GARMIN.

GFC 500

Autopilot with Electronic Stability and Protection

Part 23 AML STC Installation Manual

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RECORD OF REVISIONS

Revision	Revision Date	Description
8	02/28/19	Checkout procedure clarifications
9	03/14/19	Added G3X Information
10	05/03/19	Added M27500 wire and clarified CAN wire P/N

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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 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 the 1979. The preceding statement is required to be included on any and all reproductions in whole or in part of this manual.

WARNING

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WARNING

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

IMPORTANT

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.

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1. GENERAL

1.1 Introduction

This manual provides instructions for the installation of the Garmin GFC 500 Autopilot with Electronic Stability and Protection (ESP). This manual provides general physical, mechanical, and electrical characteristics, as well as instructions and other conditions and limitations for the installation and approval for all the components of the GFC 500 Autopilot with ESP. Model-specific installation data will be contained in separate installation manual addendums (190-02291-XX) for each airplane model covered under the STC. Refer to the Master Drawing List, 005-01264-00, for the appropriate installation manual addendum for the aircraft being modified.

The software versions and information in this document are subject to change without notice. Visit www.garmin.com and navigate to the Aviation Product/General Aviation/Indicators/G5 page for current updates and supplemental information concerning operation of the GFC 500 Autopilot with ESP.

1.2 Scope

This manual applies to the modification of an aircraft under STC SA01866WI for the installation of the GFC 500 Autopilot equipment listed in Table 1-1 below. Only the interfaces between the GFC 500 Autopilot and other equipment listed in this manual are covered by the STC.

Table 1-1 – GFC 500 Autopilot Equipment

Model	Nomenclature	Unit P/N	Mod Status	Catalog P/N	Software P/N and Version *
GMC 507	Autopilot Mode Controller	011-04548-01	--	010-01946-01	006-B2961-xx
GSA 28	Servo	011-02927-11	--	010-01068-11	006-B1626-xx

*The approved G5 Part 23 AML STC Electronic Flight Instrument software is P/N 006-B2304-XX. XX denotes the specific version P/N.

*The approved G3X Part 23 AML STC Electronic Flight Instrument software is P/N 006-B1727-XX. XX denotes the specific version P/N.

The minimum level of G5 approved software for GFC 500 functionality is P/N 006-B2304-19 software version 6.00.

The minimum level of G3X approved software for GFC 500 functionality is P/N 006-B1727-A0, software version 8.00.

The GMC 507 and GSA 28 listed above are shipped with approved software. The G5 and G3X approved software contains the approved GMC 507 and GSA 28 software. To verify the latest approved software, visit www.Garmin.com and navigate to the Aviation /General Aviation/Flight Instruments & Indicators/G5 page. Select ‘Software” in the overview tab.

1.3 Terminology

The following acronyms and abbreviations are used in this manual:

ACRONYM	DEFINITION	ACRONYM	DEFINITION
ADI	Attitude Direction Indicator	IAS	Indicated Airspeed (mode)
AFM	Airplane Flight Manual	ICA	Instructions for Continued Airworthiness
AFMS	Airplane Flight Manual Supplement	IFR	Instrument Flight Rules
ALT	Altitude (mode)	ILS	Instrument Landing System
ALTS	Selected Altitude (mode)	I/O	Input/Output
AML	Approved Model List	LOC	Localizer (mode)
AMM	Aircraft Maintenance Manual	LRU	Line Replaceable Unit
AP	Autopilot	LVL	Level (mode)
APR	Approach (mode)	NAV	Navigation (mode)
ARINC	Aeronautical Radio Incorporated	OAT	Outside Air Temperature
ARP	Aerospace Recommended Practice	OBS	Omni Bearing Selector
ASTM	American Society for Testing Materials	OEM	Original Equipment Manufacturer
AWG	American Wire Gauge	PFT	Pre-Flight Test
CAN	Controller Area Network	PIT	Pitch (mode)
CDI	Course Deviation Indicator	POH	Pilot's Operating Handbook
CFR	Code of Federal Regulations	RFI	Radio Frequency Interference
COM	Communication	RPM	Revolutions per Minute
DDM	Difference in Depth of Modulation	ROL	Roll (mode)
DTK	Desired Track	SAE	Society of Automotive Engineers
ELA	Electrical Load Analysis	STC	Supplemental Type Certificate
EMC	Electro-Mechanical Compatibility	TC	Type Certificate
EMI	Electro-Mechanical Interference	TCAS	Traffic Collision Avoidance System
ESP	Electronic Stability and Protection	VDC	Volts Direct Current
FAA	Federal Aviation Administration	VHF	Very High Frequency
FD	Flight Director	VOR	VHF Omnidirectional Range
FPM	Feet Per Minute	VS	Vertical Speed (mode)
GPS	Global Positioning System	YD	Yaw Damper
HDG	Heading (mode)		

1.4 System Overview

1.4.1 Equipment Descriptions

1.4.1.1 GMC 507 Autopilot Mode Controller

The GMC 507 Autopilot mode controller is shown in Figure 1-1. The front panel of the GMC 507 is primarily a keypad that forwards key presses and knob selections to the G5 for processing.

Additionally, the GMC 507 contains internal attitude sensors to provide some system monitoring functions for the autopilot. The GMC 507 also provides audio functions for the autopilot.

Figure 1-1 – GMC 507

1.4.1.2 Flight Director Interface to the Autopilot

The G5 Instrument sends the following information to the autopilot servos:

- Autopilot status
- Attitude information from the G5 inertial sensors
- Airspeed, altitude, and vertical speed from the G5 air data sensors
- Flight director commands

1.4.1.3 Audio Output

The GMC 507 has an analog audio output to an audio panel, plus an active low output to drive an external aural alert device (e.g. sonalert). The analog audio can be interfaced to any audio panel that has an unswitched and unmuted analog audio input.

1.4.1.4 GSA 28 Servo

The GSA 28 runs software appropriate to the axis it is installed in, as programmed by the installation straps. The servo is designed such that no single failure can jam the servo resulting in the loss of the ability to move a flight control surface. The GSA 28 servo features an advanced brushless DC motor and gearbox with an engagement clutch. An advanced electronic slip clutch provides the ability for the pilot to overpower the servo at a configurable torque threshold without the use of consumable shear pins or other moving parts.

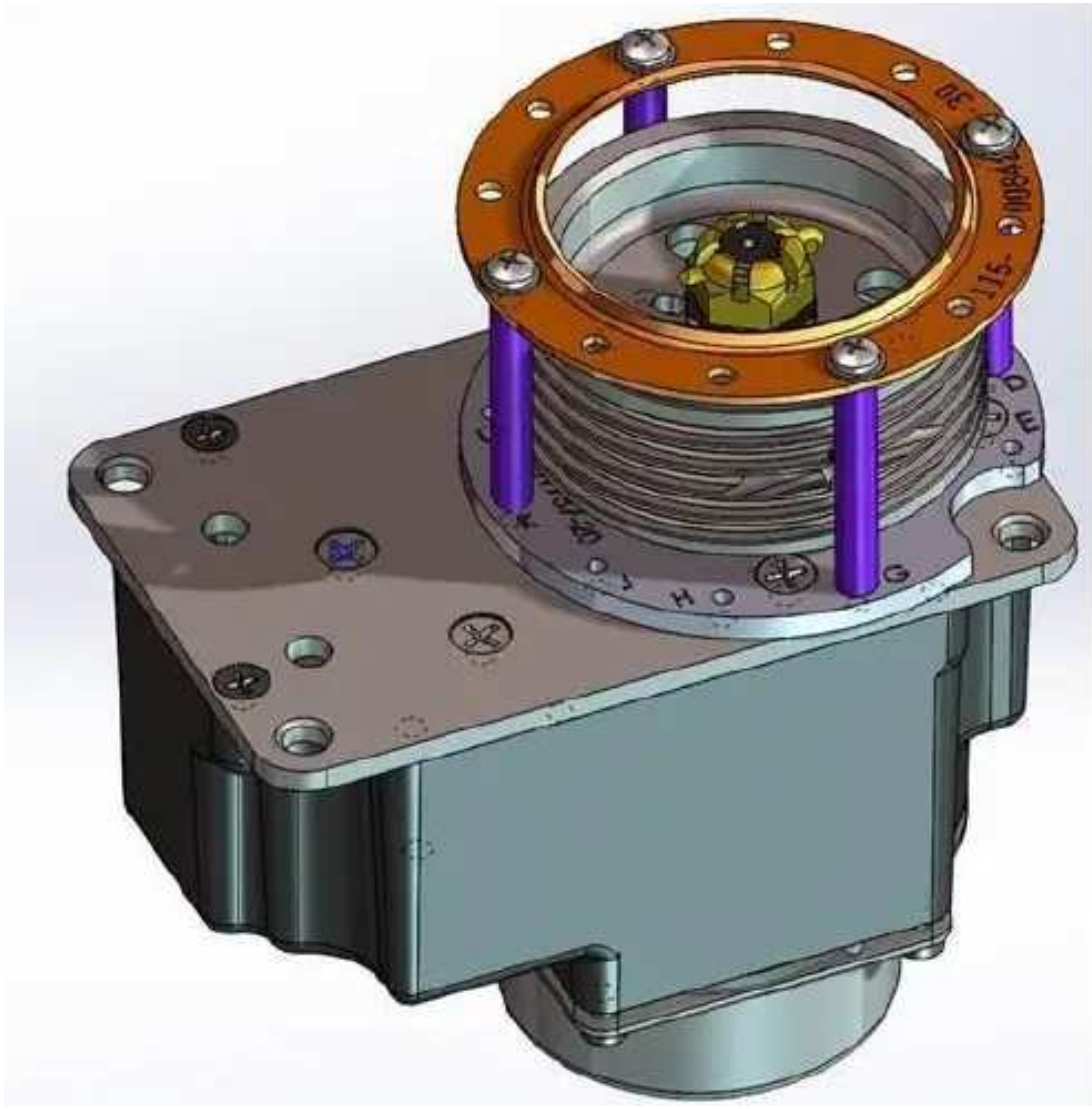


Figure 1-2 – GSA 28 Servo with Capstan

1.5 Pre-Installation Information

1.5.1 Overview

This section provides hardware equipment information for installing the GFC 500 system. See APPENDIX A for interconnect diagrams.

1.5.2 Pre-Installation Checklist

Before beginning a GFC 500 Autopilot with ESP installation, it is important to ensure the aircraft meets the prerequisites for the installation under STC SA01866WI. The following checklist is provided to help the installer determine the necessary requirements which must be met before beginning the installation.

Table 1-2 – GFC 500 System Pre-Installation Checklist

Item	Reference
G5 installed per STC SA01818WI Or G3X installed per STC SA01899WI	STC SA01818WI (G5) or SA01899WI (G3X)
Aircraft is on the Approved Model List (AML)	AML STC SA01866WI
Aircraft electrical system is sufficient for GFC 500 system installation	Section 3.6 and section 3.7
Weight and Balance calculations performed to ensure no adverse effects	Section 4.3
Aircraft model-specific information has been reviewed	190-02291-XX (Note 1)
Aircraft flight controls are rigged in accordance with Aircraft Maintenance Manual	Aircraft Manufacturer's AMM

Notes:

1. Each aircraft listed on the AML will have a model-specific installation manual addendum (190-02291-XX). Refer to the Master Drawing List, 005-01264-00, latest revision.

1.6 Technical Specifications

1.6.1 Physical Characteristics

Table 1-3 – Physical Characteristics

Item	Weight	Dimensions and CG
GMC 507 (with connector kit)	0.72 lbs (without rack) 0.82 lbs (with rack)	See APPENDIX C
GSA 28 (with capstan kit)	1.61 lbs (Spiral Capstan) 1.72 lbs (Continuous Travel Capstan) 0.12 lbs (connector kit)	

1.6.2 Power Requirements

Table 1-4 – Power Requirements

LRU	Characteristics	Specifications
GMC 507	Average Current Draw @ 14 VDC	0.11 A
	Max Current Draw @ 14 VDC	0.20 A
	Average Current Draw @ 28 VDC	0.06 A
	Max Current Draw @ 28 VDC	0.11 A
GSA 28	Average Current Draw @ 14 VDC	0.36 A
	Max Current Draw @ 14 VDC	1.80 A
	Average Current Draw @ 28 VDC	0.20 A
	Max Current Draw @ 28 VDC	0.90 A

1.7 Reference Documents

All of the documents listed in Table 1-5 are available for download on the Garmin Dealer Resource Center.

Table 1-5 – Garmin Reference Documents

Title	Document Number
G5 Electronic Flight Instrument Part 23 AML STC Installation Manual	190-01112-10
GFC 500 Autopilot with Electronic Stability and Protection Part 23 AML STC Maintenance Manual Includes Instructions for Continued Airworthiness	190-02291-01
G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft	190-01112-12
G3X Touch Electronic Flight Instrument System Part 23 AML STC Installation Manual	190-02472-01
G3X Touch Pilot's Guide for Certified Aircraft	190-02472-00

Table 1-6 – Other Reference Documents

Title	Document Number
FAA Advisory Circular, Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair	AC 43.13-1B
FAA Advisory Circular, Acceptable Methods, Techniques, and Practices – Aircraft Alterations	AC 43.13-2B
Aerospace Systems Electrical Bonding and Grounding for Electromagnetic Compatibility and Safety	SAE ARP1870
Assembly and Soldering Criteria for High Quality/High Reliability Soldered Wire and Cable Termination in Aerospace Vehicles	SAE AS4461
Wiring, Aerospace Vehicle	SAE AS50881
Standard Guide for Aircraft Electrical Load and Power Source Capacity Analysis	ASTM F 2490-05

1.8 STC Permission

A permission letter to use this STC data is available for download from the Garmin Dealer Resource Center .

2. LIMITATIONS

2.1 Installation Limitations

Only the interface connections between the GFC 500 Autopilot and other aircraft systems as specified in this manual are covered under the STC.

Electrical cables and wiring interfaced to the GMC 507 and GSA 28s must not be installed in fuel bays.

Refer to the appropriate model-specific installation manual addendum (190-02291-XX) for installation limitations that are not specified in this manual. Refer to the Master Drawing List, 005-01264-00, for the appropriate installation manual addendum for the aircraft being modified.

2.2 Operational Limitations

Refer to the appropriate model-specific Airplane Flight Manual Supplement (AFMS) for operational limitations. Refer to the Master Drawing List, 005-01264-00, for the appropriate AFMS for the aircraft being modified.

3. INSTALLATION OVERVIEW

3.1 Installation Materials Available from Garmin

Table 3-1 – Garmin Accessories

Item	Part Number	**Req'd Qty**
Install Rack, GMC 507	115-02774-00	See Note 3
Connector Kit, GMC 507	011-01824-01	1
Connector Kit, GSA 28	011-04755-00	See Note 1
Bridle Cable Clamp Kit, 0.063"	011-04888-00	See Note 1
Bridle Cable Clamp Kit, 0.125"	011-04888-01	See Note 1
Bridle Cable Clamp Kit, 0.156"	011-04888-02	See Note 1
AP DISC/TRIM INT Switch (MB2000 Series)	011-04895-00	1
Capstan Kit, 1/16" Spiral, 5 Groove, GSA 28	011-02951-10	See Note 1
Capstan Kit, Continuous Travel, GSA 28	011-02951-11	See Note 1
Capstan Kit, Continuous Travel 4" GSA 28	011-02951-12	See Note 1
Output Device Hardware, GSA 28	011-02951-16	See Note 1
GSA28 Mounting Kit, Continuous Travel	011-02952-04	See Note 1
Placard Sheet Set	161-04725-00	1
Sonalert	013-00636-00	Optional See Note 2
Trim Switch MS27717-27-1 Type	340-00235-04	1
Trim Switch Cygnet CA3112-G	340-00234-00	Optional
Coil Cord, 12 Conductor	310-00149-00	Optional
Switch 400 Series (Go Around)	340-00232-00	1
Circuit Breaker, 1 Amp	355-00010-02	Optional
Circuit Breaker, 5 Amp	355-00010-08	Optional
Circuit Breaker, 7.5 Amp	355-00010-09	Optional

Notes:

Except as noted, the items listed in the table above are included with the model-specific kits, as applicable. Part numbers are shown here for reference only.

1. Refer to the appropriate model-specific installation manual addendum (190-02291-XX) for required quantity.
2. Sonalert requirements:
    a. For G5/GFC 500 installations: The sonalert is optional if the GMC 507 is interfaced to an unswitched, unmuted input of an audio panel. If no audio panel is interfaced, or if it does not support unswitched, unmuted inputs, the sonalert is required.
    b. For G3X installations: The sonalert is optional if there is a G5 installed. If no G5 is installed, the sonalert is required. Refer to the G3X Touch Electronic Flight Instrument System Part 23 AML STC Installation Manual , p/n 190-02472-01 for details on audio wiring requirements.
3. The Install Rack is included in the aircraft-specific kits, but is not required unless the GMC 507 is installed in a standard width stack. Refer to Section 4.2.1 for cutout and mounting requirements.

3.2 Installation Materials Not Available from Garmin

The following installation materials are required, but are not available from Garmin:

- Insulated stranded wire (MIL-W-22759/34 or MIL-W-22759/16)
- Shielded wire (MIL-C-27500 cable utilizing M22759/34 wire (SD) and ETFE jacket (14) or MIL-C-27500 cable utilizing M22759/16 wire (TE) and ETFE jacket (14))
- Shielded CAN Bus wire, Carlisle IT p/n CAN24TST120(CIT)

  NOTE: CAN24TST120(CIT) is available from:

  Carlisle Interconnect Technologies
  5300 W. Franklin Drive
  Franklin, WI 53132 USA
  Toll Free +1 (800) 327-9473
  Direct: +1 (414) 421-5300
- Standard aircraft grade fasteners, including, but not limited to, MS35206 screws, AN3 bolts, MS21044 nuts, MS21059 rivet nut plates, NAS1149 washers, and MS20426AD rivets as specified this manual and in the model-specific installation manual addendum (190-02291-XX).

  NOTE: MS21044-XXX self-locking nuts are for one time use only and must be replaced if removed.

  NOTE: Cotter Pins are for one time use only and must be replaced if removed.

- Push/pull manually resettable circuit breakers:
  - Aircraft with 14 VDC electrical systems require the following circuit breakers:
    - AUTOPILOT (MS26574-7.5)
    - TRIM SWITCH (MS26574-1)
    - AUTOPILOT ALERT (MS26574-1)
  - Aircraft with 28 VDC electrical systems require the following circuit breakers:
    - AUTOPILOT (MS26574-5)
    - TRIM SWITCH (MS26574-1)
    - AUTOPILOT ALERT (MS26574-1)

  NOTE: Circuit Breakers are also available with Garmin part numbers. Refer to Table 3-1 for part numbers.
- Switches.
  - TRIM (MS27717-27-1, MS27719-27-1, or Cygnet Aerospace CA3112-G) (see Note below)
  - GO AROUND (M8805/110-5112) (See model specific installation manual addendum (190-02291-XX) for alternate part numbers, if applicable)
  - AP DISC/TRIM INT (M8805/110-5111, M8805/96-009, or M8805/96-013) (see model-specific installation manual addendum (190-02291-XX) for alternate part numbers, if applicable)

  NOTE: Trim, AP DISC/TRIM INT, and Go Around switches are included in the aircraft-specific kit and are also separately available from Garmin. Part numbers listed here are optional. Refer to Table 3-1 for the Garmin part numbers.
- Coil Cord (Cygnet Aerospace p/n CA3934-12) (See Note below and see model-specific installation manual addendum (190-02291-XX) for alternate methods, if applicable)

  NOTE: Coil cord are separately available from Garmin. Refer to Table 3-1 for part numbers.
- Cable ties (MS3367) or lacing cord A-A-52080 (MIL-T-43435)
- Ring terminals (MS25036-XXX)
- Shield terminators (AS83519/1-X or AS83519/2-X)
- Crimp splices (AS81824/1-X)
- Heat shrink tubing (M23053/4-301-X)
- Silicon fusion tape, A-A-59163 (MIL-I-46852C)

NOTE: If the aircraft being modified is equipped with an S-TEC trim switch (p/n 03112) or a Bendix/King trim switch (p/n 200-09187-0000), the existing switch may be retained.

NOTE: If the aircraft being modified is equipped with a coil cord that has six unused 22 AWG or larger conductors or ten unused 24 AWG conductors, the existing coil cord may be retained.

3.3 Test Equipment

The following test equipment is required to complete the GFC 500 Autopilot installation and to perform post-installation checkout of the system:

- Ground power cart (capable of supplying power to the aircraft systems and avionics)
- Calibrated Milliohm meter, OR
    - Ammeter capable of measuring 1.5 Amps of current with a minimum resolution of 0.1A.
    - Voltmeter capable of measuring millivolts with a minimum resolution of 0.1mV.
    - Variable DC Power Supply capable of providing 1 Amp Current
- Calibrated Air data test set (capable of maintaining 4000 feet and 150 kts or more)
- Calibrated VHF Nav test set
- Ammeter or Multimeter
- Torque wrench (capable of measuring 5-50 in lb)
- Cable tension meter (e.g. Pacific Scientific T5-2002-101-00 or similar)

3.4 Installation Considerations

The installation instructions are intended to be used in conjunction with the avionics installation practices in AC 43.13-1B and AC 43.13-2B. Modification of existing avionics shelves or the fabrication of new structure may be required to install the GFC 500 Autopilot equipment. Fabrication of a wiring harness is required. Sound mechanical and electrical methods and practices are required to achieve optimum system performance.

3.4.1 Minimum System Configuration

The minimum GFC 500 Autopilot installation requires the following items:

- GMC 507 Autopilot Mode Controller (see section 1.4.1.1)
- GSA 28 Servos (Qty 2, Pitch and Roll) (see section 1.4.1.4)
- G5 (minimum of G5 in ADI location required) – Refer to STC SA01818WI for installation approval – OR – G3X (minimum of PFD location required) – Refer to STC SA01899WI for installation approval. Note that G3X interface requires either the installation of G5 as a standby indicator or a Sonalert.
- Audio Panel Interface (see section 1.4.1.3) or Sonalert.

In this configuration, ROL, PIT, LVL, and Air Data Modes (IAS, VS, ALT, ALTS) are available.

If a GMU 11 is added, HDG mode is available in addition to the above.

If a GAD 29() is added (and interfaced to a compatible VHF Nav Radio), NAV and APR modes are available in addition to the above.

If a compatible GPS navigator is interfaced, TRK and GPS (NAV) modes are available in addition to the above.

3.4.2 Considerations for all Aircraft

All installations should consider the following items:

- Equipment Locations
    - The GSA 28 servos must be installed in the locations specified in the appropriate model-specific installation manual addendum (190-02291-XX).
    - The GMC 507 Autopilot controller may be installed anywhere in the instrument panel unless otherwise specified in the appropriate model-specific installation manual addendum (190-02291-XX).
- Existing Autopilot Installation
    - If there is an existing autopilot installed in the aircraft, it must be removed entirely. In some cases, this may require purchasing “non-autopilot” flight control cables to restore the aircraft to its original installation.
- Weight and balance
    - Addition of the GFC 500 Autopilot equipment must not cause the empty weight center of gravity (CG) to fall outside of the acceptable range for the aircraft (refer to the aircraft’s POH or AFM). Perform a weight and balance computation as described in section 4.3 before beginning the installation.

3.4.3 Considerations for Composite Aircraft

In composite aircraft, the GFC 500 Autopilot equipment must be located in an area which supports bonding requirements related to lightning protection. Refer to the appropriate model-specific installation manual addendum (190-02291-XX) for bonding requirements that are not addressed in this manual.

3.4.4 Equipment Cooling Considerations

The GFC 500 Autopilot equipment does not require external cooling.

3.4.5 Switches

The GFC 500 requires the installation of an autopilot disconnect switch on the pilot’s flight controls. If the GFC 500 installation includes manual electric trim, the installation of a trim switch on the pilot’s flight controls is also required. See Section 3.2 for switch part number.
The switch installation must meet the following criteria;

- Must be within easy reach of one or more fingers/thumb of the pilot’s left hand, when the hand is in a position for normal use on the pilot’s flight controls
- Must be easily located by the pilot without visual reference
- Must be located so that any action to operate switch will not cause an unintended input to the aircraft flight controls
- Must be located to minimize inadvertent operation and interference from other nearby switches or devices
- For aircraft without Pitch Trim installed, the Autopilot Disconnect switch must be labeled AP DISC.
- For aircraft with Pitch Trim installed, the Autopilot Disconnect switch must be labeled AP DISC/TRIM INT.

- The Trim Switch must be labeled TRIM and the directions must be labeled UP and DOWN (or DN).
- Switches must be clearly labeled as defined in Section 3.4.7

The installation of these switches may require that the installer fabricate a bracket. If a bracket must be fabricated, the bracket installation must meet the following criteria;

- Must not interfere with the pilot's hand when in a position for normal use on the pilot's flight controls
- Must not obstruct the pilot's view of any instrumentation or annunciations
- Must be rigid enough to prevent deformation under normal operation of the installed switches
- Must not interfere with other nearby switches or devices
- Must be fabricated from metal with no sharp edges
- The installation must be treated as if it were a structural repair and completed in accordance with AC 43.13-1B chapter 4, section 4.

Installer is responsible for approval of any modification of the pilot's flight controls and any needed brackets. Figure 3-1 shows the GFC 500 switches mounted in the left handle of a control wheel, this method is preferred when possible. Figure 3-2 shows examples of alternative methods for mounting the control wheel switches using a field fabricated bracket.

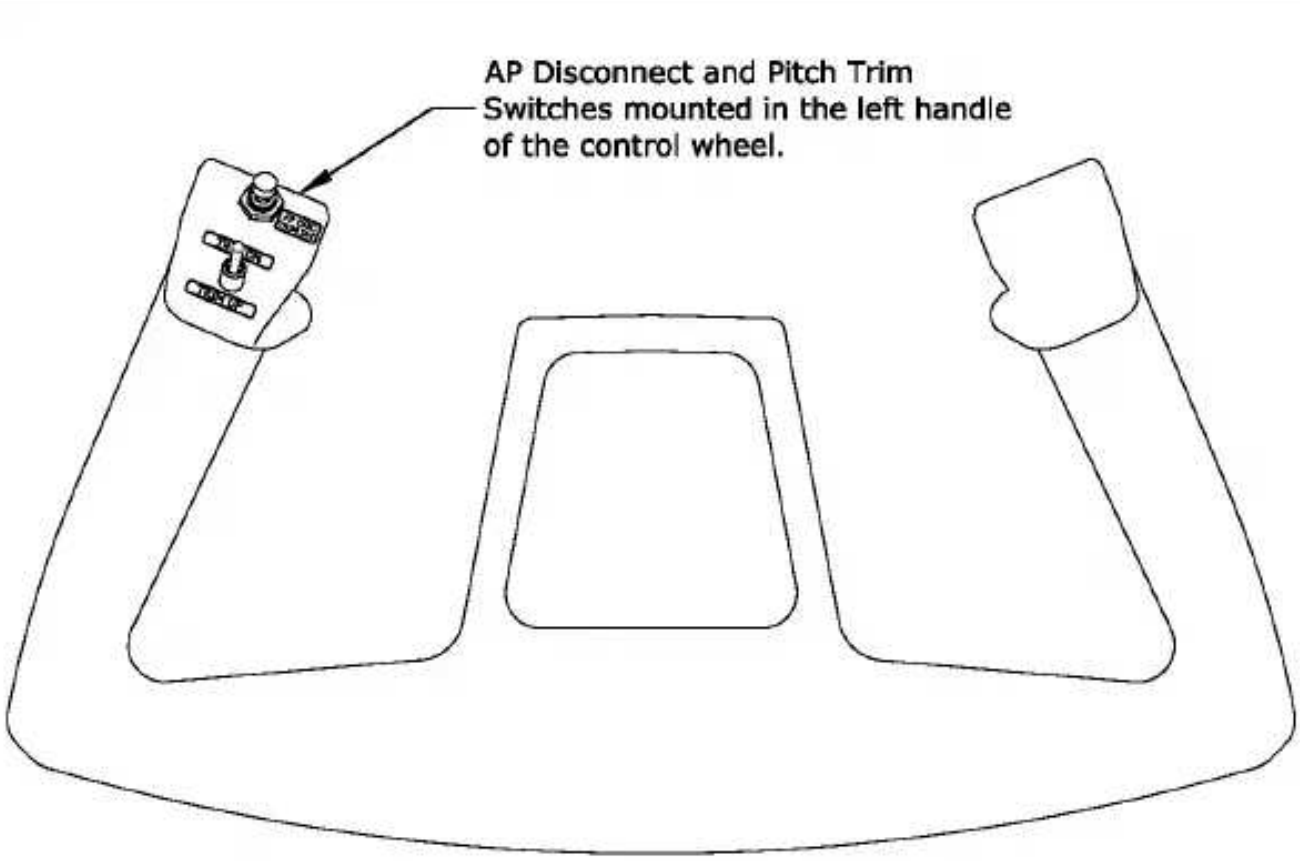


Figure 3-1, Control Wheel Switches

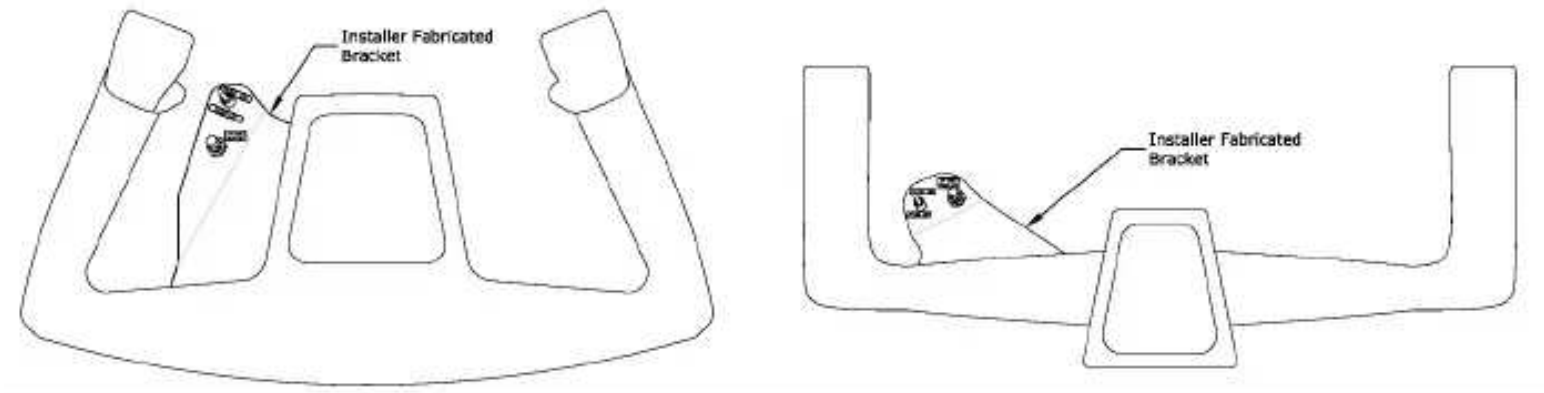


Figure 3-2, Bracket Mounted Control Wheel Switches

Installation of the GFC 500 Autopilot also requires a Go Around switch. See Section 3.2 for switch part number. The installation of the Go Around switch must meet the following criteria;

- Must be within easy reach of the hand that normally operates the throttle
- Must be easily located by the pilot without visual reference
- Must be located so that any action to operate switch will not cause an unintended input to the aircraft flight or engine controls
- Must be located to minimize inadvertent operation and interference from other nearby switches or devices
- Switch must be clearly labeled “GO AROUND” as defined in Section 3.4.77

See APPENDIX A for wiring details of the GFC 500 switches.

3.4.6 Coil Cord

Installation of the GFC 500 Autopilot may require a coil cord for electrical connection to the control wheel mounted switches. See Section 3.2 for coil cord part number and coil cord options. The aircraft-specific installation manual addendum (190-02291-XX) may provide alternate methods for wiring to the control wheel mounted switches. The installation of the coil cord must not inhibit the operation or visibility of any aircraft system controls. Also, it must be sufficiently secured at the control wheel and at the instrument panel during full travel of the control wheel. See APPENDIX A for wiring details of coil cord and switches.

3.4.7 Placards and Labels

A placard sheet set is supplied in the STC kit. If it is desired to field fabricate placards, the following guidelines should be followed.

When preparing and installing placards or labels:

- Locate placard or label in a prominent place, adjacent to the item being labeled.
- Placards and label must be readable in all cockpit lighting conditions. Ambient flood lighting is acceptable.
- Make sure the placard or label cannot be easily erased, disfigured, or obscured.
- Text color should be black or white. Do not use amber, red or green.
- Font size should be 10 or 12 point (minimum 0.10 in.).
- Font weight should be normal or bold with a solid color.
- Font style should be regular, non-italic, and easily readable.

Refer to the appropriate model-specific installation manual addendum (190-02291-XX) for any airframe-specific placard requirements that are not addressed in this manual.

The Autopilot disconnect switch should be labeled AP DISC/TRIM INT or AP DISC. See Section 3.4.5 for further details.

The Trim switch should be labeled TRIM and the directions should be labeled UP and DOWN (or DN).

The Go Around switch should be labeled GO AROUND.
The circuit breakers should be labeled AUTOPILOT (or AUTO PILOT, if two rows are needed for spacing), TRIM SWITCH (applicable only if optional Pitch Trim is installed), and AUTOPILOT ALERT (applicable only if Sonalert is installed).

3.4.8 Cable and Wiring Considerations

Select wire from the types listed in Section 3.2. Wire marking is optional. If wires and connectors are marked, mark wire in accordance with AC 43.13-1B Chapter 11, section 16. Mark harness connectors in accordance with AC 43.13 Chapter 11, section 17. Install wiring in accordance with AC 43.13-1B Chapter 11, sections 8 through 13. Use the following guidelines to prevent damage to the aircraft and systems:

- Route wiring harness with existing aircraft wiring except where shown on model-specific installation manual addendum (190-02291-XX).
- Do not route the wire harness near flight control cables, high capacity electrical lines, high-energy sources or fuel lines.
- Locate the wire harness in a protected area of the aircraft.
- Make sure the wire harness does not come in contact with sources of high heat, RF or EMI interference.
- Make sure there is ample space for the wire harness and mating connectors.
- Avoid sharp bends.

3.4.8.1 Shield Termination Considerations

Instructions on how to prepare and terminate shield for Garmin equipment installed by this STC are shown in Section 4.1.3.

Shield terminations at non-Garmin equipment must be as short as possible and must not exceed three inches in length. Refer to the manufacturer's installation requirements in case those requirement specify shorter requirements. When there are no requirements given by the manufacturer's installation manual, the shields may be connected to the metal connector backshell when the backshell is grounded to airframe chassis ground. Alternatively, the shield termination may be directly connected to airframe chassis ground. In the absence of any requirement, shields may be prepared per Section 4.1.3.

All shields must have continuity at any intermediate connectors used unless otherwise specified. With the exception of audio line shields, all shields must be grounded at all intermediate connectors, and the shields must not be run through connector pins. Shield pigtails shall be less than 3 inches at intermediate connectors. Audio line shields must be continuous from end to end and be grounded at only one end to prevent ground loops. See section 3.4.8.2.

Any wiring existing in the aircraft that has metal overbraid that is being connected to the GFC 500 must have that wiring overbraided. Terminate the overbraid at the GFC 500 equipment in the same manner as the existing wiring.

3.4.8.2 Audio Interference

Minimize effects from coupled interference and ground loops by terminating audio shields at one end only. The interconnect diagrams and accompanying notes in APPENDIX A should be followed closely to minimize interference effects.

3.4.9 CAN Bus Guidelines

The electrical architecture of the CAN bus takes the form of a linear “backbone” consisting of a single twisted wire pair with an LRU connected (terminated) at each end (Figure 3-3). The installer should attempt to make this “backbone” as short as practical. The maximum overall length of the CAN bus from end to end must not exceed 85 feet. At each of the two extreme ends of the CAN bus, a 120 Ω resistor is installed to “terminate” the bus. Termination resistors are provided via termination adapters that plug into an LRUs CAN connection or by internal resistors in the unit. Refer to APPENDIX A for specific wiring details.

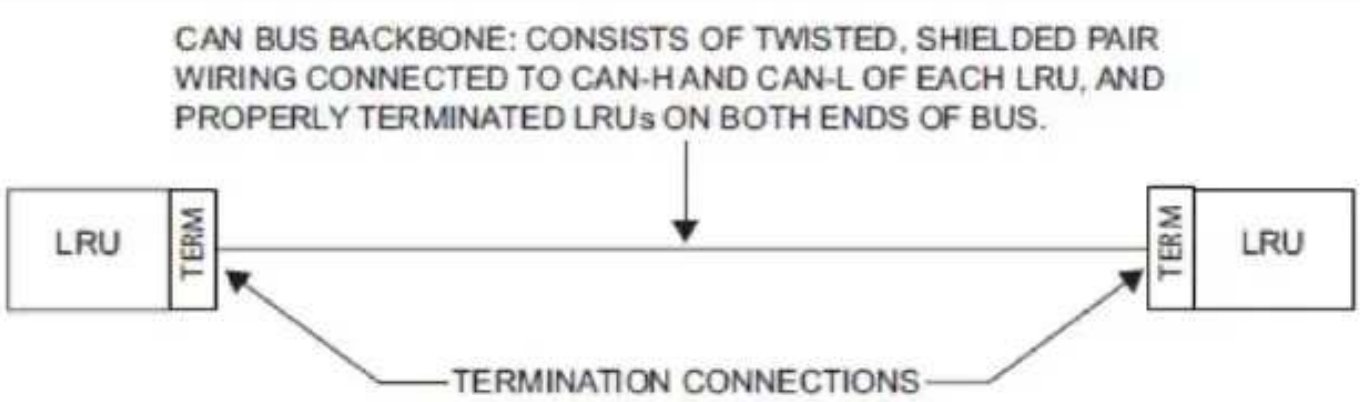


Figure 3-3 – CAN Bus Backbone

Multiple LRU’s may be connected in a daisy-chain manner along the backbone of the CAN bus (Figure 3-4).

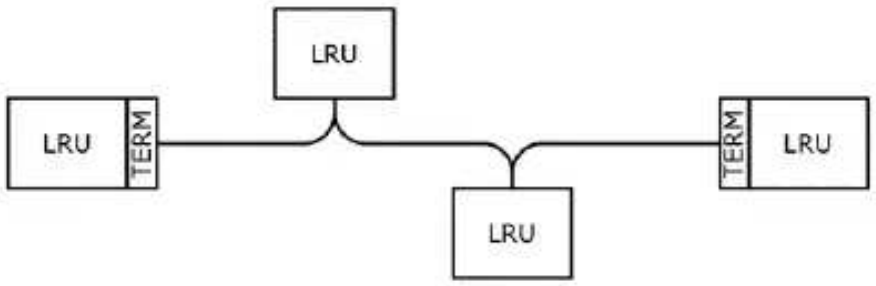


Figure 3-4 – Correct CAN Bus Wiring Example and Node Connections

Daisy-chained LRUs (LRUs not at the extreme ends of the CAN bus) connect to the CAN backbone through short “stub” or “node” connections (Figure 3-4). The length of each node connection splice should be kept as short as possible, and should not exceed 3 inches, the maximum allowed distance from a splice to a connector.

Multiple devices must not connect to the CAN bus backbone at the same point. Rather than splicing two or more stub node connections together, the CAN bus should instead be daisy-chained from one device to the next (Figure 3-4).

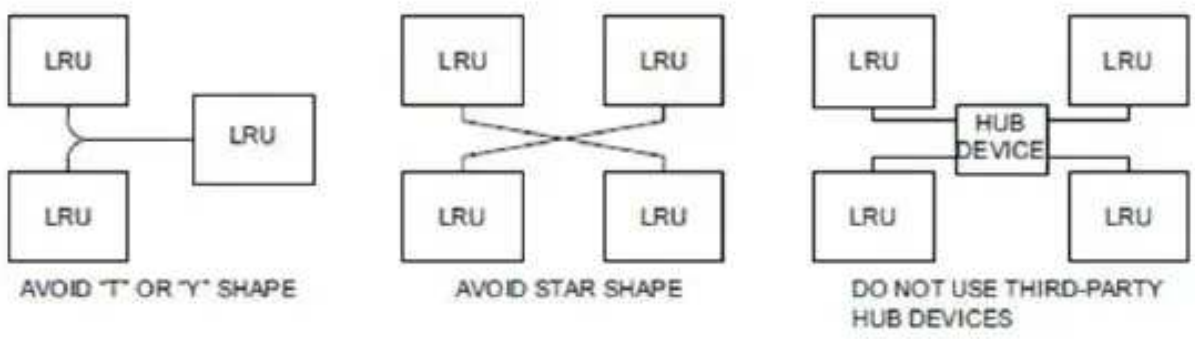


Figure 3-5 – Incorrect CAN Wiring Examples

3.4.9.1 CAN Bus Wiring

Wiring used for the CAN bus must be shielded twisted-pair cable, either Carlisle IT part number CAN24TST120(CIT) (preferred) or MIL-C-27500. The shields for each CAN bus wire segment must be interconnected, forming a continuously connected shield from one end of the CAN bus to the other end of the CAN bus. The CAN bus shield must always be grounded to the device connector backshells or all devices connected to the CAN bus.

3.4.9.2 CAN Bus Termination

At each of the two extreme ends of the CAN bus backbone, a 120 Ω resistor is installed to terminate the bus. In the GFC 500 system, separate resistors are not required. Instead, termination resistors are provided within the LRUs themselves.

For G5, GAD 29/29B, and GMU 11 CAN termination instructions refer to the Garmin G5 Part 23 AML STC Installation Manual, Garmin P/N 190-01112-10.

The GMC507 and GSA28 contain a 120 Ω resistor inside the unit that provides termination when the two CAN TERM pins are connected (Figure 3-6).

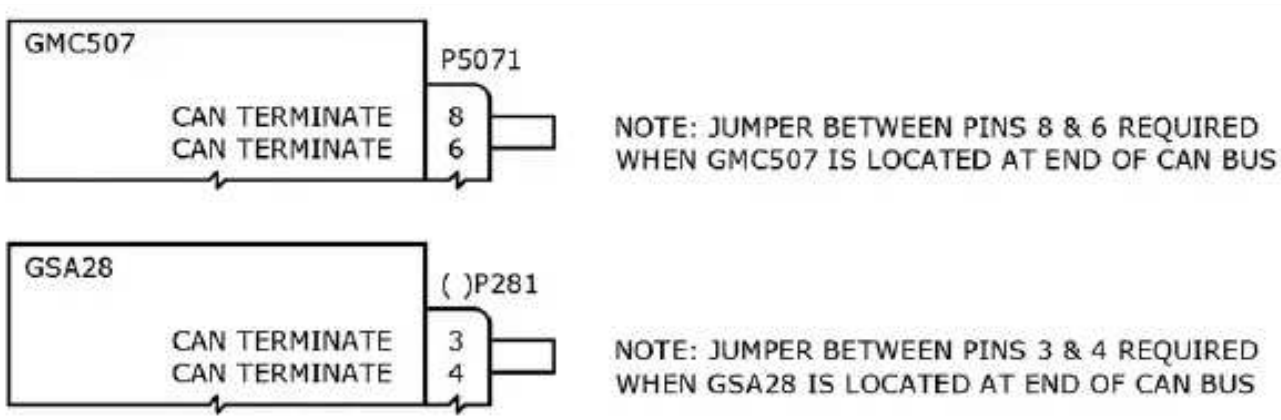


Figure 3-6 – CAN Bus Termination for GMC 507 and GSA 28.

Both ends of the CAN bus must be terminated (Figure 3-4), but devices that are not at the ends of the CAN bus must not be terminated.

3.4.9.3 CAN Bus Installation Guidelines

For maximum reliability of the CAN bus, the following guidelines must be followed:

- The CAN bus backbone must be a single linear path with exactly two distinct ends. CAN bus connections must be “daisy-chained” from device to device. Avoid “star” and “Y” topologies, and do not use a hub device (Figure 3-5).
- The overall length of the bus must not exceed 85 feet.
- Do not connect more than one device to the CAN bus backbone at the same point. Instead, daisy-chain the CAN bus backbone from one device to the next.
- Observe proper wiring, shielding, and grounding requirements as described above.
- Terminate the CAN bus at the two extreme ends of the bus, as described above.
- When adding a new device to the CAN bus, evaluate proposed modifications to the CAN bus wiring connections to ensure compliance with all above requirements.

3.5 Electrical Bonding

3.5.1 General Electrical Bonding

The equipment chassis, shield/ground terminations, supporting brackets, and install racks must be electrically bonded to the aircraft's main structure ground plane, when required. Refer to SAE ARP 1870 Section 5 when surface preparation is required to achieve electrical bond. Electrical bonding must be verified using a calibrated low resistance ohmmeter (see Section 3.3). An equivalent OEM procedure may be substituted. The electrical bond must achieve direct current (DC) resistance less than or equal to:

- 2.5 milliohms to local structure in metallic or tube and fabric aircraft
- 5.0 milliohms to the instrument panel for composite aircraft

For some aircraft the instrument panel is attached with vibration mounts. For these aircraft, the vibration-isolated instrument panel must be grounded to the airframe metallic structure. See section 3.5.2 for details.

Brackets installed with four or more rivets can provide sufficient electrical bond to allow equipment chassis or install rack to be bonded to the bracket. For the best results when bonding the GFC 500 equipment to the supporting structure, contact locations between the supporting structure and brackets should be cleaned and prepared for bond. The following steps are an acceptable method for bonding aluminum surfaces:

1. Clean grounding location with solvent.
2. Remove non-conductive films or coatings from the grounding location using a bonding brush or equivalent tool.
3. Apply a chemical conversion coat such as Alodine 1200 to the bare metal.
4. Once the chemical conversion coat is dry, clean the area.
5. Install brackets to supporting structure.
6. All areas must be refinished to the original finish specifications.

NOTE:

The radius of the cleaned area must be 0.125*" larger than the radius of the fastener head.* Ensure that there is no non-conductive finish under the head of the fastener

After satisfactory electrical bond is achieved, when it has been necessary to remove any non-conducting finish, the area from which the coating has been removed should be refinished with the same finish as is on the rest of the part within 24 hours. In cases where the parts come in with certain areas spot-faced, or if the there is no finish on the part (bare metal), apply conformal coating over the bond joint and hardware per MIL-I-46058 or clear lacquer per TT-L-20A in order to facilitate future inspection. Refer to the model specific Aircraft Maintenance Manual or Standard Practices Manual for surface protection requirements applicable to affected areas. The correct material finish is important when mating untreated or bare dissimilar metals. They should be galvanically compatible. When corrosion protection is removed to make an electrical bond, any exposed area after the bond is completed should be protected again. Additional guidance can be found in AC 43.13-1B and SAE ARP 1870. Typical electrical bonding preparation examples are shown in Figure 3-7, Figure 3-8, and Figure 3-9.

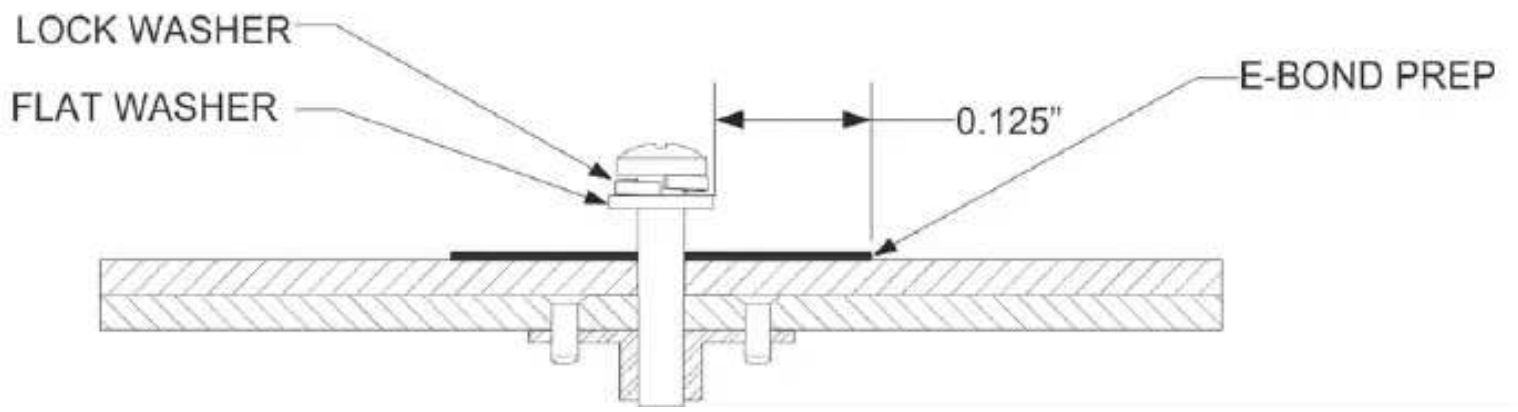


Figure 3-7 – Electrical Bonding Preparation – Nut Plate

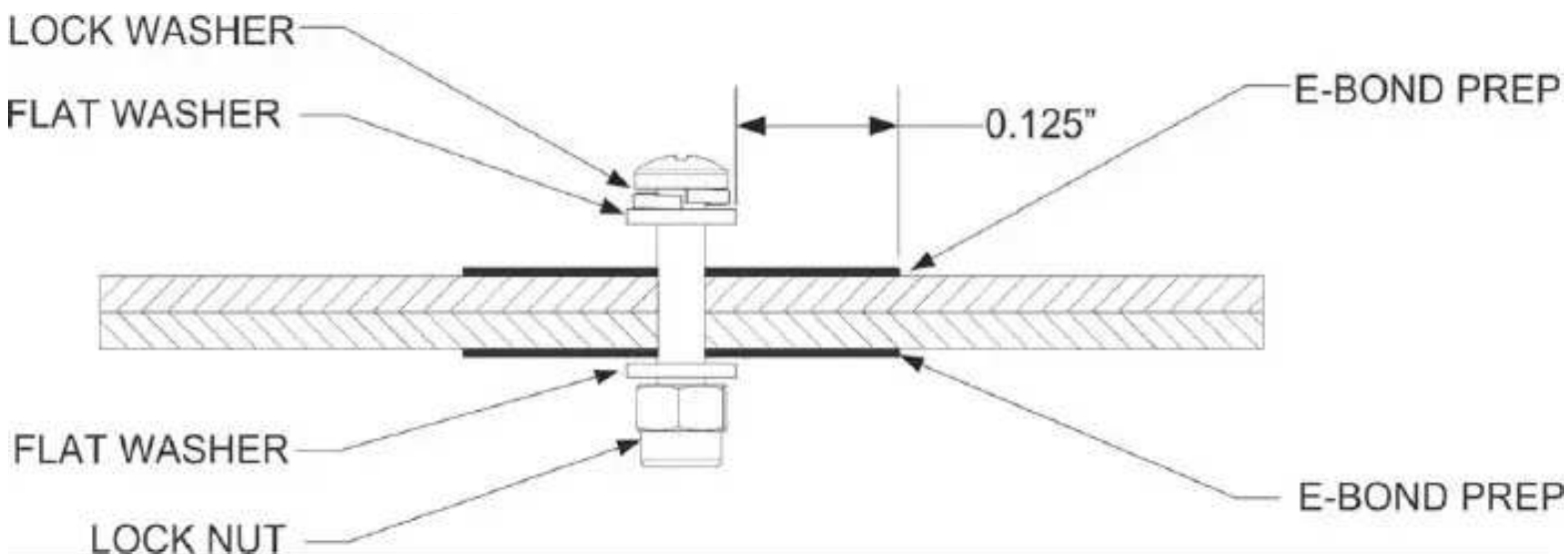


Figure 3-8 – Electrical Bonding Preparation – Bolt/Nut Joint

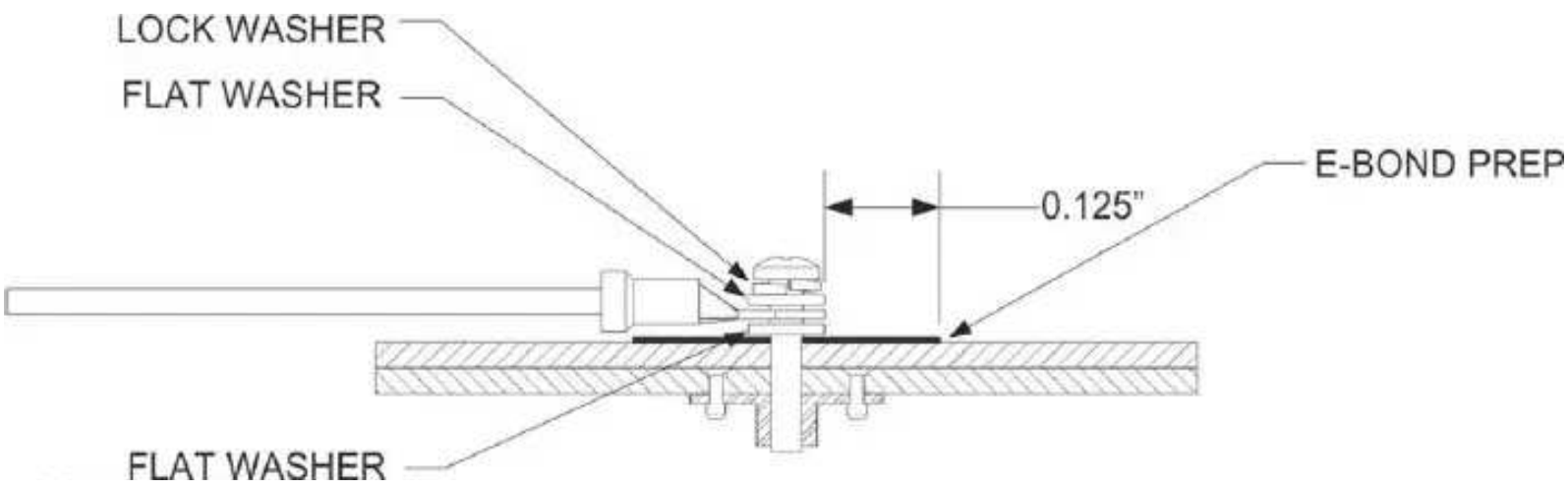


Figure 3-9 – Electrical Bonding Preparation – Terminal Lug

3.5.2 Instrument Panel Bonding

If the instrument panel in which the GMC 507 is installed is electrically isolated from the aircraft structure, it must be bonded to the aircraft structure for this installation. See Figure 3-10. The instrument panel bonding strap length should be as short as possible and must not exceed six inches in length. The installation must avoid the bonding strap looping back on itself. See section 3.5.2.1 for hardware specifications. Use the surface preparation steps provided in section 3.5.1. Complete the installation using the following procedure along with the guidance in AC 43.13-1B, AC 43.13-2B and aircraft make/model specific structural repair documentation, as necessary. Construct a bonding strap by attaching 5/16" inside diameter terminal lugs to both ends of the braid. Install the bonding strap with the following procedure:

1. Secure one end of the bonding strap to the instrument panel with a 5/16" bolt, washers, and nut. The washers must seat fully against the panel, without overhang or interference from other hardware.
2. Secure the other end of the bonding strap to the aircraft metallic structure with a 5/16" bolt, washers, and nut. The washers must seat fully against the aircraft metallic structure, without overhang or interference from other hardware.

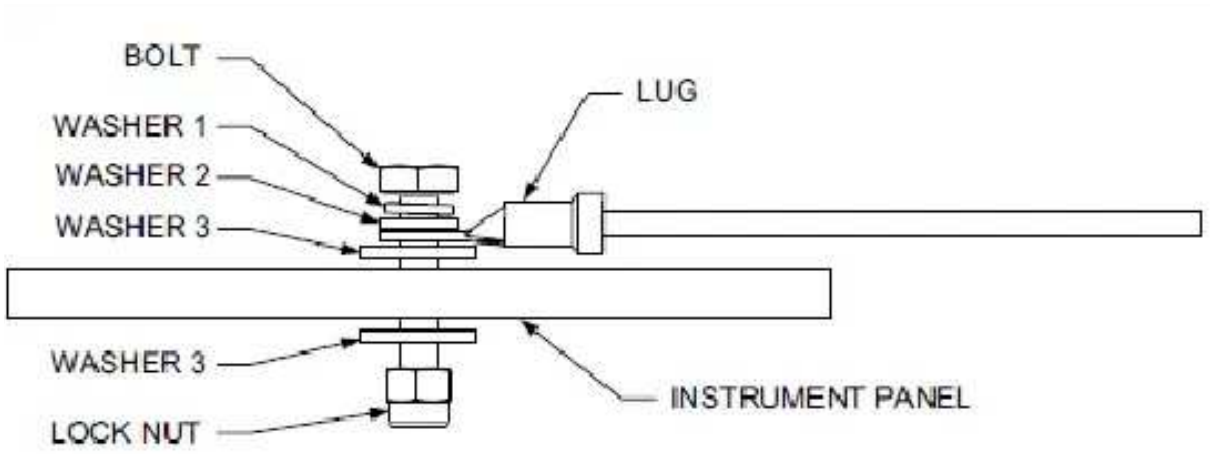


Figure 3-10 – Instrument Panel Bonding

3.5.2.1 Instrument Panel Bonding Materials

The following items are required but not supplied:

- Tinned copper flat braid, 3/4", AA59569F36T781 (recommended)
  OR
- Tinned copper tubular braid, 7/16", AA59569R30T0437
- Terminal lug, 5/16", uninsulated, MS20659-131
- Bolt, AN5-XA
- Locknut, 5/16", AN363-524
- Lock washer, 5/16", NASM35338-45 (Figure 3-10, washer 1)
- Flat washer, 5/16", NAS1149F0532P (Figure 3-10, washer 2)
- Flat washer, 0.063" thick NASM970-5 (AN970-5) (Figure 3-10, washer 3)

3.6 Electrical Load Analysis

An electrical load analysis must be performed to determine the effects of the GFC 500 installation on the aircraft electrical power generation system. See Table 3-2 for a sample net electrical load calculation. If it is determined the modification results in an increase in electrical load, then it must be verified the electrical generation and reserve battery capacity remain adequate to support electrical loads essential to safe flight and landing of the aircraft. See section 3.6.5 for electrical load analysis procedures. See section 3.7 for battery capacity analysis procedures.

3.6.1 Aircraft with Existing Electrical Load Analysis

If there is an existing electrical load analysis for the aircraft, it must be updated to reflect the modification. It must show the electrical system has adequate capacity to supply power to the modified systems in all expected conditions. Refer to the aircraft manufacturer's documentation for guidance on revising and maintaining the electrical load analysis.

3.6.2 Aircraft Without Existing Electrical Load Analysis

Prior to undertaking a complete electrical load analysis, the net change to the electrical load resulting from the GFC 500 Autopilot installation should be determined. See Table 3-2 for a sample calculation. The results of this analysis will be used to determine how to proceed further.

3.6.3 Electrical Load is Reduced Following Modification

If calculations show the overall load on the electrical system is reduced as shown in the following example, no further analysis is required. This assumes the electrical system was within all limits prior to the GFC 500 Autopilot installation. Record the new electrical load calculations.

Table 3-2 – Sample Net Electrical Load Change Calculation

Items removed from aircraft:	Electrical Load (Amps) [1]
S-Tec 55X System (Includes controller and two servos)	3.0 A
SUBTOTAL	(3.0) A
Items added to aircraft	
GMC 507 Autopilot Mode Controller	0.06 A
GSA 28 servo (qty 3)	1.8 A
SUBTOTAL	1.86 A
NET CHANGE IN BUS LOAD (NEW BUS LOAD – OLD BUS LOAD)	(1.14) A

Notes:

1. Use typical current draw when performing this calculation

3.6.4 Electrical Load is Increased Following Modification

If it is determined the electrical load has increased, a complete electrical load analysis must be performed to show the capacity of the electrical system is sufficient for the additional electrical load. For guidance on performing an electrical load analysis, refer to ASTM F 2490-05, Standard Guide for Aircraft Electrical Load and Power Source Capacity Analysis. Alternatively, the loads under various operating conditions may be measured, as described in section 3.6.5.

3.6.5 Performing an Electrical Load Analysis by Measurement

This section describes how to perform an electrical load analysis for a single alternator-single battery electrical system. These procedures may be modified accordingly for aircraft with multiple batteries or alternators, and it must be shown the maximum electrical demand does not typically exceed 80% of the electrical system capacity.

In this section the following definitions are used:

Normal operation: the primary electrical power generating system is operating normally

Emergency Operation: the primary electrical power generating system is inoperative and a back-up electrical power generating system is being used. This typically requires load shedding of non-essential equipment to provide adequate electrical power to essential required equipment for safe flight and landing of the airplane.

Either an in-circuit or clamp-on ammeter can be used for current measurement. The instrument used must be calibrated and must be capable of reading current to the nearest 0.5 A, or better.

CAUTION: To avoid damage to equipment, ensure the ammeter is capable of handling the expected load.

1. Record the continuous load rating for the alternator and battery.
2. Compile a list of electrical loads on the aircraft (generally, this is just a list of circuit breakers and circuit breaker switches). See examples in Figure 3-14 and Figure 3-15.
3. Identify whether each load is continuous (e.g. GPS) or intermittent (e.g. stall warning horn, landing gear).
4. Using the worst-case flight condition, identify whether each load is used in a particular phase of flight for normal operation. If some loads are mutually exclusive and will not be turned on simultaneously (e.g. pitot heat and air conditioning), use only those loads for the worst-case condition.
5. Identify whether each load is used in a particular phase of flight for emergency operation. As a minimum, these systems generally include:
    a. COM Radio #1
    b. NAV Radio #1
    c. Transponder and associated altitude source
    d. Audio Panel
    e. Stall Warning System (if applicable)
    f. Pitot Heat
    g. Landing Light (switched on during landing only)
    h. Instrument Panel Dimming
6. Insert/attach the ammeter in the line from the external power source to the master relay circuit as shown in Figure 3-11. This will eliminate errors due to the charging current drawn by the battery.

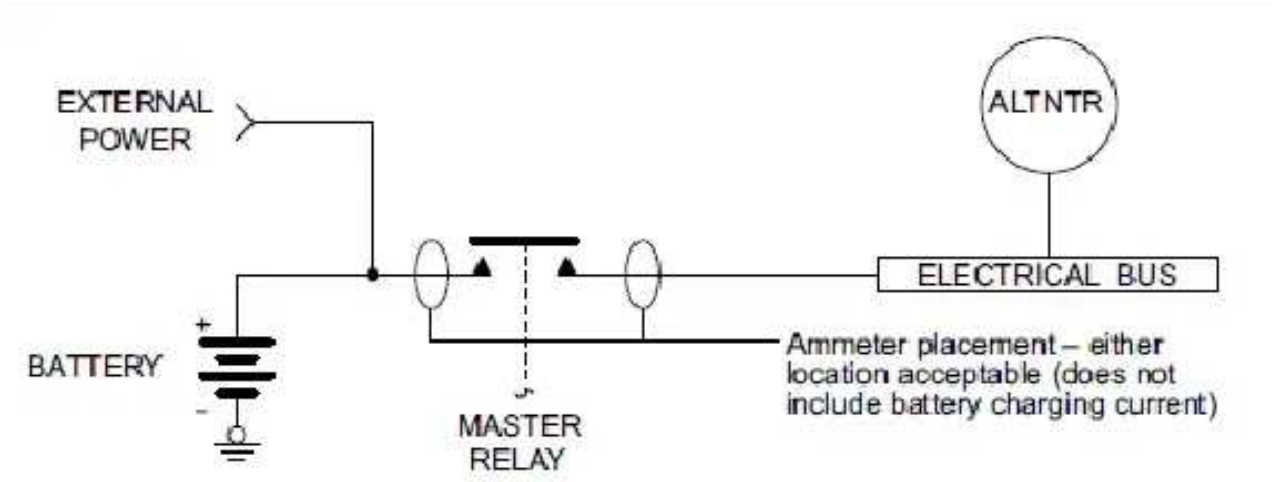


Figure 3-11 – Ammeter Placement for Current Measurements

7. Ensure all circuit breakers are closed.
8. Apply external power to the aircraft. The voltage of the power source should be set to the nominal alternator voltage (usually 13.8 VDC or 27.5 VDC).
9. Turn on the battery master switch.

Note: Intermittent electrical loads are not measured. It is assumed if additional current is required beyond what the alternator can supply, this short-duration demand will be provided by the battery.

10. Set the lighting as described below. These settings will be used for every current measurement which follows:
    a. All instrument panel and flood lights should be set to maximum brightness.
    b. Any displays with a backlight should be set to 50% brightness
11. Using the tabulation completed above, switch on all continuous electrical loads used for the taxiing phase and record the current measured by the ammeter (measurement (a) in Figure 3-13). The autopilot circuit breaker (if installed) should be closed, but the autopilot should not be engaged.

WARNING

Pitot heat should be switched on only long enough to take the current measurement and then switched off to avoid injury to personnel or damage to the pitot tube.

12. Using the tabulation completed above, switch on all continuous electrical loads used for the normal takeoff/landing phase and record the current measured by the ammeter. Measurements must be taken with the landing lights ON and OFF (measurements (b1) and (b2) in Figure 3-13).
13. Engage the autopilot (if installed).
14. Using the tabulation completed above, switch on all continuous electrical loads which are used for the normal cruise phase and record the current measured by the ammeter (measurement (c) in Figure 3-13).
15. Using the tabulation completed above, switch on all continuous electrical loads used for the emergency cruise phase and record the current measured by the ammeter.
16. Using the tabulation completed above, switch on all continuous electrical loads used for the emergency landing phase and record the current measured by the ammeter.
17. Using the values measured and recorded, complete the ELA using the blank form in Figure 3-12 and Figure 3-13.
18. Verify the maximum electrical load does not exceed 80% of the electrical system capacity. See example in Figure 3-14 and Figure 3-15.

NOTE:

Electrical loads in excess of 80% but not greater than 95% of electrical system capacity are permitted during the takeoff/landing phase of flight when landing light(s) are switched on.

AIRPLANE ELECTRICAL LOAD TABULATION FORM

Date: ________ Tail Number: ________

Circuit/System	Circuit Breaker Number	Operating Time	Phase(s) of flight during which circuit/system is used				
			Normal Operation			Emergency Operation	
			Taxiing 10 min	TO/Land 10 min	Cruise 60 min	Cruise	Land 10 min

Figure 3-12 – Blank Electrical Load Tabulation Form, Sheet 1 of 2

AIRPLANE ELECTRICAL LOAD TABULATION FORM (CONTINUED)

Date: _____ Tail Number: _____

Circuit/System	Circuit Breaker Number	Operating Time	Phase(s) of flight during which circuit/system is used: Normal Operation – Taxiing 10 min	Normal Operation – TO/Land 10 min	Normal Operation – Cruise 60 min	Emergency Operation – Cruise	Emergency Operation – Land 10 min
_____	_____	_____					
_____	_____	_____					
_____	_____	_____					
_____	_____	_____					
_____	_____	_____					
_____	_____	_____					
_____	_____	_____					
_____	_____	_____					
_____	_____	_____					
Total current used (amps):			_____ (a)	Ldg Lt ON (b1) Ldg Lt OFF (b2)	_____ (c)	_____ (d)	_____ (e)
÷ Alternator rating (amps): _____							
x 100% = Percent of alternator capacity used:			_____ % (< 80%)	% Ldg Lt ON (< 95%) % Ldg Lt OFF (< 80%)	_____ % (< 80%)	N/A	N/A
Pass/Fail:			_____	_____	_____		

Notes:

Figure 3-13 – Blank Electrical Load Tabulation Form, Sheet 2 of 2

ELECTRICAL LOAD TABULATION FORM

Date: 02/14/14 Tail Number: NXXXX

Circuit/System	Circuit Breaker Number	Operating Time	Phase(s) of flight during which circuit/system is used: Normal Operation – Taxiing 10 min	Normal Operation – TO/Land 10 min	Normal Operation – Cruise 60 min	Emergency Operation – Cruise	Emergency Operation – Land 10 min
ALTERNATOR FIELD		Continuous	☒	☒	☒	☐	☐
ANNUNCIATOR PANEL		Continuous	☒	☒	☒	☒	☒
VACUUM WARNING		Intermittent	☐	☐	☐	☐	☐
GEAR WARNING		Intermittent	☐	☐	☐	☐	☐
GEAR ACTUATOR		Intermittent	☐	☐	☐	☐	☐
CLUSTER GAUGE		Continuous	☒	☒	☒	☒	☒
IGNITION		Intermittent	☐	☐	☐	☐	☐
PFD		Continuous	☒	☒	☒	☒	☒
TURN COORDINATOR		Continuous	☒	☒	☒	☐	☐
GEAR RELAY		Intermittent	☐	☐	☐	☐	☐
ADC		Continuous	☒	☒	☒	☒	☒
PANEL LIGHTS		Continuous	☒	☒	☒	☒	☒
GLARESHIELD LIGHTS		Continuous	☒	☒	☒	☒	☒
AHRS		Continuous	☒	☒	☒	☒	☒
FLAP ACTUATOR		Intermittent	☐	☐	☐	☐	☐
COM 1		Continuous	☒	☒	☒	☒	☒
GPS/NAV 1		Continuous	☒	☒	☒	☒	☒
COM 2		Continuous	☒	☒	☒	☐	☐
GPS/NAV 2		Continuous	☒	☒	☒	☐	☐
AUTOPILOT [1]		Continuous	☒	☒	☒	☐	☐
AUDIO PANEL		Continuous	☒	☒	☒	☒	☒
RADIO BLOWER		Continuous	☒	☒	☒	☐	☐
ADF		Continuous	☒	☒	☒	☐	☐
TRANSPONDER		Continuous	☒	☒	☒	☒	☒
GDL 69		Continuous	☒	☒	☒	☐	☐
GTS 8X5		Continuous	☒	☒	☒	☐	☐
JPI ENGINE MONITOR		Continuous	☒	☒	☒	☒	☒
BOSE HEADSETS		Continuous	☒	☒	☒	☒	☒
ALTITUDE ENCODER		Continuous	☒	☒	☒	☒	☒
STROBE LIGHT		Continuous	☒	☒	☒	☒	☒
NAV LIGHTS		Continuous	☒	☒	☒	☒	☒
RECOGNITION LIGHTS		Continuous	☒	☒	☒	☒	☒
LANDING LIGHT		Continuous	☒	☒	☐	☐	☒
PITOT HEAT		Continuous	☒	☒	☒	☒	☒
BOOST PUMP		Continuous	☐	☒	☒	☒	☒

Figure 3-14 – Sample Complete Electrical Load Tabulation Form, Sheet 1 of 2

ELECTRICAL LOAD TABULATION FORM (CONTINUED)

Date: 02/14/14 Tail Number: NXXXX

Circuit/System	Circuit Breaker Number	Operating Time	Phase(s) of flight during which circuit/system is used: Normal Operation – Taxiing 10 min	Normal Operation – TO/Land 10 min	Normal Operation – Cruise 60 min	Emergency Operation – Cruise	Emergency Operation – Land 10 min
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
Total current used (amps):			47.5 (a)	60 Ldg Lt ON (b1) 44.7 Ldg Lt OFF (b2)	43.5 (c)	34.0 (d)	48.1 (e)
÷ Alternator rating (amps): 70							
x 100% = Percent of alternator capacity used:			68 % (< 80%)	86 % Ldg Lt ON (< 95%) 64 % Ldg Lt OFF (< 80%)	62 % (< 80%)	N/A	N/A
Pass/Fail:			PASS	PASS	PASS		

Notes:

Figure 3-15 – Sample Completed Electrical Load Tabulation Form, Sheet 2 of 2

3.7 Battery Capacity Analysis

The purpose of the Battery Capacity Analysis is to ensure the battery system can provide electrical power to those loads which are essential to continued safe flight and landing in the event of a complete loss of the primary electrical power generating system when the GFC 500 Autopilot is installed on a bus which would not be shed in the event of an alternator or generator failure. This analysis is completed in addition to the Electrical Load Analysis.

ASTM F2490-05, Standard Guide for Aircraft Electrical Load and Power Source Analysis, provides acceptable guidance for conducting a complete analysis of increased electrical load.

Complete the following battery capacity analysis procedure. See example calculations under each step.

1. Estimate emergency battery capacity in amp-minutes (A-min) by calculating 75% of the rated battery capacity.

   For example: 12 A-h = 720 A-min

   720 A-min x 75% = 540 A-min

2. Estimate the normal or preload shed cruise consumption (assume worst-case cruise at night) This assumes 5 minutes for the pilot to shed essential loads following a low-voltage warning. Any automatic load shedding can be assumed to be immediate and need not be considered in the preload shed calculations.

   For example: 15 A

   15 A x 5 min = 75 A-min

3. Estimate the minimum cruise load necessary to maintain flight after the alternator/generator has failed.

   For example: 10 A

4. Estimate the consumption required during the landing approach.

   For example: 20 A for 5 min

   20 A x 5 min = 100 A-min

5. Calculate emergency cruise capacity by subtracting estimated shed and landing consumptions from estimated emergency battery capacity.

   540 A-min – (75 A-min + 100 A-min) = 365 A-min

6. Calculate maximum emergency cruise duration by dividing emergency cruise capacity by emergency cruise load.

   365 A-min / 10 A = 36.5 min

7. Calculate total duration by adding preload shed cruise time, cruise duration, and landing times.

   5 min + 36.5 min + 5 min = 46.5 min

Additional information regarding Aircraft Electrical Load Analysis and Battery Capacity Analysis can be obtained from ASTM International Document F 2490-05.

4. INSTALLATION PROCEDURES

4.1 Electrical Installation

4.1.1 Special Tools

Crimp tools and positioners are required to ensure consistent, reliable crimp contact connections for the D-sub connectors. The following crimp tools are recommended:

Table 4-1 – Pin Contact Crimp Tooling

Manufacturer	Crimp Tool P/N	Positioner P/N	Insertion/Extraction Tool P/N
MIL-Spec	M22520/2-01	M22520/2-09	M81969/1-04 or M81969/14-01
Daniels	AFM8	K42	

4.1.2 Power Distribution

The circuit protection devices for the GFC 500 Autopilot must be a push-pull manually resettable circuit breaker (MS26574-X or Garmin p/n 355-00010-XX). The circuit breakers must be located where they are easily accessible by the pilot (e.g. existing circuit breaker panel below the instrument panel or cockpit sidewall). See section 3.2 for required circuit breaker part numbers. The GFC 500 Autopilot should be connected to an avionics bus (non-essential bus) so that power will be supplied when the avionics master switch is switched on. The sonalert, if installed, must be connected to the battery bus.

4.1.3 Wiring Harness

Allow adequate space for installation of the wiring harness and connectors. Construct the wiring harness in accordance with the information contained in this and the following sections. Wire marking is optional. If wires are marked, mark wire in accordance with AC 43.13-1B Chapter 11, Section 16. Strip and insert the wire into the contact and crimp with the recommended (or equivalent) crimping tools. Insert the contacts into the connector as specified by the interconnect diagrams in APPENDIX A . Verify the contacts are properly engaged into the connector by gently tugging on the wire. If connectors are marked, mark in accordance with AC 43.13 Chapter 11, Section 17. Route and secure the wiring harness away from sources of electrical interference.

Table 4-2 and Table 4-3 list the parts required to complete the assembly of the GFC 500 Autopilot wiring harness connectors. Some of the parts required for this installation are included in the connector kits, and some are to be provided by the installer. See the notes below the tables for parts that are included in the connector kits. The Garmin connector backshell gives the installer the ability to easily terminate shield grounds at the connector backshell as shown in Figure 4-1 and Figure 4-2. See Figure 4-3 for acceptable shield termination methods.

CAUTION: Check wiring connections for errors before connecting the wiring harness to the LRUs. Incorrect wiring could cause component damage.

Table 4-2 – GMC 507 Connector Parts

Item	Description	Part Number	Notes
1	Backshell, Jackscrew, 9/15 Pin	125-00171-00	1
2	Conn, Male, HD DSUB, 15 CKT	330-00366-15	1
3	Contact, Pin, Mil Crimp, Size 22D	336-00021-00	1
4	Clamp	115-01078-00	1
5	Screw, 4-40x.375, PHP, SS/P, w/Nylon	211-60234-10	1
6	Cover	115-01079-00	1
7	Screw, 4-40x.187, FLHP100, SS/P, w/Nylon	211-63234-06	1
8	Shield Termination, Solder Style, Insulated, Heat-Shrinkable, Environment Resistant	AS83519/1-X	2
9	Braid, 1/16” Flat or Braid, 1/16” Tubular	AA59569F36T0062 or AA59569R36T0062	2
10	Terminal, Lug, Crimp Style, Copper, Insulated, Ring Tongue, Bell Mouthed, Type II, Class I	MS25036-XXX	
11	Screw, PHP, 8-32 x 0.312", Cad-Plated Steel, or Screw, PHP, 8-32 x 0.312", Stainless	MS35206-242, or MS51957-42	
12	Split Washer, #8 (0.045" compressed thickness), Cad-plated Steel, or Split Washer, #8 (0.045" compressed thickness), Stainless	MS35338-42, or MS35338-137	
13	Flat washer, Cad-plated Steel, #8, 0.032" thick, 0.174" ID, 0.375" OD, or Flat Washer, Stainless, #8, 0.032" thick, 0.174" ID, 0.375" OD	NAS1149FN832P, or NAS1149CN832R	
14	Insulation Tape, Electrical, Self-Adhering, Unsupported Silicone Rubber	A-A-59163 (MIL-I-46852C)	

Notes:

1. The part number listed is a Garmin Part Number and is included in connector kit p/n 011-01824-01.
2. AS83519/1-X and braid are the preferred method for shield termination. Alternatively, AS83519/2-X with pre-installed shield drain may be used.

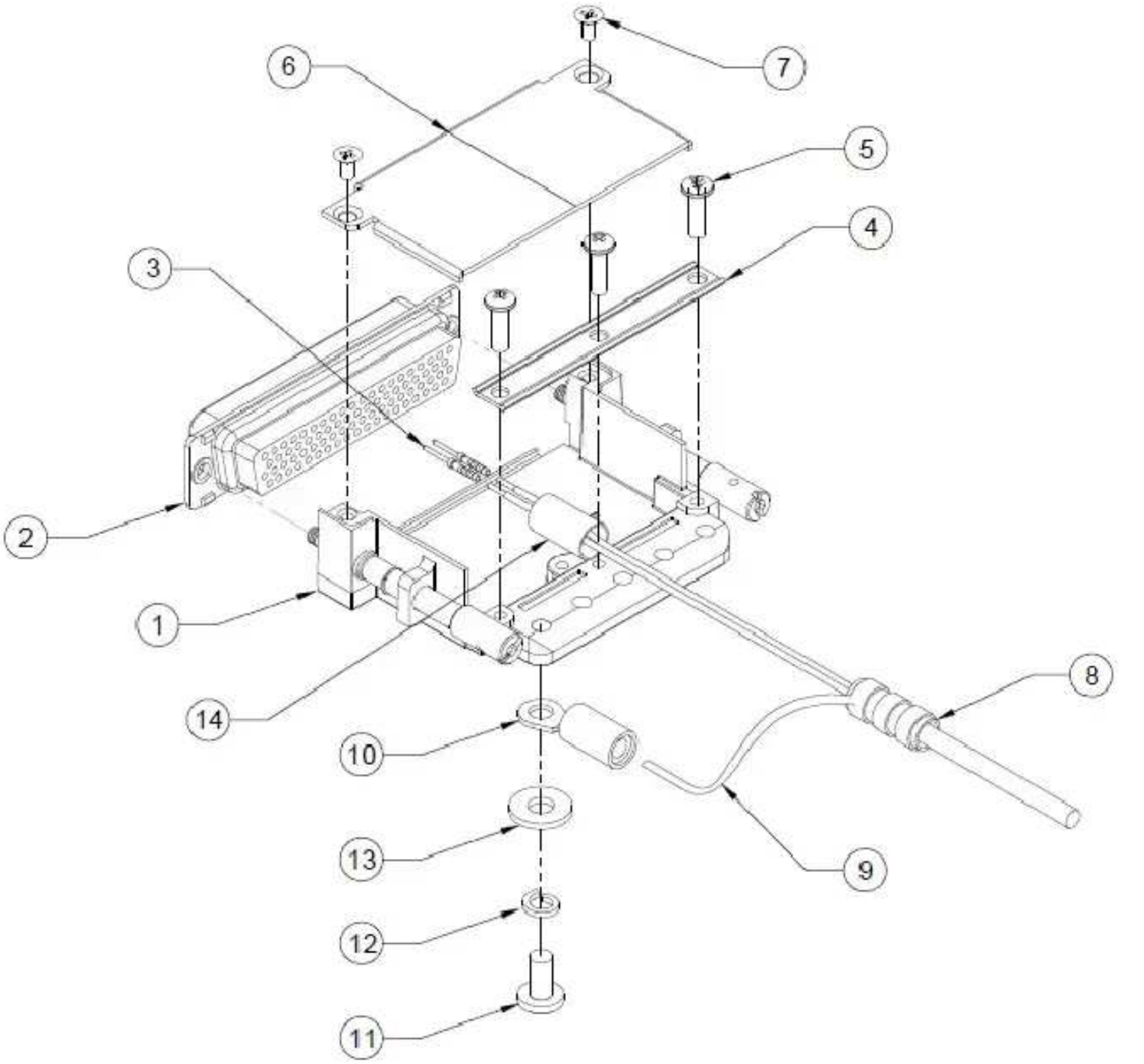


Figure 4-1 – GMC 507 Wiring Harness Connector Assembly

Table 4-3 – GSA 28 Connector Parts

Item	Description	Part Number	Notes
1	Backshell, Jackscrew, Config Module, 15/26 Pin	125-00172-00	1
2	Connector, Rcpt, D-Sub, Crimp Socket, Commercial, 15 CKT	330-00625-15	1
3	Cont, Sckt, Mil Crp, Size 20 20-24 AWG, RoHS	336-00022-02	1
4	Clamp, Backshell, Jackscrew, 15/26 Pin	115-01078-01	1
5	Screw, 4-40x.375, PHP, SS/P, w/Nylon	211-60234-10	1
6	Cover, Backshell, Jackscrew, 15/26 Pin	115-01079-01	1
7	Screw, 4-40x.187, FLHP100, SS/P, w/Nylon	211-63234-06	1
8	Shield Termination, Solder Style, Insulated, Heat-Shrinkable, Environment Resistant	AS83519/1-X	2
9	Braid, 1/16” Flat or Braid, 1/16” Tubular	AA59569F36T0062 or (AA59569R36T0062)	2
10	Terminal, Lug, Crimp Style, Copper, Insulated, Ring Tongue, Bell Mouthed, Type II, Class I	MS25036-XXX	
11	Screw, PHP, 8-32 x 0.312", Cad-Plated Steel, or Screw, PHP, 8-32 x 0.312", Stainless	MS35206-242, or MS51957-42	
12	Split Washer, #8 (0.045" compressed thickness), Cad-plated Steel, or Split Washer, #8 (0.045" compressed thickness), Stainless	MS35338-42, or MS35338-137	
13	Flat washer, Cad-plated Steel, #8, 0.032" thick, 0.174" ID, 0.375" OD, or Flat Washer, Stainless, #8, 0.032" thick, 0.174" ID, 0.375" OD	NAS1149FN832P, or NAS1149CN832R	
14	Insulation Tape, Electrical, Self-Adhering, Unsupported Silicone Rubber	A-A-59163 (MIL-I-46852C)	

Notes:

1. The part number listed is a Garmin Part Number and is included in connector kit p/n 011-04755-00.
2. AS83519/1-X and braid are the preferred method for shield termination. Alternatively, AS83519/2-X with pre-installed shield drain may be used.

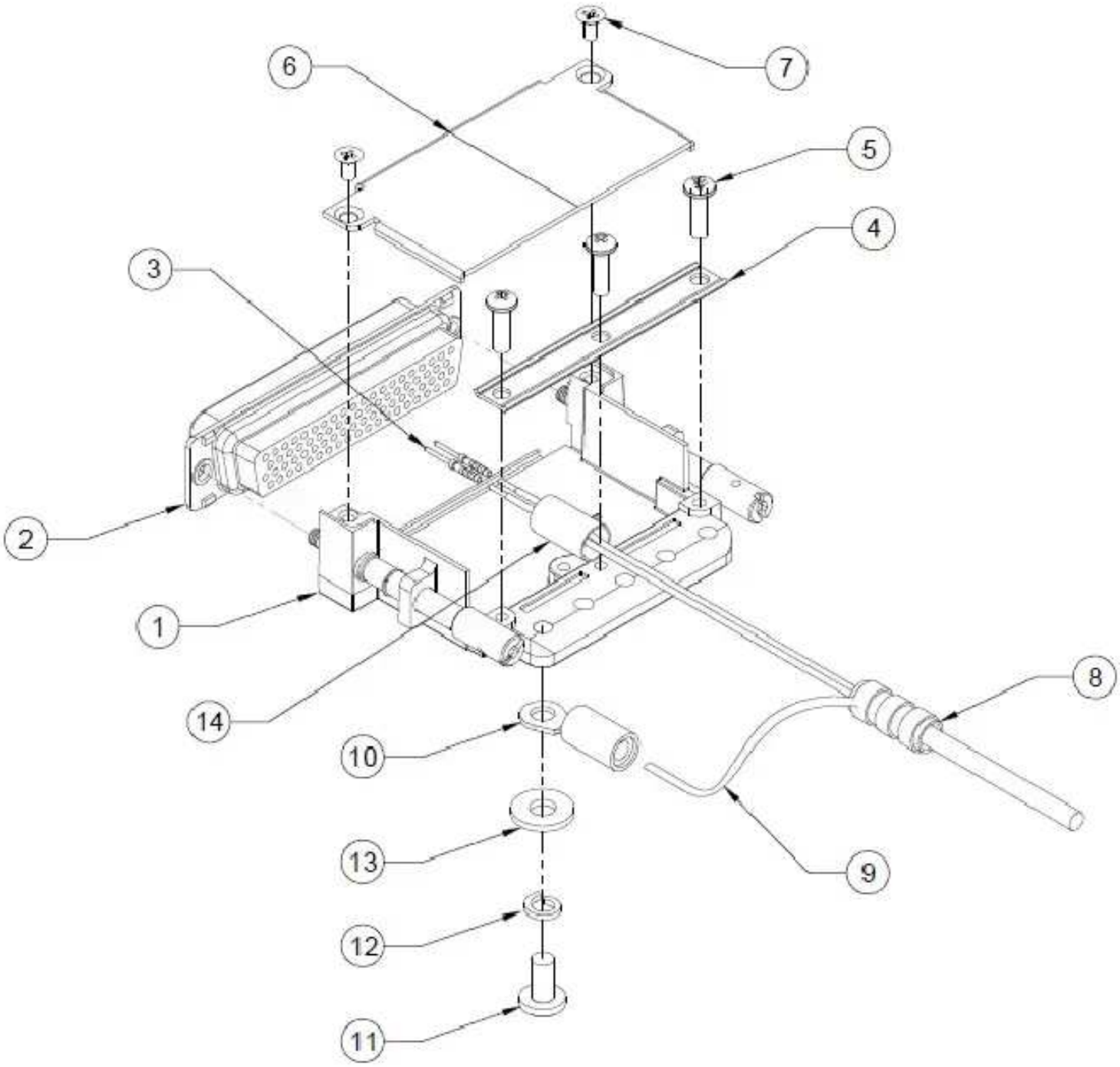


Figure 4-2 – GSA 28 Wiring Harness Connector Assembly

4.1.3.1 Wiring Harness Assembly

Prepare the wiring harness assembly using the following procedure. Numbers in parentheses are items listed in Table 4-2 and Table 4-3, and shown in Figure 4-1 and Figure 4-2.

1. Strip 2.0 inches maximum (GMC 507 connector) or 2.5 inches maximum (GSA 28 connectors) of the jacket to expose the shield braid.
2. Remove the exposed braid.
3. Carefully score the jacket 1/4 to 5/16 inches and remove the jacket to leave the braid exposed.
4. Slide a shield terminator (8) and braid (9) onto the exposed shield braid and connect the shield drain braid to the shield using a heat gun approved for use with solder sleeves.
5. Strip the signal wires approximately 0.17 inches for a pin contact (3).
6. Crimp pin contacts (3) on to the signal wires.
7. Crimp ring terminals (10) on to the shield drain braids.
8. Repeat steps 1 through 7 as needed for the remaining shielded wires.
9. Insert the signal wire pin contacts (3) into the appropriate locations in the D-sub connector (2). See APPENDIX A for interconnect diagrams.
10. Attach the shield drain ring terminals (10) to the connector backshell (1) shield block using the specified screws and washers (11), (12), and (13).

NOTE: Only two ring terminals should be attached to each screw on the connector backshell shield ground. It is preferred that only two wires be terminated in each ring terminal. This will necessitate the use of a ring terminal, #8, insulated, 18-22 AWG (MS25036-149). If more wires exist for the connector than two per ring terminal, it is permissible to terminate three wires per ring terminal.

11. Wrap the wiring harness with insulation tape (14) at the point where the strain relief clamp (4) and connector backshell (1) will contact the wiring harness.
12. Attach the strain relief clamp (4) to the connector backshell (1) using the supplied screws (5).

CAUTION: Install the strain relief clamp concave side up to avoid damaging the wiring harness.

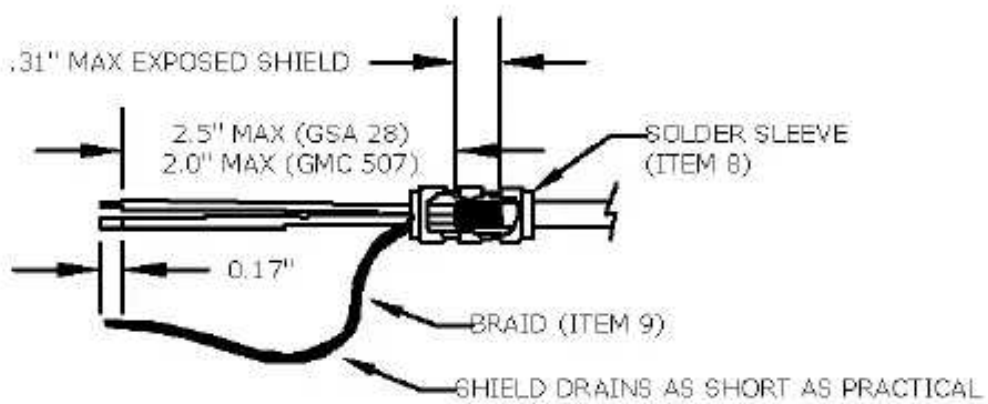
13. Install the connector backshell cover (6) using the supplied screws (7).

4.1.3.2 Shield Ground Termination

Shield grounds should be kept as short as practical to aid in reducing radio frequency interference (RFI) and electro-magnetic interference (EMI). See Figure 4-3 for acceptable shield termination methods.

NOTE: Max Length of unshielded wire = 2.0 inches for GMC 507 connector and 2.5 inches for GSA 28 connectors. Max length of shield drain (braid) = 3.0 inches. If a splice at a connector requires extra length, max length of unshielded wire = 4.0 inches and max length of shield drain (braid) = 3.0 inches. It is acceptable to use shorter lengths.

SHIELDED CABLE PREPARATION (PREFERRED METHOD)



SHIELDED CABLE PREPARATION (ALTERNATE METHOD)

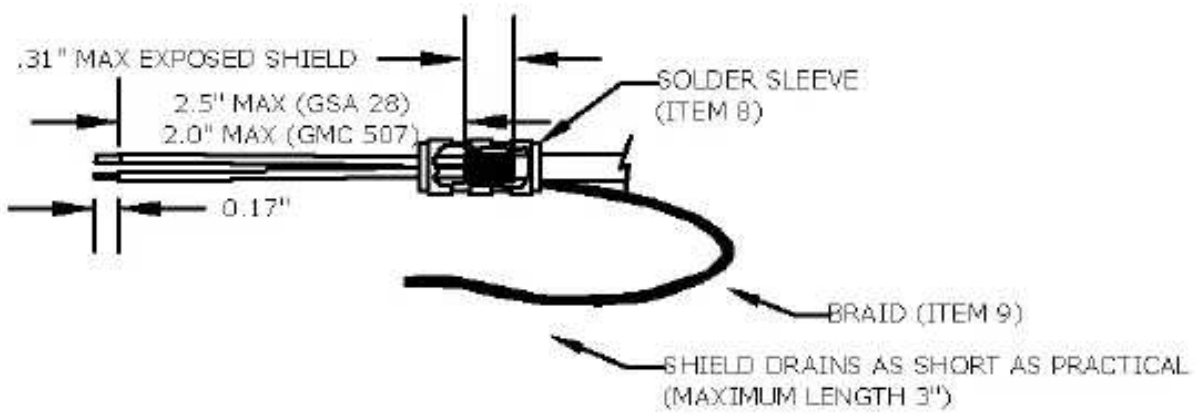


Figure 4-3 – Shield Termination Methods

4.1.4 Ground Stud Build Up

Certain model-specific installations may require the installation of ground studs for equipment grounding. See Figure 4-4 for the parts required and the buildup sequence for each ground stud installation. Refer to the appropriate model-specific installation manual addendum (190-02291-XX) to determine quantities and installation locations of ground studs. Use the surface preparation steps provided in section 3.5.1.

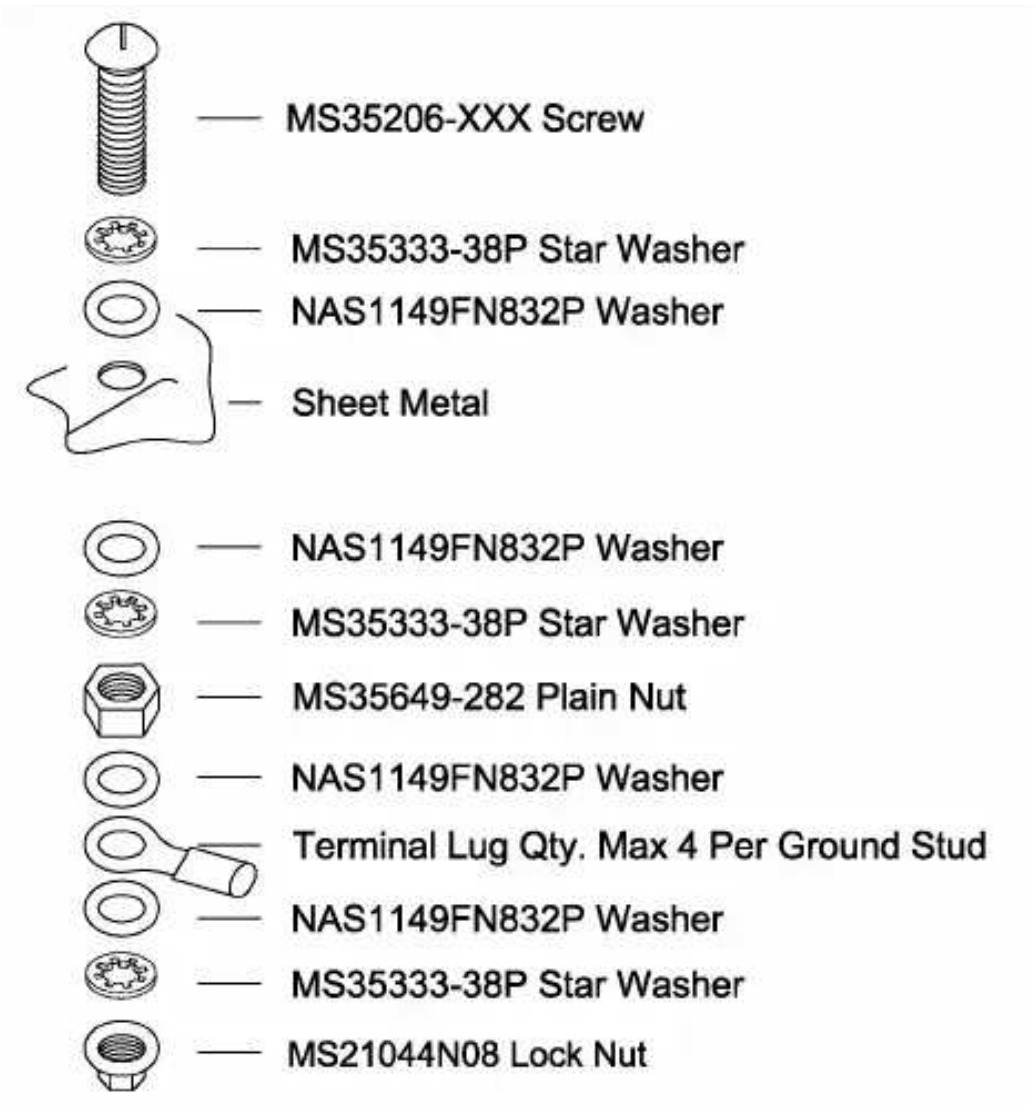


Figure 4-4 – Ground Stud Build Up

4.2 Equipment Installation

CAUTION: Applying more than 20 in lbs of torque using the hex drive tool can damage the equipment retention mechanisms.

4.2.1 GMC 507 Autopilot Mode Controller Installation

The GMC 507 Autopilot mode controller is designed to be installed either in a mounting rack or attached directly to the panel.

If the GMC 507 is installed in an existing radio stack, a mounting rack, P/N 115-02774-00, is attached to brackets or rails to adapt the GMC 507 to the width of the existing stack. In many cases, the existing brackets or rails fastened to the instrument panel can provide adequate means to attach the GMC 507 mounting rack and may require no modifications to the instrument panel. Secure the mounting rack to the rails using four 6-32 MS24693 screws. Refer to Section 4.2.1.1 and Section 4.2.1.3 for cutout and rail modification requirements.

If the GMC 507 is installed in an area of the instrument panel that does not have mounting rails, the unit may be attached directly to the panel, without the use of an install rack. Refer to Section 4.2.1.2 for cutout requirements.

Refer to the appropriate model-specific installation manual addendum (190-02291-XX) for installation limitations and additional details.

Ensure that the flight controls move freely from stop-to-stop and that there is no binding or restriction of the flight controls caused by the GMC 507 rack and the electrical wiring harness.

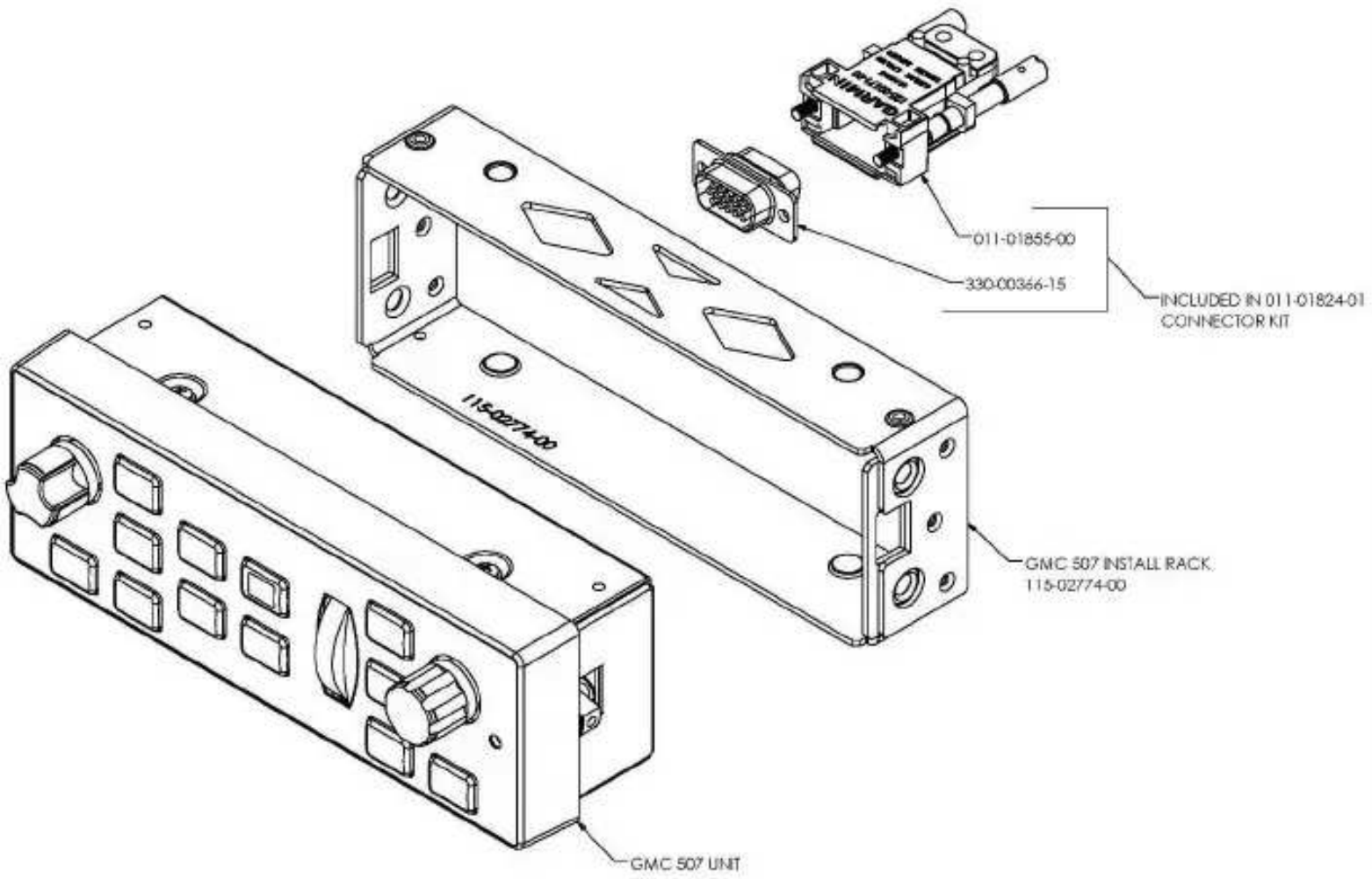


Figure 4-5 – GMC 507 Installation with Rack

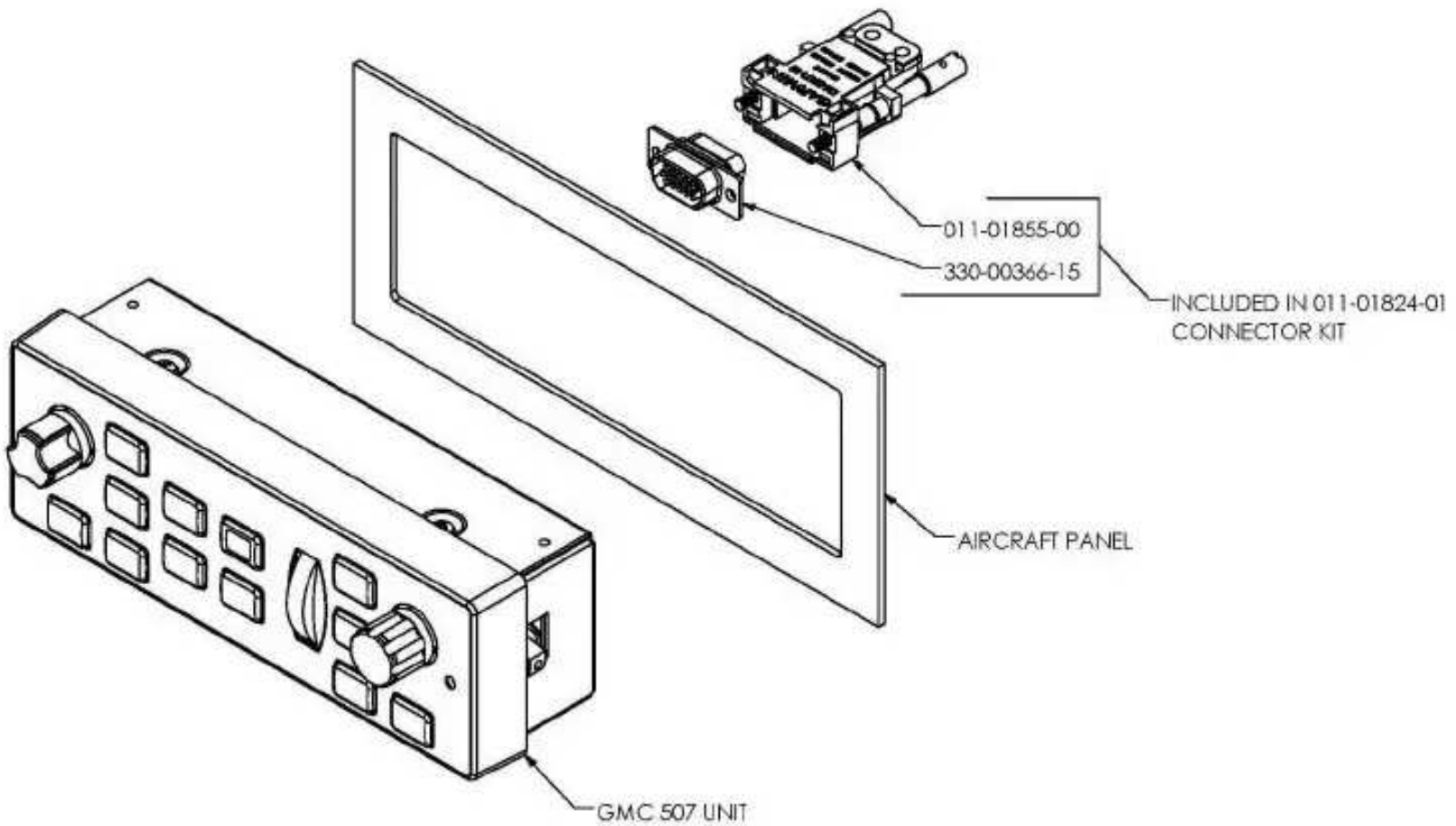


Figure 4-6 – GMC 507 Installation Without Rack

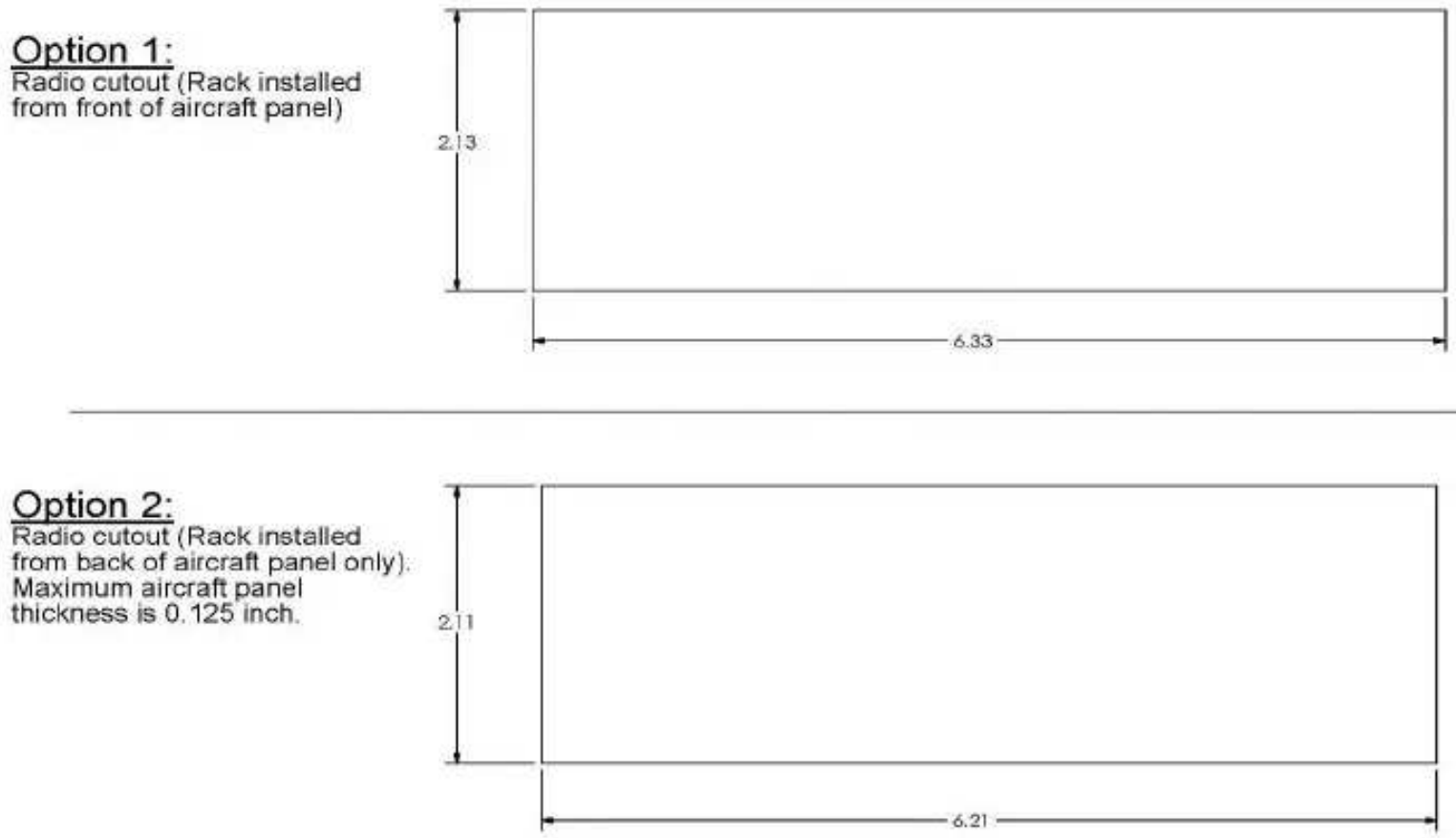
4.2.1.1 Avionics Stack Cutout

Some instrument panels may require minor modification to increase width or height of the avionics stack cutout to accommodate installation of the GMC 507.

The panel must be electrically bonded. The rack must be electrically bonded to the panel. Refer to Section 3.5.2 for details.

To satisfy the structural requirements for the installation of the GMC 507, the following conditions must be met:

1. A cutout cannot be made into aircraft primary structure.
2. Cutout area must not affect any subpanel structure.
3. Some stationary instrument panels are considered primary structure. Modification of such panels is not covered by this STC and requires additional approval.
4. Refer to Figure 4-7 for dimensions of GMC 507 cutout.
5. Radius corners and remove burrs from cut edges. Paint the cut edge or apply corrosion protection (primer which meets FED STD TT-P-1757 or MIL-PRF-23377, or other corrosion protection methods listed in the manufacturer's aircraft maintenance manual).



Tolerance for this Figure .xx +/- 0.04 Inches

Figure 4-7 – Panel Cutout Detail for GMC 507 with Rack

4.2.1.2 Panel Cutout for Installation outside of the Avionics Stack.

If it is desired to install the GMC 507 in a location not in the Avionics Stack, minor modifications to the instrument panel may be required.

To allow the GMC 507 locking pawls to properly engage and support the unit, the panel thickness must be between 0.075” and 0.140” thick.

The panel must be electrically bonded. Refer to Section 3.5.2 for details.

The hatched areas shown in Figure 4-8 are areas on the far side of the panel that will be used as the electrical bonding path for the pawl latch fasteners. These areas must be free of paint and prepared as directed in Section 3.5.1.

To satisfy the structural requirements when installing a GMC 507outside of the radio stack the following conditions must be met:

1. Modification of the instrument panel must be in accordance with AC 43.13-2B, Chapter 2.
2. The panel thickness must be between 0.075” and 0.140” thick.
3. Dimensions of the new hole must be as shown in Figure 4-8
4. There must be at least 0.25 inches between the new cutout and any adjacent holes or the edge of the panel.
5. The instrument panel must be structurally capable of supporting the weight of the unit.
6. The location of the cutout must allow for sufficient clearance for the GMC 507 wiring, see Figure 4-9.
7. The location must be free from rapid thermal transients, in particular, large heat loads from other electrical loads.
8. A cutout cannot be made into aircraft primary structure.
9. Cutout area must not affect any subpanel structure.
10. Some stationary instrument panels are considered primary structure. Modification of such panels is not covered by this STC and requires additional approval.
11. Radius corners and remove burrs from cut edges. Paint the cut edge or apply corrosion protection (primer which meets FED STD TT-P-1757 or MIL-PRF-23377, or other corrosion protection methods listed in the manufacturer’s aircraft maintenance manual).

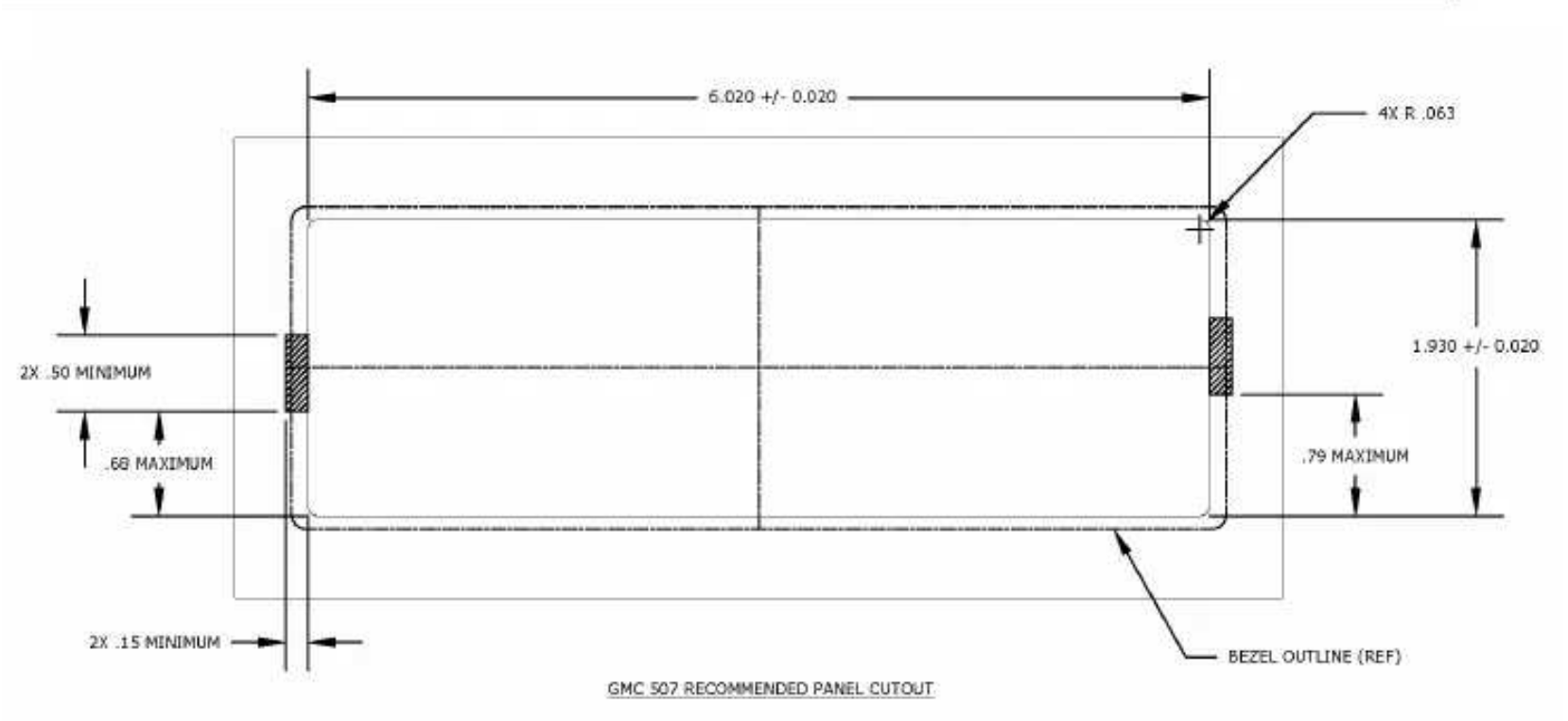


Figure 4-8 – Panel Cutout Detail for GMC 507 without Rack

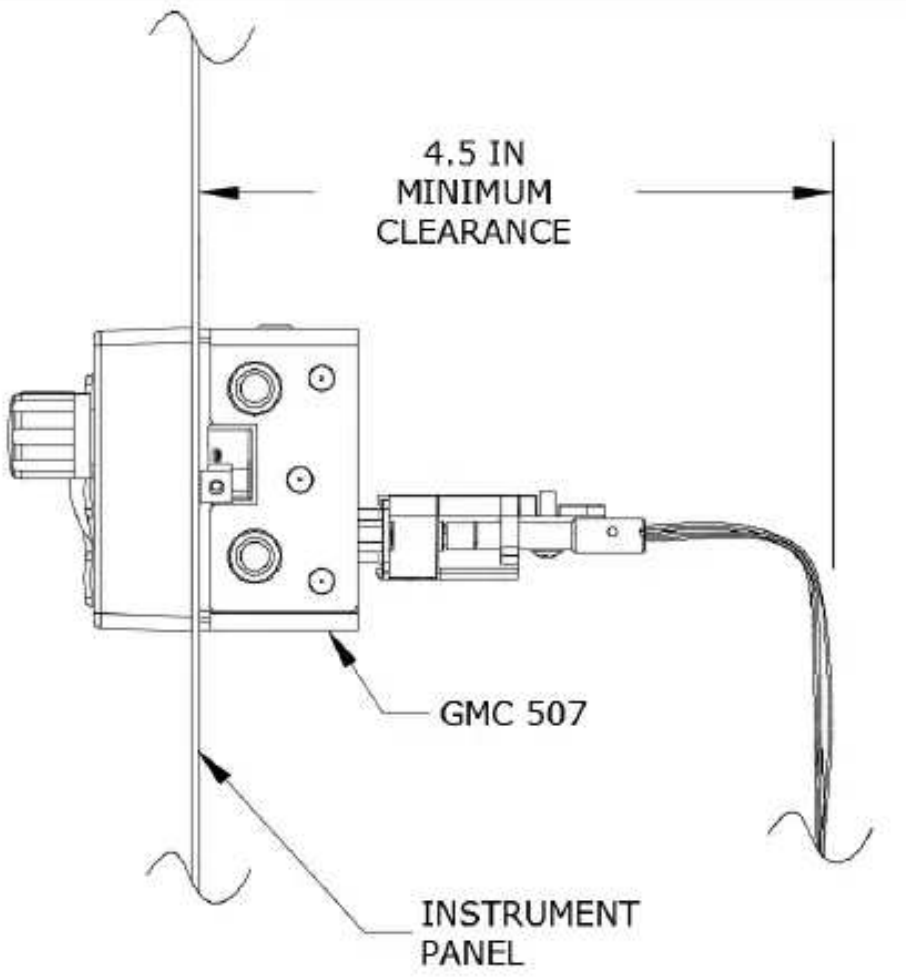


Figure 4-9 – Clearance for Connection

4.2.1.3 Modification of Avionics Stack Mounting Rails

Existing mounting rails may contain holes from previously installed equipment. If existing rail holes do not match holes in GMC 507 mounting racks, it may be acceptable to modify the rails by adding fastener holes for the GMC 507 mounting rack.

To satisfy the structural requirements, any modification of the existing mounting rails must meet the following conditions, see Figure 4-10:

1. Avionics stack brackets or rails must be at least 0.032" thick.
2. Additional fastener holes must maintain an edge distance at least 2 x D.
3. Added and existing holes in the mounting rail must maintain at least 3 x D distance between hole centers.
4. If existing brackets or mounting rails are determined to be unsuitable for installation of the GMC 507, new parts need to be fabricated. In some cases, there may be too many holes from previous avionics mounting tray installations.

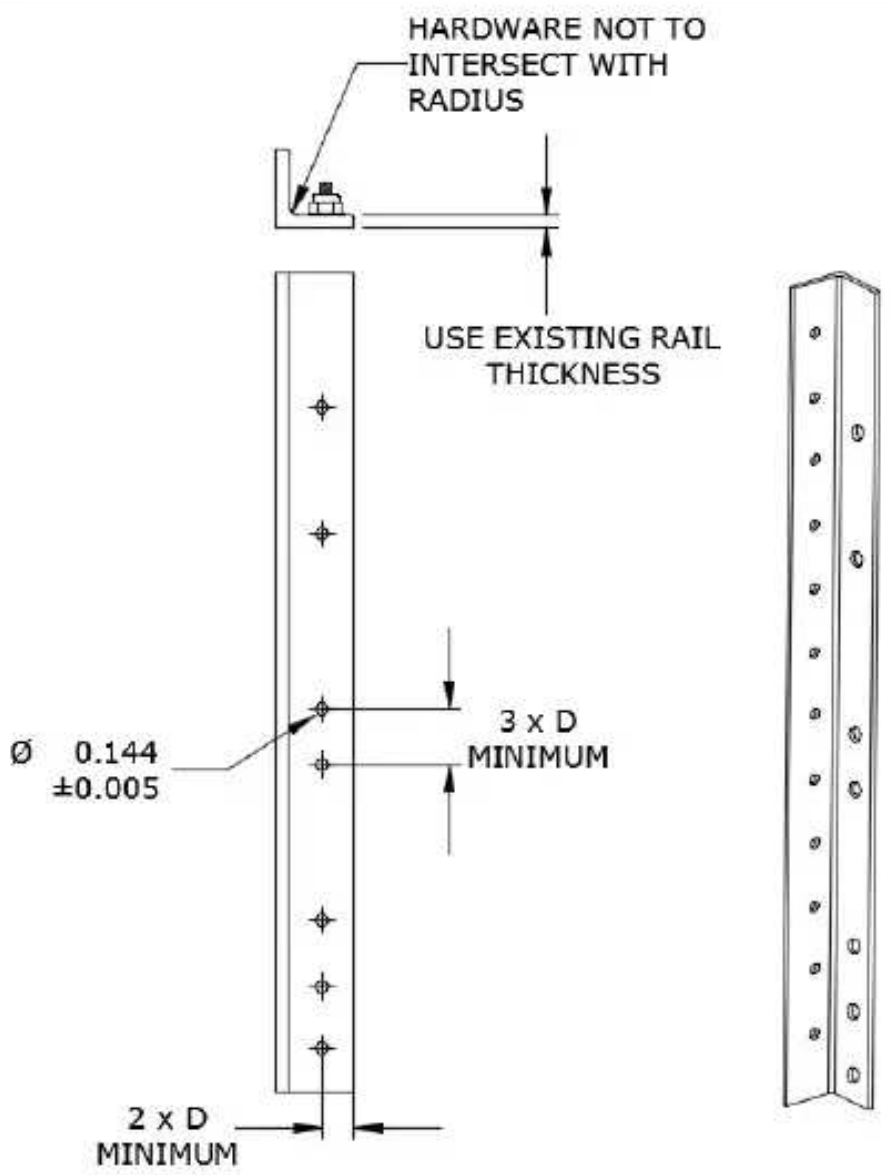


Figure 4-10 – Avionics Rack Mounting Rail

If it is required to fabricate new brackets or mounting rails for the installation of the GMC 507, the following conditions must be met:

1. Carefully remove existing mounting rails from instrument panel. Avoid enlarging existing fastener holes.
2. Fabricate new parts as close to the original design as possible (e.g., rails that had too many holes drilled to be functional for another installation should be replaced with new rails of the same material thickness and type with only the holes necessary for the planned avionics stack).
3. If material type of the original rails or brackets is unknown, replace with 2024-T3 (bare or clad) of the same thickness as the original part. Apply aviation standard sheet metal techniques (bend radius, fillets, etc.) for the material type and thickness selected for the fabricated rails or brackets.
4. Fabricated parts must be corrosion protected using methods listed in the aircraft's maintenance manual. Area around the fastener holes on the side of the fabricated rail which attaches to the GMC 507 mounting rack must be cleaned and prepared for electrical bond as detailed in section 3.5 of this manual.
5. Install fabricated mounting rails to instrument panel using the same number and size of fasteners as those removed.

4.2.1.4 GMC Installation and Removal

NOTE: Ensure the position of the GMC 507 retention mechanisms are correct by inserting a *3/32" hex drive tool into* the left and right access holes and turn the hex drive tool counterclockwise until it fully stops.

Installation

1. Ensure that the GFC 500 system is de-energized by pulling the AUTOPILOT circuit breaker.
2. Connect the electrical connector (P5071) to the GMC 507.
3. Slide unit into the rack or panel cutout until it stops.
4. Insert a 3/32" hex drive tool into the left and right access holes.
5. Push on the GMC 507 bezel while turning each of the retention mechanisms clockwise until the unit is securely seated in the rack. Do not exceed 20 in-lbs of torque.

Removal

1. De-energize the GFC 500 system by pulling the AUTOPILOT circuit breaker.
2. Insert a 3/32" hex drive tool into the left and right access holes.
3. Turn each of the retention mechanisms counterclockwise until the hex drive tool stops.
4. Pull the unit from the rack or panel cutout.
5. Disconnect the electrical connector (P5071) from the GMC 507.

4.2.2 GSA 28 Servos

Ensure that the main flight control cables are rigged and tensioned as outlined in the aircraft maintenance manual.

Ensure that the main flight control cables have adequate clearance from structure and feed-thru holes.

Refer to the appropriate model-specific installation manual addendum (190-02291-XX) for detailed electrical, structural, and mechanical installation data for the GSA 28 servos.

After the servos are installed and the servo cables are tensioned, move the flight controls through the full range of travel several times.

Ensure that the flight control surfaces move freely from stop to stop.

Ensure that there is no binding or restriction of the flight controls caused by the servo installation.

Ensure the servo cables, cable clamps, and main flight control cables have adequate clearance from adjacent structure and feed-thru holes throughout the full range of motion.

Recheck the servo cable tension and reset if necessary.

4.2.3 Sonalert

Refer to the appropriate model-specific installation manual addendum (190-02291-XX) for detailed structural installation data and limitations for the sonalert (if required).

4.3 Weight and Balance

The aircraft weight and balance must be updated after the installation of the GFC 500 Autopilot. See Table 1-3 for the weights associated with the GFC 500 equipment. See APPENDIX C for equipment dimensions and center of gravity information. Refer to the appropriate model-specific installation manual addendum (190-02291-XX) for equipment locations and center of gravity details. Refer to AC 43.13-1B, Chapter 10, for the weight and balance procedure covering the addition of equipment to the aircraft.

5. SYSTEM CONFIGURATION

5.1 Overview

This section contains instructions for configuration and checkout of the GFC 500 Autopilot. The steps which are not applicable to a particular installation may be skipped. A post-installation checkout log is provided in the GFC 500 Autopilot with Electronic Stability and Protection Part 23 AML STC Maintenance Manual, 190-02291-01. The log must be filled out during the checkout procedures and maintained with the aircraft permanent records. A summary of the steps required for checkout of the GFC 500 Autopilot is as follows:

- Perform mounting, wiring, and power checks (see section 5.2)
- Configure interfaced equipment as necessary (see section 5.3)
- Load G5 or G3X system software as necessary (see section 5.4)
- Configure the GFC 500 system (see section 5.5)
- Perform post-installation checkout procedures (see section 5.5.1.1)
- Perform documentation checks (see section 7)

NOTE: Throughout the next sections, many screenshots and examples are used to illustrate the software loading and configuration and checkout process. Changes may occur which result in the examples being out of date.

The technician performing these procedures must be familiar with the GFC 500 Autopilot. Information regarding the operation of the GFC 500 Autopilot can be found in the G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft p/n 190-01112-12 or the G3X Touch Pilot's Guide for Certified Aircraft, p/n 190-02472-00.

5.2 Wiring Harness Mounting, Continuity, and Power Checks

1. Make sure the wire harnesses are properly secured and shield grounds are properly grounded.
2. Check the movement of the flight and engine controls to verify there is no interference.
3. Check point to point continuity of the GFC 500 Autopilot wire harnesses.
4. Check the GFC 500 Autopilot wire harnesses for faults such as shorting to ground.
5. Perform power and ground checks including lighting inputs.
6. Install the GFC 500 Autopilot equipment.

5.3 Interfaced Equipment Setup

Refer to the appropriate Garmin installation manuals listed in Table 1-5 for detailed equipment setup information. Refer to the appropriate manufacturer's installation manuals for detailed third-party avionics equipment setup information.

5.4 Software Loading

Load software to the G5 and GFC 500 Autopilot in accordance with the procedures outlined in the Garmin G5 Electronic Flight Instrument Part 23 AML STC Installation Manual, Garmin p/n 190-01112-10.

-OR-

Load software to the G3X and GFC 500 Autopilot in accordance with the procedures outlined in the Garmin G3X Touch Electronic Flight Instrument System Part 23 AML STC Installation Manual, Garmin p/n 190-02472-01.

5.5 GFC 500 System Configuration

Record all configuration settings in Appendix A of the STC Maintenance Manual/ICA, 190-02291-01, and retain them with the aircraft permanent records. See section 7.2.

NOTE: To start the G5 in configuration mode, hold down the knob while powering on the G5. Configuration selections are made by rotating and pressing the knob on the face of the G5 as necessary to select the correct configurations. Each configuration item is saved as it is made.

NOTE: To start the G3X in configuration mode, hold down the menu button on the PFD while powering on the System. Configuration selections are made via the G3X PFD as necessary to select the correct configurations. Each configuration item is saved as it is made.

5.5.1 GFC 500 Configuration

NOTE: The G5 (if installed) must be configured in accordance with the Garmin G5 Electronic Instrument Part 23 AML STC Installation Manual prior to configuring the GFC 500 Automatic Flight Control System.

NOTE: The G3X (if installed) must be configured in accordance with the Garmin G3X Touch Electronic Flight Instrument System Part 23 AML STC Installation Manual prior to configuring the GFC 500 Automatic Flight Control System.

NOTE: Some settings in the G5 or G3X may change as a result of configuring the GFC 500 Autopilot with Electronic Stability and Protection. These changes are expected and need no verification. Installation checkout performed by this manual provides adequate verification of proper configuration.

When installed, prior to making configuration changes in the G5 for the GFC 500 Autopilot with Electronic Stability and Protection, verify all G5 configuration settings for the specific G5 configuration are completed and documented as required by the Garmin G5 Electronic Flight Instrument Part 23 AML STC Installation Manual, Garmin p/n 190-01112-10.

When installed, prior to making configuration changes in the G3X for the GFC 500 Autopilot with Electronic Stability and Protection, verify all G3X configuration settings for the specific G3X configuration are completed and documented as required by the Garmin G3X Touch Electronic Flight Instrument System Part 23 AML STC Installation Manual, Garmin p/n 190-02472-01.

Configure the GFC 500 Autopilot with ESP as shown on the aircraft-specific installation manual addendum (190-02291-XX). Refer to the Master Drawing List 005-01264-00 for the correct installation manual addendum part number.

5.5.1.1 Yaw Offset and Pitch/Roll Calibration with G5 ADI installed

Perform the following procedures after the G5/GFC 500 system is configured per Section 5.5.1.

1. Start the G5 ADI in configuration mode by pressing and holding the knob while applying power to the system.
2. If the GMC 507 is installed in a panel that is perpendicular to the aircraft forward motion, skip to step 6. If the GMC 507 is installed in a panel which is not perpendicular to the aircraft forward motion (i.e. in a canted panel), Navigate to the Flight Controls -> Mode Control Panel -> Calibrate Yaw Offset page and press the knob.
3. Scroll through the yaw offset calibration pages, following the instructions on each page to ensure that the system is ready for calibration.
4. Select the appropriate value of yaw offset and press the knob.
5. When the test is complete, select Done to return to the Flight Controls -> Mode Control Panel page.
6. Navigate to the Flight Controls -> Mode Control Panel -> Calibrate Pitch/Roll page and press the knob.
7. Scroll through the pitch/roll calibration pages, following the instructions on each page to ensure that the system is ready for calibration.
8. Select Calibrate to start the calibration process.
9. When the test is complete, select Done to return to the Flight Controls -> Mode Control Panel page.
10. Select Back to return to the Flight Controls page.
11. Select Back to return to the Configuration Mode page.
12. Select Exit Configuration Mode and then Yes to restart the G5 ADI in normal mode.

5.5.1.2 Yaw Offset and Pitch/Roll Calibration with G3X system installed

Perform the following procedures after the G3X/GFC 500 system is configured per Section 5.5.1.

1. Start the G3X PFD in configuration mode by pressing and holding the menu button while applying power to the system.
2. If the GMC 507 is installed in a panel that is perpendicular to the aircraft forward motion, skip to step 6. If the GMC 507 is installed in a panel which is not perpendicular to the aircraft forward motion (i.e. in a canted panel), Navigate to the Autopilot page group, General tab and touch the value on the Mode Control Panel Yaw Offset row.
3. Follow the on-screen instructions.
4. Select the appropriate value of yaw offset.

5. When the value is entered, select Save to return to the Autopilot page group, General Tab.
6. Touch the “Calibrate” button on the Mode Control Panel Pitch/Roll row.
7. Select Calibrate to start the calibration process.
8. When the process is complete, select Done to return to the Autopilot page group, General Tab.
9. Restart the G3X System in normal mode.

6. POST-INSTALLATION CHECKOUT PROCEDURES

The following procedures will verify the proper operation of the GFC 500 Autopilot. The technician performing these checks must be familiar with the GFC 500 Autopilot. Information regarding operation of the GFC 500 Autopilot can be found in the G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft p/n 190-01112-12 or the G3X Touch Pilot's Guide for Certified Aircraft, p/n 190-02472-00.

6.1 Normal Mode Tests

The following procedures will be performed with electrical power applied to the aircraft and the G5 or G3X in normal mode.

WARNING

Make sure that all equipment and personnel are clear of the flight controls (flaps, ailerons, elevator, rudder, etc.) areas before proceeding with these procedures.

NOTE: Throughout the following sections:

1. A normal autopilot disconnect will be displayed on the G5 or G3X PFD as a flashing yellow "AP" for three seconds accompanied by a normal disconnect aural alert (three high-low tones approximately three seconds in duration) through the cockpit speakers and headphones and a single three second tone will be played through the sonalert (if installed).
2. An abnormal autopilot disconnect will be displayed on the G5 or G3X PFD as a flashing red "AP" continuously accompanied by an abnormal disconnect aural alert (high-low tones until acknowledged) through the cockpit speakers and headphones for and a continuous tone will be played through the sonalert (if installed). The abnormal autopilot disconnect tones can be cancelled by pressing the AP DISC/TRIM INT switch on the pilot's flight controls or by pressing the knob on the G5 or by pressing the autopilot status bar on the G3X PFD. If Flight Director modes are still available after the abnormal disconnect, after the tones are cancelled, the G5 will display a yellow "AP" with a red X drawn on top of it. If flight director modes are not available, a Red and White "AFCS" annunciation will display, flashing until the tones are cancelled and steady after the tones are cancelled. A red PTRIM will also be displayed on the G5 or G3X PFD if pitch trim is installed.
3. If the aircraft under test is configured for MPH instead of Kts, utilize MPH as the unit in any step that references Kts. Conversion of values is not required.
4. If the aircraft under test is not equipped with a pitch trim servo, disregard the verification steps for pitch trim and associated annunciations.
5. If the aircraft under test is not equipped with a GPS/VHF navigator, disregard the verification steps for GPS/VHF navigators.
6. If the aircraft under test is not equipped with a yaw damper servo, disregard the verification steps for yaw damper and associated annunciations.

Figure 6-1 – Flight Director Command Bars

7. All references to ESP roll indices are in respect to dual hash marks displayed on the left and right of the roll indicator on the G5 or G3X PFD. See Figure 6-2 for G5 display or Figure 6-3 for G3X PFD.

Figure 6-2 – ESP Roll Indices

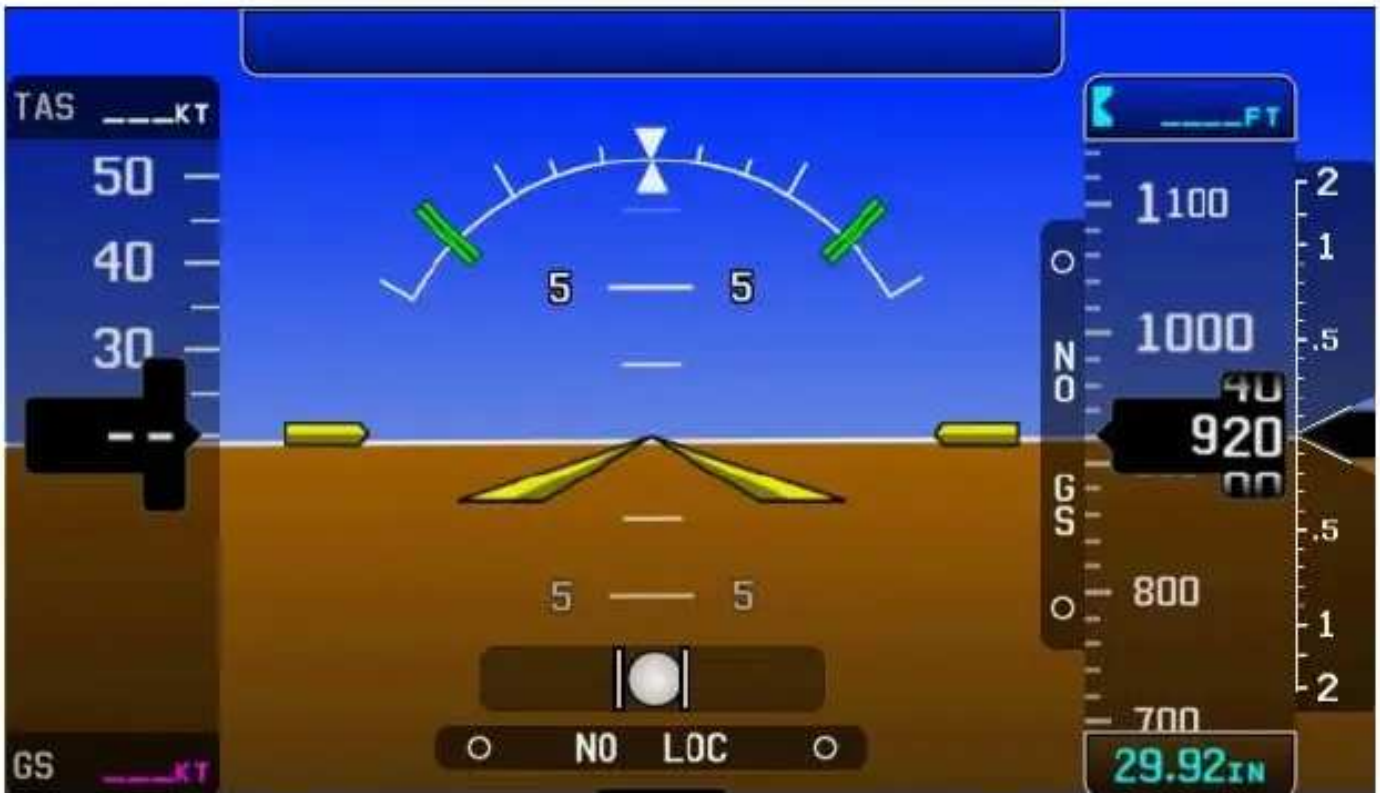


Figure 6-3 – ESP Roll Indices (G3X)

6.1.1 Autopilot Pre Flight Test

1. Apply electrical power to the aircraft avionics.
2. Verify that the G5 or G3X PFD displays PFT in black text on a white background at the top of the display.
   NOTE: It is normal to see PTRIM in white text on a red background during the PFT sequence.
3. Verify that at the conclusion of PFT the PFT annunciation is removed from the G5 or G3X PFD.
4. Disable the GPS providing signal to the G5 (if installed) by pulling its circuit breaker.
5. Using an air data test set, apply 35-40 kts of airspeed.
6. Verify that the ESP roll indices are displayed at the appropriate left and right roll attitude on the G5. Refer to the appropriate model-specific installation manual addendum (190-02291-XX) for model-specific information on the placement of the roll indices.
7. Return air data test set to ambient pressure.
8. Enable the GPS providing signal to the G5 (if installed).

6.1.2 Autopilot Switch Checks

CAUTION: Hold the flight controls securely during the following checks to prevent damage to the flight controls.

NOTE: Ensure that the flight controls are in a neutral position before performing the following checks.

1. Actuate the pitch TRIM switch on the pilot's flight controls in the nose down (forward) direction.
2. Verify the pitch trim servo engages and the pitch trim wheel drives in the nose down direction.

3. Release the pitch TRIM switch.
4. Actuate the pitch TRIM switch on the pilot's flight controls in the nose up (aft) direction.
5. Verify the pitch trim servo engages and the pitch trim wheel drives in the nose up direction.
6. Release the pitch TRIM switch.
7. Engage the autopilot by pressing the AP button on the GMC 507.
8. Press the AP DISC/TRIM INT switch on the pilot's flight controls.
9. Verify that the autopilot disengages.
10. Engage the Autopilot by pressing the AP Button on the GMC 507.
11. Press the AP button on the GMC 507.
12. Verify that the autopilot disengages but the YD remains engaged.
13. Press the AP DISC/TRIM INT switch on the pilot's flight controls.
14. Press the GO AROUND switch.
15. Verify the following:
    a. TO is annunciated for both lateral and vertical modes on the G5 or G3X PFD.
    b. The flight director command bars are displayed and indicate wings level and pitch up to the angle as shown on the appropriate Install Manual Addendum (190-02291-XX).
16. Press the FD button on the GMC 507.
17. Verify that the flight director command bars are no longer displayed.

6.1.3 Manual Electric Pitch Trim Speed Check

1. Manually adjust pitch trim fully against either mechanical stop.
2. Actuate the pitch TRIM switch until the trim runs against the other mechanical stop while monitoring the run time.
3. Verify the elapsed time for full travel of the pitch trim is within the range specified on the appropriate model-specific installation manual addendum (190-02291-XX).
4. Repeat the test in the opposite direction.

6.1.4 Interface Checks

NOTE: Ensure that the flight controls are in a neutral position before performing the following checks.

1. Set the heading bug to the current aircraft heading.
2. Engage the autopilot by pressing the AP button on the GMC 507.
3. Verify that ROL and PIT are displayed on the G5 or G3X PFD.
4. Verify that the flight director command bars are displayed in level pitch and roll attitude.
5. Press the HDG button on the GMC 507 to engage heading mode.
6. Verify that HDG replaces ROL on the G5 or G3X PFD.
7. Adjust the heading bug to the left of the aircraft heading.
8. Verify that the flight director command bars indicate a left turn, and that the flight controls move toward the left.
9. Adjust the heading bug to the right of the aircraft heading.
10. Verify that the flight director command bars indicate a right turn, and that the flight controls move toward the right.
11. Center the heading bug at the aircraft heading.
12. Click the UP/DN thumbwheel to the UP position four times.
13. Verify that the command bars indicate a fly up command and that the flight controls drive in the pitch up direction. Note: In some aircraft, it may be necessary to counteract any counterweight or control system springs to assist the servo.
14. Click the UP/DN thumbwheel to the DN position eight times.
15. Verify that the command bars indicate a fly down command and that the flight controls drive in the pitch down direction.
16. Press the AP DISC/TRIM INT switch to disengage the autopilot.
17. Press the FD button to remove the flight director bars from the G5 or G3X PFD.

6.1.5 VOR Mode Check

1. Set the Course pointer on the CDI 15 degrees to the left of aircraft heading and ensure that the CDI is displaying VOR navigation information.
2. Simulate a VOR signal with a “TO” course equal to the aircraft heading.
3. Engage the autopilot by pressing the AP button on the GMC 507.
4. Verify ROL and PIT are displayed on the G5 or G3X PFD.
5. Press the NAV button on the GMC 507.
6. Verify that VOR is displayed in white with ROL, AP, YD, and PIT in green on the G5 or G3X PFD.
7. Verify that the flight director command bars are displayed in level pitch and roll attitude.
8. Slowly adjust the course pointer on the CDI toward the aircraft heading.

9. When the course pointer is within approximately five degrees of the aircraft heading, verify that that VOR displays green on the G5 and that ROL is not displayed on the G5 or G3X PFD.
10. Center course pointer on the aircraft heading.
11. Adjust the simulated course 20 degrees to the left of current aircraft heading.
12. Verify that the flight director command bars indicate a left turn and that the flight controls move toward a left turn.
13. Adjust simulated course to aircraft heading.
14. Adjust the simulated course on the nav test set 20 degrees to the right of current aircraft heading.
15. Verify that the flight director command bars indicate a right turn and that the flight controls move toward a right turn.
16. Adjust the simulated course to aircraft heading.
17. Press the NAV button on the GMC 507.
18. Verify ROL and PIT are displayed on the G5 or G3X PFD.
19. Press the AP DISC/TRIM INT switch to disengage the autopilot.
20. Press the FD button to remove the flight director bars from the G5 or G3X PFD.

6.1.6 GPS Mode Check

1. On the GPS Navigator, enter a Direct-To flight plan to an airport that is generally in front of the aircraft.
2. Ensure GPS is displayed as the active navigation source on the G5 or G3X PFD.
3. Engage the autopilot by pressing the AP button on the GMC 507.
4. Verify that ROL and PIT are displayed on the G5 or G3X PFD.
5. Press the NAV button on the GMC 507.
6. Verify that GPS replaces ROL on the G5 or G3X PFD.
7. Select OBS mode on the GPS navigator.
8. Adjust the OBS 3 degrees higher than the current DTK (Example: If the DTK is 272 degrees, adjust the OBS to 275 degrees).
9. Verify that the CDI moves to the left.
10. Verify that the flight director command bars indicate a left turn and that the flight controls drive to the left.
11. Adjust the OBS three degrees lower than the current DTK.
12. Verify that the CDI moves to the right.
13. Verify that the flight director command bars indicate a right turn and that the flight controls drive to the right.
14. Press the AP DISC/TRIM INT switch to disengage the autopilot.
15. Press the FD button to remove the flight director bars from the G5 or G3X PFD.

6.1.7 ILS APR Checks

1. Simulate an ILS (Localizer and Glideslope) using a ramp tester.
2. Tune the NAV radio to the Localizer frequency
3. Set the G5 to display the ILS.
4. Set the signal generator to simulate 0.093 DDM Left and 0.091 DDM Up signals.
5. Adjust the course pointer to aircraft heading.
6. Engage the autopilot by pressing the AP button on the GMC 507.
7. Verify ROL and PIT are displayed on the G5 or G3X PFD.
8. Press the APR button on the GMC 507.
9. Verify LOC and GS are displayed in white on the G5 or G3X PFD.
10. Slowly center the LOC deviation on the test set.

11. Verify that LOC turns green and ROL is extinguished on the G5 or G3X PFD.
12. Slowly center the GS deviation on the test set.
13. Verify that GS turns green and PIT is extinguished on the G5 or G3X PFD.
14. Apply left LOC deviation on the test set.
15. Verify that the flight director command bars indicate a left turn and that the flight controls turn to the left.
16. Apply right LOC deviation on the test set.
17. Verify that the flight director command bars indicate a right turn and that the flight controls turn to the right.
18. Center the LOC deviation on the test set.
19. Apply up GS deviation on the test set.
20. Verify that the flight director command bars indicate a pitch up and that the flight controls drive in the pitch up direction.
21. Apply down GS deviation on the test set.
22. Verify that the flight director command bars indicate a pitch down and that the flight controls drive in the pitch down direction.
23. Center the GS deviation on the test set.
24. Press the AP DISC/TRIM INT switch to disengage the autopilot.
25. Press the FD button to remove the flight director bars from the G5 or G3X PFD.

6.1.8 IAS Mode Check

An air data test set is required for this section.

NOTE: Disable any ADS-B Transmitting equipment for this test to avoid interference with air traffic control.

1. Set the air data test set to 3000 ft. altitude and 120 kts airspeed.
2. Engage the autopilot by pressing the AP button on the GMC 507.
3. Verify ROL and PIT are displayed on the GMC 507.
4. Press the IAS button on the GMC 507.
5. Verify that IAS is displayed in green and PIT extinguishes on the G5 or G3X PFD.
6. Verify that 120 KT (+/- 2 KT) is displayed to the right of IAS on the G5 or G3X PFD.
7. Rotate the UP/DN thumbwheel UP until 100 KT is displayed to the right of IAS on the G5 or G3X PFD.
8. Verify that the flight director command bars indicate a pitch up command and the flight controls respond in a nose up direction.
9. Rotate the UP/DN thumbwheel DN until 140 KT is displayed to the right of IAS on the G5 or G3X PFD.
10. Verify that the flight director command bars indicate a pitch down command and the flight controls respond in a nose down direction.
11. Rotate the UP/DN thumbwheel UP until 120 KT is displayed on the G5 or G3X PFD.
12. Verify that the flight director command bars indicate level pitch attitude.
13. Adjust the air data test set for 100 kts airspeed.
14. Verify that the flight director command bars indicate a pitch down command and the flight controls respond in a nose down direction.
15. Adjust the air data test set for 140 kts airspeed.
16. Verify that the flight director command bars indicate a pitch up command and the flight controls respond in a nose up direction.
17. Return the air data test set to 3000 ft. altitude and 120 kts airspeed.
18. Press the IAS button on the GMC 507 to deselect IAS mode.
19. Verify that PIT illuminates in green on the G5 or G3X PFD.

20. Press the AP DISC/TRIM INT switch to disengage the autopilot.
21. Press the FD button to remove the flight director bars from the G5 or G3X PFD.

6.1.9 VS Mode Check

NOTE: Disable any ADS-B Transmitting equipment for this test to avoid interference with air traffic control.

1. Set the air data test set to 3000 ft. altitude and 120 kts airspeed, if not already there.
2. Engage the autopilot by pressing the AP button on the GMC 507.
3. Verify ROL and PIT are displayed on the G5 or G3X PFD.
4. Press the VS button on the GMC 507 to engage VS mode
5. Verify VS is displayed in green and PIT extinguishes on the G5 or G3X PFD.
6. Verify that +0 is displayed to the right of VS on the G5 and that the VS bug setting is shown at the bottom right of the G5 or G3X PFD.
7. Rotate the UP/DN thumbwheel UP until +1000 FPM is displayed on the G5 or G3X PFD.
8. Verify that the flight director command bars indicate pitch up and the flight controls respond in the direction of the command bars.
9. Rotate the UP/DN thumbwheel DN until -1000 FPM is displayed on the G5 or G3X PFD.
10. Verify that the flight director command bars indicate pitch down and the flight controls respond in the direction of the command bars.
11. Rotate the UP/DN thumbwheel UP until 0 FPM is displayed on the G5 or G3X PFD.
12. Verify that the flight director command bars indicate level pitch attitude and the flight controls are centered in pitch and roll.
13. Set the air data test set for 4000 ft. altitude at a vertical speed of 1000 fpm.
14. Verify that the flight director command bars indicate pitch down and the flight controls respond in the direction of the command bars.
15. Set the air data test set for 2000 ft. altitude at a vertical speed of 1000 fpm.
16. Verify that the flight director command bars indicate pitch up and the flight controls respond in the direction of the command bars.
17. Set the air data test set for 3000 ft. altitude and 120 kts airspeed.
18. Press the VS button on the GMC 507 to deselect VS mode.
19. Verify that PIT illuminates in green on the G5 and that the VS bug is removed from the G5 or G3X PFD.
20. Press the AP DISC/TRIM INT switch to disengage the autopilot.
21. Press the FD button to remove the flight director bars from the G5 or G3X PFD.

6.1.10 ALT Mode Check

NOTE: Disable any ADS-B Transmitting equipment for this test to avoid interference with air traffic control.

1. Set the air data test set to 3000 ft. altitude and 120 kts airspeed, if not already there.
2. Press the AP button on the GMC 507 to engage the autopilot.
3. Verify ROL and PIT are displayed on the G5 or G3X PFD.
4. Press the ALT button on the GMC 507 to select ALT mode.
5. Verify ALT is displayed in green and PIT extinguishes on the G5 or G3X PFD.
6. Verify that 3000 (+/- 120) is displayed to the right of ALT on the G5 or G3X PFD.
7. Adjust the air data test set for 3500 ft. altitude.
8. Verify that the flight director command bars indicate a pitch down and the flight controls respond in the direction of the command bars.

9. Adjust the air data test set for 2500 ft. altitude.
10. Verify that the flight director command bars indicate pitch up and the flight controls respond in the direction of the command bars.
11. Return the air data test set to 3000 ft. altitude and 120 kts airspeed.
12. Press the ALT button on the GMC 507 to deselect ALT mode.
13. Verify that PIT illuminates in green on the G5 or G3X PFD.
14. Press the AP DISC/TRIM INT switch to disengage the autopilot.
15. Press the FD button to remove the flight director bars from the G5 or G3X PFD.

6.1.11 ALTS Mode Check

NOTE: Disable any ADS-B Transmitting equipment for this test to avoid interference with air traffic control.

1. Set the air data test set to 3000 ft. altitude and 120 kts airspeed, if not already there.
2. Set the selected altitude on the G5 to 3500 ft.
3. Press the AP button on the GMC 507 to engage the autopilot.
4. Verify green ROL, AP, YD, PIT, and white ALTS are displayed on the G5 or G3X PFD.
5. Adjust the air data test set for 3500 ft. altitude at a vertical speed of 500 fpm.
6. When the altitude reaches 3400 +/- 20 feet, verify that Green ALTS flashes for approximately 3 seconds in place of PIT on the G5 or G3X PFD and then displays steady and that White ALT is displayed to the right of ALTS on the G5 or G3X PFD.
7. When the altitude reaches 3450 +/- 20 feet, verify that Green ALT flashes for approximately 3 seconds in place of ALTS on the G5 or G3X PFD and then displays steady.

NOTE:

The flight director command bars and flight controls may move up or down as the GFC 500 Autopilot is capturing the selected altitude.

8. Adjust the air data test set for 4000 ft. altitude at a vertical speed of 500 fpm.
9. Verify that the flight director command bars indicate a pitch down and the flight controls respond in the direction of the command bars.
10. Adjust the air data test set for 3000 ft. altitude at a vertical speed of 500 fpm.
11. Verify that the flight director command bars indicate a pitch up and the flight controls respond in the direction of the command bars when the altitude goes below 3500 ft.
12. Return the air data test set to 3000 ft. altitude and 120 kts airspeed.
13. Allow the air data test set to stabilize at the target altitude and airspeed.
14. Adjust the selected altitude on the G5 or G3X PFD to 0 FT.
15. Press the ALT button on the GMC 507 to deselect ALT mode.
16. Verify PIT is displayed in place of ALT on the G5 or G3X PFD with ALTS in white to the right of PIT on the G5 or G3X PFD.
17. Press the AP DISC/TRIM INT switch to disengage the autopilot.
18. Press the FD button to remove the flight director bars from the G5 or G3X PFD.
19. Return the air data test set to field elevation and 0 kts airspeed.

6.1.12 LVL Mode Check

1. Set the heading bug to the aircraft heading.
2. Press the FD button on the GMC 507 to engage the flight director.

3. Verify ROL and PIT are displayed on the G5.
4. Press the HDG button on the GMC 507 to select heading mode.
5. Verify HDG and PIT are illuminated in green and ROL is extinguished on the G5 or G3X PFD.
6. Adjust the heading bug to the left.
7. Verify that the flight director command bars indicate a left turn command.
8. Rotate the UP/DN thumbwheel UP four times.
9. Verify that the flight director command bars indicate a pitch up command.
10. Press the LVL button on the GMC 507.
11. Verify that LVL and LVL are displayed in green and HDG and PIT are extinguished on the G5 or G3X PFD.
12. Verify that the flight director command bars show level attitude and that the autopilot engages.
13. Press the AP DISC/TRIM INT switch to disengage the autopilot.
14. Press the FD button to remove the flight director bars from the G5 or G3X PFD.

6.1.13 Electromagnetic Compatibility (EMC) Check

WARNING

Ensure the aircraft is outside in a location where the engine(s) can be run safely. Make sure that all equipment and personnel are clear of the propeller before proceeding with these procedures.

An EMC check must be conducted after the GFC 500 Autopilot is installed and all interfaces to external equipment are verified to be correctly working. The EMC check makes sure the equipment is not producing unacceptable interference to the other avionics systems, and other avionics systems are not producing unacceptable interference to the GFC 500 Autopilot.

Perform the following EMI/RFI checkout with the aircraft positioned where it can receive GPS signals. The following procedures verify that there is no interference between the GFC 500 Autopilot, VHF communication system, navigation system, and other existing aircraft systems. Conduct all testing with the engine(s) running.

An example EMC source-victim matrix is shown in Table 6-1.

1. Apply power to all avionics systems except the equipment installed under this STC.
2. Verify that all existing avionics systems are functioning properly.
3. Close the AUTOPILOT circuit breaker.
4. Remove power from all other avionics systems.
5. Apply power and/or operate the systems listed in Table 6-1, one system at a time.
6. Slowly rotate the heading bug on the CDI to the left and right of the current aircraft heading while monitoring the GFC 500 Autopilot and verify that functionality of the Autopilot is not adversely affected by any of the existing aircraft systems and that the existing aircraft systems are not adversely affected by autopilot operation.
7. Make sure each radio functions properly.
   a. For VHF COM radio, monitor one local frequency, one remote (far field) frequency, and one unused frequency.
   b. Make sure there are no unintended squelch breaks or audio tones interfere with communications.
   c. For each VHF NAV radio, monitor one local frequency, one remote (far field) frequency, and one unused frequency.
   d. Make sure there are no guidance errors or audio tones that interfere with the station ID.
8. Make sure all other avionics function properly.

Table 6-1 – Example Source/Victim Matrix

SOURCE \ VICTIM	Attitude Indicator	Airspeed Indicator	Altimeter	Vertical Speed Indicator	Turn and Bank Indicator	Magnetic Compass	Clock	OAT Indicator	Power Plant Instruments	Navigation Radio(s)	Communication Radio(s)	Engine Relight	Fuel Valve	Pitot Heat	Pulse Light	Generator	Position Lights	Anti-collision Lights	Landing Lights	Gov RPM Incr/Decr	Eng Deicing	Radar Altimeter	TAS/TCAS	Transponder	Audio Panel	ADF	Stormscope	GFC 500 Autopilot
Attitude Indicator																											
Airspeed Indicator																											
Altimeter																											
Vertical Speed Indicator																											
Turn and Bank Indicator																											
Magnetic Compass																											
Clock																											
OAT Indicator																											
Power Plant Inst																											
Navigation Radio(s)																											
Comm Radio(s)																											
Engine Relight																											
Fuel Valve																											
Pitot Heat																											
Pulse Light																											
Generator																											
Position Lights																											
Anti-coll Lights																											
Landing Lights																											
Gov RPM Incr/Decr																											
Engine Deicing																											
Hydraulic System																											
TAS/TCAS																											
Transponder																											
Audio Panel																											
ADF																											
Stormscope																											
GFC 500 Autopilot																											

7. DOCUMENTATION

7.1 Airplane Flight Manual Supplement (AFMS)

Complete the checklist in the AFMS. Ensure the appropriate data fields in the AFMS are completed.

Insert the AFMS in the Airplane Flight Manual (AFM) or Pilot's Operating Handbook (POH).

7.2 Instructions for Continued Airworthiness (ICA)

Ensure the following information is recorded in Appendix A of the STC Maintenance Manual/ICA, 190-02291-01, and is retained with the aircraft permanent records:

1. Record General Installation Information; including aircraft information and installed LRU information.
2. Record interfaced equipment; including Garmin equipment and third-party equipment (as necessary).
3. Record the GFC 500 Autopilot system configuration.
4. Record the GFC 500 Autopilot system wire routing and installed unit locations.
5. Mark up the interconnect diagrams from this manual detailing which equipment was installed and how it was connected, or create new wiring diagrams detailing the installation.

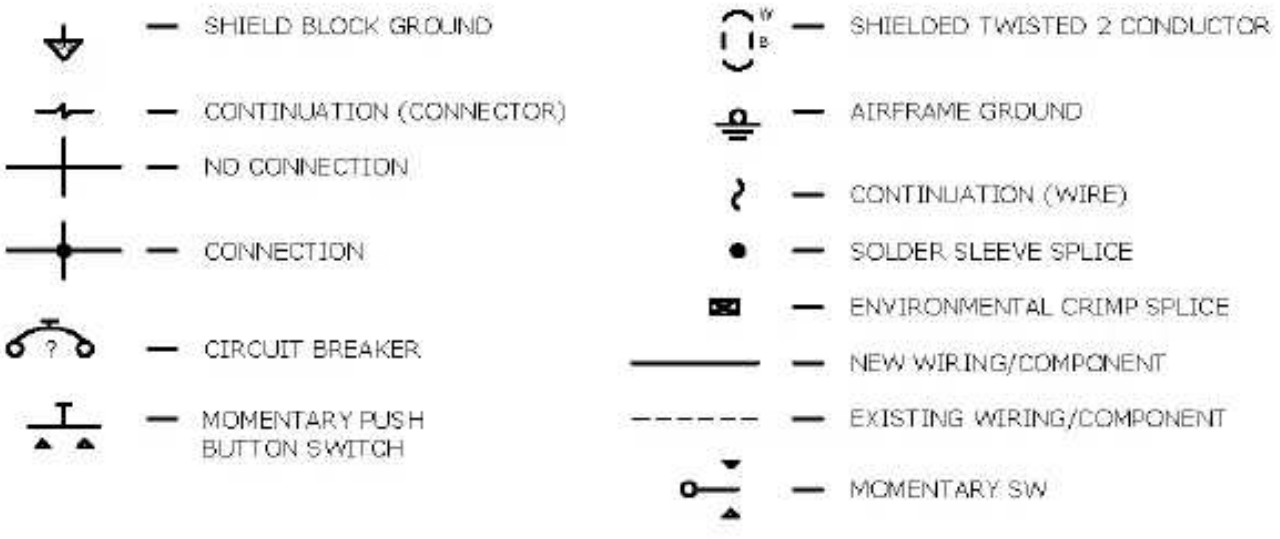
APPENDIX A INTERCONNECT DIAGRAMS

GENERAL NOTES

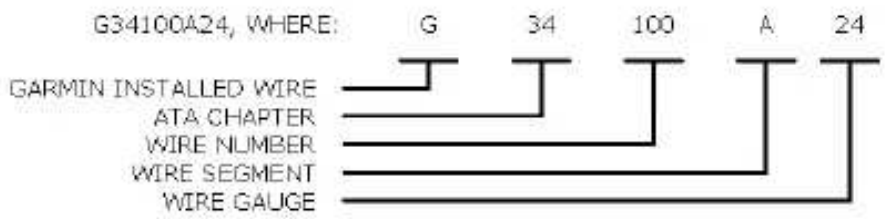
1. UNLESS OTHERWISE SPECIFIED, REFER TO SAE AS50881, REV F ; WIRING AEROSPACE VEHICLE.

2. UNLESS OTHERWISE SPECIFIED, ALL STRANDED WIRE IS 24 GAUGE MINIMUM AND SHALL MEET OR EXCEED THE REQUIREMENTS OF M22759/35 OR M22759/16. STRANDED WIRE 22 GAUGE AND LARGER SHALL MEET OR EXCEED THE REQUIREMENTS OF M22759/34 OR M22759/16. UNLESS OTHERWISE SPECIFIED, ALL SHIELDED WIRE SHALL MEET OR EXCEED THE REQUIREMENTS OF M27500 USING THE M22759/34 OR M22759/16 WIRE AND INSULATION TYPE.

3. THE FOLLOWING SYMBOLS ARE USED ON THIS DRAWING:



4. WIRE IDENTIFICATION KEY:



5. ALL SOLDER CONNECTIONS TO BE MADE IN ACCORDANCE WITH SAE AS 4461 HIGH RELIABILITY SOLDERING.

6. FOR SPLICES SHOWN NEAR CONNECTORS, MAXIMUM LENGTH FROM SPLICE TO CONNECTOR IS THREE INCHES.

7. CRIMP SPLICE AS81824/1-1 IS USED FOR 26-20 AWG WIRE (304-1510 CIRCULAR MILS)
   CRIMP SPLICE AS81824/1-2 IS USED FOR 20-16 AWG WIRE (1058-2680 CIRCULAR MILS)
   CRIMP SPLICE AS81824/1-3 IS USED FOR 16-12 AWG WIRE (2375-6755 CIRCULAR MILS)

   A MAXIMUM OF TWO WIRES PER END OF THE SPLICE IS ALLOWED. WIRE SIZES MAY BE COMBINED, PROVIDED THAT THE TOTAL CIRCULAR MILS IS WITHIN THE SPECIFIED RANGE.

   24 AWG = 475 CIRCULAR MILS
   22 AWG = 754 CIRCULAR MILS
   20 AWG = 1216 CIRCULAR MILS
   18 AWG = 1900 CIRCULAR MILS
   16 AWG = 2426 CIRCULAR MILS
   14 AWG = 3831 CIRCULAR MILS

8. MARKING OF WIRE NUMBERS IS OPTIONAL.

9. UNLESS OTHERWISE SPECIFIED FOR WIRES GOING TO AIRCRAFT GROUND, GROUND AS CLOSE AS PRACTICAL TO CONNECTION POINT. MAXIMUM LENGTH NOT TO EXCEED 8 FEET.

A.1 14 VDC AIRCRAFT POWER AND GROUND

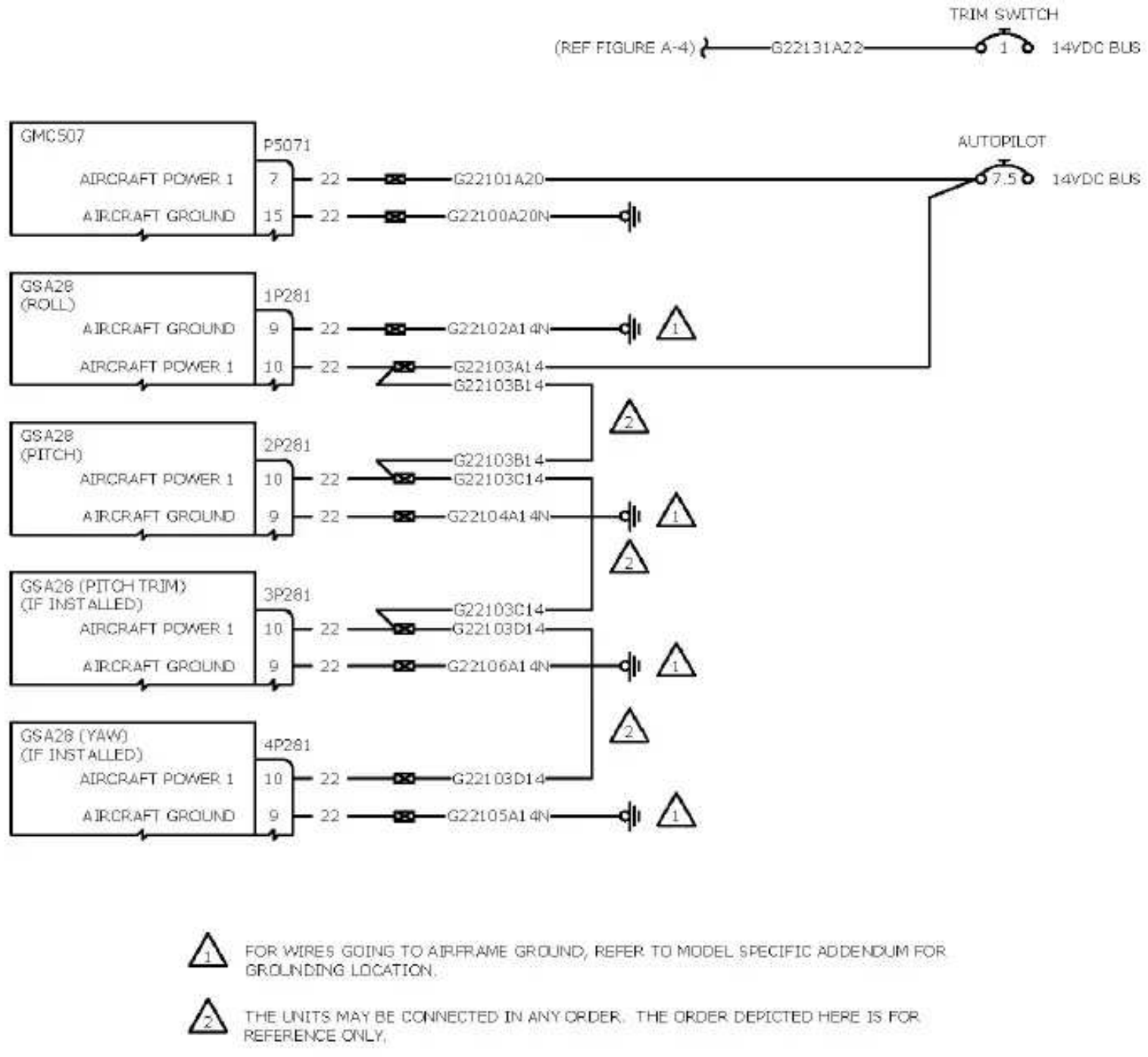
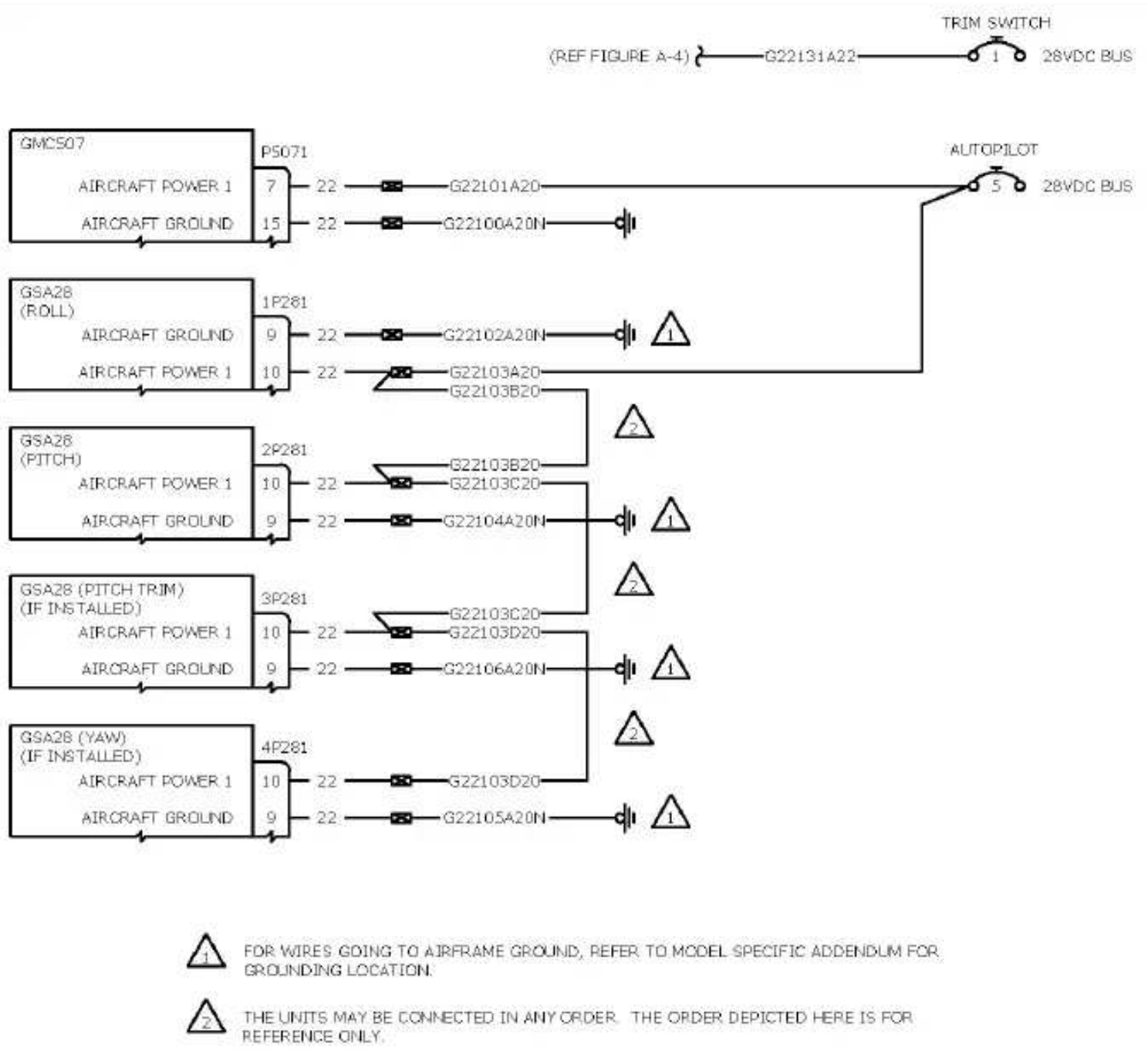


Figure A-1 – 14 VDC Aircraft Power and Ground

A.2 28 VDC AIRCRAFT POWER AND GROUND

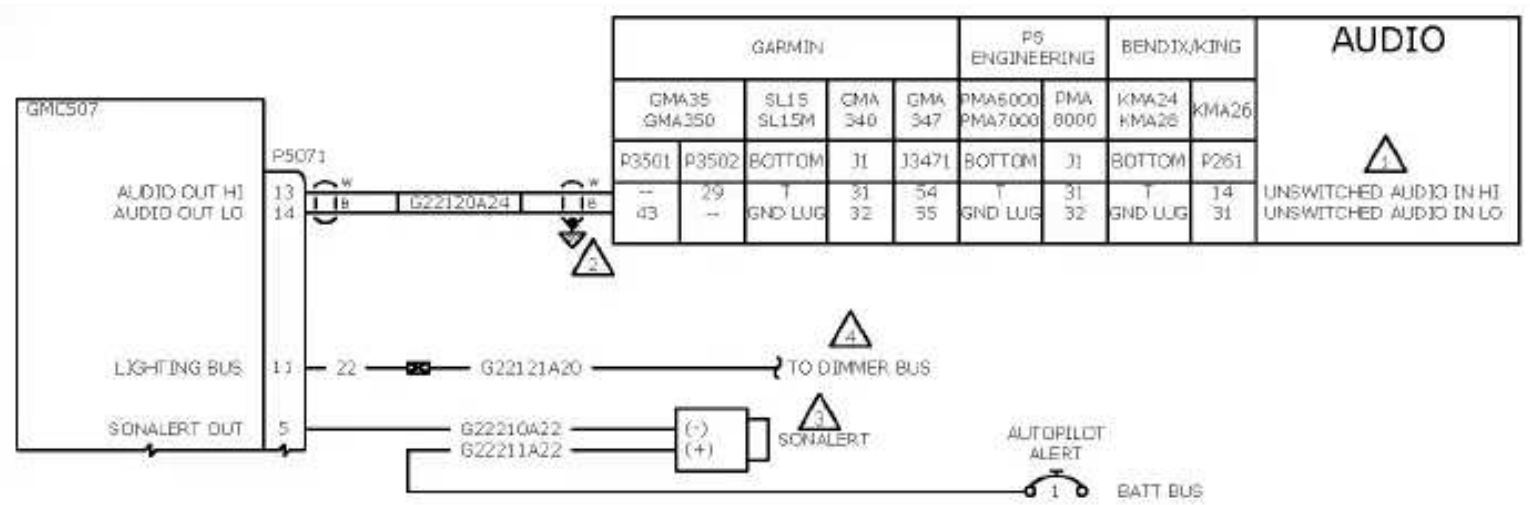


1 FOR WIRES GOING TO AIRFRAME GROUND, REFER TO MODEL SPECIFIC ADDENDUM FOR GROUNDING LOCATION.

2 THE UNITS MAY BE CONNECTED IN ANY ORDER. THE ORDER DEPICTED HERE IS FOR REFERENCE ONLY.

Figure A-2 – 28 VDC Aircraft Power and Ground

A.3 AUDIO AND LIGHTING BUS



1. IT IS ACCEPTABLE TO USE OTHER AUDIO PANEL INPUTS AS LONG AS THEY ARE UNSWITCHED AND UNMUTED.
2. GROUND SHIELD OF AUDIO WIRE AT ONE END ONLY TO PREVENT GROUND LOOP.
3. FOR SONALERT INSTALLATION REQUIREMENTS, REFER TO SECTION 3.1 OF THIS MANUAL.
4. LIGHTING BUS CONNECTION IS OPTIONAL.

Figure A-3 – Audio, Sonalert, and Lighting

A.4 SWITCHES/COIL CORD (22 AWG COIL)

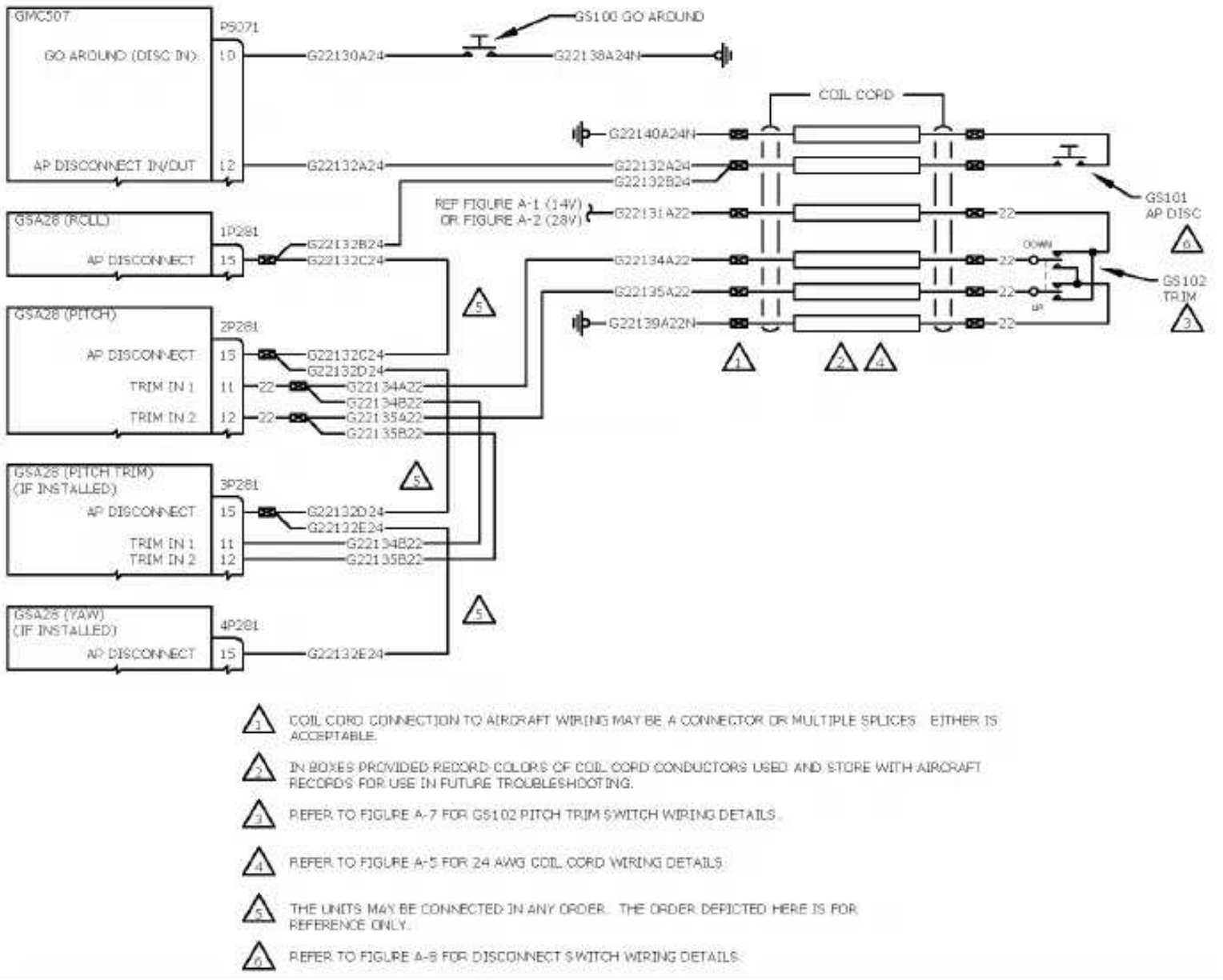
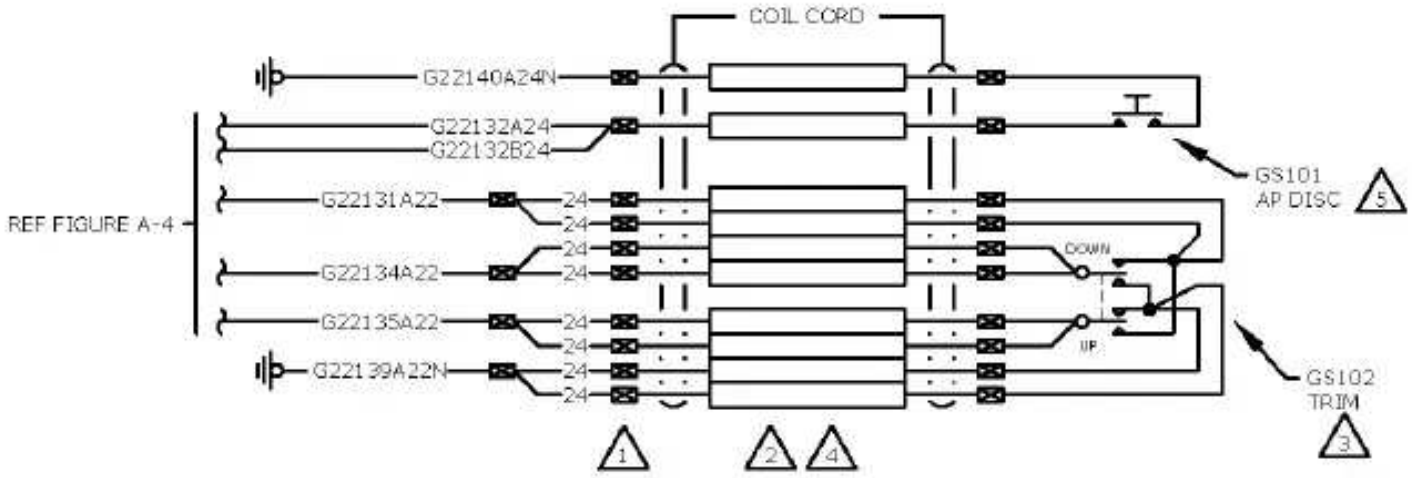


Figure A-4 – Switches (22AWG or larger Coil Cord)

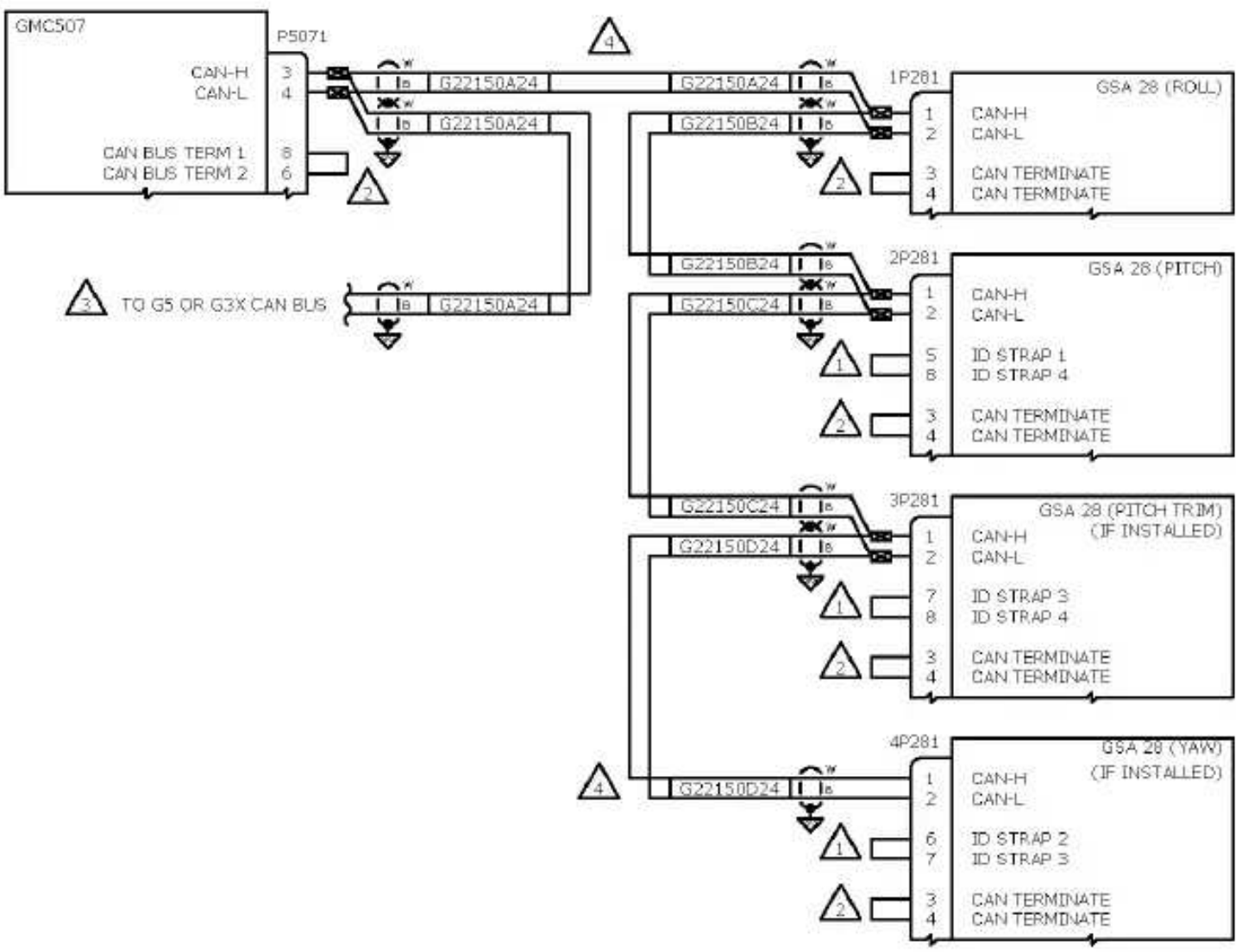
A.5 SWITCHES/COIL CORD (24 AWG COIL)



1. COIL CORD CONNECTION TO AIRCRAFT WIRING MAY BE A CONNECTOR OR MULTIPLE SPLICES. EITHER IS ACCEPTABLE.
2. IN BOXES PROVIDED RECORD COLORS OF COIL CORD CONDUCTORS USED AND STORE WITH AIRCRAFT RECORDS FOR USE IN FUTURE TROUBLESHOOTING.
3. REFER TO FIGURE A-7 FOR GS102 TRIM SWITCH WIRING DETAILS.
4. REFER TO FIGURE A-4 FOR 22 AWG COIL CORD WIRING DETAILS.
5. REFER TO FIGURE A-8 FOR DISCONNECT SWITCH WIRING DETAILS.

Figure A-5 – Switches (with 24 AWG coil cord)

A.6 CAN BUS/SERVO STRAPPING



1. FOR CONFIGURATION/STRAPPING JUMPERS MAXIMUM LENGTH IS 4 INCHES.
2. CAN BUS TERMINATE JUMPER ONLY REQUIRED WHEN UNIT IS LOCATED AT THE END OF THE CAN BUS BACKBONE. SEE CAN BUS STRUCTURE GUIDELINES SECTION FOR FURTHER INFORMATION. MAXIMUM LENGTH OF JUMPER IS 4 INCHES.
3. INSTALLATION OF G5 OR G3X LRU'S IS NOT COVERED UNDER THIS STC. REFER TO G5 INSTALLATION MANUAL GARMIN P/N 190-01112-10 OR G3X INSTALLATION MANUAL GARMIN P/N 190-190-02472-01 FOR FURTHER DETAILS. EXISTING CAN BUS BACKBONE MAY BE REUSED AND EXTENDED AS LONG AS CAN BUS STRUCTURE GUIDELINES ARE FOLLOWED. REFER TO CAN BUS STRUCTURE AND GUIDELINES SECTION FOR FURTHER INFORMATION.
4. CAN BUS LRU'S MAY BE IN ANY ORDER ALONG BACKBONE AS LONG AS CAN BUS BACKBONE STRUCTURE GUIDELINES ARE FOLLOWED. REFER TO CAN BUS STRUCTURE GUIDELINES SECTION FOR FURTHER INFORMATION.

Figure A-6 – CAN Bus/Servo Strapping

A.7 GS102 TRIM SWITCH WIRING

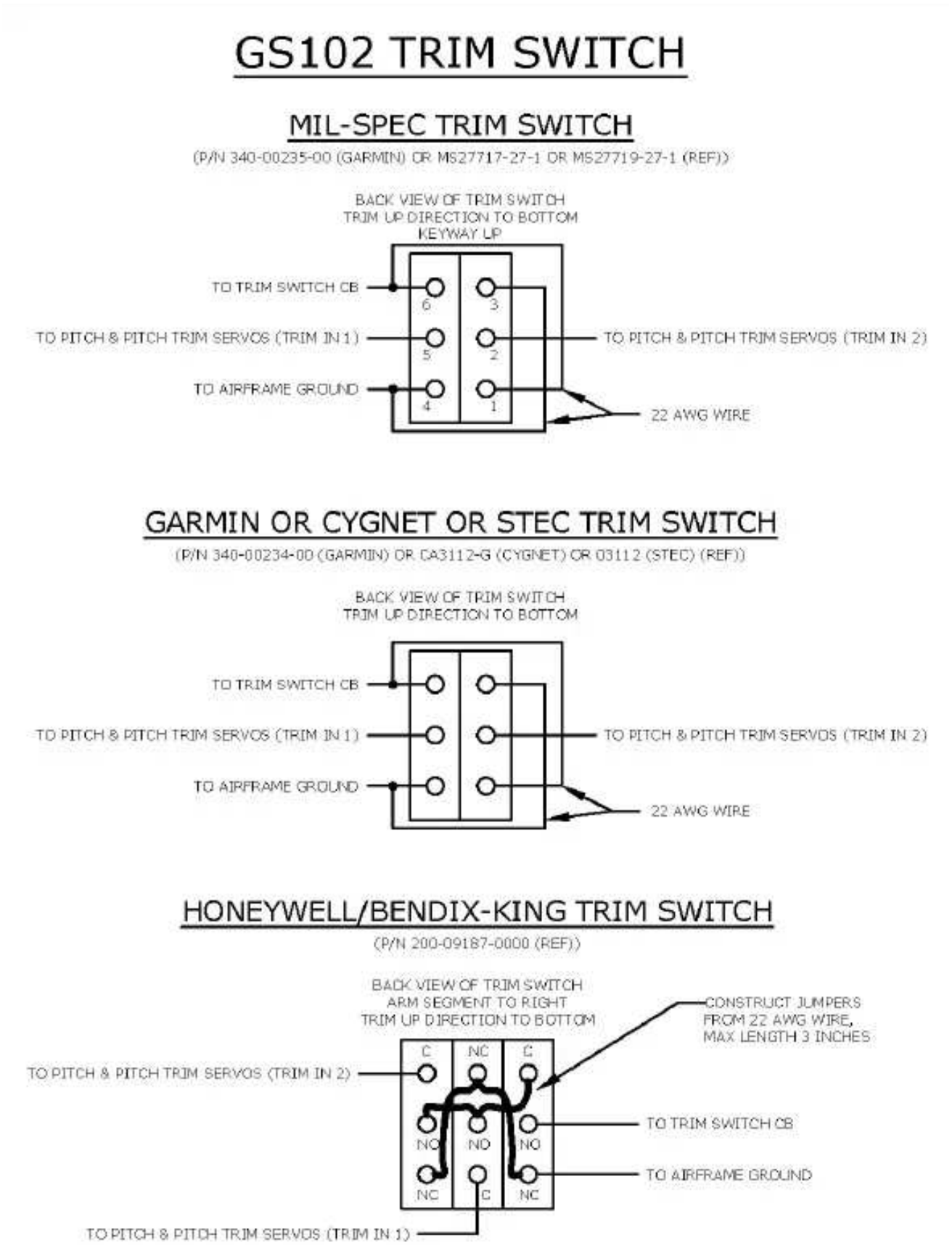


Figure A-7 – Trim Switch Wiring

A.8 GS101 DISCONNECT SWITCH WIRING

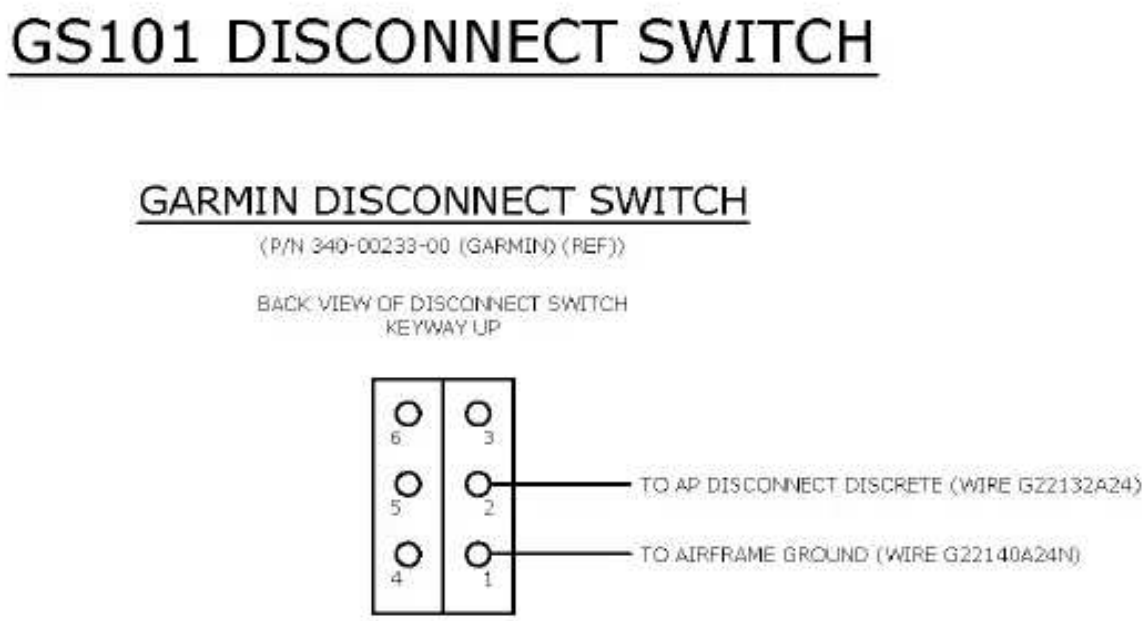


Figure A-8 – Disconnect Switch Wiring

APPENDIX B PIN FUNCTION LISTS

B.1 GMC 507 J5071 PIN FUNCTION LIST

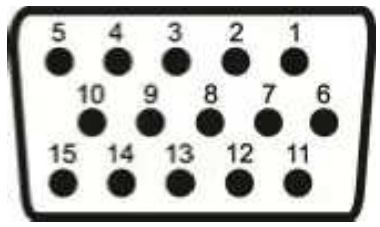


Figure B-1 – GMC 507 Connector View from Wire Entry (P5071)

PIN	TYPE	NAME
1	OUT	RS 232 OUT 1
2	IN	RS 232 IN 1
3	I/O	CAN BUS HI
4	I/O	CAN BUS LO
5	OUT	SONALERT
6	--	CAN BUS TERM 2
7	IN	AIRCRAFT POWER 1
8	--	CAN BUS TERM 1
9	IN	AIRCRAFT POWER 2
10	IN	DISCRETE IN (GO AROUND)
11	IN	LIGHTING BUS HIGH
12	OUT	AP DISCONNECT OUT
13	OUT	AUDIO OUT HI
14	OUT	AUDIO OUT LO
15	--	GROUND

B.2 GSA 28 J281 PIN FUNCTION LIST

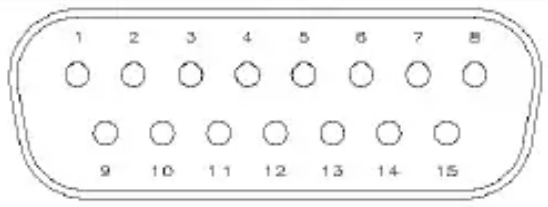
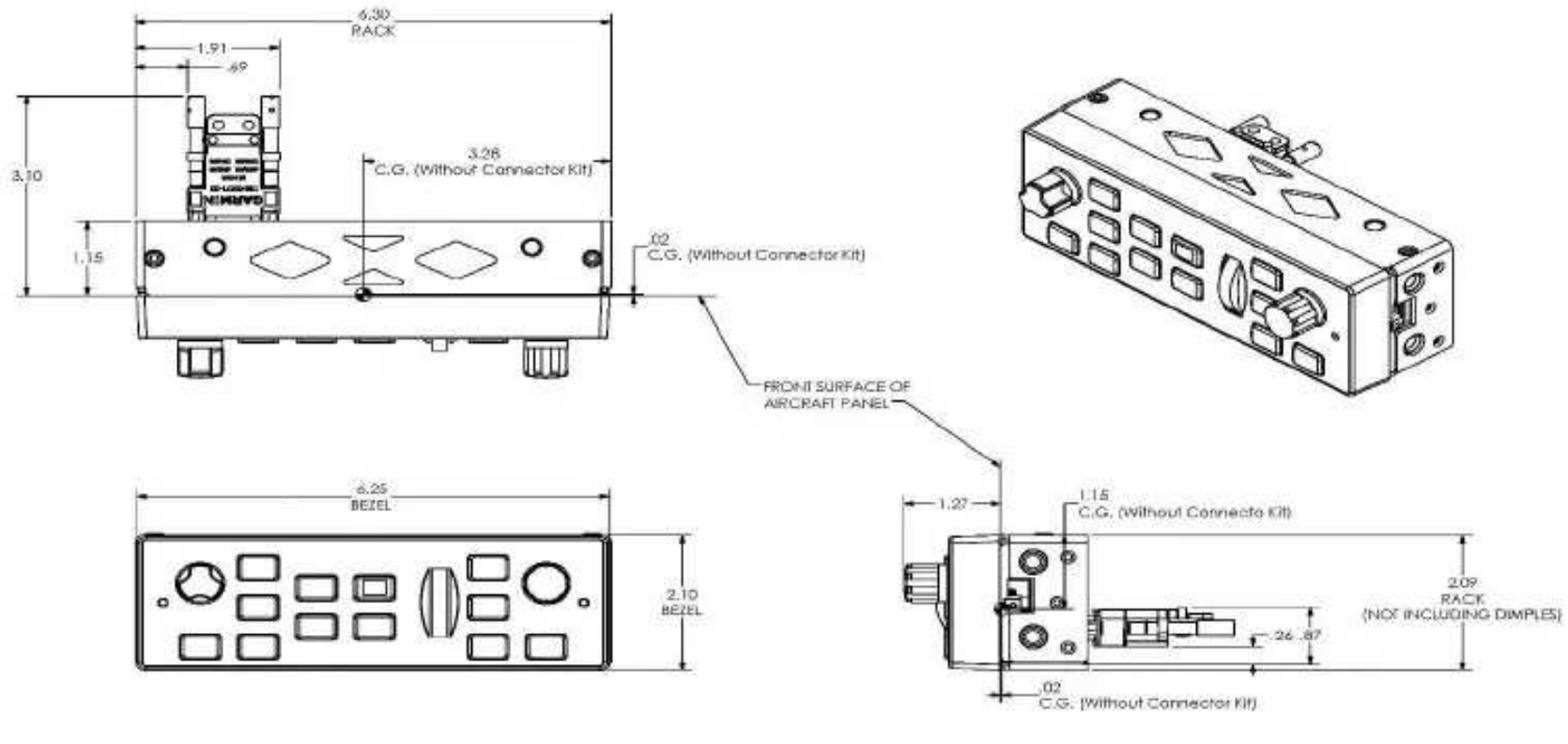


Figure B-2 – GSA 28 Connector View from Wire Entry (1P281, 2P281, 3P281, 4P281)

PIN	TYPE	NAME
1	I/O	CAN BUS HI
2	I/O	CAN BUS LO
3	--	CAN BUS TERM
4	--	CAN BUS TERM
5	--	SYS ID STRAP 1
6	--	SYS ID STRAP 2
7	--	SYS ID STRAP 3
8	--	SYS ID STRAP 4
9	--	GROUND
10	IN	AIRCRAFT POWER
11	IN	TRIM IN 1
12	IN	TRIM IN 2
13	OUT	TRIM OUT 1
14	OUT	TRIM OUT 2
15	IN	AP DISCONNECT

APPENDIX C OUTLINE DRAWINGS

C.1 GMC 507 DIMENSIONS AND CENTER OF GRAVITY



Note: Dimensions are in inches.

C.2 GSA 28 DIMENSIONS AND CENTER OF GRAVITY