

G1000 Post Installation Checkout

Synthetic Vision & Pathways Upgrade

Piper Meridian PA-46-500TP



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CAUTION

The GDUs 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.

NOTE

All G1000 screen shots used in this document are current at the time of initial 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 PURPOSE

This document presents the post-installation procedures which are required to be performed to upgrade the G1000 software and activate Synthetic Vision System / Pathways feature on PA-46-500TP series aircraft.

This document is applicable to the modification defined by Master Drawing List, Garmin drawing 005-00541-02.

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2 SCOPE

Follow the procedures in this document to load new software, configure and test the Garmin G1000 Integrated Avionics System and activate SVS/Pathways in the Piper Meridian PA-46-500TP. The person performing the configuration and testing should read through this entire document prior to beginning any procedures. It is assumed that the person performing the post-installation checks is familiar with the aircraft, has a working knowledge of typical avionics systems, and has experience using the test equipment defined in this document.

NOTE

This entire procedure must be successfully accomplished in order for the G1000/GFC 700 system to be airworthy in the PA-46-500TP Meridian.

2.1 REFERENCE DOCUMENTS

The information that is provided in this document is applicable to the installation of the G1000 system in the Piper Meridian PA-46-500TP. For additional information on the installation, refer to the documents below.

Table 2.1 – Referenced Documentation

PART NUMBER	DOCUMENT
005-00541-02	STC Master Drawing List
005-00541-03	General Arrangement Drawing

2.2 SYSTEM OPERATION

2.2.1 Starting Configuration Mode

To complete this aircraft checkout, a basic understanding of the G1000 configuration mode is required. The configuration mode allows a technician to access certain areas of the system in order to carry out various configurations, calibrations, and checks.

1. To start a GDU 104X in configuration mode, hold down the ENT key (for GDU15XX, ENT key is located on GCU) while applying power.
2. Continue to hold the ENT key until the white letters INITIALIZING SYSTEM appear in the upper left corner of the display.

2.2.2 FMS Cursor

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

- To cycle through different configuration screens:

To change page groups: Rotate the large FMS knob.

To change pages in a group: Rotate the small FMS knob.

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

2.2.3 Softkeys

Some pages have commands or selections that are activated by the GDU 1040 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. Also, a softkey that is highlighted shows the current active selection.

Figure 2.1 – GDU Softkeys



3 APPLICABLE TECHNICAL DATA AND TEST EQUIPMENT

The following test equipment is required to conduct and complete all post installation checkout procedures: (All test equipment should have current calibration records.)

1. VHF NAV/COM, ILS, & DME ramp tester or equivalent
2. Ground power unit capable of supplying 28 VDC power to the aircraft systems and avionics
3. Outdoor line-of-site to GPS satellite signals or GPS indoor repeater
4. Headset/microphone

The following technical data may be referenced throughout the post installation checkout procedures:

Table 3.1 - Technical Documentation

PART NUMBER	DOCUMENT
190-00763-01	G1000 Pilot's Guide for Piper PA-46-500TP Meridian
005-00541-03	General Arrangement Drawing
190-00303-00	G1000 Systems Installation Manual
190-00764-01	G1000 Cockpit Reference Guide for Piper PA-46-500TP Meridian
767-05	Piper PA-46-500TP Airplane Maintenance Manual

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4 LOADER CARDS

NOTE

The G1000 has various features that require the use of unlock/enable cards to activate the feature. Throughout this document these cards are generically referred to as enable cards. In some cases, the actual label on the physical card may say unlock. If uncertain, the technician should verify the card part number prior to use.

Table 4.1 – Required Loader Cards

006-B0720-XX	G1000/PA46 Software Image (where –XX will vary based on version, see Section 4.2)
010-00330-43	(3 Required) Terrain/Obstacle/Airport/Supplemental Data plus Garmin Safe Taxi and NOS Flight Charts (Remains in the bottom slot of the PFD and MFD)
010-00330-50	Chartview Enable Card (see note)
010-00330-51	TAWS Enable Card (see note)
010-00330-55	SVS Enable Card (see note)

4.1 G1000 SOFTWARE IMAGE

All software and configuration files were certified by Garmin as part of the FAA-approved Type Design data. Approved software and hardware definitions are defined on the General Arrangement drawing 005-00541-03.

G1000 software and configuration files are controlled via the approved software image part number listed on the General Arrangement drawing 005-00541-03. This software image is loaded into the G1000 using a software loader card. The installer shall create this software loader card by downloading the approved software image in accordance with Section 4.2.

NOTE

Only SanDisk and Toshiba brand SD cards are recommended for use with the G1000 system.

IMPORTANT!

To satisfy the SYNTHETIC VISION WITH PATHWAYS AND SOFTWARE UPGRADE STC requirements for the PA-46-500TP aircraft, it is critical that the technician installs the correct software image part number when servicing the G1000 system. Approved software image part numbers are defined on the appropriate General Arrangement drawing (see 005-00541-03).

CAUTION

Be cautious when using software loader cards during maintenance. The G1000 system immediately initializes 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 Section 5.2, *before* attempting to use the software loader cards.

4.2 SOFTWARE LOADER CARD CREATION

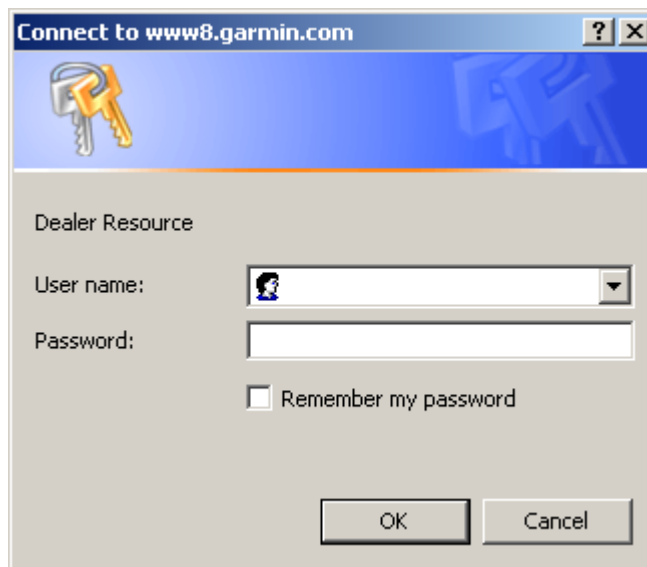
The software image is an executable self-extracting file which builds the correct file structure onto an SD card for use loading software to the G1000 and GFC700. To obtain the current file follow the procedures outlined below.

NOTE

In order to create a loader card, the installer completing these procedures must be an authorized Piper service center to gain access to the necessary data via the Garmin website.

1. Go to www.garmin.com and click on the Dealer Only link in the lower left hand portion of the home page. Enter User name and Password.

Figure 4.1 – Dealer Login

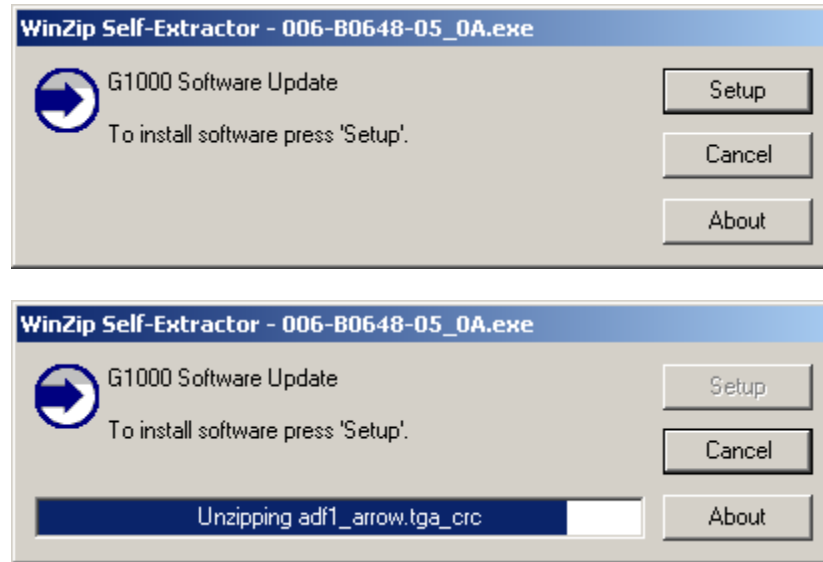


2. Click the Agree button on the confidentiality agreement page.
3. Select the [G1000 Field-Loadable Software Updates](#) link.
4. Select the [G1000 Equipped Piper PA-46](#) hyperlink.
5. A screen similar to the one shown below will appear. Select the appropriate software card part number based upon the information provided in Garmin GA Drawing 005-00541-03. The numbers shown below are for example only.

G1000 System Software Version	Service Bulletin*	Software Card Part Number
0720.05	NA	006-B0720-05

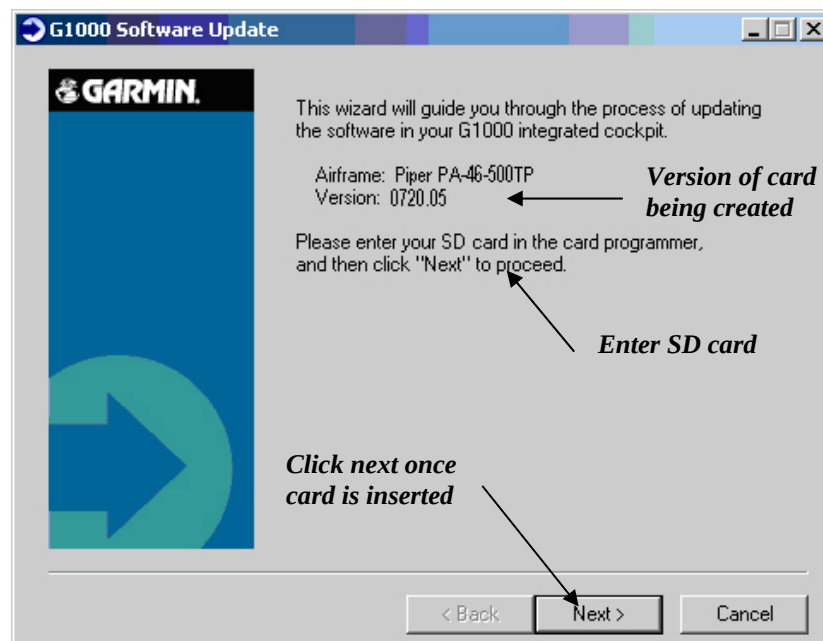
6. Select the appropriate hyperlink and save the file to the local hard drive.

7. Double-click the .exe file that was downloaded. The following window will pop-up on the screen. Ensure that there is an empty SD card in the card reader and then click Setup.

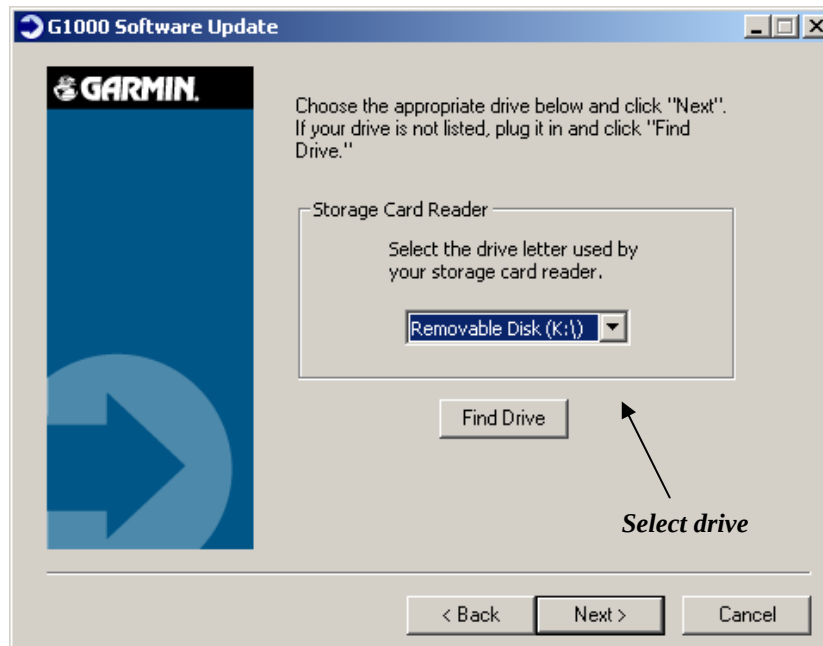


NOTE

When the extraction begins, the program automatically deletes all current files on the SD card and copies the selected files to it, regardless of the file format on the SD card. Ensure files are not necessary or card is empty before proceeding



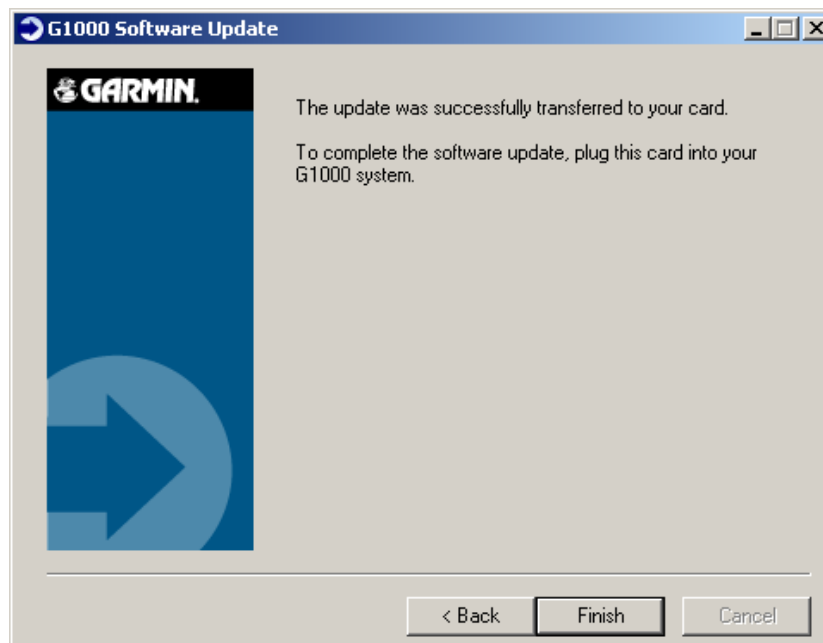
8. Ensure the card and correct drive letter is used, and click next.



A window will pop-up onto the screen to indicate file progress.



9. Once successfully completed, the following message/window will pop-up. Click Finish to finalize SD card.



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5 POST INSTALLATION PROCEDURES

5.1 G1000 HARDWARE/SOFTWARE COMPATIBILITY CHECK

A software loader card is required to install software and configuration settings to a G1000 system. The part number of the software image used to create the loader card is directly associated with the combination of software file part numbers and version levels that are defined on Garmin drawing 005-00541-03. Should software part numbers or versions change, a new software image part number is issued.

The Synthetic Vision and Pathways Upgrade General Arrangement (GA) drawing, Garmin Part Number 005-00541-03, shows all available combinations of hardware and software images. Using the GA drawing, the technician must verify that all hardware part numbers are compatible with the newly created loader card (See Section 4.2) to be used. The GA drawing allows the technician to correlate each LRU hardware part number to a compatible software image.

IMPORTANT!

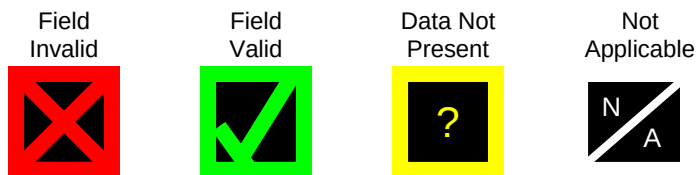
After verifying hardware/loader card compatibility, record the software image part number and all LRU hardware part numbers in the appropriate aircraft records before proceeding.

NOTE

Throughout the next section of this document, screen shots and examples are used to illustrate the software and configuration loading process. These screen shots are provided as reference only. Always refer to the General Arrangement drawing for the correct software file names, versions and part numbers.

NOTE

In GDU v9.10, the status fields, while in configuration mode, were changed to provide a more clear view of the data status. The changes were to add a characterization to the colors. The changes are indicated below, but are not included in the various screenshots throughout the remainder of the document.

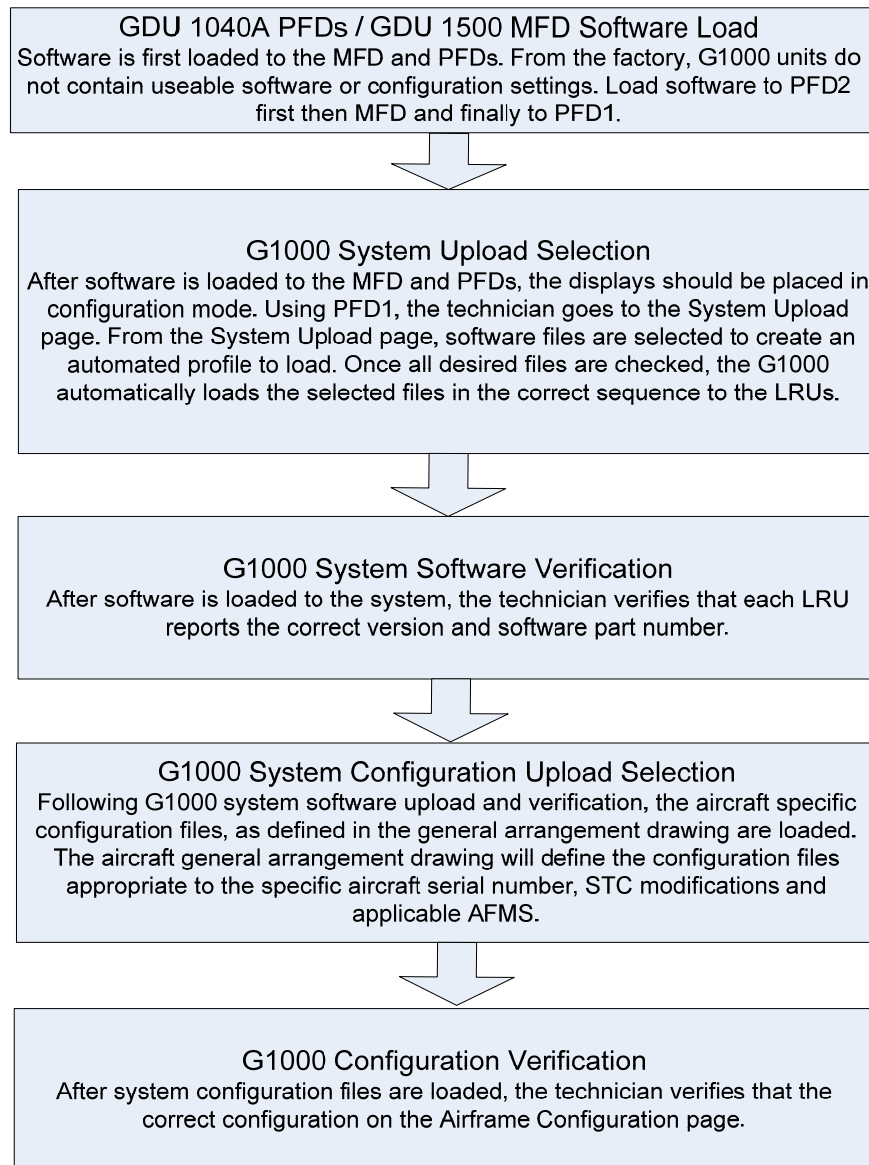


5.2 G1000 SOFTWARE/CONFIGURATION PROCEDURE

The G1000 is not airworthy unless software and configuration are accomplished successfully as described in these procedures. The following diagram depicts an overview of the software/configuration sequence for the G1000 system. It is extremely important that each LRU software load be completed successfully.

5.2.1 Software/Configuration Overview

Figure 5.1 – Software/Configuration Overview



5.3 SYSTEM POWER UP

Apply power to the G1000 by doing the following:

1. Connect a ground power unit to the external power receptacle, and turn on the ground power unit.
2. Set the battery master and avionics master switches to ON.

5.3.1 MFD & PFD Software Load

1. Pull the MFD, PFD1 and PFD2 circuit breakers.
2. Insert the loader card into PFD2 top card slot.
3. While holding the ENT key on PFD2, restore power by closing the PFD2 circuit breaker.
4. When the words **INITIALIZING SYSTEM** appear in the upper left corner of PFD2, release the PFD2 ENT key.
5. Press the PFD2 ENT key to acknowledge the following prompt (NOTE: A softkey labeled YES appears in the lower right corner and may be used in lieu of the ENT key):

**DO YOU WANT TO UPDATE SYSTEM FILES?
NO WILL BE ASSUMED IN 30 SECONDS.**

6. The following screen is displayed.

**DO YOU WANT TO UPDATE SYSTEM FILES?
NO WILL BE ASSUMED IN 30 SECONDS.
UPDATING SYSTEM FILES. PLEASE WAIT.**

7. New software is loaded to PFD2. When complete, the PFD starts in configuration mode displaying the System Status page. Do not remove power.
8. Remove the loader card from PFD2 and insert it into the top card slot on the MFD. Repeat Steps 3 through 6 for the MFD, using the far right softkey on the MFD in lieu of the ENT key where called out in Steps 3 through 6.
9. When MFD update is complete, it starts in the configuration mode. Do not remove power. Insert the loader card into PFD1 top card slot and repeat Steps 3 through 6 for PFD1. When complete, all three displays should be in configuration mode, with the Loader Card remaining in the top slot of PFD1.

IMPORTANT!

For the rest of the software/configuration procedure, do not operate the MFD or PFD2 while loading software or configuration files unless specifically instructed to do so. A failed or cancelled load may result.

10. On PFD1, verify on the SYSTEM CONFIGURATION PAGE that the following LRUs are present. (status box is green, as shown below): MFD1, PFD1, PFD2, GIA1, GIA2, GDL 69A (if installed) and GWX.
11. Verify on the SYSTEM STATUS PAGE that the following are valid. (Indicated by a green checkmark within the status box, as shown above): MFD1, PFD1, PFD2, GIA1, GIA2, GDL 69A (if installed) and GWX.

5.3.2 Base Configuration and Software Upload

1. Ensure loader card is inserted into top card slot of PFD1. On PFD1, select the System Upload page using the PFD1 small FMS knob.
2. Activate the cursor and use the PFD1 small FMS knob to highlight **PA-46-500TP** in the AIRFRAME field. Scroll small FMS knob to select the appropriate airframe and engine combination. Press the PFD1 ENT key to select the configuration .
3. Once an airframe type is selected the cursor moves to the FILE window. Rotate the PFD1 small FMS knob to activate the drop-down menu. Move the cursor to highlight the appropriate configuration for the aircraft and press ENT on PFD1.

NOTE

The PRODUCT window displays information regarding each G1000 LRU. The LRU column depicts the reported software version of the LRU, whereas the CARD VERS column shows the LRU software version stored on the Loader Card. The SOFTWARE and CONFIGURATION columns default to having all required boxes checked. Each checked file is automatically loaded to the correct G1000 LRU.

Figure 5.2 - Configuration/Software Load Page

PRODUCT	LRU VERS	CARD VERS	CARD PART NUM	SOFTWARE	CONFIGURATION
SYSTEM				N/A	☒
MANIFEST				N/A	☒
AIRFRAME				N/A	☒
AIRFRAME - PROP				N/A	☒
AIRFRAME - ENGINE				N/A	☒
ALERTS				N/A	☒
MFD 1				N/A	☒
PFD 1				N/A	☒
PFD 2				N/A	☒
GIA 1		T5.80bd	006-B0544-ZV	☒	☒

4. Use outer FMS knob and scroll to CALIBRATION line item. Uncheck the CONFIGURATION box next to CALIBRATION by pressing the ENT softkey.

Figure 5.3 - Calibration Configuration

PRODUCT	LRU VERS	CARD VERS	CARD PART NUM	SOFTWARE	CONFIGURATION
GDC 1		3.01	006-B0261-11	☒	☒
GDC 2		3.01	006-B0261-11	☒	☒
GEA 1		2.07	006-B0193-05	☒	☒
GTX 1		5.01	006-B0172-XX	☒	☒
GWX		2.11	006-B0266-10	☒	☒
CALIBRATION				N/A	☐
GSA PITCH		2.13	006-B0398-20	☒	N/A

5. Press the LOAD softkey.
6. Observe software loading progress and verify software load completes without errors as indicated by the following:
 - Green PASS or White N/A in SOFTWARE and CONFIGURATION columns.

-
- Upload Complete.....COMPLETE in the summary box.
7. Press PFD1 ENT key to acknowledge the Upload Complete box.
 8. Proceed to the next section.

5.4 OPTIONAL EQUIPMENT CONFIGURATION

Perform the following steps if any of the following options are installed:

- KTA810 TAS
 - KR87 ADF
 - KN 63 DME
 - WX-500 Storm Scope
 - Dual GTX 33
 - GDL 69A
1. Go to the System Upload page and activate cursor. Activate the drop down menu by rotating the small FMS knob and select Options and press ENT.
 2. Activate the drop down menu by rotating the small FMS knob and select the desired option, press ENT.
 3. Press the LOAD softkey.
 4. Observe software loading progress and verify software load completes without errors as indicated by the following:
 - Green PASS or White N/A in SOFTWARE and CONFIGURATION columns.
 - Upload Complete.....COMPLETE in the summary box.
 5. Press PFD1 ENT key to acknowledge the Upload Complete box.
 6. For other installed options repeat steps 2 thru 5 by rotating the large FMS knob and highlighting the File Field.
 7. De-activate the cursor.

Figure 5.4 - Option Selection



5.5 SOFTWARE LOAD CONFIRMATION

Go to the Systems Status page. Activate the cursor and toggle to the LRU window. Highlight each of the following items in the LRU window and verify that the LRU software part number and software version matches the following information.

NOTE

Verify the software and revision levels as noted below. Not all of the software and revision levels on the Systems Status page need to be verified.

Highlight each of the following items in the LRU window by scrolling with the small FMS knob, and verify that the software part number and version matches the information in Synthetic Vision and Pathways Upgrade, 005-00541-03 General Arrangement drawing.

SYSTEM	SW VER OK	SYSTEM	SW VER OK	SYSTEM	SW VER OK
GCU		GFC CERT YM		GSA PTCH MON	
GDC1		GIA1		GSA PTCH TRM C	
GDC1 FPGA		GIA1 AUDIO		GSA PTCH TRM M	
GDC2		GIA2		GSA ROLL CTL	
GDC2 FPGA		GIA2 AUDIO		GSA ROLL MON	
GDL69		GMA1		GSA YAW CTL	
GEA1		GMA2		GSA YAW MON	
GSA PTCH CTL		GMC		GTX1	
GFC CERT GIA1		GMU1		GTX2 (IF INSTALLED)	
GFC CERT GIA2		GMU1 FPGA		GWX	
GFC CERT PC		GMU2		GWX FPGA	
GFC CERT PM		GMU2 FPGA		MFD1	
GFC CERT PT C		GRS1		MFD1 FPGA	
GFC CERT PT M		GRS1 FPGA		PFD1	
GFC CERT RC		PFD2		PFD1 FPGA	
GFC CERT RM		PFD2 FPGA		GRS2	
GFC CERT YC				GRS2 FPGA	

De-activate the cursor.

Remove loader card and power down aircraft.

NOTE

If any software version and/or part number does not match, or is not successfully loaded, do not continue with post installation procedures. Troubleshoot and resolve the issue before continuing.

5.6 SVS / PATHWAYS ACTIVATION

This section provides the requirements and instructions necessary to enable the G1000 Synthetic Vision / Pathways feature.

Baseline Software:

The Garmin Synthetic Vision and Pathways feature in the Piper Meridian requires GDU software version 9.05 or later to be installed with the Meridian-specific software/configuration image prior to activation. See the STC Master Drawing List for specific installation requirements.

Database Cards:

The Garmin Synthetic Vision and Pathways feature requires 9 arc-second high resolution terrain databases to function.

Each G1000 display must be equipped with the P/N 010-00330-43 Terrain/Obstacle/SafeTaxi database card installed in the lower slot.

SVS / Pathways Enable Card:

The following enable card is required to activate the SVS/Pathways feature for G1000/Meridian installations:

Table 5.1 – SVS Enable Card

QTY	GARMIN PART NUMBER	DESCRIPTION
1	010-00330-55	Synthetic Vision & Pathways Enable, 2 PFDs

IMPORTANT!

When the SVS/Pathways option is enabled for the first time, the G1000 writes its unique system ID to the physical card and locks the files to this unique ID. This prevents the SVS/Pathways enable card from ever being used to activate the SVS/Pathway feature in other G1000 systems. This card **MUST** be kept with the aircraft for situations where SVS/Pathways must be re-activated.

5.6.1 SVS Activation Procedure

Activate the SVS/Pathways feature by performing the following steps:

1. Apply power to the G1000 system.
2. Pull the MFD, PFD 1, and PFD 2 circuit breakers.
3. A special SVS Enable card is required to activate this feature, refer to Table 5.1. Insert this card in the upper slot of PFD 1.
4. While holding the ENT key on the PFD 1, PFD 2 and MFD (for MFD press and hold the farthest right pushbutton), restore power to the displays.
5. When the words **INITIALIZING SYSTEM** appear in the upper left corner of the displays, release the ENT key.
6. From PFD 1, accomplish the following:
 - a. Go to the System Upload page using the small FMS knob.
 - b. Activate the cursor. Use the small FMS knob to select CONFIGURATION FILES in the AIRFRAME field and press the ENT key.
 - c. Highlight the FILE field. Use the small FMS knob to select the Enable SVS option and press the ENT key. Once the option is selected the configuration files in the PRODUCT field will be displayed. All files should be checked. If not, press the CHK ALL softkey.
 - d. Press the LOAD softkey.
 - e. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the upload complete confirmation.
 - f. View the SUMMARY field and ensure that the item is COMPLETE.
 - g. De-activate the cursor.
7. Power down the system and remove the SVS Enable card from the PFD.

5.7 CHARTVIEW AND TAWS ENABLE PROCEDURE (OPTIONAL)

5.7.1 Chartview Enable

NOTE

The Chart Enable card can only enable Charts on one system (one aircraft). A new Chart Enable card must be used for each aircraft.

1. Remove power from both PFDs and MFD by pulling the PFD and MFD circuit breakers.
2. Insert the Chart Enable card, 010-00330-50 in the upper slot of the #1 PFD.
3. While holding the ENT key on the MFD & PFDs, restore power by closing the circuit breakers.
4. When the words INITIALIZING SYSTEM appear in the upper left corner of the MFD and PFDs release the ENT key.
5. On the #1 PFD, go to the System Upload page.
6. Activate the cursor and rotate the small FMS knob to activate the drop down menu and select Configuration Files in the AIRFRAME field. Press ENT.
7. Rotate the small FMS knob to activate the drop down menu and select Enable Chartview in the FILE field. Press ENT.
8. Verify there is a check mark in the box in the configuration column for Airframe.
9. Press the LOAD softkey.
10. Monitor the status of the upload. When the upload is finished Complete and Pass is displayed. Press ENT.
11. De-activate the cursor.
12. Power down the system and remove the Chartview Enable card from the PFD.

5.7.2 TAWS Enable

NOTE

The TAWS Enable card can only enable TAWS on one system (one aircraft). A new TAWS Enable card must be used for each aircraft.

1. Remove power from the MFD and PFDs by pulling the PFD and MFD circuit breakers.
2. Insert the TAWS Enable card, 010-00330-51 in the upper slot of the #1 PFD.
3. While holding the ENT key on both PFDs and MFD, restore power by closing the PFD and MFD circuit breakers.
4. When the words INITIALIZING SYSTEM appear in the upper left corner of the PFDs and MFD release the ENT key.
5. On the #1 PFD, go to the System Upload page.
6. Activate the cursor and use the small FMS knob to create a pick list and select Configuration Files in the AIRFRAME field. Press ENT.
7. Use the small FMS knob to create a pick list and select Enable TAWS in the FILE field. Press ENT.
8. Verify there is a check mark in the box in the configuration column for Airframe.
9. Press the LOAD softkey.
10. Monitor the status of the upload. When the upload is finished, Complete and Pass is displayed. Press ENT.
11. De-activate the cursor.
12. Power down the system and remove the TAWS Enable card from the PFD.

5.8 AIRCRAFT REGISTRATION NUMBER ENTRY

NOTE

The large FMS knob changes Groups and the small FMS knob changes Pages within a Group.

1. Remove power (if applied) from PFD1 by pulling the PFD1 circuit breaker.
2. While holding the ENT key on the PFD1, restore power by closing the PFD1 circuit breaker.
3. When the words INITIALIZING SYSTEM appear in the upper left corner of the PFD release the ENT key.
4. Rotate the outer FMS knob to activate the GTX group, then rotate the small FMS knob to select the TRANSPONDER CONFIGURATION page on PFD #1.
5. Ensure that the ADDRESS TYPE is US TAIL under the SET and XPDR 1 ACTIVE (and XPDR 2 ACTIVE if installed) columns.
6. Ensure that the FLIGHT ID TYPE is SAME AS TAIL under the SET and ACTIVE columns.
7. Activate the cursor and highlight the MODE S ADDRESS field. Use the small/large FMS knob to enter the aircraft registration number.
8. Once the correct registration number is entered, press the ENT key to configure the transponder.
9. Observe the status window and press the ENT key on PFD #1 to acknowledge the OK prompt once configuration is complete.

5.9 AVIATION DATABASE LOADING PROCEDURES

5.9.1 Terrain Data Card Loading Procedure

1. Remove power from the PFDs and MFD by pulling the PFD and MFD circuit breakers.
2. Install a GDU 10XX Terrain Data Base Card 010-00330-43 in the bottom slot of the PFDs and MFD.
3. This completes the installation of the Terrain Data Card.

5.9.2 Aviation Database Loading

1. Remove power from PFD1, PFD2 and MFD.
2. Insert an SD card containing the latest cycle Jeppesen aviation database (data supplied by Jeppesen) into the top slot of PFD2.
3. Apply power to PFD2. The following prompt is displayed in the upper left corner of PFD2:

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

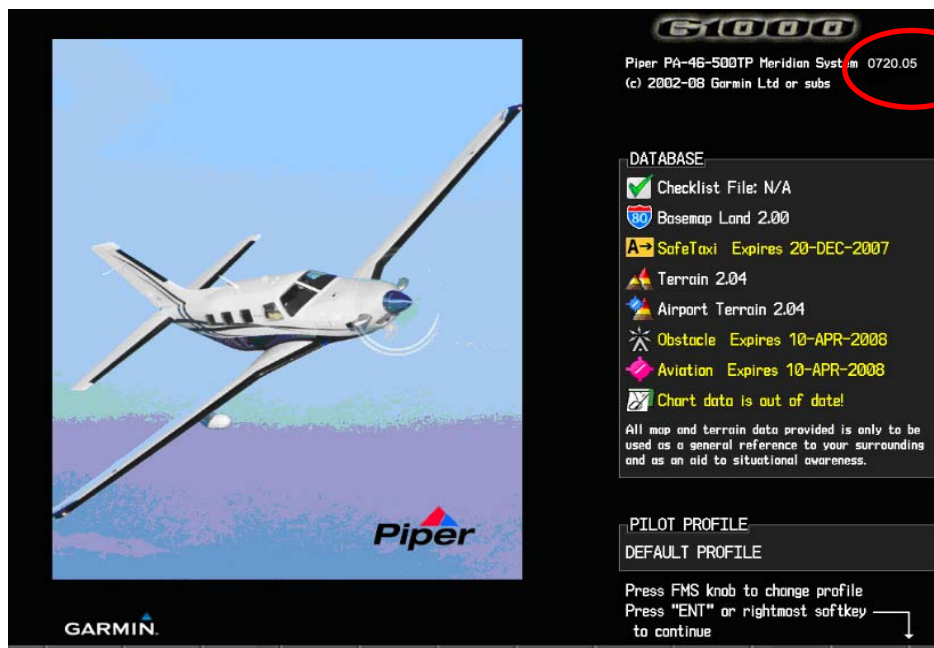
4. Press the PFD2 ENT key to confirm the database update.
5. A prompt will be displayed. Press ENT for YES.
6. After the update completes, PFD2 starts in normal mode. Remove the aviation database update SD Card from PFD2.
7. Repeat steps 2 through 4 for the MFD then PFD1.
8. The aviation databases are now updated.
9. Confirm that the correct update cycle is loaded at the power-up page of the MFD.
10. Remove the aviation database update SD Card from PFD1.

5.10 DISPLAY TESTING

The G1000 system is tested while operating in the normal mode unless otherwise specified. If the system is in configuration mode, restart the displays by cycling the PFD1, PFD2 and MFD circuit breakers to start the display in the normal mode.

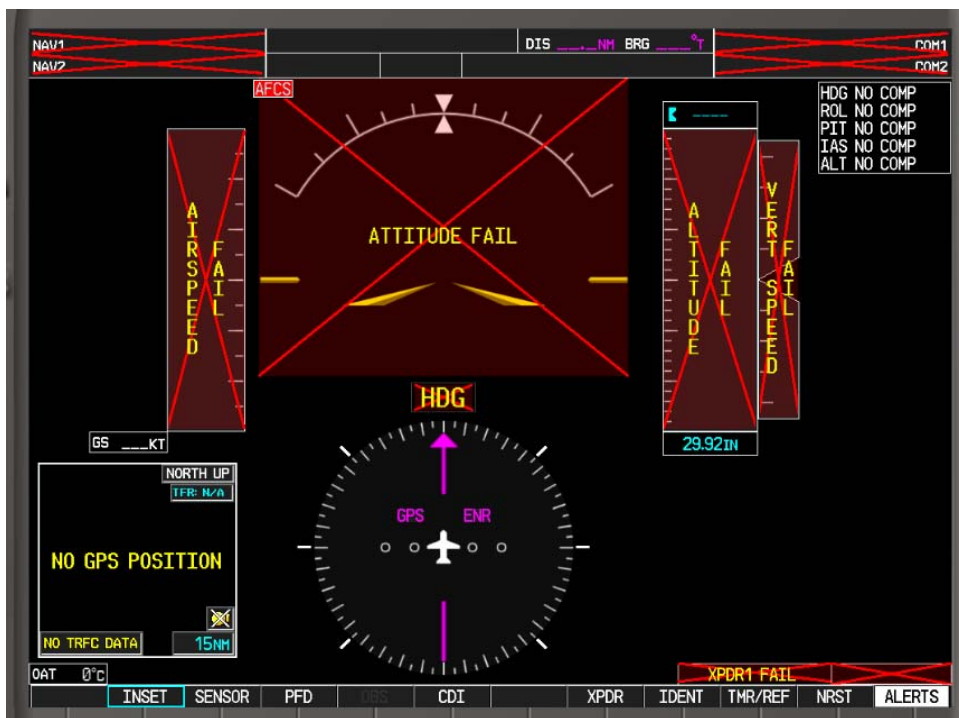
1. Apply aircraft power. Observe the MFD power-up screen. Verify the display is formatted as shown below. Figure 5.5 is a format reference, the illustration on the left may vary. Note database versions and system software represented in the upper right corner. Refer to General Arrangement Drawing 005-00541-03 drawing for the correct database and system software versions.

Figure 5.5 – MFD Initial Power Up page (format reference)



2. The System number reflected in the upper right hand corner is the System Software Version. It correlates to the G1000 SW Loader Card used to load the software to the system.
3. Verify that the System Software Version is correct per General Arrangement Drawing 005-00541-03.
4. Press the GCU **ENT** key to acknowledge the correct pilot profile on the MFD (NOTE: The rightmost softkey on the MFD may also be used).

Figure 5.6 – PFD Power Up System Annunciations



In the normal operating mode, data fields that are invalid have large red Xs through them (Figure 5.6). A valid field does not display a red X (Figure 5.7). Allow the displays to initialize for approximately one minute.

Figure 5.7 – Normal Display (without SVS enabled)



Figure 5.8 – Normal Display (with SVS enabled)



NOTE

Outputs from the GRS 77 AHRS and GMU 44 are not valid until the units have been calibrated as described later in this chapter.

5. Check that all COM/NAV fields are valid in the top corners of PFD1 and PFD2.
6. Check that altitude, airspeed, vertical speed, TAS, and OAT fields are valid on PFD1 and PFD2.
7. Press the **SENSOR** softkey on each PFD and switch between ADC1 and ADC2. Verify that data from both GDCs are valid on both displays.
8. Press the **SENSOR** softkey on each PFD and switch between AHRS1 and AHRS2. Verify that data from both GRS 77s are valid on both displays.
9. Check that engine instrument fields are valid on the MFD.
10. Verify that no MANIFEST alert messages appear in the lower right corner (press the flashing **ALERTS** softkey to view alert messages). If any MANIFEST errors appear, the correct software to the related LRU must be loaded before proceeding (refer to Section 5.3).

5.10.1 SVS / Pathways Installation Verification

1. Apply power to the G1000 system. Allow the AHRS and magnetometer systems to stabilize and align. Verify that air data information becomes valid on the PFDs. Check the MFD AUX – System Status page to verify GPS signals acquisition.
2. Press the ALERTS softkey on PFD 1 and verify no database, manifest, or configuration errors exist.
3. Press the PFD softkey. Verify a SYN VIS softkey is shown in the lower left corner of the display.
4. Press the SYN VIS softkey, then press the SYN TERR softkey to activate the Synthetic Vision terrain display feature. Verify that the traditional blue/brown attitude depiction is replaced with the Synthetic Vision rendering within 2-3 minutes of activation. See figures below for reference.

Figure 5.9 – PFD Display without SVS enabled



Figure 5.10 – PFD with SVS enabled



NOTE

Screenshots are for reference only and may not be indicative of what is present on the actual aircraft display.

Installation is complete. Be sure to keep the SVS / Pathways enable card with the aircraft for future use.

5.11 CHARTVIEW AND TAWS CHECKS

5.11.1 Chartview Check

1. Select the Airport Information page (first page in the WPT group).
2. Verify that the title at the top of the page reads WPT- Airport Information.
3. Verify that the CHRT softkey is available.
4. Press the CHRT softkey and verify the electronic chart is viewable.

5.11.2 TAWS Check

1. Ensure that matching terrain data base cards are installed in the bottom card slots in the PFD and MFD and the aircraft has a GPS position.
2. Select the TAWS page (last page in the MAP group).
3. Verify that the title at the top of the page reads MAP - TAWS - B. If TAWS has not been enabled, the title will read MAP - TERRAIN PROXIMITY or MAP - TERRAIN.
4. Press the MENU button and select Test TAWS from the pop-up menu and press ENT.
5. After the TAWS test has completed, verify that TAWS System Test Okay is annunciated over the audio system.

5.12 GMA 1347 AUDIO CHECKS

Perform the following checks in the aircraft with a known good hand microphone and headset.

5.12.1 VHF COMM Operational Check

NOTE

PA and SPKR selection is not available on GMA2.

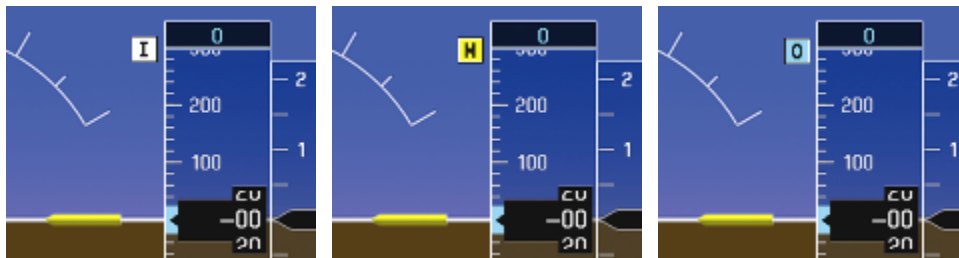
1. Perform a ramp test radio check by exercising the installed transceivers, boom mic, hand mic, microphone key and audio over the headphones and speaker. Verify that communications are clear and PTT operation is correct for each position.
2. Select the audio source corresponding to each installed avionics unit (i.e. NAV1, NAV2, COM1, COM2, ADF and DME) and check for audio over the headsets.
3. Press the SPKR key on GMA1 and verify that the selected audio is heard over the speaker.

5.12.2 Failsafe Operation Check

1. Open AUDIO MKR 1 circuit breaker.
2. Check the failsafe operation by exercising the COM 1 boom mic, hand mic, microphone key and audio over the headphones. All volume control for the COM audio should be through the PFD1 and PFD2 volume control. Verify proper operation of COM 1 using the failsafe operation (for proper failsafe operation see Garmin document 190-00763-01).
3. Close AUDIO MKR 1 circuit breaker.

5.12.3 Marker Beacon Test

Figure 5.11 – Marker Beacon Symbology



Using a ramp tester, simulate the outer marker, middle marker and inner marker signals by following the test equipment manufacturers instructions. Verify that each marker audio signal is present over the pilot and co-pilot headphones and cockpit speaker.

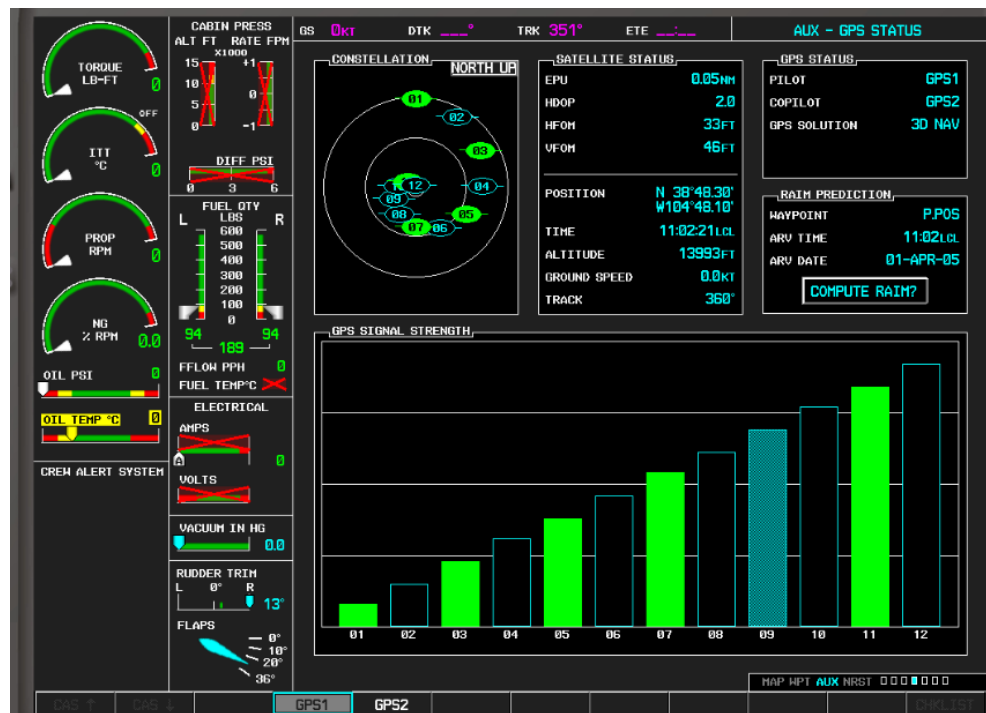
Verify that the outer, middle, and inner annunciations appear on PFD1 and PFD2 when the corresponding signal is applied. Marker beacon annunciations appear at the upper left corner of the altitude indicator on the PFD (Figure 5.11). Operate the **MKR MUTE** key on GMA1 and GMA2 and ensure that the audio signal is muted.

5.12.4 Intercom System (ICS) Check

1. Ensure that the **MAN SQ** key is off (no light).
2. Adjust GMA1 and GMA2 ICS volume to a comfortable level.
3. One at a time, plug a headset into each left and right CABIN ICS jack location (one headset on right, one headset on left).
4. Verify two-way communication exists between each CABIN ICS jack position.
5. On GMA1 select PILOT - ICS ISOLATION and verify CABIN ICS positions cannot be heard by the pilot.
6. On GMA1 select COPILOT - ICS ISOLATION and verify CABIN ICS positions cannot be heard by the copilot.
7. On GMA1, select **PA** and verify the PA select annunciator is illuminated on GMA1.
8. On GMA1 deselect PILOT - ICS ISOLATION.
9. Initiate passenger address using pilot's headset boom mic by keying the pilots **PTT**. Verify clear PA audio can be heard over cabin speaker and passenger headsets, **PA** selected annunciator on GMA1 flashes ~ once per second during PA address. Repeat using pilot hand mic.

5.13 GPS TEST

Figure 5.12 – AUX – GPS Status Page



1. Select the GPS status page on the MFD (4th page in AUX group). Toggle between GPS 1 and GPS 2 using the two softkeys on the bottom of the display. Verify that both receivers show 3D DIFF NAV next to GPS SOLUTION in the GPS STATUS field on the MFD. (The GIA 63W units should normally acquire a 3D GPS navigation solution within 2 minutes of startup, provided the aircraft is outside or indoors with a GPS repeater).

5.14 GWX 68 WEATHER RADAR CHECK

CAUTION!

Before energizing the equipment, be sure microwave radiation safety precautions including both fuel and personnel safety considerations have been observed. These include clearing all personnel to an area beyond the maximum permissible exposure level (MPEL) boundary. The MPEL for the GWX 68 is 11 feet.

1. On the GCU, turn the large FMS knob to select the Map Page Group then turn the small FMS knob to select the Weather Radar page.
2. Select the **MODE** Softkey.
3. Select the **STANDBY** softkey to initiate the one minute warm-up period. Verify the radar enters the standby mode after the warm-up is complete.
4. Press the GCU FMS knob to activate the cursor in the **TILT** field then turn the small FMS knob to select the desired antenna tilt angle. Press the GCU **ENT** key. Press the GCU FMS knob to remove the cursor.
5. Select the **WEATHER** softkey. After reading the CAUTION, press YES to continue. Select vertical profile mode.
6. Select the **TILT** softkey to activate the cursor in the TILT field and display the Tilt Line. (If the Tilt Line is not displayed, press the GCU MENU key and turn the large FMS knob to select Show Tilt Line). Press the **ENT** key.
7. On the GCU, turn the small FMS Knob to adjust the antenna tilt angle then select the **GAIN** Softkey to activate the cursor in the GAIN field.
8. On the GCU, turn the small FMS Knob to adjust the gain for the desirable level. Verify the gain setting is visible in the gain field as a movable horizontal bar in a flashing box and the line pointer is a reference depicting the calibrated position. Press the FMS Knob to remove the cursor.
9. On the GCU, select the GAIN Softkey again to recalibrate the gain. Verify **CALIBRATED** is displayed in the GAIN field.
10. Select the **STAB ON** Softkey to activate antenna stabilization or select the **STAB OFF** softkey to deactivate. Verify the current stabilization condition is shown in the upper right of the weather radar display.

6 GFC 700 TEST

Proceed with the tests in this section only after completing all previous configuration and testing. Information regarding the GFC 700 installation and operation can be found by referencing the following:

- G1000 Cockpit Reference Guide for Piper PA-46-500TP Meridian 190-00764-00
- Avionics System Installation for Piper PA-46-500TP Meridian 105-503
- PA-46-500TP Airplane Maintenance Manual 767-005

In the sections that follow, an Autopilot disconnect should be accompanied by an aural alert (two-second tone) unless otherwise specified.

6.1 PRE-FLIGHT TEST

1. Set the AVIONICS BUS switch to OFF. After 30 seconds select the AVIONICS BUS switch to ON. Verify the GFC 700 begins an automatic pre-flight test after AHRS and ADC parameters become valid.
2. Verify that a white **PFT** annunciation is displayed on PFD1 and PFD2. A momentarily red **AFCS** annunciation displayed before PFT starts is acceptable.
3. Upon successful completion of the test, an aural alert will sound and the annunciation will clear. If the **PFT** annunciation turns red, the test has failed. Refer to the Maintenance Manual for troubleshooting.
4. Repeat Steps 1 - 3 to test the PFT aural alert for the other GIA 63W. (For even-interval system power-up, the aural alert is generated by GIA 63 #1, whereas odd-interval system power-ups are generated by GIA 63 #2.)

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7 FINAL SYSTEM CHECKOUT

NOTE

The final checkout tests various secondary communications paths to ensure that the desired backup paths are in place.

NOTE

Depending upon aircraft status and configuration, various other messages and alerts may be present on GDUs during the failure tests.

7.1 FAILURE TESTS

Table 7.1 – Failure Tests

STEP	DESIRED RESULT
Single GPS Failure Conditions: - Place a shroud over the GPS antenna for GIA 1 to prevent signal reception. Verify loss of signal on MFD AUX page 4. - Remove shroud from the GIA 1 GPS antenna. - Place a shroud over the GPS antenna for GIA 2 to prevent signal reception. Verify loss of signal on MFD AUX page 4. - Remove shroud from the GIA 2 GPS antenna.	GPS Failure - For each of the specified GPS failure conditions, the following shall remain valid on both PFDs throughout the procedure: - Attitude and Heading from AHRS. - Airspeed, Altitude, Vertical Speed, and OAT from Air Data Computer. - GPS CDI remains valid on PFDs.
Dual GPS Failure Conditions: - Cover both GPS antennas. Verify loss of signal on MFD AUX page 4. - Remove shrouds from GPS antennas.	Dual GPS Failure - For a dual GPS failure, the following shall occur: - GPS CDI flags amber LOI on both PFDs. - Attitude and Heading remain valid from both AHRS on both PFDs. - Airspeed, Altitude, Vertical Speed, and OAT remain valid from both Air Data Computers on both PFDs. - TAWS N/A is present as black lettering with an amber background on PFDs. - PFD display no longer displays SVT.

STEP	DESIRED RESULT
GIA 1 Failure Conditions: • Open INTEG AV 1 and COM1 circuit breakers. • Verify desired results. • Close INTEG AV 1 and COM1 circuit breakers. Allow system to re-acquire satellites and return to normal display modes.	Verify a red-boxed AFCS annunciation appears on PFD. Verify the following flag invalid (by presence of red X): • NAV 1 and COM 1 tuning fields on PFD1 and 2. • NAV 1 CDI loses deviation bar (if valid signal is present). • XPDR • Fuel quantity Verify the following system messages: • XPDR1 - XPDR1 is inoperative (if dual GTX33 option installed) • AHRS1 GPS - AHRS1 is using backup GPS source. • AHRS2 GPS - AHRS2 not receiving backup GPS information. • GMA1 Fail – GMA1 is inoperative.

STEP	DESIRED RESULT
GIA 2 Failure Conditions: • Open INTEG AV 2 and COM2 circuit breakers. • Verify desired results. • Close INTEG AV 2 and COM2 circuit breakers. Allow system to re-acquire satellites and return to normal display modes.	Verify a red-boxed AFCS annunciation appears on PFD. Verify the following flag invalid: • NAV 2 and COM2 tuning fields on PFD1 and 2. • NAV2 CDI loses deviation bar (if valid signal is present). • XPDR2 FAIL – XPDR2 is inoperative (if dual GTX33 option installed). • Stormscope (on MFD Stormscope Map page) via LIGHTNING FAIL yellow text • Traffic (on MFD Traffic page) via NO DATA text and no traffic symbols. Verify the following system messages: • XPDR2 FAIL - XPDR2 is inoperative (if dual GTX33 option installed). • AHRS2 GPS – AHRS2 is using backup GPS source. • AHRS1 GPS – AHRS1 not receiving backup GPS information. • GMA2 Fail – GMA2 is inoperative. • STRMSCP FAIL – Stormscope has failed (if installed). • TRAFFIC FAIL – Traffic device has failed (if installed).
MFD Display Failure Conditions: • Open MFD circuit breaker. • Verify desired results. • Close MFD circuit breaker.	The following shall occur when power is removed from the MFD: • MFD goes blank. • GWX Fail. • All PFD1 and 2 primary flight information is retained. • The COM 1/2 and NAV 1/2 tuning fields remain valid and can be tuned by rotating the tuning knobs on PFD1 and PFD2. • XPDR 1/2 fields remain valid and XPDRs can be adjusted via PFD softkeys.

STEP	DESIRED RESULT
PFD2 Display Failure Conditions: • Open PFD 2 circuit breaker. • Verify desired results. • Close PFD 2 circuit breaker.	The following shall occur when power is removed from PFD2: • PFD2 goes blank. • PFD1 and MFD remain in normal display formats. The following illuminate on PFD1: – HDG NO COMP illuminates on PFD1 – ROL NO COMP illuminates on PFD1 – PIT NO COMP illuminates on PFD1 – IAS NO COMP illuminates on PFD1 – ALT NO COMP illuminates on PFD1 • GMA2 Fail – GMA2 is inoperative. • XTALK Error – A flight display crosstalk error has occurred. • XPDR2 Fail – XPDR2 is inoperative (if dual GTX33 option installed).
PFD1 Display Failure Conditions: • Open PFD 1 circuit breaker. • Verify desired results.	The following shall occur when power is removed from PFD1: • PFD1 goes blank. • PFD2 and MFD remain in normal display formats. The following illuminate on PFD2: ▪ XPDR1 Fail – XPDR1 is inoperative. ▪ GMA1 Fail – GMA1 is inoperative. ▪ XTALK ERROR – A flight display crosstalk error has occurred.

STEP	DESIRED RESULT
PFD1 and MFD Display Failure Conditions: • Open MFD circuit breaker. • Verify desired results. • Close MFD and PFD 1 circuit breakers.	The following shall occur when power is removed from PFD1 and MFD: • MFD goes blank. • GWX Fail. • The following illuminate on PFD2: – HDG NO COMP illuminates on PFD2. – ROL NO COMP illuminates on PFD2. – PIT NO COMP illuminates on PFD2. – IAS NO COMP illuminates on PFD2. – ALT NO COMP illuminates on PFD2.

7.2 G1000 BACKUP PATH TESTS

Before performing these tests, remove power from the displays by pulling the following circuit breakers:

- PFD1
 - PFD2
 - MFD
1. Reboot PFD1, PFD2 and MFD while holding the ENT key on each display (far right key on MFD) until the words INITIALIZING SYSTEM appear.
 2. In configuration mode, go to the GDU Page Group on PFD1.
 3. On PFD1, activate the cursor and select PFD1 in the SELECT UNIT field and press ENT.
 4. Observe the GRS 77 and GDC 74 DATA indicators in the ARINC 429 window.
 5. Verify both indicators are GREEN, indicating the channels are receiving data.

Figure 7.1 – Data Bus Channel Page

RS-232 / ARINC 429 CONFIG					
SELECT UNIT					
PFD1					
RS-232					
CHANNEL	DATA	SET	ACTIVE	SET	ACTIVE
CHNL 1	■	GCU476	GCU476	GCU476	GCU476
CHNL 2	■	GMC710	GMC710	GMC710	GMC710
ARINC 429					
CHANNEL	DATA	SPEED	ACTIVE	DATA	ACTIVE
IN 1	■	High	High	GRS77 #1	GRS77 #1
IN 2	■	Low	Low	GDC74 #1	GDC74 #1

6. On PFD1, activate the cursor and select PFD2 in the SELECT UNIT field and press the ENT key.
7. Repeat Steps 4 and 5.
8. On PFD1, activate the cursor and select MFD1 in the SELECT UNIT field and press the ENT key.
9. Repeat Steps 4 and 5.
10. On PFD1, go to the GIA Page Group. Go to the RS-232 / ARINC 429 CONFIG page.
11. Verify that GIA1 is selected in the SELECT UNIT field.
12. Observe the DATA indicators for all configured RS-232 and ARINC 429 channels (except GIA DEBUG), including the GRS 77 and GDC 74 ARINC 429 channels.

-
13. Verify all DATA indicators are GREEN for those channels that are actively configured.
 14. Activate the cursor and select GIA2 in the SELECT UNIT field, then press the ENT key.
 15. Repeat Steps 12 and 13.
 16. On PFD1, go to the RS-485 CONFIGURATION page in the GIA Page Group.
 17. Verify that GIA1 is selected in the SELECT UNIT field.
 18. Observe the data indicators for all configured RS-485 channels.
 19. Verify all DATA indicators are GREEN for those channels that are actively configured.
 20. Activate the cursor and select GIA2 in the SELECT UNIT field, then press the ENT key.
 21. Repeat Steps 18 and 19.

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8 POST MODIFICATION FLIGHT TEST PROCEDURE

All performance tolerances specified in the following in-flight checks assume smooth air. The pilot must be thoroughly familiar with the GFC 700 by studying the following:

- G1000 Integrated Flight Deck Pilots Guide Piper PA-46 Meridian, P/N 190-00763-00
- Airplane Flight Manual Supplement, Synthetic Vision and Pathways Upgrade Meridian PA-46-500TP, P/N 190-01038-00

8.1 INITIAL ENGAGEMENT

1. Climb to a safe altitude in VFR conditions and establish 155 KIAS in straight and level flight. Pre-selected altitude should be set at 2000-ft above the altitude selected for this step.
2. Press the FD key on the AFCS mode controller to display the Flight Director in the default PIT and ROL modes, ALTS will be in armed mode (white annunciation). Verify that the Flight Director command bars are synchronized with the aircraft attitude in both pitch and roll at the time of Flight Director engagement.

NOTE

If the bank angle is less than 6°, ROL mode will command wings-level. If the bank angle is 6° or greater, the bank angle at the time of ROL mode activation will be held, up to a maximum of 22°.

3. Press the AP key on the AFCS mode controller to engage the autopilot. The autopilot will hold the commanded pitch attitude within $\pm 2^\circ$ and the roll attitude within $\pm 2^\circ$.

8.2 VERTICAL SPEED (VS) MODE

1. With the Autopilot engaged in straight and level flight, press the VS key on the AFCS mode controller to select Vertical Speed mode. A green VS, green reference vertical speed (aircraft's vertical speed when the VS button was pressed), and a white ALTS will be annunciated in the AFCS status box. Any convenient lateral mode may be used.
2. Climb the aircraft at 500 feet per minute using the NOSE UP/DN wheel on the AFCS mode controller. Monitor proper power settings to maintain safe operating airspeed.
3. The autopilot will hold the commanded rate of climb within ± 100 feet per minute. Change the vertical speed reference to climb at 700 feet per minute. The autopilot maintains the commanded rate of climb within ± 100 feet per minute. Allow the autopilot to capture the pre-selected altitude.
4. Using the ALT SEL knob on the AFCS mode controller, select an altitude 2000-ft below the aircraft's current altitude.
5. Press the VS key on the AFCS mode controller and select a descent of 500 feet per minute using the NOSE UP/DN wheel on the AFCS mode controller. Monitor proper power settings to maintain safe operating airspeed.
6. The autopilot will hold the commanded rate of descent within ± 100 feet per minute. Change the vertical speed descent reference to 700 feet per minute. The autopilot maintains the commanded rate of descent within ± 100 feet per minute. Allow the autopilot to capture the selected altitude.
7. Disconnect autopilot and press the FD key to remove the Flight Director command bars. An aural tone will sound when the disconnect is accomplished.

8.3 PITCH MODE (PIT) & ALTITUDE ALERTING

1. With the Autopilot disconnected, establish straight and level flight at a minimum of 155 KIAS. Pre-select an altitude 2000-ft above the aircraft current altitude. Once established, press the AP key on the AFCS mode controller to engage the autopilot in the default pitch (PIT), roll (ROL) modes, and altitude armed (ALTS) mode.
2. Center heading bug by pressing HDG knob. Engage HDG mode by pressing the HDG button on the AFCS mode controller.
3. Using the NOSE UP/DN wheel on the AFCS mode controller, set a climb attitude of at least 5° and adjust the power setting to maintain a safe climb speed. The autopilot should start a climb toward the selected altitude.
4. At 1000 feet below the selected altitude, the selected altitude field will flash and change from cyan text with a black background to black text with a cyan background. At 200 feet below the selected altitude will change back to cyan text and a black background and an aural tone will sound.
5. Prior to reaching the selected altitude the system will transition to ALT mode. At this point the green PIT and the white ALTS will extinguish and be replaced by a green ALT. ALT will flash for 10 seconds to indicate the transition to the new mode and the altitude reference will be displayed in green to the right of ALT.
6. Verify the autopilot captures the selected altitude within 100 feet and maintains selected altitude within 50 feet.
7. Repeat this procedure for a selected altitude at least 2,000 feet below the present altitude. Maintain a descent rate of at least 500 feet per minute and airspeed of 155 KIAS or greater while observing the selected altitude flashing, and color reversal 1,000 feet above the selected altitude. The selected altitude will again flash and reverse colors along with an aural tone, at 200 feet above the selected altitude. The system will capture the desired altitude and transfer to the altitude hold mode with minimal overshoot.
8. Disconnect the autopilot. Initiate a climb or descent away from the selected altitude. When the aircraft altitude deviates 200 ft. from the selected altitude, the selected altitude will change to amber text on a black background, flash for 5 seconds then remain steady, and a single aural tone will sound. Return to straight and level flight.

8.4 FLIGHT LEVEL CHANGE (FLC) MODE & ALTITUDE CAPTURE

1. Establish straight and level flight with the autopilot engaged in altitude hold (ALT) mode. Synchronize the HDG bug to current aircraft heading and engage HDG mode. Select an altitude at least 1,000 feet higher than present altitude using the ALT knob on the AFCS mode controller.
2. Engage FLC mode by pressing the FLC key on the AFCS mode controller. Green FLC, green reference speed (aircraft's airspeed when the FLC button was pressed), and ALTS will be annunciated in white in the AFCS status box on PFD1 and PFD2.
3. Using the NOSE UP/DN wheel on the MFD, decrease the climb speed by 10 KIAS. Also, set an appropriate power setting to give the desired rate of climb.

NOTE

In FLC mode, sufficient power must be available to hold commanded airspeed. If sufficient power is not available, aircraft will hold the current altitude until sufficient power is available.

4. Prior to reaching the selected altitude the system will transition to ALT mode. The green FLC and airspeed reference will extinguish and be replaced by a green ALT and reference altitude. ALT will flash for 10 seconds to indicate the transition to the new mode and the reference altitude will be displayed in green to the right of ALT.
5. Repeat steps 2-4 in a descent for a selected altitude at least 1,000 feet below the present altitude and an increased reference airspeed by 10 KIAS.
6. While climbing or descending, the system will smoothly acquire the selected airspeed and maintain that airspeed within +/- 3 knots with no oscillation. The system will capture the desired altitude and transition to the ALT mode prior to the selected altitude with minimal overshoot.

8.5 ALTITUDE HOLD (ALT) MODE & HEADING SELECT (HDG) MODE

1. Establish straight and level flight with the autopilot engaged in Altitude Hold (ALT) mode. Synchronize the HDG bug to current aircraft heading and engage HDG mode.
2. Use the HDG bug to change heading 90° . The autopilot will bank the airplane at standard rate, up to a maximum bank angle of $22^\circ \pm 2^\circ$. The airplane will roll out on the selected heading with minimal overshoot. Altitude should remain within ± 50 ft of the altitude reference.
3. Repeat step 2 with a change of 90° in the other direction. Altitude should remain within ± 50 ft of the altitude reference.
4. Allow the system to fly in ALT and HDG modes for 5 minutes. The aircraft's altitude should remain within ± 50 ft. with no regular or cyclical oscillations.

8.6 OVERSPEED PROTECTION MODE

1. Establish the airplane in straight and level flight at a safe altitude. Engage the autopilot in a convenient lateral mode and VS mode.
2. Select a descent vertical speed reference and power setting to cause the aircraft to reach an airspeed that would exceed 175 KIAS. As the airspeed approaches 175 KIAS, the system is designed to enter overspeed protection mode and maintain 175 KIAS with minimal overshoot. Overspeed mode is annunciated by flashing MAXSPD in yellow and black. This annunciation is located above the airspeed tape.
3. Reduce power and decrease the vertical speed reference to a lower rate of descent to exit Overspeed mode and return to VS mode.

8.7 NAV MODES

Follow the procedures below to verify the proper operation of the navigation modes. Note that the autopilot can track VHF NAV or GPS guidance. The navigation sensor currently displayed on the HSI dictates the NAV source that will be tracked by the autopilot.

8.7.1 NAV (GPS) MODE

1. Engage the autopilot in HDG and ALT modes.
2. Select GPS as the NAV sensor displayed on the HSI. With the GCU 476, enter a Direct-To GPS waypoint.
3. Press the NAV key on the AFCS mode controller. GPS annunciates in green on the PFD AFCS Status Bar. Verify the autopilot turns as required to track the course to the selected waypoint with minimal offset and no oscillations.

8.7.2 NAV (VOR) Mode

1. Tune NAV1 to a VOR station approximately twenty miles away. Select VOR1 for display on PFD1 HSI.
2. Center the CDI by pushing the CRS1 knob. Using the CRS1 knob, change selected course by 10°.
3. Engage HDG and ALT modes and set up an intercept angle of 30° to 60° to the selected course using the heading bug on the HSI.
4. Arm the VOR mode by pressing the NAV key on the AFCS mode controller. VOR will appear in white to the left of the active HDG mode.
5. Verify the system remains in HDG mode until the proper intercept point is reached and automatically switches from HDG to VOR mode. Verify the green HDG annunciation extinguishes and a green VOR appears and the green VOR flashes for 10 seconds to indicate the transition to the new mode.
6. Verify when NAV mode is coupled, the system banks the airplane, up to a maximum bank angle of $22^\circ \pm 2^\circ$ to turn on to the radial with minimal overshoot. Allow the system to track the radial for five minutes. Verify the autopilot tracks the selected course with minimal scalloping or oscillation.

8.7.3 NAV (BC) and APR (ILS) Modes

Establish the airplane in the following configuration:

- 120 KIAS
 - Gear down
 - Approach flaps
 - Autopilot coupled in HDG and ALT mode
 - Maintaining minimum glideslope intercept altitude or higher
1. Tune the ILS frequency for the ILS approach to be flown and select NAV 1 or NAV 2 on the HSI. Verify that the course pointer is set to the published inbound approach course.

-
2. Use the heading bug to set the intercept angle to 45° to the OUTBOUND course. It will be necessary to intercept the outbound course to check proper back course (BC) operation.
 3. Press the BC key on the AFCS mode controller prior to intercepting the localizer to arm BC mode. The BC annunciation will illuminate in white on PFD1 and PFD2. The system will capture and track the localizer outbound. (Some overshoot may occur if the ground speed is excessive or the capture is made extremely close to the runway. At the point of capture, the BC annunciation will change to green and will flash for 10 seconds to indicate the transition to the new mode.
 4. Center the heading bug. Press the HDG key on the AFCS mode controller. Use the heading bug, execute a procedure turn to the inbound course.
 5. When the airplane is within 105° of the inbound course, press the APR key on the AFCS mode controller. This will cause LOC to annunciate in white to the left of HDG, GS will annunciate in white to the right of the reference altitude.
 6. With the APR mode armed, set up a ~45° intercept angle using the HDG mode. When the proper capture point is reached, the system will automatically transfer from HDG and LOC armed to LOC mode and turn on to the inbound course. LOC will change to green and flash for 10 seconds to indicate the transition to the new mode.
 7. As the airplane flies into the glideslope, the system will automatically transfer from ALT to GS mode, and the GS annunciation will change to green and flash for 10 seconds. The autopilot will track the Localizer and Glideslope guidance with minimal offsets and oscillations. Continue to the decision altitude for the ILS. Monitor proper power settings to maintain safe operating airspeed.
 8. When desired, engage the GA mode by pressing the GA (Go Around) button on the throttle. The Flight Director command bars will give a wings level pitch up command of 8°, and the autopilot will disconnect. PFD1 and PFD2 will annunciate GA in green as both the active PIT and ROL modes, and ALTS will be annunciated in white in the AFCS status box. Fly the command bars and establish climb configuration to a safe altitude.

8.7.4 APR (VOR) Mode

1. With the airplane in HDG and ALT mode, tune the VOR that is used as part of a published VOR approach. Select VOR1 on PFD1 HSI. Using published VOR approach information, set the course selector on the HSI to the inbound course.
2. Use the HDG and ALT modes to set up 45° intercept of the selected VOR radial at least 5 miles from the final approach fix. Arm the VAPP mode by pressing the APR key while the deviation is still full scale. This will cause VAPP to be annunciated in white to the left of HDG.
3. When the proper intercept point is reached, the system will go from HDG and VAPP armed to VAPP mode. At this point VAPP will change to green and flash for 10 seconds to indicate the transition to the new mode. Verify the autopilot captures and tracks the selected course with minimal overshoot, minimal offset and no oscillations.
4. Using any desired vertical mode (PIT, VS, or FLC), complete the published VOR approach and note autopilot tracking of the approach course. The autopilot should track the selected course with minimal overshoot, minimal offset and no oscillations.

8.7.5 RNAV (GPS) (LPV or LNAV/VNAV)

1. Load the approach into the Active Flight Plan and set the approach minimums on the TMR/REF page.

IF Flying Vectors-To-Final

2. Airplane on Vectors-To-Final
 - a. Mode Control Panel..... PRESS HDG to fly ATC radar vectors
 - b. PROC button on PFDs or MFD SELECT ACTIVATE VECTORS-TO-FINAL

NOTE

SUSP may annunciate on the HSI when Vectors-To-Final is selected. The flight plan will automatically un-suspend when the airplane intercepts and turns inbound on the final approach course. When automatic flight plan waypoint sequencing resumes, SUSP will extinguish.

- c. VERIFY Course pointer slews to the front course
 - d. Mode Control Panel..... PRESS APR, Verify GPS and GP armed

IF Flying Full Approach Including Transition

3. Airplane cleared to an initial approach fix
 - a. ACTIVATE THE APPROACH from the PROC page or ACTIVATE a DIRECT TO the IAF. On the HSI CDI, select GPS Nav source. On the mode control panel PRESS APR verify GPS mode active and GP armed.

NOTE

Ensure groundspeed is less than 200 KTS within 1 minute of the IAF

- b. VERIFY course pointer slews to the front course
4. Established inbound on Final Approach Course
 - a. VERIFY course pointer is set to the final approach course
 - b. VERIFY LPV or L/VNAV is annunciated on the HSI.
 - c. VERIFY GP indicator displays.
 - d. VERIFY SUSP is not displayed on HSI.
 - e. SET missed approach altitude in altitude preselect.
5. Maintain 110 KIAS or greater airspeed and verify airplane captures and tracks GPS course, captures and tracks GP with minimal overshoot and oscillation.

8.7.6 Yaw Damper

1. With AP and YD engaged in ROL and PIT attitude hold mode and wings level, overpower left rudder 5-10° and release.
2. Verify the YD returns the airplane to the original attitude with no continuous oscillations or offsets.
3. Overpower right rudder 5-10° and release.
4. Verify the YD returns the airplane to the original attitude with no continuous oscillations or offsets.
5. Disengage the AP and YD.
6. Perform a rudder doublet and engage the YD.
7. Verify the YD returns the airplane to the original attitude with no continuous oscillations or offsets.

8.8 TAWS FIVE HUNDRED CALL-OUT

During approach, verify that the FIVE HUNDRED voice call-out is issued at approximately 500' AGL (GPS altitude).

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9 SIGNATURES

Complete the information below. A copy of this procedure should be kept with the aircraft records.

Testing Completed By (Print):

Signature:

Date:
