

G1000 Synthetic Vision & Pathways Option

Activation Instructions For G1000 Installations in Diamond DA40 / DA40 F Aircraft

Contains Instructions for Continued Airworthiness for STC #SA01480WI-D



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RECORD OF REVISIONS

Revision	Revision Date	Description	ECO #
1	3/6/2008	Initial Release.	-----
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DOCUMENT PAGINATION

Section	Pagination
Section 1	1-1 – 1-2
Section 2	2-1 – 2-2
Section 3	3-1 – 3-6

1 INTRODUCTION

1.1 Scope

This document presents activation procedures and Instructions for Continued Airworthiness required for the optional Synthetic Vision and Pathways feature in the G1000 Integrated Cockpit System for DA40/DA40F aircraft, as installed by STC #SA01480WI-D.

This manual does not constitute a complete set of G1000 Post Installation or Maintenance procedures. The procedures in this manual are to be performed on a completed G1000 installation only, per the requirements of the STC Master Drawing List, 005-00442-02.

Table 1-1. Reference Documents

Part Number	Document
005-00442-02	STC Master Drawing List
190-00545-01*	G1000 System Maintenance Manual – Diamond DA40 & DA40F, With GFC 700 or KAP140 AFCS*
190-00492-15	Airplane Flight Manual Supplement, Synthetic Vision & Pathways Option

*Existing approved G1000/DA40 ICA under the prerequisite STC #SA01444WI-D.

1.2 Organization

This manual is divided into two sections as follows:

Section 2: SVS/Pathways Activation

Provides the requirements and instructions to activate the G1000 Synthetic Vision & Pathways Option.

Section 3: Continued Airworthiness

Defines the continued airworthiness requirements of the SVS/Pathways software feature.

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2 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 requires GDU software version 9.01 or later to be installed with the DA40-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/DA40 installations:

Table 2-1. SVS Unlock Card

Qty	Garmin Part Number	Description
1	010-00330-54	Synthetic Vision & Pathways Unlock, 1 PFD

IMPORTANT!

When the SVS/Pathways option is enabled for the first time (normally at the Diamond factory), 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.

The unlock card is forever tied to the specific aircraft in which it was used for the first time. This card **MUST** be kept with the aircraft for situations where SVS/Pathways must be re-activated.

2.1 SVS Activation Procedure

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

1. Pull the MFD and PFD circuit breakers.
2. Turn on the ground power unit, if used.
3. Turn on the BAT side master switch.
4. Turn on the AVIONICS MASTER switch. At this moment, all G1000 equipment should be receiving power, except the PFD and MFD.
5. A special SVS Unlock card is required to activate this feature, refer to Table 2-1. Insert this card in the upper slot of the pilot's side PFD.
6. While holding the ENT key on the MFD, restore power by closing the MFD circuit breaker.
7. When the words **INITIALIZING SYSTEM** appear in the upper left corner of the MFD, release the ENT key.
8. Repeat Steps 6 and 7 for the PFD.
9. On the PFD, go to the System Upload page using the FMS knob.
10. Activate the cursor. Use the small FMS knob to select CONFIGURATION FILES in the AIRFRAME field and press the ENT key.
11. 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.
12. Press the LOAD softkey.
13. Monitor the status of the upload. When the upload is finished, press the ENT key to acknowledge the upload complete confirmation.
14. View the SUMMARY field and ensure that the item is 'COMPLETE'.
15. De-activate the cursor.
16. Power down the system and remove the SVS Unlock card from the PFD.

2.2 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 PFD. Check the MFD AUX – System Status page to verify GPS signals acquisition.
2. Press the ALERTS softkey on the PFD 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 Continued Airworthiness

This section provides Instruction 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.

3.1.1 Applicability

This document applies to all Diamond Aircraft Industries, Inc., Model DA 40 and DA 40 F aircraft equipped with the G1000 which have the optional SVS/Pathways feature activated per STC #SA01480WI-D.

Modification of an aircraft by this Supplemental Type Certificate (STC) 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.

3.2 Airworthiness Limitations

There are no airworthiness limitations associated with the activation of the optional G1000 SVS / Pathways feature under STC #SA01480WI-D.

The previously approved Instructions for Continued Airworthiness defined by the prerequisite STC #SA01444WI-D remain valid and applicable for all other maintenance and ICA aspects of the G1000 and optional 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.

3.2.1 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

3.2.2 Units of Measure

Units of measure are not applicable to this STC.

3.3 Distribution

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

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3.4 System Description

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.

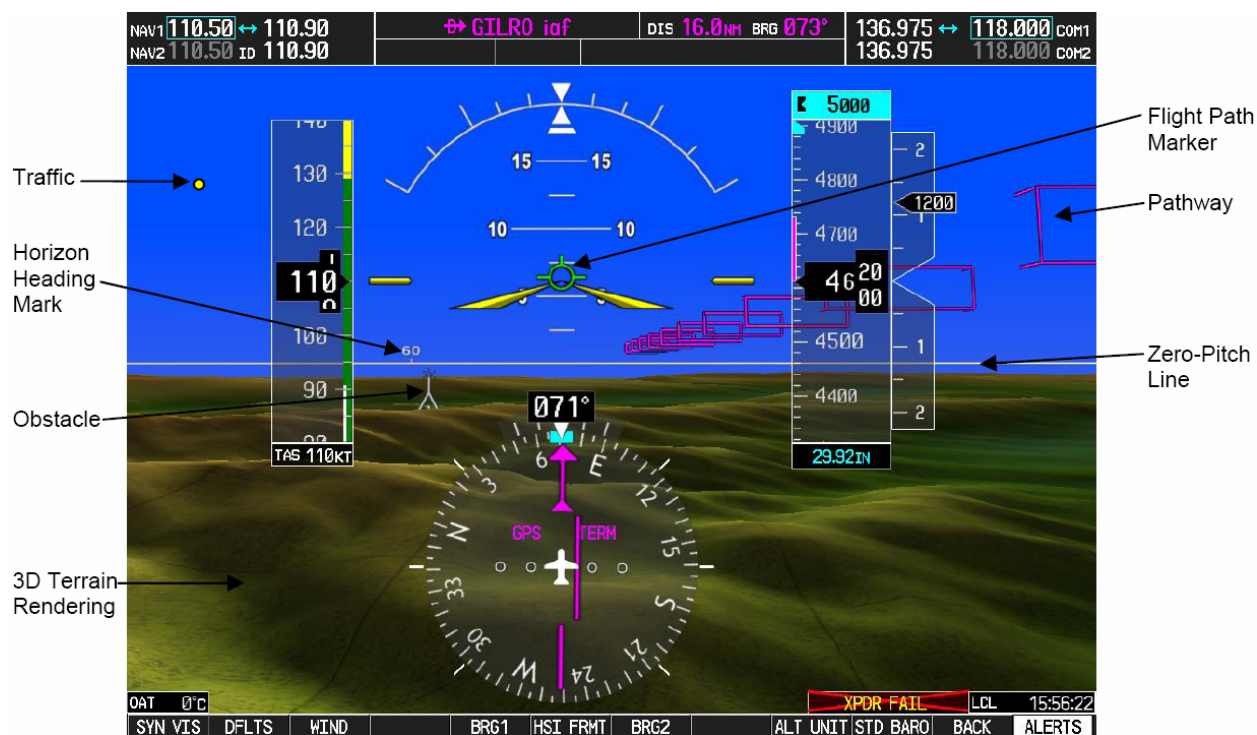


Figure 3-1. SVS/Pathways Feature

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.

3.4.1 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.

3.5 Servicing Information

SVS/Pathways is a non-serviceable software feature which is either active or inactive in the G1000 system. Section 2.2 provides a check to determine the state of the SVS/Pathways feature.

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

Reactivation may be required following normal maintenance procedures. See Section 3.7.

3.5.1 Recommended Tools

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

3.6 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 9.01 by checking the AUX – System Status Page on the MFD. If version 9.01 software is installed in the MFD and PFD, follow the steps in Section 2.1 to reactivate the SVS/Pathways feature.
3D terrain presentation does not appear on PFD.	Verify that P/N 010-00442-43 terrain datacards are installed in the lower slot of the PFD and MFD. Verify that the alert messages shown in Table 3-2 are not displayed on the PFD Alerts Window. If so, follow the solutions described in Table 3-2. 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 G1000/DA40 System Maintenance Manual, P/N 190-00545-01. 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-Related 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.

3.7 Removal & Replacement

SVS/Pathways is a non-serviceable software feature and cannot be physically removed or replaced in the G1000.

3.7.1 SVS/Pathways Reactivation Criteria

Certain G1000 maintenance activities will require the SVS/Pathways feature to be re-activated.

Specifically, any time the default AIRFRAME configuration file is reloaded to the G1000, the SVS/Pathways feature 'activation' is lost. See Section 3.5 of the existing G1000/DA40 System 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 is completely re-loaded to the G1000 system.
- Software and configuration files specific to the PFD were re-loaded, either as the result of troubleshooting procedures or of 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 Sections 2.1 and 2.2.

3.8 Return to Service

The verification steps provided in Section 2.2 must be used to verify the SVS/Pathways feature has been successfully activated and is functioning properly.