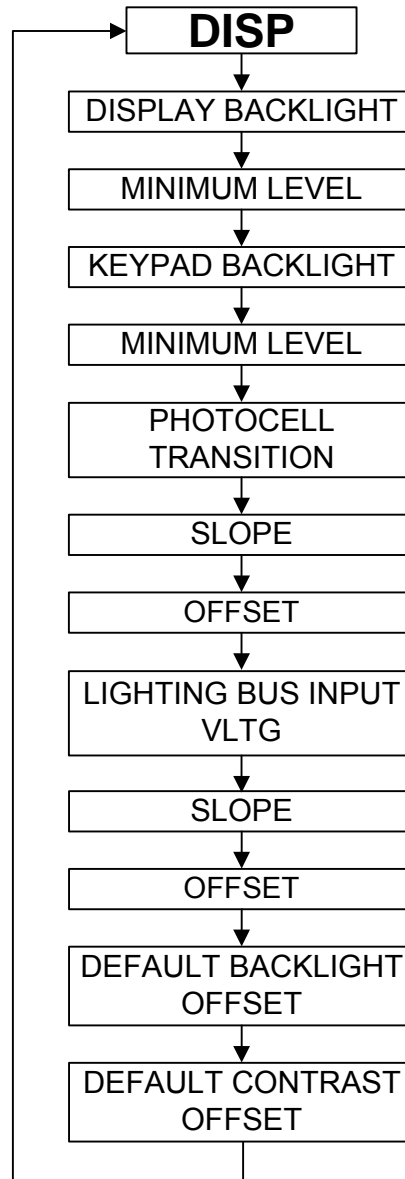


Figure 6-21 Display Group

Display Backlight

Configures the source for the display backlight control and adjustment. Select PHOTOCELL if the lighting level uses ambient lighting. Select LIGHTING BUS if an input from the lighting bus is used to dim the display.

Minimum Level

Configures the minimum brightness of the display. The range is 0 to 100. The higher the number, the brighter the minimum brightness.



Figure 6-22 Display Backlight and Minimum Level Page

Keypad Backlight

Configures the source for the keypad backlight control and adjustment. Select PHOTOCELL if the lighting level uses ambient lighting. Select LIGHTING BUS if an input from the lighting bus is used to dim the keypad.

Minimum Level

Configures the minimum brightness of the keypad. The range is 0 to 100. The higher the number, the brighter the minimum brightness.

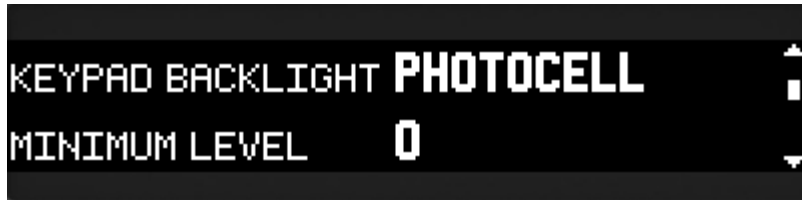


Figure 6-23 Keypad Backlight and Minimum Level Page

Photocell Transition

Configures a point on the lighting bus. When the lighting bus is below this point, the GTX 3X5 uses the photocell to adjust the display brightness. The range is 5 to 50.

Photocell Slope

Configures the sensitivity of the photocell input level. Adjusting the slope higher results in a greater display brightness change for a given increase in the photocell input level. The range is 0 to 100.

Offset

Adjusts the lighting level up or down for any given photocell input level. This field has a range of 0 to 100. Use the offset setting to match lighting curves with other equipment in the panel.

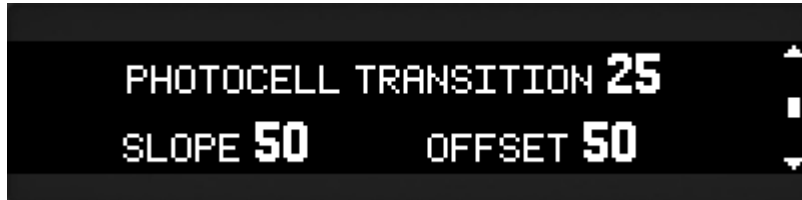


Figure 6-24 Photocell Transition, Slope, and Offset Page

Lighting Bus Input Vltg

Configures the voltage of the lighting bus source. Selections are:

- 14 VDC
- 28 VDC
- 5 VDC
- 5 VAC

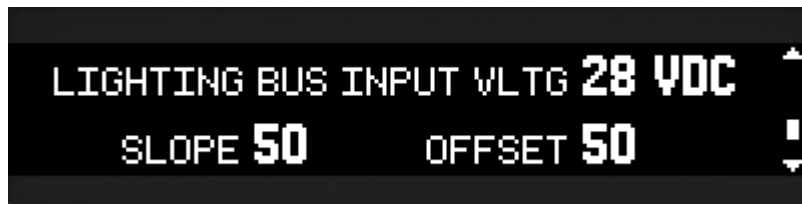


Figure 6-25 Lighting Bus Input Voltage Page

Display and Bezel Key Lighting Slope

Configures the sensitivity of the display or bezel keys for any given lighting bus input level. Set the slope higher for a brighter display for a given increase in the lighting bus input level. This field has a range of 0 to 100.

Display and Bezel Key Offset

Configures the lighting level up or down for any given lighting bus input level. This field has a range of 0 to 100. Use the offset setting to match lighting curves with other equipment in the panel.

Default Backlight Offset

Manually configures the default backlight offset value from -10 to 99.

Default Contrast Offset

Manually configures the default contrast offset value from -50 to 50.



Figure 6-26 Default Backlight and Contrast Offset Page

6.8 Sensors

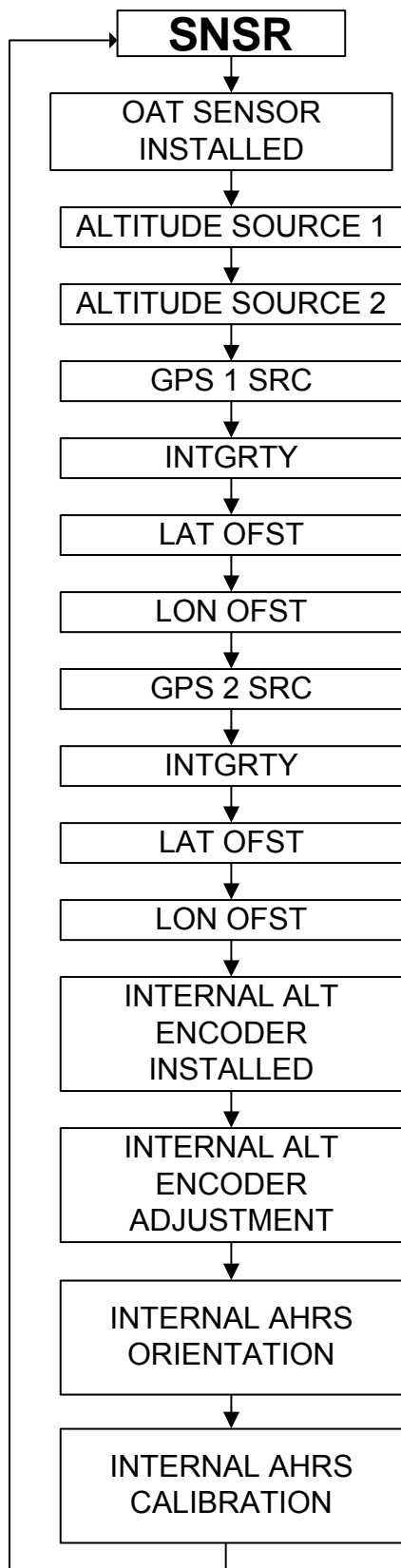


Figure 6-27 Sensor Group

OAT Sensor Installed

Select YES if an OAT sensor is installed.

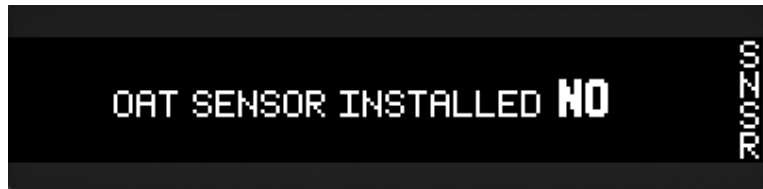


Figure 6-28 Sensor Page

Altitude Source 1



NOTE

Altitude sources do not need to be set. The GTX 3X5 uses both altitude sources if set. The GTX uses any altitude source in priority order if no altitude sources are selected. Refer to section 3.10.

Configures the primary altitude source. Selections are:

- NONE
- A429 1
- ALT ENC
- RS232 1
- A429 2
- RS232 2
- HSDB (GTX 345 only)
- RS232 3
- GILLHAM

Altitude Source 2

Configures the secondary altitude source. Selections are:

- NONE
- A429 1
- ALT ENC
- RS232 1
- A429 2
- RS232 2
- HSDB (GTX 345 only)
- RS232 3
- GILLHAM

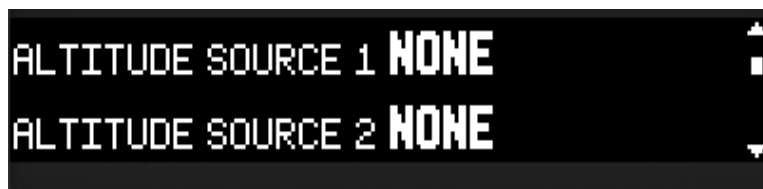


Figure 6-29 Altitude Source Page

GPS 1 SRC



NOTE

GTN 1, GTN 2, GIA 1, and GIA 2 are applicable to GTX 345 only.



NOTE

Lateral offset settings are determined from the perspective of the pilot. Right is positive and left is negative.

Configures the primary GPS source. Selections are:

- NONE
- INTRNL
- RS232 1
- RS232 2
- RS232 3
- RS232 4 (GTX 345 Only)
- A429 1
- A429 2
- GTN 1
- GTN 2
- GIA 1
- GIA 2

Intgrty

Configures the integrity for the primary GPS. Choose the setting for the GPS. All certified Garmin GPS sources are 1E-7. Selections are:

- UNK
- IE-3
- IE-5
- IE-7
- Auto (Garmin GPS only)

Lat Ofst

Configures the distance from the antenna and the centerline of the aircraft in meters. Selections are:

- UNK
- -6 mt
- -4 mt
- -2 mt
- 0 mt
- 2 mt
- 4 mt
- 6 mt

Lon Ofst

Configures the distance of the GPS antenna from the nose of the aircraft in meters. Selections are:

- UNK
- 2 mt to 60 mt in 2 mt increments

GPS 2 Src

Configures the secondary GPS source. Selections are:

- NONE
- INTRNL
- RS232 1
- RS232 2
- RS232 3
- RS232 4
- A429 1
- A429 2
- GTN 1
- GTN 2
- GIA 1
- GIA 2

Intgrty

Configures the integrity for the secondary GPS. Selections are:

- UNK
- IE-3
- IE-5
- IE-7
- AUTO

Lat Ofst

Configures the secondary GPS lateral offset in meters. Selections are:

- UNK
- -6 mt
- -4 mt
- -2 mt
- 0 mt
- 2 mt
- 4 mt
- 6 mt

Lon Ofst

Configures the secondary GPS longitudinal offset. Selections are:

- UNK
- 2 mt to 60 mt in 2 mt increments



Figure 6-30 Source, Integrity, and Offset Page

Internal Alt Encoder Installed

Select YES if a GAE module is connected to the backplate.

Ceiling

Configures aircraft maximum altitude between 8,000 feet and 30,000 feet.

Test Points

Configures the number of test points used to calibrate the GAE module. The range is 3 to 20. The maximum number of test points are limited by the aircraft ceiling setting.



Figure 6-31 Internal Alt Encoder Page

Internal Alt Encoder Adjustment

Configures the GAE module altitude to match the primary altitude display.



Figure 6-32 Internal Alt Encoder Adjustment Page

Internal AHRS Orientation (GTX 345 Only)

Configures connectors and vent to the orientation of the unit. Refer to figure B-10. Set the yaw angle of the unit relative to the centerline of aircraft. When setting the yaw angle, a positive angle indicates the GTX 345 is rotated clockwise from the longitudinal axis of the airplane (line from nose to tail). A negative angle indicates the GTX 345 is rotated counterclockwise. Refer to figure 6-33.

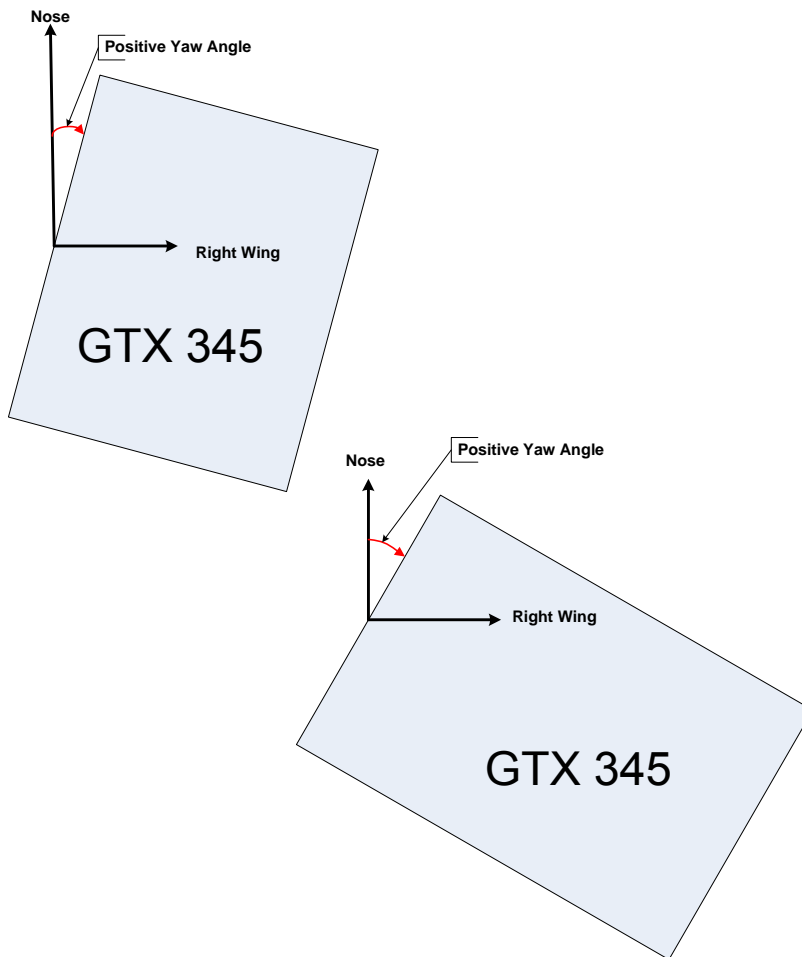


Figure 6-33 Setting the Yaw Angle



Figure 6-34 Internal AHRS Orientation Page

Internal AHRS Calibration (GTX 345 Only)

Calibrate the internal AHRS to level (0° pitch and 0° roll). The Internal AHRS Orientation must be set and the aircraft must be level before beginning this procedure.



Figure 6-35 Internal AHRS Calibration Page

6.9 ADSB



NOTE

Both 1090ES and UAT In settings can be set to YES when a portable ADS-B In receiver system, such as a GDL 39, is installed. It is not necessary to install a certified ADS-B In system.



NOTE

The GDL format must be configured to modify UAT OUT RMT CONTROL.

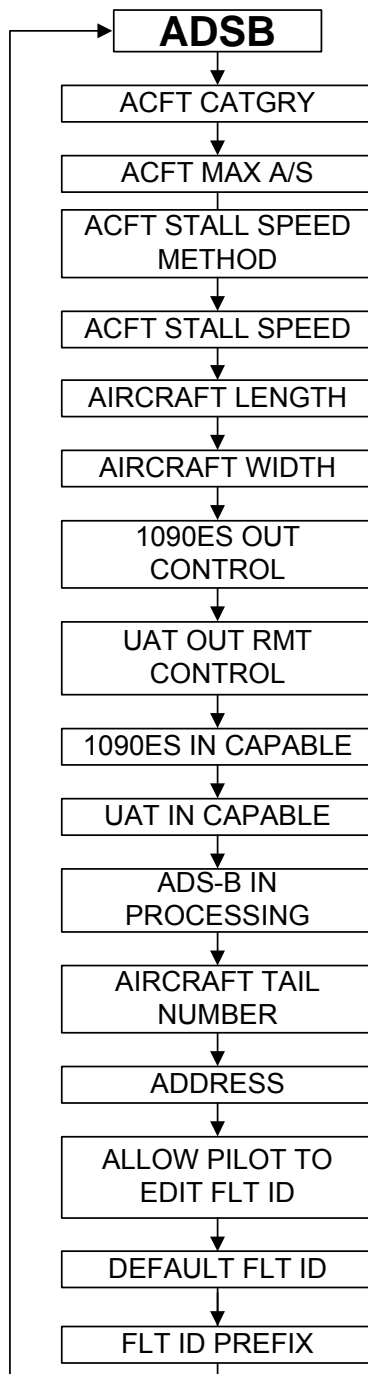


Figure 6-36 ADS-B Group

Acft Catgry

Configures the aircraft type. Select LIGHT for aircraft with a maximum gross weight less than 15,500 lbs. Selections are:

- UNKNOWN
- ROTORCRAFT
- UAV
- LIGHT
- GLIDER
- SMALL
- LIGHTER-THAN-AIR
- HIGH PERFORMANCE
- ULTRALIGHT

Acft Max A/S

Configures the maximum airspeed of the aircraft. Selections are:

- UNKNOWN
- <=600 kt
- <=75 kt
- <=1200 kt
- <=150 kt
- >1200 kt.
- <=300 kt



Figure 6-37 Aircraft Category and Max Airspeed Page

Acft Stall Method

Configures which type of action is taken in the event of a stall. Selections are:

- DEFAULT
- MANUAL

Acft Stall Speed

If the aircraft category is set to Light, Small, or High Performance, stall speed selections are 30 kts to 200 kts, in 1 kt increments.

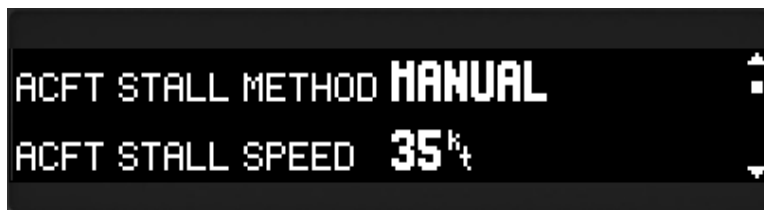


Figure 6-38 Aircraft Stall Method and Stall Speed Page

Aircraft Length

Configures aircraft length in meters.

- UNKNOWN
- <=15 mt
- <=25 mt
- <=35 mt
- <=45 mt
- <=55 mt
- <=65 mt
- <= 75 mt
- <= 85 mt
- >85 mt

Aircraft Width

Configures aircraft width in meters.

- Unknown
- <=23.0 mt
- <=28.5 mt
- <=33.0 mt
- <=34.0 mt
- <=38.0 mt
- <=39.5 mt
- <= 45.0 mt
- <= 52.0 mt
- <=59.5 mt
- <=67.0 mt
- <=72.5 mt
- <=80.0 mt
- > 80 mt



Figure 6-39 Aircraft Length and Width Page

1090ES Out Control

Configures 1090ES ADS-B transmission function. Selections are:

- Enabled
- Pilot Set
- Disabled

UAT Out Rmt Control

Not available with GDL 88 software v3.33 or earlier.



Figure 6-40 1090ES Out Control and UAT Out Remote Control Page

1090ES In Capable

Select YES if the aircraft can receive 1090ES ADS-B messages.

UAT In Capable

Select YES if the aircraft can receive UAT ADS-B messages.



Figure 6-41 1090ES In Capable and UAT In Capable Page

ADS-B in Processing

Select ENABLED.

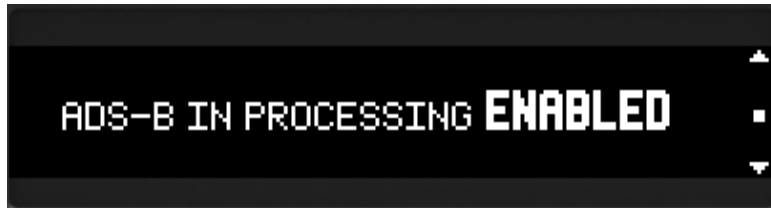


Figure 6-42 ADS-B In Processing Page

Aircraft Tail Number

Set this to the registered aircraft tail number.

Address

Set the ICAO address to either octal or hex format. If the tail number is recognized as a US registered tail number, the ICAO address will be pre-filled by the GTX. It only needs to be compared to the aircraft registration records. Selections are:

- Octal
- Hex



Figure 6-43 Aircraft Tail Number and Address Page

Allow Pilot To Edit Flt ID

Select YES to let the pilot change the flight ID.

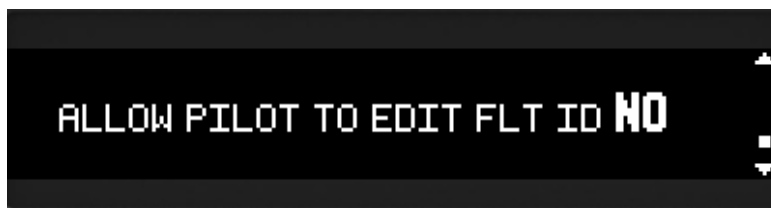


Figure 6-44 Allow Pilot to Edit Flight ID Page

Default Flt ID

Configures the default flight ID used in normal mode.

Flight ID Prefix

Configures the flight ID prefix with the carrier abbreviation. For example, Garmin AT is GAT.

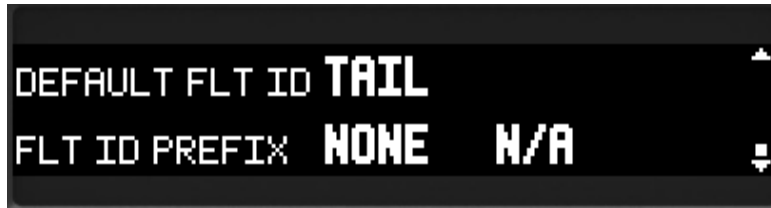


Figure 6-45 Default Flight ID and Flight ID Prefix Page

6.10 Diagnostics

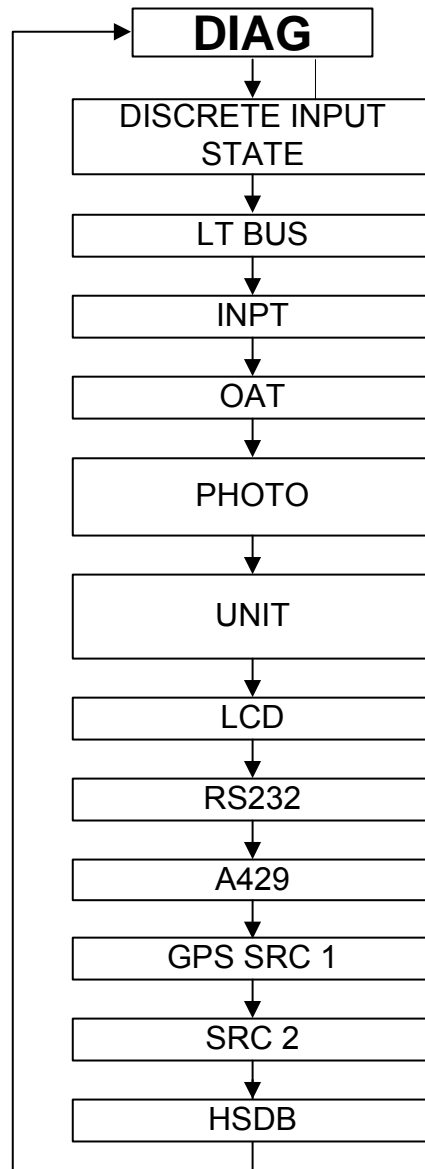


Figure 6-46 Diagnostics Group

The Diagnostics group shows information for troubleshooting purposes. Information includes:

- Discrete input state
- Lighting bus voltages
- Photocell voltages
- Outside air temperature
- Display temperature
- RS-232 channels
- ARINC 429 channels
- GPS Source 1 and GPS Source 2 status
- HSDB status (GTX 345)
- Gillham input state



Figure 6-47 Diagnostics Page

6.11 Remote Unit Configuration

For remote unit configuration refer to *GTX 3X5 Transponder Installation Tool Guide*.

6.12 Ground Check - GPS Reception Check



NOTE

If an external GPS is in use, GPS reception checks are not necessary.

The GPS check in this section is applicable to GTX 335 and GTX 345 units with an optional internal GPS receiver.

1. Make sure the LAT/LON on the ADS-B Out page matches with a known reference.
2. Select 121.150 MHz on the COM transceiver to be tested.
3. Transmit for a period of 35 seconds.
4. Make sure the LAT/LON continues to match the known reference.
5. Repeat steps 3 and 4 for the following frequencies.
 - 121.15 MHz
 - 121.22 MHz
 - 131.22 MHz
 - 131.30 MHz
 - 121.17 MHz
 - 121.25 MHz
 - 131.25 MHz
 - 131.32 MHz
 - 121.20 MHz
 - 131.20 MHz
 - 131.27 MHz
 - 131.35 MHz
6. For VHF radios that include 8.33 kHz channel spacing, include the following frequencies in addition to those in step 5.
 - 121.185 MHz
 - 130.285 MHz
 - 121.190 MHz
 - 131.290 MHz
7. Repeat steps 2 through 6 for all remaining COM transceivers in the aircraft.
8. Turn on the TCAS system and make sure the GPS position remains valid if the aircraft is TCAS equipped.
9. Use the SATCOM system to make sure the GPS position remains valid if the aircraft is SATCOM equipped.

6.13 Ground Check - Transponder

FAR 91.413 transponder checks require the GTX to reply to different types of interrogations. The GTX 3X5 only replies to Mode S/A/C All Calls when airborne.

To simulate a temporary airborne state, place the GTX 3X5 in Ground Test mode. Ground Test mode overrides the air/ground logic to transmit as if the GTX is airborne. This mode has a duration of one power cycle.

To enable Ground Test mode, press and hold **CRSR** while applying power to the unit. Ground Test mode can be enabled by the GTX 3X5 Install Tool on the State page.

FAR 91.413 provides guidance for the transponder check.

6.14 Software Installation Procedure

For software installation procedures refer to *GTX 3X5 Transponder Installation Tool Guide*.

7 Continued Airworthiness

Other than for regulatory periodic functional checks, maintenance of the GTX 3X5 is “on condition” only. Periodic maintenance of the GTX 3X5 is not required.

Appendix A Data Formats

A.1	RS-232 Air Data Input Format	A-1
A.1.1	Electrical Interface	A-1
A.1.2	Altitude Format 1 Sentence	A-1
A.1.3	Altitude Format 3 Sentence	A-1
A.1.4	Airdata Format 1 Sentence	A-2
A.2	ARINC 429 Input Formats	A-5
A.3	ARINC 429 Output Formats	A-9

A.1 RS-232 Air Data Input Format

A.1.1 Electrical Interface

The input signals are compatible with RS-232C. Data input at 9600 baud with a word length of 8 bits, one stop bit, and no parity. One message is received per second.

A.1.2 Altitude Format 1 Sentence

The GTX 3X5 is capable of receiving the following 10-byte message from the altitude serializer.

```
ALT <sp>12345<CR>
```

Where:

ALT	ASCII characters
<sp>	space (0x20)
12345	altitude in feet
<CR>	carriage return (0x0D)

A.1.3 Altitude Format 3 Sentence

The GTX 3X5 is capable of receiving the following 17-byte message from GAE modules, altitude serializers, and altitude converters.

```
RMS<sp><+/->12345T<+/->12ul<CR>
```

Where:

RMS	ASCII characters
<sp>	space (0x20)
<+/->	sign indicator (0x2B[+] or 0x2D[-])
12345	altitude in feet
T	ASCII character
<+/->	sign indicator
12	sensor temperature
ul	checksum of bytes 1 through 14 in hex ASCII (i.e., FA)
<CR>	carriage return (0x0D)



NOTE

Checksum is calculated by adding each byte in the message (1 through 14).

A.1.4 Airdata Format 1 Sentence

The GTX 3X5 is capable of receiving the following message strings from the air data computer.

SHADIN Z FORMAT

<STX>

ZA012<CR><LF>	ZA (ASCII characters); 012 represents indicated air speed (knots)
ZB345<CR><LF>	ZB (ASCII characters); 345 represents true air speed (knots)
ZC678<CR><LF>	ZC (ASCII characters); 678 represents mach speed (thousandths)
ZD<+/->9012<CR><LF>	ZD (ASCII characters); sign; 9012 represents pressure altitude (tens of feet)
ZE<+/->3456<CR><LF>	ZE (ASCII characters); sign; 3456 represents density altitude (tens of feet)
ZF<+/->78<CR><LF>	ZF (ASCII characters); sign; 78 represents outside air temperature (Celsius)
ZG<+/->90<CR><LF>	ZG (ASCII characters); sign; 90 represents true air temperature (Celsius)
ZL234<CR><LF>	ZL (ASCII characters); 234 represents heading (degrees from north)
ZQ345<CR><LF>	ZQ (ASCII characters); 345 represents error log/reason indicator
ZR678<CR><LF>	ZR (ASCII characters); 678 represents checksum

<ETX>

Where:

<STX>	start-transmit character (0x02)
<CR>	carriage-return character (0x0D)
<LF>	line-feed character (0x0A)
<+/->	sign indicator (0x2B[+] or 0x2D[-])
<ETX>	end-transmit character (0x03)



NOTE

Checksum is calculated by adding each byte in the message (including all characters from <STX> up to and including the error log/reason indicator), such that carries are discarded to give a one byte result. The ASCII-coded decimal representation of that byte is given, ranging from 0 (0x30, 0x30, 0x30) to 255 (0x32, 0x35, 0x35).

SHADIN G FORMAT

<STX>	
GA012<CR><LF>	GA (ASCII characters); 012 represents indicated air speed (knots)
GB345<CR><LF>	GB (ASCII characters); 345 represents true air speed (knots)
GC678<CR><LF>	GC (ASCII characters); 678 represents Mach speed (thousandths)
GD<+/->9012<CR><LF>	GD (ASCII characters); sign; 9012 represents pressure altitude (tens of feet)
GE<+/->3456<CR><LF>	GE (ASCII characters); sign; 3456 represents density altitude (tens of feet)
GF<+/->78<CR><LF>	GF (ASCII characters); sign; 78 represents outside air temperature (Celsius)
GG<+/->90<CR><LF>	GG (ASCII characters); sign; 90 represents true air temperature (Celsius)
GK<+/->901<CR><LF>	GK (ASCII characters); sign; 901 represents vertical speed (tens of ft/minute)
GL234<CR><LF>	GL (ASCII characters); 234 represents heading (degrees from north)
GP89012<CR><LF>	GP (ASCII characters); 89012 represents fuel used, left (or Single) (tenths gallons)
GR6789.0<CR><LF>	GR (ASCII characters); 6789.0 represents fuel remaining (gallons) [1]
Ga<+/->1234<CR><LF>	Ga (ASCII characters); sign; 12.34 represents barometric corrected altitude (tens of feet)
Gb56.78<CR><LF>	Gb (ASCII characters); 56.78 represents current barometric pressure setting (inches Hg)
G*901<CR><LF>	G* (ASCII characters); 901 represents checksum

<ETX>

Where:

<STX>	start-transmit character (0x02)
<CR>	carriage-return character (0x0D)
<LF>	line-feed character (0x0A)
<+/->	sign indicator (0x2B[+] or 0x2D[-])
<ETX>	end-transmit character (0x03)

[1] Not available from Airdata Computer

**NOTE**

Checksum is calculated by adding each byte in the message (including all characters from <STX> up to and including the error log/reason indicator), such that carries are discarded to give a one byte result. The ASCII-coded decimal representation of that byte is given, ranging from 0 (0x30, 0x30, 0x30) to 255 (0x32, 0x35, 0x35).

SHADIN S FORMAT

<STX>	
SA012<CR><LF>	SA (ASCII characters); 012 represents indicated air speed (knots)
SB345<CR><LF>	SB (ASCII characters); 345 represents true air speed (knots)
SC678<CR><LF>	SC (ASCII characters); 678 represents Mach speed (thousandths)
SD<+/->9012<CR><LF>	SD (ASCII characters); sign; 9012 represents pressure altitude (tens of feet)
SE<+/->3456<CR><LF>	SE (ASCII characters); sign; 3456 represents density altitude (tens of feet)
SF<+/->78<CR><LF>	SF (ASCII characters); sign; 78 represents outside air temperature (Celsius)
SG<+/->90<CR><LF>	SG (ASCII characters); sign; 90 represents true air temperature (Celsius)
SK<+/->901<CR><LF>	SK (ASCII characters); sign; 901 represents vertical speed (tens of ft/minute)
SL234<CR><LF>	SL (ASCII characters); 234 represents heading (degrees from north)
Sa<+/->1234<CR><LF>	Sa (ASCII character); sign; 1234 represents barometric corrected altitude (tens of feet)
Sb56.78<CR><LF>	Sb (ASCII character); 56.78 represents current barometric pressure setting (inches Hg)
S*901<CR><LF>	S* (ASCII character); 901 represents checksum

<ETX>

Where:

<STX>	start-transmit character (0x02)
<CR>	carriage-return character (0x0D)
<LF>	line-feed character (0x0A)
<+/->	sign indicator (0x2B[+] or 0x2D[-])
<ETX>	end-transmit character (0x03)

**NOTE**

Checksum is calculated by adding each byte in the message (including all characters from <STX> up to and including the error log/reason indicator), such that carries are discarded to give a one byte result. The ASCII-coded decimal representation of that byte is given, ranging from 0 (0x30, 0x30, 0x30) to 255 (0x32, 0x35, 0x35).

A.2 ARINC 429 Input Formats

AHRS

Table A-1 AHRS Inputs

Label	Data	Transmission Rate	Periodic Timeout
270	AHRS Discrete Word	500 ms	2000 ms
314	True Heading	50 ms	200 ms
320	Magnetic Heading	50 ms	200 ms
324	Pitch Angle	50 ms	200 ms
325	Roll Angle	50 ms	200 ms
332	Body Lateral Acceleration	60 ms	240 ms
333	Body Normal Acceleration	60 ms	240 ms
340	Inertial Yaw Rate	20 ms	80 ms
365	Inertial Vertical Velocity	40 ms	160 ms

ADC

Table A-2 ADC Inputs

Label	Data	Transmission Rate	Periodic Timeout
203	Altitude	62.5 ms	250 ms
204	Baro-Corrected Altitude #1	62.5 ms	250 ms
205	Mach	125 ms	500 ms
206	Indicated Airspeed	125 ms	500 ms
210	True Airspeed	125 ms	500 ms
211	Total Air Temperature	500 ms	2000 ms
212	Altitude Rate	62.5 ms	250 ms
213	Static Air Temperature	500 ms	2000 ms

ARINC 743A

Table A-3 ARINC 743A Inputs

Label	Data	Transmission Rate	Periodic Timeouts
76	GNSS Altitude	200 ms	2000 ms
101	HDOP	200 ms	2000 ms
102	VDOP	200 ms	2000 ms
103	GNSS Track Angle	200 ms	2000 ms
110	GNSS Latitude	200 ms	2000 ms
111	GNSS Longitude	200 ms	2000 ms
112	GNSS Ground Speed	200 ms	2000 ms
120	GNSS Latitude Fine	200 ms	2000 ms
121	GNSS Longitude Fine	200 ms	2000 ms
130	Horizontal Protection Limit	200 ms	2000 ms
133	Vertical Protection Limit	200 ms	2000 ms
136	Vertical Figure of Merit	200 ms	2000 ms
140	UTC Fine	200 ms	2000 ms
141	UTC Fine Fractions	200 ms	2000 ms
142	Vertical Velocity Figure of Merit	200 ms	2000 ms
145	Horizontal Velocity Figure of Merit	200 ms	2000 ms
150	UTC	200 ms	2000 ms
165	Vertical Velocity	200 ms	2000 ms
166	North/South Velocity	200 ms	2000 ms
174	East/West Velocity	200 ms	2000 ms
247	Horizontal Figure of Merit	200 ms	2000 ms
260	Date	200 ms	2000 ms
273	GNSS Sensor Status	200 ms	2000 ms
370	GNSS Height	200 ms	2000 ms

EFIS Air Data

Table A-4 EFIS Air Data

Label	Data	Transmission Rate	Periodic Timeout
100	Selected Course #1	250 ms	250 ms
102	Selected Altitude	800 ms	800 ms
164	Radio Height	250 ms	250 ms
203	Altitude	250 ms	250 ms
204	Baro-Corrected Altitude #1	250 ms	250 ms
205	Mach	500 ms	500 ms
206	Indicated Airspeed	500 ms	500 ms
210	True Airspeed	50 ms	50 ms
211	Total Air Temperature	2000 ms	2000 ms
212	Altitude Rate	250 ms	250 ms
213	Static Air Temperature	2000 ms	2000 ms
234	Baro Setting (hPa)	500 ms	500 ms
235	Baro Setting (in Hg)	500 ms	500 ms
306	Joystick Waypoint Latitude	500 ms	500 ms
307	Joystick Waypoint Longitude	500 ms	500 ms
314	True Heading	200 ms	200 ms
320	Magnetic Heading	200 ms	200 ms
325	Roll Angle	200 ms	200 ms

Flight Control

Table A-5 Flight Control

Label	Data	Transmission Rate	Periodic Timeout
102	Selected Altitude	200 ms	800 ms
234	Baro Setting (hPa)	125 ms	500 ms
235	Baro Setting (in Hg)	125 ms	500 ms
271	Pitch Discrete Data, Bendix/ King KFC 225	125 ms	500 ms

Heading

Table A-6 Heading

Label	Data	Transmission Rate	Periodic Timeout
314	True Heading	50 ms	200 ms
320	Magnetic Heading	50 ms	200 ms

Transponder Control Format 1

Table A-7 Transponder Control Format 1

Label	Data	Transmission Rate	Periodic Timeout
013	TCAS Display Control	100 ms	400 ms
015	Altitude Select Limits	100 ms	400 ms
016	Mode S Control Panel Data	100 ms	400 ms
024	Tandem Control Word	See Note 1	See Note 1
031	ATCRBS Control	100 ms	400 ms
233	Flight ID Data Word 1	5000 ms	20000 ms
234	Flight ID Data Word 2	5000 ms	20000 ms
235	Flight ID Data Word 3	5000 ms	20000 ms
236	Flight ID Data Word 4	5000 ms	20000 ms

[1] This label is forwarded by the GTX, but not processed by the GTX. Therefore, the transmission rate and timeout attributes do not apply.

Radar Altimeter

Table A-8 Radio Altitude

Label	Data	Transmission Rate	Periodic Timeout
164	Radio Height	62.5 ms	250 ms

The Traffic Input formats are only available on the GTX 345.

Traffic Input

Table A-9 Traffic Inputs

Label	Data	Transmission Rate	Periodic Timeout
016	TCAS Mode/ Sense	500 ms	2000 ms
130	Intruder Range	500 ms	NA
131	Intruder Altitude	500 ms	NA
132	Intruder Bearing	500 ms	NA
270	Vertical RA	500 ms	2000 ms
274	TCAS Output	500 ms	2000 ms
350	TCAS Fault Summary	500 ms	2000 ms
357	Request to Send/End of Transmission	500 ms	NA

A.3 ARINC 429 Output Formats

GPS Data

The GPS data format is used to forward GPS data received from the selected GPS source as defined in ARINC 743. The GPS Data format can only be used when combined with other ARINC output formats from table A-10. GPS labels transmit in the order specified.

Table A-10 GPS Data Formats

Label	Data	Transmission Rate	Priority Order
273	GNSS Sensor Status	200 ms	1
76	GNSS Altitude	200 ms	2
112	GNSS Ground Speed	200 ms	3
130	Horizontal Protection Limit	200 ms	4
136	Vertical Figure of Merit	200 ms	5
260	Date	200 ms	6
110	GNSS Latitude	200 ms	7
111	GNSS Longitude	200 ms	8
120	GNSS Latitude Fine	200 ms	9
121	GNSS Longitude Fine	200 ms	10
150	UTC	200 ms	11

Garmin

Table A-11 Garmin Labels

Label	Data	Transmission Rate
100	Selected Course #1	200 ms
203	Altitude	100 ms
204	Baro-Corrected Altitude #1	100 ms
206	Indicated Airspeed	100 ms
210	True Airspeed	100 ms
211	Total Air Temperature	100 ms
213	Static Air Temperature	100 ms
306	Joystick Waypoint Latitude	500 ms
307	Joystick Waypoint Longitude	500 ms
314	Own Aircraft True Heading	100 ms
320	Own Aircraft Magnetic Heading	100 ms

TAS Output

The Garmin TAS format is only available on the GTX 335 and the GTX 345. This format is used to perform TCAS coordination with a Garmin TCAS 1 system. GPS data is also provided to the Garmin TCAS 1 system with this format. The Garmin TAS format is a simplified version of the transponder-to-TCAS interface specified in ARINC 735, also known as the XT bus.

Table A-12 TAS Output Labels

Label	Data	Transmission Rate
272	TCAS COORDINATION DATA (MID PART 1)	100 ms
274	TCAS COORDINATION DATA (MID PART 2)	100 ms

TIS-A Output

The Garmin TIS-A format is only available on the GTX 335. The Garmin TIS-A format is used to send TIS-A traffic data to traffic displays using a variant of the TCAS-to-Display interface specified in ARINC 735. Because the format is unidirectional, TIS-A control must be performed by another means, such as the TIS-A toggle discrete.

Table A-13 TIS-A Output Labels

Label	Data	Transmission Rate
130	Intruder Range	500 ms
131	Intruder Altitude	500 ms
132	Intruder Bearing	500 ms
274	TCAS Output	500 ms
313	Own Aircraft Track Angle	500 ms
350	TCAS Fault Summary	500 ms
357	End of Transmission	500 ms
371	GA Equipment Identifier	500 ms

Transponder Control Format 1

Table A-14 Transponder Control Format 1 Labels

Label	Data	Transmission Rate
024	Tandem Control Word	[1]
031	ATCRBS Control	100 ms
077	Diagnostic Word, Honeywell	100 ms
203	Altitude	200 ms
204	Baro-Corrected Altitude	200 ms [2]
233	Flight ID Data Word 1	[1]
234	Flight ID Data Word 2	[1]
235	Flight ID Data Word 3	[1]
236	Flight ID Data Word 4	[1]
275	Mode S Address Part 1	1000 ms
276	Mode S Address Part 2	1000 ms
350	Diagnostic Word, Rockwell Collins	100 ms

[1] The GTX transmits this label immediately when it is received.

[2] The GTX only transmits this label when the data is valid.

Traffic

The Traffic Output is only available on the GTX 345. The traffic output format is used to send consolidated ADS-B and TCAS traffic data to a traffic display using a variant of the TCAS-to-display interface specified in ARINC 735.

Table A-15 Traffic Labels

Label	Data	Transmission Rate
130	Intruder Range	500 ms
131	Intruder Altitude	500 ms
132	Intruder Bearing	500 ms
203	Own Aircraft Pressure Altitude	500 ms
313	Own Aircraft True Hack	500 ms
314	Own Aircraft True Heading	500 ms
353	ADS-B Alerts and Status	500 ms
354	TAS/TCAS/TCAD Status	500 ms
357	Request to Send	500 ms
357	End of Transmission	500 ms

Appendix B GTX 3X5 Mechanical Drawings

Figure B-1	GTX 3X5 GPS Panel Mount Assembly	B-2
Figure B-2	GTX 3X5 GPS Panel Mount Dimensions and Center of Gravity	B-3
Figure B-3	GTX 3X5R GPS Standard Remote Mount Assembly	B-4
Figure B-4	GTX 3X5R GPS Standard Remote Mount Dimensions and Center of Gravity	B-5
Figure B-5	GTX 3X5 Vertical Remote Mount	B-6
Figure B-6	GTX 3X5 Vertical Remote Mount Dimensions and Center of Gravity	B-7
Figure B-7	GTX 3X5R GPS G1000 Mount Rack Assembly	B-8
Figure B-8	GTX 3X5R GPS G1000 Mounting Rack Dimensions and Center of Gravity	B-9
Figure B-9	GTX 3X5 Panel Cutout Detail	B-10
Figure B-10	GTX 3X5 Connector and Vent Locations	B-11
Figure B-11	Optional Garmin Altitude Encoder	B-11

STANDARD KIT	UNIT PN	UNIT DESCRIPTION	CONNECTOR KIT	CONFIG MODULE	RACK	BACK PLATE ASSY	MOUNT TYPE	Dim A - inch (mm)	Dim B - inch (mm)	Dim C - inch (mm)
010-01083-01	011-02974-00	Sub-Assy, GTX325, Black	011-02977-00	011-00979-03	115-01771-01	011-02976-00	Panel	4.5 (114)	3.2 (81)	0.8 (20)
010-01214-01	011-03300-00	Sub-Assy, GTX 335	011-02977-00	011-00979-03	115-01771-01	011-02976-00	Panel	4.5 (114)	3.2 (81)	0.8 (20)
010-01214-21	011-03300-20	Sub-Assy, GTX 335, NV	011-02977-00	011-00979-03	115-01771-01	011-02976-00	Panel	4.5 (114)	3.2 (81)	0.8 (20)
010-01214-41	011-03300-40	Sub-Assy, GTX 335 w/GPS	011-02977-00	011-00979-03	115-01771-01	011-02976-01	Panel	4.5 (114)	3.2 (81)	0.8 (20)
010-01216-01	011-03302-00	Sub-Assy, GTX 345	011-02977-01	011-00979-03	115-01771-01	011-02976-00	Panel	4.7 (119)	3.0 (76)	0.8 (20)
010-01216-41	011-00302-40	Sub-Assy, GTX 345 w/GPS	011-02977-01	011-00979-03	115-01771-01	011-02976-01	Panel	4.6 (117)	3.0 (76)	0.8 (20)
010-01216-21	011-03302-20	Sub-Assy, GTX 345, NV	011-02977-01	011-00979-03	115-01771-01	011-02976-00	Panel	4.7 (119)	3.0 (76)	0.8 (20)
010-01216-61	011-03302-60	Sub-Assy, GTX 345, NV, w/GPS	011-02977-01	011-00979-03	115-01771-01	011-02976-01	Panel	4.6 (117)	3.0 (76)	0.8 (20)

Note: The standard rack, P/N 115-01771-01, is the functional equivalent of P/N 115-01771-00.

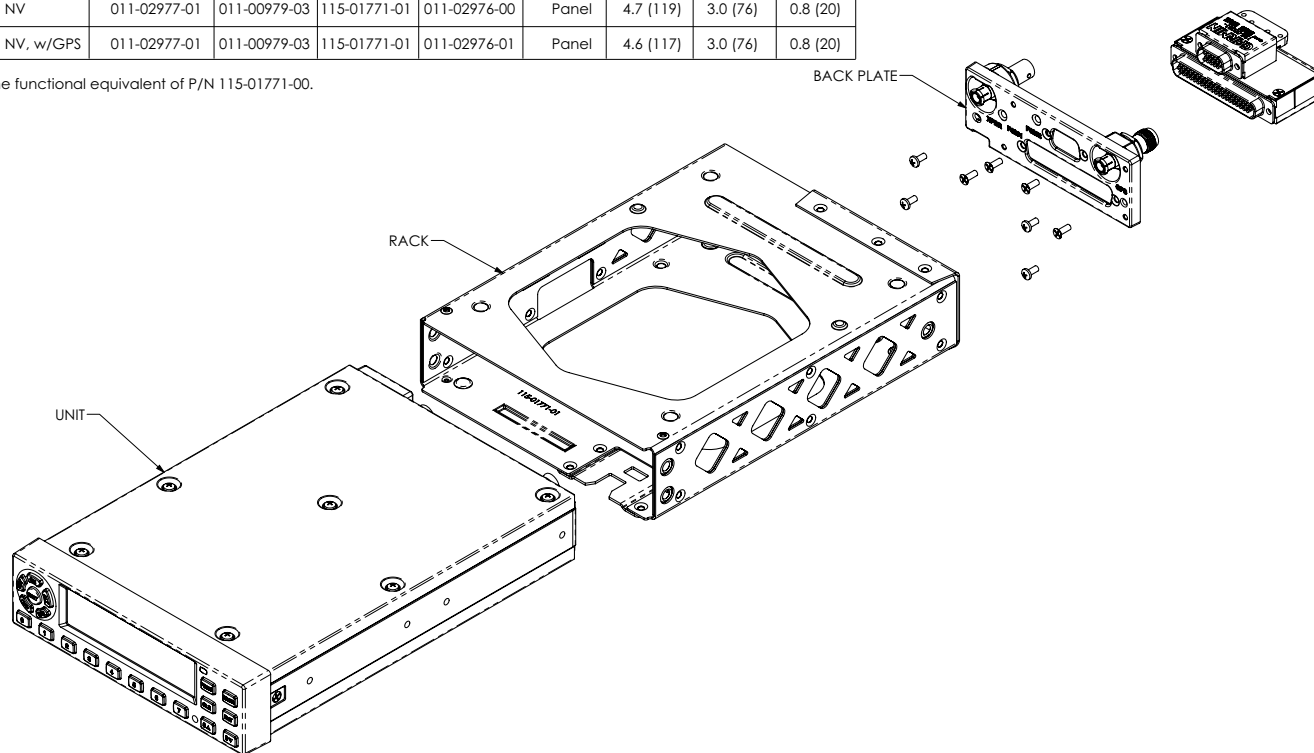


Figure B-1 GTX 3X5 GPS Panel Mount Assembly

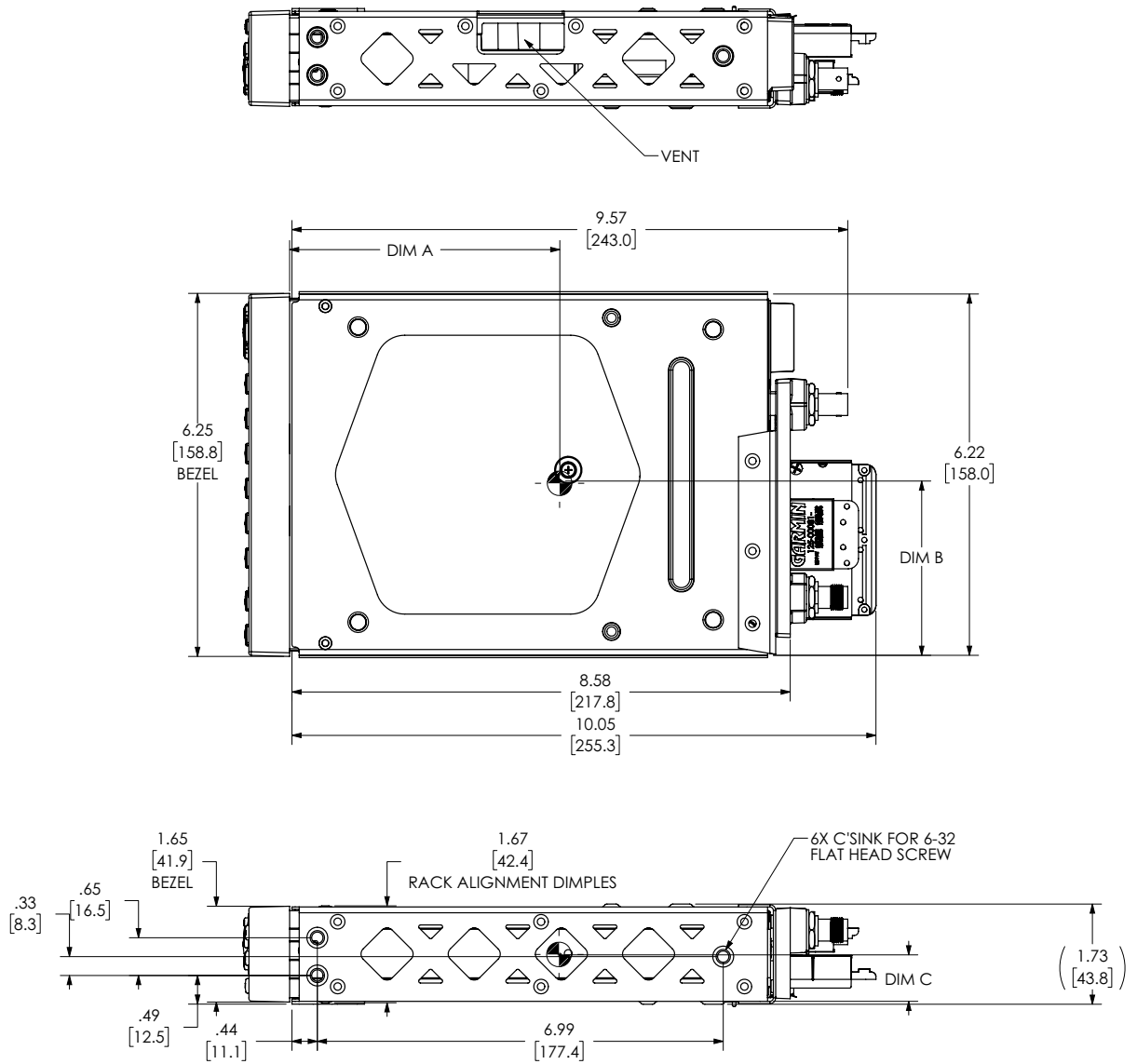


Figure B-2 GTX 3X5 GPS Panel Mount Dimensions and Center of Gravity

STANDARD KIT	UNIT PN	UNIT DESC	CONNECTOR KIT	CONFIG MODULE	RACK	BACK PLATE ASSY	MOUNT TYPE	DIM A inch (mm)	DIM B inch (mm)	DIM C inch (mm)
010-01215-01	011-03301-00	Sub-Assy, GTX 335R	011-02977-00	011-00979-03	115-01771-01	011-02976-00	Remote	4.8 (120)	3.3 (84)	0.8 (20)
010-01215-40	011-03301-40	Sub-Assy, GTX335R, w/GPS	011-02977-00	011-00979-03	115-01771-01	011-02976-01	Remote	4.9 (124)	3.2 (81)	0.8 (20)
010-01217-00	011-03303-00	Sub-Assy, GTX345R	011-02977-01	011-00979-03	115-01771-01	011-02976-00	Remote	5.0 (127)	3.0 (76)	0.8 (20)
010-01217-40	011-03303-40	Sub-Assy, GTX345R, w/GPS	011-02977-01	011-00979-03	115-01771-01	011-02976-01	Remote	5.0 (127)	3.1 (79)	0.8 (20)

Note: The standard rack, P/N 115-01771-01, is the functional equivalent of P/N 115-01771-00.

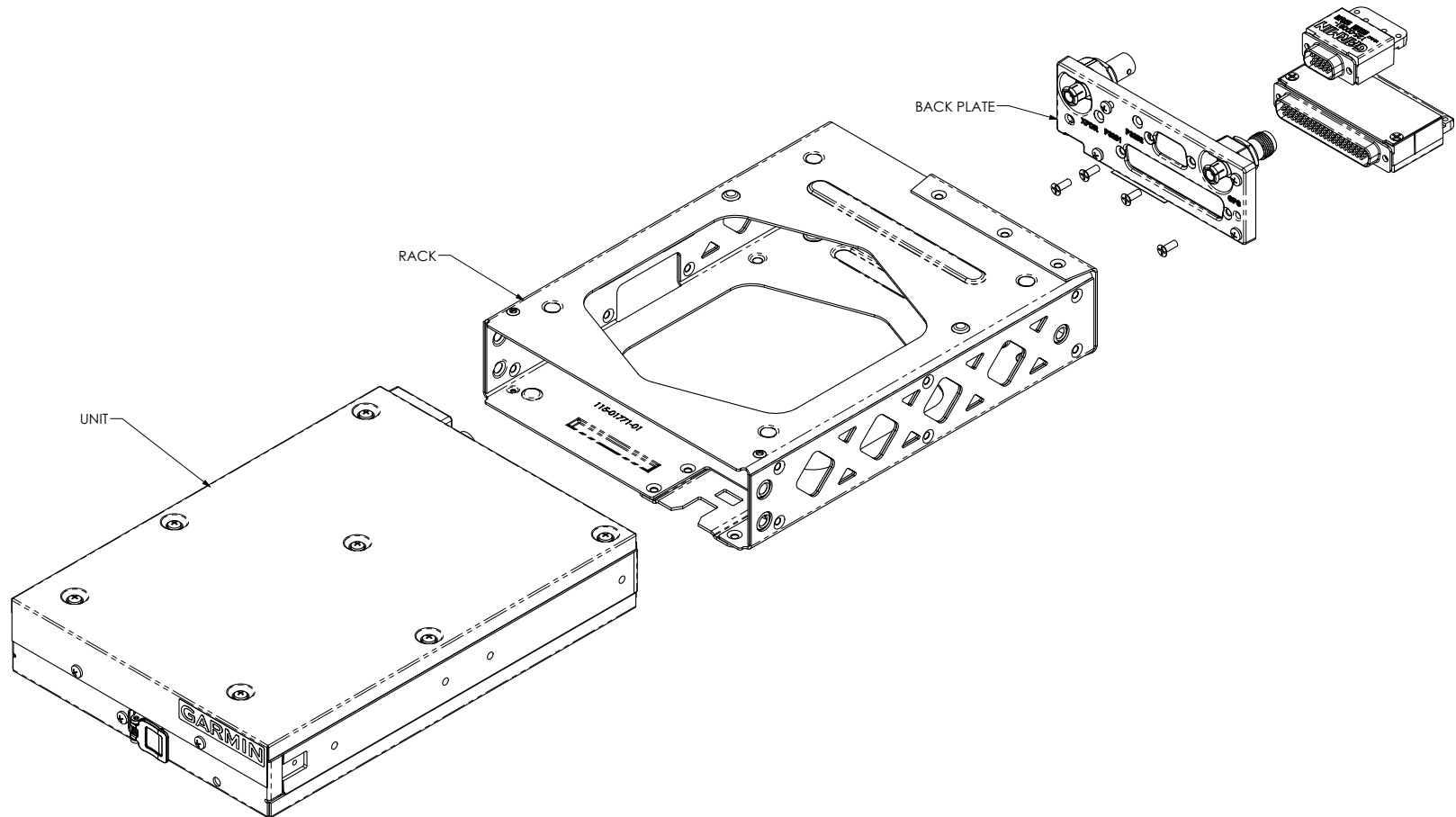


Figure B-3 GTX 3X5R GPS Standard Remote Mount Assembly

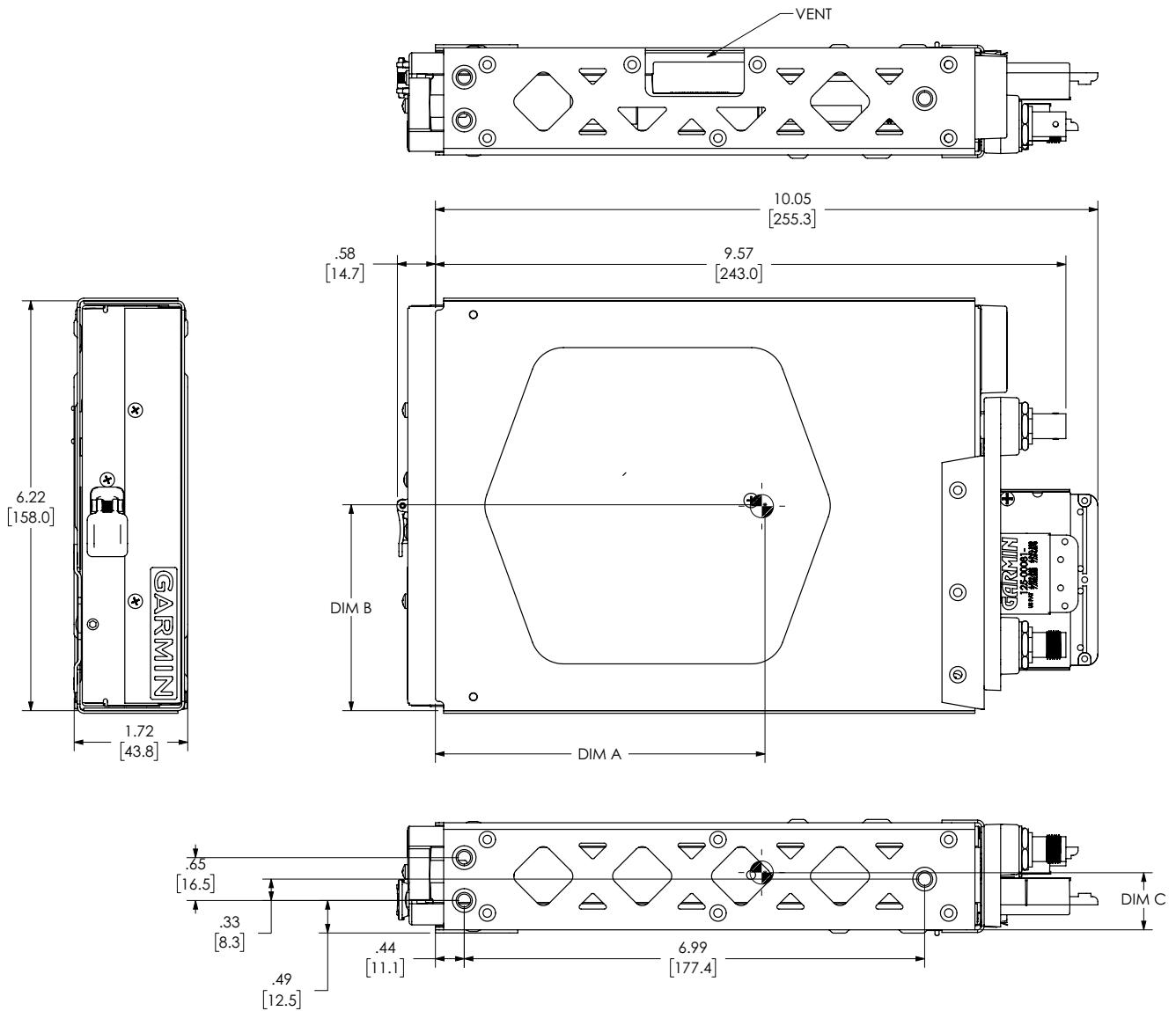
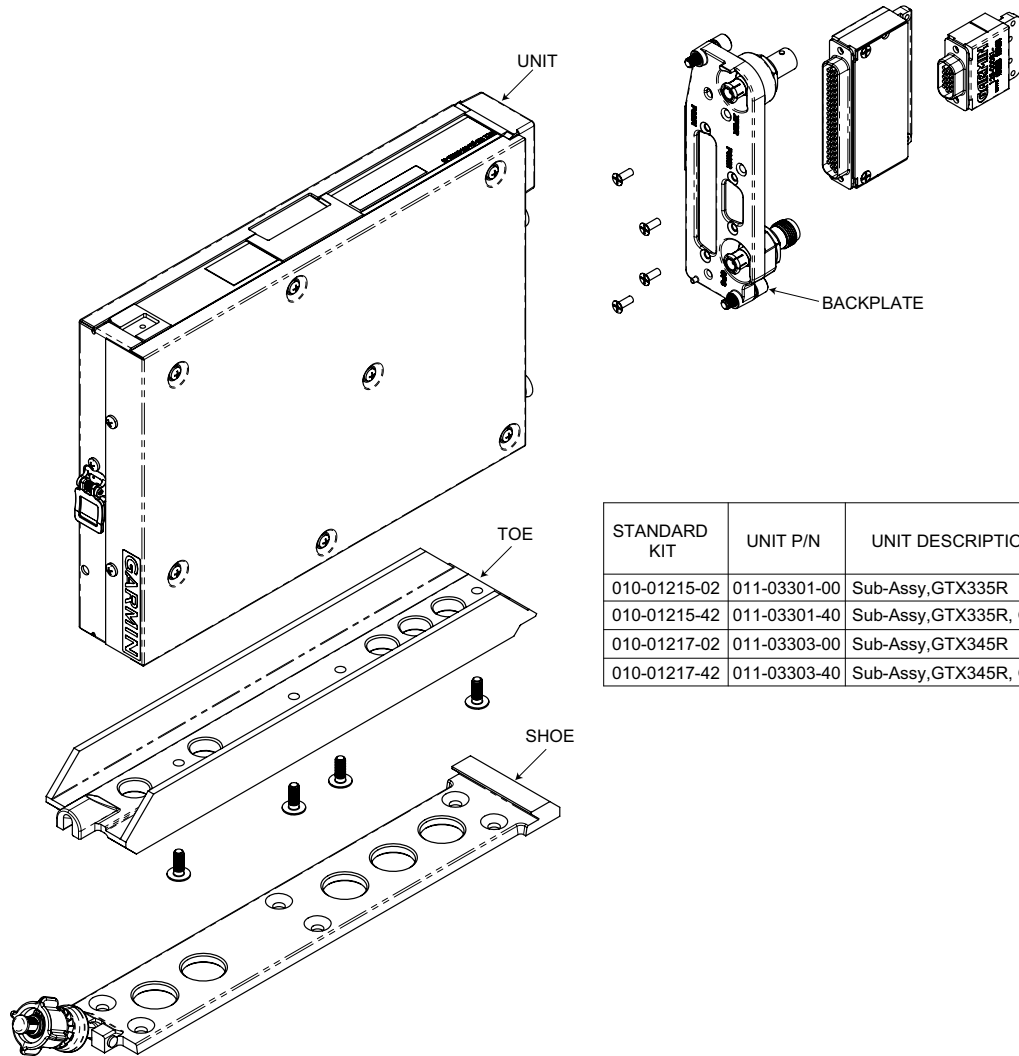


Figure B-4 GTX 3X5R GPS Standard Remote Mount Dimensions and Center of Gravity



STANDARD KIT	UNIT P/N	UNIT DESCRIPTION	CONNECTOR KIT	CONFIG MODULE	RACK	BACK PLATE ASSEMBLY	MOUNT TYPE	DIM A INCH (mm)	DIM B INCH (mm)	DIM B INCH (mm)
010-01215-02	011-03301-00	Sub-Assy,GTX335R	011-02977-00	011-00979-03	011-03762-00	011-02976-10	Remote	5.5 (140)	2.7 (69)	1.0 (25)
010-01215-42	011-03301-40	Sub-Assy,GTX335R, GPS	011-02977-00	011-00979-03	011-03762-00	011-02976-11	Remote	5.5 (140)	2.8 (71)	0.9 (23)
010-01217-02	011-03303-00	Sub-Assy,GTX345R	011-02977-01	011-00979-03	011-03762-00	011-02976-10	Remote	5.6 (142)	2.7 (69)	0.9 (23)
010-01217-42	011-03303-40	Sub-Assy,GTX345R, GPS	011-02977-01	011-00979-03	011-03762-00	011-02976-11	Remote	5.6 (142)	2.7 (69)	0.9 (23)

Figure B-5 GTX 3X5 Vertical Remote Mount

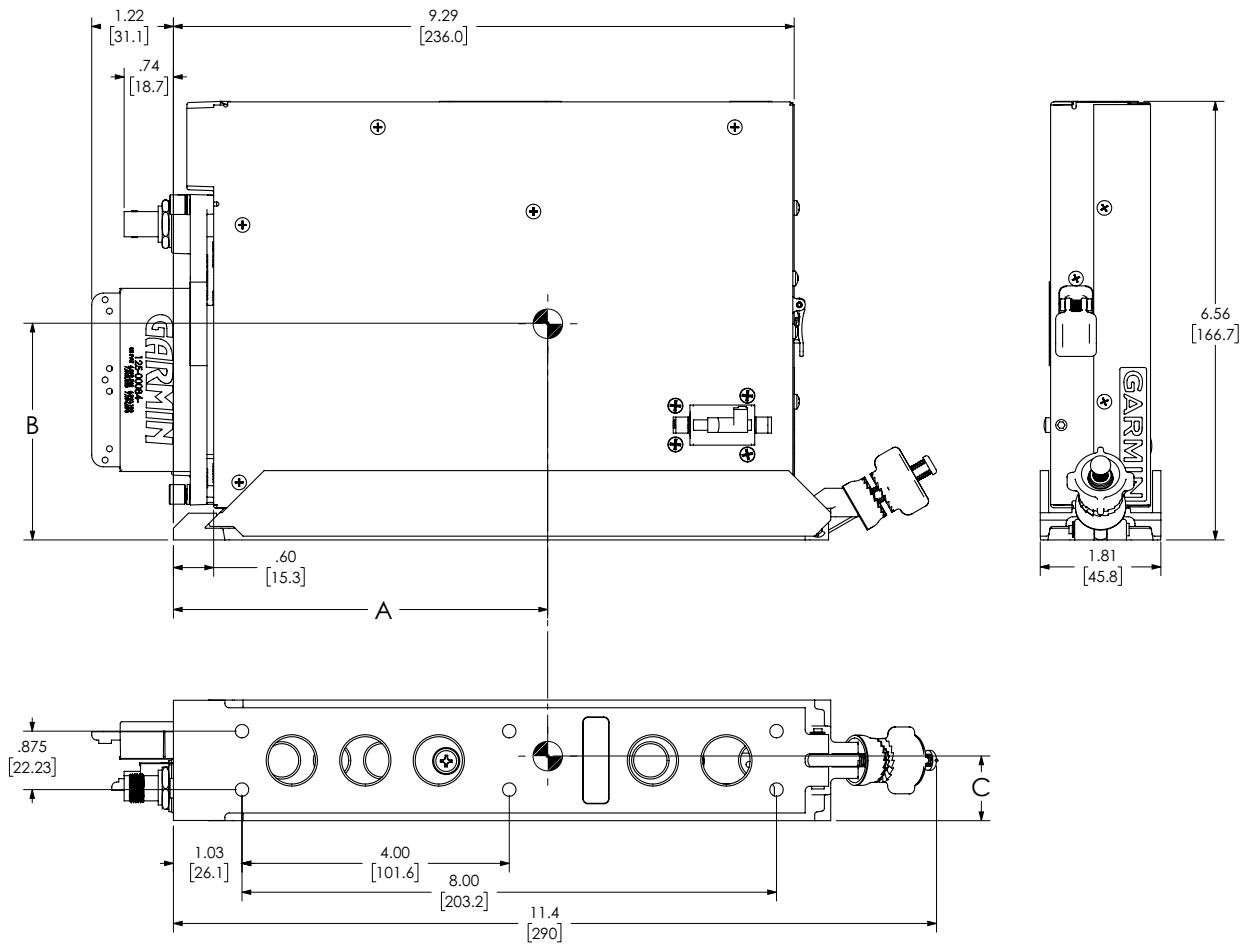


Figure B-6 GTX 3X5 Vertical Remote Mount Dimensions and Center of Gravity

STANDARD KIT	UNIT PN	UNIT DESCRIPTION	CONNECTOR KIT	CONFIG MODULE	RACK	BACK PLATE ASSEMBLY	MOUNT TYPE	DIM A inch (mm)	DIM B inch (mm)	DIM C inch (mm)
G1000 MOUNT	011-03301-00	Sub-Assy,GTX335R	011-02977-00	011-00979-03	115-02250-00	011-02976-00	G1000	5.3 (135)	3.2 (81)	0.7 (18)
G1000 MOUNT	011-03301-40	Sub-Assy,GTX335R, GPS	011-02977-00	011-00979-03	115-02250-00	011-02976-01	G1000	5.3 (135)	3.2 (81)	0.8 (20)
G1000 MOUNT	011-03303-00	Sub-Assy,GTX345R	011-02977-01	011-00979-03	115-02250-00	011-02976-00	G1000	5.4 (137)	3.0 (76)	0.8 (20)
G1000 MOUNT	011-03303-40	Sub-Assy,GTX345R, GPS	011-02977-01	011-00979-03	115-02250-00	011-02976-01	G1000	5.4 (137)	3.1 (79)	0.8 (20)

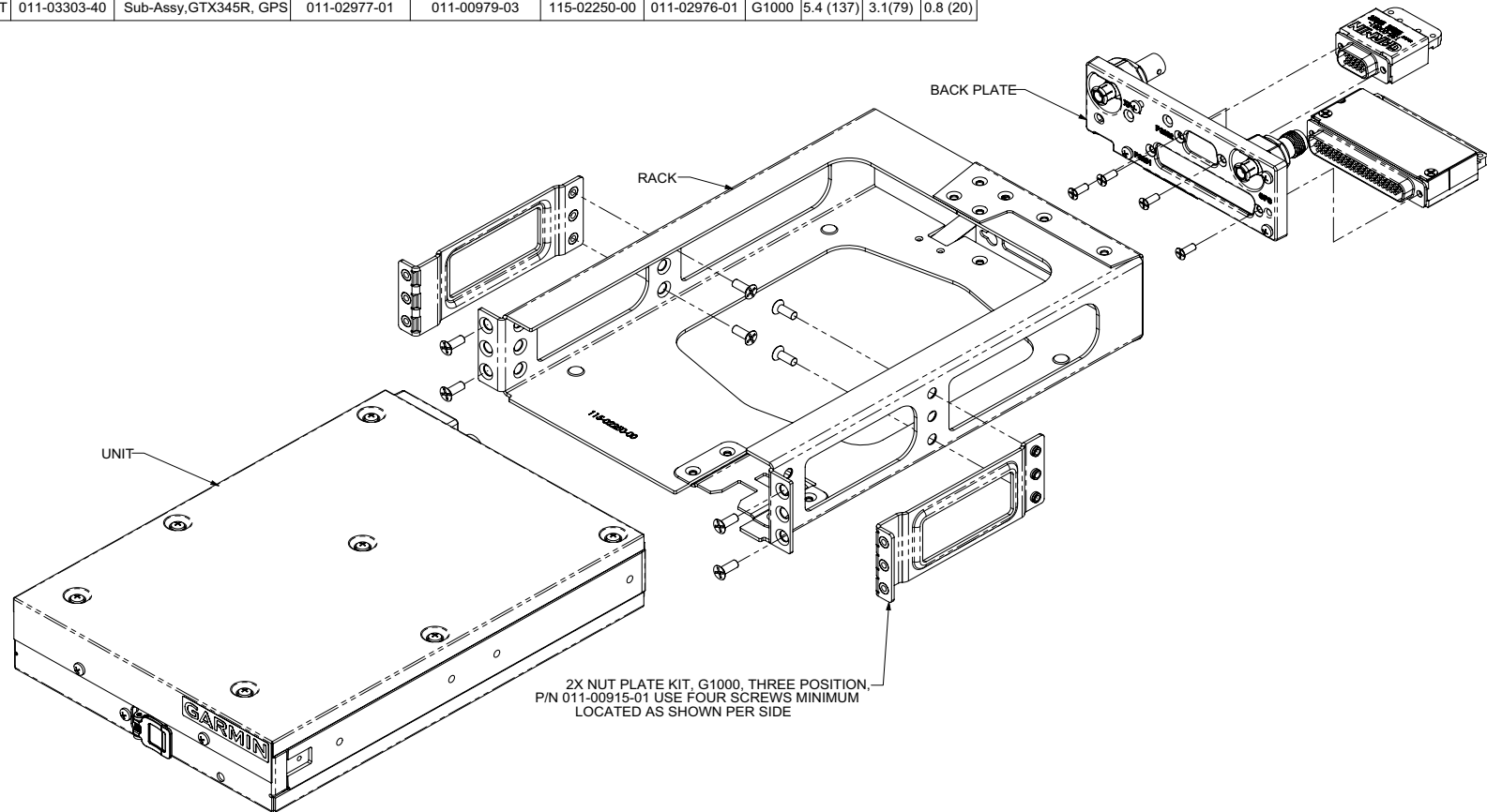


Figure B-7 GTX 3X5R GPS G1000 Mount Rack Assembly

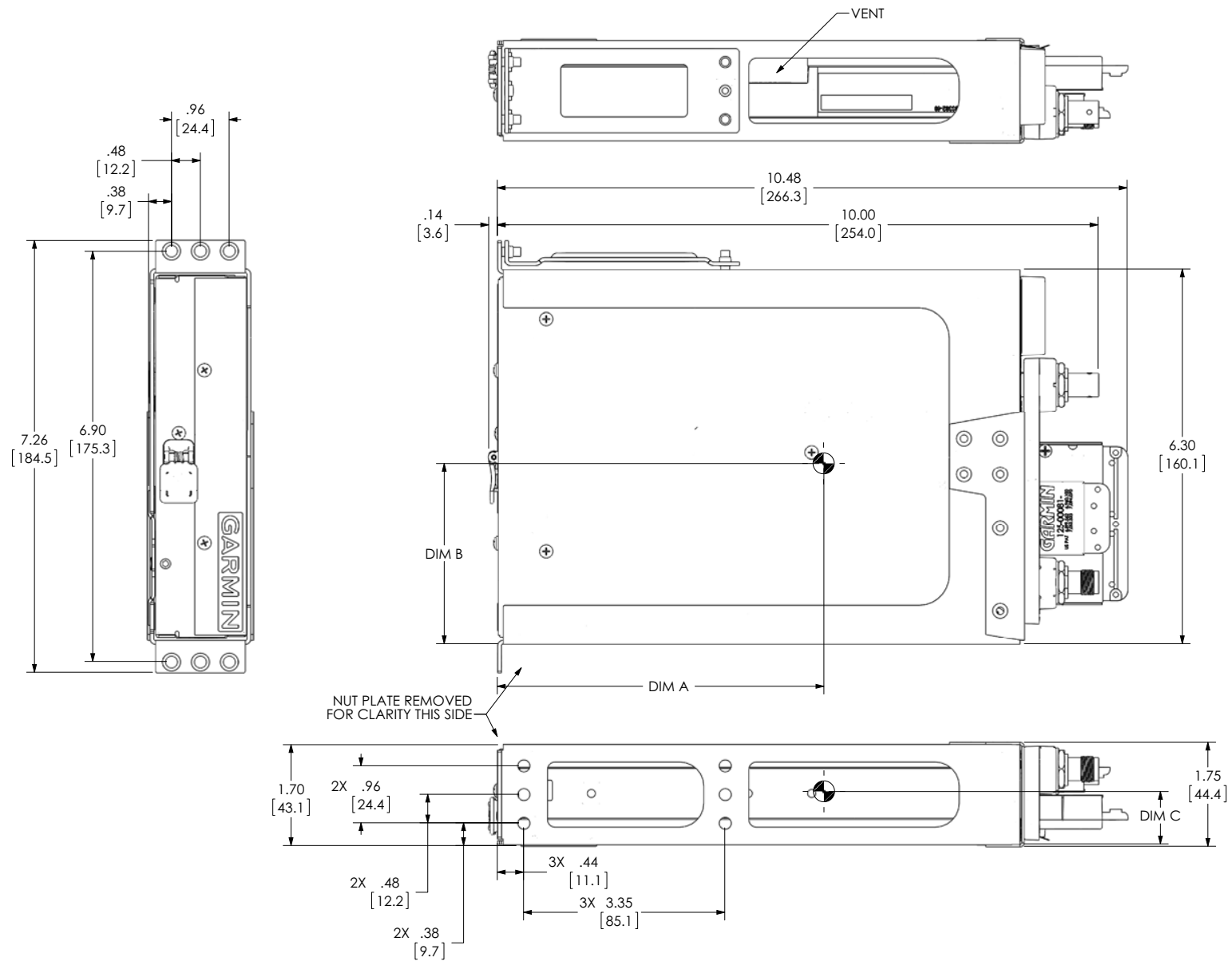
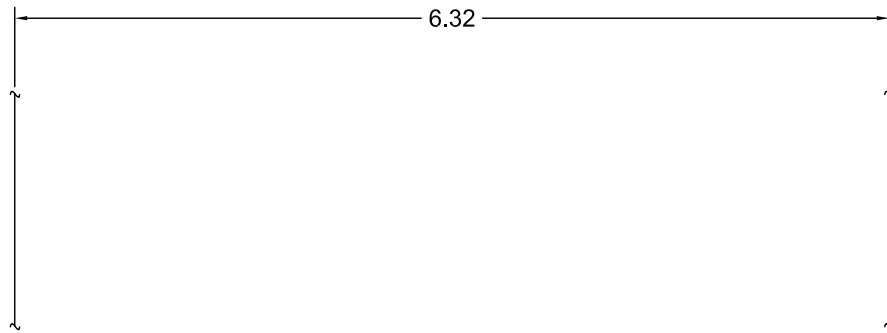
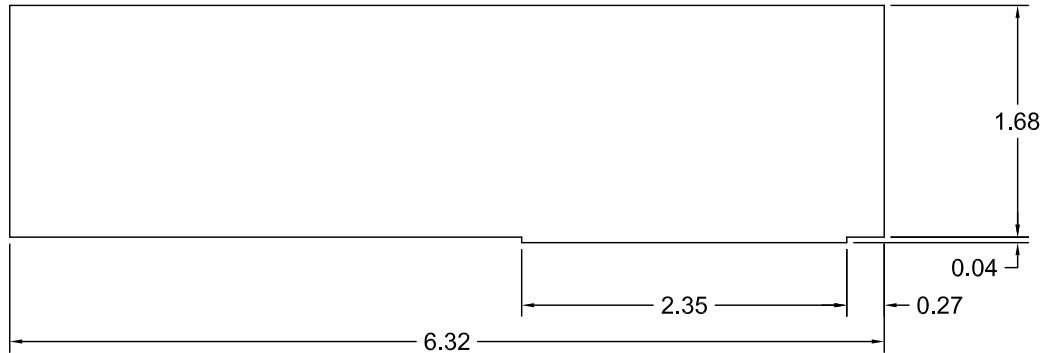


Figure B-8 GTX 3X5R GPS G1000 Mounting Rack Dimensions and Center of Gravity



SUGGESTED STACK CUTOUT OPTION #1



SUGGESTED PANEL CUTOUT OPTION #2

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.

Figure B-9 GTX 3X5 Panel Cutout Detail

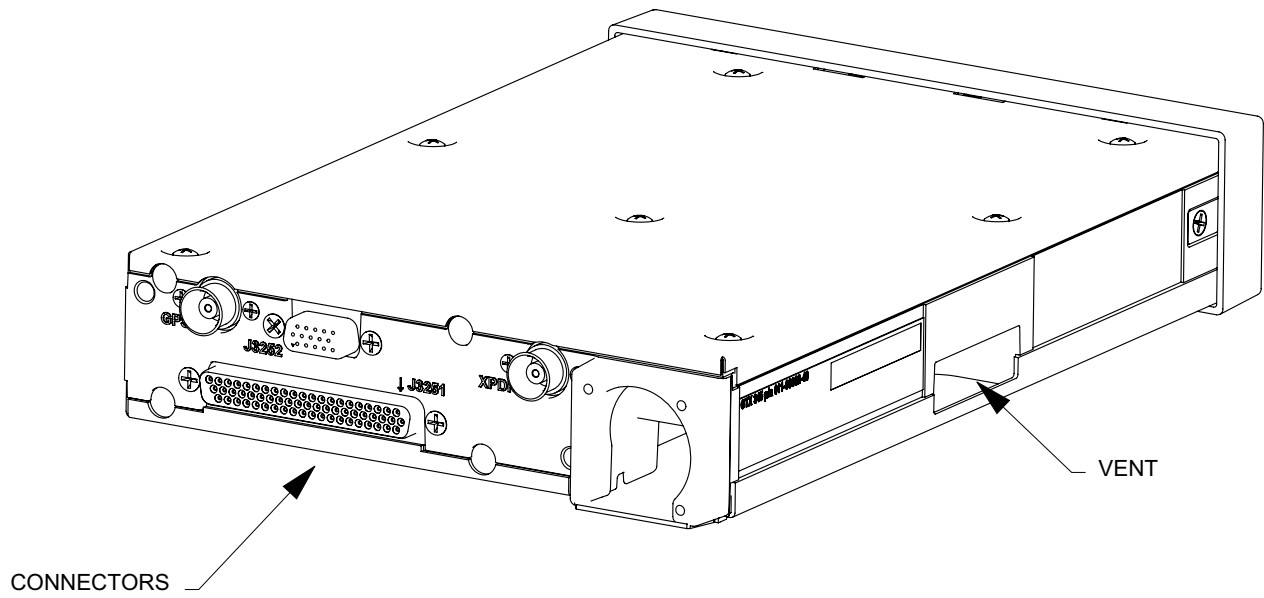


Figure B-10 GTX 3X5 Connector and Vent Locations

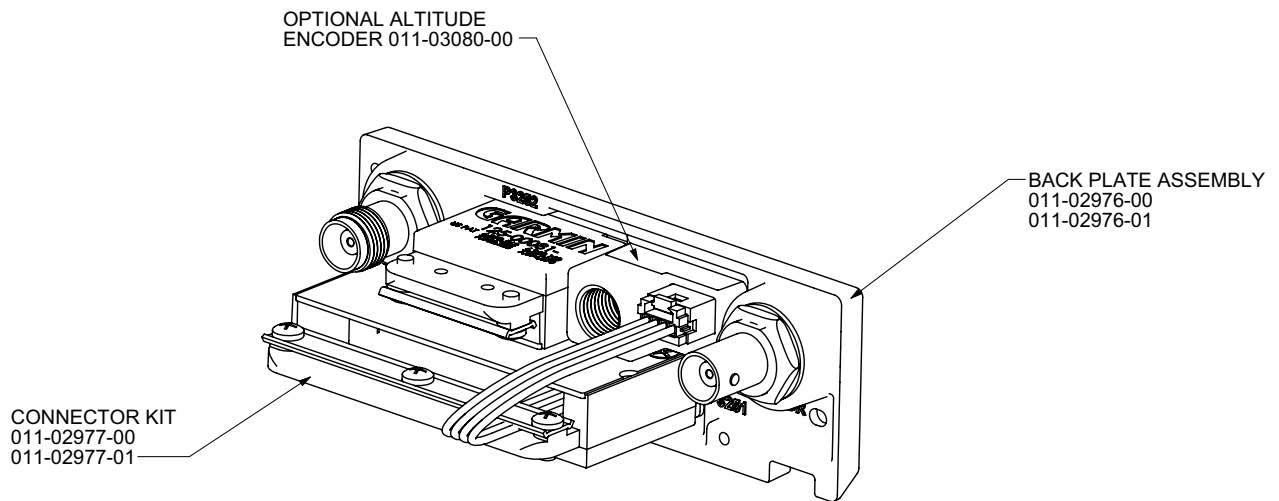


Figure B-11 Optional Garmin Altitude Encoder

Appendix C Equipment Compatibility and Configuration

C.1	ADS-B In Displays.....	C-2
C.2	GPS Sources	C-3
C.3	Altitude Sources	C-4
C.4	Audio Panels.....	C-6
C.5	Radar Altimeters	C-6
C.6	Heading Reference Sources.....	C-7
C.7	Traffic Sensors (GTX 345 Only).....	C-9
C.8	Bluetooth	C-10
C.9	Remote Control.....	C-11
C.10	TIS-A Display.....	C-12

C.1 ADS-B In Displays

Table C-1 ADS-B In Display

Manufacturer	Model	Data Format	Interface Configuration	GTX 345 Configuration Setting	Notes
Garmin	GTN 6XX/7XX	HSDB	ADS-B In Source: GTX	GTN	
	GNS 400W/500W Series [3]	RS-232	ADSB TFC	GNS	Supports control of ADS-B Traffic only (also includes GPS data from the GNS 400W/500W).
			ADSB TFC WX	GNS	Supports weather and control of ADS-B traffic (also includes GPS data from the GNS 400W/500W).
		ARINC 429	ADSB TFC	TRAFFIC	Supports ADS-B traffic without TAS/TCAS.
			ADSB TFC w/TCAS	TRAFFIC	Supports ADS-B traffic w/ TAS/TCAS correlation.
	G950/G1000	RS-232	GDL 90	LGCY TRAFFIC	Supports GTX 345R installations only (ADS-B traffic).
		RS-422	GDL 90 ADS-B	Garmin MX Series 1 [1]	Supports GTX 345R installations only (FIS-B weather).
	GMX 200	RS-422	FIS Data Link: Enabled GDL 90 UAT Radio: Disp Only GDL 90 Code Edit: Disabled	MX Format 1	
	UPSAT	MX20	RS-422	FIS Data Link: Enabled GDL 90 UAT Radio: Disp Only GDL 90 Code Edit: Disabled	MX Format 2

[1] If GDU software v12.00 or later and GIA software v6.20 or later is used.

[2] If GDU software prior to v12.00 or GIA software prior to v6.20 is used.

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

C.2 GPS Sources

Table C-2 GPS Source

Manufacturer	Model	Data Format	Interface Configuration	GTX 3X5 Configuration	Notes
Garmin	G950/G1000	RS-232	GTX 33ES #1 [1] OR GTX 33ES #1 w/ TIS [2]	REMOTE FMT 1 [1,3] OR REMOTE FMT 2 [2,3]	The primary purpose of this interface is transponder control, however this format also includes GPS data. Refer to table C-9.
				LGCY REMOTE 1 [1,4] OR LGCY REMOTE 2 [2,4]	
	Internal	N/A	N/A	Refer to section 6.8.	
	GTN 6XX/7XX	RS-232	ADS-B OUT +	ADS-B + FMT 1	
		HSDB	ADS-B In Source: GTX	GTN - Enabled	Applicable to GTX 345 installations only.
	GNS 400W/ 500W	RS-232	ADSB TFC	GNS	Applicable to GTX 345 only (software version 2.10 and earlier), or GTX 335/345 (software version 2.11 and later). Note that the primary purpose of this interface is for ADS-B In Data, however this format also includes GPS data. Refer to table C-1.
			ADSB TFC WX		
			ADS-B OUT +	ADS-B + FMT 1	
	GNS 480	RS-232	GTX + [1]	REMOTE FMT 1 [1]	Note that the primary purpose of this interface is transponder control, however this format also includes GPS data. Refer to table C-9.
			GTX w/TIS+ [2]	REMOTE FMT 2 [2]	
			ADS-B OUT +	ADS-B + FMT 1	
	GTX 3X5	RS-232	ADS-B + FMT 1	N/A	
ADS-B + FMT 2			ADS-B + FMT 2		
GDL 84/88 with GPS/SBAS	ARINC 429	743A	ARINC 743A		

[1] Installations with no TIS.

[2] Installations with TIS (GTX 335 only).

[3] Installations with GDU software v15.00 or later.

[4] Installations with GDU software prior to v15.00.

C.3 Altitude Sources

Table C-3 Altitude Sources

Manufacturer	Model	Interfacing Equipment Configuration	GTX 335 Configuration Setting	GTX 345 Configuration Setting	Notes
ACT Tech	A-30	N/A	ALT FMT 1 25ft	ALT FMT 1 25 ft	
B&D	90004-003	N/A	ADC	ADC	
Garmin	G950/G1000	GEN PURPOSE (Speed: HIGH)	N/A	EFIS AIR DATA (Speed: HIGH)	Interface is primarily for providing true heading to the GTX, however this format also provides altitude. Refer to table C-6. Required if external traffic system is installed.
	GDC 74()	N/A	ADC	ADC	
	GDU 620	GENERAL (Speed: HIGH)	EFIS AIR DATA (Speed: HIGH)	EFIS AIR DATA (Speed: HIGH)	
	GTN 6XX/7XX	GTX Mode S+ [1] OR GTX w/TIS+ [2]	REMOTE FMT 1 [1] OR REMOTE FMT 2 [2]	REMOTE FMT 1 [1] OR REMOTE FMT 2 [2]	This configuration is primarily for purposes of transponder remote control, however this configuration also provides altitude data. Refer to table C-9.
	GAE 12	N/A	Garmin Altitude Encoder: Present	Garmin Altitude Encoder: Present	
Honeywell (Bendix/King)	KDC 281	N/A	ADC	ADC	
	KDC 481	N/A	ADC	ADC	
Icarus Instruments	3000	N/A	ALT FMT 1 100ft	ALT FMT 1 100 ft	
Sandia	SAE 5-35	N/A	ALT FMT 1 25ft	ALT FMT 1 25 ft	Either RS-232 or Gillham Gray code format can be used to provide altitude data from the Sandia SAE 5-35 to the GTX 3X5.
		N/A	Gillham Discretes ON	Gillham Discretes ON	

Manufacturer	Model	Interfacing Equipment Configuration	GTX 335 Configuration Setting	GTX 345 Configuration Setting	Notes
Shadin	8800T	25 ft or lower encoding	ALT FMT 3 25 ft	ALT FMT 3 25 ft	Applicable to installations with the 8800T unit configured for 25ft or lower encoding.
		100 ft encoding	ALT FMT 3 100 ft	ALT FMT 3 100 ft	Applicable to installations with the 8800T unit configured for parallel Gray source or 100 ft encoding.
	F/ADC-200	N/A	ADC FMT 1	ADC FMT 1	
	F/ADC-2000	N/A	ADC FMT 1	ADC FMT 1	Either the RS-232 or ARINC 429 data format can be used for the Shadin F/ADC-2000 interface to the GTX (not both).
		N/A	ADC (Speed: LOW)	ADC (Speed: LOW)	
Trans-Cal Industries	IA-RS232-X	N/A	ALT FMT 1 100 ft	ALT FMT 1 100 ft	
	SSD120	25 ft or lower encoding	ALT FMT 1 25 ft	ALT FMT 1 25 ft	Applicable to installations with the SSD120 unit configured for 25ft or lower encoding.
		100 ft encoding	ALT FMT 1 100 ft	ALT FMT 1 100 ft	Applicable to installations with the SSD120 unit configured for parallel Gray source or 100 ft encoding.

[1] Installation with no TIS traffic.

[2] Installation with TIS traffic (GTX 335 only).

C.4 Audio Panels

Table C-4 Audio Panels

Manufacturer	Model	Data Format	GTX 3X5 Configuration Setting
Garmin	SL10, SL10MS, SL10M, SL10S, SL15, SL15M, GMA 340, GMA 347, GMA 35, GMA 350	Analog Audio	Audio: XPDR
Honeywell (Bendix/King)	KMA 24, KMA 24H-70/71, KMA 26, DMA 28		
PS Engineering	PMA 6000, PMA 7000 Series, PMA 8000 Series		

C.5 Radar Altimeters

Table C-5 Radar Altimeters

Manufacturer	Model	Data Format	Interface Configuration	GTX 3X5 Configuration
Free Flight	RA-4500	ARINC 429	N/A	RADIO ALTITUDE
Garmin	GRA 55/5500			
Honeywell (Bendix King)	KRA 405B			

C.6 Heading Reference Sources

Table C-6 Heading Reference Source

Manufacturer	Model	Configuration Parameter	Interfacing Equipment Configuration	GTX 335 Configuration Setting	GTX 345 Configuration Setting	Notes
Aspen	EFD1000	ARINC 429	N/A	HEADING [1] (Speed: LOW)	HEADING [1] (Speed: LOW)	
Avidyne	EXP5000 700-00006-()	ARINC 429		HEADING [1] (Speed: LOW)	HEADING [1] (Speed: LOW)	
Collins	AHC-85E	ARINC 429		AHRS [2] (Speed: HIGH)	AHRS [2] (Speed: HIGH)	
Garmin	G950/G1000	ARINC 429	GEN PURPOSE	N/A	EFIS AIR DATA [3] (Speed: HIGH)	
	GRS 77	ARINC 429	N/A	AHRS [2] (Speed: HIGH)	AHRS [2] (Speed: HIGH)	
	GAD 42	ARINC 429	N/A	HEADING [1] (Speed: LOW)	HEADING [1] (Speed: LOW)	
	GDU 620	ARINC 429	GENERAL	EFIS AIR DATA [3] (Speed: HIGH)	EFIS AIR DATA [3] (Speed: HIGH)	Note that this interface also provides altitude data. Refer to table C-3.
	GTN 6XX/7XX	RS-232	GTX Mode S+ [4] OR GTX w/TIS+ [5]	REMOTE FMT 1 [4] OR REMOTE FMT 2 [5]	REMOTE FMT 1 [4] OR REMOTE FMT 2 [5]	This configuration is primarily for purposes of transponder remote control, however this configuration also provides magnetic heading. Refer to table C-9.
	GNS 400W/ 500W	ARINC 429	ARINC 429	HEADING [1] (Speed: HIGH)	HEADING [1] (Speed: HIGH)	
Honeywell (Bendix/King)	EFIS 40/50 (SG 465)	ARINC 429	N/A	HEADING [1] (Speed: LOW)	HEADING [1] (Speed: LOW)	
Sandel	SN3500	ARINC 429		AHRS [2] (Speed: LOW)	AHRS [2] (Speed: LOW)	
	SN3308			AHRS [2] (Speed: LOW)	AHRS [2] (Speed: LOW)	

- [1] Heading information only.
- [2] Attitude and heading information.
- [3] Altitude, airspeed, altitude rate, and heading information.
- [4] Installation with no TIS traffic.
- [5] Installation with TIS traffic (GTX 335 only).

C.7 Traffic Sensors (GTX 345 Only)

Table C-7 Traffic Sensors

Manufacturer	Model	Configuration Parameter	I/O (To/From GTX)	Interfacing Equipment Configuration	GTX 345 Configuration Setting	Notes
Avidyne	RYAN TAS 600 (9900BX)	RS-232	Input/Output	N/A	TRAFFIC FMT 4	Configuration setting available on RS-232 Channel 4 only.
Garmin	GTS 8XX	ARINC 429	Input	Traffic Display Destination (Primary TX) [1]	TRAFFIC (Speed - HIGH)	
			Output [2]	Transponder 1 Communication (Primary RX) [1]	FORMAT 4 (Speed - HIGH)	Data format includes Garmin TAS.
				Pressure Altitude Source (Primary RX); Magnetic Heading Source (Primary RX); GPS Position/Velocity/Time Source (Primary RX); Transponder 1 Communication (Primary RX) [1]	FORMAT 5 (Speed - HIGH)	Data format includes Garmin TAS as well as Garmin concentrator; required for G1000.
N/A	Transponder 1 Communication (Primary TX) [1] (Speed - LOW)	N/A	This interface is required for GTS 8xx installations, even though it does not correspond to physical interface/wiring (configure for an unused ARINC 429 output port on the GTS 8XX).			

Manufacturer	Model	Configuration Parameter	I/O (To/From GTX)	Interfacing Equipment Configuration	GTX 345 Configuration Setting	Notes
Honeywell (Bendix/King)	KTA 870/810 KMH 880/820 KTA 970/910 KMH 980/920	ARINC 429	Input	Controller - Discrete Intruder File Protocol - ARINC 735	TRAFFIC 5 (Speed - HIGH)	
L3 Comm	SKY 497 SKY 899	ARINC 429	Input	N/A	TRAFFIC 2 (Speed - HIGH)	

[1] Configure the listed function(s) with the appropriate ARINC 429 channel based on the specific installation.

[2] ARINC 429 output from GTX 345 to GTS 800 is not required, but is required for all other GTS 8XX units.

C.8 Bluetooth

Table C-8 Bluetooth

Manufacturer	Model	Data Format	Input/Output	GTX 345 Configuration Setting	Notes
Garmin	Internal	Bluetooth	N/A	Bluetooth: Enabled	
	Flight Stream 110/210	RS-232	Input	CONNEXT FMT 3	Both the RS-232 input and RS-422 output are required; internal Bluetooth must be disabled on the GTX with a FS 110/210 installation.
		RS-422	Output	CONNEXT FMT 3	

C.9 Remote Control

Table C-9 Remote Control

Manufacturer	Model	Data Format	Interface Configuration	GTX 335 Configuration Setting	GTX 345 Configuration Setting	Notes
Garmin	GTN 6XX/ 7XX	RS-232	GTX Mode S+	REMOTE FMT 1	REMOTE FMT 1	Installations with no TIS.
			GTX w/TIS+	REMOTE FMT 2	N/A	Installations with TIS.
	GNS 480	RS-232	GTX+	REMOTE FMT 1	REMOTE FMT 1	Installations with no TIS.
			GTX w/TIS+	REMOTE FMT 2	N/A	Installation with TIS.
	G950/G1000	RS-232	GTX 33 [1] OR GTX 33ES [2]	REMOTE FMT 1 [3] OR LGCY REMOTE 1 [4]	REMOTE FMT 1 [3] OR LGCY REMOTE 1 [4]	Installations with no TIS.
			GTX 33 w/TIS [1] OR GTX 33ES w/TIS [2]	REMOTE FMT 2 [3] OR LGCY REMOTE 2 [4]	N/A	Installations with TIS.

[1] GDU software prior to v9.10.

[2] GDU software v9.10 or later.

[3] GDU software v15.00 or later.

[4] GDU software prior to v15.00.

C.10 TIS-A Display

Table C-10 TIS-A Displays

Manufacturer	Model	Data Format	Interface Configuration	GTX 335 Configuration Setting	Notes
Garmin	GTN 6XX/7XX	RS-232	GTX w/TIS+	REMOTE FMT 2	Note that the primary purpose of this interface is for remote control, however this format also includes TIS-A data. Refer to table C-9.
	GDU 620	ARINC 429	GTX 330	FORMAT 8	
	GNS 400W/500W Series	ARINC 429	GARMIN GTX 330	FORMAT 8	
	GNS 480	RS-232	GTX w/TIS+	REMOTE FMT 2	Note that the primary purpose of this interface is for remote control, however this format also includes TIS-A data. Refer to table C-9.
	G950/G1000	RS-232	GTX 33 w/TIS [1] OR GTX 33ES w/TIS [2]	REMOTE FMT 2 [3] OR LGCY REMOTE 2 [4]	Note that the primary purpose of this interface is for remote control, however this format also includes TIS-A data. Refer to table C-9.

[1] GDU software prior to v9.10.

[2] GDU software v9.10 or later.

[3] GDU software v15.00 or later.

[4] GDU software prior to v15.00.



Appendix D Interconnect Drawings

Figure D-1	GTX 3X5 Power Configuration Typical Interconnect	D-3
Figure D-2	GTX 345 - G1000 Interconnect	D-5
Figure D-3	GTX 335 - G1000 Interconnect	D-7
Figure D-4	GTX 3X5 - GNS 480 (CNX80) Interconnect	D-8
Figure D-5	GTX 335 - GTN 6XX/7XX Typical Interconnect	D-9
Figure D-6	Single/Dual GTX 335 - Single GTN 6XX/7XX Interconnect	D-10
Figure D-7	GTX 345 - GTN 6XX/7XX Typical Interconnect	D-11
Figure D-8	GTX 345 - Single/Dual GTN 6XX/7XX Interconnect	D-13
Figure D-9	GTX 335/345 - GDL 88 Interconnect	D-14
Figure D-10	GTX 345 - Traffic Sensor Interconnect	D-15
Figure D-11	GTX 345 - Single and Dual 400W/500W Series	D-19
Figure D-12	GTX 3X5 - Audio Interconnect	D-20
Figure D-13	GTX 3X5 - Radio Altimeter Interconnect	D-21
Figure D-14	GTX 3X5 - AHRS/Heading Source	D-22
Figure D-15	GTX 3X5 - Switches and OAT Probe Interconnect	D-23
Figure D-16	GTX 3X5 - Altitude Source Interconnect	D-24
Figure D-17	GTX 335 - GNS 400W/500W Series Interconnect	D-26
Figure D-18	GTX 345/345R - Flight Stream Interconnect	D-27
Figure D-19	GTX 345 - MX20/GMX 200 Interconnect	D-28
Figure D-20	GTX 335 - GDU 620 Interconnect	D-28

This section contains wiring interconnect details and examples for the connections necessary for the installation of the GTX 33X and GTX 3X5 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.
- In dual GTX transponder installations, each transponder must be grounded through separate ground terminal/stud locations on the aircraft.
- 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. For information refer to the manufacturer's installation manual.
- HDSB Ethernet wiring must use 24 AWG aircraft grade category 5 Ethernet cable:

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

- RS-232 and ARINC 429 ports shown are suggested port configurations.
- Installations can require alternate port configurations and are acceptable provided the equipment interfaces and data formats are available on alternate ports.

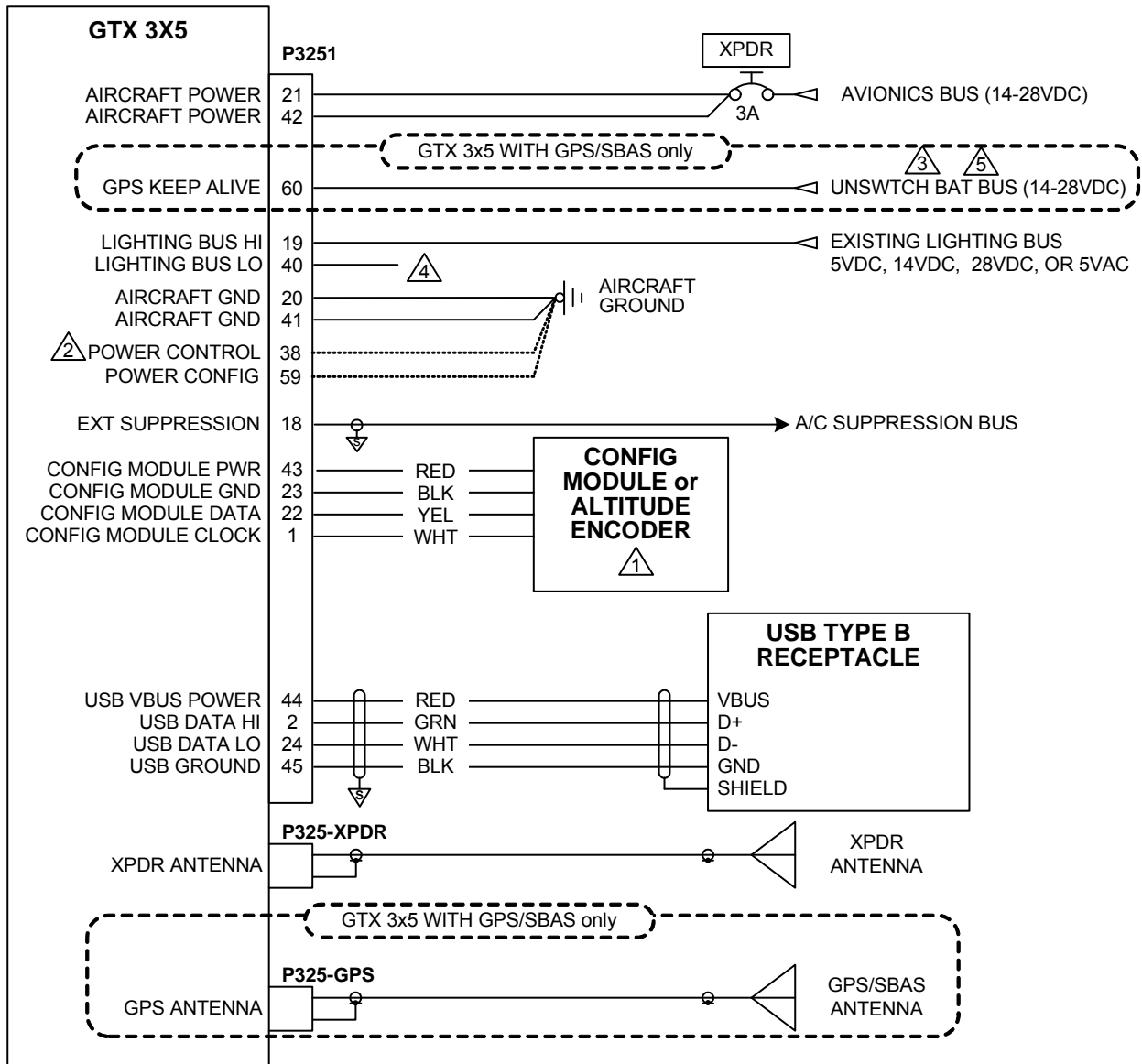


Figure D-1 GTX 3X5 Power Configuration Typical Interconnect
Sheet 1 of 2

NOTES



CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00122-00. PRESSURE SENSOR/CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00421-00. MODULE WIRE HARNESSES ARE NOT INTERCHANGEABLE. WIRE COLOR IN MODULE WIRE HARNESS DESIGNATES FUNCTION. CONNECT MODULE WIRE HARNESS TO GTX 3X5 ACCORDING TO WIRE COLOR.



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.



FOR LIGHTING BUS CONNECTIONS REFER TO SECTION 5.4.



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

**Figure D-1 GTX 3X5 Power Configuration Typical Interconnect
Sheet 2 of 2**

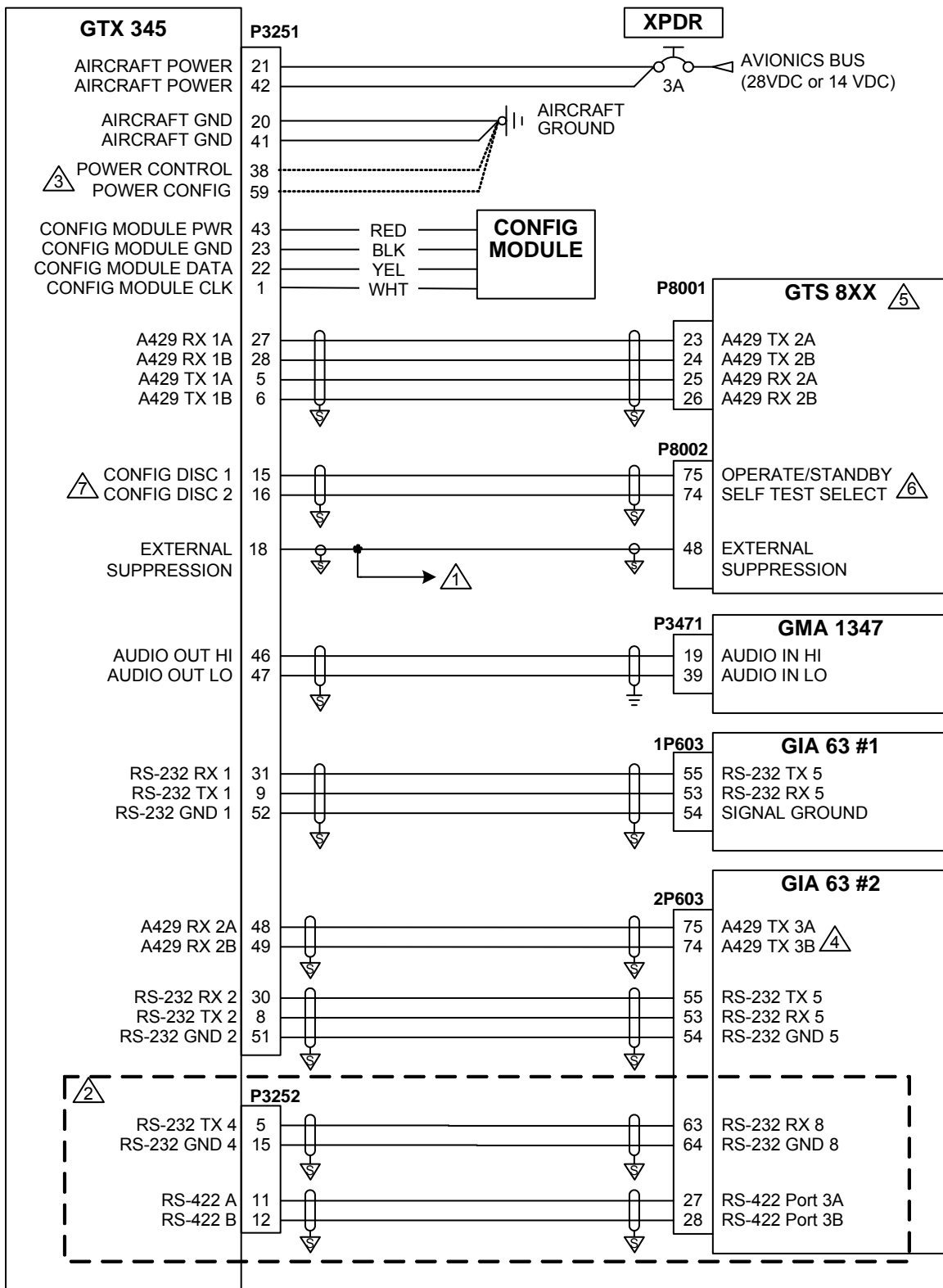


Figure D-2 GTX 345 - G1000 Interconnect
Sheet 1 of 2

NOTES

CONNECTION TO AIRCRAFT SUPPRESSION BUS.



GDL 90 EMULATION - RS-422 FIS-B CONNECTION AND RS-232 ADS-B IN TRAFFIC.



REFER TO SECTION 5.3.1.



PROVIDES TRUE HEADING TO UNIT. USE ANY AVAILABLE ARINC 429 PORT. THIS MUST BE CONFIGURED BY THE INSTALLER.



GTS 8XX SHOWN AS AN EXAMPLE, FOR ALTERNATE EXTERNAL TRAFFIC SYSTEM OPTIONS, REFER TO EXTERNAL TRAFFIC SENSORS.

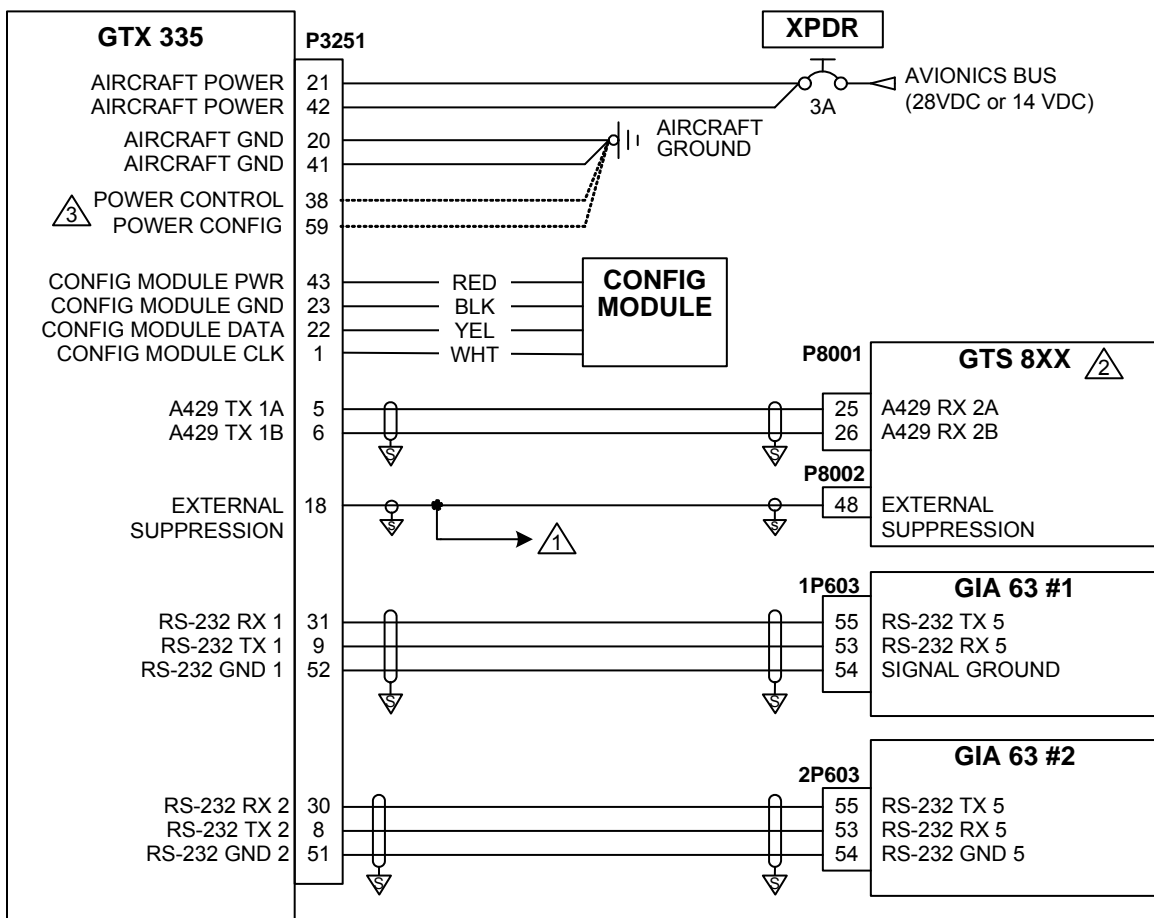


GTX 345 PROVIDES AUTOMATIC CONTROL OF OPERATE/STANDBY BASED ON AIRBORNE STATUS. GTX 3X5 INSTALL TOOL PROVIDES TRAFFIC SELF TEST DISCRETE FOR EXTERNAL TRAFFIC VALIDATION.

7

THIS DIAGRAM PROVIDES AN OVERVIEW OF A TYPICAL INSTALLATION. FOR SPECIFIC EQUIPMENT, REFER TO APPLICABLE INTERCONNECT DIAGRAMS.

**Figure D-2 GTX 345 - G1000 Interconnect
Sheet 2 of 2**



NOTES



CONNECTION TO AIRCRAFT SUPPRESSION BUS.

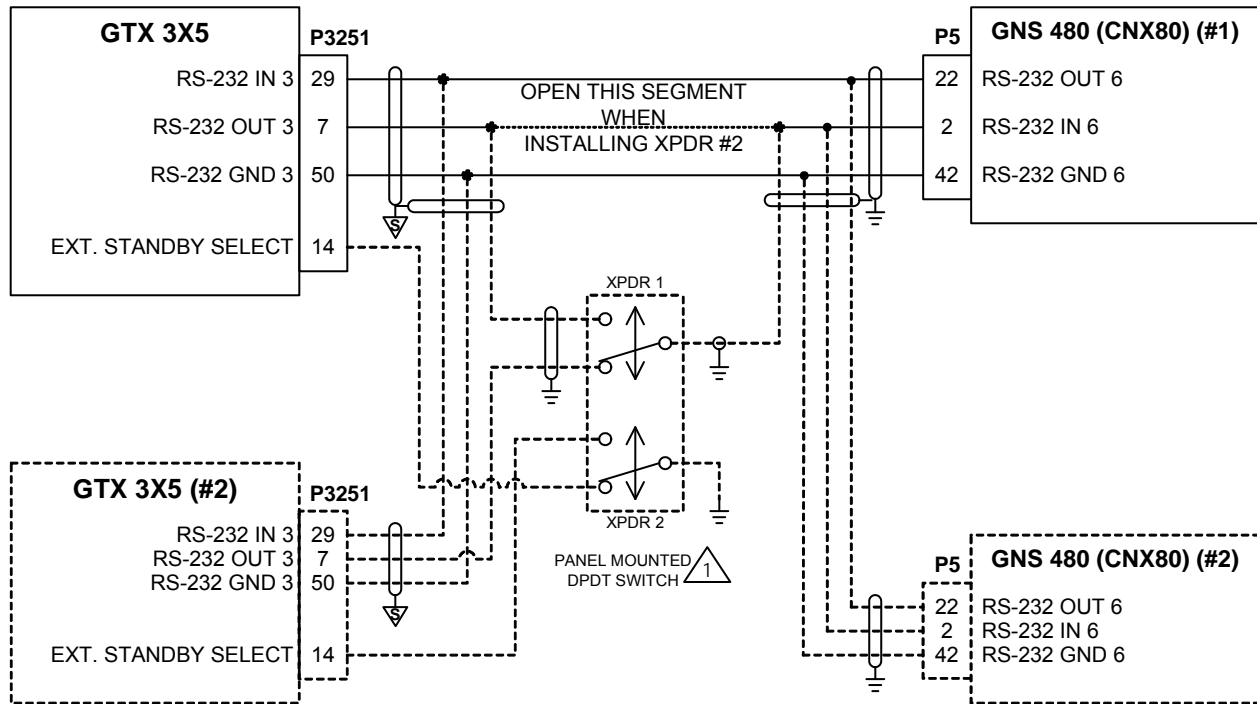


GTS 8XX IS THE ONLY SUPPORTED TRAFFIC SYSTEM THAT INTERFACES WITH THE GTX 335.



FOR DETAILS REFER TO SECTION 5.3.1.

Figure D-3 GTX 335 - G1000 Interconnect



NOTES



WHEN INSTALLING A SECOND TRANSPONDER, A SWITCH MUST BE INSTALLED TO LET ONLY ONE TRANSPONDER TO BE ACTIVE AT A TIME. SUITABLE DPDT SWITCHES: C&K 7000 SERIES P/N 7201SYZQE, OR EQUIVALENT.

2

DASHED LINES AND AREAS REPRESENT TRANSPONDER #2 AND GNS 480 (CNX80) #2 INSTALLATION DETAILS.

Figure D-4 GTX 3X5 - GNS 480 (CNX80) Interconnect

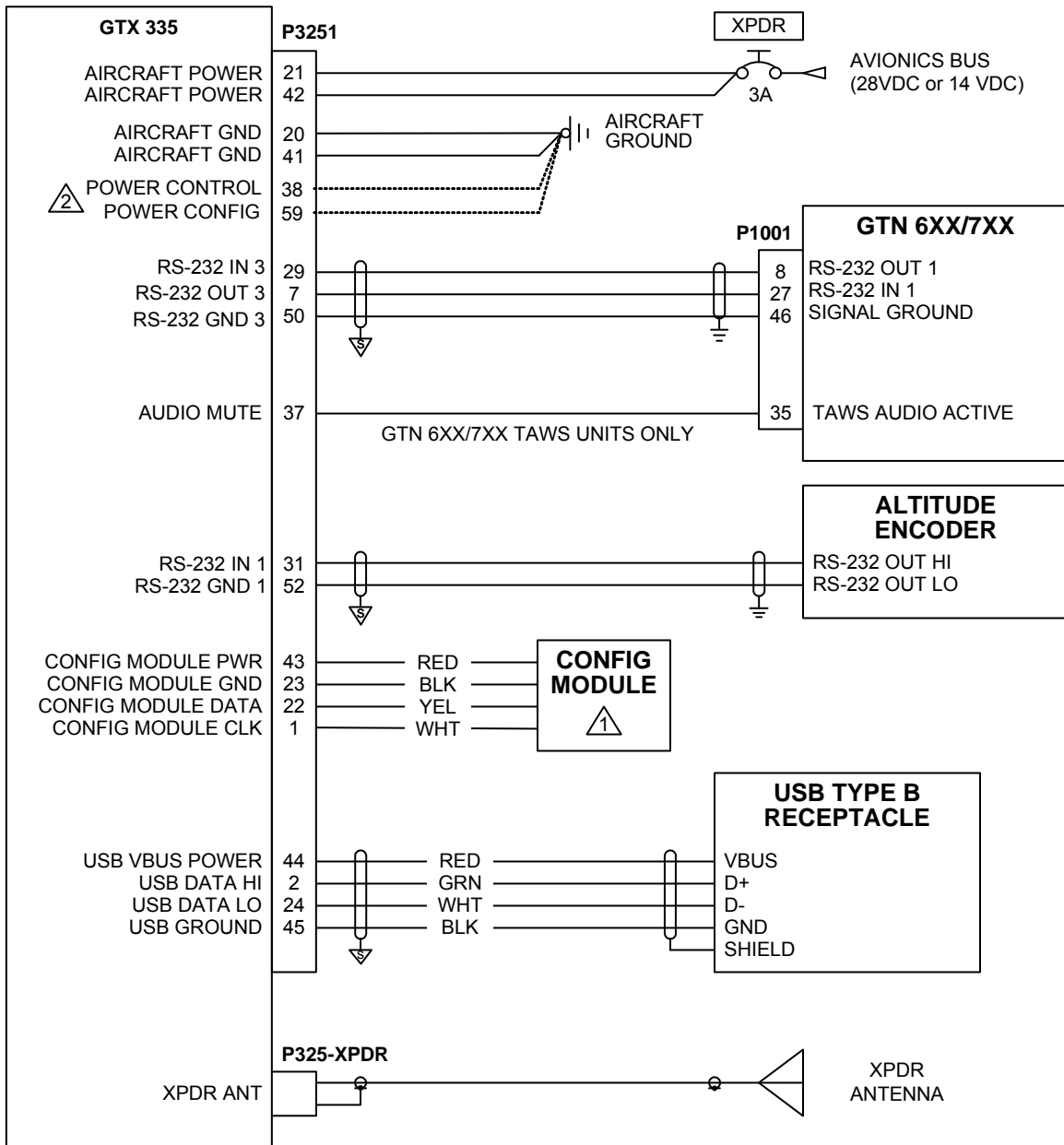


Figure D-5 GTX 335 - GTN 6XX/7XX Typical Interconnect
Sheet 1 of 2

NOTES

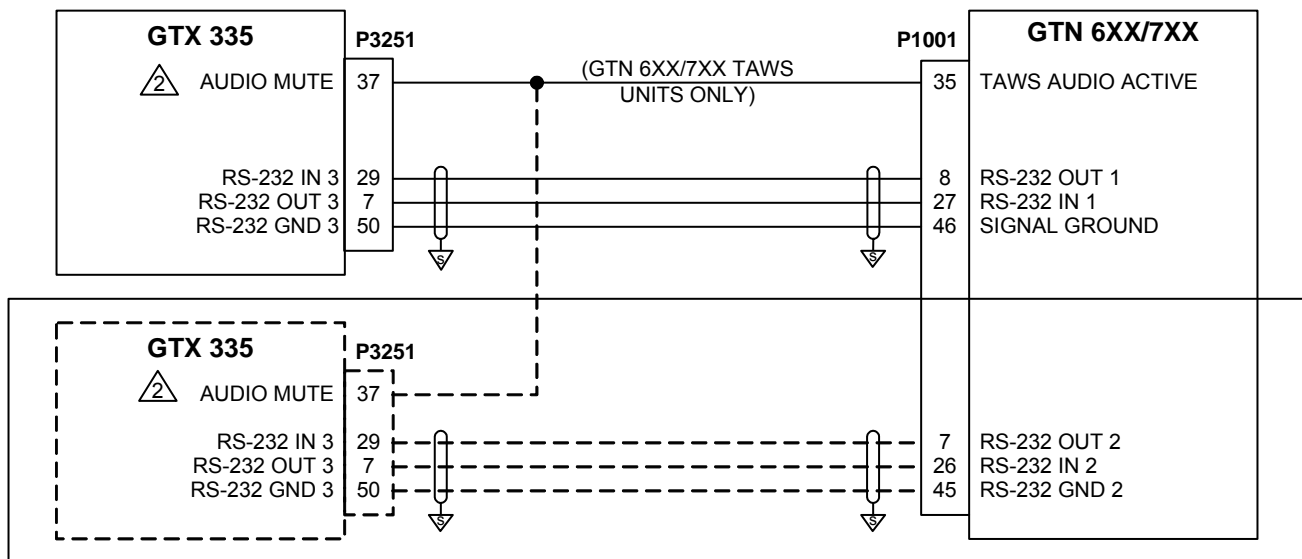
1

CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00122-00. PRESSURE SENSOR/CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00421-00. MODULE WIRE HARNESSES ARE NOT INTERCHANGEABLE. WIRE COLOR IN MODULE WIRE HARNESS DESIGNATES FUNCTION. CONNECT MODULE WIRE HARNESS TO GTX 3X5 ACCORDING TO WIRE COLOR.

2

FOR DETAILS REFER TO SECTION 5.3.1.

**Figure D-5 GTX 335 - GTN 6XX/7XX Typical Interconnect
Sheet 2 of 2**



NOTES

1

DASHED AREAS INDICATE ADDITIONAL INTERCONNECTS FOR DUAL INSTALLATION AND ARE NOT REQUIRED FOR SINGLE INSTALLATION.

2

AUDIO INHIBIT I/O PIN IS CONFIGURABLE. FOR DETAILS, REFER TO SECTION 5.6.

Figure D-6 Single/Dual GTX 335 - Single GTN 6XX/7XX Interconnect

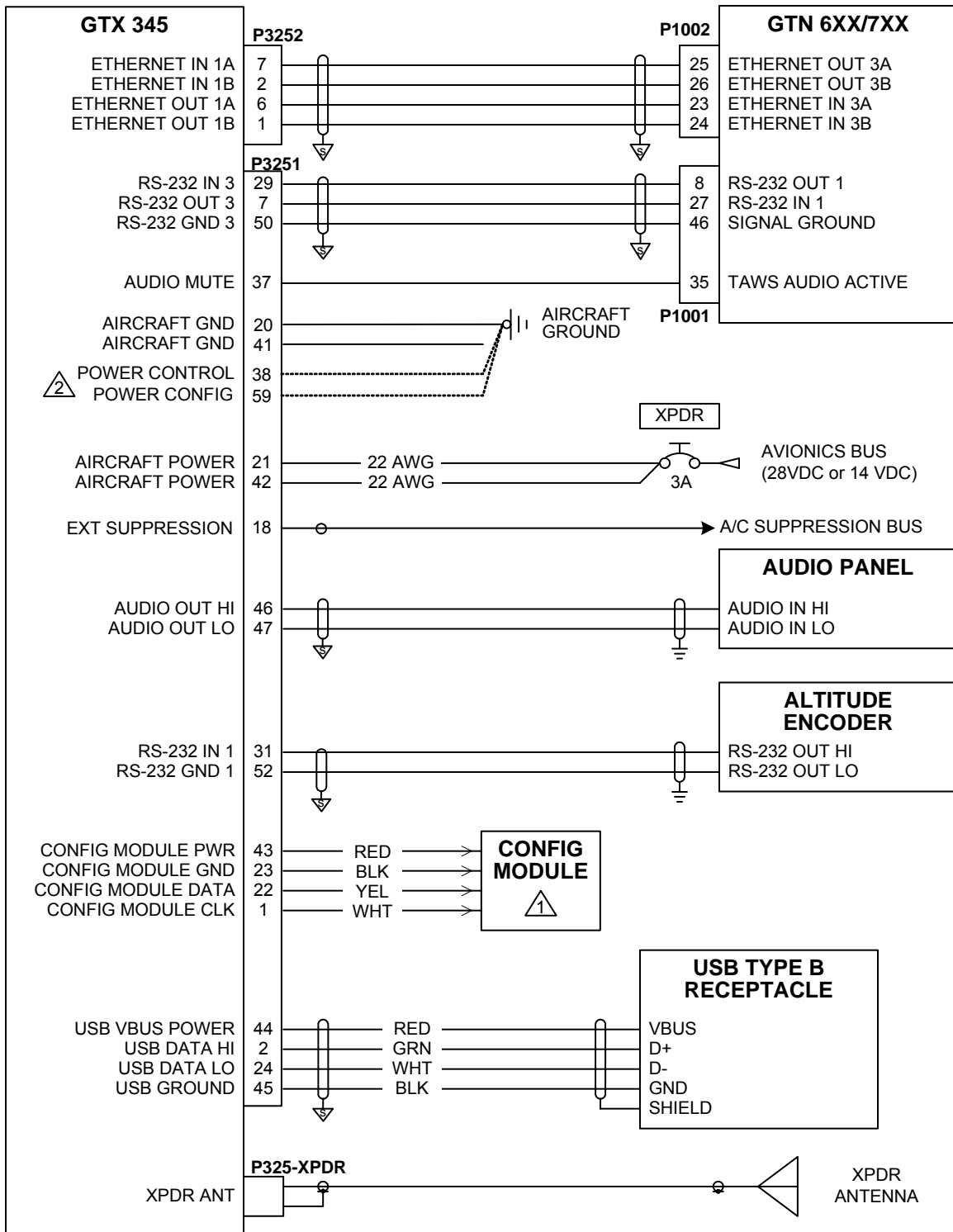


Figure D-7 GTX 345 - GTN 6XX/7XX Typical Interconnect
Sheet 1 of 2

NOTES



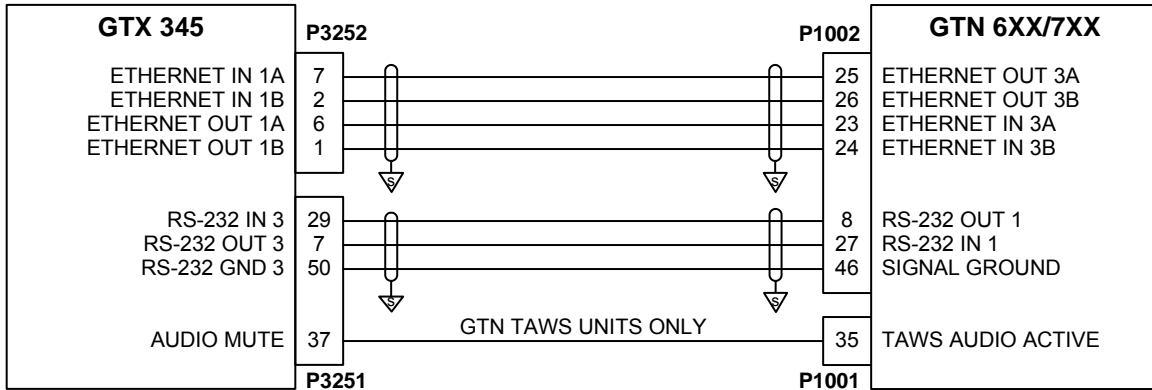
CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00122-00. PRESSURE SENSOR/CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00421-00. MODULE WIRE HARNESSES ARE NOT INTERCHANGEABLE. WIRE COLOR IN MODULE WIRE HARNESS DESIGNATES FUNCTION. CONNECT MODULE WIRE HARNESS TO GTX 3X5 ACCORDING TO WIRE COLOR.



FOR DETAILS REFER TO SECTION 5.3.1.

**Figure D-7 GTX 345 - GTN 6XX/7XX Typical Interconnect
Sheet 2 of 2**

SINGLE GTX 345 or GTX 345R with SINGLE GTN 6XX/7XX



SINGLE GTX 345 or GTX 345R with DUAL GTN 6XX/7XXs

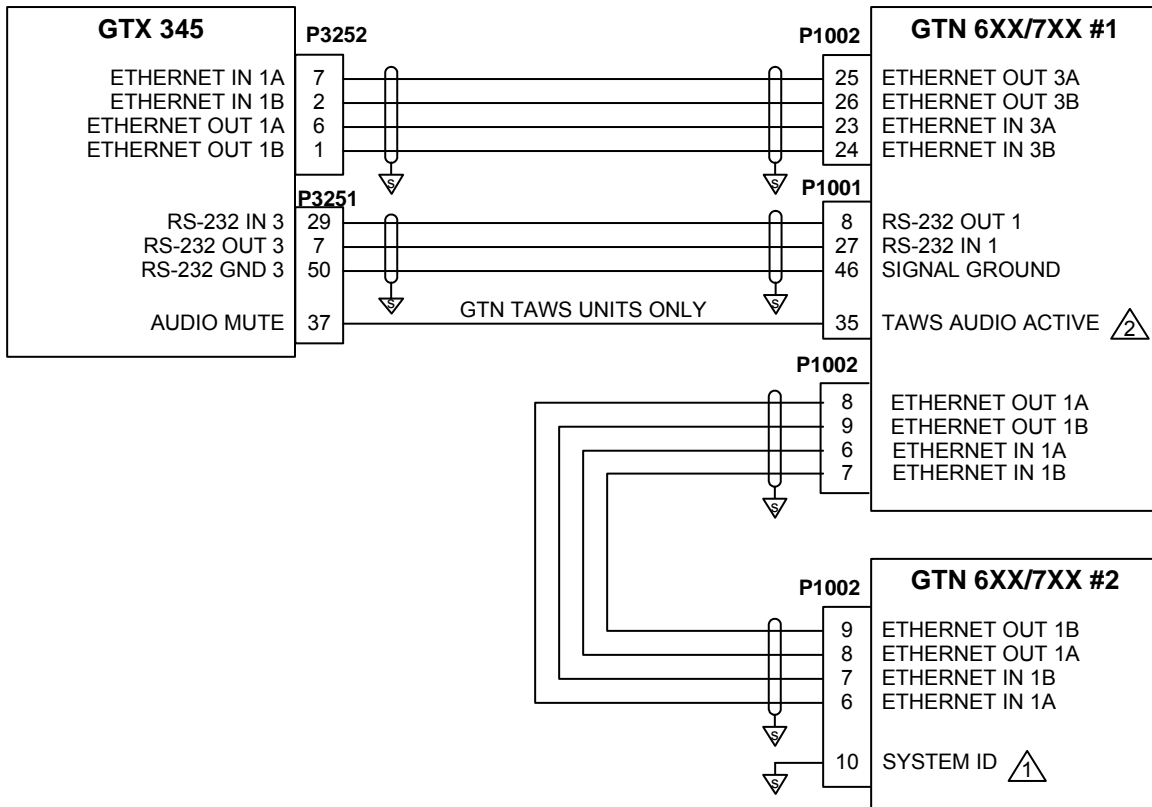


Figure D-8 GTX 345 - Single/Dual GTN 6XX/7XX Interconnect
Sheet 1 of 2

NOTES

1

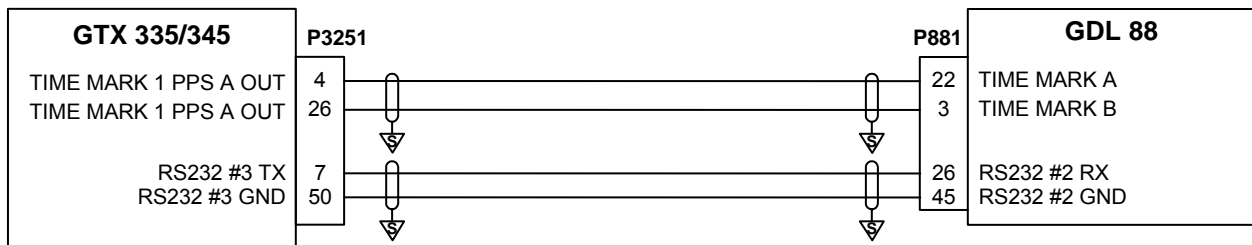
WHEN GTN 6XX/7XX IS THE ONLY INSTALLED GPS NAVIGATOR, OR GPS NAVIGATOR #1 IN A DUAL GPS NAVIGATOR INSTALLATION, CONFIGURE GTN 6XX/7XX AS GTN #1 BY LEAVING SYSTEM ID (P1002-10) NOT CONNECTED. WHEN THE GTN 6XX/7XX IS GPS NAVIGATOR #2 IN A DUAL GPS INSTALLATION, CONFIGURE GTN #2 BY GROUNDING SYSTEM ID (P1002-10)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

2

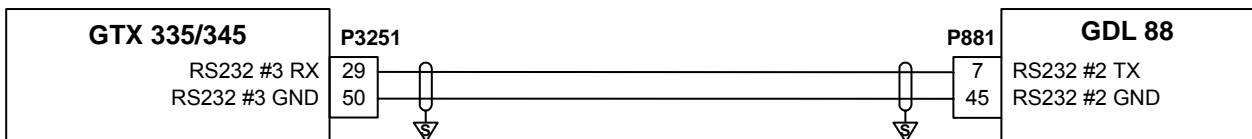
TAWS AUDIO INHIBIT FOR GTN 6XX/7XX TAWS UNITS ONLY.

**Figure D-8 GTX 345 - Single/Dual GTN 6XX/7XX Interconnect
Sheet 2 of 2**

GTX 335/345 PROVIDING GPS POSITION TO GDL 88



GDL 88 PROVIDING GPS POSITION TO GTX 335/345



NOTES

- 1 ADS-B + FORMAT 2 SHOULD BE USED FOR BOTH INTERFACES.

Figure D-9 GTX 335/345 - GDL 88 Interconnect

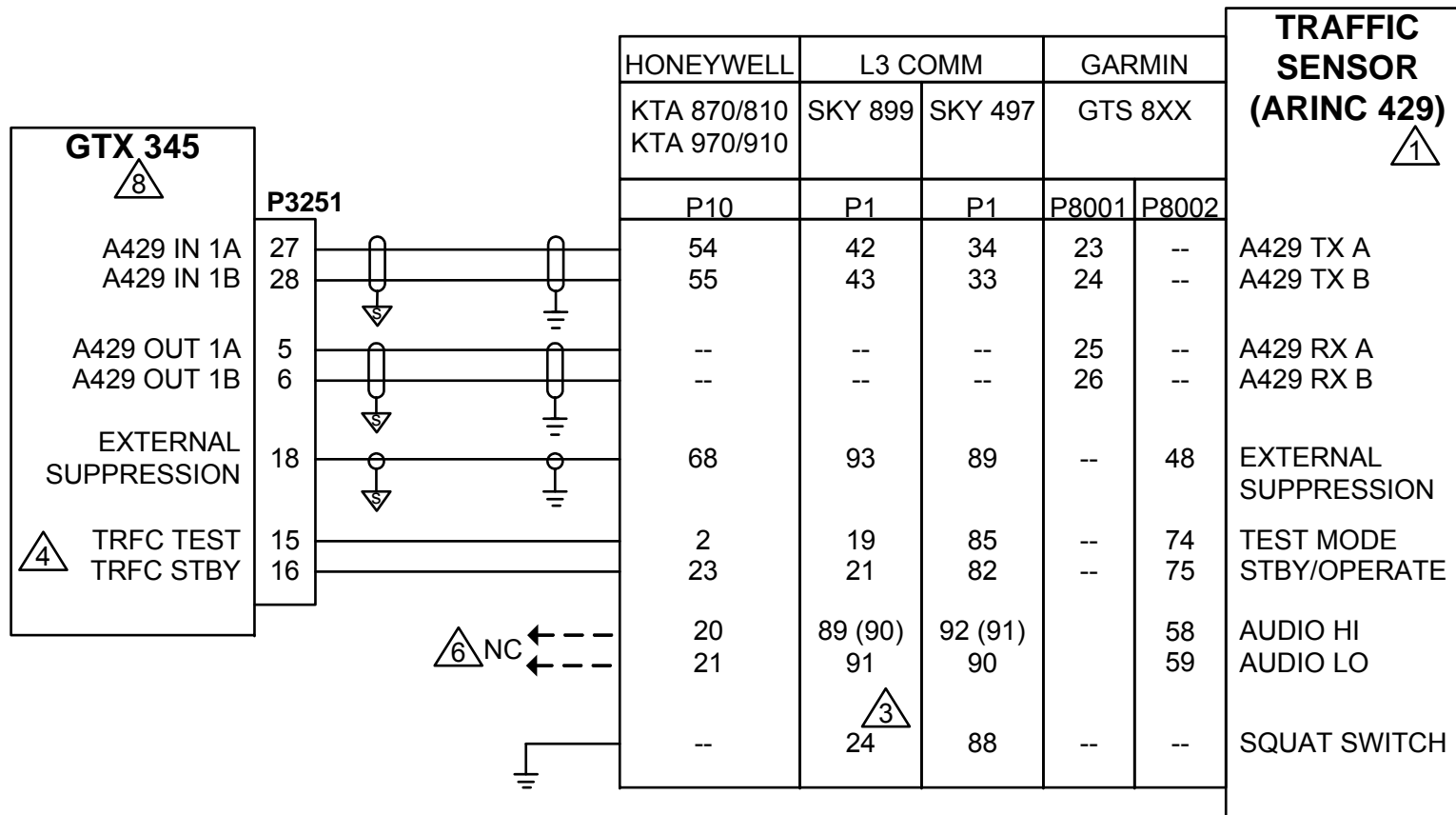


Figure D-10 GTX 345 - Traffic Sensor Interconnect
Sheet 1 of 4

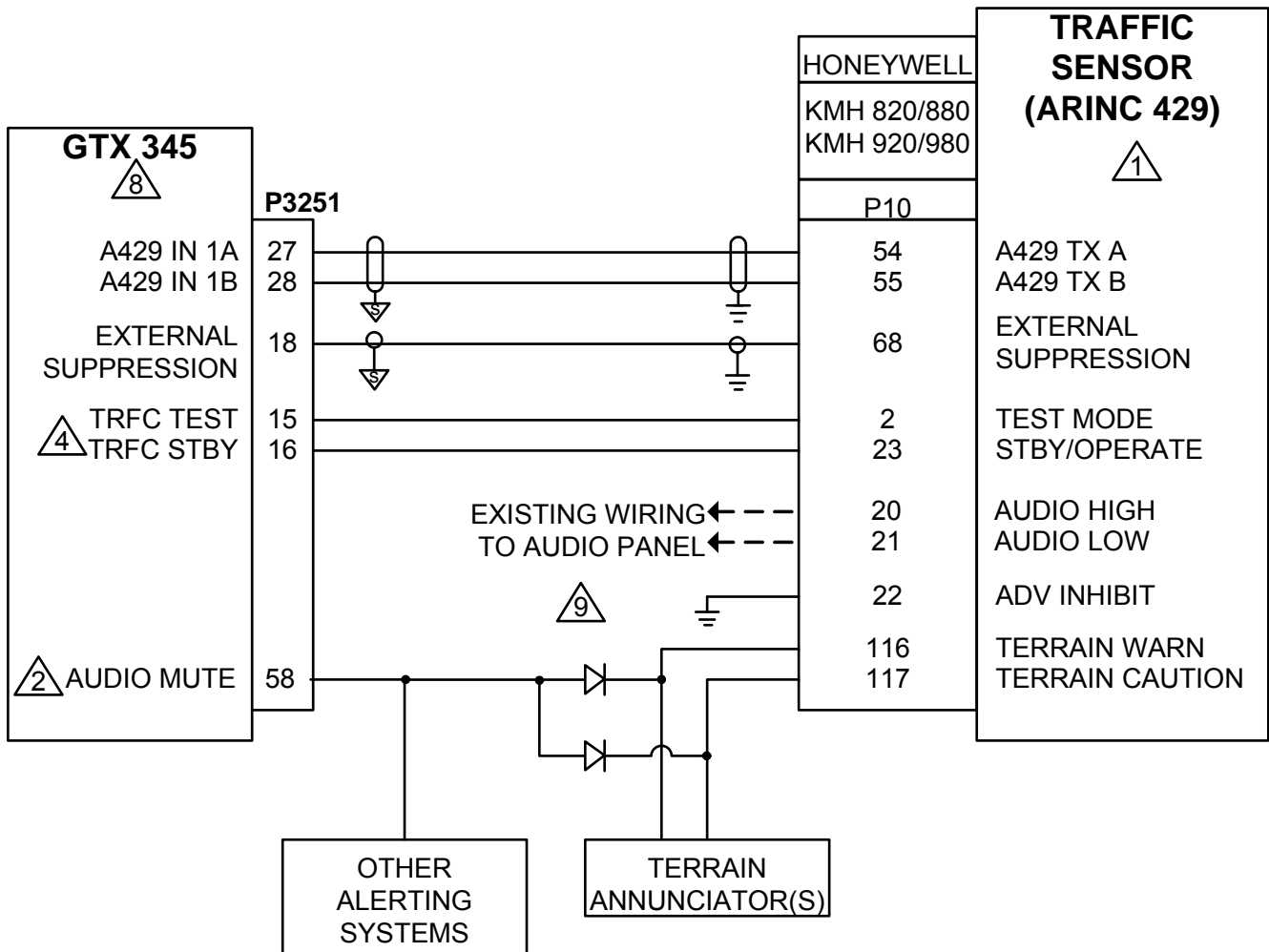
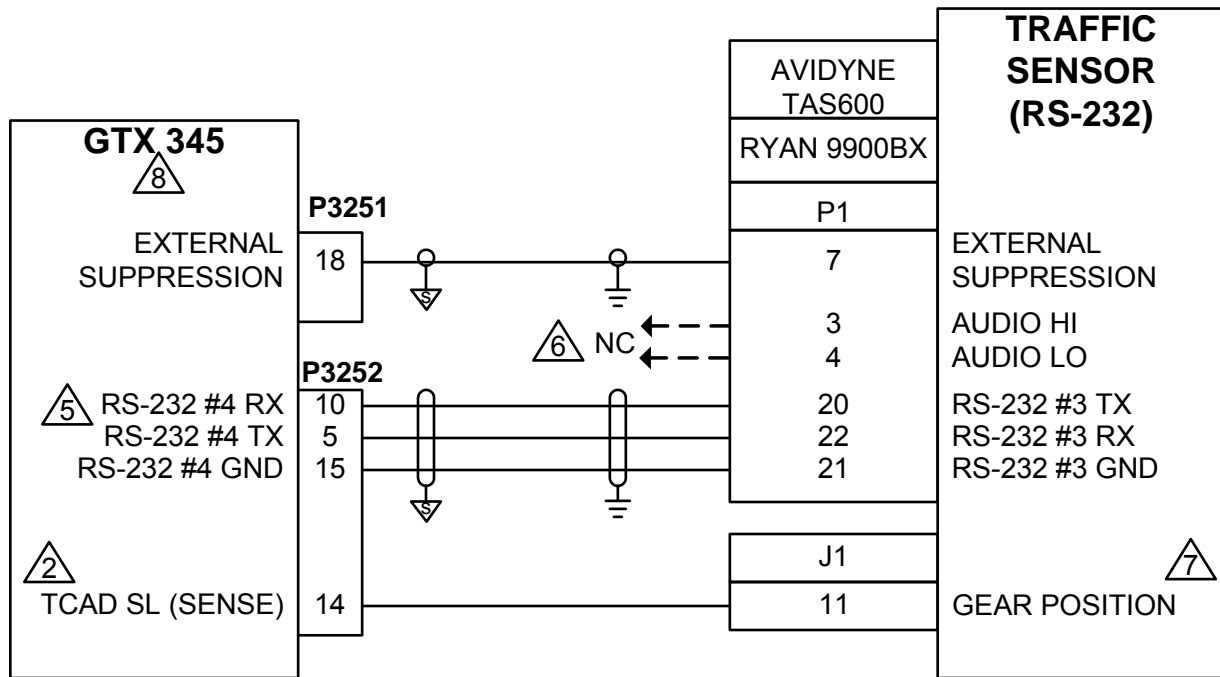


Figure D-10 GTX 345 - Traffic Sensor Interconnect
 Sheet 2 of 4



NOTES

- 1 FOR ADDITIONAL REQUIRED CONFIGURATIONS FOR THE GTX 345R AND AN EXTERNAL TRAFFIC SENSOR IN G950/1000 EQUIPPED AIRCRAFT, REFER TO THE STC INSTALLATION MANUAL.
- 2 ANY CONFIGURABLE OUTPUT DISCRETE CAN BE USED IF THIS DISCRETE IS ALREADY IN USE.
- 3 CONFIGURE THE TRC 899 "WEIGHT ON WHEELS" SWITCH AS "ACTIVE LOW." FOR COMPLETE CONFIGURATION INFORMATION REFER TO MANUFACTURER'S DOCUMENTATION.
- 4 CONFIGURABLE FOR P3251 ONLY.
- 5 NON-CONFIGURABLE PORT. ONLY RS-232 PORT 4 CAN BE USED FOR THIS CONNECTION.
- 6 IF THE EXTERNAL TRAFFIC SENSOR WAS INTERFACED TO THE AUDIO PANEL, THESE WIRES SHOULD BE CAPPED AND STOWED. ONLY THE GTX 345 SHOULD BE INTERFACED TO THE AUDIO PANEL.
- 7 THIS DISCRETE IS TO DRIVE THE SENSITIVITY LEVEL FOR THE TRAFFIC SYSTEM. FOR SPECIFIC G950/G1000 INSTALLATIONS, THIS DISCRETE IS NOT NECESSARY TO CONNECT TO THE GTX 345 UNLESS THE GTX 345 HAS A RADAR ALTIMETER INPUT.
- 8 FOR DETAILS REFER TO THE AUDIO PANEL INTERFACE.

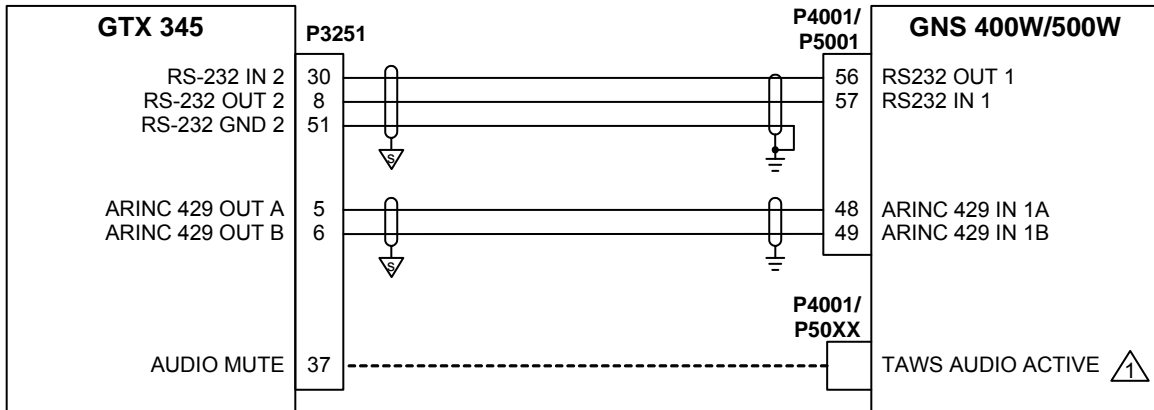
**Figure D-10 GTX 345 - Traffic Sensor Interconnect
Sheet 3 of 4**



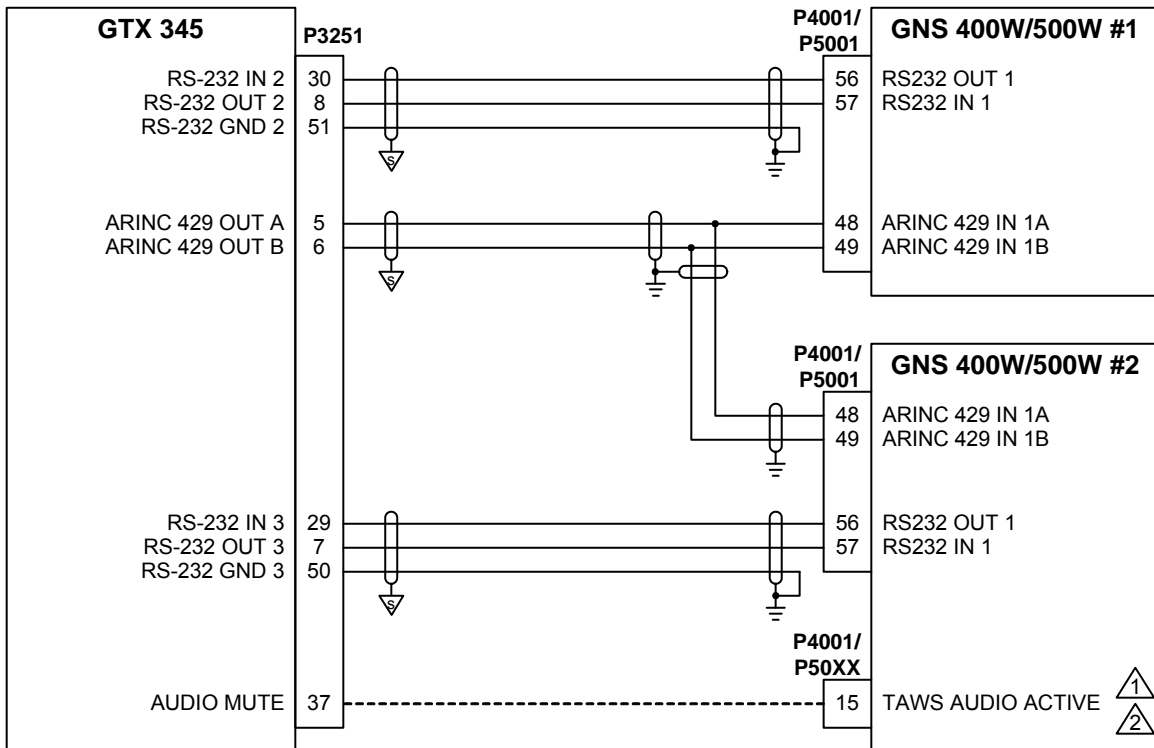
IF THE KMH HAS THE COMBINED TAS/EGPWS, THE AUDIO WIRING REMAINS CONNECTED. THE TERRAIN ANNUNCIATOR SIGNALS DRIVE THE AUDIO MUTE INPUT TO THE GTX WITH THE APPLICATION OF TWO ADDITIONAL DIODES, P/N: 1N4007. IF OTHER SYSTEMS INTERFACE TO THE ADV INHIBIT (P10-22), THEY SHOULD BE REMOVED FROM P100-22 AND INTERFACED TO THE GTX AS SHOWN. IF THE EGPWS IS NOT ENABLED, THE AUDIO WIRING CAN BE CAPPED AND STOWED AND THE TERRAIN ANNUNCIATOR SIGNALS WITH THE DIODES DO NOT NEED TO BE CONNECTED TO THE GTX AUDIO MUTE.

Figure D-10 GTX 345 - Traffic Sensor Interconnect
Sheet 4 of 4

SINGLE GNS 400W/500W SERIES



DUAL GNS 400W/500W SERIES



NOTES

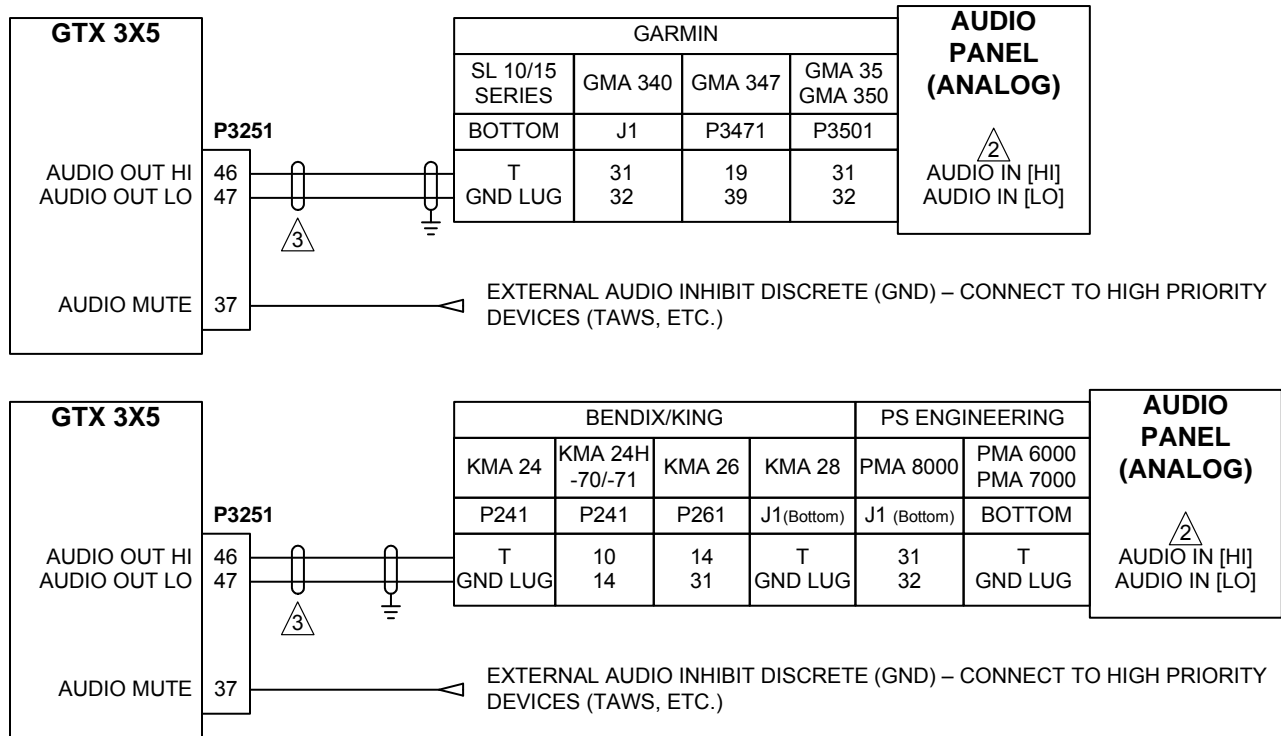


TAWS AUDIO INHIBIT USED WITH 400S/500W SERIES UNITS ONLY.



CONNECTION CAN BE MADE TO NAVIGATOR #1 IN LIEU OF NAVIGATOR #2.

Figure D-11 GTX 345 - Single and Dual 400W/500W Series



NOTES



SEE THE GENERAL NOTES IDENTIFIED AT THE BEGINNING OF THIS APPENDIX FOR ADDITIONAL DETAILS AND REQUIREMENTS.

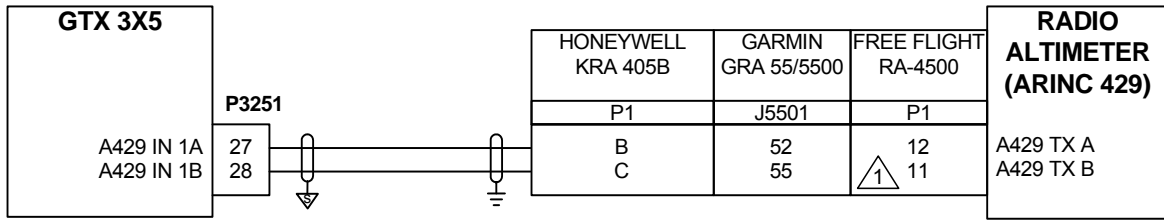


IT IS ACCEPTABLE TO USE OTHER AVAILABLE UNSWITCHED, UNMUTED INPUTS. IF AUDIO PANEL DOES NOT HAVE AN AVAILABLE UNSWITCHED, UNMUTED INPUT, AUDIO FROM THE GTX 3X5 MUST BE MIXED WITH AN EXISTING AUDIO SOURCE USING RESISTORS TO ISOLATE THE AUDIO OUTPUT FROM EACH LRU. A TYPICAL VALUE FOR MIXING RESISTORS IS 390Ω ¼ W.



THE AUDIO LEVELS OF EXISTING AUDIO SOURCES WILL HAVE TO BE RE-EVALUATED AFTER MIXING RESISTORS ARE INSTALLED. SHIELDS FOR AUDIO CABLES SHOULD BE GROUNDED AT ONE END (WITH LEADS LESS THAN 3.0 INCHES) AND LEFT FLOATING AT THE OTHER END.

Figure D-12 GTX 3X5 - Audio Interconnect

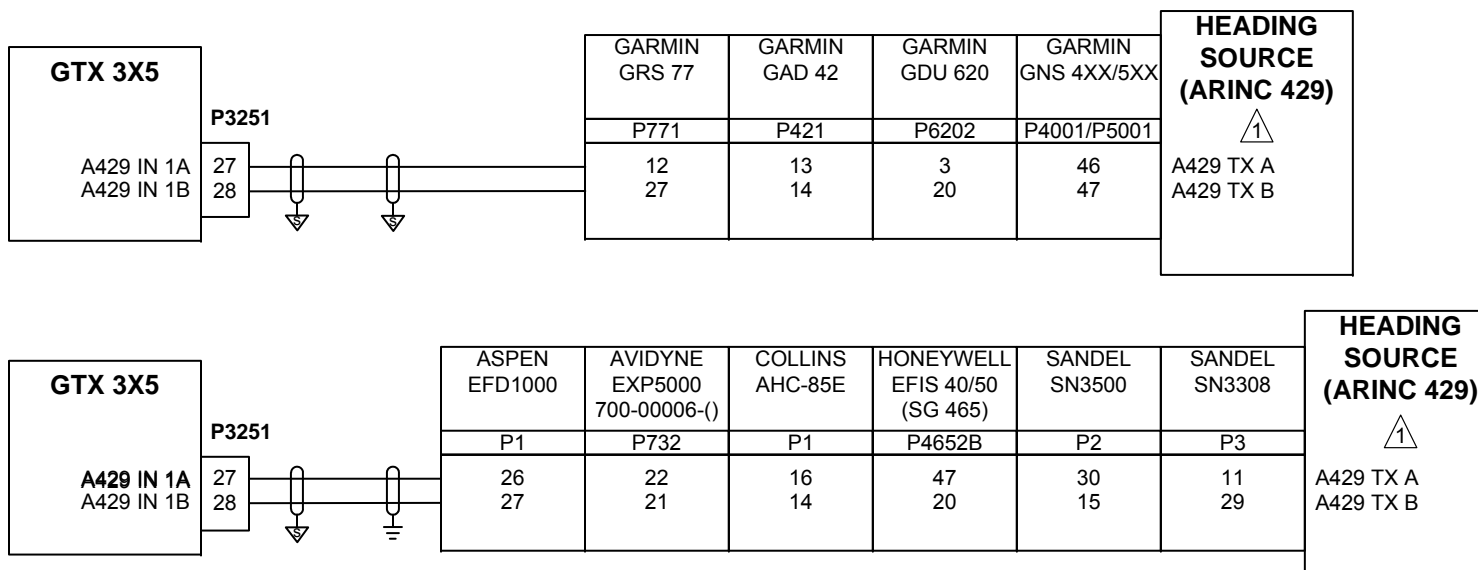


NOTES



ONLY APPLICABLE TO FREE FLIGHT RA-4500 P/N 84560-X2-XXXX.

Figure D-13 GTX 3X5 - Radio Altimeter Interconnect

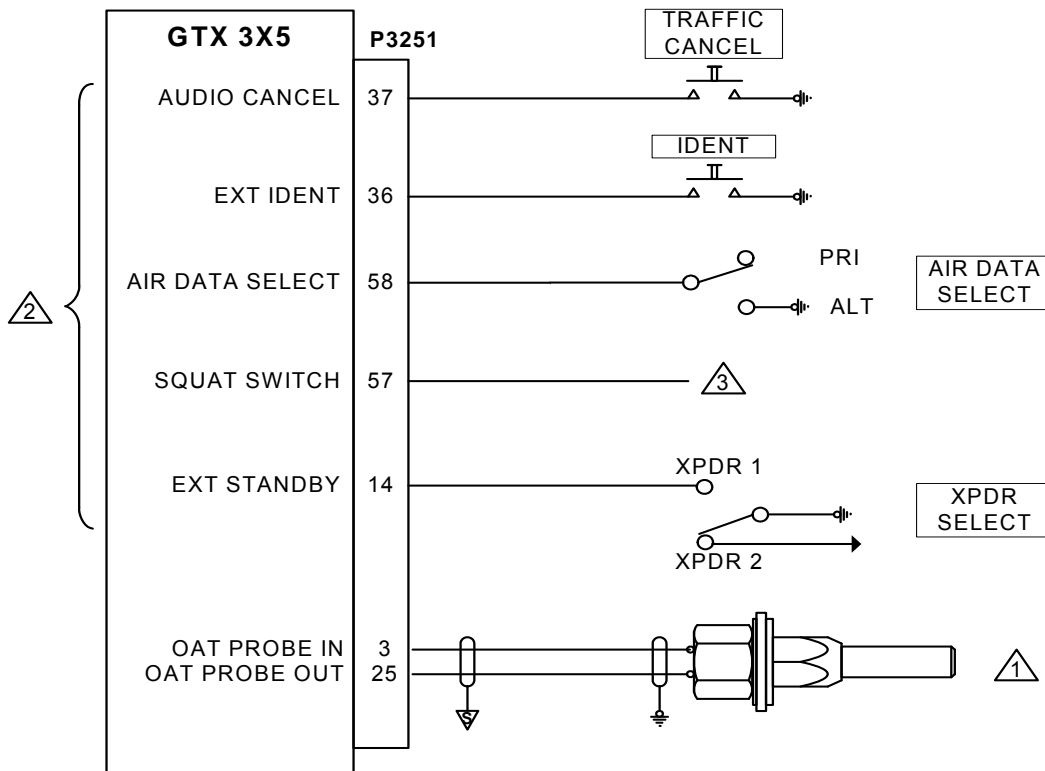


NOTES



SUPPORTED EQUIPMENT SHOWN CONNECTED IN PARALLEL.

Figure D-14 GTX 3X5 - AHRS/Heading Source



NOTES

- 1 OUTSIDE AIR TEMPERATURE PROBE STANDARD 2-WIRE THERMOCOUPLE WITH 1 MICRO-AMP PER DEGREE KELVIN RESPONSE. SUITABLE MODELS ARE: EDMO 655 AND DAVTRON C307PS.
- 2 DISCRETE I/O PINS ARE CONFIGURABLE. REFER TO SECTION 6.5.
- 3 THE SQUAT SWITCH INPUT CAN BE USED TO CONTROL AIR/GROUND STATUS. THE INPUT SENSE CONFIGURATION IS DESCRIBED IN TABLE 6-8.

Figure D-15 GTX 3X5 - Switches and OAT Probe Interconnect

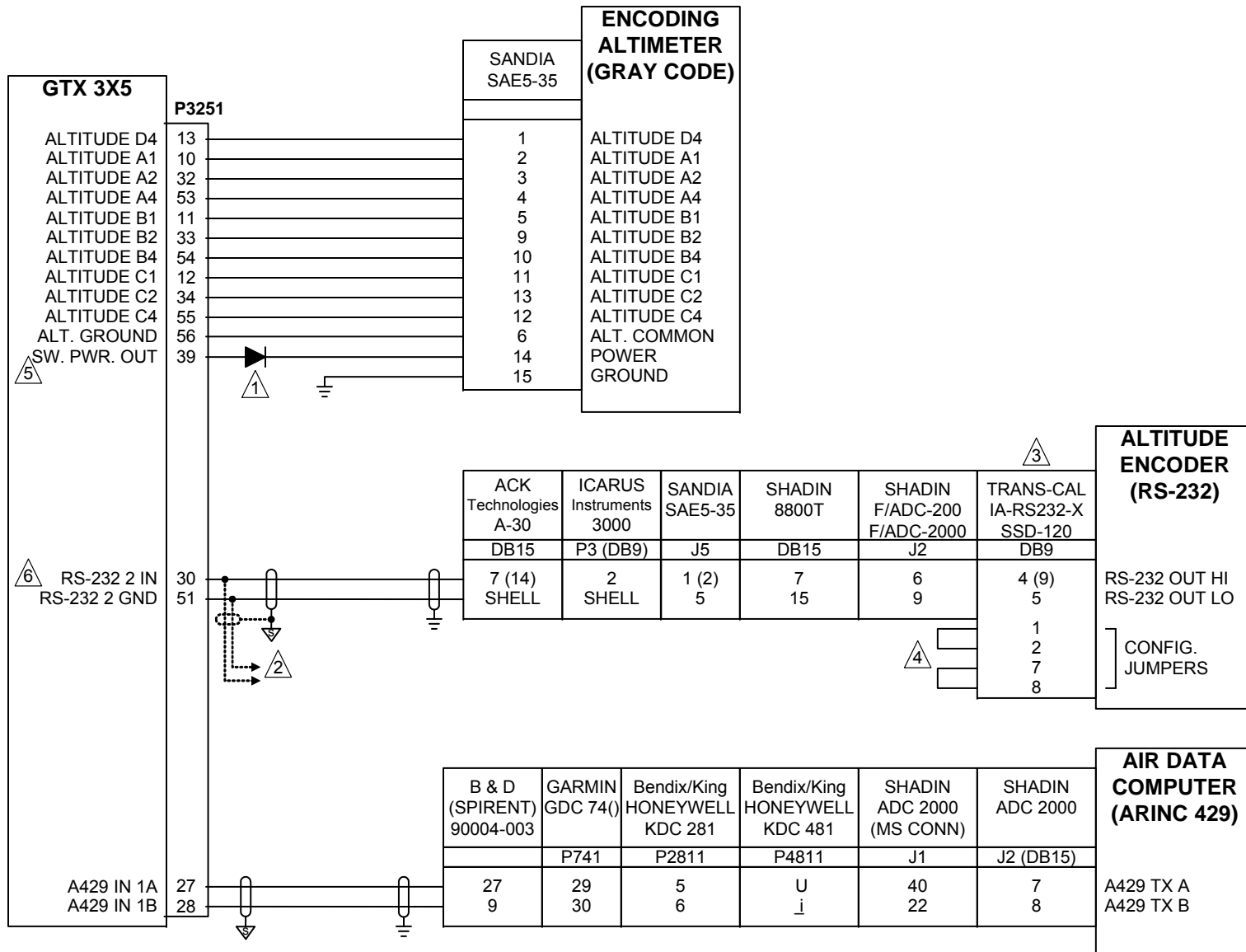


Figure D-16 GTX 3X5 - Altitude Source Interconnect
 Sheet 1 of 2

NOTES



USE 1N4007 DIODE FOR ENCODER POWER.



TO GTX #2 IF INSTALLED. RS-232 SPLICE MUST BE MADE ADJACENT TO GTX #1 CONNECTOR AS SHOWN.



CONFIGURE ENCODER OUTPUT TO "TRIMBLE/GARMIN 9600 BPS" FORMAT IF USING RS-232 SOFTWARE METHOD.



LIMIT STRAP LENGTH TO SPECIFIED LENGTH IN THE MANUFACTURER'S INSTALLATION MANUAL.



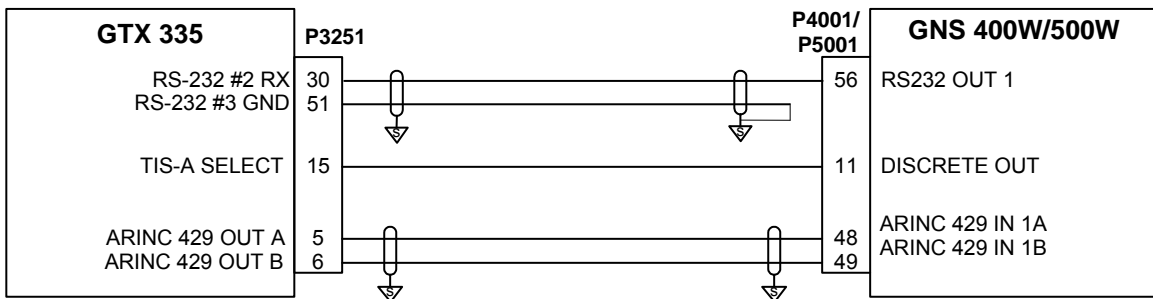
POWERING SAE 5-35 THROUGH THE SWITCHED OUTPUT IS OPTIONAL.



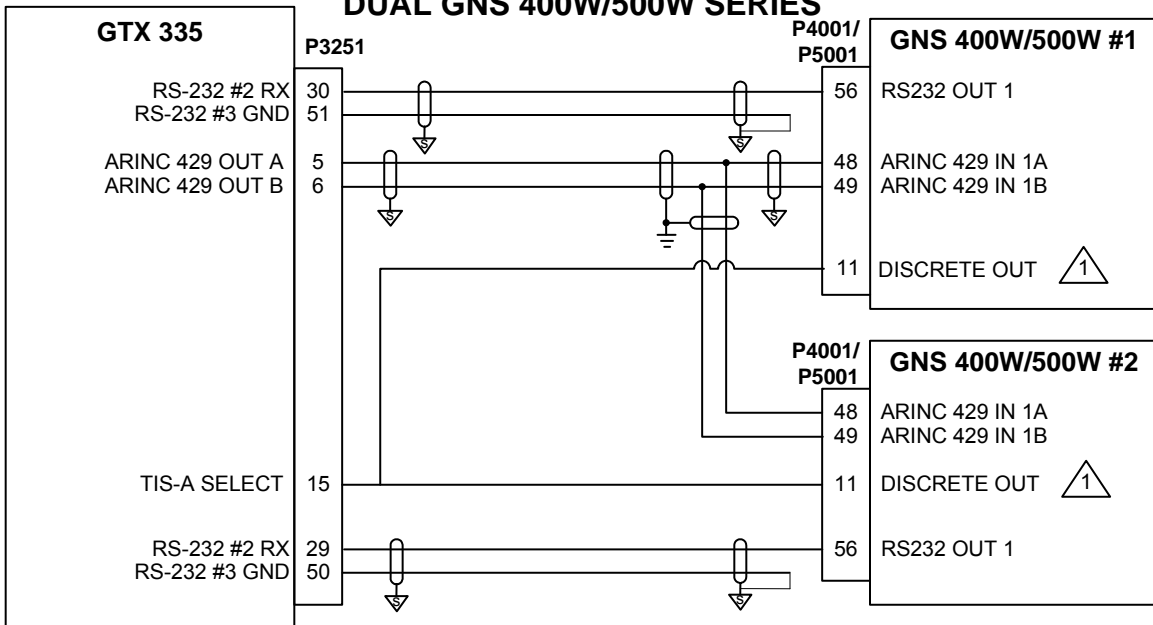
ALTITUDE MAY BE INPUT ON RS-232 IN 1, RS-232 IN 2, OR RS-232 IN 3.

**Figure D-16 GTX 3X5 - Altimeter Interconnect
Sheet 2 of 2**

SINGLE GNS 400W/500W SERIES



DUAL GNS 400W/500W SERIES

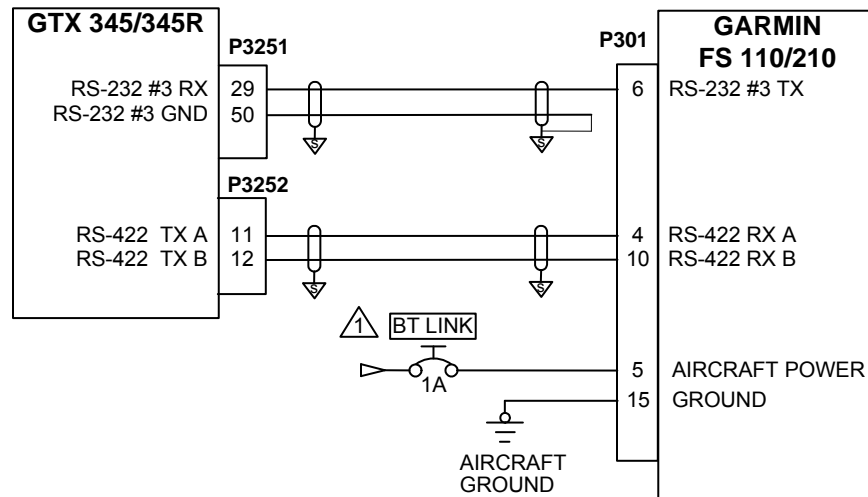


NOTES



CONNECTION CAN BE MADE TO NAVIGATOR #1 IN LIEU OF NAVIGATOR #2.

Figure D-17 GTX 335 - GNS 400W/500W Series Interconnect

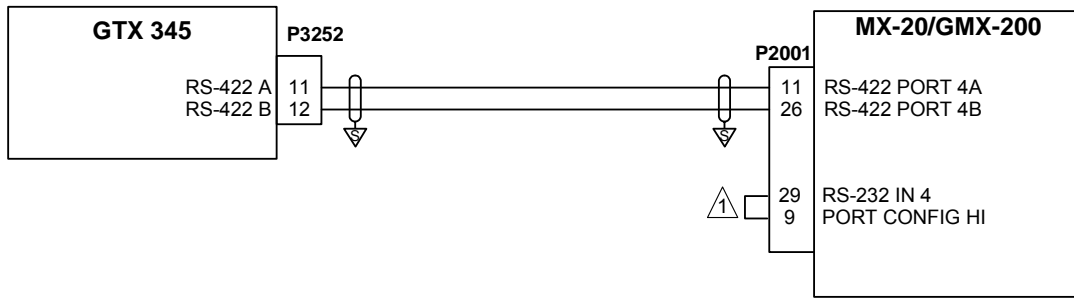


NOTES



CIRCUIT BREAKER SHOULD BE LABELED AS SHOWN.

Figure D-18 GTX 345/345R - Flight Stream Interconnect



GMX 200 ONLY: JUMPER MUST BE INSTALLED AS SHOWN TO CONFIGURE PORT 4 FOR RS-422 OPERATION. IF PORT 4 IS USED AS AN RS-422 PORT, RS-232 PORT 4 CANNOT BE USED.

Figure D-19 GTX 345 - MX20/GMX 200 Interconnect

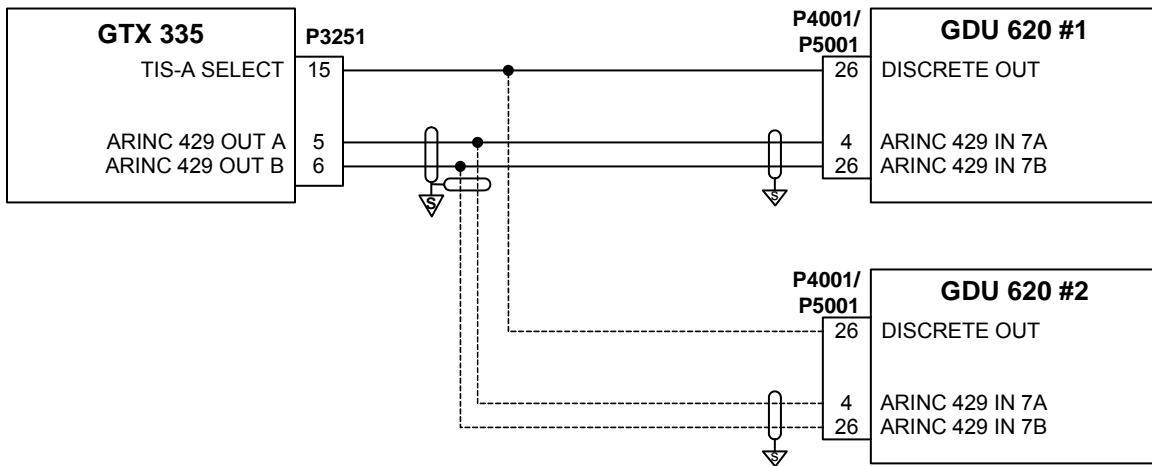


Figure D-20 GTX 335 - GDU 620 Interconnect

Appendix E CS-ACNS Compliance Matrix

E.1	Elementary Surveillance (ELS)	E-1
E.2	Enhanced Surveillance (EHS)	E-7
E.3	ADS-B.....	E-9

E.1 Elementary Surveillance (ELS)

The information in appendix E-1 is applicable to GTX 335/335R/345/345R units running software v2.05 or earlier.

Table E-1 ELS

CS-ACNS SECTION	CS-ACNS ITEM DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ELS.001 Applicability	Provided that the differences listed in Appendix D have also been addressed, then previous compliance declarations with JAA TGL 13 Revision1 (Certification of Mode S Transponder Systems for Elementary Surveillance) supplemented with the additional assessments is another Acceptable Means of Compliance.	Not applicable for the new GTX 335/335R/345/345R units.
CS ACNS.D.ELS.010 Transponder Characteristics	a) The transponder(s) is (are) an approved level 2 or greater Mode S transponder(s) with Elementary Surveillance and Surveillance Identifier (SI) capability.	The GTX 335/335R/345/345R units are TSO Class 1 Level 2 transponder with Level C (Major) Failure classification with SI mode capability.
	b) The transponder(s) of aircraft that have ACAS II installed is (are) ACAS compatible.	The GTX 335/335R/345/345R units do not support an interface with an ACAS II system therefore the Resolution Advisory (BDS 3,0) is transmitted as all zeros.
	c) The peak pulse power available at the antenna end of the transmission line of the transponder is more than 125 W (21 dBW) and not more than 500 W (27 dBW) for aircraft that operate at altitudes exceeding 4 570 m (15 000 ft) or with a maximum cruising speed exceeding 90 m/s (175 knots).	The GTX 335/335R/345/345R units meets the minimum and maximum transmit power level, 125 W (21 dBW) and 500 W (27 dBW), respectively, when installed according to the installation manual.

CS-ACNS SECTION	CS-ACNS ITEM DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ELS.010 Transponder Characteristics (continued)	d) The peak pulse power available at the antenna end of the transmission line of the transponder is more than 70 W (18.5 dBW) and not more than 500 W (27 dBW) for aircraft operating at or below 4 570 m (15000 ft) with a maximum cruising airspeed of 90 m/s (175 knots) or less.	The GTX 335/335R/345/345R units are a Class 1 transponder meeting the higher requirements identified in ACNS.D.ELS.010.c, when installed according to the installation manual.
CS ACNS.D.ELS.015 Data Transmission	a) The surveillance system provides the following data in the Mode S replies:	The GTX 335/335R/345/345R units provide the following:
	1. The Mode A Code in the range 0000 to 7777 (Octal)	1. Mode A code provided in DF=5 and 21 replies. Mode A Code in the range 0000 to 7777 using either the panel mount push-buttons or a compatible control device e.g., GTN 6XX/7XX, GX000, GNS 480.
	2. The pressure altitude corresponding to within plus or minus 38 m (125 ft), on a 95 per cent probability basis, with the pressure-altitude information (referenced to the standard pressure setting of 1013.25 hectopascals), used on board the aircraft to adhere to the assigned flight profile. The pressure altitude ranges from minus 300 m (1 000 ft) to the maximum certificated altitude of aircraft plus 1 500 m (5 000 ft).	2. Altitude is reported in DF=4 and 20 replies. The transponder transmits altitude in 100ft increments from -1000 to 62,700ft or 25ft increments from -1000 to 50,175ft depending on the source data.
3. On-the-ground status information.	3. CA field in DF=11 or FS field in DF=4, 5, 20, and 21 replies includes airborne state. The GTX units automatically transition the aircraft state from airborne to ground-borne and report surface mode broadcasting ground-only information such as aircraft length and width. If the aircraft airborne state is unknown, it will report AIRBORNE with additional details in DF 11 with CA code of 6 or 7.	

CS-ACNS SECTION	CS-ACNS ITEM DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ELS.015 Data Transmission (continued)	4. The Aircraft Identification as specified in Item 7 of the ICAO flight plan or the aircraft registration.	4. The GTX units provide BDS register 20 (Aircraft Identification) as configured by the installer, or changed by the flight crew via panel mount push-buttons or a compatible control device. BDS register 21 (Aircraft Registration) is provided as a constant message.
	5. Special Position Indication (SPI).	5. FS (Flight Status) field in DF=4, 5, 20, and 21 replies includes SPI/IDENT indication. SPI/IDENT is commanded by flight crew via discrete input, panel mount push button, or a compatible control device.
	6. Emergency status (Emergency, Radio communication failure, Unlawful interference).	6. Emergency status is reported in DF=5 and 21 replies.
	7. The data link capability report.	7. BDS register 10 (Data Link Capability Report) is provided.
	8. The common usage GICB capability report.	8. BDS register 17 (Common Usage Ground Initiated Comm-B Capability Report) is provided
	9. The ICAO 24-bit aircraft address.	9. ICAO 24-bit aircraft address is provided in DF=11 squitters
	10. Aircraft that have ACAS II installed provide the ACAS active resolution advisory report.	10. Resolution Advisory (BDS 3,0) is transmitted as all zeros, as the GTX units do not support an interface with ACAS II
	b) All other data transmitted is verified.	The installation data requires a transponder / ADS-B test to be run IAW Part 43 applicable regulatory tests.
1. If the system transmits one or more additional downlink airborne parameters in addition to those listed in paragraph (a), then the relevant sub specifications of CS ACNS.D.EHS.015 are also complied with.		

CS-ACNS SECTION	CS-ACNS ITEM DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ELS.015 Data Transmission (continued)	2. If the system transmits additional parameters on the extended squitter and if their full compliance with CS ACNS.D.ADSB has not been verified, as a minimum the aircraft identification, pressure altitude, ICAO 24-bit aircraft address is identical to those transmitted in the Mode S replies. Additionally the position and velocity quality indicators reports the lowest quality.	The installation data requires a transponder / ADS-B test to be run IAW Part 43 applicable regulatory tests.
CS ACNS.D.ELS.020 On-the-Ground Status Determination	a) The on-the-ground status is not set by a manual action.	The GTX 335/335R/345/345R software's air/ground state will be automatically determined based on emitter category, remote air/ground state, ground speed, GPS track, airspeed, squat switch, height above terrain, and radio altitude when possible. The on-the-ground status cannot be set my manual action.
	b) If automatic determination of the on-the-ground status is not available, the on-the ground status is set to airborne.	The GTX 335/335R/345/345R units will report the airborne state in FS fields 4, 5, 20, 21 and the CA field of DF 11. Furthermore, DF 11 provides the additional capability of identifying if the aircraft didn't know the air/ground state by transmitting a CA code of 6 or 7 which still translates to an AIRBORNE state.
CS ACNS.D.ELS.025 Altitude Source	a) The reported pressure altitude is obtained from an approved source.	The installation manual provides approved altitude interfaces.
	b) The altitude resolution is equal to or less than 30.48 m (100 ft.).	When the unit retrieves valid pressure altitude data, the unit sets the altitude precision of the system based on the data source and the precision field, with a worst-case resolution of 100ft.
	c) The altitude source connected to the active transponder is the source being used to fly the aircraft.	The GTX 335/335R/345/345R provides the option to utilize the Garmin Altitude Encoder which interfaces to the existing aircraft static system and provides the altitude data via I2C to the GTX. It is required to conduct a transponder test upon completion of the installation, which also requires an altitude inspection to compare the input altitude to the aircraft altitude and broadcasted altitude.

CS-ACNS SECTION	CS-ACNS ITEM DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ELS.030 Flight Deck Interface	a) A means is provided:	The GTX 335/335R/345/345R units provide the following:
	1. To select Mode A Code, including emergency indicators.	1. Mode A code entry either on the panel or from a compatible control device, e.g., GTN 6XX/7XX, GNS 480, or GX000.
	2. To initiate the IDENT (SPI) feature.	2. Ident can be activated via front panel button, discrete input, or compatible control device.
	3. For an aircraft identification to be inserted by the flight crew if the aircraft uses variable aircraft identification.	3. Flight ID is entered from the transponder main page on panel mounted units. For remote units, Flight ID is entered remotely from a compatible control device.
	4. To notify the flight crew when the transmission of pressure altitude information has been inhibited, if a means to inhibit the transmission of pressure altitude is provided.	4. The GTX 3X5 provides a means to inhibit the transmission of pressure altitude. The means is through selection of ON mode or Standby mode. The flight crew is notified when transmission of pressure altitude is inhibited, via the annunciation of ON or Standby mode on the front panel or remotely on a compatible control device.
	5. To select the transponder to the 'standby' or "OFF" condition.	5. The GTX 335/335R/345/345R units are equipped with an OFF and STBY key. Remotely installed units are controlled serially and provide a means to place the unit in OFF or STBY.
	6. To indicate the non-operational status or failure of the transponder system without undue delay and without the need for flight crew action.	6. Failure messages are provided to the display of panel mounted units. Failure messages are provided to the control source of remotely installed units. Failure messages are documented in the maintenance manual.
	7. To display the selected Mode A code to the flight crew.	7. Mode A codes are displayed and entered from the transponder main page on Panel mounted units. For remote units, Mode A codes are displayed and entered remotely from a compatible control device.
8. To display the aircraft identification to the flight crew	8. Flight ID is displayed on the transponder main page on Panel mounted units. For remote units, Flight ID is displayed remotely on a compatible control device.	

CS-ACNS SECTION	CS-ACNS ITEM DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ELS.030 Flight Deck Interface (continued)	b) Input which is not intended to be operated in flight, is not readily accessible to the flight crew.	The Transponders have a Ground Test mode, which requires a unit power cycle while depressing a soft key.
CS ACNS.D.ELS.040 Integrity	The Mode S ELS airborne surveillance system integrity is designed commensurate with a "minor" failure condition.	Mode S operations are classified as a Minor failure classification for the GTX 335/335R/345/345R units. The transponder is designed to meet design assurance level C which exceeds the "minor" failure classification for Mode S ELS.
CS ACNS.D.ELS.045 Continuity	The Mode S ELS airborne surveillance system continuity is designed to an allowable qualitative probability of "remote."	The GTX 335/335R/345/345R units have a design assurance level of C "remote" for listed functions. The GTX 335/335R/345/345R units also have a maximum ELS system failure rate of no less than 5000 hours using the MTBF rates, or 2.0E-04 failure rate.
CS ACNS.D.ELS.050 Dual/multiple Transponder Installation	If more than one transponder is installed, simultaneous operation of transponders is prevented.	Dual transponder installations are configured by the installer. A compatible control device (e.g., GTN 6XX/7XX) or a compatible external standby input discrete ensures that only one transponder can be in a state other than standby.
CS ACNS.D.ELS.055 ICAO 24-bit Aircraft Address	The ICAO 24-bit aircraft address assigned by the competent authority is correctly implemented on each transponder.	The ICAO address is programmed as part of the transponder configuration by the installer and verified as part of the transponder configuration and return to service procedures.
CS ACNS.D.ELS.060 Antenna Installation	a) The installed antenna(s) has (have) a resulting radiation pattern which is (are) vertically polarized, omni-directional in the horizontal plane, and has (have) sufficient vertical beam width to ensure proper system operation during normal aircraft maneuvers.	Transponder antenna must be compliant to TSO 112(), TSO C66() or C74().The installation manual provides a list of compatible antennas.
	b) Antenna(s) is/are located such that the effect on the far field radiation pattern(s) by the aircraft structure are minimized.	The installation of the antennas is not covered by this installation manual, however, guidance for the antenna locations is provided in the installation manual.

CS-ACNS SECTION	CS-ACNS ITEM DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ELS.065 Antenna Diversity	Aircraft with a maximum certified take-off mass in excess of 5700 kg or a maximum cruising true airspeed capability, under International Standard Atmosphere (ISA) conditions, in excess of 130 m/s (250 knots) operates with an antenna diversity installation.	The GTX 335/335R/345/345R, transponders are not diversity units and do not meet this requirement.

E.2 Enhanced Surveillance (EHS)

The information in table E-2 is applicable to GTX 335/335R/345/345R units running software v2.10 and later.

Table E-2 EHS

CS-ACNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.EHS.001 Applicability	a) This section provides standards for airborne Mode S EHS installations which provide on request (through Mode S replies elicited by Mode S interrogations) airborne parameters in addition to parameters provided by ELS installations compliant with Section 2	See CS ACNS.D.EHS.015 (c) See CS ACNS.D.EHS.015 (a) (8) (c)
	b) This certification specification is applied together with Mode S Elementary Surveillance certification specification defined in Section 2.	The GTX 3X5 was shown in the GTX 335/335R/345/345R ELS CS-ACNS compliance matrix to be compliant to CS.ACNS.D.ELS.
CS ACNS.D.EHS.010 Transponder Characteristics	a) The transponder is an approved Mode S transponder with EHS capability.	The GTX 3X5 complies with ETSO-C112e requirements for enhanced surveillance. See table 1-13 and table 1-14 of the installation manual for applicable system TSO approvals and software part numbers.

CS-ACNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.EHS.015 Data Transmission	a) The surveillance system provides in the Mode S reply the following downlink aircraft parameters in addition to those specified in CS ACNS.D.ELS:	The GTX 3X5 was shown in the GTX 335/335R/345/345R ELS CS-ACNS compliance matrix to be compliant to CS.ACNS.D.ELS. In addition, the GTX provides the following downlink aircraft parameters when available from input interfaces:
	1. MCP/FCU Selected Altitude	1. MCP/FCU Selected Altitude: is transmitted in BDS 4,0 by the GTX.
	2. Roll Angle	2. Roll Angle: is transmitted in BDS 5,0 by the GTX.
	3. True Track Angle	3. True Track Angle: is transmitted in BDS 5,0 by the GTX.
	4. Ground Speed	4. Ground Speed: is transmitted in BDS 5,0 by the GTX.
	5. Magnetic Heading	5. Magnetic Heading: is transmitted in BDS 6,0 by the GTX.
	6. Indicated Airspeed or Mach No.	6. Indicated Airspeed and Mach No: are transmitted in BDS 6,0 by the GTX.
	7. Vertical rate: Barometric Altitude rate or Inertial vertical velocity. When barometric altitude rate field is provided, it is derived solely from barometric measurement.	7. Vertical Rate: Barometric altitude rate and Inertial Vertical Velocity are transmitted in BDS 6,0 by the GTX.
	8. Barometric Pressure Setting in use minus 80 000 Pascal.	8. Barometric Pressure Setting: is transmitted in BDS 4,0.
	9. Track Angle Rate or True Airspeed.	9. True Airspeed is transmitted in BDS 5,0 by the GTX. Track Angle Rate is not transmitted.
	b) The sensor sources connected to the active transponder are the sensors relevant to the aircraft flight profile.	Input interfaces are configured during installation. Data source selection guidance is provided in the installation manual.
c) All transmitted parameters are correct and are correctly indicated as available.	Check-out procedures are provided in the installation manual. Periodic inspections are also required.	

CS-ACNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.EHS.020 Integrity	The Mode S EHS airborne surveillance system integrity is designed commensurate with a 'minor' failure condition for the downlink aircraft parameters listed in CS ACNS.D.EHS.015.	The GTX 3X5 is designed to meet design assurance level C which exceeds the "minor" failure classification for Mode S EHS.
CS ACNS.D.EHS.025 Continuity	The Mode S EHS airborne surveillance system continuity is designed to an allowable qualitative probability of "probable" for the downlink aircraft parameters listed in CS ACNS.D.EHS.015.	The GTX 3X5 units have a design assurance level of C 'remote' for listed functions which exceeds the allowable qualitative probability of "probable." The GTX units have a maximum EHS system failure rate of no less than 5000 hrs using the MTBF rates, or 2.0E-04 failure rate.

E.3 ADS-B

Table E-3 ADS-B

CS-ASNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ADSB.001 Applicability	This section provides standards for 1090 MHz Extended Squitter (ES) ADS-B Out installations.	Information only, no compliance statement necessary.
CS ACNS.D.ADSB.010 ADS-B Out System Approval	The equipment contributing to the ADS-B Out function is approved.	The GTX units are TSO Class 1 Level 2 transponder with Level C (Major) Failure classification with SI mode capability. They are 1090ES capable transponders that require a valid pressure altitude source, a valid GPS source, and meet ELS requirements.
CS ACNS.D.ADSB.020 ADS-B Out Data Parameters	a) The ADS-B Out system provides the following minimum set of data parameters:	
	1. Aircraft Identification	1. Supported in BDS (0,8) Aircraft Identification and Category, and sourced from the operator via the GTX panel, a compatible control device, or transponder configuration settings. Priority: (1) Flight ID, (2) Aircraft Registration

CS-ASNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ADSB.020 ADS-B Out Data Parameters (continued)	2. Mode A Code	2. Mode A code is supported in BDS (6,1) and entered from the transponder main page on Panel mounted units. For remote units, Mode A codes are provided / entered remotely via a compatible control device.
	3. ICAO 24-bit aircraft address	3. All DF=17 squitter transmissions provide the ICAO address. Aircraft address data is sourced from transponder internal configuration settings.
	4.	4.
	a. Airborne Horizontal Position - Latitude and Longitude	a. Supported in BDS (0,5) Airborne Position
	b. Airborne Navigation Integrity Category: NIC	b. Supported in BDS (0,5) Airborne Position
	c. Airborne/Surface Navigation Accuracy Category for Position: NACp	c. Supported in BDS (6,2) Target State and Status and (6,5) Aircraft Operational Status
	d. Airborne/Surface Source Integrity Level: SIL	d. Supported in BDS (6,2) Target State and Status and (6,5) Aircraft Operational Status
e. Airborne/Surface System Design Assurance: SDA	e. Supported in BDS (6,5) Aircraft Operational Status	

CS-ASNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ADSB.020 ADS-B Out Data Parameters (continued)	5. Pressure Altitude (incl. NICbaro)	5. Supported in BDS (0,5) Airborne Position. An encoding altimeter or other altitude source provides this data to the transponder. NICbaro is provided in BDS register (6,2) and (6,5).
	6. Special Position Identification (SPI)	6. Supported in BDS (6,5) Aircraft Operational Status. SPI data is sourced from transponder internal IDENT status. The IDENT function is controlled via GTX or via remote located button, which can also be activated via approved control source.
	7.	7.
	a. Emergency Status	a. Supported in BDS (6,1) Emergency/ Priority Status.
	b. Emergency Indication	b. Data is sourced from current Mode A code status. The Mode A code is entered and displayed via the GTX panel or a compatible control device.
	8. 1090 ES Version Number	8. Supported in BDS (6,5) Aircraft Operational Status, Bits 41-43 are populated with '2'.
	9.	9.
	a. Airborne velocity over Ground - (East/ West and North/South	a. Supported in BDS (0,9) Airborne Velocity Subtype 1&2.
	b. Airborne/Surface Navigation Accuracy Category for Velocity: NACv	b. Supported in BDS (0,9) Airborne Velocity Subtype 1&2.
	10. Emitter Category	10. Supported in BDS (0,8) Extended Squitter Identification and data source from transponder configuration.
	11. Vertical Rate	11. Supported in BDS (0,9) Airborne Velocity
	12.	12.

CS-ASNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ADSB.020 ADS-B Out Data Parameters (continued)	a. Surface Horizontal Position - Latitude and Longitude	a. Supported in BDS (0,6) Surface Position
	b. Surface Navigation Integrity Category: NIC	b. Supported in BDS (0,6) Surface Position and (6,5) Aircraft Operational Status. When the GPS mode is SBAS Nav, the GTX 3X5 limits the radius of containment to greater than or equal to 25 meters, otherwise it limits this value to greater than or equal to 75 meters
	13. Surface Ground Track	13. Supported in BDS (0,6) Surface Position
	14. Movement (surface ground speed)	14. Supported in BDS (0,6) Surface
	15. Length/width of Aircraft	15. Supported in BDS (6,5) Aircraft Operational Status Subtype 1. Data sourced from transponder configuration.
	16. GPS Antenna Longitudinal Offset	16. Supported in BDS (6,5) Aircraft Operational Status Subtype 1. Data sourced from transponder configuration.
	17.	17.
	a. Geometric Altitude	a. Supported in BDS (0,9) Airborne Velocity.
	b. Geometric Altitude Quality: GVA	b. Supported in BDS (6,5) Aircraft Operational Status Subtype 0.
	Where available in a suitable format, the ADS-B Out system provides the following data parameters:	
	1. Selected Altitude	1. Supported in BDS (6,2) Target State and Status Information.
	2. Barometric Pressure Setting	2. Supported in BDS (6,2) Target State and Status Information.
	3. ACAS Resolution Advisory	3. The GTX units do not interface with ACCAS II units and thus do not support ACAS II resolution advisory data.

CS-ASNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ADSB.025 Provision of Data	a) All data provided by the ADS-B Out system comes from approved sources.	Approved GPS sources are Garmin GPS sources (see note 1).
	b) The data transmitted by the ADS-B Out system originates from the same data source as used in the transponder replies to Mode S interrogations.	The ADS-B Out system is integrated in the GTX transponder units. ADS-B related BDS registers are populated with the same DAP parameters used to populate transponder registers.
	c) When a data quality indication is required, it is provided to the ADS-B transmit unit together with the associated data parameter and it expresses the actual quality of the respective data as valid at the time of applicability of the measurement.	Data quality parameters are only used for data parameters from the same source interface (e.g., the same A429 channel). An ADS-B Fail indication is provided when the quality of the GPS position source is below the allowable tolerance. In addition, other data parameters will only be processed when their associated validity flags (if applicable) indicate the parameter is valid.
CS ACNS.D.ADSB.030 ADS-B Transmit Unit Approval	The ADS-B transmit unit is approved and it is integrated in the Mode S transponder.	The GTX 3X5 units have TSOA and meet TSO-C112d and TSO-C166b with granted deviations.
CS ACNS.D.ADSB.035 ICAO 24-bit Aircraft address	The ICAO 24 bit aircraft address is implemented as specified in CS ACNS.D.ELS.055.	The ICAO address is programmed as part of the transponder configuration by the installer and verified as part of the transponder configuration and return to service procedures.
CS ACNS.D.ADSB.040 Antenna Diversity	The ADS-B transmit unit employs antenna diversity under the same conditions as specified in CS ACNS.D.ELS.065.	The GTX 3X5 transponders are not diversity units and do not meet this requirement.
CS ACNS.D.ADSB.045 Antenna Installation	The antenna is installed as specified in CS ACNS.D.ELS.060.	Transponder antenna must be compliant to TSO-C66(), TSO-C74(), or TSO-C112(). Antenna installations are not covered in the design/installation data however, minimum installation requirements are provided under the antenna installation guidance in sections 3.7 and 3.15 of the installation manual.
CS ACNS.D.ADSB.050 Transmit power	The ADS-B transmit unit has a peak transmit power as specified in CS ACNS.D.ELS.010(c);(d).	The GTX 3X5 units meets the minimum and maximum transmit power level, 125 W (21 dBW) and 500 W (27 dBW), respectively, when installed according to the installation manual.

CS-ASNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ADSB.055 Simultaneous Operation of ADS-B Transmit Units	If more than one ADS-B transmit unit is installed, simultaneous operation of the transmit systems is prevented.	Dual transponder installations are configured by the installer. A compatible control device (e.g., GTN 6XX/7XX) or a compatible external standby input discrete ensures that only one transponder can be in a state other than standby.
CS ACNS.D.ADSB.060 On-the-ground status determination	a) The on-the-ground status is determined and validated by the ADS-B Out system.	The GTX 3X5 units automatically transitions the aircraft mode from airborne to ground-borne and report surface mode, broadcasting ground-only information such as aircraft length and width based on an algorithm within the GTX ADS-B system.
	b) The on-the-ground status is not set by a manual action.	The GTX 3X5 software's air/ground state will be automatically determined based on emitter category, remote air/ground state, ground speed, GPS track, airspeed, squat switch, height above terrain, and radio altitude when possible. The on-the-ground status cannot be set my manual action.
CS ACNS.D.ADSB.070 Horizontal Position and Velocity Data Sources	a) The horizontal position is derived from GNSS data.	Horizontal position data will be derived from approved GPS sources.
	b) The GNSS receiver based horizontal position and velocity data source is approved and performs, as a minimum, horizontal position receiver autonomous integrity monitoring (RAIM) and fault detection and exclusion (FDE).	Refer to Garmin GPS source documentation (see Note 1).
	c) Horizontal velocity data stems from the same source as horizontal position data.	Horizontal velocity data is ground speed and N/S E/W velocity provided in BDS register (0,6) when on ground and BDS register (0,9) when airborne. Both position and velocity are used from the same selected position source.
CS ACNS.D.ADSB.080 Data Sources as defined by Mode S Elementary and Enhanced Surveillance	a) The data source requirements as defined for in section 2 and 3 of this subpart, are applicable.	Refer to table E-1 and table E-2 of the installation manual for the GTX 3X5 ELS and EHS CS-ACNS compliance matrices for Mode S, ELS and EHS data. GTX 335/335R/345/345R units with software version 2.05 and earlier are not EHS capable units.

CS-ASNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ADSB.085 Geometric Altitude	a) Geometric Altitude is provided by the horizontal position and velocity source (see CS ACNS.D.ADSB.070).	The GTX 3X5 sources Geometric Altitude from the selected GPS source, which is also the horizontal position and velocity source.
	b) Geometric Altitude is transmitted as height above WGS-84 ellipsoid.	The geometric altitude from the approved position sources is provided as the height above the WGS-84 ellipsoid in the APM (BDS register 0,5) when type codes 20-22 are transmitted, and in AVM (BDS register 0,9) as a difference between GPS and BARO altitude.
CS ACNS.D.ADSB.090 Flight deck interface	1. The control and display of surveillance data items is as per CS ACNS.D.ELS.030.	Refer to the GTX 335/335R/345/345R ELS CS-ACNS compliance matrix.
	2. A means is provided to indicate the non-operational status or failure of the ADS-B Out system without undue delay.	ADS-B Out failure indications are provided on the GTX front panel, panel annunciators, or to a compatible control device any time the ADS-B Out system constitutes a failure.
CS ACNS.D.ADSB.100 Integrity	a) The ADS-B Out system integrity is designed commensurate with a 'major' failure condition for the transmission of the following parameters:	The GTX 3X5 is designed to meet design assurance level C which meets the 'major' failure classification for ADS-B Out. All approved position sources are designed to meet at least a 'major' failure classification.
	1. ICAO 24-bit aircraft address	
	2. Airborne Horizontal Position - Latitude and Longitude	
	3. Airborne Navigation Integrity Category: NIC	
	4. Airborne/Surface Navigation Accuracy Category for Position: NACp	
	5. 5.Airborne/Surface Source Integrity Level: SIL;	
	6. 6.Airborne/Surface System Design Assurance: SDA	
	7. 1090 ES Version Number;	
8. Airborne velocity over Ground - East/West and North/South;		

CS-ASNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
CS ACNS.D.ADSB.100 Integrity (continued)	9. Airborne/Surface Navigation Accuracy Category for Velocity: NACv	The GTX 3X5 is designed to meet design assurance level C which meets the 'major' failure classification for ADS-B Out. All approved position sources are designed to meet at least a 'major' failure classification.
	10. Emitter Category	
	11. Surface Horizontal Position - Latitude and Longitude	
	12. Surface Navigation Integrity Category: NIC	
	13. Surface Ground Track	
	14. Movement (surface ground speed)	
	15. Length/width of Aircraft	
	16. GPS Antenna Offset	
	17. Geometric Altitude	
	18. Geometric Altitude Quality: GVA	
CS ACNS.D.ADSB.105 Continuity	The ADS-B Out system continuity is designed to an allowable qualitative probability of 'remote'.	The GTX 3X5 units have a design assurance level of C 'remote' for listed functions. The GTX units have a maximum ADS-B system failure rate of no less than 5000 hrs using the MTBF rates, or 2.0E-04 failure rate.
CS ACNS.D.ADSB.110 Horizontal Position and Velocity Data Refresh Rate	A horizontal position and velocity source calculates position and velocity data with a rate of at least 1 Hertz.	For Garmin GPS sources an update rate of 5 Hz is assumed (see Note 1). For non-Garmin GPS sources, the worst case update rate (1 Hz) is assumed.

CS-ASNS SECTION	CS-ACNS DESCRIPTION	COMPLIANCE SUMMARY
<p>CS ACNS.D.ADSB.115 Horizontal Position and Velocity Total Latency</p>	<p>Measured from the time of applicability within the source, the total latency of the horizontal position and horizontal velocity data introduced by the ADS-B Out system does not exceed 1.5 second.</p>	<p>For a GPS source with a 5 Hz update rate: Position solution update delay until the next solution overwrite is relayed to the transponder ≤ 200 ms (5 Hz update rate). The GTX 3X5 introduces an additional total latency of ≤ 400 ms to the ADS-B Out system. Therefore, the worst case total latency of the ADS-B Out system with a 5 Hz rate source and the listed assumptions is ≤ 850 ms.</p> <p>For a GPS source with a 1 Hz update rate (ARINC 743) and total latency contribution ≤ 200 ms: Position solution update delay until the next solution overwrite is relayed to the transponder ≤ 1000 ms (1 Hz update rate). The GTX 3X5 introduces an additional total latency of ≤ 250 ms to the ADS-B Out system. Therefore, the total latency of the ADS-B Out system with a 1 Hz rate GPS source and the listed assumptions is ≤ 1450 ms.</p>
<p>CS ACNS.D.ADSB.120 Horizontal Position Uncompensated Latency</p>	<p>The uncompensated latency of the horizontal position data introduced by the ADS-B Out System does not exceed 0.6 second.</p>	<p>Uncompensated latency introduced by an approved GPS source is assumed to be ≤ 250 ms. See Note 1 for GPS source documentation.</p> <p>The GTX 3X5 introduces an additional uncompensated latency of ≤ 150 ms to the ADS-B Out system.</p> <p>Therefore, the worst case uncompensated latency of the ADS-B Out system with an approved GPS source and given the listed assumptions is ≤ 400 ms.</p>

GARMIN[▲]®