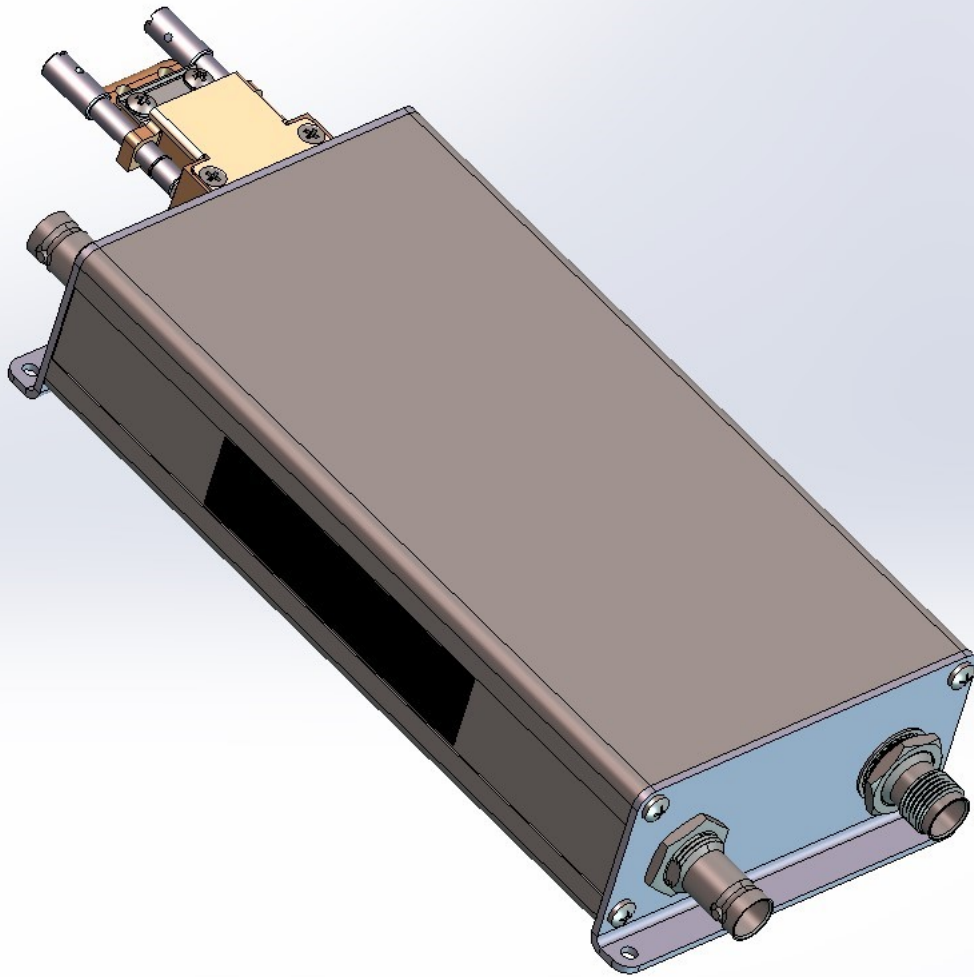




GDL 82 TSO Installation Manual



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Record of Revisions

REVISION	REVISION DATE	CHANGE DESCRIPTION
6	01/21/2020	Updated support links to Garmin's website.
5	03/08/2018	Updated PC requirements, USB cable length, and discrete input information.
4	01/17/2018	Updated figure 5-1 J821 connector.
3	12/08/2017	Updated ADS-B In receiver descriptions.
2	10/12/2017	Updated software and CLD part numbers.
1	09/19/2017	Initial release.

Current Revision Change Description

SECTION	CHANGE DESCRIPTION
1.2.1	Added instructions to download EQF.
8.2.1	Added instructions to download sample version of FMS.

Manual Layout

The aim of this installation manual is to provide clear and concise guidance in a layout designed to follow the logical order of a typical GDL 82 installation.

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.

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DEFINITIONS OF WARNINGS, CAUTIONS, AND NOTES



WARNING

A WARNING MEANS INJURY OR DEATH IS POSSIBLE.



CAUTION

A CAUTION MEANS THAT DAMAGE TO THE EQUIPMENT IS POSSIBLE.



NOTE

A note provides additional 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 WEBSITE AT WWW.GARMIN.COM/PROP65.



WARNING

PERCHLORATE MATERIAL – SPECIAL HANDLING MAY APPLY. REFER TO WWW.DTSC.CA.GOV/HAZARDOUSWASTE/PERCHLORATE.



CAUTION

TO AVOID DAMAGE TO THE GDL 82 UNIT, TAKE PRECAUTIONS TO PREVENT ELECTRO-STATIC DISCHARGE (ESD) WHEN HANDLING THE UNIT, CONNECTORS, AND ASSOCIATED WIRING. ESD DAMAGE CAN BE PREVENTED BY TOUCHING AN OBJECT THAT IS OF THE SAME ELECTRICAL POTENTIAL AS THE GDL 82 UNIT BEFORE HANDLING THE GDL 82 ITSELF.



NOTE

All screen shots used in this document are current at the time of publication. Screen shots are intended to provide visual reference only. All information depicted in screen shots, including software file names, versions, and part numbers, is subject to change and may not be up to date.

Acronyms and Initialisms

A	
ADS-B	Automatic Dependent Surveillance - Broadcast
AFMS	Aircraft Flight Manual Supplement
AGC	Automatic Gain Control
API	Appliance Project Identifier
C	
CFR	Code of Federal Regulation
D	
DAL	Design Assurance Level
DME	Distance Measuring Equipment
E	
EAR	Export Administration Regulations
EASA	European Aviation Safety Agency
EGNOS	European Geostationary Navigation Overlay Service
ELT	Emergency Locator Transmitter
EQF	Environmental Qualification Form
ETSO	European Technical Standard Order
F	
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FCC	Federal Communications Commission
FMS	Flight Manual Supplement
G	
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
H	
HDOP	Horizontal Dilution of Precision
HPL	Horizontal Protection Level
HFOM	Horizontal Figure of Merit
I	
ICAO	International Civil Aviation Organization
L	
LAT	Latitude
LON	Longitude
LRU	Line Replaceable Unit

N	
NAS	National Airspace System
P	
POH	Pilot Operating Handbook
PVT	Position, Velocity, and Time
R	
RFMS	Rotorcraft Flight Manual Supplement
S	
SATCOM	Satellite Communications
SBAS	Satellite-Based Augmentation System
T	
TAS	Traffic Advisory System
TCAS	Traffic Alert and Collision Avoidance System
TNC	Threaded Neill-Concelman
TSO	Technical Standard Order
U	
UAT	Universal Access Transceiver
UHF	Ultra-High Frequency
USB	Universal Serial Bus
UTC	Universal Time Coordinated
V	
VDOP	Vertical Dilution of Precision
VFOM	Vertical Figure of Merit
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
W	
WAAS	Wide Area Augmentation System

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1 TSO & System Information

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1.1 Certification

This installation manual provides mechanical and electrical information necessary to install the GDL 82. It is not equivalent to an approved airframe-specific maintenance manual, installation design drawing, or installation data package. The content of this manual assumes use by competent and qualified personnel using standard maintenance procedures in accordance with Title 14 of the Code of Federal Regulation and other related accepted procedures.

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

The Appliance Project Identifier (API) for the GDL 82 is GMN-01560. The API has been used for project identification with the FAA.

It is the installer's responsibility to ensure the ADS-B Out system is compliant with 14 CFR 91.227 and to ensure compatibility between the GDL 82 and the ADS-B Out position source equipment. Refer to *Garmin ADS-B Out Compatible Equipment*, for compatible equipment shown to be eligible for 14 CFR 91.227-compliant installations in accordance with AC 20-165B.

Table 1-1 TSO Authorization

GDL 82	GDL 82 W/ GPS/SBAS	FUNCTION	TSO/ETSO/ SAE/RTCA/ EUROCAE	CLASS/TYPE
	X	Airborne Navigation Sensors Using the Global Position System (GPS) Augmented by the Satellite Based Augmentation System (SBAS)	TSO-C145d DO-229D	B2
X	X	Universal Access Transceiver (UAT) Automatic Dependent Surveillance-Broadcast (ADS-B) Equipment Operating on Frequency of 978 MHz	TSO-C154c DO-282B	B1S

Table 1-2 Applicable P/Ns

DESCRIPTION	P/NS
System Software	006-B2343-00 through -0()
GPS/SBAS Software	006-B1827-00 through -0()
CLD/FPGA	006-C0177-22 through -2()
GPS/WAAS ASIC	590-00039-02 through -0()

Table 1-3 System Functions

SYSTEM FUNCTION	DO-178B DAL	DO-254 DAL
GPS/SBAS [1]	B	B [2]
UAT Transmission	B	C
Transponder Self-Interrogation	B	C
L-Band Suppression	N/A	C
System Failure Annunciation	B	N/A
Anonymous Mode	B	C

[1] GPS/SBAS is only used internally for UAT.

[2] GPS ASIC developed to DO-178B level B equivalent process.

Table 1-4 TSO Deviations

TSO	DEVIATION
TSO-C145d	1. Garmin was granted a deviation from RTCA/DO-229D Section 2.1.1.10 to use GPS antennas that meet Garmin minimum performance specifications instead of DO-301 qualified antennas.
TSO-C154c	1. Garmin was granted a deviation from RTCA/DO-282B paragraph 2.2.4.5.2.5.1.e that specifies the use of only ground speed in determining the Vertical Status of light aircraft.
	2. Garmin was granted a deviation from RTCA/DO-282B section 2.2.4.5.4.15 to not provide installers with a configuration option to enable or disable Call Sign Identification (CSID) Logic.
	3. Garmin was granted a deviation from RTCA/DO-282B section 2.2.12 to not provide a suppression bus output.
	4. Garmin was granted a deviation from RTCA/DO-282B section 2.2.7.1a Table 2-63 Line 15 to not accept barometric vertical rate input.

Table 1-5 FCC and IC IDs

MODEL	FCC ID	IC ID
GDL 82	IPH-02929	N/A

1.2 Reference Documents

Table 1-6 Garmin Reference Documents

DOCUMENT	P/N
<i>14 CFR 91.227 Garmin ADS-B Out Compatible Equipment</i>	190-01533-00
<i>GA 35, GA 36, GA 37 Antenna Installation Instructions</i>	190-00848-00
<i>GDL 82 Environmental Qualification Form</i>	005-01008-20
<i>GDL 82 Pilot Quick Start Guide</i>	190-01810-13

Table 1-7 Industry Reference Documents

DOCUMENT	P/N
<i>Airworthiness Approval of Automatic Dependent Surveillance - Broadcast OUT Systems</i>	AC 20-165B
<i>Airworthiness Approval of Global Navigation Satellite System (GNSS) Equipment</i>	AC 20-138D
<i>Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair</i>	AC 43.13-1B
<i>Acceptable Methods, Techniques, and Practices - Aircraft Alterations</i>	AC 43.13-2B
<i>Radio Specifications Standard 102</i>	RSS-102

1.2.1 Environmental Qualification Form

It is the responsibility of the installing agency to obtain the EQF necessary for the GDL 82. To download EQF:

1. Go to [garmin.com](https://support.garmin.com/en-US/?partNumber=010-01560-31&tab=manuals) (https://support.garmin.com/en-US/?partNumber=010-01560-31&tab=manuals).
2. Select "Appliance Data" from drop-down menu.
3. Select "GDL 82 Environmental Qualification Form."

1.2.2 Continued Airworthiness

Maintenance of the GDL 82 is "on condition" only. For regulatory periodic functional checks, refer to the approved aircraft maintenance manuals or manual supplements. Test according to 14 CFR §91.411, 91.413, and Part 43 Appendix F. The aircraft must be returned to service in a means acceptable to the appropriate aviation authority.

1.2.3 License Requirements



CAUTION

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

The Telecommunications Act of 1996, effective February 8, 1996, provides the FCC discretion to eliminate radio station license requirements for aircraft and ships. GDL 82 installations must comply with current transmitter licensing requirements. In the US, to find out the specific details on whether a particular installation is exempt from licensing, please visit the FCC website <http://wireless.fcc.gov/aviation>. If an aircraft license is required, submit an application for a license on FCC form 404. To provide forms by fax the FCC also has a fax-on-demand service. Outside the US, contact the responsible telecommunication authority. The GDL 82 owner accepts all responsibility for obtaining the proper licensing before using the transceiver. The maximum transmitting power, modulation identification, and frequency band information may be required for licensing and are detailed in section 2.2.

1.3 System Limitations

L-Band Antenna

The GDL 82 transmitter is limited to using antennas meeting the requirements as specified in section 4.4.1.

GPS/SBAS Antenna

The GDL 82 internal GPS/SBAS receiver is required to use one of the GPS/SBAS antennas listed in section 4.4.2.

Mode S Transponder

The GDL 82 should not be installed with a Mode S transponder.

2 System Specification and Functionality

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2.1 System Functionality

The GDL 82 is a remote-mounted unit that contains a 978 MHz transmitter, a 1090 MHz receiver, and a 1030 MHz transmitter. This unit transmits ownship Automatic Dependent Surveillance-Broadcast (ADS-B) data through the UAT data link. It interrogates connected transponders for Mode 3/A squawk code, IDENT status, and pressure altitude. The GDL 82 with GPS/SBAS includes an internal GPS/SBAS receiver. This receiver allows the unit to function as its own position source for the ADS-B Out message, when an approved position source interface is not installed. Operation of the GDL 82 with internal GPS/SBAS receiver depends on the performance of the GPS/SBAS antenna.

The GDL 82 Series consists of the following variations:

- GDL 82
- GDL 82 with GPS/SBAS

2.1.1 Anonymous Mode

In anonymous mode, the GDL 82 transmits a temporary address instead of the aircraft’s assigned ICAO address code, and a temporary Flight ID.

2.2 Unit Specifications

Table 2-1 GDL 82 Physical Specifications

CHARACTERISTICS	SPECIFICATIONS
Width	3.39 in (85.98 mm)
Height	1.48 in (37.49 mm)
Depth (unit only)	7.99 in (202.90 mm)
GDL 82 weight (unit only)	0.90 lbs (0.41 kg)
GDL 82 weight (installed with connectors)	0.99 lbs (0.45 kg)
GDL 82 with GPS/SBAS weight (unit only)	1.13 lbs (0.51 kg)
GDL 82 with GPS/SBAS weight (installed with connectors)	1.22 lbs (0.55 kg)
Connector kit weight	0.09 lbs (0.04 kg)
Operating temperature range	-45°C to +70°C
Humidity	95% at 65°C
Maximum pressure altitude [1]	55,000 ft
Input Voltage range	9 to 33 VDC

[1] UAT is restricted to 18,000 feet.

Table 2-2 GDL 82 Power Specifications

UNIT	14 VOLT CURRENT DRAW		28 VOLT CURRENT DRAW	
	TYPICAL	MAXIMUM	TYPICAL	MAXIMUM
GDL 82	0.35 A	0.4 A	0.20 A	0.25 A
GDL 82 with GPS/SBAS	0.45 A	0.5 A	0.25 A	0.30 A

Table 2-3 GPS/SBAS Specifications

CHARACTERISTICS	SPECIFICATIONS
Number of channels	15 (12 GPS and 3 GPS/SBAS)
Frequency	1575.42 MHz L1, C/A code
Sensitivity (acquisition, no interference)	-134.5 dBm GPS
	-135.5 dBm SBAS
Sensitivity (drop lock)	-144 dBm
LAT/LON position accuracy	<1.25 meter RMS horizontal, <2 meter vertical, with SBAS
Velocity	1165 knots (600 meters/second) maximum
TTFF (Time To First Fix)	2:20 min. typical with current almanac and position
Reacquisition	10 seconds typical
Position update interval	0.2 sec (5 Hz)
Time mark	±275 Nsec of UTC second
Datum	WGS-84
SATCOM compatibility	Dependent upon antenna selection
Antenna power supply	35 mA typical, 40 mA max at 4.7 VDC ± 0.1 VDC nominal, minimum 4.3 VDC with 60 mA load

Table 2-4 978 MHz UAT Specifications

CHARACTERISTICS	SPECIFICATIONS [1]
Frequency	978.00 MHz
Transmit power	40 W (+46 dBm)
Frequency tolerance	±20 PPM
Modulation	Continuous phase FSK, h = 0.6, raised cosine shaping, a = 0.5
Data rate	1.04 Mbps
99% power bandwidth	1.3 MHz
60 dB bandwidth	3.3 MHz (estimated)

[1] As measured at the ANT RF connector.

Table 2-5 1030 MHz Transmitter Specifications

CHARACTERISTICS	SPECIFICATIONS [1]
Frequency	1030 MHz
Transmit power	-53 dBm
Frequency tolerance	± 20 kHz

[1] As measured at the XPDR RF connector.

Table 2-6 1090 MHz Receiver Specifications

CHARACTERISTICS	SPECIFICATIONS [1]
Frequency	1090 MHz
Frequency tolerance	± 5 MHz
Modulation	Binary pulse-position
Data rate	1 Mbps
Sensitivity	+25 dBm for 90% MSR

[1] As measured at the XPDR RF connector.

2.3 System Interface

For interconnect details, refer to section 10.

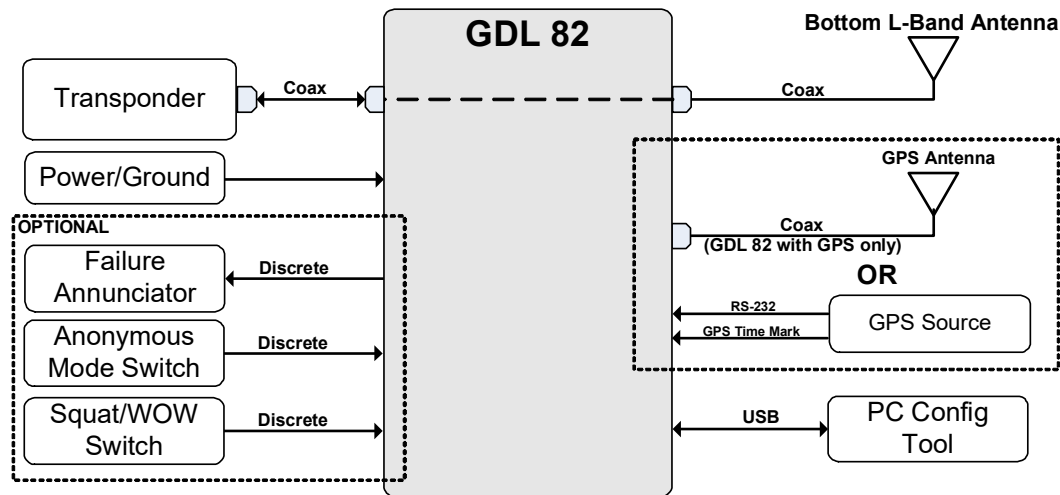


Figure 2-1 System Interfaces

Table 2-7 GDL 82 Interface Summary

INTERFACE	QUANTITY
RS-232	1
Discrete active low inputs	2
Discrete active low output	1
External GPS time mark input	1
USB data port (for configuration and checkout through PC)	1

3 Installation Materials

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This section describes hardware equipment required for GDL 82 installations. Installation should follow the aircraft TC or STC requirements. The installing agency fabricates the wire harness to fit each aircraft. For retro-fit installations, AC 43.13-1B and AC 43.13-2B guidance may be useful.

3.1 GDL 82 Materials

Table 3-1 GDL Part Numbers

MODEL	UNIT ONLY KIT	STANDARD KIT	UNIT P/N
GDL 82	010-01560-00	010-01560-01 [1]	011-03946-00
GDL 82 with GPS/SBAS	010-01560-30	010-01560-31 [2]	011-03946-40

[1] Includes GDL 82 and connector kit.

[2] Includes GDL 82, GA35 antenna, and connector kit.

Table 3-2 Installation Materials included in Standard Kit

ITEM	P/N
Connector Kit	011-03945-00

Table 3-3 Socket Contact Part Numbers

WIRE GAUGE	22-28 AWG
Garmin P/N	336-00021-00
Military P/N	M39029/58-360 [1]

[1] Part numbers not provided by Garmin are subject to change without notice.

Table 3-4 GA 35 Antenna Garmin P/N 013-002035-00

ITEM	P/N	QTY
GA 35 GPS/ WAAS Antenna [1]	013-00235-00 (Garmin)	1
	AT575-93G (Aero Antenna)	

[1] Antenna includes 8-32 x 1.00" SS mounting screws (qty 4) and O-ring (qty 1).

An antenna doubler may also be required. Refer to the applicable antenna installation data.

3.2 Optional Accessories

Table 3-5 Optional Accessories

ITEM	GARMIN P/N	MFG P/N
Annunciator, 14VDC	N/A	<ul style="list-style-type: none"> Light, indicator, press-to-test, small, MS25041-4 Lamp, T-1 3/4, midget flange, MS25237-330
Annunciator, 28VDC	N/A	<ul style="list-style-type: none"> Light, indicator, press-to-test, small, MS25041-4 Lamp, T-1 3/4, midget flange, MS25237-327
Connector, BNC, Male, Clamp	330-00087-00	N/A
Connector, TNC, Male, Clamp	N/A	Amphenol: 031-4452 Not available from Garmin.
GPS 1.57542 GHz Notch Filter	330-00067-00	N/A

Vendor Contact Information (provided for convenience only):

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

3.3 Materials Required but not Supplied

The GDL 82 is intended for use with standard aviation accessories. The following items are required for installation, but not supplied.



NOTE

If using MIL-W-22759/18, support and protect the wire.

1. Wire (MIL-W-22759/16 or equivalent)
2. Shielded wire (MIL-C-27500 or equivalent)
3. Mounting screws
4. Push/pull (manually resettable) circuit breaker
5. Tie wraps or lacing cord
6. Ring terminals (for grounding)
7. Coaxial cable (RG-400, RG-142B, or equivalent) and connectors
8. USB-A to USB-B cable (for interface between the computer USB-A receptacle and the GDL 82 USB-B receptacle)

3.4 Special Tools

The following special tools are required for building the harness.

3.4.1 Milliohm Meter

A milliohm meter with an accuracy of ± 0.1 milliohm (or better) to perform continuity and power/ground checks.

3.4.2 Crimp Tool

A crimp tool meeting MIL specification M22520/2-01 and a positioner/locator are required to ensure consistent, reliable crimp contact connections for the D-Sub connector. D-sub insertion/extraction tools from ITT Cannon are all plastic, others are plastic with metal tip.

Table 3-6 Recommended Crimp Tools

MANUFACTURER	HAND CRIMPING TOOL	22 – 28 AWG (P821)	
		POSITIONER	INSERTION/ EXTRACTION TOOL
Military P/N	M22520/2-01	M22520/2-09	M81969/14-01 M81969/1-04
Positronic	9507-0-0-0	9502-4-0-0	M81969/1-04
ITT Cannon	995-0001-582	995-0001-739	000829490 274-7048-000MIL
AMP	601966-1	601966-6	91067-1 2031838-1
Daniels	AFM8	K42	M81969/14-01 M81969/1-04
Astro	615717	615725	M81969/14-01 M81969/1-04

3.4.3 Test Equipment

The following equipment is required for the pre and post installation checks.

- Ground power source (capable of powering all aircraft systems)
- Transponder ramp test set (e.g., Aeorflex IFR-6000 or TIC TR-220)
- ADS-B test set (e.g., Garmin GDL 39 and Garmin Pilot application) if a transponder ramp test set is not capable of receiving UAT (978 MHz) ADS-B Out messages

4 Installation Planning and Considerations

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This section provides GDL 82 considerations and requirements for selecting the proper installation locations, supporting structure, electrical wiring, and antenna mounting.

4.1 Installation Requirements

The GDL 82 requires the following minimum installation.

- GDL 82
- L-Band antenna
- GPS/SBAS position source
- Transponder (pressure altitude, squawk code, and Ident Status source)

4.2 Pre-Installation Transponder Check

Use a ramp tester to verify the existing transponder system's peak output power and receiver sensitivity is compatible with the GDL 82 before installation. The GDL 82 introduces up to 1.5 dB loss in the transmission line as measured at the antenna output.

Table 4-1 Pre-Installation Check

STEP	DESCRIPTION	NOTES
1.	Determine the RF Peak Output Power and Receiver Sensitivity IAW Part 43, Appendix F for the existing transponder system. Record the observed values of RF Peak Output Power and Receiver Sensitivity.	RF Peak Output Power: _____ Class A: > 21.0 dBw (125 watts) Class B: > 18.5 dBw (70 watts) Receiver Sensitivity (MTL): _____ Any Class: MTL = -73 ±4 dBm
2.	Subtract the anticipated maximum loss (1.5 dB) from the peak output power and add 1.5 dB to the sensitivity values determined in Step 1.	<Output Power> dBw - 1.5dB = _____dBw <Sensitivity> dBm + 1.5dB = _____dBm
3.	Verify that the peak output power and sensitivity meet the required minimums.	Peak Output Power: Class A: > 21.0 dBw (125 watts) Class B: > 18.5 dBw (70 watts) Receiver Sensitivity (MTL): Any Class: MTL = -73 ±4 dBm

Consider the following modifications to help reduce loss in the transponder system, if the results of the procedure in table 4-1 do NOT meet the minimum performance specifications of Part 43, Appendix F. Any of the steps, or their combination, can be used.

**NOTE**

Performance of any or all of the following recommendations does not necessarily ensure compliance with 14 CFR §43, Appendix F.

- Replace transponder coaxial cable and connectors with MIL-C-17 type F low-loss cable (e.g., RG-400 or RG-393). For older installations it may be necessary to replace the existing coaxial cable assembly with a low-loss cable type to pass the transponder ramp check in accordance with Part 43, Appendix F. Refer to section 6.2 for specifications of recommended coaxial cable.
- Ensure the existing transponder and L-Band antenna are properly installed in accordance with manufacturer's specifications (e.g., units are properly grounded, the coaxial cables are adequately routed and that the L-Band antenna ground plane is appropriate). Any corrosion in the coaxial cable connection, or ground plane will diminish performance.
- Ensure the existing L-Band antenna meets the minimum performance specifications. New L-Band antenna maybe required. Refer to section 4.4.1 for specifications of acceptable L-Band antenna.
- Due to the nature of antenna radiation patterns, nulls or marginal conditions may be observed when measuring a utilized radiated signal from the aircraft. In these cases, tests from different positions should be performed to determine an acceptable angle for measurement.
- If the existing transponder is Class A (i.e., operational ceiling is > 15,000 feet), but the results of the existing transponder system check meet only the requirements for Class B equipment (i.e., operational ceiling is < 15,000 feet), the operating ceiling can be limited to 15,000 feet MSL if deemed acceptable. This method does not affect the transponder's equipment certification, but it does limit the aircraft's operating ceiling based on the overall system performance specifications under 14 CFR §91.215. Placards and/or an entry in the aircraft's AFMS specifying the limitation must be made.

4.3 GDL 82 External Sensors and Devices

ADS-B equipment requires GPS/SBAS data for ADS-B Out transmissions. The following GPS/SBAS data sources (and their software versions) may be used with the GDL 82:

- GDL 82 internal GPS/SBAS with approved GPS antenna
- GTN 6XX/7XX series navigators with software v6.21 or later
- GNS 4XXW/5XXW series navigators with software v5.30 or later
- GNS 480 navigator with software v2.4 or later

4.4 Antenna Requirements

4.4.1 L-Band Antenna



NOTE

Certain types of transponder antennas with thin radiator elements are intended for use at 1030 and 1090 MHz. Evaluate these antennas on a model-by-model basis to determine their suitability as UAT data link antennas.

The GDL 82 requires the existing L-Band Ultra-High Frequency (UHF) antenna(s) meet the following specifications:

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

The antenna location should be:

1. Away from major protrusions.
2. As far away as practical from openings that can affect the radiation pattern (e.g., landing gear doors, access doors, etc.).
3. At least 20 inches from any other transponder, TAS/TCAS, DME, or 1030/1090 MHz antennas.

Table 4-2 Acceptable L-Band Antennas

MANUFACTURER	PART NUMBER	MODEL/ DESCRIPTION	CONNECTOR TYPE	NOTES
Aero Antenna	AT130-16	DME Transponder	TNC	DC Grounded
Comant	CI-100 [1]	DME Transponder	BNC	Open Circuit
	CI-100-2 [1]	DME Transponder	TNC	Open Circuit
	CI-105 [1]	DME Transponder	BNC	Open Circuit
	CI-105-3 [1]	DME Transponder	BNC	Open Circuit
	CI-105-16 [1]	DME Transponder	BNC	Open Circuit
	CI-110-40-30	DME Transponder	C	Open Circuit
	CI-110-41-30	DME Transponder	C	DC Grounded
	CI-110-60-30	DME Transponder	C	Open Circuit
	CI-110-61-30	DME Transponder	C	DC Grounded
Dayton-Granger	L10-611-()	L-Band Blade	Varies	DC Grounded
Garmin	590-0052 or 013-00219-00 [1]	A-40	TNC	Open Circuit
	590-0051 or 013-00174-00	A-41	TNC	DC Grounded

[1] Not recommended for new installations.

4.4.2 GPS Antenna

Table 4-3 Acceptable GPS/SBAS Antennas

MANUFACTURER	PART NUMBER	MODEL/ DESCRIPTION	CONNECTOR TYPE	GARMIN ORDER NUMBER
Garmin	013-00235-()	GA 35,GPS/WAAS [1]	TNC	013-00235-()
Aero Antenna	AT575-93G()-TNCF-000-RG-27-NM			
Garmin	013-00244-()	GA 36,GPS/WAAS	TNC	013-00244-()
Aero Antenna	AT575-126G()-TNCF-000-RG-27-NM			
Garmin	013-00245-()	GA 37, GPS/WAAS/XM	TNC	013-00245-()
Aero Antenna	AT2300-126G()-TNCF-000-RG-27-NM			
Garmin	013-00261-()	A33W, WAAS	TNC	013-00261-()
Aero Antenna	AT575-332G()- TNCF-000-RG-27-NM			
Comant	CI-2580-200	GPS/VHF	TNC/BNC [2]	N/A
Comant	CI-2728-200	GPS/VHF	TNC/BNC [2]	N/A
Comant	CI-2580-410	GPS/XM/VHF	TNC/TNC/BNC [3]	N/A
Comant	CI-2728-410	GPS/XM/VHF	TNC/TNC/BNC [3]	N/A
Comant	CI-428-200	GPS/WAAS	TNC	N/A
Comant	CI-428-410	GPS/XM	TNC/TNC	N/A

[1] Same mounting hole pattern as GA 56, but GA 35 antenna has a physically larger footprint.

[2] The GPS connector is a TNC type. The Very High Frequency (VHF) connector is a BNC type.

[3] The GPS connector is a TNC type. The XM connector is a TNC type. The VHF connector is a BNC type.

4.5 Antenna Considerations

This section provides mounting location considerations for the antennas required for the GDL 82 units. For mounting the L-Band and GPS/SBAS antennas, refer to FAA approved data. Refer to the antenna manufacturer's data for installation guidance and minimum performance specifications.

4.5.1 L-Band

The following provides guidance for selecting an optimal location for L-Band antenna installation. The GDL 82 introduces 1.5 dB of loss to the transmission line between the interfaced transponder and the L-Band antenna. The GDL 82 should be mounted as close as possible to the antenna to reduce the length of coaxial cable between the unit and the antenna.

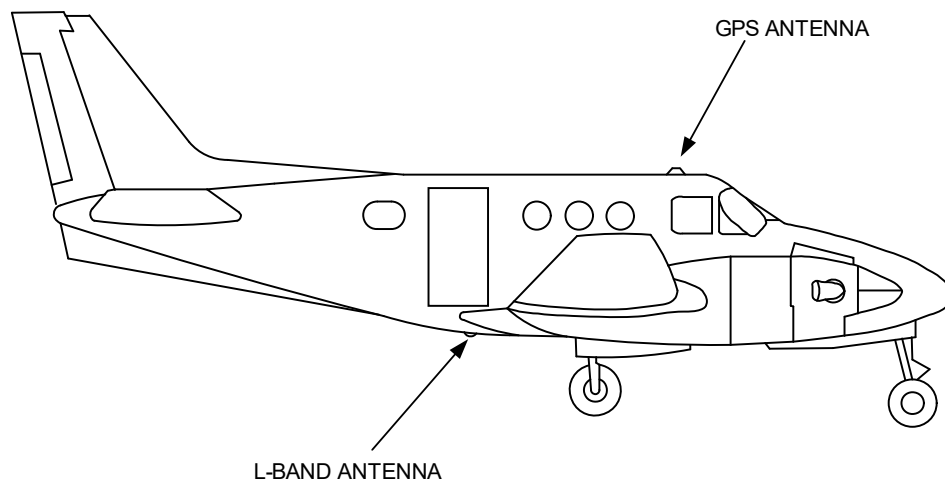


Figure 4-1 L-Band Antenna Placement

4.5.2 GPS (GDL 82 with GPS/SBAS Only)

The following provides guidance for selecting an optimal location for GPS antenna installation. The installation guidelines meet the intent of AC 20-138D Section 16. The greater the variance from these guidelines, the greater the chance of decreased signal availability. Because meeting all of these installations guidelines may not be possible on all aircraft, these guidelines are listed in order of importance to achieve optimum performance. The installer should use their best judgment to balance the installation guidelines.

1. Mount the antenna as close to level as possible with respect to the normal cruise flight attitude of the aircraft. If the normal flight attitude is not known, substitute with the waterline, which is typically referenced as level while performing a weight and balance check. A shim may be used to level the antenna.
2. The GPS antenna should be mounted in a location to minimize the effects of airframe shadowing during typical maneuvers. Typically mounting farther away from the tail section reduces signal blockage seen by the GPS antenna.
3. The GPS antenna should be mounted no closer than two feet from any VHF COM antenna or any other antenna which may emit harmonic interference at the L1 frequency of 1575.42 MHz.



NOTE

When mounting a combination antenna, the recommended distance of two feet or more is not applicable to the distance between the antenna elements in a combination antenna (e.g., GPS and COM, GPS and XM) provided the combination antenna is TSO authorized and has been tested to meet Garmin's minimum performance standards.

4. The GPS antenna should be mounted no closer than two feet from any antennas emitting more than 25 watts of power.
5. To minimize the effects of shadowing at 5° elevation angles, the GPS antenna must be mounted no closer than 9 inches (center to center) from other antennas, including passive antennas such as another GPS antenna or XM antenna.
6. To maintain a constant gain pattern and limit degradation by the windscreen, avoid mounting the antenna closer than 3 inches from the windscreen.
7. A 12 inch center-to-center spacing between GPS antennas is required to achieve the best possible low-elevation antenna gain by minimizing pattern degradation due to shadowing and near-field interaction. When practical, 12 inch center-to-center spacing between GPS antennas must be used. If 12 inch spacing is not practical, the maximum center-to-center spacing possible must be used, but never less than 9 inch center-to-center spacing. Spacing less than 9 inches center-to-center results in unacceptable antenna pattern degradation.

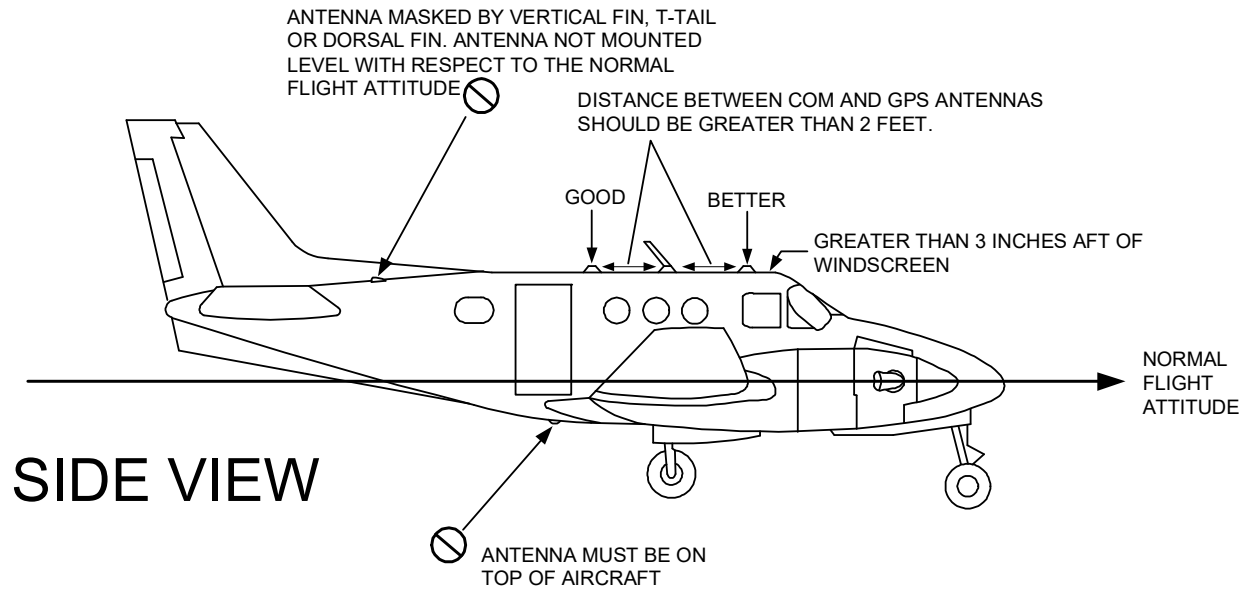


Figure 4-2 Fixed Wing GPS Antenna Mounting Considerations

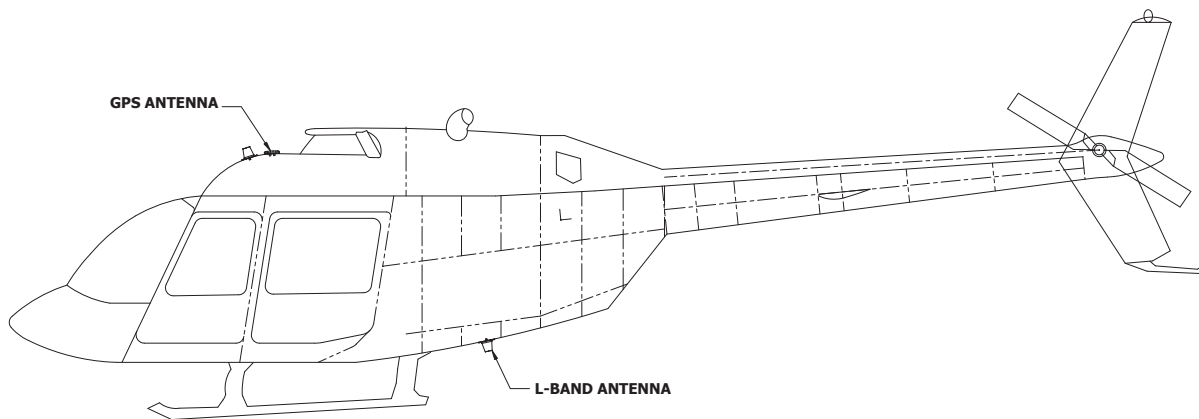


Figure 4-3 Rotorcraft GPS Antenna Mounting Considerations

4.6 Interference Considerations



CAUTION

THE USE OF GROUND-BASED CELLULAR TELEPHONES, WHILE AIRCRAFT ARE AIRBORNE, IS PROHIBITED BY FCC RULES. DUE TO THE POTENTIAL INTERFERENCE WITH ON-BOARD SYSTEMS, THE USE OF GROUND-BASED CELL PHONES, WHILE THE AIRCRAFT IS ON THE GROUND, IS SUBJECT TO FAA REGULATION 14 CFR §91.21. FCC REGULATION 47 CFR §22.925 PROHIBITS AIRBORNE OPERATION OF GROUND BASED CELLULAR TELEPHONES. WHEN ANY AIRCRAFT LEAVES THE GROUND, ALL GROUND-BASED CELLULAR TELEPHONES ON BOARD THAT AIRCRAFT MUST BE TURNED OFF. GROUND-BASED CELL PHONES THAT ARE ON, EVEN IN A MONITORING STATE, CAN DISRUPT GPS/SBAS PERFORMANCE.

Certain non-aviation radios, including marine transceivers, can interfere with civil aviation navigation and surveillance equipment, including the GDL 82. The installer is responsible to ensure any modifications are compatible with all previous aircraft modifications. If the GDL 82 is installed with non-aviation radios, verify there is no interference.

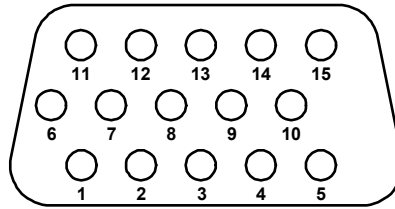
If interference is found it must be eliminated. Recommended methods of eliminating interference include:

1. Relocating antennas.
2. Rerouting cables.
3. Using filters to attenuate unintentional harmonic frequency transmissions.
4. Removing or replacing the interfering radio with a model that does not interfere.

5 Connector Pinouts

- 5.1 J821 Connector 5-2
- 5.2 Functional Descriptions 5-3
 - 5.2.1 Power and Antennas 5-3
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 - 5.2.3 Discrete Inputs 5-4
 - 5.2.4 Discrete Output 5-5
 - 5.2.5 Time Mark Inputs 5-5

5.1 J821 Connector



**Figure 5-1 J821 Connector
View Looking at Unit**

Table 5-1 J821 Connector

PIN	PIN NAME	I/O
1	USB D-	In/Out
2	TIME MARK A	In
3	TIME MARK B	In
4	SQUAT SWITCH*	In
5	ANONYMOUS MODE*	In
6	USB D+	In/Out
7	GROUND	--
8	RS-232 TX1	Out
9	RS-232 RX1	In
10	FAULT ALERT	Out
11	USB V	In
12	RESERVED	--
13	RESERVED	--
14	GROUND	--
15	POWER	In

Discrete Inputs*

The GDL 82 has two active-low discrete input pins denoted with an asterisk (*). The following signal conditions are required for the states of those inputs:

- Active (low) state: Input signal is < 1.0 VDC and/or resistance to ground < 375 ohm
- Inactive (open/high) state: Input signal is between 2.0 VDC and 33 VDC and/or resistance to ground > 130 kilohm

5.2 Functional Descriptions

5.2.1 Power and Antennas

This section provides power input requirements and antenna connections. Refer to section 10 for interconnect information. The transponder and antenna connections use BNC coaxial connectors. The GPS/SBAS antenna uses a TNC coaxial connector.

Table 5-2 Power

PIN NAME	CONNECTOR	PIN	I/O
POWER	P821	15	In
GROUND	P821	14	--
	P821	7	--

Table 5-3 Antennas

PORT NAME	CONNECTOR
TRANSPONDER	XPDR
L-BAND ANTENNA	ANT
GPS/SBAS ANTENNA	GPS

5.2.2 RS-232

The RS-232 port is compatible with EIA Standard RS-232C with an output voltage swing of at least ± 5 V when driving a standard RS-232 load.

Table 5-4 RS-232

PIN NAME	CONNECTOR	PIN	I/O
RS-232 TX 1	P821	8	Out
RS-232 RX 1	P821	9	In

5.2.3 Discrete Inputs

Table 5-5 Discrete Inputs

PIN NAME	CONNECTOR	PIN	I/O
SQUAT SWITCH*	P821	4	In
ANONYMOUS MODE*	P821	5	In

Squat Switch*

Depending on whether the input is ground or open, the Squat Switch* discrete determines when the aircraft is airborne or on the ground.

Anonymous Mode*

The Anonymous Mode* discrete input supports activation of the anonymous mode feature. When the discrete is grounded and the integrated transponder is tuned to the configured VFR squawk code, the GDL 82 will enter anonymous mode. If the integrated transponder is not tuned to the VFR squawk code, the GDL 82 will not enter anonymous mode in either discrete state.

5.2.4 Discrete Output

This output is an open drain capable of sinking 500 mA when active/grounded.

Table 5-6 Discrete Outputs

PIN NAME	CONNECTOR	PIN	I/O
FAULT ALERT	P821	10	Out

Fault Alert

The Fault Alert functions as an equipment annunciator output.

Table 5-7 Fault Alert Functions

FAULT ALERT	MEANING	ANNUNCIATOR LAMP
Active (grounded - 0 V)	System is not transmitting all FAA required ADS-B data.	On
Inactive (open)	ADS-B Out messages provide all required information.	Off

5.2.5 Time Mark Inputs

Table 5-8 Time Mark Inputs

PIN NAME	CONNECTOR	PIN	I/O
TIME MARK A	P821	2	In
TIME MARK B	P821	3	In

The GDL 82 accepts a Time Mark Input signal pair. When used with an external position source, the navigator sense Time Mark signals connect to the Time Mark input pins. Connect a single-ended time mark to TIME MARK A.

6 Installation Procedures

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This section provides guidance necessary for GDL 82 installation. Perform steps in the order presented. All materials needed are identified in section 3.

6.1 Cabling and Wiring General Instructions



CAUTION

ENSURE THERE ARE NO WIRING ERRORS BEFORE CONNECTING THE CABLES. INCORRECT WIRING COULD DAMAGE COMPONENTS.



NOTE

Shield terminations to the GDL connector backshell must be less than 3.0". Shield terminations for interfaced equipment should be as short as practical. Wiring must be shielded as required in section 10.

Install wire in accordance with AC 43.13-1B chapter 11. Allow adequate space for installation of cables and connectors. For connector and tooling information, refer to section 3. The installer supplies and fabricates all cables according to information in this manual. Cable lengths will vary depending on installation. Ground and shield terminations of interfaced equipment can vary. For more information, refer to the equipment manufacturer's installation manual. The following considerations should also be addressed.

- Cable harness should not be located near controls/control cables, high voltage, electrical noise sources, or fuel lines
- Cable harness should be in a protected area of the aircraft (e.g., isolated from engine rotor burst)
- Use wire gauge specified in section 10
- Route and secure the wire bundle as appropriate
- Avoid sharp bends and chafing
- Pigtail lengths must be less than 3.0 inches

6.1.1 Shielded Cable Preparation

1. At the end of the shielded cable, strip back 2.5 inch maximum length of the jacket to expose the braid.
2. Remove the exposed braid.
3. Carefully score the jacket 1/4 inches to 5/16 inches from the end and remove the jacket to leave the braid exposed.
4. Connected a 20 or 22 AWG wire to the exposed braid of the prepared cable. For termination techniques, refer to AC 43.13.

Preferred Method

Slide a solder sleeve (1) onto the prepared cable and shrink using a heat gun. The chosen size of solder sleeve must accommodate the number of conductors present in the cable assembly. Refer to M83519/1-2 for 2-conductor and M83519/1-3 for 3-conductor solder sleeves. Solder sleeves with preinstalled leads are acceptable.

Alternate Method

- a. Solder the wire (2) to the exposed braid of the prepared cable.
- b. Ensure a solid electrical connection through the use of acceptable soldering practices.
- c. Slide a piece of shrink tube (1) onto the prepared cable and shrink using a heat gun. The chosen size of shrink tube must accommodate the number of conductors present in the cable.

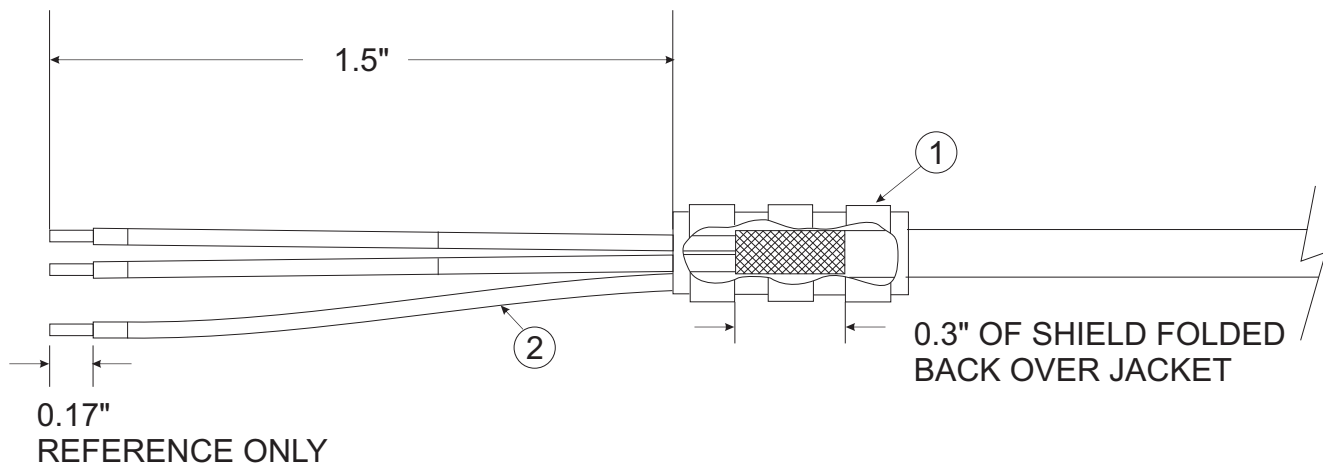


Figure 6-1 Shield Termination

5. Repeat steps 1 through 4 as needed for the remaining shielded cables.

6.1.2 Instructions to Crimp Pins to Wires

1. Strip back approximately 0.17 inches of insulation from each wire.
2. Insert the wire (1) into the pin/socket (2) and crimp with one of the recommended crimping tools.
3. Insert the pin into the connector housing location as specified by the interconnect drawings in section 10.
4. Verify the pin is properly engaged in the connector by tugging on the wire.

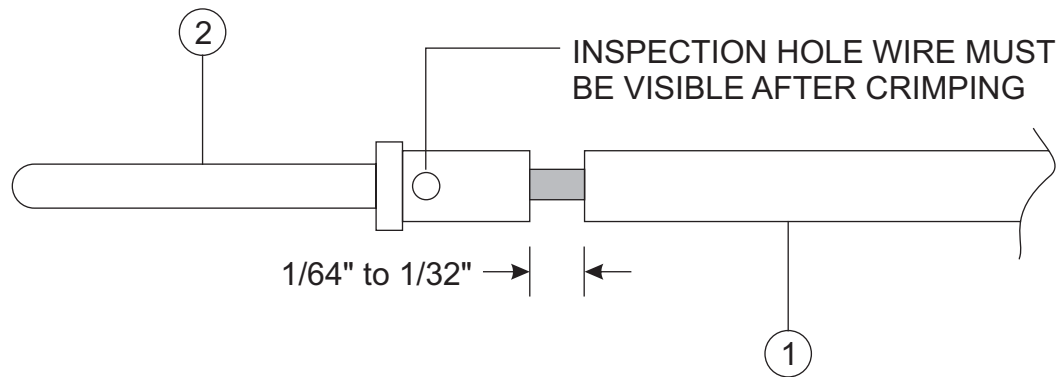


Figure 6-2 Insulation to Pin/Socket Clearance

6.1.3 Backshell Assembly

**CAUTION**

PLACE THE SMOOTH SIDE OF THE STRAIN RELIEF CLAMP ACROSS THE CABLE BUNDLE. PLACING THE CONCAVE SIDE AGAINST THE CABLE BUNDLE WILL DAMAGE WIRES.

**CAUTION**

TAKE CARE IN ORIENTING THE CONNECTOR ON THE GDL 82. INCORRECT ORIENTATION MAY DAMAGE THE GDL 82.

- Each tapped hole on the backshell may accommodate up to two ring terminals
 - Each ring terminal may accommodate up to three wires, but two wires is preferred
 - For two wires, use a 14-16 AWG, #8 insulated ring terminal (MS25036-153)
 - For single wires, use a 18-22 AWG, #8 insulated ring terminal (MS25036-149)
-
1. Wrap the cable bundle with silicone fusion tape where the strain relief clamps the bundle.
 2. Place the connector (6) edge inside of the backshell groove (5).
 3. Place the smooth side of the backshell strain relief clamp (4) across the cable bundle and secure using two 4-40 x 0.375 panhead screws (3).
 4. Attach the backshell cover (2) to the backshell using the supplied screws (1).
 5. Install a ring terminal onto the cable shield drains, grouping wires as appropriate for the connector.
 6. Place the following items on the 8-32 x 0.312 panhead shield terminal screw in the order they are presented.
 - a. Split washer
 - b. Flat washer
 - c. First ring terminal
 - d. Second ring terminal (if necessary)
 5. Insert the panhead shield terminal screw into the tapped holes on the shield block.

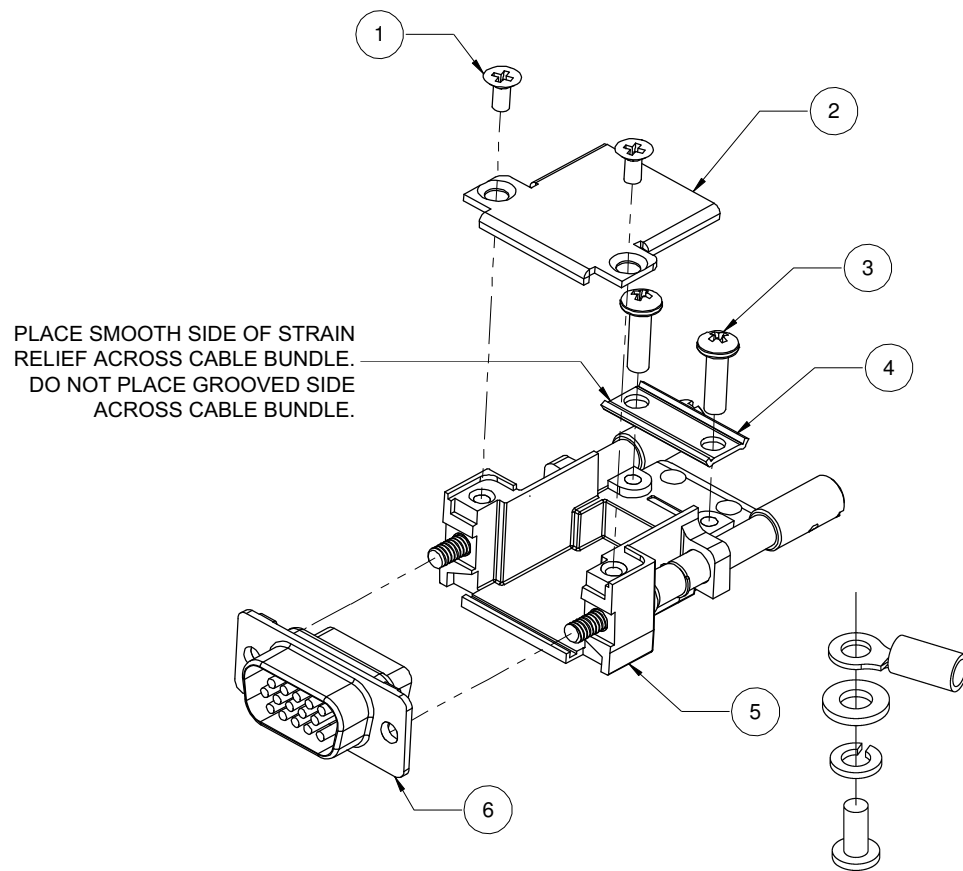


Figure 6-3 Jackscrew Backshell Assembly

6.2 Coaxial Cable Installation



NOTE

Due to cable loss requirements, older coaxial cable may need to be replaced, i.e., RG-58. Refer to section 4.2 for additional details.

Any standard 50 ohm, double shielded coaxial cable that meets the attenuation requirements with connectors can be used, depending on the installation configuration and cable length.

1. Route the transponder coaxial cable to the GDL 82 location.
2. Secure the cable.
3. Trim the coaxial cable to the desired length.
4. Install the TNC or BNC connectors per the manufacturer's instructions.
5. Ensure the coaxial line to the transponder is connected to the XPDR port and the antenna coaxial line to the ANT port.

Table 6-1 Coaxial Cable Specifications

INSERTION LOSS (DB/100FT) [1]	CARLISLE IT [2]	MIL-C-17	RG [3]
18.5	N/A	M17/128-RG400	RG-400
11.1	N/A	M17/112-RG304	RG-304
9.2	N/A	M17/127-RG393	RG-393
15.2	3C142B	N/A	N/A
9.2	311601	N/A	N/A
7.5	311501	N/A	N/A
5.8	311201	N/A	N/A
3.8	310801	N/A	N/A

- [1] RG type coaxial cable insertion loss can change significantly between manufacturers. The insertion loss for RG type cables shown is considered the worst case scenario. Refer to the cable manufacturer's specification sheet for the actual cable attenuation (insertion loss).
- [2] Supplier information (for reference only):
 Carlisle IT:
 5300 W. Franklin Drive Franklin, WI 53132
 Tel: 800-327-9473
www.carlisle.com
- [3] RG types are obsolete, reference only, and replaced by M17 type numbers.

Cables are shown for reference only. Any standard 50 ohm, double-shielded coaxial cable assembly that meets the attenuation (with connectors) and airworthiness requirements can be used. A loss of 0.2 dB can be used for each connection when calculating cable loss. Cables that meet the specifications in table 6-1 are satisfactory for GDL 82 installations.

Table 6-2 Typical Cable Connector Loss

CONNECTOR TYPE	APPROXIMATE DB LOSS
TNC	0.08 dB
BNC	0.20 dB
C	0.15 dB
N	0.05 dB

Table 6-3 Acceptable GPS dB Loss

UNIT	MINIMUM	MAXIMUM
GPS 82 w/GPS	1.5 dB	6.5 dB

6.3 Unit Installation

The GDL 82 is mounted with four 6/32-inch screws and self locking nuts. Use the dimensions shown in section 9 to prepare unit mounting holes.

6.4 Antenna Installation and Connections

The GPS/SBAS installation instructions meet the guidance material contained in AC 20-138D, *Airworthiness Approval of Global Navigation Satellite System (GNSS) Equipment*.

6.4.1 GPS Antenna

This section provides information on the GPS/SBAS antenna installation. Refer to section 4.5.2 for installation location considerations. Refer to *GA 35, GA 36, GA 37 Antenna Installation Instructions* for additional installation information. Temporarily locate the GPS/SBAS antenna with coax connected to the GDL 82 unit and check the GPS/SBAS performance as described in section 8.1.1. Once a suitable location has been verified, then permanently mount the antenna.

For RG-142B or RG-400 coaxial cable, 1.5 dB equates to a length of approximately 6.5 feet of cable with a connector on each end. RG-142B or RG-400 cable can be used for lengths less than 35 feet. For longer lengths, use low-loss double or triple shielded 50 ohm coax cable.

For mounting the antenna, follow the antenna manufacturer's installation instructions. Ensure that the GPS/SBAS antenna is electrically bonded to the aircraft. The GPS/SBAS antenna requires a minimum ground plane radius of 7.5 inches around the perimeter of the antenna.

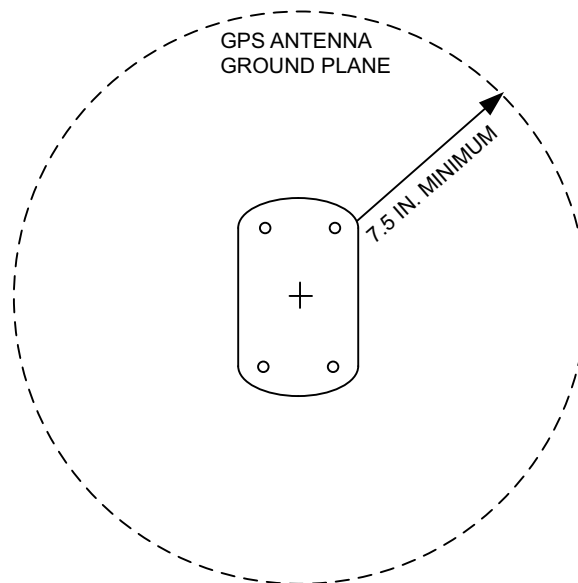


Figure 6-4 GPS Antenna Ground Plane

To reduce or eliminate signal interference, signal loss of the GPS antenna cable assembly, including connectors and adapters, must be between 1.5 dB and 6.5 dB. Coaxial connectors and adapters, i.e., TNC to BNC, add additional loss to the cable and should be considered when computing the cable loss. A typical loss of 0.2 dB can be used for each connection. To maintain integrity of the SBAS signal, the GPS antenna coaxial cable must have a minimum of two shields (e.g., RG-400 or RG-142B).

For short runs with less than 1.5 dB loss, increase the cable length until the loss is between 1.5 dB to 6.5 dB. Coil any additional cable.

During the post-installation checkout, evaluate susceptibility to harmonics of VHF COM transmitters. If problems arise, better isolation or distance may be required between the GPS and COM antennas. To reduce or eliminate the harmonic interference, install 1575.42 MHz notch filter in series with the antenna coax of the VHF COM transceiver. A notch filter is available from Garmin (P/N 330-00067-00).

If a VHF COM transmitter causes problems with the GPS on selected frequencies, as listed in the post-installation checkout, the problem may be due to the ELT. To verify, disconnect the ELT antenna coax at the ELT unit. If the ELT is causing the problem, contact the ELT manufacturer or replace the ELT.

6.4.2 GPS Antenna Doubler

1. Secure the antenna with the following items.
 - #8 washers (qty 4)
 - 8-32 (qty 4) self-locking nuts or suitable nutplates installed on the doubler
2. Torque the four supplied 8-32 stainless steel screws 12-15 in-lbs. Torque should be evenly applied across all mounting screws to avoid deformation of the mounting area.
3. Use a TNC plug to connect the GPS coaxial cable to the antenna.

7 System Configuration

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This section provides configuration instructions that include:

- Basic diagnostics information
- Load software into the GDL 82 (if required)
- Configure the GDL 82 for the specific installation

7.1 GDL 8X Install Tool

The GDL 8X Install Tool provides:

- Diagnostics – reports device, system, and faults information
- Configuration – allows selection of installation options
- System Update – allows upload of software and firmware to the GDL 82 unit

GDL 8X Install Tool Requirements:

1. To install the GDL 8X Install Tool, administrative rights may be required.
2. Laptop or PC to run GDL 8X Install Tool. The laptop or PC requirements:

Operating system	Windows 7 or later
Processor speed	850 MHz
Hard drive free memory	500 MB
RAM memory	256 MB

 Winzip® (or equivalent application) to extract downloaded file
3. USB-A to USB-B adapter cable to interface between a computer USB-A receptacle and the GDL 82 USB-B receptacle installed in the wiring harness. The cable length should not exceed 16 ft.

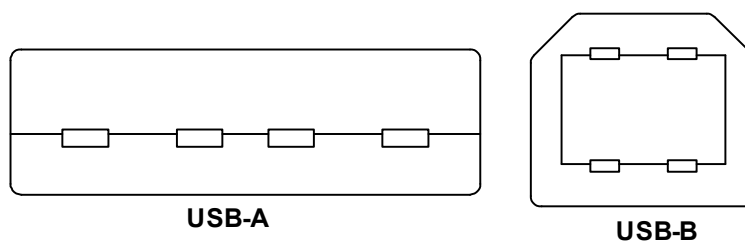


Figure 7-1 USB-A and USB-B Connectors

GDL 8X Install Tool Instructions

1. Download the GDL 8X Install Tool from [garmin.com](https://www8.garmin.com/support/collection.jsp?product=010-01560-31) (https://www8.garmin.com/support/collection.jsp?product=010-01560-31) and install.
2. Connect the USB-A plug on the adapter cable to the computer.
3. With the GDL 82 powered down, connect the USB-B plug on the adapter cable to unit.
4. Apply power to unit.
5. Start the GDL 8X Install Tool on the computer.
6. Select GDL 82.

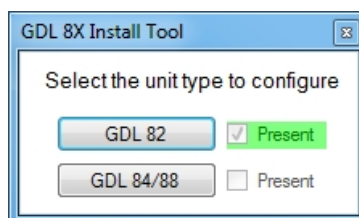


Figure 7-2 GDL 8X Install Tool Selection Page

Tool tips provide additional information to assist in configuring or trouble shooting the GDL 82 installation. Question marks display when tool tips are available. Hover the cursor over a question mark for one second to view the tool tip.

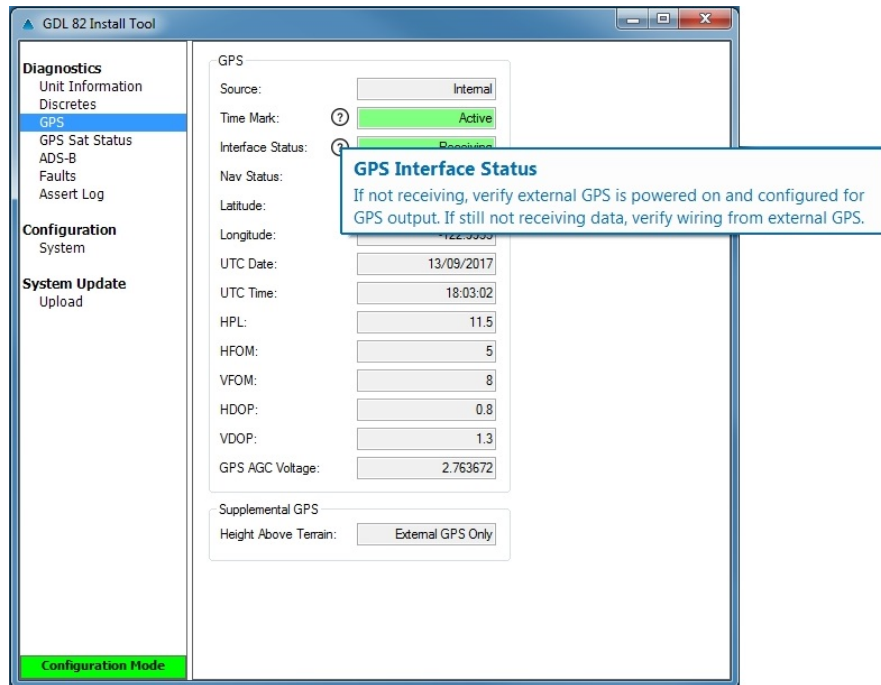


Figure 7-3 Tool Tip Example

7.2 Diagnostics

7.2.1 GDL 82 Unit Information Page

Device

- Model
- Part Number
- Serial Number

Key Region

- Version
- Part Number

Software

- Version
- Part Number

FPGA

- Version
- Part Number

Internal GPS Software

- Version
- Part Number

System Statistics

- Powerup Count
- Powerup Time (Hours)

The screenshot shows the 'GDL 82 Install Tool' window with the 'Unit Information' page selected in the left sidebar. The main content area displays the following information:

Device Information	
Model:	GDL 82 W/GPS
Part Number:	011-03946-40
Serial Number:	4PF000000

Key Region	
Version:	2.00
Part Number:	006-D7004-00

Software	
Version:	2.00
Part Number:	006-B2343-00

FPGA	
Version:	2.1
Part Number:	006-C0177-21

Internal GPS Software	
Version:	6.0
Part Number:	006-B1827-00

System Statistics	
Powerup Count:	847
Powerup Time (Hours):	325.0

The left sidebar contains the following menu items: **Diagnostics** (Unit Information, Discretes, GPS, GPS Sat Status, ADS-B, Faults, Assert Log), **Configuration** (System), and **System Update** (Upload). The 'Configuration Mode' button is highlighted at the bottom.

Figure 7-4 Unit Information Page

7.2.2 Discretes Page

This page provides squat switch and anonymous mode input discrete statuses and allows the failure annunciation discrete output to be set active or inactive. The active setting helps verify whether the unit failure annunciation lamp is connected correctly.

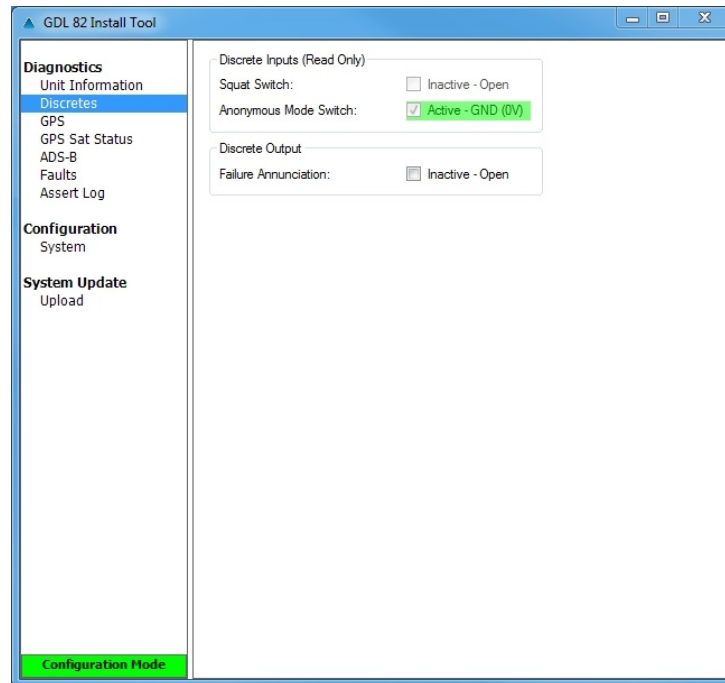


Figure 7-5 Discretes Page

7.2.3 GPS Page

This page provides GPS information.

- GPS source
- Nav status
- UTC date
- HFOM
- VDOP
- Time mark
- Latitude
- UTC time
- VFOM
- GPS AGC voltage
- Interface status
- Longitude
- HPL
- HDOP
- Height above terrain (for external GPS only)

GPS	
Source:	Internal
Time Mark:	Active
Interface Status:	Receiving
Nav Status:	3D Diff Fix
Latitude:	44.90826
Longitude:	-122.9954
UTC Date:	12/09/2017
UTC Time:	21:50:50
HPL:	10.5
HFOM:	4
VFOM:	6
HDOP:	0.8
VDOP:	1.6
GPS AGC Voltage:	2.763672

Supplemental GPS	
Height Above Terrain:	External GPS Only

Configuration Mode

Figure 7-6 GPS Page

7.2.4 GPS Sat Status Page

This page provides GPS satellite channel status.

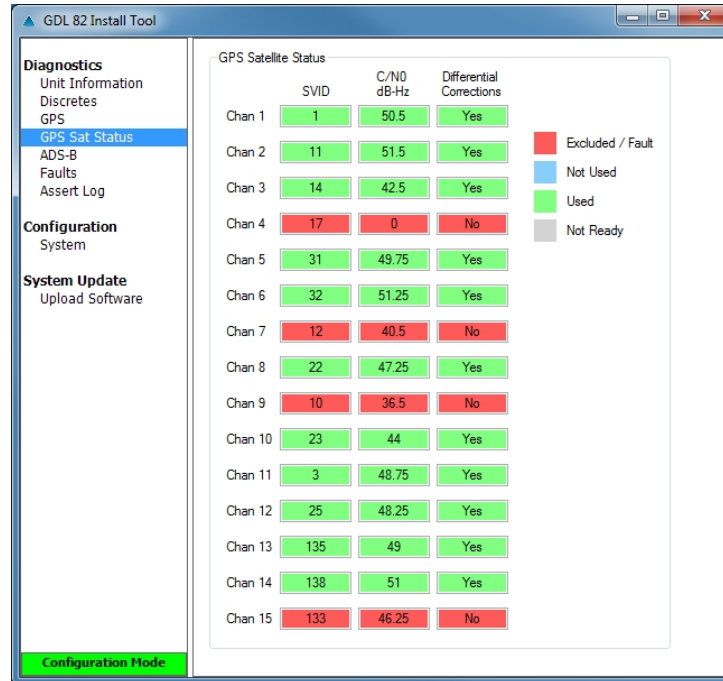


Figure 7-7 GPS Sat Status Page

7.2.5 ADS-B Page

This page provides transponder and UAT information.

Transponder

- Interface status
- Active mode
- Pressure altitude
- Squawk code
- IDENT status

UAT

- Address
- Flight ID
- Air/Ground status

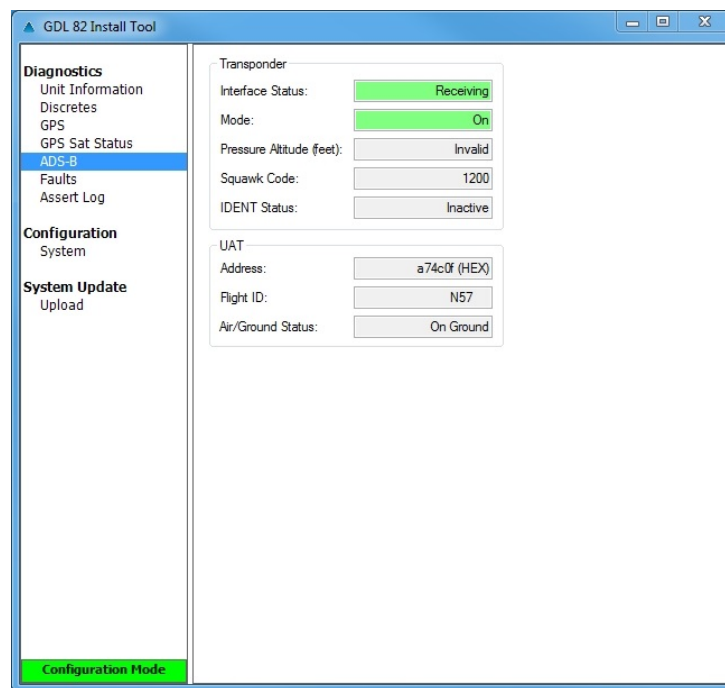


Figure 7-8 ADS-B Page

7.2.6 Faults Page

This page displays detected failures.

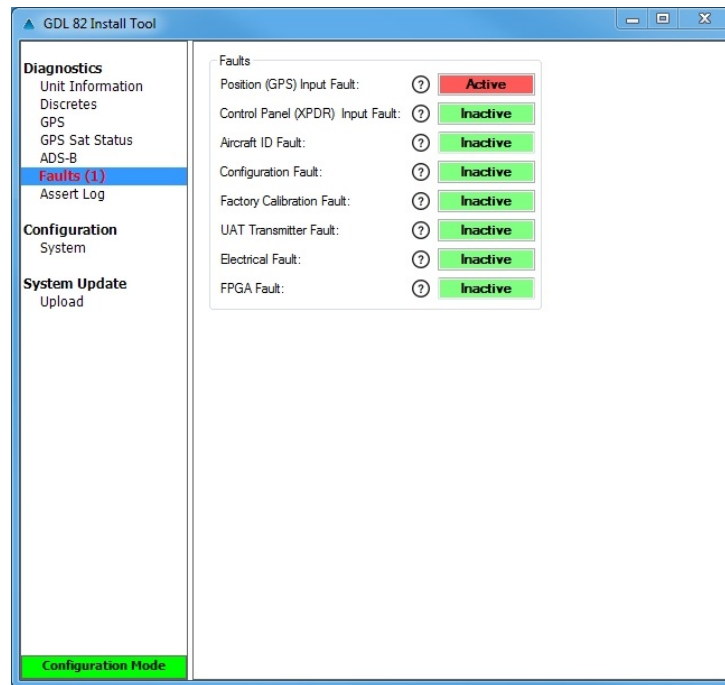


Figure 7-9 Faults Page

7.2.7 Assert Log Page

Diagnostic information can be saved or cleared from this page.

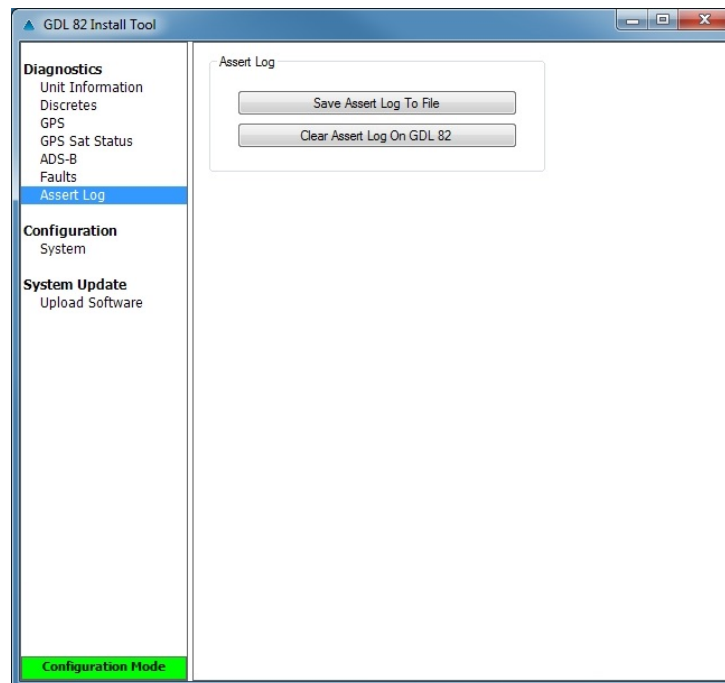


Figure 7-10 Assert Log Page

7.3 Configuration

Configure the installation parameters on the System page after installation.

The screenshot shows the 'GDL 82 Install Tool' window. The 'Configuration' tab is active, showing various aircraft and system settings. The 'Aircraft' section includes fields for Tail Number (N57), ICAO Address (A74C0F), Emitter Category (Light), Light Category Stall Speed (30 Knots), and Squat Switch (Not Installed). The 'Transponder' section has VFR Squawk Code (1200). The 'GPS' section has Source (Internal) and Lon Antenna Offset (1 Feet from nose). The 'ADS-B' section has Anonymous Mode Switch (Not Installed), 1090 ES Receive Capable (Not Capable), and UAT Receive Capable (Not Capable). Buttons for 'Save Configuration To File' and 'Reset Configuration' are at the bottom.

Figure 7-11 System Page

7.3.1 Aircraft

Configure the following:

Tail Number

Enter the aircraft tail number. If the aircraft has a U.S. registered tail number, select **Compute ICAO** to automatically fill in the ICAO address.

ICAO Address

If not automatically computed, set the ICAO address as specified in the aircraft registration records.

Emitter Category

Select the aircraft type.

Table 7-1 Emitter Categories

SELECTION	DESCRIPTION
Light	Light (ICAO) < 15,000 lbs maximum gross weight
Rotorcraft	Rotorcraft

Stall Speed

Set the stall speed for air/ground determination to the value of aircraft landing configuration stall speed (V_{s0}).

Squat Switch

This input determines the aircraft on-ground status.

Table 7-2 Squat Switch Selections

SELECTION	DESCRIPTION
Not Installed	No squat switch installed in aircraft.
GND (0V) = On Ground	Switch must be grounded to indicate aircraft is on ground.
GND (0V) = Airborne	Switch must be grounded to indicate aircraft is airborne.

7.3.2 Transponder

The code must match the VFR code configured on the transponder. This is typically 1200 for U.S. registered aircraft.

This setting is used for the UAT anonymous mode feature (if enabled). The transponder must be tuned to this code before the GDL 82 is capable of transmitting a temporary address and a flight ID. This field has a range of 0000-7777 (octal).

7.3.3 GPS

Source

Enter the GPS source for the GDL 82.

Table 7-3 GPS Source

SOURCE	DESCRIPTION
Internal	GLD 82 with Internal GPS/SBAS
GNS Series	GNS 4XXW/5XXW Series Navigators
ADS-B+ Format 2	GTN 6XX/7XX or GNS 480

Longitudinal Antenna Offset

Enter the offset distance (in feet) of the GPS antenna from the aircraft nose to the center of the GPS antenna.

7.3.4 ADS-B Selections

Anonymous Mode Switch

Select if an Anonymous Mode switch is installed. This setting controls the availability of the UAT anonymity feature. Consult the aircraft operator for guidance on whether this feature should be installed. When installed, enabled, and the flight crew selects the anonymous mode with the transponder tuned to the VFR code, the GDL 82 transmits a temporary address instead of the aircraft's assigned ICAO address code, and a temporary Flight ID.

1090 ES Receive Capable

Select whether the aircraft is capable of receiving 1090 ES (i.e., an ADS-B In receiver such as the GDL 39 or GDL 52 is available in the aircraft).

UAT Receive Capable

Select whether the aircraft is capable of receiving UAT (i.e., an ADS-B In receiver such as GDL 39 or GDL 52 is available in the aircraft).

7.4 Software Loading Instructions



NOTE

Some software files may contain multiple release versions. Always check release versions against [Dealer Resource Center](https://www8.garmin.com/support/collection.jsp?product=010-01560-31) or [garmin.com](https://www8.garmin.com/support/collection.jsp?product=010-01560-31) (<https://www8.garmin.com/support/collection.jsp?product=010-01560-31>) to verify the correct software version.

The GDL 82 comes preloaded with software. However, it is necessary to verify the software version and part numbers. The Upload Software page displays version and part number information for the GDL 82 software, FPGA, and GPS/SBAS software.

1. Download the appropriate GDL 82 field-loadable file from [garmin.com](https://www8.garmin.com/support/collection.jsp?product=010-01560-31) (<https://www8.garmin.com/support/collection.jsp?product=010-01560-31>).
2. Select **Browse** on the Upload Software page of the GDL 8X Install Tool and locate the file containing the GDL 82 software previously downloaded in step 1.
3. Select the desired region to be uploaded.
4. Select **Upload Software**.
5. Verify the On Unit region version and part number matches the In File region version and part number for each region that was loaded.

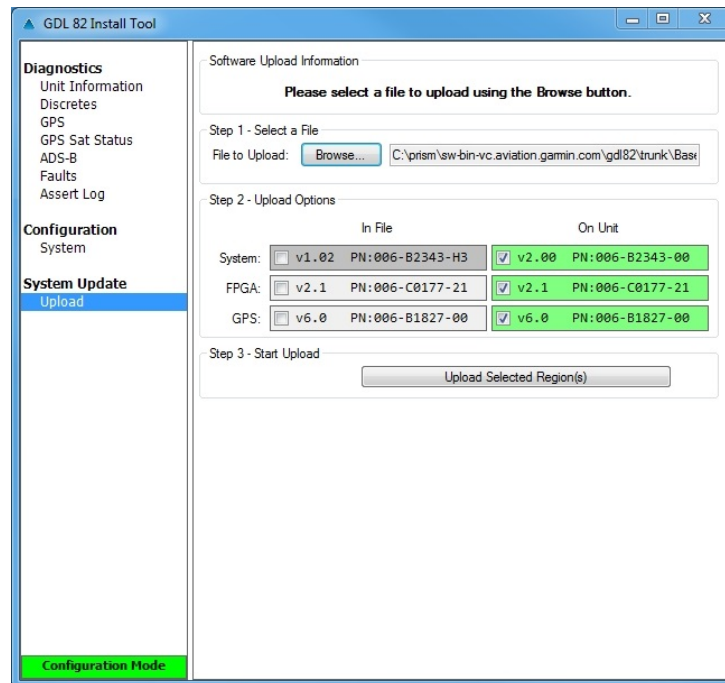


Figure 7-12 Upload Software Page

8 System Checkout

- 8.1 Ground Checks..... 8-2
 - 8.1.1 GPS 8-2
 - 8.1.2 Interface Checks..... 8-3
- 8.2 Documentation Checks..... 8-4
 - 8.2.1 Flight Manual Supplement..... 8-4

8.1 Ground Checks

Configure the GDL 82 before performing system checkouts. When configured correctly, the GDL 82 annunciates failures detected with interfacing systems. Correct annunciated failures before proceeding with the ground checks. Failures are displayed on the Faults page of the GDL 8X Install Tool. All ground checks are done through the GDL 8X Install Tool.

8.1.1 GPS



NOTE

After installation, the initial position acquisition can take up to 20 minutes. Subsequent acquisitions will not take as long.

Internal GPS Source

The GPS checkouts described in this section are applicable for installations utilizing the GDL 82 internal GPS/SBAS receiver as a position source. To ensure the GDL 82 is able to compute a GPS position, all other avionics should be turned off at the start of this test, with the GDL 82 powered on. To verify, go to the GPS page.

Use the GDL 8X Install Tool to ensure that a 3D Fix or 3D Diff Fix is obtained. If the unit is unable to acquire satellites, move the aircraft away from obstructions that might shade GPS reception. If the GPS solution does not improve, check the GPS antenna installation.

Once GPS position information is available, move aircraft to a known reference position and perform the following steps:

1. On the GPS page, verify that the LAT/LON agree with the known reference position.
2. While monitoring the GPS page, turn on other avionics one at a time and check Navigation Status, and ensure that a 3D Fix or 3D Diff Fix is obtained or retained. If position is lost, the Navigation Status will change to ACQUIRING.
3. Before proceeding with the interference check, verify that any connected equipment is transmitting and/or receiving data from the GDL 82 and is functioning properly.
4. If you are testing a transmitter from a non-aviation device, each frequency must be verified by transmitting for at least 30 seconds on each channel.
5. Check for VHF COM transmitter interference as follows:
6. Select 121.150 MHz on the COM transceiver to be tested.
 - a. Transmit for a period of 35 seconds.
 - b. While transmitting, check Navigation Status and verify that a 3D Fix or 3D Diff Fix is retained.
7. Repeat step 6 for the following frequencies:
 - a. 25 kHz COM Channel Spacing:

121.150 MHz	131.225 MHz
121.175 MHz	131.250 MHz
121.200 MHz	131.275 MHz
121.225 MHz	131.300 MHz
121.250 MHz	131.325 MHz
131.200 MHz	131.350 MHz

- b. For VHF radios with 8.33 kHz channel spacing, include the following frequencies in addition to those listed above:

121.185 MHz	130.285 MHz
121.190 MHz	131.290 MHz

8. Repeat steps 6 and 7 for all remaining COM transceivers installed in the aircraft.
9. If the aircraft is equipped with:
 - a. Traffic Collision Avoidance System (TCAS), turn on TCAS and verify that GPS position remains valid.
 - b. SATCOM, use the SATCOM system and verify that GPS position remains valid.

External GPS Source

The GPS checkouts described in this section are applicable for installations where position information is provided by an external GPS source.

If the following steps do not perform correctly, check the electrical connections and configuration setup for the interfaced GPS source.

1. Allow the external GPS source to acquire a position fix.
2. Go to the GPS page in the GDL 8X Install Tool and verify the applicable external GPS status fields are valid.

8.1.2 Interface Checks

Verify the GDL 82 is communicating properly to interfaced equipment. Skip non-applicable interfaces.

Transponder

This check verifies that the GDL 82 is receiving the correct input information from the transponder. If the following steps do not perform correctly, check the electrical connections and configuration setup for the interfaced transponder.

1. Go to the ADS-B page in the GDL 82 Install Tool.
2. Select **ALT** mode on the transponder.
3. Verify the Interface Status field indicates receiving (green box).
4. Verify the Mode field indicates the same as the active transponder.
5. Verify the Squawk code agrees with the transponder.
6. Activate the **IDENT** function on the transponder.
7. Verify the IDENT Status on the ADS-B page changes from inactive to active.
8. Verify the Pressure Altitude field agrees with the active altitude source.

Discrete Inputs

If the GDL 82 is connected to any external switches, perform the following steps:

1. Go to the GDL 82 Discretes page.
2. If a squat switch is installed, verify the Squat Switch* discrete input indicates Active when the switch provides a ground signal, and Inactive when the switch provides an open signal.
3. If an anonymous mode switch is installed, verify the Anonymous Mode* discrete input indicates Active when the switch is in the ENABLED position, and Inactive when the switch is in the DISABLED position.
4. If the GDL 82 does not receive the correct signal from the interfaced switch, verify the wiring and ensure it is connected properly and not shorted to ground.

Discrete Output

If the GDL 82 is connected to any optional external annunciators, perform the following steps:

1. Go to the GDL 82 Discretes page.
2. If the Fault Alert discrete output is connected to an annunciator, toggle the output to ACTIVE (corresponding box is checked and displays "ACTIVE") and verify that the annunciator is illuminated. Toggle the Fault Alert output to INACTIVE (corresponding box is not checked and displays "INACTIVE"), and verify the annunciator is extinguished.
3. If the annunciator does not receive the signal, verify the wiring and ensure it is connected properly and not shorted to ground.

8.2 Documentation Checks

8.2.1 Flight Manual Supplement

If the installation needs an FMS, sample versions can be found at Garmin's website.

1. Go to [garmin.com](https://support.garmin.com/en-US/?partNumber=010-01560-31&tab=manuals) (<https://support.garmin.com/en-US/?partNumber=010-01560-31&tab=manuals>).
2. Select "STC SA02573SE" from drop down menu.
3. Select applicable file.

9 Mechanical Drawings

This section contains mechanical drawings with dimensions and center of gravity required for the installation of the GDL 82.

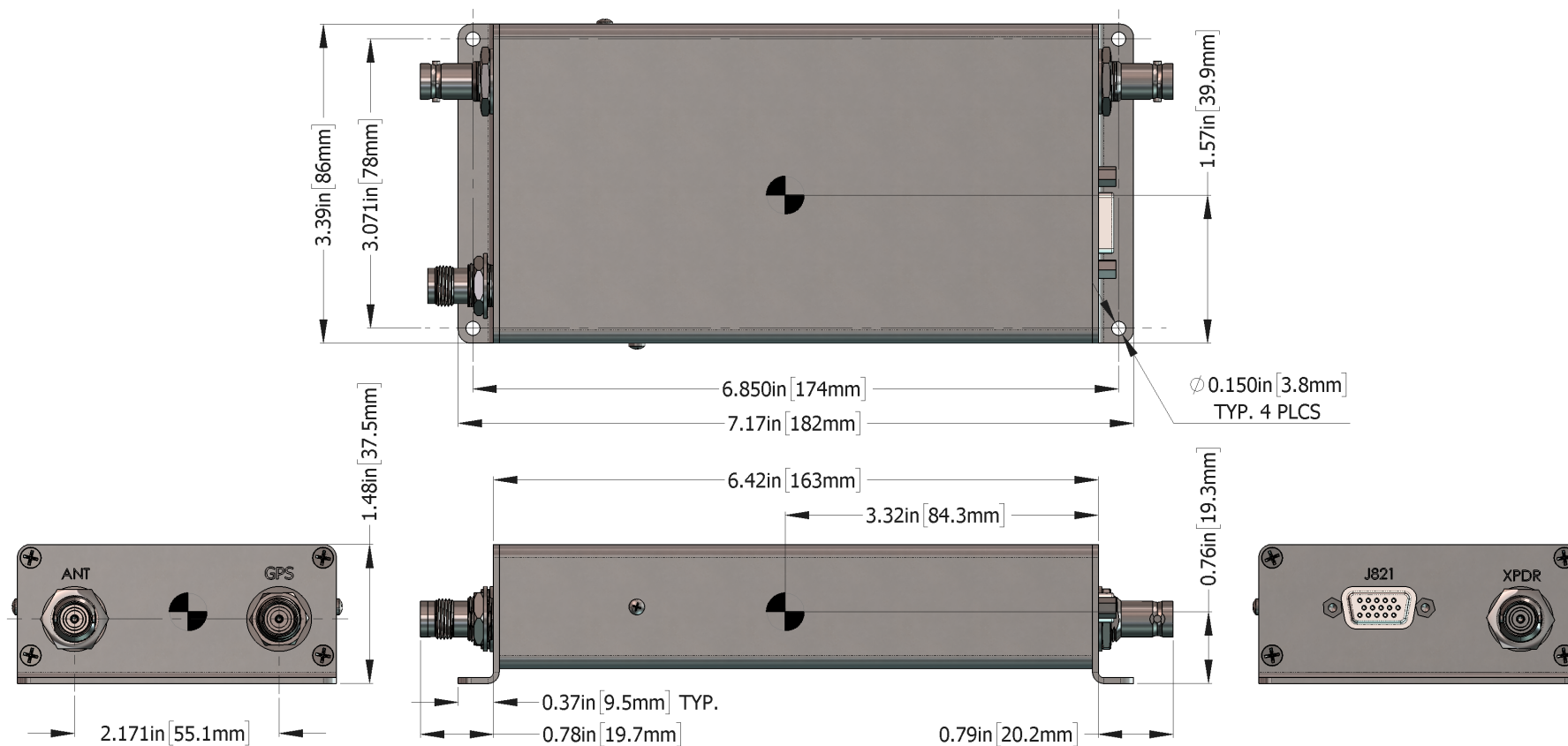


Figure 9-1 GDL 82 Dimensions and Center of Gravity



10 Interconnect Drawings

Figure 10-1 Typical Installation 10-2

General notes apply to the figure in this section, and must be followed.

General Notes

- Unless specified differently, all wires 24 AWG or larger.
- Power and ground connections are 22 AWG wire.
- Separate grounds and wiring routings in case of wiring or grounding system failure.
- Designations for ground connections are as follows.

 Shield Block Ground  Aircraft Ground
- Shield block ground terminations to the connector backshell must be 3.0 inches or less in length.
- Interfaced equipment shown with aircraft ground designation is where the actual grounding method is unknown.
- Grounding method may be either shield block ground or aircraft ground depending on specific equipment terminations.

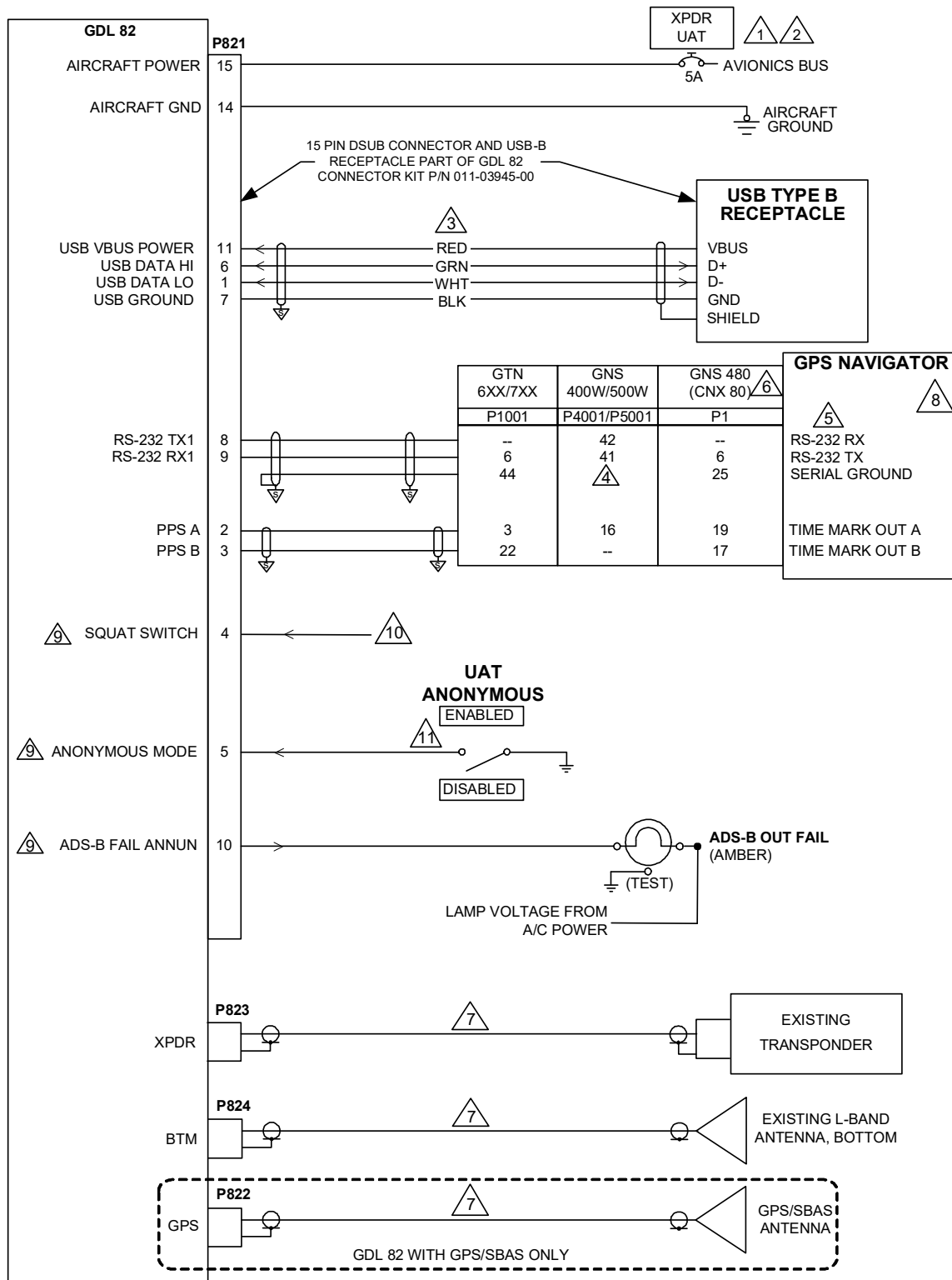


Figure 10-1 Typical Installation
Sheet 1 of 2

NOTES












-  CIRCUIT BREAKER MUST BE LABELED AS SHOWN AND READILY ACCESSIBLE TO THE PILOT. THE LABEL MUST BE DIRECTLY ADJACENT TO THE CIRCUIT BREAKER.
-  THE GDL 82 CAN BE PROTECTED BY THE EXISTING TRANSPONDER CIRCUIT BREAKER. THE COMBINED TRANSPONDER AND GDL 82 CURRENT MUST NOT EXCEED 80% OF THE CIRCUIT BREAKER RATED CURRENT. REPLACE EXISTING CIRCUIT BREAKER IN ACCORDANCE WITH AC 43.13-1B, CHAPTER 11, SECTION 4, IF REQUIRED.
-  USB TYPE B RECEPTACLE PIGTAIL (P/N 011-01782-00) MUST BE WIRED DIRECTLY TO P821 TO MINIMIZE LIGHTNING EXPOSURE. LABEL AND PLACE IN ACCESSIBLE LOCATION.
-  A GROUND WIRE BETWEEN THE GDL 82 AND THE GNS 400W/500W SERIES GPS SOURCE IS NOT NEEDED.
-  IF THE SPECIFIED RS-232 PORT ON THE GTN 6XX/7XX OR GNS 400W/500W SERIES NAVIGATORS IS ALREADY USED, ANY RS-232 PORT MAY BE CONNECTED.
-  FOR THE GNS 480 (CNX80), THE RS-232 SERIAL PORT, CHANNEL 3, IS THE ONLY PORT THAT ALLOWS FOR THE ADS-B OUT+ FORMAT TO INTERFACE AS AN EXTERNAL GPS SOURCE TO THE GDL 82.
-  REFER TO SECTION 6.2 FOR L-BAND AND GPS ANTENNA COAXIAL CABLE SPECIFICATIONS.
-  EXTERNAL GPS SOURCE IS ONLY REQUIRED FOR GDL 82 UNITS NOT EQUIPPED WITH INTERNAL GPS AND/OR INTERFACED TO GPS ANTENNA.
-  OPTIONAL INSTALLATION: THESE INPUTS MUST BE CONFIGURED IF INSTALLED. REFER TO SECTION 7 FOR CONFIGURATION SETTINGS.
-  THE SQUAT SWITCH INPUT CAN BE USED TO CONTROL AIR/GROUND STATUS. AN AIRSPEED GEAR SAFE SWITCH COULD BE USED INSTEAD OF A WEIGHT ON WHEELS OR SQUAT SWITCH IF PRESENT.
-  THE ANONYMOUS MODE SWITCH MAY BE USED TO CONTROL THE GDL 82 ANONYMITY FEATURE. THE SWITCH MUST BE LABELED AS SHOWN DIRECTLY ADJACENT TO THE SWITCH.

Figure 10-1 Typical Installation
Sheet 2 of 2

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