GARMIN

GTX 330/330D

Transponder Installation Manual

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Aircraft On Ground (AG) Hotline: 913.397.0836
Aviation Dealer Technical Support:888.606.5482
www.garmin.com

Garmin (Europe) Ltd.
Liberty House, Hounsdown Business Park
Southampton, Hampshire SO40 9LR U.K.
Aviation Support: +44 (0) 370 850 1243

Garmin aviation product support and warranty information can be found at www.flygarmin.com.

RECORD OF REVISIONS

Revision	Revision Date	Description
AA	02/01/16	Removed incorrect note from Figure D-2
AB	07/06/16	Updated ADS-B TX Page description
AC	01/03/18	Updated Transponder Capabilities info in Table 1-3
AD	11/13/18	Updated LRU SW Part Number Table 1-6
AE	02/04/20	Correct pin 58 info

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

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CURRENT REVISION DESCRIPTION

Revision	Page Number(s)	Section Number	Description of Change
AE	1-12	1.10	Updated Aircraft Station Licensing Requirements
	4-2	4.1.1	Updated pin 58 info in Table 4-1
	4-11	4.6.1	Updated Table 4-8

DEFINITIONS OF WARNINGS, CAUTIONS, AND NOTES

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

CAUTION
A caution means that damage to the equipment is possible.

NOTE
A note gives more information.

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

NOTE
Throughout this document references made to GTX 330 shall equally apply to the GTX 330 and the GTX 330D except where specifically noted.

CAUTION
The GTX 330 lens is coated with a special anti-reflective coating that is very sensitive to skin oils, waxes, and abrasive cleaners. CLEANERS CONTAINING AMMONIA WILL HARM THE ANTI-REFLECTIVE COATING. It is very important to clean the lens using a clean, lint free cloth and an eyeglass lens cleaner that is specified as safe for anti-reflective coatings.

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GTX 330 HARDWARE MOD LEVEL HISTORY

The following table identifies hardware modification (Mod) Levels for the GTX 330 and GTX 330D Mode S Transponders. Mod Levels are listed with the associated service bulletin number, service bulletin date, and the purpose of the modification. The table is current at the time of publication of this manual (see date on front cover) and is subject to change without notice. Authorized Garmin Sales and Service Centers are encouraged to access the most up-to-date bulletin and advisory information on the Dealer Resource Center portion of the Garmin website at www.garmin.com using their Garmin-provided user name and password.

GTX 330 P/N 011-00455-00, -20, -60, -80 HARDWARE MOD LEVEL HISTORY

MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION
1	NA	---	Changed to ESD Protected Display Bd
2	0714	05/29/07	Improve decay time of the suppression circuit

GTX 330 P/N 011-00455-10, -30, -70, -90 HARDWARE MOD LEVEL HISTORY

MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION
1	0311	02/06/04	GTX 330D Only. Switch/diplexeer Assembly rewrked to prevent +200 volt supply line from shorting to the chassis.
2	NA	---	Changed to ESD Protected Display Bd
3	0714	05/29/07	Improve decay time of the suppression circuit

GTX 330 P/N 011-00455-40AND 011-00455-50 HARDWARE MOD LEVEL HISTORY

MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION
1	0714	05/29/07	Improve decay time of the suppression circuit

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1 GENERAL DESCRIPTION

1.1 Introduction

This manual is intended to provide mechanical and electrical information for use in the planning and design of an installation of the GTX 330 into an aircraft. This manual is not a substitute for an approved airframe-specific maintenance manual, installation design drawing, or complete installation data package. Attempting to install equipment by reference to this manual alone and without first planning or designing an installation specific to your aircraft may compromise your safety and is not recommended. The content of this manual assumes use by competent and qualified avionics engineering personnel and/or avionics installation specialists using standard aviation maintenance practices in accordance with Title 14 of the Code of Federal Regulations and other relevant accepted practices. This manual is not intended for use by individuals who do not possess the competencies and abilities set forth above.

NOTE

Garmin recommends installation of the GTX 330 by a Garmin-authorized installer. To the extent allowable by law, Garmin will not be liable for damages resulting from improper or negligent installation of the GTX 330. For questions, please contact Garmin Aviation Product Support at 1-888-606-5482.

1.2 Equipment Description

The Garmin GTX 330 is a panel mounted Non-Diversity Mode S Transponder while the GTX 330D is a Diversity Mode S Transponder. The GTX 330D employs two antennas, one intended to be mounted on the top and the other on the bottom of the aircraft. The ES option provides ADS-B extended Squitter functionality. The design meets RTCA/DO-181E and EUROCAE ED-73E specifications.

The GTX 330 transponder is a radio transmitter and receiver that operates on radar frequencies, receiving ground radar and TCAS interrogations at 1030 MHz and transmitting a coded response of pulses on a frequency of 1090 MHz. The GTX 330 is equipped with IDENT capability that activates the Special Position Identification (SPI) pulse for 18 seconds.

The GTX 330 replies to ATCRBS Mode A, Mode C and Mode S interrogations. Mode A replies consist of any one of 4,096 codes, which differ in the position and number of pulses transmitted. Mode C replies include framing pulses and encoded altitude. Mode S interrogations are selective. The Mode S transponders can respond to a single directed interrogation from the ground station or another aircraft.

The GTX 330 with software version 4.01 or later, meets Mode S Enhanced Surveillance (EHS) requirements. Mode S Enhanced Surveillance is used predominantly in European airspace. It provides information consisting of additional aircraft parameters (refer to CS-ACNS and AMC 20-13) to ground radar systems. Fixed wing aircraft that can provide all of the required Downlink Aircraft Parameters (DAPs) in BDS Registers 4,0, 5,0 and 6,0 (see Section 1.6 Interface Summary) are considered to be Mode S EHS capable. If these conditions cannot be met the aircraft will not be considered EHS capable. Compliance with Enhanced Surveillance may require additional interface between aircraft systems and the GTX 330.

The GTX 330 is a Level 2 transponder, providing downlink of aircraft information. Ground stations can interrogate Mode S Transponders individually using a 24-bit ICAO Mode S address, which is unique to the particular aircraft. In addition, ground stations may interrogate a GTX 330 for its Transponder data capability and the aircraft's Flight ID, which may be the registration number or other call sign. The GTX 330 makes the maximum airspeed capability (set via configuration pages, see Section 5) available to TCAS systems on-board nearby aircraft to aid in the determination of TCAS advisories. The GTX 330 also supports receiving TIS services from ground stations.

In addition to displaying the code, reply symbol and mode of operation, the GTX 330 screen displays pressure altitude, density altitude, temperature, and timer functions, depending on equipment connections and configuration selection. The unit also features an altitude monitor, TIS traffic advisories and flight timers. A voice or tone audio output announces altitude deviation, TIS traffic advisory and count down timer expiration.

The GTX 330 features multiple transmit/receive ARINC 429 and RS-232 data ports. The unit concentrates data from three ARINC 429 inputs, gray code, RS-232 input data and discrete inputs to the high-speed ARINC 429 output bus used by display systems such as the Garmin 400 Series/500 Series units.

The GTX 330 is configured with all key controls. The layout of the front panel keys and displays segregates the transponder's primary functions from the secondary functions. The unit can be configured so the aircraft avionics master bus can turn the unit on.

Provision is made for unit software upgrade by means of RS-232 data through rear connector pins. The installation of an optional connector is highly recommended. If the optional connector is placed in the aircraft, transponder removal and reinstallation for software upgrade is not required. The software can be changed while the unit is still mounted inside the aircraft.

1.3 ADS-B Capabilities

Automatic Dependent Surveillance-Broadcast (ADS-B) technology improves situational awareness and flight safety. With ADS-B capabilities, position, velocity, and heading information are automatically transmitted to other aircraft and ground stations. The current air traffic control system depends on a transponder request for pertinent aircraft information. ADS-B provides automatic transmission of aircraft information without a request.

1.3.1 ADS-B Versions

There are three distinct ADS-B versions recognized by regulatory authorities. As shown in the table below, the Garmin GTX 330 w/ES currently supports ADS-B Out 1090MHz Extended Squitter capability meeting 'Version 1' or 'Version 2' ADS-B system requirements depending on software version (see Table 1-1).

NOTE

GTX 330 w/ES transponders with software version 6.20 or earlier are not compliant with the ADS-B version required by the 14 CFR 91.225(a) equipage mandate.

Table 1-1 ADS-B Versions

ADS-B Version	GTX 330 w/ES Compliant	Supported SW Version	Regulatory Standard/Minimum Performance Specification
Version 0	No	None	Equipment designed to TSO-166 / RTCA DO-260
Version 1	Yes	6.00 - 6.20	Equipment designed to (E)TSO-166a / RTCA DO-260A
Version 2*	Yes	7.01 and later	Equipment designed to (E)TSO-166b / RTCA DO-260B

*Version required by 2020 ADS-B Out mandate defined in 14 CFR 91.225

1.3.1.1 Installation Approval of Version 2 ADS-B Systems

GTX 330 w/ES transponders running software versions v7.01 and later support Version 2 ADS-B Out functionality.

There are two options for installers wanting to install GTX 330 w/ES transponders running software versions v7.01 and later:

1. Installers may elect to disable the ADS-B Extended Squitter function, as described in Section 5.2.17.
2. Installers must utilize a Supplemental Type Certificate (STC) for the GTX 330 with the Version 2 ADS-B Extended Squitter activated.

NOTE

It is the installer's responsibility to ensure the ADS-B Out system is compliant with AC 20-165 and to ensure compatibility between the GTX 330 and the ADS-B Out position source equipment. See Garmin ADS-B Out Compatible Equipment (190-01533-00) for compatible equipment shown to be eligible for 14 CFR 91.227-compliant installations in accordance with AC 20-165

1.4 TIS System Capabilities

The GTX 330 also provides uplink information such as Traffic Information Service (TIS). TIS is a ground-based service providing relative location of all transponder equipped aircraft within a specified service volume. The TIS ground sensor uses real time track reports to generate traffic notification. TIS provides a graphic display of traffic advisory information in the cockpit for non-TCAS equipped aircraft.

Advisory traffic information is available to aircraft equipped with a Mode S data link such as the Garmin GTX 330 transponder. Advisory traffic information may be displayed on a Garmin 400/500 Series unit.

The GTX 330 unit can also be incorporated in installations with other compatible control/display units such as the Garmin GNS 480 (CNX80), GTN 6XX/7XX, and GMX 200 (MX20) Multifunction Display (MFD).

Surveillance data includes all transponder equipped aircraft within the coverage volume. Aircraft without an operating transponder are invisible to TIS. TIS displays traffic within seven nautical miles from 3000 feet below to 3500 feet above the requesting aircraft. The pilot sees the location, relative direction and altitude of other aircraft.

1.5 Mutual Suppression Pulses

Other equipment on board the aircraft may transmit in the same frequency band as the transponder, such as DME or another transponder. Mutual suppression is a synchronous pulse that is sent to the other equipment to suppress transmission of a competing transmitter for the duration of the pulse train transmission. The transponder transmission may be suppressed by an external source and other equipment on board may be suppressed by the transponder. This feature is designed to limit mutual interference.

1.6 Interface Summary

The GTX 330 provides the following interface connections via the rear connector:

- Ten (10) encoding altimeter inputs.
- External IDENT input.
- External STBY input (useful for dual transponder installations).
- External suppression pulse input.
- Switched power output of up to 1.5 amps (for digital altitude encoder power).
- Aircraft dimming bus input voltage.
- Aircraft master switch turn-on option.
- Serial air data or GPS input.
- Serial altitude input. (Reduces wire count vs. parallel wire gray code altimeter interface.)
- Software update input.
- Supports Comm-A and Comm-B protocol.
- Temperature, Altitude Hold and Density Altitude.
- Digitally recorded voice and discrete warning annunciator activated by Altitude Hold when limits are exceeded.
- Diversity: GTX 330 is available with or without the diversity feature.
- ARINC 429 input

The GTX 330 supports the following list of Comm-B Data Selector (BDS) registers:

- BDS (0,0) Air Initiated Comm-B (AICB)
- BDS (0,5) Extended Squitter Airborne Position (ES Enabled Units Only)
- BDS (0,6) Extended Squitter Surface Position (ES Enabled Units Only)
- BDS (0,7) Extended Squitter Status Position (ES Enabled Units Only)
- BDS (0,8) Extended Squitter Aircraft Identification and Category (ES Enabled Units Only)
- BDS (0,9) Extended Squitter Airborne Velocity (ES Enabled Units Only)
- BDS (0,A) Extended Squitter Event Driven Information (ES Enabled Units Only)
- BDS (1,0) Data Link Capability Report
- BDS (1,7) Common Usage Ground Initiated Comm-B (GICB) Capability Report
- BDS (1,8) Mode S Specific Services GICB Capability Report
- BDS (1,9) Mode S Specific Services GICB Capability Report
- BDS (1,D) Mode S Specific Services Protocols (MSP) Capability Report
- BDS (2,0) Aircraft Identification
- BDS (4,0) Selected Vertical Intention (EHS Only)
- BDS (5,0) Track and Turn Report (EHS Only)
- BDS (6,0) Heading and Speed Report (EHS Only)
- BDS (6,1) Emergency/Priority Status (ES Enabled Units Only)
- BDS (6,2) Target State and Status (ES Enabled Units Only, software versions v8.01 and later)
- BDS (6,5) Aircraft Operational Status (ES Enabled Units Only)

BDS register information is presented for the installation agency to understand the functionality of the GTX 330, and make a determination that the unit complies with the requirements of their civil aviation authorities. No further wiring or configuration programming is required for the unit.

Note that BDS (3,0) is only required for transponders compatible with ACAS/TCAS II. The GTX 330 does not support BDS (3,0).

1.7 Technical Specifications

1.7.1 Environmental Qualification Form

It is the responsibility of the installing agency to obtain the latest revision of the GTX 330 Environmental Qualification Form. The form is available directly from Garmin under the following part number:

GTX 330/GTX 33/GTX 328/GTX 23 Environmental Qualification Form, Garmin part number 005-00131-03

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

The following tables present general environmental specifications. For detailed specifications, see the Environmental Qualification Form.

1.7.2 General Specifications

Table 1-2 General Specifications

Characteristic	Specification
Environmental Qualification Form	005-00131-03
FCC Authorization	Emission Designator 12M0M1D
FCC Authorization ID	IPH-0046400
Temperature Range	-45°C to +70°C (continuous operation)
Humidity	95% @ +50°C for 6 hours; 85% @ +38°C for 16 hours; Tested to Category A in DO-160D
Altitude	55,000 Feet
Transmitter Frequency	1090 MHz ±1 MHz
Transmitter Power	125 Watts minimum, 250 Watts nominal.
Receiver Frequency	1030 MHz
Receiver Sensitivity	-74 dBm nominal for 90% replies
External Suppression Input	Low <= 0.5 V; High >= 8 V, maximum is +33 Vdc
External Suppression Output	Output: minimum is +18 V (for 300 Ω load) and maximum of +23 V (for 2000 Ω load).
Audio Output	4.04 Vrms to 7.85 Vrms into a 500 Ω load
Maximum Days of Continuous Operation	48

1.7.3 Transponder Capabilties

Table 1-3 Transponder Capabilities

Characteristic	Specification
Mode A Capability	4096 Identification Codes
Mode C Altitude Capability	100 Foot increments from -1000 to 62,700 feet.
Mode S Altitude Capability	25 Foot increments from -1000 to 50,175 feet with suitable serial data altitude. 100 Foot increments from -1000 to 62,700 feet.
Mode S Uplink Capability	UF0, UF4, UF5, UF11, UF16, UF20, UF21 - see Note 1
Mode S Downlink Capability	DF0, DF4, DF5, DF11, DF16, DF17, DF20, DF21
Data Link Capability	Level 2, Comm-A (TIS), Comm-B (GICB, Comm-B Broadcast), TCAS Crosslink, Subnetwork Version 5
Diversity	Yes
Extended Squitter	Yes, see Note 2, 3
Elementary Surveillance	Yes, see Note 3
Enhanced Surveillance	Yes, see Note 3
Selective Identification Code Support	Yes
(E)TSO-C112d	Class 1

Note 1: Each supported UF Format interrogation will elicit the corresponding DF format response. There is no response to the following UF formats: 1, 2, 3, 6, 7, 8, 9, 10, 12, 13, 14, 15, 17, 18, 19, 22, 23, 24.

The following are exceptions to the responses:
- If UF4 is received with RR of 16 through 31 the unit will respond with DF 20.
- If UF5 is received with RR of 16 through 31 the unit will respond with DF 21.
- If UF20 is received with RR of 0 through 15, the unit will respond with DF4.
- If UF21 is received with RR of 0 through 15, the unit will respond with DF5.
- If UF16 Broadcast interrogation is received, the unit will not reply. If UF16 non-Broadcast interrogation is received, the unit will reply with DF16 if RL indicates a request for a long reply, otherwise it will reply with DF0.
- IF UF0 is received with RL=1 the unit will respond with a DF16.

Note 2: The GTX 330 does not source the data for extended squitter / ADS-B messages. The GTX 330 must receive this data from other equipment in order to provide extended squitter / ADS-B functionality. Also, ADS-B must be configured on.

Note 3: Compliance with elementary surveillance, enhanced surveillance, and extended squitter ADS-B is shown at the installation-level per EASA CS-ACNS. The GTX 330 implements the technical requirements necessary of a transponder that CS-ACNS requires, but installation of a GTX 330 by itself does not constitute compliance with elementary surveillance, enhanced surveillance, or extended squitter ADS-B requirements. Also, in order for the GTX 330 to meet the technical requirements of CS-ACNS for enhanced surveillance or extended squitter ADS-B, the GTX 330 must have the feature configured on and it must receive data to populate the relevant BDS registers.

1.7.4 Physical Characteristics

Table 1-4 Physical Characteristics

Characteristic	Specification
Bezel Height	1.65 inches (42 mm)
Bezel Width	6.25 inches (159 mm)
Rack Height (Dimple to Dimple)	1.68 inches (43 mm)
Rack Width	6.30 inches (160 mm)
Depth Behind Panel with Connectors (measured from face of aircraft panel to rear of connector backshells)	11.25 inches (286 mm)
GTX 330 Unit Weight	3.4 lbs. (1.5 kg)
GTX 330 Rack Weight (Installed with rack and connectors)	4.2 lbs. (1.9 kg)

1.7.5 Power Requirements

Table 1-5 Power Requirements

Characteristic	Specification
Input Voltage	14/28 Vdc. See the Environmental Qualification Form for details on surge ratings and minimum/ maximum operating voltages.
Power Input	22 Watts Typical, 45 Watts Maximum
Maximum Full TSO Reply Rate; 1200 PRF, Code 7777	1.6 A @ 27.5 Vdc, 3.1 A @ 13.75 Vdc
Maximum Quiescent	0.85 A @ 27.5 Vdc, 1.1A @ 13.75 Vdc

1.8 Certification

The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only if performed under 14 CFR Part 43 or the applicable airworthiness requirements. For GTX 330 TSO compliance and STC, see Appendix A. For antenna TSO compliance, refer to antenna manufacturer's literature.

It is the installer's responsibility to ensure the ADS-B Out system is compliant with AC 20-165 and to ensure compatibility between the GTX 330 and the ADS-B Out position source equipment. See Garmin ADS-B Out Compatible Equipment (190-01533-00) for compatible equipment shown to be eligible for 14 CFR 91.227-compliant installations in accordance with AC 20-165.

1.8.1 TSO/ETSO/RTCA/ICAO Compliance

Table 1-6 TSO/ETSO/RTCA/ICAO Compliance

Function	Performance Standard	Category	Applicable LRU SW Part Numbers	Applicable LRU CLD Part Numbers
Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/ MODE S) Airborne Equipment	TSO-C112	Class 2A	006-B0172-01 (v3.00 through v7.XX except v7.00)	006-B0172-01 (v3.00 through v4.06):N/A 006-B0172-01 (v5.00): 006-C0034-02 006-B0172-01 (v5.01): 006-C0034-03 006-B0172-01 (v6.00): 006-C0034-20 006-B0172-01 (v6.10 through v7.XX):006-C0034-21
	TSO-C112d	Class 1 Level 2ens (non-diversity) Class 1 Level 2dens (diversity)	006-B0172-1( ) except -10 (v8.XX except v8.00)	006-C0034-2() except -20
	ETSO-C112d	Class 1 Level 2ens (non-diversity) Class 1 Level 2dens (diversity)	006-B0172-1( ) except -10 (v8.XX except v8.00)	006-C0034-2() except -20
	ETSO-2C112a	2C112a Class 1 Level 2s	006-B0172-01 (v3.00 through v4.06)	N/A
	ETSO-2C112b	2C112b Class 1 Level 2s	006-B0172-01 (v5.00 through v5.01)	006-B0172-01 (v5.00): 006-C0034-02 006-B0172-01 (v5.01): 006-C0034-03
	ETSO-2C112b	2C112b Class 1 Level 2es	006-B0172-01 (v6.00 through v6.20)	006-B0172-01 (v6.00): 006-C0034-20 006-B0172-01 (v6.10 through v6.20): 006-C0034-21

1. Complies with TSO-C166a/ETSO-C166a functionality only when the Extended Squitter function is enabled during configuration (refer to Section 5.2.17).
2. Complies with TSO-C166b/ETSO-C166b A1 functionality only when the Extended Squitter function is enabled during configuration (refer to Section 5.2.17).

Table 1-6 TSO/ETSO/RTCA/ICAO Compliance

Function	Performance Standard	Category	Applicable LRU SW Part Numbers	Applicable LRU CLD Part Numbers
Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)	TSO-C166a (See Note 1)	B0 (non-diversity) B1 (diversity)	006-B0172-01 (v6.00 through v6.20)	006-B0172-01 (v6.00): 006-C0034-20 006-B0172-01 (v6.10 through v6.20): 006-C0034-21
	TSO-C166b (See Note 2)	B1S (non-diversity) B1 (diversity)	006-B0172-01 (v7.XX except v7.00)	006-C0034-21
			006-B0172-1( ) except -10 (v8.XX except v8.00)	006-C0034-2() except -20
	ETSO-C166a (See Note 1)	B0 (non-diversity) B1 (diversity)	006-B0172-01 (v6.00 through v6.20)	006-B0172-01 (v6.00): 006-C0034-20 006-B0172-01 (v6.10 through v6.20): 006-C0034-21
	ETSO-C166b A1 (See Note 2)	B1S (non-diversity) B1 (diversity)	006-B0172-1( ) except -10 (v8.XX except v8.00)	006-C0034-2() except -20

1. Complies with TSO-C166a/ETSO-C166a functionality only when the Extended Squitter function is enabled during configuration (refer to Section 5.2.17).
2. Complies with TSO-C166b/ETSO-C166b A1 functionality only when the Extended Squitter function is enabled during configuration (refer to Section 5.2.17).

1.8.2 TSO/ETSO Deviations

Table 1-7 TSO/ETSO Deviations

TSO/ETSO	Deviation
TSO-C112	1. Garmin was granted a deviation from TSO-C112 to use RTCA DO-178B instead of RTCA DO-178A.
	2. Garmin was granted a deviation from TSO-C112 to use RTCA DO-160D instead of RTCA DO-160B.
	3. Garmin was granted a deviation from TSO-C112 to use RTCA DO-181C instead of RTCA DO-181.
	4. Garmin was granted a deviation from RTCA DO-160D, Section 20.3.d to perform RF Susceptibility testing at 50 mV/m for frequencies between 980 MHz to 1080 MHz.
	5. Garmin was granted a deviation from DO-181C Section 2.2.16.2.6.2 to not provide Mode-S Extended Squitter for an ADS-B system (for non-ES transponders only).
TSO-C112d	1. Garmin was granted a deviation from TSO-C112d to use RTCA/DO-160D instead of RTCA/DO-160G.
	2. Garmin was granted a deviation from RTCA/DO-181E Section 2.3.1 Environmental Test Conditions to perform DO-160D Section 20 RF Susceptibility testing at 50 mV/m for frequencies between 980 MHz to 1080 MHz.
	3. Garmin was granted a deviation from RTCA/DO-181E Section 2.2.2.4.G Sensitivity and Dynamic Range.
	4. Garmin was granted a deviation from RTCA/DO-181E Section 2.2.8.6 Response in the Presence of CW Interference.
	5. Garmin was granted a deviation from RTCA/DO-181E Section 2.2.11 Response to Mutual Suppression Pulses Paragraph B.
ETSO-C112d	1. Garmin was granted a deviation from EUROCAE ED-73E section 3.2.4.g (RTCA/DO-181E section 2.2.2.4.g) Sensitivity and Dynamic Range requirements.
	2. Garmin was granted a deviation from EUROCAE ED-73E section 4.2 (RTCA/DO-181E section 2.3.1) for the Environmental Conditions to perform testing between 980 MHz and 1080 MHz at 50 mV/m instead of the Category S level of 1 V/m as specified in EUROCAE ED-14E (RTCA/DO-160D) section 20.3(d).
	3. Garmin was granted a deviation to make the requirement from EUROCAE ED-73 section 3.12.7 (RTCA/DO-181E section 2.2.8.6) Response in the Presence of CW Interference not applicable.
	4. Garmin was granted a deviation from EUROCAE ED-73E section 3.15.1 (RTCA/DO-181E section 2.2.11) Response to Mutual Suppression Pulses Paragraph B to allow the suppression output signal to return to the inactive state in less than 15 microseconds instead of 10 microseconds after the transponder RF transmission.
TSO-C166a	1. Garmin was granted a deviation from TSO-C166a to use RTCA DO-160D instead of RTCA DO-160E.
	2. Garmin was granted a deviation from TSO-C166a to place relevant TSO marking information within the installation manual, rather than on the equipment.
ETSO-C166a	1. Garmin was granted a deviation from ETSO-C166a to use RTCA/DO-160D instead of RTCA/DO- 160E as the standard for Environmental Conditions and Test Procedures for Airborne Equipment.
	2. Garmin was granted a deviation from ETSO-C166a, section 4.1 and 4.2 to reference the installation manual for the equipment's ETSO compliance and class for this ETSO.
TSO-C166b	1. Garmin was granted a deviation from RTCA DO-260B Section 2.1.10 to meet the transponder function requirements of RTCA DO-181C instead of RTCA DO-181D. (For TSO-C112 compliant versions)
	2. Garmin was granted a deviation from TSO-C166b Section 4.b to not mark the TSO number on the unit.
	3. Garmin was granted a deviation from TSO-C166b Section 4.c to reference the installation manual for granted TSO deviations.
	4. Garmin was granted a deviation from TSO-C166b Section 4.e to reference the installation manual for equipment class.
	5. Garmin was 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. (For TSO-C112d compliant versions)
	6. Garmin was granted a deviation from RTCA/DO-260B Section 2.3 to use RTCA/DO-160D (including Change 1, 2, and 3) instead of RTCA/DO-160F.

Table 1-7 TSO/ETSO Deviations

TSO/ETSO	Deviation
ETSO-C166b A1	1. Garmin was granted a deviation from ETSO-C166b A1, 4.2 to not mark the unit with class information.
	2. Garmin was granted a deviation from EUROCAE ED-102A (RTCA/DO-260B) section 2.1.10 Integration and Interoperability with a Mode S Transponder to meet the transponder requirements specified in EUROCAE ED-73E (RTCA/DO-181E) instead of EUROCAE ED-73C (RTCA/DO-181D).
ETSO-2C112a	1. Garmin was granted a deviation from RTCA DO-160D, Section 20.3.d to perform RF Susceptibility testing at 50 mV/m for frequencies between 980 MHz to 1080 MHz.
	2. Garmin was granted a deviation from ED-73B, Section 1.4.2.2 to mark the equipment's functional level on the chassis in a location not visible when the transponder is mounted in the aircraft.
ETSO-2C112b	1. Garmin was granted a deviation from RTCA DO-160D, Section 20.3.d to perform RF Susceptibility testing at 50 mV/m for frequencies between 980 MHz to 1080 MHz.
	2. Garmin was granted a deviation from ED-73B, Section 1.4.2.2 to mark the equipment's functional level on the chassis in a location not visible when the transponder is mounted in the aircraft.

1.8.3 Additional TSO/ETSO Deviations Specific to Software Versions

Table 1-8 Additional TSO/ETSO Deviations Specific to Software Versions

TSO/ETSO	Deviation	Applicable Software Versions
TSO-C112	1. Garmin was granted a deviation from RTCA DO-181C Section 2.2.17.1.13.e to remove the requirement to report the new aircraft identification to the ground by use of the Comm-B Broadcast Message protocol if the aircraft identification reported in the AIS subfield is changed in flight.	006-B0172-01 (v3.00 through v7.02, except for v7.00)
TSO-C166b	1. Garmin was granted a deviation from RTCA DO-260B Section 2.2.3.3.1.4.2 to remove the requirement to change the broadcast rate of the Operational Status Message (OSM) for a period of 24+/- 1 seconds after a change in NIC_{SUPP} information.	006-B0172-01 (v7.01 and v7.02)

1.8.4 Non-TSO Functions

Table 1-9 Non-TSO Functions

Function	Performance Standard	Category	Applicable LRU SW Part Numbers	Applicable LRU CLD Part Numbers
Traffic Information Service (TIS)	RTCA DO-239	N/A	006-B0172-01 (v3.00 through v7.XX)	006-B0172-01 (v3.00 through v4.06): N/A 006-B0172-01 (v5.00): 006-C0034-02 006-B0172-01 (v5.01): 006-C0034-03 006-B0172-01 (v6.00): 006-C0034-20 006-B0172-01 (v6.10 through v7.XX): 006-C0034-21
			006-B0172-1( ) (v8.XX)	006-C0034-2() except -20
Enhanced Surveillance	ICAO Annex 10, Amendment 77 Tables: 2-64, 2-80, 2-96 (See Note 1)	N/A	006-B0172-01 (v3.00 through v7.XX)	N/A

1. Complies with ICAO Annex 10, Amendment 77 Tables: 2-64, 2-80, 2-96 functionality only when the Enhanced Surveillance function is enabled during configuration (refer to Section 5.2.18).

1.8.5 Other Regulatory Criteria

Table 1-10 Other Regulatory Criteria

Function	Performance Standard	Category	Applicable LRU SW Part Numbers	Applicable LRU CLD Part Numbers
RTCA DO-178B Compliance	DO-178B	Level D	006-B0172-01 (v3.00 through v5.01)	N/A
RTCA DO-178B Compliance	DO-178B	Level C	006-B0172-01 (v6.00 through v7.XX) 006-B0172-1( ) (v8.XX)	N/A
RTCA DO-254 Compliance	DO-254	Level C	006-B0172-01 (v6.00 through v7.XX)	006-B0172-01 (v6.00): 006-C0034-20 006-B0172-01 (v6.10 through v7.XX): 006-C0034-21
			006-B0172-1( ) (v8.XX)	006-C0034-2() except -20

1.9 Operating Instructions

For operating instructions, see Section 5.1 of this document.

See also the GTX 330 Pilot's Guide, Garmin part number 190-00207-02 available from the Garmin website www.garmin.com.

1.10 Aircraft Station Licensing 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 330 installation must comply with current transmitter licensing requirements. To find out the specific details on whether a particular installation is exempt from licensing, visit the FCC web site https://www.fcc.gov/wireless/bureau-divisions/mobility-division/aviation-radio-services.

If an aircraft license is required, make application for a license on FCC form 605, Quick-Form Application for Authorization in the Ship, Aircraft, Amateur, Restricted and Commercial Operator, and General Mobile Radio Services. The FCC also has a fax-on-demand service to provide forms by fax. The GTX 330 owner accepts all responsibility for obtaining the proper licensing before using the transponder.

CAUTION

The UHF transmitter in this equipment is guaranteed to meet Federal Communications Commission acceptance over the specified operating temperature range. Modifications to Garmin equipment 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.

2 INSTALLATION OVERVIEW

2.1 Introduction

This section provides hardware equipment information for installing the GTX 330 Mode S Transponder, related hardware and optional accessories. Installation of the GTX 330 should follow the data detailed in this manual. Cabling is fabricated by the installing agency to fit each particular aircraft. The installation should follow the guidance of FAA Advisory Circulars AC 43.13-1B and AC 43.13-2B where applicable.

2.2 Installation Materials

The GTX 330 is available under the following part numbers:

2.2.1 Configurations Available

Table 2-1 Available Configurations

Model	Catalog Part Number	Unit Part Number	Diversity	Extended Squitter (ES)	Front Panel Color	Install Kit/Docs*	TSO Class
GTX 330	010-00230-00	011-00455-00	No	No	Black	No	Level 2ens, Class 1
GTX 330	010-00230-01	011-00455-00	No	No	Black	Yes	Level 2ens, Class 1
GTX 330	010-00230-20	011-00455-20	No	No	Gray	No	Level 2ens, Class 1
GTX 330	010-00230-21	011-00455-20	No	No	Gray	Yes	Level 2ens, Class 1
GTX 330D	010-00293-00	011-00455-10	Yes	No	Black	No	Level 2dens, Class 1
GTX 330D	010-00293-01	011-00455-10	Yes	No	Black	Yes	Level 2dens, Class 1
GTX 330D	010-00293-20	011-00455-30	Yes	No	Gray	No	Level 2dens, Class 1
GTX 330D	010-00293-21	011-00455-30	Yes	No	Gray	Yes	Level 2dens, Class 1
GTX 330	010-00230-60	011-00455-60	No	Yes	Black	No	Level 2ens, Class 1
GTX 330	010-00230-61	011-00455-60	No	Yes	Black	Yes	Level 2ens, Class 1
GTX 330	010-00230-70	011-00455-80	No	Yes	Gray	No	Level 2ens, Class 1
GTX 330	010-00230-71	011-00455-80	No	Yes	Gray	Yes	Level 2ens, Class 1
GTX 330D	010-00293-60	011-00455-70	Yes	Yes	Black	No	Level 2dens, Class 1
GTX 330D	010-00293-61	011-00455-70	Yes	Yes	Black	Yes	Level 2dens, Class 1
GTX 330D	010-00293-70	011-00455-90	Yes	Yes	Gray	No	Level 2dens, Class 1
GTX 330D	010-00293-71	011-00455-90	Yes	Yes	Gray	Yes	Level 2dens, Class 1

*Documentation includes pilot's guide and warranty registration card.

2.2.2 Equipment Available

Table 2-2 Equipment Available

Item	Garmin P/N
Sub Assy, Connector Kit, GTX 330 (see Table 2-3)	011-00583-00
SMP, Install Rack, GTX 330	115-00294-00
Sub Assy, Backplate, GTX 330, BNC	011-00582-00 (For use with GTX 330)
Sub Assy, Backplate, GTX 330D, BNC	011-00582-01 (For use with GTX 330D)
Sub Assy, Backplate, GTX 330, TNC	011-00582-04 (For use with GTX 330)
Sub Assy, Backplate, GTX 330D, TNC	011-00582-05 (For use with GTX 330D)
Garmin GTX 330 Antenna kit* (two required for diversity)	010-10160-00

*A transponder antenna approved to TSO C66( ) or C74( ) that has been installed to meet the requirements of this manual may be approved for use with the GTX 330.

Table 2-3 GTX 330 Connector Kit (011-00583-00)

Item	Garmin Part Number	Quantity
37 Pos D-Sub for Nut Plate	125-00056-00	1
Screw, 4-40x.500, PHP, SS/P, w/Nyl	211-60234-12	2
Screw, 4-40x.500, FLHP100, SS/P, Nyl	211-63234-12	2
High Density Connector, D-Sub, Mil Crimp 62 ckt	330-00185-62	1
Metal D-Sub Backshell, 37 Pos	330-00220-37	1
Edge Card Connector, 20 Pos	330-00228-20	1
Pin Contact, Mil Crimp, Size 22D	336-00021-00	40
Connector Contact	336-00029-00	23

2.2.3 Additional Equipment Required

- Cables - The installer will supply all system cables including circuit breakers. Cable requirements and fabrication are detailed in Section 3 of this manual.
- Hardware - #6-32 x 100° Flat Head SS Screw [(MS24693, AN507R or other approved fastener) (6 ea.)] and #6-32 Self-Locking Nut [MS21042 or other approved fastener (6 ea.)]. Hardware required to mount the installation rack is not provided.
- Encoding Altitude Digitizer - Use encoding altimeter manufacturer's instructions, install according to FAA Advisory Circulars AC 43.13-1B and AC 43.13-2B. The Garmin GAE 43 (Garmin P/N 013-00066-00) can provide altitude data in either serial or parallel gray code format.

2.3 Installation Considerations

The GTX 330 can interface with equipment including altimeters, Air Data Computer (ADC) and a temperature probe. RS-232 and ARINC 429 provide a serial communication path between interfacing equipment. Fabrication of a wiring harness is required.

Optional available discrete line interfaces are described in Section 4.5 Discrete Inputs, and shown in installation diagrams provided in Appendix D.

2.4 Antenna Installation

2.4.1 Location Considerations

Antenna mounting should utilize the aircraft manufactures Type Certificated antenna location and style of antenna. If a second (diversity) antenna is installed in the aircraft, considerations for its mounting should be made as outlined in Figure 2-1. The antenna installation should be performed in accordance with Advisory Circular AC 43.12-2A Chapter 3. Note that penetration of the pressure vessel on the pressurized aircraft requires additional data not contained in this manual. (See Section 2.6)

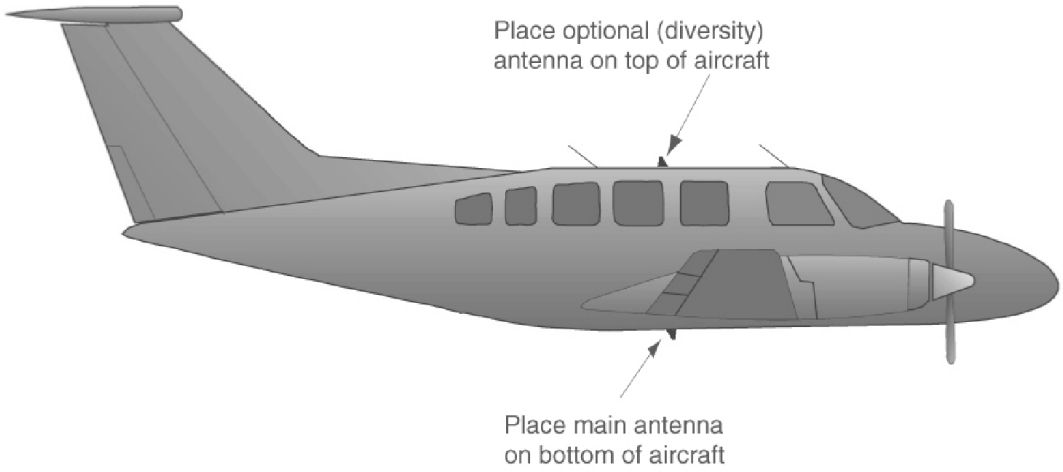


Figure 2-1 Antenna Installation Considerations

1. The antenna(s) (Garmin P/N 010-10160-00) should be mounted away from major protrusions, such as engine(s), propeller(s), and antenna masts. It should also be as far as practical from landing gear doors, access doors, or other openings that could effect its radiation pattern.
2. The main antenna should be mounted vertically on the bottom of the aircraft. The optional second (diversity) antenna should be mounted vertically on top of the aircraft. Horizontal separation must be no more than 7.6 meters (25 feet).
3. Avoid mounting the antenna within three feet of the ADF sense antenna or any other communication antenna and six feet from the DME antenna.
4. To prevent RF interference, the antenna must be physically mounted a minimum distance of three feet from the GTX 330.

NOTE

If the antenna is being installed on a composite aircraft, ground planes must be considered. Conductive wire mesh, radials, or thin aluminum sheets embedded in the composite material provide the proper ground plane allowing the antenna pattern (gain) to be maximized for optimum transponder performance.

2.4.2 Antenna Installation

Install the antenna according to the antenna manufacturer's instructions and FAA Advisory Circulars AC 43.13-1B and AC 43.13-2B.

2.5 Cabling and Wiring Considerations

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

Use wire and cable meeting the applicable aviation regulation. When routing wire and cable, observe the following precautions:

- Keep as short and as direct as practical.
- Avoid sharp bends.
- Avoid routing near power sources (e.g., 400 Hz generators, trim motors, etc.), sources of heat, or near power for fluorescent lighting, RF, or EMI interference.
- Avoid routing antenna cables near ADF antenna cable (allow at least a 12-inch separation).
- Check that there is ample space for mating connectors.

Table 2-4 lists examples of the recommended antenna cable vendors and the type of cable to be used for specific lengths of cable. Any cable meeting specifications is acceptable for the installation.

The maximum coaxial cable attenuation at 1090 MHz must not exceed 1.5 dB, including connectors. Each connector will present 0.08 dB of additional loss. In the diversity installation the cable loss characteristics must be the same within ±0.1 dB (cables within 4 inches of the same length will have less than 0.1 dB difference in their loss characteristics).

Table 2-4 is for reference only, and lists some suitable cable types. Any 50 Ω, double shielded coaxial cable assembly that meets airworthiness requirements and the 1.5 dB maximum loss figure (including connectors) may be used.

Table 2-4 Cable Specifications

Insertion loss (dB/100ft)	Carlisle IT Type	MIL-C-17 Type	RG Type
17.2		M17/128-RG400	RG-400
14.45	3C142B		
10.0		M17/112-RG304	RG-304
8.7	311601		
7.7		M17/127-RG393	RG-393
7.12	311501		
5.56	311201		
3.63	310801		
Supplier Information	Vendor: Carlisle Interconnect Technologies 100 Tensolite Drive St. Augustine, FL 32092 Tel: 800-458-9960 904-829-5600 Fax: 904-829-3447 wwwcarlisleit.com	See current issue of Qualified Products List QPL-17.	RG types are obsolete and are shown for reference only; replaced by M17 type numbers.

2.6 Installation Approval Considerations for Pressurized Aircraft

Antenna and cable installations on pressurized cabin aircraft require FAA approved installation design and engineering substantiation data whenever such installations incorporate alteration (penetration) of the cabin pressure vessel by connector holes and/or mounting arrangements.

For needed engineering support pertaining to the design and approval of such pressurized aircraft antenna installations, it is recommended that the installer proceed according to any of the following listed alternatives:

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

2.7 Electrical Bonding

Electrical equipment, supporting brackets, and racks should be electrically bonded to the aircraft's main structure. Refer to SAE ARP 1870 section 5 when aluminum surface preparation is required to achieve electrical bond. An equivalent OEM bonding procedure may also be substituted. The electrical bond should achieve direct current (DC) resistance less than or equal to 2.5 milliohms to local structure to where the equipment is mounted. Compliance should be verified by inspection using a calibrated milliohm meter.

2.8 Cooling Air

The GTX 330 meets all applicable TSO requirements without forced air cooling. The application of forced air cooling to the rear air nozzle of the GTX 330 is highly recommended to provide beneficial cooling to the unit.

The GTX 330 was designed to handle a constant interrogation of 450 Pulse Repetition Frequency (PRF) per second, with short periods of 1200 PRF. Rate limit is set at 1200 PRF. A typical radar site would interrogate the transponder once every 5 to 10 seconds for approximately 100 milliseconds at a 400 PRF rate. In very high traffic areas with multiple ground stations and TCAS traffic it is possible to have long term PRF rates above 450 PRF.

2.9 GTX 330 Installation

2.9.1 Viewing Angle

Ensure that any mounting location will offer sufficient viewing angle. The display has been proven to meet specifications when seen within the envelope of viewing positions listed in Table 2-5.

Table 2-5 Viewing Angles

Direction	Pilot's Viewing Angle
Left and Right	±45°
From Top	30°
From Bottom	10°

2.9.2 Mechanical Installation

NOTE

Avoid installing the unit near heat sources. If this is not possible, insure that additional cooling is provided. Allow adequate space for installation of cables and connectors. The installer will supply and fabricate all of the cables. All wiring must be in accordance with FAA Advisory Circulars AC 43.13-1B and AC 43.13-2B.

1. Assemble the connector/rack kit according to Figure C-2. Install the rack assembly according to the dimensions given in Figure C-1 and Section 1.7.3, Physical Characteristics. Mounting brackets are not supplied due to the wide range of mounting configurations available. Suitable mounting brackets may be fabricated from sheet metal or angle stock. To insure a sturdy mount, rear support for the unit must be provided.
2. Looking at the bottom of the transponder, make sure the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32" hex wrench through the face plate.
3. Slide the unit into the rack until the front lobe of the unit touches the rack.
4. Turn the hex wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not over-tighten the screw.
5. To remove the unit from the rack, turn the 3/32" hex wrench counterclockwise until it disengages from the rack.

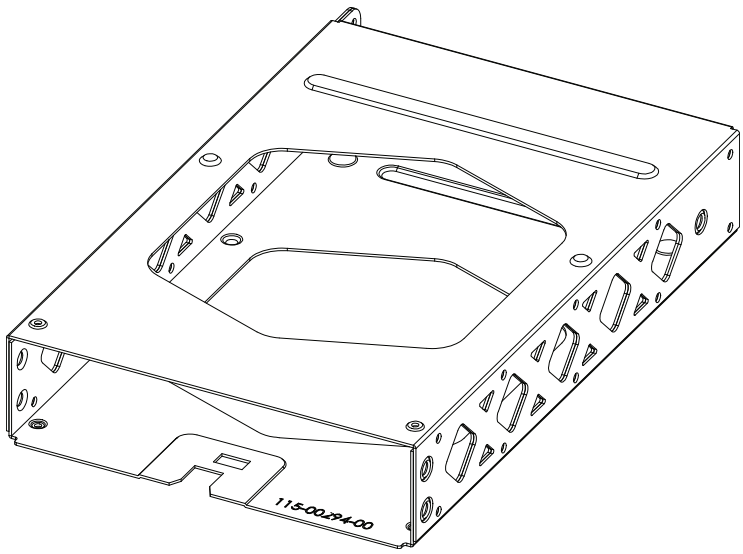


Figure 2-2 GTX 330 Unit Rack (115-00294-00)

3 INSTALLATION PROCEDURE

3.1 Unpacking Unit

Carefully unpack the equipment and make a visual inspection of the unit for evidence of damage incurred during shipment. If the unit is damaged, notify the carrier and file a claim. To justify a claim, save the original shipping container and all packing materials. Do not return the unit to Garmin until the carrier has authorized the claim.

Retain the original shipping containers for storage. If the original containers are not available, a separate cardboard container should be prepared that is large enough to accommodate sufficient packing material to prevent movement of the item within the container.

3.2 Wiring Harness Installation

All electrical connections, except for the antenna(s) and shield ground, are made through a single, 62 pin D-subminiature connector (Figure 4-1). The card-edge connector may be used to terminate shield grounds to the GTX 330 back plate. Table 4-1 lists the electrical connections of all input and output signals. See Section D for interconnect wiring diagrams and cable requirements for each signal. Required connector and associated hardware are supplied in the connector kit (P/N 011-00583-00).

CAUTION

Check wiring connections for errors before inserting the GTX 330 into the rack. Incorrect wiring could cause internal component damage.

Table 3-1 Pin Contact Part Numbers (High Density)

Manufacturer*	62 pin connector (P3301)	
	18-20 AWG (Power Only)	22-28 AWG
Garmin P/N	336-00044-00	336-00021-00
Military P/N	N/A	M39029/58-360

*Non-Garmin part numbers shown are not maintained by Garmin and consequently are subject to change without notice.

Table 3-2 Recommended Crimp Tools (High Density)

Manufacturer (note 1)	Hand Crimping Tool	18-20 AWG		22-28 AWG	
		Positioner	Insertion/ Extraction Tool (note 2)	Positioner	Insertion/ Extraction Tool
Military P/N	M22520/2-01	N/A	M81969/1-04	M22520/2-09	M81969/1-04
Positronic	9507-0	9502-11	M81969/1-04	9502-4	M81969/1-04
AMP	601966-1	N/A	91067-1	601966-6	91067-1
Daniels	AFM8	K774	M81969/1-04	K42	M81969/1-04
Astro	615717	N/A	M81969/1-04	615725	M81969/1-04

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

2) Extracting the #18 or #20 contact requires that the expanded wire barrel be cut off from the contact. It may also be necessary to push the pin out from the face of the connector when using an extractor due to the absence of the wire. A new contact must be used when reassembling the connector.

3.3 Circuit Breaker Placard

Install a Circuit Breaker Placard labeled Transponder or Transponder 1, Transponder 2 as appropriate as indicated in FAA Advisory Circular AC 43.13-2B, paragraph 114.

3.4 Post Installation Checkout

After the installation is complete, refer to Section 5 for system configuration.

Verify proper operation of the transponder by testing in accordance with Appendix F to 14 CFR Part 43 – ATC Transponder Tests and Inspections.

Refer to 190-00734-10 GTX 330/33 with ADS-B Out AML STC Installation Manual for more information, and for guidance on verifying ADS-B Out functionality.

4 SYSTEM INTERCONNECTS

4.1 Pin Function List

4.1.1 J3301

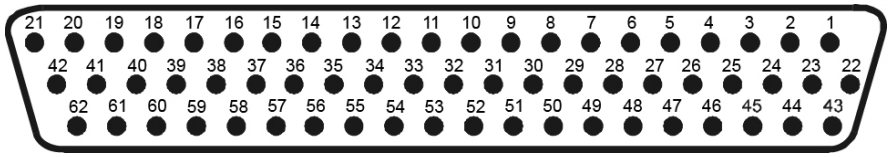


Figure 4-1. Rear Connector, J3301

Table 4-1 J3301 Pin Assignments

Pin	Pin Name	I/O
1	AVIONICS MASTER ON SELECT	In
2	ALTITUDE A1	In
3	ALTITUDE C2	In
4	ALTITUDE A2	In
5	ALTITUDE A4	In
6	ALTITUDE C4	In
7	ALTITUDE B1	In
8	ALTITUDE C1	In
9	ALTITUDE B2	In
10	ALTITUDE B4	In
11	ALTITUDE D4	In
12	EXTERNAL IDENT SELECT*	In
13	EXTERNAL STANDBY SELECT*	In
14	28 V LIGHTING BUS HI	In
15	AUDIO OUT HI	Out
16	AUDIO OUT LO	Out
17	SQUAT SWITCH IN	In
18	RESERVED	--
19	ALTITUDE ALERT ANNUNCIATE*	Out
20	RESERVED	--
21	AIRCRAFT POWER 1	In
22	RS-232 IN 1	In
23	RS-232 OUT 1	Out
24	RS-232 IN 2	In
25	RS-232 OUT 2	Out
26	ARINC 429 IN 3 A	In
27	POWER GROUND	--
28	ARINC 429 OUT 2 B	Out
29	ARINC 429 IN 3 B	In
30	ARINC 429 OUT 2 A	Out

*Denotes Active Low (Ground to activate)

Table 4-1 J3301 Pin Assignments

Pin	Pin Name	I/O
31	EXTERNAL SUPPRESSION I/O	I/O
32	ARINC 429 IN 1 A	In
33	ARINC 429 IN 2 A	In
34	ARINC 429 OUT 1 B	Out
35	ARINC 429 IN 1 B	In
36	ARINC 429 IN 2 B	In
37	ARINC 429 OUT 1 A	Out
38	RESERVED	--
39	RESERVED	--
40	SPARE	--
41	CURRENT TEMPERATURE PROBE OUT	Out
42	AIRCRAFT POWER 1	In
43	POWER GROUND	--
44	CURRENT TEMPERATURE PROBE IN	In
45	14 V/5 V LIGHTING BUS HI	In
46	TIS CONNECT SELECT*	In
47	AUDIO MUTE SELECT*	In
48	ARINC 429 IN 4 A	In
49	ARINC 429 IN 4 B	In
50	ALTITUDE COMMON (GROUND)	--
51	SIGNAL GROUND	--
52	RESERVED	--
53	RESERVED	--
54	RESERVED	--
55	SPARE	--
56	AIRCRAFT POWER 2	In
57	SPARE	--
58	SIGNAL GROUND	--
59	SPARE	--
60	AIRCRAFT POWER 2	In
61	SPARE	--
62	SWITCHED POWER OUT	Out

*Denotes Active Low (Ground to activate)

4.2 Power and Lighting Function

Power Input requirements and Lighting Bus input are listed in the following tables. The power-input pins accept 14/28 Vdc. AIRCRAFT POWER 2 is for connecting to an alternate power source, such as on aircraft with two electrical buses. Switched Power Out is a power source available for devices such as a remote digital altitude encoder. Refer to Figure D-1 and Figure D-2 for power and lighting interconnections.

4.2.1 Aircraft Power

Table 4-2 Aircraft Power Pin Assignments

Pin Name	Pin Number	I/O
AIRCRAFT POWER 1	21	In
AIRCRAFT POWER 1	42	In
AIRCRAFT POWER 2	56	In
AIRCRAFT POWER 2	60	In
SWITCHED POWER OUT	62	Out
POWER GROUND	27	--
POWER GROUND	43	--

4.2.2 Lighting Bus

The GTX 330 unit can be configured to track a 28 Vdc, 14 Vdc, 5 Vdc or 5 Vac lighting bus using these inputs. The GTX 330 can also automatically adjust for ambient lighting conditions based on the photocell. Refer to Section 5.2.5 and Section 5.2.6 for lighting configuration.

Table 4-3 Aircraft Lighting Pin Assignments

Pin Name	Pin Number	I/O
14 V/5 V LIGHTING BUS HI	45	In
28 V LIGHTING BUS HI	14	In

4.3 Temperature Inputs

Temperature input is used for Outside Air Temperature (OAT) display and Density Altitude computations. The type of temperature probe required is a current sensor type, such as an EDMO P/N 655-PROBE or Davtron P/N C307PS. Connect the red wire to pin 41 and the black wire to pin 44. The GTX 330 is not configurable for different types of temperature sensors. The temperature-input specification is 1 microamp per degree Kelvin (1 µA/°K). Refer to Figure D-6 for the temperature probe interconnect and to Section 5.2.12 for probe configuration.

Table 4-4 Temperature Probe Pin Assignments

Pin Name	Pin Number	I/O
CURRENT TEMPERATURE PROBE OUT	41	Out
CURRENT TEMPERATURE PROBE IN	44	In

4.4 Altitude Functions

Parallel gray code altitude inputs are considered active if either the voltage to ground is < 1.9 V or the resistance to ground is < 375 Ω. These inputs are considered inactive if the voltage to ground is 11-33 Vdc. Refer to Figure D-6 and Figure D-9 for parallel gray code and serial data altitude interconnections. Carefully check encoder input lines for correct connection after wiring is complete.

NOTES

The GTX 330 contains internal altitude code line isolation diodes to prevent the unit from pulling the encoder lines to ground when the transponder is turned off.

If two separate altitude encoders are connected to the GTX 330, one providing parallel gray code and the other, serial data, the unit selects only one for use at a time, with serial data input receiving the highest priority.

For altimeters that can be connected in both serial data and parallel gray code format, such as the Garmin GAE 43 (Garmin P/N 013-00066-00), select one or the other but not both wiring connections.

Among the surveillance items the Mode S transponder will transmit to the ground stations and other aircraft are altitude reporting in 25-foot increments with the proper encoder. In order to report altitude in 25-foot increments the GTX 330 must receive altitude from suitable altitude reporting devices through serial input connections. Altitude input to the GTX 330 received from parallel wire gray code encoders is supplied to the unit in 100-foot increments and thus reported in 100-foot increments.

4.4.1 Altimeter Inputs

Table 4-5 Encoded Altitude Pin Assignments

Pin Name	Pin Number	I/O
ALTITUDE D4	11	In
ALTITUDE A1	2	In
ALTITUDE A2	4	In
ALTITUDE A4	5	In
ALTITUDE B1	7	In
ALTITUDE B2	9	In
ALTITUDE B4	10	In
ALTITUDE C1	8	In
ALTITUDE C2	3	In
ALTITUDE C4	6	In
ALTITUDE COMMON	50	--
RS-232 IN 2	24	In

4.4.2 Altimeter Calibration and Checkout

Refer to Section 5.2.19 for the gray code altitude checkout.

4.4.3 Altimeter Interconnect, Dual GTX 330 Installation

A dual GTX 330 installation can accept either parallel wire gray code altimeter input or RS-232 serial data input as shown in Figure 4-2. If transponder number 2 is a Garmin GTX 327, connect the RS-232 output from the altitude encoder to J3271 pin 19 (refer to GTX 327 Transponder Installation Manual, P/N 190-00187-02).

Refer to Figure D-9, Sheet 1 for dual GTX 330 gray code altimeter interconnections. Refer to Figure D-9 Sheet 4 for dual transponder interconnections to a GNS 480 (CNX80). The GNS 480 (CNX80) can receive digital data from only one transponder at a time. Due to system configuration, dual transponders must be identical, i.e. dual GTX 330s, in a system with one GNS 480 (CNX80).

Refer to Figure D-10 for dual transponder interconnections to a GTN 6XX/7XX.

For complete dual installations containing two encoders, it is best to connect one encoder to each transponder.

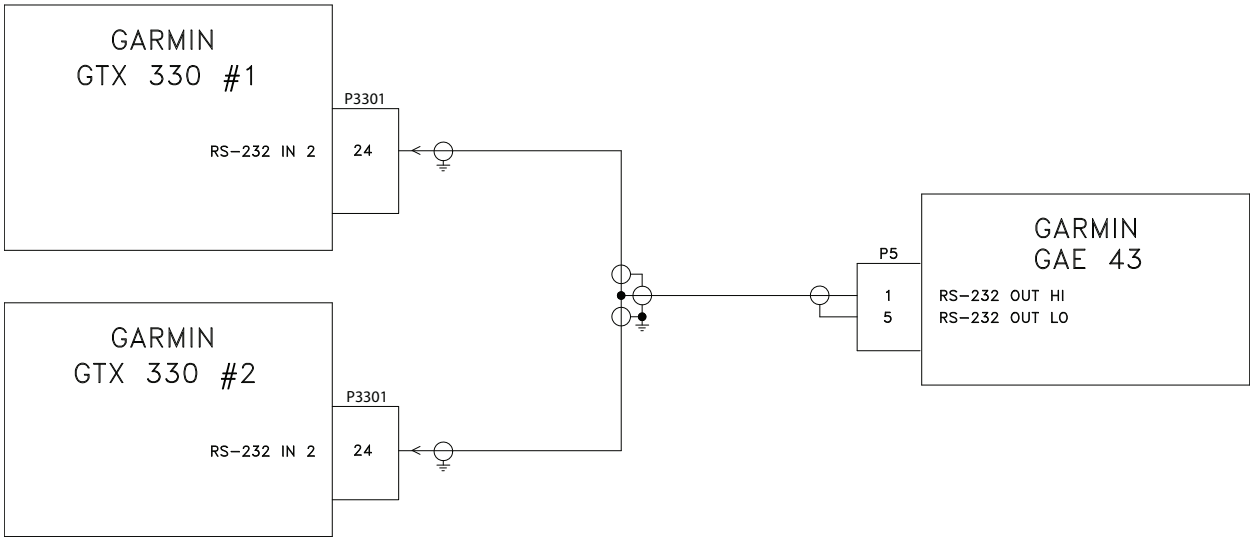


Figure 4-2. Dual GTX 330, Single Encoder, Serial Input Connections

4.4.4 Altimeter Selection Priority

The installer must be aware of the GTX 330 priority for selecting encoded altimeter interconnections. The GTX 330 searches in this sequence for altitude, and stops when it finds a valid pressure altitude input.

Only approved devices may provide altitude to the GTX 330 in accordance with 14 CFR 91.217. In addition, all altitude reporting devices installed in the aircraft must meet certification requirements of 14 CFR 91.413. The installer must select an altitude reporting device that is a certified altitude source for the particular aircraft.

Altitude reporting equipment order of precedence:

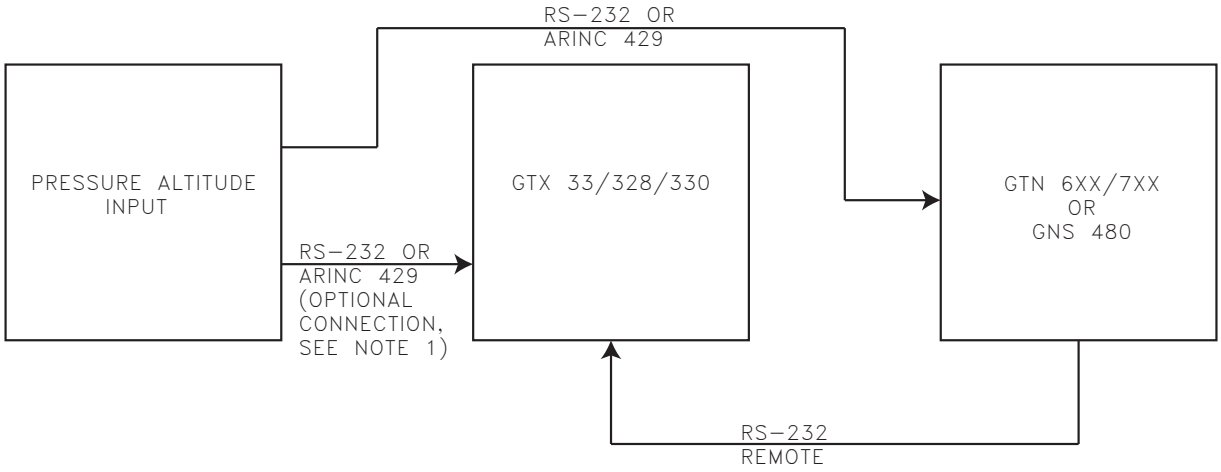
1) ARINC 429 Air Data Computer (label 203, if configured W/ALT) (25')
2) ARINC 429 EFIS (label 203, if configured W/ALT) (25')
3) RS-232 data from GNS 480 (CNX80) or GTN 6XX/7XX
4) RS-232 Fuel/Air Data Computer (if configured W/ALT.) (25')
5) Shadin Altitude Serializer/Encoder (if configured for 25')
6) Icarus Altitude Serializer/Encoder (if configured for 25')
7) Parallel wire Gray Code input (100')
8) Shadin Altitude Serializer/Encoder (if configured for 100')
9) Icarus Altitude Serializer/Encoder (if configured for 100')

It is the installing agency's responsibility to determine that the installed encoder is compatible with the selected altitude reporting criteria, either 100' or 25'. Refer to Section 5.2.9 and Section 5.2.10 for the altitude data reporting configuration.

Refer to the GNS 480 (CNX80) Installation Manual or the appropriate GTN 6XX/7XX Installation Manual for altitude data reporting configuration when connecting a GTX 330 to these units.

The routing of altitude data must be carefully considered when interfacing the GTX 330 to other LRUs. Incorrect routing of altitude data can create a closed data loop that causes erroneous/unchanging altitude to be displayed. The GTX 330 can receive altitude data directly from an altitude source, or from a different LRU such as a GTN. The GTX 330 (functioning as a data concentrator) can resend altitude data on the RS-232 and ARINC 429 buses. If this data is received by another LRU and is sent back to the GTX 330, a data loop can occur. To avoid this, a general rule to be followed is that any altitude data received by the GTX 330 should not be sent from the GTX 330 to another LRU. See following Figure 4-3, Figure 4-4, and Figure 4-5.

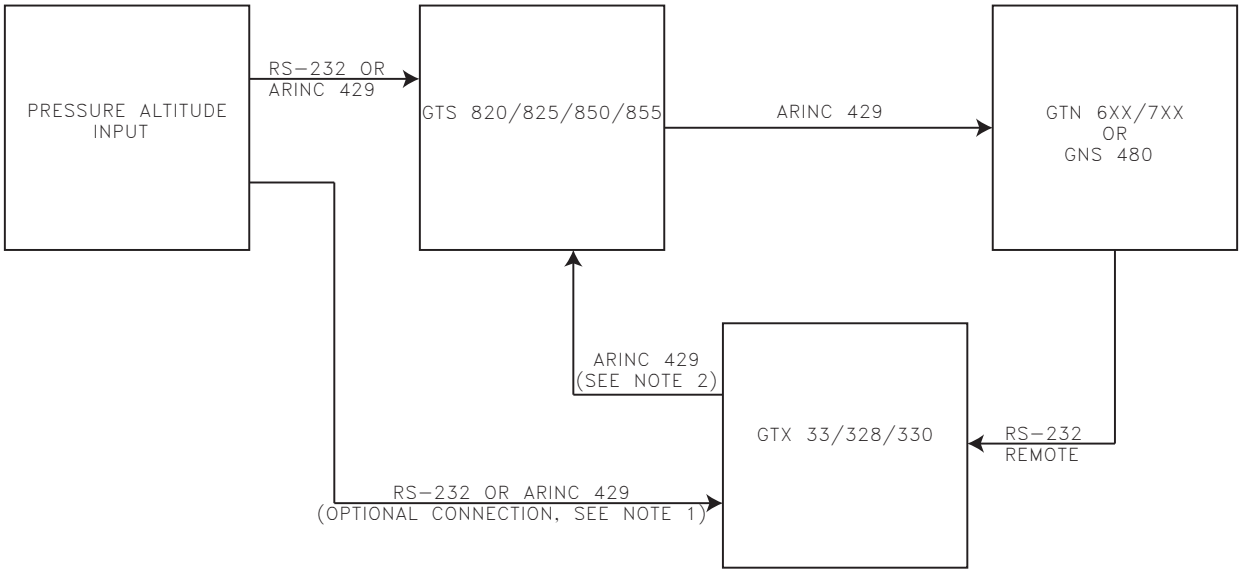
Figure 4-3 shows an example of a GTX-GTN/GNS 480 installation that will not cause an altitude data loop. Note how the GTX 330 does not provide data to any LRU, eliminating the possibility of the transponder's altitude data getting circulated back into its data inputs. For GTN 6XX/7XX or GNS 480 to GTX 330 installations, configure altitude data per Figure 4-3.



NOTE 1: IF THIS OPTIONAL RS−232 CONNECTION IS USED, RS−232 REMOTE INPUT WILL BE USED AS THE PRIMARY SOURCE OF PRESSURE ALTITUDE TO THE GTX UNIT.
IF THIS OPTIONAL ARINC 429 CONNECTION IS USED, ARINC 429 PRESSURE ALTITUDE INPUT IS PRIORITIZED OVER THE RS−232 REMOTE PRESSURE ALTITUDE AND IS USED AS THE PRIMARY SOURCE OF PRESSURE ALTITUDE TO THE GTX UNIT.

Figure 4-3 GTX 330-GTN/GNS 480 Installations

Figure 4-4 shows an example of an installation including a GTS 820/825/850/855 which will not cause an altitude data loop. The only data provided from the transponder to another LRU is on the ARINC 429 bus using the GARMIN TAS format, which does not include altitude data, eliminating the possibility of the transponder's altitude data getting circulated back into its data inputs. For GTS 820/825/850/855 (does not apply to GTS 800) to GTN 6XX/7XX to GTX 330 installations, configure per Figure 4-4.



NOTE 1: IF THIS OPTIONAL RS-232 CONNECTION IS USED, RS-232 REMOTE INPUT WILL BE USED AS THE PRIMARY SOURCE OF PRESSURE ALTITUDE TO THE GTX UNIT.
IF THIS OPTIONAL ARINC 429 CONNECTION IS USED, ARINC 429 PRESSURE ALTITUDE INPUT IS PRIORITIZED OVER THE RS-232 REMOTE PRESSURE ALTITUDE AND IS USED AS THE PRIMARY SOURCE OF PRESSURE ALTITUDE TO THE GTX UNIT.

NOTE 2: FOR INSTALLATIONS USING GTS 820/825/850/855 UNITS, ARINC 429 OUT MUST BE CONFIGURED FOR 'GARMIN TAS' FORMAT. DO NOT CONNECT ARINC 429 OUT OF GTX 33/328/330 UNITS USING THE 'GARMIN' FORMAT.

Figure 4-4 GTS-GTN-GTX 330 Installations

Figure 4-5 shows an example of an installation including a GTS 800 which will not cause an altitude data loop. Note how the GTX 330 does not provide data to any LRU, eliminating the possibility of the transponder's altitude data getting circulated back into its data inputs. For GTS 800 (or other non-Garmin traffic systems) to GTN 6XX/7XX to GTX 330 installations, configure per Figure 4-5.

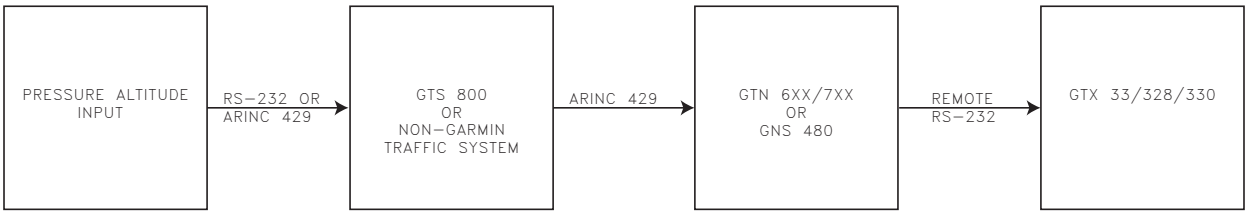


Figure 4-5 GTS 800-GTN-GTX 330 Installations

4.5 Discrete Functions

4.5.1 Discrete Outputs

External suppression should be connected if a DME is installed in the aircraft avionics system. The GTX 330 suppression I/O pulses may not be compatible with all models of DME. Known incompatible units include the Bendix/King KN 62, KN 64 and KNS 80. These models have an output-only suppression port and can be damaged by the GTX 330 mutual suppression output. In this case, leave the suppression pin open.

Table 4-6 Discrete Outputs Pin Assignments

Pin Name	Pin Number	I/O
ALTITUDE ALERT ANNUNCIATE*	19	Out
EXTERNAL SUPPRESSION I/O	31	In/Out

*Denotes active low (ground = active state, floating = inactive state)

4.5.2 Discrete Inputs

EXTERNAL IDENT SELECT (remote IDENT) is a momentary input.

Refer to Figure D-4 for the squat switch interconnect and to Section 5.2.11 for the squat switch configuration.

EXTERNAL STANDBY SELECT (remote STANDBY) is a switched discrete input used when two GTX 330 systems are installed in an aircraft. Refer to Figure D-4, Figure D-7, and Figure D-9 for the EXTERNAL STANDBY SELECT interconnect and to Section 5.2.20 for verifying external standby configuration. When EXTERNAL STANDBY SELECT is grounded, the GTX 330 operates in standby mode.

When TIS CONNECT SELECT is inactive ("Standby" is displayed on the 400/500 Series units) the GTX 330 logs onto TIS service when a momentary ground is applied to J3301-46. When TIS is active, a momentary ground logs off of TIS service. Refer to Figure D-1, Figure D-3, Figure D-4, Figure D-7 and Figure D-8 for TIS CONNECT SELECT connections, and to Section 5.2.2, Section 5.2.3, Section 5.2.9 and Section 5.2.10 for TIS configuration.

An AUDIO MUTE SELECT mute switch may be used to control TIS audio alerts. TIS (Traffic) Mute must be clearly marked with MUTE ON/MUTE OFF or TIS Audio ON/Audio OFF labels. The muting feature may be enabled through a Multi-Function display. In order to prevent inadvertent muting, the status of muting must default to "Mute off" upon each power cycle. Refer to Figure D-1, Figure D-4, and Figure D-8 for AUDIO MUTE SELECT connections and to Section 5.2.2 and Section 5.2.3 for AUDIO configuration.

Table 4-7 Discrete Inputs Pin Assignments

Pin Name	Pin Number	I/O
AVIONICS MASTER ON SELECT	1	In
EXTERNAL IDENT SELECT*	12	In
EXTERNAL STANDBY SELECT*	13	In
SQUAT SWITCH IN	17	In
TIS CONNECT SELECT*	46	In
AUDIO MUTE SELECT*	47	In

*Denotes active low (ground to activate)

4.6 Serial Data Electrical Characteristics

The GTX 330 can be configured to include GPS, Airdata, AHRS and EFIS/Airdata, and ARINC 429 inputs functioning as an ARINC 429 data concentrator.

Since the Garmin 400/500 Series products have only two ARINC 429 input ports, the GTX 330 manages support for several equipment interfaces. The GTX 330 has four ARINC 429 input ports, making it capable of taking altitude, air data, heading, EFIS selected course and possible future features, and then concentrating it on the ARINC 429 OUT 2 port. This line is then wired to an ARINC 429 input port on the 400/500 Series products. TIS data is included on the same high-speed ARINC 429 bus.

NOTE

The GTX 330 is currently FAA approved to display TIS traffic information on Garmin 400/500 Series, GNS 480 (CNX80), GMX 200, GTN 6XX/7XX, and MX20 products only.

4.6.1 RS-232 Input/Output

Table 4-8 RS-232 Pin Assignments

Pin Name	Pin Number	I/O
RS-232 OUT 1	23	Out
RS-232 IN 1	22	In
RS-232 OUT 2	25	Out
RS-232 IN 2	24	In
SIGNAL GROUND	51	--
SIGNAL GROUND	58	--

The RS-232 outputs conform to EIA Standard RS-232C with an output voltage swing of at least ±5 V when driving a standard RS-232 load. Refer to Figure 4-6, Figure D-2, Figure D-3, Figure D-5, Figure D-6, Figure D-7 and Figure D-8 for RS-232 serial data interconnect and to Section 5.2.10 and Section 5.2.22 for RS-232 serial data configuration.

When connecting two GTX 330 transponders to a GPS, the unit can only receive RS-232 serial data from one unit at a time. Use a DPDT switch for connecting both serial data and External Standby Select. Refer to Figure D-9, Sheets 2 and 3.

4.6.2 RS-232 Input/Output, Software Update Connections

When the GTX 330 is installed in an aircraft an optional RS-232 serial data connector should be installed in the aircraft for future software upgrades, negating the need to remove the transponder from the aircraft panel. The connector can be mounted anywhere convenient for access, such as under the instrument panel, on a remote avionics shelf or in the instrument panel itself. Be sure to label the connector for Software Update. Do not include the Test Mode Select switch in the aircraft. See Figure 4-6 for software update connections.

If the GTX 330 installation interfaces with a GNS 480 (CNX80) in the aircraft, the GNS 480 (CNX80) must be turned off during GTX 330 software upload, due to loading of RS-232 port 1.

CAUTION

Software versions prior to 6.00 should not be loaded onto GTX 330 **w/ES** and GTX 330D **w/ES** units.

CAUTION

A software conflict could result if older revision software is loaded into some GTX330(D) units, which could cause backlighting failures. Do not load any software versions prior to 4.00 into the following units.

Table 4-9 Affected Serial Numbers

Unit Name	Garmin P/N	Serial Numbers Affected
GTX 330	011-00455-00	84113984 and above
	011-00455-20	84305559 and above
GTX 330D	011-00455-10	84205684 and above
	011-00455-30	84405736 and above

CAUTION

If the unit is removed from the aircraft and operated, always connect J3302 (and J3303 for GTX 330D) to an antenna or a 50 Ω, 5-Watt load. The GTX 330 transmits Mode S acquisition squitter replies about once per second whether interrogations are received or not.

NOTE

The installation of an optional software upgrade connector is highly recommended. If the connector is wired in the aircraft, transponder removal and reinstallation for software upgrade is not required.

Beginning with SW version 3.06, the GTX 330 software can be updated in the Configuration mode as well as in Test mode. Updating software in Configuration mode does not require the TEST MODE SELECT switch. See Figure 4-6 for software update connections.

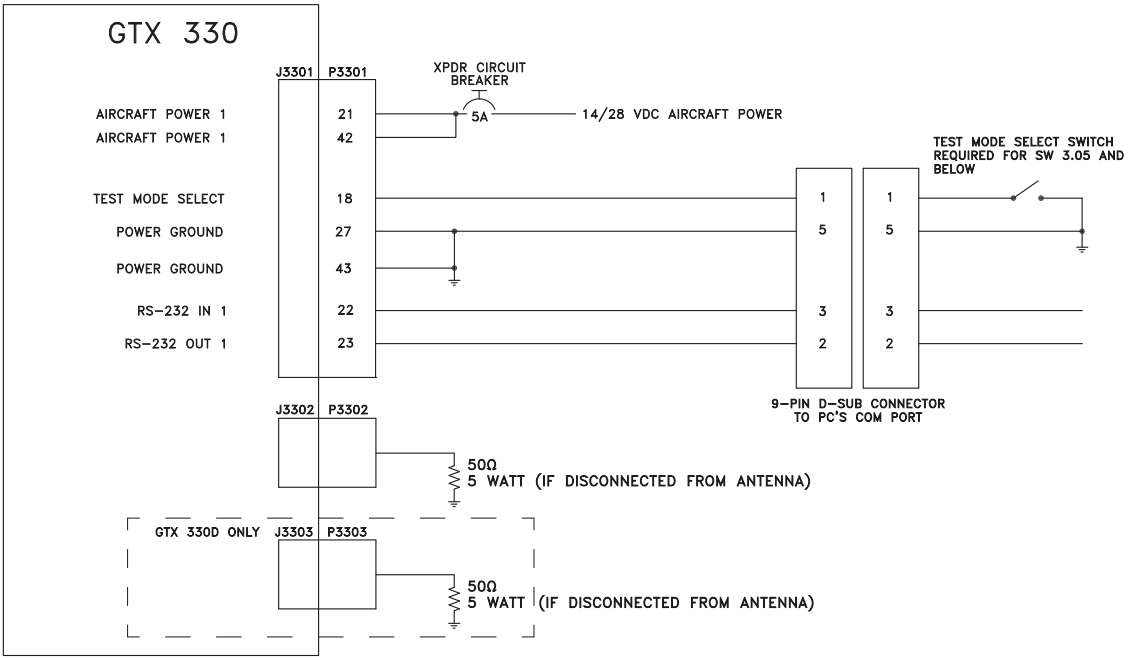


Figure 4-6. GTX 330 Software Update Connections

4.6.3 Aircraft with Both TIS and TCAS/TCAD Installed

Refer to Figure D-8 for wiring connections. If redundant traffic systems are desired in the aircraft, such as TIS and TCAD/TCAS, both systems cannot be connected to the same 400/500 Series unit to display traffic simultaneously. In a multiple traffic system/multiple 400/500 Series unit installation, connect ARINC 429 CHANNEL 1 from the GTX 330 to only one of the 400/500 Series units and ARINC 429 CHANNEL 2 to the other 400/500 Series unit.

Connect the TIS CONNECT SELECT line from the GTX 330 to the 400/500 Series unit receiving TIS data. The TCAD/TCAS system may now be connected to the second 400/500 Series unit.

Refer to Section 5 for configuration. Configure ARINC 429 output CHANNEL 1 for GARMIN W/TIS and ARINC 429 output CHANNEL 2 for GARMIN. TIS is then enabled over CHANNEL 1 when the GTX 330 is connected to a Garmin 400/500 Series unit through the ARINC 429 wiring.

All configured input data that is concentrated through the GTX 330 via ARINC 429 lines, is received in the second 400/500 Series unit via ARINC 429 CHANNEL 2 while the GTX 330 is active. No data is received over ARINC 429 CHANNEL 2 while the GTX 330 is in remote standby. (Remote standby is usually used as part of a dual transponder installation.)

4.6.4 ARINC 429 Input/Output

The ARINC 429 Output 2 port, J3301 pins 30 and 28, is at a high-impedance when in remote standby, therefore not active. When two GTX 330s are installed, the two ARINC 429 Output 2 ports may be hard wired together since the EXTERNAL STANDBY SELECT input is active for only one of the two GTX 330s at any given time.

The GTX 330 ARINC 429 Output 1 port is active when J3301 pin 13 is grounded [EXTERNAL STANDBY SELECT (remote STANDBY)]. In installations having a transponder combination of GTX 330/GTX 327 (or GTX 330/other transponder), the GARMIN and GARMIN W/TIS formats from the ARINC 429 Output 1 port, J3301 pins 34 and 37, are available if the GTX 330 has SW 3.03 and above.

Table 4-10 ARINC 429 Pin Assignments

Pin Name	Pin Number	I/O
ARINC 429 OUT 1A	37	Out
ARINC 429 OUT 1B	34	Out
ARINC 429 IN 1A	32	In
ARINC 429 IN 1B	35	In
ARINC 429 IN 2A	33	In
ARINC 429 IN 2B	36	In
ARINC 429 OUT 2A	30	Out
ARINC 429 OUT 2B	28	Out
ARINC 429 IN 3A	26	In
ARINC 429 IN 3B	29	In
ARINC 429 IN 4A	48	In
ARINC 429 IN 4B	49	In

The ARINC 429 outputs conform to ARINC 429 electrical specifications when loaded with up to 5 standard ARINC 429 receivers. Refer to Figure D-1, Figure D-3, Figure D-5, Figure D-7, and Figure D-8 for the ARINC 429 serial data interconnect and Section 5.2.9 and Section 5.2.23 for ARINC 429 serial data configuration.

5 POST INSTALLATION CONFIGURATION AND CHECKOUT PROCEDURE

Perhaps the most important factor in the GTX 330 transponder configuration and checkout is the Mode S address entry and Flight ID. Refer to Section 5.2.13 for Mode S address entry pages.

CAUTION

Be sure to check all aircraft control movements before flight is attempted to insure that the wiring harness does not touch any moving part.

Verify proper operation of the transponder during a flight test under VFR conditions. If the unit detects an internal failure mode the word FAIL is displayed on the screen.

Make sure an approved device is installed for reporting altitude in accordance with 14 CFR 91.217. Refer to Section 4.4.4 for altimeter data selection priority.

5.1 Operation

NOTE

The coverage you can expect from the GTX 330 is limited to line of sight. Low altitude or antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

Figure 5-1. GTX 330 Front Panel

NOTE

The GTX 330 should be turned off before starting aircraft engine(s).

5.1.1 Function Selector Switches

The function selection switches are:

- OFF — Powers off the GTX 330. Pressing the STBY, ON or ALT key powers on the transponder displaying the last active identification code.
- STBY — Selects the standby mode. When in standby mode, the transponder does not reply to any interrogations.
- ON — Selects Mode A and Mode S. In this mode, the transponder replies to Mode A, Mode C and Mode S interrogations, as indicated by the Reply Symbol ("®"), but the replies do not include altitude information.
- ALT — Selects Mode A, Mode C and Mode S. In ALT mode, the transponder replies to identification, altitude and Mode S interrogations as indicated by the Reply Symbol ("®"). Replies to altitude interrogations include the standard pressure altitude received from an external altitude source, which is not adjusted for barometric pressure. The ALT mode may be selected in aircraft not equipped with an optional altitude encoder; however, the reply signal does not include altitude information.

NOTE

Any time the function switch is in the ON or ALT position the transponder becomes an active part of the Air Traffic Control Radar Beacon System (ATCRBS). The transponder also responds to interrogations from TCAS equipped aircraft.

- IDENT — Pressing the IDENT key activates the Special Position Identification (SPI) Pulse for 18 seconds, identifying the transponder return from others on an air traffic controller's screen. During the IDENT period the word 'IDENT' appears in the upper left corner of the display.
- VFR — Sets the transponder code to the pre-programmed VFR code selected in Configuration mode (Set to 1200 at the factory). Pressing the VFR key again restores the previous identification code.

NOTE

The VFR button is on (functional) by default, but can be disabled in configuration mode

- FUNC — Changes the page shown on the right side of the display. Display data includes Flight ID, Pressure Altitude, Flight Time, Altitude Monitor, Count Up and Count Down timers. In the Configuration mode, steps through the function pages.
- START/STOP — Starts and stops the Altitude Monitor, Count Up, Count Down and Flight timers. In Configuration mode, steps through functions in reverse.
- CRSR — Initiates Flight ID entry, also initiates entry of the starting time for the Count Down timer and cancels transponder code entry. Selects changeable fields in Configuration mode.
- CLR —Resets the Count Up, Count Down and Flight timers. Cancels the previous keypress during code selection and Count Down entry. Used in Configuration mode.
- 8 — Reduces Contrast and Display Brightness when the respective fields are displayed and enters the number eight into the Count Down timer. Used in Configuration mode.
- 9 — Increases Contrast and Display Brightness when the respective fields are displayed and enters the number nine into the Count Down timer. Used in Configuration mode.

5.1.2 Code Selection

Code selection is entered with eight keys (0 – 7) providing 4,096 active identification codes. Pushing one of these keys begins the code selection sequence. The new code is not activated until the fourth digit is entered. Pressing the CLR key moves the cursor back to the previous digit. Pressing the CLR key when the cursor is on the first digit of the code, or pressing the CRSR key during code entry, removes the cursor and cancels data entry, restoring the previous code. You may press the CLR key up to five seconds after code entry is complete to return the cursor to the fourth digit. The numbers 8 and 9 are not used for code entry, only for entering a Count Down time, contrast and display brightness, and data selection in the Configuration mode.

NOTE

The selected identification code should be entered carefully, either one assigned by air traffic control for IFR flight or an applicable VFR transponder code.

- Important Codes:

  1200 — VFR code for any altitude in the US (Refer to ICAO standards elsewhere)

  2000 — VFR code commonly used in Europe (Refer to ICAO standards)

  7000 — VFR code commonly used in Europe (Refer to ICAO standards)

  7500 — Hijack code (Aircraft is subject to unlawful interference)

  7600 — Loss of communications

  7700 — Emergency

Avoid selecting code 7500 and all codes in the 7600-7777 range. These codes trigger special indicators in automated facilities. An aircraft's transponder code is used for ATC tracking purposes, therefore exercise care when making routine code changes.

5.1.3 Function Display

FLIGHT ID	Displays the Flight ID. The CRSR key will open the Flight ID entry dialog if the ALLOW PILOT TO EDIT FLT ID option is enabled during installation configuration.
PRESSURE ALT	Displays the altitude data supplied to the GTX 330 in feet, hundreds of feet (i.e., flight level), or meters, depending on configuration.
FLIGHT TIME	Displays the Flight Time, controlled by the START/STOP key or by one of four airborne sources (squat switch, GPS ground speed recognition, airdata airspeed recognition or altitude increase) as configured during installation. The timer begins when the GTX 330 determines that the aircraft is airborne.
ALTITUDE MONITOR	Controlled by START/STOP key. Activates a voice alarm and warning annunciator when altitude limit is exceeded.
OAT/DALT	Displayed when the GTX 330 is configured with temperature input. Displays Outside Air Temperature and Density Altitude.
COUNT UP TIMER	Controlled by START/STOP and CLR keys.
COUNT DOWN TIMER	Controlled by START/STOP, CLR, and CRSR keys. The initial Count Down time is entered with the 0 – 9 keys.
CONTRAST	This page is only displayed if manual contrast mode is selected in Configuration mode. Contrast is controlled by the 8 and 9 keys.
DISPLAY	This page is only displayed if manual backlighting mode is selected in Configuration mode. Backlighting is controlled by the 8 and 9 keys.
ADS-B TX	Controlled by START/STOP key. Starts/stops extended squitter function.

5.2 Configuration Pages

NOTE

The configuration descriptions given in this section reflect software version 6.00 or higher. Software version 4.01 or later is required for Mode S Enhanced Surveillance (EHS).

NOTE

When connecting the GTX 330 to a NAV/COM/GPS unit such as a GNS 480 (CNX80) or GTN 6XX/7XX unit, the transponder can be configured from either the NAV/COM/GPS unit or the GTX 330. Although possible from the NAV/COM/GPS unit, configuration from the GTX 330 front panel offers more functions and easier to interpret displays.

Holding down the FUNC key and pressing the ON key provides access to the configuration pages. The FUNC key sequences forward through the configuration pages. The START/STOP key reverses through the pages, stopping at the Menu page. The CRSR key highlights selectable fields on each page. When a field is highlighted, the 0 – 9 keys enter numeric data and the 8 or 9 keys move through list selections. Press the CRSR key to accept changes. When a field is highlighted, pressing the FUNC key moves to the next configuration page without saving the changes.

Changes made through the configuration pages are stored in EEPROM memory. To exit the configuration pages, turn the power off. Then turn on again (without holding the FUNC key) for normal operation.

The configuration page sequence is as follows (menu categories are listed in parentheses):

- 'Jump To' Menu
- Audio and Messages #1
- Audio and Messages #2
- Traffic Messages
- Display Mode
- Display Backlight
- Key Backlight
- Contrast
- VFR Key Configuration
- ARINC 429 Input #1 (First I/O Configuration page)
- ARINC 429 Input #2 (Second I/O Configuration page)
- ARINC 429 Output
- RS-232 Input Output
- Operation Configuration #1 (First Aircraft Configuration page)
- Operation Configuration #2 (Second Aircraft Configuration page)
- Temperature
- Aircraft Address
- Default Flight ID
- Flight ID Configuration
- GPS Configuration
- Aircraft Type
- Aircraft Size
- ADS-B Configuration (ES Enabled Units Only)

- EHS
- Gray Code Input
- External Switch State
- Analog Input
- RS-232 Input Display
- ARINC 429 Input Display #1
- ARINC 429 Input Display #2

5.2.1 Configuration Menu Page

CONFIGURATION MENU

CONFIGURATION MENU Page

The JUMP TO menu page provides the capability to select a Configuration mode starting page without having to step through all of the pages. Press the CRSR key and sequence through to the desired selection with the 8 and 9 keys. Jump to the selection by pressing the CRSR key again with the desired selection highlighted.

The FUNC key steps to the next configuration page, after which the START/STOP key reverses until stopping at the JUMP TO menu page.

Table 5-1 Configuration Menu Selections

SELECTION	DESCRIPTION
DIAGNOSTICS	Jumps to Gray Code Input page.
DISPLAY/AUDIO	Jumps to Audio Volume page.
I/O CONFIG	Jumps to ARINC 429 INPUT #1 page.
ACFT CONFIG	Jumps to Operation Configuration #1 page.

5.2.2 Audio Mode Pages

AUDIO MODE (First) Page

AUDIO MODE (Second) Page

VOICE and VOLUME

Select desired VOICE. The choice of OFF is not available for traffic (TIS) audio. Make sure the volume level is sufficient for the aircraft environment involved.

MESSAGE

Message is used as a test function only. Message **0** is a continuous tone. Message **1** is a short tone and **2** through **5** are voice messages. Choose each selection to listen to the message.

Table 5-2 Audio Mode Selections

SELECTION	DESCRIPTION
VOICE (MALE/FEMALE)	Sets the voice to male or female. Default is male voice.
VOLUME	Volume is adjusted from 0 (default) to maximum with the 8 or 9 key.
MESSAGE (0-9)	Selected audio tones and messages: **0** = Toggles a continuous tone on and off. **1** = Attention Tone, precedes voice messages to attract the pilot's attention. **2** = "Leaving Altitude," when altitude monitor is active and the altitude deviation is exceeded. **3** = "Traffic," when a TIS traffic alert is received (similar to a "Traffic Advisory" in TCAS terms). **4** = "Timer Expired," when the countdown timer expires. **5** = "Traffic Not Available," when TIS service is not available or out of range of an operating TIS Mode S site. **6** through **9** are not used at this time.
ALTITUDE MONITOR	Off, tone or message
COUNT DOWN TIMER	Off, tone or message
PAGE CHANGE	Enables/Disables Altitude Monitor sub page when altitude deviation is exceeded.

5.2.3 Traffic Information Page

TRAFFIC INFORMATION Page

TRAFFIC MESSAGES

Sets the Traffic Messages to either Tone or Message. Traffic Information Service (TIS) provides notification of close proximity traffic.

5.2.4 Display Mode Page

DISPLAY MODE

DISPLAY MODE Page

Table 5-3 Display Mode Selections

SELECTION	DESCRIPTION
AUTO (Automatic)	DEFAULT. Display automatically changes between Positive mode (during the day) and Negative mode (at night), depending on ambient light level received by the photocell.
NGTV (Negative)	Display always has light characters on a black background, regardless of ambient lighting.
PSTV (Positive)	Display always has black characters on a light background, regardless of ambient lighting.

5.2.5 Display Backlight Page

DISPLAY BACKLIGHT Page

BKLT (Backlight)

Table 5-4 Display Backlight Selections

SELECTION	DESCRIPTION
AUTO (Automatic)	DEFAULT. Display backlighting is automatically controlled, based on the parameters entered on this configuration page. When AUTO is selected, the DISPLAY page does not appear to the pilot.
MAN (Manual)	Display backlighting is controlled manually by the pilot on the GTX 330 DISPLAY page. No backlight parameters can be entered when the manual mode is selected.

LVL (Level)

Shows the current level of display backlighting, based on the lighting input source (lighting bus voltage, or the ambient light if the source is PHOTO) and the settings on this configuration page. This field has a range of 0 (zero) to 999. The level is set by pressing the 8 and 9 keys when MAN mode is selected. When in AUTO mode, the field is for display only.

RSP TIME (Response Time)

Sets the speed with which the brightness responds to ambient light changes (only for AUTO backlight mode). The higher the number, the slower the display responds. This field has a range of 0 to 7, with the default set to 4.

MIN (Minimum) (Auto Only)

Sets the minimum brightness of the display. The higher the number, the brighter the minimum brightness. Display minimum brightness has a range of 0 (zero) to 99, with the default set to 8. It is prudent to verify that display lighting characteristics match those of other equipment in the panel under night lighting conditions.

BKLT SRCE (Backlight Source)

Table 5-5 Backlight Source Selections

SELECTION	DESCRIPTION
PHOTO (Photocell)	DEFAULT. Backlight level is determined by the ambient light level as measured by the photocell on the GTX 330.
14V	Backlight level tracks a 14 Volt DC aircraft lighting bus.
28V	Backlight level tracks a 28 Volt DC aircraft lighting bus.
5V	Backlight level tracks a 5 Volt DC aircraft lighting bus.

NOTE

If a lighting bus (any selection other than PHOTO) is selected, and the lighting bus control is turned to its minimum (daytime) setting, the display brightness tracks the GTX 330 photocell.

SLOPE (Auto Only)

Sets the sensitivity of the display brightness to changes in the input level. The higher the number, the brighter the display for a given increase in the input level. This field has a range of 0 (zero) to 99, with the default set to 50.

OFFSET (Auto Only)

Adjusts the lighting level up or down for any given input level. This field has a range of 0 (zero) to 99, and is set to 50 at the factory. This may also be used to match lighting curves with other equipment in the panel.

5.2.6 Key Lighting Page

The key lighting mode is always the same as the display backlight mode, so the mode must be changed on the Display Backlight configuration page. If the lighting mode is AUTO, then the key lighting parameters can be edited on this page.

KEY BACKLIGHT Page

KEY (Key Lighting)

Table 5-6 Key Lighting Selections

SELECTION	DESCRIPTION
AUTO (Automatic)	Key lighting is automatically controlled based on the parameters entered on this configuration page.
MAN (Manual)	Key lighting is controlled manually by the pilot on the GTX 330 DISPLAY page.

LVL (Level)

Shows the current level of key lighting, based on the lighting input source (lighting bus voltage, or the ambient light if the source is PHOTO) and the settings on this configuration page. This field has a range of 0 (zero) to 999, but is not a user-entered field (display only).

RSP TIME (Response Time)

Sets the speed with which the brightness responds to ambient light changes (only for AUTO key lighting mode). The higher the number, the slower the key lighting responds. This field has a range of 0 to 7, and is set to 4 at the factory.

MIN (Minimum) (Auto Only)

Sets the minimum brightness of the key lighting. The higher the number, the brighter the minimum brightness. Key lighting minimum brightness has a range of 0 (zero) to 99, and is set to 8 at the factory. It is prudent to verify that key lighting characteristics match those of other equipment in the aircraft panel under night lighting conditions.

KEY SRCE (Key Lighting Source) (Auto Only)

Table 5-7 Key Source Selections

SELECTION	DESCRIPTION
PHOTO (Photocell)	DEFAULT. Key lighting level is determined by the ambient light level as measured by the photocell on the GTX 330.
14V	Backlight level tracks a 14 Volt DC aircraft lighting bus.
28V	Backlight level tracks a 28 Volt DC aircraft lighting bus.
5V	Backlight level tracks a 5 Volt DC aircraft lighting bus.

SLOPE (Auto Only)

Sets the sensitivity of the key lighting brightness to changes in the input level. The higher the number, the brighter the key lighting for a given increase in the input level. This field has a range of 0 (zero) to 99, and is set to 50 at the factory.

OFFSET (Auto Only)

Adjusts the key lighting level up or down for any given input level. This field has a range of 0 (zero) to 99, and is set to 50 at the factory. This may also be used to match lighting curves with other equipment in the panel.

5.2.7 Contrast Configuration Page

CONTRAST CONFIGURATION Page

CONTRAST MODE

Table 5-8 Contrast Mode Selections

SELECTION	DESCRIPTION
AUTO (Automatic)	DEFAULT. Display contrast is automatically compensated for LCD temperature and other factors. An offset can be entered in the contrast level adjustment described below.
MAN (Manual)	Display contrast is manually adjusted either here or by the pilot using the GTX 330 CONTRAST page.

CONTRAST LEVEL ADJUSTMENT

This is a "slider" bar graph control. Use the 8 key to move the graph to the left, decreasing the numbers and contrast level. Use the 9 key to move it to the right, increasing the numbers and contrast level. In manual contrast mode, this is a direct adjustment of the display contrast. In automatic contrast mode, this adjusts the offset to the automatically compensated contrast.

Display contrast is set manually in the factory to achieve optimum contrast performance in cold, hot, and ambient temperatures. The factory set value is not intended to be used as a production requirement. The contrast level can be manually set during installation if further adjustments are necessary.

5.2.8 VFR Key Configuration Page

VFR KEY CONFIGURATION Page

VFR KEY FUNCTIONALITY

Available settings are 'Enable' or 'Disable'. Use the 8 Key to select 'Disable', or the 9 Key to select the 'Enable' setting.

Table 5-9 VFR Key Selections

SELECTION	DESCRIPTION
ENABLE	DEFAULT. The VFR Key functions normally in this setting.
DISABLE	When the VFR Key is disabled and the VFR key is pressed, the unit displays an advisory message that indicates no operation took place. Advisory message clears after 5 seconds elapses, or if the CLR key is pressed. All other keys behave normally.

5.2.9 ARINC 429 Configuration Pages

ARINC 429 INPUT

ARINC 429 INPUT (First) Page

ARINC 429 INPUT (Second) Page

The ARINC 429 INPUT Pages configure the ARINC 429 input ports. Each port can be configured independently for the desired function(s). The same input data source cannot be selected for multiple input channels 1 through 3.

SPEED (Channel 1 – 3)

Table 5-10 Speed Selections

SELECTION	DESCRIPTION
Low	Standard low-speed ARINC 429 (nominally 12.5 kilobits per second)
High	High-speed ARINC 429 (nominally 100 kilobits per second)

DATA (Channel 1 – 3)

Table 5-11 Data Selections

CHANNEL	SELECTION	DESCRIPTION
All	OFF	No unit connected to this ARINC 429 input
1 through 3	GPS/FMS	Selected waypoint information and GPS ground speed recognition (see Note 1)
	ADC NO ALT	Temperature and speed information
	ADC W/ALT	Altitude, temperature and speed information
	AHRS	Attitude and heading information
	EFIS NO ALT	Selected course, heading, temperature, joystick waypoint and speed information
	EFIS W/ALT	Selected course, heading, temperature, joystick waypoint and speed information plus altitude data
	FLIGHT CTRL	Selected altitude, barometric setting, and AFCS pitch discretes
	GRMN DISPLAY	Same as GPS with added ability of receiving phase of flight data from a Garmin 400/500 Series (non-WAAS). (see Notes 1 & 2)
	GRMN TAS	TAS Mode data from Garmin GTS 820 and GTS 850 (see Note 3)
	GRMN 743A	Standard GNSS input. Includes position, velocity, and integrity data. (see Note 1 for software versions earlier than v8.04)

1. This ARINC 429 Input format does not fully support Version 2 ADS-B Out compliance with AC 20-165. For full compliance to AC 20-165, the RS-232 REMOTE input format must be used with a compatible GPS WAAS position source (Section 5.2.10).
2. This format should not be configured for any installation using the GARMIN ARINC 429 output.
3. This format is obsolete and should not be used.

ARINC 429 OUTPUT

ARINC 429 OUTPUT Page

The GTX 330 can be configured to include GPS, Airdata, AHRS and EFIS/Airdata, ARINC 429 inputs functioning as an ARINC 429 data concentrator. Refer to Section 4.6 SERIAL DATA ELECTRICAL CHARACTERISTICS for details. The ARINC 429 OUTPUT Pages configure the ARINC 429 output ports. Each port can be configured independently for the desired function(s). Both ARINC 429 outputs send high speed ARINC 429 data.

Table 5-12 ARINC Channel Selections

SELECTION	DESCRIPTION
CHANNEL 1 (DATA)	DATA SOURCE: OFF, GARMIN, GARMIN W/TIS, or GARMIN TAS. DEFAULTS to OFF.
CHANNEL 2 (DATA)	DATA SOURCE: OFF, GARMIN, GARMIN W/TIS, or GARMIN TAS. DEFAULTS to GARMIN W/TIS. (See Figure D-5, Note 2 for description of Garmin format.) Do not select GARMIN W/TIS if the aircraft contains another traffic detection system.

In aircraft having multiple traffic systems and multiple 400/500 Series units, configure ARINC 429 output CHANNEL 1 for GARMIN W/TIS and ARINC 429 output CHANNEL 2 for GARMIN. TIS is then enabled over CHANNEL 1.

For a connection to a Garmin GTS 820/825/850/855, GARMIN TAS must be selected.

The GARMIN format is a data concentration function. The following data is sent out at specified intervals using high speed ARINC 429 (100 kilobits per second). The transmit data labels and their rates are as follows:

Table 5-13 GARMIN ARINC Output Labels, Data, and Rates

Label	Data	Rate
100	Selected Course (degrees)	200 ms
203	Pressure Altitude (feet)	100 ms
204	Barometric Corrected Altitude (feet)	100 ms
206	Indicated Air Speed (knots)	100 ms
210	True Air Speed (knots)	100 ms
211	Total Air Temperature (degrees)	100 ms
213	Static Air Temperature (degrees)	100 ms
306	Joystick Lat	500 ms
307	Joystick Lon	500 ms
314	True Heading	100 ms
320	Magnetic Heading (degrees)	100 ms
371	GA Equipment Identifier	500 ms
377	Equipment Identifier	500 ms

When GARMIN w/TIS is configured, the following data are sent out in packets approximately every 0.5 seconds at high speed (100 kilobits per second), in the specified sequence:

Table 5-14 TIS ARINC Output Labels, High Speed Data

Label	Data
350	Fault Summary
274	Transponder Control
313	Own Aircraft Track Angle
357 (RTS)	Request to Send
130	Intruder Range (0 – 8 sets)
131	Intruder Altitude (0 – 8 sets)
132	Intruder Bearing (0 – 8 sets)
357 (ETX)	End of Transmission

5.2.10 RS-232 Input and Output Page

RS-232 INPUT-OUTPUT Page

RS-232 INPUT (Altitude Source, GPS Data)

This is the electrical source for the GTX 330 altitude and GPS data input. Refer to Section 4.4.4 for altimeter data selection priority.

Table 5-15 RS-232 Input Selections

SELECTION	DESCRIPTION
OFF	DEFAULT. The altitude code input is not from an RS-232 source.
GPS	RS-232 ground speed from a GPS device. (see Note 1)
ICARUS ALT	RS-232 serial altitude from an Icarus Instruments 3000. (see Note 4)
ICRS ALT 25ft	Reports Icarus Instruments 3000 altitude in 25-foot increments
ADC NO ALT	RS-232 serial air data information from Shadin ADC 200, 200+, 2000.
ADC W/ALT	RS-232 serial air data information from Shadin ADC 200, 200+, 2000 plus altitude data.
SHADIN ALT	RS-232 serial altitude from Shadin 8800T, 9000T, 9200T. (see Note 4)
SHDN ALT 25ft	Reports Shadin 8800T, 9000T, 9200T altitude in 25-foot increments
FADC NO ALT	RS-232 serial air data from Shadin 9628XX-X family of Air Data Computers and Fuel/Air Data Computers.
FADC W/ALT	RS-232 serial air data from Shadin 9628XX-X family of Air Data Computers and Fuel/Air Data Computers plus altitude data.
REMOTE (see Note 2)	RS-232 serial input remote data. Also used to receive GPS WAAS information from Garmin ADS-B position source equipment (see Note 3).
GNS (see Note 5)	RS-232 serial data from a Garmin 400W/500W Series unit. Receives GPS WAAS and height above terrain data in the Garmin 400W/500W Series "ADSB TFC" format (see Note 3)

1. This RS-232 GPS Input format does not fully support Version 2 ADS-B Out compliance with AC 20-165. For full compliance to AC 20-165, the RS-232 REMOTE input format must be used with compatible ADS-B Out position source equipment (see Note 3).
2. For GTX 330 Software versions earlier than v7.05, if REMOTE input is selected, it is the installer's responsibility to ensure the output selection for that channel is either OFF, REMOTE, or REMOTE + TIS.
3. For GTX 330 w/ES units with Software versions v7.01 or later (ADS-B Out Version 2), it is the installer's responsibility to ensure the ADS-B Out system is compliant with AC 20-165 and to ensure compatibility between the GTX 330 and the ADS-B Out position source equipment. See Garmin ADS-B Out Compatible Equipment (190-01533-00) for compatible equipment shown to be eligible for 14 CFR 91.227-compliant installations in accordance with AC 20-165.
4. Gilham-based altitude sources cannot be configured when ADS-B is enabled (see Section 5.2.17) for software v8.01 and all software versions prior to v7.05.
5. If GNS input is selected, it is the installer's responsibility to ensure the output selection for that channel is GNS.

RS-232 OUTPUT (Altitude Source)

Table 5-16 RS-232 Output Selections

SELECTION	DESCRIPTION
OFF	DEFAULT for channel 2. No unit is connected to output of this channel.
ICARUS ALT	DEFAULT for channel 1. RS-232 serial altitude data.
REMOTE	RS-232 serial output remote data.
REMOTE + TIS	RS-232 serial output remote data with TIS.
GNS	RS-232 serial data to a Garmin 400W/500W Series unit.

5.2.11 Operation Configuration Pages

VS RATE (Vertical Speed Rate)

First CONFIGURATION Page

This field is the typical vertical speed for climb/descent of the aircraft. The range is 100 feet per minute to 9999 feet per minute, and is set to 500 fpm at the factory.

FORMAT (Altitude Format)

This field determines how the pressure altitude is shown on the GTX 330 display.

Table 5-17 Altitude Format Selections

SELECTION	DESCRIPTION
FLIGHT LVL (Flight Level)	DEFAULT. The pressure altitude is displayed in hundreds of feet. For example, a pressure altitude of 12,300 feet is displayed as “FL 123”.
FEET	Pressure altitude is displayed in feet.
METERS	Pressure altitude is displayed in meters.

VFR ID (VFR Transponder Code)

This field is the four-digit code that is selected when the user presses the GTX 330 VFR key. In the United States, 1200 is the VFR code for any altitude. The default is set to 1200.

ALTITUDE ALERT DEVIATION (Altitude Format)

This field determines the amount of altitude difference from selected altitude to generate an altitude alert deviation. It is set to 200 feet, the minimum altitude, at the factory.

SQUAT SWITCH

The squat switch field may be set to either YES or NO. Selecting YES in this field sets the GTX 330 to use the squat switch to determine lift off. Selecting NO sets the GTX 330 to use Automated Airborne Determination from other sources.

Second CONFIGURATION Page v7.05-v8.02

Second CONFIGURATION Page v8.03 and newer

NOTE

If "SQUAT SWITCH?" is set to YES while configured for a rotorcraft (see Section 5.2.15), ground speed must be available from a valid GPS source for the squat switch to determine the aircraft is on the ground.

SENSE

The sense setting sets the logic level to HIGH or LOW. With the sense set to HIGH the unit will go into ground mode when Pin 17 (SQUAT SWITCH IN) is pulled high. With the sense set to LOW the unit will go into ground mode when Pin 17 (SQUAT SWITCH IN) is pulled low.

NOTE

The sense setting (HIGH or LOW) does not affect the operation of the External Switch State Page. Refer to Section 5.2.20 for information about the External Switch State Page.

AUTO ALT

Automatic ALT field can be set to ON or OFF. Selecting ON enables the unit to automatically switch from STBY to ALT mode when a lift off is detected in normal mode.

NOTE

Automatic ALT mode switching is only configurable in software version 8.03 or later. Before 8.03, automatic mode switching was always enabled.

AUTO FLIGHT TIMER

Available choices are MAN, CLEAR and ACCUM. Selecting CLEAR resets flight time to zero and starts the flight timer when lift off is sensed.

Table 5-18 Auto Flight Timer Selections

SELECTION	DESCRIPTION
MAN	Manual selection. DEFAULT. Flight timer START/STOP is controlled manually by the pilot.
CLEAR	Automated flight timer START/STOP resets to zero at every lift off.
ACCUM	Automated flight timer START/STOP accumulates, meaning, it continues counting up at lift off.

5.2.12 Temperature Page

SENSOR INSTALLED

Sets the Sensor to YES or NO. Default is NO.

TEMPERATURE Page

UNITS

Sets the units to degrees Fahrenheit or Centigrade. Default is degrees C.

5.2.13 Mode S Address Entry Pages

NOTE

It is VERY important to enter the Mode S address correctly in the GTX 330.

When the unit is turned on for the first time, or an invalid address is recognized, the unit prompts the user to enter a valid aircraft address. When an invalid Flight ID is recognized, the unit prompts the user to enter a valid Flight ID. Once the aircraft address is entered, the unit remains on in the same mode as before.

5.2.13.1 US TAIL and Hex ADDRESS Entry Pages

For first time turn-on, proceed to step 5. Otherwise begin at step 1, with the unit turned off:

1. To enter the configuration pages, press and hold the FUNC key while powering on the unit.
2. Power the unit on by pressing the ON, ALT, or STBY key or turn on with the avionics master switch (while holding the FUNC key). The unit performs a self-test routine and displays a "Jump to Diagnostics" page.
3. Navigate to the address entry page by repeatedly pressing the FUNC Key.
   a. The page that appears is either ADDRESS US TAIL# N _ _ _ _ _ .
   b. Or ADDRESS HEX _ _ _ _ _ _ .

MODE S US TAIL # Page

MODE S Address Hex Page

NOTE

It is not necessary for the installer to convert a US aircraft registration number (N-number) to a Hex address. The GTX 330 converts the US registration number to hexadecimal automatically.

4. To select between Hex or Tail number, press the CRSR key, then 8 or 9 key to move to the correct selection.
5. For entering either the address hex code or the US registration number, press the CRSR key 1 time. (This highlights the address field).
6. Enter the aircraft address using the number keys. Press a key repeatedly to scroll through the digit/ alpha characters for that key.
7. Press the CRSR key to select the next numeric entry field. Enter the next character as stated in the previous step, then move onto the next one, repeating the process until the complete number is entered.
8. When finished, press the CRSR key to accept the number entry.
9. Using the FUNC and/or START/STOP keys, toggle through the pages to get off of, then back onto the aircraft address page. Verify that the address is correct.

The unit now contains a Mode S address and may be turned off. To power the unit on in the normal mode, press only the **ON, ALT,** or **STBY** key (without holding the **FUNC** key) or turn on with the avionics master switch.

MODE S ADDRESS, AIRCRAFT REGISTRATION PAGE

Table 5-19 Mode S Address Selections

SELECTION	DESCRIPTION
US TAIL #	N-Registration Number
HEX	Hexadecimal code address

5.2.13.2 MODE S Flight ID Pages

Used to support Default Flight ID entry.

DEFAULT FLIGHT ID ENTRY Page

Table 5-20 Default Flight ID Entry Configuration Selections

SELECTION	DESCRIPTION
US TAIL	Set the Default Flight ID to the US registration number.
ENTRY	Set the Default Flight ID using this page.

For entering all Mode S Flight IDs:

DEFAULT FLIGHT ID ENTRY Page

1. Press the CRSR key once to highlight the address field.
2. Enter the aircraft address using the number keys. Pressing a key repeatedly scrolls through the alphanumeric characters for that key.
3. Press the CRSR key to select the next alphanumeric entry field, and enter the next character as stated in the previous step. Repeat the process until the complete number is entered.
4. When finished, press the CRSR key to complete Default Flight ID entry.

NOTE

No space is needed when entering Flight ID characters. When a Flight ID contains a space, the GTX 330 automatically removes the spaces upon completion of Flight ID entry.

When ALLOW PILOT TO EDIT FLT ID is disabled, the Default Flight ID is used as the normal mode Flight ID. In this configuration, the GTX 330 will not accept a blank Default Flight ID (i.e. one set to all spaces). To verify the Flight ID was set properly in this configuration, restart the unit in the normal mode and verify the Flight ID reported on the FLIGHT ID page is correct.

NOTE

Prior to software version 8.01, this page supported both entry and configuration of the Flight ID. The available options were CONFIG ENTRY, PWR-UP ENTRY, and SAME AS TAIL. CONFIG ENTRY and PWR-UP ENTRY allowed Flight ID entry on this page as per the above procedure, and PWR-UP ENTRY allowed Flight ID to be set in normal mode by the flight crew.

5.2.13.3 Mode S Flight ID Configuration Page

Used to support Flight ID entry configurations in software versions 8.01 and later.

ALLOW PILOT TO SET FLT ID

Available settings are 'Yes' or 'No'. Use the 8 key to select 'No', or the 9 key to select 'Yes'.

MODE S FLIGHT ID CONFIG Page

Table 5-21 Allow Pilot To Set FLT ID Selections

SELECTION	DESCRIPTION
NO	The Default Flight ID set in installation is used as the normal mode Flight ID.
YES	The Flight ID can be set in the normal mode by the flight crew by pressing the CRSR key on the FLIGHT ID page.

5.2.14 GPS Configuration Page

Used to support GPS antenna position and source integrity level configurations.

GPS Configuration Page

Table 5-22 GPS Configuration Page

SELECTION	DESCRIPTION
GPS X OFST	Set to 6 (R) to 6 (L) in 2m steps, Default is Unknown
GPS Y OFST	Set to 2 to 60 in 2m steps, Default is Unknown
GPS INTEGRITY	UNK, 1E-3, 1E-5, and 1E-7, Default is 1E-3

GPS OFFSETS

GPS X OFST refers to the lateral offset of the GPS antenna from the centerline of the aircraft. GPS Y OFST refers to the longitudinal offset of the GPS antenna from the nose of the aircraft. Refer to Section 5.2.16 for additional considerations when setting these parameters.

GPS INTEGRITY

Sets the GPS INTEGRITY to UNK, 1E-3, 1E-5, or 1E-7. 1E-3 is the default.

NOTE

The GPS INTEGRITY configuration field indicates the integrity of the GPS sensor that is connected to the GTX 330. It is measured in errors per flight hour, 1E-3 being the worst and 1E-7 being the best rating. This data is used in ADS-B transmissions. Check with the GPS manufacturer for guidance on this setting.

NOTE

*When installed with a Garmin 400/500 or GTN 6XX/7XX series unit, the GPS INTEGRITY should be set to **1E-7**.*

5.2.15 Mode S Aircraft Type Page

Used to support Mode S protocols.

MODE S (A/C Type) Page

Table 5-23 Mode S Aircraft Type Selections

SELECTION	DESCRIPTION
AC TYPE	UNKNOWN, <15.5K Lb, >=15.5K Lb, or ROTOR.
MAX AIRSPEED	UNKNOWN, <=75 kt, <=150 kt, <=300 kt, or >300 kt.
STALL SPEED	DEFAULT, >=30 kt, >=35 kt, >=40 kt, ..., >=190 kt, >=195 kt, or >=200 kt.

AIRCRAFT TYPE

Sets the AIRCRAFT TYPE Message to ROTOR, to a weight of less than 15,500 pounds, more than or equal to 15,500 pounds, or unknown weight. Defaults to less than 15,500 pounds.

MAXIMUM AIRSPEED

Sets the AIRCRAFT AIRSPEED Message to a speed of less than or equal to 75 knots, between 75 knots and 150 knots, between 150 knots and 300 knots, more than 300 knots, or unknown airspeed. Defaults to less than or equal to 150 knots. Enter the aircraft's maximum cruising true airspeed capability.

STALL SPEED

Sets the stall speed of the aircraft to either DEFAULT or a fixed speed between 30 and 200 knots. Enter the aircraft's minimum stall speed if known, otherwise set to DEFAULT to let the GTX 330 automatically set the stall speed based on other parameters.

5.2.16 Aircraft Size Page (Only Affects ES Enabled Units Only)

AIRCRAFT SIZE Page

AIRCRAFT LENGTH TYPE

Sets the length of the aircraft to less than or equal to 15 meters, less than or equal to 25 meters, less than or equal to 35 meters, less than or equal to 45 meters, less than or equal to 55 meters, less than or equal to 65 meters, less than or equal to 75 meters, less than or equal to 85 meters, or more than 85 meters. Enter the aircraft's minimum length category.

AIRCRAFT WIDTH TYPE

Sets the width of the aircraft to less than or equal to 11.5 meters, less than or equal to 23.0 meters, less than or equal to 28.5 meters, less than or equal to 33.0 meters, less than or equal to 34.0 meters, less than or equal to 38.0 meters, less than or equal to 39.5 meters, less than or equal to 45.0 meters, less than or equal to 52.0 meters, less than or equal to 59.5 meters, less than or equal to 67.0 meters, less than or equal to 72.5 meters, less than or equal to 80.0 meters, or more then 80.0 meters. Enter the aircraft's minimum width category.

When configuring the aircraft size and GPS antenna offsets it is important to ensure that the enclosing box fully contains the aircraft as shown in Figure 5-2.

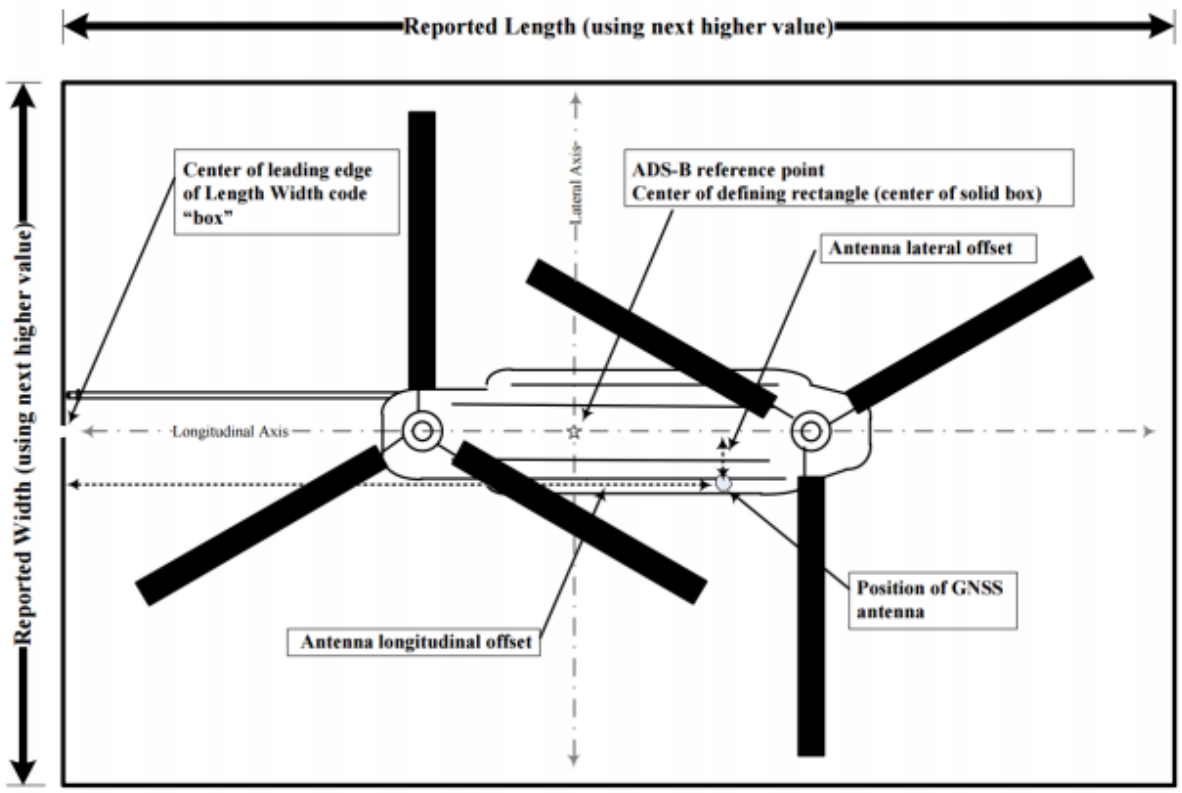


Figure 5-2. Aircraft Length and Width Determination

In installations with multiple GPS sources tied to a single transponder, it is recommended that the GPS antenna furthest aft from the nose is used when configuring the GPS antenna offsets. Further, the configured aircraft length and width parameters may need to be adjusted such that the containing box fully encloses the aircraft when any of the GPS antennas are sourcing data to the transponder. The example in Figure 5-3 of two GPS sources demonstrates the need to expand the aircraft length and width parameters such that the containment box fully encloses the aircraft when GPS 1 is the selected GPS source.

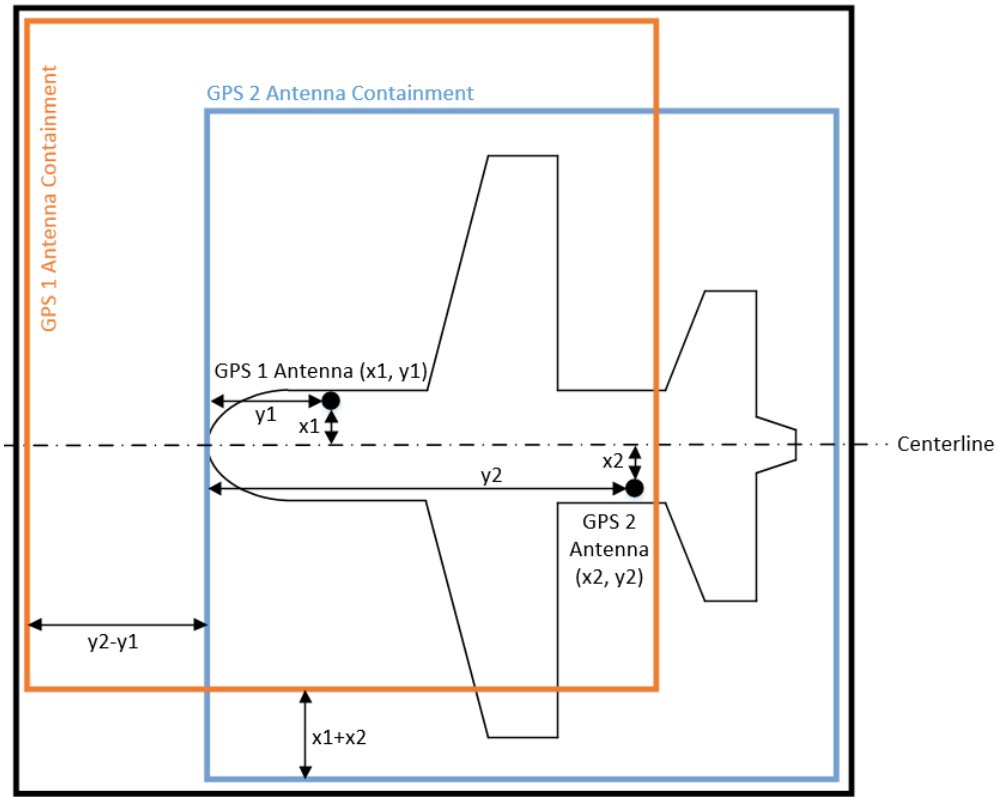


Figure 5-3. Combined GPS Antenna Containment

Based on Figure 5-3, the following would be used to configure the transponder:

Values used to configure Aircraft Length and Width:

Combined Aircraft Width = Actual Aircraft Width + 2 * (x1+ x2)

Combined Aircraft Length = Actual Aircraft Length + (y2 – y1)

NOTE

The equation "x1+x2" simply represents the lateral distance between the two antennas.

Values used to configure GPS antenna offsets:

Longitudinal Offset = y2

Lateral Offset = x2

5.2.17 ADS-B TX Page (ES Enabled Units Only)

ADS-B TX Page

ADS-B TX

This page is used to support ADS-B configurations. Automatic Dependant Surveillance-Broadcast (ADS-B) TX can be set to DISABLE, ENABLE, or PILOT SET. DISABLE is the default. When ADS-B TX is set to DISABLE the BDS items listed in Section 1.6 that are marked "ES Enabled Units Only" are not active (no extended squitter). When ADS-B TX is set to ENABLE, ADS-B transmissions are active. When ADS-B TX is set to PILOT SET, the pilot controls whether ADS-B transmissions are active from the Function Display using the START/STOP key (see Section 5.1.3).

1090 IN can be set to NO or YES, default is NO. UAT IN can be set to NO or YES, default is YES.

The data for these fields should be set to match the type of receiver installed in the aircraft. This info is used to inform the ground station what type of receiver is in the aircraft and allows the ground station to tailor the uplink data to match the type of receiver(s) in use for a particular operating area. A GDL 39 is capable of receiving both 1090 Mhz ES and 978 Mhz UAT, so both of these fields (1090 IN and UAT IN) would normally be set to YES (for installations using a GDL 39). However, (depending upon the installation) these fields won't always match.

5.2.18 EHS Page

EHS Page

EHS

Sets Enhanced Surveillance (EHS) to DISABLE or ENABLE. ENABLE is the default. When EHS is set to DISABLE the BDS items listed in Section 1.6 that are marked "EHS Only" are not active (no enhanced surveillance).

5.2.19 Gray Code Input Page

GRAY CODE INPUT Page

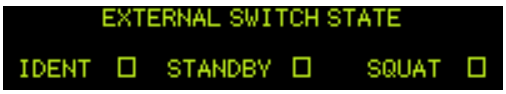
GRAY CODE

This field shows the status (1 = ground, 0 = open) of each of the ten gray code altitude inputs. This information may aid in installation troubleshooting.

DECODED ALTITUDE

This field displays the gray code altitude input in feet. Verify that it is the correct altitude.

5.2.20 External Switch State Page



EXTERNAL SWITCH Page

IDENT

This field displays the state of the EXTERNAL IDENT discrete input. The box is filled when EXTERNAL IDENT is grounded.

STANDBY

This field displays the state of the EXTERNAL STANDBY discrete input. The box is filled when EXTERNAL STANDBY is grounded.

SQUAT

This field displays the state of the SQUAT SWITCH input. The box is filled when the SQUAT SWITCH input is active (the aircraft is on the ground as configured on the SETUP 2 page).

5.2.21 Analog Input Page

ANALOG INPUT Page

The Analog to Digital Converter counts are shown on the display, providing troubleshooting data.

14/5V LTG

This field displays the input level of the 14/5 V lighting bus.

PHOTO

This field displays the input level of the photocell.

LCD TEMP

This field displays the input level of the LCD temperature sensor.

28V LTG

This field displays the input level of the 28 V lighting bus.

OAT

This field displays the input level from the outside air temperature sensor.

UNIT TEMP

This field displays the input level from the unit temperature sensor.

5.2.22 RS-232 Input Page

RS-232 INPUT Page

Depending on the selected inputs on Channel 1 and Channel 2 from the RS-232 Input page (reference Section 5.2.10), this page displays the information received on the channel.

If GPS is selected as an input ground speed can be viewed (GSPD), latitude (LAT), longitude (LON) and track (TRK).

If ICARUS or SHADIN-ALT is selected as an input pressure altitude (PALT) can be viewed.

If FADC or ADC is selected as an input, true or static air temperature (SAT), outside or total air temperature (TAT), indicated air speed (IAS), true air speed (TAS), density altitude (DALT), pressure altitude (PALT*), current barometric pressure (BARO) and vertical speed (VSPD) can be viewed.

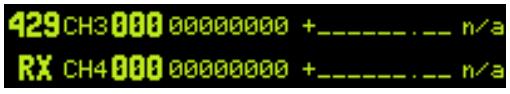
**If ADC W/ALT or FADC W/ALT format selected.*

If REMOTE is selected as an input, ground speed (GSPD), pressure altitude (PALT), track angle (TRK), track rate (TRKR), indicated airspeed (IAS), true airspeed (TAS), Mach (MACH), vertical speed (VSPD), heading (HDG), roll angle (ROLL), AFCS selected altitude (SALT), AP vertical reference (VREF), FMS selected altitude (FALT), baro setting (BARO), latitude (LAT), longitude (LON), east/west velocity (EVEL), north/south velocity (NVEL), up/down velocity (UVEL), horizontal figure of merit (HFOM), vertical figure of merit (VFOM), horizontal protection limit (HPL), vertical protection limit (VPL), true heading (THDG), height above ellipsoid (HAE), horizontal figure of merit velocity (HFMV), vertical figure of merit velocity (VFMV), radio altitude (RALT), height above terrain (HAT), geoid height (GSL), nearest airport latitude (ALAT), nearest airport longitude (ALON), and nearest airport field elevation (AALT) can be viewed.

If GNS is selected as an input, ground speed (GSPD), track angle (TRK), latitude (LAT), longitude (LON), east/west velocity (EVEL), north/south velocity (NVEL), up/down velocity (UVEL), horizontal figure of merit (HFOM), vertical figure of merit (VFOM), horizontal protection limit (HPL), vertical protection limit (VPL), height above ellipsoid (HAE), horizontal figure of merit velocity (HFMV), vertical figure of merit velocity (VFMV), and height above terrain (HAT) can be viewed.

5.2.23 ARINC 429 Receive Channels Pages

ARINC 429 CHANNELS 1 and 2



ARINC 429 CHANNELS 3 and 4

The GTX 330 receives one of the following sets of ARINC 429 data on either ARINC 429 receivers #1, #2 or #3. The labels are chosen when selected in ARINC 429 INPUT, Section 5.2.9. The received data may be at either LOW or HIGH speed. The default is LOW. The transmit data labels are described in detail in the Serial Data ICD (190-00207-10) and are as follows:

AHRS COMPUTER (AHRS)

Table 5-24 Received Labels and Data from AHRS

Label	Data
314	True Heading (degrees)
320	Magnetic Heading (degrees)
325	Roll Angle
365	Vertical Rate (feet/min)

AIR DATA COMPUTER (ADC)

Table 5-25 Received Labels and Data from ADC

Label	Data
203*	Pressure Altitude (feet)
204	Barometric Corrected Altitude (feet)
205	Mach Number
206	Indicated Air Speed (knots)
210	True Air Speed (knots)
211	Total Air Temperature (degrees)
212	Vertical Speed (feet/min)
213	Static Air Temperature (degrees)

*If ADC W/ALT or EFIS W/ALT format selected

EFIS DISPLAY SYSTEM (EFIS)

Table 5-26 Received Labels and Data from EFIS Display

Label	Data
100	Selected Course (degrees)
102	Selected Altitude (feet)
164	Radio Altitude (feet)
203*	Pressure Altitude (feet)
204	Barometric Corrected Altitude (feet)
205	Mach Number
206	Indicated Air Speed (knots)
210	True Air Speed (knots)
211	Total Air Temperature (degrees)
212	Vertical Speed (feet/min)
213	Static Air Temperature (degrees)
234	Barometric Setting (hPa)
235	Barometric Setting ("Hg)
306	Joystick Lat
307	Joystick Lon
314	True Heading (degrees)
320	Magnetic Heading (degrees)
325	Roll Angle (degrees)

*If ADC W/ALT or EFIS W/ALT format selected

GPS/FMS NAVIGATION SYSTEM (GPS/FMS)

Table 5-27 Received Labels and Data from GPS/FMS

Label	Data
102	Selected Altitude (feet)
310*	Latitude (degrees)
311*	Longitude (degrees)
312*	Ground Speed (knots)
313*	Track Angle (degrees)

*These labels are rejected when ADS-B TX is not set to DISABLE (see Section 5.2.17) for software versions 8.04 and later

GARMIN DISPLAY

Table 5-28 Received Labels and Data from Garmin Display

Label	Data
261*	Discrete Data
310*	Latitude (degrees)
311*	Longitude (degrees)
312*	Ground Speed (knots)
313*	Track Angle (degrees)
314	True Heading (degrees)
320	Magnetic Heading (degrees)

*These labels are rejected when ADS-B TX is not set to DISABLE (see Section 5.2.17) for software versions 7.05 and later except 8.01 and 8.02.

GARMIN TAS

Table 5-29 Received Labels and Data from Garmin TAS

Label	Data
274	TAS Discrete Data

ARINC 743A

Table 5-30 Received Labels and Data from ARINC 743A

Label	Data
076	MSL Altitude (feet)
103	Track Angle (degrees)
110	Latitude (degrees)
111	Longitude (degrees)
112	Ground Speed (knots)
120	Latitude Fine
121	Longitude Fine
130	Horizontal Protection Level (feet)
133	Vertical Protection Level (feet)
136	Vertical Figure of Merit (feet)
140	UTC Fine
141	UTC Fine Fraction
142	Vertical Figure of Merit Velocity (feet per minute)
145	Horizontal Figure of Merit Velocity (knots)
150	UTC
165	GPS Vertical Velocity (feet per minute)
166	N/S Velocity (knots)
174	E/W Velocity (knots)
247	Horizontal Figure of Merit (feet)
260	Date
273	GNSS Sensor Status
370	Height above Ellipsoid (feet)

AUTOMATIC FLIGHT CONTROL SYSTEM (FLIGHT CTRL)

Table 5-31 Received Labels and Data from FLIGHT CTRL

Label	Data
102	Selected Altitude (feet)
234	Barometric Setting (hPa)
235	Barometric Setting (“Hg)
271	AFCS Pitch Discretes

5.3 Input Data Source Availability and Prioritization

Table 5-32 shows the available equipment connections to provide Mode S Enhanced Surveillance (EHS) and/or ADS-B Out functionality. Each supported BDS register is broken down into the data parameters that affect the BDS register. If multiple data parameters affect the register, the priority of the parameters is listed with "1" being the highest priority. If a data parameter is available on multiple input formats the priority of the inputs is listed with "1" being the highest priority.

It is the responsibility of the installing agency to determine whether the equipment that interfaces with the GTX 330 Mode S transponder actually provides the required output. Make sure the interfacing equipment outputs the correct parameter to the GTX 330 to meet Mode S EHS and/or ADSB-Out. See the manufacturer's documentation to configure the external data sources to output the required data.

Table 5-32 Required BDS Register Equipment Connections

REGISTER NUMBER (HEX)	ASSIGNMENT	REGISTER FIELD	LABEL	PARAMETER DESCRIPTION	PRIORITY	GILLHAM	ARINC 429								RS-232					
							GPS/FMS (Note 4)	ADC (Note 1)	FLIGHT CTRL	AHRS	EFIS (Note 1)	GRMN DISPLAY (Note 2)	GRMN TAS	GRMN 743A	GPS	ICARUS ALT	SHADIN ALT	FADC and ADC (Note 1)	REMOTE (Note 3)	GNS
00	Air Initiated Comm-B (AICB)	NA	NA	NA	NA		No External Sources													
05	Extended Squitter Airborne Position	Type	-	Horizontal Protection Limit (HPL)	-							♦ (261)		♦ (130)					♦	♦
			-	GNSS Height (HAE)	-									♦ (370)					♦	♦
		NIC Supplement-B	-	Horizontal Protection Limit (HPL)	-							♦ (261)		♦ (130)					♦	♦
		Altitude	203	Altitude (1013.25 hPa)	-	7		1			2					6 (25 ft), 9 (100ft)	5 (25 ft), 8 (100ft)	4	3	
		Encoded Latitude	-	Latitude, Present Position	-		♦ (310)					♦ (310)		♦ (110/ 120)	♦				♦	♦
		Encoded Longitude	-	Longitude, Present Position	-		♦ (311)					♦ (311)		♦ (111/ 121)	♦				♦	♦
		Lat/Long Estimation Extrapolation Parameters	-	Track Angle	2		♦ (313)					♦ (313)		♦ (103)	♦				♦	♦
			-	Ground Speed			♦ (312)					♦ (312)		♦ (112)	♦				♦	♦
			-	GNSS N/S Velocity	1									♦ (166)					♦	♦
			-	GNSS E/W Velocity										♦ (174)					♦	♦

♦GPS data has no explicit priority and is chosen based off of the HPL for each interface.
(Note 1) EFIS, ADC, and FADC refer to both W/ALT and NO ALT with the exception that pressure altitude is not supported on NO ALT.
(Note 2) Labels 261, 310, 311, 312, and 313 are only accepted when ADS-B TX is set to DISABLE (see Section 5.2.17) for software versions 7.05 and later except 8.01 and 8.02.
(Note 3) Only GPS data from "+" formats, for example, "ADS-B+" and "GTX w/TIS+", are accepted when ADS-B TX is not DISABLE.
(Note 4) Labels 310, 311, 312, and 313 are only accepted when ADS-B TX is set to DISABLE (see Section 5.2.17) for software versions 8.04 and later.

Table 5-32 Required BDS Register Equipment Connections

REGISTER NUMBER (HEX)	ASSIGNMENT	REGISTER FIELD	LABEL	PARAMETER DESCRIPTION	PRIORITY	GILLHAM	ARINC 429								RS-232					
							GPS/FMS (Note 4)	ADC (Note 1)	FLIGHT CTRL	AHRS	EFIS (Note 1)	GRMN DISPLAY (Note 2)	GRMN TAS	GRMN 743A	GPS	ICARUS ALT	SHADIN ALT	FADC and ADC (Note 1)	REMOTE (Note 3)	GNS
06	Extended Squitter Surface Position	Type	-	Horizontal Protection Limit (HPL)	-							♦ (261)		♦ (130)					♦	♦
		Movement	-	Ground Speed	-		♦ (312)					♦ (312)		♦ (112)	♦				♦	♦
		Heading/Ground Track	-	Track Angle	3		♦ (313)					♦ (313)		♦ (103)	♦				♦	♦
			314	True Heading	1							1								
			320	Magnetic Heading	2					1	2	3							4	
		Encoded Latitude	-	Latitude, Present Position	-		♦ (310)					♦ (310)		♦ (110/ 120)	♦				♦	♦
		Encoded Longitude	-	Longitude, Present Position	-		♦ (311)					♦ (311)		♦ (111/ 121)	♦				♦	♦
		Lat/Long Estimation Extrapolation Parameters	-	Track Angle	2		♦ (313)					♦ (313)		♦ (103)	♦				♦	♦
			-	Ground Speed			♦ (312)					♦ (312)		♦ (112)	♦				♦	♦
			-	GNSS N/S Velocity	1									♦ (166)					♦	♦
			-	GNSS E/W Velocity										♦ (174)					♦	♦
07	Extended Squitter Status	Altitude Type Subfield	-	GNSS Height (HAE)	-									♦ (370)					♦	♦
			203	Altitude (1013.25 hPa)	-	7		1			2					6 (25 ft), 9 (100ft)	5 (25 ft), 8 (100ft)	4	3	

♦GPS data has no explicit priority and is chosen based off of the HPL for each interface.
(Note 1) EFIS, ADC, and FADC refer to both W/ALT and NO ALT with the exception that pressure altitude is not supported on NO ALT.
(Note 2) Labels 261, 310, 311, 312, and 313 are only accepted when ADS-B TX is set to DISABLE (see Section 5.2.17) for software versions 7.05 and later except 8.01 and 8.02.
(Note 3) Only GPS data from "+" formats, for example, "ADS-B+" and "GTX w/TIS+", are accepted when ADS-B TX is not DISABLE.
(Note 4) Labels 310, 311, 312, and 313 are only accepted when ADS-B TX is set to DISABLE (see Section 5.2.17) for software versions 8.04 and later.

Table 5-32 Required BDS Register Equipment Connections

REGISTER NUMBER (HEX)	ASSIGNMENT	REGISTER FIELD	LABEL	PARAMETER DESCRIPTION	PRIORITY	GILLHAM	ARINC 429								RS-232					
							GPS/FMS (Note 4)	ADC (Note 1)	FLIGHT CTRL	AHRS	EFIS (Note 1)	GRMN DISPLAY (Note 2)	GRMN TAS	GRMN 743A	GPS	ICARUS ALT	SHADIN ALT	FADC and ADC (Note 1)	REMOTE (Note 3)	GNS
09	Extended Squitter Airborne Velocity Subtype 1 and 2	Subtype = 1 or 2	-	GNSS N/S Velocity	-									♦ (166)					♦	♦
			-	GNSS E/W Velocity	-									♦ (174)					♦	♦
		NAC Velocity	-	Horizontal Velocity Figure of Merit	-									♦ (145)					♦	♦
		E/W Velocity	-	GNSS E/W Velocity	-									♦ (174)					♦	♦
		N/S Velocity	-	GNSS N/S Velocity	-									♦ (166)					♦	♦
		Vertical Rate	-	Vertical Rate	-			3 (212)			4 (212)			5♦(165)				1	2 (VSPD), 5♦ (UVEL)	5♦ (UVEL)
		Difference from Baro Altitude	203	Altitude (1013.25 hPa)	-	7		1			2					6 (25 ft), 9 (100ft)	5 (25 ft), 8 (100ft)	4	3	
	Extended Squitter Airborne Velocity Subtype 3 and 4	Subtype = 3 or 4	210	True Airspeed	2			1			2							3	4	
			206	Indicated Airspeed	1			1			2							3	4	
		Heading	320	Magnetic Heading	2					1	2	3							4	
			314	True Heading	1							1								
		Airspeed	210	True Airspeed	2			1			2							3	4	
			206	Indicated Airspeed	1			1			2							3	4	
		Vertical Rate	-	Vertical Rate	-			3 (212)			4 (212)			5♦(165)				1	2 (VSPD), 5♦ (UVEL)	5♦ (UVEL)
		Difference from Baro Altitude	203	Altitude (1013.25 hPa)	-	7		1			2					6 (25 ft), 9 (100ft)	5 (25 ft), 8 (100ft)	4	3	
0A	Extended Squitter Event Driven Information	NA	NA	NA	NA		No External Sources													
10	Data Link Capability Report	NA	NA	NA	NA		No External Sources													
17	Common Usage Ground Initiated Comm-B (GICB) Capability Report	NA	NA	NA	NA		No External Sources													

♦GPS data has no explicit priority and is chosen based off of the HPL for each interface.
(Note 1) EFIS, ADC, and FADC refer to both W/ALT and NO ALT with the exception that pressure altitude is not supported on NO ALT.
(Note 2) Labels 261, 310, 311, 312, and 313 are only accepted when ADS-B TX is set to DISABLE (see Section 5.2.17) for software versions 7.05 and later except 8.01 and 8.02.
(Note 3) Only GPS data from "+" formats, for example, "ADS-B+" and "GTX w/TIS+", are accepted when ADS-B TX is not DISABLE.
(Note 4) Labels 310, 311, 312, and 313 are only accepted when ADS-B TX is set to DISABLE (see Section 5.2.17) for software versions 8.04 and later.

Table 5-32 Required BDS Register Equipment Connections

REGISTER NUMBER (HEX)	ASSIGNMENT	REGISTER FIELD	LABEL	PARAMETER DESCRIPTION	PRIORITY	GILLHAM	ARINC 429								RS-232					
							GPS/FMS (Note 4)	ADC (Note 1)	FLIGHT CTRL	AHRS	EFIS (Note 1)	GRMN DISPLAY (Note 2)	GRMN TAS	GRMN 743A	GPS	ICARUS ALT	SHADIN ALT	FADC and ADC (Note 1)	REMOTE (Note 3)	GNS
18	Mode S Specific Services GICB Capability Report	NA	NA	NA	NA		No External Sources													
19	Mode S Specific Services GICB Capability Report	NA	NA	NA	NA		No External Sources													
1D	Mode S Specific Services Protocols (MSP) Capability Report	NA	NA	NA	NA		No External Sources													
20	Aircraft Identification	NA	NA	NA	NA		No External Sources													
40	Selected Vertical Intention	MCP/FCU Selected Altitude	102	MCP/FCU Selected Altitude	1				1		2								3	
		FMS Selected Alitude	102	Selected Altitude	2		1												2	
		Barometric Pressure Setting	235 / 234	Baro Correction (mb) #1	-				2		1								3	
50	Track and Turn Report	Roll Angle	325	Roll Angle	-					1	2								3	
		True Track Angle	-	Track Angle	-		♦ (313)					♦ (313)		♦ (103)	♦				♦	♦
		Ground Speed	-	Ground Speed	-		♦ (312)					♦ (312)		♦ (112)	♦				♦	♦
		Track Angle Rate	335	Track Angle Rate	-														1	
		True Airspeed	210	True Airspeed	-			1			2							3	4	
60	Heading and Speed Report	Magnetic Heading	320	Magnetic Heading	-					1	2	3							4	
		Indicated Airspeed (IAS)	206	Indicated Airspeed	-			1			2							3	4	
		Mach	205	Mach	-			1			2								3	
		Barometric Altitude Rate	212	Altitude Rate, Baro	-			1			2							3	4	
		Inertial Vertical Velocity	365	Inertial Vertical Velocity	-					1										

♦GPS data has no explicit priority and is chosen based off of the HPL for each interface.
(Note 1) EFIS, ADC, and FADC refer to both W/ALT and NO ALT with the exception that pressure altitude is not supported on NO ALT.
(Note 2) Labels 261, 310, 311, 312, and 313 are only accepted when ADS-B TX is set to DISABLE (see Section 5.2.17) for software versions 7.05 and later except 8.01 and 8.02.
(Note 3) Only GPS data from "+" formats, for example, "ADS-B+" and "GTX w/TIS+", are accepted when ADS-B TX is not DISABLE.
(Note 4) Labels 310, 311, 312, and 313 are only accepted when ADS-B TX is set to DISABLE (see Section 5.2.17) for software versions 8.04 and later.

Table 5-32 Required BDS Register Equipment Connections

REGISTER NUMBER (HEX)	ASSIGNMENT	REGISTER FIELD	LABEL	PARAMETER DESCRIPTION	PRIORITY	GILLHAM	ARINC 429								RS-232					
							GPS/FMS (Note 4)	ADC (Note 1)	FLIGHT CTRL	AHRS	EFIS (Note 1)	GRMN DISPLAY (Note 2)	GRMN TAS	GRMN 743A	GPS	ICARUS ALT	SHADIN ALT	FADC and ADC (Note 1)	REMOTE (Note 3)	GNS
62	Target State and Status Information	MCP/FCU Selected Altitude or FMS Selected Altitude	102	MCP/FCU Selected Altitude	1				1		2								3	
		FMS Selected Alitude	102	Selected Altitude	2		1												2	
		Barometric Pressure Setting	235 / 234	Baro Correction (mb) #1	-				2		1								3	
		Navigation Integrity Category_Position (NAC_p)	-	Horizontal Figure of Merit (HFOM)	-									♦ (247)					♦	♦
		TCAS OPERATIONAL	274	From TCAS	-		No External Sources													
65	Aircraft Operational Status Subtype=0	TCAS OPERATIONAL	274	From TCAS	-		No External Sources													
		NIC Supplement-A	-	Horizontal Protection Limit (HPL)	-							♦ (261)		♦ (130)					♦	♦
		NAC_p	-	Horizontal Figure of Merit (HFOM)	-									♦ (247)					♦	♦
		Geometric Vertical Accuracy	-	Vertical Figure of Merit (VFOM	-									♦ (136)					♦	♦
		Heading Reference Direction	320	Magnetic Heading	2					1	2	3							4	
			314	True Heading	1							1								
			-	Track Angle	3		♦ (313)					♦ (313)		♦ (103)	♦				♦	♦

♦GPS data has no explicit priority and is chosen based off of the HPL for each interface.
(Note 1) EFIS, ADC, and FADC refer to both W/ALT and NO ALT with the exception that pressure altitude is not supported on NO ALT.
(Note 2) Labels 261, 310, 311, 312, and 313 are only accepted when ADS-B TX is set to DISABLE (see Section 5.2.17) for software versions 7.05 and later except 8.01 and 8.02.
(Note 3) Only GPS data from "+" formats, for example, "ADS-B+" and "GTX w/TIS+", are accepted when ADS-B TX is not DISABLE.
(Note 4) Labels 310, 311, 312, and 313 are only accepted when ADS-B TX is set to DISABLE (see Section 5.2.17) for software versions 8.04 and later.

APPENDIX A CERTIFICATION DOCUMENTS

A.1 STC Permission

Installers may reference the following STC as evidence of initial airworthiness. Installers are hereby granted permission to refer to this STC. It should be noted, however, this STC is a 'one-only' STC.

United States of America
Department of Transportation -- Federal Aviation Administration

Supplemental Type Certificate

Number SA01125WI

This certificate issued to: Garmin International, Inc.
1200 East 151st Street
Olathe, KS 66062

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 3 *of the* Civil Air *Regulations.*

Original Product - Type Certificate Number: A3SO
Make: Piper
Model: PA-32-260

Description of Type Design Change:
Installation of Garmin GTX 330 Mode S Transponder with Traffic Information System Capability.

Limitations and Conditions: Compatibility of this design change with previously approved modifications must be determined by the installer. If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission.

Descriptive data pertaining to this design change are considered inadequate for duplication of other products. This approval is limited to only the installation made in Piper model PA-32-260, Serial Number 32-7100002. This STC does not permit manufacturing of parts for multiple installations.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: March 11, 2002
Date of issuance: December 12, 2002
Date reissued: November 25, 2003
Date amended: June 20, 2005

By direction of the Administrator

(*Signature*)
Harvey E. Nero
FAA Program Manager
Wichita Aircraft Certification Office

(*Title*)

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

FAA FORM 8110-2(10-68) PAGE 1 of 2 PAGES *This certificate may be transferred in accordance with FAR 21.47.*

A.2 Continued Airworthiness

Other than for regulatory periodic functional checks, maintenance of the GTX 330 is “on condition” only. Refer to the GTX 330 Maintenance Manual (Garmin P/N 190-00207-05). Periodic maintenance of the GTX 330 is not required.

Aviation Authority approved installers are hereby granted permission to reference appropriate service instructions and excerpts from this Installation Manual to accomplish the Instructions for Continued Airworthiness. This permission does not construe suitability of the documents. It is the applicant’s responsibility to determine the suitability of the documents for the ICA.

APPENDIX B CS-ACNS COMPLIANCE MATRIX

The following tables provide the compliance matrix for CS-ACNS for the GTX 330/330D (ES). The GTX 330/330D (ES) meets the requirements for ELS and EHS. The GTX 330/330D w/ES additionally meets the requirements for ADS-B Out.

NOTE

In this appendix, "(ES)" denotes the compliance information applies to both ES enabled units and non-ES enabled units.

Table B-1.GTX 330/330D Elementary Surveillance (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.	See CS ACNS.ELS.015 (b) 1 and 2 regarding the GTX 330/330D (ES).
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 330/330D (ES) units are TSO Class 1 Level 2 transponders with Level C (Major) Failure classification with SI mode capability.
AMC1 ACNS.D.ELS.010 Transponder Characteristics	(b) The transponder(s) of aircraft that have ACAS II installed is (are) ACAS compatible.	The GTX 330/330D (ES) units do not support an interface with an ACAS II system, therefore the Resolution Advisory (BDS 3,0) is transmitted as all zeros.
AMC1 ACNS.D.ELS.010 Transponder Characteristics	(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 330/330D (ES) 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.
AMC1 ACNS.D.ELS.010 Transponder characteristics	(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 (15 000 ft) with a maximum cruising airspeed of 90 m/s (175 knots) or less.	The GTX 330/330D (ES) units are Class 1 transponders meeting the higher requirements identified in ACNS.D.ELS.010.c, when installed according to the installation manual.

Table B-1.GTX 330/330D Elementary Surveillance (ELS)

CS-ACNS Section	CS-ACNS Item Description	Compliance Summary
CS ACNS.D.ELS.015 Data transmission	(a) The surveillance system provides the following data in the Mode S replies: 1. The Mode A Code in the range 0000 to 7777(Octal) 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 (1000 ft) to the maximum certificated altitude of aircraft plus 1500 m (5000 ft) 3. On-the-ground status information 4. The Aircraft Identification as specified in Item 7 of the ICAO flight plan or the aircraft registration 5. Special Position Indication (SPI) 6. Emergency status (Emergency, Radio communication failure, Unlawful interference) 7. The data link capability report 8. The common usage GICB capability report 9. The ICAO 24-bit aircraft address 10. Aircraft that have ACAS II installed provide the ACAS active resolution advisory report	The GTX 330/330D (ES) units provide the following: 1. Mode A code provided in DF=5 and 21 replies. Mode A Code is in the range 0000 to 7777 using either the panel mount push-buttons or an approved control source e.g. GTN 6XX/ 7XX, or GNS 480. 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. CA field in DF=11 or FS field in DF=4, 5, 20, and 21 replies includes airborne state. The GTX 330/330D (ES) 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. 4. The GTX 330/330D (ES) units provide BDS register 20 (Aircraft Identification) configured by the installer, or changed by the flight crew via panel mount push-buttons or an approved control source. 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 an approved control source. 6. Emergency status is reported in DF=5 and 21 replies. 7. BDS register 10 (Data Link Capability Report) is provided. 8. BDS register 17 (Common Usage Ground Initiated Comm-B Capability Report) is provided. 9. ICAO 24-bit aircraft address is provided in DF=11 squitters. 10. Resolution Advisory (BDS 3,0) is transmitted as all zeros, as the GTX 330/330D (ES) units do not support an interface with a ACAS II

Table B-1.GTX 330/330D Elementary Surveillance (ELS)

CS-ACNS Section	CS-ACNS Item Description	Compliance Summary
CS ACNS.D.ELS.015 Data transmission	(b) All other data transmitted is verified. 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. 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. The GTX 330/330D (ES) units transmit the following BDS registers with proper interface: 4,0 (selected vertical intention), 5,0 (Track and Turn report), and 6,0 (heading and speed report). The GTX 330/330D w/ES units transmit additional extended squitter data, and compliance to CS ACNS.D.ADSB is shown below.
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 330/330D (ES) software's air/ground state will be automatically determined based on emitter category, stall speed, remote air/ground state, GPS PVT, airspeed, squat switch, height above terrain, and radio altitude, when possible. The on-the-ground status cannot be set by manual action.
CS ACNS.D.ELS.020 On-the-ground Status determination	(b) If automatically determination of the On-the-ground status is not available, the On-the ground status is set to airborne.	The GTX units will report the airborne state in FS fields 4, 5, 20, 21 and the CA field of DF 11. If the airborne state is unknown, the GTX 330/330D (ES) will report AIRBORNE in the FS field. The CA field of DF 11 will indicate UNKNOWN via code 6 or 7.
CS ACNS.D.ELS.025 Altitude source	(a) The reported pressure altitude is obtained from an approved source.	The Install data provides approved altitude interfaces.
CS ACNS.D.ELS.025 Altitude source	(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.
CS ACNS.D.ELS.025 Altitude source	(c) The altitude source connected to the active transponder is the source being used to fly the aircraft.	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.

Table B-1.GTX 330/330D Elementary Surveillance (ELS)

CS-ACNS Section	CS-ACNS Item Description	Compliance Summary
CS ACNS.D.ELS.030 Flight deck interface	(a) A means is provided: 1. To select Mode A Code, including emergency indicators 2. To initiate the IDENT (SPI) feature 3. For an aircraft identification to be inserted by the flight crew if the aircraft uses variable aircraft identification 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 5. To select the transponder to the 'standby' or 'OFF' condition 6. To indicate the non-operational status or failure of the transponder system without undue delay and without the need for flight crew action 7. To display the selected Mode A code to the flight crew 8. To display the aircraft identification to the flight crew	The GTX 330/330D (ES) units provide the following: Mode A code entry either on the panel or from a remote source e.g. GTN 6XX/7XX or GNS 480. Ident can be activated via a front panel button, discrete input, or compatible control source. Flight ID entry is provided on the GTX 330/330D (ES) front panel or on a compatible control source. The GTX 330/330D (ES) 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. The GTX 330/330D (ES) units are equipped with an OFF and STBY key. Units may be remotely controlled via a serial communications link, which provides a means to place the unit in OFF or STBY. Failure messages are provided to the front panel display or compatible control source. Failure messages are documented in the Maintenance Manual. Mode A codes are provided and entered from the transponder main page on the front panel, or remotely from an approved control source. Flight ID is provided and entered from the transponder main page on Panel mounted units. For remotely controlled units, Flight ID is displayed / entered remotely from the transponder page of the remote control unit.
CS ACNS.D.ELS.030 Flight deck interface	(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 softkey.
CS ACNS.D.ELS.040 Integrity	The Mode S ELS airborne surveillance system integrity is designed commensurate with a 'minor' failure condition.	The GTX 330/330D (ES) 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 330/330D (ES) units have a design assurance level of C for listed functions which meets the allowable qualitative probability of 'remote'. The GTX units have a maximum ELS system failure rate of no less than 5000 hrs 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.

Table B-1.GTX 330/330D Elementary Surveillance (ELS)

CS-ACNS Section	CS-ACNS Item Description	Compliance Summary
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, omnidirectional in the horizontal plane, and has (have) sufficient vertical beam width to ensure proper system operation during normal aircraft maneuver's.	Transponder antenna must be compliant to TSO-C112(), TSO-C66(), or TSO-C74() from the installation data.
CS ACNS.D.ELS.060 Antenna installation	(b) Antenna(s) is/are located such that the effect on the far field radiation pattern(s) by the aircraft structure are minimized.	Antenna installations are not covered in the design/installation data however, minimum installation requirements are provided under the antenna installation guidance in Section 2.4 of the installation manual.
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 330D (ES) are diversity supported transponders. The GTX 330 (ES) transponders are not diversity units and do not meet this requirement.

Table B-2.GTX 330/330D Enhanced Surveillance (EHS)

CS-ACNS Section	CS-ACNS Item 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)
CS ACNS.D.EHS.001 Applicability	(b) This certification specification is applied together with Mode S Elementary Surveillance certification specification defined in Section 2.	The GTX 330/330D (ES) was shown in the GTX 330/330D 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 330/330D (ES) complies with ETSO-C112d requirements for enhanced surveillance. See installation manual Table 1-6 for applicable system software part numbers.
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.: 1. MCP/FCU Selected Altitude 2. Roll Angle 3, True Track Angle 4. Ground Speed 5. Magnetic Heading 6. Indicated Airspeed or Mach No. 7. Vertical rate: Barometric Altitude rate or Inertial vertical velocity. When barometric altitude rate field is provided, it is derived solely from barometric measurement 8. Barometric Pressure Setting in use minus 80 000 Pascal 9. Track Angle Rate or True Airspeed	The GTX 330/330D (ES) was shown in the GTX 330/330D ELS CS-ACNS compliance matrix to be compliant to CS.ACNS.D.ELS. In addition, the GTX provides the following downlink aircraft parameters: 1. Selected Altitude: is transmitted in BDS 4,0 by the GTX 2. Roll Angle: is transmitted in BDS 5,0 by the GTX 3. True Track Angle: is transmitted in BDS 5,0 by the GTX 4. Ground Speed: is transmitted in BDS 5,0 by the GTX 5. Magnetic Heading: is transmitted in BDS 6,0 by the GTX 6. Indicated Airspeed and Mach No: are transmitted in BDS 6,0 by the GTX 7. Vertical Rate: is transmitted in BDS 6,0 by the GTX 8. Barometric Pressure Setting: is transmitted in BDS 4,0 by the GTX 9. Track Angle Rate and True Airspeed: are transmitted in BDS 5,0 by the GTX.
CS ACNS.D.EHS.015 Data transmission	(b) The sensor sources connected to the active transponder are the sensors relevant to the aircraft flight profile.	Guidance is provided in the installation data.
CS ACNS.D.EHS.015 Data transmission	(c) All transmitted parameters are correct and are correctly indicated as available.	Check-out procedures are provided in the installation data. Periodic inspections are also required.
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 330/330D (ES) is designed to meet design assurance level C which exceeds the “minor” failure classification for Mode S EHS.

Table B-2.GTX 330/330D Enhanced Surveillance (EHS)

CS-ACNS Section	CS-ACNS Item Description	Compliance Summary
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 330/330D (ES) units have a design assurance level of C for listed functions which exceeds the required allowable qualitative probability of 'probable'. The GTX units have a maximum EHS system failure rate of no less than 5,000 hrs using the MTBF rates, or 2.0E-04 failure rate.

Table B-3.GTX 330/330D w/ES ADS-B

CS-ACNS Section	CS-ACNS Item Description	Compliance Summary
CS ACNS.D.ADSB.001 Applicability	This section provides standards for 1090 MHz Extended Squitter (ES) ADS-B Out installations	No compliance statement necessary
CS ACNSD..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 transponders 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.

Note 1: Refer to 190-01533-00 for Garmin GPS source documentation and to confirm assumptions.

Table B-3.GTX 330/330D w/ES ADS-B

CS-ACNS Section	CS-ACNS Item Description	Compliance Summary
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 2. Mode A Code 3. ICAO 24-bit aircraft address 4. a. Airborne Horizontal Position — Latitude and Longitude b. Airborne Navigation Integrity Category: NIC c. Airborne/Surface Navigation Accuracy Category for Position: NACp d. Airborne/Surface Source Integrity Level: SIL e. Airborne/Surface System Design Assurance: SDA 5. Pressure Altitude (incl. NICbaro) 6. Special Position Identification (SPI) 7. a. Emergency Status b. Emergency Indication 8. 1090 ES Version Number 9. a. Airborne velocity over Ground — (East/West and North/South) b. Airborne/Surface Navigation Accuracy Category for Velocity: NACv 10. Emitter Category 11. Vertical Rate 12. a. Surface Horizontal Position — Latitude and Longitude b. Surface Navigation Integrity Category: NIC 13. Surface Ground Track 14. Movement (surface ground speed) 15. Length/width of Aircraft 16. GPS Antenna Longitudinal Offset 17. a. Geometric Altitude b. Geometric Altitude Quality: GVA	1. Supported in BDS (0,8) Aircraft Identification and Category, and sourced from the operator via the GTX panel, a compatible control source, or transponder configuration settings. Priority: (1) Flight ID, (2) Aircraft Registration 2. Mode A code is supported in BDS (6,1) and entered from the transponder main page on Panel mounted units. For remotely controlled units, Mode A codes are provided / entered remotely from the transponder page of the remote control unit. 3. All DF=17 squitter transmissions provide the ICAO address. Aircraft address data is sourced from transponder internal configuration settings. 4. a. Supported in BDS (0,5) Airborne Position b. Supported in BDS (0,5) Airborne Position. When the GPS mode is SBAS Nav, the GTX 330/330D w/ES 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. c. Supported in BDS (6,2) Target State and Status and (6,5) Aircraft Operational Status d. Supported in BDS (6,2) Target State and Status and (6,5) Aircraft Operational Status e. Supported in BDS (6,5) Aircraft Operational Status 5. Supported in BDS (0,5) Airborne Position. An encoding altimeter or other altitude source provides this data to the transponder. 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. a. Supported in BDS (6,1) Emergency/Priority Status. b. Data is sourced from current Mode A code status. The Mode A code is entered via transponder code keys or via an approved control source. Codes are displayed either on the panel of the GTX or on the remote unit controlling the GTX 8. Supported in BDS (6,5) Aircraft Operational Status, Bits 41-43 are populated with ‘2’. 9. a. Supported in BDS (0,9) Airborne Velocity Subtype 1 & 2. b. Supported in BDS (0,9) Airborne Velocity Subtype 1 & 2. 10. Supported in BDS (0,8) Extended Squitter Identification and data source from transponder configuration. 11. Supported in BDS (0,9) Airborne Velocity 12. a. Supported in BDS (0,6) Surface Position b. Supported in BDS (0,6) Surface Position and (6,5) Aircraft Operational Status. When the GPS mode is SBAS Nav, the GTX 330/330D w/ES 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. Supported in BDS (0,6) Surface Position 14. Supported in BDS (0,6) Surface Position 15. Supported in BDS (6,5) Aircraft Operational Status Subtype 1 Data source from transponder configuration. 16. Supported in BDS (6,5) Aircraft Operational Status Subtype 1 Data source from transponder configuration. 17. a. Supported in BDS (0,9) Airborne Velocity. b. Supported in BDS (6,5) Aircraft Operational Status Subtype 0.

Note 1: Refer to 190-01533-00 for Garmin GPS source documentation and to confirm assumptions.

Table B-3.GTX 330/330D w/ES ADS-B

CS-ACNS Section	CS-ACNS Item Description	Compliance Summary
CS ACNS.D.ADSB.020 ADS-B Out Data Parameters	Where available in a suitable format, the ADS-B 1. Out system provides the following data parameters: Selected Altitude 2. Barometric Pressure Setting 3. ACAS Resolution Advisory	1. Supported in BDS (6,2) Target State and Status Information. 2. Supported in BDS (6,2) Target State and Status Information. 3. The GTX units do not support ACAS II resolution advisory data.
CS ACNS.D.ADSB.025 Provision of Data	(a) All data provided by the ADS-B Out system comes from approved sources.	The installation data references specific interfacing LRU's which are approved sources for ADS-Out.
CS ACNS.D.ADSB.025 Provision of Data	(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.
CS ACNS.D.ADSB.025 Provision of Data	(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 source is below the allowable tolerance, or a failure of the internal system occurs that will inhibit the transmission of the ADS-B Out data. In addition, other data parameters will only be processed when their associated 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 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 330D w/ES are diversity supported transponders. The GTX 330 w/ES 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 TSOC66( ), 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 Section 2.4 of this 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 units meet the minimum and maximum transmit power level, 125 W (21 dBW) and 500 W (27 dBW), respectively, when installed according to the installation manual.

Note 1: Refer to 190-01533-00 for Garmin GPS source documentation and to confirm assumptions.

Table B-3.GTX 330/330D w/ES ADS-B

CS-ACNS Section	CS-ACNS Item 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 units automatically transition 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.
CS ACNS.D.ADSB.060 On-the-ground status determination	(b) The on-the-ground status is not set by a manual action.	The GTX units automatically transition 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.
CS ACNS.D.ADSB.070 Horizontal Position and Velocity Data Sources	(a) The horizontal position is derived from GNSS data.	Horizontal position data is derived from approved GPS sources.
CS ACNS.D.ADSB.070 Horizontal Position and Velocity Data 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).
CS ACNS.D.ADSB.070 Horizontal Position and Velocity Data Sources	(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 (0,6) when on ground and BDS (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	The data source requirements as defined for in section 2 and 3 of this subpart, are applicable.	Refer to the GTX 330/330D ELS and GTX 330/330D EHS CS-ACNS compliance matrix for Mode S, ELS, and EHS data.
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 330/330D w/ES sources Geometric Altitude from the selected GPS source, which is also the horizontal position and velocity source.
CS ACNS.D.ADSB.085 Geometric Altitude	(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.

Note 1: Refer to 190-01533-00 for Garmin GPS source documentation and to confirm assumptions.

Table B-3.GTX 330/330D w/ES ADS-B

CS-ACNS Section	CS-ACNS Item Description	Compliance Summary
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 330/330D ELS CS-ACNS compliance matrix.
CS ACNS.D.ADSB.090 Flight deck interface	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 fail message is displayed on the GTX panel and connected remote control units, e.g., the GTN or GNS 480, 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: 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. Airborne/Surface Source Integrity Level: SIL 6. Airborne/Surface System Design Assurance: SDA 7. 1090 ES Version Number 8. Airborne velocity over Ground — East/West and North/South 9. Airborne/Surface Navigation Accuracy Category for Velocity: NACv 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	The GTX 330/330D w/ES 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.

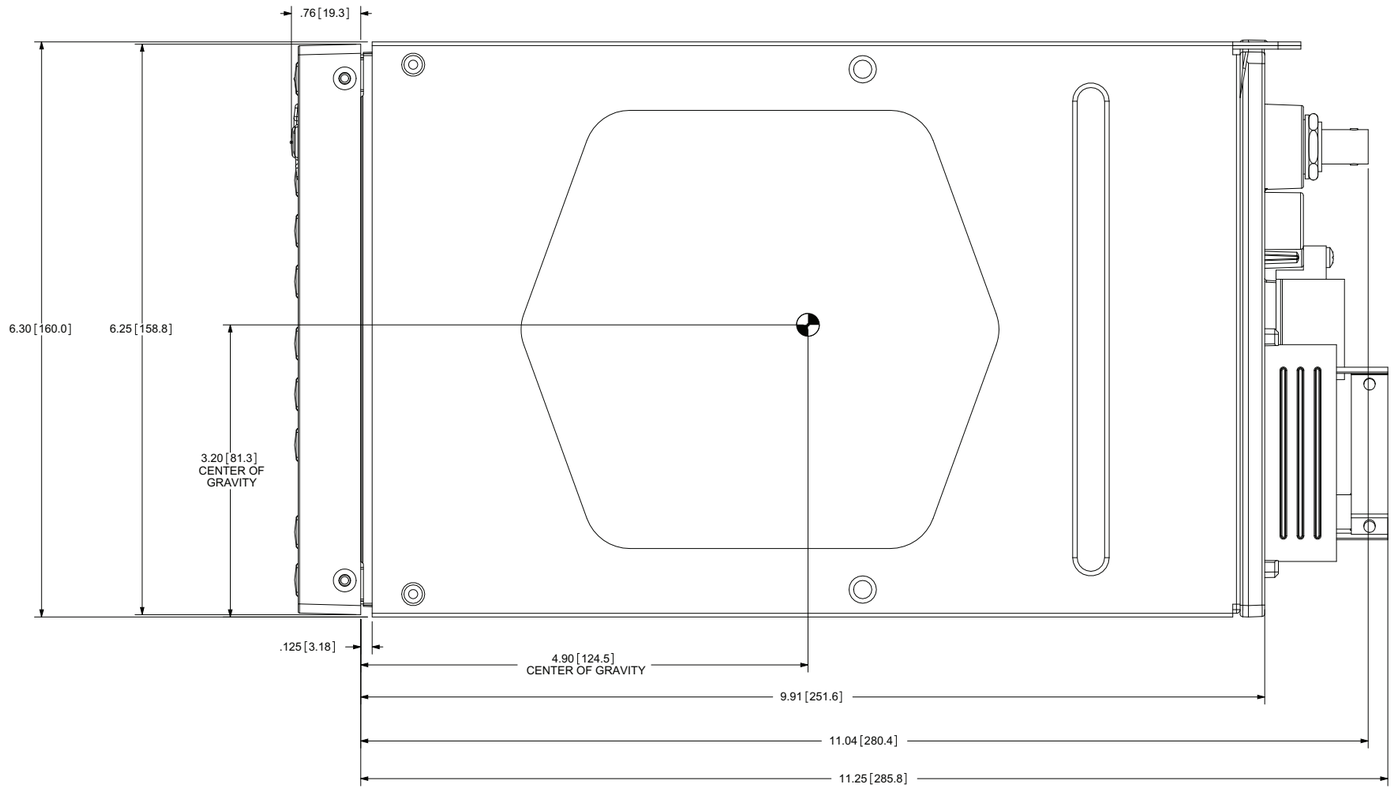
Note 1: Refer to 190-01533-00 for Garmin GPS source documentation and to confirm assumptions.

Table B-3.GTX 330/330D w/ES ADS-B

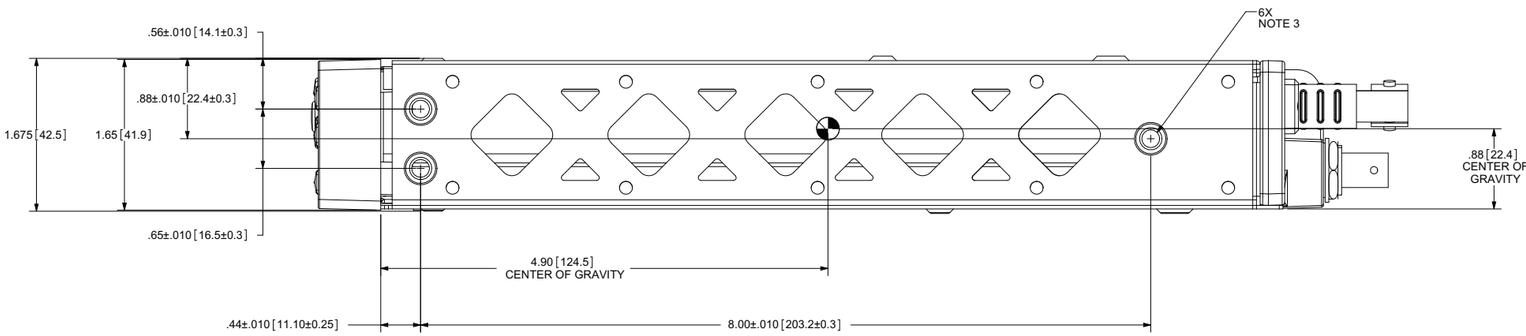
CS-ACNS Section	CS-ACNS Item Description	Compliance Summary
CS ACNS.D.ADSB.100 Integrity	b) The ADS-B Out system integrity is designed commensurate with a ‘minor‘ failure condition for the transmission of other data parameters.	GTX is designed to meet design assurance level C which exceeds the ‘Minor’ Failure classification for TSO-C166b 3.b loss of ADS-B Out transmission as a ‘minor’ failure condition.
CS ACNS.D.ADSB.105 Continuity	The ADS-B Out system continuity is designed to an allowable qualitative probability of ‘remote’.	The GTX units have a design assurance level of C for listed functions, which meets the allowable qualitative probability of 'remote'. 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)
CS ACNS.D.ADSB.115 Horizontal Position and Velocity Total Latency	Measured from the time of applicability within the source, the total latency of the horizontal position and horizontal velocity data introduced by the ADSB Out system does not exceed 1.5 second.	Total latency introduced by an approved GPS source is assumed to be <= 250 ms. See Note 1 for GPS source documentation. 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 330/330D w/ES introduces an additional total latency of <= 600 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 <= 1050 ms.
CS ACNS.D.ADSB.120 Horizontal Position Uncompensated Latency	The uncompensated latency of the horizontal position data introduced by the ADS-B Out System does not exceed 0.6 second.	Uncompensated latency introduced by an approved GPS source is assumed to be <= 250 ms. See Note 1 for GPS source documentation. The GTX 330/330D w/ES introduces an additional uncompensated latency of <= 150 ms to the ADS-B Out system. 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.

Note 1: Refer to 190-01533-00 for Garmin GPS source documentation and to confirm assumptions.

APPENDIX C ASSEMBLY AND INSTALLATION DRAWINGS



NOTES:
1. DIMENSIONS: INCHES [mm]
2. DIMENSIONS ARE SHOWN FOR REFERENCE ONLY.
3. MOUNTING HOLE FOR #6 100° FLATHEAD SCREW.



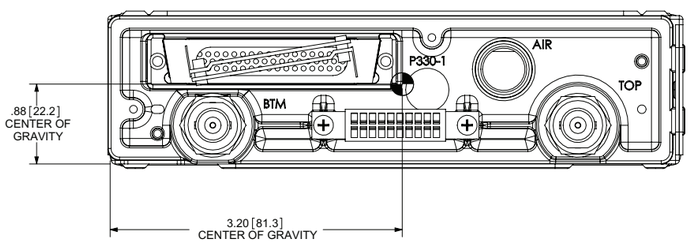


Figure C-1 GTX 330 Outline Drawing

APPENDIX C ASSEMBLY AND INSTALLATION DRAWINGS

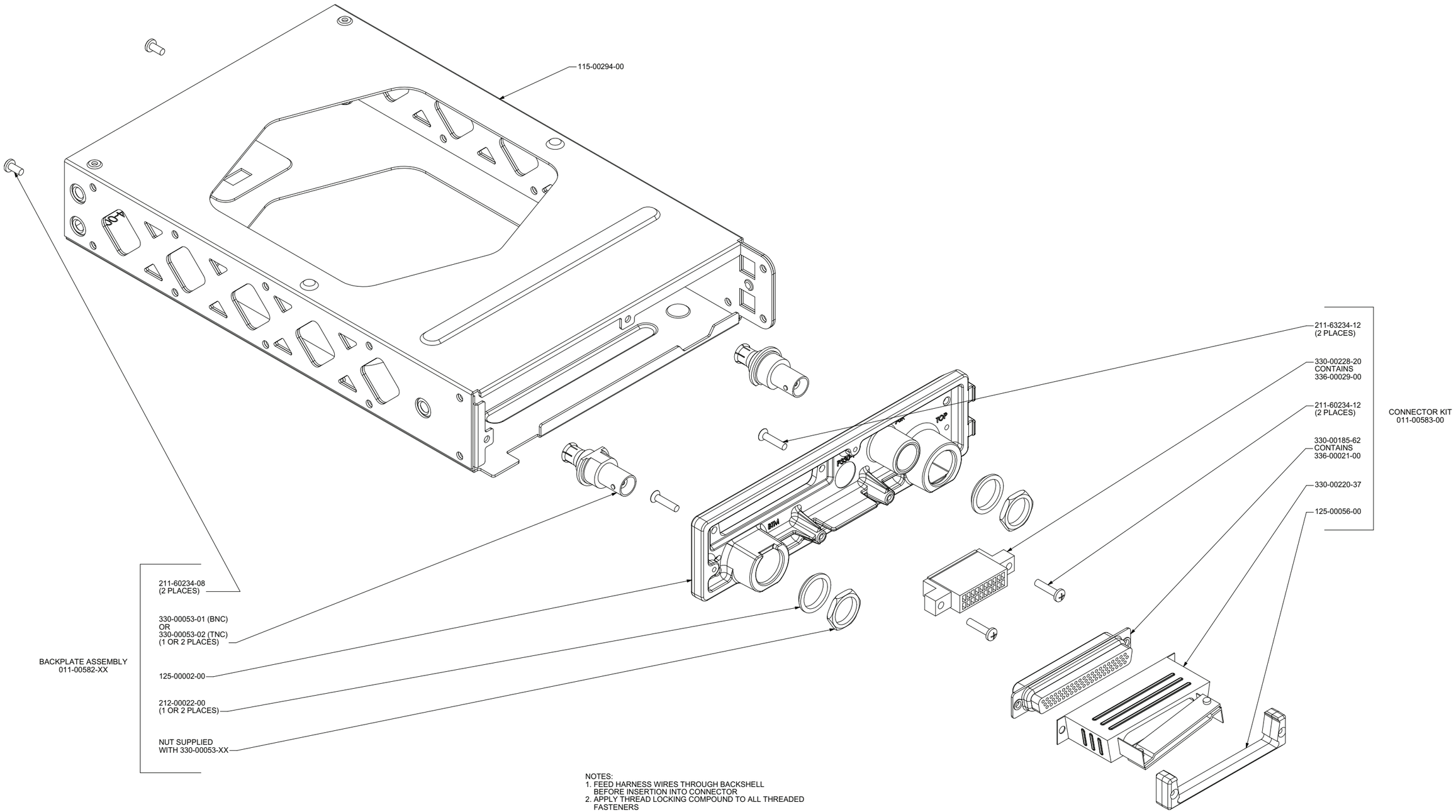
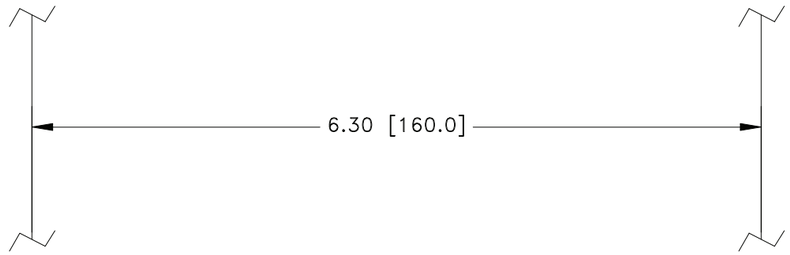


Figure C-2 GTX 330 Connector/Rack Assembly Drawing

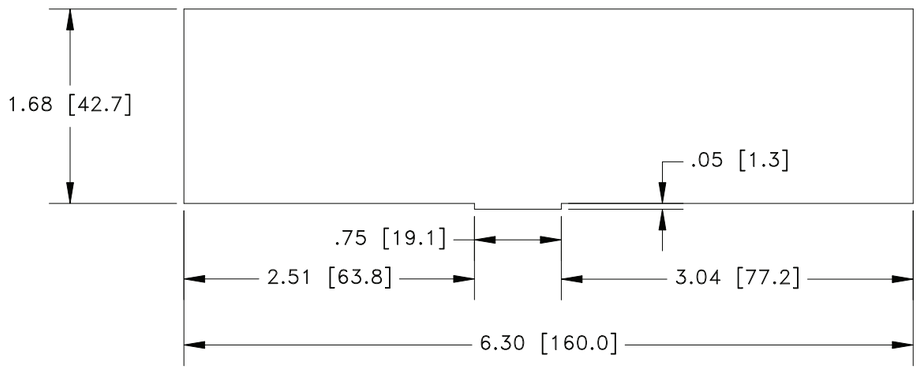
OPTION 1:

STACK CUTOUT (RACK INSTALLED FROM FRONT OF AIRCRAFT PANEL)



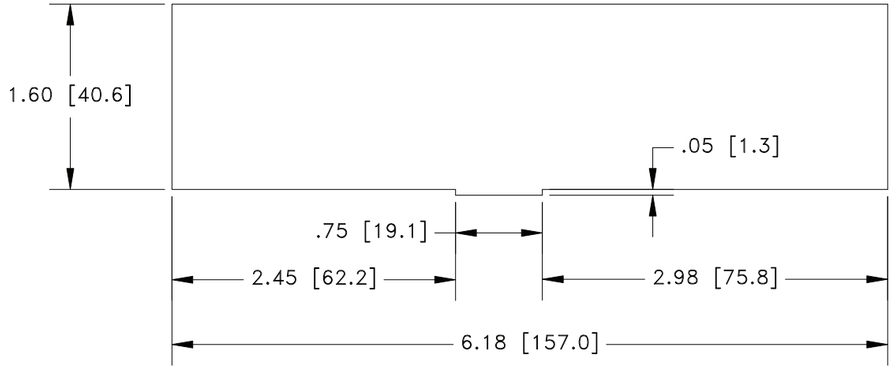
OPTION 2:

RADIO CUTOUT (RACK INSTALLED FROM FRONT OF AIRCRAFT PANEL)



OPTION 3:

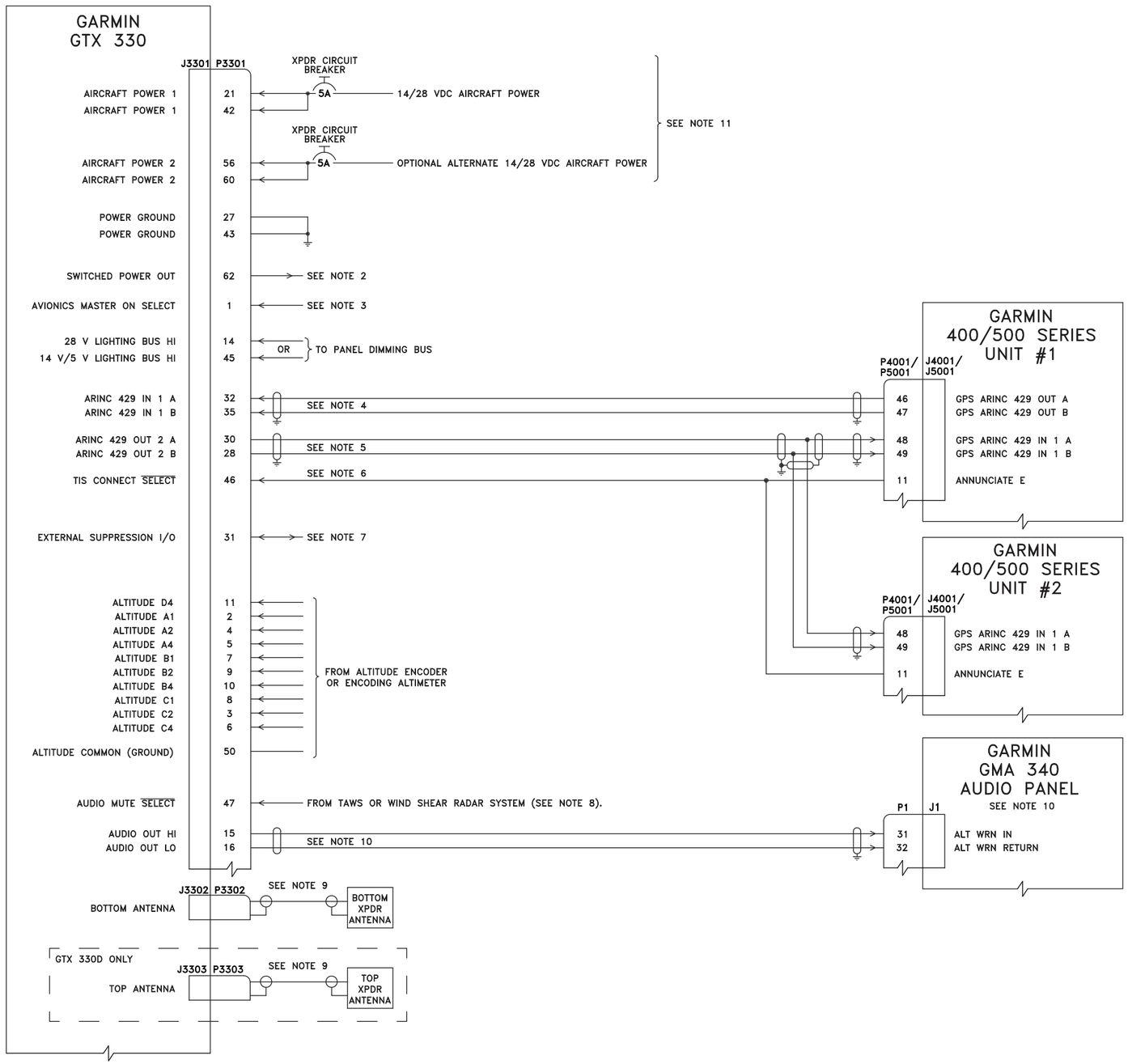
RADIO CUTOUT (RACK INSTALLED FROM BACK OF AIRCRAFT PANEL ONLY)
MAXIMUM AIRCRAFT PANEL THICKNESS IS .125 INCH [3.2 mm]



NOTES:

1. DIMENSIONS: INCH [mm].
2. IF THE FRONT LIP OF THE MOUNTING RACK IS BEHIND THE SURFACE OF THE AIRCRAFT PANEL, THE UNIT CONNECTORS MAY NOT FULLY ENGAGE.

Figure C-3 GTX 330 Recommended Panel Cutout Dimensions

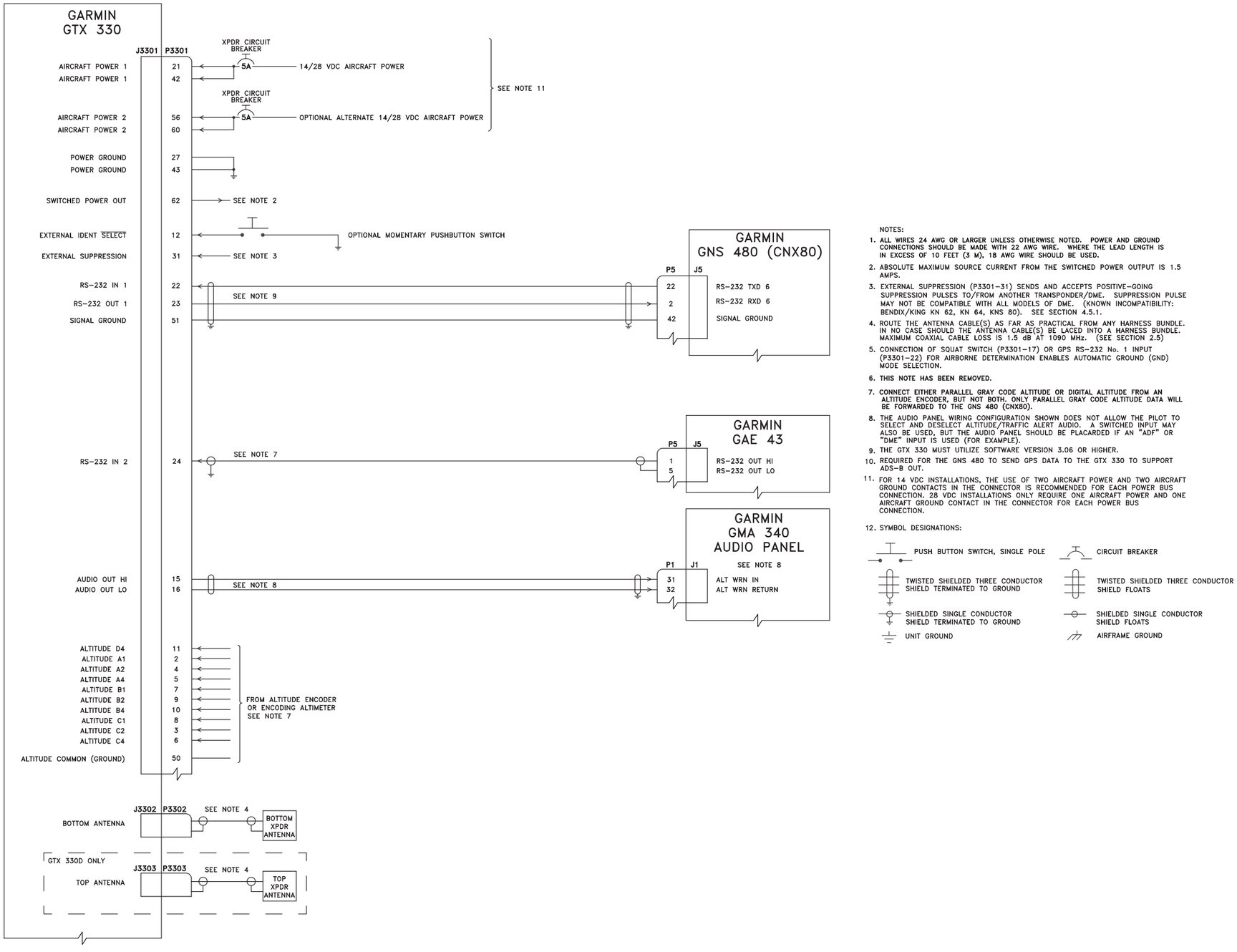


NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED. POWER AND GROUND CONNECTIONS SHOULD BE MADE WITH 22 AWG WIRE. WHERE THE LEAD LENGTH IS IN EXCESS OF 10 FEET (3 M), 18 AWG WIRE SHOULD BE USED.
2. ABSOLUTE MAXIMUM SOURCE CURRENT FROM THE SWITCHED POWER OUTPUT IS 1.5 AMPS.
3. AVIONICS MASTER ON SELECT (P3301–1), WHEN TIED TO AIRCRAFT POWER INPUT (P3301–21 OR –42) PROVIDES AUTOMATIC UNIT POWER UP. WHEN POWER IS APPLIED THE UNIT WILL POWER UP IN THE LAST MODE SELECTED.
4. ARINC 429 IN 1 (P3301–32 AND –35) INPUT ALLOWS AUTOMATED START AND STOP OF FLIGHT TIMER.
5. IF EXTERNAL STBY SELECT IS CONNECTED IN THIS CONFIGURATION, USE AIRINC 429 OUT 1 A AND 1 B, (PINS 37 AND 34) RATHER THAN AIRINC 429 OUT 2 A AND 2 B (PINS 30 AND 28) SHOWN. ALTITUDE DATA WILL NOT BE TRANSMITTED OVER AIRINC 429 PORT 2 TO THE 400/500 SERIES UNIT WHEN EXTERNAL STBY SELECT IS GROUNDED.
6. WHEN TIS IS USED IN THE AIRCRAFT DO NOT CONNECT ANOTHER TRAFFIC SYSTEM TO THE SAME 400/500 SERIES UNIT. REFER TO FIGURE D–8.
7. EXTERNAL SUPPRESSION (P3301–31) SENDS AND ACCEPTS POSITIVE–GOING SUPPRESSION PULSES TO/FROM ANOTHER TRANSPONDER/DME. SUPPRESSION PULSE MAY NOT BE COMPATIBLE WITH ALL MODELS OF DME. (KNOWN INCOMPATIBILITY: BENDIX/KING KN 62, KN 64, KNS 80). SEE SECTION 4.5.1.
8. THE AUDIO MUTE SELECT INPUT (P3301–47) MUTES ALL GTX 330 AUDIO WHEN OTHER SYSTEMS ARE OUTPUTTING HIGHER–PRIORITY AUDIO WARNINGS. REFER TO PARAGRAPH 4.5.2 FOR A DESCRIPTION OF A PILOT CONTROLLED AUDIO MUTE SELECT SWITCH.
9. ROUTE THE ANTENNA CABLE(S) AS FAR AS PRACTICAL FROM ANY HARNESS BUNDLE. IN NO CASE SHOULD THE ANTENNA CABLE(S) BE LACED INTO A HARNESS BUNDLE. MAXIMUM COAXIAL CABLE LOSS IS 1.5 dB AT 1090 MHz. (SEE SECTION 2.5)
10. THE AUDIO PANEL WIRING CONFIGURATION SHOWN DOES NOT ALLOW THE PILOT TO SELECT AND DESELECT ALTITUDE/TRAFFIC ALERT AUDIO. A SWITCHED INPUT MAY ALSO BE USED, BUT THE AUDIO PANEL SHOULD BE PLACARDED IF AN "ADF" OR "DME" INPUT IS USED (FOR EXAMPLE).
11. FOR 14 VDC INSTALLATIONS, THE USE OF TWO AIRCRAFT POWER AND TWO AIRCRAFT GROUND CONTACTS IN THE CONNECTOR IS RECOMMENDED FOR EACH POWER BUS CONNECTION. 28 VDC INSTALLATIONS ONLY REQUIRE ONE AIRCRAFT POWER AND ONE AIRCRAFT GROUND CONTACT IN THE CONNECTOR FOR EACH POWER BUS CONNECTION.

Figure D-1 GTX 330 to 400/500 Series Units, Typical Interconnect Wiring Diagram

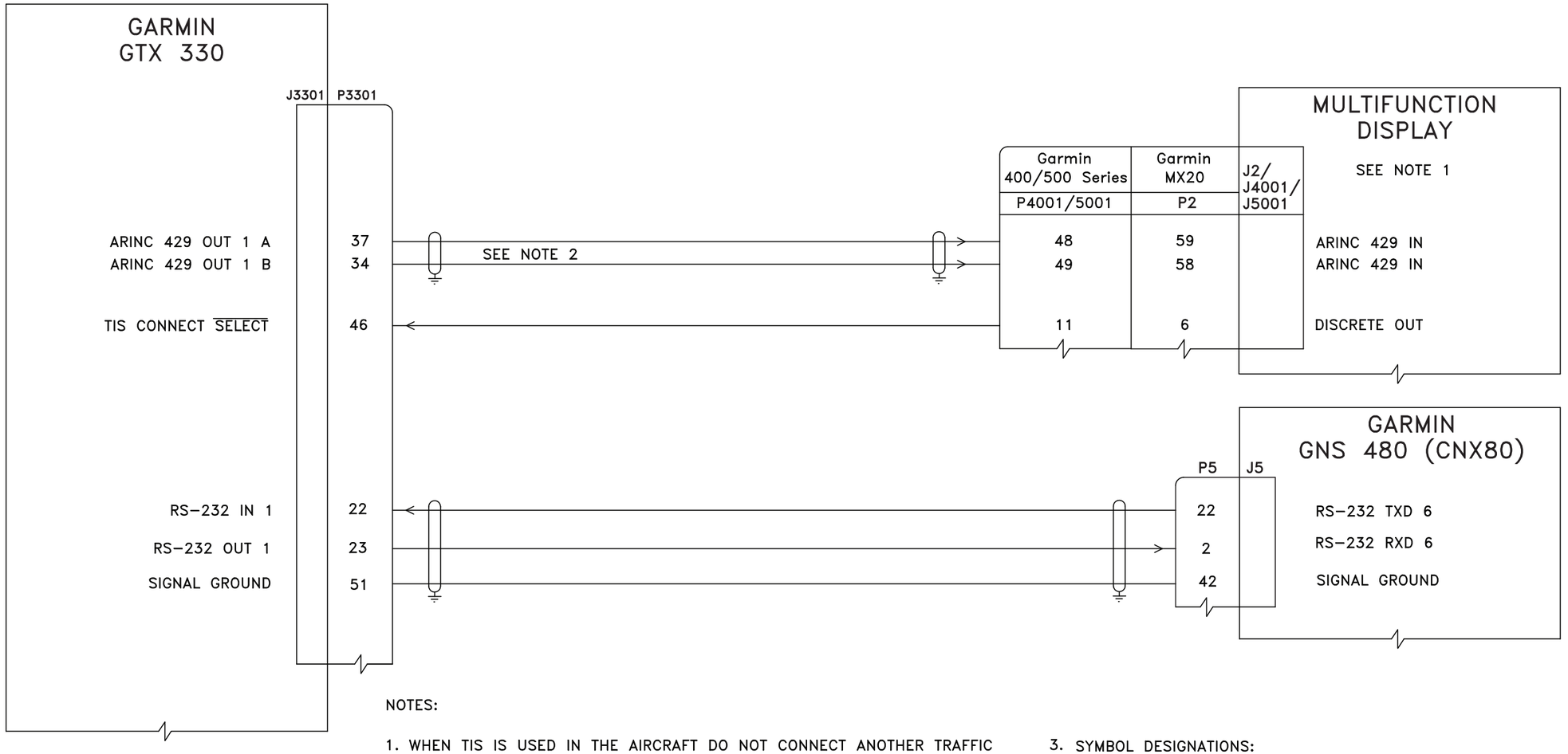
APPENDIX D INTERCONNECT DRAWINGS



NOTES:

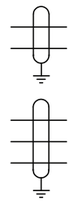
1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED. POWER AND GROUND CONNECTIONS SHOULD BE MADE WITH 22 AWG WIRE. WHERE THE LEAD LENGTH IS IN EXCESS OF 10 FEET (3 M), 18 AWG WIRE SHOULD BE USED.
2. ABSOLUTE MAXIMUM SOURCE CURRENT FROM THE SWITCHED POWER OUTPUT IS 1.5 AMPS.
3. EXTERNAL SUPPRESSION (P3301-31) SENDS AND ACCEPTS POSITIVE-GOING SUPPRESSION PULSES TO/FROM ANOTHER TRANSPONDER/DME. SUPPRESSION PULSE MAY NOT BE COMPATIBLE WITH ALL MODELS OF DME. (KNOWN INCOMPATIBILITY: BENDIX/KING KN 62, KN 64, KNS 80). SEE SECTION 4.5.1.
4. ROUTE THE ANTENNA CABLE(S) AS FAR AS PRACTICAL FROM ANY HARNESS BUNDLE. IN NO CASE SHOULD THE ANTENNA CABLE(S) BE LACED INTO A HARNESS BUNDLE. MAXIMUM COAXIAL CABLE LOSS IS 1.5 dB AT 1090 MHz. (SEE SECTION 2.5)
5. CONNECTION OF SQUAT SWITCH (P3301-17) OR GPS RS-232 No. 1 INPUT (P3301-22) FOR AIRBORNE DETERMINATION ENABLES AUTOMATIC GROUND (GND) MODE SELECTION.
6. THIS NOTE HAS BEEN REMOVED.
7. CONNECT EITHER PARALLEL GRAY CODE ALTITUDE OR DIGITAL ALTITUDE FROM AN ALTITUDE ENCODER, BUT NOT BOTH. ONLY PARALLEL GRAY CODE ALTITUDE DATA WILL BE FORWARDED TO THE GNS 480 (CNX80).
8. THE AUDIO PANEL WIRING CONFIGURATION SHOWN DOES NOT ALLOW THE PILOT TO SELECT AND DESELECT ALTITUDE/TRAFFIC ALERT AUDIO. A SWITCHED INPUT MAY ALSO BE USED, BUT THE AUDIO PANEL SHOULD BE PLACARDED IF AN "ADF" OR "DME" INPUT IS USED (FOR EXAMPLE).
9. THE GTX 330 MUST UTILIZE SOFTWARE VERSION 3.06 OR HIGHER.
10. REQUIRED FOR THE GNS 480 TO SEND GPS DATA TO THE GTX 330 TO SUPPORT ADS-B OUT.
11. FOR 14 VDC INSTALLATIONS, THE USE OF TWO AIRCRAFT POWER AND TWO AIRCRAFT GROUND CONTACTS IN THE CONNECTOR IS RECOMMENDED FOR EACH POWER BUS CONNECTION. 28 VDC INSTALLATIONS ONLY REQUIRE ONE AIRCRAFT POWER AND ONE AIRCRAFT GROUND CONTACT IN THE CONNECTOR FOR EACH POWER BUS CONNECTION.
12. SYMBOL DESIGNATIONS:

Figure D-2 GTX 330 to GNS 480(CNX80), Typical Interconnect Wiring Diagram



NOTES:

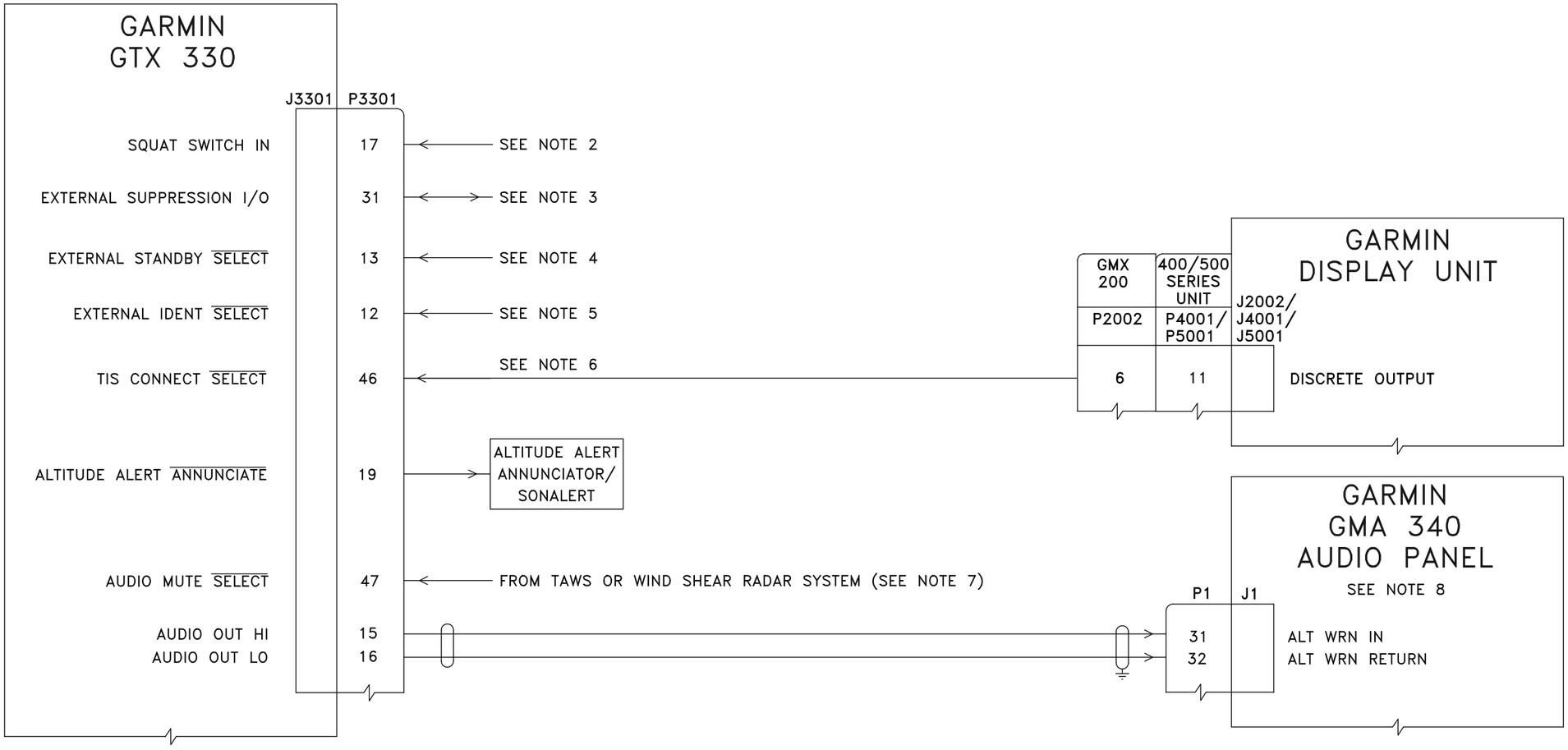
1. WHEN TIS IS USED IN THE AIRCRAFT DO NOT CONNECT ANOTHER TRAFFIC SYSTEM TO THE SAME UNIT.
2. GARMIN AND GARMIN W/TIS FORMATS ARE AVAILABLE ON ARINC 429 PORT 1 IN UNITS WITH SW 3.03 AND ABOVE.
3. SYMBOL DESIGNATIONS:



TWISTED SHIELDED TWO CONDUCTOR SHIELD TERMINATED TO GROUND

TWISTED SHIELDED THREE CONDUCTOR SHIELD TERMINATED TO GROUND

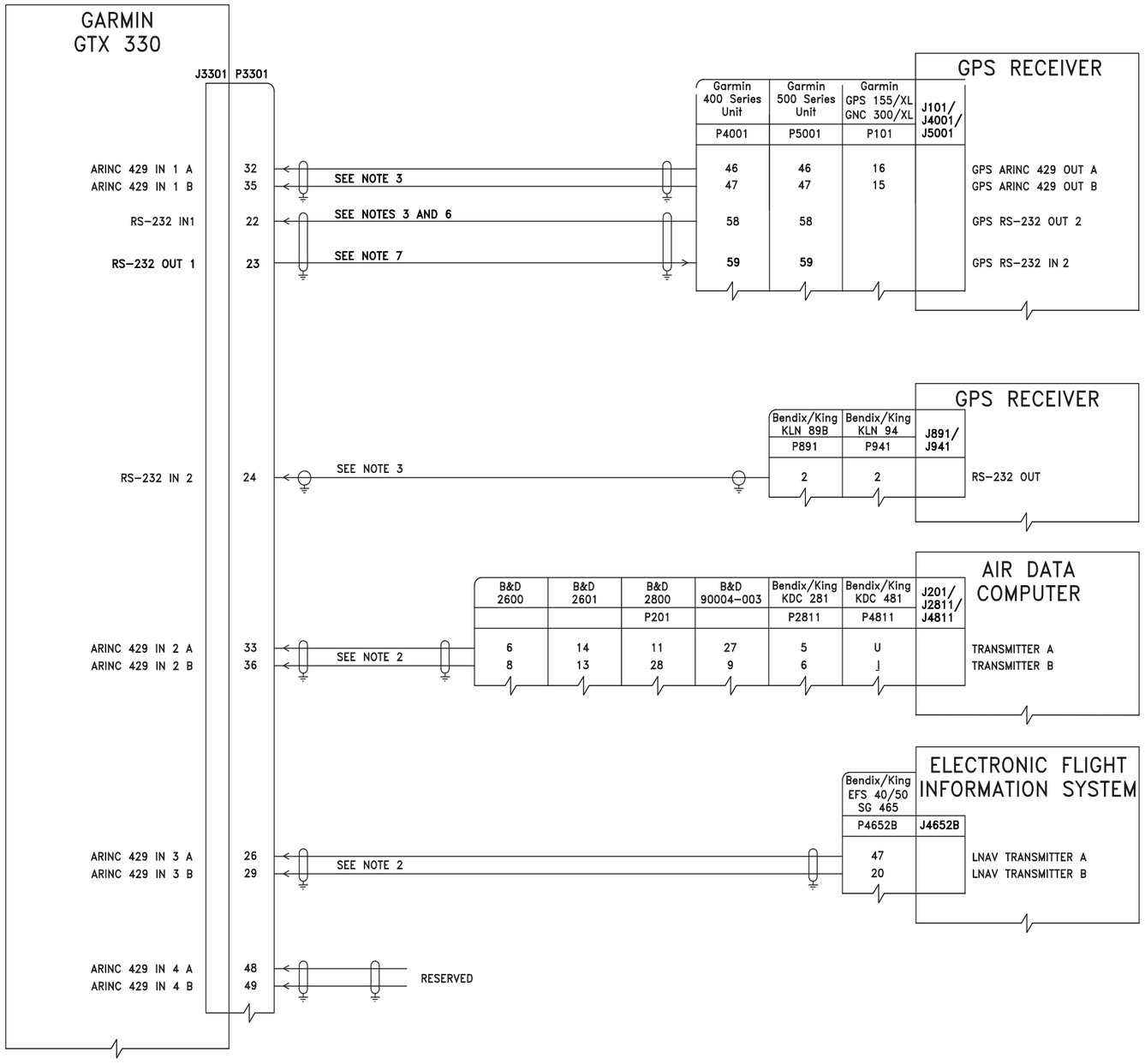
Figure D-3 GTX 330 to GNS 480 (CNX80) and MFD, Simplified Interconnect Wiring Diagram



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. SQUAT SWITCH IN (P3301–17) INPUT ALLOWS AUTOMATED START AND STOP OF FLIGHT TIMER. LOGIC IS SET VIA A CONFIGURATION PAGE.
3. EXTERNAL SUPPRESSION (P3301–31) SENDS AND ACCEPTS POSITIVE–GOING SUPPRESSION PULSES TO/FROM ANOTHER TRANSPONDER/DME. SUPPRESSION PULSE MAY NOT BE COMPATIBLE WITH ALL MODELS OF DME. (KNOWN INCOMPATIBILITY: BENDIX/KING KN 62, KN 64, KNS 80). SEE SECTION 4.5.1.
4. EXTERNAL STANDBY SELECT (P3301–13), WHEN TIED TO GROUND, WILL PLACE THAT UNIT IN STANDBY MODE. TYPICALLY USED IN DUAL INSTALLATIONS.
5. MOMENTARY CONNECTION OF EXTERNAL IDENT SELECT (P3301–12) TO GROUND WILL CAUSE THE GTX 330 TO TRANSMIT IDENT PULSES.
6. WHEN TIS IS USED IN THE AIRCRAFT DO NOT CONNECT ANOTHER TRAFFIC SYSTEM TO THE SAME 400/500 SERIES UNIT. REFER TO FIGURE D–8.
7. THE AUDIO MUTE SELECT INPUT (P3301–47) MUTES ALL GTX 330 AUDIO WHEN OTHER SYSTEMS ARE OUTPUTTING HIGHER–PRIORITY AUDIO WARNINGS. REFER TO PARAGRAPH 4.5.2 FOR A DESCRIPTION OF A PILOT CONTROLLED AUDIO MUTE SELECT SWITCH.
8. THE AUDIO PANEL WIRING CONFIGURATION SHOWN DOES NOT ALLOW THE PILOT TO SELECT AND DESELECT ALTITUDE/TRAFFIC ALERT AUDIO. A SWITCHED INPUT MAY ALSO BE USED, BUT THE AUDIO PANEL SHOULD BE PLACARDED IF AN "ADF" OR "DME" INPUT IS USED.

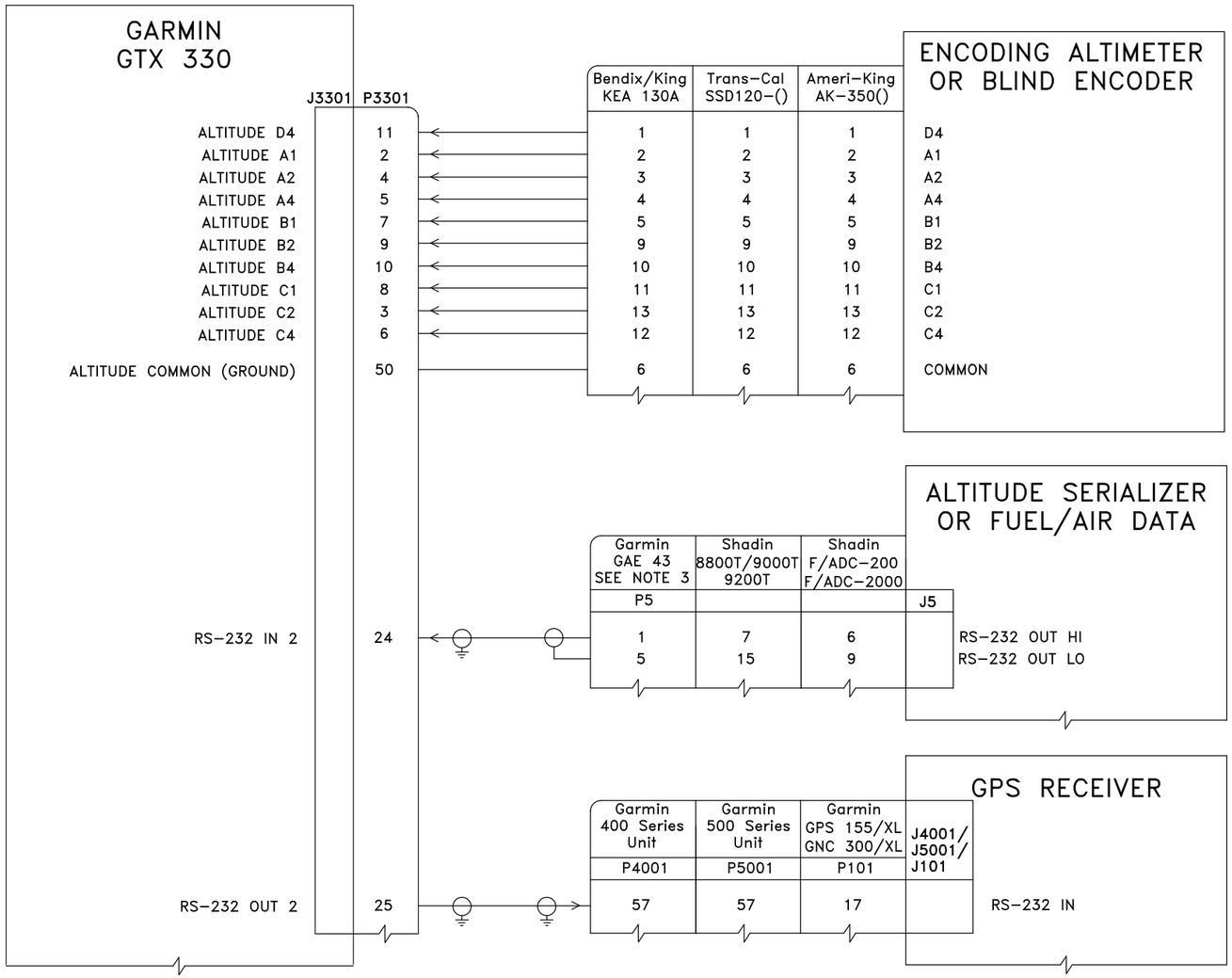
Figure D-4 GTX 330 Interconnect Wiring Diagram, Discrete and Audio Connections



NOTES:

1. ALL WIRE 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. THE "GARMIN" FORMAT ON ARINC 429 OUT 2 IS A DATA CONCENTRATOR OUTPUT THAT COMBINES DATA FROM GTX 330 DATA INPUTS. THE "GARMIN W/TIS" FORMAT ADDS TIS TRAFFIC DATA ON THE SAME HIGH-SPEED ARINC 429 BUS. WHEN TIS IS USED IN THE AIRCRAFT, DO NOT CONNECT ANOTHER TRAFFIC SYSTEM TO THE SAME 400/500 SERIES UNIT. REFER TO FIGURE D-8.
3. ARINC 429 IN 1 (P3301-32 AND -35), RS-232 IN 1 (P3301-22), OR RS-232 IN 2 (P3301-24) INPUT ALLOWS AUTOMATED START AND STOP OF FLIGHT TIMER.
4. LOWER CASE PIN DESIGNATORS ARE SHOWN AS UNDERLINED UPPER CASE LETTERS.
5. REFER TO MANUFACTURERS' DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION. PINOUTS OF OTHER UNITS SHOWN FOR REFERENCE ONLY.
6. RS-232 IN 1 (P3301-22) INPUT FROM A GARMIN 400W OR 500W SERIES UNIT (W/MAIN SOFTWARE VERSION 5.03 OR LATER) ALLOWS FOR CONFIGURATION OF "REMOTE" (GTX) AND "ADS-B OUT+" (400W/500W SERIES) TO PROVIDE ADS-B POSITION DATA.
7. RS-232 IN/OUT 1 (P3301-22 AND -23) TO A GARMIN 400W OR 500W SERIES UNIT (W/MAIN SOFTWARE VERSION 5.30 OR LATER AND A VALID TERRAIN DATABASE) ALLOWS FOR CONFIGURATION OF "GNS" (GTX) AND "ADSB TFC" (400W/500W SERIES) TO PROVIDE ADS-B POSITION DATA WITH HEIGHT ABOVE TERRAIN DATA TO ENHANCE AUTOMATIC AIRORNE DETERMINATION.

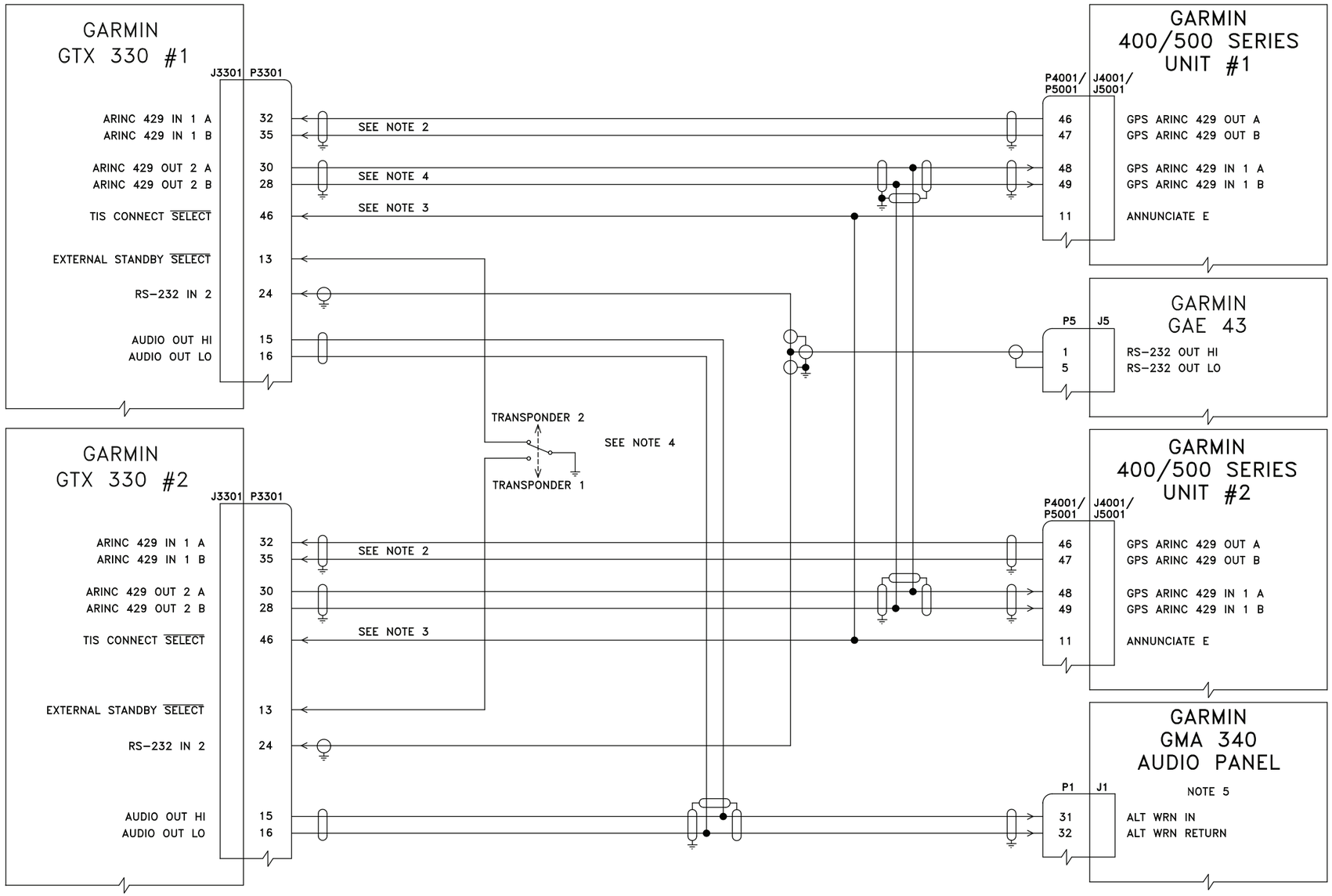
Figure D-5 GTX 330 Interconnect Wiring Diagram, Serial Devices Connections



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. ALTITUDE DATA MAY BE SUPPLIED BY PARALLEL OR SERIAL SOURCE. SOURCE USED IS SELECTED VIA A CONFIGURATION PAGE. ALTITUDE DATA SUPPLIED TO THE GTX 330 CAN ALSO BE OUTPUT TO ANOTHER UNIT VIA RS-232.
3. THE GAE 43 CAN ALSO PROVIDE ALTITUDE DATA IN THE FORM OF PARALLEL GRAY CODE.
4. REFER TO MANUFACTURERS' DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION. PINOUTS OF OTHER UNITS SHOWN FOR REFERENCE ONLY.
5. IF ARINC 429 IS CONECTED, THE GTX 330 WILL IGNORE RS-232 INPUT FROM THE GPS RECEIVER AND RS-232 ALTITUDE INPUT.

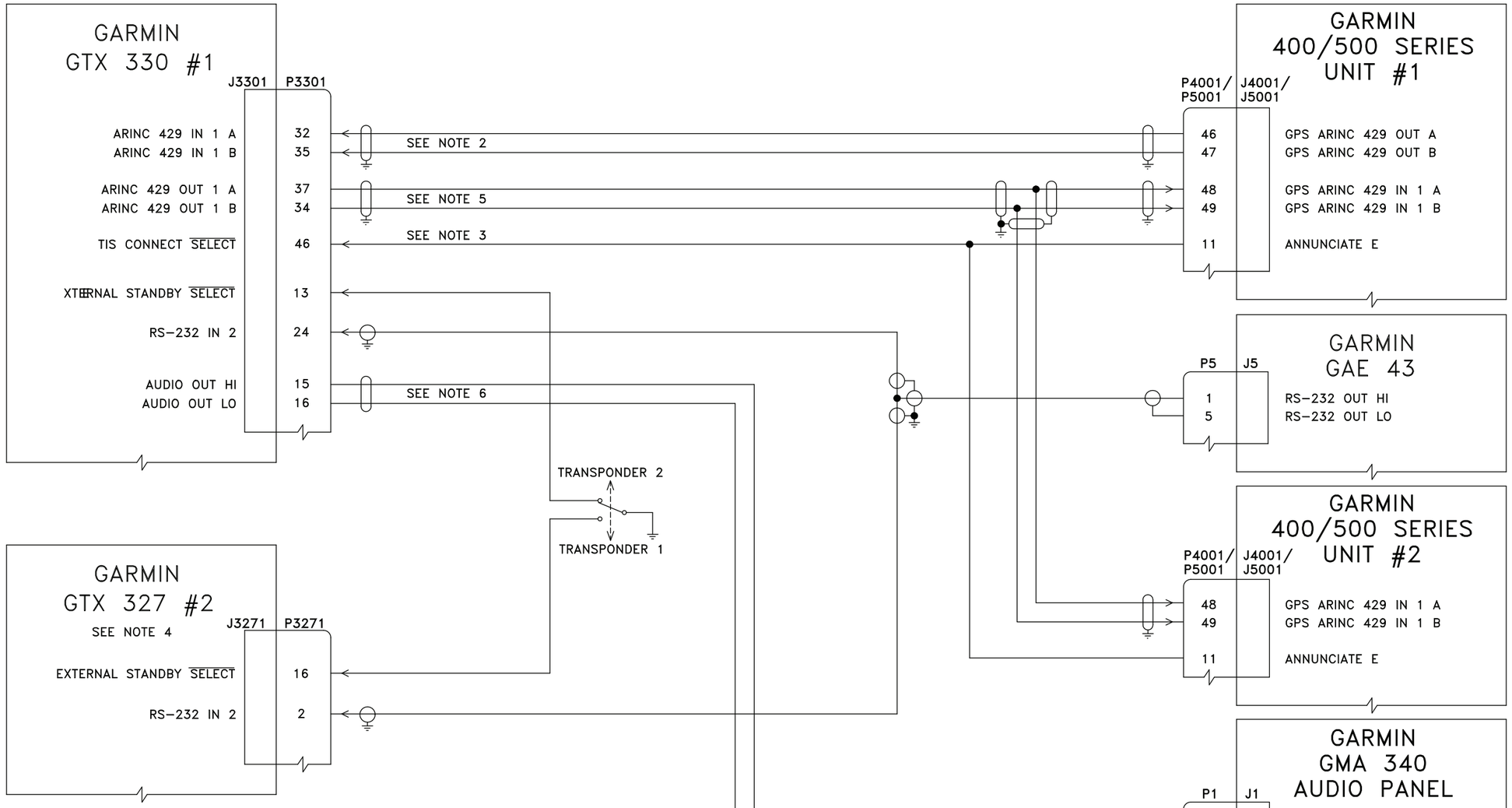
Figure D-6 GTX 330 Interconnect Wiring Diagram and Altitude Connections



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. ARINC 429 IN 1 (P3301-32 AND -35) INPUT ALLOWS AUTOMATED START AND STOP OF FLIGHT TIMER.
3. WHEN TIS IS USED IN THE AIRCRAFT DO NOT CONNECT ANOTHER TRAFFIC SYSTEM TO THE SAME 400/500 SERIES UNIT. REFER TO FIGURE D-8.
4. THE GTX 330 ARINC 429 OUT 2 PORT IS HIGH-IMPEDANCE WHEN THE EXTERNAL STANDBY SELECT INPUT IS GROUNDED. THIS ALLOWS ARINC 429 OUTPUTS FROM DUAL GTX 330 UNITS TO BE HARD-WIRED TOGETHER SINCE THE EXTERNAL STANDBY SELECT INPUT WILL BE ACTIVE FOR ONE OF THE TWO GTX 330'S AT ANY GIVEN TIME.
5. THE AUDIO PANEL WIRING CONFIGURATION SHOWN DOES NOT ALLOW THE PILOT TO SELECT AND DESELECT ALTITUDE/TRAFFIC ALERT AUDIO. A SWITCHED INPUT MAY ALSO BE USED, BUT THE AUDIO PANEL SHOULD BE PLACARDED IF AN "ADF" OR "DME" INPUT IS USED (FOR EXAMPLE).

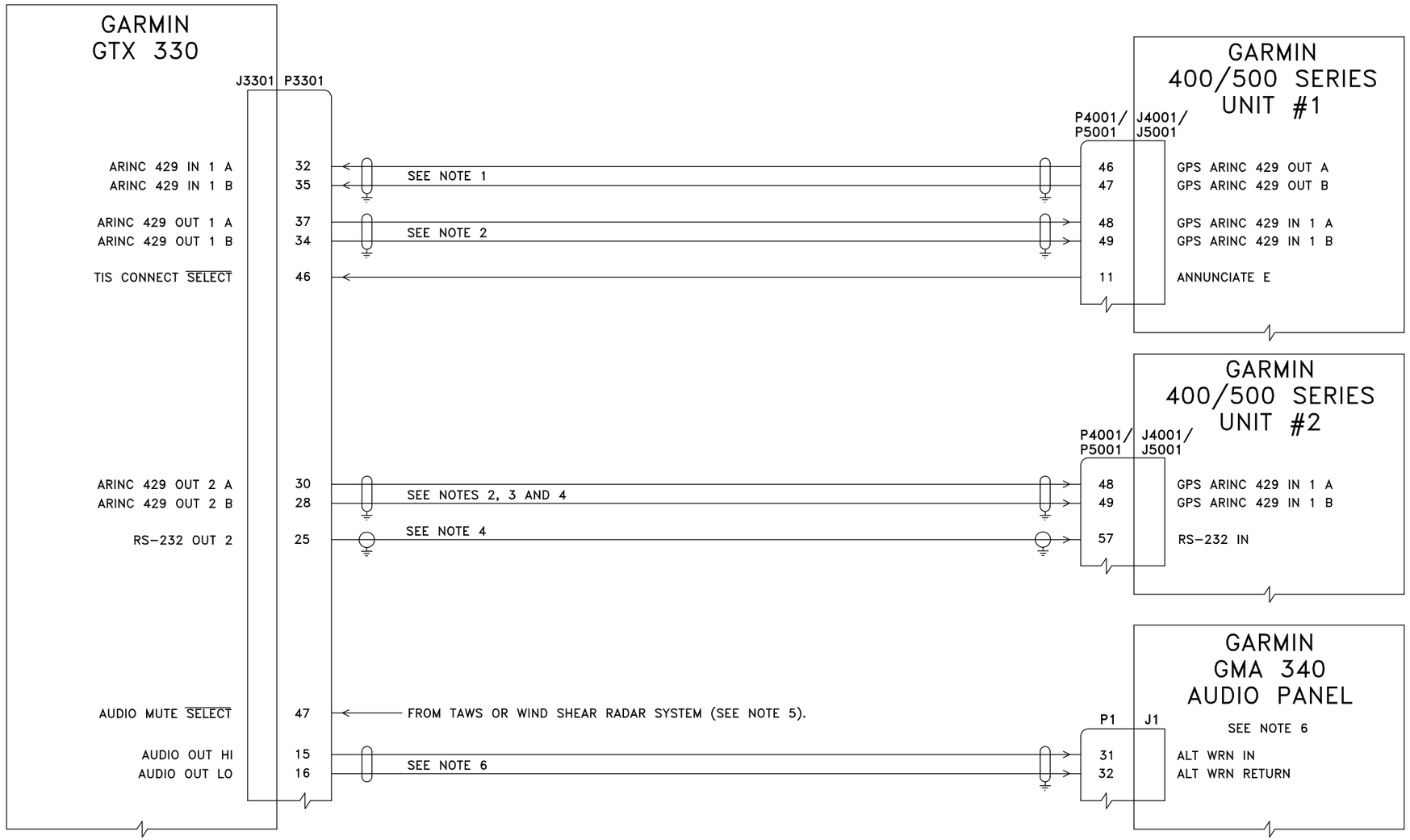
Figure D-7 Dual Transponder Interconnect Wiring Diagram, Dual Display Connections (Sheet 1 of 2)



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. ARINC 429 IN 1 (P3301-32 AND -35) INPUT ALLOWS AUTOMATED START AND STOP OF FLIGHT TIMER.
3. WHEN TIS IS USED IN THE AIRCRAFT DO NOT CONNECT ANOTHER TRAFFIC SYSTEM TO THE SAME 400/500 SERIES UNIT. REFER TO FIGURE D-8.
4. FOR THE REMAINDER OF GTX 327 CONNECTIONS REFER TO GTX 327 TRANSPONDER INSTALLATION MANUAL, P/N 190-00187-02.
5. GARMIN AND GARMIN W/TIS FORMATS ARE AVAILABLE ON ARINC 429 PORT 1 IN UNITS WITH SW 3.03 AND ABOVE. UNLIKE PORT 2, ARINC 429 OUT PORT 1 REMAINS ACTIVE WHEN EXTERNAL STANDBY SELECT IS GROUNDED.
6. THE AUDIO PANEL WIRING CONFIGURATION SHOWN DOES NOT ALLOW THE PILOT TO SELECT AND DESELECT ALTITUDE/TRAFFIC ALERT AUDIO. A SWITCHED INPUT MAY ALSO BE USED, BUT THE AUDIO PANEL SHOULD BE PLACARDED IF AN "ADF" OR "DME" INPUT IS USED (FOR EXAMPLE).

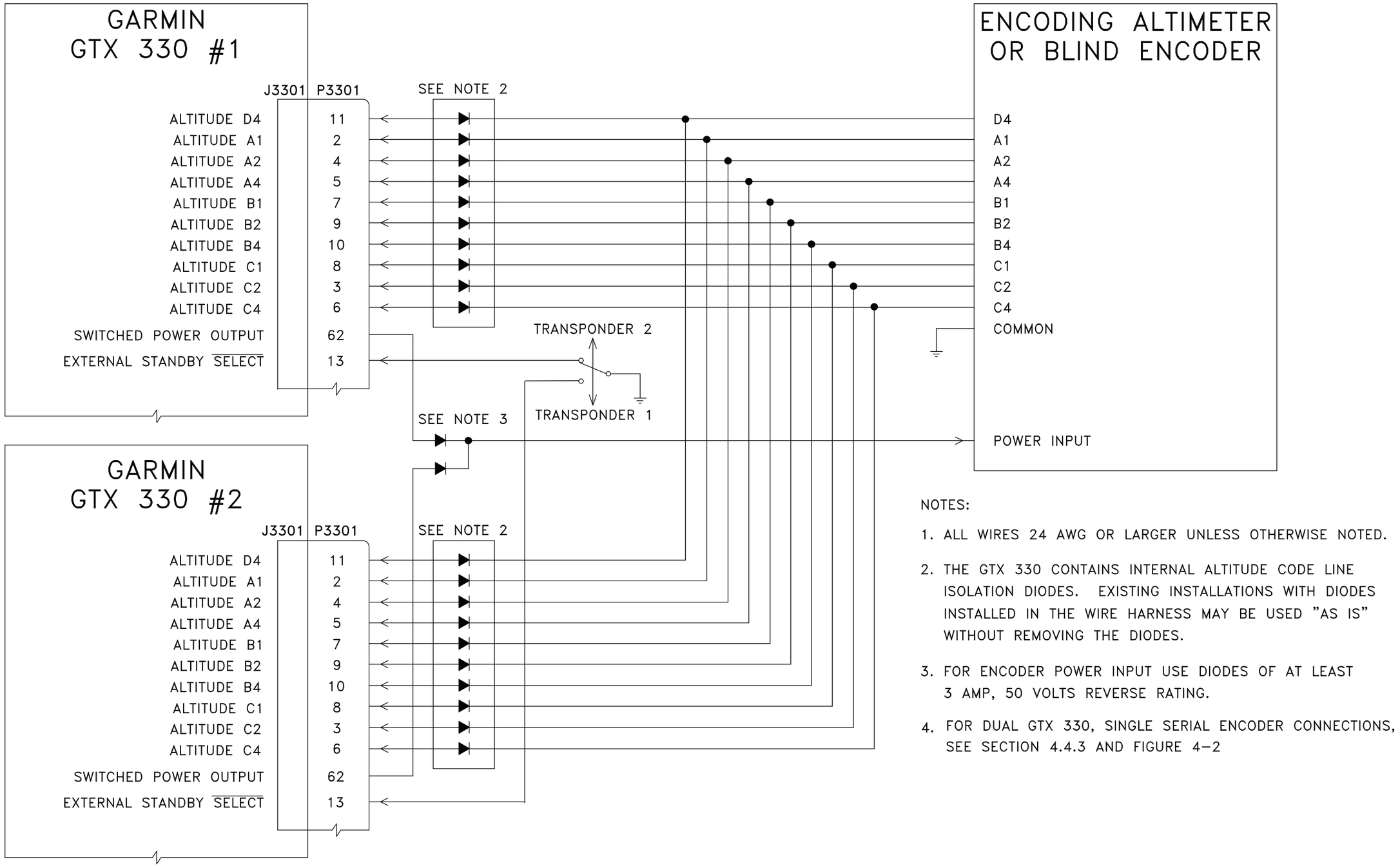
Figure D-7 Dual Transponder Interconnect Wiring Diagram, Dual Display Connections (Sheet 2 of 2)



NOTES:

1. ARINC 429 IN 1 (P3301-32 AND -35) INPUT ALLOWS AUTOMATED START AND STOP OF FLIGHT TIMER.
2. WHEN TIS IS INSTALLED IN THE AIRCRAFT TIS MAY TRANSMIT DATA ON ARINC 429 OUTPUT 1 WHILE OTHER DATA MAY BE TRANSMITTED VIA ARINC 429 OUTPUT 2. THE OTHER TRAFFIC SYSTEM CAN THEN BE CONNECTED TO THE SECOND 400/500 SERIES UNIT. SEE SECTIONS 4 AND 5 FOR CONFIGURATION.
3. IN DUAL TRANSPONDER INSTALLATIONS, WHEN THE PRIMARY GTX 330 IS IN REMOTE STANDBY, ALTITUDE DATA IS NOT TRANSMITTED OVER ARINC 429 OUTPUT 2 LINES. IN ORDER TO PROVIDE ALTITUDE TO THE OTHER GPS UNIT CONTINUOUSLY, CONNECT THE RS-232 OUTPUT TO THE SECOND 400/500 SERIES UNIT (THE ONE NOT USED FOR TIS).
4. USE ARINC 429 ONLY IF SINGLE INSTALLATION (NO REMOTE STBY). USE RS-232 IF DUAL TRANSPONDER INSTALLATION USING REMOTE STBY.
5. THE AUDIO MUTE SELECT INPUT (P3301-47) MUTES ALL GTX 330 AUDIO WHEN OTHER SYSTEMS ARE OUTPUTTING HIGHER-PRIORITY AUDIO WARNINGS. REFER TO PARAGRAPH 4.5.2 FOR A DESCRIPTION OF A PILOT CONTROLLED AUDIO MUTE SELECT SWITCH.
6. THE AUDIO PANEL WIRING CONFIGURATION SHOWN DOES NOT ALLOW THE PILOT TO SELECT AND DESELECT ALTITUDE/TRAFFIC ALERT AUDIO. A SWITCHED INPUT MAY ALSO BE USED, BUT THE AUDIO PANEL SHOULD BE PLACARDED IF AN "ADF" OR "DME" INPUT IS USED (FOR EXAMPLE).

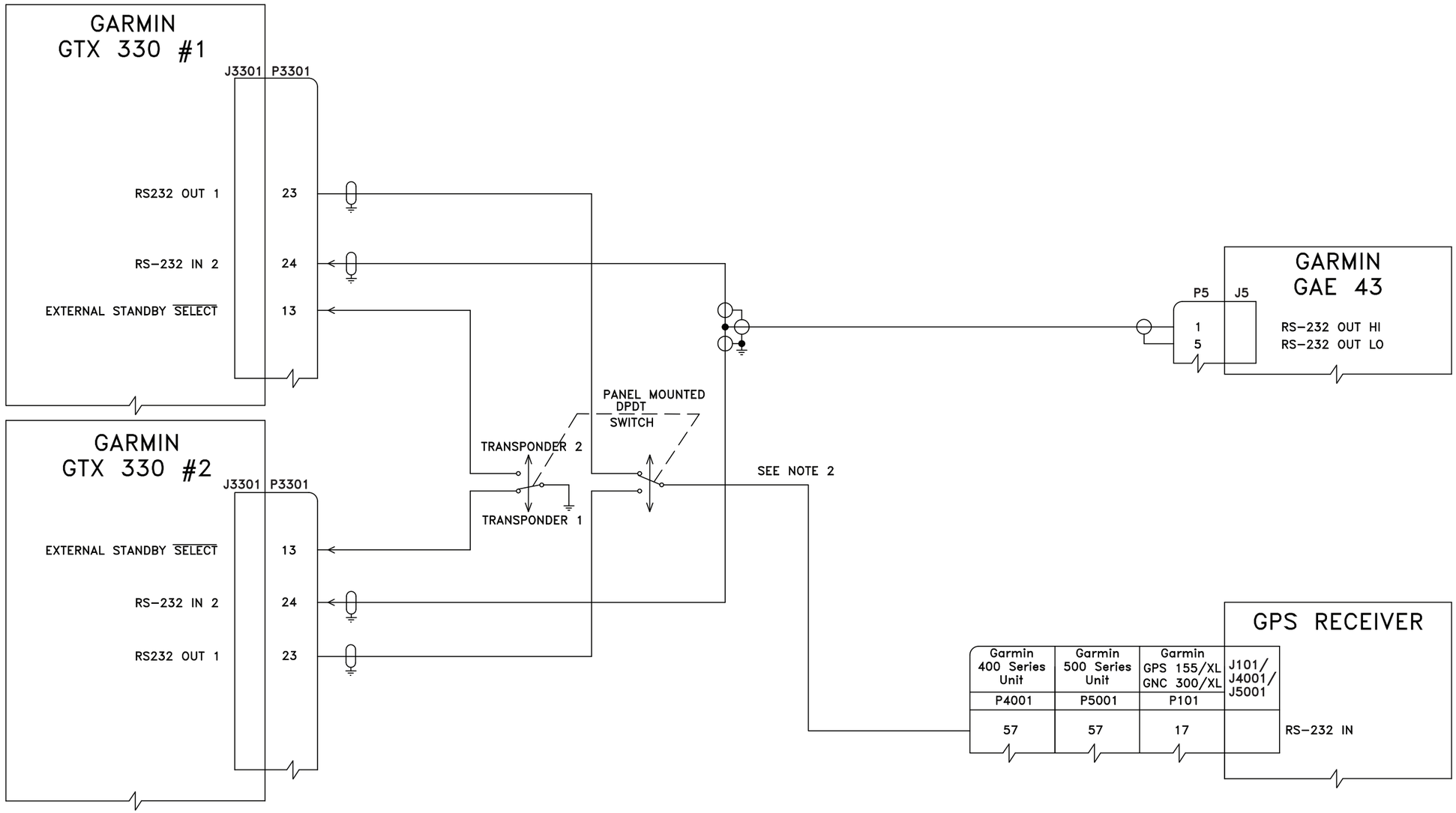
Figure D-8 GTX 330 Interconnect Wiring Diagram, Aircraft with TIS and TCAD/TCAS



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. THE GTX 330 CONTAINS INTERNAL ALTITUDE CODE LINE ISOLATION DIODES. EXISTING INSTALLATIONS WITH DIODES INSTALLED IN THE WIRE HARNESS MAY BE USED "AS IS" WITHOUT REMOVING THE DIODES.
3. FOR ENCODER POWER INPUT USE DIODES OF AT LEAST 3 AMP, 50 VOLTS REVERSE RATING.
4. FOR DUAL GTX 330, SINGLE SERIAL ENCODER CONNECTIONS, SEE SECTION 4.4.3 AND FIGURE 4-2

Figure D-9 Dual TXP Interconnect Wiring Diagram, Encoding Altitude Connections (Sheet 1 of 4)



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. THE GPS CAN ONLY RECEIVE SERIAL DATA FROM ONE UNIT AT A TIME.

3. SYMBOL DESIGNATIONS

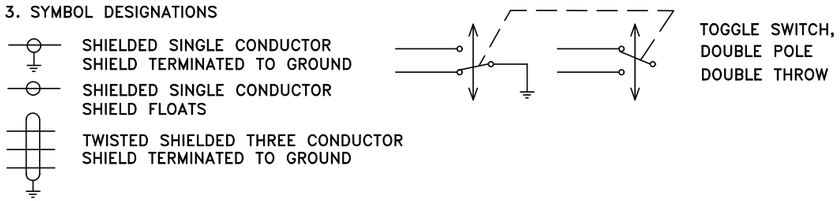


Figure D-9 Dual TXP Interconnect Wiring Diagram, Encoding Altitude Connections (Sheet 2 of 4)

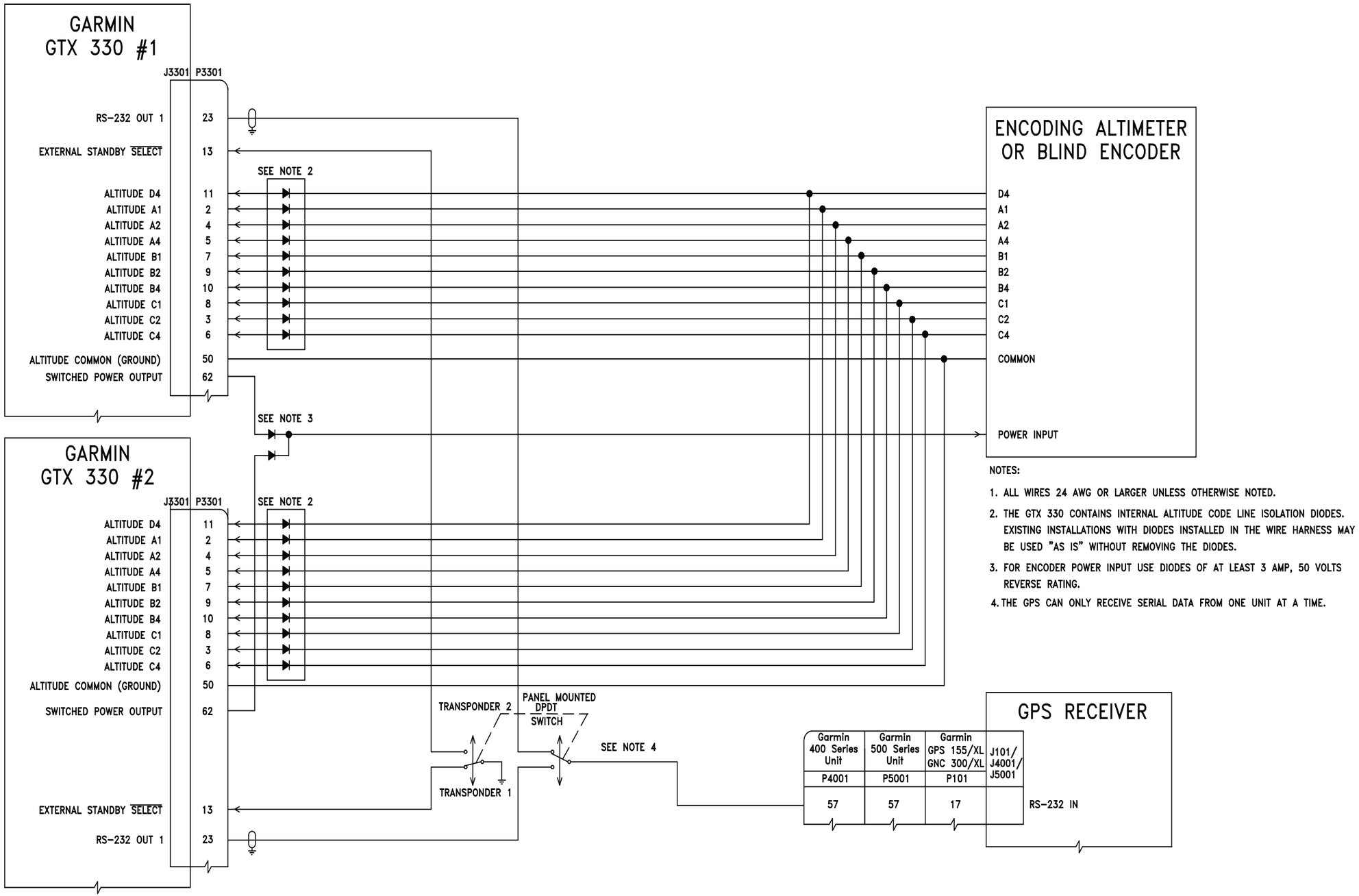
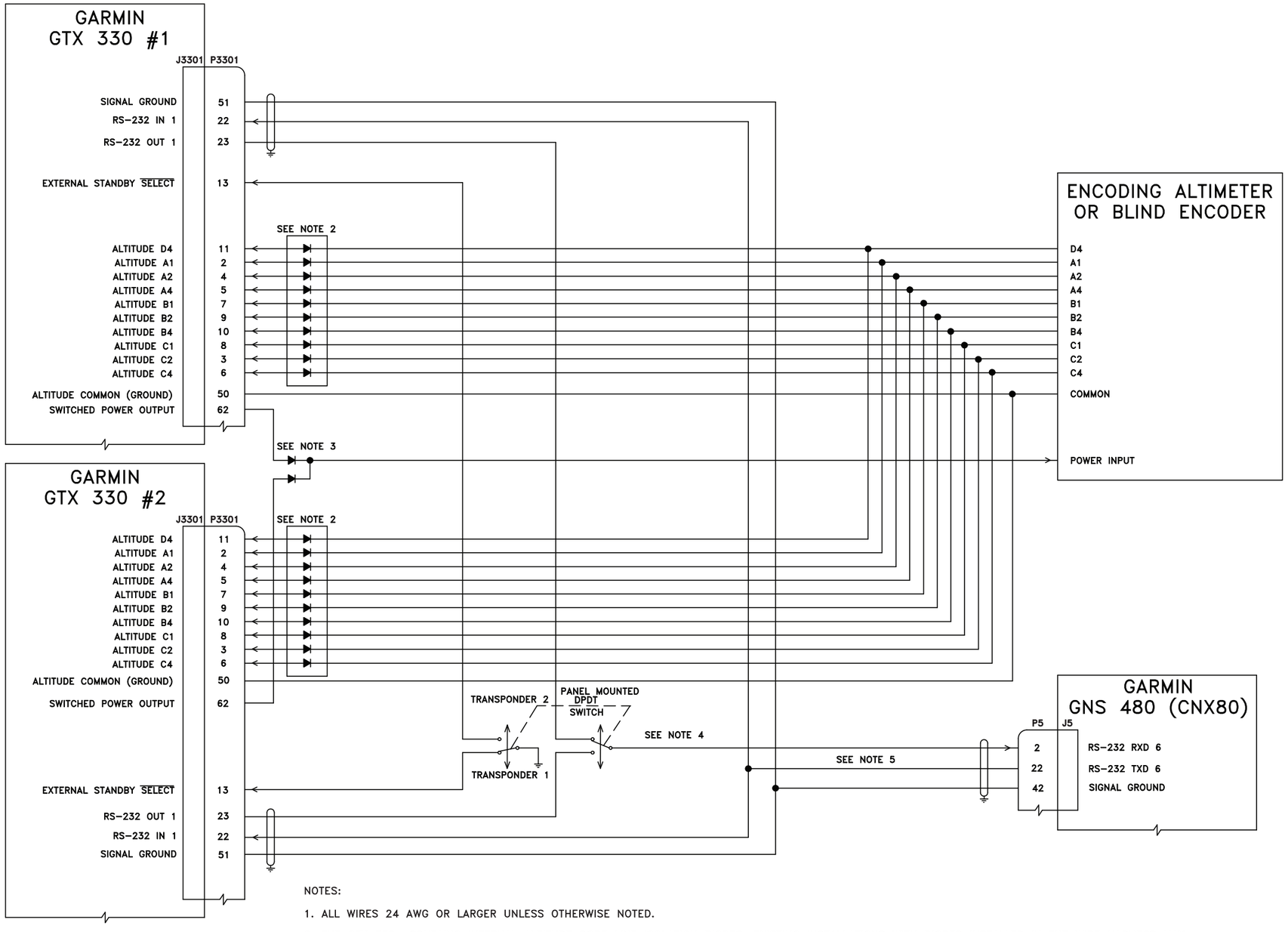


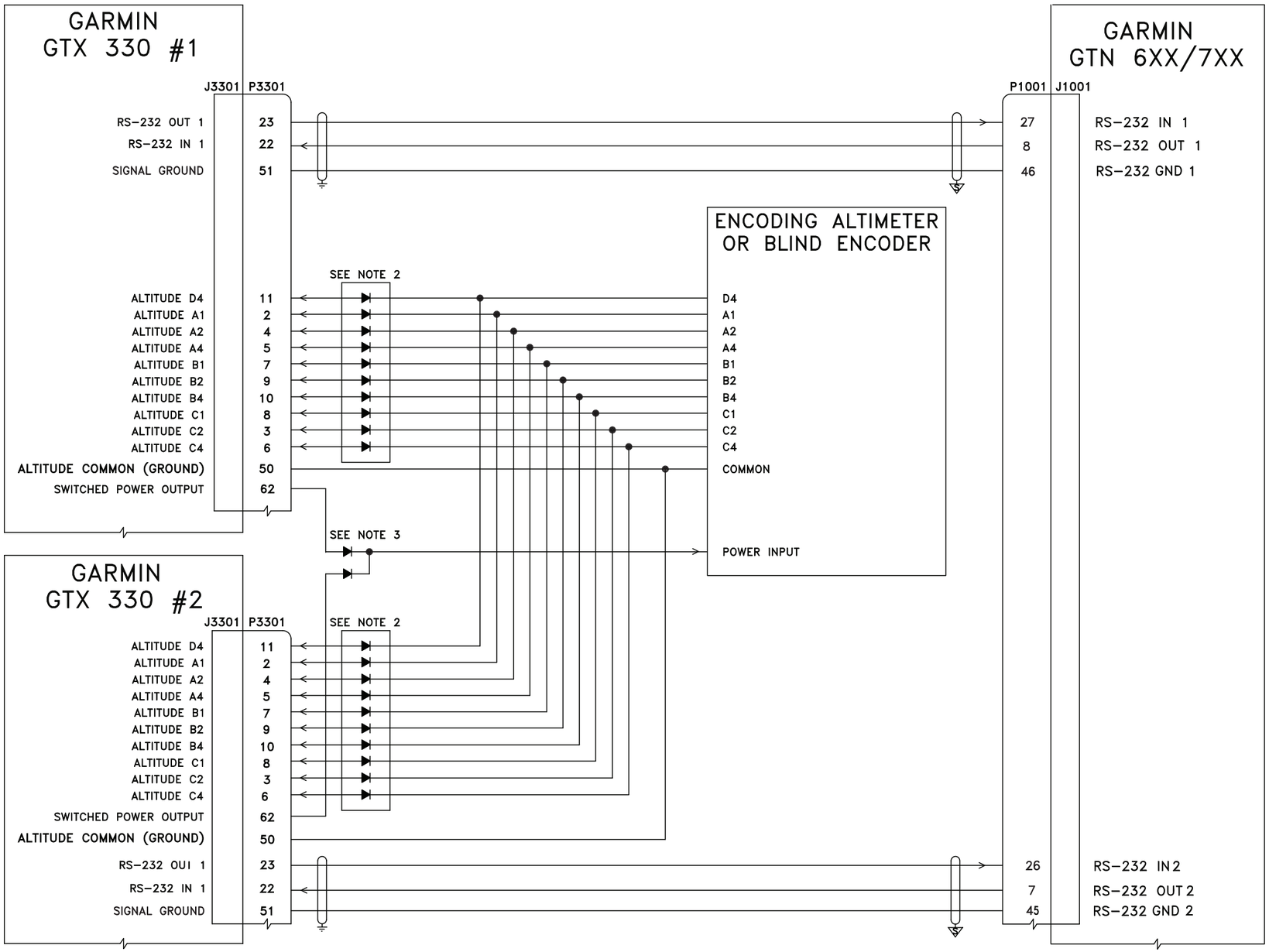
Figure D-9 Dual TXP Interconnect Wiring Diagram, Encoding Altitude Connections (Sheet 3 of 4)



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. THE GTX 330 CONTAINS INTERNAL ALTITUDE CODE LINE ISOLATION DIODES. EXISTING INSTALLATIONS WITH DIODES INSTALLED IN THE WIRE HARMESS MAY BE USED "AS IS" WITHOUT REMOVING THE DIODES.
3. FOR ENCODER POWER INPUT USE DIODES OF AT LEAST 3 AMP, 50 VOLTS REVERSE RATING.
4. THE GNS 480 CAN ONLY RECEIVE SERIAL DATA FROM ONE UNIT AT A TIME. ALSO, DUE TO SYSTEM CONFIGURATION, DUAL TRANSPONDERS MUST BE IDENTICAL (I.E. DUAL GTX 330'S) IN A SYSTEM WITH ONE GNS 480 (CNX80).
5. THE GTX 330 MUST UTILIZE SOFTWARE VERSION 3.06 OR HIGHER.

Figure D-9 Dual TXP Interconnect Wiring Diagram, Encoding Altitude Connections (Sheet 4 of 4)



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. THE GTX 330 CONTAINS INTERNAL ALTITUDE CODE LINE ISOLATION DIODES. EXISTING INSTALLATIONS WITH DIODES INSTALLED IN THE WIRE HARNESS MAY BE USED "AS IS" WITHOUT REMOVING THE DIODES.
3. FOR ENCODER POWER INPUT USE DIODES OF AT LEAST 3 AMP, 50 VOLTS REVERSE RATING.
4. IF THE GTN IS TO CONTROL THE GTX 330 UNITS, THE GTX 330 UNITS MUST USE SOFTWARE VERSION 6.11 OR HIGHER.
5. ANY AVAILABLE GTN 6XX/7XX RS-232 PORT MAY BE USED.

AIRCRAFT GROUND

GARMIN SHIELD BLOCK GROUND (REFER TO 190-00313-09)

Figure D-10 Dual TXP to GTN 6XX/7XX Interconnect Wiring Diagram, Encoding Altitude Connections

NOTES:
1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.

Figure D-11 GTX 330 w/ES to GDL 90 Connections

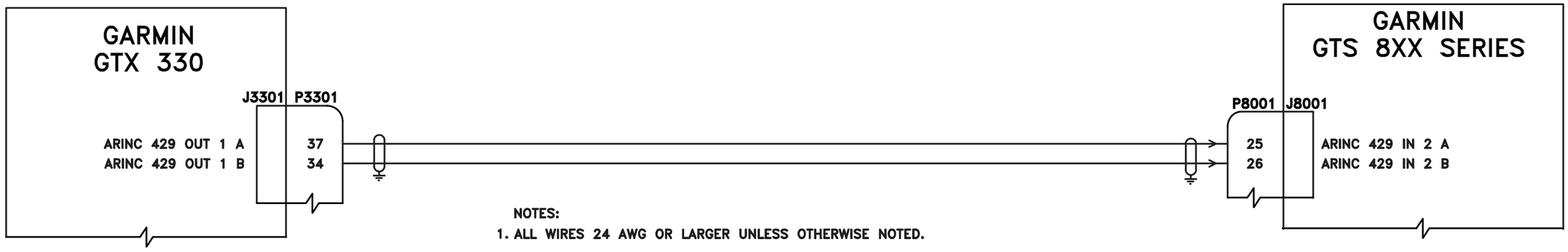
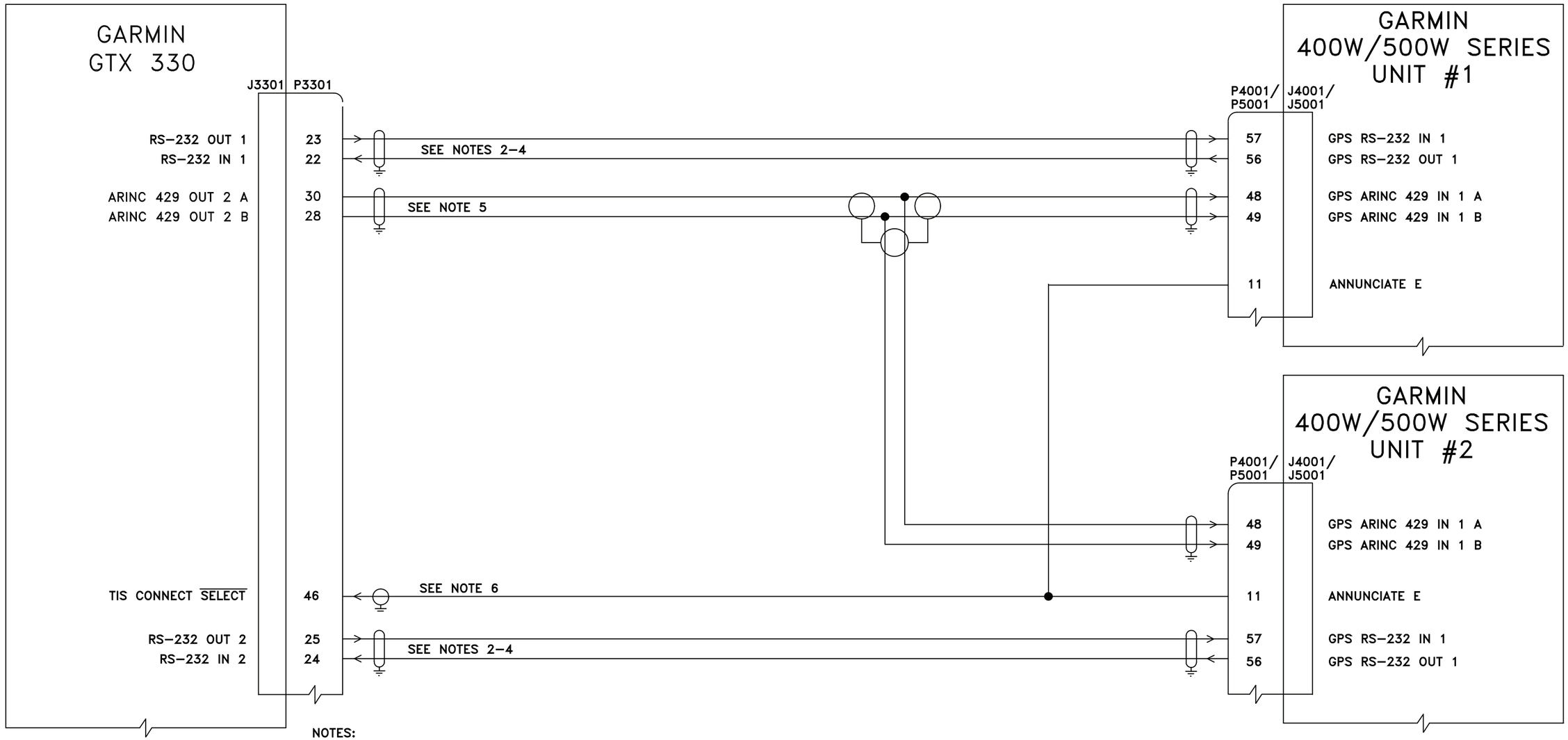


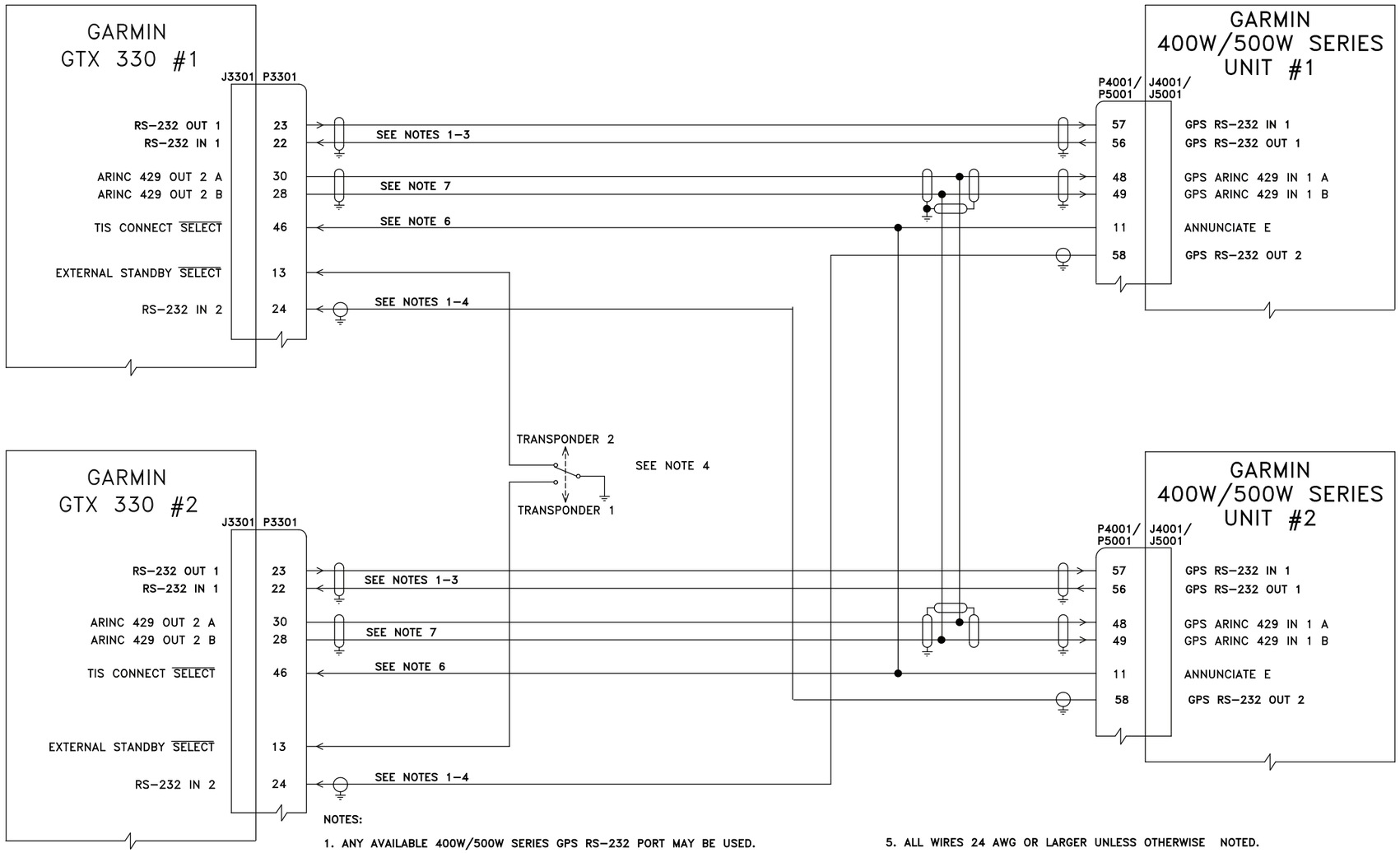
Figure D-12 GTX 330 to GTS 8XX Series Interconnect



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. ANY AVAILABLE 400W/500W SERIES GPS RS–232 PORT MAY BE USED.
3. RS–232 IN 1 (P3301–22) FROM A GARMIN 400W OR 500W SERIES UNIT (W/MAIN SW VERSION 5.00 OR LATER) ALLOWS FOR CONFIGURATION OF "REMOTE" (GTX) AND "ADS–B OUT+" (400W/500W SERIES) TO PROVIDE ADS–B POSITION DATA.
4. RS–232 IN/OUT 1 TO A GARMIN 400W OR 500W SERIES UNIT (W/MAIN SW VERSION 5.30 OR LATER AND A VAILID TERRAIN DATABASE) ALLOWS FOR CONFIGURATION OF "GNS" (GTX) AND "ADSB TFC" (400W/500W SERIES) TO PROVIDE ADS–B POSITION DATA WITH HEIGHT ABOVE TERRAIN DATA TO ENHANCE AUTOMATIC AIRBORNE DETERMINATION.
5. IF EXTERNAL STANDBY SELECT IS CONNECTED IN THIS CONFIGURATION, USE ARINC 429 OUT 1A AND 1B, (PINS 37 AND 34) RATHER THAN ARINC 429 OUT 2A AND 2B (PINS 30 AND 28) SHOWN. ALTITUDE DATA WILL NOT BE TRANSMITTED OVER ARINC 429 PORT 2 TO THE 400/500 SERIES UNIT WHEN EXTERNAL STANDBY SELECT IS GROUNDED.
6. WHEN TIS IS USED IN THE AIRCRAFT DO NOT CONNECT ANOTHER TRAFFIC SYSTEM TO THE SAME 400/500 SERIES UNIT. REFER TO FIGURE D–8.
7. GTX 330 MUST BE "ES" ENABLED.

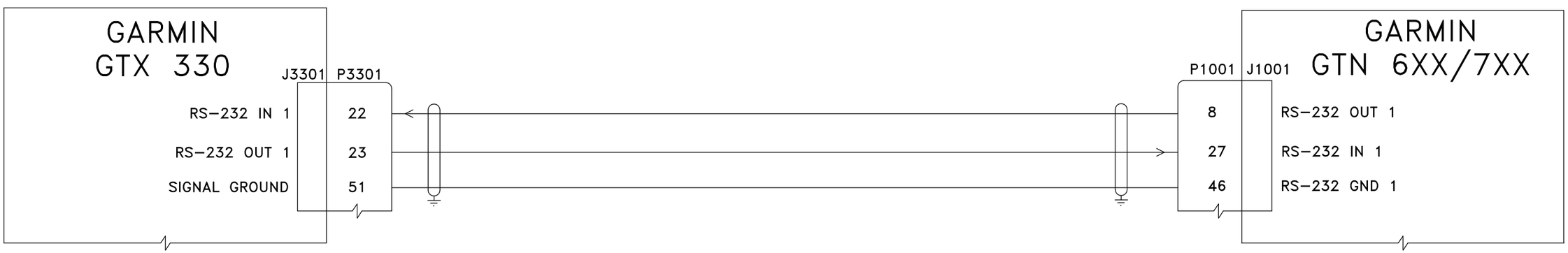
Figure D-13 GTX 330 to 400W/500W Series Units ADS-B TX Only Interconnect (Sheet 1 of 2)



NOTES:

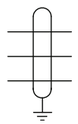
1. ANY AVAILABLE 400W/500W SERIES GPS RS-232 PORT MAY BE USED.
2. RS-232 IN 1 (P3301-22) FROM A GARMIN 400W OR 500W SERIES UNIT (W/MAIN SW VERSION 5.00 OR LATER) ALLOWS FOR CONFIGURATIONOF "REMOTE" (GTX) AND "ADS-B OUT+" (400W/500W SERIES) TO PROVIDE ADS-B POSITION DATA.
3. RS-232 IN/OUT 1 (P3301-22 AND -23) TO A GARMIN 400W OR 500W SERIES UNIT (W/MAIN SW VERSION 5.30 OR LATER AND A VAILID TERRAIN DATABASE) ALLOWS FOR CONFIGURATION OF "GNS" (GTX) AND "ADSB TFC" (400W/500W SERIES) TO PROVIDE ADS-B POSITION DATA WITH HEIGHT ABOVE TERRAIN DATA TO ENHANCE AUTOMATIC AIRBORNE DETERMINATION.
4. GPS RS-232 OUT FROM THE SECOND GARMIN 400W OR 500W SERIES UNIT ALLOWS FOR REDUNDANT ADS-B INPUT TO THE GTX (SEE NOTE 2).
5. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
6. WHEN TIS IS USED IN THE AIRCRAFT DO NOT CONNECT ANOTHER TRAFFIC SYSTEM TO THE SAME 400/500 SERIES UNIT. REFER TO FIGURE D-8.
7. THE GTX 330 ARINC 429 OUT 2 PORT IS HIGH-IMPEDANCE WHEN THE EXTERNAL STANDBY SELECT INPUT IS GROUNDED. THIS ALLOWS ARINC 429 OUTPUTS FROM DUAL GTX 330 UNITS TO BE HARD-WIRED TOGETHER SINCE THE EXTERNAL STANDBY SELECT INPUT WILL BE ACTIVE FOR ONE OF THE TWO GTX 330'S AT ANY GIVEN TIME.

Figure D-13 GTX 330 to 400W/500W Series Units ADS-B TX Only Interconnect (Sheet 2 of 2)



NOTES:

1. WHEN TIS IS USED IN THE AIRCRAFT, DO NOT CONNECT ANOTHER TRAFFIC SYSTEM TO THE SAME UNIT.
2. ANY AVAILABLE GTN 6XX/7XX RS–232 PORT MAY BE USED.
3. SYMBOL DESIGNATIONS:



TWISTED SHIELDED THREE CONDUCTOR SHIELD TERMINATED TO GROUND

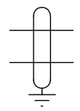
Figure D-14 GTX 330 to GTN 6XX/7XX Simplified Interconnect Wiring Diagram

NOTES:

1. THE IN-LINE RESISITOR IS REQUIRED FOR DO-160D SECTION 22 CATEGORY A1E1 COMPLIANCE.

2. THE RESISTOR MUST BE A 1/2 WATT LEADED RESISTOR WITH A RESISTANCE BETWEEN 5KΩ AND 6KΩ AND PART OF VISHAY'S RLR SERIES OF RESISTORS. THE VISHAY PART NUMBER PREFIX MUST BE RLR20C. AN EXAMPLE OF A SUITABLE RESISTOR IS VISHAY PART NUMBER RLR20C5491FMB14, WHICH IS A 5.49KΩ, 1/2 WATT, 1% RESISTOR. THE RLR SERIES OF RESISTORS ARE AVAILABLE IN 1% AND 2% TOLERANCE.

3. SYMBOL DESIGNATIONS:



TWISTED SHIELDED TWO CONDUCTOR
SHIELD TERMINATED TO GROUND

4. WIRING DETAIL:

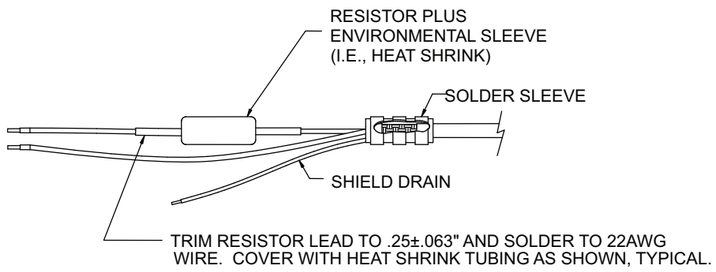


Figure D-15 GTX 330 to Temp Probe Interconnect Wiring Diagram