GARMIN

G1000 / GFC 700 System Maintenance Manual

Mooney M20M, M20R

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CAUTION

The GDU 1040s 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.

IMPORTANT

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 the installation and field maintenance of the Garmin G1000 Integrated Cockpit avionics suite, including the GFC 700 AFCS as installed in the Mooney M20M/R in accordance with this STC. This document is required in order to perform maintenance on the installation. Use the information presented in the manual in conjunction with required documents shown in Table 1-2.

1.1.1 Applicability

This document applies to all M20M/R aircraft equipped with the G1000 integrated avionics cockpit and GFC 700 AFCS.

1.2 General Information

This document applies to the Mooney M20 aircraft series. There are two M20 aircraft models which are distinguished by the type of engine aspiration. Table 1-1 describes the differences between each aircraft model.

Table 1-1. General

MODEL DESIGNATION	MODEL NAME	ASPIRATION
M20M	Bravo	Turbocharged
M20R	Ovation 2	Normal

Unless otherwise stated, references to "M20" will apply to both models. Items that apply only to a particular model are identified as necessary.

1.3 Identifying an STC Configuration

There is one approved configuration of this STC. Configurations are governed primarily by the G1000 System Software Version number.

The following table identifies System Software Versions for the STC.

STC Amendment Level	Aircraft Model	G1000 System Software Version	Notes
STC Original Issue	Mooney M20M,R	**424.20**	Initial STC Approval.

IMPORTANT!

If the technician is unsure of an aircraft's STC Configuration, perform the following steps:

1. Inspect the aircraft maintenance logs for signs of equipment alteration (if a field update has been performed).
2. Power on the G1000 system by turning on the MASTER switch. Look at the MFD power-up screen. In the upper right corner, the display will show 'Mooney M20M System XXXX.XX' or 'Mooney M20R System XXXX.XX':

3. This 'System' number is the System Software Version. It correlates to the G1000 SW Loader Card used to load the software to the system:

EXAMPLE:

System Software Version **'0424.20'** = Loader Card P/N 010-0**0424-20**

The GFC 700/Mooney General Arrangement Drawing, Garmin Document 005-00343-03, defines the approved G1000 software for each configuration of this STC.

1.4 Organization

The following outline briefly describes the organization of this manual:

Section 2: System Description
Provides a complete description of the G1000 integrated cockpit system and GFC 700 AFCS installation in the aircraft. 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: Special Maintenance Practices
Provides maintenance instructions for continued airworthiness of the G1000 system. Refer to the G1000/GFC 700 ICA – Mooney for intervals on when to perform these practices.

Section 5: Troubleshooting
Provides troubleshooting information to aid in diagnosing and resolving potential problems with the G1000 system.

Section 6: G1000 Equipment Removal & Replacement
Gives instructions for the removal and replacement of G1000 equipment.

Section 7: G1000 Equipment Configuration & Testing
Gives instructions for loading software, configuring, and testing of G1000 equipment.

Section 8: System Return to Service Procedure
Specifies return-to-service procedures to be performed upon completion of maintenance of the G1000 system.

1.5 Definitions/Abbreviations

ADF: Automatic Direction Finder

ADI: Attitude Display Indicator

AFCS: Automatic Flight Control System

AHRS: Attitude Heading Reference System

AMM: Airplane Maintenance Manual

CDU: Control Display Unit

CFR: Code of Federal Regulations

DME: Distance Measuring Equipment

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

VOR: VHF Omni-Range

1.5.1 Units of Measure

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

1.6 Reference Publications

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

Table 1-2. Required Documents

Document	Part Number	Vendor
G1000 / GFC 700 Instructions for Continued Airworthiness	190-00638-02	Garmin
M20M/M20R GFC 700 and TAWS General Arrangement Drawing	005-00343-03	Garmin
Wiring Diagram, GFC 700 AFCS/TAWS	005-00343-04	Garmin
Installation, Pitch servo, GFC 700 AFCS, Mooney M20M/M20R	005-00343-05	Garmin
Installation, Roll servo, GFC 700 AFCS, Mooney M20M/M20R	005-00343-06	Garmin
Installation, Pitch Trim servo, GFC 700 AFCS, Mooney M20M/M20R	005-00343-07	Garmin
G1000/M20M Airplane Flight Manual Supplement	190-00453-04	Garmin
G1000/M20R Airplane Flight Manual Supplement	190-00453-00	Garmin
M20M/M20R GFC 700 and TAWS Airplane Flight Manual Supplement	190-00638-00	Garmin
GDL 69/69A XM Satellite Radio Activation Instructions	190-00355-04	Garmin
M20M/M20R G1000 Cockpit Reference Guide (GFC 700 and TAWS)	190-00450-02	Garmin
G1000 Line Maintenance and Configuration Manual	190-00303-04	Garmin
Airplane Maintenance Manual, M20M	151	Mooney
Airplane Maintenance Manual, M20R	160	Mooney
Mooney INSTL Drawing	950257	Mooney
Garmin G1000 System Installation	950300	Mooney
Mooney G1000 Wiring diagram	950296	Mooney
Master Schematic Drawing M20M	800413	Mooney
Master Schematic Drawing M20R	800414	Mooney

1.7 Distribution

This document is required for maintaining the continued airworthiness of the aircraft. Revisions to this document will be made by Garmin and will be distributed by Garmin per standard documentation revision procedures.

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2 SYSTEM DESCRIPTION

2.1 G1000

The G1000 Integrated Cockpit system is composed of the following LRUs:

- GDU 1040 PFD
- GDU 1042 MFD
- GIA 63 Integrated Avionics Unit
- GMA 1347 Audio Panel
- GRS 77 AHRS
- GMU 44 Magnetometer
- GDC 74A Air Data Computer
- GTP 59 Temperature Probe
- GEA 71 Engine/Airframe Unit
- GTX 33 Mode S Transponder

2.1.1 Flight Instrumentation

The GRS 77 AHRS, GDC 74A Air Data Computer, and GMU 44 Magnetometer provide the G1000 system with flight instrument data, consisting of aircraft attitude, heading, yaw rate, altitude, airspeed, vertical speed, and outside air temperature information. This information is displayed on the PFD (and also on the MFD when in reversionary mode).

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.

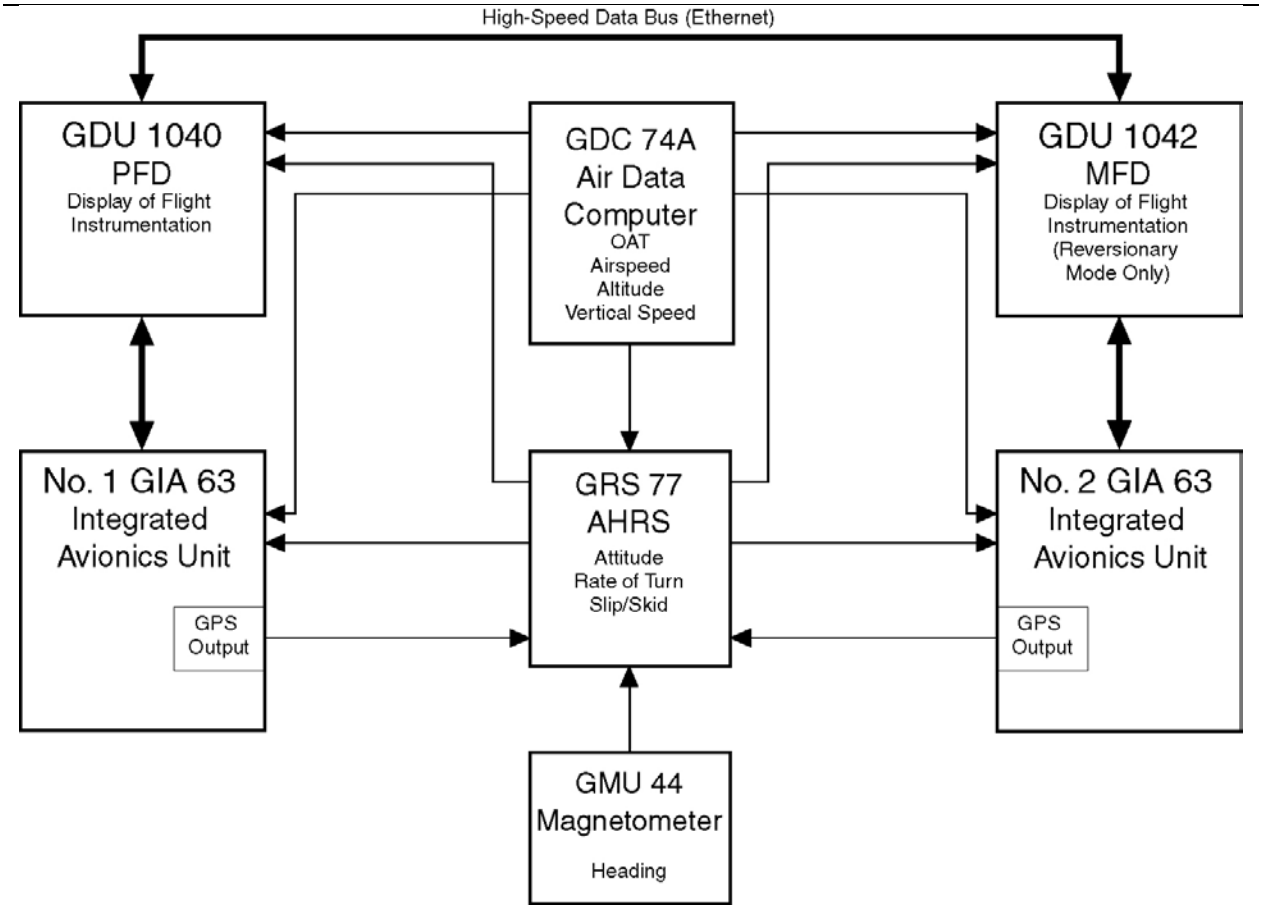


Figure 2-1. Flight Instrumentation Interface

2.1.2 Engine Indicator System

The GEA 71 provides engine/airframe data to the G1000 system. The unit interfaces to the various transducers in the aircraft; reference Mooney drawing 950257, -501 or -503 drawing. Analog data is received from the transducers and is converted to 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.

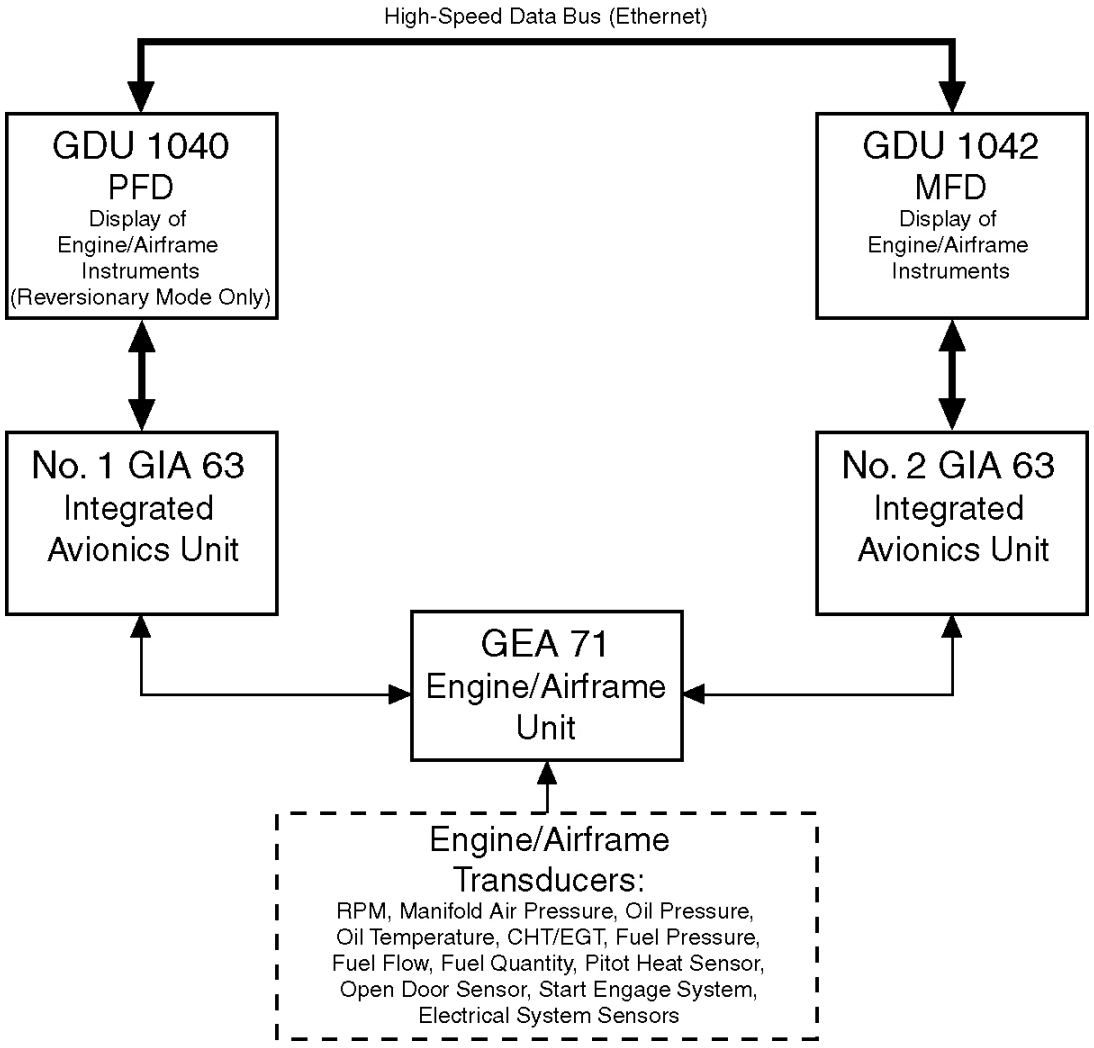


Figure 2-2. G1000 Engine/Airframe Interface

2.1.3 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 both displays for processing assistance.

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.

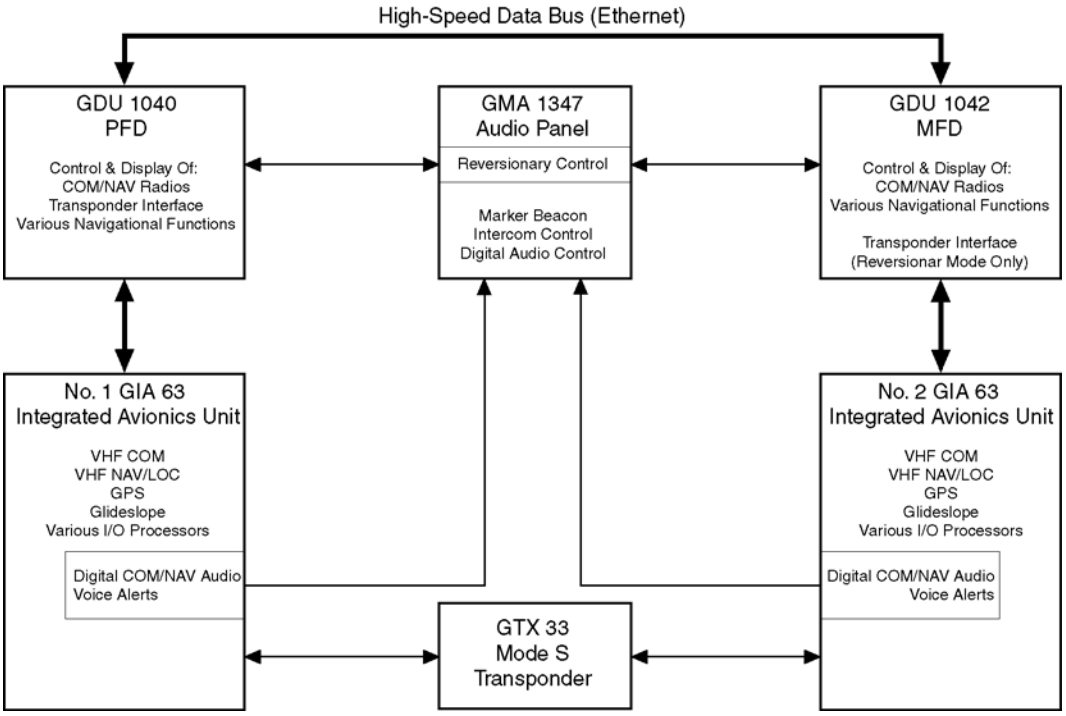


Figure 2-3. G1000 Navigation/Communications

2.2 GFC 700

The GFC 700 is a two-axis fail-safe digital flight control system that is integrated within the G1000 system. It consists of the following components which are added to the existing G1000 components (Section 2.1):

- GSA 81 Servo Actuators, 3 ea, (Roll, Pitch, Pitch Trim)
- GSM 85 Servo Mounts, 3 ea, (Roll, Pitch, Pitch Trim)

The following functions are provided by the GFC 700 in this installation:

- Flight Director
- Autopilot: Pitch and Roll axis, including Pitch Auto-Trim
- Manual Electric Pitch 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 aircraft using command bar guidance, if desired.

Autopilot:

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

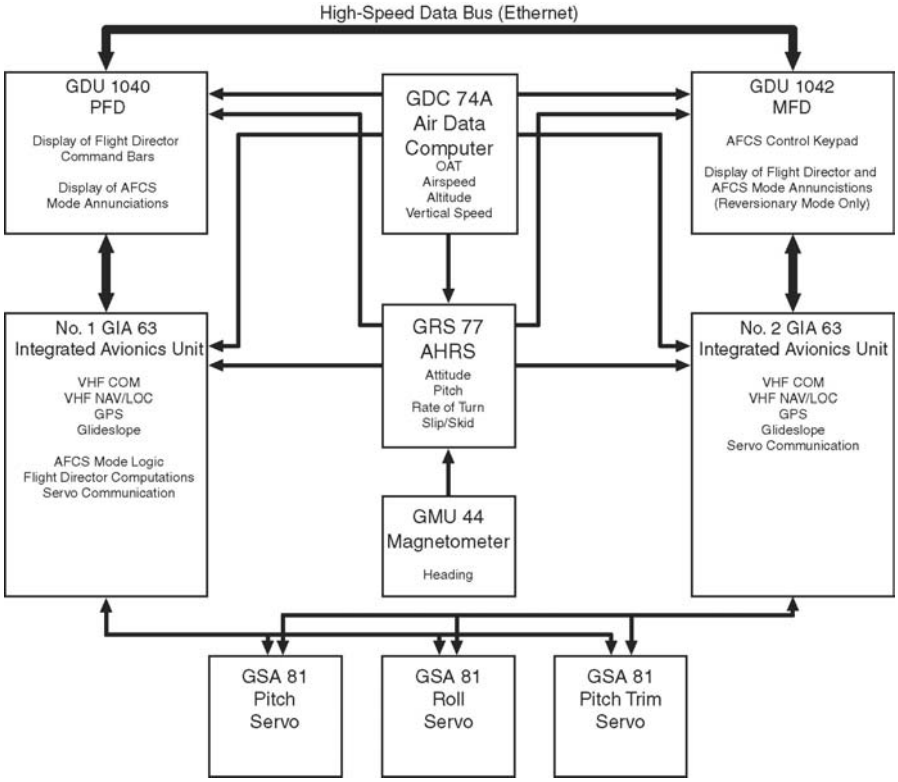


Figure 2-4. AFCS System Block Diagram

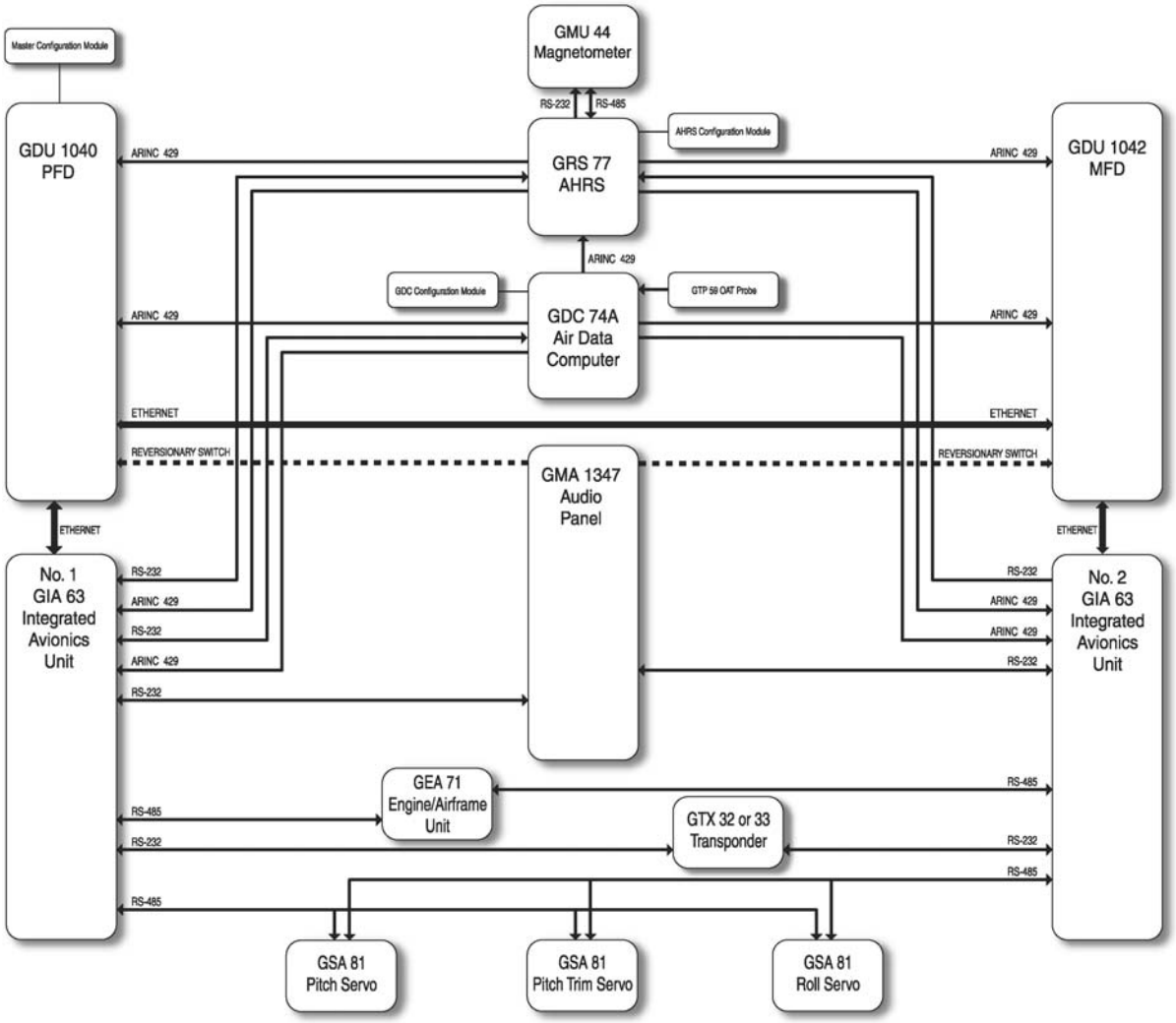


Figure 2-5. G1000 with GFC 700 Data Flow Summary

2.3 Equipment Descriptions

2.3.1 GDU 1040 PFD and GDU 1042 MFD

Figure 2-6. G1000/M20 Display Configuration

One Garmin GDU 1040 CDU is installed in the Mooney instrument panel as the PFD and a Garmin GDU 1042 CDU is installed as the MFD (Configuration is determined by wiring harness and configuration files). 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 between them.

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 both the PFD and MFD is supplied from the 'Essential' bus.

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

2.3.2 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/microphone systems as well as COM/VOR/LOC audio. The unit also provides display reversion mode control through a large red button. Power is received from the 'Essential' bus. The GMA 1347 interfaces with the existing marker beacon antenna as well as the existing microphone and headphone jacks.

2.3.3 GIA 63 Integrated Avionics Unit (2)

Figure 2-7. GIA 63 Integrated Avionics Unit

Two Garmin GIA 63 IAUs provide VHF COM, VHF NAV, GPS NAV and other various navigation functions. GIAs provide communication interface to all other G1000 LRUs in the system. Both GIAs are located in the tailcone of the aircraft, installed into their respective LRU racks. The #1 GIA is powered through the 'Essential' power bus and the #2 GIA is powered through the 'Non-Essential' bus. Both GIAs immediately power up when the battery master switch is turned on. Both GIA 63s interface to the following equipment:

- GSA 81 Servos
- Existing VOR/LOC/Glideslope Antenna System
- Existing VHF COM 1 & 2 Antennas
- Existing GPS 1 & 2 Antennas
- WX500 StormScope (GIA2 Only)

2.3.4 GEA 71 Engine/Airframe Unit

Figure 2-8. 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 is 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 MFD in its LRU rack. Power is received from the 'Essential' power bus.

2.3.4.1 Engine/Airframe Sensors

The GEA interfaces to the following:

- Manifold Pressure Sensor (MAP)
- Oil Pressure Sensor
- Tachometer Sensor
- Oil Temperature Sensor
- Fuel Flow Sensor
- Six Cylinder Head Temperature (CHT) Sensors
- Six Exhaust Gas Temperature (EGT) Sensors (M20M) (Seven EGT Sensors on M20R)
- TIT Sensor (M20M only)
- Battery Current Monitor Shunts
- Existing Fuel Probes
- Landing Gear Not Extended Switch
- Fuel Pressure (M20M only)
- Flap Position
- Rudder Trim
- Elevator Trim
- Stall Warning Switch

2.3.5 GTX 33 Mode S Transponder

Figure 2-9. GTX 33 Mode S Transponder

The Garmin GTX 33 provides Mode A, C, and S altitude and position reporting information to the G1000 system. The unit is mounted in the aft fuselage of the aircraft in its LRU rack. Power is received from the 'Essential' bus. Similar to the GEA 71, 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. A remote ident switch is also installed on the pilot's control yoke.

2.3.6 GDC 74A Digital Air Computer

Figure 2-10. GDC 74A Air Data Computer

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

2.3.7 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 starboard wing.

2.3.8 GRS 77 Attitude and Heading Reference System

Figure 2-11. GRS 77 AHRS

The Garmin GRS 77 AHRS provides attitude and heading information to the G1000 system. The unit is rigidly mounted in the aft fuselage of the aircraft next to the access door panel. 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, yaw rate, and heading information directly to the PFD, MFD, and to both GIAs.

2.3.9 GMU 44 Magnetometer

Figure 2-12. 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 in the starboard wing near the wingtip.

2.4 GSA 81 Servo and GSM 85 Servo Mount

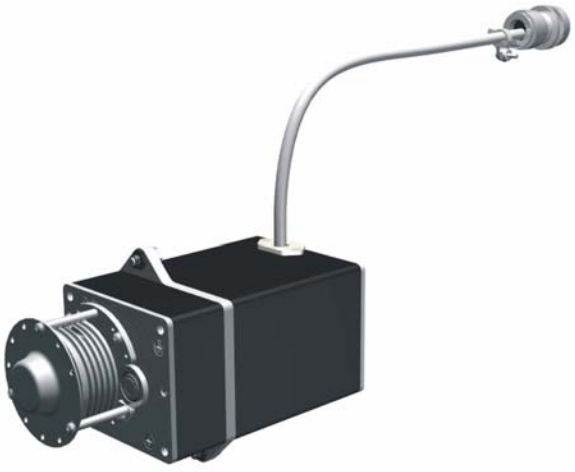


Figure 1-3. GSA 81 & GSM 85

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

- Pitch – Located in the aft fuselage, station ~165.
- Pitch Trim – Located in the aft fuselage, station ~146.
- Roll – Located in the pedestal, station ~15.

The design of the servo assembly allows the servo actuator (GSA 81) to be removed from the servo mount (GSM 85) without the need to de-rig the aircraft control attachments.

2.5 GDL 69A (Optional)

The GDL 69A provides optional XM Radio weather and music entertainment through means of a dedicated satellite data link. The GDL 69A is mounted in the Avionics Rack. Power to the GDL 69A is received from the 'non-essential' avionics bus. The GDL 69A sends weather data through the HSDB bus to the MFD, where the data link interface is controlled. Digital audio is sent directly to the GMA 1347.

2.6 G1000 Optional Interfaces

2.6.1 Installation of all other optional equipment that interfaces to the G1000, including ADF, and DME, is documented in applicable Mooney Aircraft factory drawings. Refer to Mooney drawings 950257, -501 or -503 Instl for additional information.

2.7 Electrical Installation

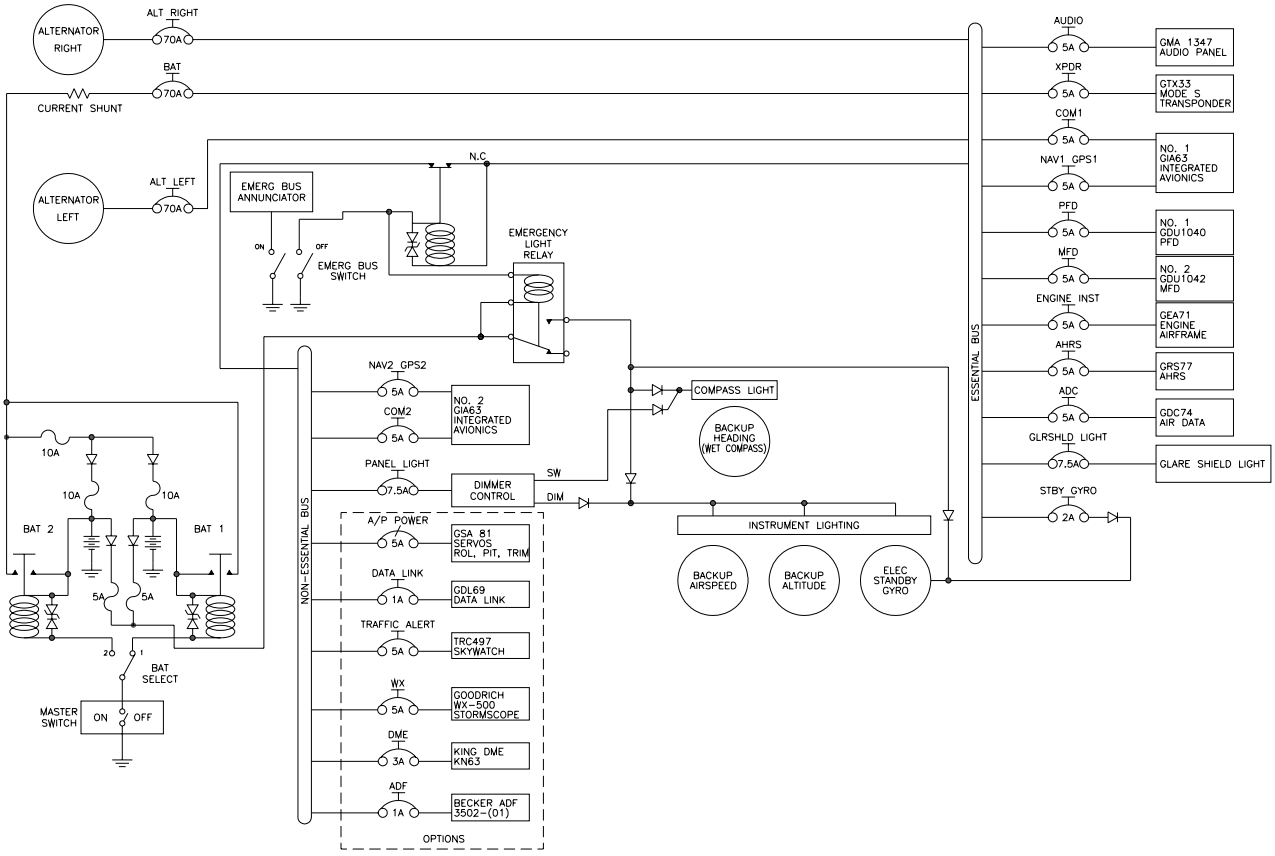
2.7.1 Power Distribution

2.7.1.1 Mooney M20M

Distribution of power to the G1000 system occurs on two aircraft electrical busses.

Essential Bus: The 'Essential' bus is tied directly to the selected aircraft battery via the battery master switch. When the master switch is turned on, power is immediately supplied to the 'Essential' bus. The 'Essential' bus is tied via a bus contactor to the 'Non-Essential' bus. The emergency bus (EMER BUS) switch is connected to this bus contactor, and when turned on, the connection between the 'Non-Essential' and 'Essential' busses is broken.

Non-Essential Bus: The 'Non-Essential' bus receives power from the aircraft battery when tied to the 'Essential' bus. After the aircraft engine is started, the alternator supplies power to the 'Non-Essential' bus and to the rest of the system. This bus is shed when the 'EMER BUS' switch is turned on.



M20M (GFC) POWER SUMMARY

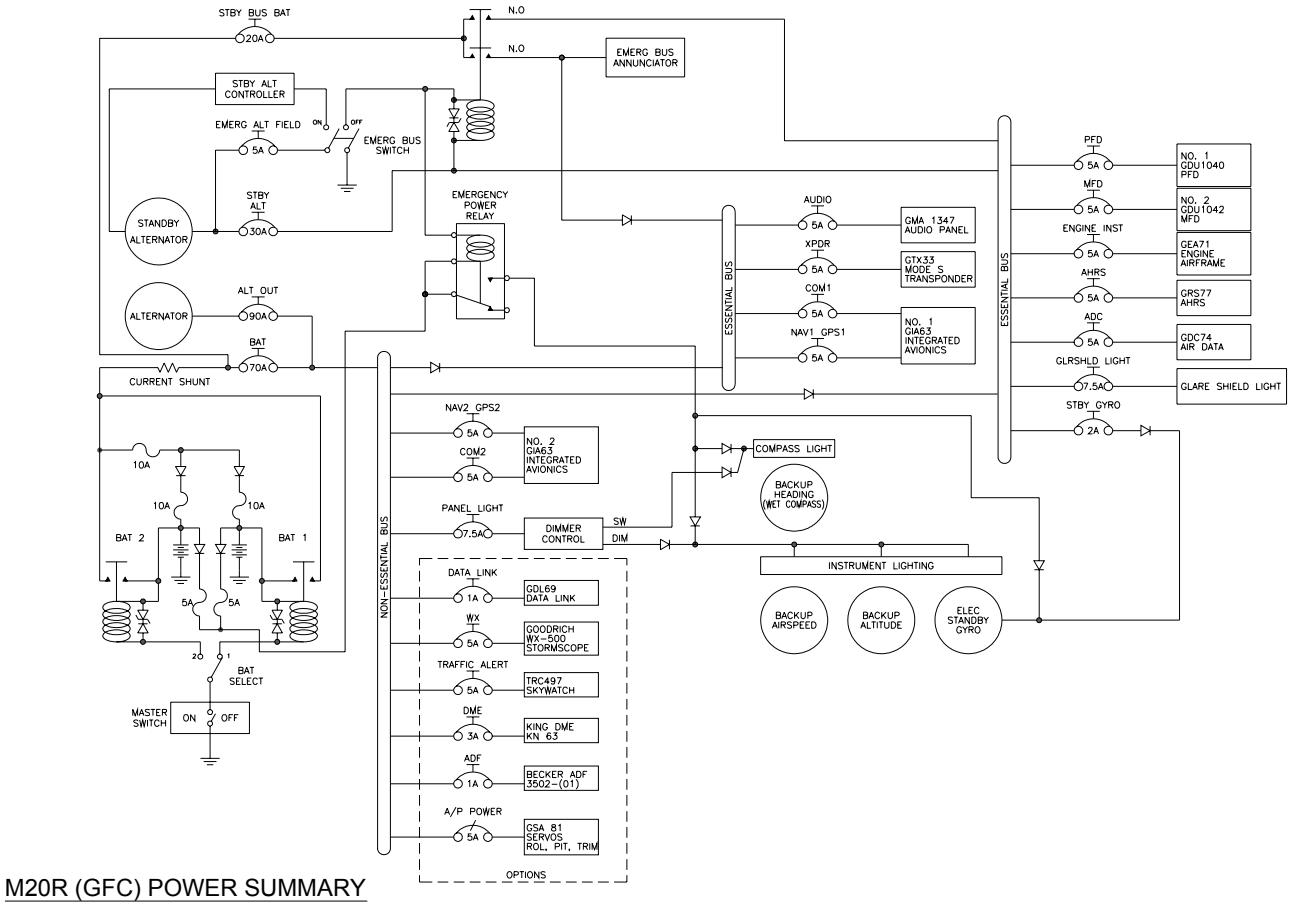
Figure 2-13. M20M Essential and Non-Essential Busses

2.7.1.2 Mooney M20R

Distribution of power to the G1000 system occurs on two aircraft electrical busses.

Essential Bus: The 'Essential' bus is fed directly from the 'Non-Essential' bus via the battery master switch. When the master switch is turned on, power is immediately supplied to the 'Essential' bus. The 'Non-Essential' bus is tied via a protection diode to the 'Essential' bus. The battery breaker (BAT) is connected to the 'Essential' bus. When the emergency bus (EMER BUS) switch is turned on and when the battery breaker (BAT) pulled, the connection between the 'Non-Essential' and 'Essential' busses is broken and the standby alternator field is engaged.

Non-Essential Bus: The 'Non-Essential' bus receives power from the selected aircraft battery. After the aircraft engine is started, the alternator supplies power to the 'Non-Essential' bus and to the rest of the system.



M20R (GFC) POWER SUMMARY

Figure 2-14. M20R Essential and Non-Essential Busses

2.7.2 Wiring

A wiring harness is fabricated and installed according to the wiring diagrams; reference Mooney General Arrangement drawing for listing.

2.7.3 Lightning Strike Protection

The following modifications to the aircraft provide additional protection from the effects of lightning strike.

2.7.3.1 Voltage Suppressors

One Transient Voltage Suppressor (TVS) is installed behind the instrument panel for protection of the backup attitude indicator (installed behind the MFD and PFD). The TVS helps protect the avionics/electrical equipment against the effects of a lighting strike.

2.7.3.2 Lightning Strike Maintenance

Proper electrical bonding of all metallic components is critical for the protection against the effects of lighting. Severe corrosion may inhibit a component's ability to bond to the aircraft's electrical ground plane. The following summarizes maintenance practices which are implemented to maintain adequate lightning protection for the aircraft. See Instructions for Continued Airworthiness (190-00638-02) for exact maintenance requirements and associated intervals:

- An annual visual inspection of all G1000 equipment which includes the voltage suppressor.
- An electrical bonding check of G1000 equipment every 1000 hours or anytime a lightning strike occurs or is suspected.
- Replacement of the voltage suppressor anytime a lightning strike occurs or is suspected.

2.7.4 SPIDER Grounds

G1000 connectors may employ a SPIDER grounding system to provide necessary ground reference to shielding and/or transducers. A single 16-gauge wire is connected locally to the airframe. Additional SPIDER wires, 24-gauge, are used to connect shield grounds. The assembly is fastened directly to the backshell housing with two screws. Figure 2-15 shows an example SPIDER installation.

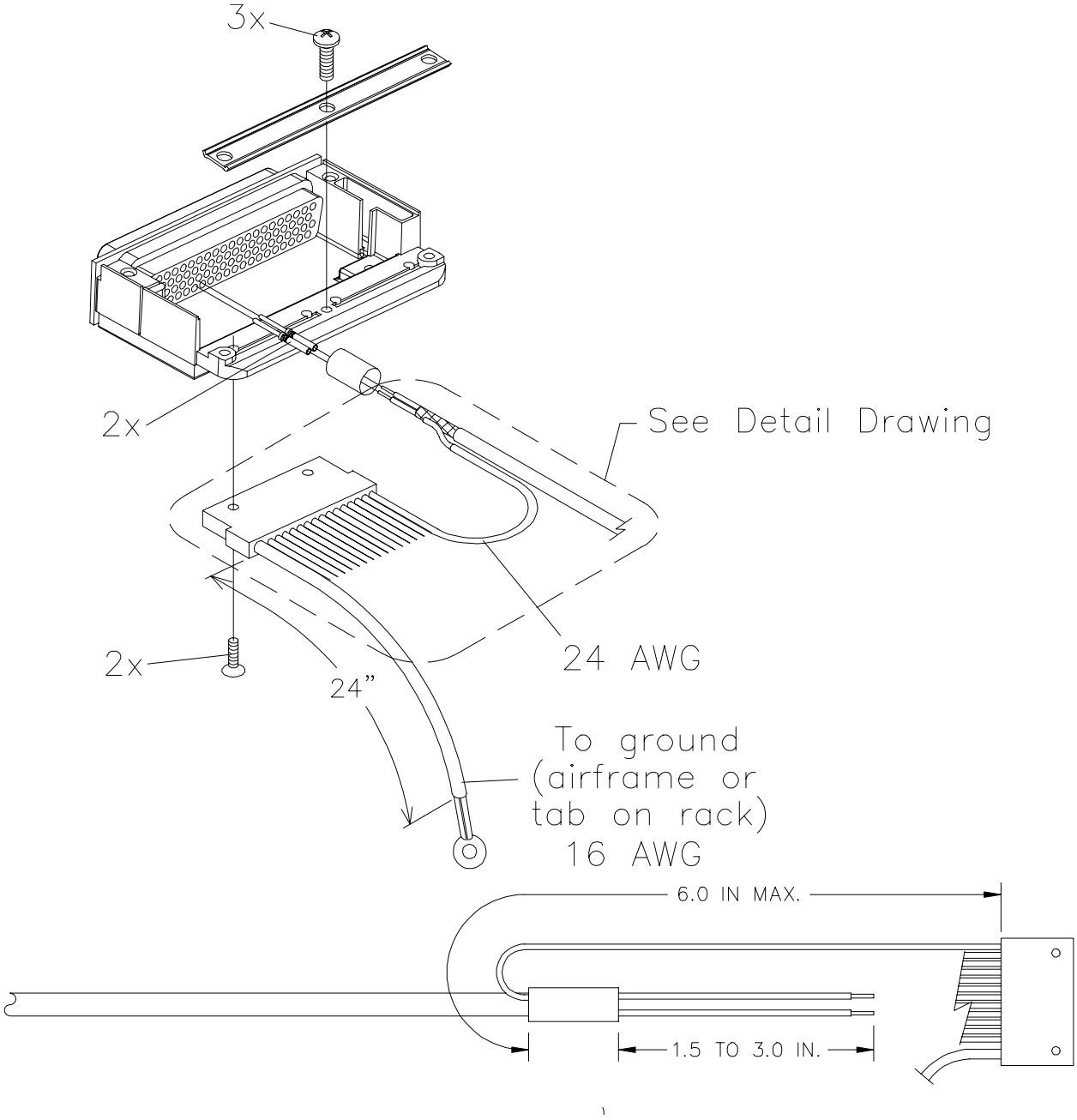


Figure 2-15. SPIDER Ground Installation

2.7.5 Shield Block Grounds

G1000 connectors may employ a Shield Block grounding system to provide necessary ground reference to shielding and/or transducers.

The shield block termination method allows multiple grounds to be terminated directly to a block mounted to the backshell assembly.

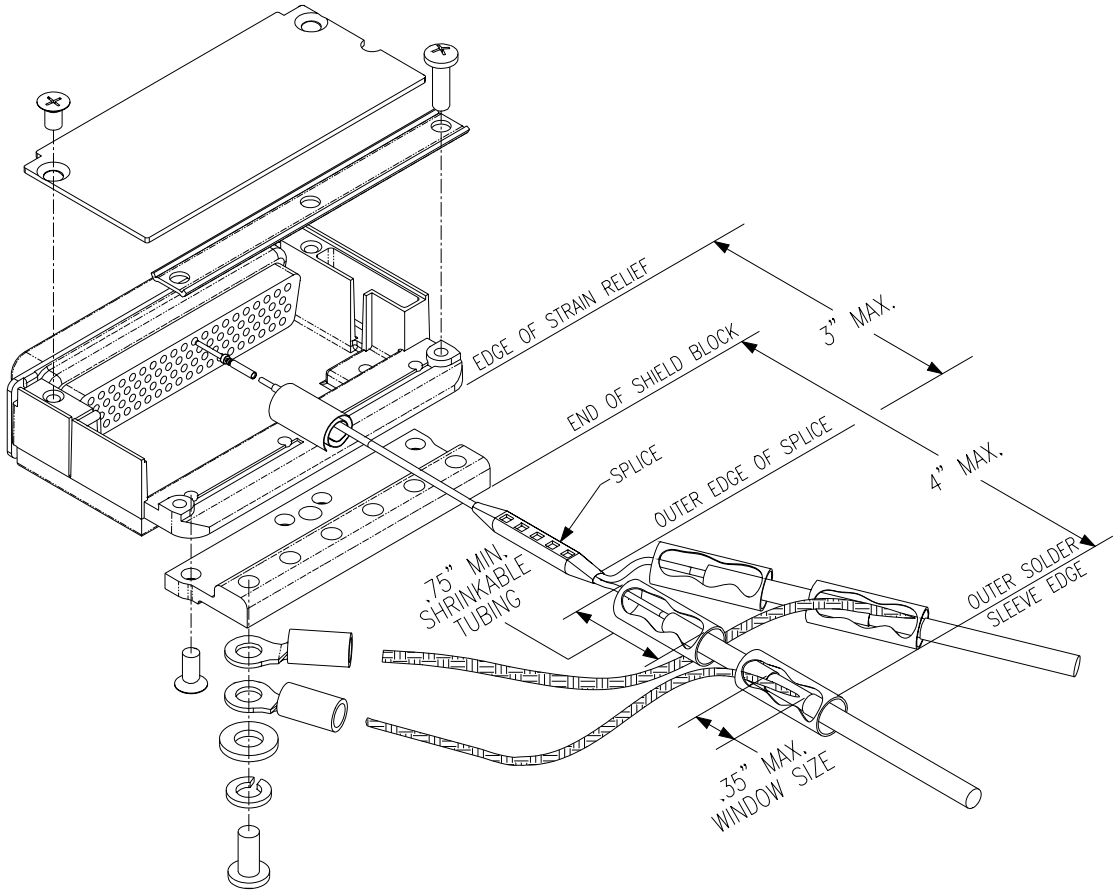


Figure 2-2-16 Shield Block Installation (typical)

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3 G1000/GFC 700 Control and Operation

All control and operation of G1000 equipment as normally used in flight occurs through the PFD (GDU 1040), MFD (GDU 1042), and GMA 1347 audio panel. Figure 3-1 identifies various GDU 1042 buttons. The GDU 1040 PFD layout is identical except for the group of AFCS buttons on the lower left bezel. Figure 3-2 identifies various GMA 1347 buttons.

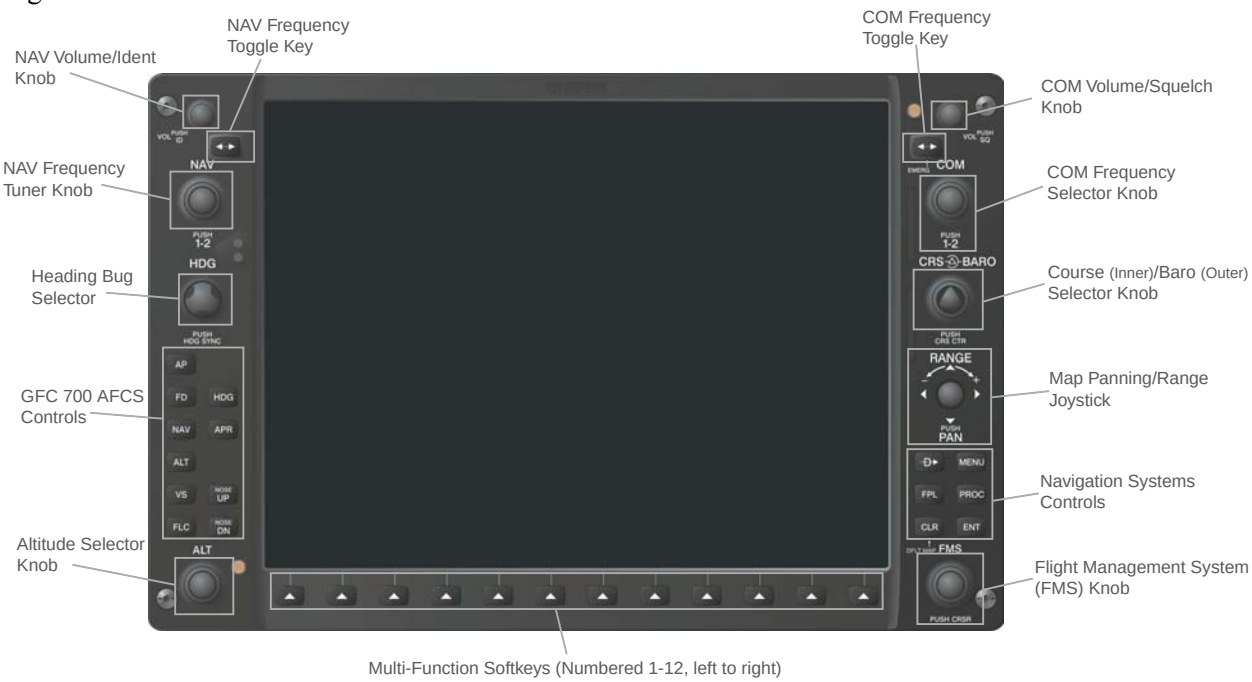


Figure 3-1. GDU 1042 Control Interface

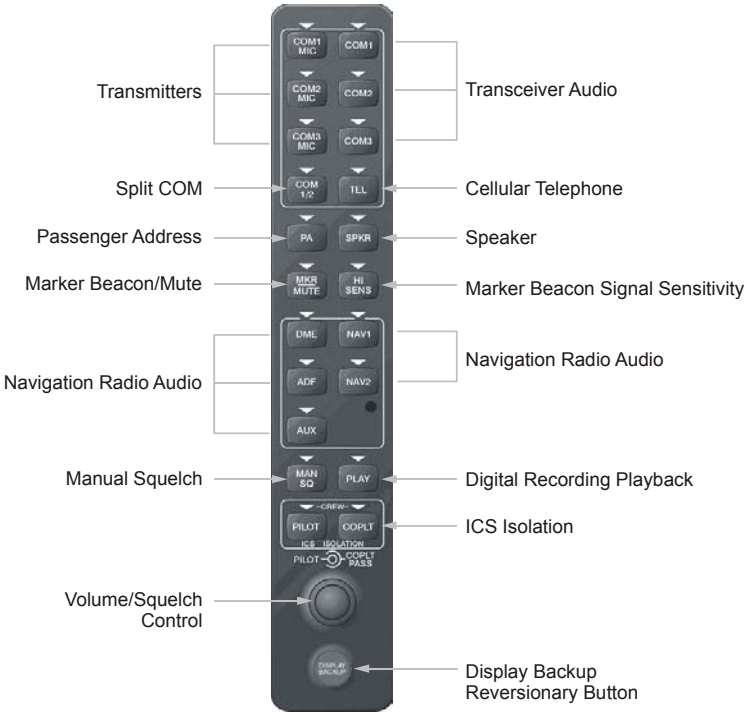


Figure 3-2. GMA 1347 Controls

The dedicated AFCS controls on the GDU 1042 are discussed in detail in the G1000/Mooney Cockpit Reference Guide for Mooney M20M & M20R, P/N 190-00450-02. Figure 3-3 is provided for reference.

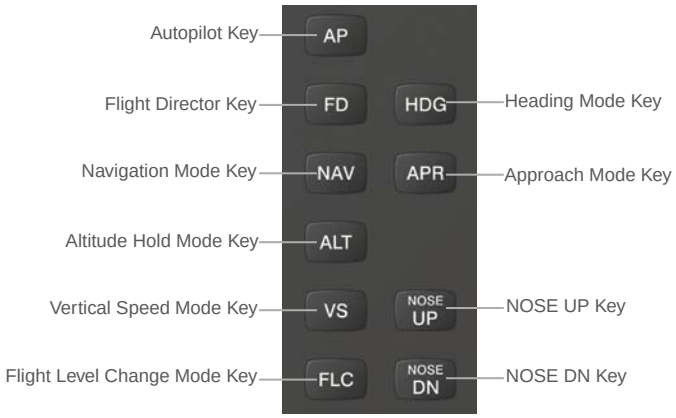


Figure 3-3. AFCS Controls

3.1 User Interface

3.1.1 Flight Management System (FMS) Knob

The FMS knob is the primary control for the G1000 system. Its 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

3.2 G1000 Normal Mode

To start the G1000 system in Normal Mode:

Turn on the battery master switch. The following G1000 equipment is powered on:

- GDU 1040 PFD
- GDU 1042 MFD
- GRS 77 AHRS
- GDC 74A Air Data Computer
- No. 1 GIA 63 Integrated Avionics Unit
- No. 2 GIA 63 Integrated Avionics Unit
- GSA 81 Servo Actuators
- GEA 71 Engine/Airframe Unit
- GTX 33 Mode S Transponder
- GMA 1347 Digital Audio Panel

The G1000 system is now powered in the normal mode. The PFD and MFD will function as specified in the G1000/M20M/R Cockpit Reference Guide when the system has been correctly installed and configured.

Figure 3-4. Normal Mode Displays (typical)

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 labeled 'DISPLAY BACKUP' located on the GMA 1347 audio panel activates the manual reversionary mode.

Figure 3-5. MFD Failure Mode (typical)

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 3-6. PFD Failure Mode (typical)

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 Line Maintenance Configuration Manual, Garmin part number 190-00303-04.

3.4.1 Loader Card Interface

The G1000/Mooney SW Loader Card interface provides a means of loading software and configuration files to the system and LRUs. The G1000/Mooney SW Loader Card uses a 128 MB Secure Digital (SD) data card that contains:

- All G1000 and GFC 700 LRU Software Files
- All G1000 and GFC 700 Configuration Files

Software and configuration files were determined by Garmin and/or Mooney during development of the system. The G1000/Mooney SW Loader Card part number defines all files specific to the G1000 system as installed in the aircraft for each configuration on the G1000 STC.

To satisfy the requirements for this STC, it is critical that the technician uses the correct G1000/Mooney SW Loader Card part number when servicing the G1000 system.

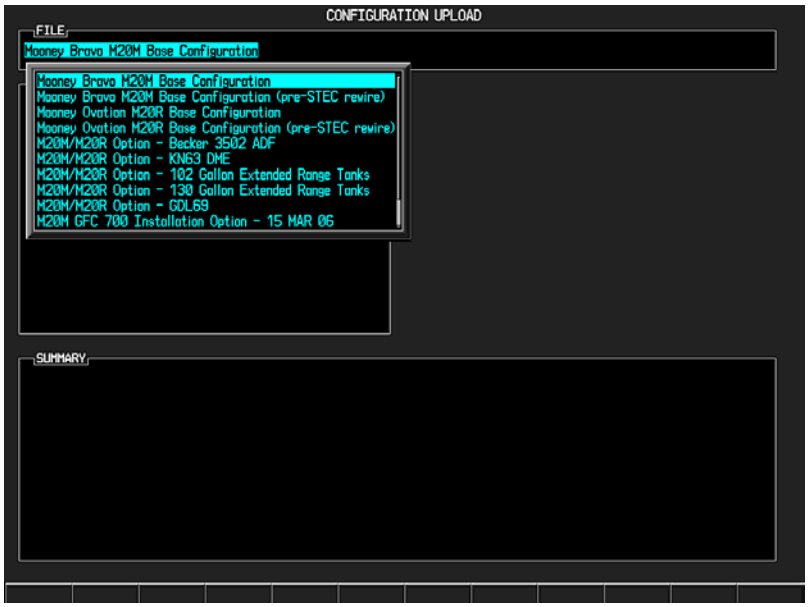
Approved Loader Card part numbers for this STC can be found in the G1000/GFC 700 General Arrangement Drawing, 005-00343-03.

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 7 *before* attempting to use the SW Loader Cards.

3.4.2 Configuration Files

Configuration Files are divided into groups, and are displayed at the Configuration Upload page.



3.4.2.1 Factory Base Configuration Groups

Mooney M20M Configuration
Mooney M20R Configuration

These groups represent the baseline configuration, used to configure the *entire* G1000 system for the first time during post installation checkout.

NOTE

These files must be loaded in accordance with the G1000/GFC 700 Post Installation Checkout M20M/M20R, 190-00638-03, for the system to function properly. This is typically accomplished by a appropriately rated repair station during final assembly.

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 airframe.
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.
CALIBRATION	This file configures certain system calibrations for the GEA 71.
GDC1	This file configures GDC 74A air data values for the airframe.
AUDIO	This file configures the audio alerts for the airframe.

3.4.2.2 Optional Configuration Groups

The following optional configuration groups are available, current as of G1000 System Software Version 0424.20.

Each option group contains one or more of the above configuration files. These files are loaded after the factory baseline configuration is established. They contain customized settings that enable listed options for the G1000. It should be noted that any required supporting hardware for the option must be installed before the option can function.

Mooney Option – ADF

Mooney Option – DME

Mooney Option – Extended Range Tanks

Mooney Option – GDL 69A (Data Link)

Mooney Option – GFC 700 (AFCS)

Mooney Option – SKY 497 (Traffic)

Mooney Option – WX 500 Stormscope

Mooney Option – TAWS (Requires a separate TAWS enable SD card)

Table 3-1. LRU to Configuration File Relationship

Configuration File Groups										
LRU	**File Name**	**Baseline Factory Config** **M20M** **M20R**	**Optional Configuration Files**							
			ADF	DME	Extended Range Tanks	GDL69	GFC 700 AFCS	SKY 497 TAS	WX 500 LTNG DET	TAWS
PFD	AIRFRAME	X			X		X			
	SYSTEM	X				X	X			
	PFD1	X								
	MANIFEST	X					X			
MFD	MFD1	X					X			
GIA63 #1	GIA1	X					X	X		
GIA63 #2	GIA2	X	X	X			X	X	X	
GIA 1 OR GIA 2	AUDIO	X								
GMA 1347	GMA1	X	X	X						
GTX 33	GTX1	X								
GEA 71	GEA1	X								
	CALIBRATION	X								
GDC 74A	GDC1	X								
GDL 69	GDL69					X				

NOTE

CERTAIN SOFTWARE AND CONFIGURATION FILES ARE **REQUIRED** TO BE RE-LOADED DURING MAINTENANCE THAT INVOLVES REMOVAL AND REPLACEMENT OF G1000 EQUIPMENT.

REFER TO SECTION 7 FOR RE-CONFIGURATION REQUIREMENTS FOR EACH G1000 LRU. PAY SPECIAL ATTENTION TO THE CONFIGURATION OF OPTIONS FOR THE G1000.

TO ENABLE TAWS FUNCTION, A SEPARATE “TAWS ENABLE” SD CARD IS USED. SEE MOONEY GENERAL ARRANGEMENT DRAWING FOR PART NUMBER INFORMATION.

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.

During system configuration, each file is sent directly to the applicable LRU where it is stored in local LRU memory (except GRS 77 & GDC 74A). Each file is also stored in PFD internal memory. The PFD also sends a copy of all configuration files to the 'Master Configuration module', located in the PFD harness connector backshell (see Figure 6-2). 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 have a configuration file. However, these LRUs do require several calibrations during the post installation checkout to tailor sensor characteristics to each airframe. While performing maintenance on these units, re-calibration may be required. See Section 7.7.3 for more information on AHRS re-calibration criteria.

Figure 3-7 and Figure 3-8 illustrate where the various configuration files are stored.

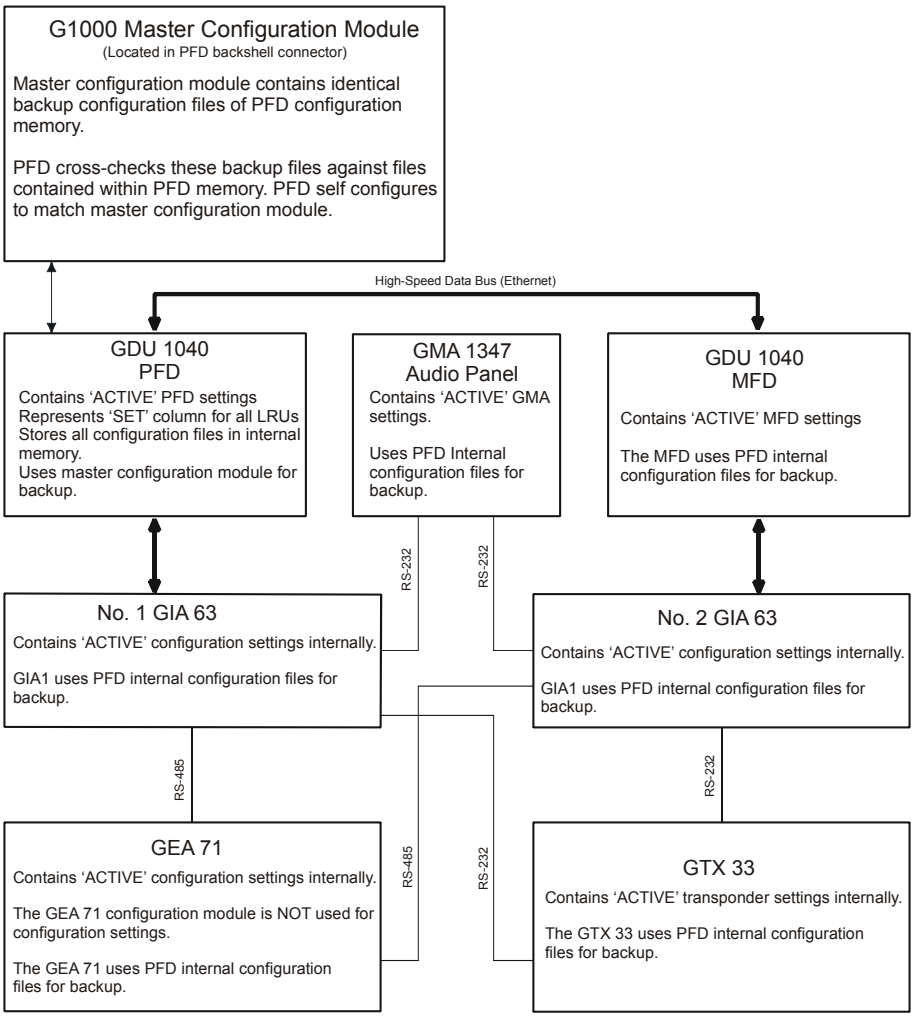


Figure 3-7. G1000 LRU Configuration File Storage

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.

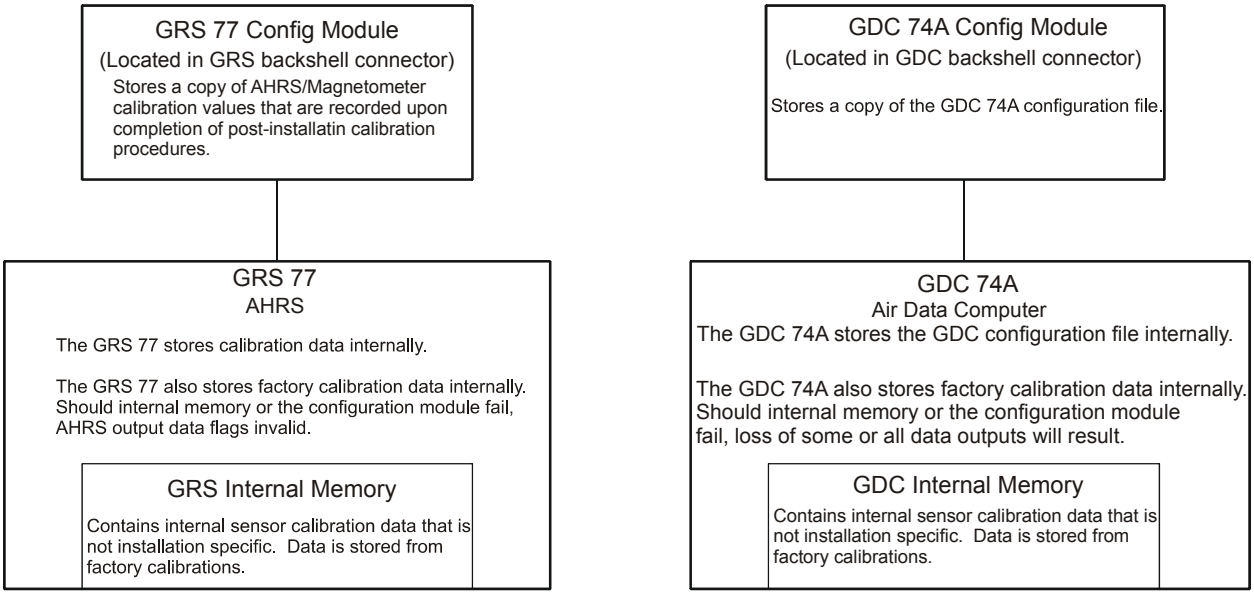


Figure 3-8. GRS/GDC Configuration Settings Storage

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 config 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 3-9, 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.

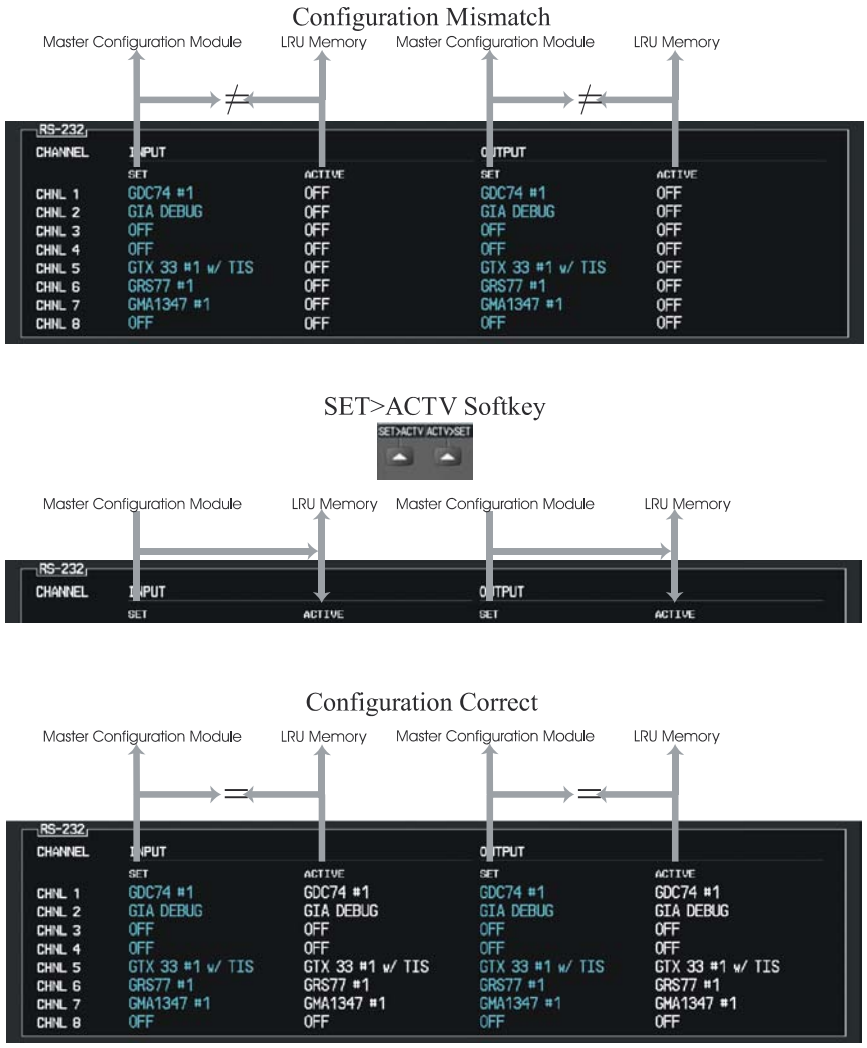


Figure 3-9. SET>ACTV Diagram

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 G1000 Loader Card. Section 7 describes this method for each LRU).

A blank active column, as shown in Figure 3-10 represents loss of communication between the display and the particular unit. See Section 5 for more details on troubleshooting.

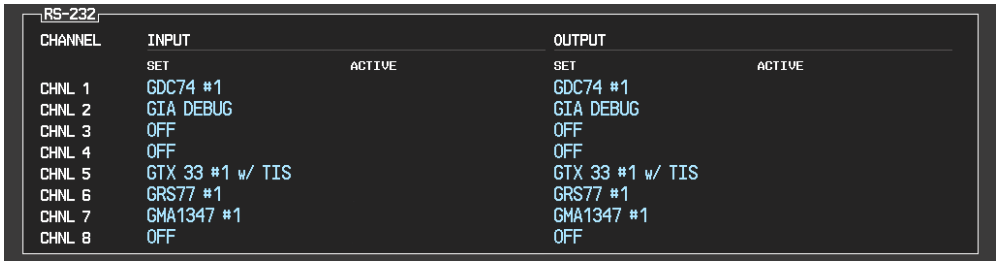


Figure 3-10. Loss of Communication

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 3-11. Section 7 shows other prompts encountered during the configuration process.

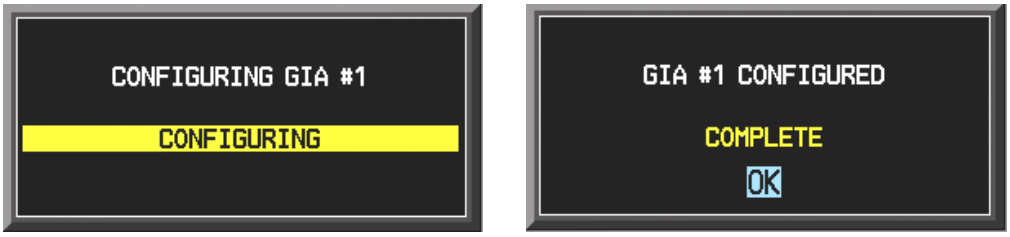


Figure 3-11. Configuration Status

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.

Figure 3-12. 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 Line Maintenance & Configuration manual, Garmin part number 190-00303-04.

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

Figure 3-13. Configuration Page Navigator

The above illustration shows the "SYSTEM" configuration mode page group selected, and the third page of that grouping being selected.

The following pages are available under the SYSTEM and subsequent groupings:

CONFIGURATION MODE SETUPS

"**SYSTEM**" PAGE GROUP		
1. System Status	5. Software Upload	9. System Configuration
2. Date/Time Setup	6. Configuration Upload	10. Manifest Configuration
3. Main Lighting	7. Diagnostics terminal	
4. Audio Alert Configuration	8. OEM Diagnostics	
"**GDU**" PAGE GROUP		
1. RS-232 / ARINC 429 Configuration	3. GDU test	5. Alert Configuration
2. GDU Status	4. Serial / Ethernet I/O	6. Airframe Configuration
"**GIA**" PAGE GROUP		
1. RS-232 / ARINC 429 Configuration	3. GIA I/O Configuration	5. GIA Status Page
2. CAN / RS-485 Configuration	4. COM Setup	
"**GEA**" PAGE GROUP		
1. Engine Data	2. GEA Status	3. GEA Configuration
"**GTX**" PAGE GROUP		
1. RS-232 / ARINC 429 Configuration	2. Transponder Configuration	
"**GRS**" PAGE GROUP		
1. AHRS / Airdata Input	2. GRS / GMU Calibration	
"**GDC**" PAGE GROUP		
1. GDC Configuration		
"**GFC**" Page Group		
1. GFC Configuration	2. GFC Status	
"**GMA**" PAGE GROUP		
1. GMA Page Configuration		
"**OTHER**" PAGE GROUP		
1. Stormscope Configuration (optional)		
"**CAL**" PAGE GROUP		
1. Fuel Calibration	2. Fuel Tank Configuration	3. Flaps and Trim Calibration

NOTE

The "OTHER" page group will only be displayed if the G1000 is configured for the WX500 StormScope.

4 Special Maintenance Practices

4.1 Servicing Information

Refer to the G1000/GFC 700 – Mooney Instructions For Continued Airworthiness document p/n 190-00638-02 for all inspection intervals and requirements pertaining to the maintenance procedures listed in this section.

4.2 Visual Inspection

In accordance with the ICA, perform a visual inspection to check for corrosion, damage, or other defects for each of the items listed in Table 4-1. Replace any damaged parts as required. Inspection may require the temporary removal of a unit or units to gain access to connectors. Follow guidance in Section 6 for equipment removal and replacement. Refer to the Mooney Airplane Maintenance Manual for instructions on removing any access panels.

Table 4-1. Visual Inspection Procedure

Item	Description/Procedure	Initials
To gain access for the following inspections: 1. Remove the glare shield as described in the Mooney Aircraft Maintenance Manual.		
GDC 74A Air Data Computer	a) Visually inspect the GDC 74A unit, mount, and connector for corrosion or other defects. Check the integrity of the "SPIDER" or "SHIELD BLOCK" ground attachments to the harness connector assembly as well as the integrity of the individual shields and their attachment. b) Ensure that pitot/static plumbing is secure and in good condition.	
GEA 71 Engine/Airframe Unit	a) Inspect the GEA 71 unit, rack, and connectors for corrosion or other defects. Check the integrity of the "SPIDER" or "SHIELD BLOCK" ground attachments to the harness connector assembly as well as the integrity of the individual shields and their attachment.	
GMA 1347 Audio Panel	a) Inspect the GMA 1347 unit, rack, and connectors for corrosion or other defects. Check the integrity of the "SPIDER" or "SHIELD BLOCK" ground attachments to the harness connector assembly as well as the integrity of the individual shields and their attachment.	
Backup Attitude Indicator Voltage Suppressor	a) Inspect the voltage suppressor and associated wiring for cracks, chaffing, or other defects.	
CDU Fans	a) Inspect both CDU fans for accumulation of dirt and other damage. Remove excess dirt as required. b) Ensure that both fans are operational.	
GDU 1040 PFD & GDU 1042 MFD	a) Remove the MFD and PFD as described in Section 6. b) Inspect the mounting surface, copper bonding fingers and connector for corrosion, heavy oxidation, or other damage. Check the integrity of the "SPIDER" or "SHIELD BLOCK" ground attachments to the harness connector assembly as well as the integrity of the individual shields and their attachment. c) Reinstall the MFD and PFD.	
To gain access for the following Inspections: 1. Remove aft fuselage access cover (approx F.S. 130). Refer to the Mooney Aircraft Maintenance Manual for access cover removal instructions.		
GRS 77	a) Inspect the GRS 77 unit, rack, and connector for corrosion or other defects. Check the integrity of the "SPIDER" or "SHIELD BLOCK" ground attachments to the harness connector assembly as well as the integrity of the individual shields and their attachment. b) Inspect wiring harness for chaffing.	
GSA 81 Pitch Servo	a) Inspect the servo, servo mount, connector, and support structures to ensure that no	

Item	Description/Procedure	Initials
& GSM 85 Servo Mount	corrosion, chaffing, cracks, or other defects exist. b) Check the servo control cable to ensure no fraying, corrosion, or other damage exists. If the condition of the cable is questionable, replace it with a new one. c) Ensure that the cable is correctly attached to the pulley. d) Check the tension of the servo control cable. Refer to the *Pitch Servo Install Drawing* 005-00343-05 for cable tension specifications. e) Have an assistant manually move the elevator from stop to stop and visually observe the servo, servo mount, and control surface cabling. Ensure there is no binding in the control cabling, and that the capstan pulley rotates freely. f) Be sure to follow Mooney's recommended checks for checking main control rods, following the instructions in Chapter 27, Flight Controls, of the Mooney Aircraft Maintenance Manual. g) Inspect the servo wiring and ensure no chaffing, wear, or other damage exists. h) Replace the access panels if no other maintenance is to be performed.	
GSA 81 Pitch Trim Servo & GSM 85 Servo Mount	a) Inspect the servo, servo mount, connector, and support structures to ensure that no corrosion, chaffing, cracks, or other defects exist. b) Check the servo control chain to ensure no link deformation, corrosion, or other damage exists. If the condition of the chain is questionable, replace it with a new one. c) Ensure that the chain is correctly engaged to the sprockets. d) Check the rigging of the servo control chain. Refer to the *Pitch Trim Servo Install Drawing* 005-00343-07 for chain rigging specifications. e) Have an assistant manually move the elevator trim wheel from stop to stop and visually observe the servo, servo mount, and control chain movement. Ensure there is no binding in the control chain and that the capstan sprockets and idler pulley rotate freely. f) Be sure to follow Mooney's recommended checks for checking main control rods, following the instructions in Chapter 27, Flight Controls, of the Mooney Aircraft Maintenance Manual. g) Inspect the servo wiring and ensure no chaffing, wear, or other damage exists. h) Replace the access panels if no other maintenance is to be performed.	
Avionics Rack	a) Inspect the outer area around the avionics rack for damage. b) Inspect the antenna connections on the unit racks as well as diplexer. c) Inspect the harness wiring for chaffing or other damage. d) Inspect the cooling fan and associated ducts. e) Inspect the mounting tray and all connectors; ref GIA #1, GIA #2, GTX, GDL (if installed). Check the integrity of the "SPIDER" or "SHIELD BLOCK" ground attachments to the harness connector assembly as well as the integrity of the individual shields and their attachment.	
To gain access for the following Inspections: Remove wing access inspection plates at or near WS 171 & WS 186 in starboard wing. Refer to the Mooney Aircraft Maintenance Manual for removal instructions.		
GMU 44	a) Using a non-magnetic screwdriver, remove the three Phillips screws holding the GMU access plate to the wing. b) Carefully lower the assembly and inspect the GMU 44 and rack. c) Inspect the mounting hardware and GMU 44 for corrosion or other damage. d) Reinstall the GMU 44 beneath the wing.	
GTP 59	a) Inspect the GTP 59 for dirt accumulation, corrosion, and other damage. Clean or replace as required.	
To gain access for the following Inspections: Remove pilot and copilot seats and pedestal cover. Refer to the Mooney Aircraft Maintenance Manual for removal instructions.		

Item	Description/Procedure	Initials
GSA 81 Roll Servo & GSM 85 Servo Mount	a) Inspect the servo, servo mount, connector, and support structures to ensure that no corrosion, chaffing, cracks, or other defects exist. b) Check the servo push rod to ensure no corrosion, deformation, cracks, nor other damage exists. If the condition of the push rod is questionable, replace it with a new one. c) Ensure that the push rod attach points (end fittings) are secure. d) Have an assistant manually move the ailerons from stop to stop and visually observe the servo, servo mount, and control linkage. Ensure there is no binding, nor interference in the control linkage, and that the servo capstan rotates freely. e) Be sure to follow Mooney's recommended checks for checking main control rods, following the instructions in Chapter 27, Flight Controls, of the Mooney Aircraft Maintenance Manual. f) Inspect the servo wiring and ensure no chaffing, wear, or other damage exists. g) Replace the pedestal cover and seats if no other maintenance is to be performed.	

IMPORTANT

For all other equipment installed under this STC listed in this maintenance manual, use the inspection procedures set forth in Chapter 05 of the Mooney Airplane Maintenance Manual.

4.3 Electrical Bonding Test

The following bonding test is required to be performed on G1000-equipped Mooney aircraft as a requirement beyond what is provided in the manufacturer's maintenance data.

4.3.1 Requirements

All G1000 equipment must be installed to conduct this test. Remove the glare shield, aft fuselage access cover, and wing inspection plates to gain access to required areas following instructions in the Mooney AMM.

Test Equipment

A milliohm meter and Kelvin probes are recommended for this test. However, a standard voltmeter, a power supply with adjustable current limit, and an ammeter may be substituted. The following procedure is written using the voltmeter, power supply and ammeter. All test equipment must have valid calibration records.

4.3.2 Procedure

1. Connect the positive lead of the power supply to the firewall to establish a good grounding point. Connect/touch the positive lead of the voltmeter to the same point.

   NOTE

   Ensure that the voltmeter and power supply probes do not touch, so as not to induce contact resistance.

2. Touch negative lead of power supply to each of the test points listed while performing Step 3. At each point, configure the power supply to produce 1 amp before measuring voltage. (Use an ammeter to ensure current is within 1 amp ±100 milli-amp at each point)
3. Set the voltmeter to measure milli-volts and null the reading. Measure the voltage from the grounding point (step 1) to each of the following points and record the voltage. (Perform Step 2 at each point to ensure that 1 amp ±100 milli-amp is present before measuring)

   a) Top metal case of PFD: _____ milli-volts
   b) Top metal case of MFD: _____ milli-volts
   c) Top metal case of GMA 1347: _____ milli-volts
   d) GEA 71 Body: _____ milli-volts
   e) GDC 74A Body: _____ milli-volts
   f) GTP 59 OAT Probe Base Nut: _____ milli-volts
   g) GIA 1 Top: _____ milli-volts
   h) GIA 2 Top: _____ milli-volts
   i) GTX 33 Top: _____ milli-volts
   j) GRS 77 metal base: _____ milli-volts
   k) GMU 44 Magnetometer metal base: _____ milli-volts
   l) GSA 81 Servo body: _____ milli-volts

4. Ensure that at each test point, no more than 2.5 milli-volts (2.5 mΩ) are present. In this case, voltage is equivalent to resistance (Ω), assuming that the 1 amp reference current is present.

   TIP: If 1 amp reference current cannot be maintained, note the difference between the attainable current and 1 amp reference current. Calculate the percentage difference and apply this to the voltage reading to obtain the equivalent resistance. Example: If the measured

current is 1.2 amps, (20% high from the target 1 amp current), then the allowable voltage measurement would be 20% high, 2.5 milli-volts would now be 3.0 milli-volts.

4.4 Fuel Tank Probe Re-Calibration

The fuel tank quantity probes are calibrated at the aircraft factory to ensure their measuring accuracy. Should either fuel tank probe fail and require replacement, the new probe(s) must be calibrated by performing the following procedure.

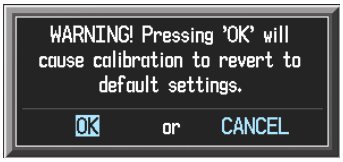
1. Level the aircraft, following instructions in the M20 Airplane Maintenance Manual.
2. Fill each fuel tank with 3.0 gallons fuel (unusable fuel, refer to M20 AFM). Use proper precautions when handling fuel. Ensure that the aircraft is grounded correctly and that there is adequate ventilation.

NOTE

If the G1000 system is shut down during fuel handling, it is imperative that the system be allowed to stabilize for *AT LEAST* three minutes before proceeding.

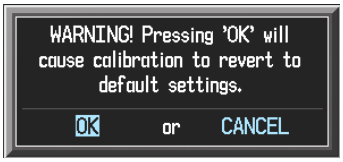
3. Go to the CAL Page Group on the PFD.
4. Select the Fuel Calibration page (1st page in CAL group), shown below:

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:

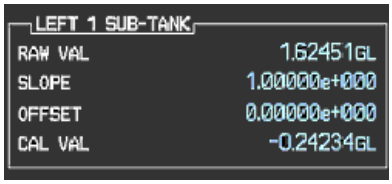


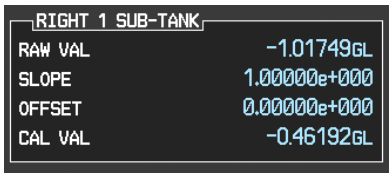
7. Ensure that the CAL VAL indication for the Left 1 Sub-Tank is stable.
8. Press the L EMPTY softkey.

9. Press the R RESET softkey. Press ENT to acknowledge the following prompt:



10. Ensure that the CAL VAL indication for Right 1 Sub-Tank is stable.
11. Press the R EMPTY softkey.
12. 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:

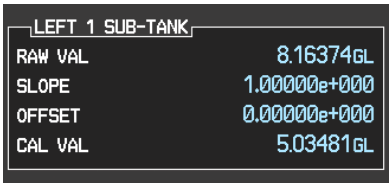


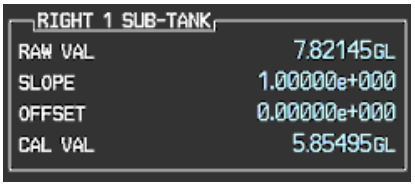


LEFT 1 SUB-TANK				
Actual Useable Fuel	**Calibrated Value (CAL VAL) Range**		**Record Actual Indicated CAL VAL Here**	**Is CAL VAL Within Specified Range? Yes / No**
	Minimum Allowed Indication	Maximum Allowed Indication		
0	-0.5	0.5		
6	5	7		

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		
6	5	7		

13. Fill each fuel tank with 6 gallons ± 0.1 gallons usable fuel.
14. Allow the system to stabilize before taking readings.
15. Record '6 gallon' CAL VAL indications for both Right 1 and Left 1 Sub-Tanks in the tables above. The CAL VAL values should fall between 5 and 7 gallons as shown in the following examples:





a) If both CAL VAL values fall within the specified ranges, the calibration is finished.

b) If any CAL VAL value is outside of the specified ranges, perform the full-tank calibration procedure in Section 4.4.1.

4.4.1 Full Tank Calibration

Perform this procedure ONLY if the preliminary calibration failed. Only the failed tank(s) need to be calibrated at full fuel level.

1. Fill the failed fuel tank(s) to maximum capacity (this includes the extended range tanks, if equipped).
2. Allow system to stabilize.
3. Ensure that the CAL VAL indication for the failed tank is stable before proceeding.
4. If the right tank failed, press the R FULL softkey. Likewise, if the left tank failed, press the L FULL softkey.
5. Drain the failed fuel tank(s).
6. Add 3.0 gallons (unusable fuel) to the failed tank(s).
7. Observe the CAL VAL indications for the failed tank(s) and record the readings in the following tables. The CAL VAL values should fall between –0.5 and 0.5 for the failed tank(s).

FAILED 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		
6	5	7		

FAILED 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		
6	5	7		

8. Fill the failed fuel tank(s) with 6 gallons ± 0.1 gallons usable fuel.
9. Allow the system to stabilize before taking readings.
10. Record '6 gallon' CAL VAL indications for the failed tank(s) in the tables above.
    a) *If the CAL VAL value(s) fall within the specified ranges, the calibration is finished.*
    b) *If any CAL VAL value is outside of the specified ranges, the fuel quantity system requires service.*

4.4.2 Low Fuel Warnings

1. Ensure that there is 6 gallons of usable fuel in each wing before proceeding.
2. Restart the PFD in the normal mode by cycling the PFD circuit breaker. Restart the MFD in the normal mode by cycling the MFD circuit breaker. Press the ENT key to acknowledge the agreement on the MFD.
3. Verify that the L and R fuel quantity pointers are in the red band and that the LEFT FUEL and RIGHT FUEL annunciators on the annunciator panel are illuminated.
4. Add approximately 2 gallons (±0.1 gal) of fuel to the left wing and verify that the LEFT FUEL annunciator extinguishes when the left fuel pointer exits the red band on the fuel quantity indicator.
5. Add approximately 2 gallons (±0.1 gal) of fuel to the right wing and verify that the RIGHT FUEL annunciator extinguishes when the right fuel pointer exits the red band on the fuel quantity indicator

4.5 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: 2005, 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." Garmin and/or Mooney Aircraft will distribute update instructions when updates are available. As of this writing, Garmin Service Bulletin #0533 addresses the most recent update to the 2005 database. Service Bulletins may be obtained from www.garmin.com at the 'Dealers Only' portion of the web site.

4.6 GSA 81 Greasing Procedure

Re-grease each servo output gear following the procedure below:

1. Remove each servo.
2. Remove excess grease build-up from the single servo output gear using a lint-free cloth.

IMPORTANT

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!

3. 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).
4. Re-install the servos.
5. Move control surfaces through their range of motion.

4.7 GSM 85 Slip Clutch Torque Check

Remove the GSM 85 Servo Mount; reference Section 6.12.

The slip clutch torque values must be checked, and adjusted if necessary, to the limits prescribed on each servo mount installation drawing. The procedure for adjusting the clutch is given on each servo mount installation drawing.

NOTE

This adjustment requires the use of the Garmin servo adjustment fixture, P/N 011-01085-00 or 011-01085-01. (The 011-01085-01 fixture is required for adjusting the Roll and Pitch slip clutches.)

Refer to the following servo mount installation drawings:

005-00343-06: Roll Servo Installation Drawing:

005-00343-05: Pitch Servo Installation Drawing

005-00343-07: Pitch Trim Servo Installation Drawing

4.8 Flap Position Discrete Input Check

To perform this check, all G1000 and GFC 700 equipment must be installed and operational. Start the G1000 system in Configuration Mode and go to the GIA Page Group and select the GIA I/O Configuration Page using the FMS knob. Perform the following checks:

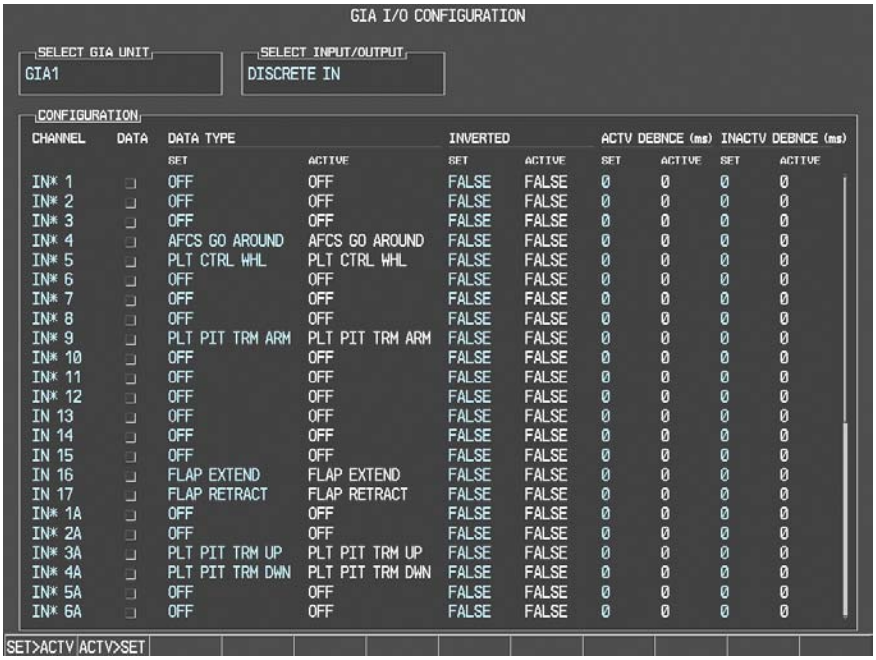


Figure 4-1. GIA I/O Page

1. Extend the flaps down. While the flaps are transitioning down, check that the discrete input labeled 'FLAP EXTEND' lights up green.
2. Retract the flaps up. While the flaps are transitioning up, check that the discrete input labeled 'FLAP RETRACT' lights up green.
3. Restart the G1000 system in normal mode. Wait until the AHRS and ADC systems come online and for the AFCS Pre-flight Test to complete.
4. Press the FD key on the MFD to engage the Flight Director. Press the AP key to engage the Autopilot. Press the CWS button for a few seconds and release; verifying there is no residual force on the control wheel for the pitch axis. Extend the flaps to approach position. The trim wheel should immediately run in the DOWN direction. Now retract the flaps. The trim should immediately run in the UP direction.
5. The flap discrete input check is complete.

5 TROUBLESHOOTING

This section provides instructions and guidance for G1000 system troubleshooting, as installed in the Mooney M20 aircraft.

IMPORTANT

Sections 6, 7, and 8 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 these sections 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 display 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.

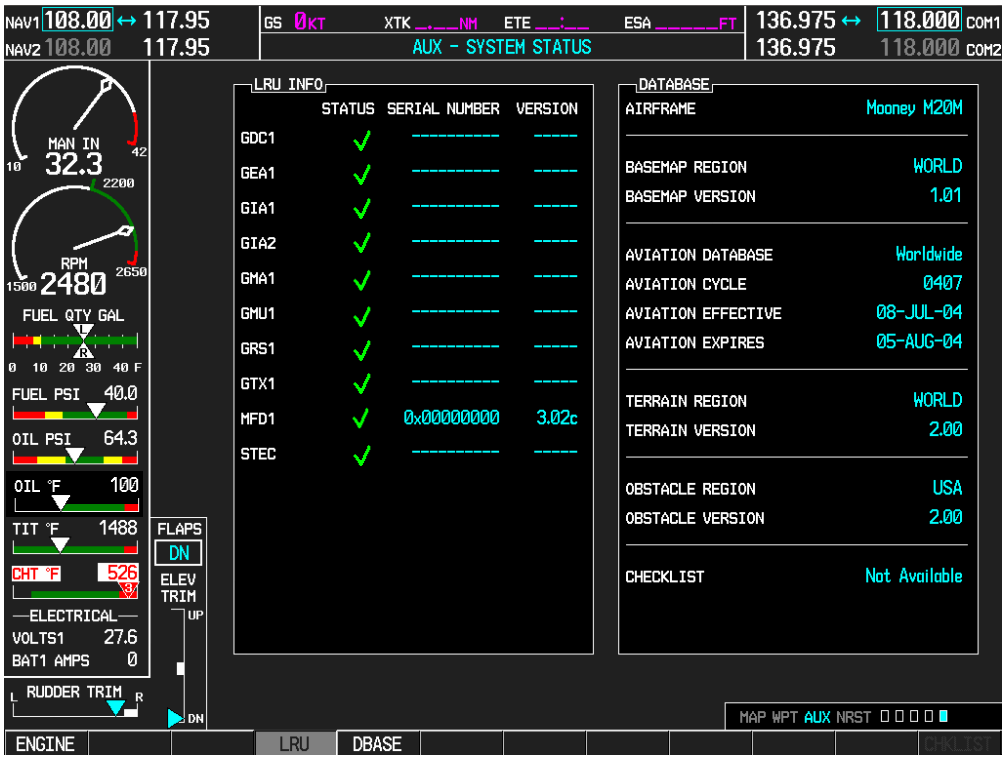


Figure 5-1. Typical System Status Page (AUX Group Normal Mode)

The AUX – System Status page is the 5th page in the AUX Page Group and displays the following information for each LRU and sub-function:

- Status: A green check is displayed for properly operating LRUs. A red 'x' appears when a LRU fault is detected, or if the LRU is unavailable.
- Serial Number: Each LRU serial number is displayed (functions such as GPS and GS are contained within an LRU; therefore, serial numbers are not shown for these).
- Current SW Version Loaded.

When troubleshooting, first check to ensure that each LRU status is 'green' and that the correct software is loaded in each unit.

5.1 G1000 Alerting System

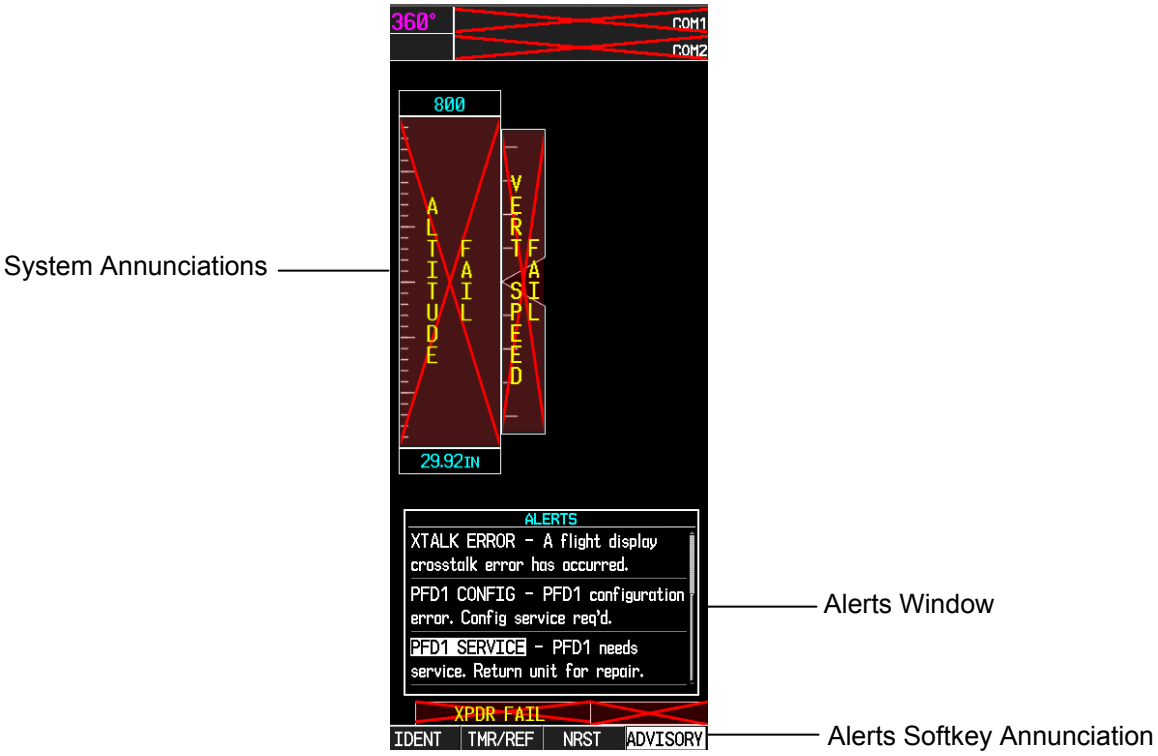


Figure 5-2. Typical Alerts and Annunciations

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

Annunciation Window:

The Annunciation Window displays abbreviated annunciations text. The Annunciation Window is located to the right of the Altitude and Vertical Speed windows on the display. All Mooney-specific annunciations can be displayed simultaneously.

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.

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/Mooney Alert System uses three levels:

WARNING:

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 always RED. A warning alert is also accompanied by a flashing WARNING softkey annunciation, as shown Figure 5-3, along with a continuous aural tone. Pressing the WARNING softkey acknowledges the presence of the warning alert and stops the aural tone. Pressing the ALERTS softkey displays the related alert message in the Alert Window.

Figure 5-3. WARNING Softkey Annunciation

CAUTION:

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 5-4, along with a single aural tone. Pressing the CAUTION softkey acknowledges the presence of the caution alert. Pressing the ALERTS sofkey displays the related alert message in the Alert Window.

Figure 5-4. CAUTION Softkey Annunciation

MESSAGE ADVISORY:

This level of alert provides general information to the pilot. A message advisory alert does not appear in the Annunciation Window. A message advisory alert is only accompanied by a flashing **ADVISORY** softkey annunciation, as shown in Figure 5-5. Pressing the **ADVISORY** softkey acknowledges the presence of the message advisory alert and displays the advisory message in the Alert Window.

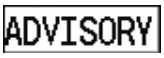


Figure 5-5. ADVISORY Softkey Annunciation

5.1.1 Aural & Audio Alerts

The G1000 system is capable of issuing audio and aural (voice) alerts for various situations. The following alerts are utilized by the G1000:

Alert Name	Purpose
350, 1000, & 2500 Hz Tone	Various System Alerts
Beep Beep	
Alert Ping	G1000 Alert Issued
"Traffic" (voice)	TIS Traffic Advisory
"No Traffic" (voice)	TIS Traffic Unavailable
Alt Alert	Altitude Alerting Function
"Caution Terrain, Caution Terrain" (voice) *and* "Terrain Ahead, Terrain Ahead" (voice)	TAWS **Caution** alert: Reduced required terrain clearance Or Imminent impact with terrain.
"Terrain Terrain, Pull Up Pull Up" (voice) *and* "Terrain Ahead Pull Up, Terrain Ahead Pull Up"	TAWS **Warning** alert: Reduced required terrain clearance Or Imminent impact with terrain.
"Too Low Terrain" (voice)	TAWS **Caution** alert: Premature descent alert (PDA)
"Sink Rate" (voice)	TAWS **Caution** alert: Ground Proximity envelope 1, 2, or 3, Excessive Descent Rate
"Pull Up" (voice)	TAWS **Warning** alert: Ground Proximity envelope 1, 2, or 3, Excessive Descent Rate
"Don't Sink" (voice) *and* "Too Low Terrain"	TAWS **Caution** alert: Ground Proximity altitude loss after takeoff
"Five Hundred" (voice)	TAWS **Caution** alert: Ground proximity voice callout
"Caution Obstacle, Caution Obstacle" (voice)	TAWS **Caution** alert: Obstacle awareness caution.
"Obstacle Obstacle Pull Up Pull Up" (voice) *or* "Obstacle Ahead Pull Up, Obstacle Ahead Pull Up" (voice)	TAWS **Warning** alert: Obstacle awareness warning.
"TAWS System Failure" (voice)	TAWS status alert: Terrain failure
"TAWS Not Available" (voice)	TAWS status alert: Terrain not available
"TAWS System Test, OK" (voice)(If passed) or "TAWS System Failure" (voice) (If test failed)	TAWS status alert: Terrain self-test
"TAWS Available" (voice)	TAWS status alert: Terrain available

5.2 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.

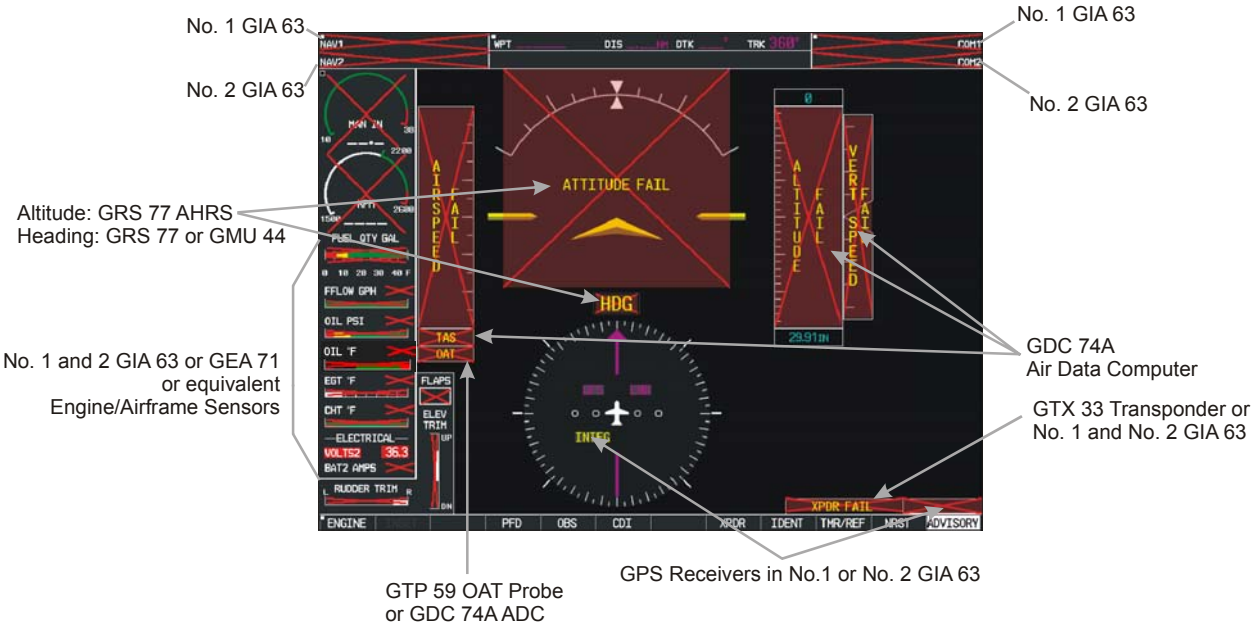
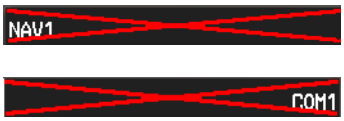
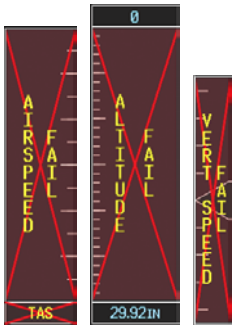
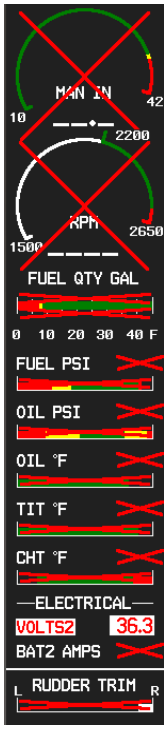


Figure 5-6. Typical System Annunciations

5.2.1 System Failure Troubleshooting

The following table provides basic troubleshooting guidance for LRU failures:

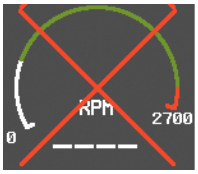
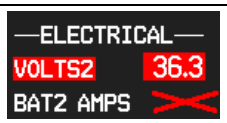
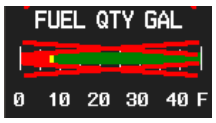
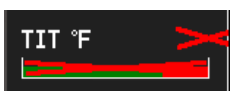
Invalid Data Field	Associated LRU(s)	Solution
NAV1 & COM1 	GIA1	• Check configuration settings for GIA1 and the PFD. • Check Ethernet interconnect from GIA1 to the PFD. • Switch GIA1 and GIA2, to verify location of problem: ✓ If problem follows unit, replace defective unit. ✓ If problem persists, replace defective PFD.
NAV2 & COM2 	GIA2	• Check configuration settings for GIA2 and the MFD. • Check Ethernet interconnect from GIA2 to the MFD. • Switch GIA1 and GIA2, to verify location of problem: ✓ If problem follows unit, replace defective unit. ✓ If problem persists, replace defective MFD.
GPS INTEG & Time  	GIA1 or GIA2	• Check GPS1 and GPS2 signal strength on the 3rd AUX page. • Check corresponding GPS antenna and cable. • Check Ethernet interconnect from PFD to GIA1 or MFD to GIA2. • Switch GIA1 and GIA2, to verify location of problem: ✓ If problem follows unit, replace defective unit. ✓ If problem persists, replace defective MFD or PFD.
XPDR FAIL 	GTX 33	• Check GTX RS-232 configuration settings for GIA1, GIA2, and GTX 33. • Check GIA1 – GTX and GIA2 – GTX wiring. • Replace defective GTX 33.
TAS FAIL AIRSPEED FAIL ALTITUDE FAIL VERT SPEED FAIL 	GDC 74A	• Inspect GDC 74A pitot/static plumbing integrity. • Inspect pitot/static ports and associated equipment. • For TAS failure, also check GTP 59 OAT probe as stated below. • Check GDC ARINC 429 configuration settings for the PFD, MFD, GIA1, and GIA2. ✓ If PFD, MFD, and GIA configuration settings are correct, replace defective GDC configuration module according to Section 6.13. ✓ If problem persists, replace defective GDC 74A.
OAT 	GTP 59	• See above guidance for GDC 74A troubleshooting. • Replace GTP 59 probe: ✓ If problem persists replace GDC 74A with a known good unit.

Invalid Data Field	Associated LRU(s)	Solution
ATTITUDE FAIL 	GRS 77	• Check GRS ARINC 429 configuration settings for the PFD, MFD, GIA1, and GIA2. • Replace defective GRS 77.
HDG FAIL 	GRS 77 & GMU 44	• Check GRS – GMU wiring. • Replace the GMU 44 with a known good unit: ✓ If problem persists, replace defective GRS 77.
	GRS 77 & GMU 44	• If this message persists, perform AHRS calibration procedures as described in Section 7.7.3.
Engine/Airframe Sensors (All Invalid) 	GEA 71	If software was loaded to a new GDU display, be sure that the user settings for the *replaced* display were cleared. Clear user settings by pressing the CLR key on the *replaced* display while applying power to it. Acknowledge the on-screen prompt by pressing the ENT key or the right-most softkey. • Check GEA 71 RS-485 configuration settings for GIA1 and GIA2. • Reconfigure the GEA 71 per Section 7.4.2. • Check GEA – GIA1 and GEA – GIA2 Wiring. • Replace defective GEA 71.

5.2.2 Engine / Airframe Instrument Failures

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 7.4.3 to check for correct operation of the sensors and GEA 71 after any part has been replaced.

Invalid Field	Sensor	Solution
	Tachometer	• Check tachometer – GEA wiring. • Replace tachometer sensor. Refer to M20M/R AMM. • Replace defective GEA 71.
	MAP Sensor	• Check MAP sensor – GEA wiring. • Replace MAP sensor. Refer to M20M/R AMM. • Replace defective GEA 71.
	Fuel Flow	• Check fuel flow sensor – GEA wiring. • Replace fuel flow sensor. Refer to M20M/R AMM. • Replace defective GEA 71.
 	CHT Probes (6)	• Check CHT probe – GEA wiring. • Replace CHT probe. Refer to M20M/R AMM. *If all 6 CHT indicators are flagged, check the following:* • Replace backshell thermocouple and/or configuration module in GEA connector. See Section 6.14. • Replace defective GEA 71.
	Oil Pressure Sensor	• Check oil pressure sensor – GEA wiring. • Replace oil pressure sensor. Refer to M20M/R AMM. • Replace defective GEA 71.
	Oil Temperature Sensor	• Check oil temperature sensor – GEA wiring. • Replace oil temperature sensor. Refer to M20M/R AMM. • Replace defective GEA 71.
	Battery Amps	• Check current sensor – GEA wiring. • Replace current sensor. Refer to M20M/R AMM. • Replace defective GEA 71.
	Fuel Quantity Sensors (4 per side)	• Check fuel quantity sensor – GEA wiring. • Replace fuel quantity sensor. Refer to the M20M/R AMM. • Replace defective GEA 71.
	TIT Probe (M20M only)	• Check TIT Probe – GEA wiring. • Replace temperature probe. Refer to the M20M/R AMM. • Replace defective GEA 71.

	EGT Sensors (6) (M20M only)	• Check EGT probe – GEA wiring. • Replace EGT probe. Refer to M20M/R AMM. *If all 6 EGT indicators are flagged, check the following:* • Replace backshell thermocouple and/or configuration module in GEA connector. See Section 6.14. • Replace defective GEA 71.
	Rudder Trim Position	• Check GEA wiring. • Replace rudder trim potentiometer. Refer to M20M/R AMM. • Replace defective GEA 71.
	Fuel Pressure Sensor	• Check fuel pressure transducer – GEA wiring. • Replace fuel pressure transducer. Refer to M20M/R AMM. • Replace defective GEA 71.
	Flap Position Indicator	• Check flap position – GEA wiring. • Replace flap position potentiometer. Refer to M20M/R AMM. • Replace defective GEA 71.
	Elevator Trim Position Indicator	• Check elevator trim – GEA wiring. • Replace elevator trim potentiometer. Refer to M20M/R AMM. • Replace defective GEA 71.

5.2.3 ADF/DME Failure

Effective System Software Version 0369.08 or later, ADF and DME interfaces were added as options. The PFD functions as a control head for the remote-mounted Becker ADF and Honeywell DME. A DME or ADF failure is represented by the following red X's.

  	Becker ADF and Honeywell DME	Ensure that GIA 63 #2 is properly functioning. Check for proper operation of the ADF or DME receivers. Ensure that each is receiving power. Check ADF – GIA2 and DME – GIA2 interconnect. Refer to Mooney wiring diagram for details.

5.3 GFC 700 AFCS Troubleshooting

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 at the AUX – System Status page (on MFD). Any alert messages, annunciations, or other abnormal behaviors should be noted in an effort to pinpoint the fault. The object is to locate the fault within a LRU or LRUs in efforts to replace the defective equipment.

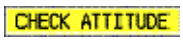
NOTE

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

Figure 5-7. AFCS Annunciation Field

Table 5-1. AFCS Annunciation Troubleshooting

The following annunciations may appear in the AFCS Annunciation field:

Annunciation	Condition	Resolution
	AFCS System Failure	1. Ensure that the G1000 system is in proper working order. Check specifically for proper operation of the: • GIA 63 Integrated Avionics Unit • GRS 77 AHRS • GDC 74A Air Data Computer • All GSA 81 Servos 2. Check that no red X's are present on the MFD and PFD. 3. Check that no related alert messages are present on the PFD (press the ALERTS softkey). 4. Go to the AUX SYSTEM STATUS page on the MFD and verify that all LRUs have a 'green' check (see Section 5). 5. Isolate the fault to an LRU. Replace this LRU and confirm the resolution of the annunciation. 6. Check AFCS wiring.
	Pitch Axis Failure	1. Check the AUX – SYSTEM STATUS page to see if the servo is online (green check). 2. Check that the affected servo is receiving power. 3. Check the servo wiring and connector. 4. If failure condition still exists, remove and replace the affected servo.
	Pitch Trim Axis Failure	
	Roll Axis Failure	
	Elevator Miss-Trim Down	1. If miss-trim annunciations persist, check the Pitch Trim servo for proper operation. Verify that the servo is online at the AUX – SYSTEM STATUS page. 2. Check the Pitch Trim servo wiring and connector. Ensure the servo is receiving power. 3. Check the aircraft trim control rigging. 4. If miss-trim condition still exists, remove and replace the affected servo.
	Elevator Miss-Trim Up	
	Aileron Miss-trim Right	1. Check for possible fuel imbalance. 2. Check aileron control rigging. 3. If miss-trim condition still exists remove and replace the roll servo.
	Aileron Miss-trim Left	
	Pre-Flight Test	Allow the system to complete pre-flight tests. The preflight test should finish within 2 minutes. If it does not pass, the red 'PFT' annunciation is shown. In case of PFT failure, troubleshoot in the same manner as for the red 'AFCS' annunciation.
	AHRS Monitor Failure	If the AHRS inputs have been determined to be "unreasonable" while the AP is engaged, in air, this message will be displayed until AHRS inputs are determined reasonable for 5 seconds.

5.4 G1000 Alerts

NOTE

From this point forward, all message advisory alerts presented are common to all G1000 systems and are not aircraft specific. Messages are grouped according to LRU.

5.5 GDU 1040 / 1042 Troubleshooting

5.5.1 GDU 1040 /1042 Common Problems

Symptom	Recommended Action
Display Backlight Excessively Dim	Re-load PFD1 and MFD1 configuration files per Section 7.1.2: ✓ If problem persists, replace defective unit.
Display will not track photocell	
Keypad/bezel will not track photocell	
Display will not track dimmer bus	Re-load PFD1 and MFD1 configuration files per Section 7.1.2. Switch MFD and PFD: ✓ If problem follows unit, replace defective unit.
Keypad/bezel will not track dimmer bus	Re-load PFD1 and MFD1 configuration files per Section 7.1.2. Switch MFD and PFD: ✓ If problem follows unit, replace defective unit.

5.6 GDU 1040 / 1042 Alerts

5.6.1 Software/Configuration Alerts

Failure Message	Cause	Solution
SW MISMATCH – GDU software version mismatch. Xtalk is off.	The system has found the PFD and MFD software versions do not match.	• Load correct software version. See Section 7.1 for GDU 1040/1042 Software Loading procedure.
MANIFEST – PFD1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in the PFD.	
MANIFEST – MFD software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in MFD.	
CNFG MODULE – PFD1 configuration module is inoperative.	The PFD master configuration module has failed.	See Section 6.13 for removal & replacement of the PFD master configuration module.
MFD1 CONFIG – MFD 1 configuration error. Config service req'd.	A configuration mismatch has occurred between the display and the Master Configuration Module.	• Reconfigure MFD and/or PFD as described in Section 7.1.2. • If unable to reconfigure, replace defective master configuration module as described in Section 6.13.
PFD1 CONFIG – PFD 1 configuration error. Config service req'd.		

5.6.2 Database Alerts

Failure Message	Cause	Solution
MFD1 DB ERR – MFD1 aviation database error exists.	The MFD or PFD has encountered an error in the Jeppesen aviation database.	Reload Jeppesen database. Replace the MFD or PFD.
PFD1 DB ERR – PFD1 aviation database error exists.		
MFD1 DB ERR – MFD1 basemap database error exists.	The MFD or PFD has encountered an error in the basemap database.	Replace the MFD or PFD.
PFD1 DB ERR – PFD1 basemap database error exists.		
MFD1 DB ERR – MFD1 terrain database error exists.	The MFD has encountered an error in the terrain database.	Confirm terrain datacard is inserted properly. Replace terrain datacard. Replace the MFD.
PFD1 DB ERR – PFD1 terrain database error exists.	The PFD has encountered an error in the terrain database.	Confirm terrain datacard is inserted properly. Replace terrain datacard. Replace the PFD.
DB MISMATCH – Aviation database version mismatch. Xtalk is off.	The system has found the Jeppesen aviation database cycles in the PFD and MFD do not match.	Load current database versions.
DB MISMATCH – Aviation database type mismatch. Xtalk is off.	The system has found the Jeppesen aviation database types in the PFD and MFD do not match (i.e., different regions: Americas, International, Atlantic, etc)	Load same type aviation database to both displays.
DB MISMATCH – Basemap database version mismatch. Xtalk is off.	The PFD and MFD have different basemap versions installed.	Replace one or both displays to ensure both basemap versions are identical.
DB MISMATCH – Terrain database version mismatch. Xtalk is off.	The PFD and MFD have different terrain database versions installed.	Insert two identical version 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.	Insert two identical version database cards in the PFD and MFD.
DB MISMATCH – Terrain database type mismatch. Xtalk is off.	The PFD and MFD have different terrain database types installed (i.e., different regions: Americas, International, Atlantic, etc).	Insert two identical version database cards in the PFD and MFD.

5.6.3 Cooling Alerts

Failure Message	Cause	Solution
MFD1 COOLING – has poor cooling. Reducing power usage.	MFD1 has exceeded its operating temperature range.	Check MFD Fan for proper operation. Replace the MFD. If problem persists contact Garmin.
PFD1 COOLING – has poor cooling. Reducing power usage.	The PFD has exceeded it's operating temperature range.	Check PFD Fan for proper operation. Replace the PFD. If problem persists contact Garmin.

5.6.4 Key Alerts

Failure Message	Cause	Solution
MFD1 "key" KEYSTK – key is stuck.	The SYSTEM has determined a key is stuck on MFD1.	Exercise stuck key. Replace the MFD.
PFD1 "key" KEYSTK – key is stuck.	The system has determined a key is stuck on the PFD.	Exercise stuck key. Replace the PFD.

5.6.5 Miscellaneous Alerts

Failure Message	Cause	Solution
XTALK ERROR – A flight display cross talk error has occurred.	A communication error has occurred between the MFD and PFD.	Verify that both PFD and MFD are receiving power. In Configuration Mode, check the System Configuration page: ✓ Ensure that MFD1 and PFD1 are green. ✓ If configuration is not correct, reconfigure the PFD and MFD per instructions in Section 7.1.2 Check Ethernet interconnect. Replace PFD with a known good unit to verify location of problem: ✓ If problem persists, replace MFD. ✓ If problem does not persist, replace PFD.
DATA LOST – Pilot stored data lost. Recheck settings.	Pilot stored data has been lost.	Cycle power to PFD: ✓ If problem persists, replace PFD.
MFD1 SERVICE – needs service. Return unit for repair.	The system has determined MFD1 needs service.	Replace the MFD.
PFD1 SERVICE – needs service. Return unit for repair.	The system has determined the PFD needs service.	Replace the PFD.

5.7 GMA Alerts

Failure Message	Cause	Solution
GMA1 SERVICE – GMA1 needs service. Return unit for repair.	The system has determined that the GMA 1347 needs service.	Replace GMA 1347.
GMA1 FAIL – GMA1 in inoperative.	The system has detected a failure in the GMA 1347.	
MANIFEST – GMA1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GMA 1347.	See Section 7.2.1 for GMA 1347 Software Loading procedure.
GMA1 CONFIG – GMA1 configuration error. Config service req'd.	The system has detected a GMA 1347 configuration mismatch.	See Section 7.2.1 for GMA 1347 Configuration Loading procedure.

5.7.1 GMA Redundant Paths

Failure Message	Cause	Solutions
BACKUP PATH – Audio panel using backup data path.	The GMA 1347 is using a backup RS-232 data path.	Check GIA RS-232 configuration settings: ✓ If configuration is not correct, reconfigure GIAs as described in Section 7.3.2. Check wiring. Replace GMA 1347 with a known good unit, to verify location of problem: ✓ If problem persists, replaced GIA1. ✓ If problem does not persist, replace GMA 1347.

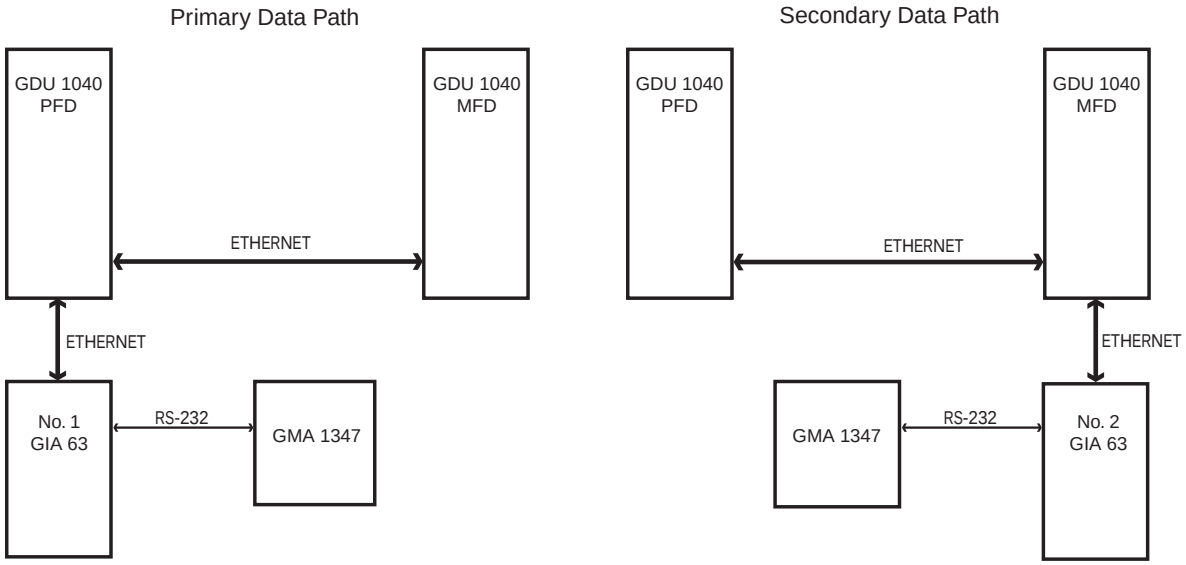


Figure 5-8. GMA 1347 Data Paths

5.8 GIA 63 Troubleshooting

5.8.1 COM

Symptom	Recommended Action
Weak COM transmit power	• Check COM antenna and cabling. • Switch GIA1 and GIA2, to identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2): If problem follows unit, replace defective unit per Section 6.3.
Weak COM receiver	• Check COM antenna and cabling. • Switch GIA1 and GIA2, to identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2): If problem follows unit, replace defective unit per Section 6.3.
No COM sidetone	• Switch GIA1 and GIA2, to identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2): If problem follows GIA, replace defective GIA per Section 6.3. If problem persists, replace defective GMA per Section 6.2.

5.8.2 NAV

Symptom	Recommended Action
Weak NAV receiver	• Check NAV antenna, coupler, and cabling. • Switch GIA1 and GIA2, to identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2): If problem follows unit, replace defective unit per Section 6.3.

5.8.3 G/S

Symptom	Recommended Action
Weak G/S receiver	• Check G/S antenna, coupler, and cabling. • Switch GIA1 and GIA2, to identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2): If problem follows unit, replace defective unit per Section 6.3

5.8.4 GPS

Symptom	Recommended Action
Will Not Acquire Satellites	• Go to AUX 3 Page on MFD and confirm which GPS receiver is inoperative (GPS 1 or GPS 2). • Check appropriate GPS Antenna and Cabling. • Switch GIA1 and GIA2, to identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2): If problem follows unit, replace defective unit per Section 6.3.

5.9 GIA Alert Messages

5.9.1 COM Alerts

Failure Message	Cause	Solutions
COM1 SERVICE – COM1 needs service. Return unit for repair.	The system has determined COM1 needs service.	• Replace GIA1 according to instructions in Section 6.3.
COM2 SERVICE – COM2 needs service. Return unit for repair.	The system has determined COM2 needs service.	• Replace GIA2 according to instructions in Section 6.3.
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.	• 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 identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped; see Section 7.3.2): If problem follows the unit, replace GIA1. If problem persists replace defective 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.	• 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 identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2): If problem follows the unit, replace GIA2. If problem persists replace defective GMA 1347.

COM Related Alerts, Continued		
Failure 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.	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 identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2). If problem follows the unit, replace GIA1. If problem persists, continue to troubleshoot remote transfer switch & wiring.
COM2 RMT XFR – COM2 remote transfer key is stuck.	The COM2 external remote transfer switch is stuck in the enabled (or "pressed") state.	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 identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2): If problem follows the unit, replace GIA2. If problem persists, continue to troubleshoot remote transfer switch & wiring.

5.9.2 NAV Alerts

Failure Message	Cause	Solution
NAV1 SERVICE – NAV1 needs service. Return unit for repair.	The system has detected a failure in NAV1 receiver.	Replace GIA1.
NAV2 SERVICE – NAV2 needs service. Return unit for repair.	The system has detected a failure in NAV2 receiver.	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.	Press the NAV1 external remote transfer switch again to cycle its operation. Check NAV1 remote transfer switch and wiring. • Switch GIA1 and GIA2, to identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2): If problem follows unit, replace GIA1. If problem persists, continue to troubleshoot remote transfer switch & wiring.
NAV2 RMT XFR – NAV2 remote transfer key is stuck.	The NAV2 external remote transfer switch is stuck in the enabled (or "pressed") state.	Press the NAV2 external remote transfer switch again to cycle its operation. Check NAV2 remote transfer switch and wiring. • Switch GIA1 and GIA2, to identify whether the unit or connectors/wiring is at fault (Both GIAs must be configured when swapped, see Section 7.3.2): If problem follows unit, replace GIA1. If problem persists, continue to troubleshoot remote transfer switch & wiring.

5.9.3 Glideslope Alerts

Failure Message	Cause	Solution
G/S1 SERVICE – G/S1 needs service. Return unit for repair.	The system has detected a failure in G/S1 receiver.	Replace GIA1.
G/S2 SERVICE – G/S2 needs service. Return unit for repair.	The system has detected a failure in G/S1 receiver.	Replace GIA2.
G/S1 FAIL – G/S1 is inoperative.	The system has detected a failure in G/S1 system.	Check G/S1 antenna and cabling. Replace GIA1 if problem persists.
G/S2 FAIL – G/S2 is inoperative.	The system has detected a failure in G/S2 system.	Check G/S2 antenna and cabling. Replace GIA2 if problem persists.

5.9.4 GPS Alerts

Failure Message	Cause	Solution
MANIFEST – GPS1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GIA1.	• See Section 7.3.1 for GIA 63 Software Loading procedure.
MANIFEST – GPS2 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GIA2.	• See Section 7.3.1 for GIA 63 Software Loading procedure.
GPS1 SERVICE – GPS1 needs service. Return unit for repair.	The system has detected a failure in GPS1 receiver.	• Replace GIA1.
GPS2 SERVICE – GPS2 needs service. Return unit for repair.	The system has detected a failure in GPS2 receiver.	• Replace GIA2.
GPS1 FAIL – GPS1 is inoperative.	The system has detected a failure in GPS1 system.	• Check GPS1 antenna and cabling. • Replace GIA1 if problem persists.
GPS2 FAIL – GPS2 is inoperative.	The system has detected a failure in GPS2 system.	• Check GPS2 antenna and cabling. • Replace GIA2 if problem persists.

5.9.5 GIA Cooling Alerts

Failure Message	Cause	Solution
GIA1 COOLING – GIA1 temperature too low.	GIA1 operating temperature is too low.	• Allow unit to warm up.
GIA2 COOLING – GIA2 temperature too low.	GIA2 operating temperature is too low.	• Allow unit to warm up.
GIA1 COOLING – GIA1 over temperature.	GIA1 has exceeded its operating temperature range.	• Check Avionics Fan for proper operation. • Replace GIA1. • If problem persists contact Garmin.
GIA2 COOLING – GIA2 over temperature.	GIA2 has exceeded its operating temperature range.	• Check Avionics Fan for proper operation. • Replace GIA2. • If problem persists contact Garmin.

5.9.6 GIA Configuration Alerts

Failure Message	Cause	Solution
MANIFEST – GIA1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GIA1.	• See Section 7.3.1 for GIA 63 Software Loading procedure.
MANIFEST – GIA2 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GIA2.	
GIA1 CONFIG – GIA1 configuration error. Config service req'd.	The system has detected a GIA configuration mismatch. If GIAs are not properly configured after being swapped/replaced, this message appears.	• See Section 7.3.2 for GIA 63 Configuration Loading procedure.
GIA2 CONFIG – GIA2 configuration error. Config service req'd.		

5.10 GEA Troubleshooting

5.10.1 GEA Alerts

Failure Message	Cause	Solution
MANIFEST – GEA1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GEA 71.	• See Section 7.4.1 for GEA 71 Software Load Procedure.
GEA1 CONFIG – GEA1 configuration error. Config service req'd.	The system has detected a GEA 71 configuration mismatch.	• See Section 7.4.2 for GEA 71 Configuration Procedure.

5.10.2 GEA Redundant Paths

Failure Message	Cause	Solutions
BACKUP PATH – EIS using backup data path.	The GEA 71 is using a backup RS-485 data path.	• Check RS-485 configuration settings at the GIA page group: If configuration is not correct, reconfigure GIA as described in Section 7.3.2. • Check wiring. • Replace GIA1 with a known good unit, to verify location of problem: If problem persists, replace the GEA 71. If problem does not persist, replace GIA1.

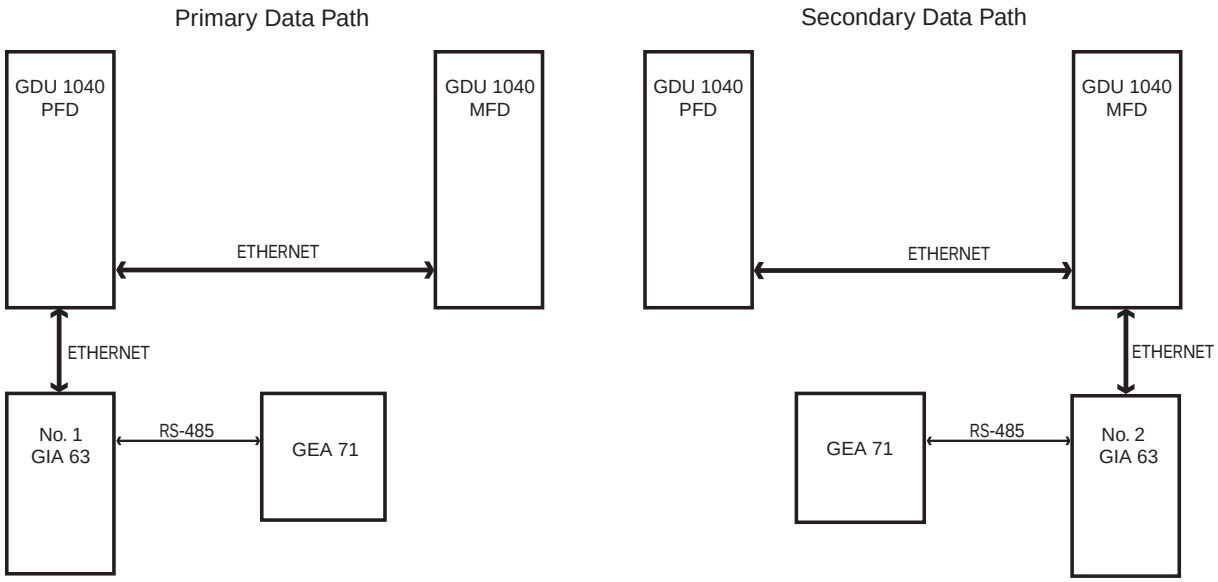


Figure 5-9. GEA 71 Data Paths

5.11 GTX Troubleshooting

5.11.1 GTX Alerts

Failure Message	Cause	Solutions
MANIFEST – GTX1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GTX 33.	Reload software. See Section 7.5.1 for GTX 33 Software Load Procedure.
XPDR1 CONFIG – XPDR1 configuration error. Config service required.	The system has detected a GTX 33 configuration mismatch.	Reload configuration file. See Section 7.5.2 for GTX 33 Configuration Procedure.

5.11.2 GTX Redundant Paths

Failure Message	Cause	Solutions
BACKUP PATH – Transponder using backup data path.	The GTX 33 is using a backup RS-232 data path.	• Check RS-232 configuration settings at GIA and GTX page groups: If configuration is not correct, reconfigure GIA or GTX as described in Section 7. • Check wiring. • Replace GIA1 with a known good unit, to verify location of problem: If problem persists, replace the GTX 33. If problem does not persist, replaced GIA1.

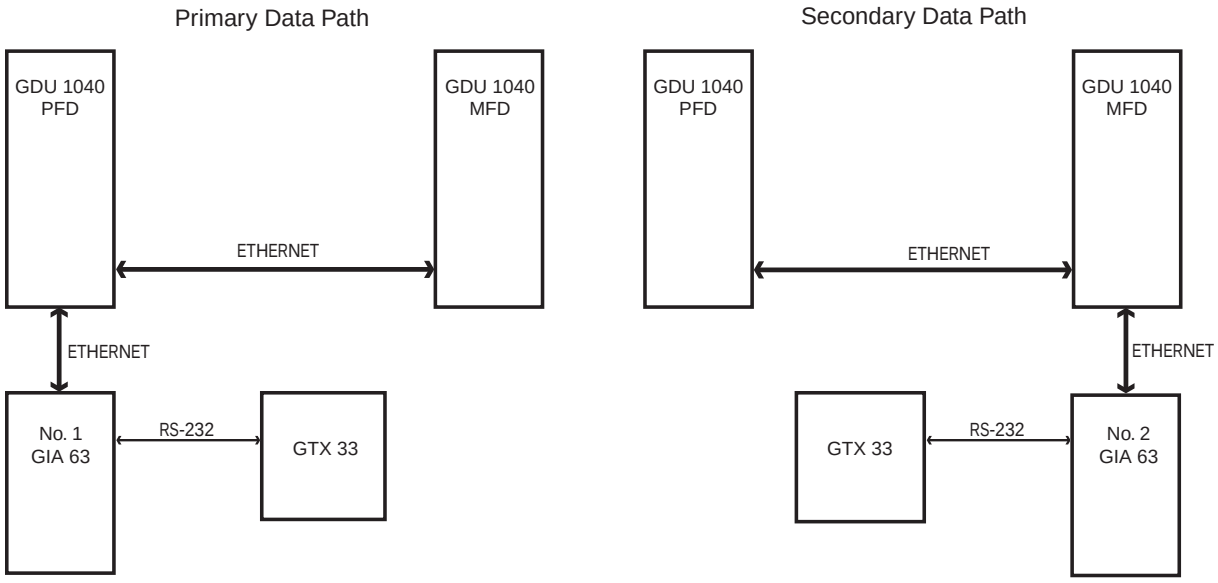


Figure 5-10. GTX 33 Data Paths

5.12 GRS 77/GMU 44 Troubleshooting

5.12.1 GRS Alerts

Failure Message	Cause	Solutions
MANIFEST – GRS1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GRS 77.	Reload software. See Section 7.7 for GRS 77 Software Load Procedure.
AHRS1 SERVICE – AHRS1 Magnetic-field model needs update.	The AHRS magnetic field model should be updated. Appears on ground only.	See Section 4.5.
GEO LIMITS – AHRS1 too far North/South, no magnetic compass.	The aircraft is outside of its operating limits; i.e., too far North or South. Heading will be flagged invalid.	Operate the aircraft only within the limits as specified in the aircraft AFMS.
AHRS1 TAS – AHRS1 not receiving airspeed.	The GRS 77 is not receiving airspeed from the GDC 74A.	Check GRS/GDC interconnect.
MAG VAR WARN – Large magnetic variance. Verify all course angles.	Magnetic variance value from GMU 44 is not accurate.	If problem persists, run magnetic interference check in Section 5.12.4 to check for localized magnetic interference.
AHRS1 GPS – AHRS1 not receiving backup GPS information.	The GRS 77 is not receiving backup GPS information from either GIA 63.	Ensure that both GPS1 and GPS2 can lock on to GPS signals: ✓ If GPS receivers are faulty, replace GIA unit(s). If GPS receivers operate correctly, check GRS/GIA interconnects: ✓ If interconnects operate correctly, replace GRS 77.
AHRS1 GPS – AHRS1 operating exclusively in no-GPS mode.	The GRS 77 is operating in the absence of GPS.	
AHRS1 GPS – AHRS1 not receiving any GPS information.	The GRS 77 is not receiving GPS data from the GPS receivers.	
AHRS1 GPS – AHRS1 using backup GPS source.	The GRS 77 is using the backup GPS data path.	

5.12.2 GMU Alerts

Failure Message	Cause	Solutions
MANIFEST – GMU1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GMU 44.	• Reload software. See Section 7.7.2 for GMU 44 Software Load Procedure.
HDG FAULT – AHRS1 magnetometer fault has occurred.	A fault has occurred in the magnetometer; heading will be flagged invalid.	• Replace GMU 44.

5.12.3 GRS Redundant Paths

Failure Message	Cause	Solutions
BACKUP PATH – AHRS1 using backup data path.	The GRS 77 is using a backup ARINC 429 data path.	Check ARINC 429 configuration settings at the GDU and GIA page groups: If configuration is not correct, reconfigure GDU or GIA as described in Section 7. • Check wiring PFD. • Replace PFD1 with a known good unit, to verify location of problem: If problem persists, replace the GRS 77. If problem does not persist, replace PFD.

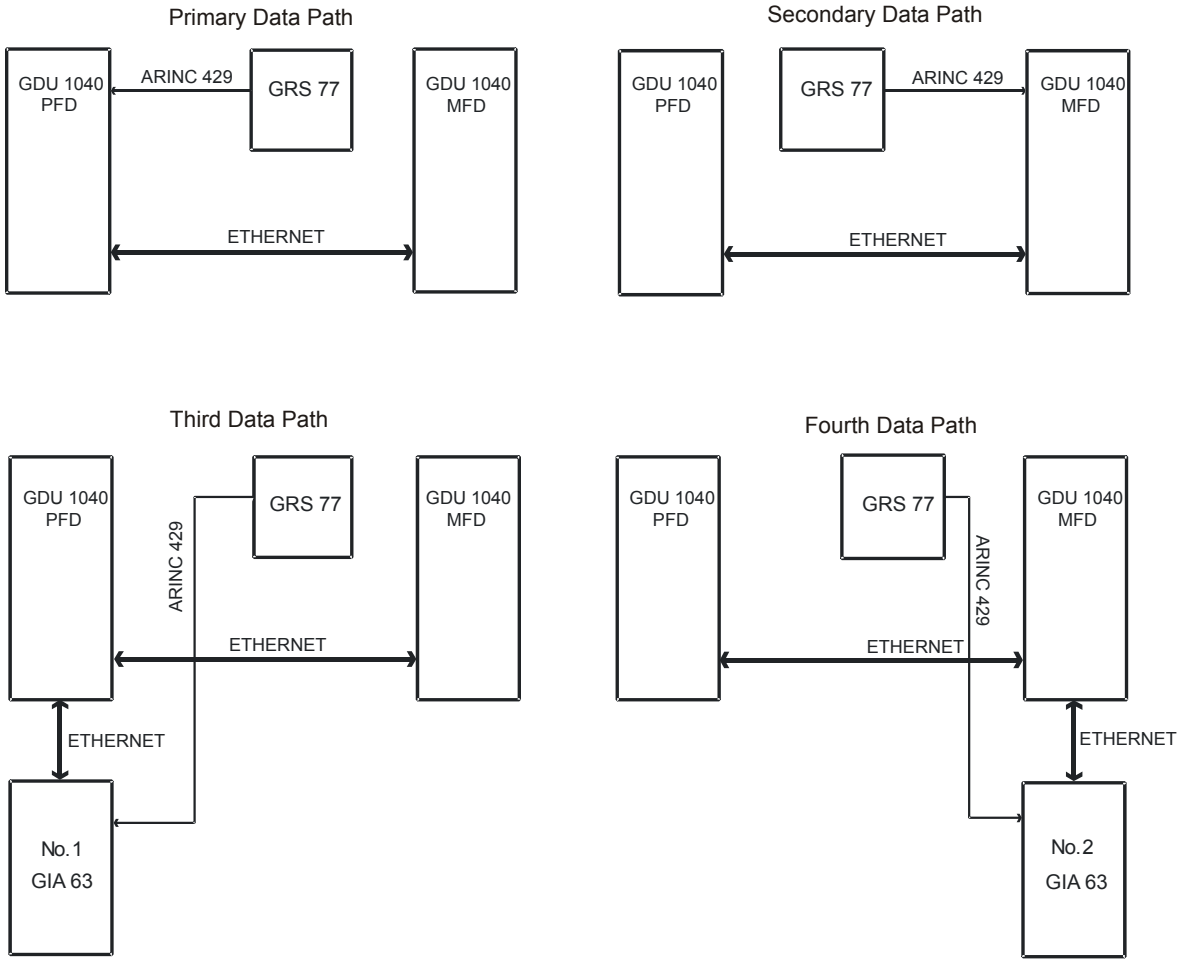


Figure 5-11. GRS 77 Data Paths

5.12.4 Calibration Procedure E: Magnetometer Interference Test (Optional)

A magnetometer interference test is available for troubleshooting and/or verifying a magnetically 'clean' installation of the GMU 44. This test exercises various devices on the aircraft that could potentially affect the magnetic field as measured by the GMU 44 (examples include navigation lights, control servos, landing gear motors, etc).

NOTE

This test is optional and is used to validate that no electronic device interferes with the operation of the GMU 44 magnetometer. It is highly recommended that this test be performed after installation or maintenance of electrical components on the aircraft and/or for troubleshooting the GMU 44.

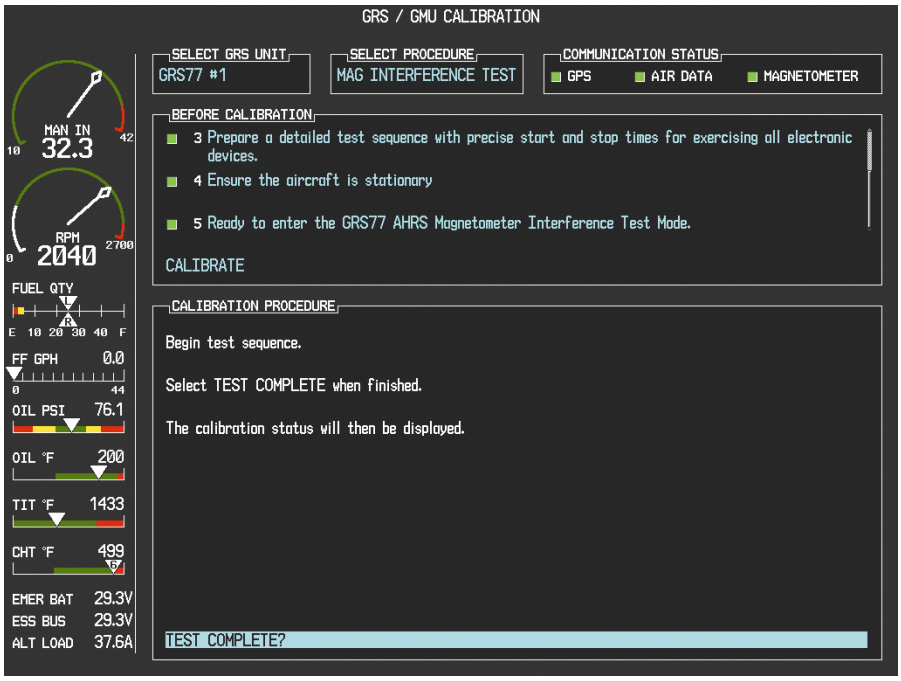


Figure 5-12. Magnetometer Interference Test

1. Initiate the AHRS magnetometer interference test procedure by performing the following steps:
2. Enter Configuration Mode and go to GRS/GMU Calibration page as shown in Figure 5-12.
3. This page is protected and requires a keystroke password to perform this test. Press the following softkeys in sequence:
   i) softkey 9
   ii) softkey 10
   iii) softkey 11
   iv) softkey 12
4. Select MAG INTERFERENCE TEST and press the ENT key.
5. Follow the checklist items displayed on the PFD, and press the ENT key as each one is completed or confirmed.

NOTE

The 3rd item on the checklist instructs the operator to "prepare a detailed test sequence with precise start and stop times for exercising all electronic devices". Only the electronic devices that are likely to affect the operation of the GMU 44 magnetometer need be included in the test sequence. The list of relevant electronic devices will vary from aircraft to aircraft. An example of an appropriate test sequence is given Table 5-2.

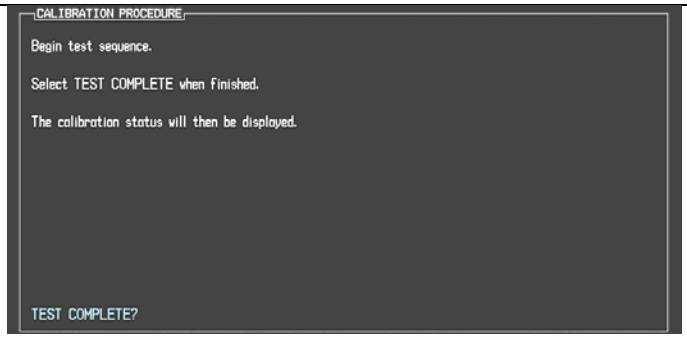
Table 5-2. Magnetometer Interference Test Sequence (Example)

Elapsed Time since Start of Test (min:secs)	Action
0:00	Test begins
0:10	Aileron full right
0:20	Aileron full left
0:30	Aileron level
0:40	Flaps down
0:50	Flaps up
1:00	Landing gear up
1:20	Landing gear down
1:40	Speed brake up
1:50	Speed brake down
2:00	Navigation lights on
2:10	Navigation lights off
2:20	Landing lights on
2:30	Landing lights off
2:40	Taxi lights on
2:50	Taxi lights off
3:00	Landing + Taxi lights on
3:10	Landing + Taxi lights off
3:20	Strobes on
3:30	Strobes off
3:40	Recognition lights on
3:50	Recognition lights off
4:00	Beacon on
4:10	Beacon off
4:20	End of test

6. When the CALIBRATE field is blinking, press the ENT key to begin the procedure, and have a stopwatch ready to begin recording the elapsed time.

NOTE

It is important that the "time equals zero" moment corresponds with the moment the PFD first displays the blinking TEST COMPLETE? message.



7. The operator should carry out the actions called for in the prepared test sequence.

NOTE

It is important that all actions are carried out in the order and at the precise elapsed time as specified in the prepared test sequence.

8. When the operator has completed the actions specified in the test sequence, press the ENTER button to indicate that the process is complete. When this is done, the TEST COMPLETE field stops blinking.
9. 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 for this test.

If the test fails, the installation should be considered unreliable until the source of magnetic interference is identified and remedied. When the magnetometer interference test fails, record the three magnetometer maximum deviation values and their corresponding timestamps. Any maximum deviation value greater than **2.5** milliGauss indicates a problem that must be resolved. Compare the corresponding timestamps with the prepared test sequence to identify which action produced the problem. Contact Garmin for assistance in resolving the problem.

NOTE

Two common reasons for a failed magnetometer interference test are: 1) new equipment is installed in close proximity to the GMU 44 magnetometer, and 2) an existing or new electronic device has become grounded through the aircraft structure instead of via the proper ground wire in a twisted shielded pair.

10. Press the ENT key on the PFD to conclude this procedure.

5.13 GDC 74A Troubleshooting

5.13.1 GDC Alerts

Failure Message	Cause	Solutions
MANIFEST – GDC1 software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GDC 74A.	Reload software. See Section 7.6.1 for GDC 74A Software Load Procedure.
BACKUP PATH – Airdata using backup data path.	The GDC 74A is using a backup ARINC 429 data path.	• Check ARINC 429 configuration settings at GDU and GIA page groups: If configuration is not correct, reconfigure GIA or GDU as described in Section 7. • Check wiring. • Replace PFD with a known good unit, to verify location of problem: If problem persists, replace the GDC 74A. If problem does not persist, replace PFD.

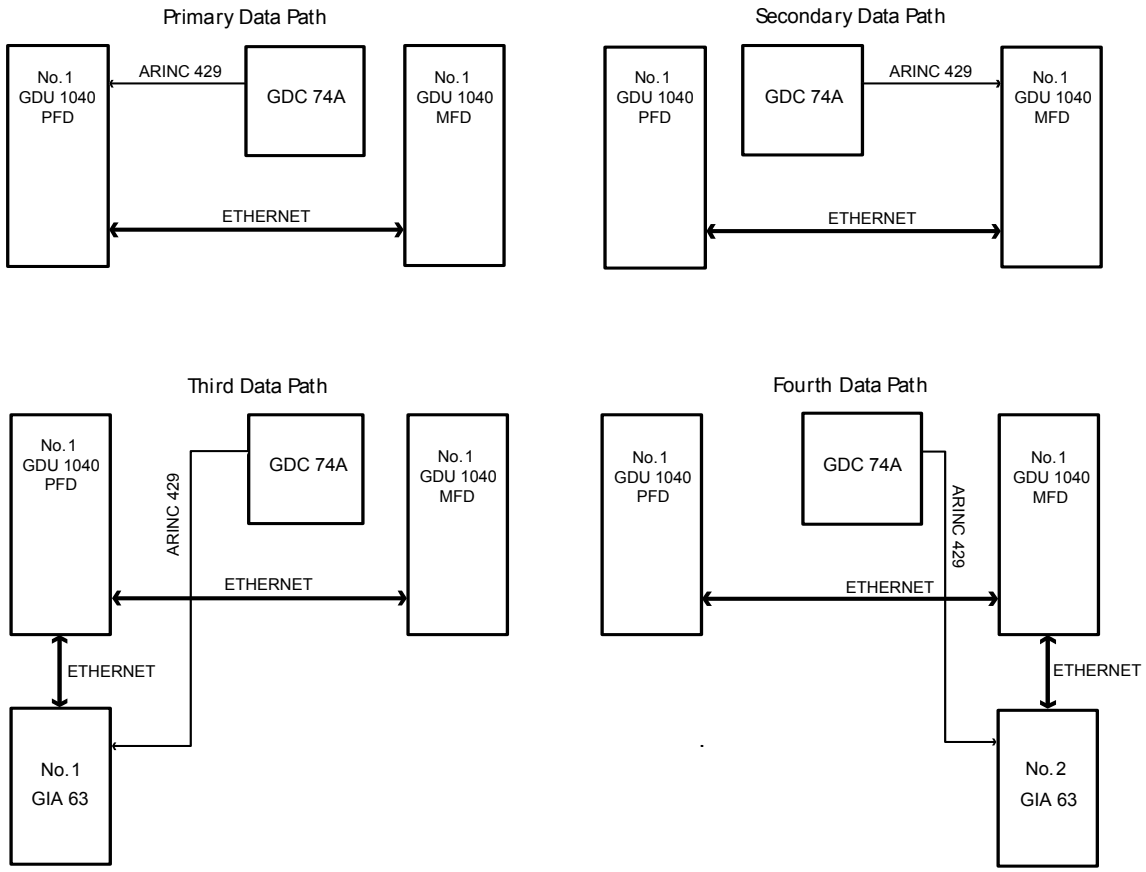
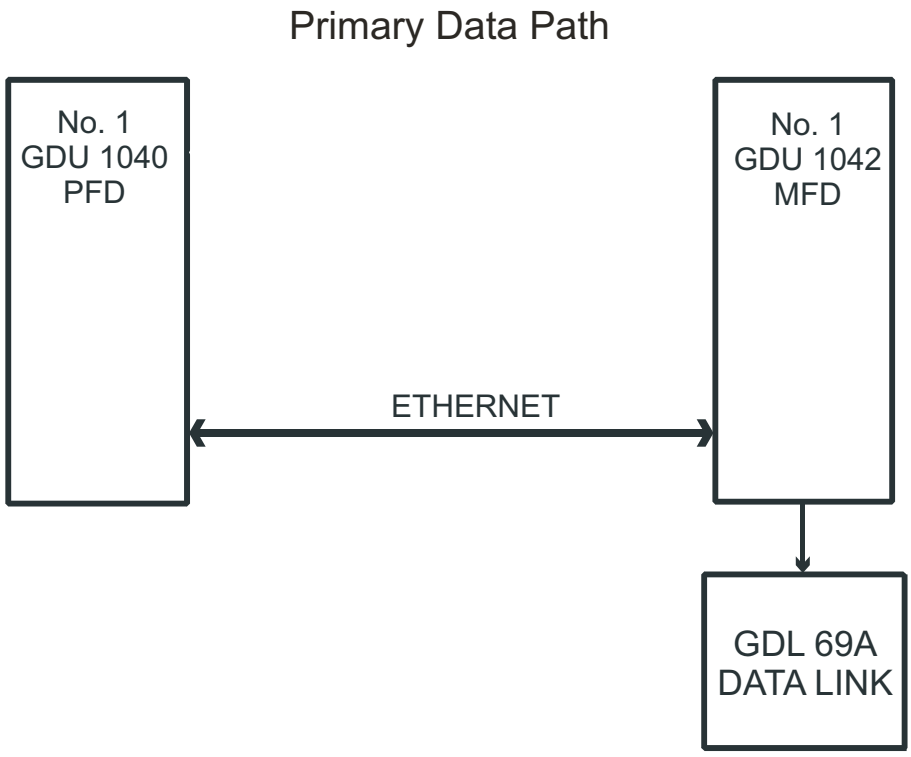


Figure 5-13. GDC 74A Data Paths

5.14 GDL 69A Troubleshooting

5.14.1 GDL 69A Alerts

Failure Message	Cause	Solutions
MANIFEST – GDL software mismatch. Communication Halted.	The system has detected an incorrect software version loaded in GDL 69A.	• Reload software. See Section 7.9.1 for GDL 69A Software Load Procedure.
GDL69 CONFIG - GDL 69 config error. Config service req'd.	The system has detected a GDL 69A configuration mismatch.	• See Section 7.9.2 for GDL 69A Configuration Procedure.
GDL69 FAIL - GDL 69 has failed.	The system has detected a failure in the GDL 69A.	• Ensure that the GDL 69A is receiving power. • Check GDL 69A antenna and cabling, including connections from the GDL to the MFD. • Replace GDL 69A if problem persists.



5.15 Backshell Connectors

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

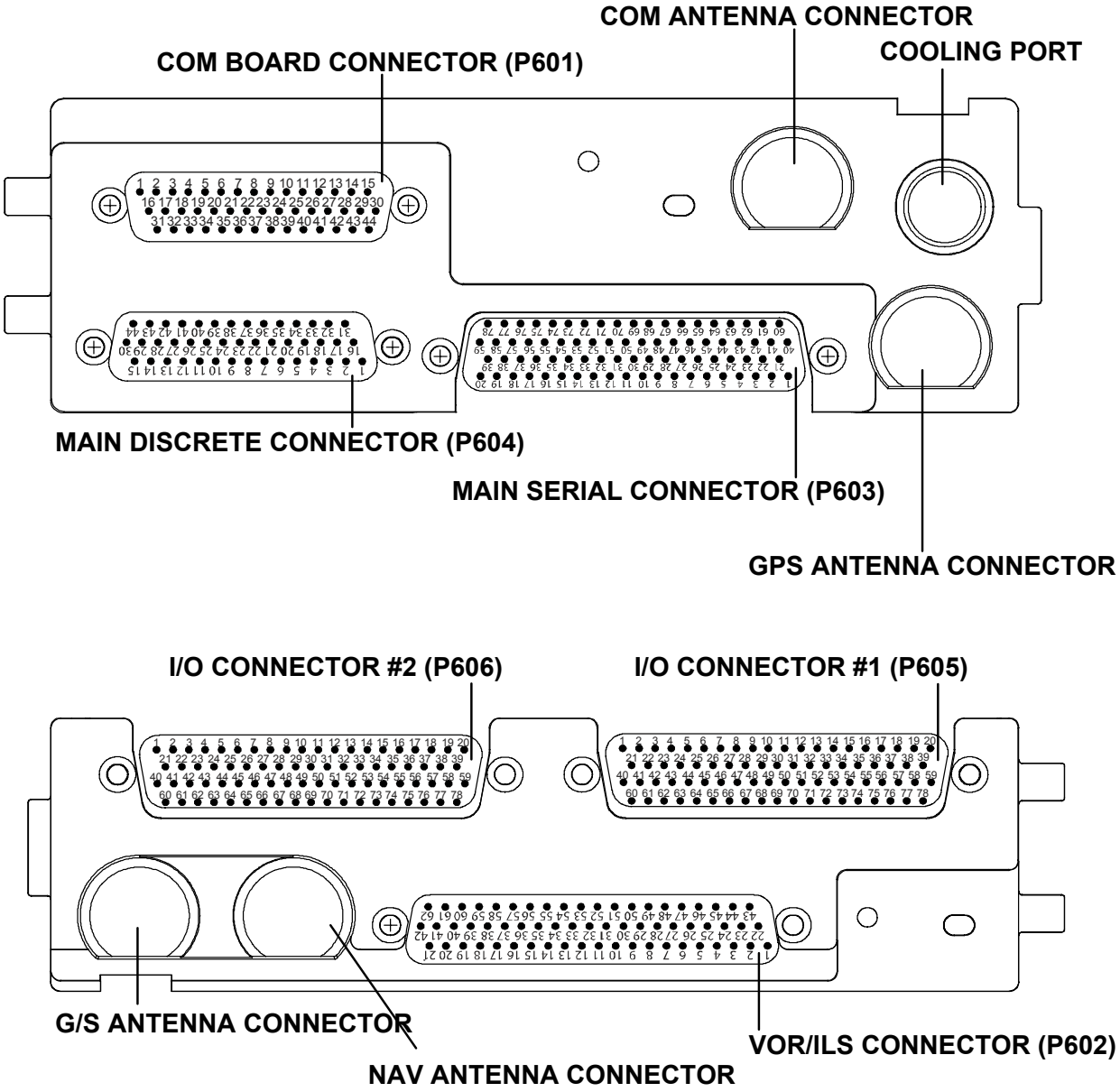


Figure 5-14. GIA 63 Backshell Connectors

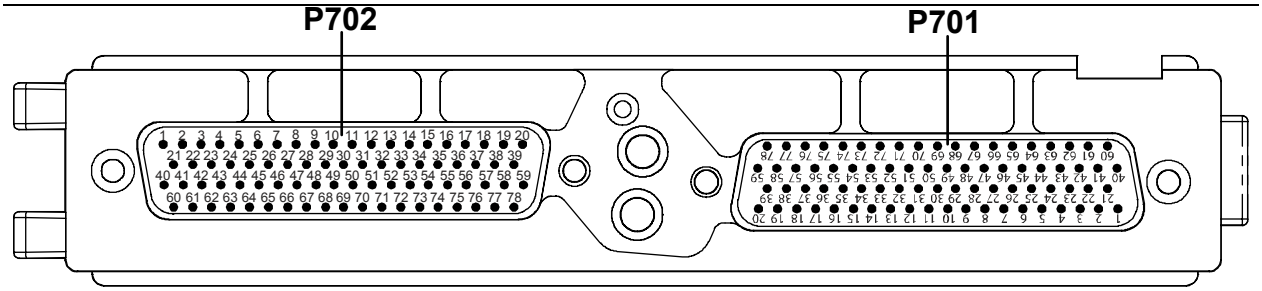


Figure 5-15. GEA 71 Backshell Connectors

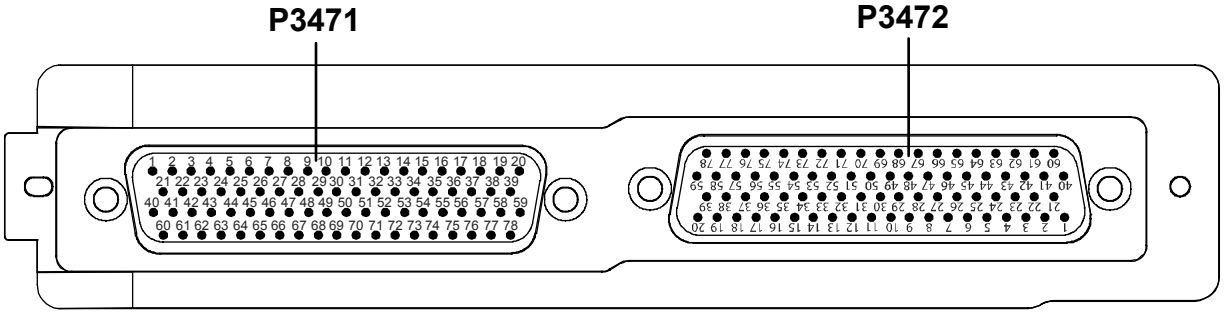


Figure 5-16. GMA 1347 Backshell Connectors

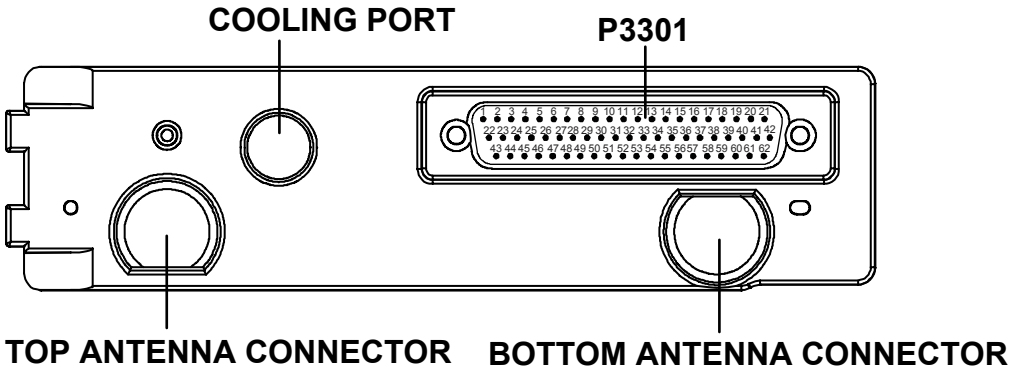


Figure 5-17. GTX 33 Backshell Connectors

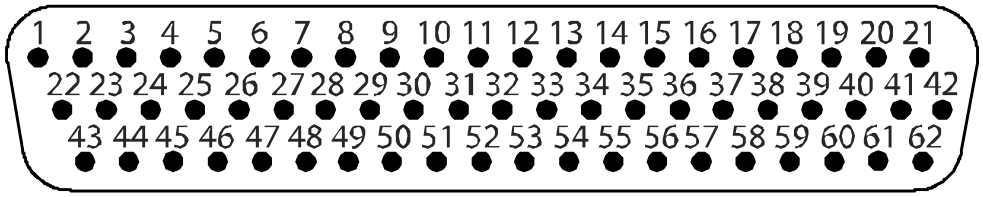


Figure 5-18. GDU 1040/1042 Backshell Connector (P10001)

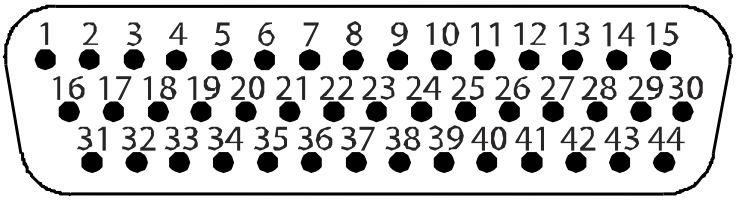


Figure 5-19. GRS 77 Backshell Connector (P771)

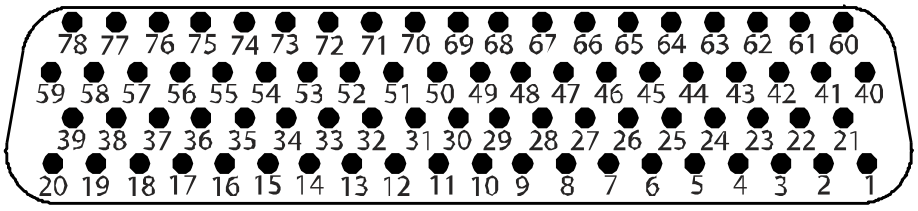


Figure 5-20. GDC 74A/ GDL 69() Backshell Connector (P741)/ P69()

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6 G1000 EQUIPMENT REMOVAL AND REPLACEMENT

This section describes how to remove and replace G1000 equipment in the Mooney M20M/R. After removal and replacement, LRUs must be configured and tested as described in Section 7.

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 software configuration listed on the Mooney General Arrangement drawing.

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

1. Start the G1000 system in configuration mode as described in Section 3.4.

Figure 6-1. Typical System Status Page (Configuration Mode)

2. The System Status page shows a list of LRUs in the LRU window. Activate the cursor and use the FMS knob to scroll through the list in the window and select the following items:

LRU	SW VER OK	LRU	SW VER OK
PFD1	_____	GTX1 – GIA1	_____
MFD1	_____	GEA1 – GIA1	_____
GIA1	_____	GDC1 – GIA1	_____
GIA2	_____	GDC1 FPGA	_____
GPS1	_____	GMA1 – GIA1	_____
GPS2	_____	GMU1	_____
GRS1 – GIA1	_____	GMU1 FPGA	_____
GRS1 FPGA	_____	GDL 69 (Optional)	_____
GSA P C – GIA1	_____	GFC1 CERT P C	_____
GSA PT C – GIA1	_____	GFC1 CERT PT C	_____
GSA R C – GIA1	_____	GFC1 CERT R C	_____
GSA P M – GIA1	_____	GFC1 CERT P M	_____
GSA PT M – GIA1	_____	GFC1 CERT PT M	_____
GSA R M – GIA1	_____	GFC1 CERT R M	_____

3. The software part number and version is displayed in the DATA window. Compare this to the software configuration on the Mooney General Arrangement drawing.

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 Mooney General Arrangement drawing. The Software Manifest page may also be used to check part numbers and versions.

6.1 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. Configure and test the MFD and/or PFD according to Section 7.1.

6.2 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. Configure and test the GMA 1347 according to Section 7.2.

6.3 GIA 63 Integrated Avionics Units

Removal:

1. Remove the left rear access panel.
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 hand to lock the unit into the rack.
4. Lock the handle to the GIA 63 body using the Phillips screw.
5. Reinstall the left rear access panel.
6. Configure and test the GIA 63(s) according to Section 7.3.

6.4 GEA 71 Engine/Airframe Unit

Removal:

1. Remove the MFD as described in Section 6.1.
2. Unlock the GEA 71 handle by unscrewing the Phillips screw.
3. Pull the handle aft to unlock the GEA 71.
4. 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 MFD as described in Section 6.1.
6. Configure and test the GEA 71 according to Section 7.4.

6.5 GTX 33 Transponder

Removal:

1. Remove the left rear access panel.
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 left rear access panel.
6. Configure and test the GTX 33 according to Section 7.5.

6.6 GDC 74A Air Data Computer

Removal:

1. Remove the glareshield.
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 glareshield.
6. Configure and test the GDC 74A according to Section 7.6.

6.7 GTP 59 OAT Probe

Removal:

1. Remove the OAT probe cover assembly from the underside of the right 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 7.6.3.

6.8 GRS 77 AHRS

Removal:

1. Remove the aft fuselage access panel.
2. Disconnect the AHRS connector.
3. Remove the four Phillips thumbscrews with a screwdriver and set them aside.
4. Gently lift the GRS 77 from the mounting plate. (If the mounting plate is removed, the GRS 77 must be re-calibrated. See Section 7.7.3)

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.

NOTE

Use a #2 Phillips screwdriver to tighten the GRS77 to the rack, rather than hand tightening the knurled screws.

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. Calibrate and test the GRS 77 according to Section 7.7.
5. Reinstall the aft fuselage access panel.

6.9 GMU 44 Magnetometer

Removal:

1. Remove outer starboard wing access panel.
2. Using a non-magnetic screwdriver, 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:

1. Visually inspect the connectors to ensure there are no bent or damaged pins. Repair any damage. Connect the wiring harness to the GMU 44.
2. Lower the GMU 44 into the rack and secure the plate with the 3 Phillips screws.
3. Reinstall the outer right wing access panel.
4. Calibrate and test the GMU 44 according to Section 7.7.

6.10 GDL 69A

Removal:

1. Remove the baggage compartment floor and compartment to gain access to the remote avionics enclosure.
2. Unlock the GDL 69A handle by loosening the Phillips screw on the handle.
3. Pull the handle upward to unlock the GDL 69A. Gently remove the unit from the 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 GDL 69A into its rack. The handle should engage the dogleg track.
3. Press down on the GDL 69A hand to lock the unit into the rack.
4. Lock the handle to the GDL 69A body using the Philips screw.
5. Configure and test the GDL 69A according to Section 7.9.

6.11 GSA 81 Servos

Removal:

1. Gain access to the desired servos by following instructions provided in the Mooney Airplane Maintenance Manual, and by referring to the GFC 700/Mooney General Arrangement Drawing.
2. Disconnect the harness connector.
3. Use a socket or open-wrench to loosen and remove the servo attachment bolts.
4. Carefully remove the servo and place a protective cover on the output gear.

Replacement:

1. Inspect the output gear for abnormal wear or the absence of grease. If grease is required, refer to Section 4.6 and grease the gear.
2. Carefully place the servo into the servo mount, ensuring proper orientation and alignment.
3. Fasten the servo to the servo mount using the existing hardware.
4. Inspect the harness connectors and check that no pins are bent or otherwise damaged. Connect the harness and secure it appropriately.
5. If no further maintenance is required, replace the servo access panels.

6.12 GSM 85 Servo Mounts

Removal:

1. Remove the desired servo(s) per Section 6.11.
2. De-rig the flight control attach points; reference applicable Installation Drawing.
3. Use a socket or open-wrench to loosen and remove the servo mount attachment bolts.
4. Carefully remove the servo mount.

Replacement:

1. Follow the installation instructions provided in the respective servo installation drawings.
2. If no other maintenance is to be performed, reinstall the servo(s) per Section 6.11.

6.13 Configuration Module Removal and Replacement

Configuration modules are located in the following LRU harness connector backshells: GDU 1040 PFD, GRS 77 AHRS, GDC 74A Air Data Computer, and the GEA 71 Engine/Airframe Unit.

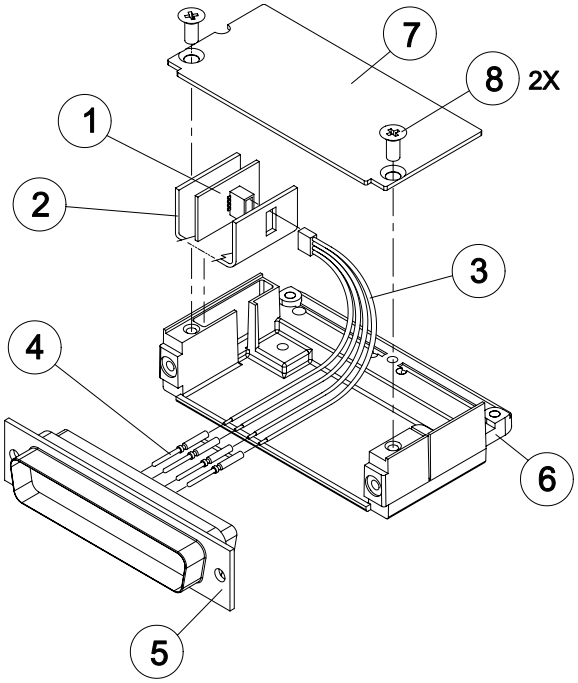

Figure 6-2. Configuration Module Installation

Table 6-1 Configuration Module Key Parts

Item	Description	Qty Needed	Garmin Part Number
1	Configuration Module PCB Board Assembly w/EEPROM & Temp Sensor	1	012-00605-00
2	Spacer, Config Module	1	213-00043-00
3	Cable, 4-Conductor Harness	1	325-00122-00
4	Pins, #22 AWG (HD)	5	336-00021-00

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.

6.13.1 Configuration Module Checkout

If the GRS 77 AHRS Configuration Module is replaced:

All three GRS 77/GMU 44 calibration procedures must be performed. Proceed to Section 7.7.3.

If GDC 74 Configuration Module is replaced:

Configuration settings must be reloaded to the GDC 74A. Proceed to Section 7.6.2.

If GEA 71 Configuration Module is replaced:

Check the EGT / CHT indications for accurate readings; see Section 7.4.3.

If the Master Configuration Module is replaced:

1. Start the G1000 system in configuration mode.
2. Go to the Configuration Upload Page on the PFD.
3. Press the UPDT CFG softkey.

If both the PFD and Master Configuration Module are replaced:

1. The entire G1000 system must be re-configured. Insert the approved G1000 Loader Card into the PFD (reference the Mooney General Arrangement drawing).
2. Start the G1000 in configuration mode.
3. Go to the Configuration Upload Page on the PFD.
4. Activate cursor and rotate the FMS knob once to activate the FILE menu.

IMPORTANT

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

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

9. View the SUMMARY field and ensure that all items are ‘complete’, then de-activate the cursor.
10. After performing the re-configuration of the system, examine the G1000 installation for any configuration options. Options are listed in Section 3.4.2.2. It is important that all pertinent OPTIONAL CONFIGURATION FILES be loaded according to the options installed. Load optional files as necessary.
11. Continue to Section 8 and conduct the return to service checkout.

6.14 GEA 71 Backshell Thermocouple Removal and Replacement

The GEA 71 has a K-Type thermocouple (Item 1 shown below) installed in its connector backshell, in addition to the configuration module. The thermocouple is used in conjunction with the configuration module temperature sensor to compensate for EGT/CHT temperature probe errors resulting from the dissimilar metals at the pin contacts.

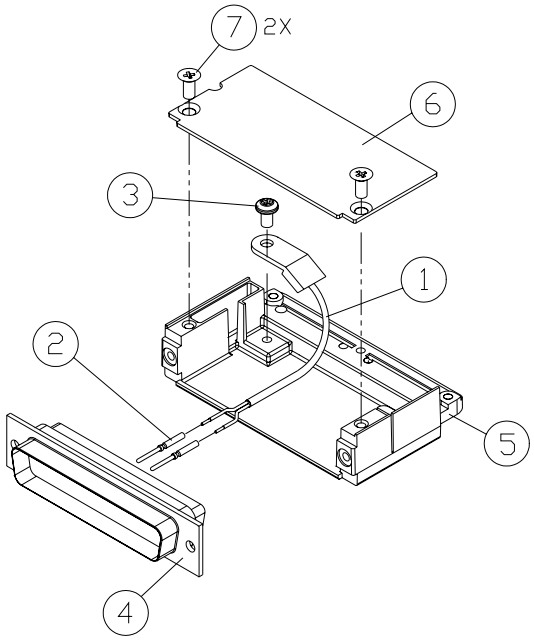

Figure 6-3. GEA Backshell Thermocouple

Table 6-2. 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 6.4.
2. Remove GEA connector backplate.
3. Remove connector J701 (4) 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 M20M/R avionics wiring diagram.
3. Place thermocouple body (1) onto the backshell boss (5). Place the thermocouple as shown in Figure 6-3 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).
6. Check temperature related parameters in accordance with Section 7.4.3.

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7 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 where original equipment was reinstalled as well as for situations where new equipment (new serial number) is installed.

7.1 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. Continue to the PFD/MFD Test procedure.

Original Displays Installed in Opposite Configurations

If the PFD and MFD are installed in opposite positions, no software or configuration loading is required. Continue to the PFD/MFD Test procedure. Note that this configuration assumes interchangeable displays which are only possible if the GFC 700 AFCS is NOT installed.

New Display(s) Installed

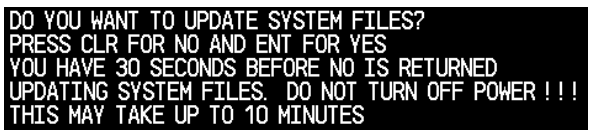
If a new GDU 1040 or GDU 1042 (new serial number) is installed, the correct software and configuration files must be loaded to the unit.

7.1.1 PFD/MFD Software Loading

1. Pull the MFD and PFD circuit breakers.
2. Power up the aircraft using a ground power unit.
3. Insert the correct G1000 Code Loader Card into the replaced display top card slot. See the Mooney General Arrangement drawing for correct Card Loader 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:

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

8. The following screen is displayed.



9. Software is loaded to the replaced display. When complete, the display starts in configuration mode.
10. If both displays were replaced, repeat steps 3 through 9 for the other display.
11. Continue to the PFD/MFD Configuration procedure.

7.1.2 PFD/MFD Configuration

1. On the PFD, go to the Configuration Upload page using the FMS knob:

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

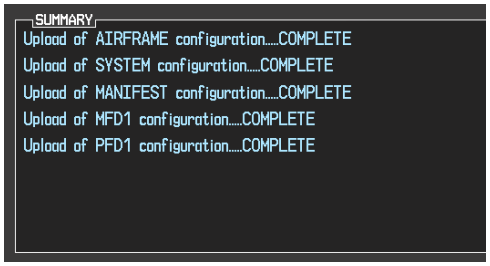
IMPORTANT

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

3. 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.
4. Using the FMS knob, highlight 'AIRFRAME' in the SECTION field.
5. Press the "LOAD ALL" softkey.
6. Select YES and press the ENT key to acknowledge the following prompt:

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

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

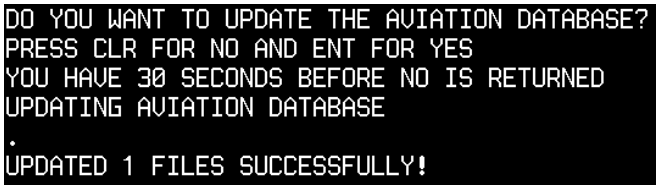


9. Continue to the Section 7.1.3.

7.1.3 Aviation Database Loading

1. Remove the G1000 Code Loader Card from the display and remove power from both displays.
2. Insert an aviation database update SD card into the top slot of the PFD.
3. Apply power to the PFD. The following prompt is displayed in the upper left corner of the PFD:

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



5. After the update completes, the PFD starts in normal mode. Remove the aviation database update SD Card from the PFD.
6. Remove power from the MFD.
7. Repeat steps 2 through 4 for the MFD. The MFD and PFD aviation databases are now updated.
8. Confirm that the correct update cycle and version is loaded during startup of the MFD.
9. Remove the aviation database update SD Card from the MFD.
10. Continue to the PFD/MFD Test procedure.

7.1.3.1 Mooney Options Configuration

After performing the re-configuration of the PFD and/or MFD, examine the G1000 installation for any configuration options. Options are listed in Section 3.4.2.2.

IMPORTANT!

If the Mooney aircraft is equipped with any of these options, GO TO SECTION 3.4.2.2 AND DETERMINE WHICH OPTIONAL CONFIGURATION FILES NEED TO BE LOADED.

ONLY THE FILES THAT AFFECT THE PFD AND/OR MFD ARE REQUIRED TO BE LOADED FOR THIS SCENARIO. However, to avoid confusion, it is highly recommended that the technician load all files within each optional configuration group.

If the aircraft is not equipped with any options listed in Section 3.4.2.2, continue to Section 7.1.4.

NOTE: Enabling the TAWS function involves an entirely separate SD Card than the G1000 Code Loader Card.

7.1.4 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 7-1. G1000 Normal Mode Check (typical display shown)

3. Push the red DISPLAY BACKUP 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 7-2. G1000 Reversionary Mode Check (typical display shown)

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 8.

7.2 GMA 1347 Audio Panel

Original GMA 1347 Reinstalled

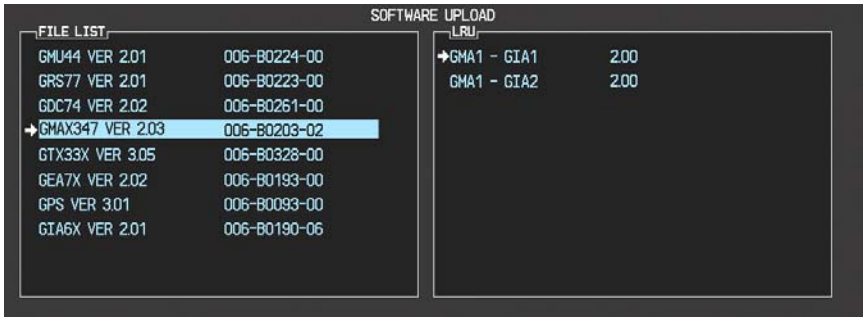
No software/configuration loading or testing is required if the removed GMA 1347 is re-installed. Continue to the final return-to-service checks in Section 8.

New GMA 1347 Installed

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

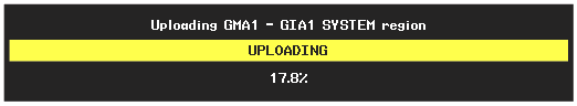
7.2.1 GMA 1347 Software Loading

1. Insert the correct G1000 Code Loader Card into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. At the PFD, go to the Software Upload page using the FMS knob.
4. Highlight the GMA software file. Ensure that both paths to the GMA through GIA1 and GIA 2 appear in the LRU field as shown (typical display shown):

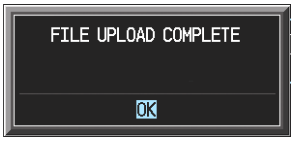


5. Press the LRU softkey. Select the GMA1 - GIA1 data path to load software. Press the LOAD softkey.
6. Select YES and press the ENT key to acknowledge the following prompt:

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



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



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

7.2.2 GMA 1347 Configuration

1. Insert the correct G1000 Code Loader Card into the top slot of the PFD.
2. Start the G1000 system in Configuration mode, (if its not already 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.

IMPORTANT

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 'GMA 1' in the SECTION 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 the load is 'COMPLETE', then de-activate the cursor.
11. Go to the System Status page.
12. Activate the cursor and highlight 'GMA 1 – GIA 1' in the LRU window.
13. Verify that the reported part number and version of the software file matches the data on the Mooney General Arrangement drawing.
14. Continue to the GMA 1347 Test procedure.

7.2.3 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 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 circuit breaker to continue testing.

Marker Beacon Test:

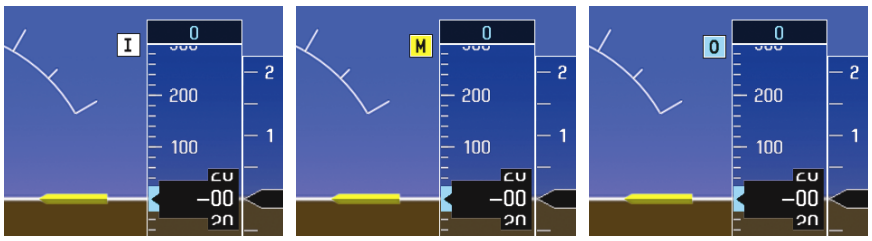


Figure 7-3. Marker Beacon Symbology

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, Figure 7-3. 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 8.

7.3 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). Continue to the return-to-service checks in Section 8.

Original GIA 63s Swapped:

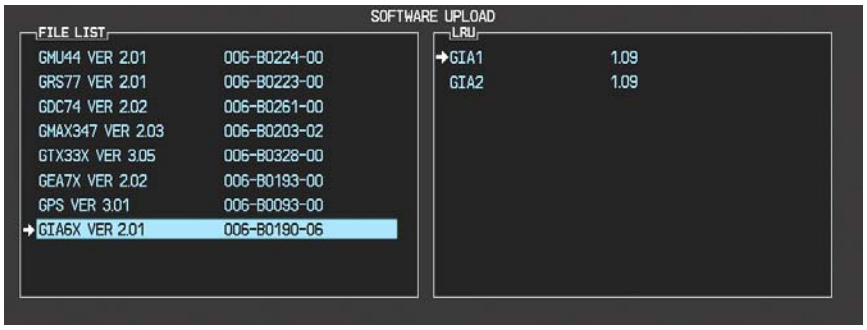
No software loading is required if the originally installed GIA units are re-installed in opposite positions (GIA1 and GIA2 in opposite unit racks). However, the units must be re-configured. Continue to the GIA 63 Configuration Loading procedure.

New GIA 63(s) Installed

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

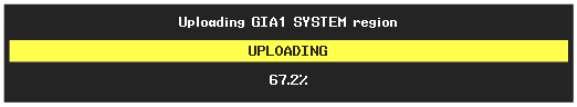
7.3.1 GIA 63 Software Loading

1. Insert the correct G1000 Code Loader Card into top slot of PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Software Upload page using the FMS knob.
4. Activate the cursor and select the GIA software file. Verify that GIA1 and GIA2 appear in the LRU field as shown (typical display shown: see Mooney General Arrangement drawing for actual software part numbers):



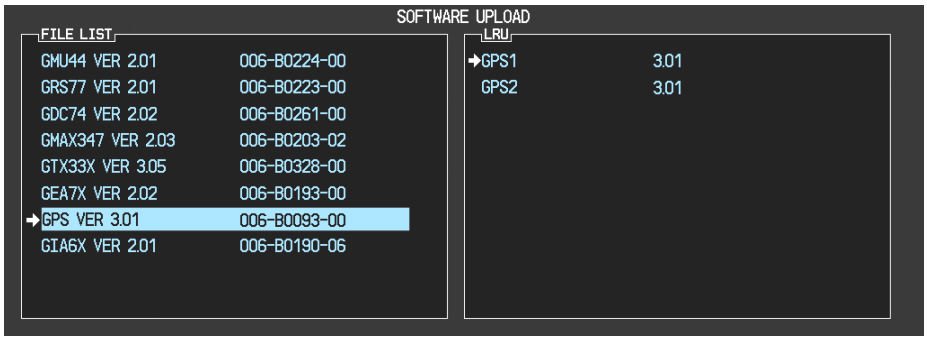
5. Press the LRU softkey and select the appropriate replaced GIA. Press the LOAD softkey.
6. Select YES and press ENT to acknowledge the following prompt:

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



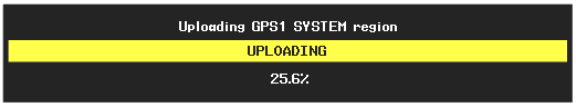
8. After the files finish loading, press ENT to acknowledge the following prompt:

9. View the SUMMARY field and verify that both GIA1 and GIA2 software loading is complete.
10. Highlight the GPS software file. Ensure that GPS1 and GPS2 appear in the LRU field as shown., (typical display shown: see Mooney General Arrangement drawing for actual software part numbers):

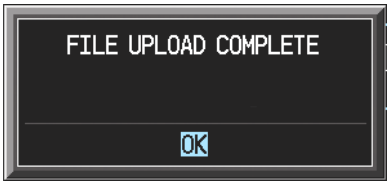


11. Press the LOAD softkey.
12. Select YES and press the ENT key to acknowledge the following prompt:

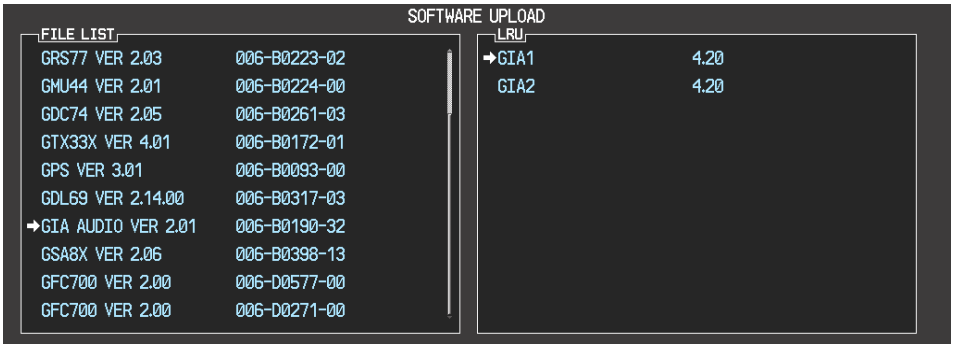
13. The software for GPS1 begins to load. GPS2 software loads immediately after GPS1 software finishes loading. Monitor the upload status as it progresses:



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

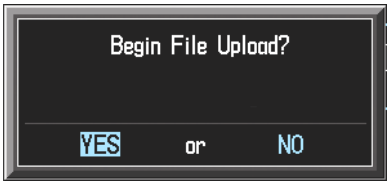


15. Check the SUMMARY field to ensure the load is 'COMPLETE'.
16. Highlight the GIA AUDIO software file. Ensure that GIA1 and GIA2 appear in the LRU field as shown (typical display shown: see Mooney General Arrangement drawing for actual software part numbers):

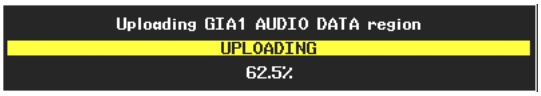


17. Press the LOAD softkey.

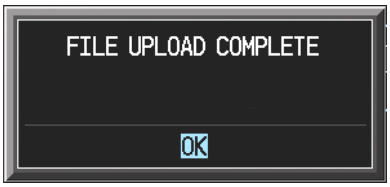
18. Select YES and press the ENT key to acknowledge the following prompt:



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:



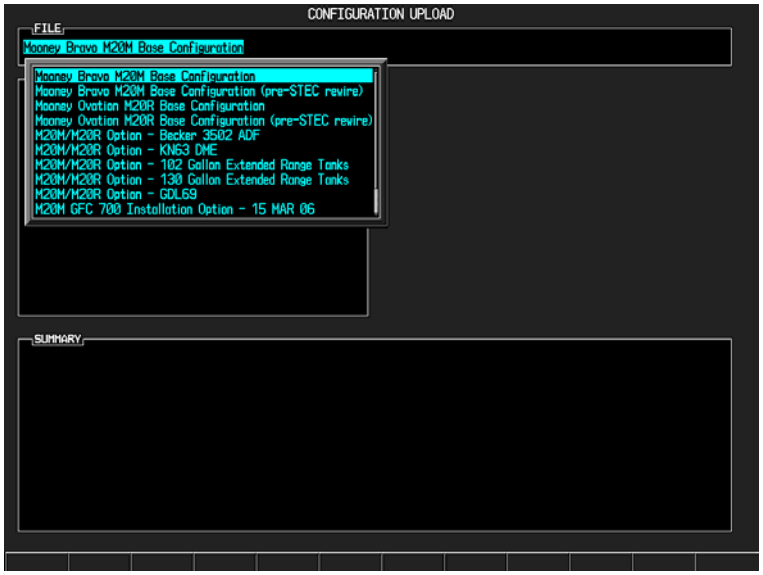
20. After the files finish loading, press ENT to acknowledge the following prompt:



21. Check the SUMMARY field to ensure the load is 'COMPLETE'.
22. De-activate the cursor.
23. Continue to the GIA 63 Configuration Loading procedure.

7.3.2 GIA 63 Configuration Loading

1. Insert the correct G1000 Code Loader Card 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.

IMPORTANT

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 ‘GIA 1’ in the SECTION 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 GIA 2 in the SECTION field and repeat Steps 7 through 9.
11. Highlight AUDIO in the SECTION field and repeat Steps 7 through 9.
12. View the SUMMARY field and ensure that all items are ‘COMPLETE’:
13. De-activate the cursor.
14. Go to the System Status page.
15. Activate the cursor and highlight each of the following items in the LRU window:

    -GIA1
    -GIA2
    -GPS1
    -GPS2

16. Check the reported part number/version of each software file and compare to the data on the Mooney General Arrangement drawing .
17. Continue to the GIA 63 Test procedure.

7.3.3 GIA 63 Test

GPS Signal Acquisition:

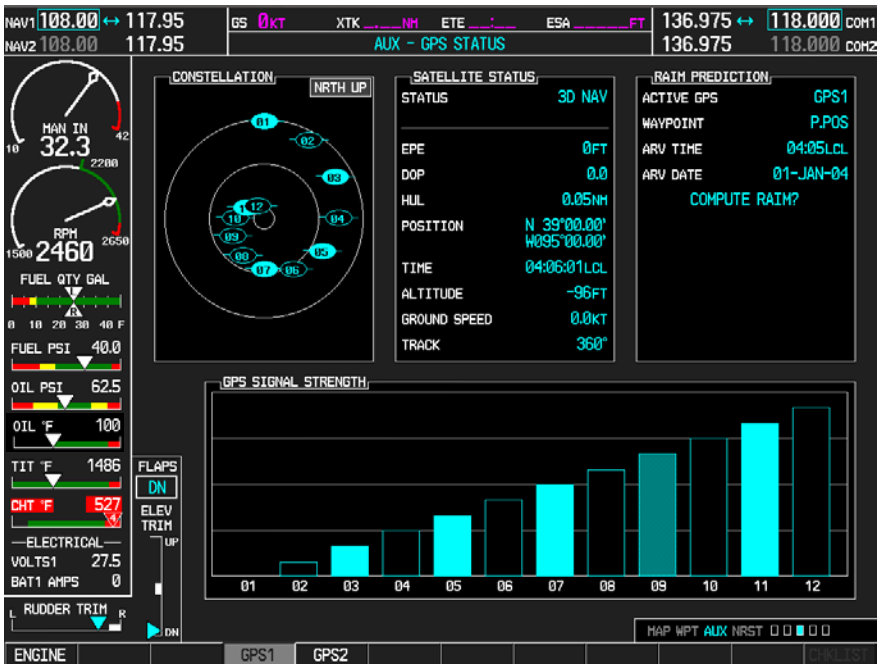


Figure 7-4. GPS Signal Status (typical)

The GIA 63 units should normally acquire a 3D GPS navigation solution within 5 to 10 minutes of startup, provided the aircraft is outside (or indoors with a GPS signal repeater). Select the satellite 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, since a GPS repeater generally amplifies the "Sky" signal, the results of the tests performed will not reflect "real world" conditions. 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 AUX – GPS STATUS 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 4 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.
11. Under the COM CONFIG field, change the COM channel spacing from 25 kHz to 8.33 kHz.
12. Go back to the AUX – GPS STATUS 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 14 through 17 for the No. 2 COM transceiver (GIA2).
19. On the MFD, select the AUX – SYSTEM SETUP 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. Repeat using a Localizer signal; (tune NAV 1 and NAV2 receivers to appropriate LOC frequency). 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 8.

7.4 GEA 71 Engine/Airframe Unit

Original GEA 71 Reinstalled

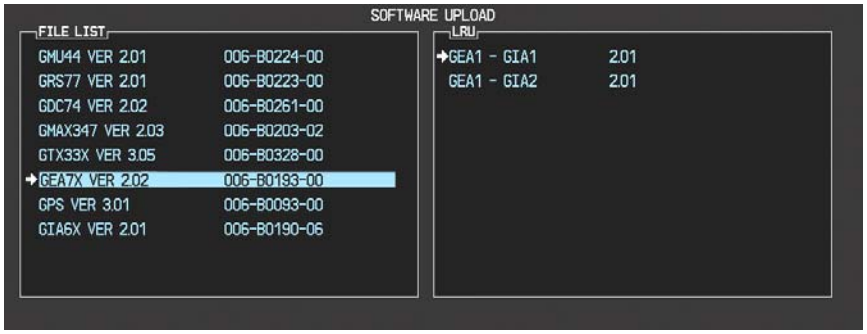
No software or configuration loading is required if the removed GEA 71 is re-installed. Continue to the return-to-service checks in Section 8.

New GEA 71 Installed

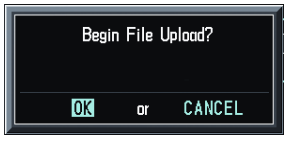
If a new GEA 71 (new serial number) is installed, the correct software and configuration files must be loaded to the unit. Continue to the GEA 71 Software Loading procedure.

7.4.1 GEA 71 Software Loading

1. Insert the correct G1000 Code Loader Card into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Software Upload page using the FMS knob.
4. 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, (the display shown is typical. See the Mooney General Arrangement drawing for actual software levels):

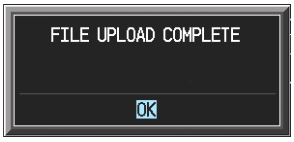


5. Press the LRU softkey. Select the GEA - GIA1 data path to load software. Press the LOAD softkey.
6. Select YES and press the ENT key to acknowledge the following prompt:



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

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



9. Check the SUMMARY field to ensure that all software loads are 'COMPLETE'.
10. De-activate the cursor.
11. Continue to the GEA 71 Configuration Loading procedure.

7.4.2 GEA 71 Configuration Loading

1. Insert the correct G1000 Code Loader Card into the top slot of the PFD.
2. Start the G1000 system in Configuration mode, (if the system is not already in the 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.

IMPORTANT

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 71' in the SECTION 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. Go to the System Status page.
12. Activate the cursor and highlight 'GEA1 – GIA1' in the LRU window.
13. Verify that the reported part number and version of the software file matches the data on the Mooney General Arrangement drawing .

7.4.2.1 Mooney Options Configuration

After performing the re-configuration of the GEA 71, examine the G1000 installation for any configuration options. Options are listed in Section 3.4.2.2.

IMPORTANT!

If the Mooney aircraft is equipped with any of these options, GO TO SECTION 3.4.2.2, AND DETERMINE WHICH OPTIONAL CONFIGURATION FILES NEED TO BE LOADED.

ONLY THE FILES THAT AFFECT THE GEA 71 ARE REQUIRED TO BE LOADED FOR THIS SCENARIO. However, to avoid confusion, it is highly recommended that the technician load all files within each optional configuration group.

Continue to the GEA 71 Test procedure.

7.4.3 GEA 71 Test

To test the GEA 71, start the G1000 system in normal mode. The Engine Indicator System gauges should become valid within 2 minutes of power-up.

Figure 7-5. G1000 Engine/Airframe Indicators (ENGINE, LEAN, & SYSTEM)

On the MFD, check the indication for each of the sensor or monitor inputs with the aircraft engine off. Observe the 'ENGINE' page, 'LEAN' page, and 'SYSTEM' pages by using the ENGINE, LEAN, and SYSTEM softkeys on the MFD. At the appropriate EIS group (Engine, Lean, or System), observe the following sensor indications (see Figure 7-5):

Sensor	Reading with Aircraft Engine Off and Cool
• MAN IN	Atmospheric Pressure
• RPM	'0'
• FUEL QTY	'Full' with fully fueled tanks
• FFLOW GPH	'0'
• OIL PSI	Approximately 0. 'Engine' and 'System' page.
• OIL °F	Ambient. 'Engine' and 'System' page.
• EGT °F	Ambient. 'Engine' and 'Lean' page. Verify that all six indicators on 'Lean' page are valid. Verify that the EGT on the 'System' page is valid. (M20R Only)
• TIT °F	Ambient. 'Engine' and 'Lean' page. (M20M)
• CHT °F	Ambient. 'Engine' and 'Lean' page. Verify that all six indicators on 'Lean' page are valid.
• VOLTS 1/2	Voltage present across current battery. 'Engine' and 'System' page.
• FUEL PSI	Approximately '0'. 'Engine' and 'System' page. (M20M Only)
• BAT 1/2 AMPS	Varies with demand on the system. Positive when battery charging and negative when discharging. 'Engine' and 'System' page.
• Flap Position	Varies depending on position of flap switch. 'Engine', 'Lean', and 'System' page.
• Elevator Trim Position	Varies depending on position of elevator trim wheel. 'Engine', 'Lean', and 'System' page.
• Rudder Trim Position	Varies depending on position of rudder trim. 'Engine' and 'System' page.
• Stall Warning	Ensure that the speaker is switched ON on the GMA 1347 audio panel. On the left wing, gently hold the stall warning vane to the UP position. Verify that the sonalert tone is heard immediately, and approximately one second later "STALL" is annunciated over the speaker. Release the stall warning vane.
• Check Gear Discrete	The throttle control operates the landing gear warning (CHECK GEAR annunciator and aural) when the throttle is retarded to within ¼ inch of the IDLE position and the landing gear is still in the UP position. This may be checked during a flight test or with the aircraft elevated on jacks by verifying that the check gear warning occurs when the throttle is retarded and the landing gear is still in the UP position.

If no other service is to be performed, continue to the return-to-service checks in Section 8.

7.5 GTX 33 Transponder

Original GTX 33 is Reinstalled

No software or configuration loading is required if the removed GTX 33 is re-installed. Continue to the GTX 33 Test procedure.

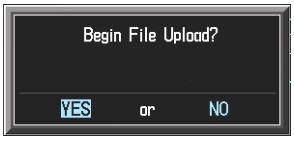
New GTX 33 is Installed

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

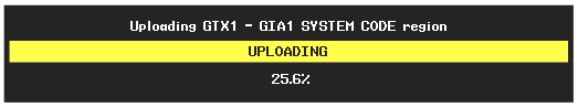
7.5.1 GTX 33 Software Loading

1. Insert the correct G1000 Code Loader Card into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Software Upload page using the FMS knob.
4. Highlight the GTX software file. Ensure that both paths to the GTX 33 through GIA1 and GIA2 appear in the LRU field as shown (screen shown is typical, see Mooney General Arrangement drawing for approved software levels):

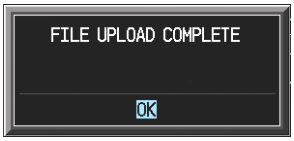
5. Press the LRU softkey. Select the GTX1 - GIA1 data path to load software. Press the LOAD softkey.
6. Select YES and press the ENT key to acknowledge the following prompt:



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



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



9. Check the SUMMARY field to ensure the load is 'COMPLETE'.
10. Continue to the GTX 33 Configuration procedure.

7.5.2 GTX 33 Configuration Loading

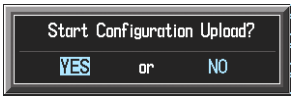
1. Insert the correct G1000 Code Loader Card into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Configuration Upload page using the FMS knob:

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

IMPORTANT

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

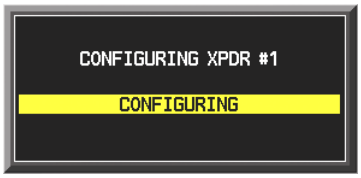
5. Press the ENT key to select the appropriate airframe type. Once an airframe type is selected the configuration files in the SECTION field will be displayed.
6. Using the FMS knob, highlight 'GTX 33' in the SECTION field.
7. Press the LOAD softkey.
8. Select YES and press the ENT key to acknowledge the following prompt:



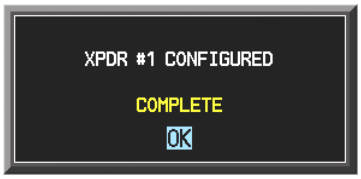
9. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the following confirmation:

10. View the SUMMARY field and ensure that all items are 'complete', then de-activate the cursor.
11. Go to the System Status page.
12. Activate the cursor and highlight 'GTX1 – GIA1' in the LRU window.
13. Verify that the reported part number and version of the software matches the data on the Mooney General Arrangement Drawing.
14. Select the GTX page group, then select the Transponder Configuration page on the PFD:

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



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



19. Press the ENTER key on the PFD and deactivate the cursor.
20. Continue to the GTX 33 Test procedure.

7.5.3 GTX 33 Test

Operation of the GTX 33 Mode-S transponder is accomplished using the G1000 PFD. Refer to Garmin part number 190-00450-02, G1000 Cockpit Reference Guide/M20M/R, 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 8.

7.6 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. Continue to the GDC 74A Test procedure.

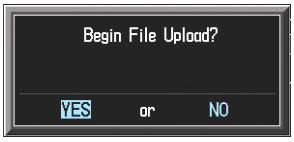
New GDC 74A is Installed

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

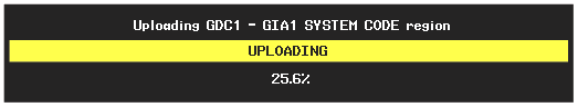
7.6.1 GDC 74A Software Loading

1. Insert the correct G1000 Code Loader Card into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Software Upload page using the FMS knob.
4. Highlight the GDC software file. Ensure that GDC to GIA data path appears in the LRU field as shown, (screen shown is typical, see Mooney General Arrangement drawing for approved software levels):

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



7. The software for the GDC 74A Air Data Computer begins to load. Note that there are two files that load to the GDC 74A: "System Code" and "FPGA". These load sequentially automatically. Monitor the upload status as it progresses:



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

9. Check the SUMMARY field to ensure that both the System Code Region and the FPGA loads are 'COMPLETE'.
10. Continue to the GDC 74A Configuration Loading procedure.

7.6.2 GDC 74A Configuration Loading

1. Insert the correct G1000 Code Loader Card 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.

IMPORTANT

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 SECTION 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. Go to the System Status page.
12. Activate the cursor and highlight 'GDC1 – GIA1', then highlight 'GDC1 FPGA' in the LRU window.
13. Verify that the reported part number and version of both software files match the data on the Mooney General Arrangement drawing .
14. Continue to the GDC 74A Test procedure.

7.6.3 GDC 74A Test

NOTE

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

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 a minimum of **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 system in normal mode as described in Section 3.2.
2. Remove power to the PFD by pulling the circuit breaker labeled PFD.
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.

CAUTION

The 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.

NOTE

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

5. Rotate the FMS knob until the display shows the GRS page group. Within the Air Data 1 sub window is the field "B ALT" which is barometric altitude. B ALT is equivalent to the altitude that will be displayed to the pilot on the altitude display when the PFD is in normal mode. B ALT will be used for all CFR Part 43 Appendix E tests for G1000 altitude.
6. Push the red "display backup" button on the MFD controller. This will activate reversionary mode for the MFD. 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 pushing the red "display backup" button. Return the PFD to normal mode by pulling the PFD circuit breaker and then resetting.

NOTE

The following tests are above and beyond the requirements set forth in Part 43 Appendix E. Perform these tests every **2000 hours or 4 years of service**, whichever comes first.

Pitot/Static Airspeed Test

1. Adjust 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 8.

7.7 GRS 77 AHRS / GMU 44 Magnetometer

Original GRS 77 is Reinstalled

If the original GRS 77 was reinstalled, then no software loading is required. Continue to the GRS/GMU Calibration section.

New GRS 77 is Installed

If the GRS 77 was replaced with a new unit (new serial number) 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. Continue to the GRS/GMU Calibration section.

New GMU 44 is Installed

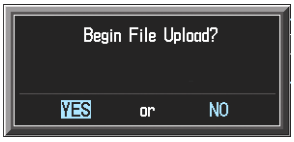
If the GMU 44 was replaced with a new unit (new serial number) then software must be loaded. Continue to the GMU 44 Software Loading procedure.

7.7.1 GRS 77 Software Loading

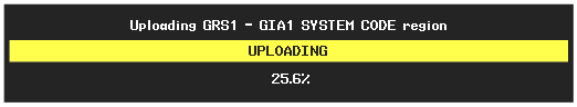
1. Insert the correct G1000 Code Loader Card into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Software Upload page using the FMS knob.

4. Highlight the GRS software file. Ensure that the GRS to GIA data path appears in the LRU field as shown, (screen shown is typical, see the Mooney General Arrangement drawing for approved software levels):

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



7. The software for the GRS 77 AHRS begins to load. There are two files that load to the GRS 77: "System Code" and "FPGA". These load sequentially automatically. Monitor the upload status as it progresses:



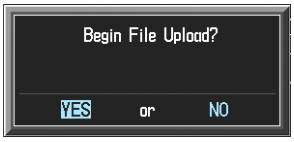
8. After the files finish loading, press the ENT key to acknowledge the following prompt:

9. Check the SUMMARY field to ensure that both the System Code Region and the FPGA loads are 'COMPLETE'.
10. Go to the System Status page.
11. Activate the cursor and highlight 'GRS1 – GIA1', then 'GRS1 – GIA2', and finally, 'GRS1 FPGA' in the LRU window.
12. Verify that the reported part numbers and versions of the software files match the data on the Mooney General Arrangement drawing.
13. Continue to the GRS/GMU Calibration section.

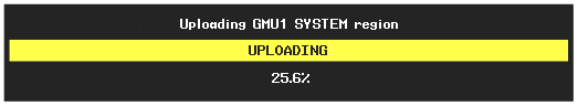
7.7.2 GMU 44 Software Loading:

1. Insert the correct G1000 Code Loader Card into the top slot of the PFD.
2. Start the G1000 system in Configuration mode.
3. On the PFD, go to the Software Upload page using the FMS knob.
4. Highlight the GMU software file. Ensure that GMU1 appears in the LRU field as shown, (screen shown is typical, see the Mooney General Arrangement drawing for approved software levels):

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



7. The software for the GMU 44 Magnetometer begins to load. There are two files that load to the GMU 44: “System Code” and “FPGA”. These load sequentially automatically. Monitor the upload status as it progresses:



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

9. Check the SUMMARY field to ensure that both the System Code Region and the FPGA loads are ‘COMPLETE’.
10. Go to the System Status page.
11. Activate the cursor and highlight ‘GMU1’, then ‘GMU1 FPGA’ in the LRU window.
12. Verify that the reported part number and version of the software files match the data on the Mooney General Arrangement drawing.
13. Continue to the GRS/GMU Calibration section.

7.7.3 GRS/GMU Calibration Procedures

GRS/GMU Recalibration Criteria

There are five calibration procedures available for the GRS 77 and GMU 44:

- Pitch/Roll Offset: (Procedure A, PROVIDED IN SECTION 7.7.4)
- Magnetometer Calibration: (Procedure B, PROVIDED IN SECTION 7.7.6)
- Heading Offset Compensation: (Procedure C, NOT REQUIRED)
- Engine Run-Up Vibration Test: (Procedure D, PROVIDED IN SECTION 7.7.7)
- Magnetometer Interference Test: (Procedure E, PROVIDED IN SECTION 5.12.4)

NOTE

Procedure C is not required and thus should not be performed on the aircraft.

When ready to perform the procedures, shut the PFD and MFD off by pulling the PFD and MFD circuit breakers. Restart both displays in configuration mode. Follow the steps given for each procedure on-screen at the GRS/GMU CALIBRATION page. Note that the CALIBRATE command cannot be selected and activated until the installer acknowledges all required steps have been carried out by pressing the ENT key on each step.

Condition	Calibrations Required		
	Procedure A: GRS 77 Pitch/Roll Offset	**Procedure B: GRS/GMU Magnetic Calibration**	**Procedure D: 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

7.7.4 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 ±0.25° of zero pitch and zero roll using a digital level. (Follow instructions in the Aircraft Maintenance Manual 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.

7.7.5 Compass Rose Evaluation of Magnetic Disturbances for Magnetometer Calibration Procedure (Optional)

NOTE

Typically, a compass rose is an acceptable location to perform the magnetometer calibration procedure. However, because not all compass roses are well maintained, even an existing compass rose should be regularly evaluated using the method described here to determine if it is free of magnetic disturbances. If evaluation of an existing compass rose indicates that magnetic disturbances are present, then an alternative

location must be found to perform the Magnetometer Calibration Procedure.

A G1000-equipped aircraft can be used to evaluate a candidate site for magnetic disturbances and determine whether it is a suitable location to perform the magnetometer calibration procedure. The magnetometer calibration procedure itself contains the logic to simultaneously survey the location for magnetic cleanliness while it is computing the magnetometer calibration parameters.

The aircraft used to evaluate the site must have already completed the pitch/roll offset compensation procedure (Procedure A). However, prior completion of the Magnetometer Calibration Procedure (Procedure B) is not required.

In order to evaluate a candidate site, the Magnetometer Calibration Procedure must be performed twice: once turning clockwise around the site, and once turning counter-clockwise. Both times, the procedure should be conducted as described in Section 7.7.6 of this document, with the exception of the direction of turns around the site.

NOTE

Although Section 7.7.6 indicates that the Magnetometer Calibration Procedure should be performed by making a series of clockwise turns around the site, the procedure can also be performed by making counter-clockwise turns for the purpose of evaluating the site for magnetic disturbances.

If, upon completion of the Magnetometer Calibration Procedure in each clockwise and counter-clockwise direction, the PFD displays the "CALIBRATION SUCCESSFUL / SITE IS CLEAN" message, then the candidate site is sufficiently free of magnetic disturbances and is acceptable for performing the Magnetometer Calibration Procedure. It is important to obtain successful result in both the clockwise and counter-clockwise directions to ensure that the magnetometer sweeps over a large enough area at the candidate site.

If, upon completion of the Magnetometer Calibration Procedure in either of the two directions, the PFD displays either the "MAG FIELD AT SITE NOT UNIFORM", or "MAG FIELD AT SITE DIFFERS FROM IGRF MODEL" message, then the site contains magnetic disturbances that are too large. An alternate site must then be used to perform the Magnetometer Calibration Procedure on the aircraft.

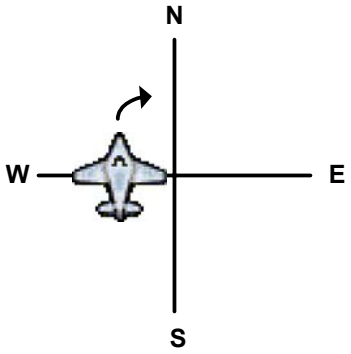
7.7.6 Procedure B: GRS/GMU Magnetic Calibration Procedure

The Magnetometer Calibration Procedure (Calibration Procedure B) must be carried out at a site that is determined to be free of magnetic disturbances. Attempting to carry out this procedure on a typical ramp area may not yield a successful calibration. The accuracy of the AHRS cannot be guaranteed if this calibration procedure is not performed on a magnetically clean compass rose. If it is unsure whether the site is 'clean' the technician should verify that the site is 'clean' by following the guidance provided in Section **7.7.5**. The technician may skip Section 7.7.5 if the site condition is acceptable.

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 CALIBRATION PROCEEDURE ON A TYPICAL RAMP AREA MAY NOT YIELD SUCCESSFUL RESULTS. THE ACCURACY OF THE AHRS CANNOT BE GUARANTEED IF THIS CALIBRATION IS NOT PERFORMED ON A MAGNETICALLY CLEAN COMPASS ROSE OR EQUIVALENT FACILITY.

1. Start both displays in normal mode.
2. Start the aircraft engine following the procedures in the Airplane Flight Manual Supplement.
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 (±5°).



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) Note that the engine instruments may be monitored at this page.

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. This new stationary point is termed a "station."

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 30 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.

7.7.7 Procedure D: Engine Run-Up Vibration Procedure

Calibration Procedures A and B are not required prior to this procedure. Calibration Procedure D must be performed in order to ensure that the AHRS mounting is sufficiently rigid and insensitive to vibration.

1. Start both displays in normal mode.
2. Start the aircraft engine following the procedures in the 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.

Should a failure occur, the technician may perform the Engine Run-up test up to 3 times successively before corrective action must be taken. 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.

7.8 GRS/GMU Test

The aircraft can now be taxied back and the engine can be shut down for final testing. Restart both displays in normal mode to conduct final system checks. When the PFD powers up in normal mode, the AHRS attitude and heading information displayed should become valid within 1 minute of power-up, as typically shown in Figure 7-6 (provided both GPS receivers have a valid position; if GPS is unavailable, AHRS initialization may take as long as 2 minutes).

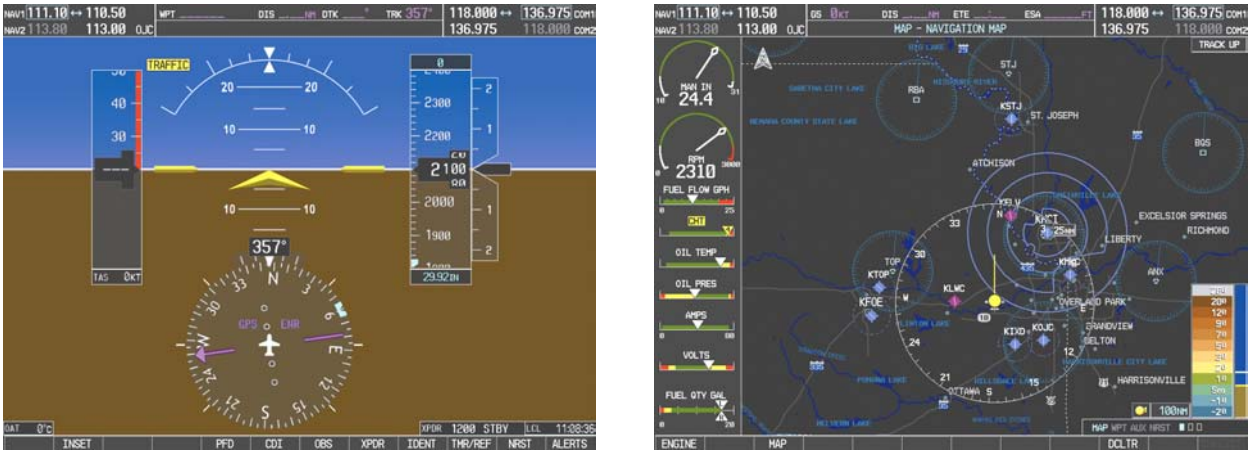


Figure 7-6. Normal Mode AHRS Check

Test the AHRS reversionary paths by pressing the red reversionary mode button on the audio panel. Ensure that both displays have valid AHRS information, as shown in Figure 7-7.

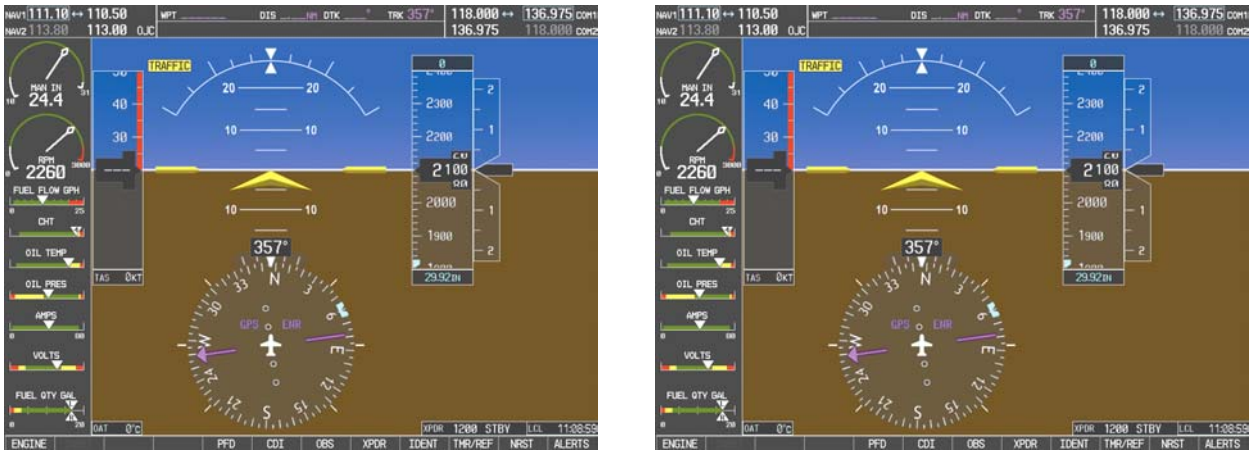


Figure 7-7. Reversionary Mode AHRS Information

If no other service is to be performed, continue to the return-to-service checks in Section 8.

7.9 GDL 69 XM Data Link

Original GDL 69 is Reinstalled

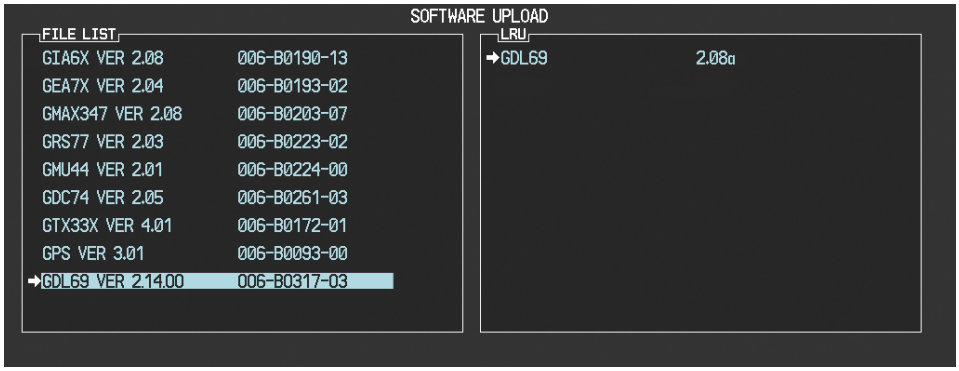
No software or configuration loading is required if the removed GDL 69 is re-installed. Continue to the GDL 69 Test procedure.

New GDL 69 is Installed

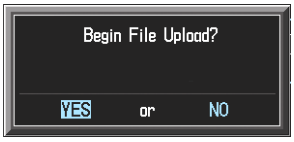
If a new GDL 69 (new serial number) is installed, the correct software and configuration files must be loaded to the unit, then the XM Satellite Radio subscription must be activated. Continue to the GDL 69 Software Loading procedure.

7.9.1 GDL 69 Software Loading

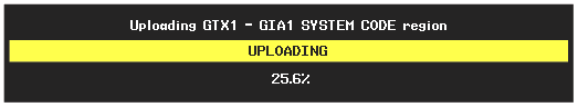
1. Insert the correct G1000 SW Loader Card into top slot of PFD.
2. Start the G1000 system in Configuration mode.
3. Go to the Software Upload page using the FMS knob.
4. Highlight the GDL software file. Ensure that the GDL appears in the LRU field as shown, (screen shown is typical, see the Mooney General Arrangement drawing for approved software levels):



5. Press the LRU softkey. Press the LOAD softkey.
6. Select YES and press the ENT key to acknowledge the following prompt:



7. The software for the GDL 69 receiver begins to load. Monitor the upload status as it progresses:



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

9. Check the SUMMARY field to ensure the load is 'COMPLETE'.
10. Continue to the GDL 69 Configuration procedure.

7.9.2 GDL 69 Configuration Loading

1. Go to the Configuration Upload page using the FMS knob.
2. Activate cursor and rotate the FMS knob once to activate the FILE menu.
3. Select '**M20M/M20R Option – GDL69**'
4. Press the LOAD ALL softkey.
5. Select YES 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. View the SUMMARY field and ensure that all items are 'complete', then de-activate the cursor.
8. Go to the System Status page.
9. Activate the cursor and highlight 'GDL69' in the LRU window.
10. Verify that the reported part number and version of the software matches the data on the Mooney General Arrangement drawing.
11. Continue to the GDL 69 Test procedure.

7.9.3 GDL 69 Test

If an XM Satellite Radio subscription has already been activated for the GDL 69, then power up the G1000 and go to the AUX – XM INFORMATION page and verify that the GDL 69 is working properly. Refer to the Cockpit Reference Guide for details on XM Radio weather and music operation.

If the GDL 69 is replaced (new unit), the owner must re-activate the subscription, using the new GDL 69's Radio ID number(s). Refer to the GDL 69/69A XM Satellite Radio Activation Instructions, Garmin document 190-00355-04 for details on the activation process.

As a final operations check, make sure there are no MANIFEST errors shown on the PDF for the GDL 69.

7.10 GSA 81 Servo

Original GSA 81 is Reinstalled

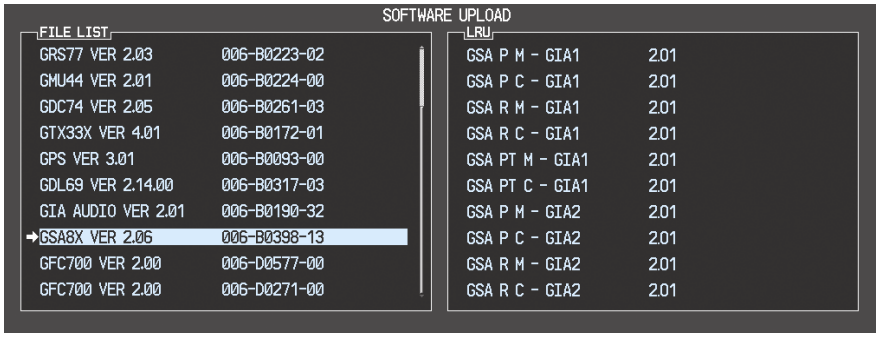
No software or configuration loading is required if the removed GSA 81 is re-installed. Continue to the GSA 81 Test procedure.

New GSA 81 is Installed

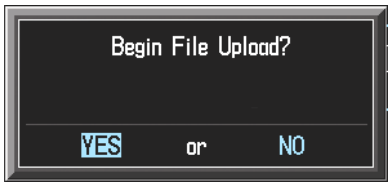
If a new GSA 81 (new serial number) is installed, the correct software and configuration files must be loaded to the unit that was replaced. Continue to the GSA 81 Software Loading procedure.

7.10.1 GSA 81 Software Loading

1. Insert the correct G1000 SW Loader Card into the top slot of the PFD
2. Start the G1000 in the Configuration mode.
3. At the PFD, go to the Software Upload page using the FMS knob.
4. Highlight the GSA software file. Ensure that both paths to the GSA through GIA1 and GIA2 appear in the LRU filed as shown, (screen shown is typical, see the Mooney General Arrangement drawing for approved software levels):



5. Press the LRU softkey to highlight servo-to-GIA paths.
6. With the first line item in the LRU window selected, press the LOAD softkey.
7. Select YES and press the ENT key to acknowledge the following prompt:



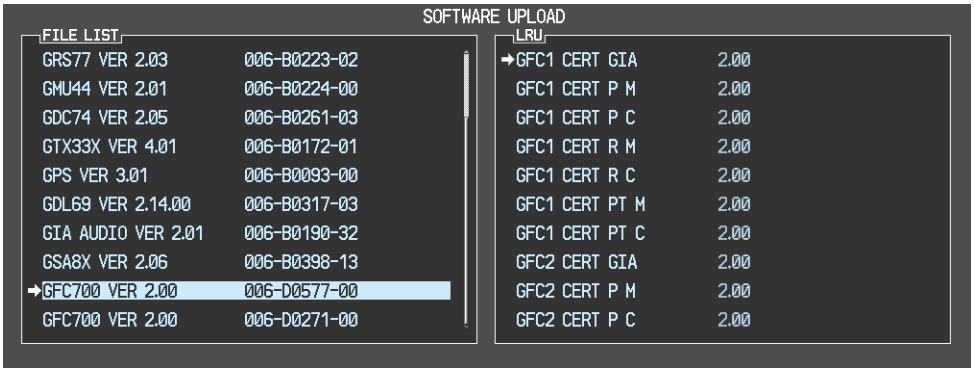
8. The software for the GSA 81 servo begins to load. Monitor the upload status as it progresses:

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

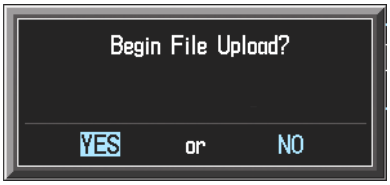
10. Check the SUMMARY field to ensure each load is 'COMPLETE'.
11. Highlight each next servo-to-GIA1 path and repeat Steps 3 through 7. The servo-to-GIA2 paths should not be loaded.

7.10.2 GSA 81 Certification Gains Software

1. Highlight the GFC700 Certification Gains software file, (screen shown is typical, see the Mooney General Arrangement drawing for approved software levels):

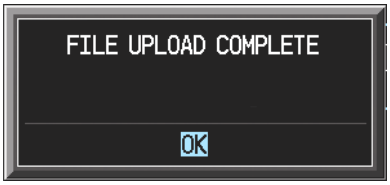


2. Press the LRU softkey to toggle the cursor to the LRU window. The first line item in the LRU field should be selected by default.
3. Press the LOAD softkey to start loading the first line item.
4. Select YES and press the ENT key to acknowledge the following prompt:



5. The GFC 700 certification software gains begin to load. Monitor the upload status as it progresses:

6. After the file finishes loading, press the ENT key to acknowledge the following prompt:



7. Check the SUMMARY field to ensure the load is 'COMPLETE'.

8. Highlight each subsequent GFC1 CERT file in the LRU window and repeat steps 3 through 7.
9. Highlight GFC2 CERT GIA file in the LRU window and repeat steps 3 through 7. The remaining 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).
10. If no other maintenance is to be performed, conduct return-to-service check according to Section 8.5. This section includes GFC 700 system checks.

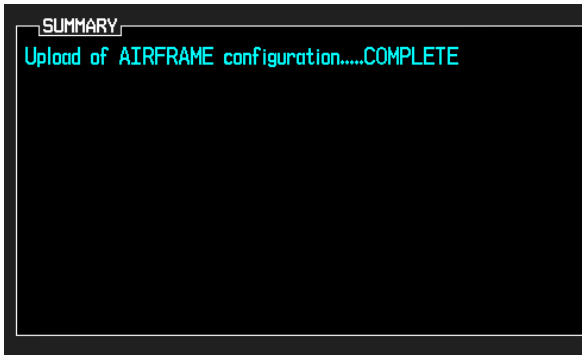
7.11 TAWS FUNCTION (option)

1. Remove power from the PFD and MFD by opening the PFD and MFD circuit breakers.
2. Note that a separate TAWS Enable card, (reference Mooney General Arrangement Drawing), is required to enable the TAWS function. 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 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.

7.12 Software/Configuration Troubleshooting

Problem	Solutions
GDU 104X MFD or PFD display does not power up.	Ensure that the criteria listed in 7.12.1 are fulfilled for the applicable situation. Ensure power is present at display connector. Replace display.
Software file load fails: 	Ensure that criteria listed in 7.12.1 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 the Mooney General Arrangement drawing. Replace LRU.
Configuration file load fails: 	Ensure that criteria listed in 7.12.1 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 the Mooney General Arrangement drawing. Replace LRU.
GIA1 and/or GIA2 to 'LRU' data path not working	Ensure that criteria listed in 7.12.1 are fulfilled for the applicable situation. Ensure GIA1 and GIA2 are configured correctly. Check wiring, connectors & pins as needed.
Software File Mismatch Alert appears in lower right corner of PFD when started in normal mode: 	Ensure that proper software file part number and version were loaded to LRU. Refer to the Mooney General Arrangement drawing. Check and ensure that correct Loader Card was used during load process. Refer to the Mooney General Arrangement drawing. Reload software to LRU. Reload 'MANIFEST' configuration file to PFD.

7.12.1 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 104X MFD or PFD Displays	G1000 Code Loader Card must be inserted in top slot for each display to be loaded. • CLR & 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	G1000 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.
Load Software/Configuration files to GIA 63s	G1000 Code Loader Card must be inserted in top slot of PFD. G1000 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.
Load Software/Configuration files to: - GMA 1347 - GDC 74A - GEA 71 - GRS 77 (software only) - GMU 44 (software only) - GTX 33	G1000 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.

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8 SYSTEM RETURN TO SERVICE PROCEDURE

After reinstalling any G1000 LRU, verify the LRU software part number and version against those listed on the Mooney General Arrangement Drawing.

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

1. Start the G1000 system in configuration mode as described in Section 3.4

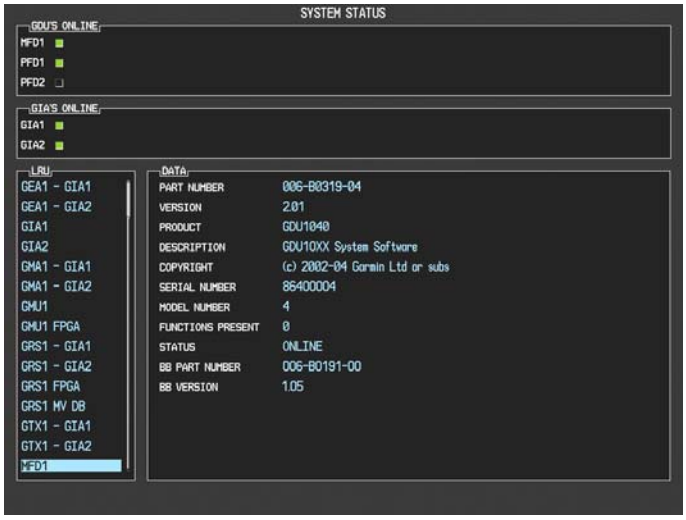

Figure 8-1 Typical System Status Page (Configuration Mode)

2. The System Status page shows a list of LRUs in the LRU window. Activate the cursor and highlight the LRU window. Use the FMS knob to scroll through the list in the window and select the following LRUs.

LRU	SW VER OK	LRU	SW VER OK
PFD1	_____	GTX1 – GIA1	_____
MFD1	_____	GEA1 – GIA1	_____
GIA1	_____	GDC1 – GIA1	_____
GIA2	_____	GDC1 FPGA	_____
GPS1	_____	GMA1 – GIA1	_____
GPS2	_____	GMU1	_____
GRS1 – GIA1	_____	GMU1 FPGA	_____
GRS1 FPGA	_____	GDL69 (Optional)	_____
GSA P C – GIA1	_____	GFC1 CERT P C	_____
GSA PT C – GIA1	_____	GFC1 CERT PT C	_____
GSA R C – GIA1	_____	GFC1 CERT R C	_____
GSA P M – GIA1	_____	GFC1 CERT P M	_____
GSA PT M – GIA1	_____	GFC1 CERT PT M	_____
GSA R M – GIA1	_____	GFC1 CERT R M	_____

3. The software part number and version is displayed in the DATA window. Compare this to the software configuration shown on the Mooney General Arrangement Drawing.

IMPORTANT

It is essential that the software versions be checked and validated according to the listed versions on the Mooney General Arrangement drawing. Software Configuration is a critical part of the G1000 operation and must be verified before returning an aircraft to service. Refer to Section 1.3 for details on STC Configurations.

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.

8.1 GPS Failure Test

Step	Desired Result
Single GPS Failure Conditions: 1. Place a shroud over the GPS antenna for GIA1 to prevent signal reception. Verify loss of signal on MFD AUX page 3. 2. Check for desired results. 3. Remove shroud from the GIA1 GPS antenna. 4. Place a shroud over the GPS antenna for GIA2 to prevent signal reception. Verify loss of signal on MFD AUX page 3. 5. Check for desired results. 6. Remove shroud from the GIA2 GPS antenna.	GPS Failure – For each of the specified GPS failure conditions, the following shall remain valid on the PFD throughout the procedure: ✓ Attitude and Heading from AHRS. ✓ Airspeed, Altitude, Vertical Speed, and OAT from Air Data Computer. ✓ GPS CDI remains valid on PFD.
Dual GPS Failure Conditions: 1. Cover both GPS antennas. Verify loss of signal on MFD AUX page 3. 2. Check for desired results. 3. Remove shrouds from GPS antennas. 4. Allow both receivers to re-acquire satellite signals before continuing.	Dual GPS Failure – For a dual GPS failure, the following shall occur: ✓ GPS CDI flags INTEG on PFD. ✓ Attitude and Heading remain valid from AHRS. ✓ Airspeed, Altitude, Vertical Speed, and OAT remain valid from Air Data Computer.

8.2 GIA Failure Test

Step	Desired Result
Single GIA Failure Conditions: 1. Remove power from GIA1 by pulling NAV1/GPS1 and COM1 breakers. 2. Check for desired results. 3. Restore power to GIA1. Allow GPS1 to re-acquire satellites. 4. Remove power from GIA2 by pulling NAV2/GPS2 and COM2 breakers. 5. Check for desired results. 6. Restore power to GIA2. Allow GPS2 to re-acquire satellites.	GIA1 Failure – For a GIA1 failure, only the following shall flag invalid: COM1/NAV1 field (PFD & MFD). NAV1 CDI loses deviation bar (PFD only). GIA2 Power Failure – For a GIA2 failure, only the following shall flag invalid: COM2/NAV 2 field (PFD & MFD). NAV2 CDI loses deviation bar (PFD only).
Dual GIA Failure Conditions: 1. Remove power from both GIA units. 2. Check for desired results. 3. Restore power to both GIA units.	Dual GIA Failure – For a dual GIA failure, the following shall occur: COM1/NAV1 & COM2/NAV2 fields flag invalid. GPS CDI flags INTEG on PFD. NAV1 & NAV2 CDI loses deviation bar. XPDR field flags invalid on PFD. Engine Instrument field flags invalid on MFD. All AHRS & ADC fields remain valid.

8.3 Display Failure Test

Step	Desired Result
MFD Display Failure Conditions: 1. Remove power from MFD. 2. Check for desired results. 3. Restore power to MFD.	The following shall occur when power is removed from the MFD: PFD switches to reversionary mode. Attitude and Heading remain valid from AHRS. Airspeed, Altitude, Vertical Speed, and OAT remain valid from Air Data Computer. Valid Engine Instrumentation appears on PFD. XPDR field remains valid on PFD. COM2/NAV2 fields flag invalid.
PFD Display Failure Conditions: 1. Remove power from PFD. 2. Check for desired results. 3. Replace power to PFD.	The following shall occur when power is removed from the PFD: MFD switches to reversionary mode. Attitude and Heading remain valid from AHRS. Airspeed, Altitude, Vertical Speed, and OAT remain valid from Air Data Computer. MFD retains engine instrumentation. Valid XPDR field appears on MFD COM1/NAV 1 fields flag invalid.

8.4 AHRS/ADC Backup Path Test

Step	Desired Result
Secondary AHRS/ADC path check: 1. Remove power from PFD. 2. Remove power from GIA2 by pulling NAV2/GPS2 and COM2 breakers. 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: MFD switches to reversionary 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.

8.5 GFC 700 Test

The following procedure will verify the proper operation of the GFC 700 AFCS. This procedure is designed to test the installation of the AFCS after maintenance is performed. The technician performing these checks must be familiar with the GFC 700 by referring to the M20M/M20R G1000 Cockpit Reference Guide, Garmin P/N 190-00450-02.

8.5.1 Pre-Flight Test

1. Power down the G1000 system using the Radio Master, then the BAT-side aircraft master switch. If a ground power unit is being used, it too must be powered off. Wait 30 seconds then restore power to the system. The GFC 700 will begin an automatic pre-flight test after AHRS and ADC parameters become valid.
2. Verify that a white 'PFT' annunciation is displayed on the PFD, as shown in Figure 8-2.

Figure 8-2 Pre-Flight Test

NOTE

A red AFCS (AFCS) annunciation may be displayed momentarily before PFT starts. This indicates that the Autopilot and Manual Electric Trim are not available (due to system failure, power loss, or PFT has not been performed)

3. Upon successful completion of the test, an aural alert will sound and the annunciation will clear. For even-interval system power-up, the aural alert is generated by GIA 63 #1, whereas odd-interval system power-ups are generated GIA 63 #2.
4. Repeat Step 1 to test the PFT aural alert for the opposite GIA 63.
5. If the aural alert is not heard, but pre-flight testing passed, engage the Autopilot by pressing the AP key 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 the GIA and audio panel should be checked. Reference GFC 700 AFCS Wiring Diagram for interface information.
6. Continue to Section 8.5.2. (If the 'PFT' annunciation turns red, the test has failed. Refer to Section 5 for further guidance).

8.5.2 AFCS Switch Checks

To verify that the AFCS system buttons and switches are operating correctly, perform the following checks:

1. Actuate both halves of the autopilot trim (AP TRIM) switch. The trim clutch should engage and the trim wheel should drive in the requested direction. Check operation in both UP and DOWN directions.
2. Press the AP DISC button and hold while actuating the AP TRIM switch. Trim should not run and the trim wheel should rotate freely when moved manually. Release only the AP DISC button: trim should still not run. Release the AP TRIM switch. Now actuate the AP TRIM switch and trim should now run in the direction requested.
3. Engage the Autopilot by pressing the AP key on the MFD. Press and hold the left half of the AP TRIM switch. The Autopilot should disengage accompanied by a 2 second disconnect tone, the trim wheel should not move, and the trim wheel should rotate freely when moved manually.
4. Engage the Autopilot again by pressing the AP key on the MFD. The pitch and roll clutches should engage, resisting movement of the control yoke. Press and hold the CWS switch. The control yoke should now move freely when moved manually through its full range of movement.
5. Release the CWS switch and press the AP DISC switch. The Autopilot should disengage with a flashing amber 'AP' annunciation on the PFD, accompanied by an aural alert. Verify that the control yoke is free in pitch and roll axes.
6. Engage the Autopilot again by pressing the 'AP' key on the MFD. Use the A/P POWER switch to remove power to the system. The Autopilot should disconnect and the abnormal disconnect should be provided, consisting of a continuous aural alert and a flashing red/white 'AP' annunciation. No AFCS annunciations (e.g. AFCS, PFT, Mistrim) should remain on the PFD. Press the AP DISC switch to cancel the abnormal alert. Use the A/P POWER switch to restore power to the system and watch the pre-flight test sequence again.
7. Press the GA button, on the throttle lever. '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.
8. Press the FD key on the MFD to deactivate Go Around mode and Flight Director. Press the AP key to engage the Autopilot and Flight Director. Press the CWS button for at least 5 seconds and release; verifying there is no residual force on the control yoke for the pitch axis. Extend the flaps to approach position. The trim wheel should immediately run in the **UP** direction. Now retract the flaps. The trim should immediately run in the **DOWN** direction.
9. Disengage the Autopilot by pressing the AP DISC switch. Now 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'.
10. 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 the M20 aircraft).

11. 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 (within the nearest 20 feet).
12. Press the FD key and verify that the mode annunciations and command bars are removed from the display.

8.5.3 Autopilot Clutch Overpower Check

NOTE

In flight conditions, 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 removed, allowing manual checks of the slip-clutch settings.

1. Engage the Autopilot by pressing the AP key on the MFD.
2. Manually overpower the autopilot in pitch and roll axis. If the Autopilot clutches cannot be overpowered, then the servo clutch torque settings need to be verified in accordance with the installation drawings for the axis in question.
3. Actuate the AP TRIM switch in either the UP or DOWN direction (this causes an Autopilot disconnect). While the trim is running, grasp the aircraft pitch trim wheel and verify that the trim clutch can be overpowered. If it cannot be overpowered, verify the trim servo clutch torque setting in accordance with the Pitch Trim Installation Drawing.
4. Actuate the AP TRIM switch in either the UP or DOWN direction and verify that the trim wheel moves smoothly in both directions throughout the entire trim range. If the trim wheel hesitates, this may indicate that the pitch trim clutch is slipping. First verify the proper clutch setting in accordance with the Pitch Trim Installation Drawing. If the clutch setting is within tolerance, check the aircraft pitch trim system for excessive friction in accordance with the Mooney AMM.

8.5.4 Manual Electric Trim Speed Check

1. Run AP TRIM in one direction until it runs against the mechanical stop.
2. Actuate the AP TRIM switch in the opposite direction and using a stop watch or equivalent device, time the trim speed from one end of travel to the opposite mechanical stop. The elapsed time should measure **30 ± 3** seconds for each direction.

8.5.5 Autopilot Operation Checks

1. Engage the Autopilot by pressing the AP key on the MFD. Push the HDG knob in to synchronize the heading bug to the present aircraft heading on the HSI. Select Heading mode by pressing the HDG key on the MFD. The command bars should be level and the control yoke should be stationary. NOTE: Very slow yoke movement is acceptable if the aircraft is not level.
2. Turn the HDG knob to the left and right and check that the command bars move in the correct direction and that the control yoke follows the command bars.
3. Push and hold the CWS button and pull the control yoke to the middle of the pitch control range. Release the CWS button. The Autopilot clutches should re-engage and hold the yoke stationary.
4. Holding the control yoke lightly, press the NOSE UP key on the MFD twice, to increase the pitch reference. The command bars should move up 2 degrees and the control yoke should begin moving aft. Note: normal friction, spring linkages, or gravity may restrict control yoke movement, thus manual assistance may be necessary to get aft control yoke movement.
5. Hold the control yoke and press and hold the CWS button, re-synchronizing the pitch reference and re-centering the control yoke. Release the CWS button and check that servo clutches re-engage before releasing the control yoke.
6. Press the NOSE DN key on the MFD twice. The command bars should command down and the control yoke should begin moving forward. Hold the controls and press CWS to re-center the command bars and stop control yoke movement.

7. With the Autopilot still engaged and the CWS button pressed, move the control yoke to its aft limit. Release the CWS button and apply continuous forward pressure, slowly moving the control yoke. After 1 to 2 seconds, the trim wheel should begin moving in a trim **up** direction.
8. Grip the control yoke and press the CWS button. Trim motion should stop. Move the control yoke to the forward limit and release the CWS button. Now slowly pull back on the control yoke. After a similar delay (step 7), the trim wheel should begin to trim **down**. Relieve pressure on the yoke and the trim motion should stop. Check that the trim wheel is free to turn. Hold the control yoke and press the AP DISC switch to disconnect the Autopilot.

8.5.6 VOR/LOC/GS Test

Perform the following test using 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.

NOTE

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

1. Simulate a VOR signal on radial 360° with a course-width of 20°. Tune the NAV 1 and NAV 2 receivers to the ramp test equipment frequency.
2. Set the HSI on the PFD to NAV1 by pressing the CDI soft key until NAV1 is selected. Adjust the HSI course as necessary using the CRS knob to center the D-bar. Alternately, the CRS knob can be pushed in momentarily to center the D-bar.)
3. Verify full scale deflection of the CDI while adjusting the CRS knob 10° left and 10° right of a center D-bar course setting.
4. Engage the Autopilot by pressing the NAV key on the MFD. Adjust the CRS knob to show a right signal deviation to the CDI. Verify that the Flight Director and aircraft controls respond and follow the CDI. Adjust the CRS knob to show a left signal deviation and verify the Flight Director and aircraft controls follow the CDI.
5. Press the CDI soft key to select the NAV 2 receiver. Verify that the NAV annunciation flashes yellow, then returns to default ROL mode.
6. Repeat Steps 3 and 4 while the NAV 2 source is selected on the HSI.
7. Simulate a Localizer/Glideslope signal. Tune this frequency on NAV 1 receiver. Set the HSI to LOC1. Set the CRS pointer so its head is aligned under the lubber line. Use the test equipment to center the deviation bars (localizer and glideslope) on the PFD.
8. Press the APR key on the MFD. Verify that the LOC and GS annunciations are green on the PFD. Apply right/left and up/down localizer/glideslope signals using the test equipment. Verify that the Flight Director and flight controls respond appropriately.
9. Repeat Steps 7 and 8 for the NAV 2 receiver.

8.6 Tests for Optional Systems

This section describes the checks that must be completed in order to verify the system interface to the G1000. The checks must be completed only for those systems that are installed. Following the interface verification with the G1000, additional system checks may be required – refer to the appropriate system installation manual for additional details.

8.6.1 Stormscope Functional Check (if WX-500 Stormscope installed)

Figure 8-3 Stormscope Configuration (typical)

1. Restart the G1000 in configuration mode by opening the PFD and MFD circuit breakers. While holding the ENT keys on the PFD and MFD, restore power by closing the PFD and MFD circuit breakers.
2. Select the OTHER page group on the PFD. The STORMSCOPE page is shown by default.
3. Activate the cursor and highlight the DATA field. Use the small FMS knob to select 'Config' and press the ENT key on the PFD.
4. Verify that the DATA window shows the following:

Hdg: None:	J3-1	Open
	J3-2	Open
Hdg Valid Flag		N/A
Flag Sense		N/A
Hdg Value		NA
Inhibit Line		Off
Antenna Mount		Bottom
	J3-3	Open

5. Deactivate the cursor

NOTE

The DATA window is only updated once every five seconds, so changes made to the inhibit line may not be displayed immediately.

6. Key the Pilot's mic for at least five seconds and verify that the Inhibit Line field changes from Off to On while the mic is keyed.
7. Key the Copilot's mic for at least five seconds and verify that the Inhibit Line field changes from Off to On while the mic is keyed.

8.6.2 GDL 69A Functional Check (if GDL 69A installed)

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 document 190-00355-04.

1. Select the AUX – XM RADIO page on the MFD, shown below. The graphic shown below is for the AUX – XM RADIO page only.

Figure 8-4 AUX-XM Radio Page (typical)

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 channels. The volume level may be adjusted to a comfortable level at this point.
5. Plug a set of headphones into the pilot's station and verify that you cannot hear the XM radio playing in both channels.
6. Repeat for copilot's headphones.

8.6.3 Skywatch Functional Check (if SKY497 Skywatch installed)

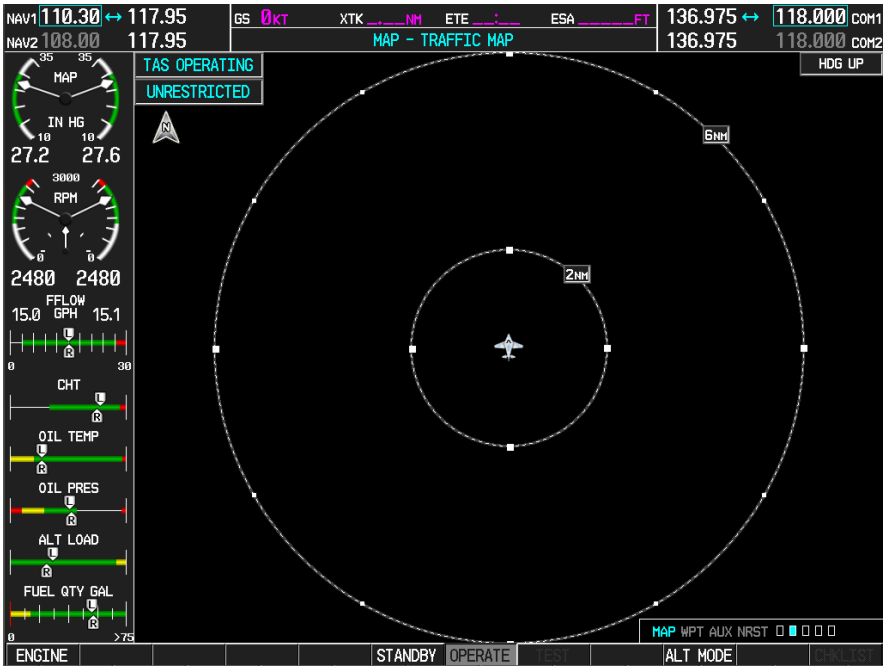

Figure 8-5 Skywatch Display (typical)

1. Select the TRAFFIC MAP map page on the MFD.
2. Verify that the STANDBY, OPERATE, TEST (only when in Standby mode) and ALT MODE soft keys are available on the bottom of the display. Verify that a TAS mode (and not TAS FAIL) is displayed in the upper left corner of the traffic map. Verify that NO DATA is not displayed in yellow in the center of the display (in place of the ownership symbol)

NOTE

If TIS is displayed instead of TAS, the G1000 has not been properly configured for Skywatch.

3. Press the OPERATE soft key and verify that TAS OPERATING is displayed in the upper left corner of the traffic map.
4. Press the STANDBY soft key and verify that TAS STANDBY is displayed in the upper left corner of the traffic map.
5. Press the TEST soft key and verify that TAS TEST is displayed in the upper left corner of the traffic map and a traffic test pattern is displayed. Upon completion of the test, verify that "TRAFFIC ADVISORY SYSTEM TEST PASSED" is heard over the cockpit speaker.
6. Using a pitot/static ramp tester set the airspeed to 60 KIAS. Verify that the Skywatch mode changes from TAS STANDBY to TAS OPERATING within 15 seconds of exceeding 50 KIAS.
7. Return the airspeed on the pitot/static ramp tester to 0 KIAS and disconnect the test set if it is no longer required. Verify that the Skywatch mode changes from TAS OPERATING to TAS STANDBY within 30 seconds of decreasing below 50 KIAS
8. Open the TRAFFIC ALERT circuit breaker on the avionics circuit breaker panel. On the MFD, verify that NO DATA is displayed in yellow after several seconds.
9. Close the TRAFFIC ALERT circuit breaker on the avionics circuit breaker panel and verify that NO DATA is removed after several seconds.

8.6.4 DME Functional Check (if KN 63 DME installed)

This check verifies that the DME-to-G1000 interface operates correctly. This check is only required for M20 aircraft with the Honeywell remote mounted KN63 DME installed.

1. On the PFD, check to see if the DME window is displayed. If not, press the PFD softkey, then press the DME softkey to display the DME window next to the HSI.
2. On the PFD, press the ADF/DME softkey. Verify that the ADF/DME TUNING screen is displayed.
3. With the ADF/DME TUNING screen activated, use the large FMS knob to highlight the DME field. Verify that the NAV1, NAV2 and HOLD modes can be selected by turning the small FMS knob.
4. Verify that NAV1 and NAV2 frequencies are set to 108.00 and 117.00.
5. Select the DME NAV1 mode by pressing the ENT softkey. Verify that the DME window display is set to the NAV1 frequency of 108.00.
6. Select the DME NAV2 mode by pressing the ENT softkey. Verify that the DME window display is set to the NAV2 frequency of 117.00.
7. Select the DME HOLD mode by pressing the ENT softkey. Verify that the last selected NAV frequency of 117.00 remains the same when the NAV2 frequency is changed.
8. On the NAV Test Set, set up a DME test and note the nav frequency. Tune NAV 1 to the test set frequency and set the DME MODE to NAV1. Ensure that NAV 2 is set to a frequency other than the test set frequency.
9. Verify that the DME distance on the PFD matches the test set.
10. Press the DME and SPKR buttons on the audio panel to select the DME audio and turn on the speaker. Verify that the DME audio can be heard over the speaker.
11. On the PFD, set the DME mode to NAV2 and verify that the DME distance is dashed out.
12. Tune NAV 2 to the test set frequency.
13. Verify that the DME distance on the PFD matches the test set.

8.6.5 ADF Functional Check (if Becker ADF installed)

This check verifies that the ADF-to-G1000 interface operates correctly. This check is only required for M20 aircraft with the remote-mount Becker RA3502 ADF installed.

1. On the PFD, check to see if the ADF window(s) is displayed. If not, press the PFD softkey. Using either the BRG1 or BRG2 softkeys, toggle the softkey until the ADF bearing is shown. Press the BACK softkey.
2. Verify that the ADF window is not invalid (no red ‘X’).
3. Press the ADF/DME softkey and check to ensure the ADF tuning window displays correctly.
4. Using the large FMS knob, highlight the ADF frequency field. Turn the small FMS knob to select the desired frequency. For this test select a known valid local ADF station and press the ENT softkey. Press the ENT again to activate the frequency field. Verify that the ADF bearing pointer moves towards a bearing and stabilizes.

5. Close the ADF/DME TUNING screen by pressing the ADF/DME softkey.
6. Verify that the audio from the station tuned can be heard on the pilots and copilots headset.
7. Verify that the audio from the station turned can be heard over the PA system.
8. On the PFD, press the ADF/DME softkey. Verify that the ADF/DME TUNING screen is displayed.
9. Change the ADF mode by using the large FMS knob to highlight the ADF mode field. Verify that ANT, BFO, and ADF can be displayed in the field by turning the small FMS knob. Verify that pressing the ENT softkey activates the desired field.
10. Change the ADF volume by using the large FMS knob to highlight the VOL level field "xx%". Verify over the PA and headsets that the volume increases and decreases as indicated when the small FMS is used.

8.6.6 TAWS Functional Check (if activated)

Figure 8-6 TAWS Display (typical)

1. Select the TAWS page (5th page in the MAP group) on the MFD.
2. Verify that the title at the top of the page reads "MAP – TAWS". If TAWS has not been enabled, the title will read "MAP – TERRAIN PROXIMITY" or "MAP – TERRAIN".
3. Press the MENU button and select "Test TAWS" from the pop-up menu.
4. After the TAWS test has completed, verify that "TAWS System Test Okay" is heard over the cockpit speaker.
5. Press the MENU button again and select "Inhibit TAWS" from the pop-up menu and press ENT. Verify "TAWS INHIBIT " is displayed on the PFD.
6. Press the MENU button again and select "Enable TAWS" from the prop-up menu and press ENT. Verify the "TAWS INHIBIT" annunciation on the PFD has extinguished.
7. With a GPS position acquired (refer to Section 3.1.1), shield or disconnect the GPS antennas to remove the GPS signal. Verify "No GPS Position" shows on the MFD and the "TAWS N/A" annunciation shows on the PFD.
8. Reconnect or remove the shield from the GPS antennas, and verify the MFD indication and PFD annunciation are removed.

9. Pull the PFD and MFD circuit breakers. Power-on the system in configuration mode, and use the FMS knob to go to the Audio Alert Configuration page. Verify each of the following audio messages can be played:

    PDA – Caution: Too Low Terrain
    EDR – Caution: Sink Rate
    EDR – Warning: Pull Up
    NCR – Caution: Don't Sink
    VCO – Caution: Five Hundred
    RTC – Caution: Caution, Terrain (2X)
    RTC – Warning: Terrain (2X), Pull Up (2X)
    ROC – Caution: Caution, Obstacle (2X)
    ROC – Warning: Obstacle (2X), Pull Up (2X)
    ITI – Caution: Terrain Ahead (2X)
    ITI – Warning: Terrain Ahead, Pull Up (2X)
    IOI – Caution: Obstacle Ahead (2X)
    IOI – Warning: Obstacle Ahead, Pull Up (2X)

10. Pull the MFD and PFD circuit breakers, and power-on the system in the normal operating mode.

8.7 Maintenance Records

After successfully conducting the function check flight in accordance with the Airplane Maintenance Manual, the aircraft may be returned to service.

Record the following information in appropriate aircraft maintenance logs:

- The part number of the G1000 Code Loader Card used to perform software loading or software updates.
- Any other applicable information related to the maintenance work performed on the aircraft.

----- End -----