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Document No. 190-00303-02

FAA APPROVED

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
GARMIN G1000 INTEGRATED AVIONICS SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

Reg. No. _____ S/N _____

This Supplement must be attached to the FAA Approved Airplane Flight Manual when the Garmin G1000 Integrated Avionics System is installed in accordance with STC SA01254WI. The information contained herein supplements the information of the basic Airplane Flight Manual. For Limitations, Procedures and Performance information not contained in this Supplement consult the basic Airplane Flight Manual.

Note: This Airplane Flight Manual Supplement follows the format and content of the Airplane Flight Manual for the Diamond DA 40 for consistency and ease of use.

Only the Limitations Section is FAA APPROVED.

for Margaret Kline
Manager, Aircraft Certification Office
Federal Aviation Administration
Wichita, Kansas 67209
Date: 6-25-2004

Revised: 10-27-2006

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LOG OF REVISIONS				
Revision Number	**Page Number(s)**	**Description**	**FAA Approved**	**Date of Approval**
1	All	Initial Release	--	--
2	All	Updated doc. To reflect current processes Updated header/footer to current format.	--	--
3	All	Revised to reflect FAA Approval of Limitations Section only.	--	--
4	All	Initial FAA Approval	GMB [1]	6/25/2004
5	All	Make KAP 140 autopilot an optional equipment installation	GMB [1]	9/20/2004
6	All	Amendment 1 revision and administrative corrections.	GMB[1]	3/30/05
7	All	DA 40 F revision and administrative corrections	GMB[1]	6/27/05
8	All	Amendment 2 revision and administrative corrections.	GMB[1]	9/16/05
9	All	Amendment 3 revision	[signature]	11/1/05

[1] For Margaret Kline, Manager
Wichita Aircraft Certification Office

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FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
GARMIN G1000 INTEGRATED AVIONICS SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

SECTION I
GENERAL

1. The G1000 Integrated Avionics System is a fully integrated flight, engine, communication, navigation and surveillance instrumentation system. The system consists of a Primary Flight Display (PFD), Multi-Function Display (MFD), audio panel, Air Data Computer (ADC), Attitude and Heading Reference System (AHRS), engine sensors and processing unit (GEA), and integrated avionics (GIA) containing VHF communications, VHF navigation, and GPS (Global Positioning System).

2. The primary function of the PFD is to provide attitude, heading, air data, navigation, and alerting information to the pilot. The PFD may also be used for flight planning. The primary function of the MFD is to provide engine information, mapping, terrain information, and for flight planning. The audio panel is used for selection of radios for transmitting and listening, intercom functions, and marker beacon functions.

3. The primary function of the VHF Communication portion of the G1000 is to enable external radio communication. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS system satellites, recover orbital data, make range and Doppler measurements, and process this information in real-time to obtain the user's position, velocity, and time.

4. Provided a Garmin G1000 GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

   - VFR/IFR enroute, oceanic, terminal, and non-precision instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) operation within the U.S. National Airspace System in accordance with AC 20-138A.

   - Oceanic/Remote per FAA Notice 8110.60 – Two FMSs are required to be installed, operating and receiving usable signals from independent GPS sensors (one GPS sensor for those routes requiring only one Long Range Navigation (LRN) sensor. This does not constitute operational approval.

   - North Atlantic (NAT) Minimum Navigation Performance Specifications (MNPS) Airspace as defined in AC 91-49 and AC 91-70 – Provided two FMSs are installed, operating and

are receiving usable signals from any two GPS navigation sensors (one GPS sensor for those routes requiring only one Long Range Navigation (LRN) sensor). The GPS sensor meets the requirements of FAA Notice 8110.60 for primary navigation sensors. This does not constitute operational approval.

- RNAV (GPS) Approaches – The G1000 GPS meets the requirements of AC 20-138(A) for GPS based RNAV approaches. This includes RNAV approaches labeled as RNAV (GPS), provided GPS sensor data is valid.
- The systems meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138A, JAA GAJ-20 ACJ 20X4, and FAA Order 8110.60 for oceanic and remote airspace operations, provided it is receiving usable navigation information from the GPS receiver.

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. GPS navigation data is based upon use of only the GPS operated by the United States of America.

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
GARMIN G1000 INTEGRATED AVIONICS SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F
SECTION II
LIMITATIONS

2.1 INTRODUCTION

General Limitations:

1. The Garmin G1000 Cockpit Reference Guide (CRG) must be immediately available to the flight crew. The required CRG is referenced to the System Software Version number. The System Software Version number is displayed at the top right side of the MFD Power-up page. DA 40 F requires System Software Version 0369.07 or later FAA approved software.

System Software Version	Garmin G1000 Cockpit Reference Guide (CRG) revision
0369.04	P/N 190-00324-00, dated November, 2003 or later appropriate revision.
0369.06	P/N 190-00324-01, dated February, 2005 or later appropriate revision.
0369.07	P/N 190-00324-03, dated June, 2005 or later appropriate revision.
0369.08	
0369.09	P/N 190-00324-04, Revision A or later appropriate revision.

2. The G1000 installation in the DA 40 requires the following or later FAA approved LRU software versions. Approved LRU software versions are referenced to the System Software Version number. DA 40 F requires System Software Version 0369.07 or later FAA approved software.

LRU	LRU Software Version			
	0369.04	0369.06	0369.07	0369.08 & 0369.09
COM 1 & 2	7.00	7.00	7.00	7.00
GDC 1	2.02	2.05	2.05	2.05
GEA 1	2.02	2.04	2.04	2.04
GIA 1 & 2	2.01	2.06	2.06	3.01
GMA 1	2.03	2.07	2.07	2.08
GMU 1	2.01	2.01	2.01	2.01
GPS 1 & 2	3.01	2.01	3.01	3.01
GRS 1	2.01	2.03	2.03	2.03
GS 1 & 2	3.00	3.00	3.00	3.00
GTX 1	3.06	4.01	4.01	4.01
MFD1	2.02	4.04	4.06	5.02
NAV 1 & 2	4.00	4.00	4.00	4.00
PFD 1	2.02	4.04	4.06	5.02
GDL				2.14

The system's databases and System Software Version number are displayed on the MFD Power-up page immediately after system power-up and must be acknowledged. The LRU software versions can be verified on the AUX group sub-page 5, "AUX - SYSTEM STATUS" along with the system's databases.

3. IFR enroute, oceanic and terminal navigation predicated upon the G1000 GPS Receiver is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.

4. Instrument approach navigation predicated upon the G1000 GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment database. The GPS equipment database must incorporate the current update cycle.

NOTE

Not all published approaches are in the FMS database. The pilot must ensure that the planned approach is in the database.

(a) Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.

(b) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the G1000 GPS receiver is not authorized.

(c) Use of the G1000 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be present on the display.

(d) Vertical Navigation information may be utilized for advisory information only. Use of Vertical Navigation information for Instrument Approach Procedures does not guarantee step-down fix altitude protection, or arrival at approach minimums in normal position to land.

(e) IFR non-precision approach approval is limited to published approaches within the U.S. National Airspace System. Approaches to airports in other airspace are not approved unless authorized by the appropriate governing authority.

(f) RNAV (GPS) approaches must be conducted utilizing the GPS sensor.

(g) When conducting missed approach procedures, autopilot (if installed) coupled operation is prohibited until the pilot has established a rate of climb that ensures all altitude requirements of the procedure will be met.

(h) RNP RNAV operations are not authorized, except as noted in item 4 of Section I of this AFMS.

5. If not previously defined, the following default settings must be made in the "SYSTEM SETUP" menu of the G1000 prior to operation (refer to Pilot's Guide for procedure if necessary):

   (a) **DIS, SPD** .....nm kt (sets navigation units to "nautical miles" and "knots")

   (b) **ALT, VS** .....ft fpm (sets altitude units to "feet" and "feet per minute")

   (c) **MAP DATUM** ..WGS 84 (sets map datum to WGS-84, see note below)

   (d) **POSITION**.....deg-min (sets navigation grid units to degree-minutes)

NOTE

In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the G1000 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the G1000 prior to its use for navigation.

6. Operation is prohibited north of 70°N and south of 70°S latitudes. In addition, operation is prohibited in the following two regions: 1) north of 65°N between 75°W and 120°W longitude and 2) south of 55°S between 120°E and 165°E longitude.

7. CDI sequencing of the ILS must be set to manual for instrument approaches conducted with the autopilot coupled (if installed). If the CDI source is changed when the autopilot is engaged in NAV mode, the autopilot lateral mode will revert to ROLL ATTITUDE mode and NAV mode must be manually reselected by the pilot.

8. The fuel quantity, fuel required, and fuel remaining functions of the FMS are supplemental information only and must be verified by the flight crew.

9. The pilot's altimeter is the primary altitude reference during all operations using advisory vertical navigation information.

10. If a KAP 140 autopilot is installed, autopilot-coupled ILS, LOC, LDA, and Back Course approaches are prohibited with direct crosswinds greater than 15 knots with greater than light turbulence.

11. Navigation must not be predicated upon the use of the Terrain or Obstacle data displayed by the G1000.

NOTE: The terrain display is intended to serve as a situational awareness tool only. It may not provide either the accuracy or fidelity, or both, on which to solely base decisions and plan maneuvers to avoid terrain or obstacles.

12. The Terrain/Obstacle/Airport databases have an area of coverage as detailed below:

    (a) The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.

    (b) The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.

    (c) The Obstacle Database has an area of coverage that includes the United States.

    NOTE: The area of coverage may be modified, as additional terrain data sources become available.

13. The ADF aural identifier must be monitored any time the ADF is used as the primary source of navigation.

14. Display of NEXRAD information on the NAVIGATION map of the MFD, and the inset map on the PFD, is prohibited for ranges of 30 NM or less, except in North Up display mode.

2.3 AIRSPEED MARKINGS

Marking	IAS	Significance
Red band	20 KIAS – 53 KIAS	Low speed awareness – stall is imminent
Yellow band	53 KIAS – 58 KIAS	Low speed awareness – reduced airspeed margin to stall
White band	58 KIAS – 91 KIAS	Operating range with flaps fully extended
Green band	58 KIAS – 129 KIAS	Normal operating range
Yellow band	129 KIAS – 178 KIAS	Caution range – smooth air only
Red band	178 KIAS and greater	Lower limit of 178 KIAS is the maximum speed for all operations

The airspeed indicator is marked in IAS values.

2.5 ENGINE INSTRUMENT MARKINGS

Engine instrument markings and their color code significance are shown in the table below.

NOTE

When an indication lies in the upper or lower prohibited range, the legend for that display will change to the color of the prohibited range and will begin flashing as well.

Indication	Red arc or bar = Lower prohibited range	Yellow arc or bar = Caution range	Green arc or bar = Normal operating range	Yellow arc or bar = Caution range	Red arc or bar = Upper prohibited range
Manifold Pressure In. – Hg *Note 2*	--	--	13 – 30	--	--
RPM	--	--	500 – 2700	--	>2700 *Note 3*
Oil Temp °F	--	--	149 – 230	231 - 245	>245
Cylinder Head Temp °F	--	--	150 – 475	476 – 500	>500
Fuel Press PSI (DA 40) *Note 4*	0 – 14	--	14 – 35	--	>35
Oil Press PSI	0 – 25	25 - 55	56 – 95	96 - 97	>97
Fuel flow Gal/hr	--	--	1 – 20	--	>20
Voltage Volts	0 – 24.1	24.1 – 25	25.1 – 30	30.1 – 32	>32
Amperage Amps	--	--	2 – 75	--	--
Fuel quantity US gal Standard Tanks	0	–	<0 – 17	--	--
Fuel quantity US gal Long Range Tanks	0	--	<0 – 16 19 – 24	--	--

Note 2: Not applicable to DA 40 F. Manifold Pressure gauge is not installed in the DA 40 F.

Note 3: To prevent nuisance alerts during normal takeoffs, the legend "RPM" and digits will not turn red or flash until the RPM exceeds 2780.

Note 4: Fuel Pressure Gauge is optional for DA 40 aircraft.

2.6 WARNING, CAUTION AND STATUS MESSAGES

The following tables show the color and significance of the warning, caution, and advisory messages which may appear on the G1000 displays.

NOTE

The G1000 Cockpit Reference Guide and the G1000 Pilot's Guide contain detailed descriptions of the annunciator system and all warnings, cautions and advisories.

Warning annunciations – Red	
Annunciation	**Cause**
OIL PRES LO	Oil pressure is less than 25 psi
FUEL PRES LO (DA40 Only)	Fuel pressure is less than 14 psi
FUEL PRES HI (DA 40 Only)	Fuel pressure is greater than 35 psi
ALTERNATOR	Alternator failure
STARTER ENGD	Operation of the starter without the key in the start position, or failure of the starter motor to disengage from the engine after starting
DOOR OPEN	Front canopy and/or rear door not completely closed and locked
TRIM FAIL	Failure of the automatic trim system of the autopilot (if installed)
Caution annunciations – Yellow	
Annunciation	**Cause**
PITOT OFF	Pitot heat is not switched on
PITOT FAIL	Fault in the pitot heating system
L FUEL LOW	Fuel quantity in the left tank is less than 3 US gal (+1 US gal)
R FUEL LOW	Fuel quantity in the right tank is less than 3 US gal (+1 US gal)
LOW VOLTS	On-board voltage below 24 volts

Advisory annunciations – White	
Annunciation	**Cause**
PFD FAN FAIL	The cooling fan for the PFD is inoperative.
MFD FAN FAIL	The cooling fan for the MFD is inoperative.
GIA FAN FAIL	The cooling fan for the GIA is inoperative.

2.13 KINDS OF OPERATION

Minimum operational equipment (serviceable)

Equipment	Number installed	VFR Day	VFR Night	IFR
Primary Flight Display	1	1	1	1
Multi-Function Display	1	1	1	1
Audio panel	1	1	1	1
Air data computer	1	1	1	1
Attitude and Heading Reference System	1	-	1	1
Static dischargers	7	-	-	7
GPS	2	-	1	2

2.14 FUEL

Fuel Quantity: Total fuel quantity:

Standard Tanks:	2 x 20.6 US gal (approx. 156 liters)
Long Range Tanks:	2 x 24.0 US gal (approx. 185 liters)

Unusable fuel: 2 x 0.5 US gal (approx. 3.8 liters)

Max. Indicated Fuel Quantity:

Standard Tanks:	17 US gal per tank
Long Range Tanks:	24.0 US gal per tank

Max. permissible difference between right and left tank:

Standard Tanks:	10 US gal (approx. 38 liters)
Long Range Tanks:	8 US gal (approx. 30.3 liters)

2.15 Limitation Placard

Below the MFD, next to the fuel quantity indication:

Standard Tanks

Fuel qty. Indication: max 17 US gal
Max. difference LH/RH tank: 10 US gal
For use of max. tank capacity see AFM

Long Range Tanks

Fuel qty. Indication: max 24 US gal
Refer to AFM to use entire tank capacity
Max. difference LH/RH tank: 8 US gal

SECTION III
EMERGENCY PROCEDURES

GENERAL

1. If Garmin G1000 GPS navigation information is not available or invalid, utilize remaining operational navigation equipment as required.
2. If the "POSN ERROR" annunciation is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the G1000 VOR/ILS receivers or an alternate means of navigation other than the G1000 GPS receivers.
3. If the "RAIM UNAVAIL" annunciation is displayed in the enroute, oceanic, terminal, or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the G1000 GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the G1000 VOR/ILS receiver or another IFR-approved navigation system.
4. If the "RAIM UNAVAIL" annunciation is displayed while on the final approach segment, GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity (0.3 nautical mile). After 5 minutes the system will flag and no longer provide course guidance with approach sensitivity. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity and integrity by executing the missed approach.
5. In an in-flight emergency, depressing and holding the Com transfer button for 2 seconds will tune the emergency frequency of 121.500 MHz. If the display is available, it will also show it in the "Active" frequency window.
6. The following warnings and cautions appear in various locations on the PFD or MFD.

Annunciation	Cause
AHRS Aligning – Keep Wings Level	Attitude and Heading Reference System is aligning. Keep wings level using standby attitude indicator.
ATTITUDE FAIL	Display system is not receiving attitude reference information from the AHRS; accompanied by the removal of sky/ground presentation and a red X over the attitude area.
AIRSPEED FAIL	Display system is not receiving airspeed input from the air data computer; accompanied by a red X through the airspeed display
ALTITUDE FAIL	Display system is not receiving altitude input from the air data computer; accompanied by a red X through the altimeter display
VERT SPEED FAIL	Display system is not receiving vertical speed input from the air data computer; accompanied by a red X through the vertical speed display
HDG	Display system is not receiving valid heading input from the AHRS; accompanied by a red X through the digital heading display
Red X	A red X through any display field, such as com frequencies, nav frequencies, or engine data, indicates that display field is not receiving valid data.
INTEG	RAIM is not available.
WARN	RAIM position warning – nav deviation bar removed

3.2.3 ENGINE PROBLEMS IN FLIGHT

(h) High Fuel Flow – (DA 40 only)

Fuel flow in red sector

1. Fuel pressure ..... check for red FUEL PRESS LO message

   - If fuel pressure is low (FUEL PRESS LO message), there is possibly a leak (between the injection system and the injectors). Land at the nearest available airport.
   - If there is no FUEL PRESS LO message, there is no leak; the likely cause is a defective fuel flow indication, which should thus be ignored (the airplane should be serviced). Fuel flow data should be taken from the engine performance table in Chapter 5 of the AFM.

(g) High Fuel Flow – (DA 40 F only)

1. Fuel Quantity ..... Check and Monitor
2. Power Setting ..... Check

Land as soon as practical. Consider the reduced range and endurance due to possible loss of fuel.

NOTE

Have the airplane inspected before next flight.

3.3.3 SMOKE AND FIRE IN FLIGHT

(b) Electrical fire with smoke in flight

3. Emergency switch ..... ON if installed

CAUTION

Switching OFF the master switch (ALT/BAT) will lead to total loss of all electronic and electric equipment, including the AHRS and attitude display.

However, by switching the HORIZON EMERGENCY switch ON, the emergency battery will supply power to the standby attitude gyro (artificial horizon) and the flood light.

In case of extreme smoke development, the front canopy may be unlatched during flight. This allows it to partially open, in order to improve ventilation. The canopy will remain open in this position. Flight characteristics will not be affected significantly.

4. Master switch (ALT/BAT) ..... OFF
5. Cabin heat ..... OFF
6. Emergency window(s) ..... OPEN
7. Use standby instruments for airspeed, altitude and attitude reference, if necessary
8. Land at the nearest suitable airport as soon as possible

If electronic or avionics equipment is required for continued flight, the following procedure may be used to isolate the source of the smoke or fumes:

7. BATtery switch ..... ON
8. ESS BUS switch ..... ON

NOTE

This removes power from the main and avionics busses, but does not allow alternator operation. See the table at the end of this section for the equipment which is still available.

If smoke or fumes decrease:

9. Land at the nearest suitable airport as soon as possible

If smoke or fumes persist:

10. ALTernator switch ..... ON
11. ESS BUS switch ..... OFF
12. BATT and ESS TIE circuit breakers ..... PULL

This removes power from the essential bus and restores power to the main and avionics busses. See the table at the end of this section for the equipment which will still be available.

13. Use standby instruments for attitude, airspeed and altitude
14. Refer to Section 3.7.2 (b) of this Supplement, Alternator Failure
15. Land at the nearest suitable airport as soon as possible

The equipment available on **Essential Bus** only (operating on battery only and the Essential Bus switch selected) is:

Air Data Computer (airspeed, altitude, vertical speed, OAT, TAS)
Attitude and Heading Reference System (attitude, heading)
PFD (in composite mode)
Pitot Heat
Flaps
Com 1
GPS/Nav 1
Transponder
Landing light
Instrument flood lights
Engine instruments
Starter

Refer to the "Essential Bus" area of the circuit breaker panel for a quick reference to equipment on the Essential Bus.

Equipment available on the **Main and Avionics Busses** only:

Com 2
GPS/Nav 2
MFD
Electric fuel pump
Instrument lights
Strobe lights

Position lights
Taxi light

Refer to the "Main Bus" and "Avionics Bus" areas of the circuit breaker panel for a quick reference to equipment on those busses.

3.7.1 ICING

Unintentional flight into icing conditions

1. Leave the icing area (by changing altitude or turning back, in order to reach zones with a higher ambient temperature).
2. Pitot heating ..... ON
3. Cabin heat ..... ON
4. Air distribution lever ..... ▲(UP)
5. RPM ..... increase, in order to prevent ice build-up on the propeller blades
6. Alternate Air **(DA 40 only)** ..... OPEN

6a Carburetor Heat **(DA 40 F only)** ..... HOT

7. Emergency window(s) ..... open if required

CAUTION

Ice build-up increases the stalling speed. If required for safety reasons, engine speeds up to 2700 RPM are permissible without time limit.

8. ATC ..... advise if an emergency is expected

CAUTION

When the pitot heating fails (yellow PITOT FAIL annunciation), and the alternate static valve is installed:

9. Alternate static valve ..... OPEN
10. Emergency window(s) ..... close

3.7.2 FAILURES IN THE ELECTRICAL SYSTEM

(b) Alternator failure

An alternator failure is indicated by a red ALTERNATOR message and an ammeter indication of 0 Amps.

1. Circuit breakers ..... Check in
2. ALTernator switch ..... OFF, then ON

If alternator does not come back on line (message extinguishes and ammeter indication greater than zero):

3. ESS BUS switch ..... ON
4. Switch off any non-essential electrical loads.
5. Land within 30 minutes

If PFD attitude information is lost prior to landing:

6. HORIZON EMERGENCY Switch ..... ON

CAUTION

The following items are available on the Essential Bus:

- PFD in composite (backup) format
- NAV/COM 1
- GPS 1
- Attitude and Heading Reference System (AHRS)
- Air Data Computer
- Pitot heat
- Engine instruments
- Transponder
- Flood light
- Landing light

Refer to the ESSENTIAL BUS area of the circuit breaker panel for a quick reference to equipment on those busses. These items of equipment can be supplied with power by the battery for at least 30 minutes. During this 30-minute period, the airplane must be landed at a suitable airport. Economical use of electrical equipment, in particular of pitot heat, and switching off equipment that is not needed extends the time during which the other equipment remains available.

For cases in which the battery capacity is not sufficient to reach a suitable airport, an emergency battery is installed to power the standby attitude gyro and floodlight. This battery is switched on with the HORIZON EMERGENCY Switch. It provides power for 1 hour and 30 minutes when the floodlight is switched on.

3.8 AVIONICS EMERGENCIES

3.8.1 PFD OR MFD DISPLAY FAILURE

a) DISPLAY BACKUP button on audio panel.....PUSH

3.8.2 AHRS FAILURE

NOTE

A failure of the Attitude and Heading Reference System (AHRS) is indicated by removal of the sky/ground presentation and a red X and a yellow "AHRS FAILURE" shown on the PFD. The digital heading presentation will be replaced with a yellow "HDG" and the compass rose digits will be removed. The course pointer will indicate straight up and course may be set using the digital window.

1. Use Standby Attitude Indicator, magnetic compass and Navigation Map
2. Course..... Set using digital window

3.8.3 AIR DATA COMPUTER (ADC) FAILURE

NOTE

Complete loss of the Air Data Computer is indicated by a red X and yellow text over the airspeed, altimeter, vertical speed, TAS and OAT displays. Some FMS functions, such as true airspeed and wind calculations, will also be lost.

1. Use Standby Airspeed Indicator and Altimeter
2. Land as soon as practical at a suitable airport

3.8.4 ERRONEOUS OR LOSS OF ENGINE AND FUEL DISPLAYS

NOTE

Loss of an engine parameter is indicated by a red X through the data field. Erroneous information may be identified by indications that do not agree with other system information. Erroneous indications may be determined by comparing a display with other displays and other system information.

1. Set power based on throttle lever position, engine noise, and speed.

2. Monitor other indications to determine the health of the engine.

3. Use known power settings from Table 5.3.2 (DA 40) or Charts 5.3.8 (DA 40 F) of AFM for approximate fuel flow values.

4. Use other system information, such as annunciator messages, ENGINE SYSTEM page, and AUX – TRIP PLANNING page to safely complete the flight.

3.8.5 ERRONEOUS OR LOSS OF WARNING/CAUTION ANNUNCIATORS

NOTE

Loss of an annunciator may be indicated when engine or fuel displays show an abnormal or emergency situation and the annunciator is not present. An erroneous annunciator may be identified when an annunciator appears which does not agree with other displays or system information.

1. If an annunciator appears, treat it as if the condition exists. Refer to the AFM Emergency or Abnormal procedures or the procedures contained in this AFMS.

2. If a display indicates an abnormal condition but no annunciator is present, use other system information, such as engine displays, ENGINE SYSTEM page, GAL REM and FFLOW GPH displays, to determine if the condition exists. If it cannot be determined that the condition does not exist, treat the situation as if the condition exists. Refer to the AFM Emergency or Abnormal procedures or the procedures contained in this AFMS.

SECTION IVA
NORMAL PROCEDURES

WARNING

The G1000 altitude references (digits and altimeter bug) are included to increase altitude awareness, and are not connected in any way to the KAP 140 autopilot (if installed). Altitude alerter and autopilot functions are accomplished with the altitude set function of the KAP 140 autopilot if installed.

NOTE

Readability of the PFD and MFD displays may be degraded when wearing polarized sunglasses.

1. DETAILED OPERATING PROCEDURES

Normal operating procedures for the G1000 are described in the Garmin G1000 Cockpit Reference Guide and the Garmin G1000 Pilot's Guide.

PRE-FLIGHT INSPECTION

I. Cabin check

a) MET, NAV, Mass & CG ..... flight planning complete
b) Airplane documents ..... complete and up-to-date
c) Ignition key ..... pulled out
d) Front canopy & rear door ..... clean, undamaged
e) All electrical equipment ..... OFF
f) Circuit breakers ..... set in (if one has been pulled, check reason)
g) Engine control levers ..... check condition, freedom of movement
Full travel of throttle,
Full Travel of RPM (DA 40 only)
Full Travel of mixture lever
h) Throttle ..... IDLE
i) Mixture control lever ..... LEAN
j) RPM lever (DA 40 only) ..... HIGH RPM
k) Carburetor Heat (DA 40 F only) ..... COLD
l) Master switch (BAT) ..... ON
m) Fuel Quantity ..... check fuel qty. on EIS
check with fuel qty. measuring device

NOTE

FOR STANDARD TANKS, when the fuel quantity indicator reads 17 US gal the correct fuel quantity must be determined with the fuel quantity measuring device. If this measurement is not carried out, the fuel quantity available for flight planning is 17 US gal.

FOR LONG RANGE TANKS, when the fuel indicator reads 16 US gal the correct fuel quantity must be determined with the fuel quantity measuring device. There are 3 US gal of ungauged fuel from 16 to 19 US gal. If this measurement is not carried out, the fuel quantity available for flight planning is 16 US gal.

n) Position lights, strobe light (ACL's) ..... check
o) Master switch (BAT) ..... OFF
p) Check for loose items ..... complete
q) Flight controls and trim ..... free to move and correct
r) Baggage ..... stowed and secure

NOTE

Refer to DA 40 and DA 40 F AFMs to complete the Walk-around check, visual inspection

BEFORE STARTING ENGINE

1. Preflight inspection ..... Complete
2. Rudder pedals ..... Adjusted and locked
3. Passengers ..... Instructed
4. Safety Harnesses ..... All on and fastened
5. Rear door ..... Closed and locked
6. Door lock (if installed) ..... Unblocked, key removed
7. Front canopy ..... Position 1 or 2 ("cooling gap")
8. Canopy lock (if installed) ..... Unblocked, key removed
9. Parking brake ..... Set
10. Flight controls ..... Freedom of movement and proper direction
11. Trim wheel ..... T/O
12. Friction device, throttle quadrant ..... Adjusted
13. Throttle ..... IDLE
14. Mixture control lever ..... LEAN
15. RPM lever (DA 40 only) ..... HIGH RPM
16. Carburetor heat (DA 40 F only) ..... COLD
17. Alternate air (DA 40 only) ..... CLOSED
18. Alternate Static Valve ..... CLOSED, if installed

19. Avionics master switch ..... OFF
20. Essential Bus switch ..... OFF

CAUTION

When the essential bus is switched ON, the battery will not be charged.

21. BATtery switch ..... ON
22. Fuel tank selector ..... on fullest tank

WARNING

Never move the propeller by hand while the ignition is switched on, as it may result in serious personal injury.

Never try to start the engine by hand.

STARTING ENGINE (DA 40 only)

(a) Cold engine

1. Strobe light (ACL) ..... ON
2. Electrical fuel pump ..... ON, note pump noise (=functional check of pump)
3. Throttle ..... 3 cm (1.2 in) forward from IDLE (measured from rear of slot)
4. Mixture control lever ..... RICH for 3 – 5 sec, then LEAN
5. Throttle1 cm (0.4 in) forward from ..... IDLE (measured from rear of slot)

WARNING

Before starting the engine, the pilot must ensure that the propeller area is free, and no persons can be endangered.

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

CAUTION

The use of an external pre-heater and external power source is recommended whenever possible, in particular at ambient temperatures below 0°C (32°F), to reduce wear and abuse to the engine and electrical system. Pre-heat will thaw the oil trapped in the oil cooler, which can be congealed in extremely cold temperatures. After a warm-up period of approximately 2 to 5 minutes (depending on the ambient temperature) at 1500 RPM, the engine is ready for takeoff if it accelerates smoothly and the oil pressure is normal and steady.

When engine starts:

6. Mixture control lever ..... rapidly move to RICH
7. Oil pressure ..... green arc within 15 sec
8. Electrical fuel pump ..... OFF

WARNING

If the oil pressure has not moved into the green arc within 15 seconds after starting, SWITCH OFF ENGINE and investigate problem.

9. ALTernator switch ..... ON
10. Ammeter ..... Check
11. Fuel pressure ..... Check no messages illuminated
12. Annunciator section of PFD ..... Check

(b) Warm engine

1. Strobe light (ACL) ..... ON
2. Electrical fuel pump ..... ON, note pump noise (=functional check of pump)
3. Throttle ..... 3 cm (1.2 in) forward from IDLE (measured from rear of slot)
4. Mixture control lever ..... RICH for 1 - 3 sec, then LEAN

WARNING

Before starting the engine, the pilot must ensure that the propeller area is free, and no persons can be endangered.

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Ignition switch ..... START

When engine starts:

6. Mixture control lever ..... rapidly move to RICH
7. Oil pressure ..... green arc within 15 sec

WARNING

If the oil pressure has not moved into the green arc within 15 seconds after starting, SWITCH OFF ENGINE and investigate problem.

8. Electrical fuel pump ..... OFF
9. ALTernator switch ..... ON
10. Ammeter ..... Check
11. Fuel pressure ..... Check no messages illuminated
12. Annunciator section of PFD ..... Check

(c) Engine will not start after injection ("flooded engine") Warm engine

1. Strobe light (ACL) ..... ON
2. Electrical fuel pump ..... ON, note pump noise (=Functional check of pump)
3. Mixture control lever ..... LEAN, fully aft
4. Throttle ..... at mid position

WARNING

Before starting the engine, the pilot must ensure that the propeller area is free, and no persons can be endangered.

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Ignition switch ..... START
6. Throttle ..... pull back towards IDLE when engine starts

When engine starts:

7. Mixture control lever ..... rapidly move to RICH
8. Oil pressure ..... green arc within 15 sec

WARNING

If the oil pressure has not moved into the green arc within 15 seconds after starting, SWITCH OFF ENGINE and investigate problem.

9. ALTernator switch ..... ON
10. Ammeter ..... Check
11. Fuel pressure ..... Check no messages illuminated
12. Annunciator section of PFD ..... Check

STARTING ENGINE (DA 40 F only)

(a) Cold engine

1. Strobe light (ACL) ..... ON
2. Mixture ..... fully RICH
3. Electrical fuel pump ..... ON, note pump noise (=functional check of pump)
4. Throttle ..... ¼ travel forward from IDLE
5. Prime ..... 1 – 4 seconds (electric pump)

WARNING

Use the primer system to prepare the engine for a starting attempt. Do not use the throttle to pump fuel through the carburetor to the engine for priming since this may lead to carburetor fire. The primer system delivers fuel to the cylinders directly.

CAUTION

The priming system is not intended for operation in flight.

WARNING

Before starting the engine, the pilot must ensure that the propeller area is free, and no persons can be endangered.

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

CAUTION

The use of an external pre-heater and external power source is recommended whenever possible, in particular at ambient temperatures below 0°C (32°F), to reduce wear and abuse to the engine and electrical system. Pre-heat will thaw the oil trapped in the oil cooler, which can be congealed in extremely cold temperatures. After a warm-up period of approximately 2 to 5 minutes (depending on the ambient temperature) at 1500 RPM, the engine is ready for takeoff if it accelerates smoothly and the oil pressure is normal and steady.

6. Starter ..... engage

When engine starts:

7. Oil pressure ..... green arc within 15 sec
8. Throttle ..... set 1000 RPM
9. Electrical fuel pump ..... OFF

WARNING

If the oil pressure has not moved into the green arc within 15 seconds after starting, SWITCH OFF THE ENGINE and investigate problem.

10. ALTernator switch ..... ON
11. Ammeter ..... Check
12. Annunciator section of PFD ..... Check

(b) Warm engine

1. Strobe light (ACL) ..... ON
2. Mixture ..... fully RICH
3. Electrical fuel pump ..... ON, note pump noise (=functional check of pump)
4. Throttle ..... ¼ travel forward from IDLE

WARNING

Before starting the engine, the pilot must ensure that the propeller area is free, and no persons can be endangered.

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Starter ..... engage

When engine starts:

6. Oil pressure ..... green arc within 15 sec
7. Throttle ..... set 1000 RPM
8. Electrical fuel pump ..... OFF

WARNING

If the oil pressure has not moved into the green arc within 15 seconds after starting, SWITCH OFF THE ENGINE and investigate problem.

9. ALTernator switch ..... ON
10. Ammeter ..... Check
11. Annunciator section of PFD ..... Check

(c) Engine will not start after priming ("flooded engine")

1. Strobe light (ACL) ..... ON
2. Electrical fuel pump ..... OFF
3. Mixture ..... LEAN, fully aft
4. Throttle ..... MAX PWR

WARNING

Before starting the engine, the pilot must ensure that the propeller area is free, and no persons can be endangered.

CAUTION

Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool for 30 minutes before further start attempts.

5. Starter ..... engage

When engine starts:

6. Throttle ..... pull back towards IDLE when engine fires
7. Oil pressure ..... green arc within 15 sec

WARNING

If the oil pressure has not moved into the green arc within 15 seconds after starting, SWITCH OFF THE ENGINE and investigate problem.

8. Throttle ..... set 1000 RPM
9. ALTernator switch ..... ON
10. Ammeter ..... Check
11. Annunciator section of PFD ..... Check

BEFORE TAXIING

1. Avionics master switch ..... ON
2. Electrical equipment ..... On as required
3. Flaps ..... UP – T/O – LDG – T/O (indicator and visual check)
4. Flight instruments and avionics ..... set, test function, as required
5. (set both altimeters)
6. Flood light ..... ON, test function, as required
7. Ammeter ..... check, if required increase RPM
8. Fuel tank selector ..... change tanks, confirm that engine also runs on other tank (at least 1 minute at 1500 RPM)
9. Pitot heating ..... ON, test function – no yellow PITOT FAIL annunciation
10. Pitot heating ..... OFF if not required (yellow PITOT OFF annunciation)
11. Strobe lights (ACLs) ..... check ON, test function, as required
12. Position lights, landing and taxi lights ..... ON, test function, as required

CAUTION

When taxiing at close range to other aircraft, or during night flight in clouds, fog or haze, the strobe lights should be switched OFF. The position lights must always be switched ON during night flight.

13. Throttle ..... check, 600 to 800 RPM

BEFORE TAKE-OFF

1. Position airplane into wind if possible
2. Parking brake ..... set
3. Safety harnesses ..... on and fastened
4. Rear door ..... check closed and locked
5. Front canopy ..... closed and locked

CAUTION

When operating the canopy, pilots / operators must ensure that there are no obstructions between the canopy and the mating frame, for example seat belts, clothing, etc. When operating the locking handle do NOT apply undue force.

A slight downward pressure on the canopy may be required to ease the handle operation.

6. Door warning light (DOOR OPEN) ..... Check no messages illuminated

7. Fuel tank selector ..... fullest tank
8. Engine instruments ..... in green sector
9. Circuit breakers ..... pressed in
10. Fuel pressure ..... Check no messages illuminated
11. Electric fuel pump ..... ON
12. Mixture control lever ..... RICH (below 5000 ft)

NOTE

At a density altitude of 5000 ft or above or at high ambient temperatures, a fully rich mixture can cause rough running of the engine or a loss of performance. The mixture should be set for smooth running engine.

13. Flaps ..... check T/O
14. Trim ..... check T/O
15. Flight controls ..... free movement, correct sense
16. Throttle ..... 2000 RPM (DA 40)
    1800 RPM (DA 40 F)
17. Magneto check ..... L-BOTH-R-BOTH
    Max. RPM drop ..... 175 RPM
    Max. difference ..... 50 RPM

CAUTION

The lack of an RPM drop suggests a faulty ground or incorrect ignition timing. In case of doubt the magneto check can be repeated with a leaner mixture, in order to confirm a problem. Even when running on only one magneto the engine should not run unduly roughly.

18. RPM lever (DA 40 only) ..... pull back until a drop of max. 500 RPM is reached – HIGH RPM; Cycle 3 times

18a Carburetor Heat (DA 40 F only).....check function
18b Throttle (DA 40 F only)..... MAX PWR, minimum 2200 RPM

NOTE (DA 40 F only)

The result of the ground check at full throttle depends on a number of environmental factors, e.g. temperature, ambient air pressure and in particular head or tailwind components. Headwind will cause a higher RPM than tailwind.

19. Throttle..... set 1000 RPM
20. Carburetor Heat (DA 40 F only).....check COLD
21. Alternate Air (DA 40 only)..... check CLOSED
22. Parking brake.....release
23. Landing light.....ON as required

SECTION IVB
ABNORMAL PROCEDURES

4B.3 FAILURES IN THE ELECTRICAL SYSTEM

(a) Low voltage caution (LOW VOLTS)

This caution is indicated when the normal on-board (bus) voltage (28V) drops below 24V.

Possible reasons are:

-A fault in the power supply

-RPM is too low

(i) Low voltage on the ground:

1. Engine speed ..... 1200 RPM
2. Electrical equipment ..... OFF
3. Ammeter and voltmeter ..... check

If the caution message does not extinguish, and the ammeter legend flashes and reads zero, discontinue the flight.

(ii) Low voltage caution during flight:

1. Electrical equipment ..... OFF if not needed
2. Ammeter and Voltmeter ..... check

If the caution message does not go out, and the ammeter legend flashes and reads zero, follow procedure 3.7.2(b) – Alternator Failure, in this Supplement.

(iii) Low voltage caution during landing:

-Follow (i) after landing

SECTION V
PERFORMANCE
No change.

SECTION VI
WEIGHT AND BALANCE
See current weight and balance data.

SECTION VII
SYSTEM DESCRIPTIONS

The Garmin G1000 Integrated Avionics System consists of a Primary Flight Display (PFD), a Multi-Function Display (MFD), an Audio Panel, and Attitude and Heading Reference System (AHRS), an Air Data Computer (ADC), and the sensors and computers to process flight and engine information for display to the pilot. The system contains dual GPS receivers, dual VOR/ILS receivers, dual VHF communications transceivers, a transponder, an Automatic Direction Finder (ADF) receiver, Distance Measuring Equipment (DME), and an integrated annunciation system to alert the pilot of certain abnormal conditions.

The Primary Flight Display (PFD) typically displays airspeed, attitude, altitude, and heading information in a traditional format. Slip information is shown as a trapezoid under the bank pointer. One width of the trapezoid is equal to a one ball width slip. Rate of turn information is shown on the scale above the compass rose; full scale deflection is equal to a standard rate turn. The following controls are available on the PFD (clockwise from top right):

- Communications frequency volume and squelch knob
- Communications frequency set knobs
- Communications frequency transfer button
- Altimeter setting knob (baro set)
- Course knob
- Map range knob and cursor control
- FMS control buttons and knob
- PFD softkey buttons, including master warning/caution acknowledgement
- Altitude reference set knob
- Heading bug control
- Navigation frequency transfer button
- Navigation frequency set knobs
- Navigation frequency volume and Identifier knob

The PFD displays the crew alerting (annunciator) system. When a warning or caution message is received, a warning or caution annunciator will flash on the PFD, accompanied by an aural tone. A warning is accompanied by a repeating tone, and a caution is accompanied by a single tone. Acknowledging the alert will cancel the flashing and provide a text description of the message. Refer to the Emergency or Abnormal Procedures Sections of the AFM or this Supplement for the appropriate procedure to follow for each message.

Advisory messages related to G1000 system status are shown in white and are accompanied by a white flashing ADVISORY alert. Refer to the G1000 Pilot's Guide and Cockpit Reference Guide for descriptions of the messages and recommended actions (if applicable).

Trend vectors are shown on the airspeed and altimeter displays as a magenta line predicting 6 seconds at the current rate. The turn rate indicator also functions as a trend indicator on the compass scale.

The PFD can be displayed in a composite format for emergency use by pressing the DISPLAY BACKUP button on the audio panel. In the composite mode, the full crew alerting function remains, but no map functions are available.

The Multi-Function Display (MFD) typically displays engine data, maps, terrain, traffic and topography displays, and flight planning and progress information. The display unit is identical to the PFD and contains the same controls as previously listed.

The audio panel contains traditional transmitter and receiver selectors, as well as an integral intercom and marker beacon system. The marker beacon lights appear on the PFD. In addition, a clearance recorder records the last 2 ½ minutes of received audio. Lights above the selections indicate what selections are active. Pressing the red DISPLAY BACKUP button on the audio panel causes both the PFD and MFD to display a composite mode.

The Attitude and Heading Reference System (AHRS) uses GPS, rate sensors, air data, and magnetic variation to determine pitch and roll attitude, sideslip and heading. Operation is possible in a degraded mode if the system loses any of these inputs. Status messages alert the crew of the loss of any of these inputs. The AHRS will align while the aircraft is in motion, but will align more quickly if the wings are kept level during the alignment process.

The Air Data Computer (ADC) provides airspeed, altitude, vertical speed, and air temperature to the display system. In addition to the primary displays, this information is used by the FMS and TIS systems.

Engine instruments are displayed on the MFD. Discrete engine sensor information is processed by the Garmin Engine Airframe (GEA) sub-system. When an engine sensor indicates a value outside the normal operating range, the legend will turn yellow for caution range, and turn red and flash for warning range.

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
GARMIN G1000 INTEGRATED AVIONICS SYSTEM

DIAMOND MODEL DA 40
DIAMOND MODEL DA 40 F

Refer to the Garmin G1000 Cockpit Reference Guide for descriptions of the G1000 system and operating procedures. Refer to the following table to determine the appropriate guide. The System Software Version number is displayed at the top, right side of the MFD Power-up page. DA 40 F requires System Software Version 0369.07 or later FAA approved software.

System Software Version	Pilot's Guides
0369.04	**Garmin G1000 Cockpit Reference Guide (CRG)** P/N 190-00324-00, dated May, 2004 or later appropriate revision
0369.06	**Garmin G1000 Cockpit Reference Guide (CRG)** P/N 190-00324-01, dated February, 2005 or later appropriate revision
0369.07 0369.08	**Garmin G1000 Cockpit Reference Guide (CRG)** P/N 190-00324-03, dated June, 2005 or later appropriate revision
0369.09	**Garmin G1000 Cockpit Reference Guide (CRG)** P/N 190-00324-04, Revision A or later appropriate revision.

7.10 FUEL SYSTEM

Fuel Quantity Indication

Each fuel tank has a capacity probe that ascertains fuel quantity in that tank. Standard Tank configurations have two fuel probes, one in each wing. Long Range Tank configurations have four fuel probes, two in each wing, an outboard tank and an inboard tank. When the fuel quantity indicator reads zero, only unusable fuel remains in the tank. Usable capacity of each tank for the Standard Tank configuration is 20 US gal (76 liters). Usable capacity of an outboard and inboard tank for the Long Range Tank configuration is 24 US gal (91 liters).

Fuel quantity:

Fuel quantity indicating for the Standard Tank configuration functions as described in the DA 40 AFM. Also, refer to the 'G1000 Pilot's Guide for the Diamond DA 40' for additional information about the functionality of the G1000's fuel quantity gauge.

For the Long Range Tank configuration, dual pointers on a linear scale, a top pointer for the left fuel quantity and a bottom pointer for the right fuel quantity indicate fuel quantity. The fuel quantity gauge is marked in five gallon increments starting at zero to 25 US gal. The break in the green band between 16 and 19 US gal shows the ungauged portion of the fuel tanks usable fuel.

When a fuel tank is completely full, the quantity pointer will indicate 24 US gallons. As fuel is consumed from the tank, the pointer will move to the left. Once there is no more measurable fuel in the outboard tank, the pointer migrates over a 30 second period to the 16 US gal position. The pointer will remain at 16 US gallons while the ungauged fuel quantity is consumed. Once the quantity of fuel remaining in the inboard tank is less than 16 gallons, the pointer will begin moving left towards zero. When either pointer enters the amber portion of the scale, the pointer and the gauge title, 'FUEL QTY GAL', will turn amber. When either pointer enters the red portion of the gauge, the pointer will turn red, and the gauge title, 'FUEL QTY GAL', will turn red and flash continuously in inverse video.