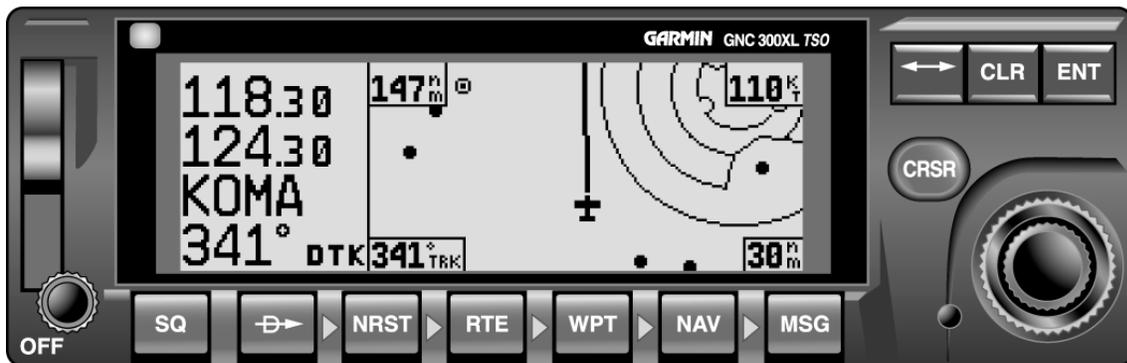
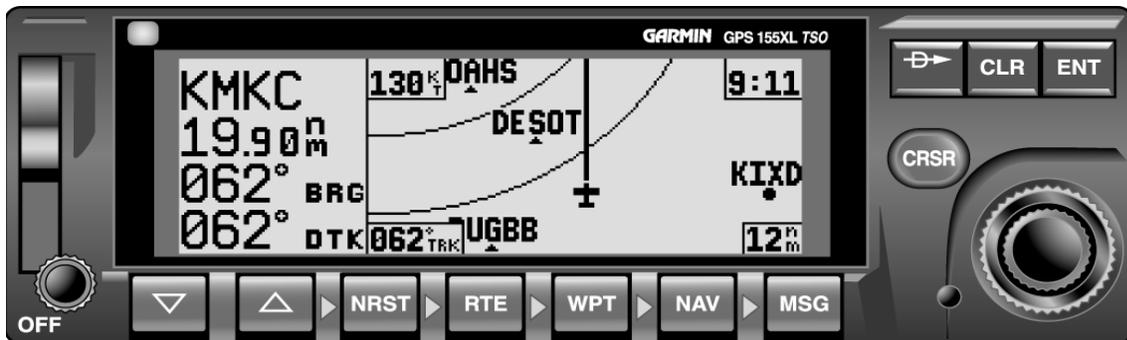




GPS 155XL/GNC 300XL INSTALLATION MANUAL



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REVISION RECORD

REVISION	REVISION DATE	DESCRIPTION	
A	02/03/98	Initial Release	
B	03/31/98	Misc Changes	
C	06/22/98	Changes to Figure 5-1, Misc Changes	
D	10/12/99	Add German Certification, JTSO, Plus Misc Changes	
E	9/07/00	Add Export Control Laws, Correct Fig 5-6, Add ICA, Sec 6	

GENERAL MAINTENANCE PRECAUTIONS

The following are general safety precautions that are not related to any specific procedure and therefore do not appear elsewhere in this maintenance manual. These are recommended precautions that personnel should understand and apply during the many phases of maintenance and repair.

KEEP AWAY FROM LIVE CIRCUITS. Maintenance personnel shall observe all safety regulations at all times. Do not replace components inside the equipment when potentially lethal voltages are present. Turn off system power before making or breaking electrical connections. Regard any exposed connector, terminal board, or circuit board as a possible shock hazard. Components that retain a charge shall be discharged only when such grounding does not result in equipment damage. If a test connection to energized equipment is required, make the test equipment ground connection before probing the voltage or signal to be tested.

DO NOT SERVICE ALONE. Personnel shall not under any circumstances reach into or enter any enclosure for the purpose of servicing or adjusting the equipment without immediate presence or assistance of another person capable of rendering aid.

WARNING

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

This document may contain information which is subject to the Export Administration Regulations ("EAR") issued by the United States Department of Commerce (15 CFR, Chapter VII, Subchapter C) and which may not be exported, released, or disclosed to foreign nationals inside or outside of the United States without first obtaining an export license. A violation of the EAR may be subject to a penalty of up to 10 years imprisonment and a fine of up to \$1,000,000 under Section 2410 of the Export Administration Act of 1979. Include this notice with any reproduced portion of this document.

NOTE

Specialized test equipment and extensive depot level repair training are required for testing the equipment covered in this manual. Therefore, this manual may not be used to test or repair the subject equipment unless the using facility has been specifically authorized by GARMIN to do so. This manual does not need to be kept current if it only used for reference purposes.

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SECTION 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

This manual describes the physical, mechanical, and electrical characteristics and the installation requirements for the GPS 155XL/GNC 300XL Aviation Kit. After installation of the GPS 155XL/GNC 300XL system, FAA Form 337 must be completed by an appropriately certified agency to return the aircraft to service.

1.2 TECHNICAL CHARACTERISTICS

The conditions and tests required for TSO C129a approval of the GPS 155XL/GNC 300XL are minimum performance standards. It is the responsibility of the agency installing this system either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. The system may be installed only if evaluation by the applicant documents an acceptable installation and is approved by the administrator. For TSO/JTSO Compliance, see Appendix A.

1.2.1 Physical Characteristics

Width	6.25 inches
Height	2 inches
Depth	5.65 inches
GPS 155XL Weight (Unit Only)	2.05 lbs.
GNC 300XL Weight (Unit Only)	2.55 lbs.
GA 56 Antenna Weight	.25 lbs.
Aviation Rack Weight (w/connector)	.83 lbs.
Max Air Speed (Structural rating for antenna)	Subsonic

1.2.2 Operational Characteristics

Operating Temperature Range	-20°C to +55°C
Humidity	95% non-condensing
Altitude Range	-1,500 to 50,000 ft.
Power Range (GNC 300XL)	10 to 15.1 VDC
Power Range (GPS 155XL)	10 to 33 VDC
Power Requirements (GNC 300XL)	1.35A @ 13.8V (not transmitting); 5.5A @ 13.8V (transmitting)
Power Requirements (GPS 155XL)	0.95A @ 13.8V

1.2.3 Interfaces

The GPS 155XL/GNC 300XL provides an interface to various general aviation instruments. Table 3-2 defines the function of each pin on the 37-pin DSUB connector located at the back of the rack. Table 3-3 lists the function of each pin in the 26-pin HD-DSUB connector (J102) located above the 37-pin connector at the back of the rack. Figures 5-4 through 5-7 define the interconnects between the rack and other instruments. J101 and J102 pin functions are provided in paragraphs 1.2.4 and 1.2.5.

1.2.4 J101 Connector Pin Functions (37-pin)

CDI (Pins 1 and 4)	Capable of driving up to three 1000 ohm parallel loads, +150 millivolts full scale deflection with a maximum output of +300 millivolts.
To/From (Pins 2 and 4)	Capable of driving up to three 200 ohm parallel loads, +190 millivolts full scale deflection.
Nav Flag (Pins 3 and 4)	Capable of driving up to three 1000 ohm parallel loads, 375 millivolts for flag out-of-view, and +40 millivolts for flag in-view.
OBI Data (Pins 7, 8, and 23)	Output providing bearing to waypoint data for a Bendix/King RMI (KI 229 or equivalent).
Message Annunciator (Pin 20)	Output capable of driving negative logic message annunciators by sinking up to 500 mA.
RS232 Chan 1 Output Data (Pin 24)	Output capable of driving devices as listed in Section 4. Conforms to the EIA specification RS-232C.
RS232 Chan 2 Output Data (Pin 19)	Output capable of driving devices as listed in Section 4. Conforms to the EIA specification RS-232C.
RS232 Chan 1 Input Data (Pin 17)	Input capable of receiving data from devices listed in Section 4. Conforms to the EIA specification RS-232C.
RS232 Chan 2 Input Data (Pin 18)	Input capable of receiving data from devices listed in Section 4. Conforms to the EIA specification RS-232C.
Arrival Annunciator (Pin 12)	Output capable of driving negative logic annunciator by sinking up to 500 mA.
GPS Approach Active Annunciator (Pin 13)	Output capable of driving negative logic annunciator by sinking up to 500 mA. See GPS 155XL/GNC 300XL Pilot's Guide (GPN 190-00067-20 and 190-00067-30), for more information.
GPS Approach Arm Annunciator (Pin 28)	Output capable of driving negative logic annunciator by sinking up to 500 mA. See GPS 155XL/GNC 300XL Pilot's Guide (GPN 190-00067-20 and GPN 190-00067-30), for more information.
ARINC 429 Output A & B (Pins 15 and 16)	Output capable of interfacing with any device that has an input conforming to the GAMA ARINC 429 (low speed) specification.
NAV Super Flag Output (Pin 10)	Output capable of driving positive logic NAV Super Flag by sourcing up to 500 mA for flag out of view (NAV valid).
GPS Approach Arm Low (Pin 9)	Input, when grounded, controls approach mode.
GPS OBS (Pins 4, 14, 35 and 37)	Capable of interfacing with a standard OBS resolver.

ARINC 429 Input A & B (Pins 32 and 33)	Input capable of receiving data from ARINC 429 (low speed) devices as listed in Section 4.
Battery +, -, Charge Enable (Pins 30, 34, and 29)	Connection for GARMIN remote battery accessory.

1.2.5 J102 Connector Pin Functions (26 pin)

MIC Audio Hi and Lo (Pins 2 and 3, GNC 300XL Only)	Input requiring 275mV RMS into 470 ohm load (Standard carbon or dynamic MIC containing transistorized pre-amp).
MIC Key (Pin 4, GNC 300XL Only)	Input, when grounded, keys the transmitter.
COMM Audio Hi and Lo (Pins 5 and 6, GNC 300XL Only)	Output capable of driving a 500-ohm load with 100mW.
MIC Intercom (Pin 8, GNC 300XL Only)	Input requiring 125 mV RMS into 470 ohm load (Standard carbon or dynamic MIC containing transistorized pre-amp).
Remote Transfer (Pin 10, GNC 300XL Only)	Input, when grounded, swaps the active and standby COMM frequencies.
TX Interlock (Pin 12, GNC 300XL Only)	Input, when grounded, reduces receiver sensitivity so squelch will not break when another transceiver is keyed.
Altimeter input (Pins 14-24)	Capable of receiving encoded output data from any parallel altimeter device.
Remote Enter (Pin 26)	Input, when ground, functions the same as the enter key on the GPS 155XL/GNC 300XL front panel.
Sequence Hold Low (Pin 13)	Input, when grounded, activates HOLD mode. See GPS 155XL Pilot's Guide (GPN 190-00067-20) or the GNC 300XL Pilot's Guide (GPN 190-00067-30) for more information.

1.2.6 Comm Antenna Connector (J4, GNC 300XL Only)

Capable of providing 5 watts, minimum, at 13.8V sensitivity of 6 dB SNR, minimum, at 2 uV hard. The COMM antenna shall be approved to TSO C37() and C38().

1.3 LICENSE REQUIREMENTS

If any of these devices are connected to a personal computer used in home or in office, then the four following paragraphs are applicable.

These devices comply with Part 15 of the FCC limits for Class B digital devices. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to other equipment, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by relocating the equipment or connecting the equipment to a different circuit than the affected equipment.

Consult an authorized dealer or other qualified avionics service technician for additional help if these remedies do not correct the problem. These devices comply with Part 15 of the FCC rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

These units do not contain any user-serviceable parts. Repairs should only be made by an authorized GARMIN service center. Unauthorized repairs or modifications could void your warranty and your authority to operate this device under Part 15 Regulations.

The FCC requires GARMIN to inform users that these units meet the more stringent requirements "For Home or Office Use".

The following guidance is provided to help ensure the proper licensing of the GNC 300XL Comm.

1. The Telecommunications Act of 1996 effective February 8, 1996 provides the FCC discretion to eliminate radio station license requirements for aircraft. At present, an individual license to operate the GNC 300XL aboard a private aircraft is not needed in many circumstances. Please see FCC Fact Sheet PR5000 or contact the FCC at 1-800-322-1117 for more information.
2. No license change is required for aircraft that already have a station license per FCC 404 Instructions dated 1994.
3. If an aircraft license is required or desired, contact the FCC at 1-800-322-1117 to request FCC form 404, "Application for Aircraft Radio Station License," to apply for FCC authorization. The FCC also has a "Fax on Demand" service to provide forms by fax at 202-418-0177.

1.4 CERTIFICATION

The GNC 300XL/GPS 155XL is certified for IFR enroute, terminal, and non-precision approaches. The GNC 300XL/GPS 155XL initial certification was accomplished via an STC by GARMIN in a Piper PA32 aircraft. See Appendix C for a copy of the STCs.

All installations must be certified. For more information, see FAA Advisory Circular "Airworthiness Approval of Global Positioning System (GPS) Navigation Equipment for use as a VFR and IFR Supplemental Navigation System," Appendix 1. All new certifications after GARMIN's Piper PA32 installation will be "Follow-On."

1.4.1 German Certification

For installations required to meet German regulation REG TP 321 ZV 034, Lowpass Filter (GPN 330-00157-00) must be installed on the GNC 300XL COM RF connector, J4, instead of the GPS Notch Filter (GPN 330-00067-00).

1.5 LIMITED WARRANTY

GARMIN Corporation warrants this product to be free from defects in materials and manufacture for one year from the date of purchase. GARMIN will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor. The customer is, however, responsible for any transportation costs. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL GARMIN BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

To obtain warranty service, call the GARMIN Customer Service department (913-397-8200) for a returned merchandise tracking number. The unit should be securely packaged with the tracking number clearly marked on the outside of the package and sent freight prepaid and insured to a GARMIN warranty service station. A copy of the original sales receipt is required as the proof of purchase for warranty repairs. GARMIN retains the exclusive right to repair or replace the unit or software or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

SECTION 2

INSTALLATION

2.1 INTRODUCTION

Careful planning and consideration of the suggestions in this section are required to achieve the desired performance and reliability from the GPS 155XL/GNC 300XL.

2.2 ANTENNA CONSIDERATIONS

2.2.1 GPS Antenna Location

The GPS 155XL/GNC 300XL GA 56 Antenna must be mounted on top of the aircraft. For best performance, select a location with an unobstructed view of the sky above the aircraft when in level flight. Figure 2-1 illustrates a typical GPS antenna installation. The antenna should be located at least 3 feet from transmitting antennas such as VHF Comm, HF transmitter, DME, Transponder, and Radar.

For rotorcraft, locate the GA 56 Antenna as far as possible from the main rotor hub. This reduces the percentage of time the blade blocks the antenna. Also mount it as far below the blade surface as possible if installing the antenna under the blade. This reduces signal distortion caused by the blades.

2.2.2 Communication Antenna Location (GNC 300XL)

The COMM antenna should be well removed from all projections, engines, and propellers. The ground plane surface directly below the antenna should be a flat plane over as large an area as possible (18 inches square minimum). The antenna should be mounted a minimum of 6 feet from any DME antennas, 4 feet from any ADF sense antennas, and 3 feet from the GNC 300XL and its GPS antenna.

The GNC 300XL COMM antenna connector is specified to have a 1.57542 GHz notch filter installed (GPN 330-00067-00) to minimize interfering harmonics.

Installations required to meet German regulation REG TP 321 ZV 034, must have Lowpass Filter (GPN 330-00157-00) installed on the GNC 300XL COM RF connector J4 instead of the GPS Notch Filter (GPN 330-00067-00).

2.2.3 Electrical Bonding

No special precautions need to be taken to provide a bonding path between the GPS antenna and the aircraft structure. Follow the manufacturer's instructions for the COMM antenna (GNC 300XL).

2.2.4 Antenna Limitations

GARMIN's GA 56 Antennas are recommended for installations where the airspeed of the aircraft will be subsonic. In such installations, GARMIN's GA 56—Mod 1 or later—must be used. See the COMM antenna specification for its limitations (GNC 300XL).

2.2.5 VHF Comm Interference of GPS

On many panel-mounted aircraft installations, VHF Communication radios can radiate strong harmonics from the comm transceivers and their antenna. The GNC 300XL COMM section will not interfere with its GPS section. However, placement of the GNC 300XL GPS antenna relative to a COMM and COMM antenna, including its own, is critical.

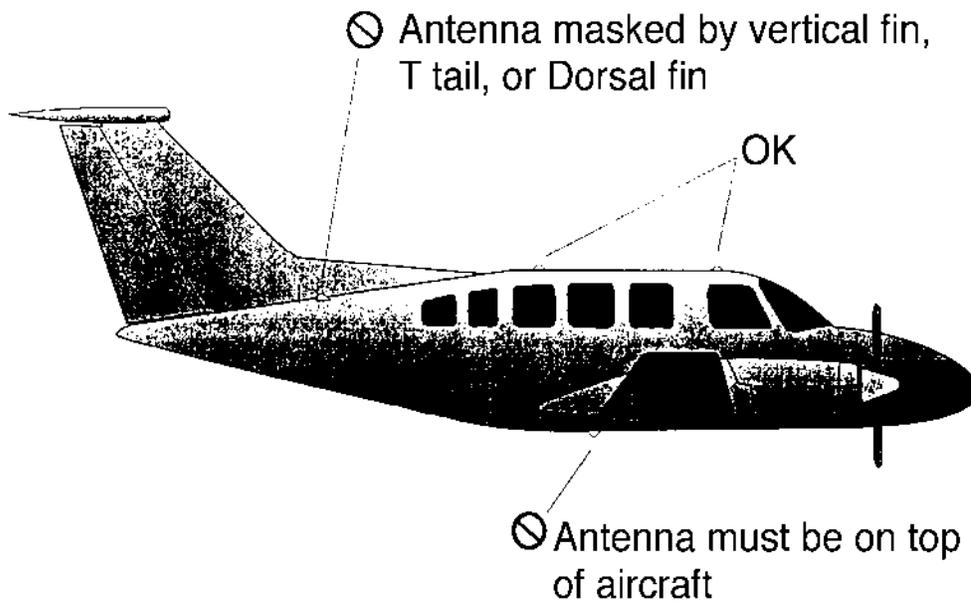


Figure 2-1. GPS Antenna Installation Considerations

Use the following guidelines, in addition to others in this document, when locating the GPS 155XL/GNC 300XL and its antenna(s).

- GPS Antenna—Locate as far as possible from all COMM antennas and all COMMs (including the GNC 300XL). The GPS antenna will be much less sensitive to COMM antennas that use a 1.57542 GHz notch filter.
- GPS 155XL/GNC 300XL—Locate as far as possible from all COMM antennas.

If a COMM antenna is found to be the problem, a 1.57542 GHz notch filter (GPN 330-00067-00) may be installed in the VHF COMM coax, as close to the COMM as possible. This filter (GPN 330-00067-00) is required for the GNC 300XL transmitter.

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

1. Replace or clean the VHF COMM rack connector to ensure a good coax ground.
2. Place a grounding brace between the GNC 300XL, the VHF COMM, and ground.
3. Shield the VHF COMM wiring harness.

2.2.6 Comm Antenna Installation Instructions (GNC 300XL)

Install the COMM antenna according to the manufacturer's recommendations.

2.3 RACK CONSIDERATIONS

2.3.1 Accessibility

Plan a location that gives the pilot comfortable access to the keypad and provides good visibility from the pilot's perspective. Check that there is adequate depth for the rack in the instrument panel. A location away from heating vents or other sources of heat generation is optimal. Figure 2-1 illustrates a typical aviation rack installation.

2.4 CABLING AND WIRING

The recommended antenna cable type for both antennas is M17/155-0001 (RG-58A/U) per MIL-C-17. Maximum allowable length for the GPS antenna using this cable type is 40 feet. Other cable types with 50 ohms nominal impedance and longer lengths can be used for the GPS antenna, provided the installer insures that the attenuation does not exceed 10 dB at 1.5 GHz for the specific installation.

Check that there is ample space for the cabling and mating connectors. Avoid sharp bends in cabling, particularly the GNC 300XL COMM antenna cable, and routing near aircraft control cables. Cabling for the GPS 155XL/GNC 300XL should not be routed near components or cabling which are sources of electrical noise. Do not route the GNC 300XL COMM antenna cable near any ADF antenna cables. Route the GPS antenna cable as far as possible away from all COMMs and COMM antenna cable.

2.5 COOLING AIR

The GPS 155XL/GNC 300XL units meet all TSO requirements without external cooling. However, as with all electronic equipment, lower operating temperatures extend equipment life. On the average, reducing the operating temperature by 15-20 °C (25 to 35 °F) doubles the mean time between failure (MTBF). Recommended airflow rating is 1 CFM (cubic foot per minute) at a pressure equivalent to 0.1 inches of water.

Units tightly packed in the avionics stack heat each other through radiation, convection, and sometimes by direct conduction. Even a single unit operates at a much higher temperature in still air than in moving air. Fans or some other means of moving the air around electronic equipment are usually a worthwhile investment. A 5/8" diameter air fitting is provided on the rear of the mounting rack for the purpose of admitting cooling air under such conditions. If a form of forced air cooling is installed, make certain that rainwater cannot enter and be sprayed on the equipment.

2.6 MINIMUM INSTALLATION REQUIREMENTS

The following is a list of required devices for A1 and A2 certification. For a specific list of equipment used in the initial STC, see GPN 190-00067-26 for the GPS 155XL and GPN 190-00067-36 for the GNC 300XL. Deviations from this equipment should be approved by the FAA or the governing organization.

- Pressure Altitude Device—This device delivers pressure altitude data to the GPS 155XL/GNC 300XL. This data comes from an encoder or altitude data digitizer.
- Manual Course Device—This device delivers the manual course selected to the GPS 155XL/GNC 300XL. Course information can come from an analog resolver or from an EFIS via the ARINC 429 bus.
- HSI/CDI Device—This device displays Nav Flag, Left/Right, and To/From information. This can be displayed on the EFIS, HSI or CDI.
- External Annunciators and Switches:

NAV	Annunciator
GPS	Annunciator
NAV/GPS	Switch
HOLD	Annunciator
AUTO	Annunciator
GPS Sequence	Switch
Approach Active	Annunciator (not required for A2)
Approach Arm	Annunciator (not required for A2)
GPS Approach	Switch (not required for A2)
Message	Annunciator
Arrival	Annunciator

The installer is advised to ensure that the switches and annunciators are the functional equivalent to and perform at least as well as the GARMIN devices used in the initial STC. The GARMIN switches and annunciators are sunlight readable and in the primary view of the pilot. Figure 2-2 shows what the GARMIN switch/annunciators look like. For other information concerning switch/annunciators see the Generic Airplane Flight Manual Supplement (GPN 190-00067-24 for the GPS 155XL and GPN 190-00067-34 for the GNC 300XL) as well as current FAA directives.

- Qualified GPS Antenna—This antenna must be one of those listed in the accessories list.

2.7 EXTERNAL ALTITUDE INPUT

Pressure altitude input from an external source may be derived from a RS-232 compatible serial altitude input or Parallel Gray Code/Gillham Altitude as described in Section 4 of this manual. Gillham Altitude is not required when serial altitude is used.

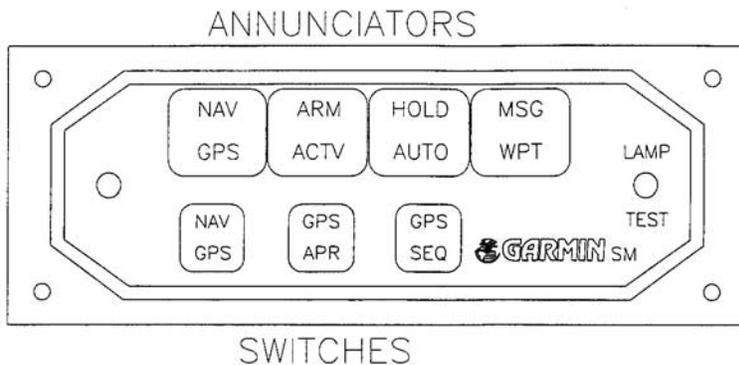


Figure 2-2. Switch/Annunciator Layout

SECTION 3 INSTALLATION PROCEDURE

3.1 INSTALLATION ACCESSORIES

The following installation accessories are available:

1. Antenna and Rack Options:

- GA 56 Antenna Kit, without cable (Mod 1 or later, P/N 010-10040-01). This kit contains the following items:

DESCRIPTION	GPN	QTY
GA 56 ANTENNA SUB-ASSEMBLY	011-00134-00	1
BACKING PLATE	115-00031-00	1
NUT, SELF-LOCKING, #8-32	210-10004-09	4
ANTENNA GASKET	253-00002-00	1

- GA 56 Flange Mount Antenna Kit, (Mod 1 or later, P/N 010-10040-02). This kit contains the following items:

DESCRIPTION	GPN	QTY
FLANGE MOUNT GA 56 ANTENNA SUB-ASSEMBLY	011-00147-00	1
NUT PLATE	115-00080-00	1
SCREW, # 10-32 X 5/8	211-62212-14	4
ANTENNA GASKET	253-00011-00	1

2. Other accessories include the following:

- Connector, BNC, Male, Clamp, (P/N 330-00087-00)
- Low-Loss Aviation Antenna Extension Cable with Right Angle BNC Connector, 15 ft., (P/N 320-00003-00)
- Low-Loss Aviation Antenna Extension Cable with Right Angle BNC Connector, 30 ft., (P/N 320-00003-02)

NOTE: One cable assembly and one BNC connector are required to make the antenna cable, or it can be fabricated by the installer from materials meeting the requirements of paragraph 2.4.

- Mounting Rack (without connectors), P/N 011-00154-00

NOTE: A mounting rack is required for approved installations. The following hardware is required for installation of the mounting rack, but is not provided—#6-32 Flat Head Screw (4 ea.) #6-32 Self-locking Nut (4 ea.)

- Connector, (J1 and J2) Kit, P/N 011-00313-00
- Sample Flight Manual Supplement, GARMIN GPS 155XL, P/N 190-00067-24
- Sample Flight Manual Supplement, GARMIN GNC 300XL, P/N 190-00067-34
- Pilot's Guide, GARMIN GPS 155XL, P/N 190-00067-20
- Pilot's Guide, GARMIN GNC 300XL, P/N 190-00067-30

3.2 DATA BASE OPTIONS

DESCRIPTION	GPN
MEMORY CARD - WORLDWIDE DATABASE	010-10051-00
MEMORY CARD - AMERICAS DATABASE	010-10051-01
MEMORY CARD - INTERNATIONAL DATABASE	010-10051-02
MEMORY CARD - USER	010-10032-03

3.3 ANNUNCIATOR OPTIONS

DESCRIPTION	GPN	MID-CONTINENT P/N
INTEGRATED SW/ANN UNIT, HOR. 28V	013-00029-10	MD41-448
INTEGRATED SW/ANN UNIT, HOR. 14V	013-00029-11	MD41-444
INTEGRATED SW/ANN UNIT, HOR, 28V (5V LIGHTING)	013-00029-12	MD41-448 (5V)
INTEGRATED SW/ANN UNIT, VERT. 28V	013-00029-15	MD41-458
INTEGRATED SW/ANN UNIT, VERT, 14V	013-00029-16	MD41-454
INTEGRATED SW/ANN UNIT, VERT. 28V (5V LIGHTING)	013-00029-17	MD41-458 (5V)

3.4 MISCELLANEOUS OPTIONS

DESCRIPTION	GPN
PC KIT	010-10075-00
GPS 155XL PILOT'S GUIDE	190-00067-20
GPS 155XL QUICK REFERENCE GUIDE	190-00067-21
GPS 155XL IN PIPER PA32 DOCUMENTED INSTALLATION	190-00067-26
GNC 300XL PILOT'S GUIDE	190-00067-30
GNC 300XL QUICK REFERENCE GUIDE	190-00067-31
GNC 300XL IN PIPER PA32 DOCUMENTED INSTALLATION	190-00067-36
GPS 1.57542 GHz NOTCH FILTER (GNC 300XL ONLY)	330-00067-00
WALL ADAPTER - 110 VAC	362-00014-00
28 TO 14V CONVERTER (GNC 300XL ONLY) (CONSISTS OF 011-00181-00)	010-10057-00
REMOTE BATTERY PACK (CONSISTS OF 011-00182-00)	010-10074-00

3.5 REQUIRED INSTALLATION ACCESSORIES NOT SUPPLIED

The following installation accessories are required but not provided (GNC 300XL only).

- Comm Antenna—Broad Band 50 Ohm Vertically Polarized with Coaxial Cable
- Headphones—500 Ohm Nominal Impedance
- Microphone—Low Impedance Carbon or Dynamic with Transistorized Preamp

3.6 ANTENNA INSTALLATION

For the COMM antenna, follow the manufacturer's instructions (GNC 300XL). The remainder of this section applies to the GPS antenna. The GA 56 Antenna outline and footprint dimensions are shown in Figure 5-1.

1. Using the backing plate as a template, mark the location of the mounting holes and the through hole for the coaxial cable. Drill or punch the holes.
2. The antenna installation must provide adequate support for the antenna considering a maximum drag load of 5 lbs. for the GA 56 antennas (at subsonic speed). Install a doubler plate to reinforce thin skinned aircraft. Observe guidelines for acceptable installation practices as outlined in AC 43.13-2A.
3. Seal the antenna and gasket to the fuselage using a good quality electrical grade sealant. Use caution to ensure that the antenna connector is not contaminated with sealant. Ensure that the mounting screws are fully tightened and that the antenna base is well seated against the gasket.

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

3.7 CABLE INSTALLATION

1. Route the coaxial cable to the rack location keeping in mind the recommendations of Section 2. Secure the cable in accordance with good mechanical practices.
2. Trim the coaxial cable to the desired length and install the BNC connector (330-0087-00) per the cabling instructions in Figure 3-1. If the connector is provided by the installer, follow the connector manufacturer's instructions for cable preparation.
3. Contacts for the 37 and 26 pin connectors must be crimped into the individual wires of the aircraft wiring harness.

Table 3-1 lists contact part numbers (for reference) and crimp tools.

Contacts					
	Standard Density Connectors				Hi Dens. Connector
	37 socket connector (J1 on unit)		9 pin connector (on battery pack)		26 pin connector (J2 on unit)
	20-24 AWG socket contact	18 AWG socket contact	20-24 AWG pin contact	18 AWG pin contact	22-28 AWG pin contact
Garmin p/n	336-00022-00	336-00023-00	336-00024-00	336-00025-00	336-00021-00
military p/n	M39029/63-368	n/a	M39029/64-369	n/a	M39029/58-360
Amp	205090-1	n/a	205089-1	n/a	204370-2
Positronic	M39029/63-368	FC6018D	M39029/64-369	MC6018D	M39029/58-360
ITT Cannon	031-1007-042	see note	330-5291-037	see note	030-2042-000

Tools							
	Hand Crimping Tool	Standard Density Connectors (size 20 contacts)				Hi Dens. Connector (size 22D)	
		pin or socket contacts (20-24 AWG)		pin or socket contacts (18 AWG)		pin contacts (22-28 AWG)	
		positioner	insert/extract	positioner	insert/extract	positioner	insert/extract
military p/n	M22520/2-01	M22520/2-08	M81969/1-02	n/a	M81969/1-02	M22520/2-09	M81969/1-04
Positronic	9507	9502-5	M81969/1-02	9502-11	M81969/1-02	9502-3	M81969/1-04
ITT Cannon	995-0001-584	995-0001-604	980-2000-426*	n/a	n/a	995-0001-739	n/a
Amp	601966-1	601966-5	91067-2	n/a	n/a	601966-6	91067-1
Daniels	AFM8	K13-1	M24308/1-02	K774	M24308/1-02	K42	M24308/18-1
Astro	615717	615725	M81969/1-02	n/a	M81969/1-02	615724	M81969/1-04

Table 3-1. Contact Part Numbers and Recommended Crimp Tools

Notes regarding the table:

- Insert/Extract tools from ITT Cannon are all plastic, others are plastic with metal tip.
- Non-GARMIN part numbers shown are not maintained by GARMIN and consequently are subject to change without notice.
- Alternate contacts for 18 AWG wire: As an alternate to the Positronic contacts listed (and provided in the install kit), the installer may use contacts made by ITT Cannon as follows:

Socket Contact - ITT Cannon P/N 031-10007-001, Pin Contact - ITT Cannon P/N 330-5291-055. These contacts require the use of a different crimp tool positioner than shown in the table, with the part numbers as follows: Daniels P/N K250, Astro P/N 616245, or ITT Cannon P/N: 980-00005-722.

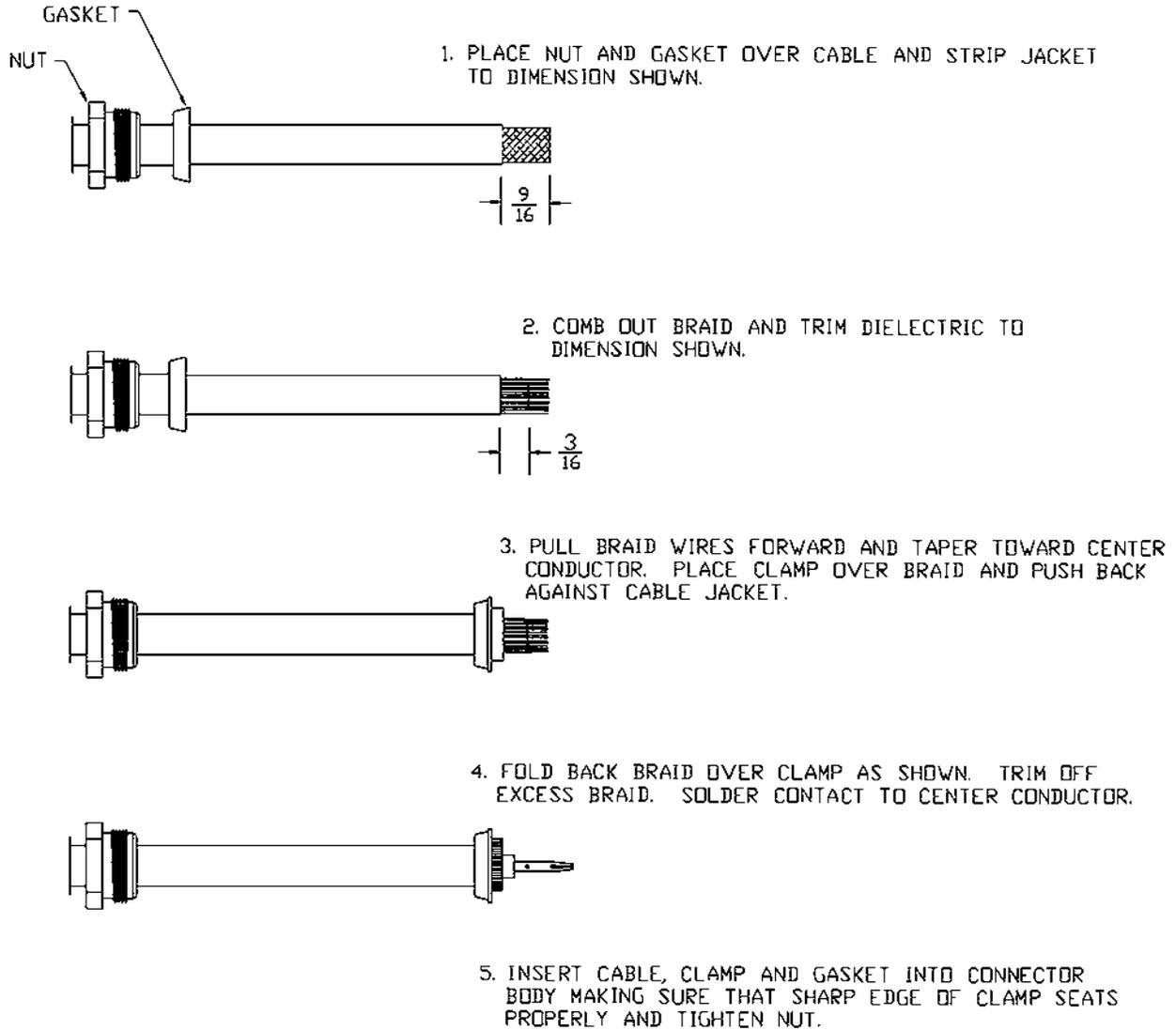


Figure 3-1. Coax Cable Installation

3.8 RACK INSTALLATION

1. Figure 5-2 shows outline dimensions for the aviation rack. Install the rack in a rectangular 6.320" x 2.000" hole in the instrument panel. Exercise caution when installing the rack into the instrument panel. The rack is designed to facilitate removal of the GPS 155XL/GNC 300XL for portable use. Deformation of the rack may make it difficult to install and remove the GPS 155XL/GNC 300XL.
2. Install the rack in the aircraft panel using four #6-32 countersunk screws and four self-locking nuts or other FAA-approved methods as per Advisory Circular 43.13-1A. The screws are inserted from the inside through the holes in the sides of the rack (see Figure 5-3).

3.9 GPS 155XL/GNC 300XL INSTALLATION AND REMOVAL

1. The GPS 155XL/GNC 300XL is installed in the rack by gently sliding it straight in until it rests against the back of the rack. A 3/32-inch hex drive tool is then inserted into the access hole at the bottom of the unit face. Rotate the hex tool clockwise while pressing on the left side of the Bezel until the unit is firmly seated in the rack.
2. To remove the unit from the rack, insert the hex drive tool into the access hole on the unit face and rotate counter-clockwise until the mounting screw turns freely and the unit protrudes about 3/8 inch from the panel.
3. Be sure not to over-tighten the unit into the rack. The application of hex drive tool torque exceeding 15 in.-lbs. can damage the locking mechanism.

3.10 J101 and J102 Pin Functions

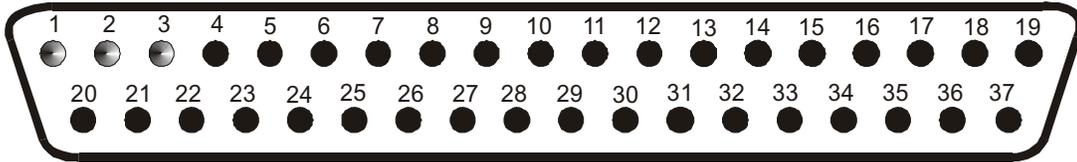


Figure 3-2. View of J101 Connector From Back of Rack

J101 PIN	PIN FUNCTION
1	DEVIATION-BAR LEFT +
2	TO +
3	FLAG +
4	FLAG -, DEVIATION BAR RIGHT +, FROM +, STATOR E, STATOR G
5	RESERVED
6	RESERVED
7	OBI CLOCK
8	OBI DATA
9	APPROACH ARM LOW
10	NAV SUPER FLAG
11	RESERVED
12	ARRIVAL ANNUN
13	APPROACH ACTV ANNUN
14	ROTOR C
15	ARINC 429 OUT B
16	ARINC 429 OUT A
17	RS232 IN 1
18	RS232 IN 2
19	RS232 OUT 2
20	MESSAGE ANNUN
21	AIRCRAFT POWER (14 VDC GNC 300XL) (14-28 VDC GPS 155XL)
22	GROUND
23	OBI SYNC
24	RS232 OUT 1
25	AIRCRAFT POWER (14 VDC GNC 300XL) (14-28 VDC GPS 155XL)
26	GROUND
27	RESERVED
28	APPROACH ARM ANNUN
29	CHARGE ENABLE
30	BATTERY + (POSITIVE)
31	RESERVED
32	ARINC 429 IN A
33	ARINC 429 IN B
34	BATTERY - (NEGATIVE)
35	STATOR D
36	RESERVED
37	STATOR F

Table 3-2. J101 Pin Functions

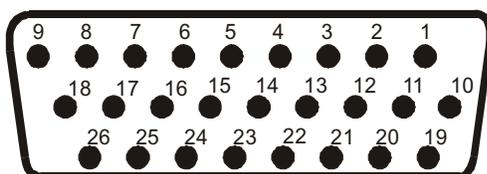


Figure 3-3. View of J102 Connector From Back of Rack

J101 PIN	PIN FUNCTION
1	RESERVED
2	MIC AUDIO HI (GNC 300XL)
3	MIC AUDIO LO (GNC 300XL)
4	MIC KEY (GNC 300XL)
5	COMM AUDIO HI (GNC 300XL)
6	COMM AUDIO LO (GNC 300XL)
7	RESERVED
8	MIC INTERCOM (GNC 300XL)
9	RESERVED
10	REMOTE TRANSFER (GNC 300XL)
11	RESERVED
12	TRANSMIT INTERLOCK (GNC 300XL)
13	SEQUENCE HOLD LOW
14	ALTITUDE D4
15	ALTITUDE A1
16	ALTITUDE A2
17	ALTITUDE A4
18	ALTITUDE B1
19	ALTITUDE B2
20	ALTITUDE B4
21	ALTITUDE C1
22	ALTITUDE C2
23	ALTITUDE C4
24	ALTITUDE COMMON
25	GROUND
26	REMOTE ENTER

Table 3-3. J102 Pin Functions

3.11 COMM ANTENNA INSTALLATION CHECK (GNC 300XL)

Check for insertion loss and VSWR. VSWR should be checked with an in-line type wattmeter inserted in the coaxial transmission line between the transceiver and the antenna. Any problem with the antenna installation will most likely be seen as a high reflected power. A VSWR of 3:1 will result in a 25% loss in power.

SECTION 4

POST-INSTALLATION CONFIGURATION & CHECKOUT PROCEDURE

4.1 INTRODUCTION

NOTE: Configuration initialization must be performed when the unit is installed or when replacing a unit or reinstallation of the same unit in an airplane. Failure to ensure that installation configuration is correct could cause erroneous operation.

The unit must be initialized before starting the checkout procedure. To initialize:

1. Remove any data cards.
2. Turn the unit on.
3. Press enter in response to "Select operating mode Normal ok?"
4. Press enter in response to "No Jeppesen database rte/prx limited to user wpts ok?"
5. After the satellite status page is displayed for 5 seconds, the unit may be turned off.

After initialization, proceed with the following steps.

4.2 TEST MODE OPERATIONS

With power applied to the aviation rack and the GPS 155XL/GNC 300XL unit turned off, depress and hold the ENT key and turn the unit on (release the ENT key when the display activates). The first page displayed is the Display Test Page. While in TEST MODE, test pages can be selected by ensuring the flashing cursor is off and rotating the large knob in either direction.

To change data on the displayed test page, depress the CRSR key. The cursor will highlight the standby COMM frequency on the GNC 300XL and the configuration section for the GPS 155XL. Press cursor again to move to configuration selections on the GNC 300XL.

The small knob will change the data on the selected field. The ENT key or the large knob will advance to the next field on the page. Pressing the CRSR key again will remove the cursor from the current field, allowing the large knob to select the next test page. The ENT key is used to enter a new value into the OBI data field after selecting the desired value using the large and small knobs (see the appropriate chapter of the Pilot's Guide for more information on page and data selection).

Note that some pages found in test mode are intended for bench testing and are not discussed here.

4.3 INSTALLATION CONFIGURATION

The following pages are in the order found when rotating the large knob clockwise starting at the Display Test Page. See Section 4. 2 to find out how to get to this page.

4.3.1 Display Adjustment

This page allows the setting of display parameters that affect the display backlight and lighting brightness in automatic mode.

- "response time" sets the speed with which the brightness responds to ambient light changes. The higher the number, the slower the display responds.
- "min" sets the minimum brightness of the display. The higher the number, the brighter the minimum brightness.
- "slope" sets the sensitivity the brightness of the display has to changes in ambient light. The higher the number, the brighter the display will be for a given increase in ambient lighting.

For more information on the display setting, see the display contrast and mode set page and the backlight set page described in the Pilot's Guide (P/N 190-00067-20 for the GPS 155XL and P/N 190-00067-30 for the GNC 300XL).

4.3.2 I/O Channel 1

Select the I/O CHANNEL 1 Test Page. Change the selectable input and output to match that of the installed equipment. The available options are:

Input:	<u>Field</u>	<u>Description</u>
	off	No units connected to Channel 1 input
	icarus-alt	Serial altitude received from: Icarus, Model 3000, Mode C Serializer
	shadin-alt	Serial altitude received from: Shadin 9000T Serializer System (Non-TSO'd) Shadin 9200T Series Serializer System (Non-TSO'd) Shadin 8800T Series Encoder System (TSO'd)
	shadin-fuel	Fuel information received from: Shadin 91204XT Series Digital Fuel Management System (TSO'd) Shadin 91053XT Series Digital Fuel Management System (TSO'd)
	arnav/ei-fuel	Fuel information received from: Arnav, Model FC- 10, Fuel Computer (TSO'd) Arnav, Model FT- 10, Fuel Totalizer (TSO'd) Electronics International, Model FP-5L, Fuel Flow Computer (Non-TSO'd)
	shadin-adc	Air data information received from various models from the 9628XX-X family
	shadin-fadc	Fuel/Air data information received from various models from the 9628XX-X family

NOTE: Verify with the manufacturer of the data input device that the unit supports a GARMIN interface.

Output:	<u>Field</u>	<u>Description</u>
	off	No units connected to Channel 1 output
	aviation	Serial position, velocity and navigation data to: Argus, Model 3000, Moving Map Argus, Model 5000, Moving Map Argus, Model 7000, Moving Map Stormscope, Series II with Navaid, Moving Map Shadin, 91204XM Digital Fuel Management System (TSO'd) Shadin, 91053XM Digital Fuel Management System Electronics International, Model FP-5L, Fuel Flow Computer (Non-TSO'd) Shadin, Model 9628XX-X Fuel/Airdata Computer (TSO'd) GARMIN GPS 195 GARMIN GPS III

4.3.3 ARINC 429 Channel

Select the ARINC 429 Channel Test Page. Change the selectable output to match that of the installed equipment. The available options are:

Input:	<u>Field</u>	<u>Description</u>
	off	No units connected to ARINC 429 output
	Selected course	Any ARINC 429 compatible unit that transmits the “Selected Course” word (label 100)
	Course/heading	Any ARINC 429 compatible unit that transmits the “Selected Course” word (label 100), as well as the “True heading” (label 314) and/or “Magnetic heading” (label 320) words
	Heading	Any ARINC 429 compatible unit that transmits the “True heading” (label 314) and/or “Magnetic heading” (label 320) words

Output:	<u>Field</u>	<u>Description</u>
	off	No units connected to ARINC 429 output
	Collins PL2 EFS	Collins Pro Line 2 EFIS connected (w/ GAMA)
	King EFS 40/50	King Radio EFIS 40 or 50 connected (w/ GAMA)
	w/o GAMA labels	Any unit that receives standard 429 output

The following is a list of labels output by the GPS 155XL/GNC 300XL:

Navigation/Position Data:

<u>Label (octal)</u>	<u>Description</u>
100	Selected course
114	Desired track
115	Bearing to waypoint
116	Cross track error
121	Horizontal command (to autopilot)
251	Distance to go
252	Time to go
310	Present position latitude
311	Present position longitude
312	Ground speed
313	Ground track
314	True heading
320	Magnetic heading
147*	Magnetic variation
261*	GPS navigation mode
275*	Navigation status
326*	Lateral scale factor
351*	Distance to destination
352*	Time to destination

Flight Plan Data:

<u>Label (octal)</u>	<u>Description</u>
074*	Flight plan header
075*	Active from/to waypoints
113*	Message checksum
300*	Station magnetic variation/type/class
303*	Message length/type/number
304*	Waypoint identifier characters 1-3
305*	Waypoint identifier characters 4-6
306*	Waypoint latitude
307*	Waypoint longitude

Identification Data:

Label (octal)	Description
377	Equipment identifier
371*	General Aviation equipment identifier

*These labels are formatted per the General Aviation Manufacturers Association (GAMA) definition. Note that the use of a 429-device w/o GAMA will cause the loss of the above asterisked labels. Some may be required for A1 certification. For example, label 326 changes the CDI scale for approach.

4.3.4 CDI Calibration

Select the test page displaying CDI output calibration. Place the cursor on the alignment field by using the large knob. Use the small knob to adjust the CDI needle until it is centered. Once centered, turn the cursor off to complete the calibration process.

4.3.5 Selected Course Calibration

Select the test page displaying the selected course input. Using an extremely accurate input source, input 150° to the GPS 155XL/GNC 300XL. The input course will indicate close to 150 and a "Calib?" field will appear in the lower right corner. Selecting the "Calib?" field will calibrate the GPS 155XL/GNC 300XL to match the input source. Verify OBS operation by checking that the bearing displayed on the GPS 155XL/GNC 300XL is within 2° of the selected bearing. Do this for every multiple of 30° around the OBS.

4.3.6 Approach Settings

Select the Approach Settings Test Page. Move the cursor over the approach switch field to change the installation state. The available options are:

Appr switch:	Field	Description
	none	The approach switch is not present
	instld	The approach switch is installed

NOTE: To verify the installation of the approach switch, the "instld" setting requires the approach switch to be pressed to confirm its presence. The following prompt is displayed in this case: "press appr switch to confirm" along with a "?" following "instld". When the switch press is recognized, the prompts are cleared and the "instld" setting is confirmed.

4.3.7 Configuration

Select the Configuration Test Page. Change the selectable Strap and Fuel selections to match that of the aircraft. The available options are:

Fuel: av gas using Aviation gas (5.8 lbs/gal)
 jet A Using Jet A/Jet A-1 fuel (6.7 lbs/gal)
 jet B Using Jet B (JP-4) fuel (6.5 lbs/gal)

NOTE: The Fuel option is used to designate the type of fuel used so that the correct fuel density will be used in calculations.

Strap: Field Description

 Inav 1 Number 1 (Pilot) long range NAV
 Inav 2 Number 2 (Co-Pilot) long range NAV
 common Common long range NAV

NOTE: The strap option affects the interpretation of ARINC 429 input data.

For ARINC 429 input data, the following applies:

 Lnav 1 Only data with SDI=0 or SDI=1 is used
 Lnav 2 Only data with SDI=0 or SDI=2 is used
 common Only data with SDI=0 is used

NOTE: SDI=0 is an "all call".

4.3.8 Remote Battery Settings

Remote Battery: none
 instld

NOTE: If "instld" is selected when a battery is not installed, erroneous voltages will be shown on the Power Test page and invalid battery messages will be issued in normal operating modes.

Low Battery—Selectable between 8.0 volts and 9.6 volts by 0.2 volt steps

NOTE: In normal operating modes, the "Battery Low" message will be issued when the battery voltage is below the low battery value. The default value is 9.0 volts.

4.3.9 I/O Channel 2

NOTE: This page is not found in the Test Pages but is included here to aid installation. For more information, see SET pages in the Pilot's Guide (GPN 190-00067-20 for the GPS 155XL or 190-00067-30 for the GNC 300XL).

Select the I/O CHANNEL 2 Set Page. Change the selectable input and output to match that of the installed equipment. The available options are:

Input:	<u>Field</u>	<u>Description</u>
	off	NO AVAILABLE SELECTIONS
	rtcm 104	RTCM SC-104 Compatible Differential GPS Receiver

NOTE: Below is a list of the RTCM SC-104 messages that the unit will receive:

- Message Type 1: Differential GPS Corrections
- Message Type 2: Delta Differential GPS Corrections
- Message Type 3: Reference Station Parameters
- Message Type 9: High Rate Differential Corrections

Output:	<u>Field</u>	<u>Description</u>
	off	No units connected to Channel 2 output
	plotting	Serial position, velocity, navigation and satellite data to: NMEA 0183 Version 2.0 compatible mapping device or GARMIN PC software

NOTE: The following is a list of the NMEA 0183 sentences (with maximum number of characters) that the GPS 155XL/GNC 300XL transmits.

RMC	-70 characters
GGA	-72 characters
GSA	-57 characters
GSV	-140 characters (70 characters x 2 sentences)
RMB	-70 characters
BOD	-35 characters
WPL	-38 characters
*PGRME	-35 characters

*GARMIN proprietary accuracy error sentence that is not a part of the NMEA 0183 standard.

4.4 GROUND TEST

The GPS 155XL/GNC 300XL ground test procedure incorporates a series of display pages to test CDI/flag, OBI, annunciators, external switches, altitude inputs, and power functions of the unit.

The following pages are in the order found when rotating the large knob counterclockwise, starting at the Display Test page. See Section 4.2 to find out how to get to this page.

4.4.1 Power Test

Select the Power Test page. This page reports the status of the GPS 155XL/GNC 300XL external power source, remote battery, and internal memory battery. During the power test, "voltage" represents the voltage currently measured for that function.

The first line of power information shows the following sources of external power:

- External Power "voltage"
- Battery Power
- Wall Adapter

The presence of a wall adapter will override the other two sources. Battery power will not be shown unless the Remote Battery is selected as "instld" on the Remote Battery Settings Page. The higher voltage of external power or battery power will determine which is shown.

The next line shows the status of the remote battery as follows:

Rmt Bat none (if Remote Battery is selected as none on the Configuration Page)

Rmt Bat "voltage" "mode" "auto status"

"mode" represents the mode of the charger and is selectable. "On" enables the charger. "Off" disables the charger. "Auto" enables the charger if the External Power is the current source and its voltage is high enough. When in "Auto" mode, "auto status" will be either "on" or "off" reflecting whether the charger is enabled or disabled.

The next line reports the status of the internal memory battery as follows:

Mem Bat ok/low.

The "TX" field will light on the display but the transmitter will not actually transmit when the GNC 300XL is powered from the wall charger.

4.4.2 CDI and Flag Test

Select the CDI Test Page. Using the controls on the GPS 155XL/GNC 300XL front panel, make the selections indicated below and verify the interfaces as appropriate:

CDI

max left	Ensure the CDI is deflected maximum scale left (10 dots)
full left	Ensure the CDI is deflected full scale left (5 dots)
centered	Ensure the CDI is centered
full right	Ensure the CDI is deflected full scale right (5 dots)
max right	Ensure the CDI is deflected maximum scale right (10 dots)

TO/FROM/FLAG

TO	Ensure TO flag is visible
FROM	Ensure FROM flag is visible
FLAG	Ensure TO and FROM are NOT visible

CDI FLAG

IN VIEW	Ensure CDI flag is in view
OUT OF VIEW	Ensure CDI flag is out of view

SUPERFLAG

IN VIEW	Ensure superflag in view
OUT OF VIEW	Ensure superflag out of view

4.4.3 Annunciator Test

Select the Annunciator Test Page. Using the controls on the GPS 155XL/GNC 300XL front panel, make the selections indicated below and verify the interfaces as appropriate:

Panel Annunciators

OFF	Ensure the unit panel annunciators are OFF
ON	Ensure the unit panel annunciators are ON

MSG Annunciator

OFF	Ensure the Message Annunciator is OFF
ON	Ensure the Message Annunciator is ON

Arrival Annunciator

OFF	Ensure the Arrival Annunciator is OFF
ON	Ensure the Arrival Annunciator is ON

Approach Annunciator

OFF	Ensure all Approach Annunciators are OFF
ACTV	Ensure the Approach Active Annunciator is ON (Arm is OFF)
ARM	Ensure the Approach Arm Annunciator is ON (Active is OFF)

4.4.4 External Switch Test

Select the External COM Switches Page (GNC 300XL). For each of the following installed remote switches perform the following:

1. Press Remote Enter and verify the Rmt ent field changes from off to on (GNC 300XL).
2. Press PTT and verify the PTT field changes from off to on.
3. Press Remote Transfer and verify the Rmt xfr field changes from off to on.

Next, select the External Switches Page. For each of the following installed remote switches, perform the following:

1. Press GPS Appr and verify the "appr" field changes from off to on.
2. Press GPS Sequence and verify the "hold" field changes from off to on.
3. Press Remote Enter and verify the "remote ent" field changes from off to on (GPS 155XL).

4.4.5 Communications Loopback Test

This page displays the results of communication loopback tests. Three channels are tested: RS232 channels 1 and 2, and ARINC 429. Results of the test are either "OPEN" or "OK." Open means the channel's transmitter and receiver are not connected or the test failed. The tests are performed continuously while on this page except for RS232 channel 2 (this channel is only tested at power on and the results are displayed on this page). Therefore, the unit must be turned off and the receiver/transmitter connected or disconnected. Then turn the unit on to perform the test.

To test the channels:

- RS232 channel 1—Connect RS232 channel 1 receiver and transmitter
- RS232 channel 2—Connect RS232 channel 2 receiver and transmitter
- ARINC 429—Connect ARINC 429 receiver and transmitter

4.4.6 Altitude Input Test

Select the Gray Code Altitude Test Page if this input is used. Verify that the altitude input is reading the correct altitude. NOTE: This does not display serial altitude.

4.4.7 OBI Test

Select the OBI Test Page. Using the controls on the GPS 155XL/GNC 300XL front panel, make the selections indicated below and verify the interfaces as appropriate:

OBI Data

VALID—Ensure that the OBI indicates the proper value

INVALID—Ensure the OBI is invalid

OBI Value—Ensure that the OBI displays the value entered when the VALID option is selected

NOTE: The 3 lines that make up the OBI interface may be toggled individually. This may be done from the "Value" field. Cycle this field to the desired line (either CLOCK, DATA, or SYNC) and toggle the output to HIGH or LOW.

4.4.8 Signal Acquisition Test

Following normal power-up, the Self Test Page will be displayed followed by the Data Base Page. Upon approval of the Data Base Page, the Satellite Status Page will be displayed. If the unit is unable to acquire satellites, relocate the aircraft away from obstructions which might be shading reception. If the situation does not improve, check the antenna installation.

Once GPS position information is available, use the DIRECT-TO key to activate the navigation function to a nearby NAVAID, intersection, or airport. Ensure any connected equipment is transmitting data to and/or is receiving data from the GPS 155XL/GNC 300XL and is functioning properly (see the Pilot's Guide for more information on the DIRECT-TO function).

4.5 VHF COMM INTERFERENCE CHECK

1. Go to the Satellite Status Page and verify that 7 to 8 satellites have been acquired.
2. See that the "NAV" flag is out of view.
3. Select 121.15 MHz on COMM 1.
4. Transmit for a period of 20 seconds.
5. Verify that the flag does not come into view.
6. Repeat steps 4 and 5 for the following frequencies:
 - 121.175
 - 121.20
 - 131.250
 - 131.275
 - 131.300
7. Repeat steps 3-6 for all COMMs installed in the aircraft
8. If the "NAV" flag comes into view, refer to Section 2.2.5 for options to improve performance.

4.6 VHF COMM CHECK (GNC 300XL)

A flight test is recommended after the installation is complete to ensure satisfactory performance. To check the communications transceiver, maintain an appropriate altitude and contact a ground station facility at a range of at least 50 nautical miles. Contact a close ground station. Press the squelch disable button to defeat the automatic squelch feature and listen for any unusual electrical noise which would reduce the COMM receiver sensitivity by increasing the squelch threshold. If possible, verify the communications capability on both the high and low end of the VHF COMM band.

SECTION 5 DIAGRAMS

5.1 GENERAL

The following diagrams are provided in this section as an aid to installation. Select the diagram(s) appropriate for your installation:

Figure 5-1—GA 56 Antenna Installation Drawing

Figure 5-2—Aviation Rack Dimensions

Figure 5-3—Aviation Rack Installation

Figure 5-4—Interconnect Wiring Diagram, Remote battery and Encoding Altimeter Connections

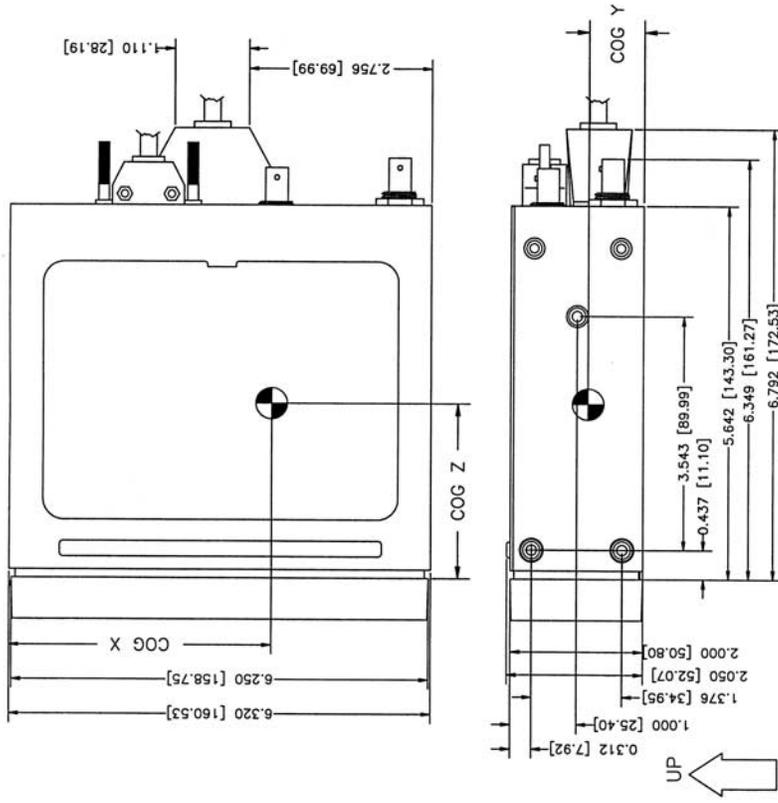
Figure 5-5—Interconnect Wiring Diagram, Navigation Indicator Connections

Figure 5-6—Interconnect Wiring Diagram, Bendix/King KI 209A Connections

Figure 5-7—Interconnect Wiring Diagram, Switch Annunciator Connections

Figure 5-8—Interconnect Wiring Diagram, Optional Accessory Connections

Figure 5-9—Interconnect Wiring Diagram, Audio Connections



INCLUDES UNIT, RACK, AND CONNECTORS				
	COG X	COG Y	COG Z	Weight
GPS 155XL	3.50"	0.9"	2.44"	2.84 lbs.
GNC 300XL	3.40"	0.93"	2.34"	3.38 lbs.

FIGURE 5-2. AVIATION RACK DIMENSIONS

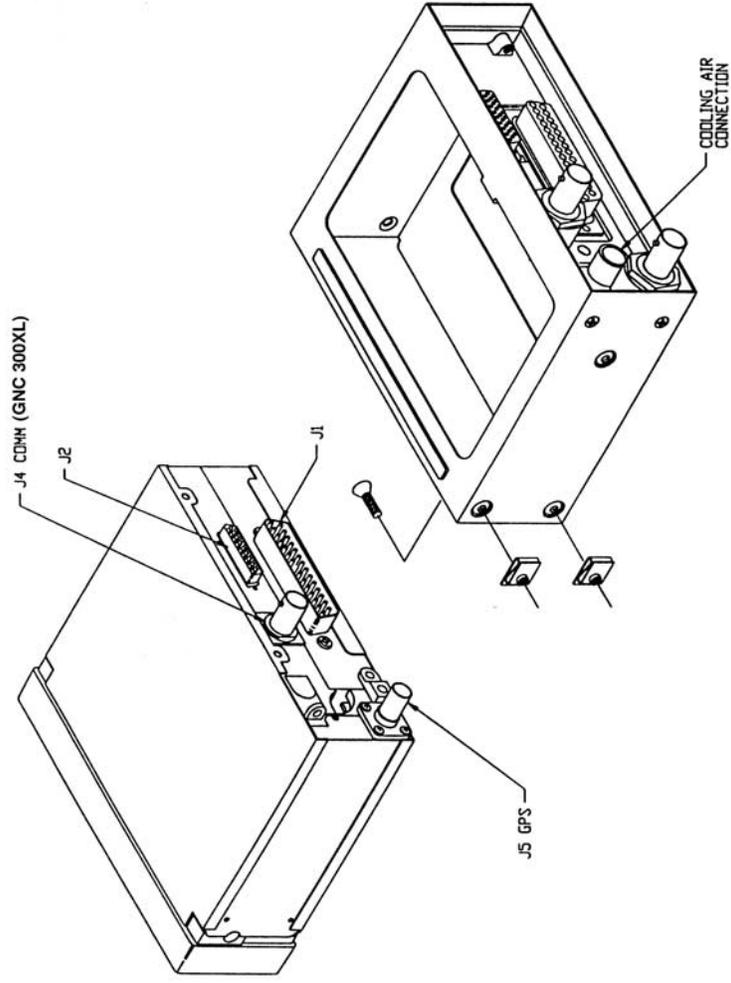
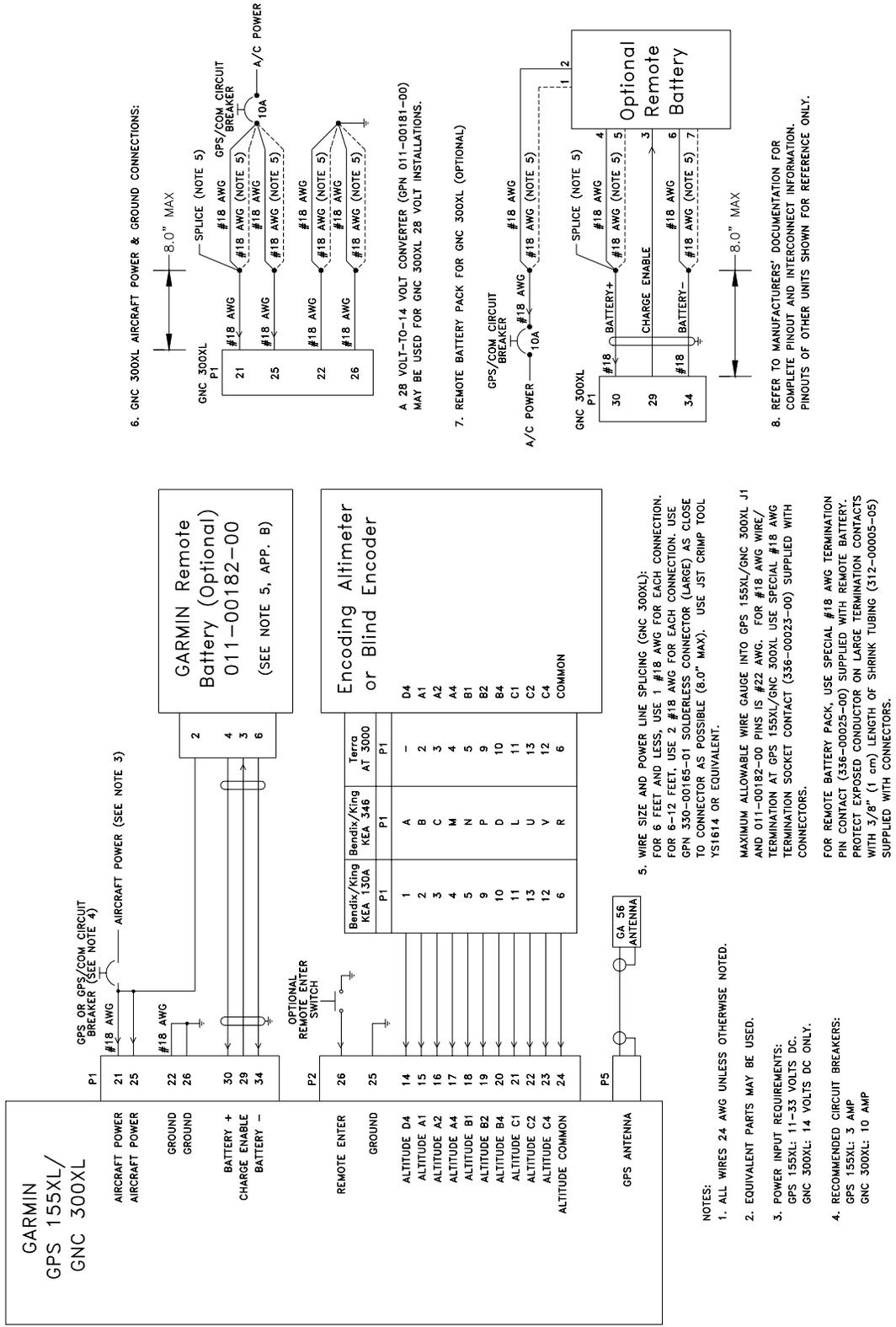
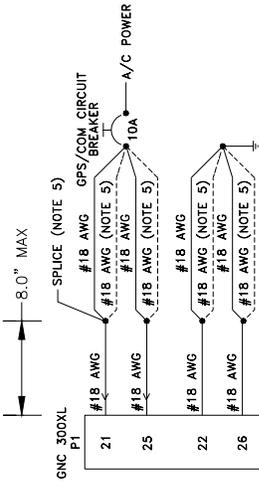


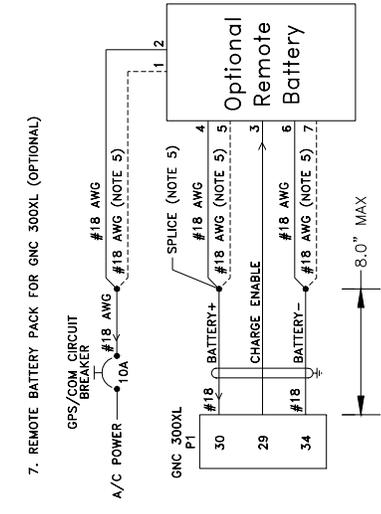
FIGURE 5-3. AVIATION RACK INSTALLATION



6. GNC 300XL AIRCRAFT POWER & GROUND CONNECTIONS:



7. REMOTE BATTERY PACK FOR GNC 300XL (OPTIONAL)

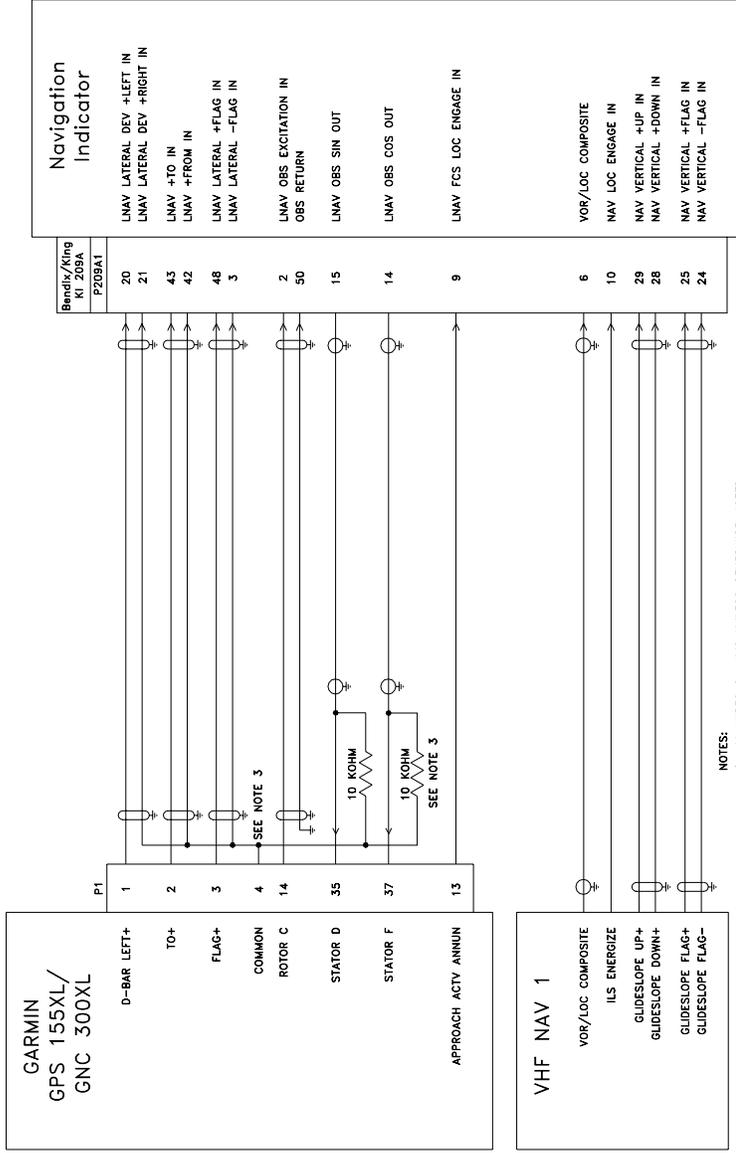


8. REFER TO MANUFACTURERS' DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION. PINOUTS OF OTHER UNITS SHOWN FOR REFERENCE ONLY.

5. WIRE SIZE AND POWER LINE SPLICING (GNC 300XL):
FOR 6 FEET AND LESS, USE 1 #18 AWG FOR EACH CONNECTION. FOR 6-12 FEET, USE 2 #18 AWG FOR EACH CONNECTION. USE GPN 330-00185-01 SOLDERLESS CONNECTOR (LARGE) AS CLOSE TO CONNECTOR AS POSSIBLE (8.0" MAX). USE JST CRIMP TOOL TS1614 OR EQUIVALENT.
- MAXIMUM ALLOWABLE WIRE GAUGE INTO GPS 155XL/GNC 300XL J1 AND 011-00182-00 PINS IS #22 AWG. FOR #18 AWG WIRE/TERMINATION AT GPS 155XL/GNC 300XL USE SPECIAL #18 AWG TERMINATION SOCKET CONTACT (336-00023-00) SUPPLIED WITH CONNECTORS.
- FOR REMOTE BATTERY PACK, USE SPECIAL #18 AWG TERMINATION PIN CONTACT (336-00025-00) SUPPLIED WITH REMOTE BATTERY. PROTECT EXPOSED CONDUCTOR ON LARGE TERMINATION CONTACTS WITH 3/8" (1 cm) LENGTH OF SHRINK TUBING (312-00005-05) SUPPLIED WITH CONNECTORS.

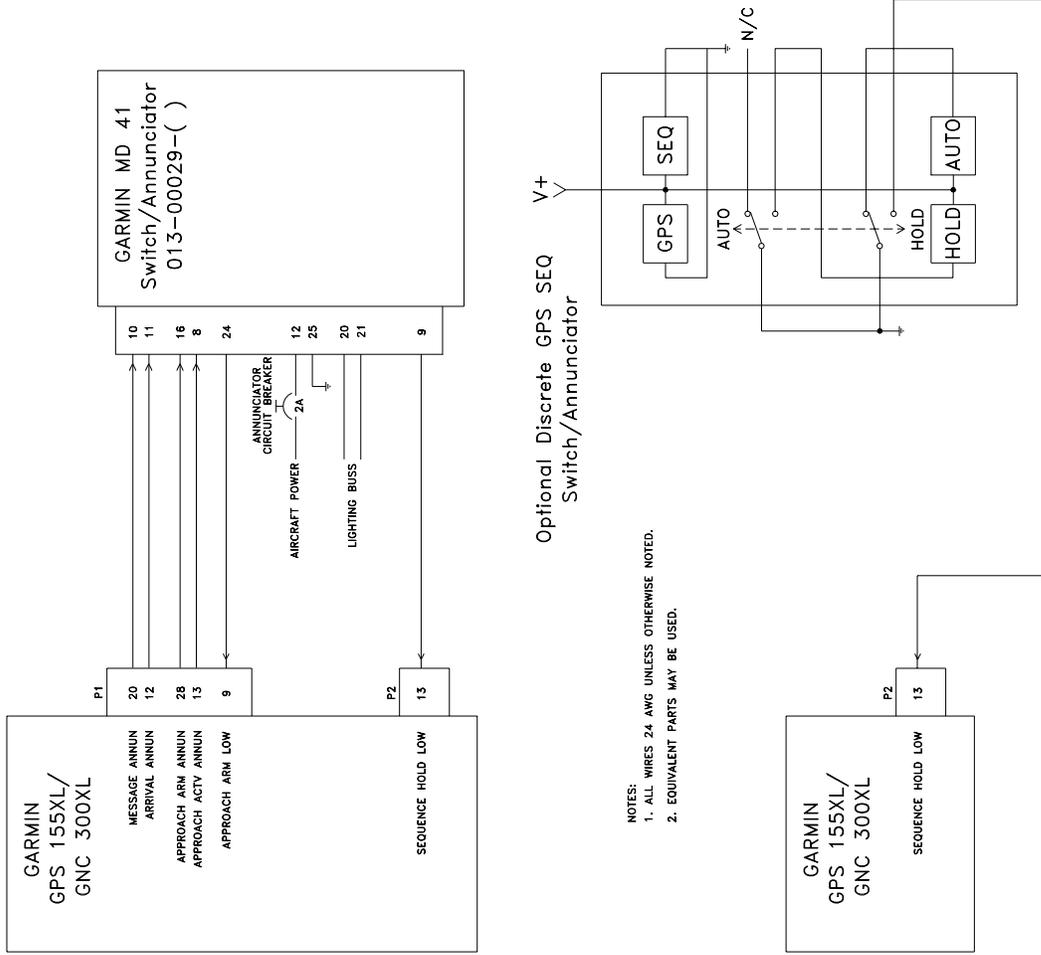
- NOTES:
- ALL WIRES 24 AWG UNLESS OTHERWISE NOTED.
 - EQUIVALENT PARTS MAY BE USED.
 - POWER INPUT REQUIREMENTS:
GPS 155XL: 11-33 VOLTS DC
GNC 300XL: 14 VOLTS DC ONLY.
 - RECOMMENDED CIRCUIT BREAKERS:
GPS 155XL: 3 AMP
GNC 300XL: 10 AMP

FIGURE 5-4 INTERCONNECT WIRING DIAGRAM, REMOTE BATTERY AND ENCODING ALTIMETER CONNECTIONS



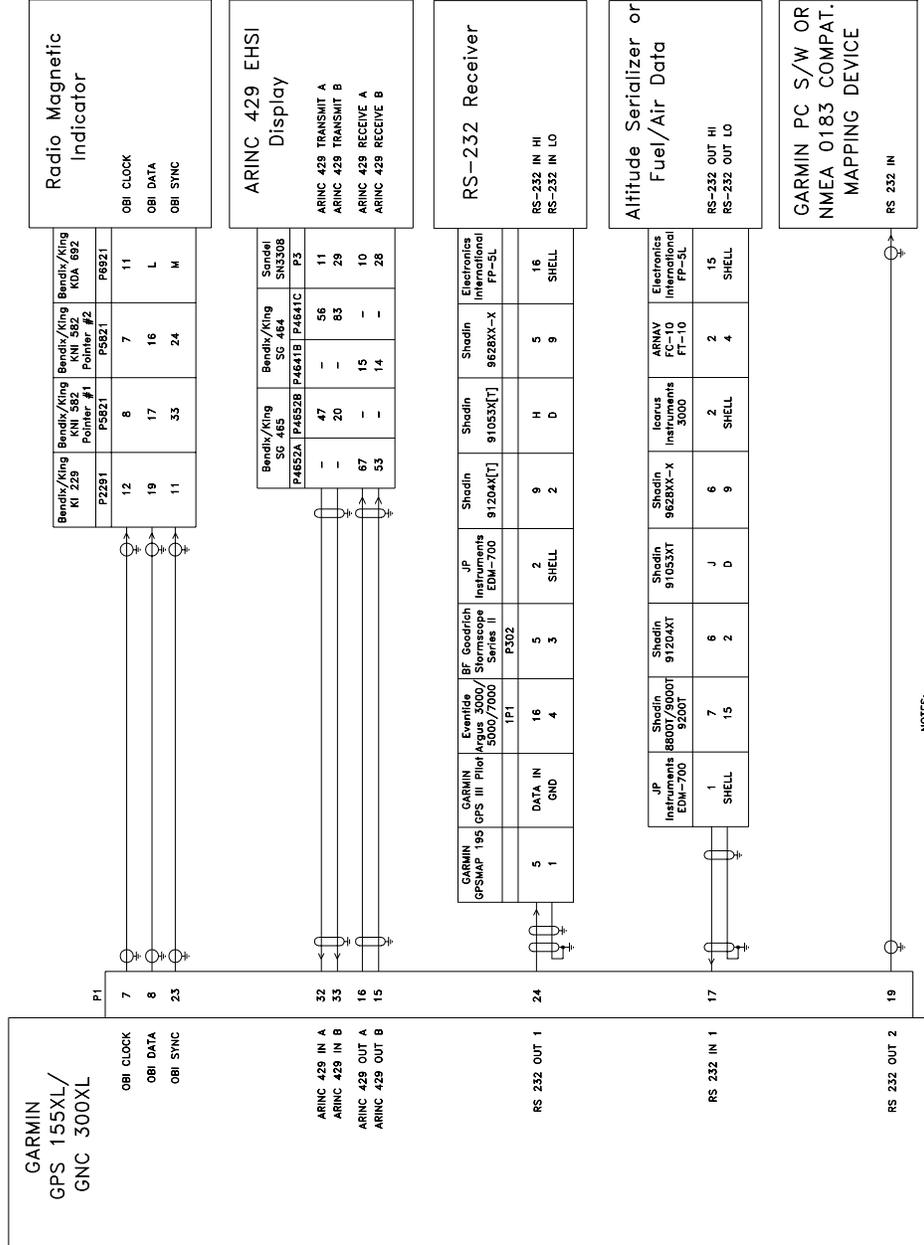
- NOTES:
1. ALL WIRES 24 AWG UNLESS OTHERWISE NOTED.
 2. EQUIVALENT PARTS MAY BE USED.
 3. SIGNAL LINE SPlicing: USE EPN 330-00185-00 SOLDERLESS CONNECTOR (SMALL) TO SPLICE 3 TO 8 #24 AWG WIRES. USE JST CRIMP TOOL YS2216 OR EQUIVALENT.
 4. TO CONNECT THE GPS 155XL OR GNC 300XL TO A KI 209A INDICATOR, ADD TWO 10 KOHM, 1/4 WATT RESISTORS, ONE BETWEEN P1 PINS 35 AND 4, AND ONE BETWEEN P1 PINS 37 AND 4.
 5. REFER TO MANUFACTURERS' DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION. PINOUTS OF OTHER UNITS SHOWN FOR REFERENCE ONLY.

FIGURE 5-6 INTERCONNECT WIRING DIAGRAM, BENDIX/KING KI 209A CONNECTIONS
190-00067-22 REV E PAGE 5-7



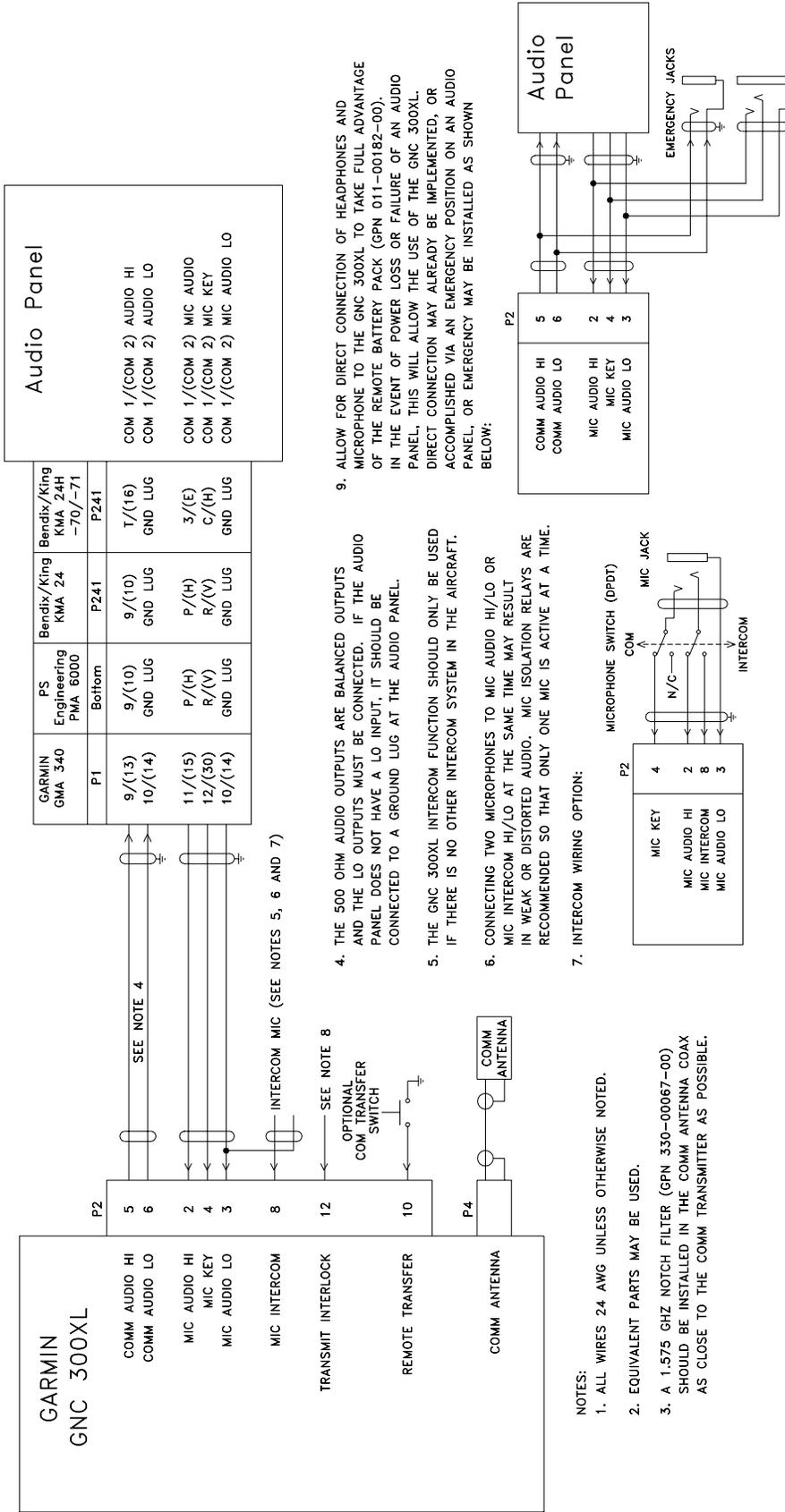
NOTES:
 1. ALL WIRES 24 AWG UNLESS OTHERWISE NOTED.
 2. EQUIVALENT PARTS MAY BE USED.

FIGURE 5-7 INTERCONNECT WIRING DIAGRAM, SWITCH ANNUNCIATOR CONNECTIONS
 190-00067-22 REV E PAGE 5-8



- NOTES:
1. ALL WIRES 24 AWG UNLESS OTHERWISE NOTED.
 2. EQUIVALENT PARTS MAY BE USED.
 3. REFER TO MANUFACTURERS' DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION. PINOUTS OF OTHER UNITS SHOWN FOR REFERENCE ONLY.

FIGURE 5-8 INTERCONNECT WIRING DIAGRAM, OPTIONAL ACCESSORY CONNECTIONS



4. THE 500 OHM AUDIO OUTPUTS ARE BALANCED OUTPUTS AND THE LO OUTPUTS MUST BE CONNECTED. IF THE AUDIO PANEL DOES NOT HAVE A LO INPUT, IT SHOULD BE CONNECTED TO A GROUND LUG AT THE AUDIO PANEL.
5. THE GNC 300XL INTERCOM FUNCTION SHOULD ONLY BE USED IF THERE IS NO OTHER INTERCOM SYSTEM IN THE AIRCRAFT.
6. CONNECTING TWO MICROPHONES TO MIC AUDIO HI/LO OR MIC INTERCOM HI/LO AT THE SAME TIME MAY RESULT IN WEAK OR DISTORTED AUDIO. MIC ISOLATION RELAYS ARE RECOMMENDED SO THAT ONLY ONE MIC IS ACTIVE AT A TIME.
7. INTERCOM WIRING OPTION:
 - CONNECT TRANSMIT INTERLOCK (P2-12) TO THE OTHER TRANSMITTER'S MIC KEY TO MINIMIZE SQUELCH BREAKS ON THE GNC 300XL COM WHEN THE SECOND COM IS KEYED.
9. ALLOW FOR DIRECT CONNECTION OF HEADPHONES AND MICROPHONE TO THE GNC 300XL TO TAKE FULL ADVANTAGE OF THE REMOTE BATTERY PACK (GPN 011-00182-00). IN THE EVENT OF POWER LOSS OR FAILURE OF AN AUDIO PANEL, THIS WILL ALLOW THE USE OF THE GNC 300XL. DIRECT CONNECTION MAY ALREADY BE IMPLEMENTED, OR ACCOMPLISHED VIA AN EMERGENCY POSITION ON AN AUDIO PANEL, OR EMERGENCY MAY BE INSTALLED AS SHOWN BELOW:
10. REFER TO MANUFACTURERS' DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION. PINOUTS OF OTHER UNITS SHOWN FOR REFERENCE ONLY.

FIGURE 5-9 INTERCONNECT WIRING DIAGRAM, AUDIO CONNECTIONS

SECTION 6

CONTINUED AIRWORTHINESS

6.1 CONTINUED AIRWORTHINESS

This section provides assistance to the installing agency in preparing Instructions for Continued Airworthiness (ICA) in response to Bulletin Number HBAW 98-18, "Checklist for Instructions for Continued Airworthiness for Major Alterations Approved Under the Field Approval Process", effective 10/7/98.

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.

Following is a suggested ICA for a GARMIN GPS 155XL or GNC 300XL installation. Some of the checklist items do not apply, in which case they should be marked "N/A" (Not Applicable). In this sample, square braces are used to indicate instances where explicit words should be substituted (e.g., replace "[GPS 155XL/GNC 300XL]" with "GNC 300XL").

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS, GARMIN [GPS 155XL/GNC 300XL]

1. Introduction

[Aircraft that has been altered: Registration (N-) number, Make, Model and Serial Number]

Content, Scope,

Purpose and Arrangement: This document identifies the Instructions for Continued Airworthiness for the modification of the above aircraft by installation of a GARMIN [GPS 155XL/GNC 300XL].

Applicability: Applies to aircraft altered by installation of the GARMIN [GPS 155XL/GNC 300XL].

Definitions and

Abbreviations: None, N/A.

Precautions: None, N/A.

Units of Measurement: None, N/A.

Referenced Publications: GARMIN GPS 155XL/GNC 300XL Installation Manual, P/N 190-00067-22
GARMIN GPS 155XL/GNC 300XL Maintenance Manual, P/Ns 190-00067-25 and 190-00067-35 respectively.
GARMIN STC # [applicable STC number for the specific model installed, refer to Appendix C of this manual].
GARMIN [GPS 155XL/GNC 300XL] Sample Flight Manual Supplement, refer to Section 3, paragraph 3-1 of this manual.
GARMIN [GPS 155XL/GNC 300XL] Pilot's Guide, refer to Section 3, paragraph 3-1 of this manual.

Distribution: This document should be a permanent aircraft record.

2. Description of the Alteration

Installation of the GARMIN GPS 155XL/GNC 300XL, with interface to external altitude encoder and CDI [include other equipment/systems as appropriate]. Refer to Sections 1 and 2, and Figures 5-4 through 5-9 of this manual for interconnect information. Antenna installation, removal and replacement should be in accordance with applicable provisions of AC43.13-1B and 43.13-2A.

3. Control, Operation Information

Refer to the [GPS 155XL/GNC 300XL] Pilot's Guide.

4. Servicing Information

N/A

5. Maintenance Instructions

Maintenance of the [GPS 155XL/GNC 300XL] is 'on condition' only. Periodic maintenance is not required. Refer to the [GPS 155XL/GNC 300XL] Maintenance Manual.

6. Troubleshooting Information

Refer to the [GPS 155XL/GNC 300XL] Maintenance Manual.

7. Removal and Replacement Information

Refer to Section 3 paragraph 3.9 of this manual. If the unit is removed and reinstalled, a functional check of the equipment should be conducted in accordance with Section 4 of this manual.

8. Diagrams

Refer to Sections 5 of this manual.

9. Special Inspection Requirements

N/A

10. Application of Protective Treatments

N/A

11. Data: Relative to Structural Fasteners

Antenna installation, removal and replacement should be in accordance with applicable provisions of AC43.13-1A and 43.13-2A. Also, refer to Sections 1 and 2 of this manual.

12. Special Tools

N/A

13. This Section is for Commuter Category Aircraft Only

A. Electrical loads: Refer to Section 1 of this manual.

B. Methods of balancing flight controls: N/A.

C. Identification of primary and secondary structures: N/A.

D. Special repair methods applicable to the airplane: Antenna installation, removal, and replacement should be in accordance with applicable provisions of AC43.13-1B and 43.13-2A.

14. Overhaul Period

No additional overhaul time limitations.

15. Airworthiness Limitation Section

Refer to the [GPS 155XL/GNC 300XL] Sample Flight Manual Supplement.

16. Revision

To revise this ICA, a letter must be submitted to the local FSDO with a copy of the revised FAA Form 337, and revised ICA. The FAA inspector accepts the change by signing Block 3 and including the following statement:

“The attached revised/new Instructions for Continued Airworthiness (date _____) for the above aircraft or component major alteration have been accepted by the FAA, superseding the Instructions for Continued Airworthiness (date _____).”

17. Assistance

Flight Standards Inspectors have the resources to respond to questions regarding the ICA.

18. Implementation and Record Keeping

For major alterations performed in accordance with FAA field approval policy, the owner/operator operating under Part 91 is responsible for ensuring that the ICA is made part of the applicable section 91.409 inspection program for their aircraft. This is accomplished when a maintenance entry is made in the aircraft's maintenance record in accordance with section 43.9. This entry records the major alteration and identifies the original ICA location (e.g., Block 8 of FAA Form 337, dated _____) along with a statement that the ICA is now part of the aircraft's inspection/maintenance requirements.

APPENDIX A

CERTIFICATION DOCUMENTS

A.1 GENERAL

This section contains the environmental qualification form for the GARMIN GPS 155XL, GNC 300XL, and GA 56 GPS Antenna. The connector changes and STCs are also included.

A.2 ENVIRONMENTAL QUALIFICATION FORM—GPS 155XL and GNC 300XL

NOMENCLATURE: GPS 155XL GPS Airborne RNAV System and GNC 300XL GPS Airborne RNAV/Comm System

TYPE/MODEL/ PART NO.: 011-00412-00 (GPS 155XL), 011-00433-00 (GNC 300XL)

GPS TSO: C129a Class A (1)

VHF COMM TRANSMITTER TSO/JTSO: C37d CLASS 4/2C37e (GNC 300XL)

VHF COMM RECEIVER TSO/JTSO: C38d CLASS 4/2C38e (GNC 300XL)

MANUFACTURER’S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION: 004-00014-00

MANUFACTURER: GARMIN International

ADDRESS: 1200 E. 151st St, Olathe, Kansas 66062

NOTE: The following information provides examples only. It is not intended to be a comprehensive listing of all test conditions. Information is applicable to both the GPS 155XL and the GNC 300XL.

CONDITIONS	SECTION	DESCRIPTION OF CONDUCTED TESTS
Temperature and Altitude	4.0	Equipment tested to Category A1 and D1 except as noted
Low Temperature	4.5.1	
High Temperature	4.5.2, 4.5.3	
In-flight Loss of Cooling	4.5.4	Cooling air not required
Altitude	4.6.1	
Decompression	4.6.2	
Overpressure	4.6.3	
Temperature variation	5.0	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested per DO-160C, Par. 7.2.1
Operational	7.2	Equipment tested per DO-160C, Par. 7.2.1
Crash Safety	7.3	Equipment tested per DO-160C, Par. 7.2.1
Vibration	8.0	Equipment tested without shock mounts to Categories B, M, and N (Table 8-1)
Explosion	9.0	Equipment identified as Category X, no test required
Waterproofness	10.0	Equipment identified as Category S
Fluids Susceptibility	11.0	Equipment identified as Category X, no test required
Sand and Dust	12.0	Equipment identified as Category X, no test required
Fungus	13.0	Equipment identified as Category X, no test required
Salt Spray	14.0	Equipment identified as Category X, no test required
Magnetic Effect	15.0	Equipment tested is class Z
Power Input	16.0	Equipment tested to Category B

Voltage Spike	17.0	Equipment tested to Category A
Audio Frequency Susceptibility	18.0	Equipment tested to Category B
Induced Signal Susceptibility	19.0	Equipment tested to Category A
Radio Frequency Susceptibility	20.0	Equipment tested to Category T
Radio Frequency Emission	21.0	Equipment tested to Category Z
Lightning Induced Transient Susceptibility	22.0	Equipment identified as Category XXXX, no test required
Lightning Direct Effects Test	23.0	Equipment identified as Category 2A
Icing	24.0	Equipment identified as Category C
Other Tests:		
Remarks:		

A.3 ENVIRONMENTAL QUALIFICATION FORM—GA 56 GPS AVIATION ANTENNA

NOMENCLATURE: GA 56, GPS Aviation Antenna

TYPE/MODEL/ PART NO.: 011-00134-00 (Stud Mount)
011-00147-00 (Flange Mount)

TSO: C129 Class A (1)

MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION: 004-00015-00

MANUFACTURER: GARMIN International

ADDRESS: 1200 E. 151st St, Olathe, Kansas 66062

NOTE: The following information provides examples only. It is not intended to be a comprehensive listing of all test conditions.

CONDITIONS	SECTION	DESCRIPTION OF CONDUCTED TESTS
Temperature and Altitude	4.0	Equipment tested to Category F2
Low Temperature	4.5.1	
High Temperature	4.5.2, 4.5.3	
In-flight Loss of Cooling	4.5.4	Cooling air not required
Altitude	4.6.1	
Decompression	4.6.2	Not Tested
Overpressure	4.6.3	Not Tested
Temperature variation	5.0	Equipment tested to Category A
Humidity	6.0	Equipment tested to Category C
Shock	7.0	Equipment tested per DO-160C, Par. 7.2.1
Operational	7.2	
Crash Safety	7.3	Not Applicable
Vibration	8.0	Equipment tested without shock mounts to Categories C, L, M and Y (Table 8-1)

Explosion	9.0	Equipment identified as Category X, no test required
Waterproofness	10.0	Equipment identified as Category S, no test required
Fluids Susceptibility	11.0	Equipment tested to category F with Ethlene Glycol De-Icing Fluid
Sand and Dust	12.0	Equipment identified as Category X, no test required
Fungus	13.0	Equipment identified as Category X, no test required
Salt Spray	14.0	Equipment identified as Category X, no test required
Magnetic Effect	15.0	Equipment identified as Category X, no test required
Power Input	16.0	Equipment identified as Category X, no test required
Voltage Spike	17.0	Equipment identified as Category X, no test required
Audio Frequency Susceptibility	18.0	Equipment identified as Category X, no test required
Induced Signal Susceptibility	19.0	Equipment identified as Category A, no test required
Radio Frequency Susceptibility	20.0	Equipment identified as Category T, no test required
Radio Frequency Emission	21.0	Equipment identified as Category Z, no test required
Lightning Induced Transient Susceptibility	22.0	Equipment identified as Category X, no test required
Lightning Direct Effects Test	23.0	Equipment identified as Category 2A, no test required
Icing	24.0	Equipment identified as Category C, no test required
Other Tests:		
Remarks:		

APPENDIX B

CONNECTOR CHANGES

B.1 REMOTE BATTERY PIN ASSIGNMENTS

A change was made to the remote battery connectors starting with serial numbers 33050055. Units with lower serial numbers have pin contacts on the battery pack. Units 33050055 and up use socket contacts on the battery, and the pin numbers are different, however the individual contact locations are unchanged. The following table shows the pin assignments for the two different types of connectors.

Unit Serial Number	Below 33050055	33050055 and up
remote batt.	pins	sockets
mating plug	sockets	pins
function	contact number	contact number
battery +	1	5
battery +	2	4
charge enable	3	3
aircraft power	4	2
aircraft power	5	1
no connection	6	9
no connection	7	8
ground	8	7
ground	9	6

APPENDIX C

STC PERMISSION

C.1 GPS 155XL

Consistent with N8110.69 or Order 8110.4, Aviation Authority approved installers are hereby granted permission to use STC # SA00639WI data to modify aircraft.

C.2 GNC 300XL

Consistent with N8110.69 or Order 8110.4, Aviation Authority approved installers are hereby granted permission to use STC # SA00640WI data to modify aircraft.

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

Supplemental Type Certificate

Number SA00639WI

This certificate issued to Garmin International
1200 E. 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 herein meets the airworthiness requirements of Part 3 of the Civil Air Regulations.

Original Product - Type Certificate Number : A350
Make : Piper
Model : PA-32

Description of Type Design Change:

Installation of the GARMIN GPS 155XL GPS Receiver in accordance with (1) GARMIN Master Drawing List, Drawing No. 005-00086-00, Revision D, dated February 11, 1998, and (2) FAA Approved Flight Manual Supplement for Piper PA32 with GARMIN GPS 155XL GPS Receiver, Document No. 190-00067-23, Revision A, dated March 12, 1998, or later FAA approved revision to (1) or (2).

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.

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 : October 13, 1997

Date received :

Date of issuance : March 16, 1998

Date amended :



By direction of the Administrator

Jose R. Flores
(Signature)

Jose R. Flores
Senior Electrical/Avionics Engineer
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(10-89)

PAGE 1 of 1 PAGES

This certificate may be transferred in accordance with FAR 21.47.

United States of America
Department of Transportation -- Federal Aviation Administration
Supplemental Type Certificate

Number SA00640WI

This certificate issued to Garmin International
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 herein meets the airworthiness requirements of Part 3 of the Civil Air Regulations.

Original Product - Type Certificate Number : A350
Make : Piper
Model : PA-32

Description of Type Design Change:

Installation of GARMIN GNC 300XL VHF Communication Transceiver / GPS Receiver in accordance with (1) Garmin Corporation Master Drawing List, Drawing No. 005-00085-00, Revision D, dated February 11, 1998, and (2) FAA Approved Airplane Flight Manual Supplement for Piper PA32 with GARMIN GNC 300XL VHF Communication Transceiver / GPS Receiver, Document No. 190-00067-33, Revision A, dated March 12, 1998, or later FAA approved revision to (1) or (2).

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.

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.

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By direction of the Administrator

Jose R. Flores
(Signature)

Jose R. Flores
Senior Electrical/Avionics Engineer
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 1 PAGES

This certificate may be transferred in accordance with FAR 21.47.