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RECORD OF REVISIONS

Revision	Revision Date	Description
1	12/14/05	Initial Release
2	1/16/06	Updated servo torque checks and fuel calibration procedures.
A	2/13/07	Revised the GDC 74A test procedure.
B	9/13/07	Improved troubleshooting in section 4, updated software loading for V8.X in section 6 along with updated servo torque checks.
C	10/19/07	Updated for WAAS configuration; removed statement "WAAS is currently not an FAA approved or available configuration" throughout section 6. Also added the GCU 476 Boot Block Upgrade procedure to section 6. Throughout document changed statements with the label IMPORTANT to read NOTE. Added a note to page 5-9 about the system ID changing when master config module is replaced.

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CAUTION

The GDU 1040 and 1042 use a lens coated with a special anti-reflective coating that is very sensitive to skin oils, waxes and abrasive cleaners. **CLEANERS CONTAINING AMMONIA WILL HARM THE ANTI-REFLECTIVE COATING.** It is very important to clean the lens using a clean, lint-free cloth and an eyeglass lens cleaner that is specified as safe for anti-reflective coatings.

CAUTION

All G1000 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 INTRODUCTION

1.1 Content, Scope, and Purpose

This document provides information for field maintenance of the Garmin G1000 Integrated Cockpit Avionics Suite as installed in the Columbia 350/400. This document is required by the Instructions for Continued Airworthiness, 190-00577-01, to perform continued airworthiness maintenance on the installation. Use the information presented in the manual in conjunction with required documents shown in Table 1-1.

1.1.1 Applicability

This document applies to all 350/400 aircraft equipped with the G1000 Integrated Cockpit Avionics Suite installed.

1.2 Organization

The following outline briefly describes the organization of this manual:

Section 2: System Description

Provides a complete description of the type design change associated with installing the G1000 integrated cockpit system in the Columbia 350/400. An overview of the electrical systems and G1000 system interface is also provided.

Section 3: G1000 Control & Operation

Presents basic control and operation information specifically tailored to maintenance practices. Basic G1000 Configuration Mode operation is also described.

Section 4: Troubleshooting

Provides troubleshooting information to aid in diagnosing and resolving potential problems with the G1000 system.

Section 5: G1000 Equipment Removal & Replacement

Gives instructions for the removal and replacement of G1000 equipment.

Section 6: G1000 Equipment Configuration & Testing

Gives instructions for loading software, configuring, and testing of G1000 equipment.

Section 7: System Return to Service Procedure

Specifies return-to-service procedures to be performed upon completion of maintenance of the G1000 system.

Section 8: Required Equipment

Provides part number for the latest revision of the Required Equipment List. The list will provide the specific code loader part number, software part number, and software version.

Appendix A: Full G1000 Software/Configuration Procedure

Provides a complete software/configuration loading procedure in cases where the G1000 system as a whole requires complete software/configuration update or reload.

1.3 Definitions/Abbreviations

ADI: Attitude Display Indicator
AHRS: Attitude Heading Reference System
AMM: Airplane Maintenance Manual
CDU: Control Display Unit
CFR: Code of Federal Regulations
EAU: Engine/Airframe Unit
EIS: Engine Instrumentation Systems
HIRF: High Intensity Radiated Fields
HSDB: High-Speed Data Bus (Ethernet)
IAU: Integrated Avionics Unit
ICS: Inter-Com System
LRU: Line Replaceable Unit
MFD: Multi-Function Flight Display
OAT: Outside Air Temperature
PFD: Primary Flight Display
STC: Supplemental Type Certificate
S/W: Software
TC: Type Certificate
TSO: Technical Standard Order
TVS: Transient Voltage Suppressor
VHF: Very High Frequency

1.3.1 Units of Measure

Unless otherwise stated, all units of measure are English units.

1.4 Reference Publications

The following documents are required in addition to this maintenance manual to perform maintenance:

Table 1-1. Required Documents

Document	Part Number	Vendor
G1000/350/400 Required Equipment List	RB011002	CAM (Columbia Aircraft Manufacturing)
G1000 Cockpit Reference Guide for the Columbia 350/400	190-00567-00	Garmin
G1000 Cockpit Reference Guide for the Columbia 350/400 (updated for GDU V8.XX software)	190-00567-01	Garmin
Columbia 350 (G1000) Pilot's Operating Handbook and FAA Approved AFM	RB050005	CAM
Columbia 400 (G1000) Pilot's Operating Handbook and FAA Approved AFM	RC050005	CAM
Columbia 350 Airplane Maintenance Manual	RB050002F	CAM
Columbia 400 Airplane Maintenance Manual	RC050001C	CAM

The following documents provide additional information above and beyond the scope of this document. The part numbers are Garmin part numbers unless otherwise noted.

Table 1-2. Reference Documents

Document	Part Number
Airplane Electrical Manual, Columbia 350	RB24009 [1]
Airplane Electrical Manual, Columbia 400	RC24008 [1]
G1000 Software Loading and Post Installation Checkout Columbia 350/400	190-00577-02
G1000 V8.XX Software Loading and Post Installation Checkout Columbia 350/400	190-00577-04
G1000 Configuration Manual	190-00303-04
Aircraft Fastener Assembly Torque	005-00249-00
Aircraft Contact and Terminal Crimping	005-00249-01
Heat Shrink Tubing Application	005-00249-02
Aircraft Soldering	005-00249-03
G1000 System Installation Manual	190-00303-00
GDU 104X Installation Manual	190-00303-01
GMA 1347 Installation Manual	190-00303-20
GIA 63 Installation Manual	190-00303-05
GEA 71 Installation Manual	190-00303-40
GDC 74A Installation Manual	190-00303-15
GRS 77 /GMU 44 Installation Manual	190-00303-10
GTX 33 Installation Manual	190-00303-61
GDL 69/69A Installation Manual	190-00355-02
GSA/GSM 8X Installation Manual	190-00303-72
GCU 47X Installation Manual	190-00303-75
GTA 82 Installation Manual	190-00303-74
GDL 69/69A XM™ Satellite Radio Activation Instructions	190-00355-04

[1] Columbia Aircraft Manufacturing P/N

1.5 Distribution

This document is to be a permanent aircraft record and is distributed with a new G1000-equipped Columbia 350/400 aircraft. Revisions to this document will be made by Garmin and will be distributed by Garmin per standard documentation revision procedures.

2 SYSTEM DESCRIPTION

The G1000 integrated cockpit is installed in the Columbia 350/400 using the equipment listed in this section.

Structures in the Columbia 350/400 must be modified and/or installed per drawing located in the Airplane Electrical Manual, part number RB240009 (Columbia 350) or part number RC240008 (Columbia 400).

NOTE

The Airplane Electrical Manual, part number RB240009 (Columbia 350) or RC240008 (Columbia 400) contains drawings that support the system description and aid in G1000 system installation awareness.

2.1 Equipment Descriptions

2.1.1 GDU 1040 PFD and GDU 1042 MFD



Figure 2-1. G1000/350/400 Display Configuration

Two Garmin GDUs are installed in the 350/400 instrument panel. The PFD is a GDU 1040 and the MFD is a GDU 1042. Both displays provide control and display of nearly all functions of the G1000 integrated cockpit system. The displays are located side-by-side, with the GMA 1347 Audio Panel located in the middle.

Both displays are installed in the instrument panel using built-in ¼-turn fasteners. Each display uses a single Garmin 62-pin connector. Electrical power to the PFD is from the essential bus, whereas the MFD receives power from the Avionics bus.

On the panel, traditional attitude, altitude, and airspeed indicators are provided as backup instruments. These are mounted in a vertical configuration to the right of the MFD.

2.1.2 GMA 1347 Audio Panel

The Garmin GMA 1347 Audio Panel is a digital audio panel with integrated marker beacon receiver. The GMA 1347 provides control of all cockpit intercom/mic systems as well as NAV/COM/ILS audio. The unit also provides display reversion mode control through a large red button. Power is received from the Avionics bus; consequently the unit only powers up when the avionics master switch is turned on. The GMA 1347 interfaces with the existing marker beacon antenna as well as existing mic and phone jacks.

2.1.3 GIA 63 Integrated Avionics Unit

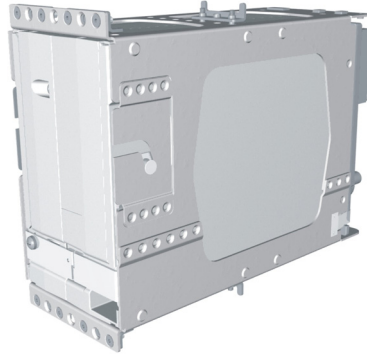


Figure 2-2. GIA 63 Integrated Avionics Unit

Two Garmin GIA 63 IAUs provide VHF COM, VHF NAV, GPS NAV and other various navigation functions, as well as control logic for the Garmin GFC 700 autopilot. GIAs provide communication interface to all other G1000 LRUs in the system. Both GIAs are located directly behind the MFD, installed into their respective LRU racks. The #1 GIA is powered through the essential bus and immediately powers up when the left battery or right battery master switch is turned on. The #2 GIA receives power through the Avionics bus and powers up when the avionics master switch is turned on. Both GIA 63s interface to the following equipment:

- Existing VOR/LOC/Glideslope Antenna System
- Existing VHF COM 1 & 2 Antennas
- Existing GPS 1 & 2 Antennas
- WX-500 StormScope (#2 GIA Only)
- GFC 700 Autopilot
- Ryan TCAD (#2 GIA Only)
- CO Detector (#2 GIA Only)

2.1.4 GEA 71 Engine/Airframe Unit



Figure 2-3. GEA 71 Engine/Airframe Unit

The Garmin GEA 71 Engine/Airframe Unit provides engine/airframe data to the G1000 system. Data received from transducers/sensors is processed, then sent via RS-485 to a GIA 63, and subsequently to the GDU 1040 MFD. The GEA 71 is connected to both GIA 63s for redundant communications. In display reversionary mode, engine instrumentation is displayed on the PFD as well. The GEA is located directly behind the PFD in its LRU rack. Power is received from the essential bus.

2.1.4.1 Engine/Airframe Sensors

The GEA interfaces to the following:

The following equipment, systems and sensors interface to the G1000 avionics systems:

- Existing Manifold Pressure Sensor
- Existing Tachometer Sensor
- Existing Oil Pressure Sensor And Low Pressure Switch
- Existing Oil Temperature Sensor
- Existing Cylinder Head Temperature (CHT) Sensors
- Exhaust Gas Temperature (EGT) Sensors
- Existing Turbine Inlet Temperature (TIT) Sensors (*Columbia 400 only*)
- Existing Fuel Level Sensors (Four)
- Existing Low Fuel Switches (L And R)
- Existing Fuel Selector Position Switches
- Existing Fuel Flow Sensor
- Existing Electrical System Sensors And Alternator Inoperative Switches
- Existing Open Door Detection Switch
- Existing Aileron And Elevator Position Sensors
- Existing Oxygen System Sensors And Switches
- Existing Starter Engage System

2.1.5 GTX 33 Mode S Transponder



Figure 2-4. GTX 33 Mode S Transponder

The Garmin GTX 33 provides Mode A, C, and S altitude and position reporting information from the G1000 system. The unit is mounted directly behind the PFD in its LRU rack. Power is received from the Avionics Bus. The GTX 33 sends data via RS-232 directly to a GIA 63. Information is then sent to the PFD, where the pilot can control the transponder. The GTX 33 is connected to both GIA 63s for redundant communications. The GTX 33 interfaces with the existing transponder antenna.

2.1.6 GDC 74A Digital Air Computer

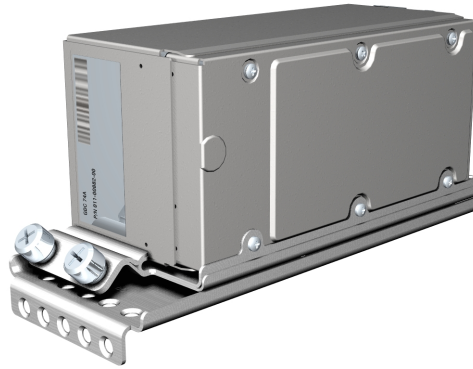


Figure 2-5. GDC 74A Air Data Computer

The Garmin GDC 74A provides digital air data to the G1000 system. The unit is mounted to its rack directly behind the PFD. Power is received from the Essential Bus. The GDC 74A connects to existing pitot/static ports. Air data is sent to the PFD for display. Four redundant data paths exist to the PFD, MFD, and both GIAs.

2.1.7 OAT Probe

The Garmin GTP 59 OAT Probe provides the GDC 74A with air temperature data. The OAT probe is mounted to the bottom side of the left wing.

2.1.8 GRS 77 Attitude and Heading Reference System



Figure 2-6. GRS 77 AHRS

The Garmin GRS 77 AHRS provides attitude and heading information to the G1000 system. The unit is mounted below the aft baggage compartment. Power is received from the Essential Bus. The GRS 77 interfaces with and provides power to the GMU 44 Magnetometer. The GRS 77 supplies attitude and heading information directly to the PFD, MFD, and to both GIAs.

2.1.9 GMU 44 Magnetometer



Figure 2-7. GMU 44 Magnetometer

The GMU 44 provides horizontal and vertical magnetic field information to the GRS 77 AHRS. This allows heading to be calculated and provides assistance during AHRS alignment. The GMU 44 is mounted at the left wingtip.

2.1.10 GSA 81 Servo and GSM 85 Servo Mount

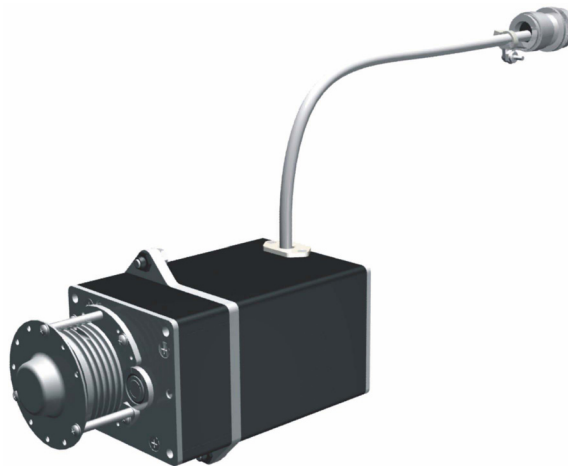


Figure 2-8. GSA 81 Servo and GSM 85 Servo Mount

The GSA 81 is mated to the GSM 85 Servo Mount to form a single servo unit. There are two servo units in this installation:

- Pitch
- Roll

The design of the servo assembly allows the servo portion (GSA 81) to be removed from the capstan (GSM 85) without the need to de-rig the aircraft control cables. The roll servo is located beneath the rear passenger seats, and the pitch servo is located beneath the aft baggage area.

2.1.11 GTA 82 Trim Adapter

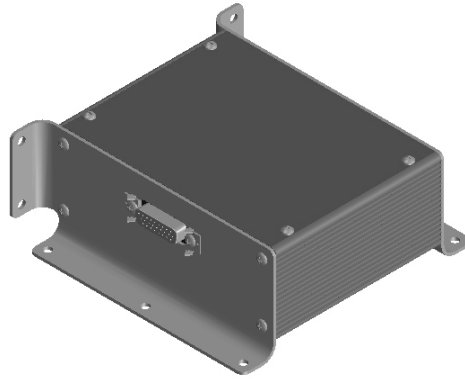


Figure 2-9. GTA 82 Pitch Trim Adapter

The Garmin GTA 82 Trim Adapter is a remote mounted device that is used to allow the GFC 700 to drive a pitch trim actuator provided by the airframe manufacturer. The GTA 82 adapter is located under the instrument panel on the pilot side beneath the standby instruments. The trim adapter is powered by the Essential Bus and interfaces with two GIA 63 Integrated Avionics units through serial communication on separate RS-485 ports.

2.1.12 GCU 476 Remote Keypad



Figure 2-10. GCU 476

The GCU 476 interfaces with the GDU 104x PFD/MFD. The GCU 476 Remote Keypad provides alphanumeric, softkey, and flight planning function keys used to interface with the G1000. In addition to alphanumeric, softkey, and flight planning function keys the GCU 476 provides COM/NAV tuning capabilities. The GCU 476 mounts on the center console using a single jackscrew.

2.1.13 GFC 700 AFCS Operational Description

The GFC 700 is a two-axis fail-safe digital flight control system. There is no single LRU with the name “GFC 700;” rather “GFC 700” refers to an integrated autopilot and flight director system, with functions provided by multiple G1000 LRUs and servos. The following functions are provided by the GFC 700 in this installation:

- Flight Director
- Autopilot
- Manual Electric Trim

Flight Director:

The Flight Director operates within the #1 GIA 63 and uses data from the G1000 system, including air data, attitude, and navigation data, to calculate commands for display to the pilot and for the Autopilot. Flight Director command bars and mode annunciations are sent to the PFD through a high-speed Ethernet connection for display to the pilot. The Flight Director operates independently of the Autopilot, and allows the pilot to hand-fly the command bars, if desired.

Autopilot:

The Autopilot operates within the four GSA 81 servos. Flight Director data is processed within the four servos and turned into aircraft flight control surface commands. The Autopilot cannot operate unless the Flight Director is engaged.

The following is a summary of the autopilot functions provided by each LRU:

- GDU 1040 PFD – Displays the Flight Director command bars and the autopilot mode annunciations.
- GDU 1042 MFD – Provides controls for the autopilot functions.
- GIA 63 – Performs the calculations to display the Flight Director command bars on the PFD and sends control movement commands to the GSA 81 autopilot servos.
- GSA 81 – Actuates the control surfaces based on commands received from the GIA 63.
- GTA 82 – Actuates the elevator trim.

2.2 Electrical Installation

2.2.1 Power Distribution

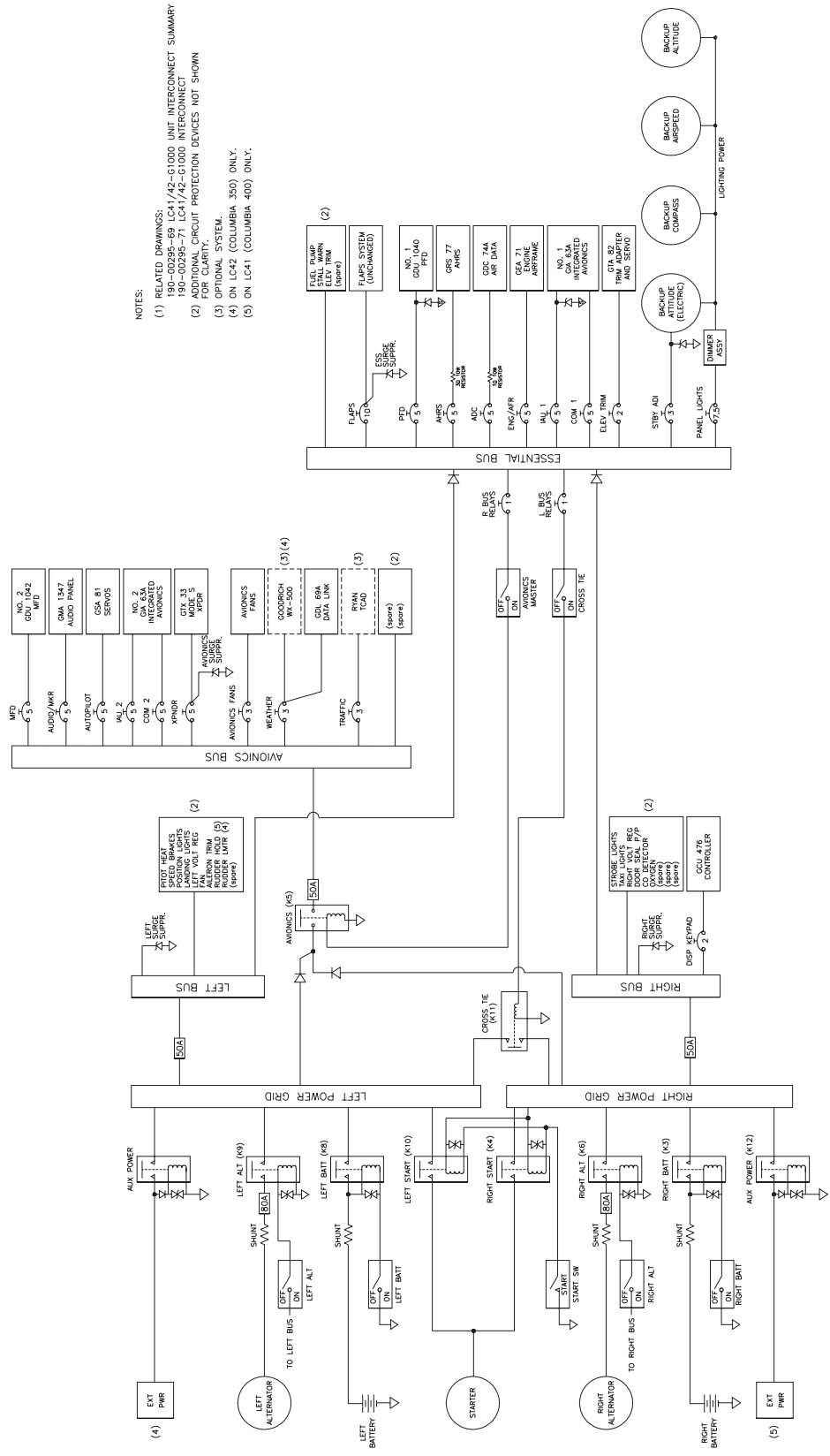
Distribution of power to the G1000 system occurs on four aircraft electrical buses. See Figure 2-11 for diagram.

Left Bus: The left bus is tied directly to the aircraft left battery (battery 1) via the left battery master switch. When the left battery master switch is turned on, power is immediately supplied to the left bus. The left bus will also receive power from the right bus when the cross tie relay is closed. The cross tie relay is operated by the switch in the overhead console.

Right Bus: The right bus is tied directly to the right battery via the right battery master switch. When the right battery master switch is turned on, power is immediately supplied to the right bus. The right bus will also receive power from the left bus when the cross tie relay is closed. The cross tie relay is operated by the switch in the overhead console.

Essential Bus: The essential bus is diode-fed from the left and right buses. When either the left or right battery master switch is turned on, power is immediately supplied to the essential bus.

Avionics Bus: The Avionics bus is tied to the left and right bus via the avionics master switch.



- NOTES:
- (1) RELATED DRAWINGS: 190-00295-69 LC41/42-G1000 UNIT INTERCONNECT SUMMARY
190-00295-71 LC41/42-G1000 INTERCONNECT
 - (2) CIP PANEL CIRCUIT PROTECTION DEVICES NOT SHOWN FOR CLARITY
 - (3) OPTIONAL SYSTEM
 - (4) ON LC42 (COLUMBIA 350) ONLY.
 - (5) ON LC41 (COLUMBIA 400) ONLY.

Figure 2-11. Power Distribution

2.2.2 Wiring

A wiring harness is fabricated and installed according to the wiring diagrams provided in the applicable and latest revision of the 350/400 electrical manual.

2.2.3 Shield Block Installation

Most G1000 connectors employ a shield block grounding system to provide necessary ground reference to shielding and/or transducers.

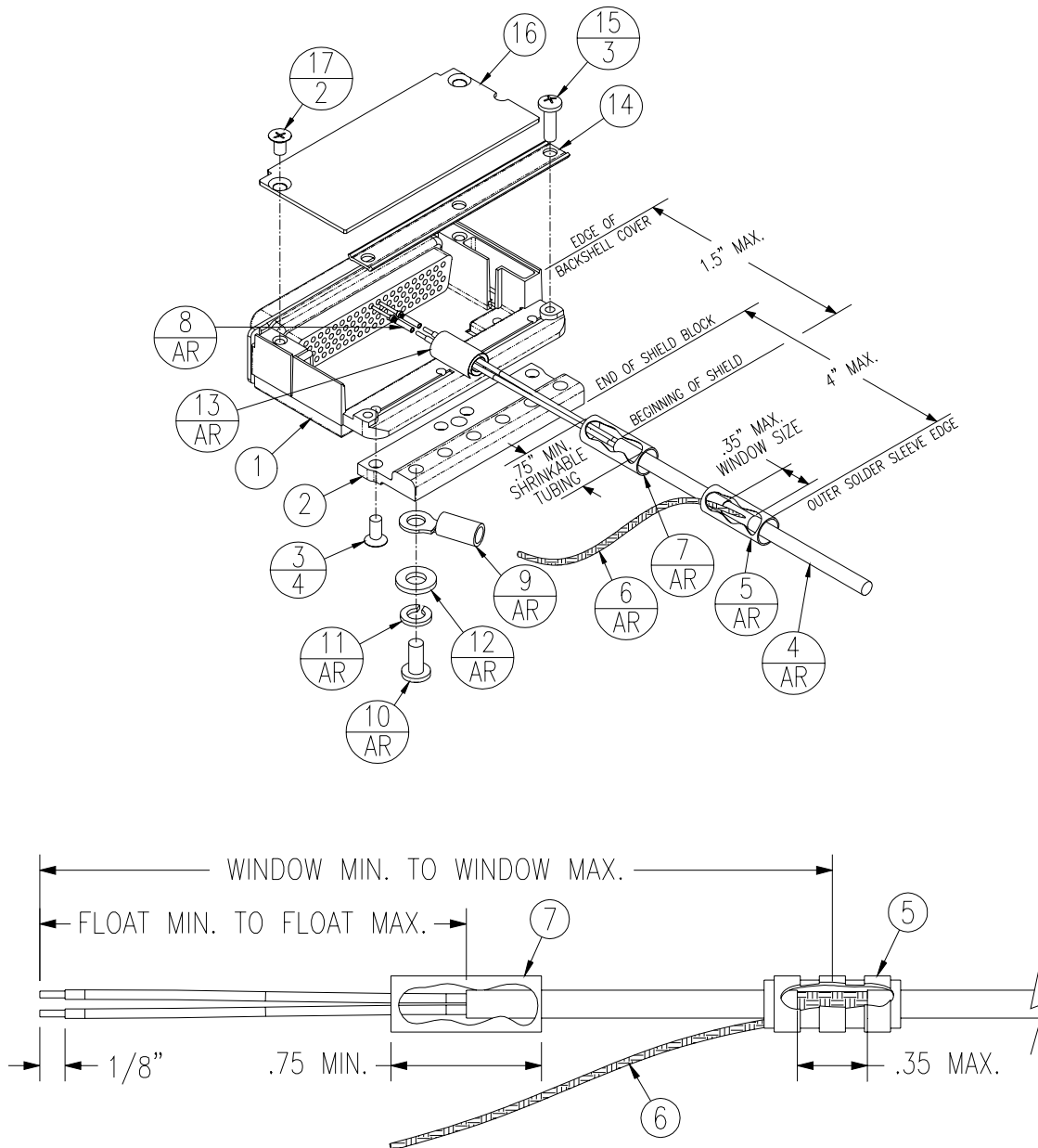


Figure 2-12. Shield Block Installation to Backshell (78-pin Connector Example)

Table 2-1. Parts Needed for Shield Block Installation

Figure Ref	Description	GPN or MIL spec
1	Cast Housing (from Garmin Backshell Kit)	125-0008x-00
2	Shield Block(s)	117-00147-00 117-00147-01
3	Screw,4-40x.250,FLHP 100,SS/P,Nylon (from Garmin Shield Block Kit)	211-63234-08
4	Multiple Conductor Shielded Cable (2 –conductor demonstrated here)	Reference Installation Wiring Diagrams
5	Drain Wire Shield Termination (method optional)	Parts used depend on method chosen (see page 7 and 8)
6	Braid, Flat (19-20 AWG equivalent, tinned plated copper strands 36 AWG, Circular Mil Area 1000 -1300)	Parts used depend on method chosen
7	Floating Shield Termination (method optional)	Parts used depend on method chosen (see page 8)
8	Pins	336-00021-00
9	Ring terminal, #8, insulated, 18-22 AWG	MS25036-149
	Ring terminal, #8, insulated, 14-16 AWG	MS25036-153
	Ring terminal, #8, insulated, 10-12 AWG	MS25036-156
10	Screw, PHP, 8-32x.312", Stainless	MS51957-42
	Screw, PHP, 8-32x.312", Cad Plated Steel	MS35206-242
11	Split Washer, #8, (.045" compressed thickness) Stainless	MS35338-137
	Split Washer, #8, (.045" compressed thickness) Cad-plated steel	MS35338-42
12	Flat Washer, Stainless, #8, .032" thick, .174"ID, .375" OD	NAS1149CN832R
	Flat washer, Cad-plated Steel, #8, .032" thick, .174"ID, .375" OD	NAS1149FN832P
13	Silicon Fusion Tape	249-00114-00
14	Strain Relief (from Garmin Backshell Kit)	115-00499-xx
15	Screw,4-40x.375,PHP,SS/P,w/Nylon (from Garmin Backshell Kit)	211-60234-10
16	Lid from Garmin Backshell Kit	115-00500-xx
17	Screw,4-40x.187,FLHP100,SS/P,w/Nylon (from Garmin Backshell Kit)	211-63234-06

2.3 G1000 System Communications

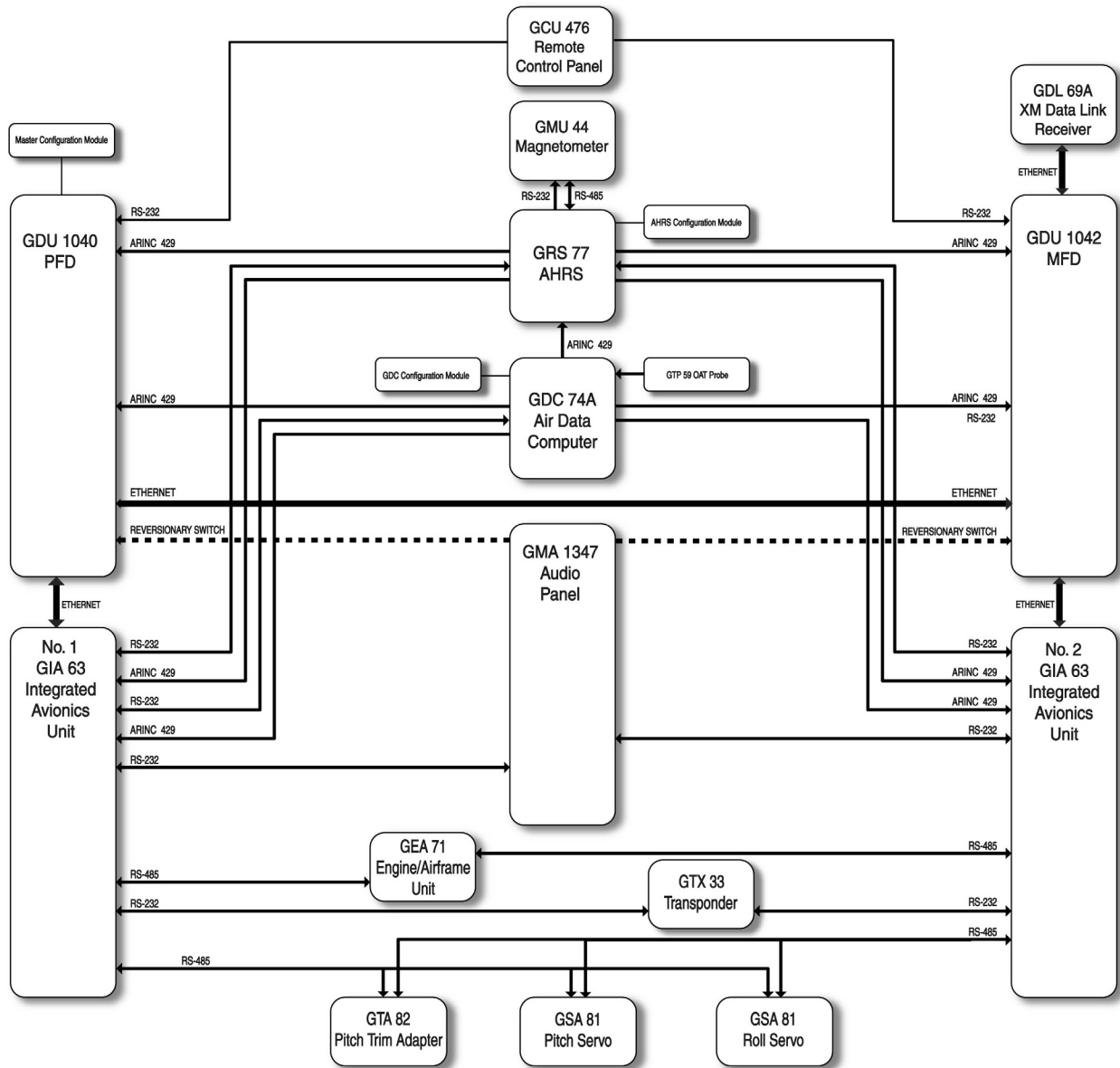


Figure 2-13. G1000 System Interface

2.3.1 Flight Instrumentation

The GRS 77 AHRS, GDC 74A Air Data Computer, and GMU 44 Magnetometer are responsible for providing the G1000 system with flight instrumentation (refer to Figure 2-14). Data consists of aircraft attitude, heading, altitude, airspeed, vertical speed, and outside air temperature information, all displayed on the PFD (data is displayed on the MFD in reversionary mode only).

Primary data outputs from the GRS and GDC are sent directly to the PFD via ARINC 429. Secondary data paths connect the GRS and GDC to the MFD. Additional communications paths connect the GRS and GDC to both GIA 63 units, providing quadruple redundant interface.

The GRS 77 receives GPS data from both GIAs, airspeed data from the GDC, and magnetic heading from the GMU. Using these three external sources, combined with internal sensor data, the GRS accurately calculates aircraft attitude and heading.

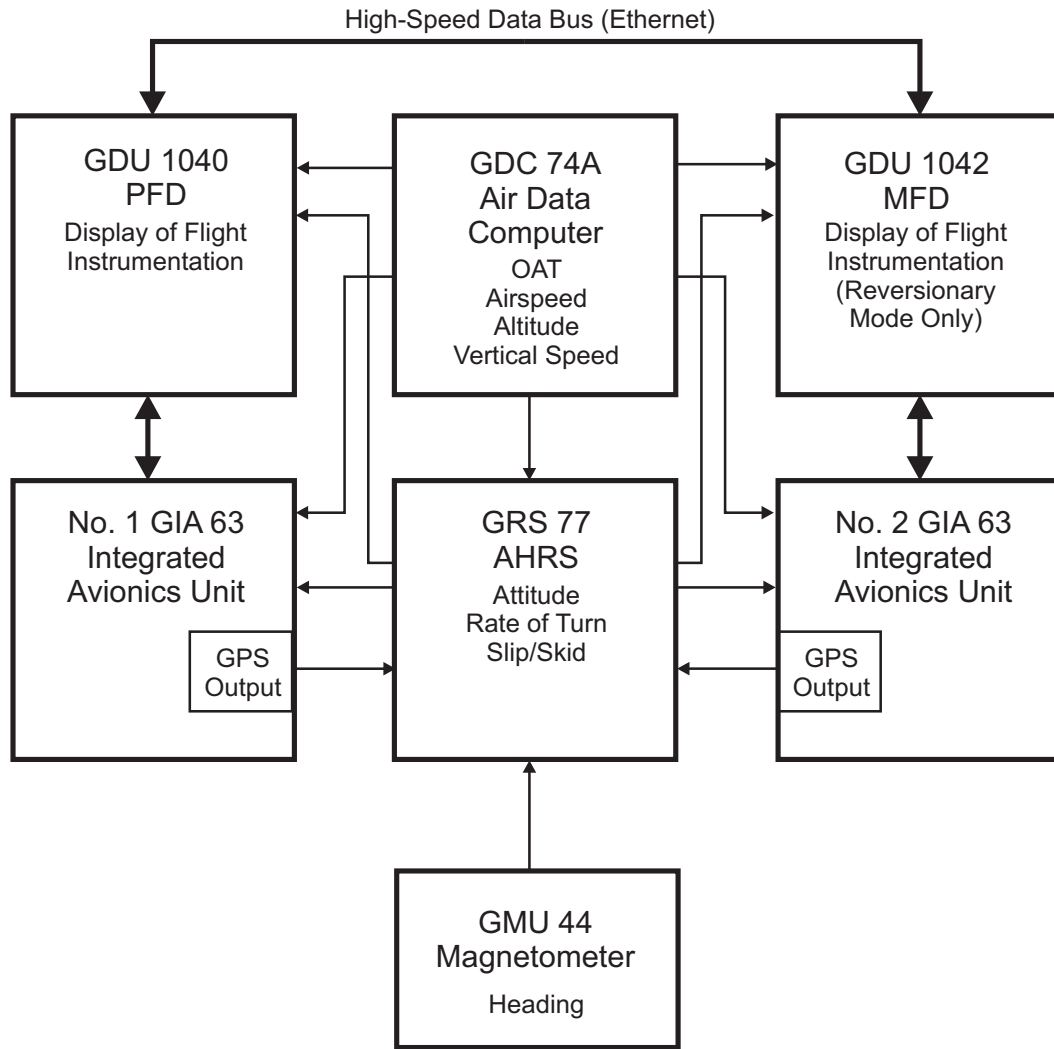


Figure 2-14. Flight Instrumentation Interface

2.3.2 Engine Indicator System

The GEA 71 provides engine/airframe data to the G1000 system. The unit interfaces to transducers shown in Figure 2-15. Analog data is received from the transducers and is converted to a digital signal by the GEA 71. Digital information is then sent through the primary RS-485 serial path to the #1 GIA 63. From the GIA, data is sent through the HSDB connection to the PFD, then on to the MFD for display. A backup data path from the GEA to the #2 GIA 63, then on to the MFD, exists in the event the primary path fails.

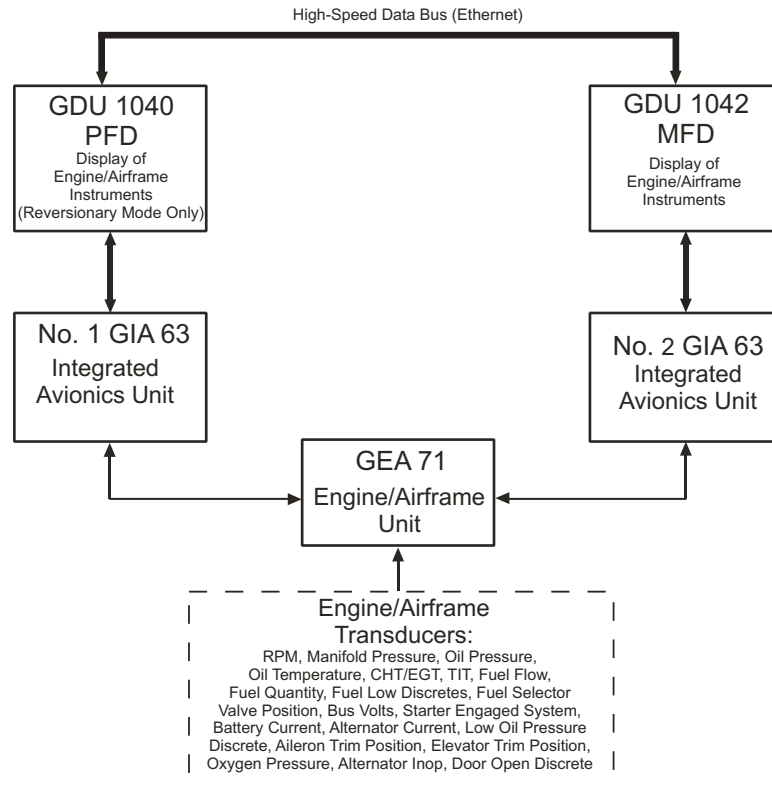


Figure 2-15. G1000 Engine/Airframe Interface

2.3.3 Communications/Navigation Systems

The GIA 63 IAUs contain VHF COM, VHF NAV, and GPS receivers. COM and NAV audio is sent via digital audio to the GMA 1347 Audio Panel.

GPS information is sent to the GRS 77 AHRS and to both displays for processing.

The GTX 33 Mode S Transponder communicates with both GIAs. Transponder data is sent from the GIAs to the PFD where control and operation occurs.

The GMA 1347 Audio Panel controls the display reversionary mode.

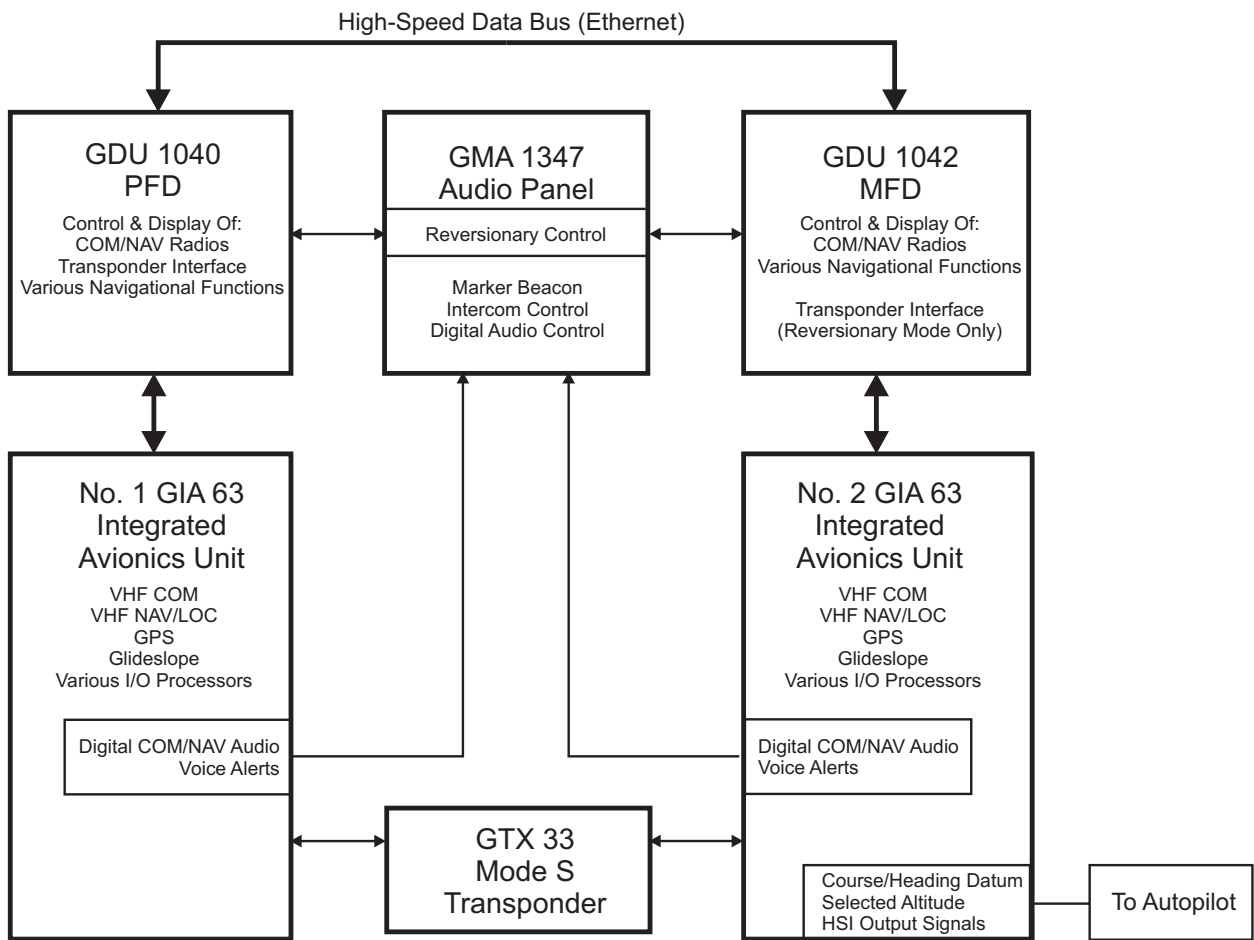


Figure 2-16. G1000 Navigation/Communications

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3 G1000 CONTROL AND OPERATION

All control and operation of G1000 equipment as normally used in flight occurs through the PFD, MFD, GCU 476 Remote Keypad and GMA 1347 audio panel. Figure 3-1 identifies various GDU 1040/1042 buttons. Figure 3-2 identifies the GCU 476 buttons. Figure 3-3 identifies various GMA 1347 buttons.

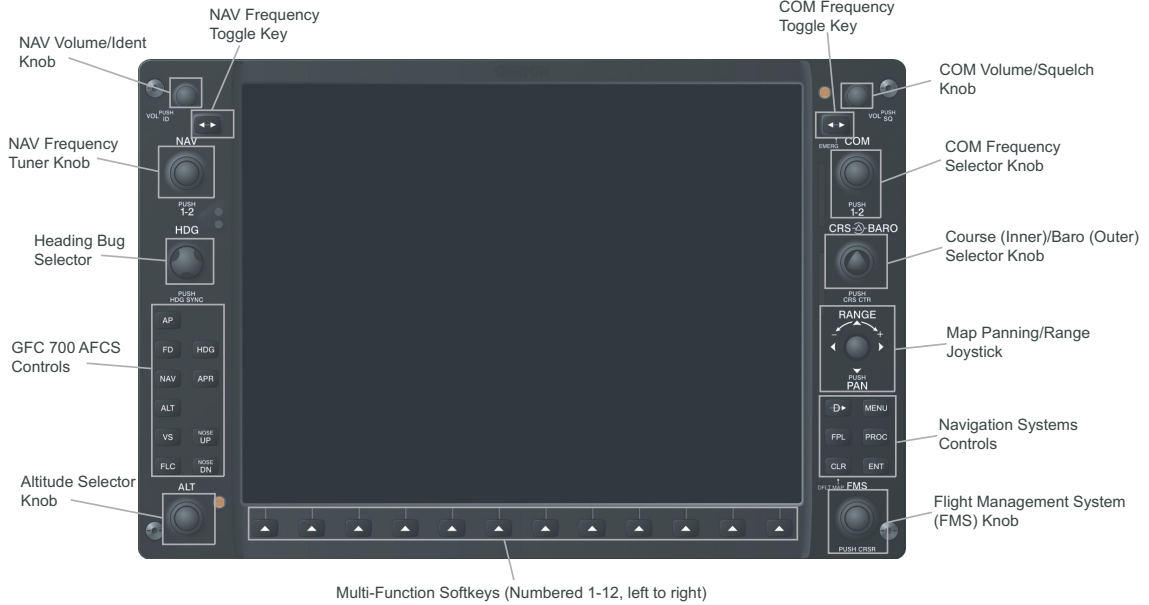
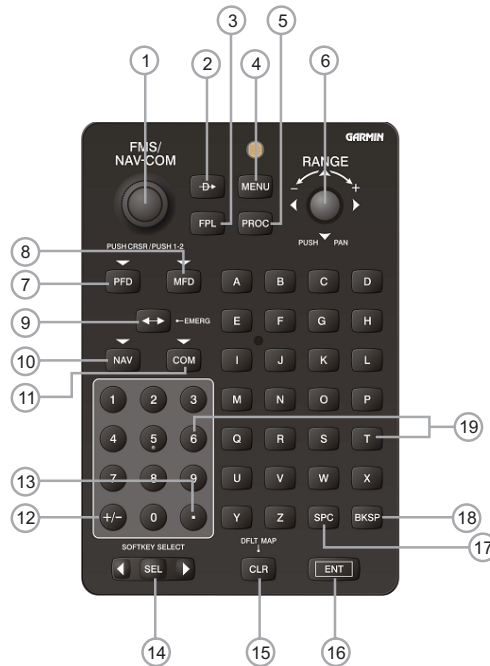


Figure 3-1. GDU 1040/1042 Control Interface



- | | | |
|----------------------|--------------------------|-----------------------|
| 1. Dual FMS/NAV Knob | 7. PFD Key | 13. Decimal (.) Key |
| 2. Direct-To Key | 8. MFD Key | 14. SEL Key |
| 3. FPL Key | 9. Flip-Flop Key (↔) | 15. CLR Key |
| 4. MENU Key | 10. NAV Key | 16. ENT Key |
| 5. PROC Key | 11. COM Key | 17. SPC Key |
| 6. Joystick | 12. Plus/Minus (+/-) Key | 18. BKSP Key |
| | | 19. Alphanumeric Keys |

Figure 3-2. GCU 476 Controls

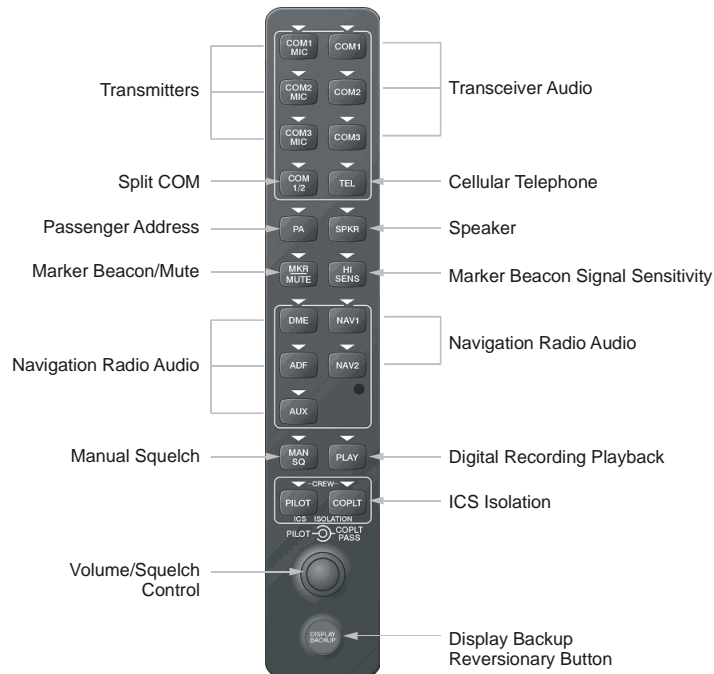


Figure 3-3. GMA 1347 Controls

3.1 User Interface

3.1.1 Flight Management System (FMS) Knob

The FMS knob is the primary control for the G1000 system. Operation is similar to the Garmin 400/500 Series units.

- To cycle through different configuration screens:
 - To change page groups:* Rotate the large FMS knob.
 - To change pages in a group:* Rotate the small FMS knob.
- To activate the cursor for a page, press the small FMS knob directly in, as one would push a regular button.
- To cycle the cursor through different data fields, rotate the large FMS knob.
- To change the contents of a highlighted data field, rotate the small FMS knob. This action either brings up an options menu for the particular field, or in some cases allows the operator to enter data for the field.
- To confirm a selection, press the ENT key.
- To cancel a selection, press the small FMS knob in again, deactivating the cursor. The CLR key may also be used to cancel a selection.

3.1.2 Softkeys

Some pages have commands or selections that are activated by the GDU 1040/1042 softkeys. If a softkey is associated with a command, that command will be displayed directly above the key. A grayed-out softkey shows a command that is unavailable. A softkey that is highlighted shows the current active selection.



Figure 3-4. G1000 Softkeys

3.1.3 AFCS Controls

The dedicated AFCS controls on the GDU 1042 are discussed in detail in the G1000 Cockpit Reference Guide for the Columbia 350/400, P/N 190-00567-00. The following figure is provided for reference.

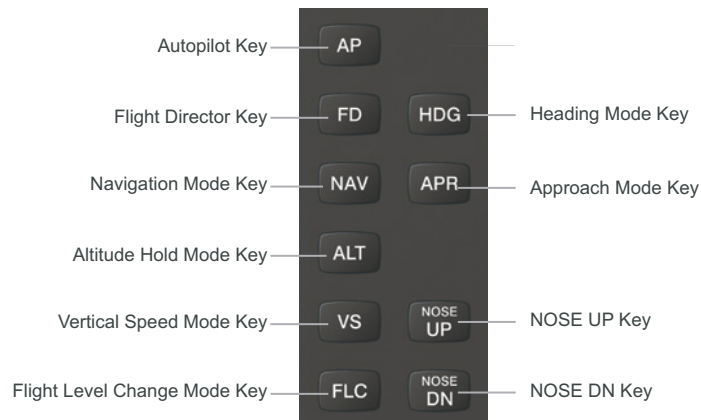


Figure 3-5. AFCS Controls

3.2 G1000 Normal Mode

To start the G1000 system in Normal Mode:

1. Turn on the left battery and right battery master switches. The following G1000 equipment is powered on:
 - GDU 1040 PFD
 - GRS 77 AHRS
 - GDC 74A Air Data Computer
 - #1 GIA 63 Integrated Avionics Unit
 - GEA 71 Engine/Airframe Unit
 - GTX 33 Mode S Transponder
 - GTA 82 Trim Adapter
 - GCU 476 Remote Keypad
2. Turn on the avionics master switch. The following G1000 equipment is powered on:
 - GDU 1042 MFD
 - #2 GIA 63 Integrated Avionics Unit
 - GMA 1347 Digital Audio Panel
 - GDL 69A Data Link
 - GSA 81 Pitch and Roll Servos

The G1000 system is now powered in the normal mode. The PFD and MFD will function as specified in the G1000 Cockpit Reference Guide for the Columbia 350/400 when the system has been correctly installed and configured.



Figure 3-6. Normal Mode

3.3 Reversionary Mode

Should a display communication or hardware failure occur, the G1000 system automatically enters the reversionary mode. The system reversionary mode forces the remaining display into showing all information related to safe flight.

A manual reversionary mode also allows the operator to force the system into reversionary mode in situations where the system does not automatically enter reversionary mode. A large red button on the GMA 1347 audio panel activates the manual reversionary mode.



Figure 3-7. MFD Failure Mode

Should the PFD display fail, the MFD automatically enters reversionary mode. In this mode, flight-critical information from the AHRS/Air Data system is displayed on the MFD along with essential engine instrumentation.



Figure 3-8. PFD Failure Mode

3.4 Configuration Mode Overview

The Configuration Mode exists to provide the technician with a means of configuring, checking, and calibrating various G1000 sub-systems. Troubleshooting and diagnostics information can also be viewed in this mode.

To start the system in Configuration Mode:

1. Start the system in normal mode as described in Section 3.2.
2. Remove power to the PFD and MFD by pulling the circuit breakers labeled PFD and MFD.
3. Press and hold the ENT key on the PFD while applying power using the PFD circuit breaker.
4. Release the ENT key after 'INITIALIZING SYSTEM' appears in the upper left corner of the PFD.
5. Power on the MFD in the same manner. It is best to have both displays in Configuration Mode whenever performing post-installation practices.

CAUTION

The Configuration Mode contains certain pages and settings that are critical to aircraft operation and safety. Such pages are protected and cannot be modified, unless the technician is properly authorized and equipped. However, most protected pages are viewable to allow system awareness for troubleshooting.

NOTE

For a complete description and breakdown of each Configuration Mode page, refer to the G1000 Configuration Manual, Garmin part number 190-00303-04.

3.4.1 Loader Card Interface

The G1000 Code Loader Card interface exists to provide a means of loading software and configuration files to the system and LRUs. The G1000-Columbia 350/400 Code Loader Cards use a 128 MB Secure Digital (SD) data card that contains:

- All G1000 LRU Software Files
- All G1000 Configuration Files

All software and configuration files were pre-determined by Garmin and/or Columbia during design of the system. During removal and replacement of LRUs, software and configuration files may need to be reloaded (See Sections 5 & 6). To satisfy TC requirements for the Columbia 350/400, it is critical that the technician uses the correct G1000-Columbia 350/400 Code Loader Card part number when servicing the G1000 system.

The G1000-Columbia 350/400 Code Loader Card part number defines all files specific to the G1000 system as installed in the Columbia 350/400. Approved Loader Card part numbers for the 350/400 can be found in the Required Equipment List, Columbia P/N RB011002.

CAUTION

Always use caution when using Code Loader Cards during maintenance. The G1000 system is designed to immediately initialize the card upon power-up. On-screen prompts must be given careful attention in order to avoid potential loss of data. Always read through procedures given in Sections 4, 5, 6, and/or Required Equipment List *before* attempting to use the Code Loader Cards.

3.4.2 Configuration Files

A G1000-Columbia 350/400 Code Loader Card typically contains the following configuration files:

- **AIRFRAME:** This file contains data such as airspeed parameters, engine/airframe sensor limitations, fuel tank parameters and alerting system settings that tailor a G1000 PFD or MFD to the 350/400.
- **SYSTEM:** This file configures the G1000 Ethernet to expect a PFD, MFD, and two GIAs.
- **MANIFEST:** This file loads a manifest of all software part numbers and versions associated with an approved system configuration.
- **MFD1:** This file configures MFD serial/discrete communication and alert system settings.
- **PFD1:** This file configures PFD serial/discrete communication and alert system settings.
- **GIA1/GIA2:** These files configure GIA1/GIA2 serial/discrete communication settings.
- **GMA1:** This file configures GMA 1347 audio and serial communication settings.
- **GTX1:** This file configures GTX 33 transponder and serial communications settings.
- **GEA1:** This file configures GEA 71 engine/airframe parameters.
- **GDC1:** This file configures GDC 74A air data values for the 350/400.
- **GDL69:** This file configures the GDL 69A data link settings.
- **GCU476:** This file configures the GCU 476.
- **CALIBRATION:** This file configures the fuel calibration data.
- **AUDIO CONFIGURATION:** This file configures the audio settings.

The above files are loaded during the configuration processes listed in Section 6. Each file is sent directly to the applicable LRU. The same file is also stored in PFD internal configuration memory. The PFD also sends a copy of all configuration files to its connector configuration module. If the PFD is replaced, the configuration module retains all configuration files in the aircraft.

NOTE

The GRS 77 AHRS and GMU 44 Magnetometer do not utilize a configuration file. However, these LRUs do require several calibrations during installation checkout to tailor sensor characteristics to a specific 350/400 airframe. While performing maintenance on these units, re-calibration may be required. See Section 6.7.4 for more information on re-calibration criteria.

3.4.3 Configuration File Storage

The G1000 system is designed to store all configuration settings in various places so that the configuration is retained in the aircraft during maintenance of units. Figure 3-9 and Figure 3-10 illustrate where the various configuration files are stored.

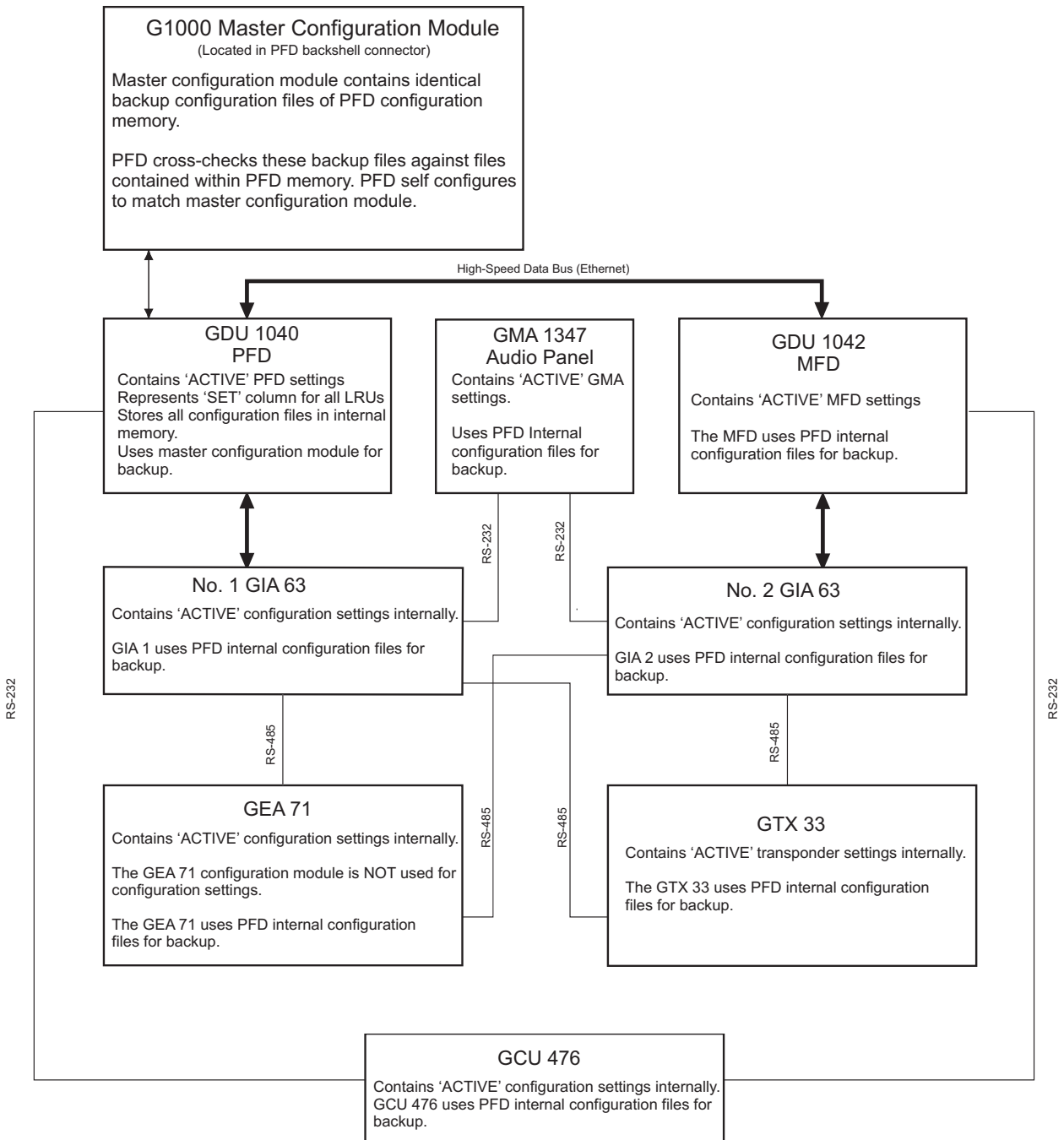


Figure 3-9. G1000 LRU Configuration File Storage

The GRS 77 and GDC 74A configuration modules function differently than the rest of the system. The GDC 74A's configuration file is loaded directly to GDC internal memory. A copy of the file is stored in the GDC configuration module.

The GRS 77 configuration module does not store any configuration settings. Rather, it stores calibration data recorded during installation calibration procedures.

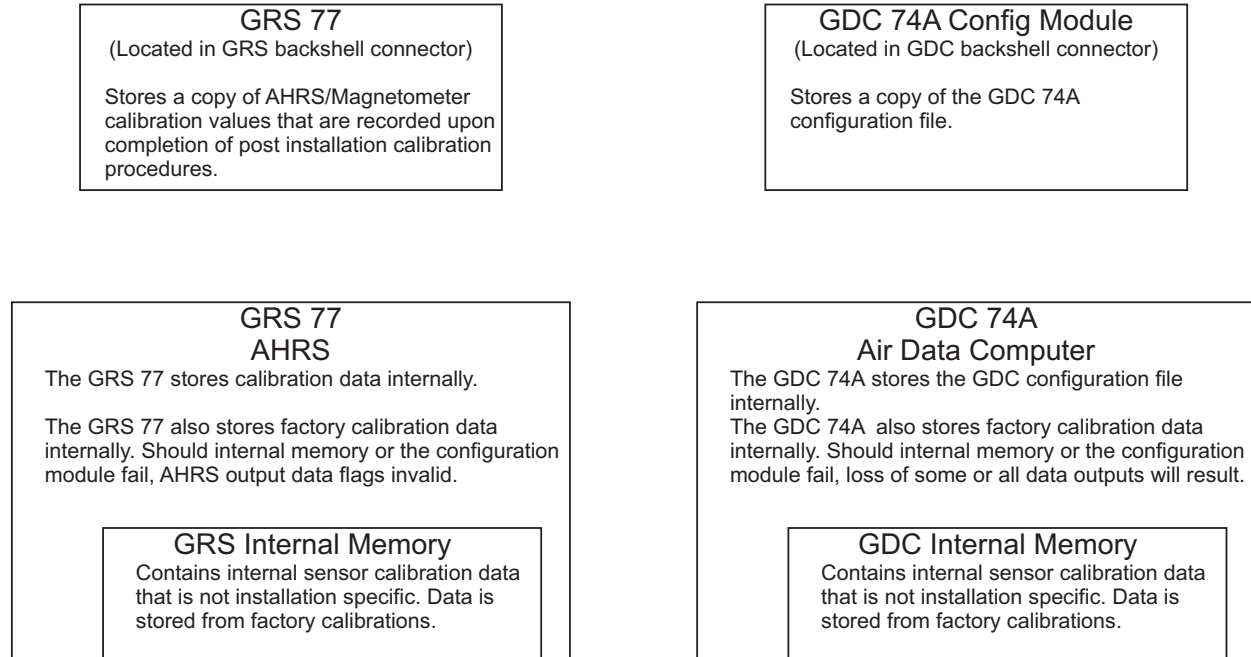


Figure 3-10. GRS/GDC Configuration Settings Storage

3.4.4 SET>ACTV Interface

Throughout various Configuration Mode pages, there are SET and ACTIVE columns for input/output settings and other parameters.

SET: Refers to a setting or group of settings that reside in PFD Internal Memory and/or the Master Configuration Module.

ACTIVE: Refers to an 'active' setting or parameter currently being used by the LRU. LRUs store the 'active' settings within internal memory.

Data can be manually copied from one column to the other by using the following two softkeys, when available:

- SET>ACTV (read 'Set to Active') softkey: Allows the installer to send the information in the SET column (data stored in the master configuration module) to the ACTV column (data used by LRU).
- ACTV>SET (read 'Active to Set') softkey: Causes the LRUs current settings to be copied to the master configuration module as SET items.

WARNING

THE ACTV>SET SOFTKEY MUST BE USED WITH CAUTION! IF AN IMPROPERLY CONFIGURED UNIT IS INSTALLED, THIS SOFTKEY CAUSES THE WRONG CONFIGURATION TO REPLACE THE CORRECT AIRCRAFT CONFIGURATION!

In the first example shown in Figure 3-11, the SET columns do not match the ACTIVE columns. The inequality between SET and ACTIVE indicates a configuration mismatch. By pressing the SET>ACTV softkey, this copies the SET column to the LRU unit's configuration memory. The settings then become the ACTIVE settings for the LRU being configured.

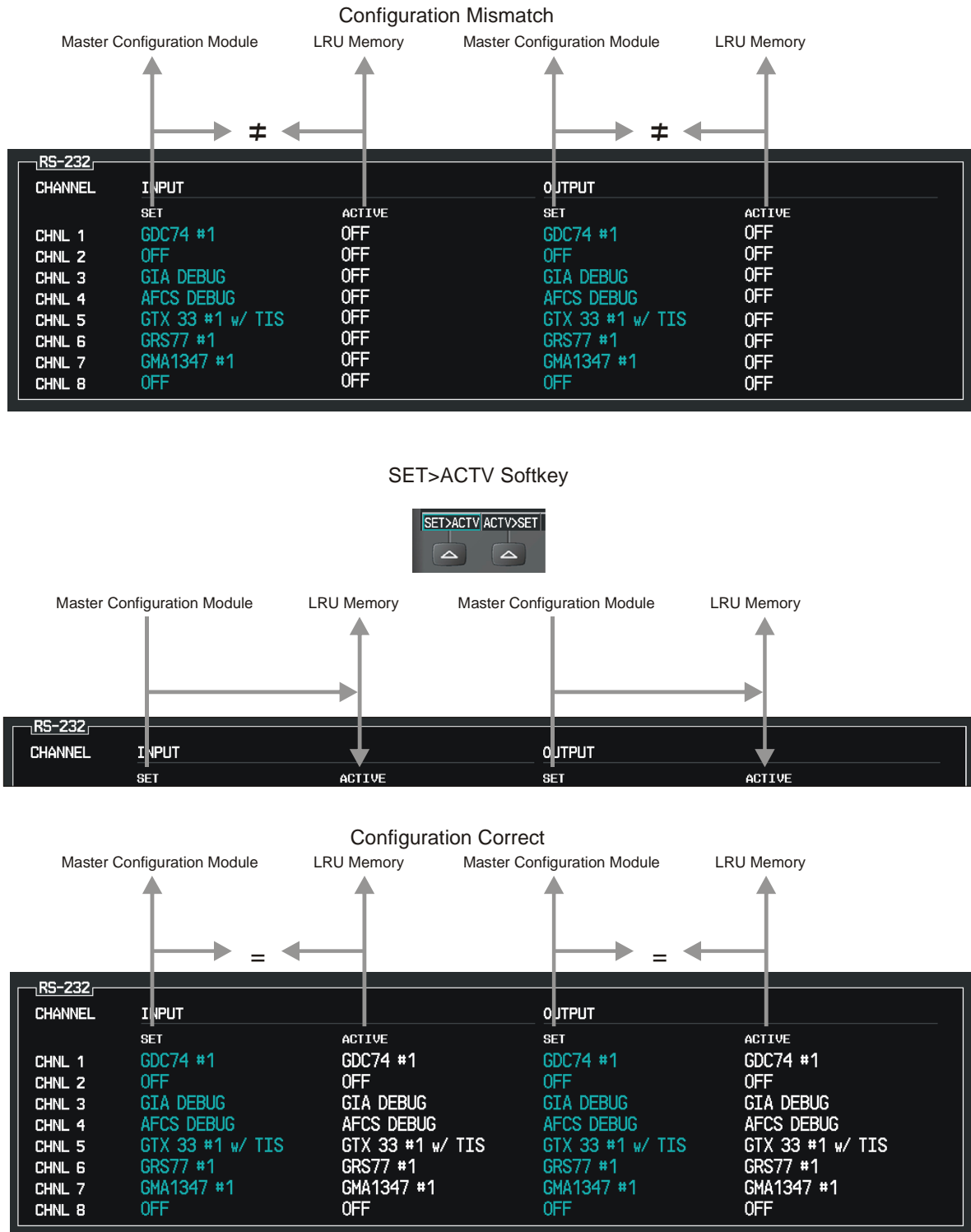


Figure 3-11. SET>ACTV Diagram

When troubleshooting the system, technicians can look for inequalities between SET and ACTIVE columns. Certain problems can be resolved simply by pressing the SET>ACTV softkey, which reloads settings to the specific LRU from the PFD. (Note that this can also be accomplished by reloading the configuration files for the LRU, using the appropriate G1000-Columbia 350/400 Code Loader Card. Section 6 describes this method for each LRU).

A blank active column, as shown in Figure 3-12 represents loss of communication between the display and the particular unit. See Section 4 for more details on troubleshooting.

RS-232				
CHANNEL	INPUT		OUTPUT	
	SET	ACTIVE	SET	ACTIVE
CHNL 1	GDC74 #1		GDC74 #1	
CHNL 2	GIA DEBUG		GIA DEBUG	
CHNL 3	OFF		OFF	
CHNL 4	OFF		OFF	
CHNL 5	GTX 33 #1 w/ TIS		GTX 33 #1 w/ TIS	
CHNL 6	GRS77 #1		GRS77 #1	
CHNL 7	GMA1347 #1		GMA1347 #1	
CHNL 8	OFF		OFF	

Figure 3-12. Loss of Communication

3.4.5 Configuration Prompts

When configuration settings are changed, the technician receives on-screen prompts and/or confirmations such as those shown in Figure 3-13.

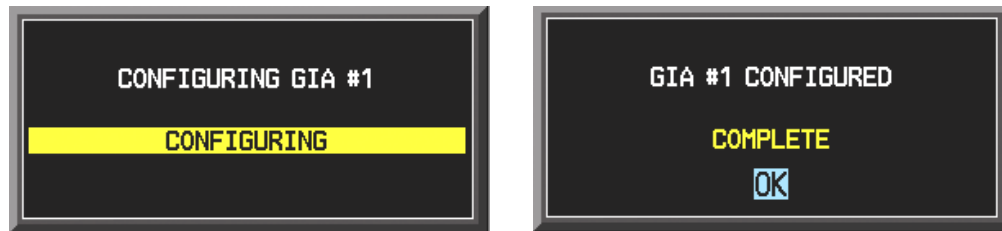


Figure 3-13. Configuration Status

3.4.6 Data Transmission Indicators

Several configuration screens utilize an indicator light system to show discrete (ON/OFF) data and/or hardware component status. Unless otherwise noted, the following applies to all such status indicators:

- Green Light: Expected data is successfully received and is ON. A green light could also indicate that the parameter/component is working correctly.
- Red Light: Expected data is not received. A red light could also indicate that a parameter/component is invalid.
- No Light (Black): Expected data is successfully received and is OFF, or no data is expected. A black light could also indicate that the parameter/component is not responding.

STATUS					
BOOT BLOCK	<input type="checkbox"/>	RAM	<input checked="" type="checkbox"/>	XILINX	<input checked="" type="checkbox"/>
BASE MAP	<input checked="" type="checkbox"/>	CONFIG	<input type="checkbox"/>	DATA	<input checked="" type="checkbox"/>
ETHERNET 1	<input checked="" type="checkbox"/>	ETHERNET 2	<input checked="" type="checkbox"/>	ETHERNET 3	<input checked="" type="checkbox"/>
RS-232 1	<input checked="" type="checkbox"/>	RS-232 2	<input checked="" type="checkbox"/>	IRDA	<input checked="" type="checkbox"/>

Figure 3-14. Data Transmission Indicators

3.5 Configuration Mode Navigation

Using the FMS knob as described in Section 3.1.1 a user can navigate through different pages and page groups in the Configuration Mode. For complete description and breakdown of each page, refer to the G1000 Configuration manual, Garmin part number 190-00303-04.

The following diagram shows the layout and organization of Configuration Mode page groups and pages.

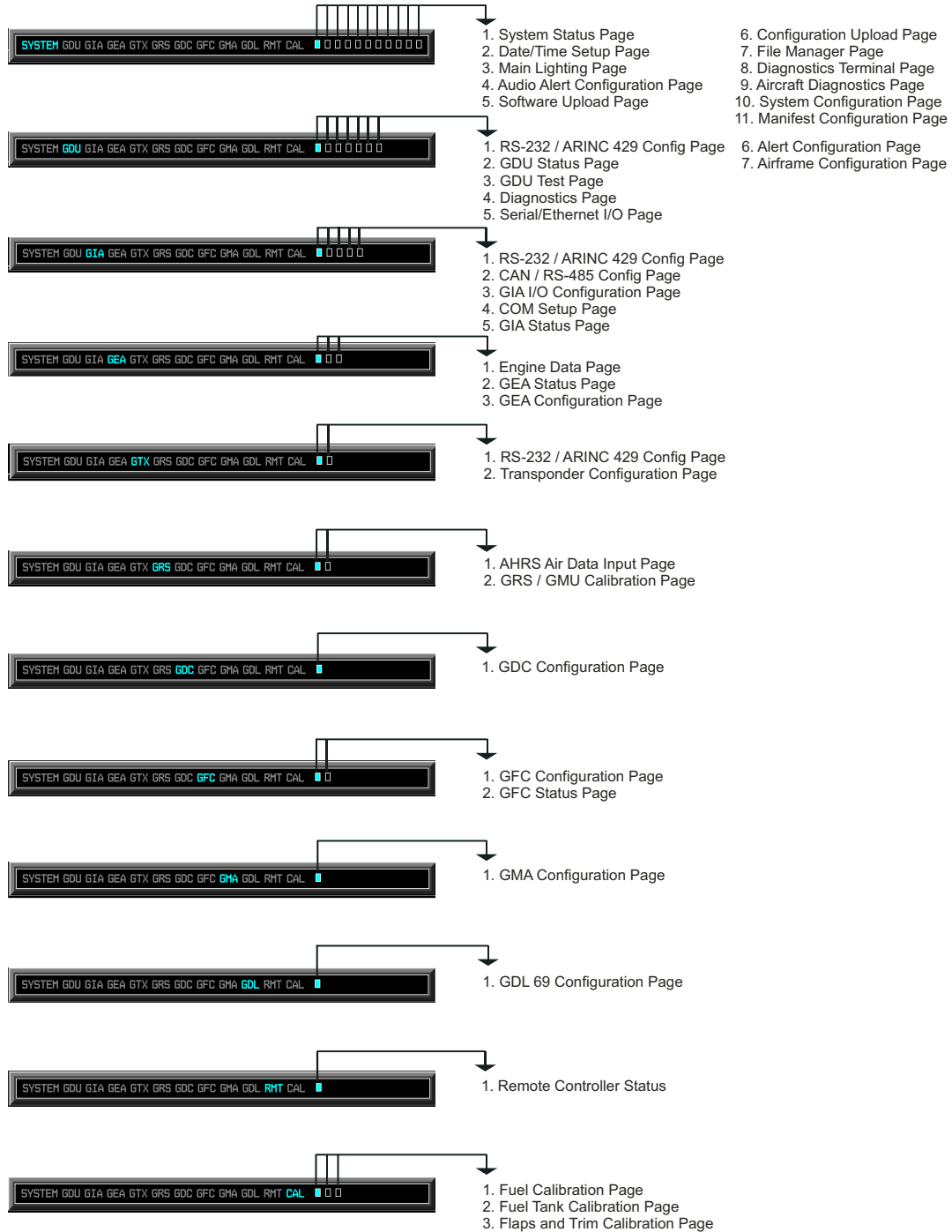


Figure 3-15. Configuration Page Navigator

4 TROUBLESHOOTING

This section provides instructions and guidance for G1000 system troubleshooting, as installed in the Columbia 350/400.

NOTE

Sections 5, 6 and 7 provide detailed instructions on equipment removal, replacement, configuration, and return-to-service testing, respectively. Anytime a G1000 component or LRU is removed, swapped, or replaced, the technician must follow the procedures given in Sections 5, 6 and 7 to ensure proper operation of the system.

Troubleshoot the G1000 system by first identifying, then isolating the specific failure to the responsible LRU. There are several indications that the G1000 presents to the pilot or technician, showing overall system condition. A course of action should be determined based on the information presented on the display. This section shows possible scenarios likely to be encountered during normal operation and gives troubleshooting guidance to the technician to resolve problems.



Figure 4-1. System Status Page (AUX Group Normal Mode)

The 6th AUX group page on the MFD provides LRU health status by means of a green check or a red 'X'. Also, LRU software versions are shown along with other database versions and dates. If a red 'X' is shown for an LRU, see the appropriate LRU troubleshooting section of this chapter for guidance. Typically, the G1000 Alerting System provides alerts/annunciations in conjunction with the information presented at the 6th AUX page.

4.1 G1000 Alerting System

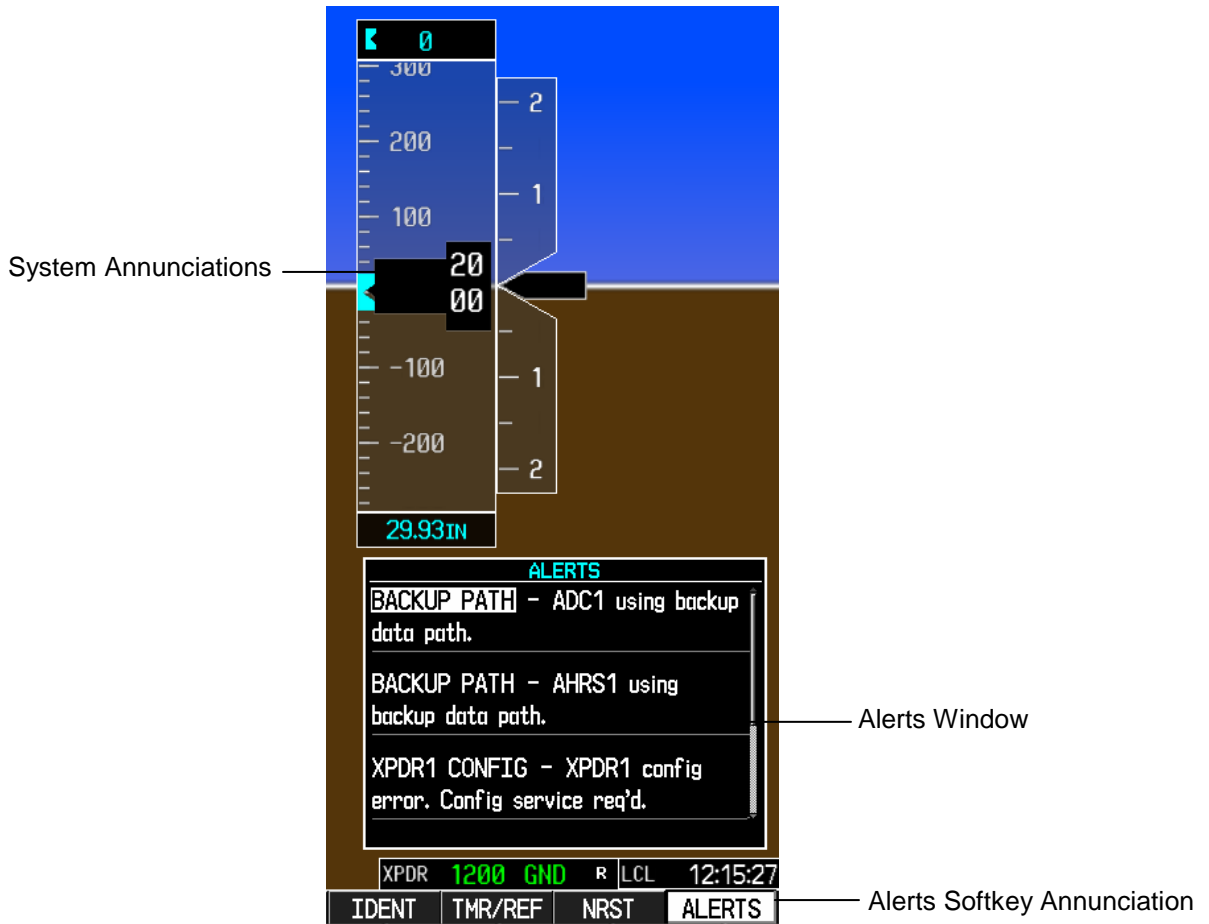


Figure 4-2. Alerts and Annunciations

The G1000 Alert System conveys alerts to the pilot using combinations of the following features:

Alerts Window:

The Alerts Window displays alert text messages. Up to 64 prioritized alerts can be displayed in the Alert window. Pressing the ALERTS softkey displays the Alerts window. Pressing the ALERTS softkey again removes the Alerts window from the display.

TAWS Failure:

When the TAWS system detects a failure or missing database, TAWS FAIL will be annunciated on the PFD. Once the cause of the failure has been identified and resolved, system power must be cycled to clear the annunciation.

Softkey Annunciation:

When the G1000 Alerting System issues an alert, the ALERTS softkey is used as a flashing annunciation to accompany the alert. During the alert, the ALERTS softkey assumes a new label consistent with the alert level (WARNING, CAUTION, or ADVISORY). Pressing the softkey annunciation acknowledges the presence of the alert and returns the softkey to its previous ALERTS label.

System Failure Annunciations:

Typically, a large red X appears in windows when a failure is detected in the LRU providing the information to the window.

The G1000 Alert System uses three levels:

WARNING Annunciation:

This level of alert requires immediate pilot attention. A warning alert is accompanied by an annunciation in the Annunciation Window. Warning alert text appearing in the Annunciation Window is RED. A warning alert is also accompanied by a flashing WARNING softkey annunciation, as shown in Figure 4-3, along with a continuous aural tone. Pressing the WARNING softkey acknowledges the presence of the alert and stops the aural tone. Pressing the ALERTS softkey displays the related alert message in the Alert Window.



Figure 4-3. WARNING Softkey Annunciation

CAUTION Annunciation:

This level of alert indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. A caution alert is accompanied by an annunciation in the Annunciation Window. Caution alert text appearing in the Annunciation Window is yellow. A caution alert is also accompanied by a flashing CAUTION softkey annunciation, as shown in Figure 4-4, along with a single aural tone. Pressing the CAUTION softkey acknowledges the presence of the alert. Pressing the ALERTS softkey displays the related alert message in the Alert Window.



Figure 4-4. CAUTION Softkey Annunciation

ADVISORY Annunciation:

This level of alert provides general information to the pilot. An advisory annunciation issues both an annunciation and a text message. An advisory annunciation is also accompanied by a flashing ADVISORY softkey annunciation, as shown in Figure 4-5. Pressing the ADVISORY softkey acknowledges the presence of the alert and displays the advisory message in the Alert Window.



Figure 4-5. ADVISORY Softkey Annunciation

If an alert is acknowledged but still active, the ALERTS key will be displayed as black text on a white background. If there are currently no active alerts, the ALERTS key will be displayed as white text on a black background.

4.2 System Annunciations

If data fields become invalid due to an LRU failure, the PFD/MFD typically annunciates the failure with a large red X, as shown in the figure below.

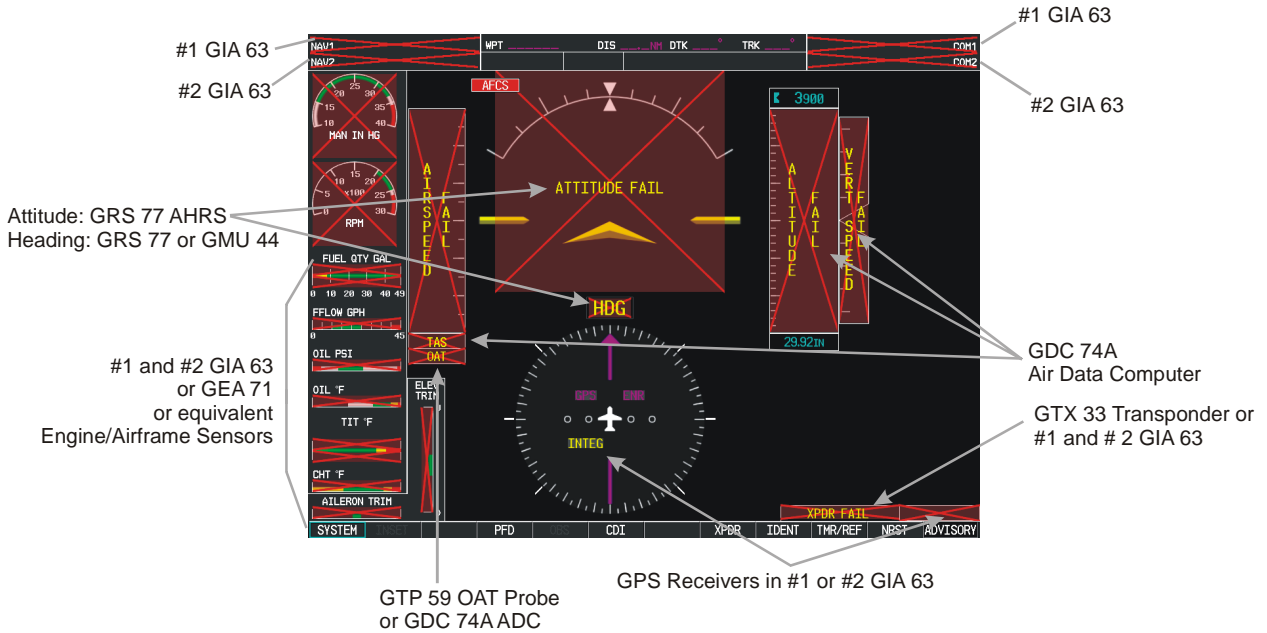


Figure 4-6. System Annunciations

The GFC 700 AFCS Annunciation field is located above the airspeed tape on the PFD as shown:



Figure 4-7. AFCS Annunciation Field

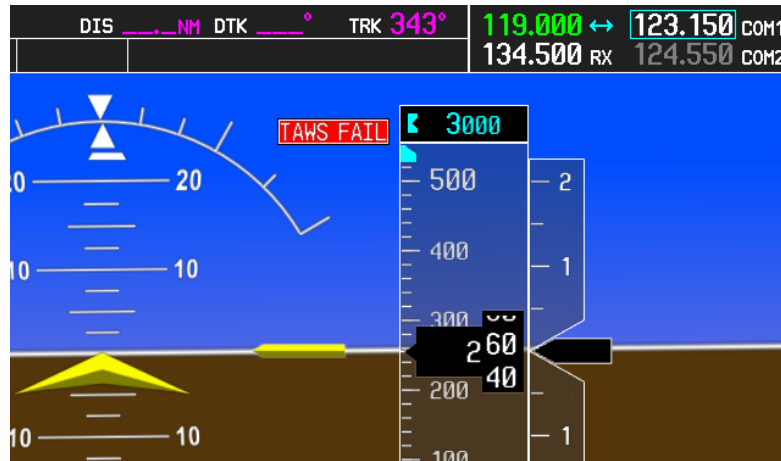




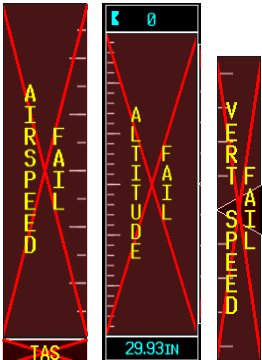





Figure 4-8. TAWS Annunciation Field

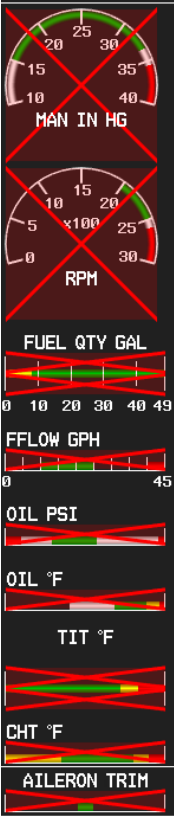
The following table provides basic troubleshooting guidance for LRU failures:

Invalid Data Field	Associated LRU(s)	Solution
NAV1 & COM1 	GIA1	<ul style="list-style-type: none"> • Check configuration settings for GIA1 and the PFD. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the GIA, replace the GIA. ✓ If problem persists, check Ethernet interconnect from GIA1 to the PFD, and then replace the PFD if wiring discrepancies are not found.
NAV2 & COM2 	GIA2	<ul style="list-style-type: none"> • Check configuration settings for GIA2 and the MFD. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the GIA, replace the GIA. ✓ If problem persists, check Ethernet interconnect from GIA2 to the MFD, and then replace the MFD if wiring discrepancies are not found.
GPS INTEG & Time 	GIA1 and GIA2	<ul style="list-style-type: none"> • Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin. • Check GPS1 and GPS2 signal strength on AUX page 3. • Check corresponding GPS antenna and cable. • Check Ethernet interconnect between the PFD and GIA1 or MFD and GIA2 for faults. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the GIA, replace the GIA. ✓ If problem persists, replace the MFD or PFD.

Invalid Data Field	Associated LRU(s)	Solution
<p style="text-align: center;">XPDR FAIL</p> 	GTX 33	<ul style="list-style-type: none"> • Check GTX 33 configuration settings for GIA1 and GIA2. • Perform a SET>ACTV configuration reset on the GTX Config page, and verify the aircraft registration is present. • Replace the GTX 33.
<p style="text-align: center;">TAS FAIL AIRSPEED FAIL ALTITUDE FAIL VERT SPEED FAIL</p> 	GDC 74A	<ul style="list-style-type: none"> • Verify that there are no GDC configuration or manifest errors in the ALERT window. • Inspect GDC 74A pitot/static plumbing integrity. • Inspect pitot/static ports and associated equipment for faults. • For TAS failure, also check GTP 59 OAT probe as stated below. • Check GDC 74 configuration settings for the PFD, MFD, GIA1, and GIA2. <ul style="list-style-type: none"> ✓ If PFDs, MFD, and GIA configuration settings are correct, replace the GDC configuration module. ✓ If problem persists, replace the GDC 74A.
<p style="text-align: center;">OAT and TAS</p> 	GTP 59	<ul style="list-style-type: none"> • Check OAT probe wiring and connectors for faults. • Check GDC configuration module wiring for damage, replace if any is found. • Replace GDC configuration module. • Replace GDC 74A with a known good unit: <ul style="list-style-type: none"> ✓ If problem persists, replace the GTP 59.


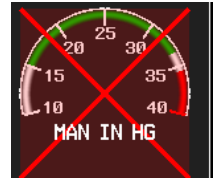
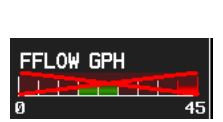


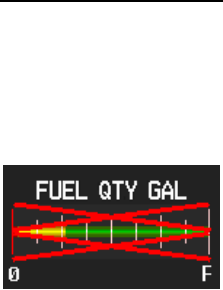
Invalid Data Field	Associated LRU(s)	Solution
<p style="text-align: center;">ATTITUDE FAIL</p>  <p style="text-align: center;">ATTITUDE FAIL</p>	GRS 77	<ul style="list-style-type: none"> • Note: AHRS requires valid ADC and GPS position. • Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin. • Cycle GRS 77 power to restart initialization. • Ensure GRS 77 connector is secure and proper wire harness strain relief is provided. • Ensure the GRS 77 is fastened down tightly in it's mounting rack and that the mounting rack is not loose (CAUTION - do not loosen the mounting rack hardware to the airframe shelf or the aircraft will need to be leveled and the PITCH/ROLL OFFSET procedure performed). • Ensure GPS has acquired at least four satellites, has a 3D navigation solution, and a DOP of less than 5.0. This is particularly important for an ATTITUDE FAIL that appears during ground operation only. • Perform an Engine Run-Up Test to check if engine vibration is causing the GRS 77 to go offline. • Load configuration files to the PFD, MFD, GIA1, and GIA2. • Calibrate the GRS 77 (Pitch/Roll Offset and Magnetometer Calibration). • Replace GRS 77 . <ul style="list-style-type: none"> ✓ If problem persists replace GRS 77 configuration module. See Section 3.4 for configuration instructions. • Contact Garmin Aviation Product Support if condition continues after replacing the GRS 77 and configuration module for additional assistance.

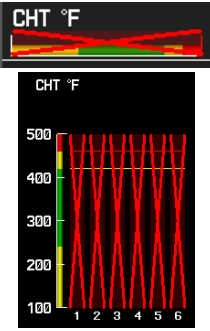
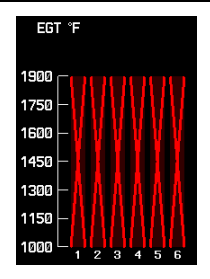
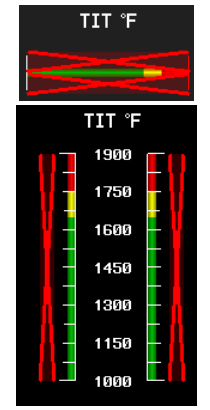
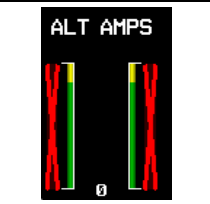
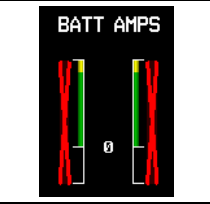
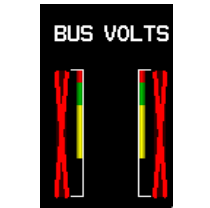
Invalid Data Field	Associated LRU(s)	Solution
<p style="text-align: center;">HDG FAIL </p>	<p style="text-align: center;">GRS 77 & GMU 44</p>	<ul style="list-style-type: none"> • Ensure metal objects (tool boxes, power carts, etc.) are not interfering with the magnetometer and aircraft is not in a hangar, near other buildings, parked over metal drainage culverts or on hard surfaces that may contain steel reinforcements. • Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin. • Cycle power after moving aircraft away from metal objects to determine if those metal objects were the source of the interference. Allow up to five minutes for the heading to reinitialize. • Perform a Magnetometer Interference Test to check for interference from onboard electrical system components (e.g. NAV lights). Pay particular attention to any new electrical devices that have been installed since the aircraft was new. Correct any discrepancies that do not allow this test to pass before continuing. • Ensure GRS 77 and GMU 44 connectors are secure. • Check the wiring and any inline connectors between the GRS and GMU for faults. • Recalibrate the GMU 44, see section 6.7.4. • Load configuration files to the PFD, MFD, GIA1, and GIA2 <ul style="list-style-type: none"> ✓ If problem persists replace the GMU 44. ✓ If problem persists, replace the GRS 77.


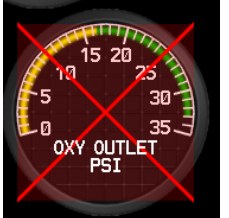
Invalid Data Field	Associated LRU(s)	Solution
<p>Engine/Airframe Sensors (All Invalid)</p> 	<p>GEA 71</p>	<ul style="list-style-type: none"> • Check for GEA related Alert messages on the PFD. Correct any Alerts concerning software or configuration errors by reloading software or configuration as noted. • Verify GEA internal power supply, configuration, and calibration status in configuration mode. <ul style="list-style-type: none"> ✓ Configuration and calibration boxes should be green. If they are red, replace the GEA 71. ✓ The INT PWR SUPPLY box should be green. If it is red, check for a shorted airframe sensor (reference Columbia wiring schematics for your aircraft type) by unplugging airframe sensors that receive power from the GEA one at a time until the INT PWR SUPPLY box turns green. The last sensor that was unplugged before the box turned green is the cause of the problem. Replace that sensor (reference Columbia Aircraft Maintenance Manual for instructions). • Verify internal, external, and reference voltages listed in the Main Analog and I/O A Analog boxes are not dashed out (does not include Aircraft Power 1 and 2). Reference Section 2.7.1.2. <ul style="list-style-type: none"> ✓ If any voltages are dashed out, replace the GEA. • Ensure the GEA is online (green checkmark on the AUX – SYSTEM STATUS page). <ul style="list-style-type: none"> ✓ If GEA is not online verify unit is receiving power at the rack connector. ✓ Check the GIA/GEA interconnects for faults. ✓ Reload configuration files to both GIA's and the GEA. ✓ If problem persists, replace the GEA 71. • For only Red-X of the EGT, TIT and CHT temperature readings, replace the GEA configuration module and back shell thermocouple. <ul style="list-style-type: none"> ✓ If problem persists, replace the GEA 71.

The following table provides guidance for troubleshooting individual engine/airframe sensor failures. Be sure to also follow previous guidance given for the GEA 71.

The technician should troubleshoot to isolate the fault by checking sensor-to-GEA wiring, replacing the suspect sensor, and finally by replacing the GEA 71. Replace one part at a time. Refer to Section 6.4.4.1 to check for correct operation of the sensors and GEA 71 after any part has been replaced.

Invalid Field	Sensor	Solution
	Tachometer	<ul style="list-style-type: none"> • Check tachometer – GEA wiring. Refer to latest revision of the 350/400 electrical manual. • Replace tachometer sensor. Refer to 350/400 AMM. • Replace GEA 71.
	MAP Sensor	<ul style="list-style-type: none"> • Check MAP sensor – GEA wiring. Refer to latest revision of the 350/400 electrical manual. • Replace MAP sensor. • Replace GEA 71.
	Fuel Flow	<ul style="list-style-type: none"> • Check fuel flow sensor – GEA wiring. Refer to the latest revision of the 350/400 electrical manual. • Replace fuel flow sensor. Refer to 350/400 AMM. • Replace GEA 71.
	Oil Pressure Sensor	<ul style="list-style-type: none"> • Check oil pressure sensor – GEA wiring. Refer to latest revision of the 350/400 electrical manual. • Replace oil pressure sensor. Refer to 350/400 AMM. • Replace GEA 71.
	Oil Temperature Sensor	<ul style="list-style-type: none"> • Check oil temperature sensor – GEA wiring. Refer to latest revision of the 350/400 electrical manual. • Replace oil temperature sensor. Refer to 350/400 AMM. • Replace GEA 71.
	Fuel Quantity Sensors (2 per side)	<ul style="list-style-type: none"> • Check fuel quantity sensor – GEA wiring. Refer to latest revision of the 350/400 electrical manual. • Replace fuel quantity sensor. Refer to the 350/400 AMM. • Replace GEA 71.

Invalid Field	Sensor	Solution
	<p>CHT Probes (6)</p>	<ul style="list-style-type: none"> • Check CHT probe – GEA wiring. Refer to the 350/400 AMM. • Replace CHT probe. Refer to the 350/400 AMM. <p><i>If all 6 CHT indicators are flagged, check the following:</i></p> <ul style="list-style-type: none"> • Replace backshell thermocouple and configuration module in GEA connector. See Section 2.1.4. • Replace GEA 71.
	<p>EGT Probes (6)</p>	<ul style="list-style-type: none"> • Check EGT probe – GEA wiring. Refer to the 350/400 AMM. • Replace EGT probe. Refer to the 350/400 AMM. <p><i>If all 6 EGT indicators are flagged, check the following:</i></p> <ul style="list-style-type: none"> • Replace backshell thermocouple and configuration module in GEA connector. See Section 2.1.4. • Replace GEA 71.
	<p>TIT Probe (Columbia 400 only)</p>	<ul style="list-style-type: none"> • Check TIT Probe – GEA wiring. • Replace temperature probe. Refer to the 350/400 AMM. <p><i>If both TIT indicators are flagged, check the following:</i></p> <ul style="list-style-type: none"> • Replace backshell thermocouple and configuration module in GEA connector. See Section 2.1.4. • Replace GEA 71.
	<p>Alternator Current Shunt</p>	<ul style="list-style-type: none"> • Check current sensor – GEA wiring. Refer to latest revision of the 350/400 electrical manual. • Replace current sensor. Refer to 350/400 AMM. • Replace GEA 71.
	<p>Battery Current Shunt</p>	<ul style="list-style-type: none"> • Check current sensor – GEA wiring. Refer to latest revision of the 350/400 electrical manual. • Replace current sensor. Refer to 350/400 AMM. • Replace GEA 71.
	<p>Bus Voltage</p>	<ul style="list-style-type: none"> • Check bus voltage – GEA wiring • Replace GEA 71.

Invalid Field	Sensor	Solution
	Oxygen Quantity Pressure Sensor	<ul style="list-style-type: none"> • Check Oxygen Qty Pressure Sensor – GEA wiring. • Replace Oxygen Qty Pressure Sensor. Refer to the 350/400 AMM. <p><i>If both Oxy Qty and Oxy Outlet Pressure indicators are flagged, check the following:</i></p> <ul style="list-style-type: none"> • Reload GEA configuration for the Oxygen Option. • Replace GEA 71.
	Oxygen Outlet Pressure Sensor	<ul style="list-style-type: none"> • Check Oxygen Outlet Pressure Sensor – GEA wiring. • Replace Oxygen Outlet Pressure Sensor. Refer to the 350/400 AMM. <p><i>If both Oxy Qty and Oxy Outlet Pressure indicators are flagged, check the following:</i></p> <ul style="list-style-type: none"> • Reload GEA configuration for the Oxygen Option. • Replace GEA 71.

4.2.1 AFCS System Troubleshooting

The information in this section specifically relates to the GFC 700. Should a problem be encountered during the operation of the GFC 700, the pilot and technician should first evaluate the overall status and condition of the G1000 system on the AUX – System Status page (on the MFD). Any alert messages, annunciations, or other abnormal behaviors should be noted in an effort to pinpoint the fault. More detailed system troubleshooting for a red AFCS or red PFT annunciation is contained in this section.








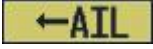

Annunciations and Alerts

The GFC 700 AFCS Annunciation field is located above the airspeed tape on the PFD as shown in Figure 4-9.



Figure 4-9. AFCS Annunciation Field

The following annunciations may appear in the AFCS Annunciation field:

Annunciation	Condition	Solutions
	AFCS System Failure	<ul style="list-style-type: none"> • Ensure that the G1000 system is in proper working order. Check specifically for proper operation of the: <ul style="list-style-type: none"> ✓ GIA 63 Integrated Avionics Unit ✓ GRS 77 AHRS (it must align before this annunciation will disappear and allow the PFT to start) ✓ GDC 74A Air Data Computer ✓ All GSA 81 Servos ✓ GTA 82 Trim adapter (A/P Trim is on) • Check that no red X's are present on the MFD and PFDs. • Check that there are no Alert messages present in the PFD Alert window. Correct any software or configuration errors noted. • Go to the AUX SYSTEM STATUS page on the MFD and verify that all LRUs have a 'green' check. • If the OAT and TAS is Red-X'd and the attitude indication is present, replace the GDC 74 configuration module.
	Pitch Axis Failure	<ul style="list-style-type: none"> • Check the AUX – SYSTEM STATUS page to see if the servo is online (green check).
	Pitch Trim Axis Failure	<ul style="list-style-type: none"> • Check that the affected servo is receiving power. • Check the servo wiring and connector.
	Roll Axis Failure	<ul style="list-style-type: none"> • Ensure PTRM switches are not stuck. • If failure condition still exists, remove and replace the affected servo.
	Elevator Mistrim Down	<ul style="list-style-type: none"> • If mistrim annunciations persist, check the Pitch Trim servo for proper operation. Verify that the servo is online at the AUX – SYSTEM STATUS page. • Check the Pitch Trim servo wiring and connector. Ensure the servo is receiving power.
	Elevator Mistrim Up	<ul style="list-style-type: none"> • Check the aircraft trim control rigging. • If mistrim condition still exists, remove and replace the affected servo.
	Aileron Mistrim Right	<ul style="list-style-type: none"> • Check for possible fuel imbalance. • Check aileron control rigging.
	Aileron Mistrim Left	<ul style="list-style-type: none"> • If mistrim condition still exists remove and replace the roll servo.
	Pre-Flight Test	<ul style="list-style-type: none"> • Reset servo power by cycling the circuit breaker.

4.3 Columbia 350/400 Specific Alerts

The following alerts are configured specifically for the Columbia 350/400:

WARNING Alerts:

Annunciation Window	Alert Definition	Solution
DOOR OPEN	Door not secured.	<ul style="list-style-type: none"> • Ensure baggage door is secured. • Verify the wiring between the baggage door switch and the GEA 71. Refer to latest revision of the 350/400 electrical manual. • Troubleshoot according to the 350/400 AMM.
FUEL VALVE	Fuel tank is not correctly selected or in OFF position.	<ul style="list-style-type: none"> • Ensure fuel selector valve is in the desired position. • Verify wiring between left and/or right fuel selector switch and the GEA 71. Refer to latest revision of the 350/400 electrical manual. • Troubleshoot according to the 350/400 AMM. • Replace GEA 71.
L BUS OFF	No power on the left bus.	<ul style="list-style-type: none"> • Ensure left battery switch is on and left bus is powered. • Verify wiring between GEA 71 and circuit breaker panel. Refer to latest revision of the 350/400 electrical manual. • Replace GEA 71.
R BUS OFF	No power on the right bus.	<ul style="list-style-type: none"> • Ensure right battery master switch is on and right bus is powered. • Verify wiring between GEA 71 and circuit breaker panel. Refer to latest revision of the 350/400 electrical manual. • Replace GEA 71.
CO LVL HIGH	Carbon monoxide level is too high.	<ul style="list-style-type: none"> • Ensure CO level in cockpit is less than 75 ppm. • Press CO RST button. • Replace CO Guardian.
OIL PRES LOW	Low oil pressure.	<ul style="list-style-type: none"> • Verify wiring between GEA 71 and oil pressure switch. Refer to latest revision of the 350/400 electrical manual. • Troubleshoot according to the 350/400 AMM. • Replace oil pressure switch. • Replace GEA 71.

CAUTION Alerts:

Annunciation Window	Alert Definition	Solution
L LOW FUEL	Less than 8 gallons in left tank.	<ul style="list-style-type: none">• Check the discrete wiring between low fuel sensor and the GEA 71. Refer to latest revision of the 350/400 electrical manual.• Troubleshoot according to the 350/400 AMM.• Replace GEA 71.
R LOW FUEL	Less than 8 gallons in right tank.	<ul style="list-style-type: none">• Check the discrete wiring between low fuel sensor and the GEA 71. Refer to latest revision of the 350/400 electrical manual.• Troubleshoot according to the 350/400 AMM.• Replace GEA 71.
FUEL PUMP	Indicates when the backup fuel pump is needed.	<ul style="list-style-type: none">• Check the wiring between the fuel pump and the GEA 71. Refer to latest revision of the 350/400 electrical manual.• Troubleshoot according to the 350/400 AMM.• Replace GEA 71.
L ALT OUT	Left alternator offline.	<ul style="list-style-type: none">• With the engine running, ensure that the correct alternator switch is in the ON position.• Check the bus voltage, if it is above 27 VDC, the alternator is probably supplying current to bus.• Verify the wiring from the left voltage regulator to the GEA• Troubleshoot according to the 350/400 AMM.• Replace GEA 71.
R ALT OUT	Right alternator offline.	<ul style="list-style-type: none">• With the engine running, ensure that the correct alternator switch is in the ON position.• Check the bus voltage, if it is above 27 VDC, the alternator is probably supplying current to bus.• Verify the wiring from the left voltage regulator to the GEA• Troubleshoot according to the 350/400 AMM.• Replace GEA 71.
OXYGEN	Oxygen system is OFF and altitude is greater than 12000 feet.	<ul style="list-style-type: none">• Turn oxygen system on when above 12,000 ft.
OXYGEN QTY	Low oxygen quantity.	<ul style="list-style-type: none">• Ensure oxygen quantity is greater than 250 psi.• Troubleshoot oxygen system according to the 350/400 AMM.

Annunciation Window	Alert Definition	Solution
OXYGEN PRES	Low oxygen outlet pressure.	<ul style="list-style-type: none"> • Ensure manual valve is ON. • Ensure oxygen outlet pressure is greater than 17.5 psi. • Troubleshoot oxygen system according to the 350/400 AMM.
STARTER ENGD	Starter relay has power applied.	<ul style="list-style-type: none"> • This annunciation is normal during the time that the starter is engaged in cranking the engine for engine start. • If the annunciation fails to illuminate during engine cranking, verify the wiring between the Starter Relay and the GEA 71. Refer to latest revision of the 350/400 electrical manual. • A stuck starter will result in a very high electrical load on the alternator, which can be verified on the PFD. • If the annunciation fails to extinguish after cranking is finished, turn off the engine immediately. • Troubleshoot according to the 350/400 AMM. • Replace GEA 71.

ADVISORY Annunciations:

Annunciation Window	Alert Definition	Solution
SPEED BRAKES	Speed brakes are extended.	<ul style="list-style-type: none"> • Verify speed brake switch position. • Verify wiring between the ALC speed brake in the avionics bay and the No. 1 or No. 2 GIA 63. Refer to latest revision of the 350/400 electrical manual. • Troubleshoot according to the 350/400 AMM. • Replace GIA 63.
RUDR LMTR	Rudder limiter is engaged. (350 Only)	<ul style="list-style-type: none"> • Verify state of rudder limiter system. • Check rudder limiter wiring to the GEA 71. • Replace GEA 71.
RUDR HOLD	Rudder hold is engaged. (400 Only)	<ul style="list-style-type: none"> • Verify state of rudder hold system. • Check rudder hold wiring to the GEA 71. • Replace GEA 71.
OXYGEN ON	Reminder to turn oxygen off when on the ground.	<ul style="list-style-type: none"> • Ensure oxygen system is off.

Annunciation Window	Alert Definition	Solution
AP/TRIM OFF	AP/Trim Master switch is in the off position.	<ul style="list-style-type: none"> • Verify A/P TRIM master switch position • Ensure that AP DISC switches on pilot and copilot control sticks are not stuck in disconnect position. • Verify wiring from A/P TRIM master switch to GTA 82 trim adapter. • Verify wiring from A/P DISC switches on both control sticks to GIA's, GSA 81 pitch and roll servos, and GTA 82 trim adapter.

MESSAGE ADVISORY Alerts:

Annunciation Window	Message Definition	Solution
PFD FAN FAIL	Cooling fan for the PFD is inoperative.	<ul style="list-style-type: none"> • Verify CB labeled AVIONICS FANS is closed. • Verify wiring between the GCF 328 PFD cooling fan and the GDU 1040 PFD. Refer to latest revision of the 350/400 electrical manual. • Troubleshoot according to the 350/400 AMM. • Replace PFD fan. • Replace PFD.
MFD FAN FAIL	Cooling fan for the MFD is inoperative.	<ul style="list-style-type: none"> • Verify CB labeled AVIONICS FANS is closed. • Verify wiring between the GDU 1042 MFD and GCF 328 MFD cooling fan. Refer to latest revision of the 350/400 electrical manual. • Troubleshoot according to the 350/400 AMM. • Replace MFD fan. • Replace MFD.
AVIONICS FAN	Cooling fan for remote avionics is inoperative.	<ul style="list-style-type: none"> • Verify CB labeled AVIONICS FANS is closed. • Verify wiring between No. 1 GIA 63 and GCF 328 cooling fan in avionics bay. Refer to latest revision of the 350/400 electrical manual. • Verify wiring between No. 2 GIA 63 and GCF 328 cooling fan in avionics bay. • Troubleshoot according to the 350/400 AMM. • Replace fan in avionics bay. • Replace No. 1 or No. 2 GIA 63.

Annunciation Window	Message Definition	Solution
FUEL IMBAL	Fuel imbalance is greater than 10 gallons.	<ul style="list-style-type: none"> • Ensure L and R fuel quantities are within 10 gallons of each other. • Ensure fuel senders are not sticking. • Verify wiring between GEA 71 and left inboard sender. Refer to latest revision of the 350/400 electrical manual. • Verify wiring between GEA 71 and left sender. • Verify wiring between GEA 71 and right sender. • Troubleshoot according to the 350/400 AMM. • Replace fuel sender. • Replace GEA 71.
LOW MAN PRESS	Manifold pressure is below 15 in.	<ul style="list-style-type: none"> • Verify wiring between GEA 71 and MAP sensor in engine compartment. Refer to latest revision of the 350/400 electrical manual. • Replace MAP sensor • Replace GEA 71.
VAPOR SUPPR	Turn on Vapor Suppression (400 Only)	<ul style="list-style-type: none"> • Verify wiring between No. 1 and No. 2 GIA 63 and vapor suppression switch. Refer to latest revision of the 350/400 electrical manual. • Replace vapor suppression switch. • Replace GIA 63.
TIMER ZERO	Timer has counted down to zero.	<ul style="list-style-type: none"> • Reset timer if desired.

4.4 GDU 1040/1042 Troubleshooting

NOTE

Garmin recommends the use of SanDisk or Toshiba SD cards to load G1000 software and configuration files. If another brand of card is used, and software loading problems occur, replace the card with a SanDisk or Toshiba card and reattempt the software load.

4.4.1 GDU 1040/1042 Common Problems

Symptom	Recommended Action
Display will not track photocell	<ul style="list-style-type: none"> • Reload PFD and MFD configuration files. • Ensure that the panel dimming potentiometer is set to minimum level. • Go to the GDU TEST page in configuration mode. Cover and uncover the photocells and verify that PHOTOCELL A or PHOTOCELL B value changes. <ul style="list-style-type: none"> ✓ If values do not change, replace the display.
Keypad/bezel will not track photocell	
Display will not track dimmer bus	<ul style="list-style-type: none"> • Reload PFD and MFD configuration files. • Check display lighting settings on the Main Lighting page and ensure dimmer input tracks dimmer setting. • Switch MFD and PFD. <ul style="list-style-type: none"> ✓ If problem follows unit, replace display per Section 5.1. ✓ If condition remains in original position after swapping displays, check the GDU dimmer input to verify voltage is present.
Keypad/bezel will not track dimmer bus	

Symptom	Recommended Action
Display is blank	<ul style="list-style-type: none"> • Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin. • Cycle power. <ul style="list-style-type: none"> ✓ If GDU recovers, observe display for yellow text containing error information at the top of the screen. If message indicates software need to be re-loaded, then re-load software. Otherwise, replace the GDU.
Display resets	<ul style="list-style-type: none"> • Use a bright light to verify LCD is active. <ul style="list-style-type: none"> ✓ Adjust avionics dimmer control to full brightness. ✓ Manually turn up backlight on the PFD and load configuration files to the GDU. • Ensure slide lock is fully engaged with the locking tabs on the back of the unit. <ul style="list-style-type: none"> ✓ If slide lock is not fully engaged, remove connector and verify the locking tabs on the GDU are perpendicular to the connector. If necessary, straighten them before reseating connector.
Display flickers	<ul style="list-style-type: none"> • Ensure GDU is receiving power. If a circuit breaker is tripped, determine source of short before resetting breaker. • Ensure circuit breakers have not failed and power wire connections are secure. • Swap PFD and MFD. <ul style="list-style-type: none"> ✓ If problem follows unit, replace the display. Please note the position it failed in (PFD or MFD). • If problem does not follow unit, troubleshoot aircraft wiring for fault.
SD card is stuck in GDU	<ul style="list-style-type: none"> • DO NOT insert a screwdriver of any length into the card slot. • DO NOT pry against the overlay. • DO NOT force the SD Card out. • Use a small screwdriver in the groove on the side of the exposed end of the card to help pull out the card. • Push the card in further to release the card locking mechanism. • Check SD Card for having more than one label. Two or more labels on the card will cause sticking. <ul style="list-style-type: none"> ✓ Remove all but one label. • Ensure the SD card is from Toshiba or SanDisk. Use of other SD Cards is not recommended. • If card was inserted with the label facing to the right, do not attempt to remove. Return the unit to Garmin for repair.
A button/knob/joystick does not appear to function	<ul style="list-style-type: none"> • Go to the GDU TEST page in configuration mode and verify button, knob, or joystick operates correctly by observing a change in color from red to green in the button/knob/joystick icon when the button/knob/joystick is pressed. If a button is stuck, the button icon will be green without pressing the button as soon as you turn to the GDU TEST page. <ul style="list-style-type: none"> ✓ If problem is verified, replace GDU.

Symptom	Recommended Action
Terrain/Obstacle/SafeTaxi does not display	<ul style="list-style-type: none"> • Ensure supplemental data cards are inserted correctly in the lower slots of all three GDUs. • Allow the system to verify the data on the cards for approximately five minutes after power-up. • If a database does not activate, reload the problem database onto the SD Card or replace the card.

4.4.2 Failed Path Messages (GDU Software Version 7.01 and later only)

The following message indicates there is a data path connected to the GDU (MFD or PFD) or the GIA 63 (1 or 2) that has failed

FAILED PATH – A data path has failed. Check configuration mode.

The **FAILED PATH** message is triggered by a timeout of any one digital channel. The channels that are checked are listed on these pages in configuration mode:

- GDU RS-232 / ARINC 429 CONFIG (PFD1 and MFD)
- GIA RS-232 / ARINC 429 CONFIG (GIA1 and GIA2)
- GIA CAN / RS-485 CONFIGURATION (GIA1 and GIA2)

Important: Once the FAILED PATH message has been triggered, it will remain on the list of messages until the next power cycle. This latching was implemented so that for intermittent failures, the message would remain at the end of the flight (to alert maintenance crew). Also, this keeps the crew from having to acknowledge message repeatedly in the case of intermittent failures.

NOTE

For GDU software below V7.01, the data path boxes may not be present on the GDU and GIA configuration pages. Troubleshooting failed path messages will require manually checking the data lines using a continuity tester and may require swapping GDU's, GIA's or other units to determine if the fault lies in the unit or wiring. Garmin recommends following the troubleshooting instructions for the red data boxes below to help find the cause of the fault.

The box next to each channel indicates the current status of the channel per the below.

Red = data path is known to be failed







Black = data path status is unknown

Green = data path is known to be good







The applicable data paths can be verified by viewing the configuration mode pages listed below.

4.4.2.1 GDU RS-232 / ARINC 429 CONFIG Page

PFD1 ARINC 429 Config

Channel	LRU	Indicator	Status
IN 1	GRS 77 #1	 (GRN)	PFD1/GRS 77 data path is functioning correctly.
		 (RED)	<p>PFD1/GRS 77 data path is not functioning correctly.</p> <ul style="list-style-type: none"> • Reconfigure PFD1. • Reconfigure GRS 77 . • Check the PFD1/GRS 77 interconnect wiring for faults. • Swap the PFD with the MFD to confirm if the problem is in the original PFD. <ul style="list-style-type: none"> ✓ Replace original PFD if box turns green after swapping displays. ✓ Replace GRS 77 if problem remains.
		 (BLK)	PFD1/GRS 77 data path functionality is unknown. Reload PFD configuration file.
IN 2	GDC 74 #1	 (GRN)	PFD1/GDC 74 data path is functioning correctly.
		 (RED)	<p>PFD1/GDC 74 data path is not functioning correctly.</p> <ul style="list-style-type: none"> • Reconfigure PFD1. • Reconfigure GDC 74A. • Check the PFD1/GDC 74 interconnect wiring for faults. • Swap the PFD with the MFD to confirm if the problem is in the original PFD. <ul style="list-style-type: none"> ✓ Replace original PFD if box turns green after swapping displays. ✓ Replace GDC 74A if problem remains.
		 (BLK)	PFD1/GDC 74 data path functionality is unknown. Reload PFD configuration file.

MFD1 ARINC 429 Config

Channel	LRU	Indicator	Status
IN 1	GRS 77 #1	 (GRN)	MFD1/GRS 77 data path is functioning correctly.
		 (RED)	<p>MFD1/GRS 77 data path is not functioning correctly.</p> <ul style="list-style-type: none"> • Reconfigure MFD1. • Reconfigure GRS 77 . • Check the MFD1/GRS 77 interconnect wiring for faults. • Swap the MFD with the PFD to confirm if the problem is in the original MFD. <ul style="list-style-type: none"> ✓ Replace original MFD if box turns green after swapping displays. ✓ Replace GRS 77 if problem remains.
		 (BLK)	MFD1/GRS 77 data path functionality is unknown. Reload MFD configuration file.
IN 2	GDC 74 #1	 (GRN)	MFD1/GDC 74 data path is functioning correctly.
		 (RED)	<p>MFD1/GDC 74 data path is not functioning correctly.</p> <ul style="list-style-type: none"> • Reconfigure MFD1. • Reconfigure GDC 74A. • Check the MFD1/GDC 74 interconnect wiring for faults. • Swap the MFD with the PFD to confirm if the problem is in the original MFD. <ul style="list-style-type: none"> ✓ Replace original MFD if box turns green after swapping displays. ✓ Replace GDC 74A if problem remains.
		 (BLK)	MFD1/GDC 74 data path functionality is unknown. Reload MFD configuration file.

4.4.3 Database and Software Alerts

Message	Cause	Solutions
MFD1 DB ERR – MFD1 aviation database error exists.	The MFD has encountered an error in the Jeppesen database.	<ul style="list-style-type: none"> • Reload aviation database into the display. • Contact Garmin Technical Support for assistance.
PFD1 DB ERR – PFD1 aviation database error exists.	The PFD has encountered an error in the Jeppesen database.	
MFD1 DB ERR – MFD1 basemap database error exists.	The MFD has encountered an error in the basemap database.	<ul style="list-style-type: none"> • Contact Garmin Technical Support for assistance.
PFD1 DB ERR – PFD1 basemap database error exists.	The PFD has encountered an error in the basemap database.	
MFD1 DB ERR – MFD1 terrain database error exists.	The MFD has encountered an error in the terrain database.	<ul style="list-style-type: none"> • Confirm supplemental data card is inserted fully. • Swap with the supplemental data card from the other display in the same system. <ul style="list-style-type: none"> ✓ If problem remains in the same GDU, replace that GDU. ✓ If problem moves to the other display, reload the database or replace the supplemental datacard.
PFD1 DB ERR – PFD1 terrain database error exists.	The PFD has encountered an error in the terrain database.	
MFD1 DB ERR – MFD1 obstacle database error exists.	The MFD has encountered an error in the obstacle database.	
PFD1 DB ERR – PFD1 obstacle database error exists.	The PFD has encountered an error in the obstacle database.	
MFD1 DB ERR – MFD1 airport terrain database error exists.	The MFD has encountered an error in the terrain database.	
PFD1 DB ERR – PFD1 airport terrain database error exists.	The PFD has encountered an error in the terrain database.	
MFD1 DB ERR – MFD1 Safe Taxi database error exists.	The MFD has encountered an error in the Safe Taxi database.	
PFD1 DB ERR – PFD1 Safe Taxi database error exists.	The PFD has encountered an error in the Safe Taxi database.	
MFD1 DB ERR – MFD1 ChartView database error exists.	The MFD has encountered an error in the ChartView database.	
PFD1 DB ERR – MFD1 ChartView database error exists.	The PFD has encountered an error in the ChartView database.	

Message	Cause	Solutions
DB MISMATCH – Aviation database version mismatch. Xtalk is off.	The G1000 has found the Jeppesen aviation database in the PFD and MFD do not match.	<ul style="list-style-type: none"> • Load current Jeppesen database to both displays.
DB MISMATCH – Aviation database type mismatch. Xtalk is off.	The G1000 has found the Jeppesen aviation database types do not match.	<ul style="list-style-type: none"> • Load same type Jeppesen database to both displays.
DB MISMATCH – Basemap database version mismatch. Xtalk is off.	The PFD and MFD have different basemap versions installed.	<ul style="list-style-type: none"> • Contact Garmin Technical Support for assistance.
DB MISMATCH – Terrain database version mismatch. Xtalk is off.	The PFD and MFD have different terrain database versions installed.	<ul style="list-style-type: none"> • Insert two identical version Terrain database cards in the PFD and MFD.
DB MISMATCH – Obstacle database version mismatch. Xtalk is off.	The PFD and MFD have different obstacle database versions installed.	
DB MISMATCH – Terrain database type mismatch. Xtalk is off.	The PFD and MFD have different terrain database types installed.	
SW MISMATCH – GDU software version mismatch. Xtalk is off.	The G1000 has found the PFD and MFD software versions do not match.	<ul style="list-style-type: none"> • Load correct software version into both PFD and MFD.
MANIFEST – PFD1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in the PFD.	<ul style="list-style-type: none"> • Load correct software version.
MANIFEST – MFD software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in MFD.	

Message	Cause	Solutions
CNFG MODULE – PFD1 configuration module is inoperative.	The PFD master configuration module has failed.	<ul style="list-style-type: none"> • Check master configuration module connector and wiring for damage inside the GDU connector backshell. ✓ Replace master configuration module wiring and pins. ✓ If problem persists, replace master configuration module. <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;">NOTE</div> <p>New Terrain/Obstacle cards, Jeppesen Aviation Database and other optional features (i.e. TAWS unlock card) will need to be replaced if the master configuration module is changed. The G1000 System ID number will change to a new number when installing a new master configuration module. The old Terrain and other cards will no longer work as they will remain locked to the old System ID number.</p>
Display will not track photocell		<ul style="list-style-type: none"> • Ensure that the panel dimming potentiometer is set to minimum level. • Check display lighting settings on the Main Lighting page and ensure lighting is configured correctly. • If problem persists, replace defective display per Section 5.1.
Keypad/bezel will not track photocell		<ul style="list-style-type: none"> • Ensure that the panel dimming potentiometer is set to minimum level. • Check keyboard lighting settings on the Main Lighting page and ensure lighting is configured correctly. • If problem persists, replace defective display per Section 5.1.
Display will not track dimmer bus		<ul style="list-style-type: none"> • Check display lighting settings on the Main Lighting page and ensure dimmer input tracks dimmer setting. • Check wiring. • Switch MFD and PFD. If problem follows unit, replace defective display per Section 5.1.
Keypad/bezel will not track dimmer bus		<ul style="list-style-type: none"> • Check keyboard lighting settings on the Main Lighting page and ensure dimmer input tracks dimmer setting. • Check wiring. • Switch MFD and PFD. If problem follows unit, replace defective display per Section 5.1.

4.4.4 GDU Cooling Alerts

Message	Cause	Solutions
MFD1 COOLING – has poor cooling. Reducing power usage.	MFD1 has exceeded its operating temperature range.	<ul style="list-style-type: none">• Check cooling fan and wiring for proper operation (if applicable).<ul style="list-style-type: none">✓ Replace cooling fan if unable to determine if operating correctly.✓ If problem persists, replace the MFD.• If problem continues contact Garmin Aviation Product Support for assistance.
PFD1 COOLING – has poor cooling. Reducing power usage.	The PFD has exceeded its operating temperature range.	<ul style="list-style-type: none">• Check cooling fan and wiring for proper operation (if applicable).<ul style="list-style-type: none">✓ Replace cooling fan if unable to determine if operating correctly.✓ If problem persists, replace the PFD.• If problem continues contact Garmin Aviation Product Support for assistance.

4.4.5 Key Alerts

Message	Cause	Solutions
MFD1 “key” KEYSTK – key is stuck.	The G1000 has determined a key is stuck on MFD1.	<ul style="list-style-type: none"> • Go to the GDU TEST page in configuration mode and verify key is stuck (if key is stuck the corresponding indicator will be green). • Exercise suspected stuck key and reset GDU TEST page to see if indicator remains green without pressing the key. <ul style="list-style-type: none"> ✓ If problem persists replace the display.
PFD1 “key” KEYSTK – key is stuck.	The G1000 has determined a key is stuck on the PFD.	

4.4.6 Datacard Alerts

Message	Cause	Solutions
MFD1 CARD – data card has failed.	MFD1 can not read a datacard	<ul style="list-style-type: none"> • Remove and reinsert datacard multiple times to clean card contacts. • Replace with known good card to verify failed card. <ul style="list-style-type: none"> ✓ If problem does not persist replace the datacard. ✓ If problem persists replace the display.
PFD1 CARD – data card has failed.	The PFD can not read a datacard.	

4.4.7 Miscellaneous Alerts

Message	Cause	Solutions
XTALK ERROR – A flight display cross talk error has occurred.	A communication error has occurred between the MFD and PFD.	<ul style="list-style-type: none"> • Ensure a database error has not occurred. <ul style="list-style-type: none"> ✓ If a database error has occurred, correct error before proceeding. • Check display Ethernet interconnect for faults. • Replace PFD1 with a known good unit, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem persists, replace MFD1. ✓ If problem does not persist, replace PFD1.
SIMULATOR – Sim mode is active. Do not use for navigation.	The GDU 104X is in simulator mode.	<ul style="list-style-type: none"> • Check wiring (pin 54 of P10001 should be empty). • Replace PFD1 with a known good unit, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem does not persist, replace original PFD1.

Message	Cause	Solutions
DATA LOST – Pilot stored data lost. Recheck settings.	Pilot stored data has been lost.	<ul style="list-style-type: none"> • If the CLR key was held during a power cycle, disregard message. • Cycle power to PFD1: <ul style="list-style-type: none"> ✓ Ensure CLR key is not stuck on the GDU TEST page. ✓ If problem persist, replace PFD1.
MFD1 SERVICE – needs service. Return unit for repair.	The G1000 has determined MFD1 needs service.	<ul style="list-style-type: none"> • Ensure the MFD connector is fully seated and locked. • If the unit was started in a very dark environment the photocells may not have enough light to initially raise the CCFT level. Go to the GDU STATUS page in configuration mode, ensure CCFT CRNT 1 & 2 levels are above 50. <ul style="list-style-type: none"> ✓ If the CCFT levels are not above 50, apply light to the photocell and observe if the CCFT level rises. ✓ If the CCFT level rises, disregard the message. ✓ If the CCFT level does not rise, replace the MFD. • Replace the MFD.

Message	Cause	Solutions
PFD1 SERVICE – needs service. Return unit for repair.	The G1000 has determined the PFD needs service.	<ul style="list-style-type: none"> • Ensure the PFD connector is fully seated and locked. • If the unit was started in a very dark environment the photocells may not have enough light to initially raise the CCFT level. Go to the GDU STATUS page in configuration mode, ensure CCFT CRNT 1 & 2 levels are above 50. <ul style="list-style-type: none"> ✓ If the CCFT levels are not above 50, apply light to the photocell and observe if the CCFT level rises. ✓ If the CCFT level rises, disregard the message. ✓ If the CCFT level does not rise, replace the PFD. • Replace the PFD. <div style="border: 1px solid black; padding: 2px; text-align: center; margin: 10px 0;">NOTE</div> <p>New Terrain/Obstacle cards, Jeppesen Aviation Database and other optional features (i.e. TAWS unlock card) will need to be replaced if the master configuration module is changed. The G1000 System ID number will change to a new number when installing a new master configuration module. The old Terrain and other cards will no longer work as they will remain locked to the old System ID number.</p>

Message	Cause	Solutions
<p>PFD1 CONFIG – PFD1 configuration error. Config service req'd.</p>	<p>The G1000 has detected a PFD configuration mismatch.</p>	<ul style="list-style-type: none"> • Reload PFD1 configuration files from SD Loader Card. • Reload system configuration files by pressing the UPDT CFG softkey on the Configuration Upload Page in the System Page Group to load configuration files into the configuration module. ✓ If message persists, check configuration module wiring for faults and replace if necessary. ✓ If issue continues, replace master configuration module. ✓ If problem persists, replace the PFD. <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;"> <p>NOTE</p> </div> <p>New Terrain/Obstacle cards, Jeppesen Aviation Database and other optional features (i.e. TAWS unlock card) will need to be replaced if the master configuration module is changed. The G1000 System ID number will change to a new number when installing a new master configuration module. The old Terrain and other cards will no longer work as they will remain locked to the old System ID number.</p>

Message	Cause	Solutions
<p>MFD CONFIG – MFD configuration error. Config service req'd.</p>	<p>The G1000 has detected a MFD configuration mismatch.</p>	<ul style="list-style-type: none"> • Reload MFD configuration files from SD Loader Card. • Reload system configuration files by pressing the UPDT CFG softkey on the Configuration Upload Page in the System Page Group to load configuration files into the configuration module. ✓ If message persists, check configuration module wiring for faults and replace if necessary. ✓ If issue continues, replace master configuration module. ✓ If problem persists, replace the MFD. <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;">NOTE</div> <p>New Terrain/Obstacle cards, Jeppesen Aviation Database and other optional features (i.e. TAWS unlock card) will need to be replaced if the master configuration module is changed. The G1000 System ID number will change to a new number when installing a new master configuration module. The old Terrain and other cards will no longer work as they will remain locked to the old System ID number.</p>

Message	Cause	Solutions
TAWS FAIL	A TAWS system failure has occurred.	<ul style="list-style-type: none"> • If message occurred on the first power up after unlocking TAWS, cycle power to initialize TAWS. • Ensure each GDU contains a TAWS/TERRAIN data card. • Ensure all GDUs are TAWS configured. <ul style="list-style-type: none"> ✓ If all GDUs are not TAWS configured, reconfigure. • Verify GIA #1 is online. • Ensure an Airport Terrain, Obstacle, Terrain, Aviation Database, or GDU SW mismatch has not occurred. <ul style="list-style-type: none"> ✓ If a mismatch has occurred, load correct database/software files or replace the terrain card.
TAWS TEST	TAWS system is currently being tested.	<ul style="list-style-type: none"> • Normal annunciation during self test. Test will take up to two minutes to complete.
TAWS INHB	TAWS system alerting is disabled	<ul style="list-style-type: none"> • Enable TAWS system alerting by pressing the MENU button from the MAP – TAWS page.
TAWS N/A	GPS system integrity not high enough to enable TAWS	<ul style="list-style-type: none"> • Ensure valid GPS position is received from the AUX – GPS STATUS page.
HIGH VOLTS	Main (M) or Essential (E) Bus voltage has exceeded 32 volts.	<ul style="list-style-type: none"> • Troubleshoot a possible alternator high voltage condition using Columbia Maintenance Manual.
CO LVL HIGH	Unsafe carbon monoxide level reported by CO Guardian unit.	<ul style="list-style-type: none"> • Refer to Columbia Pilot's Operating Handbook (POH).
PFD1 VOLTAGE – PFD1 has low voltage. Reducing power usage.	The PFD supply voltage is low.	<ul style="list-style-type: none"> • Check input voltage to PFD. • If input voltage is ok, replace PFD.
MFD1 VOLTAGE – MDF1 has low voltage. Reducing power usage.	The MFD supply voltage is low.	<ul style="list-style-type: none"> • Check input voltage to MFD. • If input voltage is ok, replace MFD.
CO DET SRVC – The carbon monoxide detector needs service.	The G1000 has determined the CO Guardian needs service.	<ul style="list-style-type: none"> • Replace the CO Guardian.
CO DET FAIL – The carbon monoxide detector is inoperative.	The G1000 and CO Guardian are not communicating.	<ul style="list-style-type: none"> • Check GIA/CO Guardian interconnect. • Replace the CO Guardian. • Contact Garmin Product Support for Assistance.

4.5 GMA 1347

4.5.1.1 GMA CONFIGURATION Page

The screenshot displays the GMA CONFIGURATION page for GMA1347 #1. It is organized into several sections:

- SELECT GMA UNIT:** GMA1347 #1
- HEADSET VOLUME:** A table with columns for parameter, SET, and ACTIVE values.

	SET	ACTIVE
MUSIC #1	15	15
MUSIC #2	15	15
UNSWITCHED IN #1	0	0
UNSWITCHED IN #2	0	0
UNSWITCHED IN #3	0	0
ALTITUDE WARNING	0	0
PILOT MIC VOLUME	0	0
COPILOT MIC VOLUME	0	0
- SPEAKER VOLUME:** A table with columns for parameter, SET, and ACTIVE values.

	SET	ACTIVE
CREW AUDIO	0	0
- MASTER SQUELCH:** A table with columns for parameter, SET, and ACTIVE values.

	SET	ACTIVE
THRESHOLD VALUE	-20	-20
- MARKER BEACON:** A table with columns for parameter, SET, and ACTIVE values.

	SET	ACTIVE
HI SENSE THRESHOLD	0	0
LO SENSE THRESHOLD	0	0
VOLUME	0	0
- KEYPAD ANNUNCIATORS:** A table with columns for parameter, SET, and ACTIVE values.

	SET	ACTIVE
DISABLE COM3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DISABLE TEL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DISABLE DME	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DISABLE ADF	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DISABLE AUX	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DISABLE SPEAKER	<input type="checkbox"/>	<input type="checkbox"/>
DISABLE PA	<input type="checkbox"/>	<input type="checkbox"/>
DISABLE PLAY	<input type="checkbox"/>	<input type="checkbox"/>
- CONFIGURATION INPUTS:** A table with columns for parameter, SET, and ACTIVE values.

	SET	ACTIVE
MASQ INHIBIT	<input type="checkbox"/>	<input type="checkbox"/>
ICS MUTE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
INTERNAL SIDETONE	<input type="checkbox"/>	<input type="checkbox"/>
MUTE AUDIO ON TX	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
MUTE AUDIO ON RX	<input type="checkbox"/>	<input type="checkbox"/>
ANALOG INSTALL	<input type="checkbox"/>	<input type="checkbox"/>
RECORD COM2	<input type="checkbox"/>	<input type="checkbox"/>
POWER-UP w/ AUX ON	<input type="checkbox"/>	<input type="checkbox"/>
DUAL INSTALL	<input type="checkbox"/>	<input type="checkbox"/>
DISABLE SPLIT COM	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
COM2 ON-SIDE	<input type="checkbox"/>	<input type="checkbox"/>

At the bottom, there is a system selection bar: SYSTEM GDU GIA GEA GTX GRS GDC GMA OTHER CAL. The GMA option is selected. Below the bar is a navigation bar with buttons: SET > ACTV / ACTV > SET.

Figure 4-10. GMA CONFIGURATION Page

NOTE

The GMA configuration settings are approved under the Columbia TC. Changes to these values could adversely affect pilot/crew alerting. For example: Decreasing an unswitched input volume level could cause certain alerts not to be heard.

SELECT GMA UNIT

This window shows the currently selected GMA 1347 audio panel.

HEADSET VOLUME

Adjustable range is between -31 and 31 for the following:

MUSIC #1, 2: Sets the music input volume levels.

UNSWITCHED IN #1, 2, 3: Sets unswitched input volume levels.

ALTITUDE WARNING: Sets the altitude warning input volume level.

SPEAKER VOLUME

CREW AUDIO: Sets the crew audio volume level. *Speaker volume adjustable range is between -31 and 31.*

MASTER SQUELCH

THRESHOLD VALUE: Sets the Master Avionics Squelch (MASQ™) threshold value. *Value is adjustable between -31 and 31.*

MARKER BEACON

HI/LO SENSE THRESHOLD: Sets Hi/Lo marker sensitivity thresholds, value is adjustable between -31 and 31.

VOLUME: Adjusts marker beacon volume, value is adjustable between –31 and 31.

KEYPAD ANNUNCIATORS

The following audio panel settings can be enabled or disabled:

DISABLE COM3: Disables COM3 button in situations where no COM3 is installed.

DISABLE TEL: Disables TEL button in situations where no telephone is installed.

DISABLE DME: Disables DME button for situations where no DME is installed.

DISABLE ADF: Disables ADF button for situations where no ADF is installed.

DISABLE AUX: Disables AUX button for situations where no auxiliary input is connected.

DISABLE SPEAKER: Disables SPEAKER button for situations where no speaker output is connected.

DISABLE PA: Disables PA button for situations where no PA output is connected.

DISABLE PLAY: Disables PLAY button for situations where no play input is connected.

CONFIGURATION INPUTS

The following audio panel settings can be enabled or disabled:

MASQ INHIBIT: Disable the Master Squelch circuit, which switches out aircraft radios during times of 'silence' to reduce the noise heard by the occupants. The Master Squelch threshold value is used to adjust the trip level of the circuit.

ICS MUTE: Mutes the MUSIC 1 channel during ICS activity.

INTERNAL SIDETONE: Causes the audio panel to provide COM sidetone in situations when the GIA radios do not provide sidetone.

MUTE AUDIO ON TX/RX: All secondary COM audio is muted upon transmitting over primary COM. Upon detection of primary COM transmission, all secondary COM is muted.

ANALOG INSTALL: COM 1 and COM 2 are connected using the analog interfaces instead of the digital interface.

RECORD COM 2: During split-COM operation, the digital clearance recorder records COM 2 only and playback only on the co-pilot's channel.

POWER-UP w/ AUX ON: Enables the GMA 1347 to always power up with the AUX channel enabled.

DUAL INSTALL: The audio panel is part of a dual-installation.

DISABLE SPLIT COM: Allows split-COM feature to be disabled for installations where split-COM operation is not desired.

COM 2 ON-SIDE: In a dual audio panel installation, this designates the unit as a 'right-hand/co-pilot' unit.

4.5.2 Common Problems

Symptom	Recommended Action
Noise in Audio	<p>Most often the cause of the noise is external to the GMA. Try the following to locate the source of the noise:</p> <ul style="list-style-type: none"> • Try a different pair of headsets. Noise cancelling headsets may pick up and/or generate more noise than standard headsets from their own circuitry. • Check for noise with engine turned off. <ul style="list-style-type: none"> ✓ If the noise is present only when the engine is running, check the alternator and/or ignition system as possible sources of noise (see applicable airframe specific maintenance manual). • Check for noise as all electrical equipment is turned on and off (strobes, other radios, etc.). <ul style="list-style-type: none"> ✓ If the noise is identified from one electrical system or component refer to the applicable airframe specific maintenance manual. • Ensure the NAV/COM squelch is not open. • Ensure the ADF and DME audio is not active. • Ensure the marker beacon audio is not active. • Ensure the ICS squelch is not open. <ul style="list-style-type: none"> ✓ Master squelch level can be adjusted on the GMA CONFIGURATION page for higher noise environments. • Remove unit and check for MOD 1 marking. <ul style="list-style-type: none"> ✓ If MOD 1 is not marked, replace GMA. • Replace unit only after all possible external sources of noise are eliminated.
Some Buttons do not work.	<ul style="list-style-type: none"> • Some buttons are disabled in the GMA CONFIGURATION page by default. This is to remove potential sources of audio noise for inputs that are not used. If in doubt as to which buttons should be disabled, reload GMA configuration file and other configuration files for optional equipment installed in the aircraft (i.e. ADF, DME) from the loader card.
COM Bleed over	<ul style="list-style-type: none"> • Verify on the GMA CONFIGURATION page that “Disable Split COM” has a green box. Due to the closeness of the COM antennas and high power of the COM transceivers, Split COM operation is not approved. If the box is black (indicating COM 1/2 button is active), highlight “Disable Split COM” with the cursor and press the ENT key to turn the box green which will deactivate Split COM mode.
Speaker Cuts Out	<ul style="list-style-type: none"> • Reduce volume level of the item that caused the speaker to cut out when turned up. A speaker protection circuit disables the speaker output if the volume is too high. If the volume is not sufficient, replace aircraft cabin speaker, reference the Airframe Maintenance Manual.
Mic Audio Heard in Speaker	<ul style="list-style-type: none"> • Reduce ICS Volume.

4.5.3 GMA Alerts

Message	Cause	Solutions
MANIFEST – GMA1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GMA 1347.	<ul style="list-style-type: none"> • Load correct software version.
GMA1 SERVICE – GMA1 needs service. Return unit for repair.	The G1000 has determined GMA1 needs service.	<ul style="list-style-type: none"> • Replace GMA1
GMA1 FAIL – GMA 1 is inoperative.	The G1000 has detected a failure in GMA1.	<ul style="list-style-type: none"> • Ensure GMA1 is receiving power. • Ensure both GIAs are receiving power. • Ensure all GDUs are receiving power. • Ensure the GMA/GIA RS-232 data lines are working properly. • Ensure the GIA/GDU Ethernet data lines are working properly. ✓ Replace GMA.
GMA1 CONFIG – GMA1 configuration error. Config service req'd.	The G1000 has detected a GMA configuration mismatch.	<ul style="list-style-type: none"> • Load GMA configuration file, see Section 6.2. ✓ Replace GMA. ✓ If problem persists, replace master configuration module, check configuration module wiring for faults and replace if necessary. <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;">NOTE</div> <p>New Terrain/Obstacle cards, Jeppesen Aviation Database and other optional features (i.e. TAWS unlock card) will need to be replaced if the master configuration module is changed. The G1000 System ID number will change to a new number when installing a new master configuration module. The old Terrain and other cards will no longer work as they will remain locked to the old System ID number.</p>

4.5.4 Backup Path Alerts

Message	Cause	Solutions
BACKUP PATH – Audio panel using backup data path.	The GMA 1347 is using a backup RS-232 data path.	✓ Ensure the GMA/GIA RS-232 data lines are working properly.

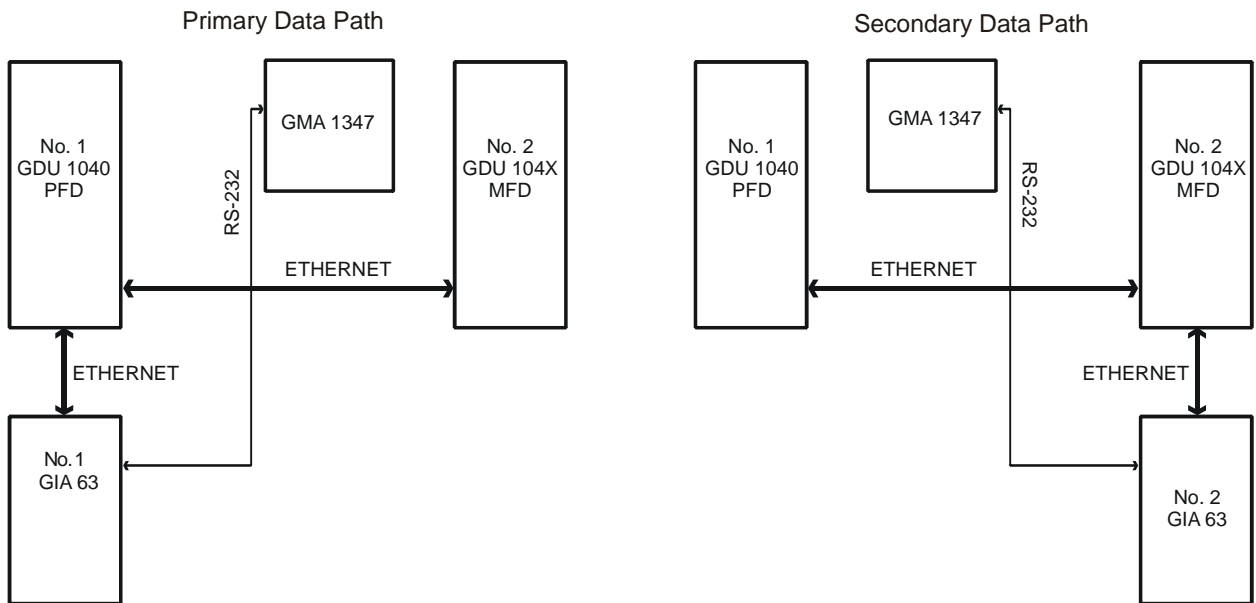


Figure 4-11. Backup Path Alerts

4.6 GIA 63

4.6.1 Configuration Pages

4.6.1.1 RS-232/ARINC 429 Page

RS-232 / ARINC 429 CONFIG				
<u>SELECT UNIT</u>				
GIA1				
<u>RS-232</u>				
CHANNEL	INPUT	ACTIVE	OUTPUT	ACTIVE
CHNL 1	GDC74 #1	GDC74 #1	GDC74 #1	GDC74 #1
CHNL 2	OFF	OFF	OFF	OFF
CHNL 3	GIA DEBUG	GIA DEBUG	GIA DEBUG	GIA DEBUG
CHNL 4	AFCS DEBUG	AFCS DEBUG	AFCS DEBUG	AFCS DEBUG
CHNL 5	GTX 33 #1 w/ TIS	GTX 33 #1 w/ TIS	GTX 33 #1 w/ TIS	GTX 33 #1 w/ TIS
CHNL 6	GRS77 #1	GRS77 #1	GRS77 #1	GRS77 #1
CHNL 7	GMA1347 #1	GMA1347 #1	GMA1347 #1	GMA1347 #1
CHNL 8	OFF	OFF	OFF	OFF
<u>ARINC 429</u>				
CHANNEL	SPEED	ACTIVE	DATA	ACTIVE
IN 1	Low	Low	OFF	OFF
IN 2	Low	Low	OFF	OFF
IN 3	Low	Low	OFF	OFF
IN 4	Low	Low	OFF	OFF
IN 5	Low	Low	GDC74 #1	GDC74 #1
IN 6	High	High	GRS77 #1	GRS77 #1
IN 7	Low	Low	OFF	OFF
IN 8	Low	Low	OFF	OFF
OUT 1	Low	Low	OFF	OFF
OUT 2	Low	Low	OFF	OFF
OUT 3	High	High	DATA LOGGER	DATA LOGGER
SDI	Common	Common		

SYSTEM GDU GIA GEA GTX GRS GDC GFC GMA GDL GWX CAL ■ □ □ □ □

SET>ACTV | ACTV>SET | CLR NV

Figure 4-12. RS-232/ARINC 429

Main ARINC 429 and RS-232 communications channels for GIA 1 and GIA 2 are shown at this page. All settings are pre-established for a particular installation and are loaded from the G1000 Loader Card and should not be changed. The 'GIA 1' and 'GIA 2' configuration files contain the settings shown on this page.

SELECT UNIT

This window shows the currently selected GIA 63 unit.

RS-232

This window shows active RS-232 configuration settings for currently selected GIA.

ARINC 429

This window shows active ARINC 429 configuration settings for currently selected GIA.

SOFTKEYS

The following softkeys appear at this page:

- SET>ACTV: See Section 3.4.4 for description.
- ACTV>SET: See Section 3.4.4 for description.
- CLR NV: Clears all 'Active' settings from memory from the selected GIA 63 and restores default settings. *You will need to reload GIA and optional equipment configuration files if you clear the memory.*

4.6.1.2 CAN/RS-485 CONFIGURATION Page

CAN / RS-485 CONFIGURATION

SELECT GIA UNIT
GIA1

CAN

CHANNEL	INPUT DATA		OUTPUT DATA		SPEED	
	SET	ACTIVE	SET	ACTIVE	SET	ACTIVE
CHNL 1	OFF	OFF	OFF	OFF	115200	115200
CHNL 2	OFF	OFF	OFF	OFF	115200	115200

RS-485

CHANNEL	INPUT DATA		OUTPUT DATA	
	SET	ACTIVE	SET	ACTIVE
CHNL 1	GEA 1	GEA 1	GEA 1	GEA 1
CHNL 2	GEA 2	GEA 2	GEA 2	GEA 2
CHNL 3	OFF	OFF	OFF	OFF
CHNL 4	GFC700	GFC700	GFC700	GFC700
CHNL 5	OFF	OFF	OFF	OFF

CLOCKED DATA INTERFACE

CHANNEL	INPUT/OUTPUT DATA	
	SET	ACTIVE
CHNL 1	OFF	OFF

SYSTEM GDU GIA GEA GTX GRS GDC GFC GHA GDL GWX CAL

SET>ACTV ACTV>SET

Figure 4-13. CAN/RS-485 CONFIGURATION Page

This page shows settings for the Controller Area Network (CAN) and RS-485 channels used by the GIA 63 . All settings are pre-established for a particular installation and are loaded from the appropriate G1000 Loader Card and should not be changed. The ‘GIA 1’ and ‘GIA 2’ configuration files contain the settings shown on this page.

SELECT GIA UNIT

This window shows the currently selected GIA 63 .

CAN

This window shows active Controller Area Network configuration settings for currently selected GIA.

RS-485

This window shows active RS-485 configuration settings for currently selected GIA.

CLOCKED DATA INTERFACE

This window shows active Clocked Data Interface settings, typically only used when interfacing to an external DME.

SOFTKEYS

The following softkeys appear at this page:

- SET>ACTV: See Section 3.4.4 for description.
- ACTV>SET: See Section 3.4.4 for description.

4.6.1.3 GIA I/O CONFIGURATION Page

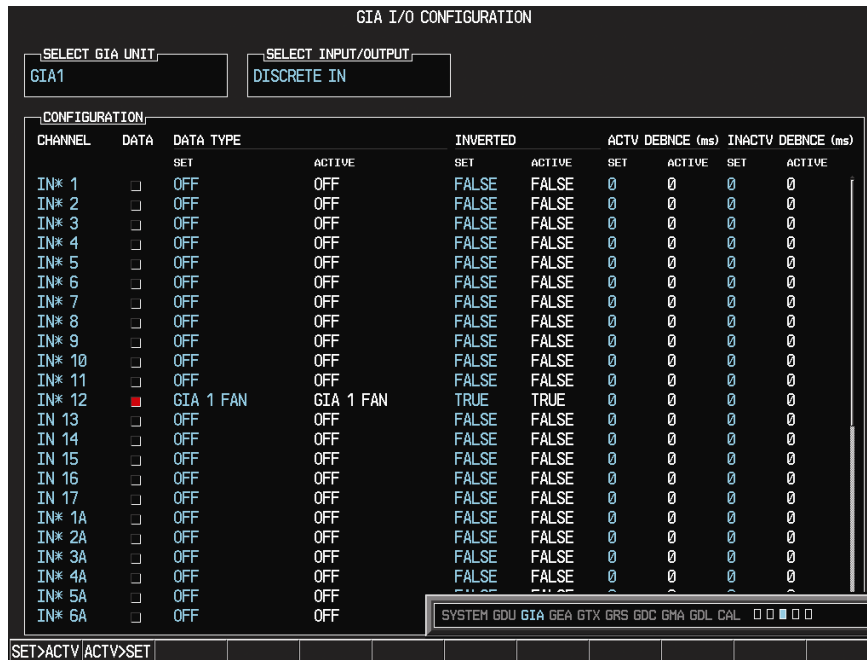


Figure 4-14. GIA I/O CONFIGURATION Page

Discrete and analog input/output channels for GIA 1 and GIA 2 are shown on this page. All settings are pre-established for a particular installation and are loaded from the G1000 Loader Card and should not be changed. The 'GIA1' and 'GIA2' configuration files contain the settings shown on this page.

SELECT GIA UNIT

This window shows the currently selected GIA 63 unit.

SELECT INPUT/OUTPUT

This window shows input/output type that is displayed for the currently selected GIA. Options include:

- Discrete In
- Discrete Out
- Analog In
- Analog Out

CONFIGURATION

This window shows active I/O configuration settings for the currently selected GIA and input/output type. A green box indicates an input is active, a black/red box indicates an input is not active or not is use.

SOFTKEYS

The following softkeys appear at this page:

- SET>ACTV: See Section 3.4.4 for description.
- ACTV>SET: See Section 3.4.4 for description.

4.6.1.4 COM SETUP Page



Figure 4-15. COM SETUP Page

SELECT GIA UNIT

This window shows the currently selected GIA 63 .

CALIBRATION

FREQUENCY: Selects a VHF communication frequency. For purposes of setting squelch and sidetone levels, only the frequencies 118.00, 127.00, 136.975 can be used.

SPACING:

Selection	Description
25.0 kHz	Selects the traditional 25 kilohertz spacing (760 channel)
8.33 kHz	Selects 8.33 kilohertz channel spacing, required in certain areas of the world.

SQ 250: Sets the squelch threshold for 25 kHz channel spacing operation. *May be set to any value between 0 (zero) and 63. The higher the number, the less signal is required to break squelch.*

SQ 833: Sets the squelch threshold for 8.33 kHz channel spacing operation. *May be set to any value between 0 (zero) and 63. The higher the number, the more signal required to break squelch.*

SIDETONE: Sets the sidetone audio output level. *May be set to any value between 0 (zero) and 63.*

MIC GAIN: Sets the headset microphone gain level. *May set to any value between 0 (zero) and 63.*

4.6.1.5 GIA STATUS Page

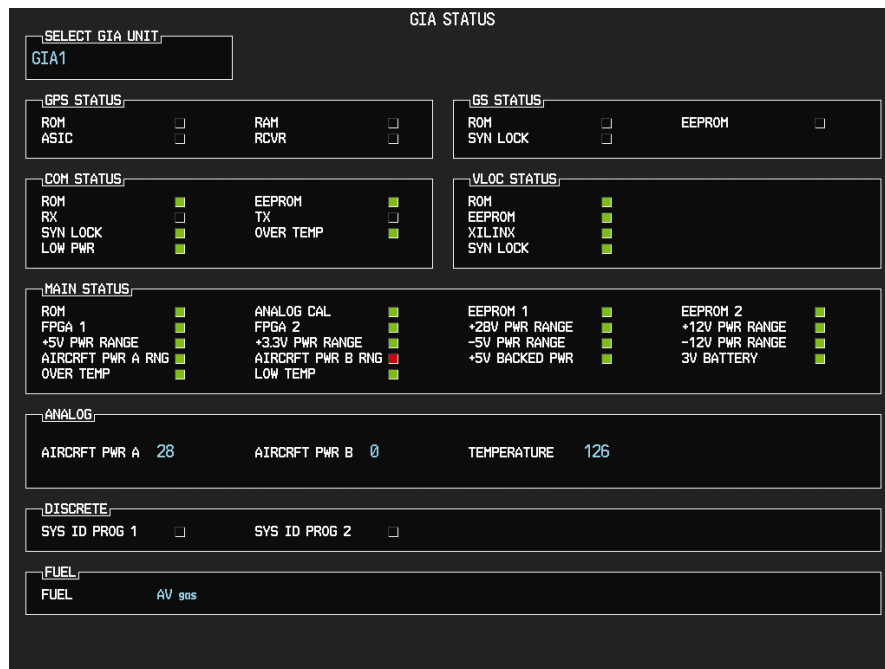


Figure 4-16. GIA STATUS Page

This page shows various items related to the GIA 63 and its operation. The technician can use this page to aid in diagnosis and troubleshooting of the GIA 63 .

SELECT GIA UNIT

This window shows the currently selected GIA 63 .

GPS STATUS

ROM, RAM, ASIC, RCVR: Shows the condition of various GPS receiver hardware components. Black boxes may indicate the GPS is not locked onto valid signals, and may not be an indication of a failed unit.

GS STATUS

ROM, SYN LOCK, EEPROM: Shows the condition of various Glideslope receiver hardware components. Black boxes may indicate the GS is not locked onto valid signals, and may not be an indication of a failed unit.

COM STATUS

ROM, EEPROM, SYN LOCK: Shows the condition of various COM transceiver hardware components.

RX: Shows whether or not the GIA 63 COM is currently receiving. (Green = Receiving)

TX: Shows whether or not the GIA 63 COM is currently transmitting. (Green = Transmitting)

LOW PWR: Informs the technician of a low power condition for the COM transceiver. (Green = Low Power)

OVER TEMP: Informs the technician of an over-temperature condition for the COM transceiver. (Red = Over-temperature, Green = Normal-temperature)

VLOC STATUS

ROM, XILINX, SYN LOCK, EEPROM: Shows condition of various NAV receiver components. *These boxes should be green, a red box indicates an internal failure.*

MAIN STATUS

ROM, FPGA 1/3, EEPROM 1/2: Shows the condition of various GIA 63 main board components. *These boxes should be green, a red box indicates an internal failure.*

+5, +3.3, -5, +12/-12, +28 PWR RANGE: Shows condition of various internal power supply ranges. They need to be within 10% of desired voltages. *Replace the unit if these values are more than 10% from the desired voltage.*

AIRCRAFT PWR A/B RNG: Shows the technician that the main power inputs of the GIA 63 are within acceptable ranges. *If a box is red, and the Aircraft PWR voltage is listed as 0 in the Analog Status box below, check that all aircraft buses are on and GIA breakers are pushed in.*

ANALOG CAL: Shows the condition of the GIA calibration. (Green = Valid Analog Calibration)

OVER TEMP: Informs the technician of an over-temperature condition on the GIA 63 main board. (Red = Over-temperature, Green = Normal-temperature)

LOW TEMP: Informs the technician of a low temperature condition on the main board. (Red = Low-temperature, Green = Normal-temperature)

ANALOG STATUS

AIRCRAFT PWR A, B: Shows aircraft power input values, expressed in Volts DC. (Example: 2214 = 22.14 VDC)

TEMPERATURE: Shows the internal temperature of GIA unit, expressed in degrees Fahrenheit. (Example: 12267 = 122.67°F)

DISCRETE

SYS ID PROG 1, 2: Identifies the assigned GIA number when two or more GIA units are installed. Green indicates that the System ID pin is left strapped to ground. Black indicates that the System ID pin is left 'open' and not strapped to ground.

GIA System ID 1	GIA System ID 2	GIA Unit Number
Black	Black	#1 GIA
Green	Black	#2 GIA
Black	Green	#3 GIA
Green	Green	#4 GIA

FUEL

FUEL: This window shows the type of fuel to be used on the aircraft.

4.6.2 COM

Symptom	Recommended Action
Weak COM transmit power	<ul style="list-style-type: none">• Switch GIA1 and GIA2, to verify location of problem:<ul style="list-style-type: none">✓ If problem follows unit, replace GIA.✓ If problem does not follow unit, check COM antenna and cabling for faults.
Weak COM receiver	<ul style="list-style-type: none">• Switch GIA1 and GIA2, to verify location of problem:<ul style="list-style-type: none">✓ If problem follows unit, replace GIA.✓ If problem does not follow unit, check COM antenna and cabling for faults.
No COM sidetone	<ul style="list-style-type: none">• Switch GIA1 and GIA2, to verify location of problem:<ul style="list-style-type: none">✓ If problem follows unit, replace GIA.✓ If problem persists replace GMA 1347.
COM Bleedover	<ul style="list-style-type: none">• Verify on the GMA CONFIGURATION page that “Disable Split COM” has a green box. Due to the closeness of the COM antennas and high power of the COM transceivers, Split COM operation is not approved. If the box is black (indicating COM ½ button is active), highlight “Disable Split COM” with the curser and press the ENT key to turn the box green which will deactivate Split COM mode.

4.6.3 GPS

Symptom	Recommended Action
Will not acquire satellites	<ul style="list-style-type: none"> • Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin. • Using the MFD AUX – GPS Status page, verify the signal strength bars are not erratic. If so, this indicates outside interference is affecting the GPS receivers. Find and remove the source of interference (i.e. cell phones, FBO datalink antennas, etc.). • Check date and time on Date/Time Setup Page. <ul style="list-style-type: none"> ✓ If date and time are incorrect, enter the correct date and time. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows unit, clear the GPS almanac by performing the following steps – <ul style="list-style-type: none"> – Using the PFD in configuration mode, go to the GIA RS-232/ARNIC 429 Config Page. – At the top of the screen, select the GIA that can not acquire satellites (GIA1 or GIA2) and press the ENT key. – Press the “CLR NV” softkey at the bottom of the screen. – Select “OK” in the “Clear GIA nonvolatile memory?” pop-up window. – Next reload GIA Audio and Config files from a loader card, see Section 4.3 and on for instructions. Be sure to reload the configuration files for any optional equipment installed on the aircraft that require the GIA configuration to be updated. • Cycle power on the system and allow it to restart in normal mode. Place the aircraft outside and allow 15-30 minutes for the GPS to acquire a position and download a new almanac. <ul style="list-style-type: none"> ✓ If clearing nonvolatile memory is unsuccessful and the GPS still can not acquire a position, replace the GIA. • If problem does not follow unit, check GPS antenna and cabling.

4.6.4 NAV

Symptom	Recommended Action
Weak NAV receiver	<ul style="list-style-type: none"> • Set up a NAV/COM Ramp Test Set to radiate a test signal. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows unit, replace GIA. ✓ If problem does not follow unit, check NAV antenna, coupler, and cabling for faults.

4.6.5 G/S

Symptom	Recommended Action
Weak G/S receiver	<ul style="list-style-type: none"> • Set up a NAV/COM Ramp Test Set to radiate a test signal. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows unit, replace GIA. ✓ If problem does not follow unit, check NAV antenna, coupler, and cabling for faults.

4.6.6 COM Related Alerts

Message	Cause	Solutions
COM1 SERVICE – COM1 needs service. Return unit for repair.	The G1000 has determined COM1 needs service.	<ul style="list-style-type: none"> • Replace GIA1
COM2 SERVICE – COM2 needs service. Return unit for repair.	The G1000 has determined COM2 needs service.	<ul style="list-style-type: none"> • Replace GIA2
COM1 PTT – COM1 push-to-talk key is stuck.	The COM1 external push-to-talk (PTT) switch is stuck in the enabled (or “pressed”) state.	<ul style="list-style-type: none"> • Press the push-to-talk switch(s) again to cycle its operation. • Check push-to-talk switch(s) and wiring. • Check GIA1/GMA 1347 interconnect. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the unit, replace GIA1. ✓ If problem persists replace GMA 1347.
COM2 PTT – COM2 push-to-talk key is stuck.	The COM2 external push-to-talk (PTT) switch is stuck in the enabled (or “pressed”) state.	<ul style="list-style-type: none"> • Press the push-to-talk switch(s) again to cycle its operation. • Check push-to-talk switch(s) and wiring. • Check GIA2/GMA 1347 interconnect. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the unit, replace GIA2. ✓ If problem persists replace GMA 1347.

Message	Cause	• Solutions
COM1 RMT XFR – COM1 remote transfer key is stuck.	The COM1 external remote transfer switch is stuck in the enabled (or “pressed”) state.	<ul style="list-style-type: none"> • Press the COM1 external remote transfer switch again to cycle its operation. • Check COM1 external remote transfer switch and wiring. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the unit, replace GIA1.
COM2 RMT XFR – COM2 remote transfer key is stuck.	The COM2 external remote transfer switch is stuck in the enabled (or “pressed”) state.	<ul style="list-style-type: none"> • Press the COM2 external remote transfer switch again to cycle its operation. • Check COM2 external remote transfer switch and wiring. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the unit, replace GIA2.
COM1 TEMP – COM1 over temp. Reducing transmitter power.	GIA1 COM has exceeded its operating temperature range.	<ul style="list-style-type: none"> • Check fan, wiring and air tubing for proper operation. • Replace cooling fan if unable to determine if operating correctly. • Replace GIA1. • If problem persists contact Garmin Aviation Product Support for assistance.
COM2 TEMP – COM2 over temp. Reducing transmitter power.	GIA2 COM has exceeded its operating temperature range.	<ul style="list-style-type: none"> • Check fan, wiring and air tubing for proper operation. • Replace cooling fan if unable to determine if operating correctly. • Replace GIA2. • If problem persists contact Garmin Aviation Product Support for assistance.

4.6.7 NAV Related Alerts

Message	Cause	Solutions
NAV1 SERVICE – NAV1 needs service. Return unit for repair.	The G1000 has detected a failure in NAV1 receiver.	<ul style="list-style-type: none"> • Replace GIA1
NAV2 SERVICE – NAV2 needs service. Return unit for repair.	The G1000 has detected a failure in NAV2 receiver.	<ul style="list-style-type: none"> • Replace GIA2
NAV1 RMT XFR – NAV1 remote transfer key is stuck.	The NAV1 external remote transfer switch is stuck in the enabled (or “pressed”) state.	<ul style="list-style-type: none"> • Press the NAV1 external remote transfer switch again to cycle its operation. • Check NAV1 remote transfer switch and wiring . • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the unit, replace GIA1.
NAV2 RMT XFR – NAV2 remote transfer key is stuck.	The NAV2 external remote transfer switch is stuck in the enabled (or “pressed”) state.	<ul style="list-style-type: none"> • Press the NAV2 external remote transfer switch again to cycle its operation. • Check NAV2 remote transfer switch and wiring. • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the unit, replace GIA2.

4.6.8 G/S Related Alerts

Message	Cause	Solutions
G/S1 SERVICE – G/S1 needs service. Return unit for repair.	The G1000 has detected a failure in G/S1 receiver.	<ul style="list-style-type: none"> • Replace GIA1
G/S2 SERVICE – G/S2 needs service. Return unit for repair.	The G1000 has detected a failure in G/S1 receiver.	<ul style="list-style-type: none"> • Replace GIA2
G/S1 FAIL – G/S1 is inoperative.	The G1000 has detected a failure in G/S1 receiver.	<ul style="list-style-type: none"> • Switch GIA1 and GIA2 to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the unit, replace GIA. ✓ If problem does not follow unit, check G/S1 antenna and cabling.
G/S2 FAIL – G/S2 is inoperative.	The G1000 has detected a failure in G/S2 receiver.	<ul style="list-style-type: none"> • Switch GIA1 and GIA2 to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the unit, replace GIA. ✓ If problem does not follow unit, check G/S2 antenna and cabling.

4.6.9 GPS Related Alerts

NOTE

Before troubleshooting, ensure that no cell phones or devices using cell phone technology are turned on, even in a monitoring state, in the cabin.

Message	Cause	Solutions
GPS1 SERVICE – GPS1 needs service. Return unit for repair.	The G1000 has detected a failure in GPS1 receiver.	<ul style="list-style-type: none"> • Replace GIA1
GPS2 SERVICE – GPS2 needs service. Return unit for repair.	The G1000 has detected a failure in GPS2 receiver.	<ul style="list-style-type: none"> • Replace GIA2
GPS1 FAIL – GPS1 is inoperative.	The G1000 has detected a failure in GPS1 receiver.	<ul style="list-style-type: none"> • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the unit, replace GIA1. ✓ If problem does not follow the unit, check GPS1 antenna and cabling.
GPS2 FAIL – GPS2 is inoperative.	The G1000 has detected a failure in GPS2 receiver.	<ul style="list-style-type: none"> • Switch GIA1 and GIA2, to verify location of problem: <ul style="list-style-type: none"> ✓ If problem follows the unit, replace GIA2. ✓ If problem does not follow the unit, check GPS2 antenna and cabling.

4.6.10 GIA Cooling Alerts

Message	Cause	Solutions
GIA1 COOLING – GIA1 temperature too low.	GIA1 operating temperature is too low.	<ul style="list-style-type: none"> • Allow unit to warm up.
GIA2 COOLING – GIA2 temperature too low.	GIA2 operating temperature is too low.	<ul style="list-style-type: none"> • Allow unit to warm up.
GIA1 COOLING – GIA1 over temperature.	GIA1 has exceeded its operating temperature range.	<ul style="list-style-type: none"> • Check fan, wiring and air tubing for proper operation. • Replace cooling fan if unable to determine if operating correctly. • Replace GIA1. • If problem persists contact Garmin Aviation Product Support for assistance.
GIA2 COOLING – GIA2 over temperature.	GIA2 has exceeded its operating temperature range.	<ul style="list-style-type: none"> • Check fan, wiring and air tubing for proper operation. • Replace cooling fan if unable to determine if operating correctly. • Replace GIA2. • If problem persists contact Garmin Aviation Product Support for assistance.

4.6.11 Other GIA Alerts

Message	Cause	Solutions
GIA1 CONFIG – GIA1 configuration error. Config service req'd.	The G1000 has detected a GIA configuration mismatch.	<ul style="list-style-type: none"> • Reload GIA configuration files. ✓ If problem persists, replace master configuration module, check configuration module harness for faults and replace if necessary. <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;">NOTE</div> <p>New Terrain/Obstacle cards, Jeppesen Aviation Database and other optional features (i.e. TAWS unlock card) will need to be replaced if the master configuration module is changed. The G1000 System ID number will change to a new number when installing a new master configuration module. The old Terrain and other cards will no longer work as they will remain locked to the old System ID number.</p>
GIA2 CONFIG – GIA2 configuration error. Config service req'd.		

Message	Cause	Solutions
GIA1 CONFIG – GIA1 audio config error. Config service req'd.	The G1000 has detected a GIA audio configuration mismatch.	<ul style="list-style-type: none"> Reload GIA audio configuration files. ✓ If problem persists, replace master configuration module, check configuration module harness for faults and replace if necessary. <div style="border: 1px solid black; padding: 5px; text-align: center;">NOTE</div> <p>New Terrain/Obstacle cards, Jeppesen Aviation Database and other optional features (i.e. TAWS unlock card) will need to be replaced if the master configuration module is changed. The G1000 System ID number will change to a new number when installing a new master configuration module. The old Terrain and other cards will no longer work as they will remain locked to the old System ID number.</p>
GIA2 CONFIG – GIA2 audio config error. Config service req'd.		
MANIFEST – GIA1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GIA 1.	<ul style="list-style-type: none"> Load correct software version.
MANIFEST – GIA2 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GIA 2.	
GIA1 SERVICE – GIA 1 needs service. Return unit for repair.	The G1000 has detected a failure in GIA1.	<ul style="list-style-type: none"> Replace GIA1
GIA2 SERVICE – GIA 2 needs service. Return unit for repair.	The G1000 has detected a failure in GIA2.	<ul style="list-style-type: none"> Replace GIA2
HW MISMATCH – GIA hardware mismatch. GIA1 communication halted.	A GIA hardware mismatch has been detected.	<ul style="list-style-type: none"> Ensure both GIA units are either WAAS or non-WAAS as applicable. WAAS GIAs can not be installed in place of non-WAAS units (and vice-versa) without additional G1000 system hardware and software modifications.
HW MISMATCH – GIA hardware mismatch. GIA 2 communication halted.	A GIA hardware mismatch has been detected.	

4.7 GEA Troubleshooting

4.7.1 GEA 71 Configuration Pages

4.7.1.1 ENGINE DATA Page

ENGINE DATA							
DATA:							
ALT AMPS 1	---A	TACH SENSOR 1	0rpm	N1 ENG1	---%	ITT ENG1	---°C
ALT AMPS 2	---A	TACH SENSOR 2	---rpm	N1 ENG2	---%	ITT ENG2	---°C
PRP D ICE CUR 1	---A	D ICE PRESS	---PSI	N2 ENG1	---%	TIT ENG1	---°C
PRP D ICE CUR 2	---A	FUEL PRESS ENG1	0PSI	N2 ENG2	---%	TIT ENG2	---°C
AIRCRAFT PWR 1	1V	FUEL PRESS ENG2	---PSI	N3 ENG1	---%	OT ENG1	82°C
AIRCRAFT PWR 2	1V	FUEL QTY LEFT	---GL	N3 ENG2	---%	OT ENG2	---°C
BATT VOLTS 1	1V	FUEL QTY RIGHT	---GL	EGT ENG1 1	322°C	CHT ENG1 1	50°C
BATT VOLTS 2	---V	FUEL FLW ENG1	0GL/HR	EGT ENG1 2	181°C	CHT ENG1 2	41°C
		FUEL FLW ENG2	---GL/HR	EGT ENG1 3	128°C	CHT ENG1 3	42°C
		FUEL FLW RTN 1	---GL/HR	EGT ENG1 4	116°C	CHT ENG1 4	42°C
		FUEL FLW RTN 2	---GL/HR	EGT ENG1 5	119°C	CHT ENG1 5	132°C
		MAP ENG1	38IN	EGT ENG1 6	117°C	CHT ENG1 6	60°C
		MAP ENG2	---IN	EGT ENG2 1	---°C	CHT ENG2 1	---°C
		VAC ENG1	---IN	EGT ENG2 2	---°C	CHT ENG2 2	---°C
		VAC ENG2	---IN	EGT ENG2 3	---°C	CHT ENG2 3	---°C
		OP ENG1	---PSI	EGT ENG2 4	---°C	CHT ENG2 4	---°C
		OP ENG2	---PSI	EGT ENG2 5	---°C	CHT ENG2 5	---°C
ENGINE HOURS	0.0			EGT ENG2 6	---°C	CHT ENG2 6	---°C

Figure 4-17. ENGINE DATA Page

The Engine Data page gives the technician real-time data showing current engine sensor readings. Items shown are typically used in most aircraft. There are no configurable parameters on this page.

DATA

ALT AMPS 1, 2: Alternator Amps measurement, expressed in amperes.

PROP D ICE CUR 1, 2: Propeller De-Ice current measurement, expressed in amperes.

AIRCRAFT PWR 1, 2: Aircraft power input measurement, expressed in volts DC.

BATT VOLTS 1, 2: Battery Voltage measurement, expressed in volts DC.

ENGINE HOURS: Shows engine time in hours, as measured by the engine tachometer input.

TACH SENSOR 1, 2: Tachometer sensor measurement, expressed in revolutions per minute (RPM).

D ICE PRESS: De-Ice system pressure measurement, expressed in pounds per square inch (PSI).

FUEL PRESS ENG 1, 2: Fuel Pressure measurement, expressed in pounds per square inch (PSI).

FUEL QTY RIGHT, LEFT: Fuel Quantity measurement, expressed in gallons (GL).

FUEL FLW ENG 1, 2: Fuel Flow measurement, expressed in gallons per hour (GL/HR).

MAP ENG 1, 2: Manifold Air Pressure sensor reading, expressed in inches/mercury ("Hg).

VAC ENG 1, 2: Vacuum measurement, expressed in inches/mercury ("Hg).

OP ENG 1, 2: Oil Pressure, expressed in pounds per square inch (PSI).

N1, N2, N3 ENG 1, 2: Compressor spool speeds, expressed in percent RPM. (Turbine aircraft only)

EGT ENG 1, 2 (1-6): Exhaust Gas Temperature, expressed in degrees Centigrade.

ITT ENG 1, 2: Interstage Turbine Temperature, expressed in degrees Centigrade. (Turbine aircraft only)

TIT ENG 1, 2: Turbine Intake Temperature, expressed in degrees Centigrade. (Turbine aircraft only)

OT ENG 1, 2: Oil Temperature, expressed in degrees Centigrade.

CHT ENG 1, 2 (1-6): Cylinder Head Temperature, expressed in degrees Centigrade.

4.7.1.2 GEA STATUS Page

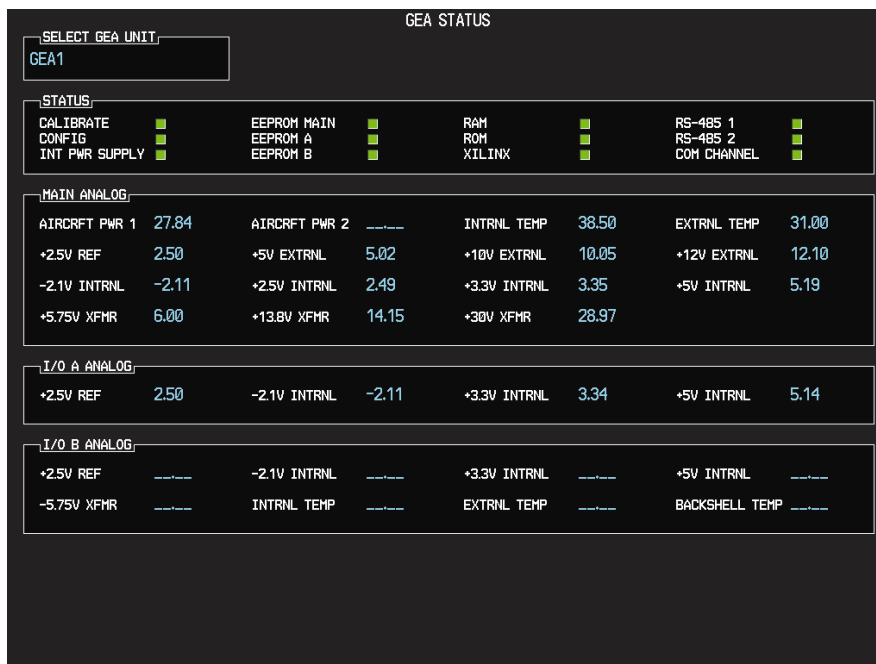


Figure 4-18. GEA STATUS Page

This page shows various items related to the GEA 71 and its operation. The technician can use this page to aid in diagnosis and troubleshooting of the GEA 71.

SELECT GEA UNIT

This window shows the currently selected GEA 71 engine/airframe unit.

STATUS

NOTE

A green box indicates good working order. A red box indicates a problem, contact Garmin for assistance.

CALIBRATE: Shows status of GEA 71 calibration.

CONFIG: Shows status of GEA 71 configuration.

INT PWR SUPPLY: Shows status of the GEA 71 +5, +10, and +12 sensor power supply voltages.

EEPROM MAIN, A, B: Shows status of internal EEPROM for main, I/O 'A' and I/O 'B' boards.

RAM, ROM, XILINX: Shows status of internal memory and FPGA.

RS-485 1, 2: Shows status of RS-485 I/O channels.

COM CHANNEL: Shows whether or not the main RS-485 channel usage is greater than 80%. *Red indicates a utilization of greater than 80%, whereas green indicates a utilization of less than 80% of the channels' capacity (preferred). A red box is not cause for replacement of the unit, it is an indicator of communication capacity utilization.*

4.7.2 Common Problems

Symptom	Recommended Action
CHT, EGT, and TIT are red X'd (no other field is red X'd)	<ul style="list-style-type: none"> Ensure the GEA configuration module and thermocouple wiring and pins are not damaged. Replace the GEA configuration module and thermocouple.
One or more CHT, EGT, or TIT temperatures drop as electrical load increases	<ul style="list-style-type: none"> Check temperature probe(s) for shorts on the low side of the thermocouple (usually where bayonet is cramped). Replace temperature probe(s).
One or more CHT, EGT, or TIT temperatures drift up and flag	<ul style="list-style-type: none"> Check for an open temperature probe or open wiring and replace and/or correct.
Fuel quantity flags intermittently	<ul style="list-style-type: none"> Check for an open in the wiring and connectors between the GEA and the sender. Check fuel sender for an open or dead spot.

4.7.3 GEA 71 Related Alerts

Message	Cause	Solutions
GEA1 CONFIG – GEA1 configuration error. Config service req'd.	The G1000 has detected a GEA configuration mismatch.	<ul style="list-style-type: none"> Reload GEA configuration files. <ul style="list-style-type: none"> ✓ If problem persists, replace master configuration module, check configuration module harness for faults and replace if necessary. <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;">NOTE</div> <p>New Terrain/Obstacle cards, Jeppesen Aviation Database and other optional features (i.e. TAWS unlock card) will need to be replaced if the master configuration module is changed. The G1000 System ID number will change to a new number when installing a new master configuration module. The old Terrain and other cards will no longer work as they will remain locked to the old System ID number.</p>
MANIFEST – GEA1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GEA 71.	<ul style="list-style-type: none"> Load correct software version.

4.7.4 Backup Path Alerts

Message	Cause	Solutions
BACKUP PATH – EIS using backup data path.	The GEA 71 is using a backup RS-485 data path.	<ul style="list-style-type: none"> See Section 4.7 for troubleshooting.

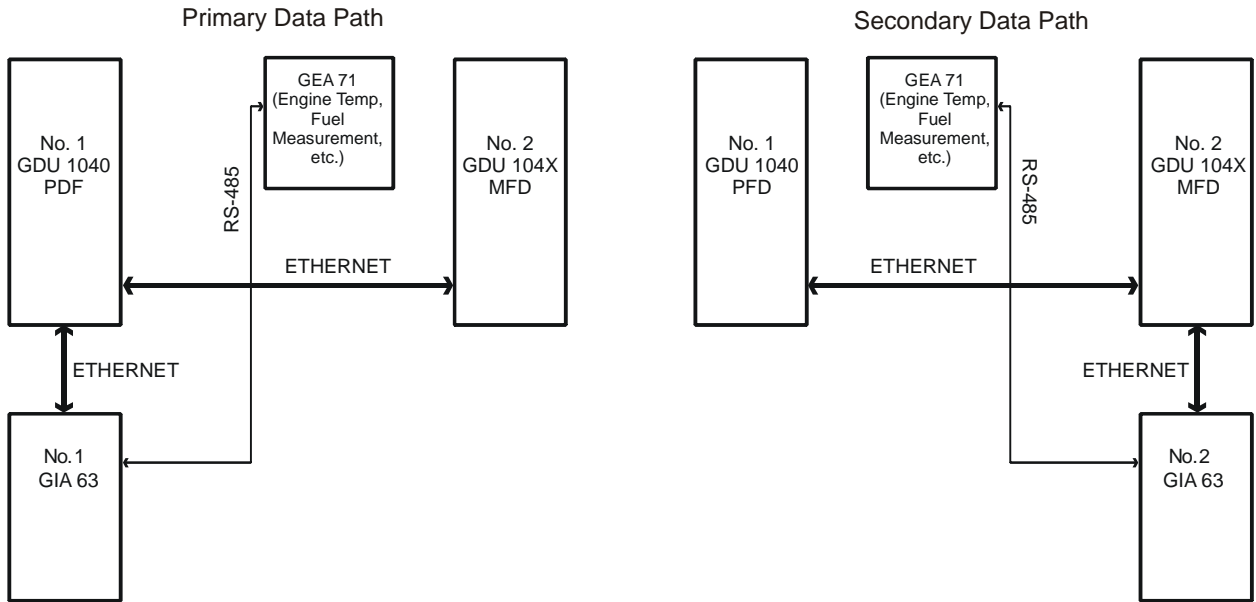


Figure 4-19. GEA 71 Data Paths

4.8 GTX Troubleshooting

4.8.1 GTX 33 Common Alerts

Message	Cause	Solutions
XPDR1 CONFIG – XPDR1 configuration error. Config service req'd.	The G1000 has detected a GTX 33 configuration mismatch.	<ul style="list-style-type: none"> • Perform a SET>ACTV configuration reset on the GTX Configuration page and verify the aircraft registration number is present. • If error is still present, reload configuration files from a loader card. <ul style="list-style-type: none"> ✓ If problem persists, replace master configuration module, check configuration module harness for faults and replace if necessary.. <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;">NOTE</div> <p>New Terrain/Obstacle cards, Jeppesen Aviation Database and other optional features (i.e. TAWS unlock card) will need to be replaced if the master configuration module is changed. The G1000 System ID number will change to a new number when installing a new master configuration module. The old Terrain and other cards will no longer work as they will remain locked to the old System ID number.</p>
MANIFEST – GTX1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GTX 33.	<ul style="list-style-type: none"> • Load correct software version.
XPDR1 SRVC – XPDR1 needs service. Return unit for repair.	The G1000 has detected a failure in GTX 33.	<ul style="list-style-type: none"> • Replace GTX 33.
XPDR1 FAIL – XPDR1 is inoperative.	GTX 33 is not responding.	<ul style="list-style-type: none"> • Check communication paths between GTX and GIAs for faults, see Figure 4-20. • Replace GTX 33.

4.8.2 Backup Path Alerts

Message	Cause	Solutions
BACKUP PATH – Transponder using backup data path.	The GTX 33 is using a backup RS-232 data path.	<ul style="list-style-type: none"> See Section 4.8 for troubleshooting.

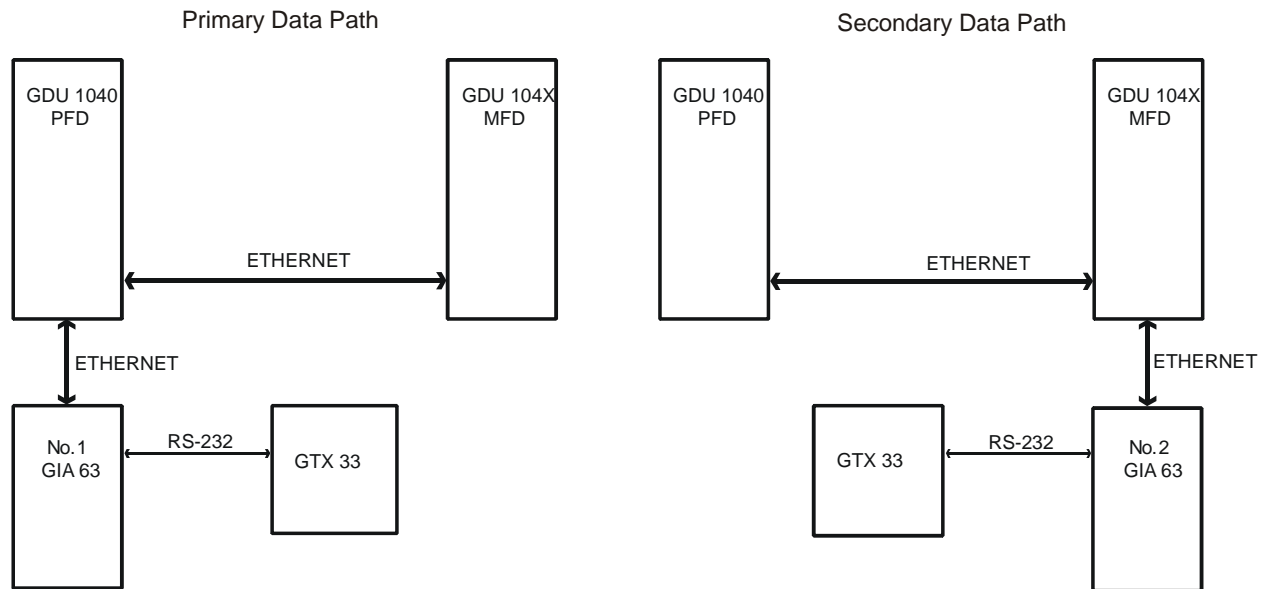


Figure 4-20. GTX 33 Data Paths

4.9 GRS 77 /GMU 44

4.9.1 Configuration Pages

4.9.1.1 AHRS/AIR DATA INPUT Page

AHRS / AIR DATA INPUT					
AHRS 1					
T HDG	271.3°	ROLL	+0°	PITCH	+0°
X ACC	0.03	Y ACC	0.05	Z ACC	0.01
AIR DATA 1					
SAT	24°C	IAS	0KT	TAS	0KT
B ALT	1073FT	D ALT	2428FT	P ALT	1074FT
AHRS 2					
T HDG	----	ROLL	----	PITCH	----
X ACC	----	Y ACC	----	Z ACC	----
AIR DATA 2					
SAT	----	IAS	----	TAS	----
B ALT	----	D ALT	----	P ALT	----

Figure 4-21. AHRS/AIR DATA INPUT Page

This page shows real time data from the GRS 77 (AHRS 1) and GDC74A (Air Data1). The aircraft is not equipped with a second GRS 77 or GDC74A, so the AHRS 2 and Air Data 2 fields will remain blank. If the AHRS 1 or Air Data 1 fields are blank, the units are not online and the cause should be determined.

AHRS 1, 2

T HDG: True heading value input from GRS 77 , expressed in degrees.

ROLL: Roll value input from GRS 77 , expressed in degrees.

PITCH: Pitch value input from GRS 77 , expressed in degrees.

X ACC: X Axis acceleration value, expressed in m/s².

Y ACC: Y Axis acceleration value, expressed in m/s².

Z ACC: Z Axis acceleration value, expressed in m/s².

AIR DATA 1, 2

SAT: Static Air Temperature measurement input from GDC 74A, expressed in degrees Centigrade.

IAS: Indicated Air Speed measurement input from GDC 74A, expressed in knots.

TAS: True Air Speed measurement input from GDC 74A, expressed in knots.

B ALT: Barometric corrected altitude input from GDC 74A, expressed in feet.

D ALT: Density altitude input from GDC 74A, expressed in feet.

P ALT: Pressure altitude input from GDC 74A, expressed in feet.

4.9.2 Common Problems

Symptom	Recommended Action
AHRS does not complete initialization	<ul style="list-style-type: none"> • Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin. • Ensure GPS has acquired at least four satellites, has a 3D navigation solution, and a DOP of less than 5.0. This is particularly important if this issue appears during ground operation only. • Calibrate the GRS77. • Check GRS 77 configuration module wiring for damage. • Check GRS 77 connector for bent pins. <ul style="list-style-type: none"> ✓ If no damage can be found, replace GRS 77 configuration module. ✓ If problem persists, replace the GRS77.
Attitude appears unstable	<ul style="list-style-type: none"> • Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin. • Ensure the four GRS 77 mounting screws are tight. Finger tight is not sufficient, a screwdriver must be used to verify. • Ensure mounting rack and airframe shelf are secure and all hardware and brackets are present (CAUTION - do not loosen the mounting rack hardware to the airframe shelf or the aircraft will need to be leveled and the PITCH/ROLL OFFSET procedure performed).. • Ensure aircraft battery is mounted securely if located near the GRS77. • Ensure GRS 77 connector is securely fastened and proper strain relief is provided. • Remove GRS 77 connector and verify there are no bent pins. • Replace the GRS77. • Contact Garmin for further troubleshooting if required.

4.9.3 Common Alerts

Message	Cause	Solutions
AHRS TAS – AHRS not receiving airspeed.	The GRS 77 is not receiving airspeed information from the GDC 74A.	<ul style="list-style-type: none"> • Check GRS/GDC interconnect for faults. • Replace the GDC 74A with a known good unit: <ul style="list-style-type: none"> ✓ If problem does not persist, replace the GRS 77 .
AHRS GPS – AHRS using backup GPS source.	The GRS 77 is using a backup GPS source.	<ul style="list-style-type: none"> • Ensure that a cell phone or a device using cell phone technology is not turned on (even in a monitoring state) in the cabin. • Check GPS status for GIA 1 and 2 on MFD - AUX GPS STATUS page. If one or both GPS receivers cannot acquire a position lock, see Section 4 for GPS troubleshooting. • See Section 4.9 for data path troubleshooting. • Replace the GRS 77 .
AHRS GPS – AHRS not receiving backup GPS information.	The GRS 77 is not receiving backup GPS information from either GIA 63 .	
AHRS GPS – AHRS operating exclusively in no-GPS mode.	The GRS 77 is operating in the absence of GPS.	
AHRS GPS – AHRS not receiving any GPS information.	The GRS 77 is not receiving GPS data from the GPS receivers.	
AHRS Service – AHRS magnetic field model needs updated.	The AHRS magnetic field model has expired.	<ul style="list-style-type: none"> • Reference SB 0533 for update instructions.
MANIFEST-GRS1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GRS 77 or the GMU 44.	<ul style="list-style-type: none"> • Load correct software version.

4.9.4 Backup Path Alerts

Message	Cause	Solutions
BACKUP PATH – AHRS using backup data path.	The PFD is using a backup ARINC 429 data path to receive AHRS data.	<ul style="list-style-type: none"> See 4.9.4 for troubleshooting.

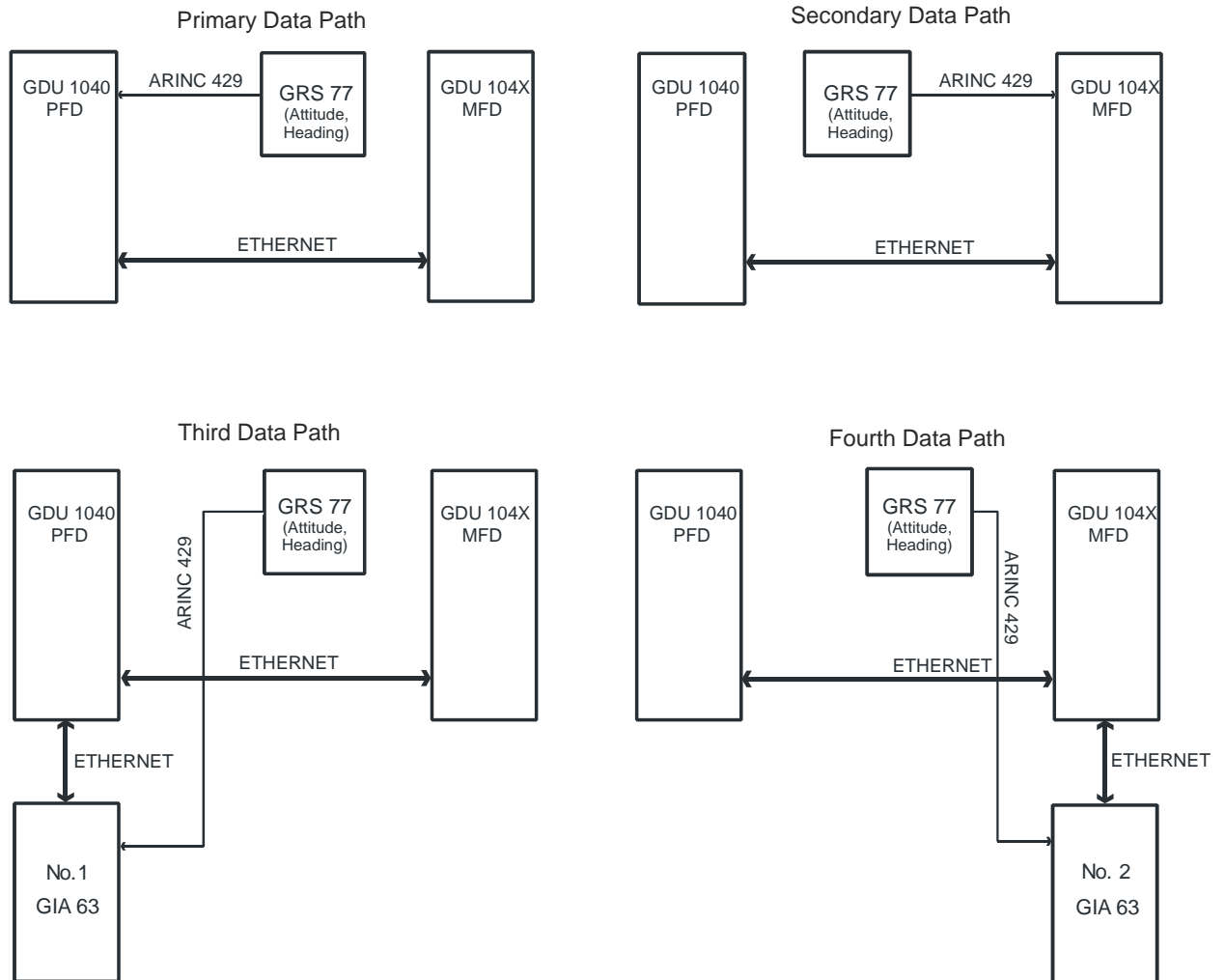


Figure 4-22. GRS 77 Data Paths

4.9.5 GMU Related Alerts

Message	Cause	Solutions
MANIFEST – GMU1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in the GMU 44.	<ul style="list-style-type: none"> • Load correct software version.
HDG FAULT – A magnetometer fault has occurred.	A fault has occurred in the magnetometer.	<ul style="list-style-type: none"> • Check GMU 44/GRS 77 interconnect for faults. • Replace the GMU 44. <ul style="list-style-type: none"> ✓ If problem persists, replace the GRS 77 .

4.10 GDC 74A

4.10.1 Common Problems

Symptom	Recommended Action
Altitude is different than standby altimeter	<ul style="list-style-type: none"> • Perform a pitot/static check (see Columbia maintenance manual for procedure). Allow the GDC to warm up for fifteen minutes before checking accuracy, per Garmin Service Advisory 0606. • Determine which instrument is outside limits and replace. The GDC is not field adjustable. Note: Both units may individually be in spec but show a difference in altitude. Do not return the GDC to Garmin for service if not outside limits.
GDC configuration file does not load.	<ul style="list-style-type: none"> • Replace GDC configuration module. <ul style="list-style-type: none"> ✓ If problem persists, replace GDC configuration module wire harness.

4.10.2 GDC 74A Related Alerts

Message	Cause	Solutions
MANIFEST – GDC1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in the GDC 74A.	<ul style="list-style-type: none"> • Load correct software version.

4.10.3 Backup Path Alerts

Message	Cause	Solutions
BACKUP PATH – Airdata using backup data path.	The GDC 74A is using a backup ARINC 429 data path.	<ul style="list-style-type: none"> See Section 4.10 for troubleshooting.

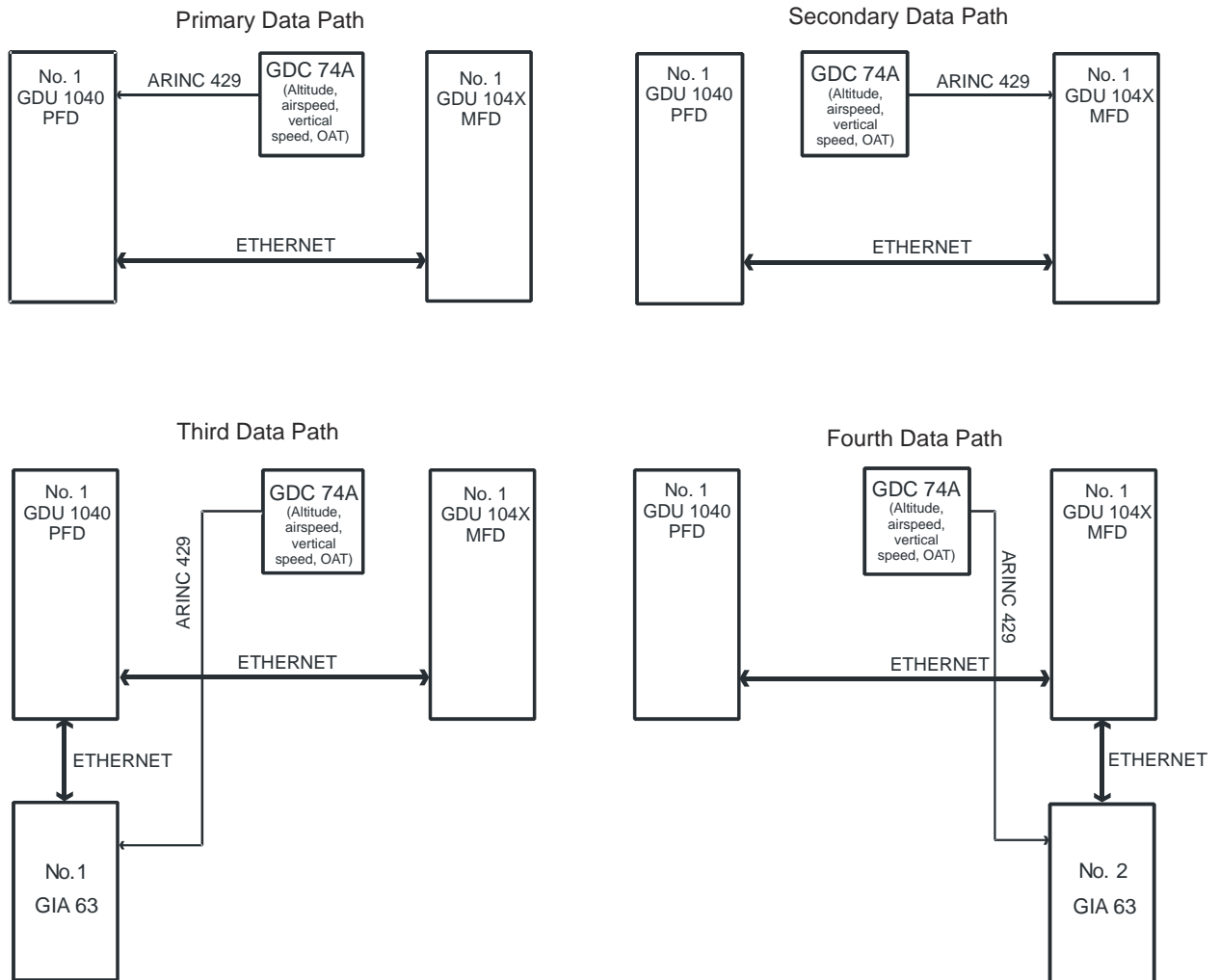


Figure 4-23. GDC 74A Data Paths

4.11 GDL 69/69A Configuration Pages

4.11.1 GDL 69 Page

CONFIGURATION		
SELECT GDL ANTENNA	SET	ACTIVE
UPPER BOUND ANTENNA GAIN (NOMINAL dB)	34.00	
LOWER BOUND ANTENNA GAIN (NOMINAL dB)	30.00	
CABLE LOSS INCLUDING INLINE ATTENUATORS IF USED (NOMINAL dB)	10.00	
DESIRED YODA MODULE GAIN (NOMINAL dB)	21.00	
GDL CONFIGURABLE ATTENUATION (dB)	6.5	6.5
ETHERNET PORT 2	DISABLE	DISABLE
ETHERNET PORT 3	DISABLE	DISABLE
ETHERNET PORT 4	DISABLE	DISABLE

DATA		
	AUDIO RADIO	DATA RADIO
ID	RPT550MH	J0PH50MK
ACTIVE	YES	NO
SIGNAL	0	0

DIAGNOSTICS		
	AUDIO RADIO	DATA RADIO
QUALITY OF SERVICE	1NSNSNS0	1NSNSNS0
TERRESTRIAL ERROR STATUS	2NNS0000	2NNS0000
SATELLITE 1 ERROR	3NNS0000	3NNS0000
SATELLITE 2 ERROR	4NNS0000	4NNS0000
TUNER STATUS	5LD-----	

SYSTEM GDU GIA GEA GTX GRS GDC GMA GDL CAL ■

SET>ACTV>ACTV>SET

Figure 4-24. GDL 69 Page

NOTE

Refer to Service Bullitens 0538 and 0544 when troubleshooting a GDL 69/69A.

Configuration settings are not field adjustable.

AUDIO RADIO refers to XM audio receiver installed in the GDL 69A, DATA RADIO refers to the XM data receiver installed in both the GDL 69 and GDL 69A.

CONFIGURATION

SELECT GDL ANTENNA: Selects the GDL antenna.

UPPER BOUND ANTENNA GAIN (NOMINAL dB): Sets the upper bound antenna gain value.

LOWER BOUND ANTENNA GAIN (NOMINAL dB): Sets the lower bound antenna gain value.

CABLE LOSS INCLUDING INLINE ATTENUATIONS IF USED (NOMINAL dB): Sets the inline cable loss attenuation value.

DESIRED YODA MODULE GAIN (NOMINAL dB): Sets the desired YODA module gain.

GDL CONFIGURABLE ATTENUATION (dB): Sets the desired GDL attenuation value.

ETHERNET PORT 2, 3, 4: Enables and/or disables the desired Ethernet port.

DATA

ID: Displays the identification number for the GDL 69/69A.

ACTIVE: Displays the active status for the GDL 69/69A.

SIGNAL: Displays the signal level for the GDL 69/69A.

0 – no signal

1 – weak signal

2 – adequate signal

3 – good signal

NOTE

Levels 2 and 3 should allow for proper operation of all GDL69/69A audio and weather options. Levels 0 and 1 are likely indications of problems with availability. A “204” message in the signal field indicates that signal information has not initialized.

DIAGNOSTICS (For XM use only, not useful for troubleshooting)

QUALITY OF SERVICE: Displays the quality of service for the GDL 69/69A.

TERRESTRIAL ERROR STATUS: Displays the terrestrial error status for the GDL 69/69A.

SATELLITE 1 ERROR: Displays the error status for satellite 1.

SATELLITE 2 ERROR: Displays the error status for satellite 2.

TUNER STATUS: Displays the tuner status for the GDL 69/69A.

4.11.2 Common Problems

Symptom	Recommended Action
No XM audio is heard	<ul style="list-style-type: none"> • Ensure the following items are not preventing the audio panel from distributing XM audio (reference applicable G1000 Pilot’s Guide): <ul style="list-style-type: none"> ✓ Verify the XM volume is not muted on the AUX – XM RADIO page on the MFD. ✓ Verify no music sources are plugged into the AUX music input jack. ✓ Verify the COM squelch is not open. ✓ Verify the ICS squelch is not open. ✓ Verify the marker beacon tones are not being received. ✓ Verify the headphone (if equipped) volume is turned up. • Go to the AUX – SYSTEM STATUS page on the MFD and ensure unit is online. <ul style="list-style-type: none"> ✓ If a red X is present, verify the unit is receiving power at the rack connector. • Ensure there are no GDL alerts in the alert window. If there is an Alert for software or configuration error or mismatch, reload the file noted in the Alert. • Restart the PFD and MFD in configuration mode and go to the GDL page. <ul style="list-style-type: none"> ✓ Verify unit is active. ✓ Verify the Signal number is “2” or “3”. If it is “0” or “1” check the GDL 69/69A antenna and cabling for faults. <ul style="list-style-type: none"> ○ Reseat the GDL 69/69A to verify the coax connector is fully seated. ✓ If unit is not active, contact XM Customer service at 1-800-985-9200 to have a refresh signal sent to your unit. You will need to provide them the Audio Radio ID (and Data Radio ID number for XM weather) numbers. Also verify with XM that the correct Weather package (Aviator Lite or Aviator) is on the account, and that no traffic service has been activated against that Radio ID. The unit must be on for approximately one hour after the request for the refresh has been sent to receive the signal. <ul style="list-style-type: none"> ○ Alternatively, you may also go to XM’s website at http://www.xmradio.com/refresh/ and enter the radio IDs to have a refresh signal sent. ✓ If there is still problems receiving weather products after performing the above step, call XM and have the account deactivated, and a new account activated to clear out any corrupt account information. • Verify there is a good ground connection through the aircraft between the MFD and the GDL69/69A unit. Reference the Aircraft Maintenance Manual for instructions on how to check bonding and ground points. <ul style="list-style-type: none"> ✓ If problem persists, replace the GDL 69/69A.
No XM weather information is displayed	

4.11.3 GDL 69/69A Related Alerts

Message	Cause	Solutions
GDL 69 FAIL – GDL 69 has failed.	The G1000 has detected a failure in the GDL 69/69A.	<ul style="list-style-type: none"> • Replace GDL 69A. • Check GDL 69A antenna and cabling. • Check the GDL 69A and MFD interconnect.
GDL69 CONFIG – GDL 69 configuration error. Config service req'd.	The G1000 has detected a GDL 69A configuration mismatch.	<ul style="list-style-type: none"> • Reload GDL configuration files. <ul style="list-style-type: none"> ✓ If problem persists, replace master configuration module, check configuration module harness for faults and replace if necessary. <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px 0;">NOTE</div> <p>New Terrain/Obstacle cards, Jeppesen Aviation Database and other optional features (i.e. TAWS unlock card) will need to be replaced if the master configuration module is changed. The G1000 System ID number will change to a new number when installing a new master configuration module. The old Terrain and other cards will no longer work as they will remain locked to the old System ID number.</p>
MANIFEST – GDL software mismatch. Communication halted.	The system has detected an incorrect software version loaded in GDL 69A.	<ul style="list-style-type: none"> • Load correct software version.

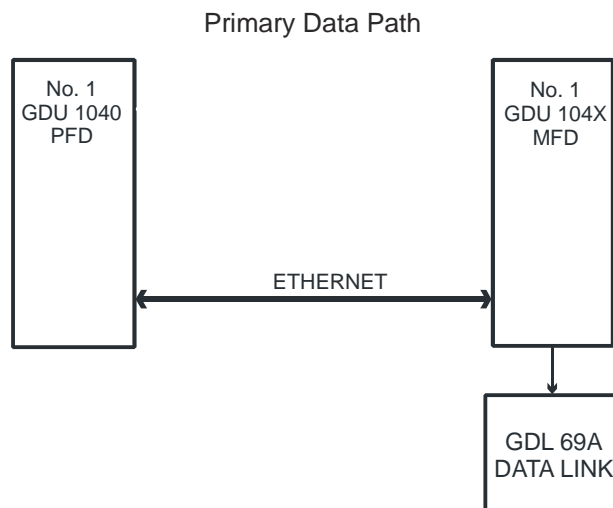


Figure 4-25. GDL 69 Data Paths

4.11.4 GCU 476 Troubleshooting

Failure Message	Cause	Solutions
MANIFEST – GCU software mismatch. Communication Halted.	The system has detected an incorrect software version loaded into the GCU 476.	<ul style="list-style-type: none"> Reload software. See Section 6.11.1 for GCU 476 Software Load Procedure.
GCU CONFIG - GCU config error. Config service req'd.	The system has detected a GCU configuration mismatch.	<ul style="list-style-type: none"> See Section 6.11 for GCU 476 Configuration Procedure.
GCU FAIL – The GCU 476 has failed.	The system has detected a failure in the GCU 476.	<ul style="list-style-type: none"> Ensure GCU 476 is receiving power. Check GCU wiring. Replace GCU 476 if problem persists.
GCU PATH – A GCU path has failed.	The system has detected a path from the GCU 476 to the PFD or MFD is bad.	<ul style="list-style-type: none"> Check GCU wiring. Check status of GCU-MFD1 and GCU-PFD1 in configuration mode on the system status page. Replace the display.

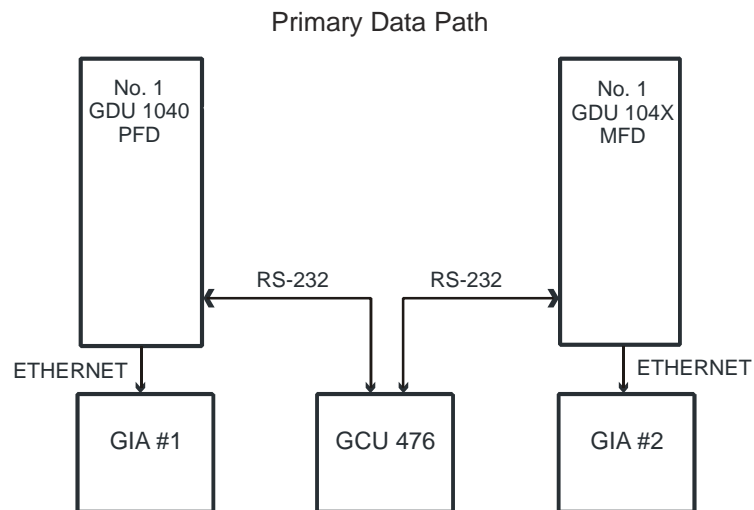


Figure 4-26. GCU 476 Data Paths

4.12 GFC 700

4.12.1 Configuration Pages

4.12.1.1 GFC Configuration Page

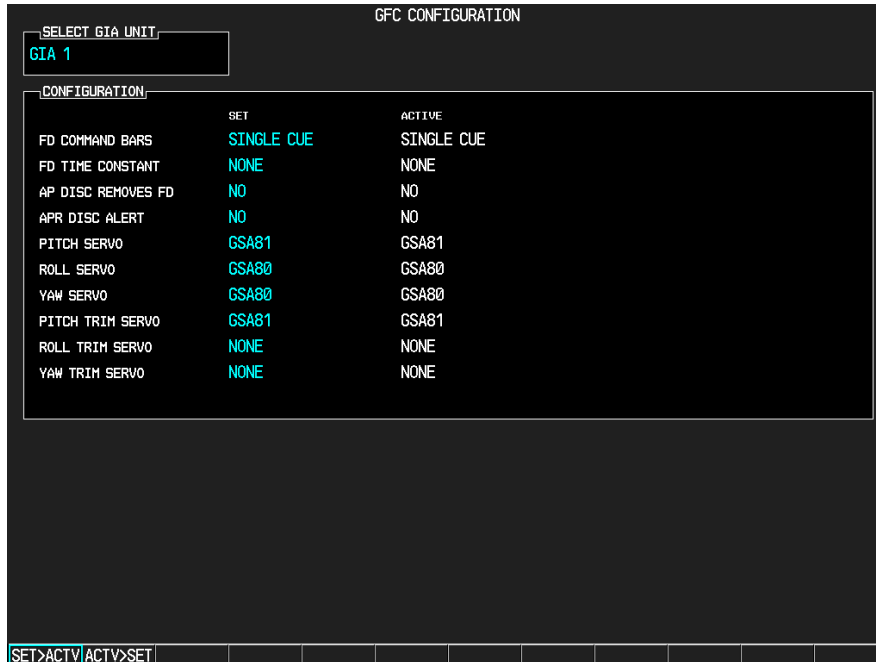


Figure 4-27. GFC CONFIGURATION Page

All settings are contained in the GFC configuration file.

CAUTION

The data contained on this page is extremely critical to aircraft safety.

SELECT GIA UNIT

This window shows the currently selected GIA.

CONFIGURATION

FD COMMAND BARS: Selects the type of flight director command bars.

FD TIME CONSTANT: Selects the flight director time constant.

AP DISC REMOVES FD: Turns the autopilot disconnect removes flight director function on or off.

AP DISC ALERT: Turns the approach disconnect alert on or off.

PITCH SERVO: Shows the currently selected pitch servo.

ROLL SERVO: Shows the currently selected roll servo.

YAW SERVO: Shows the currently selected yaw servo.

PITCH TRIM SERVO: Shows the currently selected pitch trim servo.

ROLL TRIM SERVO: Shows the currently selected roll trim servo.

YAW TRIM SERVO: Shows the currently selected yaw trim servo.

4.12.1.2 GFC Status Page

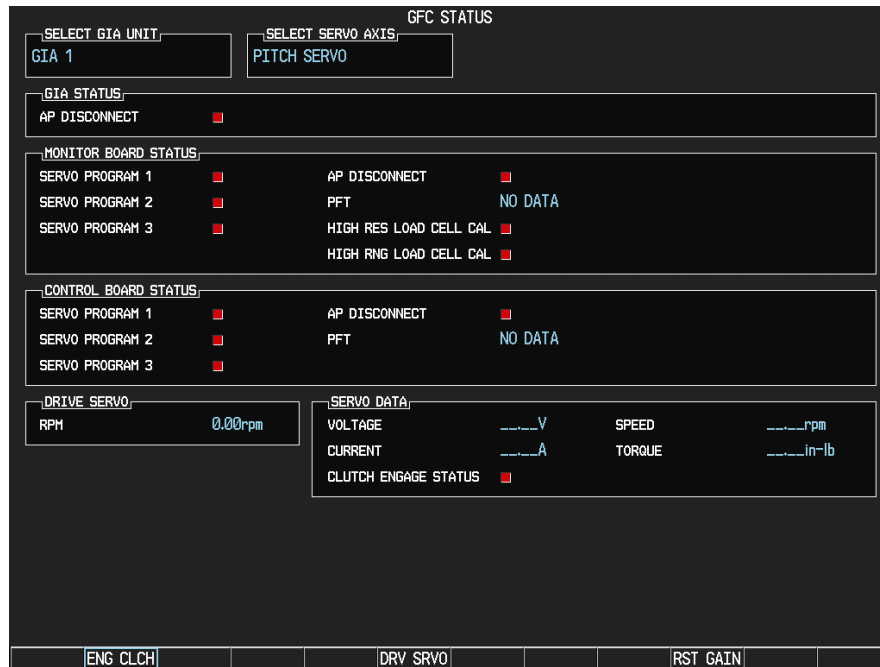


Figure 4-28. GFC STATUS Page

SELECT GIA UNIT

This window shows the currently selected GIA.

SELECT SERVO AXIS

This window shows the currently selected servo axis.

GIA STATUS

AP DISCONNECT: Shows the condition of the autopilot disconnect. A green box indicates the AP disconnect connection to the GIA is actively receiving power. A black box indicates the AP disconnect switch is no longer receiving power.

MONITOR/CONTROL BOARD STATUS

Shows the condition of various monitor board components.

SERVO PROGRAM (1-3): Servo program discreets are used to determine the HW strapping for each GSA to define the servo type. This information can be cross-referenced against the system interconnects to verify proper servo grounding.

AP DISCONNECT: A green box is displayed if the GSA AP Disconnect input is receiving power.

PFT: Indicates whether the pre-flight test has passed or failed.

HIGH RES & HIGH RNG LOAD CELL CAL: Shows the condition of the high resolution and high range load cells on the monitor board. If box is black, return to Garmin.


DRIVE SERVO

Shows the revolutions per minute (RPM) of the drive servo.

SERVO DATA

Shows various servo data such as: voltage, speed, current, torque, clutch settings. A green box indicates the servo clutch is engaged.

4.12.2 GFC 700 Pre-Flight Test Sequence and Troubleshooting

This section was created to help determine why the GFC700 has failed the Pre-Flight Test indicated by the PFT red annunciation - . It defines the PFT sequence for the servos and the GFC 700 system and then provides troubleshooting information to help resolve failures.

There are 16 steps to the GFC700 PFT. The PFT is performed by both GIAs at startup, and needs to pass on both GIAs before the autopilot can be engaged.

The PFT is only started if the AHRS has aligned, the GIAs and servos are configured and the certification gains are valid. If the PFT has not completed after one minute from when the initialization started, the PFT will fail. After the system PFT has passed, it will be performed again if a servo resets, if the autopilot servo breaker is reset or the cross side GIA restarts it.

Generally, the PFT failure fault is logged in the GIA Maintenance Log and not in the Servo Maintenance Logs unless the GIA log fault identifies a servo problem.

NOTE

A thorough understanding of operating and understanding the G1000 system in Configuration mode is recommended before you start this procedure.

To access the GIA and GSA Maintenance Logs, perform the following steps –

1. Start the G1000 in Configuration mode.
2. Use the FMS knob on the PFD to go to the Diagnostics Terminal page in the System group. This page allows the technician to view maintenance logs associated with the GFC 700.
3. Choose “GIA 1” or “GIA 2” in the LRU window.
4. In the SERVO window, choose “NONE” to view the GIA Maintenance Log, or choose a servo to view their logs.
5. Using the FMS knob, choose “VIEW MAINTENANCE LOG” in the COMMAND window.
6. Press the ENT key.
7. Scroll through the OUTPUT list by pressing the OUTPUT softkey to view the stored faults.

The GIA Maintenance Log can record any of the following faults:

- **FCS Task not started: Bad gains**

The FCS task has not started because the gains are not present or have been corrupted.

Reload the gain files to correct.

- **FCS Task not started: Gain structure out of range**

The FCS task has not started because the gains are not compatible with the GIA software.

Reload the gain files to correct.

- **PFT FAIL: Timeout, <STEP>**

Pre-flight test has failed because the specified step has not passed in the allotted time. See the GIA pre-flight steps for a description of the possible values for <STEP> on the failed GIA and corrective actions.

- **PFT FAIL: Cross GIA Failed, State: <STEP>**

Pre-flight test has failed on opposite GIA. <STEP> specifies the pre-flight test step on selected GIA that was in progress when the pre-flight test failed on the opposite GIA. See the GIA pre-flight steps for a description of the possible values for <STEP> on the failed GIA and corrective actions.

- **PFT FAIL: <STEP>**

Pre-flight has failed because the step specified has failed. See the GIA pre-flight test steps for a description of the possible values for <STEP> on the failed GIA and corrective actions.

- **AHRS MON invalid: <STATE>**

The AHRS monitor has detected that the AHRS data is invalid. The possible values for <STATE> are:

- Mon Prmtr Invalid:** The ARINC 429 data used by one of the monitors has not been received.
- Attitude Prmtr Invalid:** The ARINC 429 pitch or roll angle has not been received.
- Exceeded Attitude Limits:** The pitch or roll angle has exceeded the engagement limits.
- Cross Hdg Accel Fail:** Cross heading acceleration monitor failed.
- Vert Accel Fail:** Vertical acceleration monitor failed.
- Fltrd Cross Hdg Accel Fail:** Filtered cross heading acceleration monitor failed.
- Fltrd Vert Accel Fail:** Filtered vertical acceleration monitor failed.
- Roll Accel Fail:** Roll acceleration monitor has failed.
- Normal Accel Fail:** Normal acceleration has failed.

Troubleshoot the GRS 77 for the cause of the failure.

- **Stuck switch invalidated parameter: <AXIS>**

A MET switch in the specified axis is stuck.

Check the MET (trim) switches for proper operation.

- **PRMTR: <PARAMETER> MODE:<MODE> Parameter lost**

The mode specified by <MODE> has been disengaged because the parameter specified by <PARAMETER> has become invalid. The following is a list of some of the possible values for <PARAMETER>:

- AD TDM Comm Valid:** The specified mode has been disengaged because communication with the servos, via the Time Division Multiplexer protocol, has been lost.
- AP Pitch MET not stuck:** The specified mode has been disengaged due to a stuck pitch MET switch.

Check the MET (trim) switches for proper identification.

4.12.2.1 GIA Pre-Flight Test Steps

- **PFT Step 0: System initializing, verify GFC powered**

This step checks to ensure the GFC is powered up.

Ensure the GIA is connected to the autopilot disconnect on the GFC Configuration page.

Ensure all configured servos are communicating on the System Status page.

- **PFT Step 1: System initializing, verify GIA audio is valid**

This step checks to ensure the GIA audio region has been loaded and configured.

Load GIA audio files to correct.

- **PFT Step 2: System initializing, verify required servos are configured**

This step checks to ensure the current servo configuration matches the servo configuration specified in the certification gain file.

Reload the gain files to correct.

- **PFT Step 3: System initializing, verify selected side**

This step checks to ensure the PFD is online and sending the selected AFCS side data over HSDB to the GIA.

Ensure the PFD is turned on.

Ensure the Ethernet connection from the PFD to the GIA is functioning.

- **PFT Step 4: System initializing, verify AHRS monitor**

This step checks to ensure the AHRS monitor is valid and not reporting an AHRS failure. NOTE: AHRS monitor will be assumed valid if on the ground.

Ensure the GRS 77 and GDC 74 are turned on and sending valid data.

- **PFT Step 5: System initializing, verify configured servos are valid**

This step checks to ensure that none of the servos are reporting any type of failure. Note that trim servos will report a failure on stuck MET switches.

Ensure MET switch is not stuck.

Cycle power on all servos.

- **PFT Step 6: System initializing, verify cross GIA valid**

This step checks to ensure the cross-side GIA is online and communicating with all servos from ARINC 485 data lines. The cross-side GIA must also pass its AHRS monitoring.

Ensure both GIAs are online and communicating with all servos.

- **PFT Step 7: Verify cross GIA initialized**

This step checks to ensure the cross-side GIA is initialized.

Cycle power on all servos and GIAs.

Ensure the PFD and MFD are turned on.

- **PFT Step 8: Verify servo type**

This step checks to ensure the servos are correct type.

Verify servos are correct type.

- **PFT Step 9: Verify servo first certification data**

This step checks to ensure the servos and the GIAs have the same certification gains.

Reload the certification gains to all GIAs and servos.

- **PFT Step 10: Verify servo second certification data**

This step checks to ensure the servos and the GIAs have the same certification gains.

Reload the certification gains to all GIAs and servos.

- **PFT Step 11: Updating servo RTC**

This step sets the servo system time to the GIA system time.

- **PFT Step 12: Verify servo PFT status**

This step checks to ensure all servos have passed their own pre-flight test.

- **PFT Step 13: Verify AP disconnect enabled**

This step checks to ensure GIA 1, GIA 2, and all servos are connected to the 28 volt autopilot disconnect.

Ensure the autopilot disconnect is connected to all GIAs and servos and is registering 28 volts.

Ensure the autopilot disconnect switch is not pressed.

- **PFT Step 14: Verify servo validity**

This step checks to ensure all servos are online and communicating with valid data.

Ensure all servos are turned on and communicating.

- **PFT Step 15: Verify cross GIA PFT is completed**

This step checks to ensure the cross-side GIA is also on step 14.

Cycle power on all servos and GIAs.

Ensure the PFD and MFD are turned on.

- **PFT Step 16: PFT completed**

The pre-flight test is successfully completed.

- **PFT Step 17: PFT failed**

The pre-flight test has failed.

4.12.2.2 Servo Faults and Troubleshooting

Whenever a servo fault occurs, a status message is logged to the corresponding servo control or monitor maintenance log. This information is also accompanied by a time and date stamp. An “RTC DATE” entry is made every time a servo is powered on, it is normally not useful for troubleshooting.

The following is a listing of possible faults that could be reported in a GSA fault log. Faults can occur in either the monitor board processor or the control board processor, both of which are contained in the GSA unit.

Monitor Processor

The monitor processor contains the logs that are found in these processors -

2 – Pitch Servo

4 – Roll Servo

8 – Pitch Trim Servo

There are two main groupings of faults that can occur in the monitor processor.

The first grouping of faults can occur during the GSA unit pre-flight test (PFT). If there is a fault during PFT the unit will not be able to transition to normal mode and the only way to clear this state would be to cycle unit power.

The second grouping of faults can occur during normal mode. These faults generally cause a disconnect of power to the GSA and report that a fault has occurred to the GIA.

The Notes column indicates any actions that can be taken to troubleshoot the problem in the aircraft by the technician. Any faults that are not listed here indicate an internal problem requiring replacement of the servo. If the items in the Notes column check out ok, replace the servo.

Table 4-1. Monitor Processor PFT Faults

MONITOR PFT STEP	NOTES
"INTERNAL COMM FAIL"	This can sometimes be a result of a failure on the other internal servo board, check faults on the other processor
"UNSW POWER INV"	Check unit power
"MON SOL PWR ON FAIL"	Check unit power and AP Disconnect power
"CTL SOL PWR ON FAIL"	Check unit power and AP Disconnect power
"SOL PWR FAIL"	Check unit power and AP Disconnect power
"CERT DATA UNINSTALLED"	Upload the certification gain file to the Monitor board
"STRAP CODE MISMATCH"	Check the connector strap inputs to the unit

Table 4-2. Monitor Processor Normal Mode Faults

MONITOR FAULT	NOTES
"GIA DIS FAULT"	Check the AP Disconnect power into the unit
"HOST DATA DIF"	Check the AHRS wiring to the system
"HOST DATA INV"	Check the AHRS wiring to the system
"SVO PWR INV"	Check unit power and AP Disconnect power
"STRP CODE CHNG"	Check the connector strap inputs to the unit
"MET STUCK SWITCH"	Check the MET switch inputs into the system
"MET STATUS DIF"	Check the MET switch inputs into the system

Control Processor

The control processor contains the logs that are found in these processors –

- 3 – Pitch Servo
- 5 – Roll Servo
- 9 – Pitch Trim Servo

There are two main groupings of faults that can occur in the control processor.

The first grouping of faults can occur during the GSA unit pre-flight test (PFT). If there is a fault during PFT the unit will not be able to transition to normal mode and the only way to clear this state would be to cycle unit power.

The second grouping of faults can occur during normal mode. These faults generally cause a disconnect of power to the GSA and report that a fault has occurred to the GIA.

The Notes column indicates any actions that can be taken to troubleshoot the problem in the aircraft by the technician. Any faults that are not listed here indicate an internal problem requiring replacement of the servo. If the items in the Notes column check out ok, replace the servo.

Table 4-3. Control Processor PFT Faults

CONTROL PFT STEP	NOTES
"INT COMM TEST FAIL"	This can sometimes be a result of a failure on the other board, check faults on other processor
"CTL MOT PWR ON FAIL"	Check unit power and AP Disconnect power
"MON MOT PWR ON FAIL"	Check unit power and AP Disconnect power
"HALL 1 FAIL"	Check unit power and AP Disconnect power
"HALL 2 FAIL"	Check unit power and AP Disconnect power
"HALL 3 FAIL"	Check unit power and AP Disconnect power
"HALL 4 FAIL"	Check unit power and AP Disconnect power
"HALL 5 FAIL"	Check unit power and AP Disconnect power
"HALL 6 FAIL"	Check unit power and AP Disconnect power
"CURR OFFST FAIL"	Check unit power and AP Disconnect power
"SVO TYPE FAIL"	Check unit power and AP Disconnect power
"CERT DATA UNINSTALLED"	Upload the certification gain file to the Control board
"STRAP CODE MISMATCH"	Check the connector strap inputs to the unit

Table 4-4. Control Processor Normal Mode Faults

CONTROL FAULT	NOTES
"GIA DIS FAULT"	Check the AP Disconnect power into the unit
"HOST DATA DIF"	Check the AHRS wiring to the system
"HOST DATA INV"	Check the AHRS wiring to the system
"SVO PWR INV"	Check unit power and AP Disconnect power
"STRP CODE CHNG"	Check the connector strap inputs to the unit
"MET STUCK SWITCH"	Check the MET switch inputs into the system
"MET STATUS DIF"	Check the MET switch inputs into the system

4.12.2.3 Downloading GIA and GSA Maintenance Logs

If additional assistance is needed troubleshooting autopilot faults, the Maintenance logs can be downloaded to an SD card as a text file (.txt) and emailed to Garmin Aviation Product Support at Avionics@Garmin.com. Please call Garmin Aviation Product Support before you send a Maintenance Log to notify them you are sending it to prevent a delay in response. You may download multiple GIA and GSA Maintenance Logs to the same file, however in your email to Garmin you must furnish the order in which they were downloaded (i.e. GIA1, then GIA2, then SRVO PTCH MON, then SRVO PTCH CTL, etc.).

1. Insert a FAT 32 formatted SD card into the top slot of the PFD before turning on the displays.
2. Power up PFD and MFD in the configuration mode.

-
3. On the PFD in the System page group, use the small FMS knob to scroll to the Diagnostics Terminal page.
 4. Press the LG2CRD softkey at the bottom of the PFD. Verify that the softkey text grays out. This indicates the recording function is active and all text that is displayed in the OUTPUT window will be saved to the card.
 5. Enable the cursor by pressing the FMS knob, select either “GIA1” or “GIA2” in the LRU drop down menu and then press the ENT key to select it.
 6. Servo Fault logs can be retrieved if needed by moving the cursor to the SERVO box and selecting the servo you need to access using the small FMS knob to activate the drop down list and press the ENT key. Be sure to download both the Monitor and Control Logs for that servo.
 7. Move the cursor to the COMMAND box and select “View Maintenance Log” in the drop down menu then press the ENT key. The error log data will be displayed in the OUTPUT box. If you see the “more...press any key to continue” text at the bottom of the screen, you may need to reselect “View Maintenance Log”. Continue to scroll through all the OUTPUT data until you see the text, “End of Fault Log”.
 8. Press the LG2CRD softkey to turn off the recording function.
 9. Wait 1 minute for the system to save the data from the download to the SD card.
 10. While you are waiting for the data to be saved to the SD card, record the order of the LRUs and/or Servos were downloaded so that you can provide that information to Garmin to help decipher the order of the error data.
 11. Power down the G1000 System and remove the SD card.
 12. Insert SD card in the card reader of a laptop or desktop computer and open the “diag_buf_log.txt” file from the SD card using the WordPad program. Verify that all of the fault logs were downloaded by checking for the “End of Fault Log” message at the end of the data.
 13. Insert the fault log as an attachment to an email and include the LRU order how the data was downloaded and send to Garmin Aviation Product Support at avionics@garmin.com.

4.13 Backshell Connectors

The following figures depict the backshell connectors as viewed with the LRU removed.

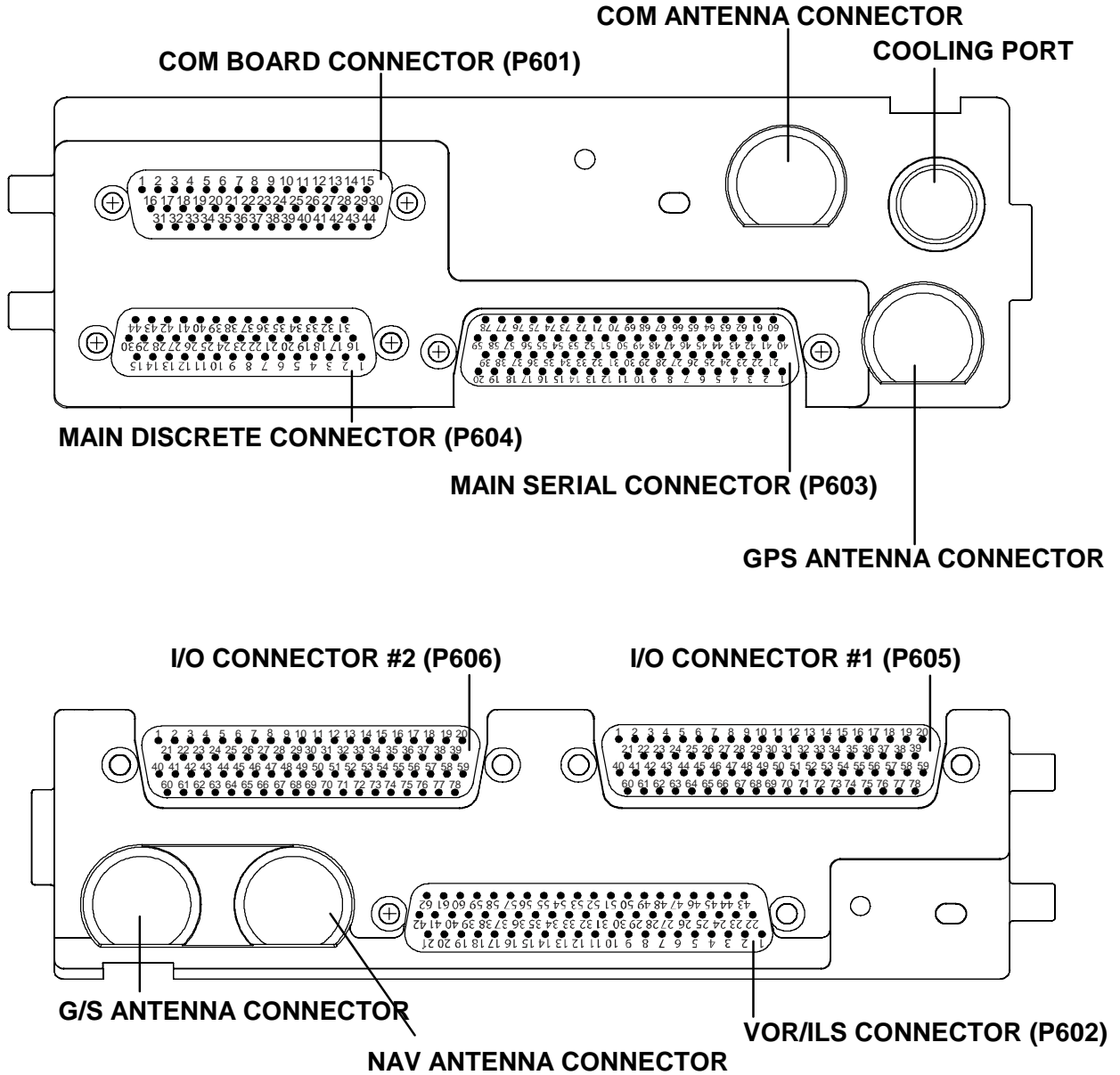


Figure 4-29. GIA 63 Backshell Connectors

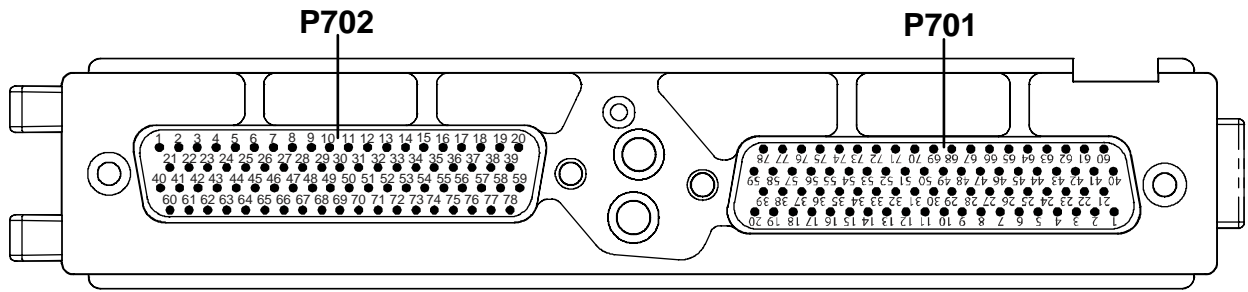


Figure 4-30. GEA 71 Backshell Connectors

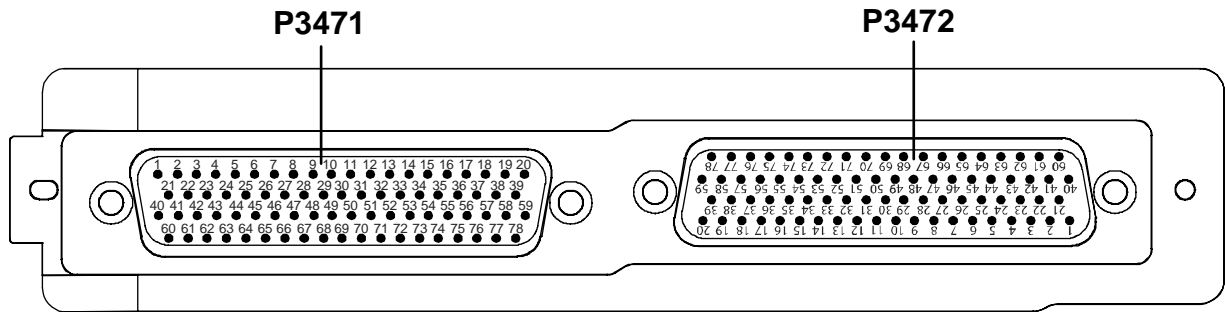


Figure 4-31. GMA 1347 Backshell Connectors

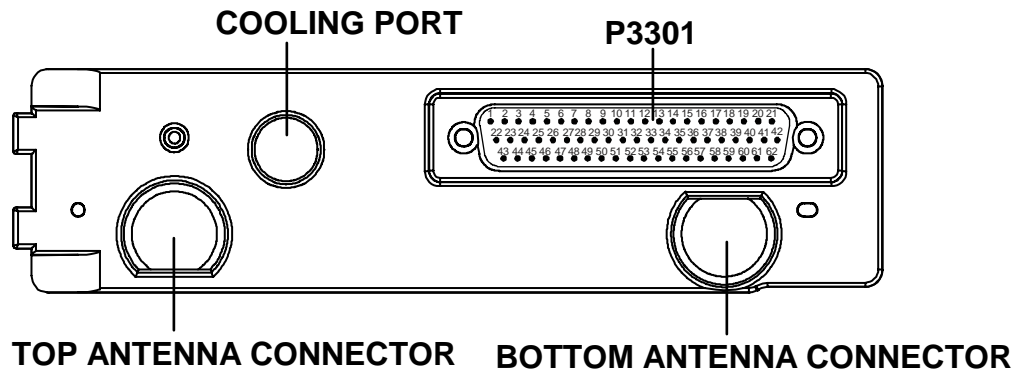


Figure 4-32. GTX 33 Backshell Connectors

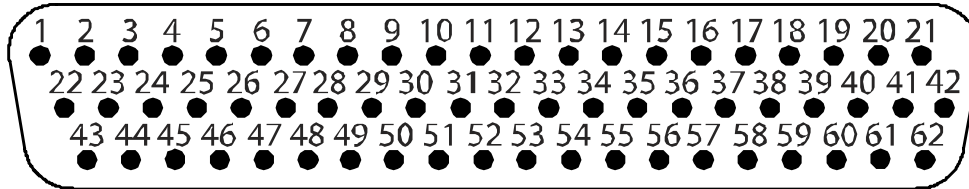


Figure 4-33. GDU 1040/42/44 Backshell Connector (P10001)

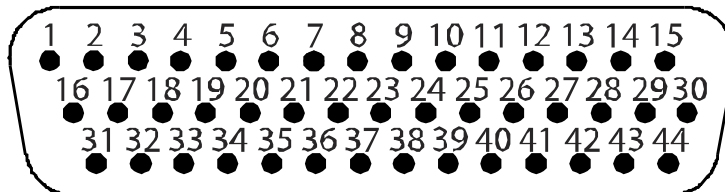


Figure 4-34. GRS 77 Backshell Connector (P771)

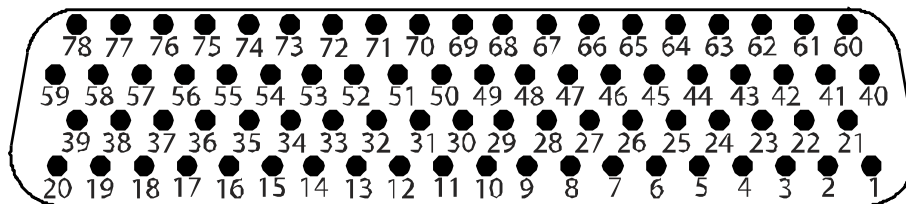


Figure 4-35. GDC 74A Backshell Connector (P741)

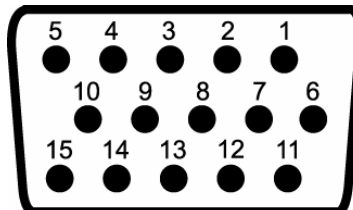


Figure 4-36. GCU 476 Backshell Connector (P4751)

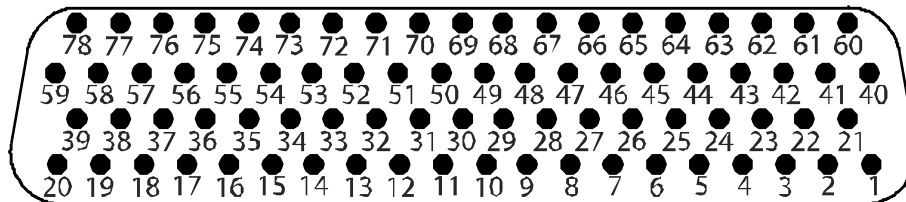


Figure 4-37. GDL 69/69A Backshell Connector (P691)

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5 G1000 EQUIPMENT REMOVAL AND REPLACEMENT

This section describes how to remove and replace G1000 equipment in the Columbia 350/400. After removal and replacement, LRUs must be configured and tested as described in Section 6.

CAUTION

When removing and/or replacing any G1000 component, always ensure that aircraft power is off. Unplug any auxiliary power supplies.

Before removing any G1000 LRU, it is required that the technician verify the LRU software part number and version against the Required Equipment List.

To check an LRU software part number and/or version:

1. Start the G1000 system in configuration mode as described in Section 3.4.
2. The System Status page shows a list of LRUs in the LRU window. Activate the cursor and highlight the LRU window.
3. Use the FMS knob to scroll through the list in the window and select the desired LRU.
4. The software part number and version is displayed in the DATA window. Compare this to the data in the Required Equipment List.

NOTE

If a faulty LRU is not reporting its software version and part number, check aircraft maintenance logs for last software version loaded and verify against the Required Equipment List. The Software Manifest page may also be used to check part numbers and versions.

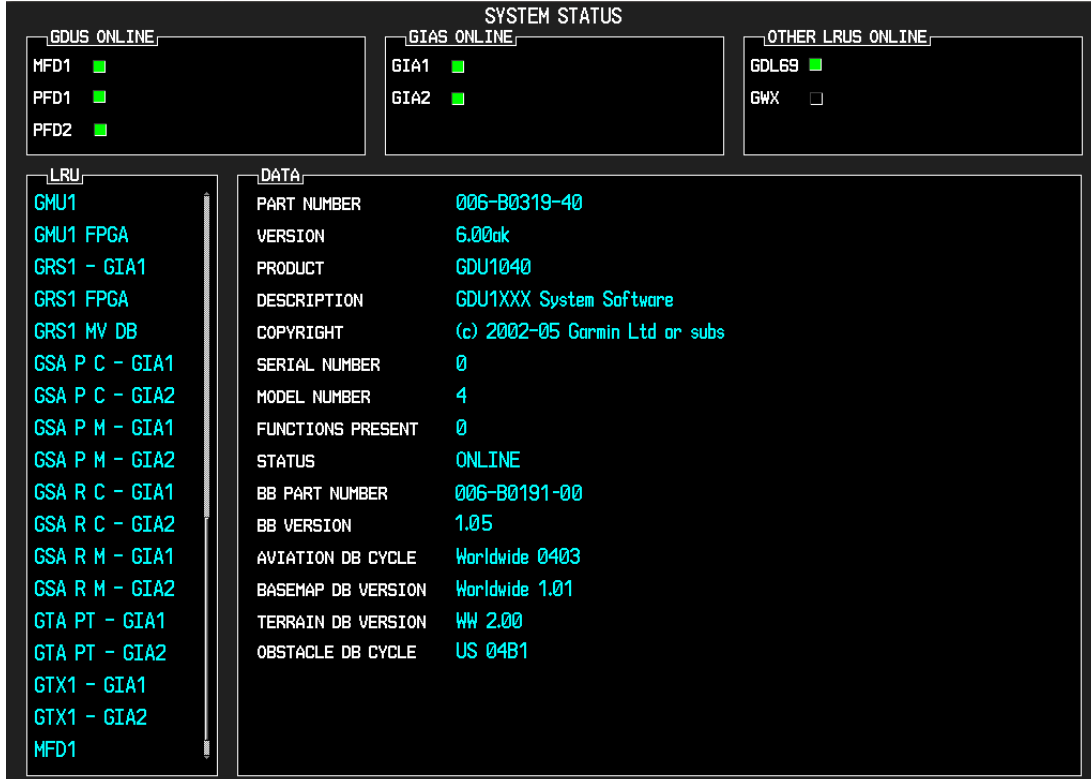


Figure 5-1. System Status Page (Configuration Mode)

5.1 GDU 1040 PFD/GDU 1042 MFD

Removal:

1. Using a 3/32nd hex tool, rotate all four ¼-turn fasteners counter-clockwise until they reach their stops.
2. Carefully remove the display from the panel.
3. While supporting the display, disconnect the connector.

Replacement:

1. Visually inspect the connector and pins for signs of damage. Repair any damage. While supporting the display, connect the connector to the rear of the unit.
2. Carefully insert the display into the panel cutout, ensuring that all four ¼-turn fasteners align with the corresponding holes.
3. Seat the display in the panel cutout. Do not use excessive force while inserting the display.
4. Once seated, rotate all four ¼-turn fasteners clockwise to lock the display to the panel.
5. Load software, configure and test the MFD and/or PFD according to Section 6.1.

5.2 GMA 1347 Audio Panel

Removal:

1. Using a 3/32nd hex tool, turn the hex nut counter-clockwise until the GMA 1347 is unlocked from its location.
2. Carefully remove the GMA 1347 from its rack.

Replacement:

1. Visually inspect the connectors using a flashlight to ensure there are no bent or damaged pins. Repair any damage.
2. Gently insert the GMA 1347 into the rack until the locking tab engages the rack.
3. Begin to turn the hex nut clockwise. This draws the unit into the rack until seated. Do not over-tighten the nut.
4. Load software, configure and test the GMA 1347 according to Section 6.2.

5.3 GIA 63 Integrated Avionics Units

Removal:

1. Remove the MFD as described in Section 5.1.
2. Unlock the GIA 63 handle by loosening the Phillips screw on the handle.
3. Pull the handle upward to unlock the GIA 63. Gently remove the unit from the rack.

Replacement:

1. Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage.
2. Gently insert the GIA 63 into its rack. The handle should engage the dogleg track.
3. Press down on the GIA 63 handle to lock the unit into the rack.
4. Lock the handle to the GIA 63 body using the Phillips screw.
5. Reinstall the MFD as described in Section 5.1.
6. Load software, configure and test the GIA 63(s) according to Section 6.3.

5.4 GEA 71 Engine/Airframe Unit

Removal:

1. Remove the PFD as described in Section 5.1.
2. Unlock the GEA 71 handle by unscrewing the Phillips screw.
3. Pull the handle upward to unlock the GEA 71. Gently remove the GEA 71 from its rack.

Replacement:

1. Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage.
2. Gently insert the GEA 71 into the rack. The handle should engage the dogleg track.
3. Press down on the handle to lock the unit into place.
4. Lock the handle to the GEA 71 body using the Phillips screw.
5. Reinstall the PFD as described in Section 5.1.
6. Load software, configure and test the GEA 71 according to Section 6.4.

5.5 GTX 33 Transponder

Removal:

1. Remove the PFD as described in Section 5.1.
2. Unlock the GTX 33 handle by loosening the Phillips screw on the handle.
3. Pull the handle upward to unlock the GTX 33. Gently remove the unit from the rack.

Replacement:

1. Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage.
2. Gently insert the GTX 33 into its rack. The handle should engage the dogleg track.
3. Press down on the GTX 33 hand to lock the unit into the rack.
4. Lock the handle to the GTX 33 body using the Phillips screw.
5. Reinstall the PFD as described in Section 5.1.
6. Load software, configure and test the GTX 33 according to Section 6.5.

5.6 GDC 74A Air Data Computer

Removal:

1. Remove the PFD as described in Section 5.1.
2. Disconnect the pitot/static plumbing from the rear of the unit. Disconnect the single connector.
3. Loosen each thumbscrew on the hold-down clamp and remove the clamp.
4. Carefully remove the unit from its mount.

Replacement:

1. Place the unit in the mounting tray.
2. Position the locking clamp and fasten using the thumbscrews.
3. Connect the pitot/static plumbing.
4. Inspect the connector and pins for damage. Repair any damage. Connect the connector to the unit.
5. Reinstall the PFD as described in Section 5.1.
6. Load software, configure and test the GDC 74A according to Section 6.6.

5.7 GTP 59 OAT Probe

Removal:

1. Remove the OAT probe cover assembly from the underside of the left wing by removing the Phillips screws.
2. Disconnect the connector.
3. Use a deep-socket to hold the probe in place on the outside of the cover. On the inside of the cover, loosen the GTP 59 mounting nut and remove the GTP 59.

Replacement:

1. Replacement is the reverse of removal.
2. No configuration is required for the GTP 59. Test according to Section 6.6.4.

5.8 GRS 77 AHRS

Removal:

1. Remove pogo tower.
2. Disconnect the AHRS connector.
3. Remove the four Phillips thumbscrews with a screwdriver and set them aside.
1. Gently lift the GRS 77 from the mounting plate. (If the supports for the mounting plate are removed, the GRS 77 must be re-calibrated. See Section 6.7.4. If the mounting plate is removed and reinstalled in *exactly* the same position, the GRS 77 does not need to be recalibrated.)

Replacement:

1. Place the GRS 77 on the mounting plate, ensuring the orientation is correct.
2. Fasten the unit to the plate using the Phillips thumbscrews.
3. Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage. Connect the connector to the GRS 77 .
4. Load software, calibrate and test the GRS 77 according to Section 6.7.
5. Reinstall aft baggage compartment floor.

5.9 GMU 44 Magnetometer

Removal:

1. Remove left wing access cover by unscrewing the Phillips screws.
2. Unscrew the three screws that hold the GMU 44 to its mounting rack.
3. Carefully lift the GMU 44 from the rack.
4. Disconnect the wiring harness.

Replacement:

2. Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage. Connect the wiring harness to the GMU 44.
3. Lower the GMU 44 into the rack and secure the plate with three Phillips screws.
4. Reinstall left wingtip cover.
5. Load software, calibrate and test the GMU 44 according to Section 6.7.

5.10 GDL 69A Data Link

Removal:

1. Remove the PFD as described in Section 5.1.
2. Unlock the GDL 69A handle by unscrewing the Phillips screw.
3. Pull the handle upward to unlock the GDL 69A. Gently remove the GDL 69A from its rack.

Replacement:

1. Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage.
2. Gently insert the GDL 69A into the rack. The handle should engage the dogleg track.
3. Press down on the handle to lock the unit into place.
4. Lock the handle to the GDL 69A body using the Phillips screw.
5. Reinstall the PFD as described in Section 5.1.
6. Load software, configure and test the GDL 69A according to Section 6.8.

5.11 GCU 476

Removal:

1. Remove the setscrew securing the keypad with a 3/32nd hex tool and carefully remove keypad.
2. While supporting the keypad disconnect the connector.
3. Remove the unit.

Replacement:

1. Connect the connector to the back of keypad.
2. Gently place keypad into position.
3. Secure with setscrew using a 3/32nd hex tool. Do not over-tighten.
4. Load software, configure and test according to Section 6.11.

5.12 GSA 81 Autopilot Roll Servo

Removal:

1. Remove the belly access panel.
2. Disconnect servo connector P680 (1P801).
3. Remove the four screws holding servo to servo mount.
4. Remove unit.
5. Remove excess grease build-up from the single servo output gear using a lint-free cloth.

NOTE

It is not necessary to remove all of the grease from the output gear, only the excess grease. DO NOT USE SOLVENTS TO CLEAN THE OUTPUT GEAR!

6. Using a brush or other applicator, apply a thin coat of grease to the servo output gear. Use Aeroshell 17 or equivalent (Synthetic Diester, Low Temp; Must meet MIL-G-21164D).

Replacement:

1. Set unit in place.
2. Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage.
3. Install the four screws holding the servo to the servo mount.
4. Connect servo connector 2P801.

-
5. Load software, load certification gains and test the GSA 81 according to Section 6.9.
 6. Reinstall the belly access panel.

5.13 GSM 85 Autopilot Roll Servo Mount

Removal:

1. Remove the GSA 81 Servo according to Section 5.12.
2. Loosen the turnbuckle and remove the clevis pin holding the bridle cable to the main control tube.
3. Remove the four screws holding the mount to the servo bracket.
4. Remove the unit with the bridle cable.

Replacement:

1. Prior to installation, the slip clutch torque should be checked in accordance with Section 5.17.
2. Set unit in place.
3. Install the four screws holding the mount to the servo bracket.
4. Install the bridle cable and set the cable tension according to drawing LB53402200.
5. Install the GSA 81 servo according to Section 5.12.

5.14 GSA 81 Autopilot Pitch Servo

Removal:

1. Remove the aft upholstery and panel to gain access to the aft fuselage.
2. Disconnect servo connector.
3. Remove the screws holding servo to servo mount (2 each for Pitch).
4. Remove unit.
5. Remove excess grease build-up from the single servo output gear using a lint-free cloth.

NOTE

It is not necessary to remove all of the grease from the output gear, only the excess grease. DO NOT USE SOLVENTS TO CLEAN THE OUTPUT GEAR!

6. Using a brush or other applicator, apply a thin coat of grease to the servo output gear. Use Aeroshell 17 or equivalent (Synthetic Diester, Low Temp; Must meet MIL-G-21164D).

Replacement:

1. Set unit in place.
2. Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage.
3. Install the screws holding the servo to the servo mount (2 each for Pitch).
4. Connect servo connector 2P801 (Pitch).
5. Load software, load certification gains and test the GSA 81 according to Section 6.9.
6. Reinstall the aft panel and upholstery.

5.15 GSM 85 Autopilot Pitch Servo Mount

Removal:

1. Remove the GSA 81 Servo according to Section 5.14.
2. Loosen the turnbuckle and remove the clevis pin holding the bridle cable to the main control tube.
3. Remove the four screws holding the mount to the servo bracket.
4. Remove the unit with the bridle cable.

Replacement:

1. Prior to installation, the slip clutch torque should be checked in accordance with Section 5.17.
2. Set unit in place.
3. Install the four screws holding the mount to the servo bracket.
4. Install the bridle cable and set the cable tension according to drawing LB53402200.
5. Install the GSA 81 servo according to Section 5.14.

5.16 GTA 82 Pitch Trim

Removal:

1. Remove four screws securing the GTA 82 adapter to the panel. The GTA 82 adapter is located under the instrument panel on the pilot side beneath the standby instruments.
2. Disconnect servo connector.
3. Remove unit.

Replacement:

1. Set unit in place.
2. Install four screws. Do not over-tighten.
3. Connect servo connector.
4. Load software, load certification gains and test the GTA 82 according to Section 6.9.

5.17 GSM Slip Clutch Adjustment Procedure

The slip clutches must be adjusted to the limits prescribed on the Autopilot Assembly GIFD drawing, LB53402200. This adjustment requires the use of the Garmin servo adjustment fixture, P/N 011-01085-10 or other approved method. It is recommended that clutches be set in room temperature conditions with low humidity. Temperatures of 15°C to 25°C and less than 50% humidity will yield the best results.

Prior to installing the servo mount, adjust and verify the slip clutch torque is set to the value specified in the GFC 700 Autopilot Installation drawing.

1. Place the servo mount onto the Garmin servo adjustment fixture and secure with toggle clamps.
2. Install the cable supplied with the stand between the capstan under test and the fixture capstan.
3. Remove the slack in the cable with a tension adjust knob.
4. Tighten the thumbscrews on the fixture capstan.
5. Attach a socket to a calibrated torque wrench of the appropriate range and place the assembly on top of the fixture capstan. The torque wrench handle should go through the wrench support so that it contacts the handle in the location appropriate for that particular torque wrench.
6. Connect a 24 VDC power supply to the test stand.

7. Place the solenoid switch to ON and move the direction switch to the CW or CCW position. Allow the capstan to rotate about 1 revolution in each direction.
8. Observe the slip clutch torque on the wrench and adjust the nut on the capstan as needed to obtain the desired torque.
9. Move the nut to align with holes in the capstan shaft for later installation of a locking cotter key.
10. Observe the torque reading for at least one full revolution in each direction.
11. Ensure that the minimum and maximum torque readings are within the tolerances specified in the Autopilot Assembly GIFD drawing, LB53402200
12. When finished, remove the servo mount from the servo adjustment fixture.
13. Install a locking cotter key through the capstan nut and servo mount shaft.

5.18 Configuration Module Removal and Replacement

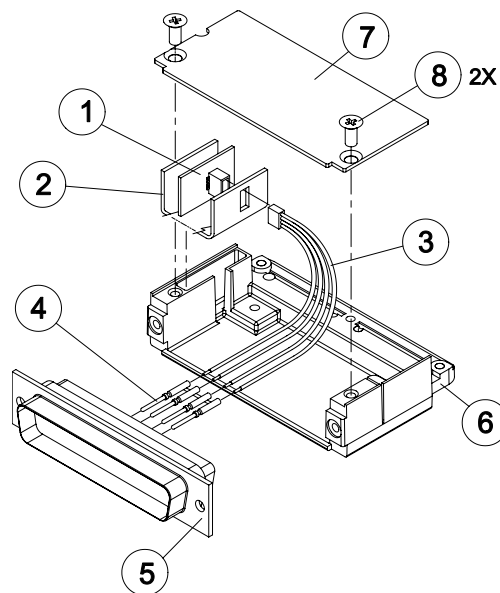


Figure 5-2. Configuration Module Installation

Location of Configuration Modules (Garmin P/N 011-00979-00):

LRU	Connector
GDU 1040 PFD	1P10001
L GEA 71 Engine Airframe Adapter	1P701
R GEA 71 Engine Airframe Adapter	2P701
GRS 77 AHRS	P771
GDC 74A Air Data Computer	P741

Removal:

1. Disconnect connector from LRU.
2. Remove 2 screws (8) from cover (7) and remove cover.
3. Unplug connector from configuration module (1).
4. Remove configuration module.

Replacement:

1. Inspect connector for damaged pins (4).
2. Place configuration module (1) in position.
3. Insert connector into configuration module (1).
4. Assembly of the connector is the reverse of disassembly.

If the GRS 77 AHRS Configuration Module is replaced:

All three GRS 77 /GMU 44 calibration procedures must be performed. Proceed to Section 6.7.4

If GDC 74 Configuration Module is replaced:

Configuration settings must be reloaded to the GDC 74A. Proceed to Section 6.7.4

If GEA 71 Configuration Module is replaced:

No configuration is required.

If the Master Configuration Module is replaced:

NOTE

The G1000 System ID number will change when installing a new master configuration module. New SD database cards, as well as the optional features unlock cards (i.e. TAWS unlock cards, ChartView unlock card), will need to be replaced when the master configuration module is changed. The old data cards will no longer function as they remain locked to the old System ID number.

1. Start the G1000 system in configuration mode as described in Section 3.4.
2. Go to the Configuration Upload Page on the PFD.
3. Press the UPDT CFG softkey.
4. Replace Terrain/Obstacle cards as they will be locked to the old System ID number in the original configuration module.
5. Unlock optional features as appropriate (i.e. TAWS and ChartView). See Section 6.12.

If both the PFD and Master Configuration Module is replaced:

The G1000 system (except GRS 77 /GMU 44 and GDC 74A) must be re-configured. Proceed to Section 6.

5.19 GEA 71 Backshell Thermocouple Removal and Replacement

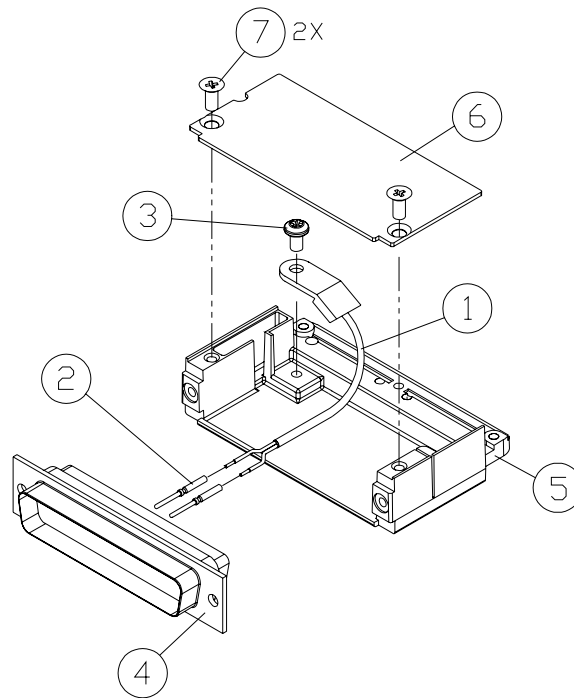


Figure 5-3. GEA Backshell Thermocouple

Table 5-1. Thermocouple Kit (011-00981-00)

Item #	Description	Qty. Needed	Garmin Part Number
1	3" Thermocouple, K type	1	925-L0000-00
2	Pins #22 AWG	2	336-00021-00
3	Screw	1	211-60234-08

Removal:

1. Remove GEA 71 per Section 5.4.
2. Remove GEA connector backplate.
3. Remove connector J701 (5) from the backplate.
4. Remove cover (6) from the backshell.
5. Unscrew thermocouple from boss on backshell. Extract the thermocouple pins from the connector.

Replacement:

1. Crimp pins (2) onto each of the thermocouple wires (1). Ensure that pre-stripped wire length is 1/8" prior to crimping.
2. Insert newly crimped pins and wires into the appropriate connector housing location (4) as specified by the 350/400 avionics wiring diagram.
3. Place thermocouple body (1) onto the backshell boss (5). Place the thermocouple as shown in Figure 5-3 so that the wires exit towards the bottom of the backshell.
4. Fasten thermocouple tightly to backshell using the provided screw (3).
5. Fasten cover (6) to backshell using the provided screws (7).

NOTE

If the GEA thermocouple is replaced, no reconfiguration is required.

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6 G1000 EQUIPMENT CONFIGURATION AND TESTING

This section provides procedures to be followed after a piece of G1000 equipment is replaced. At the beginning of each LRU section, instructions are given to guide the technician for various removal/replacement scenarios. These instructions define necessary procedures to be followed for situations in which original equipment was reinstalled as well as for situations in which new equipment (new serial number) is installed.

CAUTION

Remove Supplemental Database Cards from the lower slot of all displays before loading software into any unit. Not removing the cards may corrupt them. Replacing corrupted database cards are not covered under warranty.

Garmin recommends the use of Sandisk or Toshiba SD cards for loading software and configuration files. Use of other brand cards is not recommended.

WARNING

Connect a ground power unit to the aircraft for software loading. Do not rely on only the aircraft batteries to prevent loss of power during the software loading process. **DO NOT ALLOW POWER TO BE REMOVED FROM THE SYSTEM WHEN LOADING SOFTWARE!** Remove power only when told to do so by the following procedure. As a general rule all displays should be in the same mode (configuration or normal), unless instructed differently.

6.1 GDU 1040 PFD/GDU 1042 MFD

Original Display Reinstalled

If the removed display(s) are re-installed in their original positions, no software or configuration loading is required. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process. Continue to the PFD/MFD Test procedure.

PFD and MFD Displays Installed in Opposite Locations for Troubleshooting

If PFD and MFD are installed in opposite locations for troubleshooting, no software or configuration loading is required. When troubleshooting is complete, displays must be returned to their original positions. Continue to PFD/MFD Test procedure.

New or Repaired Display(s) Installed

If a new GDU 1040 or GDU 1042 is installed, the correct software and configuration files must be loaded to the unit.

6.1.1 PFD/MFD Software Loading using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

1. Pull the MFD or PFD circuit breaker corresponding to the display being replaced.
2. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.

-
3. Insert the appropriate G1000-Columbia 350/400 Code Loader Card into the replaced display top card slot. See the Required Equipment List for correct Loader Card part number.
 4. Hold the ENT and CLR keys on the replaced display and restore power by closing the applicable circuit breaker (power only the replaced unit).
 5. When the words **INITIALIZING SYSTEM** appear in the upper left corner of the display, release the ENT and CLR keys.
 6. Press the ENT key to acknowledge the following prompt:

```
DO YOU WANT TO CLEAR USER SETTINGS?  
PRESS CLR FOR NO AND ENT FOR YES  
YOU HAVE 10 SECONDS BEFORE YES IS RETURNED
```

7. Press the ENT key to acknowledge the following prompt:

```
DO YOU WANT TO UPDATE SYSTEM FILES?  
PRESS CLR FOR NO AND ENT FOR YES  
YOU HAVE 30 SECONDS BEFORE NO IS RETURNED
```

8. The following screen is displayed.

```
DO YOU WANT TO UPDATE SYSTEM FILES?  
PRESS CLR FOR NO AND ENT FOR YES  
YOU HAVE 30 SECONDS BEFORE NO IS RETURNED  
UPDATING SYSTEM FILES. DO NOT TURN OFF POWER !!!  
THIS MAY TAKE UP TO 10 MINUTES
```

9. Software is loaded to the replaced display. When complete, the display starts in configuration mode.
10. If both displays were replaced, repeat steps 1-8 for the opposite display.
11. Continue to the PFD/MFD Configuration procedure.

6.1.2 PFD/MFD Configuration using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX.
Procedures for G1000 systems with GDU version 8.XX follow this section

1. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the PFD top card slot, if it is not already in the PFD.
2. Start both the MFD and PFD in Configuration mode by holding the ENT key during power up until INITIALIZING SYSTEM appears in the upper left corner of the display.
3. On the PFD, go to the Configuration Upload page using the small FMS knob:

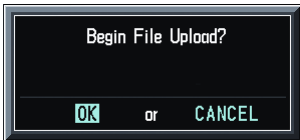


1. Activate the cursor and use the small FMS knob to highlight the airframe type in the FILE field.

NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

2. Press the ENT key to select the appropriate airframe type. Once an airframe type is selected the configuration files in the SECTION field will be displayed.
3. Using the FMS knob, highlight 'AIRFRAME' in the FILE LIST field.
4. Press the LOAD softkey.
5. Select OK and press the ENT key to acknowledge the following prompt:



6. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



7. Highlight 'SYSTEM' in the FILE LIST field and repeat steps 5 through 7.
8. Highlight 'MANIFEST' in the FILE LIST field and repeat steps 5 through 7.
9. Highlight 'MFD1' in the FILE LIST field and repeat steps 5 through 7.
10. Highlight 'PFD1' in the FILE LIST field and repeat steps 5 through 7.
11. Highlight 'CALIBRATION' in the FILE LIST field and repeat steps 5 through 7.
12. View the SUMMARY field and ensure that all items are 'COMPLETE', then de-activate the cursor:

```

SUMMARY
Upload of AIRFRAME configuration.....COMPLETE
Upload of SYSTEM configuration.....COMPLETE
Upload of MANIFEST configuration.....COMPLETE
Upload of MFD 1 configuration.....COMPLETE
Upload of PFD 1 configuration.....COMPLETE
Upload of CALIBRATION configuration.....COMPLETE

```

SYSTEM STATUS		
GDUS ONLINE MFD1 <input checked="" type="checkbox"/> PFD1 <input checked="" type="checkbox"/> PFD2 <input checked="" type="checkbox"/>	GIA5 ONLINE GIA1 <input checked="" type="checkbox"/> GIA2 <input checked="" type="checkbox"/>	OTHER LRUS ONLINE GDL69 <input checked="" type="checkbox"/> GMX <input type="checkbox"/>
LRU GMU1 FPGA GRS1 - GIA1 GRS1 FPGA GRS1 MV DB GSA P C - GIA1 GSA P C - GIA2 GSA P M - GIA1 GSA P M - GIA2 GSA R C - GIA1 GSA R C - GIA2 GSA R M - GIA1 GSA R M - GIA2 GTA PT - GIA1 GTA PT - GIA2 GTX1 - GIA1 GTX1 - GIA2 MFD1 PFD1	DATA PART NUMBER 006-B0319-40 VERSION 6.00ak PRODUCT GDU1040 DESCRIPTION GDU1XXX System Software COPYRIGHT (c) 2002-05 Garmin Ltd or subs SERIAL NUMBER 0 MODEL NUMBER 4 FUNCTIONS PRESENT 0 STATUS ONLINE BB PART NUMBER 006-B0191-00 BB VERSION 1.05 AVIATION DB CYCLE Worldwide 0403 BASEMAP DB VERSION Worldwide 1.01 TERRAIN DB VERSION WW 2.00 OBSTACLE DB CYCLE US 04B1	

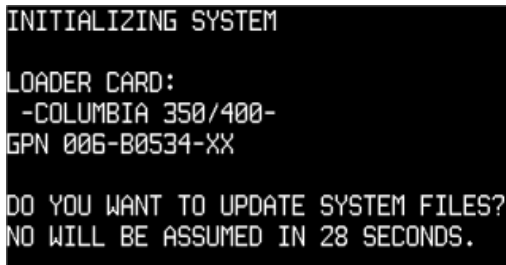
13. At the System Status page, activate the cursor and highlight 'PFD1' and 'MFD1' in the LRU window.
14. Verify that the part number and version of the software reported matches the data in the Required Equipment List.
15. Continue to the Aviation Database Loading procedure.

6.1.3 MFD & PFD software loading and Configuration using GDU V8.XX

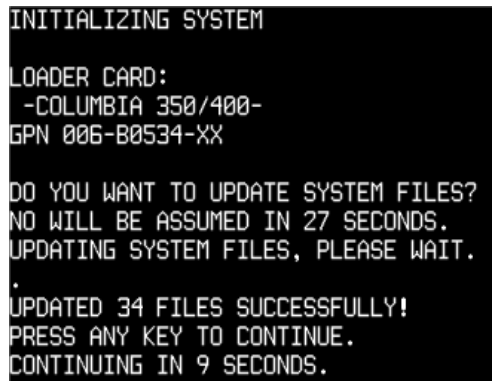
NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section

1. Pull the MFD and PFD circuit breakers.
2. Insert the correct G1000-Columbia 350/400 Loader Card into the MFD top card slot (refer to the Required Equipment List document for the correct card part number).
3. While holding the ENT key on the MFD, restore power by closing the MFD circuit breaker.
4. When the words **INITIALIZING SYSTEM** appear in the upper left corner of the MFD, release the ENT key. (NOTE: A softkey labeled 'YES' appears in the lower right corner and may be used in lieu of the ENT key):



5. The following screen is displayed:



6. New software is loaded to the MFD. When complete, the MFD starts in configuration mode.
7. Remove the G1000 Loader Card from the MFD and insert it into the top card slot on the PFD. Repeat Steps 3 through 7 for the PFD.
8. When the PFD load is complete, it starts in the configuration mode. Do not remove power.

NOTE

For the rest of the software/configuration procedure, do not operate the MFD while loading software or configuration files unless specifically instructed to do so. A failed or cancelled load may result.

9. Continue to the Aviation Database Loading procedure.

6.1.4 Aviation Database Loading

1. Remove power from both displays. Remove the G1000-Columbia 350/400 Code Loader Card from the display.

-
2. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
 3. Insert an aviation database update SD card into the top slot of the PFD.
 4. Apply power to the PFD. The following prompt is displayed in the upper left corner of the PFD:

```
DO YOU WANT TO UPDATE THE AVIATION DATABASE?  
PRESS CLR FOR NO AND ENT FOR YES  
YOU HAVE 30 SECONDS BEFORE NO IS RETURNED
```

5. Press the ENT key to confirm the database update. The following prompt is displayed:

```
DO YOU WANT TO UPDATE THE AVIATION DATABASE?  
PRESS CLR FOR NO AND ENT FOR YES  
YOU HAVE 30 SECONDS BEFORE NO IS RETURNED  
UPDATING AVIATION DATABASE  
*  
UPDATED 1 FILES SUCCESSFULLY!
```

6. After the update completes, the PFD starts in normal mode. Remove the aviation database update SD Card from the PFD.
7. Remove power from the MFD.
8. Repeat steps 3 through 5 for the MFD. The MFD and PFD aviation databases are now updated.
9. Confirm that the correct update cycle and version is loaded during startup of the MFD.
10. Remove the aviation database update SD Card from the MFD.
11. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
12. Continue to the PFD/MFD Test procedure.

6.1.5 PFD/MFD Test

1. Allow displays to initialize for ~1 minute.
2. Check that all COM/NAV display fields are valid in the top corners of the display.
For PFD: Check that attitude, heading, altitude, airspeed, vertical speed and OAT fields are valid within 2 minutes of power up.
For MFD: Check that the engine instrument fields are valid.

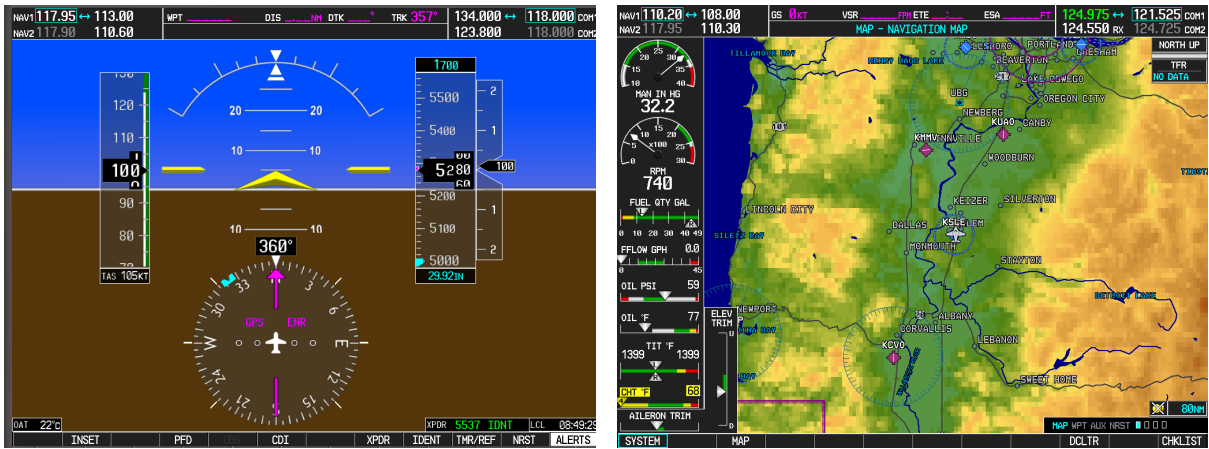


Figure 6-1. G1000 Normal Mode Check

3. Push the red display reversion button on the GMA 1347. Verify both displays enter reversionary mode (both should have valid attitude, heading, altitude, airspeed, vertical speed, and engine instruments):



Figure 6-2. G1000 Reversionary Mode Check

4. De-activate reversionary mode by pushing the red reversion button again.
5. If no other service is to be performed, perform final return to service test as specified in Section 7.

6.2 GMA 1347 Audio Panel

Original GMA 1347 Reinstalled

No software/configuration loading or testing is required if the removed GMA 1347 is re-installed. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process. Continue to the final return-to-service checks in Section 7.

New or Repaired GMA 1347 Installed

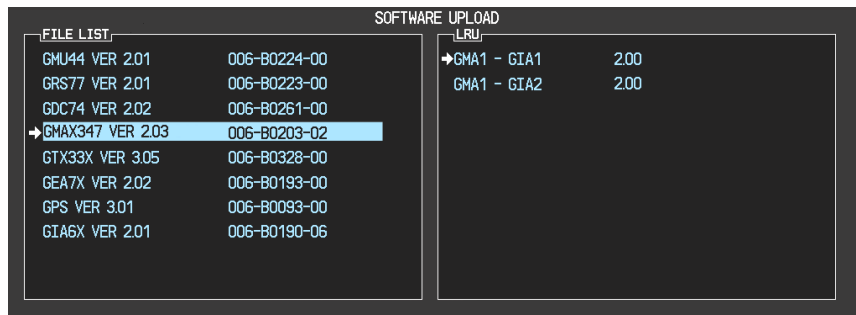
If a new GMA 1347 is installed, the correct software and configuration files must be loaded to the unit.

6.2.1 GMA 1347 Software Loading using GDU V6.XX

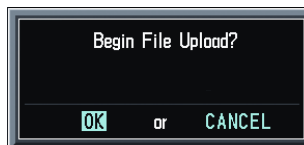
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section

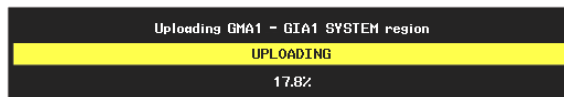
1. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
2. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
3. Start the G1000 system in Configuration mode.
4. On the PFD, go to the Software Upload page using the small FMS knob.
5. Highlight the GMA software file. Ensure that both paths to the GMA through GIA1 and GIA 2 appear in the LRU field as shown:



6. Press the LRU softkey. Select the GMA1 - GIA1 data path to load software. Press the LOAD softkey.
7. Select OK and press the ENT key to acknowledge the following prompt:



8. The software for the GMA 1347 Audio Panel begins to load. Monitor the upload status as it progresses:



- After the file finishes loading, press ENT to acknowledge the following prompt:



- Check the SUMMARY field to ensure the load is 'COMPLETE'.
- Continue to the GMA 1347 Configuration procedure.

6.2.2 GMA 1347 Configuration using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section

- Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
- Start the G1000 system in Configuration mode.
- On the PFD, go to the Configuration Upload page using the small FMS knob:

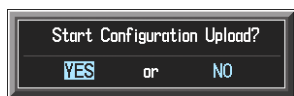


- Activate the cursor and use the small FMS knob to highlight the airframe type in the FILE field.

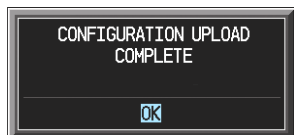
NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

- Press the ENT key to select the appropriate airframe type. Once an airframe type is selected the configuration files in the SECTION field will be displayed.
- Using the FMS knob, highlight 'GMA 1' in the FILE LIST field.
- Press the LOAD softkey.
- Select OK and press the ENT key to acknowledge the following prompt:



9. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



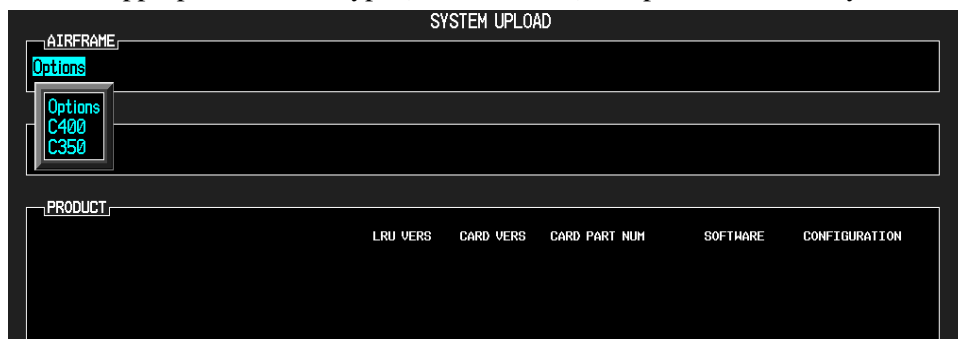
10. View the SUMMARY field and ensure that the load is 'COMPLETE', then de-activate the cursor.
11. Go to the System Status page.
12. Activate the cursor and highlight 'GMA1 – GIA1' in the LRU window.
13. Verify that the reported part number and version of the software file matches the data in Required Equipment List.
14. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
15. Continue to the GMA 1347 Test procedure.

6.2.3 GMA 1347 Software Load and Configuration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section

1. On the PFD, go to the System Upload page using the small FMS knob.
2. Activate the cursor and use the small FMS knob to highlight the airframe type in the AIRFRAME field. Select the appropriate aircraft type (C400 or C350) and press the ENT key.



NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

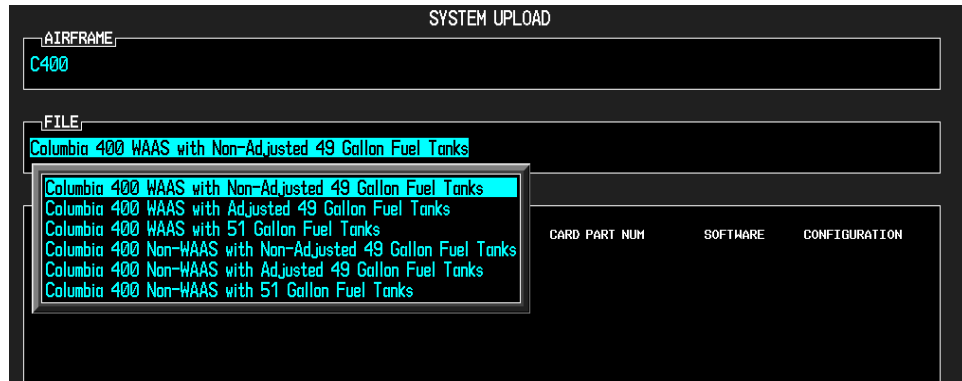
3. Once an airframe type is selected the cursor moves to the FILE window. Rotate the small FMS knob to activate the drop-down menu. Three FQIS fuel tank options are available: 49 gallon (non-adjusted); 49 gallon (adjusted); 51 gallon. Confirm the serial number of the aircraft prior to selection as well as inspect logbooks for field upgrades according to the following table.

	C350	C400	Comments
49 Gallon (non-adjusted)	42502 - 42564	41563 - 41757	Verify logbooks for compliance with Columbia Service Letter SL-07-008B
49 Gallon (adjusted)	42565 - 42567	41758 - 41799	
51 Gallon	42568 and higher	41800 and higher	Inspect fuel tank placard

If the aircraft is a Columbia 350 within the serial number range of 42502-42564 or a Columbia 400 within the serial number range of 41563-41757, confirm the FQIS fuel tank option by referencing the aircrafts logbooks. Compliance with Columbia Service Letter number SL-07-008B requires the selection of “49 gallon adjusted”. Columbia aircraft with 51 gallon tanks can be verified by inspection of the fuel tank placard.

NOTE

At this step, select to load WAAS or non-WAAS G1000 software.



- The PRODUCT window will populate and display software and configuration file information for each G1000 LRU. The LRU VERS column shows the currently loaded software version in the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. Each check designates a file to be loaded to the G1000.

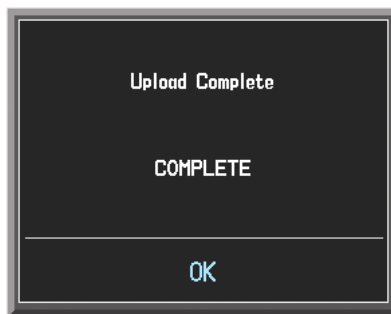



By default, if an inequality between the LRU and CARD columns exists, the SOFTWARE CONFIGURATION boxes will be pre-selected (checked). By default all of the CONFIGURATION boxes will be pre-selected.

The following softkeys provide an easy way to select files:

- CHK ALL: Selects all files, both configuration and software
- CHK SW: Selects all software files only.
- CHK CFG: Selects all configuration files only.
- CLR ALL: Clears all selections.

5. After verifying that the GMA software and configuration files are checked, press the LOAD softkey. It is acceptable to simply load the pre-selected software and config files. The G1000 system automatically begins loading software and default configuration files to the selected LRUs in the proper order.
6. When the system finishes loading, it prompts the technician accordingly. Press the ENT key to acknowledge that the upload is finished:



-
7. Verify that each column indicates  in green when the loading process has finished and inspect the SUMMARY window as well to ensure that the load is successful.
 8. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
 9. Continue to the GMA 1347 Test procedure.

6.2.4 GMA 1347 Test

Except for marker beacon operation, an in-aircraft checkout may be performed in the aircraft with known good microphone, headset, and speaker.

Intercom System (ICS) Check:

1. Plug in headsets at each ICS position.
2. Ensure that the MAN SQ key is off (no light).
3. Adjust volume for each position and verify that the ICS is working properly.
4. Check Pilot and Copilot ICS positions for isolation and proper operation of volume and squelch controls.
5. Press the PA key. Verify that microphone audio is heard over the speaker when the Push-To-Talk (PTT) key is pressed.

Transceiver Operational Check:

Perform a ramp test radio check by exercising the installed transceivers, microphone, microphone key and audio over the headphones and speaker. Verify that communications are clear and PTT operation is correct for each pilot position.

1. Select the audio source corresponding to each installed avionics unit (i.e. NAV1, NAV2, COM1, COM2) and check for audio over the headsets.
2. Press the SPKR key and verify that the selected audio is heard over the speaker.

Failsafe Operation Check:

1. Turn the GMA 1347 off by pulling the AUDIO MKR circuit breaker. This directs all COM 1 phone audio, MIC audio and MIC key to the pilot's position.
2. Check the failsafe operation by exercising the COM 1 microphone, microphone key and audio over the headphones. All volume control for the COM audio should be through the PFD/MFD volume control. Verify proper operation of COM 1 using the failsafe operation.
3. Close the AUDIO MKR circuit breaker to continue testing.

Marker Beacon Test:

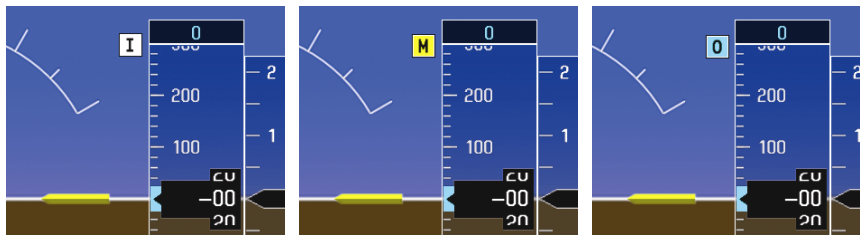


Figure 6-3. Marker Beacon Symbology

Using a ramp tester, simulate the outer marker, middle marker and inner marker signals by following the test equipment manufacturer's instructions. Verify that each marker audio signal is present over the headphones and speaker.

Verify that the outer, middle, and inner annunciations appear on the PFD when the corresponding signal is applied. Marker beacon annunciations appear at the upper left corner of the altitude indicator on the PFD. Operate the MKR MUTE key on the GMA 1347 and ensure that the audio signal is muted.

If no other service is to be performed, continue to the return-to-service checks in Section 7.

6.3 GIA 63 Integrated Avionics Unit

Original GIA 63(s) Reinstalled:

No software or configuration loading is required if the removed GIA is re-installed in its original position (GIA1 and GIA2 in their original racks). This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process. Continue to the return-to-service checks in Section 7.

Original GIA 63s Installed in Opposite Locations for Troubleshooting:

No software loading is required if the originally installed GIA units are re-installed in opposite positions (GIA1 and GIA2 in opposite unit racks). However, the units must be re-configured. Continue to the GIA 63 Configuration Loading procedure.

New or Repaired GIA 63(s) Installed

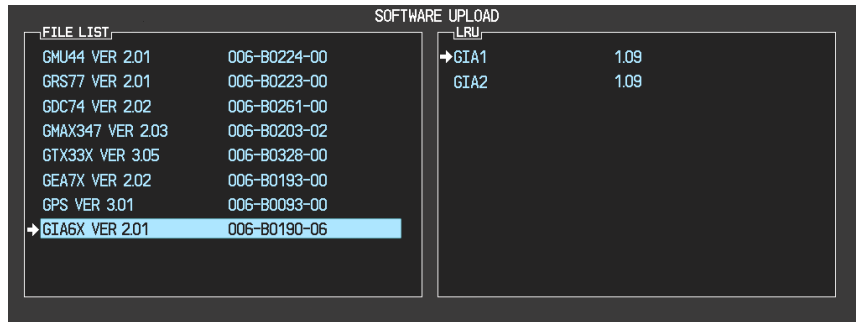
If a new GIA 63 is installed, the correct software, configuration files, and certification gains must be loaded to the unit. Continue to the GIA 63 Software Loading procedure.

6.3.1 GIA 63 Software Loading using GDU V6.XX

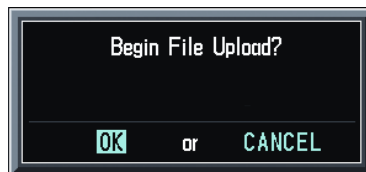
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

1. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
2. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into top slot of PFD.
3. Start the G1000 system in Configuration mode.
4. On the PFD, go to the Software Upload page using the small FMS knob.
5. Activate the cursor and select the GIA software file. Verify that GIA1 and GIA2 appear in the LRU field as shown:



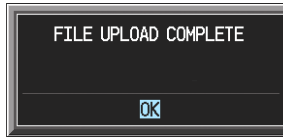
6. Press the LRU softkey and select the appropriate replaced GIA. Press the LOAD softkey.
7. Select OK and press ENT to acknowledge the following prompt:



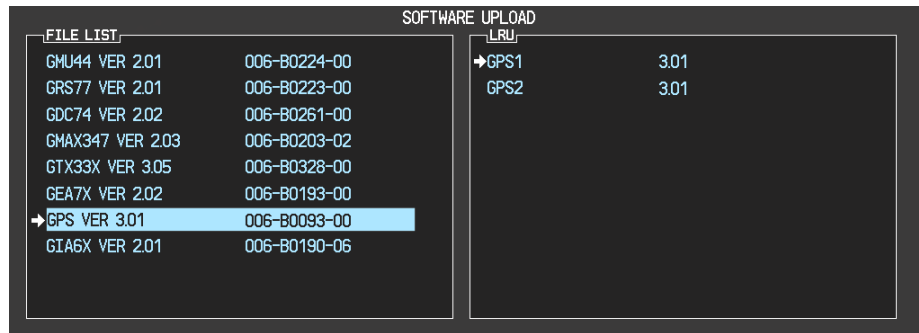
8. The software for GIA1 begins to load. GIA2 software loads immediately after GIA1 software finishes loading. Monitor the upload status as it progresses:



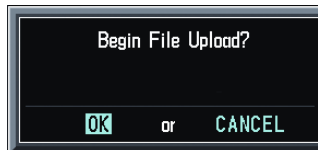
9. After the files finish loading, press ENT to acknowledge the following prompt:



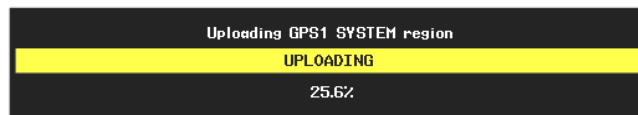
10. View the SUMMARY field and verify that both GIA1 and GIA2 software loading is complete.
 11. Highlight the GPS software file. Ensure that GPS1 and GPS2 appear in the LRU field as shown:



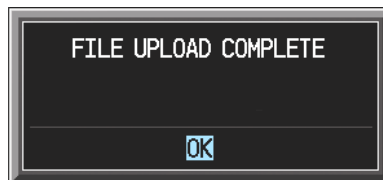
12. Press the LOAD softkey.
 13. Select OK and press the ENT key to acknowledge the following prompt:



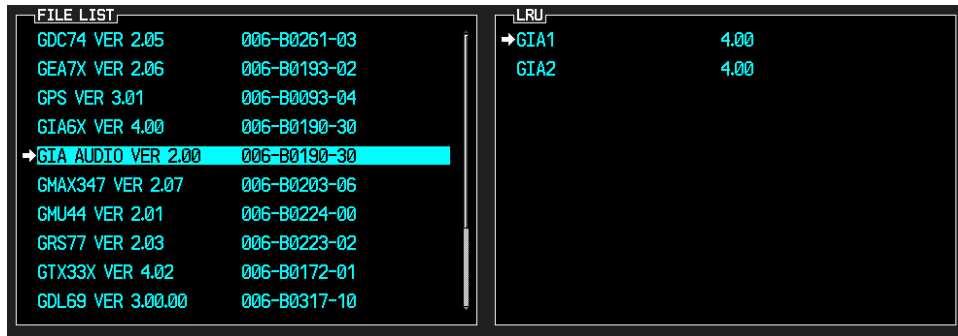
14. The software for GPS1 begins to load. GPS2 software loads immediately after GPS1 software finishes loading. Monitor the upload status as it progresses:



15. After the files finish loading, press ENT to acknowledge the following prompt:



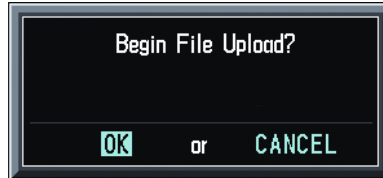
16. Activate the cursor and select the GIA Audio software file. Ensure that GIA1 and GIA2 appear in the LRU field as shown:



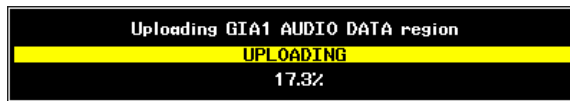
NOTE

The version that appears in the LRU window on the right is the current version of GIA system software. The version that appears in the GIA AUDIO file description on the left is the GIA audio software version. The two versions will not necessarily match.

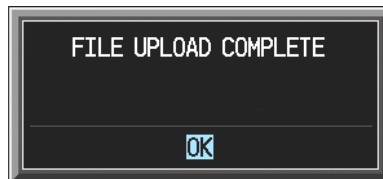
17. Press the LOAD softkey.
18. Select OK and press the ENT key to acknowledge the following prompt:



19. The software for GIA1 Audio begins to load. GIA2 Audio software loads immediately after GIA1 Audio software finishes loading. Monitor the upload status as it progresses:



20. After the files finish loading, press ENT to acknowledge the following prompt:



21. Check the SUMMARY field to ensure the load is 'COMPLETE'.
22. Go to the System Status page.
23. Activate the cursor and highlight each of the following items in the LRU window:
 - GIA1
 - GIA1 Audio
 - GIA2
 - GIA2 Audio
 - GPS1
 - GPS2
24. Check the reported part number/version of each software file and compare to the data in the Required Equipment List.
25. Check the SUMMARY field to ensure the load is 'COMPLETE'.
26. De-activate the cursor.
27. Continue to the GIA 63 Configuration Loading procedure.

6.3.2 GIA 63 Configuration using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section

When swapping GIA #1 and GIA #2, it is not necessary to use the G1000-Columbia 350/400 Code Loader Card to reconfigure the units. After swapping the units, go to the GIA RS232/ARINC 429 Configuration page and press the SET>ACTV softkey. This will load the stored configuration into GIA #1. After configuring GIA #1, select GIA #2 at the top left of the page and once again press the SET>ACTV softkey. Both GIA #1 and GIA #2 are now reconfigured.

1. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Configuration Upload page using the FMS knob:

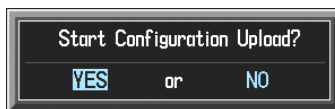


4. Activate the cursor and use the small FMS knob to highlight the airframe type in the FILE field.

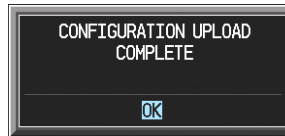
NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

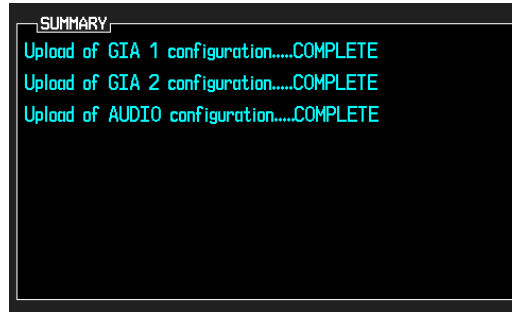
5. Press the ENT key to select the appropriate airframe type. Once an airframe type is selected the configuration files in the SECTION field will be displayed.
6. Using the FMS knob, highlight GIA1 in the FILE LIST field.
7. Press the LOAD softkey.
8. Select YES and press ENT to acknowledge the following prompt:



-
9. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



10. Highlight GIA2 in the FILE LIST field and repeat Steps 3 through 5.
11. Highlight AUDIO in the FILE LIST field and repeat Steps 3 through 5.
12. View the SUMMARY field and ensure that all items are 'COMPLETE':



13. De-activate the cursor.

NOTE

After loading the GIA2 configuration, the configuration for the WX-500, Ryan TCAD and Oxygen options will have to be loaded (if installed) according to Section 6.12.

14. Continue to the GIA Certification Gain Loading procedure.

6.3.3 GIA 63 Certification Gain Loading

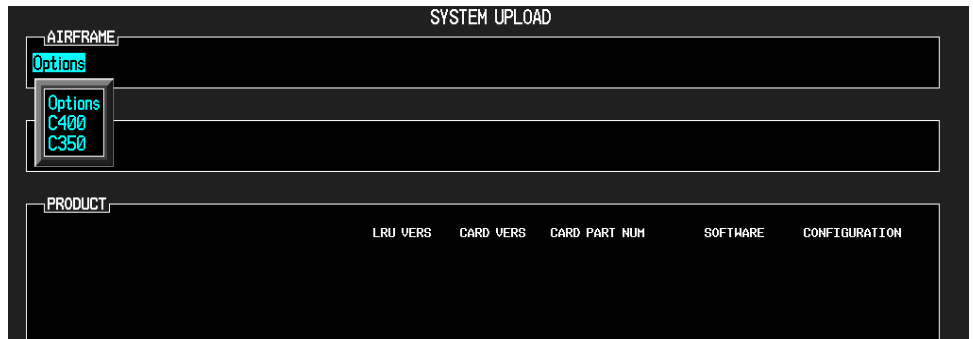
1. Load certification gains into GIA1 and GIA2 according to Section 6.9.3.
2. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
3. Continue to the GIA Test procedure.

6.3.4 GIA 63 Software Load and Configuration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section

1. On the PFD, go to the System Upload page using the small FMS knob.
2. Activate the cursor and use the small FMS knob to highlight the airframe type in the AIRFRAME field. Select the appropriate aircraft type (C400 or C350) and press the ENT key.



NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

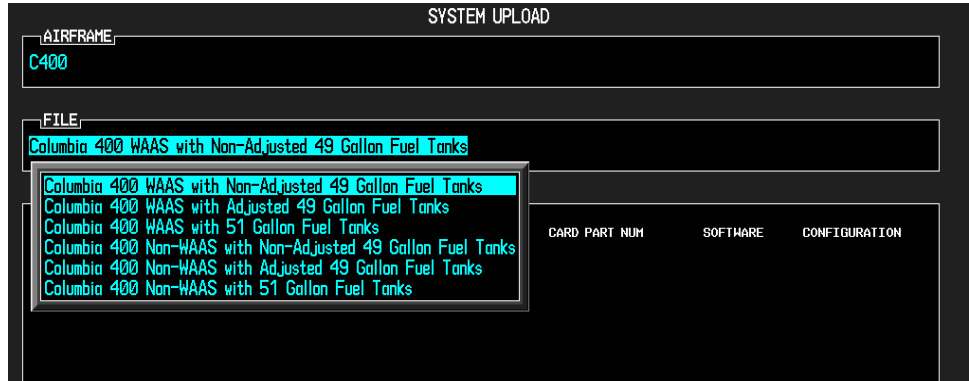
3. Once an airframe type is selected the cursor moves to the FILE window. Rotate the small FMS knob to activate the drop-down menu. Three FQIS fuel tank options are available: 49 gallon (non-adjusted); 49 gallon (adjusted); 51 gallon. Confirm the serial number of the aircraft prior to selection as well as inspect logbooks for field upgrades according to the following table.

	C350	C400	Comments
49 Gallon (non-adjusted)	42502 - 42564	41563 - 41757	Verify logbooks for compliance with Columbia Service Letter SL-07-008B
49 Gallon (adjusted)	42565 - 42567	41758 - 41799	
51 Gallon	42568 and higher	41800 and higher	Inspect fuel tank placard

If the aircraft is a Columbia 350 within the serial number range of 42502-42564 or a Columbia 400 within the serial number range of 41563-41757, confirm the FQIS fuel tank option by referencing the aircrafts logbooks. Compliance with Columbia Service Letter number SL-07-008B requires the selection of “49 gallon adjusted”. Columbia aircraft with 51 gallon tanks can be verified by inspection of the fuel tank placard.

NOTE

At this step, select to load WAAS or non-WAAS G1000 software.



- The PRODUCT window will populate and display software and configuration file information for each G1000 LRU. The LRU VERS column shows the currently loaded software version in the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. Each check designates a file to be loaded to the G1000.



By default, if an inequality between the LRU and CARD columns exists, the SOFTWARE and CONFIGURATION boxes will be pre-selected (checked).

The following softkeys provide an easy way to select files:

CHK ALL: Selects all files, both configuration and software

CHK SW: Selects all software files only.

CHK CFG: Selects all configuration files only.

CLR ALL: Clears all selections.

5. After verifying that the GIA1, GIA2, AUDIO, GPS1, GPS2 and Certification Gains are checked, press the LOAD softkey. It is acceptable to simply load the pre-selected software and config files. The G1000 system automatically begins loading software and default configuration files to the selected LRUs in the proper order.
6. When the system finishes loading, it prompts the technician accordingly. Press the ENT key to acknowledge that the upload is finished:



7. Verify that each column indicates **PASS** in green when the loading process has finished and inspect the SUMMARY window as well to ensure that the load is successful.
8. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD

6.3.5 GIA 63 Test

GPS Signal Acquisition:

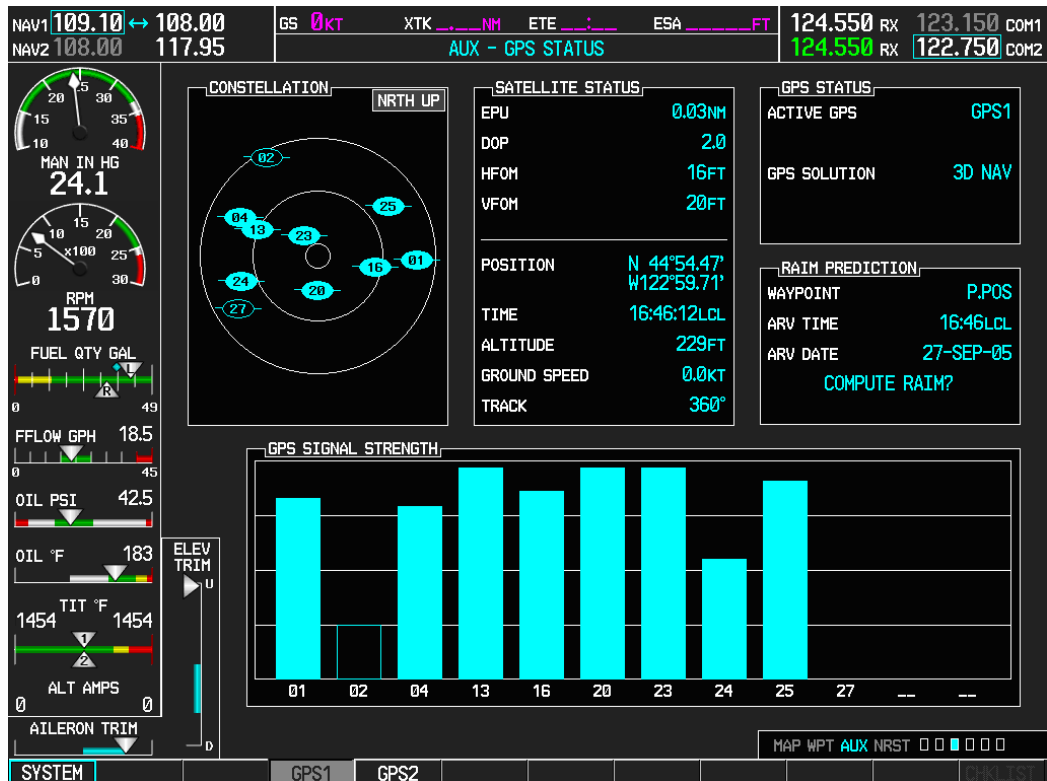


Figure 6-4. GPS Signal Status

The GIA 63 units should normally acquire a 3D GPS navigation solution within 2 minutes of startup, provided the aircraft is outside (or indoors with a GPS repeater). Select the AUX-GPS STATUS page on the MFD (3rd page in AUX group). Two softkeys on the bottom of the display allow the user to toggle between GPS 1 and GPS 2. Verify that both receivers show 3D Navigation on the MFD.

Continue to the VHF COM Interference test.

VHF COM Interference Test:

This test must be conducted outside. Use of a GPS repeater inside a hangar may result in a failed test. This procedure assumes that the system is currently set to 25 kHz COM channel spacing. Once the signal acquisition test has been completed successfully, perform the following steps:

1. On the MFD, monitor GPS signal strength bars on the 3rd AUX page.
2. On the PFD, ensure that the CDI is set to GPS. If it is not, press the 'CDI' softkey until GPS ENR is displayed.
3. Verify that the GPS "INTEG" flag is out of view.
4. Select 121.150 MHz on the No. 1 COM transceiver.
5. Transmit for a period of 35 seconds while monitoring GPS 1 signal strength levels.
6. During the transmit period, verify that the GPS "INTEG" flag does not come into view on the PFD and verify that GPS 1 does not lose a 3-D navigation solution on the MFD.
7. Repeat steps 5 and 6 and re-transmit while monitoring GPS 2 signal levels on the MFD.
8. Repeat steps 5 through 7 for each of the following frequencies:

-
- 121.175 MHz
 - 121.200 MHz
 - 131.250 MHz
 - 131.275 MHz
 - 131.300 MHz
9. Repeat steps 4 through 8 for the No. 2 COM transceiver (GIA2).
 10. On the MFD, select the AUX-SYSTEM SETUP Page (4th page in AUX group).
 11. Under the COM CONFIG field, change the COM channel spacing from 25 kHz to 8.33 kHz.
 12. Go back to the 3rd AUX page.
 13. Select 121.185 MHz on the No. 1 COM transceiver.
 14. Transmit for a period of 35 seconds while monitoring GPS 1 signal strength levels.
 15. During the transmit period, verify that the GPS “INTEG” flag does not come into view on the PFD and verify that GPS 1 does not lose a 3-D navigation solution on the MFD.
 16. Repeat steps 14 and 15 and re-transmit while monitoring GPS 2 signal levels on the MFD.
 17. Repeat steps 14 through 16 for each of the following frequencies:
 - 121.190 MHz
 - 130.285 MHz
 - 131.290 MHz
 18. Repeat steps 13 through 17 for the No. 2 COM transceiver (GIA2).
 19. On the MFD, select the 4th AUX page and change the COM channel spacing back to 25 kHz.
 20. Continue to the VOR/LOC/GS Test.

VOR/LOC/GS Test:

Check the VOR, ILS, and Glideslope functions with ramp test equipment. Operate the equipment according to the test equipment manufacturer’s instructions. Adjust the RF signal to a level adequate to perform the test. Select the appropriate HSI source by using the CDI softkey.

NOTE

The PFD HSI does not show a course deviation bar unless a valid VHF NAV frequency is tuned.

Simulate a VOR signal on radial 000° with a course-width of 20°. Verify full-scale deflection of the CDI while applying a 10° deviation signal. Exercise the CDI with both right and left deviations for both NAV 1 and 2. Exercise the Glideslope deviation indicator with up and down deviation indications.

If no other service is to be performed, continue to the return-to-service checks in Section 7.

6.4 GEA 71 Engine/Airframe Unit

Original GEA 71 Reinstalled

No software or configuration loading is required if the removed GEA 71 is re-installed. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process. Continue to the return-to-service checks in Section 7.

New or Repaired GEA 71 Installed

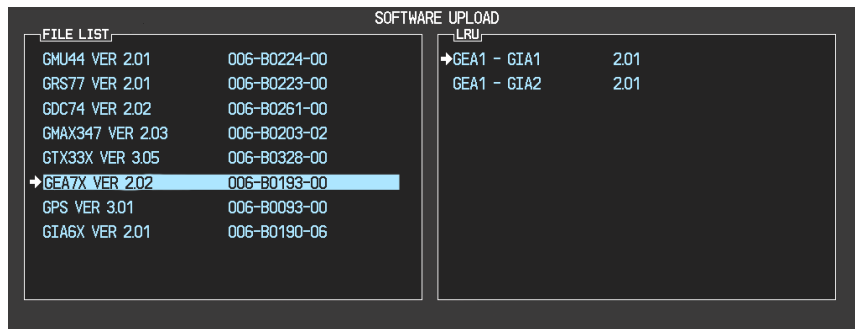
If a new GEA 71 is installed, the correct software and configuration files must be loaded to the unit, and the fuel quantity, aileron trim and elevator trim transducers must be calibrated. Continue to the GEA 71 Software Loading procedure.

6.4.1 GEA 71 Software Loading using GDU V6.XX

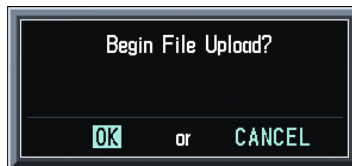
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

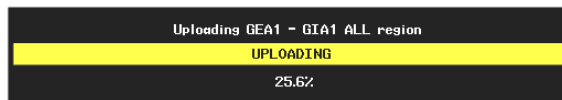
1. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
2. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
3. Start the G1000 system in Configuration mode.
4. On the PFD, go to the Software Upload page using the small FMS knob.
5. Highlight the GEA software file. Ensure that both paths to the GEA 71 through GIA1 and GIA 2 appear in the LRU field as shown:



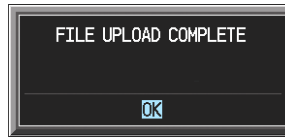
6. Press the LRU softkey. Select the GEA - GIA1 data path to load software. Press the LOAD softkey.
7. Select OK and press the ENT key to acknowledge the following prompt:



8. The software for the GEA 71 Engine/Airframe Unit begins to load. Monitor the upload status as it progresses:



-
9. After the files finish loading, press ENT to acknowledge the following prompt:



10. Check the SUMMARY field to ensure the all software loads are 'COMPLETE'.
11. De-activate the cursor.
12. Go to the System Status page.
13. Activate the cursor and highlight 'GEA1 – GIA1' in the LRU window.
14. Verify that the reported part number and version of the software file matches the data in the Required Equipment List.
15. Continue to the GEA 71 Configuration Loading procedure.

6.4.2 GEA 71 Configuration Loading using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

1. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Configuration Upload page using the small FMS knob:

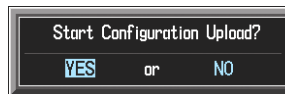


4. Activate the cursor and use the small FMS knob to highlight the airframe type in the FILE field.

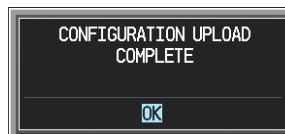
NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

5. Press the ENT key to select the appropriate airframe type. Once an airframe type is selected the configuration files in the SECTION field will be displayed.
6. Using the FMS knob, highlight 'GEA 1' in the FILE LIST field.
7. Press the LOAD softkey.
8. Select YES and press the ENT key to acknowledge the following prompt:



9. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



10. View the SUMMARY field and ensure that all items are 'COMPLETE', then de-activate the cursor.

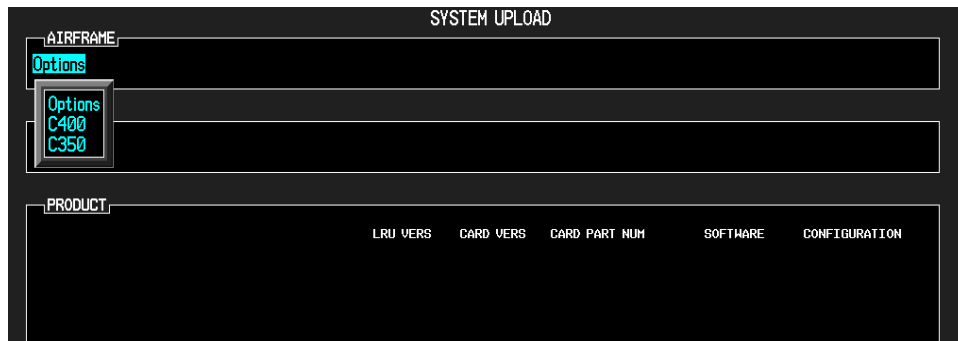
11. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
12. Continue to the GEA 71 Test procedure.

6.4.3 GEA 71 Software Load and Configuration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.

1. On the PFD, go to the System Upload page using the small FMS knob.
2. Activate the cursor and use the small FMS knob to highlight the airframe type in the AIRFRAME field. Select the appropriate aircraft type (C400 or C350) and press the ENT key.



NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

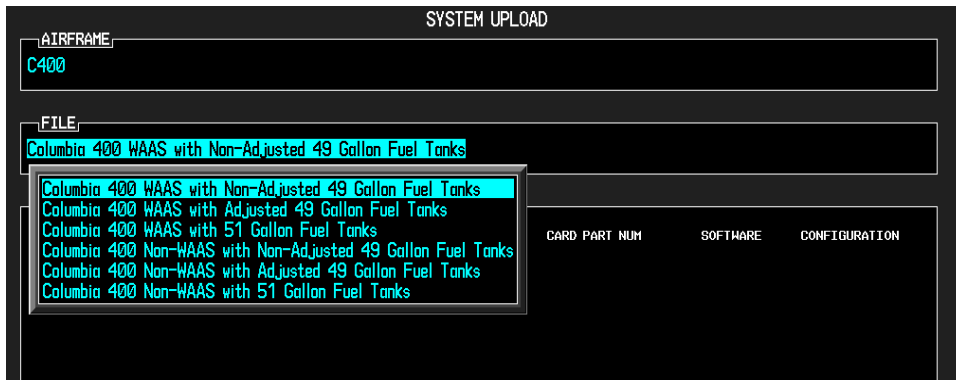
3. Once an airframe type is selected the cursor moves to the FILE window. Rotate the small FMS knob to activate the drop-down menu. Three FQIS fuel tank options are available: 49 gallon (non-adjusted); 49 gallon (adjusted); 51 gallon. Confirm the serial number of the aircraft prior to selection as well as inspect logbooks for field upgrades according to the following table.

	C350	C400	Comments
49 Gallon (non-adjusted)	42502 - 42564	41563 - 41757	Verify logbooks for compliance with Columbia Service Letter SL-07-008B
49 Gallon (adjusted)	42565 - 42567	41758 - 41799	
51 Gallon	42568 and higher	41800 and higher	Inspect fuel tank placard

If the aircraft is a Columbia 350 within the serial number range of 42502-42564 or a Columbia 400 within the serial number range of 41563-41757, confirm the FQIS fuel tank option by referencing the aircrafts logbooks. Compliance with Columbia Service Letter number SL-07-008B requires the selection of “49 gallon adjusted”. Columbia aircraft with 51 gallon tanks can be verified by inspection of the fuel tank placard.

NOTE

At this step, select to load WAAS or non-WAAS G1000 software.



- The PRODUCT window will populate and display software and configuration file information for each G1000 LRU. The LRU VERS column shows the currently loaded software version in the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. Each check designates a file to be loaded to the G1000.



By default, if an inequality between the LRU and CARD columns exists, the SOFTWARE CONFIGURATION boxes will be pre-selected (checked). By default all of the CONFIGURATION boxes will be pre-selected.

The following softkeys provide an easy way to select files:

CHK ALL: Selects all files, both configuration and software

CHK SW: Selects all software files only.

CHK CFG: Selects all configuration files only.

CLR ALL: Clears all selections.

5. After verifying that the GEA software and configuration files are checked, press the LOAD softkey. It is acceptable to simply load the pre-selected software and config files. The G1000 system automatically begins loading software and default configuration files to the selected LRUs in the proper order.
6. When the system finishes loading, it prompts the technician accordingly. Press the ENT key to acknowledge that the upload is finished:



7. Verify that each column indicates PASS in green when the loading process has finished and inspect the SUMMARY window as well to ensure that the load is successful.
8. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
9. Continue to the GEA 71 Test procedure.

6.4.4 GEA 71 Calibration using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

The GEA 71 provides a means to recalibrate the system in the event that a sensor is replaced. This section contains the procedures necessary to accomplish recalibration.

NOTE

If the GEA 71 is replaced with a new unit, these calibration procedures are not required.

6.4.4.1 Fuel Quantity Transducer Calibration using GDU V6.XX

1. Level the aircraft, following instructions in the Columbia 350/400 Airplane Maintenance Manual.
2. With the aircraft in a dry-tank configuration, fill each fuel tank with 4.0 gallons fuel (unusable fuel, refer to Columbia 350/400 POH/AFM). Use proper precautions when handling fuel. Ensure that the aircraft is grounded correctly and that there is adequate ventilation.

NOTE

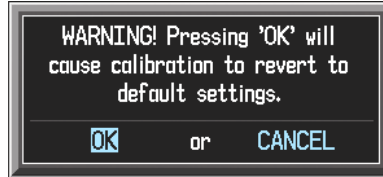
After the addition of fuel, tap the wing near the fuel senders or use some other appropriate method to ensure that the fuel senders are not “sticking” prior to doing any calibration or taking any measurements. This is especially important when doing the EMPTY calibrations.

3. Go to the CAL Page Group on the PFD.
4. The Fuel Calibration page (1st page in CAL group) will be shown by default:

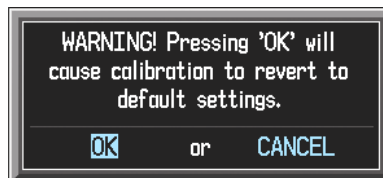
FUEL CALIBRATION								
LEFT 1 SUB-TANK			FUEL FLOW			RIGHT 1 SUB-TANK		
RAW VAL	-----	GL	ENG 1 SCALE	1.00000	RAW VAL	-----	GL	
SLOPE	1.00000e+000		ENG 2 SCALE	0.00000	SLOPE	1.00000e+000		
OFFSET	0.00000e+000				OFFSET	0.00000e+000		
CAL VAL	-----	GL			CAL VAL	-----	GL	
LEFT 2 SUB-TANK						RIGHT 2 SUB-TANK		
RAW VAL	-----	GL			RAW VAL	-----	GL	
SLOPE	1.00000e+000				SLOPE	1.00000e+000		
OFFSET	0.00000e+000				OFFSET	0.00000e+000		
CAL VAL	-----	GL			CAL VAL	-----	GL	
LEFT 3 SUB-TANK						RIGHT 3 SUB-TANK		
RAW VAL	-----	GL			RAW VAL	-----	GL	
SLOPE	1.00000e+000				SLOPE	1.00000e+000		
OFFSET	0.00000e+000				OFFSET	0.00000e+000		
CAL VAL	-----	GL			CAL VAL	-----	GL	
LEFT 4 SUB-TANK			CENTER 1 SUB-TANK			RIGHT 4 SUB-TANK		
RAW VAL	-----	GL	RAW VAL	-----	GL	RAW VAL	-----	GL
SLOPE	1.00000e+000		SLOPE	1.00000e+000		SLOPE	1.00000e+000	
OFFSET	0.00000e+000		OFFSET	0.00000e+000		OFFSET	0.00000e+000	
CAL VAL	-----	GL	CAL VAL	-----	GL	CAL VAL	-----	GL
LEFT 5 SUB-TANK			CENTER 2 SUB-TANK			RIGHT 5 SUB-TANK		
RAW VAL	-----	GL	RAW VAL	-----	GL	RAW VAL	-----	GL
SLOPE	1.00000e+000		SLOPE	1.00000e+000		SLOPE	1.00000e+000	
OFFSET	0.00000e+000		OFFSET	0.00000e+000		OFFSET	0.00000e+000	
CAL VAL	-----	GL	CAL VAL	-----	GL	CAL VAL	-----	GL
L EMPTY	L FULL	L RESET	C EMPTY	C FULL	C RESET	R EMPTY	R FULL	R RESET

5. This page is protected and requires a keystroke password to perform the calibration. Press the following softkeys in sequence:

- a) softkey 12 (Far Right softkey)
 - b) softkey 11
 - c) softkey 10
 - d) softkey 9
6. Press the L RESET softkey. Press ENT to acknowledge the following prompt:



- 7. Ensure that the CAL VAL indication for the Left 1 Sub-Tank is stable.
- 8. Press the L EMPTY softkey.
- 9. Press the R RESET softkey. Press ENT to acknowledge the following prompt:



- 10. Ensure that the CAL VAL indication for the Right 1 Sub-Tank is stable.
- 11. Press the R EMPTY softkey.
- 12. Fill each fuel tank with an additional 49.0 ± 0.1 gallons usable fuel.
- 13. Ensure that the CAL VAL indication for the Left 1 Sub-Tank is stable.
- 14. Press the L FULL softkey.
- 15. Ensure that the CAL VAL indication for the Right 1 Sub-Tank is stable.
- 16. Press the R FULL softkey.
- 17. Completely drain the fuel from the left and right tanks.
- 18. Fill each fuel tank with 4 gallons fuel (unusable fuel, refer to Columbia 400 AFM) and ensure that the CAL VAL indications are stable.
- 19. Observe the CAL VAL indications for both Right 1 and Left 1 Sub-Tanks and record the readings in the following tables. The CAL VAL values should fall between -0.5 and 0.5 as shown in the following examples:

LEFT 1 SUB-TANK	
RAW VAL	-1.01749GL
SLOPE	1.00000e+000
OFFSET	0.00000e+000
CAL VAL	-0.46192GL

RIGHT 1 SUB-TANK	
RAW VAL	-1.01749GL
SLOPE	1.00000e+000
OFFSET	0.00000e+000
CAL VAL	-0.46192GL

LEFT 1 SUB-TANK				
Actual Useable Fuel	Calibrated Value (CAL VAL) Range		Record Actual Indicated CAL VAL Here	Is CAL VAL Within Specified Range? Yes / No
	Minimum Allowed Indication	Maximum Allowed Indication		
0	-0.5	0.5		

RIGHT 1 SUB-TANK				
Actual Useable Fuel	Calibrated Value (CAL VAL) Range		Record Actual Indicated CAL VAL Here	Is CAL VAL Within Specified Range? Yes / No
	Minimum Allowed Indication	Maximum Allowed Indication		
0	-0.5	0.5		

20. Using the large FMS knob, select the GEA STATUS page (2nd page in the GEA page group). GEA 1 will be shown by default.
21. Press the DSCRT softkey to select the Discrete Inputs status page.



NOTE

Unless specified, the status of other discrete inputs may not match the figure above and does not matter for this portion of the test.

22. Verify that the boxes beside the “1A LOW MAIN FUEL L” (low fuel quantity left) and “2A LOW MAIN FUEL R” (low fuel quantity right) are green.
23. Fill each fuel tank with an additional 5.0 ± 0.1 gallons usable fuel.
24. Continue to slowly add fuel to each tank one measured gallon at a time. Stop adding fuel when the associated LOW MAIN FUEL L or LOW MAIN FUEL R box changes from green to black.
25. Using the large FMS knob, select the FUEL CALIBRATION page (1st page in CAL page group).
26. In the table below, record the amount of usable fuel added to each tank. Also record the CAL VAL indications for both Right 1 and Left 1 Sub-Tanks. The amount of fuel added to each tank to turn the discrete off must be 8 ± 2 gal, and the CAL VAL values should be within ±2 gallon of the actual amount of usable fuel added.

NOTE

If any CAL VAL value is outside of the specified ranges, the fuel quantity system requires service.

TANK	Actual Useable Fuel Added (gal)	Allowable Range for Actual Fuel		Actual Indicated CAL VAL (gal)	Tolerance on CAL VAL (gal)
		Minimum Allowable Fuel	Maximum Allowable Fuel		
LEFT 1 SUB-TANK		6.0 gal	10.0 gal		± 2.0
RIGHT 1 SUB-TANK		6.0 gal	10.0 gal		± 2.0

6.4.5 GEA 71 Calibration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.

NOTE

The G1000 system can be calibrated for 49 as well as 51 gallon fuel tanks. Ensure the appropriate option has been selected when performing fuel calibration. Incorrect calibration will lead to misleading displays and potential fuel starvation of the aircraft. Attention to detail is imperative.

6.4.5.1 Fuel Quantity Calibration using GDU V8.XX

1. Level the aircraft, following instructions in the Columbia Maintenance Manual.
2. Drain all fuel from each fuel tank, and set the fuel selector switch to the 'OFF' position.
3. Fill each fuel tank with unusable fuel level, 2 gallons (for 51 gallon option) or 4 gallons (for 49 gallon option).

NOTE

Ensure appropriate option for calibration. Use proper precautions when handling fuel. Ensure that the aircraft is grounded correctly and that there is adequate ventilation.

4. Start the G1000 system in Configuration mode. Reboot the MFD in normal mode for this procedure by pulling, then resetting, the MFD circuit breaker. On the MFD, press the ENGINE softkey to display the full page engine instrumentation.
5. Go to the CAL Page Group on the PFD. The FUEL TANK CALIBRATION page should be displayed as shown:

FUEL FLOW		FUEL TANK CALIBRATION			
ENG 1 SCALE	1.00000	FUEL CALIBRATION POINTS			
ENG 2 SCALE	0.00000	CURRENT TANK	◀ RIGHT ▶	FUEL UNITS	GALLONS(GL, GL/HR)
		SENSOR LIMITS		SENSOR INPUTS	
		RIGHT 1 FLOOR	0.00000	RIGHT 1	57.42822
		RIGHT 1 CEILING	58.80592	RIGHT 2	11.05903
		RIGHT 2 FLOOR	0.00000	RIGHT 3	-----
		RIGHT 2 CEILING	21.33109	RIGHT 4	-----
		RIGHT 3 FLOOR	0.00000	RIGHT 5	-----
		RIGHT 3 CEILING	0.00000		
		RIGHT 4 FLOOR	0.00000	ACTUAL	CALIBRATION VALUE
		RIGHT 4 CEILING	0.00000	FUEL QUANTITY	-----GL
		RIGHT 5 FLOOR	0.00000		68.48725
		RIGHT 5 CEILING	0.00000	CALIBRATE?	
		CALIBRATION TABLE			
		ACTUAL QUANTITY	CALIBRATED VALUE		

6. This page is protected and requires a keystroke password to perform the calibration. Press the following softkeys in sequence:
 - a) softkey 12 (Far Right softkey)
 - b) softkey 11
 - c) softkey 10
 - d) softkey 9
7. Press the TNK SEL softkey to activate the cursor in the CURRENT TANK field. Rotate the FMS knob as necessary throughout this procedure to select the RIGHT or LEFT tanks.

6.4.5.2 Empty Calibration using GDU V8.XX

1. Verify that unusable fuel has been added to both tanks per section 6.4.5.1. Allow both fuel probes to stabilize for at least 2 minutes.
2. Select the LEFT tank on the PFD.
3. Press the EMPTY softkey. The cursor will automatically activate and select the CALIBRATE? option. The calibrated value setting will default to 00.00.
4. Press the ENT key. A prompt appears requesting overwrite acknowledgement. Select YES and press the ENT key. The G1000 system will 'zero' the actual fuel quantity value to be displayed.
5. Select the RIGHT tank.
6. Press the EMPTY softkey. The cursor will automatically activate and select the CALIBRATE? option. The calibrated value setting will default to 00.00.
7. Press the ENT key. A prompt appears requesting overwrite acknowledgement. Select YES and press the ENT key. The G1000 system will 'zero' the actual fuel quantity value to be displayed.
8. Observe the CALIBRATED TOTAL indication for the RIGHT tank. Verify that it remains at 0.00 (+/- 0.5 gallons).
9. Select the LEFT tank. Observe the CALIBRATED TOTAL indication for the LEFT tank. Verify that it remains at 0.00 (+/- 0.5 gallons).
10. On the MFD, verify the fuel quantity indicators correctly point to '0'.

6.4.5.3 5 Gallon Calibration using GDU V8.XX

1. Fill each fuel tank with 5 ± 0.1 gallons usable fuel.
2. Allow the fuel probes to stabilize at least 2 minutes before continuing.
3. Record the CALIBRATED TOTAL indication for the RIGHT tank. This is the pre-calibrated value.

RIGHT 1 SUB-TANK				
Actual Useable Fuel	Calibration Value Range		Record Actual Indicated Calibration Value Here	Is Calibration Value Within Specified Range? Yes / No
	Minimum Allowed Indication	Maximum Allowed Indication		
0	-0.5	0.5		

4. Select the LEFT tank. Record the CALIBRATED TOTAL indication for the LEFT tank. This is the pre-calibrated value.

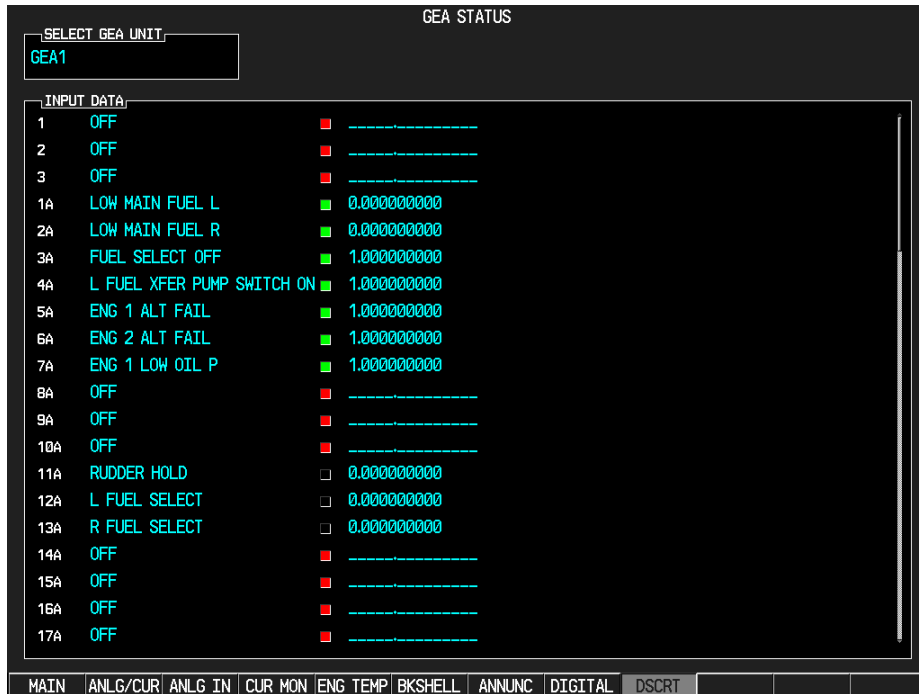
LEFT 1 SUB-TANK				
Actual Useable Fuel	Calibration Value Range		Record Actual Indicated Calibration Value Here	Is Calibration Value Within Specified Range? Yes / No
	Minimum Allowed Indication	Maximum Allowed Indication		
0	-0.5	0.5		

5. With the LEFT tank selected, highlight the ACTUAL FUEL QUANTITY field and enter 5.00 gallons.
6. Press the ENT key. The cursor automatically selects the CALIBRATE? option.
7. Press the ENT key again to calibrate the 5 gallon point.
8. Verify a 5.00 gallon point appears in the CALIBRATION TABLE.
9. Verify that the CALIBRATED TOTAL value indicates 5.00 (+/- 0.5 gallons).
10. Select the RIGHT tank. Highlight the ACTUAL FUEL QUANTITY field and enter 5.00 gallons.
11. Press the ENT key. The cursor automatically selects the CALIBRATE? option.

12. Press the ENT key again to calibrate the 5 gallon point.
13. Verify a 5.00 gallon point appears in the CALIBRATION TABLE.
14. Verify that the CALIBRATED TOTAL value indicates 5.00 (+/- 0.5 gallons).

6.4.5.4 Low Fuel Level Check using GDU V8.XX

1. Using the large FMS knob, select the GEA STATUS page (2nd page in the GEA page group). GEA 1 will be shown by default.
2. Press the DSCRT softkey to select the Discrete Inputs status page.



NOTE

Unless specified, the status of other discrete inputs may not match the figure above and does not matter for this portion of the test.

3. Verify that the boxes beside the “1A LOW MAIN FUEL L” (low fuel quantity left) and “2A LOW MAIN FUEL R” (low fuel quantity right) are green.
4. Continue to slowly add fuel to each tank one measured gallon at a time. Stop adding fuel when the associated LOW MAIN FUEL L or LOW MAIN FUEL R box changes from green to black .
5. Using the large FMS knob, select the FUEL CALIBRATION page (1st page in CAL page group).
6. In the table below, record the amount of usable fuel added to each tank. Also record the Calibration Value indications for both Right 1 and Left 1 Sub-Tanks. The amount of fuel added to each tank to turn the discrete off must be 8 ± 2 gal, and the Calibration Values should be within ± 2 gallon of the actual amount of usable fuel added.

NOTE

If any calibration value is outside of the specified ranges, the fuel quantity system requires service.

TANK	Actual Useable Fuel Added (gal)	Allowable Range for Actual Fuel		Actual Indicated Calibration Value (gal)	Tolerance on Calibration Value (gal)
		Minimum Allowable Fuel	Maximum Allowable Fuel		
LEFT 1 SUB-TANK		6.0 gal	10.0 gal		± 2.0
RIGHT 1 SUB-TANK		6.0 gal	10.0 gal		± 2.0

6.4.5.5 Full Calibration using GDU V8.XX

1. Verify that both fuel tanks are full. Allow both fuel probes to stabilize for at least 2 minutes.
2. Select the LEFT tank on the PFD.
3. Press the FULL softkey. The cursor will automatically activate and select the CALIBRATE? option. The calibrated value setting will default to 49.00 or 51.00 as appropriate.
4. Press the ENT key. A prompt appears requesting overwrite acknowledgement. Select YES and press the ENT key. The G1000 system will set the actual fuel quantity value to be full.
5. Select the RIGHT tank.
6. Press the FULL softkey. The cursor will automatically activate and select the CALIBRATE? option. The calibrated value setting will default to 49.00 or 51.00 as appropriate.
7. Press the ENT key. A prompt appears requesting overwrite acknowledgement. Select YES and press the ENT key. The G1000 system will set the actual fuel quantity value to be full.
8. Observe the CALIBRATED TOTAL indication for the RIGHT tank. Verify that it remains at 49.00 or 51.00 as appropriate.
9. Select the LEFT tank. Observe the CALIBRATED TOTAL indication for the LEFT tank. Verify that it remains at 49.00 or 51.00 as appropriate.
10. On the MFD, verify the fuel quantity indicators correctly point to 'F'.

6.4.6 Aileron and Elevator Trim Calibration

NOTE

Before conducting the flaps and trim calibration procedure, ensure that the elevator, elevator trim, aileron and aileron trim systems have been properly rigged and adjusted.

1. Go to the CAL Page Group on the PFD.
2. Select the Flaps and Trim Calibration page (3rd page in CAL group), shown below:

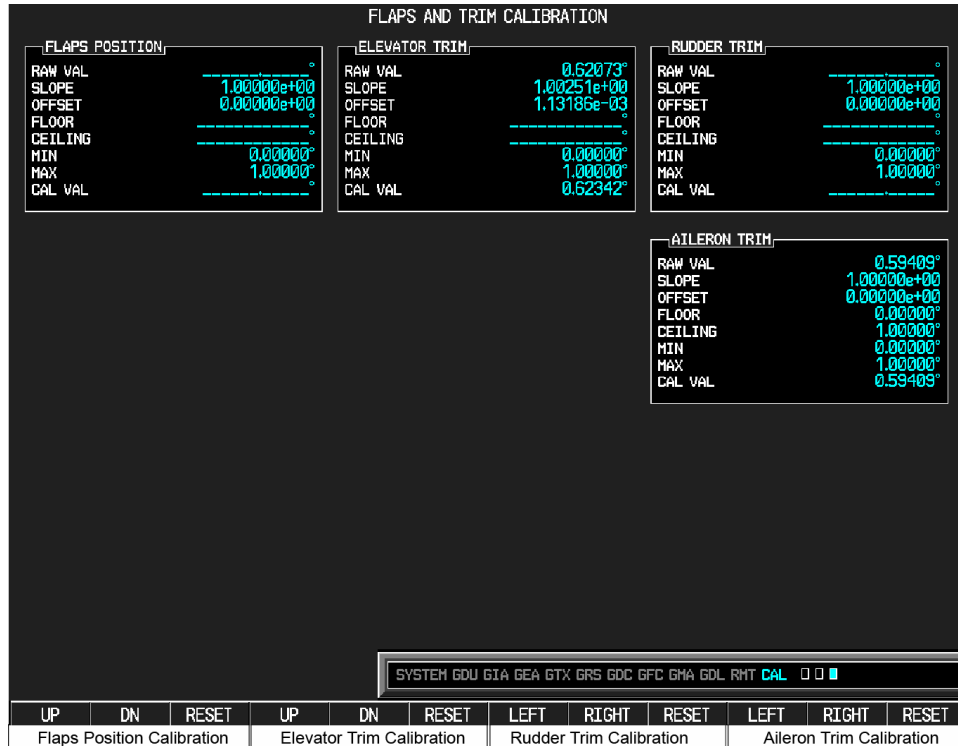
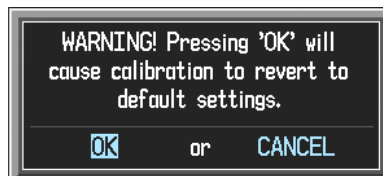


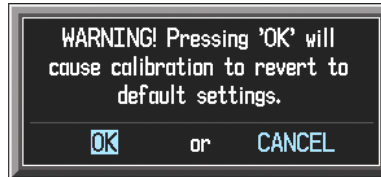
Figure 6-5. Aileron and Elevator Trim Calibration

3. This page is protected and requires a keystroke password to perform the calibration. Press the following softkeys in sequence:
 - a) softkey 1 (Far Left softkey)
 - b) softkey 2
 - c) softkey 3
 - d) softkey 4
4. Press the *Elevator Trim* RESET softkey (see Figure 6-5). Press ENT to acknowledge the following prompt after the RESET softkey is pressed:



5. Use the trim hat switch to run the elevator trim to the FULL UP position.
6. Press the *Elevator Trim* UP softkey on the PFD (see Figure 6-5).
7. Run the elevator trim to the FULL DOWN position. Press the *Elevator Trim* DN softkey on the PFD.

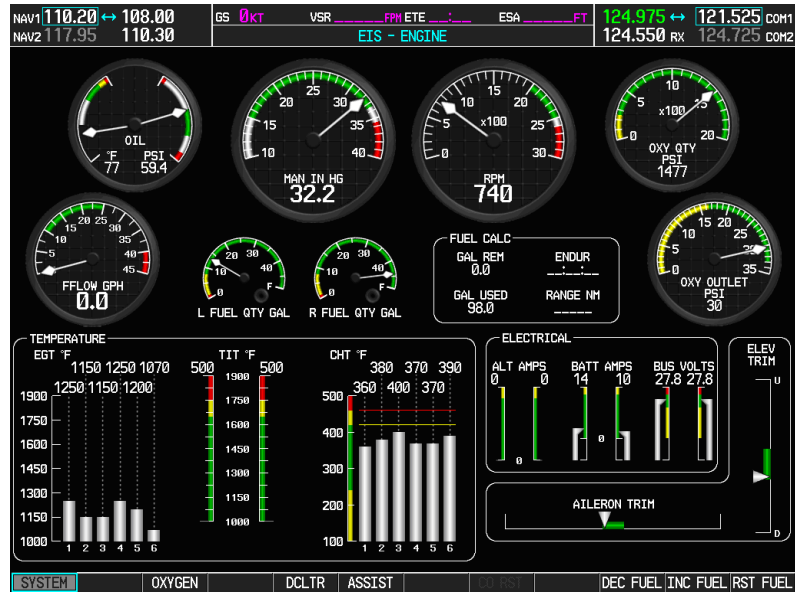
-
8. Run the elevator trim back to the FULL UP position.
 9. Verify that the CAL VALUE in the ELEVATOR TRIM window indicates 1.00000 ± 0.02000 . If it does not, repeat steps 4 to 8 for 4 tries. If calibration can not be achieved, the motor, switch or transducer may have failed. See Columbia maintenance documentation for additional support.
 10. Press the *Aileron Trim* RESET softkey on the PFD (see Figure 6-5). Press ENT to acknowledge the following prompt after the RESET softkey is pressed:



11. Use the trim hat switch to run the aileron trim full RIGHT.
12. Press the *Aileron Trim* RIGHT softkey on the PFD (see Figure 6-5)
13. Use the hat trim switch in the aircraft to run the aileron trim full LEFT. Press the LEFT softkey on the PFD (see Figure 6-5).
14. Run the aileron trim full RIGHT.
15. Verify that the CAL VALUE in the AILERON TRIM window indicates 1.00000 ± 0.02000 . If it does not, repeat steps 10 to 14 for 4 tries. If calibration can not be achieved, the motor, switch or transducer may have failed. See Columbia maintenance documentation for additional support.
16. Calibration is complete.
17. Continue to the GEA71 Test procedure.

6.4.7 GEA 71 Test

All engine/airframe transducers must be checked to ensure proper operation. Restart both displays in normal mode.



Columbia 400 (with Oxygen System Option)



Columbia 350 (without Oxygen System Option)

Figure 6-6. G1000/350/400 Engine/Airframe Indicators

On the MFD, check the indication for each of the sensor or monitor inputs with the aircraft engine off. Observe the 'Engine' page by using the SYSTEM softkey on the MFD. Observe the following sensor indications (see Figure 6-6):

Engine Page:

<u>Sensor</u>	<u>Reading with Aircraft Engine Off and Cool</u>
• OIL TEMP	Ambient
• OIL PRESS	Approximately '0'
• MAN IN HG	Atmospheric Pressure
• RPM	'0'
• OXY QTY (if installed)	'2000' with fully filled bottles
• FFLOW GPH	'0'
• FUEL QTY GAL	'F' with fully fueled tanks (Left and Right)
• OXY OUTLET (if installed)	Low
• EGT	Ambient
• TIT (Columbia 400 only)	Ambient
• CHT	Ambient.
• ALT AMPS	'0' if on external power
• BATT AMPS	Negative if battery is discharging
• BUS VOLTS	GPU Voltage if on external power and crosstie closed.
• AILERON TRIM	Centered if aileron trim tab is centered.
• ELEVATOR TRIM	Centered if elevator trim tab is centered.

If no other service is to be performed, continue to the return-to-service checks in Section 7.

6.5 GTX 33 Transponder

Original GTX 33 is Reinstalled

No software or configuration loading is required if the removed GTX 33 is re-installed. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process. Continue to the GTX 33 Test procedure.

New or Repaired GTX 33 is Installed

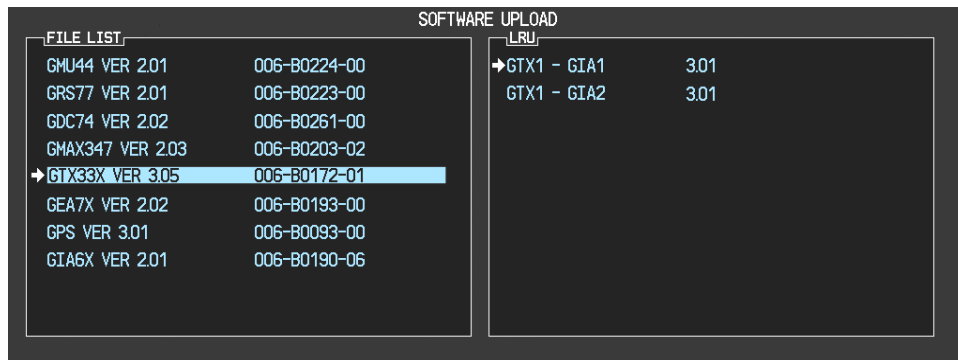
If a new GTX 33 is installed, the correct software and configuration files must be loaded to the unit. Continue to the GTX 33 Software Loading procedure.

6.5.1 GTX 33 Software Loading using GDU V6.XX

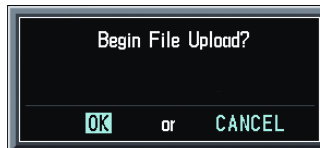
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

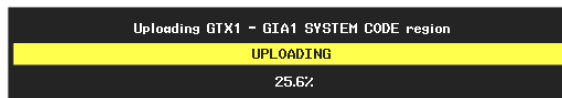
1. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
2. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
3. Start the G1000 system in Configuration mode.
4. On the PFD, go to the Software Upload page using the FMS knob.
5. Highlight the GTX software file. Ensure that both paths to the GTX 33 through GIA1 and GIA2 appear in the LRU field as shown:



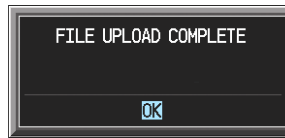
6. Press the LRU softkey. Select the GTX1 - GIA1 data path to load software. Press the LOAD softkey.
7. Select OK and press the ENT key to acknowledge the following prompt:



8. The software for the GTX 33 transponder begins to load. Monitor the upload status as it progresses:



- After the files finish loading, press ENT to acknowledge the following prompt:



- Check the SUMMARY field to ensure the load is 'COMPLETE'.
- Deactivate the cursor.
- Go to the System Status page.
- Activate the cursor and highlight 'GTX1 – GIA1' in the LRU window.
- Verify that the reported part number and version of the software matches the data in the Required Equipment List.
- Continue to the GTX 33 Configuration procedure.

6.5.2 GTX 33 Configuration Loading using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

- Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
- Start the G1000 system in Configuration mode.
- On the PFD, go to the Configuration Upload page using the FMS knob:



- Activate the cursor and use the small FMS knob to highlight the airframe type in the FILE field.

NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

- Press the ENT key to select the appropriate airframe type. Once an airframe type is selected the configuration files in the SECTION field will be displayed.

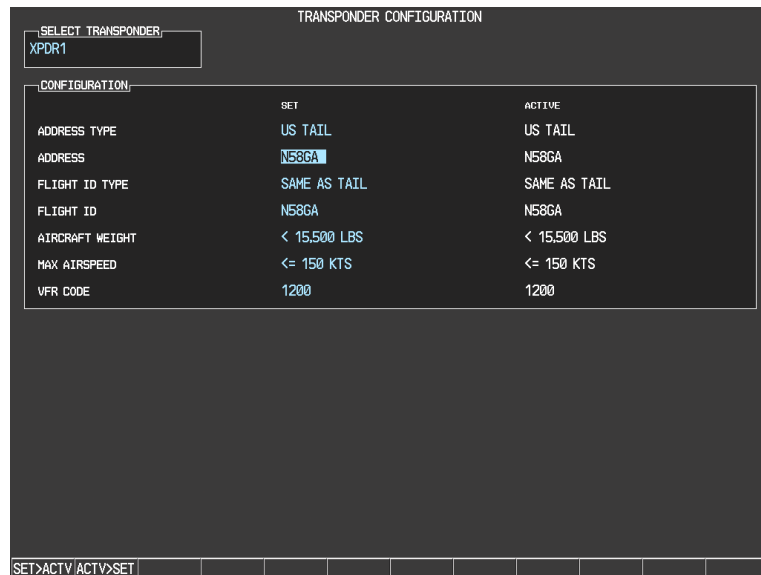
6. Using the FMS knob, highlight 'GTX 1' in the FILE LIST field.
7. Press the LOAD softkey.
8. Select YES and press the ENT key to acknowledge the following prompt:



9. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



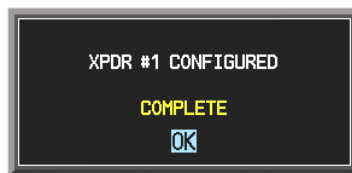
10. View the SUMMARY field and ensure that all items are 'complete', then de-activate the cursor.
11. Select the GTX page group, then select the Transponder Configuration page on the PFD:



12. Ensure that the 'ADDRESS TYPE' is 'US TAIL' under the 'SET' and 'ACTIVE' columns.
13. Activate the cursor and highlight the 'ADDRESS' field. Use the small/large FMS knobs to enter the aircraft registration number.
14. Once the correct registration number is entered, press the ENTER key. The transponder is configured:



15. The transponder then alerts the technician of complete configuration:



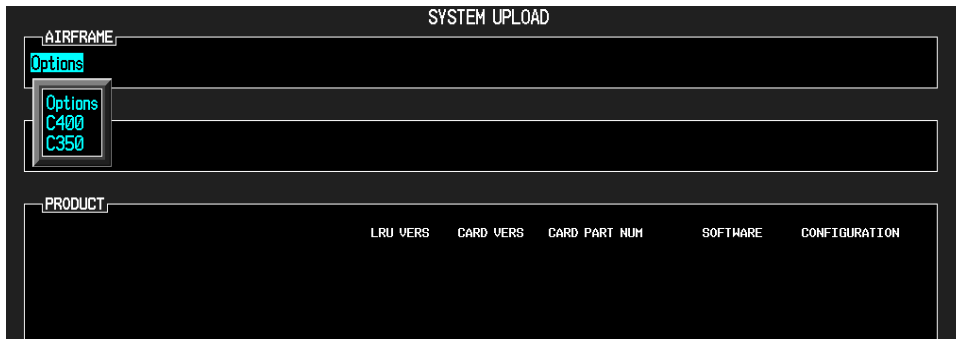
16. Press the ENTER key on the PFD and deactivate the cursor.
17. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
18. Continue to the GTX 33 Test procedure.

6.5.3 GTX 33 Software Load and Configuration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.

1. On the PFD, go to the System Upload page using the small FMS knob.
2. Activate the cursor and use the small FMS knob to highlight the airframe type in the AIRFRAME field. Select the appropriate aircraft type (C400 or C350) and press the ENT key.



NOTE

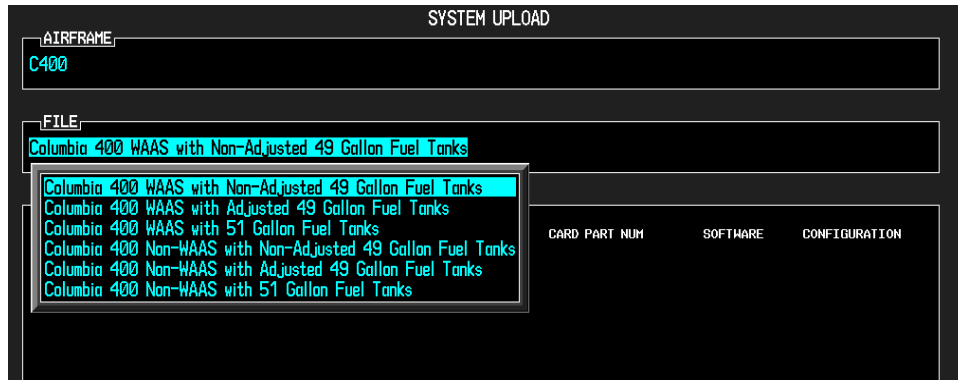
3. Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.
4. Once an airframe type is selected the cursor moves to the FILE window. Rotate the small FMS knob to activate the drop-down menu. Three FQIS fuel tank options are available: 49 gallon (non-adjusted); 49 gallon (adjusted); 51 gallon. Confirm the serial number of the aircraft prior to selection as well as inspect logbooks for field upgrades according to the following table.

	C350	C400	Comments
49 Gallon (non-adjusted)	42502 - 42564	41563 - 41757	Verify logbooks for compliance with Columbia Service Letter SL-07-008B
49 Gallon (adjusted)	42565 - 42567	41758 - 41799	
51 Gallon	42568 and higher	41800 and higher	Inspect fuel tank placard

If the aircraft is a Columbia 350 within the serial number range of 42502-42564 or a Columbia 400 within the serial number range of 41563-41757, confirm the FQIS fuel tank option by referencing the aircrafts logbooks. Compliance with Columbia Service Letter number SL-07-008B requires the selection of “49 gallon adjusted”. Columbia aircraft with 51 gallon tanks can be verified by inspection of the fuel tank placard.

NOTE

At this step, select to load WAAS or non-WAAS G1000 software.



- The PRODUCT window will populate and display software and configuration file information for each G1000 LRU. The LRU VERS column shows the currently loaded software version in the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. Each check designates a file to be loaded to the G1000.



By default, if an inequality between the LRU and CARD columns exists, the SOFTWARE CONFIGURATION boxes will be pre-selected (checked). By default all of the CONFIGURATION boxes will be pre-selected.

The following softkeys provide an easy way to select files:

CHK ALL: Selects all files, both configuration and software

CHK SW: Selects all software files only.

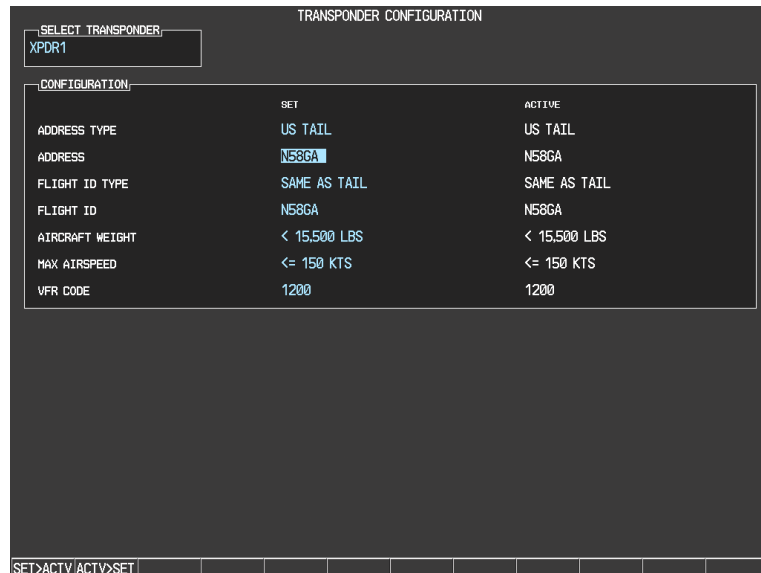
CHK CFG: Selects all configuration files only.

CLR ALL: Clears all selections.

6. After verifying that the GTX software and configuration files are checked, press the LOAD softkey. It is acceptable to simply load the pre-selected software and config files. The G1000 system automatically begins loading software and default configuration files to the selected LRUs in the proper order.
7. When the system finishes loading, it prompts the technician accordingly. Press the ENT key to acknowledge that the upload is finished:



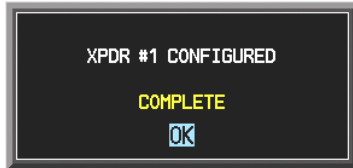
8. Verify that each column indicates PASS in green when the loading process has finished and inspect the SUMMARY window as well to ensure that the load is successful.
9. Select the GTX page group, then select the Transponder Configuration page on the PFD:



10. Ensure that the 'ADDRESS TYPE' is 'US TAIL' under the 'SET' and 'ACTIVE' columns.
11. Activate the cursor and highlight the 'ADDRESS' field. Use the small/large FMS knobs to enter the aircraft registration number.
12. Once the correct registration number is entered, press the ENTER key. The transponder is configured:



13. The transponder then alerts the technician of complete configuration:



14. Press the ENTER key on the PFD and deactivate the cursor.
15. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
16. Continue to the GTX33 Test procedure.

6.5.4 GTX 33 Test

Operation of the GTX 33 Mode-S transponder is accomplished using the G1000 PFD. Refer to Columbia part number 190-00567-00, [G1000 Cockpit Reference Guide for the Columbia 350/400](#) for basic operation. Perform a basic operational check on the transponder.

The integrated transponder/altitude reporting system must be verified in accordance with Title 14 of the Code of Federal Regulations (CFR) §§ 91.411 and 91.413. This test requires the use of a Mode S ramp generator. Specific instructions for operating the ramp tester are contained in the applicable operator's manual. Refer to Title 14 CFR Part 43 Appendix F for testing criteria.

If no other service is to be performed, continue to the return-to-service checks in Section 7.

6.6 GDC 74A Air Data Computer

Original GDC 74A is Reinstalled

No software or configuration loading is required if the removed GDC 74A is re-installed. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process. Continue to the GDC 74A Test procedure.

New or Repaired GDC 74A is Installed

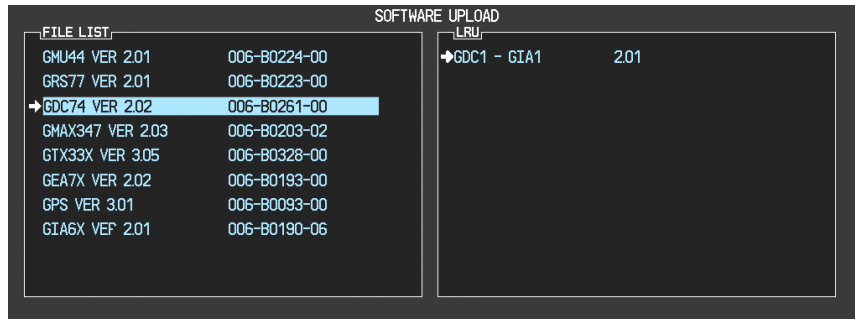
If a new GDC 74A is installed, the correct software and configuration files must be loaded to the unit. Continue to the GDC 74A Software Loading procedure.

6.6.1 GDC 74A Software Loading using GDU V6.XX

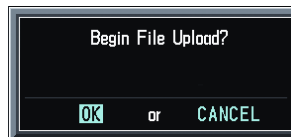
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

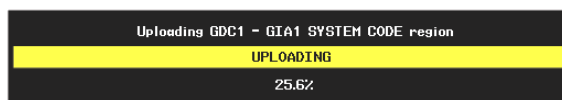
1. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
2. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
3. Start the G1000 system in Configuration mode.
4. On the PFD, go to the Software Upload page using the FMS knob.
5. Highlight the GDC software file. Ensure that GDC to GIA data path appears in the LRU field as shown:



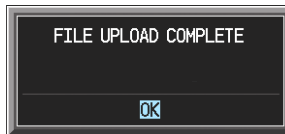
6. Press the LOAD softkey.
7. Select OK and press the ENT key to acknowledge the following prompt:



8. The software for the GDC 74A Air Data Computer begins to load. Monitor the upload status as it progresses:



9. After the files finish loading, press ENT to acknowledge the following prompt:



10. Check the SUMMARY field to ensure the load is 'COMPLETE'.
11. Deactivate the cursor.
12. Go to the System Status page.
13. Activate the cursor and highlight 'GDC1 – GIA1', then highlight 'GDC1 FPGA' in the LRU window.
14. Verify that the reported part number and version of both software files matches the data in the Required Equipment List.
15. Continue to the GDC 74A Configuration Loading procedure.

6.6.2 GDC 74A Configuration Loading using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

1. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Configuration Upload page using the FMS knob:



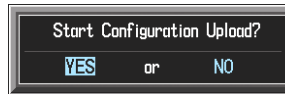
4. Activate the cursor and use the small FMS knob to highlight the airframe type in the FILE field.

NOTE

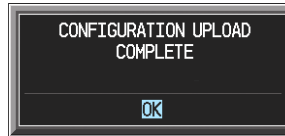
Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

5. Press the ENT key to select the appropriate airframe type. Once an airframe type is selected the configuration files in the SECTION field will be displayed.
6. Using the FMS knob, highlight 'GDC 1' in the FILE LIST field.
7. Press the LOAD softkey.

8. Select YES and press the ENT key to acknowledge the following prompt:



9. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



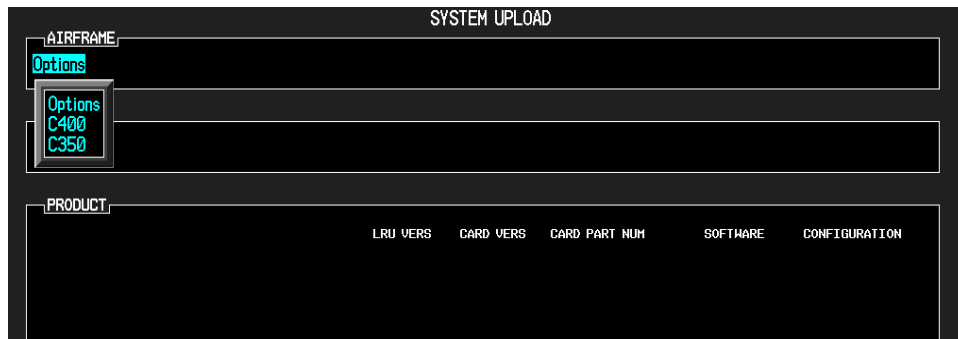
10. View the SUMMARY field and ensure that all items are 'complete', then de-activate the cursor.
11. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
12. Continue to the GDC 74A Test procedure.

6.6.3 GDC 74A Software Load and Configuration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.

1. On the PFD, go to the System Upload page using the small FMS knob.
2. Activate the cursor and use the small FMS knob to highlight the airframe type in the AIRFRAME field. Select the appropriate aircraft type (C400 or C350) and press the ENT key.



NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

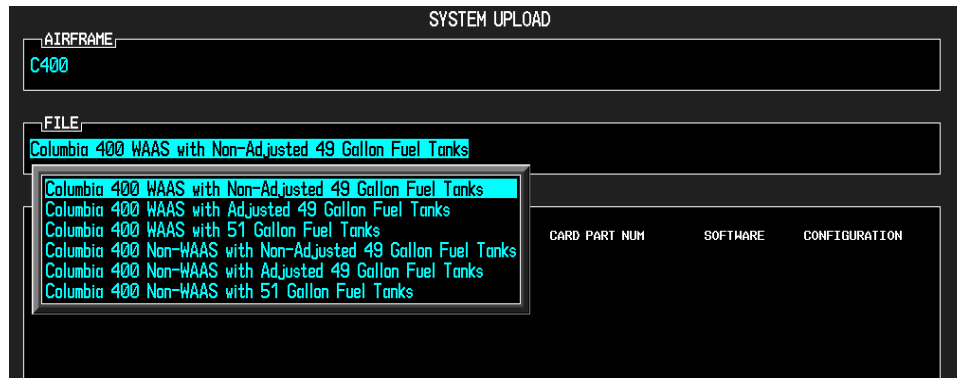
3. Once an airframe type is selected the cursor moves to the FILE window. Rotate the small FMS knob to activate the drop-down menu. Three FQIS fuel tank options are available: 49 gallon (non-adjusted); 49 gallon (adjusted); 51 gallon. Confirm the serial number of the aircraft prior to selection as well as inspect logbooks for field upgrades according to the following table.

	C350	C400	Comments
49 Gallon (non-adjusted)	42502 - 42564	41563 - 41757	Verify logbooks for compliance with Columbia Service Letter SL-07-008B
49 Gallon (adjusted)	42565 - 42567	41758 - 41799	
51 Gallon	42568 and higher	41800 and higher	Inspect fuel tank placard

If the aircraft is a Columbia 350 within the serial number range of 42502-42564 or a Columbia 400 within the serial number range of 41563-41757, confirm the FQIS fuel tank option by referencing the aircrafts logbooks. Compliance with Columbia Service Letter number SL-07-008B requires the selection of “49 gallon adjusted”. Columbia aircraft with 51 gallon tanks can be verified by inspection of the fuel tank placard.

NOTE

At this step, select to load WAAS or non-WAAS G1000 software.



- The PRODUCT window will populate and display software and configuration file information for each G1000 LRU. The LRU VERS column shows the currently loaded software version in the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. Each check designates a file to be loaded to the G1000.



By default, if an inequality between the LRU and CARD columns exists, the SOFTWARE CONFIGURATION boxes will be pre-selected (checked). By Default all of the CONFIGURATION boxes will be pre-selected.

The following softkeys provide an easy way to select files:

CHK ALL: Selects all files, both configuration and software

CHK SW: Selects all software files only.

CHK CFG: Selects all configuration files only.

CLR ALL: Clears all selections.

- After verifying that the GDC software and configuration files are checked, press the LOAD softkey. It is acceptable to simply load the pre-selected software and config files. The G1000 system automatically begins loading software and default configuration files to the selected LRUs in the proper order.
- When the system finishes loading, it prompts the technician accordingly. Press the ENT key to acknowledge that the upload is finished:



- Verify that each column indicates PASS in green when the loading process has finished and inspect the SUMMARY window as well to ensure that the load is successful.

-
8. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD
 9. Continue to the GDC 74 Test procedure

6.6.4 GDC 74A Test

NOTE

Allow unit to warm up for 15 minutes before performing the following tests.

Altimeter & Pitot/Static Test

Verification of the altimeter and airspeed must be performed using a pitot/static ramp tester. The static port and altimeter must be verified in accordance with Title 14 of the Code of Federal Regulations (CFR) § 91.411 and Part 43 Appendix E, every two years. The PFD must be in Configuration mode and the MFD must be in Reversionary mode for performing the tests as outlined in Part 43 Appendix E.

To prepare the G1000 System for Part 43 Appendix E testing:

1. Start the G1000 system in normal mode.
2. Remove power to the PFD.
3. Turn the PFD on in Configuration mode by pressing and holding the ENT key on the PFD while applying power.
4. Release the ENT key after “INITIALIZING SYSTEM” appears in the upper left corner of the PFD.

CAUTION

Configuration mode contains certain pages and settings that are critical to aircraft operation and safety. These pages are protected and cannot be modified, unless the technician is properly authorized and equipped. However, most protected pages are viewable to allow system awareness for troubleshooting.

5. Using the outer FMS knob on the PFD turn to the GRS page group. Use the B ALT field for all CFR Part 43 Appendix E tests for G1000 altitude.
6. Place the MFD in Reversionary mode by pressing the red “display backup” button on the GMA 1347 Audio Panel. Baro settings can then be read from the MFD for the CFR Part 43 Appendix E tests.

After completing the tests specified by § 91.411 and Part 43 Appendix E, return the MFD to normal mode by pressing the red “display backup” button on the GMA 1347. Return the PFD to normal mode by shutting off the master switch. Upon restart the PFD will enter normal mode.

NOTE

The following tests are above and beyond the requirements set forth in Appendix E. Perform these tests every 2000 hours or 4 years, whichever comes first.

Pitot/Static Airspeed Test

1. Command the pitot/static ramp tester to simulate air speeds shown in the table below.
2. Wait for the ramp tester to report that target values have been achieved.
3. Verify that computed air speeds shown on the PFD are within the tolerances specified in the table below:

Calibrated air speed, knots	Allowed tolerance, ±knots
50	5.0
80	3.5
100	2.0
120	2.0
150	2.0

Static Port Vertical Speed (Rate of Climb) Test

1. Command ramp tester to change the altitude at the rates shown in the table below.
2. Wait for ramp tester to report that target rates have been achieved.
3. Verify that the Rate of Climb reported by the Vertical Speed field on the PFD is within the tolerances specified in the table below:

Vertical Speed, feet/minute	Allowed tolerance, ±feet/minute
2000	100
0	45
-2000	100

OAT Probe Check

Check the outside air temperature (OAT) measurement shown on the PFD to ensure it reads ambient temperature.

If no other service is to be performed, continue to the return-to-service checks in Section 7.

6.7 GRS 77 AHRS / GMU 44 Magnetometer

Original GRS 77 is Reinstalled

If the original GRS 77 was reinstalled, then no software loading is required. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process. Continue to the GRS/GMU Calibration section.

New or Repaired GRS 77 is Installed

If the GRS 77 was replaced with a new unit then software must be loaded. Continue to the GRS 77 Software Loading procedure.

Original GMU 44 is Reinstalled

If the original GMU 44 was reinstalled, then no software loading is required. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process. Continue to the GRS/GMU Calibration section.

New or Repaired GMU 44 is Installed

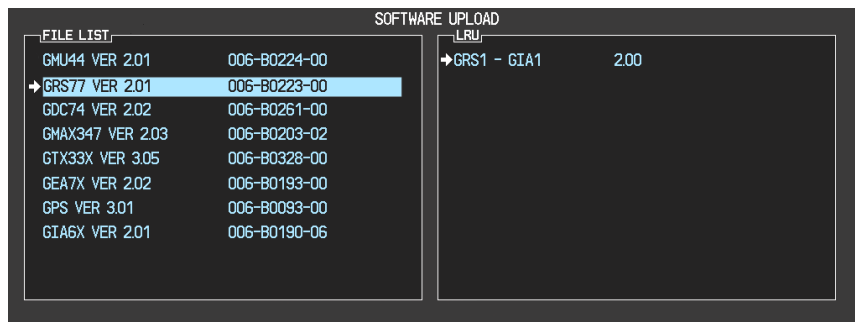
If the GMU 44 was replaced with a new unit then software must be loaded. Continue to the GMU 44 Software Loading procedure.

6.7.1 GRS 77 Software Loading using GDU V6.XX

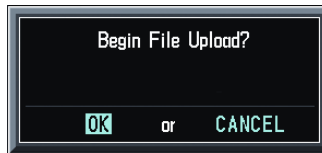
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

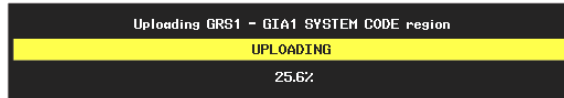
1. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
2. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
3. Start the G1000 system in Configuration mode.
4. On the PFD, go to the Software Upload page using the FMS knob.
5. Highlight the GRS software file. Ensure that the GRS to GIA data path appears in the LRU field as shown:



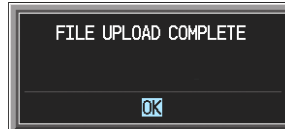
6. Press the LOAD softkey.
7. Select OK and press the ENT key to acknowledge the following prompt:



- The software for the GRS 77 AHRS begins to load. Monitor the upload status as it progresses:



- After the files finish loading, press the ENT key to acknowledge the following prompt:



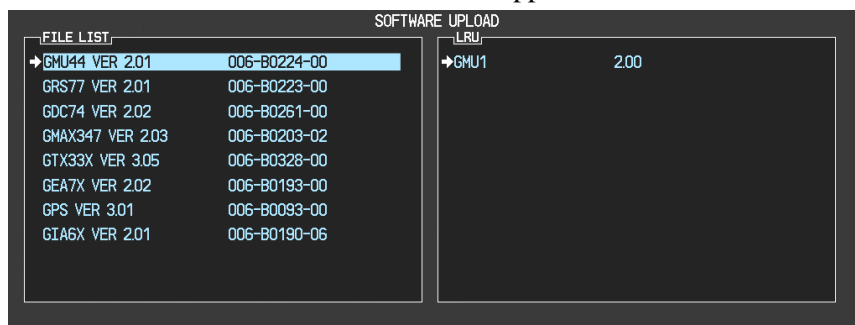
- Check the SUMMARY field to ensure the load is 'COMPLETE'.
- Go to the System Status page.
- Activate the cursor and highlight 'GRS1 – GIA1', and then 'GRS1 FPGA' in the LRU window.
- Verify that the reported part numbers and versions of the software files match the data in the Required Equipment List.
- After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
- Continue to the GRS/GMU Calibration section.

6.7.2 GMU 44 Software Loading using GDU V6.XX

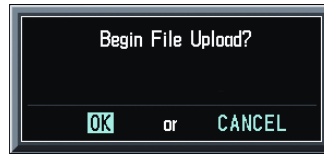
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

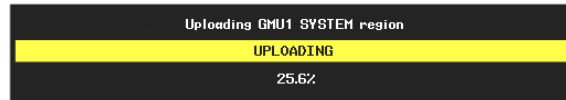
- Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
- Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
- Start the G1000 system in Configuration mode.
- On the PFD, go to the Software Upload page using the FMS knob.
- Highlight the GMU software file. Ensure that GMU1 appears in the LRU field as shown:



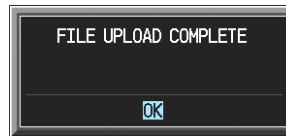
-
6. Press the LOAD softkey.
 7. Select OK and press the ENT key to acknowledge the following prompt:



8. The software for the GMU 44 Magnetometer begins to load. Monitor the upload status as it progresses:



9. After the files finish loading, press the ENT key to acknowledge the following prompt:



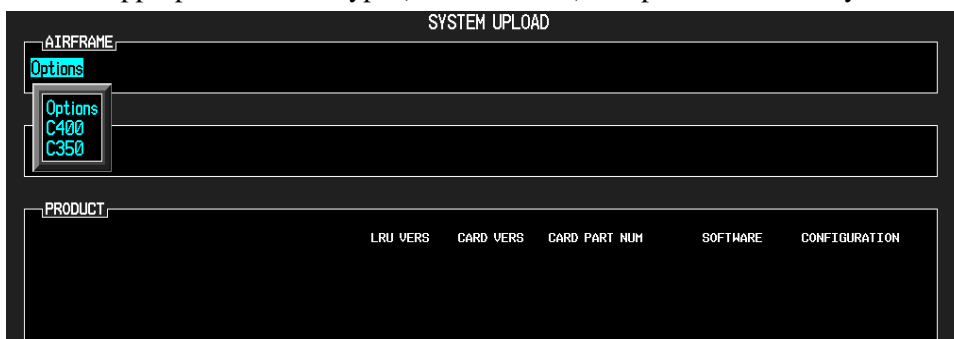
10. Check the SUMMARY field to ensure the load is 'COMPLETE'.
11. Go to the System Status page.
12. Activate the cursor and highlight 'GMU1', then 'GMU1 FPGA' in the LRU window.
13. Verify that the reported part number and version of the software files match the data in the Required Equipment List.
14. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
15. Continue to the GRS/GMU Calibration section.

6.7.3 GRS 77 / GMU 44 Software Load and Configuration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.

1. On the PFD, go to the System Upload page using the small FMS knob.
2. Activate the cursor and use the small FMS knob to highlight the airframe type in the AIRFRAME field. Select the appropriate aircraft type (C400 or C350) and press the ENT key.



NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

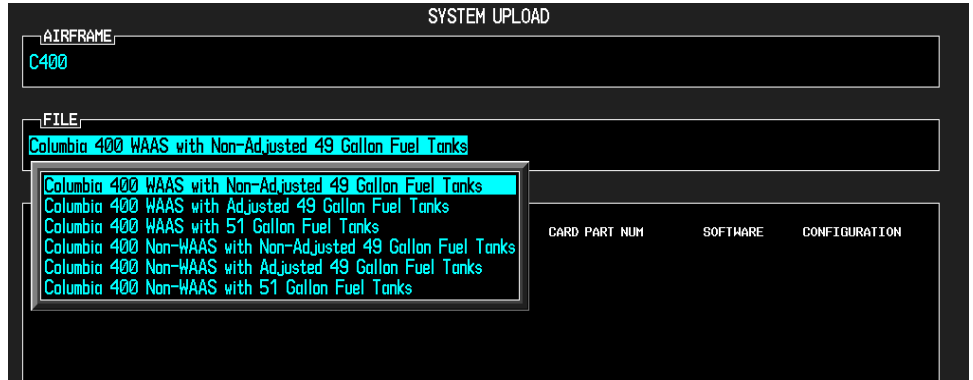
3. Once an airframe type is selected the cursor moves to the FILE window. Rotate the small FMS knob to activate the drop-down menu. Three FQIS fuel tank options are available: 49 gallon (non-adjusted); 49 gallon (adjusted); 51 gallon. Confirm the serial number of the aircraft prior to selection as well as inspect logbooks for field upgrades according to the following table.

	C350	C400	Comments
49 Gallon (non-adjusted)	42502 - 42564	41563 - 41757	Verify logbooks for compliance with Columbia Service Letter SL-07-008B
49 Gallon (adjusted)	42565 - 42567	41758 - 41799	
51 Gallon	42568 and higher	41800 and higher	Inspect fuel tank placard

If the aircraft is a Columbia 350 within the serial number range of 42502-42564 or a Columbia 400 within the serial number range of 41563-41757, confirm the FQIS fuel tank option by referencing the aircrafts logbooks. Compliance with Columbia Service Letter number SL-07-008B requires the selection of “49 gallon adjusted”. Columbia aircraft with 51 gallon tanks can be verified by inspection of the fuel tank placard.

NOTE

At this step, select to load WAAS or non-WAAS G1000 software.



- The PRODUCT window will populate and display software and configuration file information for each G1000 LRU. The LRU VERS column shows the currently loaded software version in the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. Each check designates a file to be loaded to the G1000.



By default, if an inequality between the LRU and CARD columns exists, the SOFTWARE CONFIGURATION boxes will be pre-selected (checked). By default all of the CONFIGURATION boxes will be pre-selected.

The following softkeys provide an easy way to select files:

CHK ALL: Selects all files, both configuration and software

CHK SW: Selects all software files only.

CHK CFG: Selects all configuration files only.

CLR ALL: Clears all selections.

5. After verifying that the GRS/GMU software and configuration files are checked, press the LOAD softkey. It is acceptable to simply load the pre-selected software and config files. The G1000 system automatically begins loading software and default configuration files to the selected LRUs in the proper order.
6. When the system finishes loading, it prompts the technician accordingly. Press the ENT key to acknowledge that the upload is finished:



7. Verify that each column indicates PASS in green when the loading process has finished and inspect the SUMMARY window as well to ensure that the load is successful.
8. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
9. Continue to the GRS/GMU calibration procedure.

6.7.4 GRS/GMU Calibration

GRS/GMU Recalibration Criteria

Condition	Calibrations Required		
	Procedure A: GRS 77 Pitch/Roll Offset	Procedure B: GRS/GMU Magnetic Calibration	Procedure C: Engine Run-up Vibration Test
GMU 44 was removed and reinstalled. (no change in serial number)	None Required. Continue to GRS/GMU Test section.		
GMU 44 was replaced with new unit. (New serial number)		X	
GRS 77 AHRS was removed and/or replaced. The mounting tray was NOT removed and the mounting tray bolts were NOT loosened.	None Required. Continue to GRS/GMU Test section.		
GRS 77 AHRS was removed and/or replaced. The mounting tray WAS removed and/or mounting tray bolts WERE loosened.	X	X	X
GRS 77 AHRS Configuration Module was replaced.	X	X	X

After the necessary calibrations have been done, continue to the GRS/GMU Test section.

6.7.4.1 Procedure A: GRS 77 Pitch/Roll Offset Calibration

This first procedure must be carried out with the engine off.

1. Level the aircraft to within $\pm 0.25^\circ$ of zero pitch and zero roll using a digital level. (Follow instructions in the 350/400 AMM for leveling)
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the GRS Page Group and select the GRS/GMU Calibration page. This page is protected and the following softkey password must be entered on the PFD to continue:
 - a) 9
 - b) 10
 - c) 11
 - d) 12 (Far Right softkey)



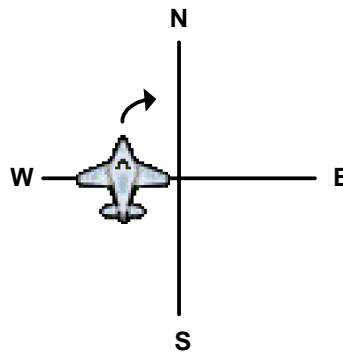
4. Ensure that the No. 1 GRS 77 is selected in the SELECT GRS UNIT window on the PFD.
 - a) Activate the cursor and highlight the SELECT PROCEDURE window and select PITCH/ROLL OFFSET.
 - b) Press the ENT key.
 - c) Use the cursor to highlight the BEFORE CALIBRATION window.
 - d) Follow the checklist items displayed on the PFD and press the ENT key as each step is completed or confirmed.
 - e) When the CALIBRATE field is blinking, press the ENT button to begin the procedure.
 - f) After several seconds, a new checklist appears in the lower half of the PFD. Press the ENT key as each step is confirmed. When the CONFIRM AIRCRAFT IS LEVEL field is blinking, press the ENT key to continue.
5. The result of the pitch/roll offset compensation is displayed on the PFD. If successful, the AHRS records the required pitch and roll offsets, informs the operator of a successful conclusion and returns to normal operation.
6. Press the ENT key on the PFD to conclude this procedure.

6.7.4.2 Procedure B - GRS/GMU Magnetic Calibration

CAUTION

Calibration Procedure B must be carried out on a compass rose in order to guarantee measurements free of environmental magnetic disturbances. Attempting to carry out this maneuver on a typical ramp area may not yield a successful calibration. The accuracy of the AHRS cannot be guaranteed if this calibration is not performed on a magnetically clean compass rose or equivalent.

1. Start both displays in normal mode.
2. Start the aircraft engine following the procedures in the Columbia Pilot's Operating Handbook.
3. After aircraft engine startup, taxi the aircraft to a properly calibrated compass rose. At the compass rose, align the aircraft to a heading of magnetic north ($\pm 5^\circ$).



4. Restart the PFD and MFD in configuration mode.
5. Go to the GRS Page Group on the PFD.
6. Select the GRS/GMU Calibration page and enter the following softkey password:
 - a) 9
 - b) 10
 - c) 11
 - d) 12 (Far Right softkey)



7. Activate the cursor and highlight the SELECT PROCEDURE window and select MAGNETOMETER.
8. Press the ENT button.
9. Use the cursor to highlight the BEFORE CALIBRATION window.
10. Follow the checklist items displayed on the PFD and press the ENT key as each one is completed or confirmed. When the CALIBRATE field is blinking, press the ENT key to begin the procedure.
11. The PFD display advises the operator when to turn the aircraft, when to stop, and when to turn again.
12. Upon instruction to turn, taxi the aircraft in a right turn. After approximately 25° to 30° of turn from the last heading, the PFD display advises the operator to stop the aircraft.

NOTE

Due to the difficulties in executing smooth, accurate turns the PFD may incorrectly interpret a station and instruct to “HOLD POSITION” prior to full completion of a 30° turn. If this scenario is encountered, it is best for the operator to ignore the “HOLD POSITION” command and instead use outside references to complete the approximate 30° turn. Instead of using the PFD instruction to turn as a real-time indication of when to turn, simply judge the 30° (±5°) turn increments of the aircraft by using the compass rose radials. Dwelling at these 30° increments for the time recommended by the PFD should result in successful calibration.

-
13. The PFD guides the operator to dwell at multiple headings around a complete circle.

NOTE

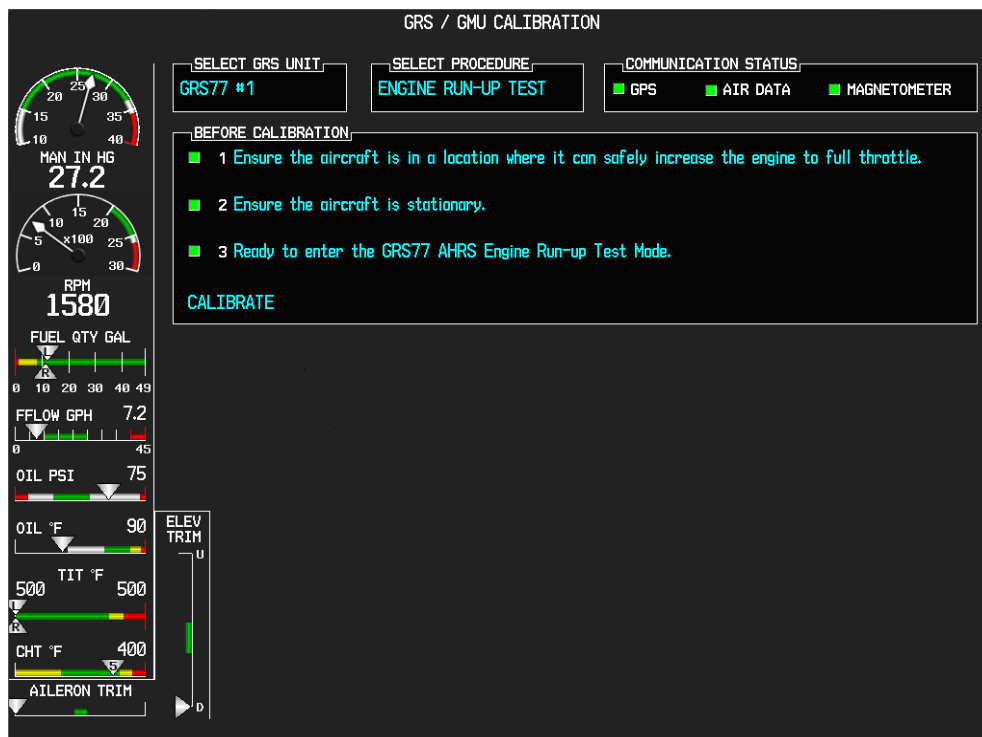
Due to high winds or excessive airframe vibration, the operator may encounter a condition where the PFD restarts the 18-second countdown without full completion of the previous countdown. If this is encountered more than once for a given station, the operator should begin turning to the next station (approximately 30°). A minimum of 2 successful stations per quadrant is required, where a successful station is a full 18-second countdown followed by instruction to move. Ensure that at least 2 stations per quadrant are completed. Thus, it may sometimes be required to dwell at a station after a countdown restart. A maximum of 20 stations is allowed for the entire calibration procedure. If too many countdown restarts are encountered, the calibration will fail with the message, "TOO MANY STATIONS."

14. Repeat the turn-and-stop process until the PFD advises that a successful calibration is complete. The GRS 77 AHRS then enters its normal operational mode. Press the ENT button on the PFD to conclude this procedure.

6.7.4.3 Procedure C: Engine Run-Up Vibration Procedure

Calibration procedures A and B are not required prior to this procedure.

1. Start both displays in normal mode.
2. Start the aircraft engine following the procedures in the G1000/350/400 Airplane Flight Manual Supplement.
3. After aircraft engine startup, taxi the aircraft to a suitable area for engine run-up.
4. Restart both displays in configuration mode.
5. On the MFD, select the GEA page group. On the Engine Data page, monitor engine performance during the procedure.
6. Go to the GRS Page Group on the PFD.
7. Select the GRS/GMU Calibration page and enter the following softkey password:
 - a) 9
 - b) 10
 - c) 11
 - d) 12 (Far Right softkey)



8. Initiate the AHRS engine run-up vibration test procedure by performing the following steps:
 - a) Select the ENGINE RUN-UP TEST procedure and press the ENT key.
 - b) Follow the checklist items displayed on the PFD, and press the ENT key as each step is completed or confirmed.
 - c) When the CALIBRATE field is blinking, press the ENT key to begin the procedure.
9. The PFD instructs the operator to gradually increase power from idle to full throttle and back to idle over a period of 2-4 minutes.

-
10. When the operator has completed the engine run-up and the engine is back to an idle setting, press the ENT key to indicate that the process is complete. When this is done, the TEST COMPLETE field stops blinking.
 11. The PFD informs the operator if the installation has passed or failed the vibration test. If the test fails, the specific measurements causing the failure are identified and numeric values are displayed on the PFD.
 12. Press the ENT button on the PFD to conclude this procedure.

NOTE

If failures are indicated, the engine run-up test may be repeated once or at most twice. If the test does not pass after three attempts, then the installation should not be considered reliable until the source of the vibration problem is identified and remedied. In the event of repeated failure of the engine run-up test, record the values that are reported to be out of range for future reference.

The following are potential causes for failure of the engine run-up test:

- a) Vibration motion of GRS 77 and/or GMU 44 caused by neighboring equipment and/or supports.
- b) Mounting screws and other hardware for GRS 77 and/or GMU 44 not firmly attached.
- c) GRS 77 connector not firmly attached to unit.
- d) Cabling leading to GRS 77 or GMU 44 not firmly secured to supporting structure.
- e) An engine / propeller that is significantly out of balance

6.7.4.4 Magnetometer Interference Test

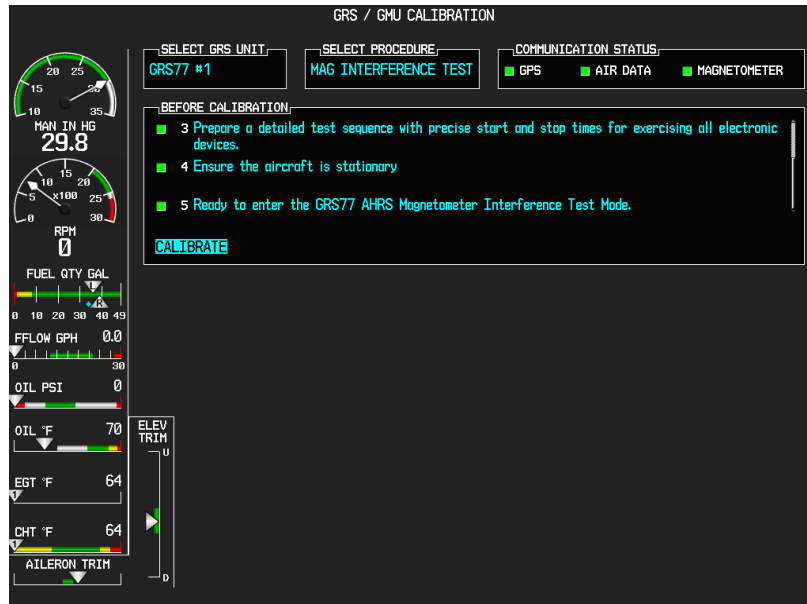


Figure 6-7. Magnetometer Interference Test

1. Initiate the AHRS engine run-up vibration test procedure by performing the following steps:
 - a) Select the MAG INTERFERENCE TEST procedure and press the ENT key.
 - b) Follow the checklist items displayed on the PFD, and press the ENT key as each one is completed or confirmed. When the CALIBRATE field is blinking, press the ENT key to begin the procedure (as soon as the ENT key is pressed this time, a CALIBRATION PROCEDURE window will appear).

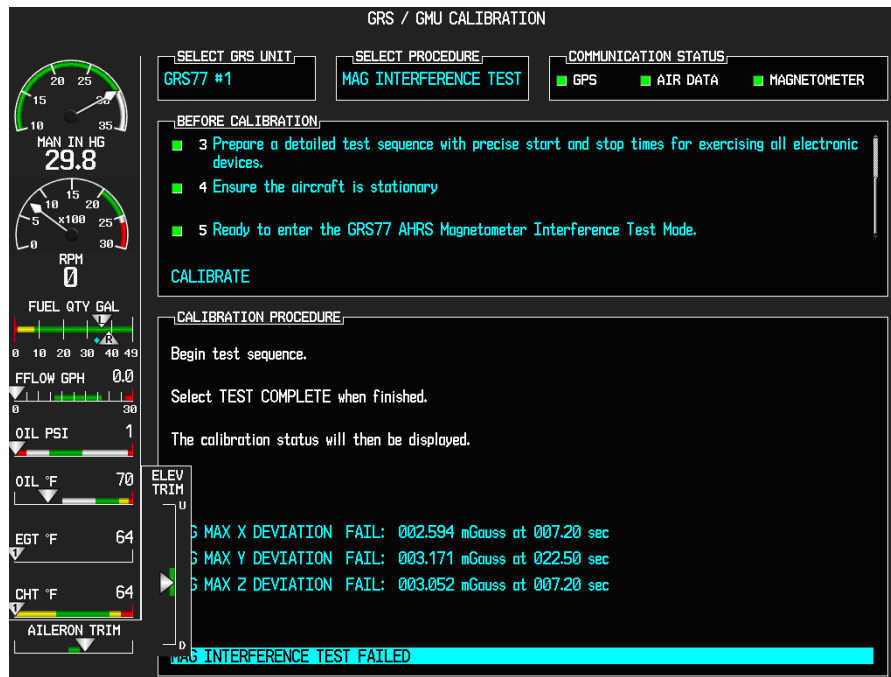


Figure 6-8. Magnetometer Interference Test Complete

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2. Leave the Navigation lights on for approximately 10 seconds, and then turn them off.
 3. Wait approximately five seconds and then press the ENT key to complete the test.
 4. The PFD informs the operator if the installation has passed or failed the magnetometer interference test. If the test passes, no further action is required.
 5. Press the ENT key on the PFD to conclude this procedure.
 6. If the MAG INTERFERENCE TEST fails but ALL of the deviations are less than the following thresholds ($X < 5$ mGauss, $Y < 5$ mGauss, and $Z < 8$ mGauss), the installation must be verified with a flight test before it is acceptable.

NOTE

If failures are indicated, the magnetometer interference test may be repeated at most twice. If the test shows an X or Y deviation greater than or equal to 6 mGauss, or a Z deviation greater than or equal to 10 mGauss after three attempts, then the installation should not be considered reliable until the source of the interference problem is identified and remedied. In the event of repeated failure of the magnetometer interference test, record the values that are reported to be greater than or equal to 6 mGauss for future reference.

6.7.5 GRS/GMU Test

The aircraft can now be taxied back and the engine can be shut down for final checkout.

When the PFD powers up in normal mode, the AHRS attitude and heading information displayed should become valid within 1 minute of power-up. This confirms that the GRS 77 and GMU 44 work correctly.

If no other service is to be performed, continue to the return-to-service checks in Section 7.

6.7.6 GRS 77 Earth Magnetic Field Updates

The GRS 77 utilizes an Earth magnetic field model which is updated once every five years. The update is expected to be available from Garmin in each of the following years: 2010, 2015 and every five years thereafter, so long as the GRS 77 remains a Garmin-supported product.

The G1000 system alerts the operator that the magnetic field database is out of date by issuing the message “AHRS SERVICE – AHRS Magnetic-field model needs update” (Reference Section Common Alerts 4.9.3). Contact Garmin for update instructions.

6.8 GDL 69A Data Link

Original GDL 69A is Reinstalled

No software or configuration loading is required if the removed GDL 69A is re-installed. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process. Continue to the GDL 69A Test procedure.

New GDL 69A is Installed

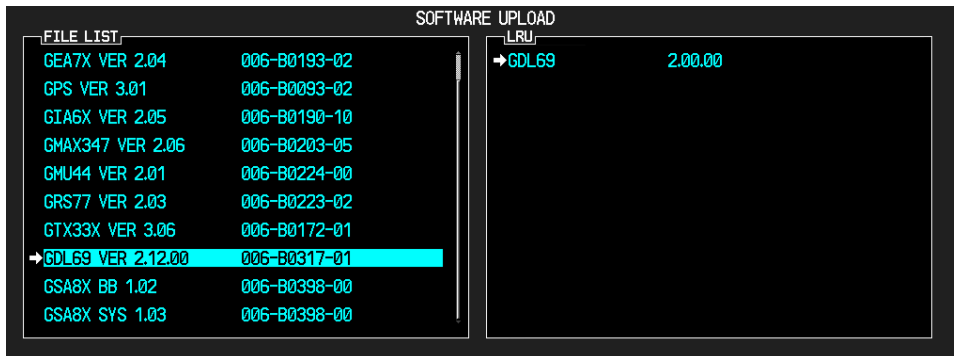
If a new GDL 69A is installed, the correct software and configuration files must be loaded to the unit. The GDL 69A will also have to be activated. Continue to the GDL 69A Software Loading procedure.

6.8.1 GDL 69A Software Loading using GDU V6.XX

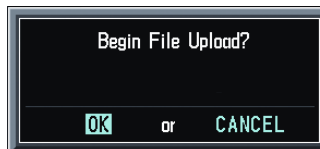
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section

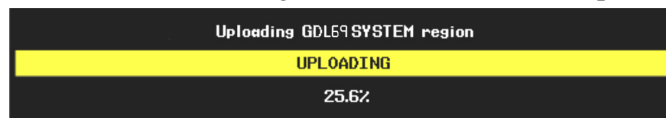
1. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
2. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
3. Start the G1000 system in Configuration mode.
4. On the PFD, go to the Software Upload page using the FMS knob.
5. Highlight the GDL software file. Ensure that GDL69 appears in the LRU field as shown:



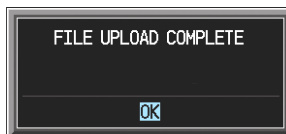
6. Press the LOAD softkey.
7. Select OK and press the ENT key to acknowledge the following prompt:



8. The software for the GDL 69A data link begins to load. Monitor the upload status as it progresses:



9. After the files finish loading, press ENT to acknowledge the following prompt:



10. Check the SUMMARY field to ensure the load is 'COMPLETE'.
11. Deactivate the cursor.
12. Go to the System Status page.
13. Activate the cursor and highlight 'GDL69' in the LRU window.
14. Verify that the reported part number and version of the software matches the data in the Required Equipment List.
15. Continue to the GDL 69A Configuration procedure.

6.8.2 GDL 69A Configuration Loading using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section

1. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Configuration Upload page using the FMS knob:

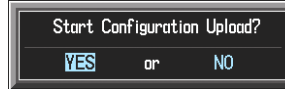


4. Activate the cursor and use the small FMS knob to highlight the airframe type in the FILE field.

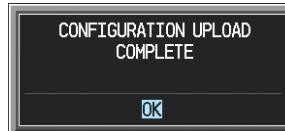
NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

5. Press the ENT key to select the appropriate airframe type. Once an airframe type is selected the configuration files in the SECTION field will be displayed.
6. Using the FMS knob, highlight 'GDL69' in the FILE LIST field.
7. Press the LOAD softkey.
8. Select YES and press the ENT key to acknowledge the following prompt:



9. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



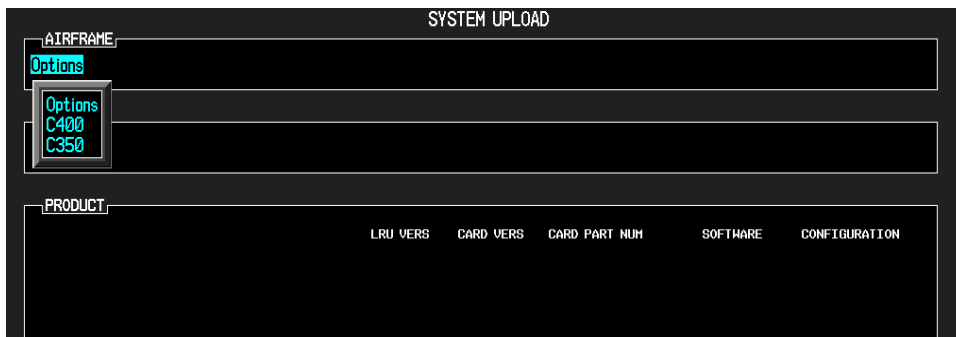
10. View the SUMMARY field and ensure that all items are 'complete', then de-activate the cursor.
11. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
12. Continue to the GDL 69A Test procedure.

6.8.3 GDL 69A Software Load and Configuration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.

1. On the PFD, go to the System Upload page using the small FMS knob.
2. Activate the cursor and use the small FMS knob to highlight the airframe type in the AIRFRAME field. Select the appropriate aircraft type (C400 or C350) and press the ENT key.



NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

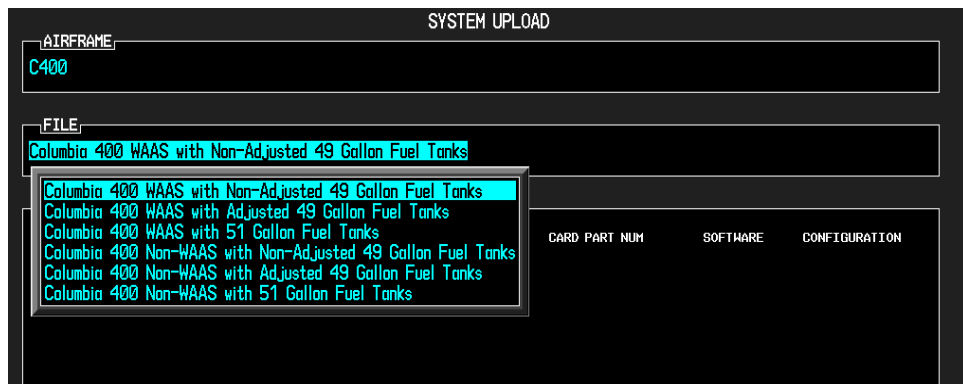
3. Once an airframe type is selected the cursor moves to the FILE window. Rotate the small FMS knob to activate the drop-down menu. Three FQIS fuel tank options are available: 49 gallon (non-adjusted); 49 gallon (adjusted); 51 gallon. Confirm the serial number of the aircraft prior to selection as well as inspect logbooks for field upgrades according to the following table.

	C350	C400	Comments
49 Gallon (non-adjusted)	42502 - 42564	41563 - 41757	Verify logbooks for compliance with Columbia Service Letter SL-07-008B
49 Gallon (adjusted)	42565 - 42567	41758 - 41799	
51 Gallon	42568 and higher	41800 and higher	Inspect fuel tank placard

If the aircraft is a Columbia 350 within the serial number range of 42502-42564 or a Columbia 400 within the serial number range of 41563-41757, confirm the FQIS fuel tank option by referencing the aircrafts logbooks. Compliance with Columbia Service Letter number SL-07-008B requires the selection of “49 gallon adjusted”. Columbia aircraft with 51 gallon tanks can be verified by inspection of the fuel tank placard.

NOTE

At this step, select to load WAAS or non-WAAS G1000 software.



- The PRODUCT window will populate and display software and configuration file information for each G1000 LRU. The LRU VERS column shows the currently loaded software version in the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. Each check designates a file to be loaded to the G1000.



By default, if an inequality between the LRU and CARD columns exists, the SOFTWARE CONFIGURATION boxes will be pre-selected (checked). By default all of the CONFIGURATION boxes will be pre-selected.

The following softkeys provide an easy way to select files:

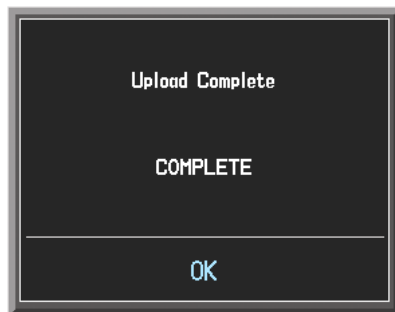
CHK ALL: Selects all files, both configuration and software

CHK SW: Selects all software files only.

CHK CFG: Selects all configuration files only.

CLR ALL: Clears all selections.

- After verifying that the GDL software and configuration files are checked, press the LOAD softkey. It is acceptable to simply load the pre-selected software and config files. The G1000 system automatically begins loading software and default configuration files to the selected LRUs in the proper order.
- When the system finishes loading, it prompts the technician accordingly. Press the ENT key to acknowledge that the upload is finished:



- Verify that each column indicates PASS in green when the loading process has finished and inspect the SUMMARY window as well to ensure that the load is successful.

8. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
9. Continue to the GDL 69 Test procedure.

6.8.4 GDL 69A Test

NOTE

This section verifies correct installation in the aircraft. It does not activate the GDL 69 XM data link radio. If the XM Radio is activated, the channel list will contain more channels than the three that are shown for a radio that has not been activated. Complete instructions for activating the XM data link can be found in Garmin document 190-00355-04.



1. Select the AUX – XM RADIO page on the MFD.
2. Using the channel control located in the cabin, verify that you can increment and decrement the channels (the white arrow to the left of the channel list indicates the currently selected channel). Select channel 1 when complete.
3. Using the volume control located in the cabin, verify that you can increase and decrease the XM radio volume (the volume bar at the bottom of the screen will show changes to the volume level). Set the volume to the mid position when done.
4. Plug a set of headphones into one of the passenger stations and verify that you can hear the XM radio playing in both left and right channels. The volume level may be adjusted to a comfortable level at this point.
5. Plug a set of headphones into one of the pilot station and verify that you can hear the XM radio playing in both left and right channels.

6.9 GSA 81 Autopilot Servos/GTA 82 Pitch Trim Adapter

Original GSA 81/GTA 82 is Reinstalled

No software is required if the removed GSA 81/GTA 82 is re-installed. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process. Continue to the GFC 700 Autopilot Ground Checks in Section 6.10.

New GSA 81/GTA 82 is Installed

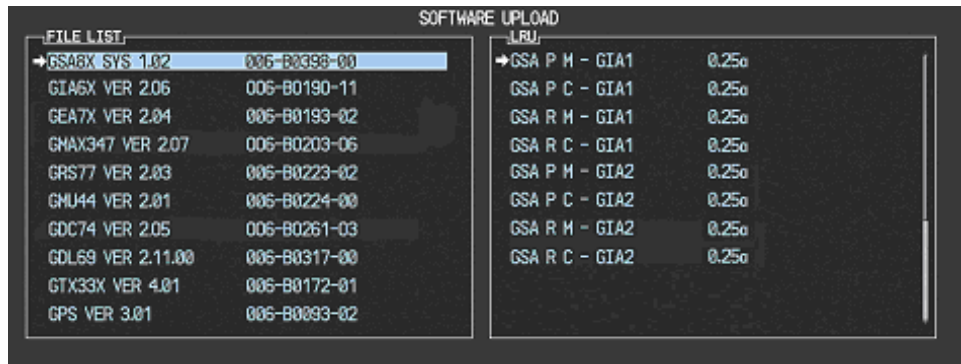
If a new GSA 81/GTA 82 is installed, the correct software and certification gains must be loaded to the unit. Continue to the GSA 81 or GTA 82 Software Loading procedure, as appropriate. After software is loaded, load certification gains into affected unit according to Section 15 and then complete the GFC 700 Autopilot Ground Checks in Section 6.106.10

6.9.1 GSA 81 Servo Software Loading using GDU V6.XX

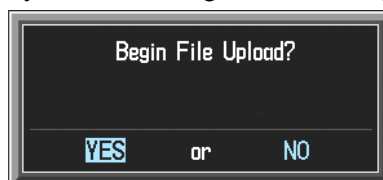
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

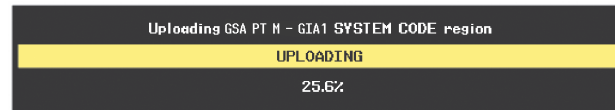
1. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
2. Insert the G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
3. Start the G1000 system in Configuration mode.
4. On the PFD, go to the Configuration Upload page using the FMS knob:



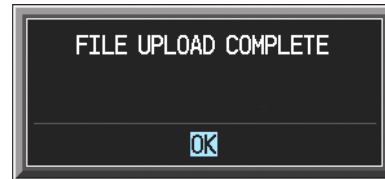
5. Highlight the GSA 8X software file. Ensure that each GSA to GIA data path appears in the LRU field as shown. Each servo axis is identified by the letters 'P' for pitch and 'R' for roll. Each servo consists of a monitor, denoted by the letter 'M', and a controller, denoted by the letter 'C'. Each servo interfaces to GIA1 and GIA2. The current software version is noted next to each LRU.
6. Press the LRU softkey to toggle the cursor to the LRU window.
7. Use the FMS knob to select the LRU to load and press the LOAD softkey.
8. Verify YES and press the ENT key to acknowledge the following prompt:



-
9. The software for the GSA 81 servo begins to load. Monitor the upload status as it progresses:



10. After the files finish loading, press the ENT key to acknowledge the following prompt:



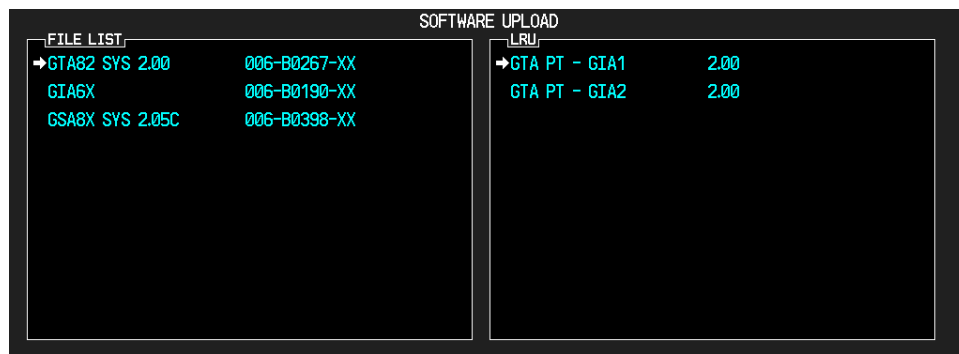
11. Check the SUMMARY field to ensure the load is 'COMPLETE'.
12. Highlight both the monitor (M) and controller (C) for each servo that was replaced and repeat Steps 5 through 10. The servo-to-GIA2 paths should not be loaded, since these are just redundant paths (loading via the GIA2 paths will simply reload the GSA software).
13. Deactivate the cursor.
14. Go to the System Status page.
15. Activate the cursor and highlight 'GSA x C – GIA1', then highlight 'GSA x M – GIA1' in the LRU window, where *x* is P or R for the pitch or roll servo as appropriate.
16. Verify that the reported part number and version of the software files matches the data in the Required Equipment List.
17. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.

6.9.2 GTA 82 Pitch Trim Adapter Software Loading using GDU V6.XX

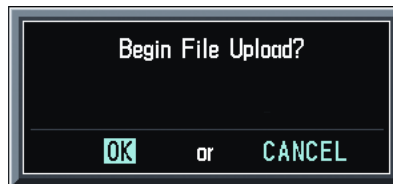
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

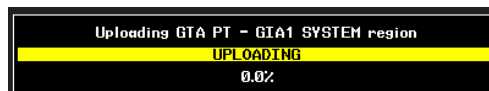
1. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
2. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
3. Start the G1000 system in Configuration mode.
4. On the PFD, go to the Configuration Upload page using the FMS knob:



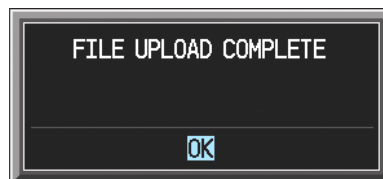
5. Highlight the GTA 82 software file. Ensure that both paths to the GTA 82 through GIA1 and GIA2 appear in the LRU field as shown:
6. Press the LRU softkey. Select the GTA - GIA1 data path to load software. Press the LOAD softkey.
7. Select OK and press the ENT key to acknowledge the following prompt:



8. The software for the GTA 82 begins to load. Monitor the upload status as it progresses:



9. After the files finish loading, press ENT to acknowledge the following prompt:



10. Check the SUMMARY field to ensure the all software loads are 'COMPLETE'.
11. De-activate the cursor.

-
12. Go to the System Status page.
 13. Activate the cursor and highlight 'GTA PT – GIA1' in the LRU window.
 14. Verify that the reported part number and version of the software file matches the data in the Required Equipment List.
 15. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.

6.9.3 GIA 63, GSA 81 and GTA 82 Certification Gain Loading using GDU V6.XX

NOTE

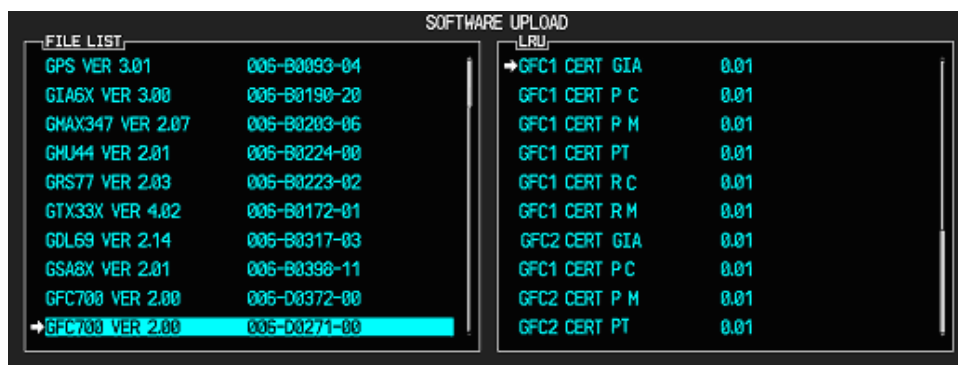
The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

NOTE

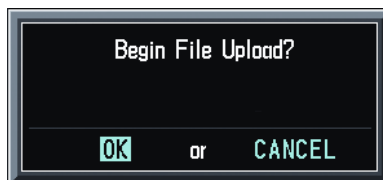
There will be two GFC 700 files on the loader card. Selecting the 006-D0271-00 file will cause items that have never been loaded before to appear in the LRU window. Selecting the second GFC 700 file will cause items that have been previously loaded to appear in the LRU window. Highlight the file that causes the appropriate item to appear in the LRU window and do not use the other file if its associated LRU window is empty.

1. Highlight the GFC700 Certification Gains software file. The following GFC1 CERT and GFC2 CERT paths may appear in the LRU field (a sample screen is shown below):

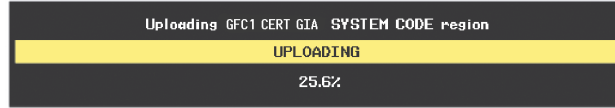
GFC1 CERT GIA	—	GFC2 CERT GIA	—
GFC1 CERT P C	—	GFC2 CERT P C	— (not loaded)
GFC1 CERT P M	—	GFC2 CERT P M	— (not loaded)
GFC1 CERT PT	—	GFC2 CERT PT	— (not loaded)
GFC1 CERT R C	—	GFC2 CERT R C	— (not loaded)
GFC1 CERT R M	—	GFC2 CERT R M	— (not loaded)



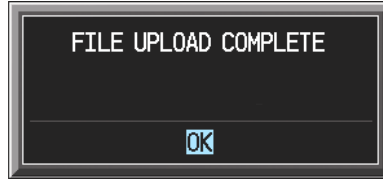
2. Press the LRU softkey to toggle the cursor to the LRU window.
3. Use the FMS knob to select the LRU to be loaded. The pitch and roll servos each require two items to be loaded – monitor (M) and controller (C). The GIA and pitch trim adapter each only require that one item be loaded.
4. Press the LOAD softkey to start loading the selected item.
5. Select YES and press the ENT key to acknowledge the following prompt:



6. The GFC 700 certification software gains begin to load. Monitor the upload status as it progresses:



7. After the file finishes loading, press the ENT key to acknowledge the following prompt:



8. Check the SUMMARY field to ensure each load is 'COMPLETE'.

NOTE

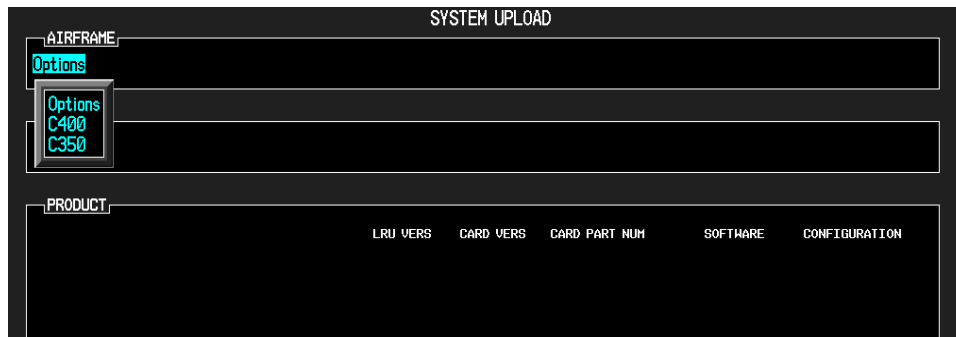
Except for the GFC2 CERT GIA, the GFC2 CERT files do not need to be loaded, since these are just redundant paths (loading via the GFC2 paths will simply reload the gains into the servos).

6.9.4 Servo Software Load and Configuration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section

1. On the PFD, go to the System Upload page using the small FMS knob.
2. Activate the cursor and use the small FMS knob to highlight the airframe type in the AIRFRAME field. Select the appropriate aircraft type (C400 or C350) and press the ENT key.



NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

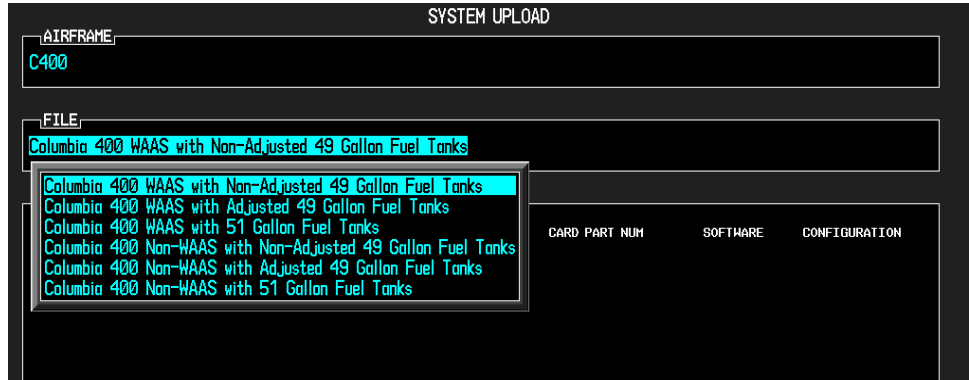
3. Once an airframe type is selected the cursor moves to the FILE window. Rotate the small FMS knob to activate the drop-down menu. Three FQIS fuel tank options are available: 49 gallon (non-adjusted); 49 gallon (adjusted); 51 gallon. Confirm the serial number of the aircraft prior to selection as well as inspect logbooks for field upgrades according to the following table.

	C350	C400	Comments
49 Gallon (non-adjusted)	42502 - 42564	41563 - 41757	Verify logbooks for compliance with Columbia Service Letter SL-07-008B
49 Gallon (adjusted)	42565 - 42567	41758 - 41799	
51 Gallon	42568 and higher	41800 and higher	Inspect fuel tank placard

If the aircraft is a Columbia 350 within the serial number range of 42502-42564 or a Columbia 400 within the serial number range of 41563-41757, confirm the FQIS fuel tank option by referencing the aircrafts logbooks. Compliance with Columbia Service Letter number SL-07-008B requires the selection of “49 gallon adjusted”. Columbia aircraft with 51 gallon tanks can be verified by inspection of the fuel tank placard.

NOTE

At this step, select to load WAAS or non-WAAS G1000 software.



- The PRODUCT window will populate and display software and configuration file information for each G1000 LRU. The LRU VERS column shows the currently loaded software version in the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. Each check designates a file to be loaded to the G1000.



By default, if an inequality between the LRU and CARD columns exists, the SOFTWARE CONFIGURATION boxes will be pre-selected (checked). By default all of the CONFIGURATION boxes will be pre-selected.

The following softkeys provide an easy way to select files:

CHK ALL: Selects all files, both configuration and software

CHK SW: Selects all software files only.

CHK CFG: Selects all configuration files only.

CLR ALL: Clears all selections.

5. After verifying that the Servo/GTA/GIA software and configuration files are checked, press the LOAD softkey. It is acceptable to simply load the pre-selected software and config files. The G1000 system automatically begins loading software and default configuration files to the selected LRUs in the proper order.
6. When the system finishes loading, it prompts the technician accordingly. Press the ENT key to acknowledge that the upload is finished:



7. Verify that each column indicates PASS in green when the loading process has finished and inspect the SUMMARY window as well to ensure that the load is successful.
8. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.
9. Continue to the GEA 71 Test procedure.

6.10 GFC 700 Autopilot Ground Checks

The following procedure will verify the proper operation of the GFC 700 AFCS. This procedure is designed to test the installation of the AFCS only after the Software Load Verification in Section 6.9 has been conducted. The technician performing these checks must be thoroughly familiar with the GFC 700 by studying the following:

- G1000 Cockpit Reference Guide for the Columbia 350/400, Garmin P/N 190-00567-00 latest revision.

6.10.1 Autopilot Pre-Flight Test

NOTE

The autopilot pre-flight test will run on every full airplane power-on.

1. Ensure that the A/P TRIM master switch in the overhead is ON.
2. Open the AUTOPILOT circuit breaker and reset. The AFCS will re-initiate the pre-flight test.

NOTE

A red AFCS (**AFCS**) annunciation will be displayed until both GIAs, the AHRS, and the autopilot servos are online.

3. Verify that a white 'PFT' annunciation is displayed on the PFD, as shown in Figure 6-9.



Figure 6-9. GFC 700 Pre-Flight Test

4. Upon successful completion of the pre-flight test, an aural alert will sound and the 'PFT' annunciation will clear. Continue to Section 6.10.2.

NOTE

If the 'PFT' annunciation turns red, the test has failed and additional troubleshooting will have to be performed prior to continuing with the test.

-
5. If the aural alert is not heard, but pre-flight testing passed, engage the Autopilot by pressing the AP key on the MFD and disengage the Autopilot by pressing the AP key again. Visual and aural disconnect alerting should occur. If no alert is heard, the audio interface between GIA No. 1 and the audio panel should be checked. If an alert is heard, the audio interface between GIA No. 2 and the audio panel should be checked.

6.10.2 AFCS Switch Checks

To verify that the AFCS system buttons and switches are operating correctly, perform the following checks:

1. Actuate the manual electric trim (MET) hat switch forward/aft on the pilot's control stick. The pitch trim should engage and the run in the selected direction. Check operation in both directions.
2. While actuating the pilot's MET switch in the pitch axis, press the A/P DISC button on the pilot's control stick and hold. The pitch trim should stop running and the pitch trim indication should stop moving. The pitch trim will not run for as long as the A/P DISC button is pressed.
3. Release the pilot's A/P DISC button. The trim should resume running. Release the MET switch.
4. Actuate the MET switch forward/aft on the copilot's control stick. The pitch trim should engage and the run in the selected direction. Check operation in both directions.
5. While actuating the copilot's MET switch in the pitch axis, press the A/P DISC button on the copilot's control stick and hold. The pitch trim should stop running and the pitch trim indication should stop moving. The pitch trim will not run for as long as the A/P DISC button is pressed.
6. Release the copilot's A/P DISC button. The trim should resume running. Release the MET switch.
7. Engage the Autopilot by pressing the AP key on the MFD. The pitch and roll clutches should engage, resisting movement of the control stick.
8. Press and hold the CWS switch on the pilot's control stick. CWS should be annunciated on the PFD and the control stick should now move freely when moved manually.
9. Release the CWS switch. CWS should be removed from the PFD and the autopilot should hold the control stick in its present attitude.
10. Press the A/P DISC switch. The Autopilot should command a normal disengagement. A single disconnect tone will be heard and a flashing amber "AP" will be visible on the PFD for approximately five seconds.
11. Verify that the control stick is free in pitch and roll axes.
12. Engage the Autopilot.
13. Pull the AUTOPILOT circuit breaker. The Autopilot should command an abnormal disconnect, consisting of a continuous disconnect tone and flashing red 'AP'. No AFCS annunciations (e.g. AFCS, PFT, Mistrim) should remain on the PFD.
14. Press the AP key on the MFD to silence the autopilot abnormal disconnect tone and then reset the AUTOPILOT breaker.
15. Wait for the pre-flight test sequence to successfully complete again.
16. Press the Go Around button on the flap control panel. 'GA' should be annunciated on the PFD for both pitch and roll modes and the command bars should indicate a wings-level climb to 7 degrees.

NOTE

The GA ENGAGED legend on the Go Around button will not illuminate, since it is not supported in the current version of software.

17. Press the FD key on the MFD twice to deactivate the Go Around mode and reset the Flight Director. Green 'PIT' and 'ROL' annunciations will be visible on the PFD.

-
18. Center the pitch trim.
 19. Engage the Autopilot.
 20. Press the CWS button and verify there is no residual force on the control stick for the pitch axis.
 21. Extend the flaps to approach position. The trim should immediately run in the NOSE DOWN direction (this can be seen by observing the pitch trim indication on the MFD).
 22. Retract the flaps. The trim should immediately run in the NOSE UP direction.
 23. Disengage the Autopilot by pressing the A/P DISC switch.

6.10.3 Autopilot Clutch Overpower Check

NOTE

The GFC 700 uses electronic torque limiting as well as mechanical slip clutches to limit the maximum servo effort. When the system is on the ground, the electronic torque limiting is disabled, allowing manual checks of the slip-clutch settings.

1. Engage the Autopilot.
2. Apply force to the control stick to determine if the Autopilot clutches can be overpowered in pitch and roll. If the Autopilot clutches cannot be overpowered, check the servo clutch torque settings.

6.10.4 Manual Electric Trim Speed Check

1. Run MET in one direction until it runs against the stop.
2. Using a stop watch or equivalent device, time the trim speed from one end of travel to the opposite stop. The elapsed time should measure 25 ± 5 seconds for each direction.
3. Verify also that the trim moves smoothly in both directions throughout the entire trim range during MET operation. If the trim hesitates, this may indicate that the pitch trim is sticking.. First verify cable tension. If cable tension is within tolerance, check the aircraft pitch trim system for excessive friction.
4. Set the overhead A/P TRIM master switch to OFF. Verify that the AP/TRIM OFF advisory is displayed on the PFD after approximately two seconds.
5. Attempt to run the MET in both directions using the MET switch and verify that it does not run.
6. Set the overhead A/P TRIM master switch to ON. Verify that the AP/TRIM OFF advisory clears.

6.10.5 Autopilot Operation Checks

1. Push the HDG knob in to synchronize the heading bug to the present aircraft heading on the HSI.
2. Engage the Autopilot.
3. Select Heading mode by pressing the HDG key on the MFD. The command bars should be level and the control stick should be stationary (very slow movement acceptable, due to the aircraft not being perfectly level).
4. Turn the HDG knob to the left and verify that the command bars move to the left and the control stick moves to the left.
5. Turn the HDG knob to the right and verify that the command bars move to the right and the control stick moves to the right.
6. Push the HDG knob in to synchronize the heading bug to the present aircraft heading on the HSI
7. Push the CWS button and pull the control stick to the middle of the pitch control range.
8. Release the CWS button. Verify that the Autopilot clutches re-engage and hold the wheel stationary.

-
9. Holding the control stick lightly, press the NOSE UP key on the MFD twice, to increase the pitch reference. Verify that the command bars move up approximately one degree and the control stick begins moving aft.
 10. Hold the control stick and press the CWS button, re-synchronizing the pitch reference and re-centering the control stick.
 11. Release the CWS button and verify that servo clutches re-engage before releasing the control stick.
 12. Press the NOSE DN key on the MFD twice. Verify that the command bars command down and the control stick begins moving forward.
 13. Hold the controls and press CWS to re-center the command bars and stop control stick movement.
 14. With the Autopilot still engaged and the CWS button pressed, move the control stick to its aft limit.
 15. Release the CWS button and apply continuous forward pressure, slowly moving the control stick. After 1 or 2 seconds, the trim should begin moving in a trim up direction.
 16. Grip the control stick and press the CWS button. Trim motion should stop.
 17. Move the control stick to the forward limit and release the CWS button.
 18. Slowly pull back on the control stick. After a similar delay, the trim should begin to trim down.
 19. Relieve pressure on the control stick and the trim motion should stop.
 20. Hold the control stick and press the A/P DISC switch to disconnect the Autopilot.
 21. Engage VS mode by pressing the VS key on the MFD. Verify the PFD displays 'VS' in green and indicates a pitch reference of '0 FPM'.
 22. Press the FLC key on the MFD and verify that 'FLC' is annunciated on the PFD in green with a reference of 80 KTS (NOTE: This is the minimum speed reference for this airplane).
 23. Press the ALT key on the MFD and verify that the 'ALT' annunciation is displayed in green on the PFD with an altitude reference equal to the aircraft altitude.
 24. Press the FD key and verify that the mode annunciations and command bars are removed from the display.

6.10.6 Servo Torque Limit Validation

This procedure validates the servo torque limits by measuring the bridle cable tension under servo load. Prior to starting, verify tension on all GFC autopilot bridle cables (servo cable rigging tension) are within the limits specified by the following procedure:

6.10.6.1 Pitch Torque

1. Open the PFD and MFD circuit breakers.
2. Turn on power to the G1000 system.
3. While holding the ENT key on the PFD, close the PFD circuit breaker.
4. When INITIALIZING SYSTEM appears on the PFD, release the ENT key. The PFD will be in configuration mode.
5. Repeat steps 3 and 4 for the MFD.
6. Using the FMS knob, navigate to the GFC page group and select the second page in this page group. The title of this page is "GFC STATUS."
7. Change the RPM to +2.50rpm as shown in Figure 6-10. and press the ENT key.

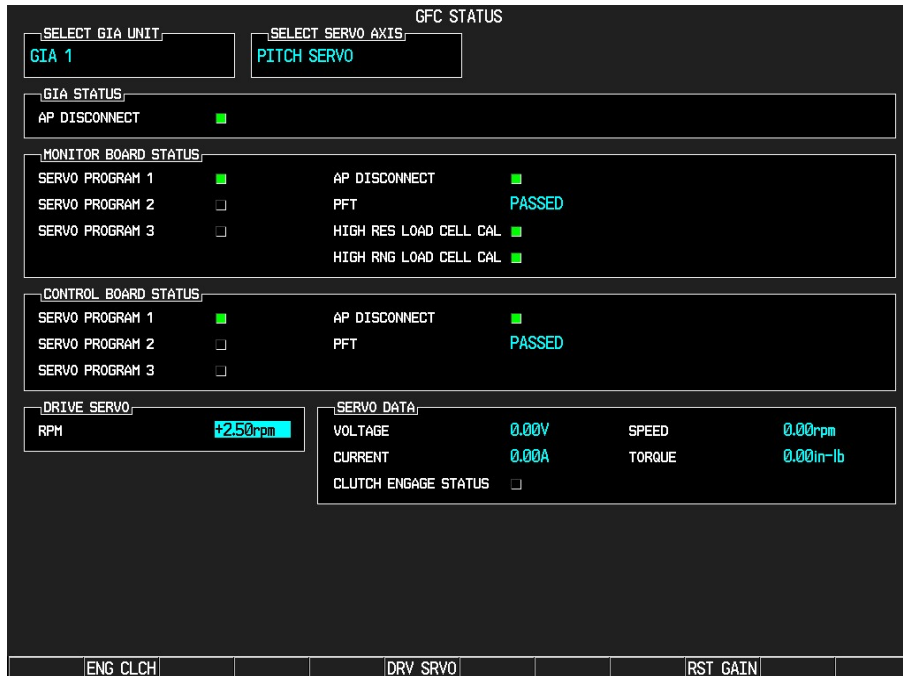


Figure 6-10. GFC Status Page, Pitch Servo

8. Hold the control stick in the full nose-down position.
9. Press the ENG CLCH softkey, followed by the DRV SRVO softkey. The servo will attempt to drive the control stick nose up.
10. While holding the control stick in the full nose down position, a second person should use a cable tensiometer to measure the tension on the pitch bridle cable. The tension should be measured on the portion of the bridle cable that is under tension.
11. Press the STP SRVO and DIS CLCH softkeys to stop driving the servo.
12. Record the tension in Table 6-1.
13. Verify that the tension is less than 35 lbs for the C400 and 72 lbs for the C350.

6.10.6.2 Roll Torque

1. In the SELECT SERVO AXIS window, select the roll servo.
2. Change the RPM to -2.50 rpm and press the ENT key.
3. Hold the control stick in the full left position.
4. Press the ENG CLCH softkey, followed by the DRV SRVO softkey. The servo will attempt to drive the control stick to the right.
5. While holding the control stick in the full left position, a second person should use a cable tensiometer to measure the tension on the roll bridle cable. The tension should be measured on the portion of the bridle cable that is under tension.
6. Press the STP SRVO and DIS CLCH softkeys to stop driving the servo.

-
7. Record the tension in Table 6-1.
 8. Verify that the tension is less than 35 lbs.

Servo Location	Measured Tension (lbs)	Allowed Tension (lbs)	
		C400	C350
Pitch		35	72
Roll		35	35

Table 6-1. Measured Tension

NOTE

If the measured values exceed the limits above, the servo must be removed from the aircraft and tested/adjusted as required. See section 5.17 for GSM slip clutch adjustment procedures.

6.11 GCU 476 Remote Keypad

Original GCU 476 is Reinstalled

No software or configuration loading is required if the removed GCU 476 is re-installed. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process.

New GCU 476 is Installed

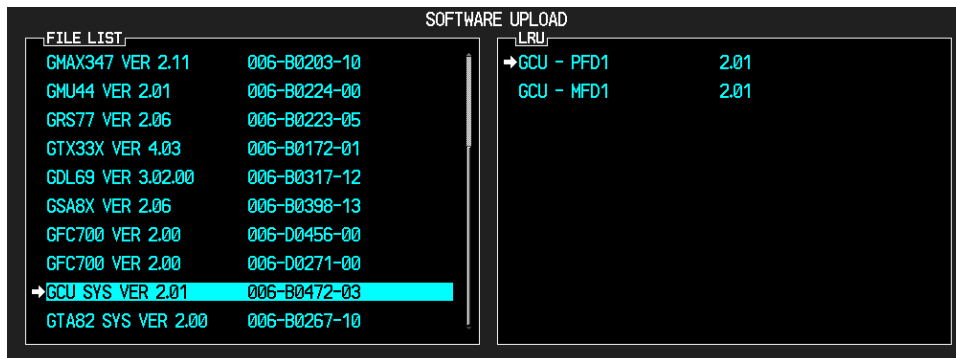
If a new GCU 476 is installed, the correct software boot block and certification gains must be loaded to the unit. Continue to the GCU 476 Software Loading procedure, as appropriate. If the configuration fails to load, performing a boot block upgrade may be required. Refer to the GCU 476 Boot Block Upgrade section 6.11.4 following the software upload section.

6.11.1 GCU 476 Software Upload using GDU V6.XX

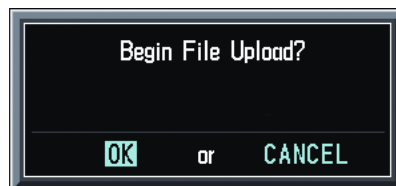
NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

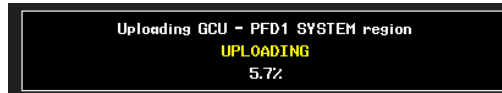
1. Remove the Supplemental Database cards from the bottom slots of each display. Note which card was removed from the MFD so it may be identified later for reinsertion in the MFD when software and configuration loading is complete. It contains a FliteChart or ChartView database which is only used by the MFD.
2. Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
3. Start the G1000 system in Configuration mode.
4. On the PFD, go to the Configuration Upload page using the FMS knob:



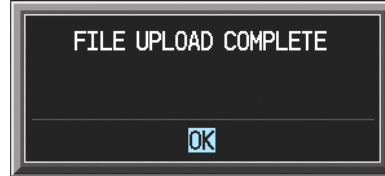
5. Highlight the GCU SYS software file. Ensure that both paths to the GCU through PFD1 appear in the LRU field as shown:
6. Press the LRU softkey. Select the GCU – PFD1 to load software. Press the LOAD softkey.
7. Select OK and press the ENT key to acknowledge the following prompt:



-
- The software for the GCU 476 begins to load. Monitor the upload status as it progresses:



- After the files finish loading, press ENT to acknowledge the following prompt:



- Check the SUMMARY field to ensure the all software loads are 'COMPLETE'.
- De-activate the cursor.
- Go to the System Status page.
- Activate the cursor and highlight 'GCU476 – PFD1' in the LRU window.
- Verify that the reported part number and version of the software matches the data in the Required Equipment List.

6.11.2 GCU 476 Configuration Loading using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

- Insert the correct G1000-Columbia 350/400 Code Loader Card (see Required Equipment List) into the top slot of the PFD.
- Start the G1000 system in Configuration mode.
- On the PFD, go to the Configuration Upload page using the FMS knob:

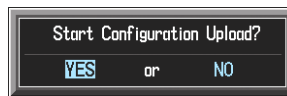


4. Activate the cursor and use the small FMS knob to highlight the airframe type in the FILE field.

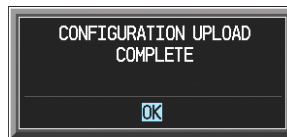
NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

5. Press the ENT key to select the appropriate airframe type. Once an airframe type is selected the configuration files in the SECTION field will be displayed.
6. Using the FMS knob, highlight 'GCU476' in the FILE LIST field.
7. Press the LOAD softkey.
8. Select YES and press the ENT key to acknowledge the following prompt:



9. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



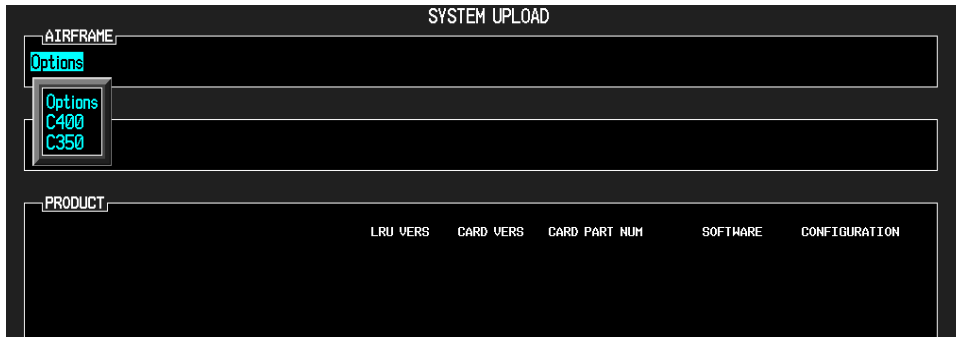
10. View the SUMMARY field and ensure that all items are 'complete', then de-activate the cursor.
11. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.

6.11.3 GCU 476 Software Load and Configuration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.

1. On the PFD, go to the System Upload page using the small FMS knob.
2. Activate the cursor and use the small FMS knob to highlight the airframe type in the AIRFRAME field. Select the appropriate aircraft type (C400 or C350) and press the ENT key.



NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

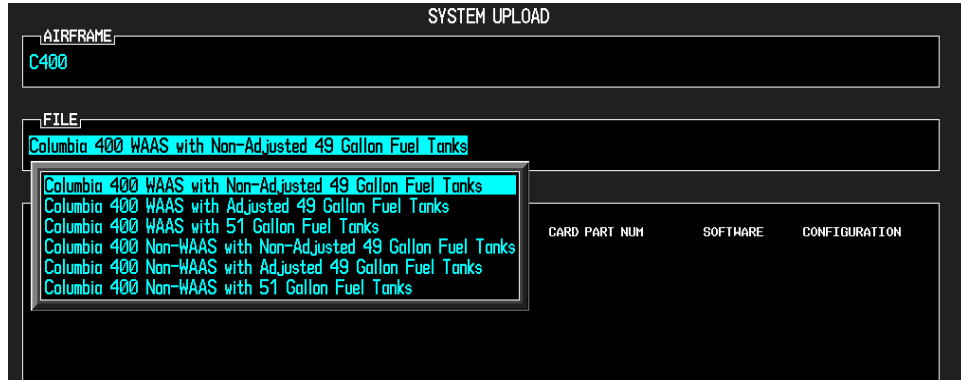
3. Once an airframe type is selected the cursor moves to the FILE window. Rotate the small FMS knob to activate the drop-down menu. Three FQIS fuel tank options are available: 49 gallon (non-adjusted); 49 gallon (adjusted); 51 gallon. Confirm the serial number of the aircraft prior to selection as well as inspect logbooks for field upgrades according to the following table.

	C350	C400	Comments
49 Gallon (non-adjusted)	42502 - 42564	41563 - 41757	Verify logbooks for compliance with Columbia Service Letter SL-07-008B
49 Gallon (adjusted)	42565 - 42567	41758 - 41799	
51 Gallon	42568 and higher	41800 and higher	Inspect fuel tank placard

If the aircraft is a Columbia 350 within the serial number range of 42502-42564 or a Columbia 400 within the serial number range of 41563-41757, confirm the FQIS fuel tank option by referencing the aircrafts logbooks. Compliance with Columbia Service Letter number SL-07-008B requires the selection of "49 gallon adjusted". Columbia aircraft with 51 gallon tanks can be verified by inspection of the fuel tank placard.

NOTE

At this step, select to load WAAS or non-WAAS G1000 software.



- The PRODUCT window will populate and display software and configuration file information for each G1000 LRU. The LRU VERS column shows the currently loaded software version in the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. Each check designates a file to be loaded to the G1000.



By default, if an inequality between the LRU and CARD columns exists, the SOFTWARE CONFIGURATION boxes will be pre-selected (checked). By Default all of the CONFIGURATION boxes will be pre-selected.

The following softkeys provide an easy way to select files:

CHK ALL: Selects all files, both configuration and software

CHK SW: Selects all software files only.

CHK CFG: Selects all configuration files only.

CLR ALL: Clears all selections.

5. After verifying that the GCU keypad software and configuration files are checked, press the LOAD softkey. It is acceptable to simply load the pre-selected software and config files. The G1000 system automatically begins loading software and default configuration files to the selected LRUs in the proper order.
6. When the system finishes loading, it prompts the technician accordingly. Press the ENT key to acknowledge that the upload is finished:



7. Verify that each column indicates PASS in green when the loading process has finished and inspect the SUMMARY window as well to ensure that the load is successful.
8. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.

6.11.4 GCU 476 Boot Block Upgrade

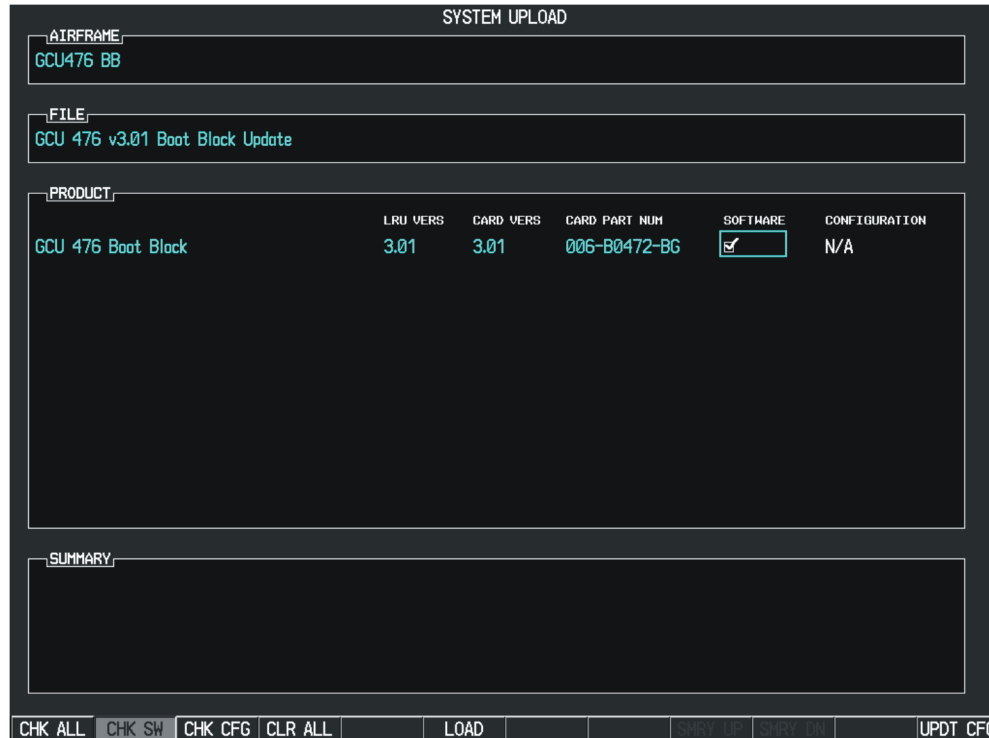
The GCU 476 requires a boot block version of 3.01 or higher. If the configuration does not load it is an indicator that boot block upgrade is required (GCUs with older dates of manufacture may not have this version). If it was determined in one of the previous software loading procedures that the GCU 476 does not have boot block version 3.01 or higher, follow this procedure to update the GCU 476's software boot block.

NOTE

It is critical for electrical power to remain on during the boot block update procedure. Take steps to ensure that a 28 VDC ground power supply is properly connected and is not disturbed during the update.

1. Obtain the required GCU 476 Boot Block loader card (SD Card, G1000, GCU476 BB v3.01 GPN 010-00533-02) from Garmin.
2. If required, remove any loader card present in the top slot of the PFD. Insert the boot block loader card into the top slot of the PFD.
3. On the PFD, press and hold the ENT key and apply system power to the G1000.
4. Press and hold the ENT key until the message "INITIALIZING SYSTEM" appears in the upper left corner of the PFD.
5. Release the ENT key.
6. On the PFD, use the FMS knob to get to the System Upload page.

7. Activate the cursor and select GCU476 BB in the AIRFRAME field. Press the ENT key. The cursor will drop down to the FILE field.
8. Rotate the small inner FMS knob and select GCU Boot Block 3.01. Press the ENT key.
9. Verify that the SOFTWARE box is checked (see screen shot). Press the LOAD softkey. The GCU boot block will begin loading. Do not remove power while the update is in process.



10. The upload is completed when the message “Upload Complete, NO UPLOAD IN PROCESS” is displayed on the PFD. Press the ENT key to confirm software upload completion.
11. Power down the PFD. Remove the GCU Boot Block loader card and re-insert the correct G1000/GFC700 Software Loader card.
12. Load the GCU configuration per prior section.

6.12 Optional Systems

This section describes the steps that must be completed in order to configure the G1000 for optional systems. Only those systems that are installed must be configured.

NOTE

If the configuration for an optional system is inadvertently loaded for a system that is NOT installed, the *basic* Columbia 400 or Columbia 350 configuration for GIA 2, GEA 1 and the Airframe must be reloaded. Following this, the configuration for the optional systems must be repeated.

6.12.1 Enabling TAWS using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

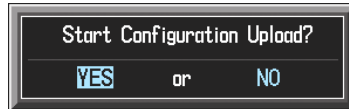
NOTE

The TAWS Enable card can only enable TAWS on one G1000 system (one aircraft). A new TAWS Enable card must be used for each aircraft.

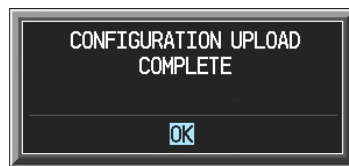


1. Remove power from the PFD and MFD by opening the PFD and MFD circuit breakers.
2. A special TAWS Enable card, referenced in the Required Equipment List, is required to enable TAWS. Insert this card in the upper slot of the PFD.
3. While holding the ENT key on the PFD, restore power by closing the PFD circuit breaker.
4. When the words **INITIALIZING SYSTEM** appear in the upper left corner of the PFD, release the ENT key.

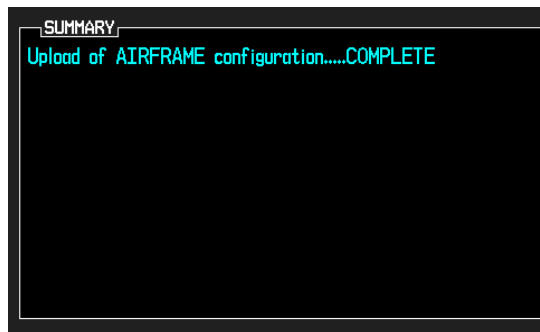
-
5. Repeat steps 3 and 4 for the MFD.
 6. On the PFD, go to the Configuration Upload page using the small FMS knob.
 7. Activate the cursor and use the small FMS knob to highlight 'Enable TAWS' in the FILE field.
 8. Press the ENT key to select the Enable TAWS option. Once the option is selected the configuration files in the SECTION field will be displayed.
 9. Press the LOAD ALL softkey.
 10. Select YES and press ENT to acknowledge the following prompt:



11. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



12. View the SUMMARY field and ensure that the item is 'COMPLETE':



13. De-activate the cursor.
14. Power down the system and remove the TAWS Enable card from the PFD.

6.12.2 TAWS Activation using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.

Perform this procedure only if the aircraft is to be equipped with the Garmin TAWS option.

1. Remove power from the PFD by opening the PFD circuit breaker.
2. A special TAWS Unlock card is required to enable TAWS. Refer to the Required Equipment List for the correct part number drawing. Insert this card in the upper slot of the PFD.
3. While holding the ENT key on the PFD and MFD, restore power to the displays.
4. When the words **INITIALIZING SYSTEM** appear in the upper left corner of both displays, release the ENT keys.
5. On the PFD, go to the System Upload page using the FMS knob.
6. Activate the cursor. Use the small FMS knob to select CONFIGURATION FILES in the AIRFRAME field and press the ENT key.

-
7. Highlight the FILE field. Use the small FMS knob to select the 'Enable TAWS' option and press the ENT key. Once the option is selected, the configuration files in the PRODUCT field will be displayed. All files should be checked. If not, press the CHK ALL softkey.
 8. Press the LOAD softkey.
 9. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the upload complete confirmation.
 10. View the SUMMARY field and ensure that the item is 'COMPLETE'.
 11. De-activate the cursor.
 12. Power down the system and remove the TAWS Enable card from the PFD.

6.12.3 ChartView

NOTE

ChartView databases are subscription-based and are to be procured by the aircraft owner directly from Jeppesen. This procedure is only required if the ChartView option is purchased by the customer.

1. Remove power from the PFD by opening the PFD circuit breaker.
2. A special ChartView Unlock card is required to activate this feature. Refer to the Required Equipment List for the correct part number. Insert this card in the upper slot of the PFD.
3. While holding the ENT key on the PFD and MFD, restore power to both displays by closing the PFD and MFD circuit breakers.
4. When the words **INITIALIZING SYSTEM** appear in the upper left corner of the displays, release the ENT key.
5. On the PFD, go to the System Upload page using the FMS knob.
6. Activate the cursor. Use the small FMS knob to select CONFIGURATION FILES in the AIRFRAME field and press the ENT key.
7. Highlight the FILE field. Use the small FMS knob to select the "Enable ChartView" option and press the ENT key. Once the option is selected the configuration files in the PRODUCT field will be displayed. All files should be checked. If not, press the CHK ALL softkey.
8. Press the LOAD softkey.
9. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the upload complete confirmation.
10. View the SUMMARY field and ensure that the item is 'COMPLETE'.
11. De-activate the cursor.
12. Power down the system and remove the ChartView Enable card from the PFD.

6.12.4 Oxygen System using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section

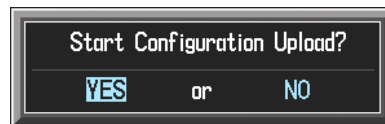


1. Remove power from the PFD by pulling the PFD circuit breaker.
2. Insert the correct 350/400 Loader Card into the PFD top card slot (refer to the Required Equipment List document).
3. While holding the ENT key on the PFD, restore power by closing the PFD circuit breaker.
4. When the words **INITIALIZING SYSTEM** appear in the upper left corner of the PFD, release the ENT key.
5. Press the NO softkey to decline the PFD software update.
6. Go to the Configuration Upload page using the FMS knob.
7. Activate the cursor and use the small FMS knob to highlight the Columbia Option – Oxygen n the FILE field.

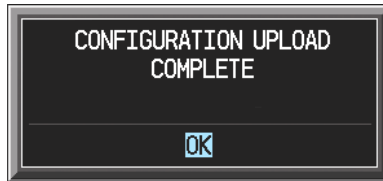
NOTE

Ensure that the correct option file is selected before proceeding; otherwise, incorrect configuration information will be loaded.

8. Press the ENT key to select the Oxygen Option. Once the option is selected the configuration files in the SECTION field will be displayed.
9. Press the LOAD ALL softkey.
10. Select YES and press ENT to acknowledge the following prompt:



11. Monitor the status of the upload. As the GEA is configured, the status of each channel will be displayed. When the upload is finished, press the ENT key to acknowledge the following confirmation:



12. View the SUMMARY field and ensure that each item shown below is 'COMPLETE':



13. De-activate the cursor.

6.12.5 Oxygen System using GDU V8.XX

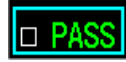
NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.



1. At the System Upload page, activate cursor and rotate the FMS knob once to activate the AIRFRAME menu.
2. Select 'Options' from the AIRFRAME window and press ENT.

-
3. From the FILE window, select the 'Columbia Option – Oxygen' in the FILE field and press ENT
 4. Press the LOAD softkey.
 5. Monitor the status of the upload. When the upload is finished, press ENT to acknowledge.
 6. View the SUMMARY field and ensure that all items are 'complete': Verify that PASS appears in green at the check box(es) as shown:



7. De-activate the cursor.

6.12.6 WX-500 Stormscope Configuration using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section

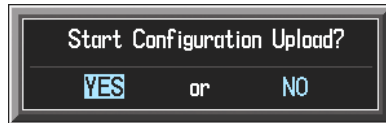


1. Remove power from the PFD by pulling the PFD circuit breaker.
2. Insert the correct 350/400 Loader Card into the PFD top card slot (refer to the Required Equipment List document).
3. While holding the ENT key on the PFD, restore power by closing the PFD circuit breaker.
4. When the words **INITIALIZING SYSTEM** appear in the upper left corner of the PFD, release the ENT key.
5. Press the NO softkey to decline the PFD software update.
6. Go to the Configuration Upload page using the FMS knob.
7. Activate the cursor and use the small FMS knob to highlight the Columbia Option – WX-500 Stormscope in the FILE field.

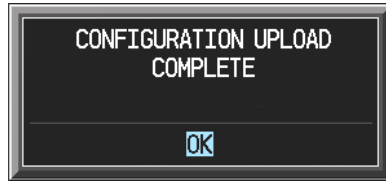
NOTE

Ensure that the correct option file is selected before proceeding; otherwise, incorrect configuration information will be loaded.

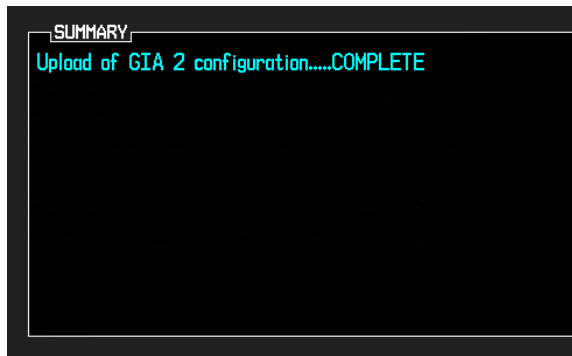
8. Press the ENT key to select the Columbia Option – WX500. Once the option is selected the configuration files in the SECTION field will be displayed.
9. Press the LOAD ALL softkey.
10. Select YES and press ENT to acknowledge the following prompt:



11. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



12. View the SUMMARY field and ensure that the item is 'COMPLETE':

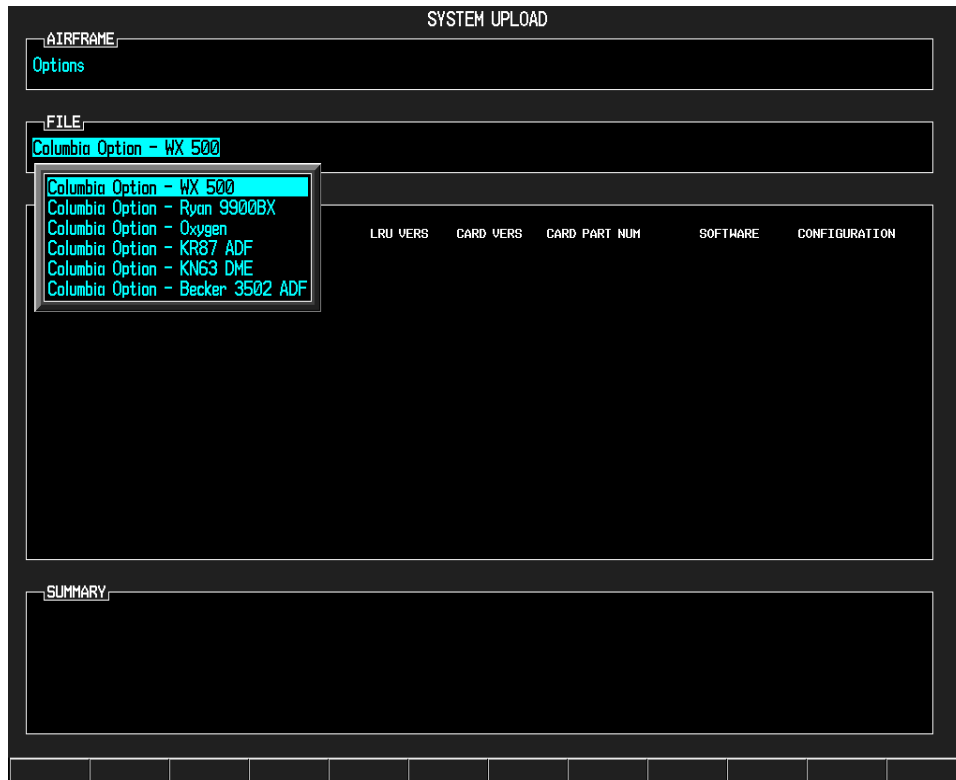


13. De-activate the cursor.

6.12.7 WX-500 Stormscope using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.



1. At the System Upload page, activate cursor and rotate the FMS knob once to activate the AIRFRAME menu.
2. Select 'Options' from the AIRFRAME window and press ENT.
3. From the FILE window, select the 'Columbia Option – WX 500' in the FILE field.
4. Press the LOAD softkey.
5. Monitor the status of the upload. When the upload is finished, press ENT to acknowledge.
6. View the SUMMARY field and ensure that all items are 'complete': Verify that PASS appears in green at the check box(es) as shown:



7. De-activate the cursor.

6.12.8 Ryan 9900BX TCAD Configuration using GDU V6.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 6.XX. Procedures for G1000 systems with GDU version 8.XX follow this section.

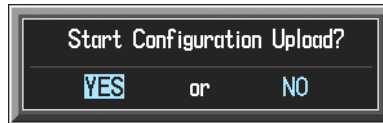


13. Remove power from the PFD by pulling the PFD circuit breaker.
14. Insert the correct 350/400 Loader Card into the PFD top card slot (refer to the Required Equipment List document).
15. While holding the ENT key on the PFD, restore power by closing the PFD circuit breaker.
16. When the words **INITIALIZING SYSTEM** appear in the upper left corner of the PFD, release the ENT key.
17. Press the NO softkey to decline the PFD software update.
18. Go to the Configuration Upload page using the FMS knob.
19. Activate the cursor and use the small FMS knob to highlight the Columbia Option – Ryan 9900BX in the FILE field.

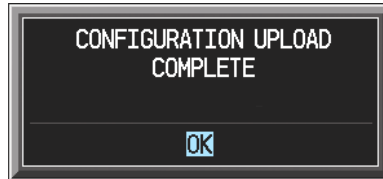
NOTE

Ensure that the correct option file is selected before proceeding; otherwise, incorrect configuration information will be loaded.

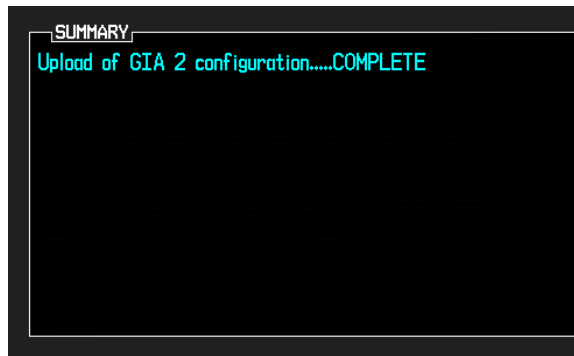
20. Press the ENT key to select the Ryan 9900BX Option. Once the option is selected the configuration files in the SECTION field will be displayed.
21. Press the LOAD ALL softkey.
22. Select YES and press ENT to acknowledge the following prompt:



23. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:



24. View the SUMMARY field and ensure that the item is 'COMPLETE':



25. De-activate the cursor.

6.12.9 Ryan 9900BX TCAD Configuration using GDU V8.XX

NOTE

The procedure in this section applies only to aircraft with GDU software version 8.XX. Procedures for G1000 systems with GDU version 6.XX precede this section.

LRU VERS	CARD VERS	CARD PART NUM	SOFTWARE	CONFIGURATION
			N/A	<input checked="" type="checkbox"/>

1. At the System Upload page, activate cursor and rotate the FMS knob once to activate the AIRFRAME menu.
2. Select 'Options' from the AIRFRAME window and press ENT.
3. From the FILE window, select the 'Columbia Option – Ryan 9900BX' in the FILE field.
4. Press the LOAD softkey.
5. Monitor the status of the upload. When the upload is finished, press ENT to acknowledge.
6. View the SUMMARY field and ensure that all items are 'complete': Verify that PASS appears in green at the check box(es) as shown:



7. De-activate the cursor.

6.13 Complete G1000 software load using GDU V8.XX

NOTE

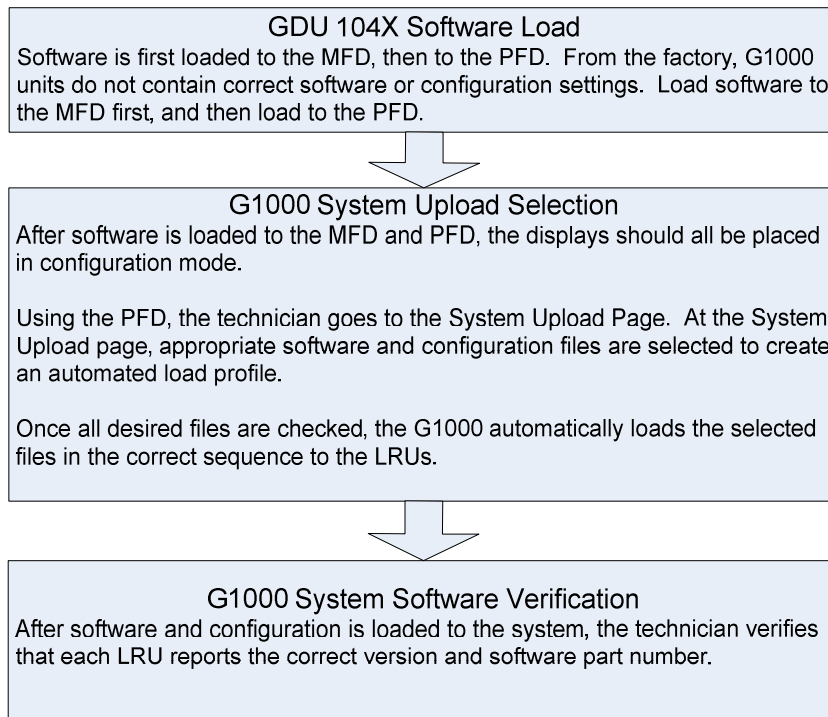
Throughout this document, many screen shots and examples are used to illustrate the software and configuration loading process. Although every effort has been made to ensure accuracy of such examples, changes may occur. Always refer to the Required Equipment List for the correct software file names, versions and part numbers.

This section provides an overview of a complete software/configuration procedure for instances where the entire G1000 system software version is to be re-loaded and/or updated. The following diagram depicts an overview of the entire software/configuration sequence for the G1000 system. It should be noted that in some cases, not all LRU software versions are updated at the same time. LRUs with unchanged S/W versions may be skipped during the process. All software versions must be verified at the beginning and end of the procedure and must agree with the data presented in the Required Equipment List. If any problems are encountered during the loading process, see Section 6.13 for troubleshooting.

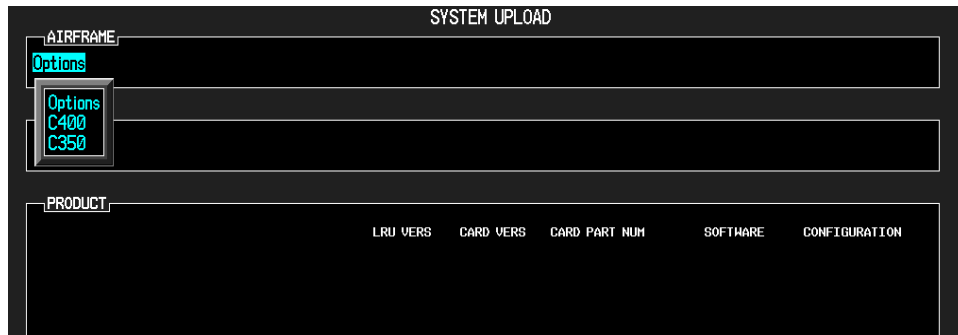
After the software and configuration data has been loaded, the Aviation Database must be loaded according to Section 6.1.4. Following this, perform the tests for each LRU as specified in Section 6, as applicable.

After completing all LRU tests, perform the final system checkout as specified in Section 7.

Be sure to record the maintenance performed in the appropriate aircraft maintenance documentation.



1. On the PFD, go to the System Upload page using the small FMS knob.
2. Activate the cursor and use the small FMS knob to highlight the airframe type in the AIRFRAME field. Select the appropriate aircraft type (C400 or C350) and press the ENT key.



NOTE

Ensure that the correct airframe type is selected before proceeding; otherwise, incorrect configuration information will be loaded.

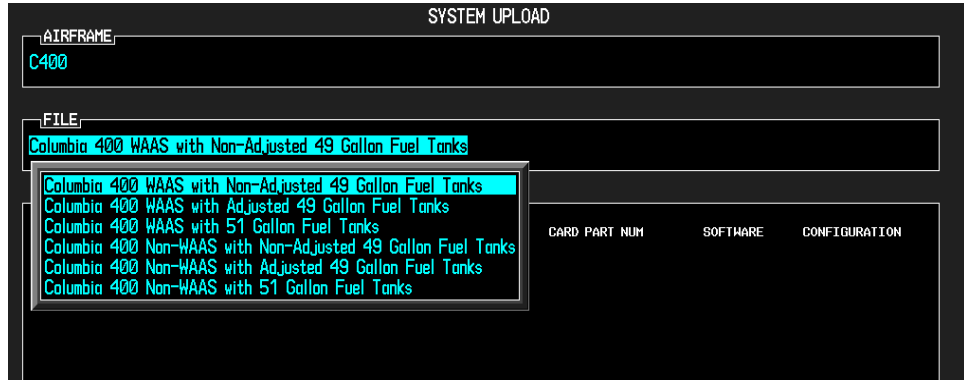
3. Once an airframe type is selected the cursor moves to the FILE window. Rotate the small FMS knob to activate the drop-down menu. Three FQIS fuel tank options are available: 49 gallon (non-adjusted); 49 gallon (adjusted); 51 gallon. Confirm the serial number of the aircraft prior to selection as well as inspect logbooks for field upgrades according to the following table.

	C350	C400	Comments
49 Gallon (non-adjusted)	42502 - 42564	41563 - 41757	Verify logbooks for compliance with Columbia Service Letter SL-07-008B
49 Gallon (adjusted)	42565 - 42567	41758 - 41799	
51 Gallon	42568 and higher	41800 and higher	Inspect fuel tank placard

If the aircraft is a Columbia 350 within the serial number range of 42502-42564 or a Columbia 400 within the serial number range of 41563-41757, confirm the FQIS fuel tank option by referencing the aircrafts logbooks. Compliance with Columbia Service Letter number SL-07-008B requires the selection of “49 gallon adjusted”. Columbia aircraft with 51 gallon tanks can be verified by inspection of the fuel tank placard.

NOTE

At this step, select to load WAAS or non-WAAS G1000 software.



- The PRODUCT window will populate and display software and configuration file information for each G1000 LRU. The LRU VERS column shows the currently loaded software version in the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. Each check designates a file to be loaded to the G1000.



By default, if an inequality between the LRU and CARD columns exists, the SOFTWARE and CONFIGURATION boxes will be pre-selected (checked).

The following softkeys provide an easy way to select files:

CHK ALL: Selects all files, both configuration and software

CHK SW: Selects all software files only.

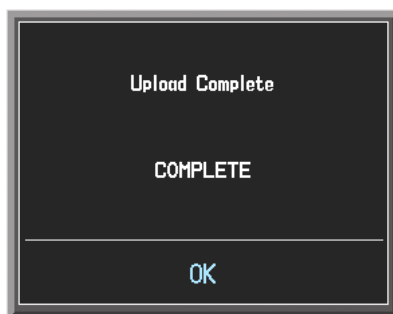
CHK CFG: Selects all configuration files only.

CLR ALL: Clears all selections.

NOTE


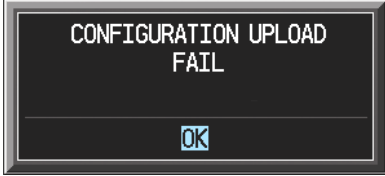

If this is the first time loading software and configuration to a new installation, it is advised to leave all check boxes selected.

5. After verifying that the desired software and configuration files are checked, press the LOAD softkey. It is acceptable to simply load the pre-selected software and config files. The G1000 system automatically begins loading software and default configuration files to the selected LRUs in the proper order.
6. When the system finishes loading, it prompts the technician accordingly. Press the ENT key to acknowledge that the upload is finished:



7. Verify that each column indicates **PASS** in green when the loading process has finished and inspect the SUMMARY window as well to ensure that the load is successful.
8. After the software and configuration files are loaded, turn off the system and reinsert the Supplemental Database Cards in the bottom slot of each display. Be sure to insert the card removed from the MFD back into the MFD.

6.14 Software/Configuration Troubleshooting

Problem	Solutions
<p>GDU 1040 PFD or GDU 1042 MFD display does not power up.</p>	<ul style="list-style-type: none"> • Ensure that the criteria listed in 6.14.1 are fulfilled for the applicable situation. • Ensure power is present at display connector. • Replace display.
<p>Software file load fails:</p> 	<ul style="list-style-type: none"> • Ensure that criteria listed in 6.14.1 are fulfilled for the applicable situation. • Ensure that LRU is reporting data on System Status page (LRU is 'ONLINE'). Check data path wiring as needed. • Retry software file load or try using a different card. • Ensure that the MFD is not touched during the loading process, unless specifically instructed to do so. • Ensure that LRU part number is compatible with software version and Loader Card. Refer to Required Equipment List. • Replace LRU.
<p>Configuration file load fails:</p> 	<ul style="list-style-type: none"> • Ensure that criteria listed in 6.14.1 are fulfilled for the applicable situation. • Ensure that LRU is reporting data on System Status page (LRU is 'ONLINE'). Check data path wiring as needed. • Retry configuration file load or try using a different card. • Ensure that the MFD is not touched during the loading process, unless specifically instructed to do so. • Ensure that LRU part number is compatible with Loader Card. Refer to Required Equipment List. • Replace LRU.
<p>GIA1 and/or GIA2 to 'LRU' data path not working</p>	<ul style="list-style-type: none"> • Ensure that criteria listed in 6.14.1 are fulfilled for the applicable situation. • Ensure GIA1 and GIA2 are configured correctly. • Check wiring, connectors & pins as needed.
<p>Software File Mismatch Alert appears in lower right corner of PFD when started in normal mode:</p> 	<ul style="list-style-type: none"> • Ensure that proper software file part number and version were loaded to LRU. • Check and ensure that correct Loader Card was used during load process. • Reload software to LRU. • Reload 'MANIFEST' configuration file to PFD.

6.14.1 System Communication Hierarchy

The following criteria must be satisfied to be able to perform these desired operations:

Desired Operation	Criteria for Success
Load Software to GDU 1040 PFD or GDU 1042 MFD Displays	<p>G1000-Columbia 350/400 Code Loader Card must be inserted in top slot for each display to be loaded.</p> <ul style="list-style-type: none"> • ENT keys must be held during power up of display. • Power on only one display at a time during software loading.
Load AIRFRAME, SYSTEM, MFD1, PFD1, and MANIFEST configuration files to MFD and PFD	<p>G1000-Columbia 350/400 Code Loader Card must be inserted in top slot of PFD. PFD and MFD must be powered on. PFD and MFD must have correct software.</p>
Load Software/Configuration files to GIA 63s	<p>G1000-Columbia 350/400 Code Loader Card must be inserted in top slot of PFD. G1000/350/400 system must be powered on. PFD and MFD must have correct software. PFD and MFD must be successfully configured with AIRFRAME, SYSTEM, MANIFEST, MFD1, and PFD1 configuration files.</p>
Load Software/Configuration files to: <ul style="list-style-type: none"> - GMA 1347 - GDC 74A - GEA 71 - GRS 77 (software only) - GTX 33 - GDL 69A - GSA 81's - GTA 82 - GCU 476 	<p>G1000-Columbia 350/400 Code Loader Card must be inserted into PFD top slot. G1000 must be powered on. PFD and MFD must have correct software and configuration settings. GIA 63s must have correct software. GIA 63s must be successfully configured with GIA1 and GIA2 configuration files. Data path from GIA1 to each LRU must be operational.</p>

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7 SYSTEM RETURN TO SERVICE PROCEDURE

This final checkout tests various secondary communications paths to ensure that the paths function correctly. Perform the following steps and verify the results of each test.

7.1 GIA Failure Test

Step	Desired Result
<p>Single GIA Failure Conditions:</p> <ol style="list-style-type: none"> 1. Remove power from GIA 1 by pulling INTEG AVION 1 and COM 1 breakers. 2. Restore power to GIA 1. Allow to re-acquire satellites. 3. Remove power from GIA 2 by pulling INTEG AVION 2 and COM 2 breakers. 4. Restore power to GIA 2. 	<p>GIA 1 Failure - For a GIA 1 failure, only the following shall flag invalid:</p> <ul style="list-style-type: none"> • COM/NAV 1 field. • NAV 1 CDI loses deviation bar. • TAWS FAIL • AFCS <p>GIA 2 Power Failure - For a GIA 2 failure, only the following shall flag invalid:</p> <ul style="list-style-type: none"> • COM/NAV 2 field. • NAV 2 CDI loses deviation bar. • TAWS FAIL • AFCS • CO Detector Fail • Stormscope Fail (if installed) • TCAD Altitude Invalid (if installed)
<p>Dual GIA Failure Conditions:</p> <ol style="list-style-type: none"> 1. Remove power from both GIA units. 2. Restore power to both GIA units. 	<p>Dual GIA Failure - For a dual GIA failure, only the following shall occur:</p> <ul style="list-style-type: none"> • COM/NAV 1 & COM/NAV 2 fields flag invalid. • GPS CDI flags INTEG on PFD. • NAV 1, 2 CDI loses deviation bar. • XPDR field flags invalid on PFD. • Engine Instrument field flags invalid on MFD. • TAWS FAIL • AFCS fail • CO Detector Fail • Stormscope Fail (if installed) • TCAD Altitude Invalid (if installed) • GMA 1 Fail (annunciation only) • AHRS 1 Not Receiving GPS Info alert

7.2 Display Failure Test

Step	Desired Result
MFD Display Failure Conditions: 1. Remove power from MFD. 2. Restore power to MFD.	The following shall occur when power is removed from the MFD: <ul style="list-style-type: none"> • PFD switches to reversion mode. • Attitude and Heading remain valid from AHRS. • Airspeed, Altitude, Vertical Speed, and OAT remain valid from Air Data Computer. • Engine Instrumentation appears on PFD. • COM/NAV 2 fields flag invalid. • TAWS N/A
PFD Display Failure Conditions: 1. Remove power from PFD. 2. Replace power to PFD.	The following shall occur when power is removed from the PFD: <ul style="list-style-type: none"> • MFD switches to reversion mode. • Attitude and Heading remain valid from AHRS. • Airspeed, Altitude, Vertical Speed, and OAT remain valid from Air Data Computer. • MFD retains engine instrumentation. • COM/NAV 1 fields flag invalid. • TAWS N/A

7.3 AHRS/ADC Backup Path Test

Step	Desired Result
Secondary AHRS/ADC path check: 1. Remove power from PFD. 2. Remove power from GIA2. 3. Check for desired results. 4. Restore power to the PFD and GIA2.	The following shall occur on the MFD when power is removed from the PFD and GIA2: <ul style="list-style-type: none"> • MFD switches to reversion mode. • Attitude and Heading remain valid from AHRS. • Airspeed, Altitude, Vertical Speed, and OAT remain valid from Air Data Computer. • Engine Instrumentation flags invalid. • All COM & NAV fields flag invalid.

7.4 Maintenance Records

After conducting a functional test in accordance with the 350/400 Airplane Maintenance Manual, the aircraft may be returned to service.

Record the following information in appropriate aircraft maintenance logs:

- Part number of the G1000-Columbia 350/400 Code Loader Card used to perform software loading or software updates.
- Part numbers and versions of LRU software files reported after maintenance is complete (found at the System Status page in Configuration Mode).

8 REQUIRED EQUIPMENT

8.1 G1000 Required Equipment

See the latest revision of “Required Equipment List” (RB011002) for the specific loader card part number, software part number, and software version.

8.2 Weight & Balance

See the latest revision of the Modification Summary, part number 005-00230-11.

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