Maintenance Manual Supplement

for G1000 Installations with Synthetic Vision and Pathways in Piper Meridian PA-46-500TP Aircraft

Contains Instructions for Continued Airworthiness for STC # SA01533WI-D

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RECORD OF REVISIONS

Revision	Revision Date	Description	ECO #
1	2/10/09	Initial Release.	-----
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DOCUMENT PAGINATION

Section	Pagination
Section 1	1-1 to 1-2
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1 INTRODUCTION

1.1 SCOPE

This document presents Instructions for Continued Airworthiness required for the Synthetic Vision and Pathways features and software upgrades in the G1000 Integrated Cockpit System for Piper Meridian PA-46-500TP aircraft, as installed by STC # SA01533WI-D. This document satisfies the requirements for continued airworthiness as defined by 14 CFR Part 23.1529 and Appendix G. Information in this document is required to maintain the continued airworthiness of the G1000 as equipped with Synthetic Vision and Pathways.

This manual does not constitute a complete set of G1000 or aircraft maintenance procedures and must be used in conjunction with the existing Piper PA-46-500TP Airplane Maintenance Manual listed in the table below. The procedures in this manual are to be performed on a completed G1000 installation only.

Table 1.1 – Reference Documents

PART NUMBER	DOCUMENT
005-00541-02	STC Master Drawing List
190-01038-00	Airplane Flight Manual Supplement, Synthetic Vision & Pathways Upgrade
767-005	Piper PA-46-500TP Airplane Maintenance Manual (dated July 18, 2008 or later approved revision)*
005-00541-03	General Arrangement, Synthetic Vision and Pathways Upgrade Meridian PA-46-500TP
190-00303-04	G1000 Configuration Manual

*Existing approved MM/ICA under the prerequisite G1000 Installation under TCDS A25SO.

1.2 APPLICABILITY

This document applies to all Piper PA-46-500TP aircraft equipped with the G1000 and Synthetic Vision and Pathways feature activated. Table 1.2 lists the G1000 System Software Version numbers approved for this STC.

Table 1.2 – Software Version

Aircraft Model	G1000 System Software Version
PA-46-500TP	0720.06

Modification of an aircraft by Supplemental Type Certificate (STC) SA01533WI-D obligates the aircraft operator to include the maintenance information provided by this document in the operator's Aircraft Maintenance Manual and the operator's Aircraft Scheduled Maintenance Program.

1.3 ORGANIZATION

This manual is divided into the following sections:

Section 2: System Description and Operation

Provides a brief description of the G1000 system and its operation sufficient to understand the maintenance instructions herein.

Section 3: Continued Airworthiness

Provides maintenance instructions for continued airworthiness of the G1000 and GFC 700 systems.

Section 4: System Return to Service Procedure

Specifies return-to-service procedures to be performed upon completion of maintenance of the G1000 system.

1.4 DISTRIBUTION

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

For the latest revision to this document, check Garmin's web site at: www.garmin.com/ and click on 'Dealers Only'.

NOTE

Only Garmin-authorized dealers and service centers are given access to the Dealer portion of the Web Site. If you do not have a Dealer Password, contact Garmin directly to obtain the latest revision of this document.

2 SYSTEM DESCRIPTION AND OPERATION

2.1 G1000/GFC700 INSTALLATION

The G1000 as installed in the Piper PA-46-500TP consists of three Garmin display units interfaced with dual AHRS, air data computers, and audio panels. Also interfaced with the system is a Garmin Engine interface that allows for engine data and parameters to be displayed on the MFD.

This STC upgrades the software in the existing G1000 / GFC 700 system and activates Synthetic Vision / Pathways. This STC did not modify the physical installation of the G1000 / GFC 700. For a complete description of the existing G1000 and GFC 700 installation and those aspects of the G1000 that are not affected by this STC, refer to the existing Piper PA-46-500TP Airplane Maintenance Manual listed in Table 1.1.

2.2 G1000 NORMAL MODE

To start the G1000 system in Normal Mode:

1. With a ground power unit connected to the external power receptacle, set the BAT and AVIONICS switches to ON (indicated by green light being lit). The following G1000 equipment is powered:
    - PFD displays & MFD display
    - GRS 77 AHRS Units
    - GDC 74A Air Data Computers
    - GIA 63W Integrated Avionics Units
    - GEA 71 Engine/Airframe Units
    - GCU 476 FMS Control Unit
    - GMC 710 Autopilot Control Unit
    - GTX 33 Mode S Transponder(s)
    - GMA 1347D Digital Audio Panels
    - GDL 69A Datalink Unit
    - GSA Servos
    - GWX 68 Weather Radar Unit

The G1000 system is now powered in the normal mode. In the normal operating mode, data fields that are invalid have large red X's through them. A valid field does not display a red X. Allow the displays to initialize for approximately one minute. The PFDs and MFD will function as specified in the G1000 Series Cockpit Reference Guide for Piper PA-46 when the system has been correctly installed and configured.

2.3 REVERSIONARY MODE

Reversionary mode allows for display of information related to safe flight in the event of a display communication or hardware failure. Manual reversionary mode allows the operator to force the pilot or copilot's PFD into reversionary mode by pressing the large red button labeled 'DISPLAY BACKUP' on the respective GMA 1347 audio panel.

Figure 2.1 – Manual Reversion with MFD failure

Figure 2.2 – Reversion with PFD1 failure

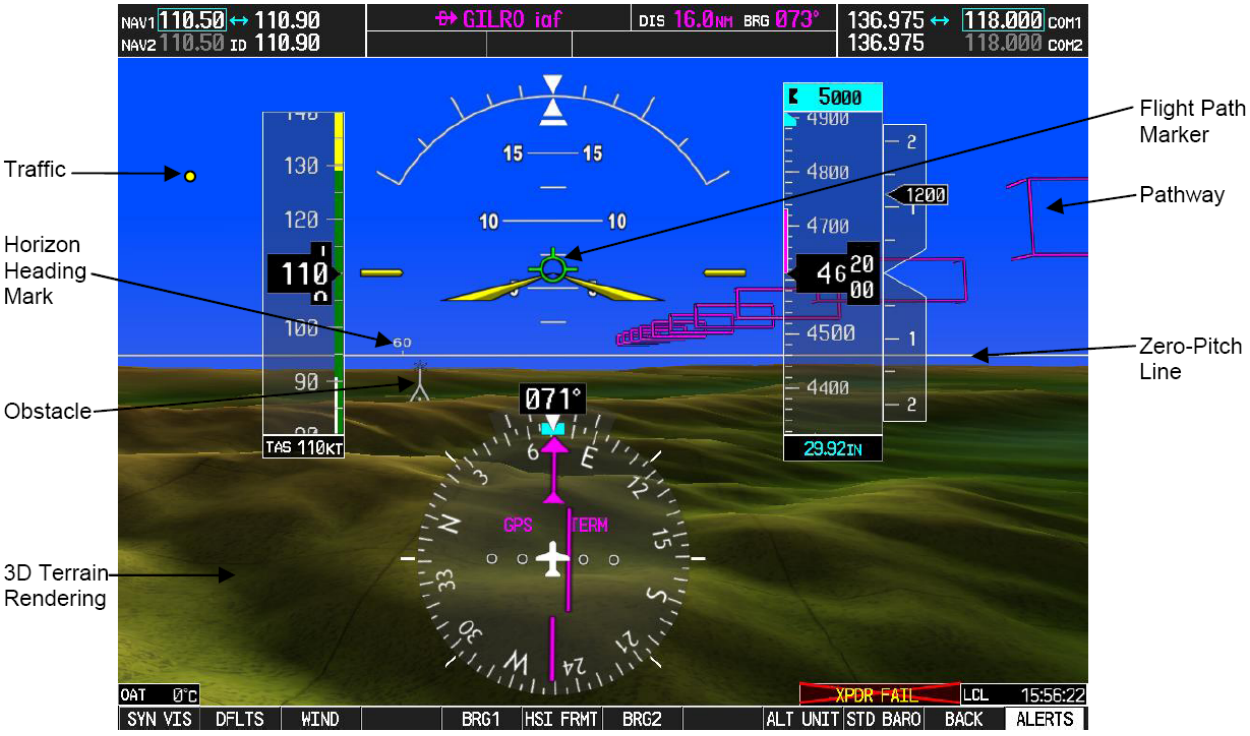
2.4 SVS OVERVIEW

The Synthetic Vision System is intended to provide the crew with a greater awareness of the aircraft's position relative to surrounding terrain, obstacles, and traffic (optional). This is accomplished by placing a three dimensional depiction of terrain, obstacles, and traffic in the PFD primary field of view such that their proximity to the aircraft is more easily understood during instrument scanning. The display of SVS can be turned on and off by the pilot by a dedicated softkey on the PFD.

The SVS PFD frame-of-reference is aligned with the aircraft body frame, using AHRS attitude and heading data for orientation. Accordingly, the SVS is egocentric and attitude-aligned. GPS position and GPS-derived altitude are used for the SVS position and elevation references, respectively. The SVS 3D terrain presentation is generated from a high resolution 9 arc-second terrain database image. For the SVS system to be made available by the G1000, valid attitude, heading, GPS position, and terrain databases are required.

All previous existing PFD display features are retained and drawn over the SVS. For example, airspeed, altitude, vertical speed, heading, and HSI items will remain unchanged, and will be drawn over the SVS presentation.

Figure 2.3 – SVS/Pathways Features (example)



Synthetic Vision System:

3D Terrain Rendering on PFD – SVS system will utilize an egocentric, forward looking perspective of 3D terrain rendering and shading, to be displayed on the PFD.

Zero Pitch Line – The PFD displays an artificial horizon pitch reference line above the display of terrain, similar to the existing artificial horizon which currently separates the blue/brown attitude depiction. The display of horizon heading marks in 30° intervals on the pitch line is a pilot-selectable feature.

Flight Path Marker – The projected aircraft flight path is displayed in the form of a Flight Path Marker on the PFD.

Display of Traffic – Traffic data from existing certified TIS, provided by the G1000 GTX 33 Mode-S transponder, is used to generate on-screen traffic symbols.

Display of Land-based Objects – Obstacles, runways, water bodies, and other land features are displayed on the PFD.

Pathways:

SVS / Pathways are a pilot-selectable feature. The display of SVS can be turned on and off by the pilot by a dedicated softkey on the PFD. The display of Pathways requires that the 3D Terrain feature be displayed (i.e. SYN TERR softkey pressed).

When active, the Pathway is displayed on the PFD and will show flight path information in the form of a virtual 3D flight path, composed of rectangular elements which form a tunnel. The depiction of this pathway is derived from the existing FMS navigation capabilities of the G1000, and the display will be consistent with that of the active flight plan shown on the MFD.

2.4.1 Control & Operation

SVS/Pathways is an embedded software feature of the G1000 and is controlled by using PFD softkeys. Specific details on operating the SVS/Pathways feature can be found in the Synthetic Vision & Pathways AFMS specified in Table 1.1.

2.5 CONFIGURATION MODE OVERVIEW

The Configuration Mode exists to provide the avionics technician with a means of configuring, checking, and calibrating various G1000 sub-systems. Troubleshooting and diagnostics information can also be viewed in this mode.

To start the system in Configuration Mode:

1. Press and hold the ENT key on the co-pilot's PFD while applying power using the PFD2 circuit breaker.
2. Release the ENT key after 'INITIALIZING SYSTEM' appears in the upper left corner of the PFD.
3. Press the ENT key or the YES softkey to update system files if prompted.
4. Repeat steps 1 through 3 on the MFD using the MFD circuit breaker to apply power and using the far right soft key on the MFD or the ENT key on the GCU 476 FMS controller where called out in Steps 1 through 3. (Note that the ENT key for the MFD is located on the GCU 476 FMS controller and will not function prior to software load).
5. Repeat steps 1 through 3 on the pilot's PFD using the PFD circuit breaker to apply power.

CAUTION!

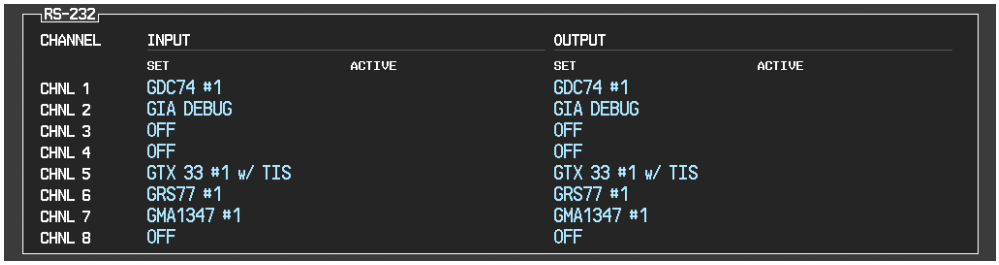
The Configuration Mode contains certain pages and settings that are critical to aircraft operation and safety. These pages are protected and cannot be modified, unless the technician is properly authorized and equipped. However, most protected pages are viewable to allow system awareness for troubleshooting.

NOTE

For a complete description and breakdown of each Configuration Mode page, refer to the G1000 Line Maintenance & Configuration Manual listed in Table 1.1.

A blank active column, as shown in Figure 2.4, represents loss of communication between the display and the particular unit. See Section 3.3 for more details on troubleshooting.

Figure 2.4 – Loss of Communication



2.5.1 Configuration Prompts

When configuration settings are changed, the technician receives on-screen prompts and/or confirmations such as those shown in Figure 2.5.

Figure 2.5 – Configuration Status

2.5.2 Data Transmission Indicators

Several configuration screens utilize an indicator light system to show discrete (ON/OFF) data and/or hardware component status. Unless otherwise noted, the following applies to all such status indicators:

- Green box: Expected data is successfully received and is ON. A green box could also indicate that the parameter/component is working correctly.
- Red box: Expected data is not received. A red box could also indicate that a parameter/component is invalid.
- White N/A: Expected data is OFF, or no data is expected.

Figure 2.6 – Data Transmission Indicators

2.5.3 Configuration Mode Navigation

Using the FMS knob, a user can navigate through different pages and page groups in the Configuration Mode. For complete description and breakdown of each page, refer to the G1000 Line Maintenance & Configuration manual.

System Page Group		
1. System Status	6. File Manager	11. System Setup
2. Time Configuration	7. Diagnostics Terminal	12. Manifest Configuration
3. Lighting Configuration	8. OEM Diagnostics	13. Maintenance Log
4. System Audio	9. System Configuration	
5. System Upload	10. System Data Path Configuration	
GDU Page Group		
1. Serial Configuration	4. Diagnostics	7. Airframe Configuration
2. CDU Status Page	5. Ethernet Test	8. TAWS Configuration
3. Key Test	6. Alert Configuration	
GIA Page Group		
1. Serial Configuration	3. GIA I/O Configuration	5. GIA Status Page
2. GIA RS-485 Configuration	4. GIA Configuration	6. GIA CAN Configuration
GEA Page Group		
1. Engine Data	2. GEA Status Page	3. GEA Configuration
GTX Page Group		
1. Serial Configuration	2. Transponder Configuration	
GRS Page Group		
1. Inputs Configuration	2. GRS / GMU Calibration	
ADC Page Group		
1. ADC Configuration	2. GDC Configuration	
GFC Page Group		
1. GFC Configuration	2. GFC Status	
GMA Page Group		
1. GMA Configuration		
GDL Page Group		
1. GDL 69 Config		
RMT Page Group		
1. Remote Controller Status		
GWX Page Group		
1. GWX Configuration		
OTHER Page Group *		
1. Stormscope		
CAL Page Group		
1. Fuel Tank Calibration	2. Flap and Trim Calibration	3. HSCM Calibration

* OTHER Page Group will not be present unless Stormscope is configured ON.

3 CONTINUED AIRWORTHINESS

This section provides Instructions for Continued Airworthiness for the G1000 Synthetic Vision & Pathways Option. This document satisfies the requirements for continued airworthiness as defined by 14 CFR Part 23.1529 and Part 23 Appendix G. Information in this section is required to maintain the continued airworthiness of the G1000 SVS/Pathways option.

3.1 AIRWORTHINESS LIMITATIONS

There are no airworthiness limitations associated with this type design change (STC # SA01533WI-D).

The previously approved Instructions for Continued Airworthiness defined under TCDS A25SO, and identified in Table 1-1, remain valid and applicable for all other maintenance and ICA aspects of the G1000 and GFC 700 systems.

The Airworthiness Limitations section is FAA-approved and specifies maintenance required under § 43.16 and 91.403 of Title 14 of the Code of Federal Regulations, unless an alternative program has been FAA-approved.

3.1.1 Definitions/Abbreviations

AFMS – Airplane Flight Manual Supplement

FPM – Flight Path Marker

GDU – Garmin Display Unit

GPS – Global Positioning System

GTX – Garmin Transponder

ICA – Instructions for Continued Airworthiness

MFD – Multi-Function Flight Display

PFD – Primary Flight Display

STC – Supplemental Type Certificate

SVS – Synthetic Vision System

LRU – Line Replaceable Unit

3.1.2 Units of Measure

Units of measure are not applicable to this STC.

3.2 SERVICING INFORMATION

The software upgrades and SVS/Pathways function are non-serviceable software which is either active or inactive in the G1000 system. Section 4.1 provides a check to determine the state, and versions of software currently installed.

There are no inspection intervals required for the SVS/Pathways feature.

Reactivation may be required following normal maintenance procedures. See Section 3.4.

3.2.1 Recommended Tools

No tools are required to activate and maintain the SVS/Pathways feature.

3.3 TROUBLESHOOTING

The SVS/Pathways software feature requires the following G1000 sensors/data to be valid:

- AHRS
- Heading
- GPS Position
- 9 Arc-Second Terrain Data

In the event that one the above items fails or is unavailable, the SVS/Pathways feature is automatically removed from the PFD. The following table describes possible symptoms associated with the SVS/Pathways feature, and provides corresponding actions for troubleshooting:

Table 3.1 – SVS Troubleshooting

Symptom	Recommended Action
"SYN VIS" softkey does not appear on PFD softkey tier.	Verify that the PFD and MFD software versions are shown to be 9.05 or later by checking the AUX – System Status Page on the MFD. If version 9.05 or later software is installed in the MFD and PFDs, follow the steps in Section 3.4.3 to reactivate the SVS/Pathways feature.
3D terrain presentation does not appear on PFD.	Verify that P/N 010-00330-43 terrain datacards are installed in the lower slot of the PFD and MFD. Verify that no alert messages are shown in the PFD Alerts Window. Verify that the G1000 AHRS, and heading data are valid on the PFD. Verify that a valid GPS 3D position solution is being received. Troubleshoot these systems in accordance with the existing Piper PA-46-500TP Airplane Maintenance Manual as referenced in Table 1-1. If a terrain database update has just been performed, allow the system time to initialize and verify the data. When the databases have been verified, the current database cycle and version are reported on the MFD AUX – System Status page.

The following table provides SVS/Pathways specific alert messages which may appear in the Alerts Window on the PFD (press the ALERTS softkey on the PFD to view the Alerts Window):

Table 3.2 – SVS Alert Messages

Failure Message	Cause	Solution
SVS – SVS DISABLED: Out of available terrain region.	SVS is disabled because the aircraft exceeded the boundaries of the loaded terrain database.	Geographical operation limitations are defined in the SVS/Pathways AFMS, which is referenced in Table 1.1. Ensure that operations are within this geographic area.
SVS – SVS DISABLED: Terrain DB resolution too low	SVS is disabled because a 9 Arc-Second or better database is not currently loaded.	Ensure the P/N 010-00330-43 Terrain Cards are installed in the lower slot of each display. If terrain data has been recently updated, ensure that the correct 9 Arc-Second databases were used.

3.4 REMOVAL & REPLACEMENT

SVS/Pathways and all software version changes associated with this STC are non-serviceable software and cannot be physically removed or replaced in the G1000.

3.4.1 G1000 LRU removal and replacement

This STC does not incorporate any hardware changes to the G1000 installation on the Piper PA-46-500TP. Removal and replacement of G1000/ GFC 700 LRUs should be done in accordance with the existing Piper PA-46-500TP Airplane Maintenance Manual listed in Table 1.1.

Reinstallation of the software upgrade and SVS reactivation per this STC should be accomplished in accordance with sections 3.5.2 and 3.5.3 respectively.

3.4.2 Software Reloading Criteria

SVS/Pathways Feature

Certain G1000 maintenance activities will require the SVS/Pathways feature to be re-activated and/or the unit software to be reloaded.

Specifically, any time the default AIRFRAME configuration file is reloaded to the G1000, the SVS/Pathways feature 'activation' is lost. See 34-20-00 Section 4.1 of the existing Piper PA-46-500TP Airplane Maintenance Manual listed in Table 1.1 for detailed information regarding G1000 configuration files.

The following specific maintenance scenarios will require re-activation of the SVS/Pathways feature:

- Software and configuration files are completely re-loaded to the G1000 system.
- Software and configuration files specific to the PFD(s) are re-loaded, either as the result of troubleshooting procedures or complete PFD replacement.

In the event one of these scenarios occurs, the technician must reactivate and verify the SVS/Pathways feature following the steps outlined in Section 3.4.3.

Software Reloading

Removal and replacement of any LRU mandates the reloading of the applicable LRU software. Refer to Piper AMM 767-005 Chapter 34-00-00 for instructions on removal, replacement, and functional checks of individual LRUs. Once completed, the software and configuration must be loaded into the new unit following the steps outlined in Sections 3.7 through 3.9.

3.4.3 SVS/Pathways Activation

This section provides the requirements and instructions necessary to unlock 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 Unlock Card:

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

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

Table 3.3 – SVS Unlock Card

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 unlock 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.

3.4.3.1 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 Unlock card is required to activate this feature, refer to Table 1.1. 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 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 Unlock card from the PFD.

3.4.3.2 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.
5. Installation is complete. Be sure to keep the SVS / Pathways unlock card with the aircraft for future use.

3.5 SOFTWARE INFORMATION

NOTE

The following sections provide a detailed description of loading all G1000 software and configuration files, which may be excessive for individual LRU removal and replacement. If removing and replacing individual LRUs, refer to Section 3.8.3 of this manual for the necessary steps.

3.5.1 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 for each STC Configuration 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 3.6.

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 3.6 through Section 3.7 *before* attempting to use the software loader cards.

3.6 SOFTWARE LOADER CARD CREATION

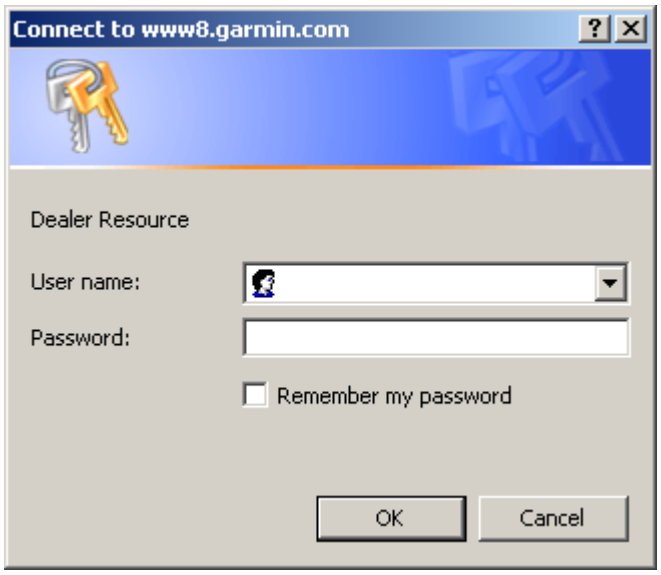
The software image is an executable self-extracting file which builds the correct file structure onto an SD card for use loading software to the G1000 and GFC700. To obtain the current file follow the procedures outlined below.

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 username and password.

Figure 3.1 – Dealer Login



2. Click the Agree button on the confidentiality agreement page.

3. Select the G1000 Field-Loadable Software Updates link.

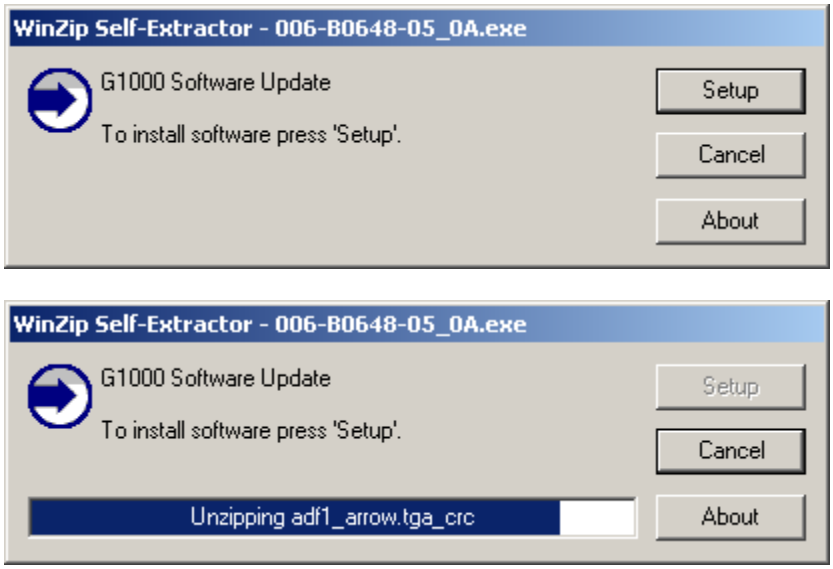
4. Select the G1000 Equipped Piper PA-46 hyperlink.

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
0720.06	NA	006-B0720-06

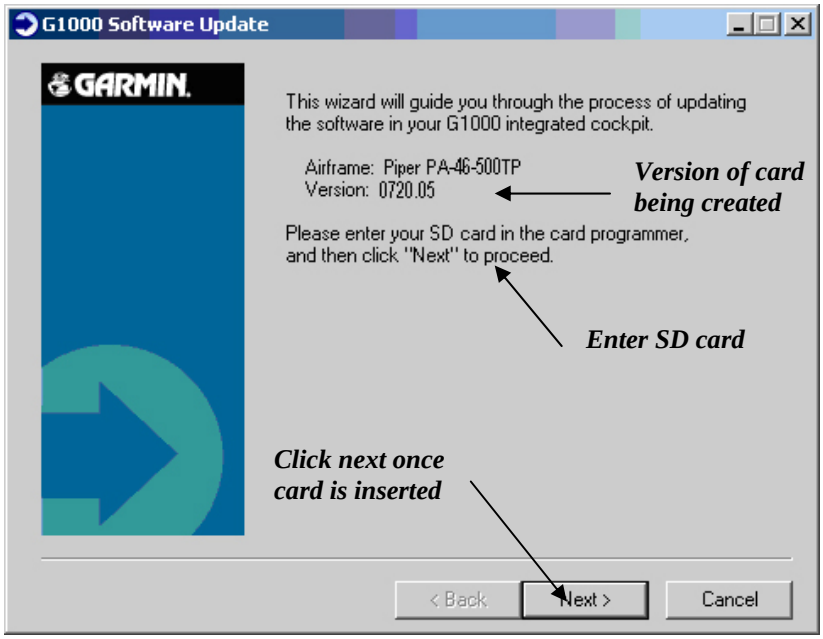
6. Select the appropriate hyperlink and save the file to the local hard drive.

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.

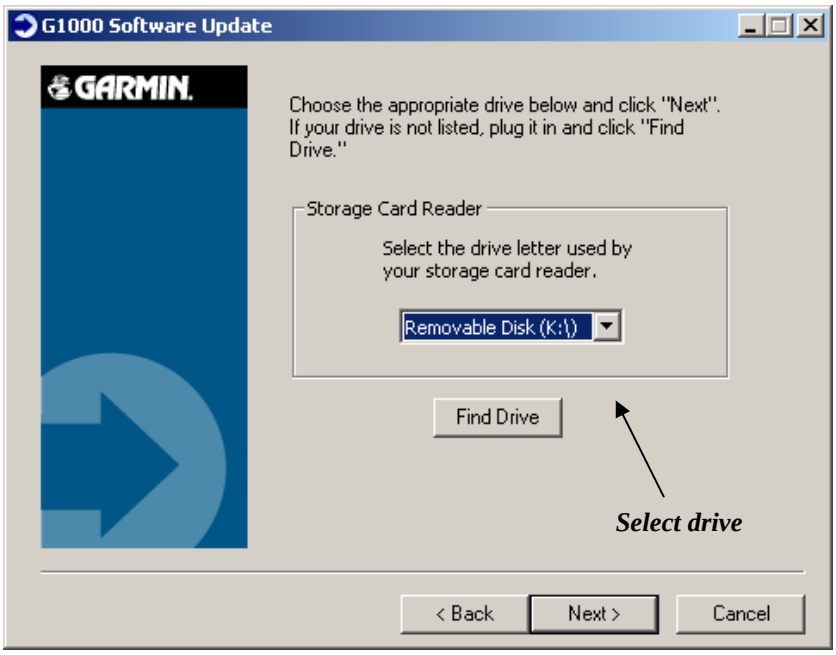


NOTE

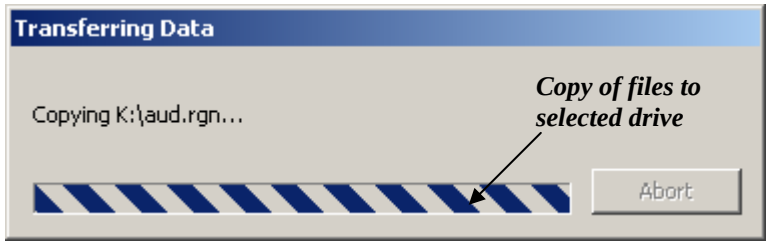
When the extraction begins, the program automatically deletes all current files on the SD card and copies the selected files to it, regardless of the file format on the SD card. Ensure files are not necessary or card is empty before proceeding



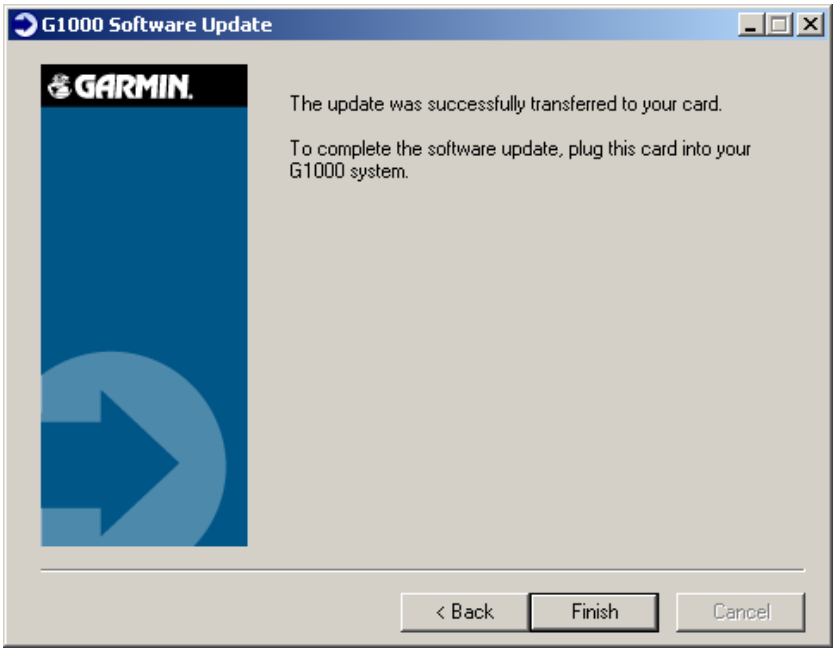
8. Ensure the card and correct drive letter is used, and click next.



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.



3.6.1 Software Files

Software files are defined by part number and version number on the General Arrangement drawing. See 005-00541-03 for the correct General Arrangement drawing part numbers. Each G1000 / GFC 700 LRU reports the software version it currently contains to the user in two places.

- Normal System Mode: The AUX – SYSTEM STATUS page lists each LRU and the reported software version.
- Configuration Mode: The SYSTEM STATUS page (SYSTEM page group) reports more detailed LRU information, including software version, part number, and LRU status.

Software files are loaded to LRUs from the SYSTEM UPLOAD page in configuration mode.

3.6.2 Configuration File Descriptions

Configuration files contain preset selections for input/output channels, aircraft-specific settings, and LRU-specific settings. The following list describes each of the configuration files:

Table 3.4 – Configuration Files

PA46_500TP_BASE_UPLOAD	This file contains data such as airspeed parameters, engine/airframe sensor limitations, fuel tank parameters and alerting system settings that tailor a G1000 system to the PA46.
PA46_option_ADF	This file configures the ADF option on.
PA46_option_DME	This file configures the DME option on.
PA46_option_GDL	This file configures the GDL69 option on.
PA46_option_GTX_2	This file configures the #2 Transponder option on.
PA46_option_TAS	This file configures the TRAFFIC option on.
PA46_option_WX500	This file configures the Stormscope option on.

IMPORTANT!

Certain software and configuration files are REQUIRED to be re-loaded during maintenance that involves removal and replacement of G1000 equipment.

Refer to Section 3.4 for re-configuration requirements for each G1000 LRU. Pay special attention to the configuration of options for the G1000.

3.6.3 Configuration File Storage

The G1000 system is designed to store all configuration settings in various places so that the configuration is retained in the aircraft during maintenance of units.

During system configuration, each file is sent directly to the applicable LRU where it is stored in local LRU memory (except GRS 77 & GDC 74A). Each file is also stored in the PFD internal memory. The applicable PFD also sends a copy of all configuration files to the 'Master Configuration module', located in the connector backshell. If the PFD is replaced, the configuration module retains all configuration files in the aircraft.

NOTE

The GRS 77 AHRS and GMU 44 Magnetometer do not have a configuration file. However, these LRUs do store calibration data acquired during the post installation checkout, which are characteristic to the specific installation. While performing maintenance on these units, re-calibration may be required.

The GRS 77 and GDC 74A configuration modules function differently than the rest of the system. The GDC 74A's configuration file is loaded directly to GDC internal memory. A copy of the file is stored in the GDC configuration module.

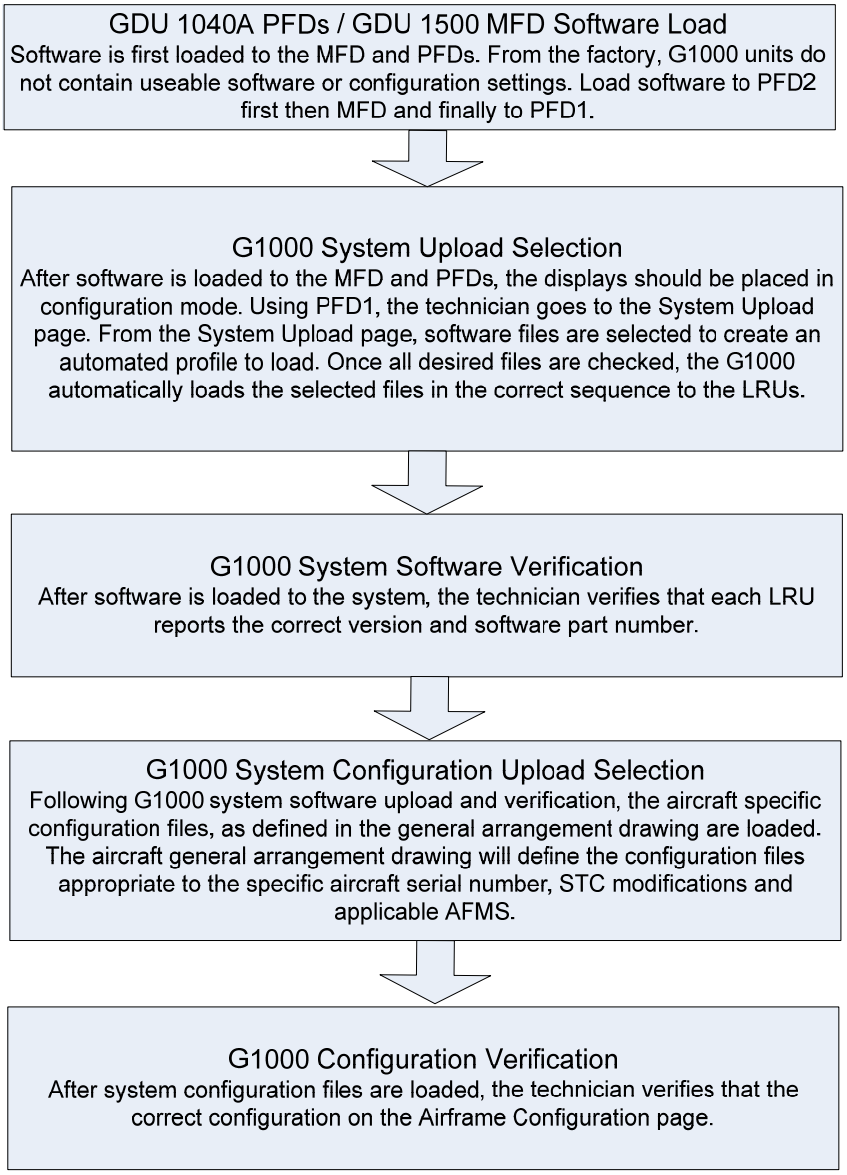
The GRS 77 configuration module does not store any configuration settings. Instead, it stores calibration data recorded during installation calibration procedures.

3.7 G1000 SOFTWARE/CONFIGURATION PROCEDURE

This section summarizes the procedures required to load software and configuration files to the G1000. It is intended to work as a central guide for technicians to use while performing maintenance on the aircraft. In sections of this manual where software is required to be reloaded, these sections will make reference back to this section for instructions. The technician should use proper judgment regarding the context of maintenance required while following this section.

The following diagram depicts an overview of the software/configuration sequence for the G1000 system. This applies mostly to a new G1000 system which has not previously been powered up and is for informative purposes only.

Figure 3.2 – Software/Configuration Overview



3.8 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.

3.8.1 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):

6. The following screen is displayed.

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.

3.8.2 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.

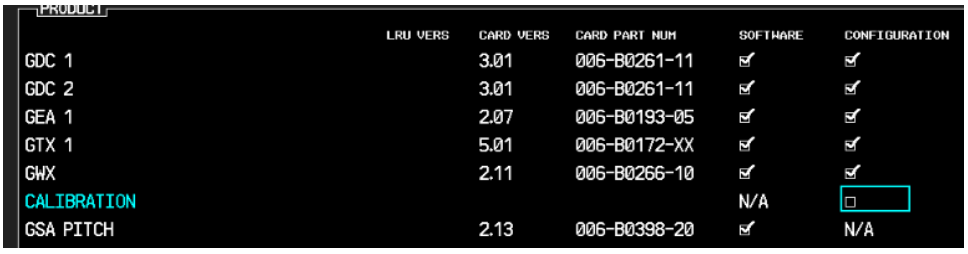
NOTE

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 3.3 - Configuration/Software Load Page

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

Figure 3.4 - Calibration Configuration



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.

3.8.3 Individual LRU 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.

4. Press the CLR ALL softkey.

5. Using the FMS knob, scroll down to the applicable LRU and press the ENT key on the SOFTWARE and CONFIGURATION boxes as necessary.

6. Press the LOAD softkey.

7. 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.

8. Press PFD1 ENT key to acknowledge the “Upload Complete” box.

9. Proceed to the next section.

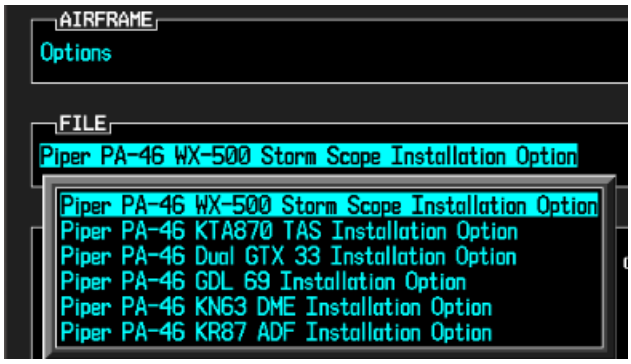
3.9 OPTIONAL EQUIPMENT CONFIGURATION

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. Create a pick list by rotating the small FMS knob and select Options and press ENT.
2. Create a pick list by rotating the small FMS knob and select the desired option, press ENT.
3. Verify both Software and Configuration boxes are checked for Garmin options.
4. Verify Configuration boxes checked for all other options.
5. Press LOAD softkey.
6. Verify the summary field lists the software and configuration are complete as required and PASS is displayed next to both appropriate boxes.
7. Press ENT to accept.
8. For other installed options repeat steps 3 thru 7 by rotating the large FMS knob and highlighting the File Field.
9. De-activate the cursor.

Figure 3.5 - Option Selection



4 SYSTEM RETURN TO SERVICE PROCEDURE

The procedures contained in this section describe the minimum return to service checks that should be performed upon reinstallation of the software and/or reactivation of SVS/Pathways. If the software reload or SVS reactivation was as a result of an LRU replacement, the technician must also perform any additional return to service tests required by the existing Piper PA-46-500TP Airplane Maintenance Manual (listed in Table 1.1) for that LRU.

4.1 SOFTWARE VERIFICATION

After reinstalling any G1000 LRU, verify the correct LRU software part numbers and versions against the numbers listed on the General Arrangement drawing 005-00541-03.

Start the G1000 system in configuration mode. 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 Part Number, 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.

Figure 4.1 – System Status Page (Configuration Mode)

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

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	
GEA2		GMC		GTX1	
GFC CERT GIA1		GMU1		GTX2	
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		GSA PTCH CTL		GRS2 FPGA	

The software part number and version is displayed in the DATA window. Compare this to the software configuration shown in the General Arrangement Drawing 005-00541-03.

IMPORTANT!

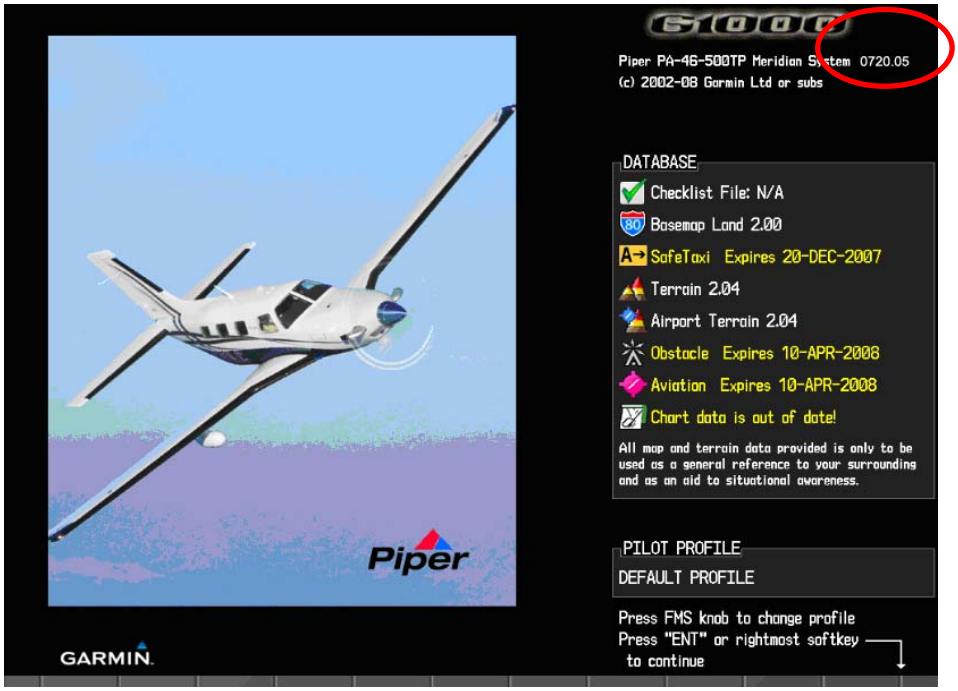
It is essential that the software versions be checked and matched against the listed versions in the General Arrangement drawing 005-00541-03. Software Configuration is a critical part of the G1000 operation and must be verified before returning an aircraft to service.

4.2 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.

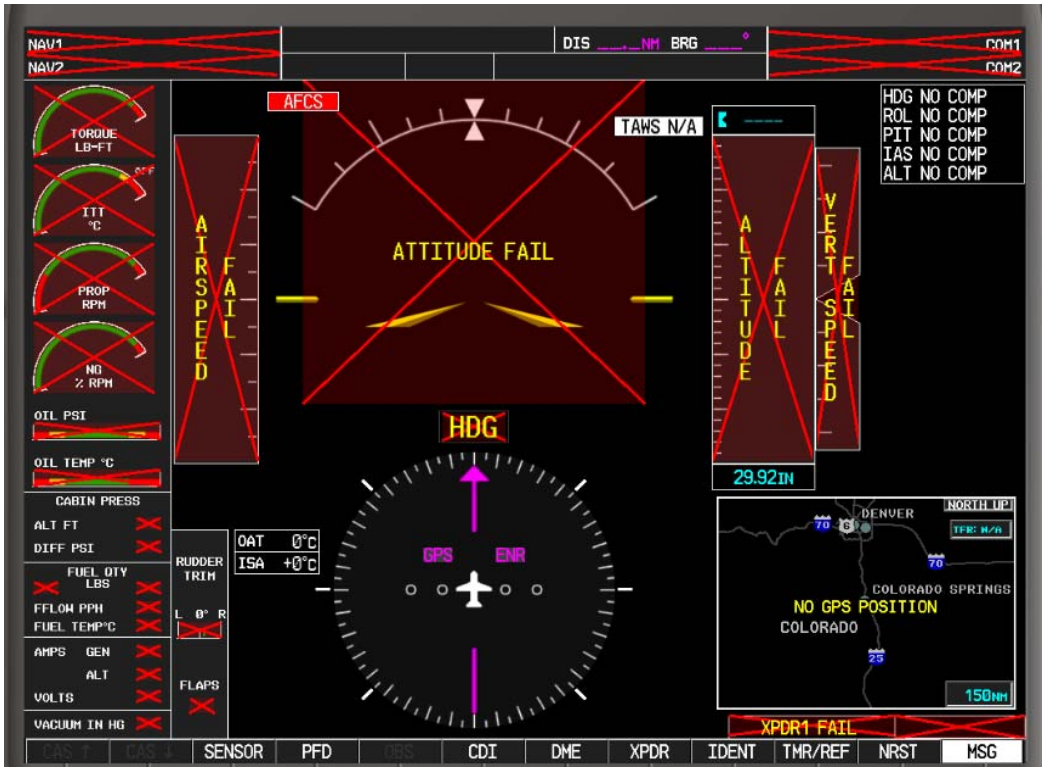
1. Apply aircraft power. Observe the MFD power-up screen. Verify the display is formatted as shown in Figure 4.2. Figure 4.2 is a format reference, the illustration on the left may vary. Note database versions and system software represented in the upper right corner. Refer to General Arrangement Drawing 005-00421-03 drawing for the correct database and system software versions.

Figure 4.2 – 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 005-00421-03.
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 4.3 – PFD Power Up System Annunciations



In the normal operating mode, data fields that are invalid have large red X's through them (Figure 4.3). A valid field does not display a red X (Figure 4.4). Allow the displays to initialize for approximately one minute. The GDC 74As requires a longer initialization period than do the other LRUs. During normal operation, this causes the airspeed, altitude, vertical speed, and OAT fields to be invalid during the first ~40-60 seconds of PFD power-up.

Figure 4.4 - PFD Operation

(SVS enabled)

(without SVS enabled)

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.

4.2.1 Reversion Mode Check

1. Push the red **DISPLAY BACKUP** button on the pilot-side GMA 1347. Verify that the pilot-side PFD and MFD displays enter reversion mode (See Figure 4.5). MFD should have valid altitude, airspeed, vertical speed, COMM1, COMM2, NAV1, NAV2 and engine instruments.

Figure 4.5 – Reversion Mode

2. De-activate pilot-side reversion mode by pushing the **DISPLAY BACKUP** button. Verify PFD1 and MFD return to normal display modes.
3. Repeat Step 1 using GMA2. Ensure that PFD2 and MFD enter reversion mode and MFD displays valid altitude, airspeed, vertical speed, COMM1, COMM2, NAV1, NAV2 and engine instruments.
4. De-activate co-pilot's side reversion mode by pushing the **DISPLAY BACKUP** button. Verify PFD2 and MFD return to normal display modes.

5. Open PFD1 circuit breaker. Verify the PFD1 goes blank and MFD display remains in normal mode.
6. Push the red **DISPLAY BACKUP** button on the pilot-side GMA 1347. Verify that the MFD displays enter reversion mode. MFD should have valid altitude, airspeed, vertical speed, COMM2, NAV2 and engine instruments.
7. Close PFD circuit breaker and de-activate pilot-side reversion mode by pushing the **DISPLAY BACKUP** button. Verify PFD1 and MFD return to normal display modes.

4.3 GPS SIGNAL ACQUISITON

Figure 4-6 - 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).