

CIRRUS PERSPECTIVE®



GARMIN™

Garmin Aviation Product Support

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Training in Cirrus Perspective Aircraft

Agenda

- **Introductions**
- **Feature vs. Failure**
- **GFC 700**
- **Pilot Troubleshooting**
- **Perspective Messages**



FEATURE vs. FAILURE

FEATURE - an action or use for which something is suited or designed

FAILURE - an occasion when something stops working or stops working adequately

FEATURE vs. FAILURE



CDI 'DR' Indication on PFD



*Symbolic Aircraft
(Map pages and Inset Map)*

Dead Reckoning Indications

FEATURE vs. FAILURE



Figure 2-41 Example HSI Annunciations

Also, while the Perspective[®] system is in DR Mode, the autopilot will not couple to GPS, and Terrain Proximity, TERRAIN-SVS, and TAWS are disabled. Additionally, the accuracy of all nearest information (airports, airspaces, and waypoints) is questionable. Finally, airspace alerts continue to function, but with degraded accuracy.

FEATURE vs. FAILURE

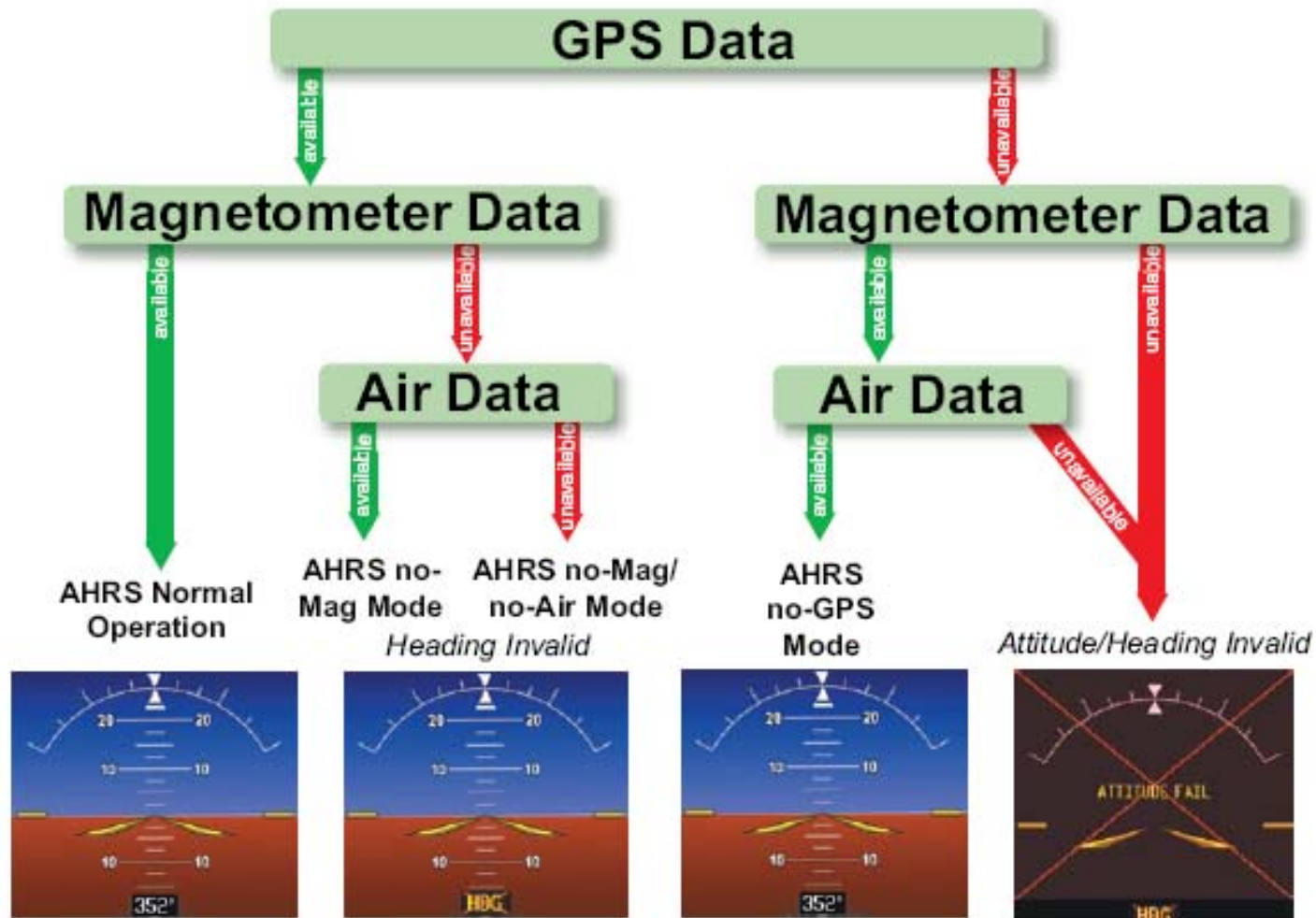


Figure 1-21 AHRS Operation

GFC 700



Figure 1-17 Normal Operation

GFC 700 AFCS

Fully integrated with Perspective

- Designed as part of Perspective system, not add-on
- Reduced number of LRUs

Flexible user interface (CDU)

Attitude/heading based

Overspeed

Airspeed scheduling

Fail-Passive

Solid State PC Boards

GSM 85 Servo Mounts



GSA 81 PC Boards



GSA 81 (3) Servo Actuator



GFC 700 Units



GDU 1240A Control Display Unit

- Displays FD commands, mode annunciations (PFD)



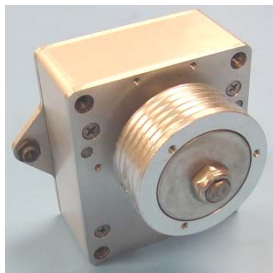
GIA 63 Integrated Avionics Unit

- Controls AFCS modes in response to CDU inputs
- Calculates FD commands
- Sends commands to servo



GSA 81/80 Servo Actuators (Pitch, Roll, and Trim)

- Calculates autopilot, trim command for each axis
- Controls and monitors servo motor and engage clutch



GSM 85 Servo Mounts

- Connects servo to aircraft control cables
- Contains engage clutch and slip clutch

GFC 700

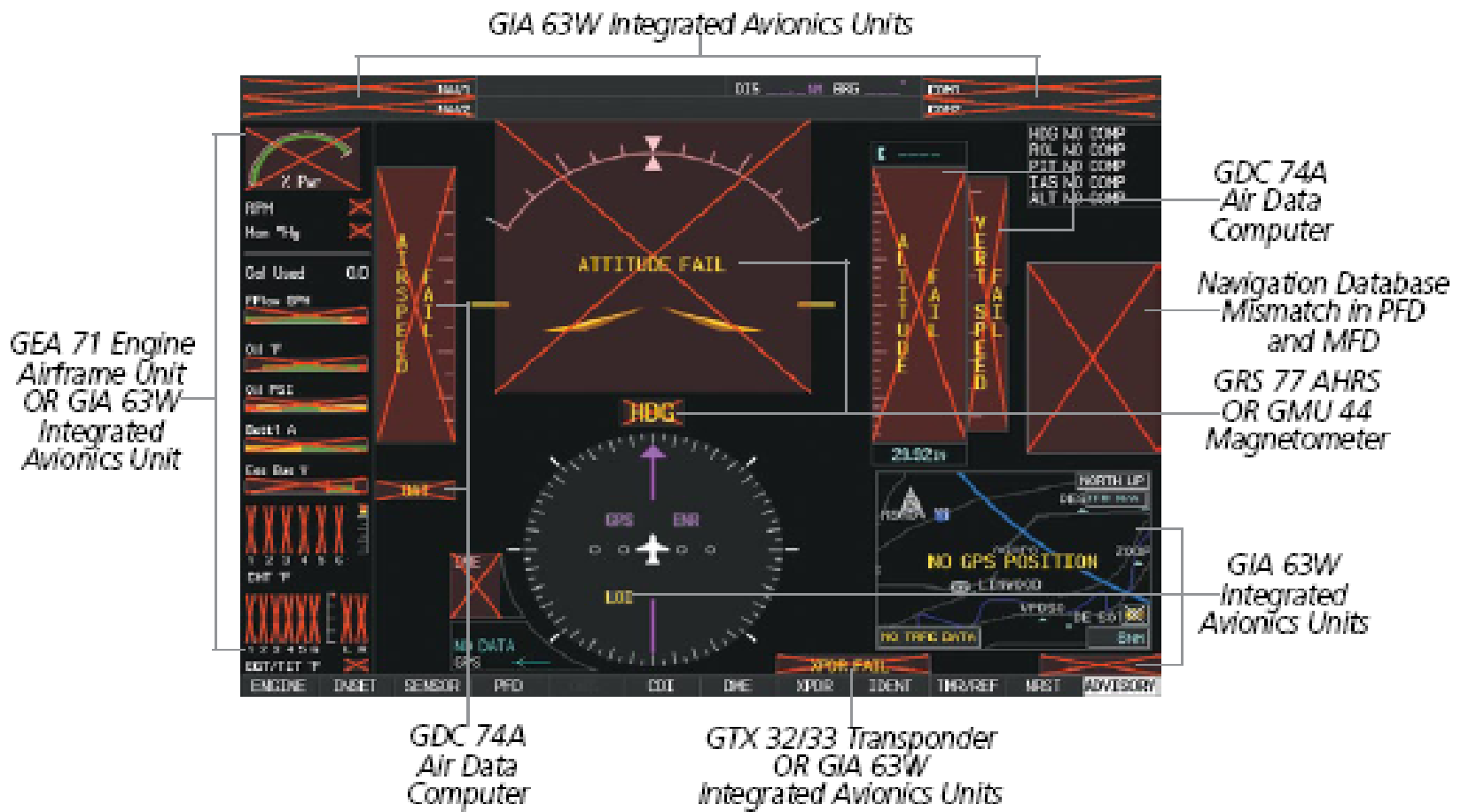


Figure 1-19 System Failure Annunciations

Annunciations displayed on PFD



GFC 700

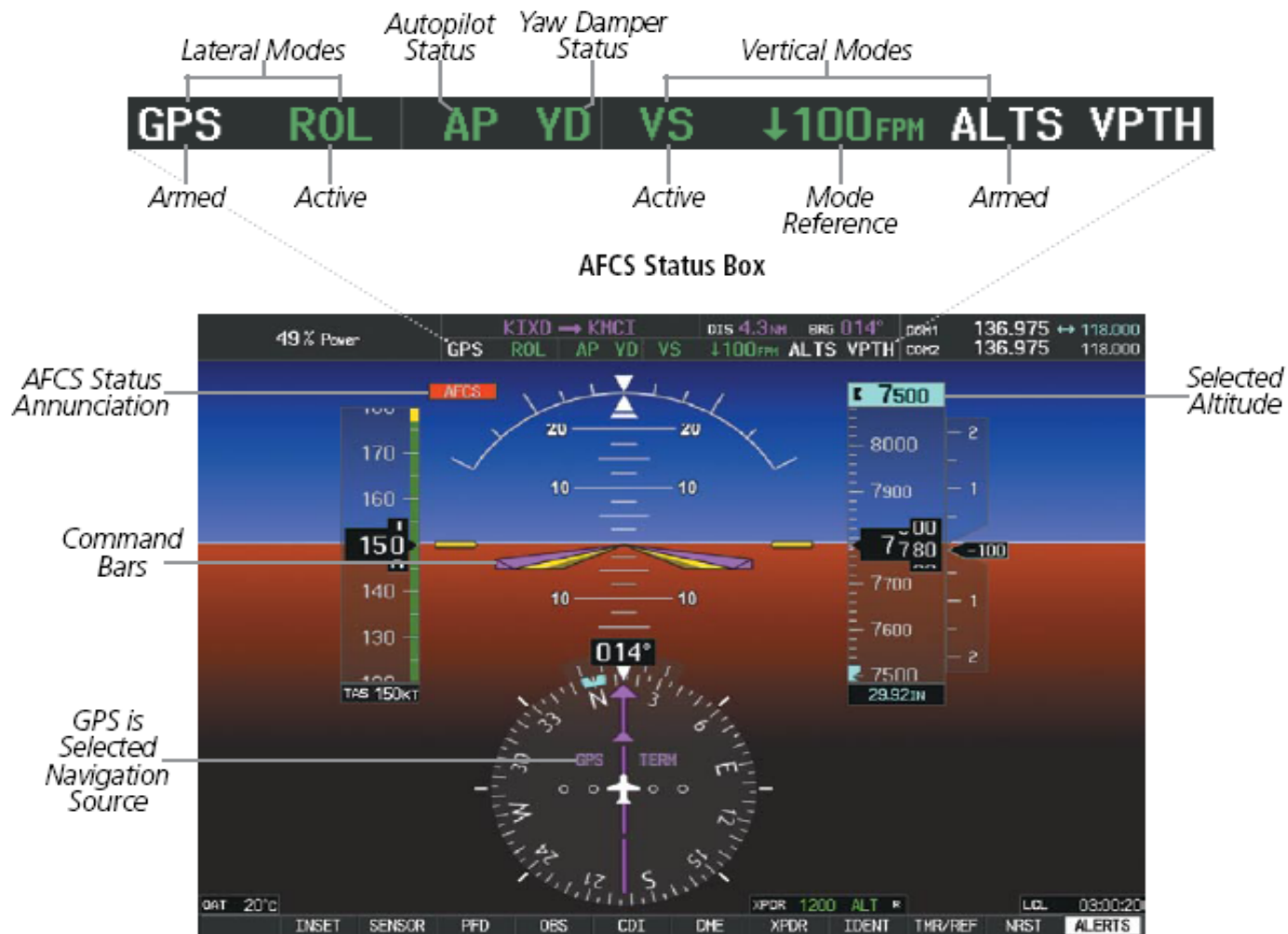
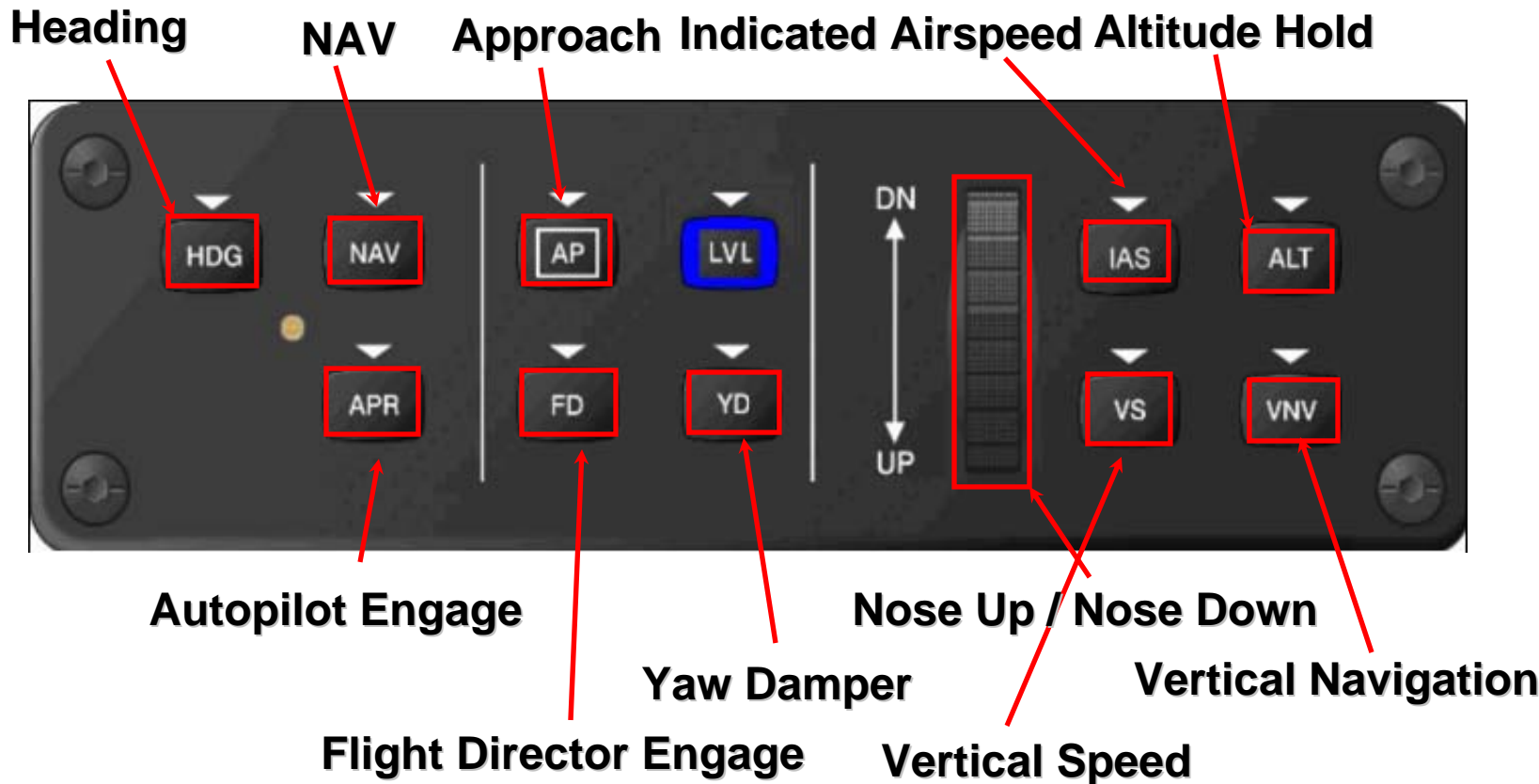


Figure 7-2 PFD AFCS Display

GFC 700 AFCS

GMC – Autopilot Control



AFCS DISCONNECT

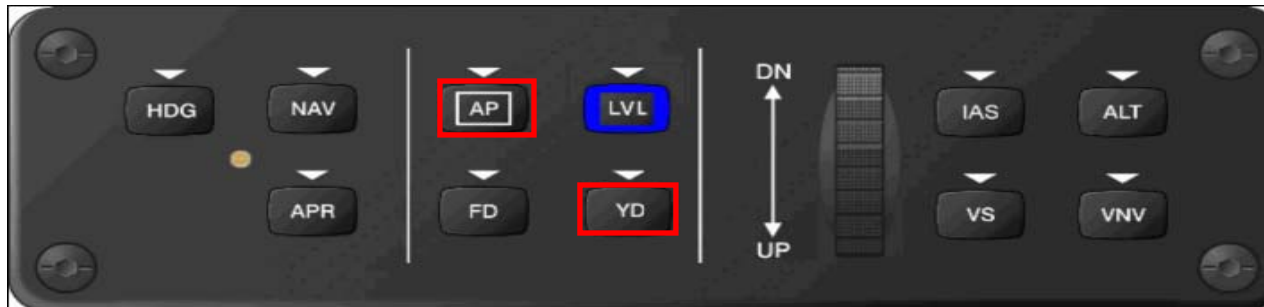
Disconnecting the AFCS

There are at least six different ways to disconnect the GFC 700 AFCS when you feel it is necessary to do so under the flight conditions.

- Pressing the “AP DISC RED” button, this is located on the pilot’s yoke.
- Pressing the “AP Button” .
- Press the “Go Around Button” located either on the left side of the throttle handle
- Pull the Circuit Breaker for the autopilot; this removes the power to the autopilot servos.
- Pull the Circuit Breakers on the GIA’s then reset the circuit breakers.
- Turn off the master switch then turn back on.

GFC 700 AFCS

Autopilot / Yaw Damper Operation



Autopilot Engagement

ROL | +AP YD | PIT | ALTS

Autopilot Disconnect - Manual

ROL | +AP YD | PIT | ALTS

Autopilot Disconnect - Automatic

ROL | +AP YD | PIT | ALTS

Yaw Damper Disconnect - Manual

ROL | +AP YD | PIT | ALTS

PILOT TROUBLESHOOTING

GFC 700

Alert Condition	Annunciation	Description
Rudder Mistrim Right	RUD→	Yaw servo providing sustained force in the indicated direction
Rudder Mistrim Left	←RUD	
Aileron Mistrim Right	AIL→	Roll servo providing sustained force in the indicated direction
Aileron Mistrim Left	←AIL	
Elevator Mistrim Down	↓ELE	Pitch servo providing sustained force in the indicated direction
Elevator Mistrim Up	↑ELE	
Pitch Trim Failure	PTRM	If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move MET switch to unstick
Yaw Damper Failure	YAW	YD control failure
Roll Failure	ROLL	Roll axis control failure; AP inoperative
Pitch Failure	PTCH	Pitch axis control failure
System Failure	AFCS	AP and MET are unavailable; FD may still be available
Preflight Test	PFT	Performing preflight system test; aural alert sounds at completion Do not press the AP DISC Button during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.
	PFT	Preflight system test failed; aural alert sounds at failure



Denotes Mistrim : Disconnect the A/P retrim that axis and reconnect

Alert Condition	Annunciation	Description
Rudder Mistrim Right	RUD→	Yaw servo providing sustained force in the indicated direction
Rudder Mistrim Left	←RUD	
Aileron Mistrim Right	AIL→	Roll servo providing sustained force in the indicated direction
Aileron Mistrim Left	←AIL	
Elevator Mistrim Down	↓ELE	Pitch servo providing sustained force in the indicated direction
Elevator Mistrim Up	↑ELE	

Denotes Servo Failure :

Alert Condition	Annunciation	Description
Pitch Trim Failure	PTRM	If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move MET switch to unstick
Yaw Damper Failure	YAW	YD control failure
Roll Failure	ROLL	Roll axis control failure; AP inoperative
Pitch Failure	PTCH	Pitch axis control failure
System Failure	AFCS	AP and MET are unavailable; FD may still be available

Denotes Pre Flight Test Failure

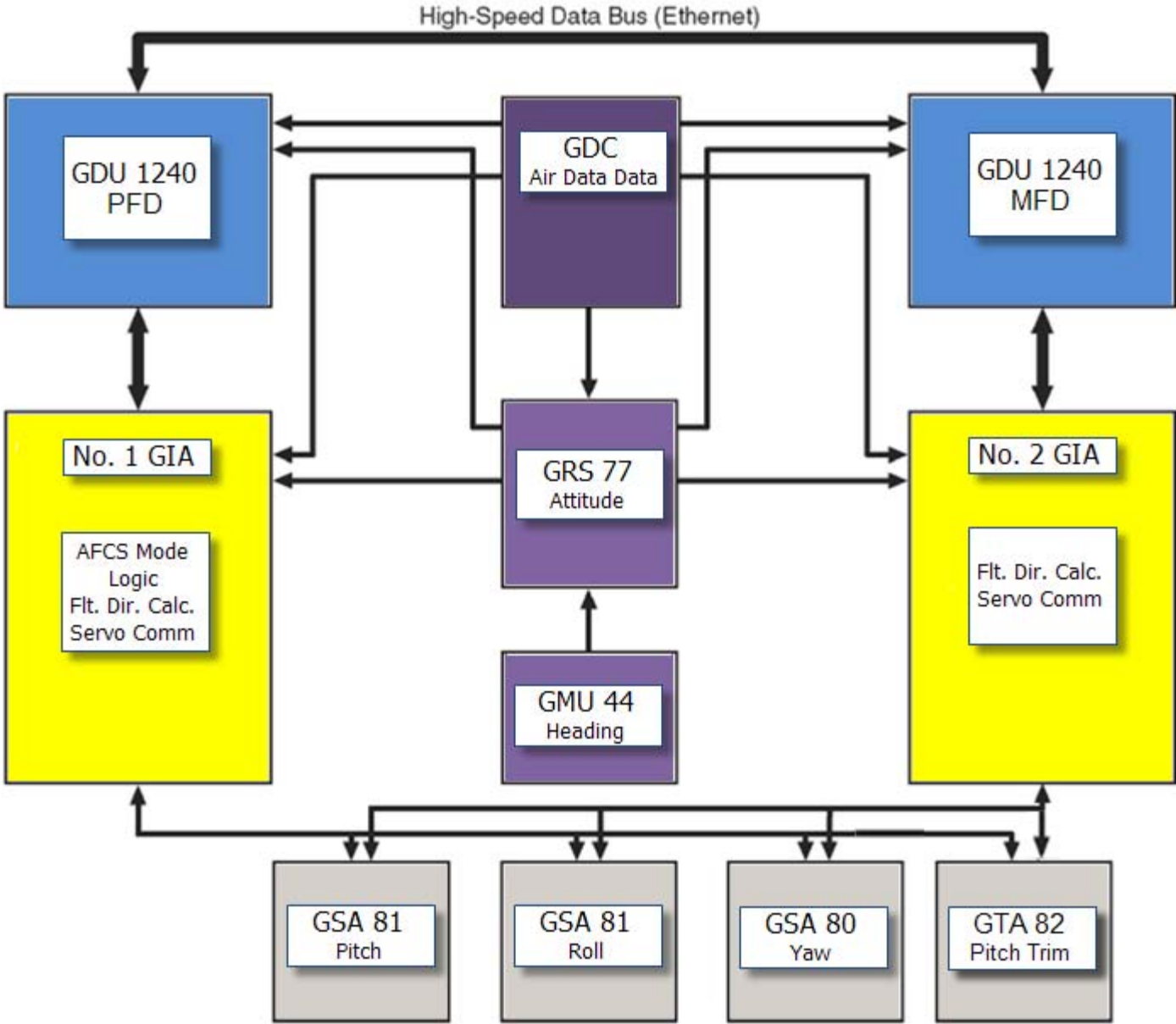
Alert Condition	Annunciation	Description
Preflight Test		Performing preflight system test; aural alert sounds at completion Do not press the AP DISC Button during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.
		Preflight system test failed; aural alert sounds at failure

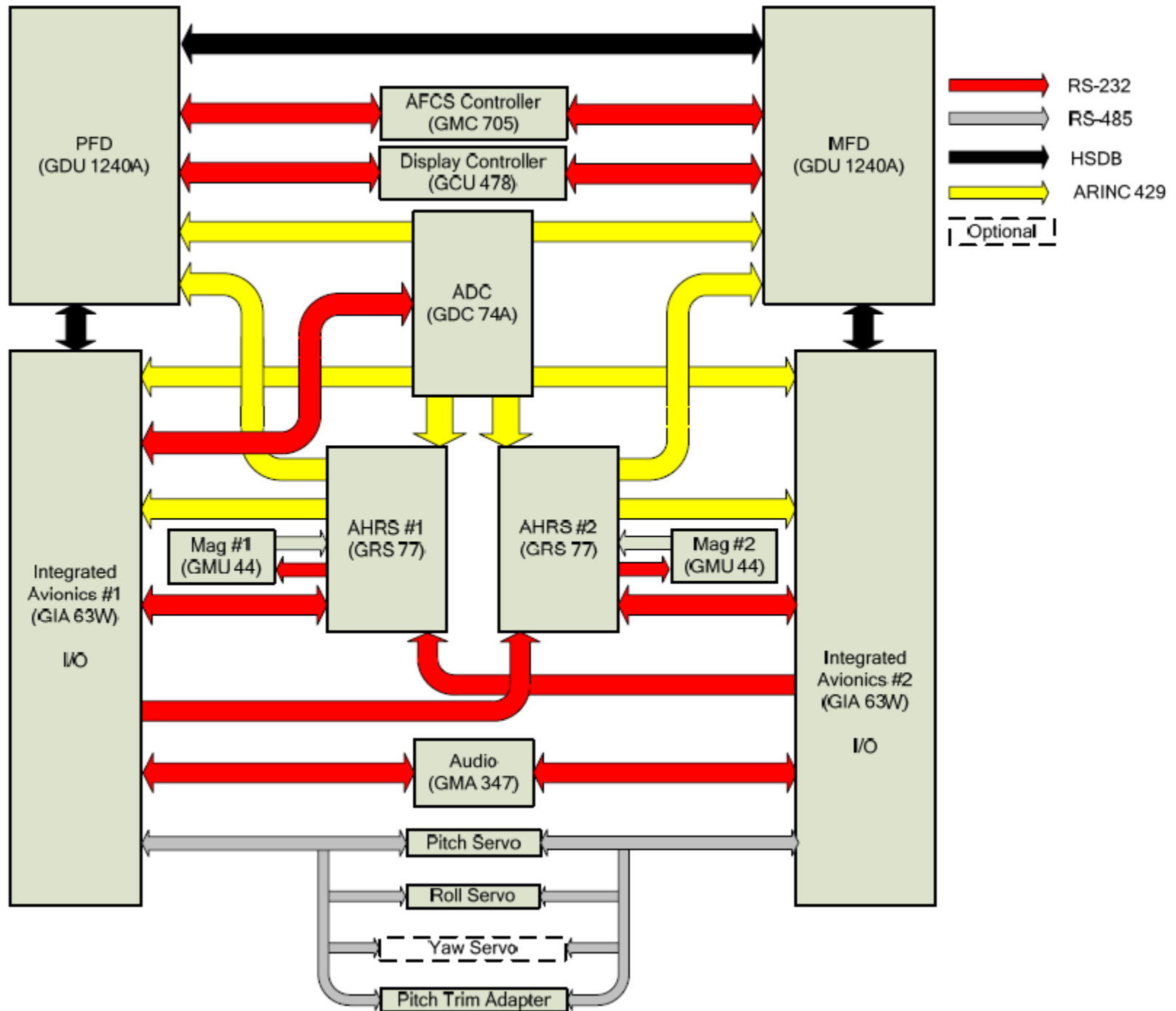
GFC 700 Pre-Flight Test Sequence and Troubleshooting

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

The PFT is only done if the GFC700 is configured and the certification gains are valid. If the PFT has not completed after one minute from when the initialization started, the PFT will fail. After the system PFT has passed, it will be performed again if a servo resets, if the autopilot servo breaker is reset or the cross side GIA restarts it.

GFC 700 Block Diagram





Messages & Annunciations



Messages & Annunciations

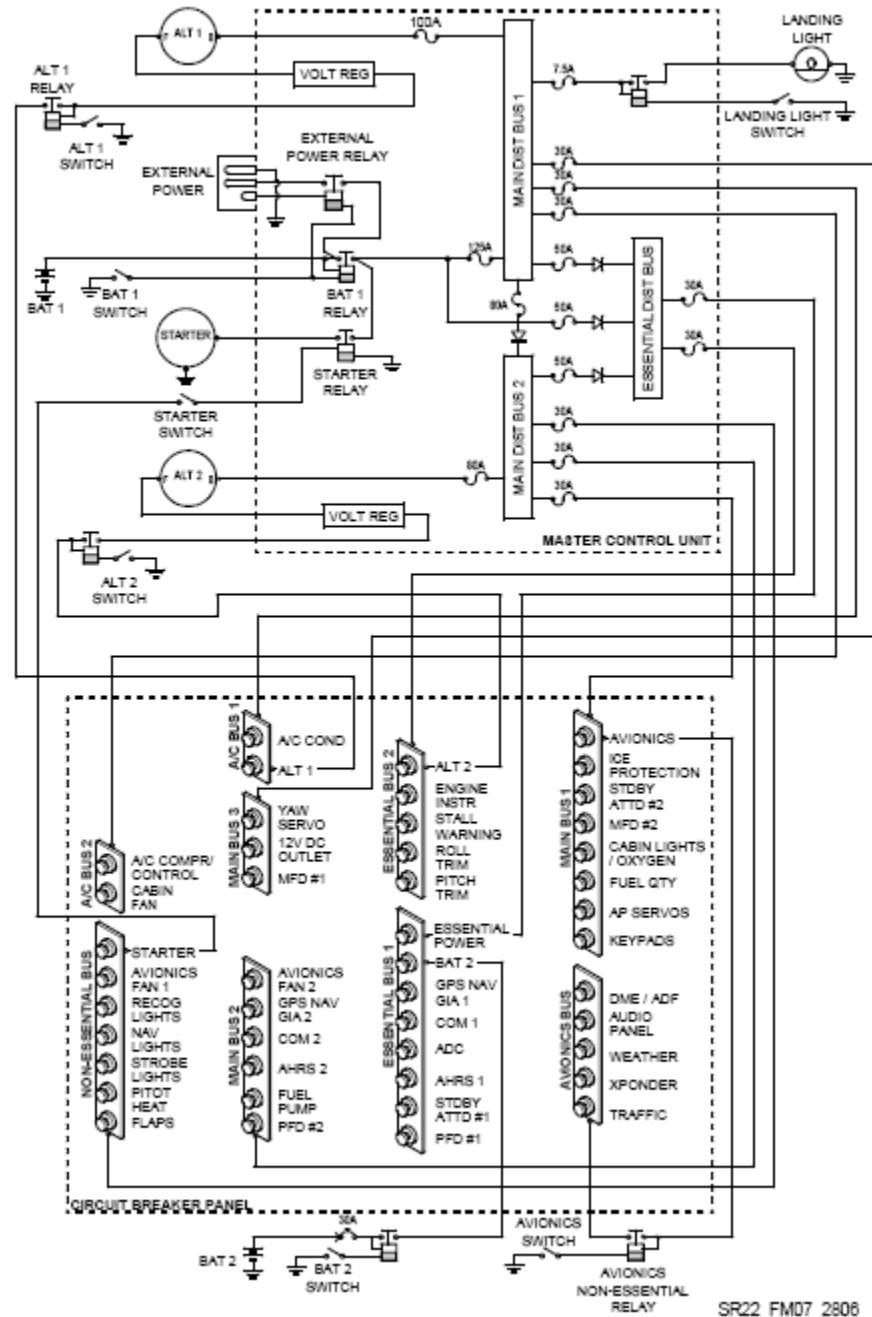
The image shows a Garmin cockpit display with several windows and annunciations:

- Comparator Window:** Located at the top right, displaying "HDG NO COMP", "ROL NO COMP", "PIT NO COMP", and "ALT NO COMP".
- Reversionary Sensor Window:** Located below the Comparator Window, displaying "USING AHRS2" and "USING ADC2".
- Annunciation Window:** Located in the middle right, displaying "ALT 2", "ALT 1", "M BUS 2", and "M BUS 1".
- Alerts Window:** Located at the bottom left, displaying "ALERTS" and the following messages:
 - M BUS 2 - Check main power bus 2 voltage.
 - M BUS 1 - Check main power bus 1 voltage.
 - SIMULATOR - Sim mode is active. Do not use for navigation.
- Softkey Annunciation:** Located at the bottom right, displaying "CAUTION" in a yellow box.

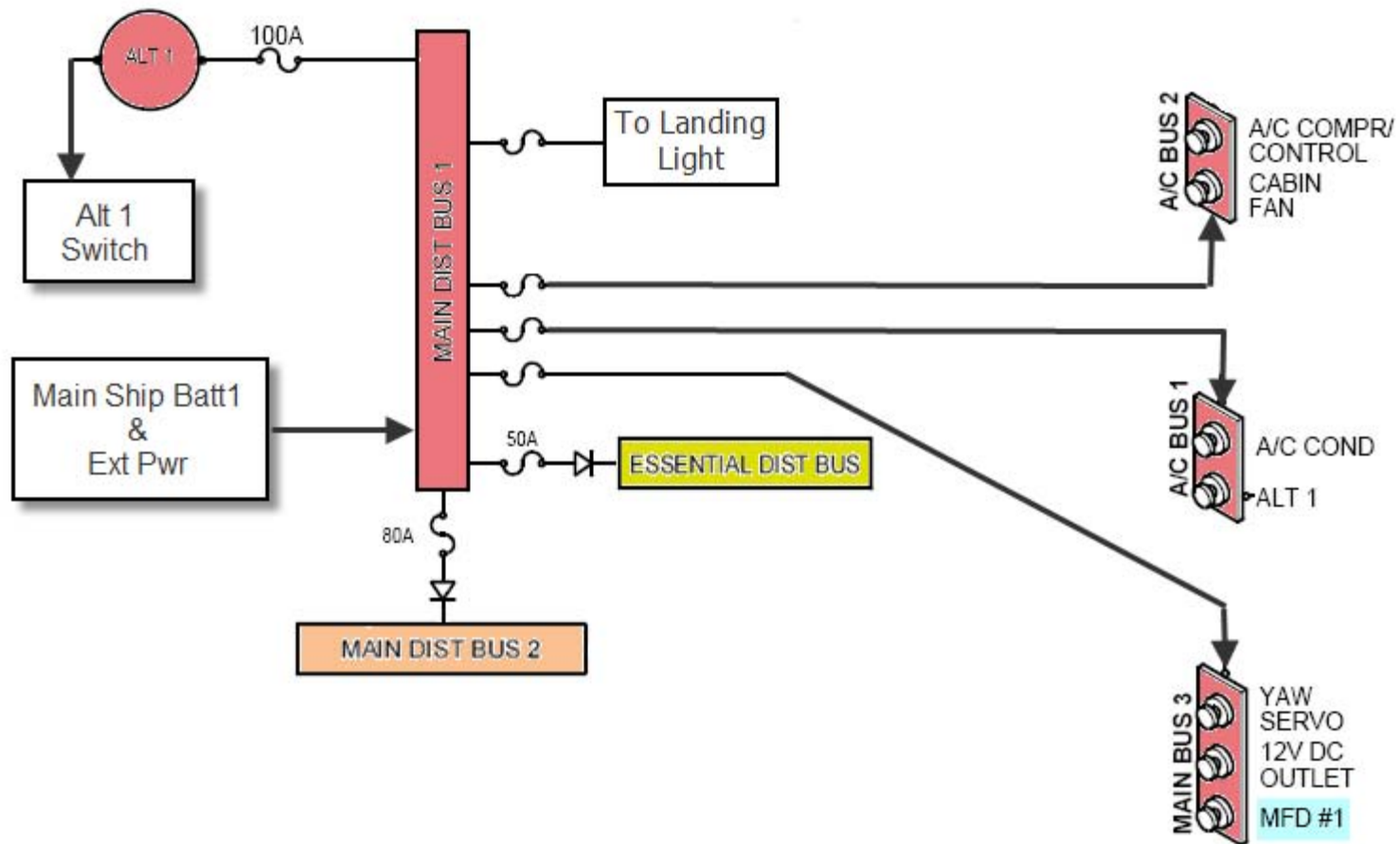
The display also shows an altitude scale on the left with a current reading of 5000 feet and a target altitude of 5000 feet. The bottom status bar includes "ALT R", "LCL 07:32:37", "IDENT", "TMR/REF", "NRST", and "CAUTION".

Auxiliary System Status Page

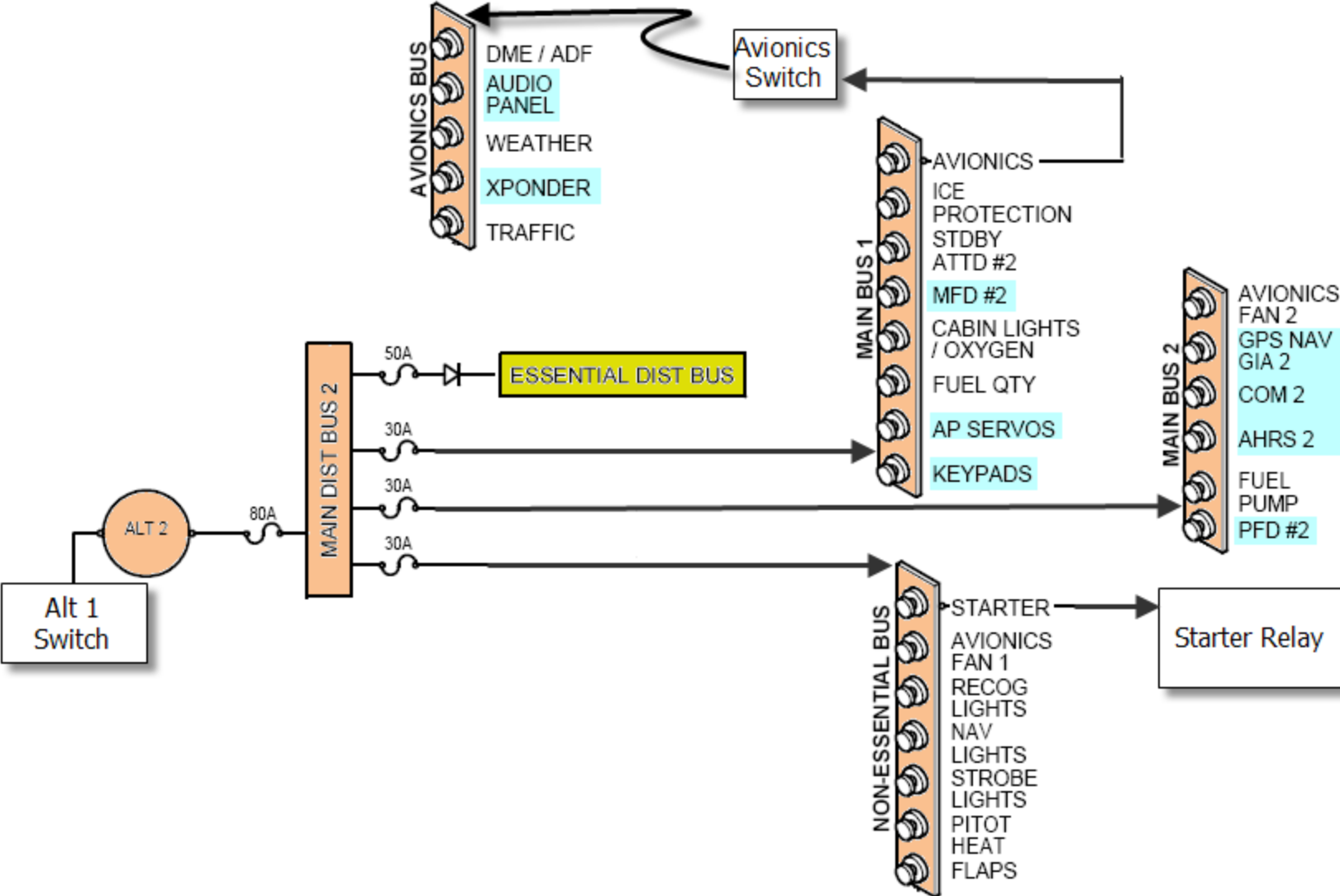




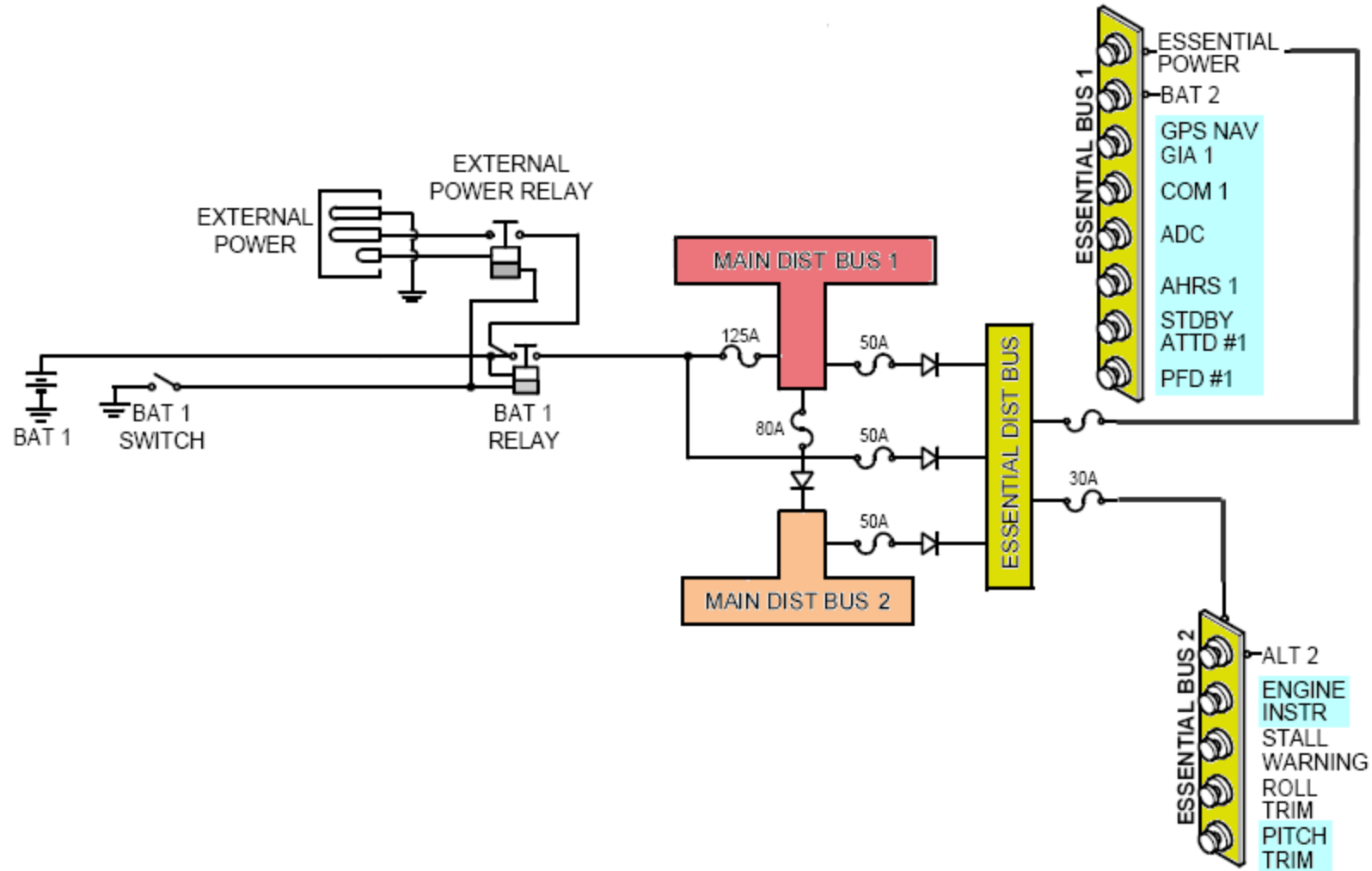
ALTERNATOR 1



Alternator 2



Essential Buss



GFC 700 Increased Availability

- Background
 - Garmin has recently made several improvements in GFC 700 operation to improve autopilot availability in the event of various LRU failures
 - Additional support has been added to allow dual GDC or dual GRS operation in single PFD configurations
- Minimum software requirements
 - One PFD Systems - GDU 9.01, GIA 5.60, GSA 2.20
 - Updated GFC 700 gain file to enable features
- Autopilot remains operational in single AHRS/ADC installations with failure of
 - Either GIA
 - PFD
 - MFD (if mode control is provided elsewhere)
 - Pitch servo (vertical modes not available)
 - Pitch trim servo (vertical modes not available)
 - Many multiple failures

GFC 700 Increased Availability

- Dual sensor autopilot remains operational with failure of
 - GDC (with two AHRS installed, air data modes not available)
 - Either GRS (with two AHRS installed)
 - Either GDC (with two ADC installed)
 - Failure of any communication path (assumes both AHRS and ADC connected to both GIAs)
- Failure behavior
 - Automatic switching and continued operation with no pilot action can occur with any single failure except a roll servo failure or mode control function
 - Any failure that causes a switch from one GIA to the other will result in reversion to PIT / ROL modes and require reselection of desired modes.
Note: GDU 10.00 / GIA 6.00 and later will allow the GIA not in control to know the previous commands of the GIA in control and therefore the system will not enter dead reckoning mode require reselection of desired modes.
 - Loss of the pitch or pitch trim servo will result in a disconnect to ensure that the pilot recognizes that a change in control capability has occurred. Re-engage is possible without vertical modes.
 - Loss of the roll servo or loss of the mode control function results in loss of the AP
 - CAS messages and advisory alerts indicate status of the system after failures
- Summary
 - In a dual AHRS installation, the autopilot will remain operational with any hardware failure except a mode controller or roll servo

KISS

QUESTIONS?

