



VFS101 Instructions for Continued Airworthiness

VFS101-ICA3, Revision A

VFS101 Pilot Speech Recognition System



FAA STC Number SA02717NY

Revision History

Rev.	Page	Date	Description	Sig.
A	All	27-Dec-2012	Initial Release	JSM

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1.0 Introduction

This document describes the routine maintenance procedures needed to maintain the VFS101 speech recognition system. Information regarding the installation of the VFS101 unit (including wiring diagrams, mechanical installation details, part numbers, wire gauges, configuration and installation procedures) can be found in the VFS101 Installation Instructions (VFS101-INSISTR3).

Modification of an aircraft by this Supplemental Type Certificate 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.

1.1 Applicability

These instructions are applicable to VFS101 units with serial numbers between 000001 and 010000 with software versions of the form 3.X.X.

The VFS101 is applicable to all appropriately equipped aircraft types listed on the VFS101 Approved Model List (AML). Required equipment is listed in Appendix F.

1.2 Equipment Location

The VFS101 may be installed within the avionics radio rack using a Tray Mount or a Sled Mount, or directly behind the instrument panel using the Panel Mount. Each of these installations are illustrated in Appendix E.

A VoiceFlight Activation Switch (VAS) is typically installed on the yoke within easy reach of the pilot as illustrated in Appendix E.

2.0 Description

The VFS101 is a speech-recognition system which allows aircraft pilots to enter aircraft navigational data using their voice. Voice entry of navigational data can be performed approximately ten times faster than with conventional knob twisting. It is designed to operate with the Garmin 400 / 500 series or 400W / 500W series of GPS navigational units, and supports installations with one or two GPS units present. (Mixed installations of one 400 / 500 series GPS and one 400W / 500W series GPS are NOT supported.)

Section 6.1 of this document provides a simple example of VFS101 usage. Detailed information on VFS101 operations can be found in the VFS101 Pilot's Guide (VFS101-PMAN3).

The VFS101 is installed either behind the aircraft instrument panel, or in the aircraft avionics rack. A momentary pushbutton VoiceFlight Activation Switch (VAS) is typically installed on the pilot's yoke.

3.0 Controls

The VFS101 has a single control, a momentary pushbutton VoiceFlight Activation Switch (VAS) typically installed on the pilot's yoke. The VAS must be held down by the pilot when speech commands are provided to the VFS101. The VFS101 will not recognize speech, or transmit updates to the GPS units, unless the VAS is depressed.

4.0 Servicing

None required, except as described in sections 5.2 and 5.3.

5.0 Maintenance

5.1 Preventive Maintenance

As a solid-state electronic device no preventative maintenance is required. See section 5.3 for information on updating the navigational database, which is required every 28 days in accordance with the AIRAC charting cycle.

5.2 Inspection and Scheduling

Condition and airworthiness inspections of the VFS101 installation are performed during each Annual and/or 100-hour inspection. Other than the periodic inspections listed below, and updates to the navigational database every 28 days as specified in Section 5.3, maintenance of the VFS101 is limited to "on condition" with no specific overhaul period.

At each annual and/or 100-hour inspection:

1. Examine the fasteners used to secure the VFS101, as well as those utilized by a tray and/or sled if installed. Insure that all fasteners are present and secure.
2. Wires and cables should be inspected for adequacy of support, protection, and general condition throughout.
3. Ensure that the electrical cables are separated from mechanical control cables. In no instance should wire be able to come closer than 1/2 inch to such controls when light hand pressure is applied to wires or controls.
4. Inspect wires for signs of:
 - (a) chaffing
 - (b) cracking
 - (c) exposure to high temperature
 - (d) crushing
 - (e) kinking
5. Ensure the DB25 connector is tightly secured to the unit.

5.3 Updating the Navigational Database

It is necessary to update the VFS101 navigational database every 28 days in synchronization with the AIRAC charting cycle. These updates should be done at the same time as a new navigation data-card is installed in the Primary GPS (and secondary GPS if so equipped).

It is the pilot's responsibility to ensure that the correct navigational data is installed on the VFS101. Failure to use current navigational data may result in incorrect airway expansion and an inability to enter some waypoints using the VFS101.

If the VFS101 navigational database and Primary GPS navigation database do not have the same cycle number, the VFS101 will play an audio warning message the first time the VAS is depressed after each power cycle.

Operating the VFS101 with an obsolete navigational database is permissible, however doing so imposes an operational restriction:

If the navigational database installed on the VFS101 is not current, the pilot must manually verify the correctness of each waypoint and airway entered using the VFS101 by comparison to current navigational charts.

To update the VFS101 Navigational Database, utilize the following procedure:

1. Download the navigational database from the "Navigation Update" section of the VoiceFlight Systems website (<http://www.voiceflight.com>) which corresponds to the Primary GPS navigation database. If the website is unavailable contact VoiceFlight Systems customer support for assistance. Contact information can be found in section 16.0 of this document. The computer used for this should be running a recent version of Microsoft Windows, Apple OS X or Linux to insure proper support for the USB flash drive used in step 2.
2. Insert the supplied USB flash drive into a USB port on the computer. On most systems the flash drive should be automatically opened (mounted) by the operating system. Transfer the downloaded navigational database file to the Flash Drive. If other VoiceFlight files (files with the extension ".vfs") exist on the USB drive, erase them. Do not place the update file into any sub-directories on the flash drive. Eject the flash drive and remove it from the computer's USB port.
3. At the aircraft, plug a suitable aviation headset into the pilot's headset jacks so that audio responses from the VFS101 can be heard. Alternatively, the aircraft's cockpit speaker may be utilized.
4. If an updated GPS navigation data-card is available install it as per Garmin instructions.
5. With the aircraft stationary, apply power to the GPS unit(s), aircraft audio panel and the VFS101. Wait at least thirty seconds for the VFS101 to initialize. Wait for the GPS(s) to initialize, and acknowledge the self-test

screens as required. Display the active flightplan page on the GPS by depressing the FPL button.

6. Insert the USB flash drive into the VFS101 USB jack. Wait at least one minute for the update to be performed.
7. Depress and hold the VAS. An audio message indicating that the navigational update has completed should be heard through the audio system. If the audio message is not heard release the VAS, wait another full minute and try depressing the VAS again. If the message is still not heard, remove the USB drive, remove power from the units and repeat steps 5 through 7.
8. If the audio message "Database Calibration Required, Double-Click to Begin" is heard immediately following the "Navigation Update Complete" message, complete the procedure described in section 5.4, then proceed with step 9 of this procedure.
9. Remove the USB flash drive from the VFS101 USB jack.
10. Depress and hold the VAS. If the explicit warning message "Warning: Navigation cycle dates do not match" is **not** heard, then the VFS101 has determined that the navigational databases have matching cycle dates.

5.4 Calibration (WAAS only)

This section is applicable only to VFS101 units used with Garmin 400W / 500W series GPS units. It is not required for VFS101 units used with Garmin 400 / 500 series GPS units.

Database calibration is a process that verifies the databases on the primary GPS and the VFS101 are synchronized and updates VFS101 information about the particular database in use on the GPS.

Recalibration is required whenever the navigational data of the primary GPS or VFS101 is changed. This process will typically complete quickly but may require up to five (5) minutes. The aircraft must remain stationary during this time.

1. Display the active flight plan page on the primary GPS by depressing the FPL button.
2. Depress and hold the VAS. An audio message "Database Calibration Required, Double-Click to Begin" will be heard.
3. Promptly double-click the VAS to begin the calibration process.
A double-click is performed by releasing the VAS, and then depressing and releasing the VAS twice in rapid succession.
4. The VFS101 will then begin a calibration cycle. During this time the flightplan on the primary GPS will fill with waypoints. Do not use the GPS during this time. After calibration is complete the original active flightplan will be restored.

5.5 Software Update

VoiceFlight Systems may issue software updates to fix software errors or to add new functionality. These will be announced on the VoiceFlight Systems webpage (<http://www.voiceflight.com>), as well as in an electronic mail message sent to all VoiceFlight authorized dealers, repair stations, and customers that have provided an e-mail address.

To update the VFS101 software, utilize the following procedure:

1. Download the applicable software update from the "Software Update" section of the VoiceFlight Systems website (<http://www.voiceflight.com>). If the website is unavailable, contact VoiceFlight Systems customer support for assistance. Contact information can be found in section 16.0 of this document. The computer used for this should be running a recent version of Microsoft Windows, Apple OS X or Linux to insure proper support for the USB flash drive used in step 4.
2. If the software update section of the website contains an updated Pilot's Guide download the PDF and print it, preferably on a two-sided color laser printer. Alternatively, contact VoiceFlight Systems via the email address provided on the website for a revised Pilot's Guide.
3. Write down the revised Recognition Processor Software and Interface Processor part numbers and checksums. These will be needed later to verify correct installation of the new software.
4. Insert the supplied USB flash drive into a USB port on the computer. On most systems the flash drive should be automatically opened (mounted) by the operating system. Transfer the downloaded software update file to the flash drive. If other VoiceFlight files (files with the extension ".vfs") exist on the USB drive, erase them. Do not place the update file into any sub-directories on the flash drive. Eject the flash drive and remove it from the computer's USB port.
5. At the aircraft, plug a suitable aviation headset into the pilot's headset jacks so that audio responses from the VFS101 can be heard. Alternatively, the aircraft's cockpit speaker may be utilized.
6. With the aircraft stationary, apply power to the aircraft audio panel and the VFS101. Wait at least thirty seconds for the VFS101 to initialize before inserting the USB flash drive into the VFS101 USB jack.
7. Wait at least one minute for the update to be performed. Depress and hold the VAS. An audio message indicating that the software update has completed should be heard through the audio system. If the audio message is not heard wait another full minute and try depressing the VAS again. If the message is still not heard, remove the USB drive, remove power from the units and repeat steps 6 & 7.
8. Remove the USB flash drive from the VFS101 USB jack.
9. Remove power from the VFS101, wait 10 seconds and re-apply power. This may be done using the VFS101 circuit breaker or dedicated power switch.

10. Apply power to the GPS(s), wait for them to initialize, and acknowledge their self-test screens as required. Depress and hold the VAS to listen to any pending audio messages. Release the VAS.
11. Enter a new title for the active flightplan on the primary GPS containing the letter "C" (for CONFIGURATION) in the first character position and no other characters. Press ENT to install the new title. Wait at least 10 seconds. Briefly depress and release the VAS to enter configuration display mode.
12. Briefly depress and release the VAS to increment the display. Configuration items will be displayed in sequence as illustrated in the following table.

#	Description	Displayed on Title Line
1	Current Volume Setting	V <Volume setting 0-63>
2	Airway Compression	AC <ENABLED or DISABLED>
3	Navigational Database Cycle/Date	DB <Cycle/Date>
4	Navigational Database checksum	DC <Checksum>
5	Recognition Processor Software part number	RP <Part Number>
6	Recognition Processor Software checksum	RC <Checksum>
7	Interface Processor Software part number	IP <Part Number>
8	Interface Processor Software checksum	IC <Checksum>

13. Verify that the Recognition Processor Software and Interface Processor Software part numbers and checksums match those noted in step 3. If not, repeat the procedure. If this again fails contact VoiceFlight Systems technical support.

5.6 Volume Adjustment

If the volume level of the VFS101's audio output requires adjustment relative to other audio sources, the following procedures may be used. These procedures are only to be used while the aircraft is not moving.

When the GPS is proceeding Direct-To a waypoint which does not appear in the active flightplan, the title line is not available (since it is displaying the Direct-To waypoint). To cancel an active Direct-To, press the Direct-To button, then MENU, then ENT.

To INCREASE the VFS101 audio output volume:

1. Plug a suitable aviation headset into the pilot headset jack.
2. With the aircraft audio panel, VFS101 and primary GPS powered up, enter a new title for the active flightplan on the primary GPS containing the letter "U" (for "UP") in the first character position and no other characters. Press ENT to install the new title. Wait at least 10 seconds. Briefly depress and release the VAS.

3. The title line will change to: "V <Volume Level 0-63> UP?" where the content in < > is replaced with a number indicating the current volume level.
4. Briefly press and release the VAS again. This will increase the volume by one step. A tone should be heard through the headset at the new volume level. Repeat until the volume is at the desired level.
5. Depress and hold the VAS for at least two seconds. This will return the VFS101 to normal operations, with the new volume output level.

To DECREASE the VFS101 audio output volume:

1. Plug a suitable aviation headset into the pilot headset jack.
2. With the aircraft audio panel, VFS101 and primary GPS powered up, enter a new title for the active flightplan on the primary GPS containing the letter "D" (for "DOWN") in the first character position and no other characters. Press ENT to install the new title. Wait at least 10 seconds. Briefly depress and release the VAS.
3. The title line will change to: "V <Volume Level 0-63> DOWN?" where the content in < > is replaced with a number indicating the current volume level.
4. Briefly press and release the VAS again. This will decrease the volume by one step. A tone should be heard through the headset at the new volume level. Repeat until the volume is at the desired level.
5. Depress and hold the VAS for at least two seconds. This will return the VFS101 to normal operations, with the new volume output level.

5.7 Setting Airway Compression

The flightplan of Garmin 400 / 500 and 400W / 500W series of GPS units is limited to a maximum of 31 waypoints. This is insufficient to contain some airways if all waypoints, including intermediate waypoints on straight segments are included. Airway compression is an optional feature that eliminates those intermediate waypoints whose removal does not change the course of the airway more than 0.1 nautical miles, or cause a leg to be longer than 100 nautical miles. Radio Nav-aids are never eliminated. Airway compression is disabled by default.

To enable or disable airway compression:

1. Plug a suitable aviation headset into the pilot headset jack.
2. Adjust the primary GPS to display the active flightplan.
3. If the title line is obscured by a Direct-To operation, cancel the Direct-To.
4. With the aircraft audio panel, VFS101 and primary GPS powered up, enter a new title for the active flightplan on the primary GPS consisting of the letter "A" (for AIRWAY) in the first character position, and no other characters. Press ENT to install the new title.
5. Wait at least 10 seconds.
6. Depress and hold the VAS.

7. An audio message indicating the new status of airway compression will be heard through the audio system. Release the VAS.
8. Repeating the process will toggle airway compression to the opposite state. (Disabled if enabled, enabled if disabled.)

Note: With airway compression enabled, an audio caution message will be played the first time the VAS is depressed each time the VFS101 is powered on.

6.0 Troubleshooting

Problems related to the VFS101 will fall into one of these broad categories:

- The VFS101 fails to function at all. (e.g. No response from the system when the VAS is depressed)
- The VFS101 responds, but fails in one or more aspects of operation. (e.g. Sounds an error tone when the VAS is depressed, or seems to recognize speech, but the waypoint does not appear on the GPS.)
- The unit exhibits poor speech recognition (e.g. Sometimes the unit is able to recognize speech, but other times is unable to do so.)

In the event the VFS101 fails to function at all, the following procedure should be performed.

1. Verify that the VFS101 is powered by measuring the voltage across the open VAS switch while the VFS101 is powered on. If less than 3V DC is found, verify the VFS101 is receiving between 14V and 28V. Check the wiring and the VFS101 circuit breaker or fuse and switch.
2. Verify the correct functioning of the VoiceFlight Activation Switch (VAS). Confirm this through continuity testing in the open and closed position.
3. Verify the wiring between the VFS101 and the primary and secondary GPS units matches that found in Appendix B. A table of replacement part numbers can be found in Appendix C.
Pay special attention to the shields as shown in the wiring diagram (Appendix B). Additional noise on the audio connections induced by incorrect grounding and shielding will degrade system performance. Verify the routing of wire bundles is not near high-current wires to avoid inducing additional noise in the system. The splice connection to the pilot microphone jack should be as close to the jack as possible. Verify the shields leading to the VFS101 do not contact the shields leading to the audio panel which will create undesirable ground loops. Proper fabrication techniques must be used for all wires. Refer to FAA Advisory Circular 43.13-2A for further information.
4. If these steps fail to reveal the cause of the problem, contact VoiceFlight Systems technical support at (518)-720-0060, via email at support@voiceflight.com or by mail at the address shown in section 16.0 of this document.

In the event the unit fails to function in one or more aspects of operation, perform the following procedure:

1. Conduct the system test found in section 6.1.

2. Confirm the correct version of the Garmin “Main Software” is installed in the GPS units, as indicated in Appendix F.
3. Confirm that the GPS unit(s) are configured for manual crossfill (not auto).
4. Verify the wiring between the VFS101 and the primary and secondary GPS units matches that found in Appendix B.
5. If these steps fail to reveal the cause of the problem, contact VoiceFlight Systems technical support at (518)-720-0060, via email at support@voiceflight.com or by mail at the address shown in section 16.0 of this document.

Poor speech recognition can be caused by a number of factors as described in the “Functional Description” section of the VFS101 Pilot's Guide. If speech recognition continues to be poor this may be caused by high levels of electrical noise in the aircraft audio system. Verify that all shields in the VFS101 wiring harness are properly connected, and that the headset jacks are properly isolated from the aircraft instrument panel.

6.1 System Test

To confirm the VFS101 is functioning properly perform the following procedure:

1. Move the aircraft to a safe location with a clear view of the sky.
2. Apply power to the aircraft's avionics, including the VFS101.
3. Turn on the primary and if installed the secondary Garmin GPS units.
4. When the GPS unit or units have initialized press the ENT button(s) twice to clear the initialization screens.
5. Wait for the GPS to acquire satellites.
6. Turn the display on the primary GPS to the active flightplan.
7. For the remainder of the test, watch the title line of the flightplan. Any error generated by the VFS101 should be accompanied by an error message being displayed on the title line. This error message may help locate the source of the problem.
8. Plug a standard aviation headset into the pilots station and adjust the microphone so it is close to the lips.
9. Depress and hold the VAS. A “double-beep” should be heard. If it is not, the VFS101 may not be powered, may not be receiving the VAS signal, or the audio output from the VFS101 may not be reaching the headphones. This may be caused by a fault in the audio output signal lines of the VFS101 wiring harness.
10. Say the words “START NEW FLIGHT PLAN”. Speak slowly and clearly. An audio message “Confirm Start New Flight Plan?” should be heard. If no message is heard, and after 20 seconds an error tone is heard instead, this indicates that audio from the pilot's microphone is not reaching the VFS101. Release and double-click the VAS to confirm the command. If it was not so before, the flightplan on the primary GPS should now be empty.

11. Select a waypoint within 100 nautical miles of the aircraft's current position. If an airport is used remember to include the preceding "K" if appropriate.
12. Depress and hold the VAS. Spell out the waypoint's name using the ICAO spelling alphabet (Alpha, Bravo, Charlie...) followed by the word "ENTER". Speak slowly and clearly, using only words found in the ICAO spelling alphabet (e.g. "FOXTROT" not "FOX", "ZERO" not "OHHH". A complete list of the ICAO alphabet can be found on the back of the VFS101 Quick Reference Card). A confirmation beep should be heard. Release the VAS.
13. The active flightplan on the primary GPS should contain a single waypoint; the waypoint entered in step 12 of this procedure. If the flightplan contains a different waypoint, confirm the waypoint entered in step 12 is valid and attempt to enter it again by repeating step 12. If a beep is heard, but no waypoint appears, check the second GPS in a dual GPS system. The wiring harness may have reversed the primary and secondary GPS. Alternatively, the crossfill wiring in the harness may be incorrect.

7.0 Removal and Replacement

7.1 Removal

To remove the VFS101 from the aircraft, first locate the VFS101. Possible installation locations are shown in Appendix E. Next, unmount the VFS101 from its installed location by removing the four #8 machine screws which hold the unit in place and remove the device. Depending on the installation location it may be necessary to first remove other hardware.

In dual GPS installations, the removal of the VFS101 will render the crossfill connection between the two Garmin GPS units inoperative. This may be remedied by plugging a crossover connector into the VFS101 wiring harness which reconnects the crossfill link. A schematic and required part numbers for this crossover connector can be found in Appendix D.

Placard the VAS switch as inoperative. Placard the VFS101 circuit breaker or dedicated power switch as inoperative and secure it in the OFF position.

For permanent removal of the VFS101 from the aircraft, any supporting structure which was installed as part of the VFS101 installation may be removed. See Appendix E for more information on mechanical installation. For dual GPS installations, install a crossover connector constructed as described in Appendix D.

If the installer prefers, they may elect to remove the VFS101 wiring in it's entirety and install wiring to return the aircraft to the condition before the VFS101 was installed.

7.2 Replacement

To re-install a temporarily-removed VFS101, disconnect the crossover connector from the VFS101 wiring harness (if installed) and re-connect the VFS101. Attach the VFS101 to the supporting structure using the correct #8 machine screws, as shown in the appropriate section of the VFS101 Installation Installations (VFS101-INSISTR3).

8.0 Diagrams

The following diagrams are attached to this document as Appendixes:

Diagram	Appendix
VFS101 System Block Diagram	A
VFS101 Wiring Diagram	B
Crossover Connector	D
Installation Locations and Parts	E

The wiring diagram uses a GMA 340 audio panel as an example. Any audio panel having an available un-switched audio input with an input impedance of at least 500 Ohms is compatible with the VFS101.

9.0 Special Inspection Requirements

None.

10.0 Protective Treatments

None / Not Applicable.

11.0 Structural Data

The VFS101 weighs .75 lb. The unit is secured to the aircraft secondary structure behind the instrument panel with 4 #8-32 machine screws, as shown in Appendix E.

As a piece of solid-state avionics hardware, the VFS101 does not require mandatory replacement or structural inspection (other than fastener verification).

12.0 Special Tools

None.

13.0 Commuter Category Aircraft Data

As the VFS101 is not approved for use on commuter category aircraft, this section is not applicable. However for convenience, electrical load data is included here for reference.

13.1 Electrical Loads

The VFS101 draws an average current of less than 1 Ampere under all circumstances at voltages between 10 Volts and 32 Volts DC. It is protected by an external 1 Ampere resettable circuit breaker or fuse (and dedicated power switch).

14.0 Recommended Overhaul Periods

None. As a solid-state electronic device, no preventative maintenance is required.

15.0 Airworthiness Limitations

<p>The Airworthiness Limitations Section is FAA Approved and specifies maintenance required under 14CFR §§ 43.16 and 91.403 unless an alternative program has been FAA approved.</p>

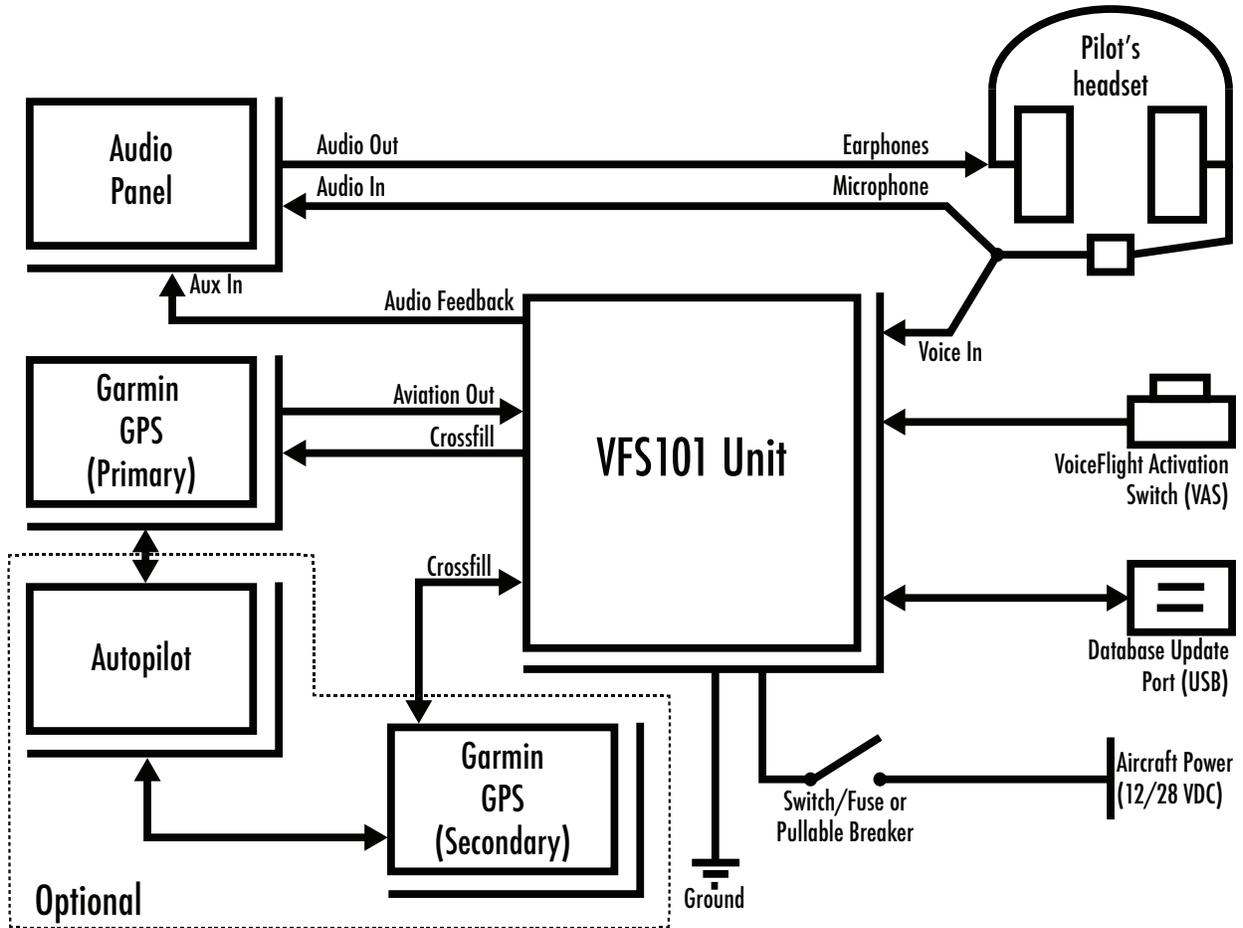
There are no Airworthiness Limitations associated with the installation of the VFS101 system.

16.0 Revision

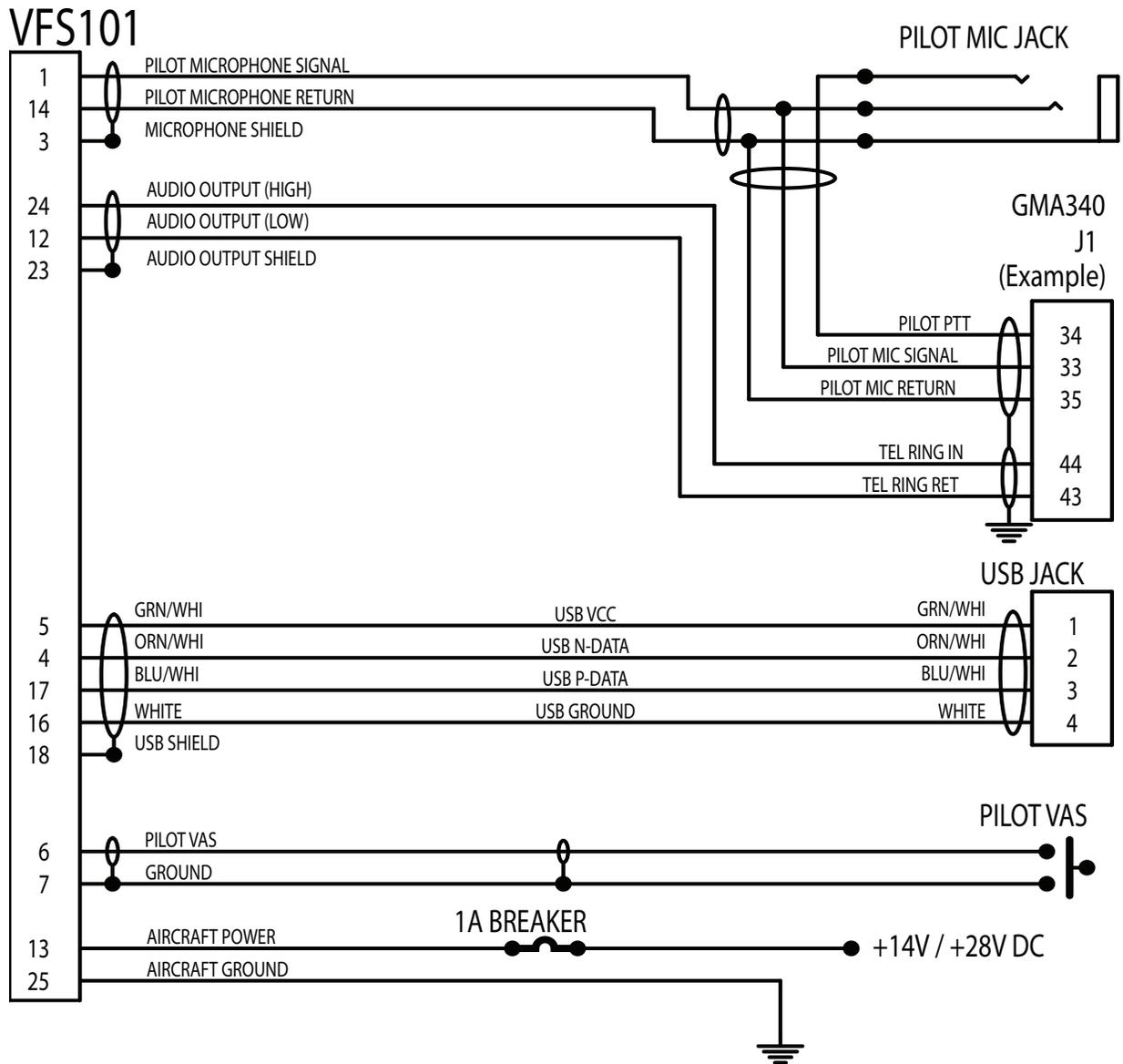
Any changes to this document will be announced on the VoiceFlight Systems website (<http://www.voiceflight.com>) and in an electronic mail message sent to all VoiceFlight authorized dealers, repair stations, and customers that have provided an e-mail address. The revised document will be available for download on the VoiceFlight Systems website. In the event the VoiceFlight website is unavailable, a new copy of these instructions may be requested by phone at (518)-720-0060 or by mail. Send a letter requesting the instructions to the address below. Be sure to include your return address.

VoiceFlight Systems, LLC
105 Jordan Road
Troy, NY 12180

Appendix A: System Block Diagram



Appendix B: Wiring Diagram

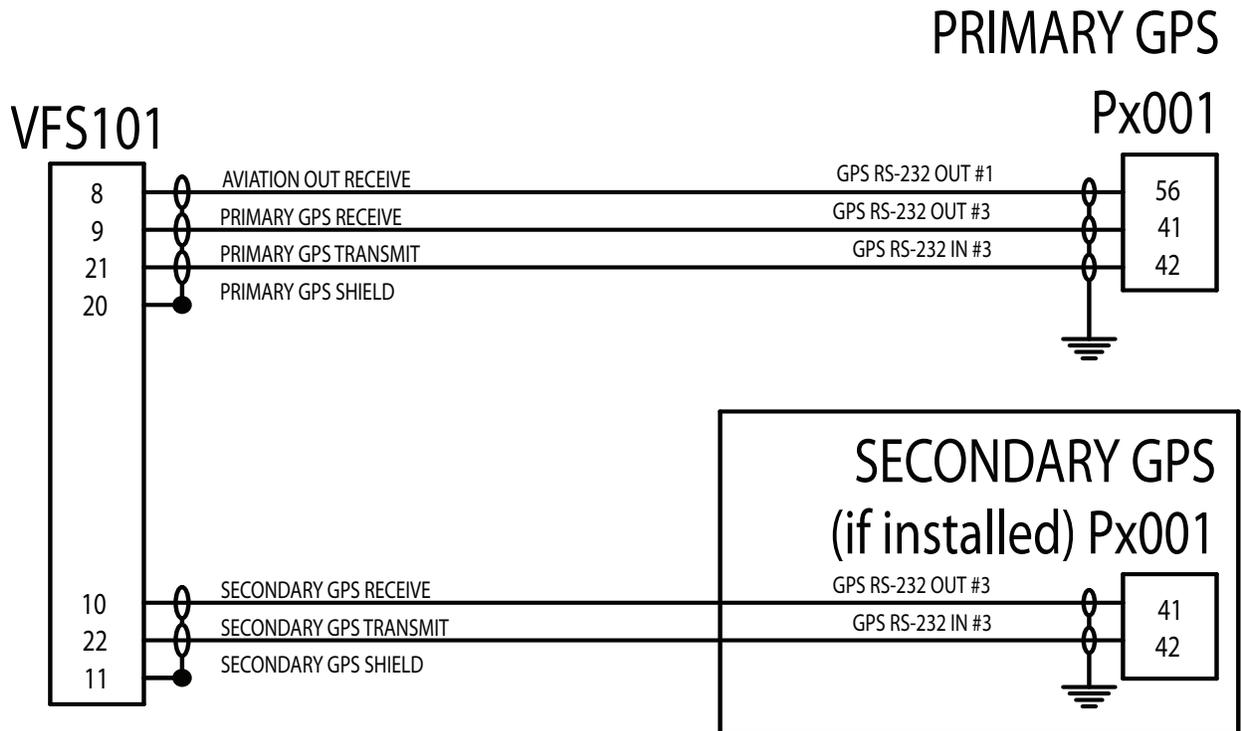


Note: VFS101 pin 23 (Audio Output Shield) is internally connected to Aircraft Ground by way of a 0.1 uF capacitor to prevent ground loops.

Note: When connecting the wires to the VFS101 and audio panel at the microphone jack, be sure not to connect the shields to avoid undesirable ground loops.

Note: The GMA340 is included here as an example. Any audio panel with an unswitched audio input with an impedance of at least 500 Ohms is acceptable.

Wire: See next page for wire type information.



Note: Approved software revision numbers for the Garmin GPS units are:

- **Garmin 400 / 420 / 420A / 430 / 430A** – “Main Software” version 5.04
- **Garmin 500 / 530 / 530A** – “Main Software” version 6.04
- **Garmin 400W / 500W Series** – “Main Software” version 3.30

Note: Alternative RS-232 ports on the GPS units may be used. The ports and pin numbers shown are the recommended port assignments. See section 6.4 of the VFS101 Installation Instructions and the Garmin GPS installation manual for information on selecting an alternate port.

Note: If a secondary GPS is present it must be wired as shown above. The VFS101 can NOT be attached as a “tap” on an existing crossfill line.

Note: VFS101 pins 11 (Secondary GPS Shield) and 20 (Primary GPS Shield) are internally connected to Aircraft Ground by way of separate 0.1 uF capacitors to prevent ground loops.

Wire (Power and Aircraft Ground): MIL-C-27500 cable or equivalent wire from AC 43.13-1B table 11-11, in 20 AWG.

Yoke Coil Cable (VAS connection.): STEC p/n 3953 (5 conductor) or STEC p/n: 3934 (19 conductor) (or equivalent cable meeting the requirements of FAR 23.1359(c))

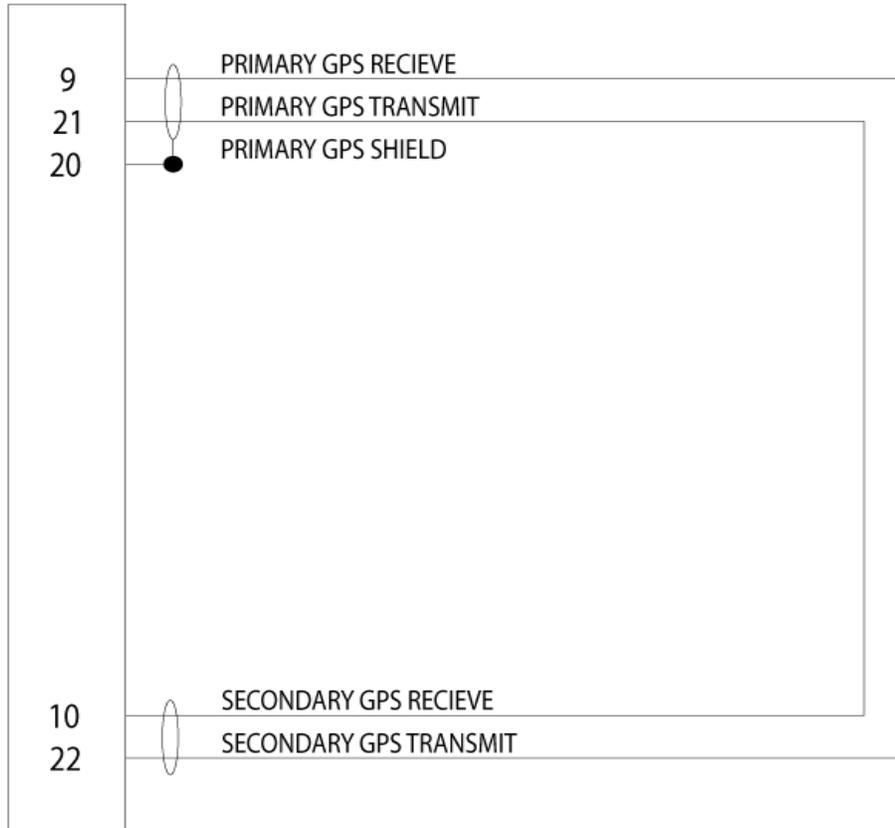
Wire (All other connections): MIL-C-27500 cable or equivalent wire from AC 43.13-1B table 11-11, in 24 AWG minimum. Shielded cable must be used as shown.

Appendix C: Part Numbers

Part Description	Acceptable Part Numbers and/or Part Characteristics
Wire (Power and Aircraft Ground)	MIL-C-27500 cable or equivalent wire from AC 43.13-1B table 11-11, in 20 AWG.
Yoke Coil Cable (VAS connection)	STEC p/n 3953 (5 conductor) or STEC p/n: 3934 (19 conductor) (or equivalent cable meeting the requirements of FAR 23.1359(c))
Wire (All other connections)	MIL-C-27500 cable or equivalent wire from AC 43.13-1B table 11-11, in 24 AWG minimum. Shielded cable must be used as shown.
DB-25 Connector	AMP p/n: 5205207-1 or equivalent
Crimp socket contacts (20-24 AWG)	AMP p/n: 205090-1 or equivalent
DB-25 Connector Backshell	AMP p/n: 5748676-3, Cannon p/n: 024659-0000 or equivalent
Circuit Breaker (1 Amp)	Klixon p/n: 7274-2-1 or equivalent
VoiceFlight Activation Switch (VAS) (normally open, momentary contact)	Any of the following switches or equivalent: Piper, p/n: 688-289 Cessna/Mason, p/n: S1985-1 C & K, p/n: 8631 C & K, p/n: MSPS103CO Grayhill, p/n: 23-1 Alco, p/n: MSPM-101B OTTO, p/n: T4
Pilot's Microphone Jack	Switchcraft p/n: 11 Switchcraft p/n: 111 Or other standard ¼ inch microphone jack
Microphone Jack Insulated shoulder washer	Switchcraft p/n: S1029 or equivalent
Microphone Jack Insulated flat washer	Switchcraft p/n: S1028 or equivalent
Alternative Power Switch (used instead of the Circuit Breaker, with Fuse Holder and Fuse)	Alco p/n: MTA-106E C & K p/n: 7101SH3ZQE or equivalent
Alternative Fuse Holder (used instead of the Circuit Breaker, with Power Switch and Fuse)	Littelfuse: FNY-1 Littelfuse: FHP-1 or equivalent
Alternative 1A Fuse (used instead of the Circuit Breaker, with Power Switch and Fuse Holder)	Littelfuse: AGC-1 or equivalent
Mounting Hardware	See parts list for appropriate configuration in Appendix E

Appendix D: Crossover Connector

DB25M



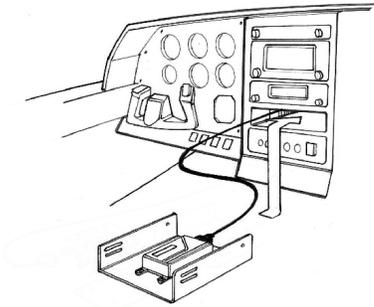
Part Description	Acceptable Part Numbers and/or Part Characteristics
Wire	MIL-C-27500 cable or equivalent wire from AC 43.13-1B table 11-11, in 24 AWG minimum. Shielded cable must be used as shown.
DB-25 Connector	AMP p/n: 5205208-1 or equivalent
Crimp socket contacts (20-24 AWG)	AMP p/n: 205089-1 or equivalent
DB-25 Connector Backshell	AMP p/n: 5748676-3, Canon p/n: 024659-0000 or equivalent

Note: Keep wire as short as possible. Connect shield as shown.

Note: If necessary, a 220 ohm ½ watt resistor can be installed between pins 12 and 24 to reduce the noise coupled into the audio panel.

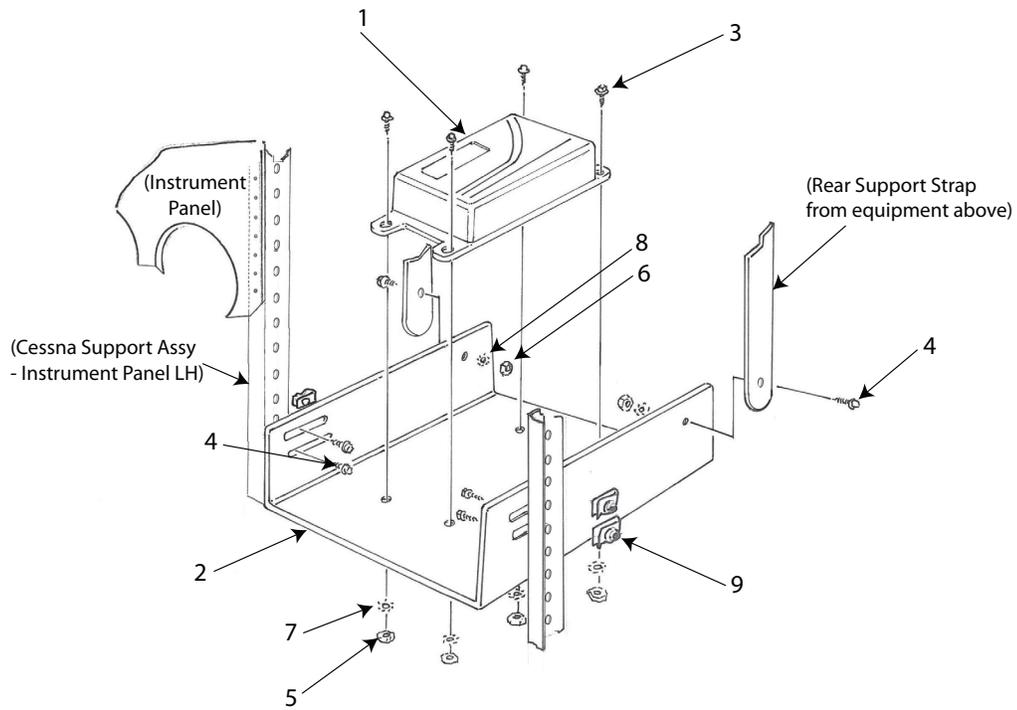
Appendix E: Installation Locations and Parts

Tray Mount



Part Numbers:

- 1: VFS101 (VFS101 Unit) Qty: 1
- 2: VFS101-M006-A (Mounting Tray) Qty: 1
- 3: MS51957-41 (#8 Mach. Screws, 1/4 inch) Qty: 4
- 4: MS51957-30 (#6 Mach. Screws, 1/2 inch) Qty: 6
- 5: MS35649-284 (#8 Mach. Screw Nuts) Qty: 4
- 6: MS35649-264 (#6 Mach. Screw Nuts) Qty: 2
- 7: MS35333-72 (#8 Star Lock Washers) Qty: 4
- 8: MS35333-71 (#6 Star Lock Washers) Qty: 2
- 9: Monadnock 294667 (#6 Clip-Nuts) Qty: 4

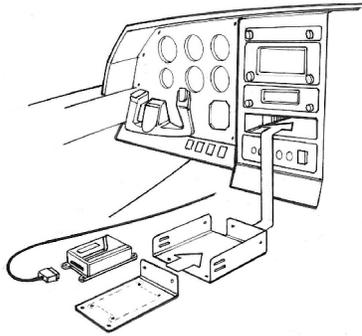


Notes:

Drill two 0.144 inch holes through supporting strap into Tray (VFS101-M006) to accommodate #6 rear mounting screws.

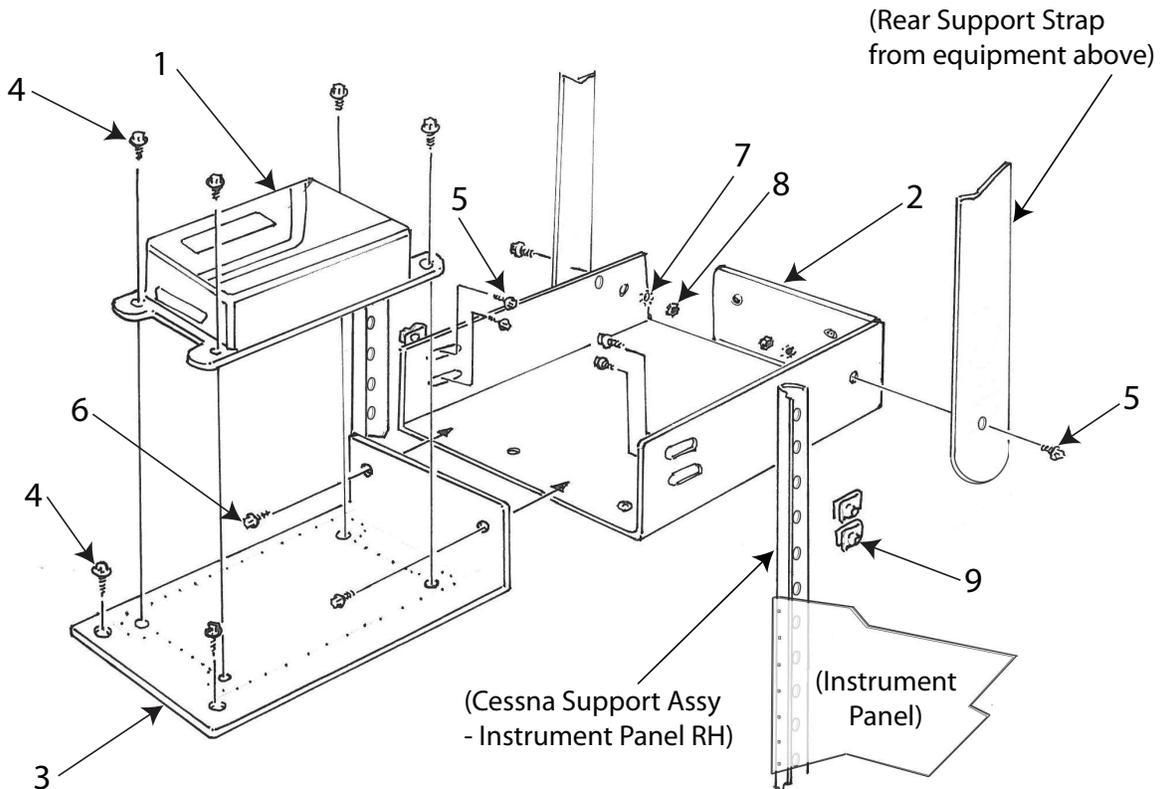
See Appendix B for Wiring Diagram.

Sled Mount



Part Numbers:

- 1: VFS101 (VFS101 Unit) Qty: 1
- 2: VFS101-M005 (Sled Mount/Base) Qty: 1
- 3: VFS101-M004 (Sled Mount/Sled) Qty: 1
- 4: MS51957-41 (#8 Mach. Screws, 1/4 in.) Qty: 6
- 5: MS51957-28 (#6 Mach. Screws, 3/8 in.) Qty: 6
- 6: MS51957-45 (#8 Mach. Screws, 1/2 in.) Qty: 2
- 7: MS35333-71 (#6 Star Lock Washer) Qty: 2
- 8: MS35649-264 (#6 Mach. Screw Nut) Qty: 2
- 9: Monadnock 294667 (Clip-Nuts) Qty: 4

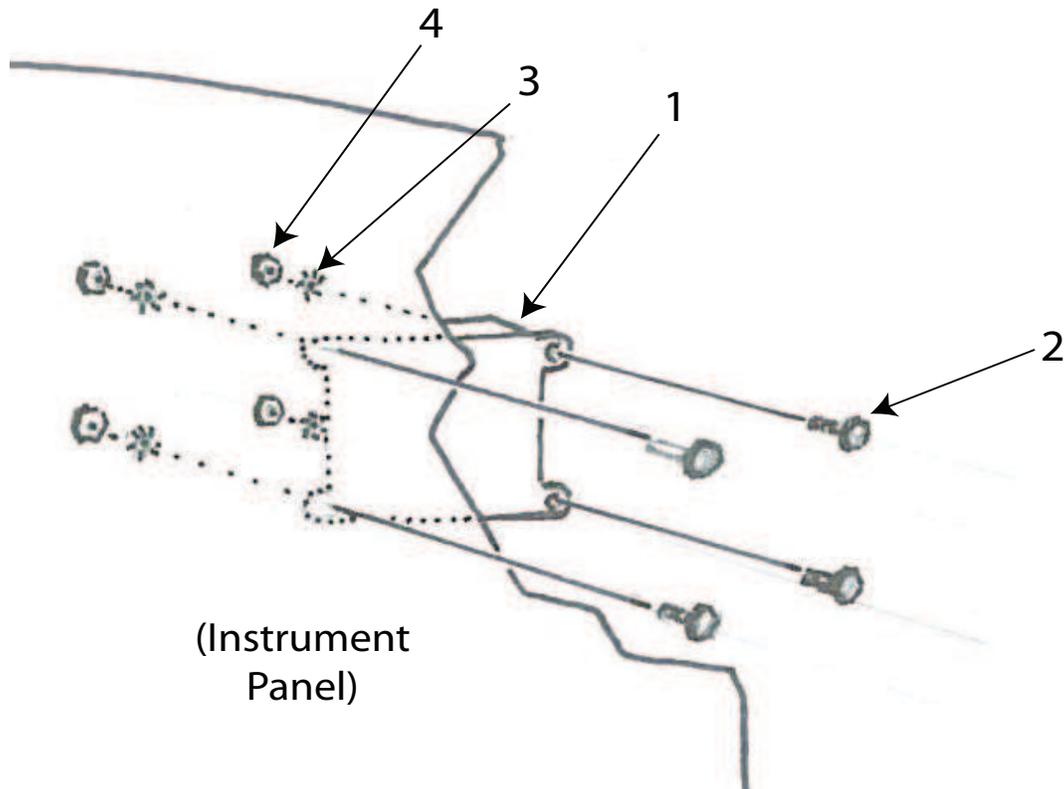


Notes:

Drill two 0.144 inch holes through the support straps into Tray (VFS101-M005) to accommodate two #6 rear mounting screws.

See Appendix B for Wiring Diagram.

Panel Mount



Part Numbers:

- 1: VFS101 (VFS101 Unit) Qty: 1
- 2: MS51957-45 (#8 Machine Screw, 1/2 in). Qty: 4
- 3: MS35333-72(#8 Star Lock Washer) Qty: 4
- 4: MS35649-284 (#8 Mach. Screw Nuts) Qty: 4

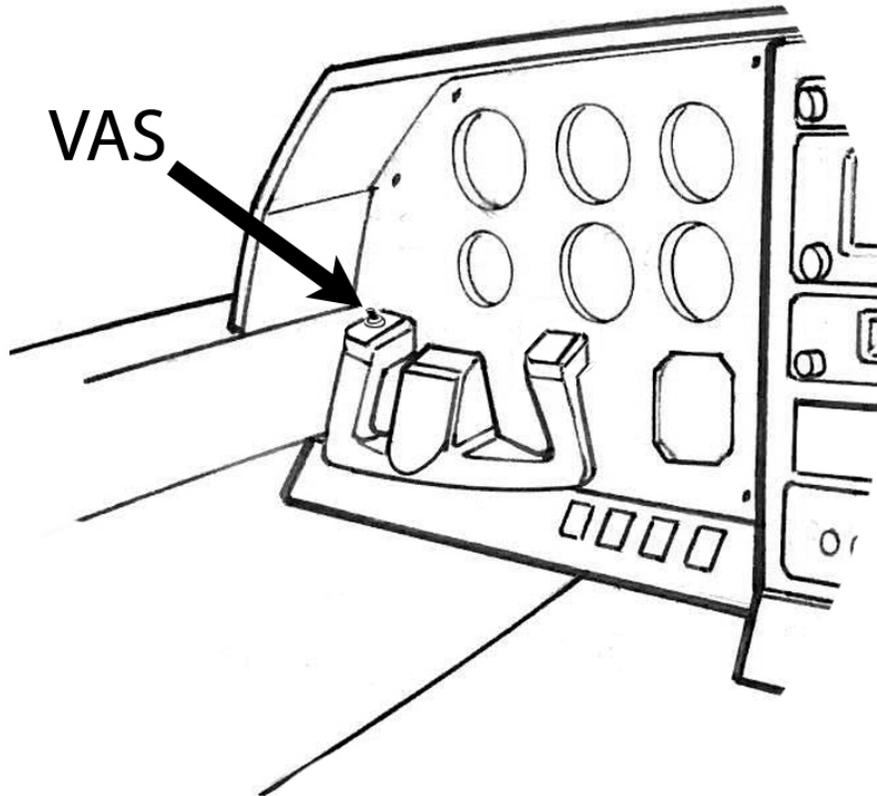
Notes:

Install on back of unused area of instrument panel.

Minimum panel thickness: 0.024 inches. Panel Material: AL2024-T3. (Alternatives: AL6061-T6, AL7075-T6)

See Appendix B for Wiring Diagram.

VAS Installation



Install VAS so as not to interfere with other yoke switches
Placard switch "VAS"
See Appendix B for Wiring Diagram.

Appendix F: Installation Requirements

Aircraft:

Limited to part 23 aircraft of Class I (Typically SRE under 6,000 lbs.) or Class II (Typically MRE, STE or MTE under 6,000 lbs.) with altitude encoding altimeter transponder per AC 23.1309-1D .

Audio Panel:

Available un-switched input having a nominal input impedance of 500 Ohms or greater.

GPS units:

Single or dual installation:

- **Garmin 400 Series (Non-WAAS)** - "Main Software" Version 5.04
GPS 400, GNC 420, GNC 420A, GNS 430, GNS 430A
- **Garmin 500 Series (Non-WAAS)** - "Main Software" Version 6.04
GPS 500, GNS 530, GNS 530A
- **Garmin 400W Series (WAAS)** - "Main Software" version 3.30
GPS 400W, GNC 420W, GNC 420AW, GNS 430W, GNS 430AW
- **Garmin 500W Series (WAAS)** - "Main Software" version 3.30
GPS 500W, GNS 530W, GNS 530AW