

G1000 System Componets Guide

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G1000 System Components



Gyroscopic instruments

Two principles of a gyroscope: *Rigidity in space* and *precession*.

- ❖ [Attitude indicator](#) – operates on the principle of rigidity in space. Shows bank and pitch information. Older AIs may have a tumble limit. Should show correct attitude within 5 minutes of turning on the engine. Normally vacuum-driven in GA aircraft, may be electrical in others. May have small acceleration, deceleration errors (accelerate-slight pitch up, decelerate-pitch down) and roll-out errors (following a 180 turn shows a slight turn to the opposite direction).
- ❖ [Heading indicator](#) – operates on the principle of rigidity in space. It only reflects changes in heading, but cannot measure the heading directly. You have to calibrate it with a magnetic compass in order for it to indicate correctly. Some HIs are slaved to a magnetic heading source, such as a flux gate, and sync automatically to the correct heading. Normally powered by the vacuum system in on GA aircraft.
- ❖ [Turn indicators](#) – operates on the principle of precision.
 - Turn coordinators show rate-of-turn and rate of roll.
 - Turn-and-slip indicators show rate-of-turn only.

Magnetic compass errors & limitations:

D.V.M.O.N.A

D- Deviation

V- Variation

M- Magnetic dip

O- Oscillation

N- North/south turn errors

(Northern hemisphere: **UNOS**

Undershoot North/ Overshoot South)

A- Acceleration errors

(Northern hemisphere: **ANDS**

Accelerate North/ Decelerate South)

Electronic flight instruments

- ❖ [Attitude Heading Reference Systems \(AHRS\)](#) – Provides more accurate and reliable attitude and heading data than traditional separate gyro systems. The first AHRS units were very expensive and relied on laser gyros and flux valves. Today they are based on solid state technologies (no moving parts) and are cheaper, smaller and easier to maintain.
- ❖ [Air Data Computers \(ADC\)](#) – replaces the mechanical pitot-static instruments. The ADC receives inputs from the pitot, static and outside temperature ports and computes airspeed, true airspeed, vertical speed and altitude.
- ❖ [Flight director](#) – computes and displays command bars over the attitude indicator to assist the pilot in flying selected heading, course or vertical speed.
- ❖ [Flight Management System \(FMS\)](#) – Receives inputs from various sensors and provides guidance to the autopilot and flight director throughout the flight. The FMS also automatically monitors and selects the most appropriate navigation source for accurate positioning. (GPS, VOR/DME, INS etc.)
- ❖ [Electronic Flight Instrument Systems \(EFIS\)](#) – AKA “Glass cockpit”.
- ❖ [Primary Flight Displays \(PFD\)](#) – Displays flight data such as attitude, altitude, airspeed, VSI and heading as well as rate tapes.
- ❖ [Multi-Function Displays \(MFD\)](#) – Displays a variety of information such as moving maps, aircraft system status, weather and traffic. It may also be used as a backup for other displays, such as the PFD or EICAS.

Generic instrument taxi cockpit check *You should tailor it to your

aircraft & operations

Airspeed – 0 KIAS.

Turn coordinator – ball centered and wings level when not turning. On turns: shows turn in correct direction, ball goes to opposite direction of the turn.

Attitude – Correct pitch attitude and bank angle $\pm 5^\circ$ within 5 minutes.

Heading indicator – Set and shows correct headings.

Altimeter – Set to local altimeter settings or field elevation. Shows correct field elevation ± 75 feet.

VSI – 0 fpm.

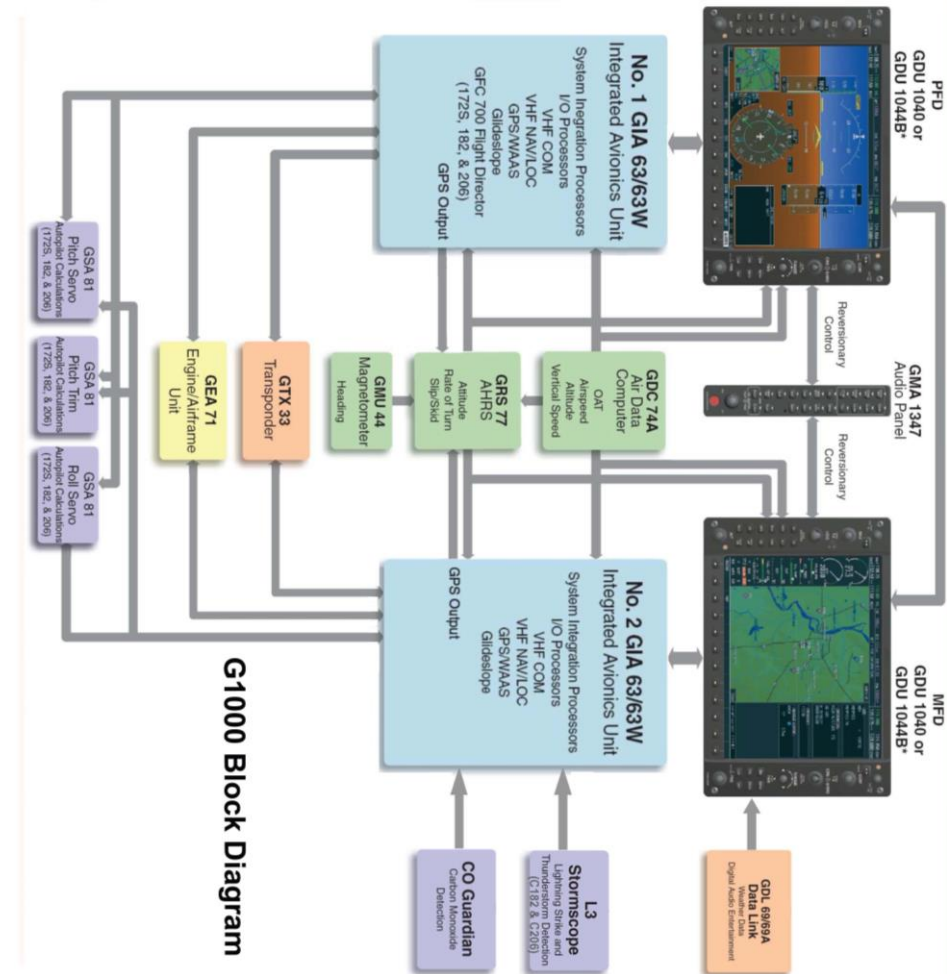
Magnetic compass – swings freely, full of fluid, shows known headings and deviation card is installed.

Marker beacons – Tested.

NAV & Comm – Set.

GPS – Checked and set.

EFIS cockpits – Check PFD/MFD/EICAS for 'X's, messages and removed symbols.



G1000 Components



- Two Control Display Units = **GDU**
- Marker/Audio Panel = **GMA**
- Attitude and Heading Reference System = **GRS**
- Air Data Computer = **GDC**
- Engine/Airframe Unit = **GEA**
- Two Integrated Avionics Units = **GIA**
- Data Link = **GDL**
- Mode S Transponder X = **GTX**
- Magnetometer Unit = **GMU**

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System Components

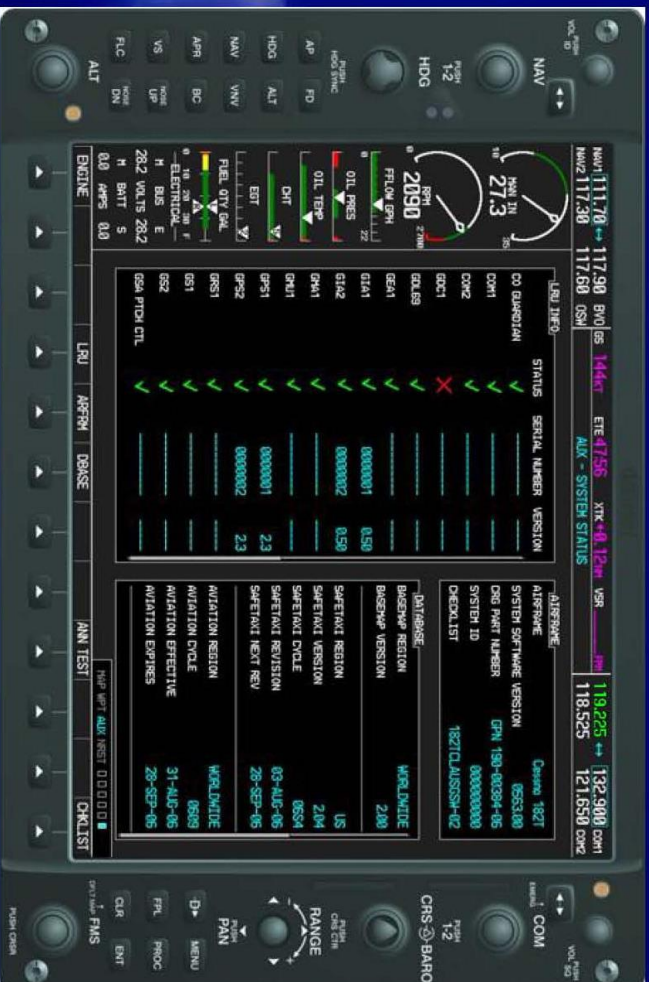


- Two Control Display Units
- Audio Panel
- Attitude and Heading Reference System
- Air Data Computer
- Engine/Airframe Unit
- Two Integrated Avionics Units
- Data Link
- Mode S Transponder
- Magnetometer



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Auxiliary - System Status



G1000 System Message Advisories





GRS 77

- Source for:
 - Attitude
 - Heading
 - Rate of Turn
 - Slip/Skid
- Solid State
 - More reliable than conventional vacuum gyros
- “On-the-Run” Initialization
- Tail Cone Avionics Bay



Control Display Units



• Garmin Control Display Unit

- Best resolution on the market
- 1044B contains AFCS mode select buttons
- Reversionary capabilities



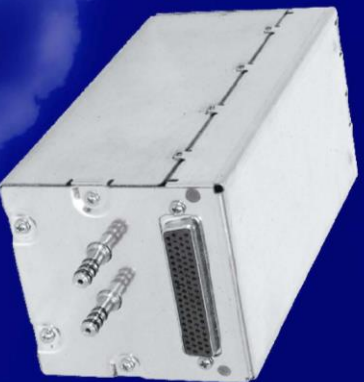
Engine/Airframe Unit



- GEA 71**
- Receives data from airframe and engine systems
 - Presents the information on the Engine Indication System (EIS)
- Provides System Integrity Monitoring
- Behind Instrument Panel



Air Data Computer - ADC



- GDC 74A**
- Source for:
 - Altitude
 - Indicated Airspeed
 - Vertical Speed
 - Outside Air Temperature
 - True Airspeed
 - Wind Vector
- Located:
 - Behind Instrument Panel (182/206)
 - Tailcone Avionics Bay(172)



Garmin Data Link



- XM Satellite Radio Receiver
 - Near, Real-time Weather
 - Digital Audio Entertainment
- Subscription Service



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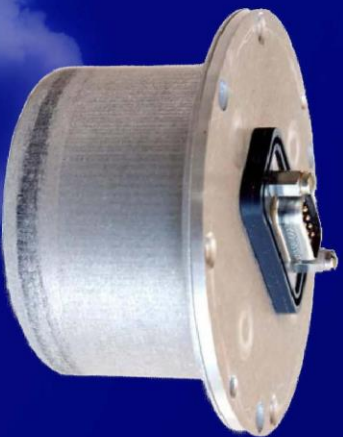
Integrated Avionics Unit



- ## GIA 63W
- WAAS-Enabled
 - Similar to a Garmin 530A without the display interface
 - Dual **GPS**, **NAV**, and **COM** Radios
 - Redundancy
 - Reliability
 - 16 watts
 - 8.33 kHz spacing
 - Tail Cone Avionics Bay



Magnetometer



GMU 44

- 3 Axis Magnetic Sensor
 - Replaces traditional Flux Valve
- Located in Left Wing



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Transponder



GTX 33

- Mode S Transponder
- Automatic activation feature at approximately 30 knots
- Traffic Information Service - TIS
- Tail Cone Avionics Bay



G1000 Failure Modes

GDU 1040 PFD SCREEN ONLY

Does not affect autopilot (AP)

Pilot Action:

Press Reversionary Button if not automatic
Fly with reference to MFD

GDU 1040 MFD SCREEN ONLY

Does not affect AP

Pilot Action:

Press Reversionary Button if not Automatic
Fly with reference to PFD

GRS 77 AHRS

Fails Attitude indicator, heading indicator and skid/slip Indicator
Fails AP HDG and APR.

Pilot Action:

Navigate with reference to GPS, VOR, and ILS
Control aircraft referencing standby instruments.
Set NAV range to 7.5 miles or less and use compass ring for heading guidance.
AP ROL, VS and ALT continue to function.

GIA 63-1

Fails Com1, Nav1, GPS 1 and PFD.
AP continues to function

Pilot Action:

Press Reversionary Button if not automatic
Use MFD screen for instrument/navigation display
Communicate with Com2
Navigate with Nav 2 and GPS 2

GIA 63-2

Fails Com 2, Nav 2, GPS 2 and MFD
AP NAV and APR modes fail.

Pilot Action:

Press Reversionary Button if not Automatic
Use PFD screen for instrument/navigation display.
Communicate with Com 1.
Navigate with Nav 1 and GPS 1.

GDS 74A Air Data Computer

Fails OAT, AS, VS; Altitude on PFD.
AP Altitude Preselect and Altitude Hold do not function.
Transponder will not report altitude required for class A, B & C airspace

Pilot Action:

Assist in control of the aircraft by reference to standby altimeter and
Airspeed indicators.
AP, VS & ALT continue to function.

GMU 44 Magnetometer

If the GMU 44 fails, only the stabilized heading data is lost

Pilot Action:

Use magnetic compass or
Set NAV range to 7.5 miles or less and use compass ring for heading Guidance.

Audio Panel

Pilot's headset is automatically connected to Com 1 upon failure of audio panel

Pilot Action:

Press frequency flip-flop button and hold for 121.5 if needed
Use of AP prohibited – No audio warning of disconnect.

GEA 71 ENGINE/AIRFRAME UNIT

Failure is indicated by loss of all engine parameters

Pilot Action:

Land at nearest airport and correct fault before further flight