DFC 90

Avidyne 700-00170-XXX
Autopilot
Instructions for Continued Airworthiness
STC SA00296BO

AVIDYNE
CORPORATION

55 Old Bedford Road
Lincoln, MA 01773

As installed in

Cirrus SR 20

(Make and Model Airplane)

Reg. No. N110RW S/N 1528

Document Revision History

Document Number	AVDFC-030	Control Category	
Revision	**Description**	**ECO**	**Date**
00	Initial Release	ECO-10-049	03/08/10
01	Updated for the DFC100	ECO-10-375	11/03/10
02	Added AEG Comments	ECO-10-386	11/23/10
03	Updated for IM Changes	ECO-11-388	11/22/11
04	Aspen Update	ECO-13-176	05/22/13

Table of Contents

List of Figures

List of Tables

1. Introduction

1.1 Scope

This document identifies the Instructions for Continued Airworthiness (ICA) for a Cirrus SR20/22 with the installation of the Avidyne 700-00170-XXX Autopilot Computer.

This ICA satisfies the requirements of 14 CFR 23.1529.

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.

1.2 Applicability

This document only applies to the equipment listed in Table 1. Reference the original equipment manufacturers Instructions for Continued Airworthiness for all other equipment connected to the Avidyne Autopilot.

The following table lists the 700-00170-XXX variants covered by this STC:

Part Number	Description
700-00170-000	DFC90 Autopilot Computer interfaced to an Avidyne Entegra PFD
700-00170-001	DFC100 Autopilot Computer interfaced to an Avidyne IFD

Table 1: Autopilot Control Panel Variants

Equipment Installed: ☐ DFC90 ☐ DFC100

1.3 Definitions and Abbreviations

ACP – Autopilot Control Panel

ADAHRS – Air Data Attitude Heading Reference System

AHRS- Attitude Heading Reference System

ICA - Instructions for Continued Airworthiness

IFD – Integrated Flight Display

STC - Supplemental Type Certificate

PFD – Primary Flight Display

AML – Approved Model List

1.4 Precautions

This section is not applicable

1.5 Units of Measure

This section is not applicable

1.6 Referenced Publications

Document Number	Description
600-00251-000	DFC Series Installation Manual
600-00252-000	DFC90 Pilot's Guide
600-00270-000	DFC100 Pilot's Guide
AVDFC-096	Post Installation Configuration and Testing

Table 2: Publications

1.7 Distribution

This Instruction for Continued Airworthiness is to be furnished with new production Autopilot Computer and is to become part of the permanent aircraft records upon installation.

In the event of a service bulletin or other circumstances that require an update, Avidyne will notify the contact as listed on the owner registration.

2. Description

The Avidyne Autopilot is an attitude based autopilot that provides dual axis flight control in a Cirrus SR20/22 Aircraft. This installation requires no changes to the structure of the aircraft. The aircrafts original autopilot is removed and replaced with the Avidyne DFC90/100 Autopilot Control Panel. The Avidyne Autopilot Computer is installed in either the existing autopilot's tray or in the optional Avidyne Autopilot tray. The DFC90/100 receives data from several external sources and outputs pitch and roll steering commands to the servo/trim motors.

The Autopilot is located in the center instrument panel as shown in Figure 1 below.

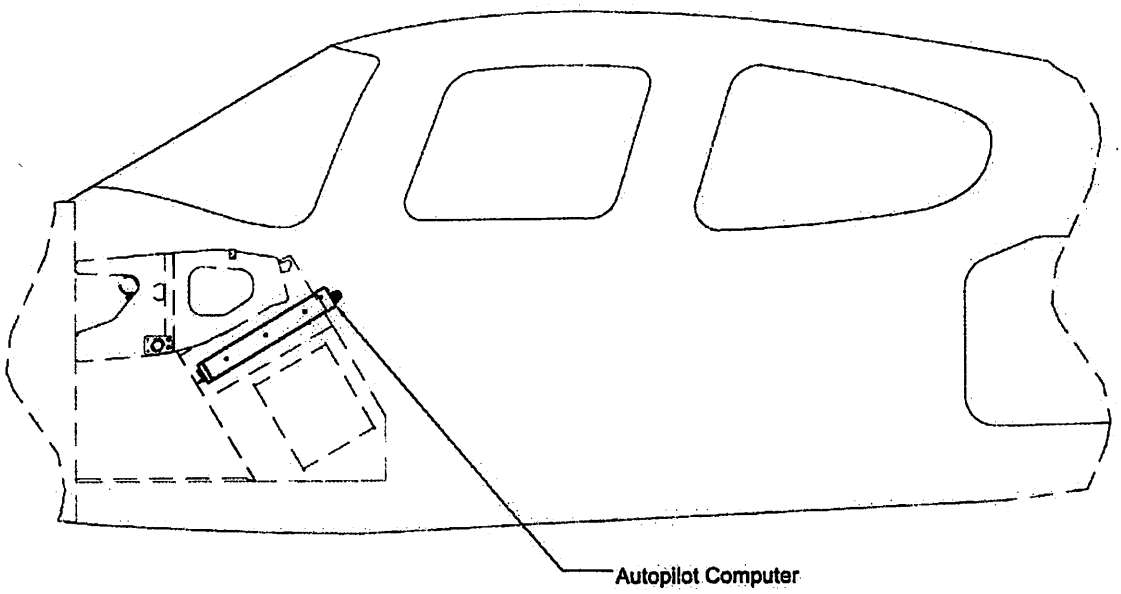

Figure 1: Autopilot Location

3. Control and Operation Information

3.1 DFC90 Autopilot Computer

The DFC90 System can be controlled from the Autopilot Computer (See Figure 2).

Figure 2: DFC90 Autopilot Computer

Using the buttons on the front of the Autopilot Computer, the DFC90 can control the Aircraft in the following modes:

- Straight & Level
- Heading Mode
- Navigation (NAV, APPR) and Roll Steering (GPSS) Modes
- Altitude Capture and Hold Mode
- Vertical Speed Mode
- Indicated Airspeed Mode
- Glideslope (GS) Mode

The two knobs provide control of the IAS and Vs bugs on the Primary Flight Display.

3.2 DFC100 Autopilot Computer

The DFC100 can be controlled from the Autopilot Computer (See Figure 3).

Figure 3: DFC100 Autopilot Computer

Using the buttons on the front of the Autopilot Computer, the DFC100 can control the Aircraft in the following modes:

- Straight & Level
- Vector Mode
- Navigation (NAV, APPR)
- Altitude Capture and Hold Mode
- Vertical Speed Mode
- Indicated Airspeed Mode
- Glideslope (GS) Mode
- VNAV Mode

The two knobs provide control of the IAS and Vs bugs on the Integrated Flight Display.

Reference the Pilot's Guide for complete control and operational information.

4. Servicing Information

The 700-00170-XXX Autopilot must be serviced by qualified and properly rated facility.

5. Maintenance Instructions

Other than the periodic inspection tasks discussed below, maintenance of the Avidyne Autopilot Computer is based on condition and function only; no other periodic maintenance is required.

During any maintenance activities involving the Autopilot System perform a post-installation check as described in Section 7.3 or Avidyne Document AVDFC-096.

5.1 Recommended periodic scheduled servicing tasks

Perform the following inspections during annual/100 hour maintenance interval.

1. Visually inspect (no magnification required) wire/bundle, overbraid (if installed), and routing for evidence of damage, chafing, grounding, security, bonding, integrity of shields, and connector backshell condition.
2. Visually inspect (no magnification required) the mechanical installation for any defects or damage to the aircraft structure or to the Autopilot.
3. Verify that all mandatory Service Alerts and/or Service Bulletins for the Autopilot System have been accomplished. (This can be done using the internet at www.avidyne.com).

6. Troubleshooting information

Refer to the manufacturers' installation and user's manuals to assist in troubleshooting. The following items present common installation problems and recommended actions for the Avidyne Autopilot System.

Table 3: Troubleshooting Guide

Component	Trouble	Probable Cause	Solution
Autopilot Annunciations on the Primary Flight Display (DFC90 Only):			
Primary Flight Display (PFD)	AHRS Fail Annunciation	Attitude Heading Reference System (AHRS) Failed on the Primary Flight Display (PFD). The ADI and Heading on the PFD has a red X.	Repair or Replace the PFD.
	Airdata Fail Annunciation	Airdata Failed on the PFD. The PFD indicates red X's on Altimeter and Airspeed tape.	Repair or Replace the PFD.
	ADAHRS Fail Annunciation	ADAHRS Failed on the PFD. The PFD indicates red X's on the ADI, Altimeter tape, Airspeed tape, and Heading.	Repair or Replace the PFD.
Turn Coordinator	TC Fail Annunciation	Autopilot is not receiving the Turn Coordinator Gyro Valid.	Check Wiring between the Turn Coordinator and the Autopilot.
			Check Gyro Valid (>4 VDC)
			Verify Autopilot is properly seated in its tray.
			Repair or Replace the Turn Coordinator.
Autopilot	Self Test Fail Annunciation	Autopilot Built In Test Failed.	Verify Autopilot is properly seated in its tray.
			Verify no Autopilot external devices has failed (i.e. trim/servo motors, turn coordinator, autopilot disconnect, trim/servo motor, etc.)
			Repair or Replace the Autopilot.
Autopilot	No COMM From Autopilot Annunciation	The Autopilot is not communicating with the PFD.	Check Wiring between the Autopilot Computer and the PFD.
			Verify PFD is configured correctly.
			Verify Autopilot is properly seated in its tray.
			Verify PFD hardware/software has been updated for the Avidyne Autopilot.

Component	Trouble	Probable Cause	Solution
Autopilot	MSR Fail is displayed on the PFD	The autopilot is unable to read or write to the internal maintenance and safety recorder.	Repair or Replace the Autopilot.
PFD	NO PFD COMM Annunciation	Autopilot is not receiving data from the PFD.	Check Wiring between the Autopilot and the PFD.
			Repair or Replace the PFD.
			Verify Autopilot is properly seated in its tray.
			Repair or Replace the Autopilot.
			Hardware Modification 55 not installed on PFD
Pitch Trim Motor	Constant Trim Annunciations	Pitch trim motor failure	Check Wiring between the Autopilot and the Pitch Trim Motor.
			Verify Autopilot Trim Motor Voltage is correct to the Trim motor.
			Repair or Replace Pitch Trim Motor.
			Repair or Replace the Autopilot.
PFD or Turn Coordinator	AHRS Miscompare Annunciation	The AHRS in the PFD differs from the turn rate from the Turn Coordinator.	Check PFD and/or Turn Coordinator for any potential problems.
Autopilot	Autopilot mode indicator lights appear dimly lit or non-functional	One string of the LED lights in the autopilot control head are inoperative OR the cockpit lighting rheostat is set to the night position	Verify cockpit lighting rheostat not in night position.
			Repair or Replace the Autopilot.
Autopilot	No aural alerts heard	Autopilot unable to access the internal SD card housing the aural alert files OR connection to the aircraft audio select panel has been lost	Check wiring between autopilot and audio select panel (note Pin 27 of autopilot connector P2 is the audio out signal).
			Repair or Replace the Autopilot.
Autopilot	Flashes alternatively between blue and white lights	The connectors on the back of the DFC90 were reversed and power applied. The DFC90 is unable to get through boot.	Repair or Replace the Autopilot.
Autopilot	Flight Director Command Bars are locked into a fully displaced position (typically commanding full down and left indication).	A S-TEC 55 Autopilot Calibration was inadvertently performed with an installed DFC90.	Reload the Autopilot Software via Field Loadable Software Service Bulletin and do NOT perform an AP Calibration on the PFD pages.

Component	Trouble	Probable Cause	Solution
Autopilot Annunciations on the Integrated Flight Display (DFC100 Only):			
Autopilot	Autopilot INOP Annunciation	Autopilot Failure	Repair or Replace Autopilot Computer
IFD	AHRS Fail Annunciation	IFD AHRS Failed	Check IFD annunciations for possible AHRS faults
			Cycle power and allow IFD system to align
			Repair or Replace the IFD AHRS
Autopilot	Self Test Fail Annunciation	Autopilot Built In Test Failed.	Verify Autopilot is properly seated in its tray.
			Verify no Autopilot external devices has failed (i.e. trim/servo motors, turn coordinator, autopilot disconnect, trim/servo motor, etc.)
			Repair or Replace the Autopilot.
IFD	AHRS Aligning Annunciation	IFD AHRS Aligning	Wait for the IFD to finish alignment
			IFD failed to Align. Press "Fast Erect" button on the IFD.
IFD	Autopilot INOP AHRS Comparator Fail Annunciation (Multiple IFD ADAHRS installations only)	One IFD AHRS is not communicating	Verify all IFDs on and communicating during aircraft power up.
IFD	Autopilot INOP AHRS Miscompare Annunciation	IFD ADAHRS	Check IFD annunciations for possible AHRS faults
			Cycle power and allow IFD system to align
			Repair or Replace the IFD ADAHRS
IFD/Autopilot	No Communication from the IFD to the DFC Annunciation	Wiring, IFD, Autopilot	Check Byteflight Wiring
			Check IFD Databus Status
			Repair or Replace the IFD
			Repair or Replace the Autopilot
Autopilot	Maintenance Safety Recorder Failure Annunciation	The autopilot is unable to read or write to the internal maintenance and safety recorder.	Repair or Replace the Autopilot

Component	Trouble	Probable Cause	Solution
Autopilot	Audio Unavailable Annunciation	The autopilot is unable to read or write to the internal maintenance and safety recorder.	Repair or Replace the Autopilot
Autopilot Hardware Problems:			
Autopilot	Buttons and/or Knob are unresponsive.	Problem with the Autopilot Bezel or wiring.	Repair or Replace the Autopilot.
			Check aircraft wiring
			Check the Autopilot Circuit Breaker
	Autopilot Button and/or Bezel backlights not responding to aircraft lighting dimmer.	Problem with the Autopilot Bezel or wiring.	Check aircraft wiring
			Repair or Replace the Autopilot.
			Check Aircraft Lighting Control
Autopilot Flight Problems:			
Autopilot	Unexpected Flight Characteristics with Autopilot Engaged in Alt Hold or Vs Climb	Moisture in the Static Line – (Note PFD and Standby Instruments will have erratic behavior as well)	Check traps and sump for moisture.
			Check lines for moisture. Perform System Test – Static Plumbing System
	Unable maintain Altitude (Porpoising)	Pitch Servo/Pitch Trim Motor/Flight Control Cables	Verify the Cable Tensions on the Aircraft and Bridle Flight Control Cables
			Verify the Pitch Servo Clutch Settings
			Check the Start-up Voltages for the Pitch Servo (≤3VDC) and Pitch Trim Motor (≤5VDC). (Reference the IM for procedure.)
			Verify the Flight Controls does not have excessive amount of friction
			Verify Pitch Freeplay (≥2 degrees)
		Aircraft unable to hold altitude or IAS/VS target accurately at slow speed and forward cg.	Increase/Decrease in 1 degree increments the adjustable Pitch Trim Tab angle. Repeat the maintenance flight test.
	Aircraft Wing Rock (S-turns)	Roll Trim Motor/Flight Control Cables	Verify the Cable Tensions on the Aircraft Flight Controls
			Check Start-up Voltage for Roll Motor (≤3VDC)
			Check Roll excessive Freeplay (>2 degrees)
			Verify the Flight Controls does not have excessive amount of friction

Component	Trouble	Probable Cause	Solution
Aircraft	Aircraft unable to hold altitude or IAS/VS target accurately at slow speed and forward cg. See Trim Tab Test in the Autopilot Installation Manual (Cirrus SR20s without Pitch Servo only)	Pitch Trim Tab	Increase/Decrease in 1 degree increments the adjustable Pitch Trim Tab angle. Repeat the maintenance flight test.
Aircraft	Autopilot indicates AP Ready but will not engage.	Pitch Trim Power	Pitch Trim Circuit Breaker is open.
			Pitch Trim Relay Removed
			Check Wiring

1. Heading Mode
    a. Sync the Heading Bug on the PFD/IFD to the current heading
    b. Engage the Autopilot in Heading Mode
    c. Vary the Heading Bug on the Primary Flight Display by +/- 5 degrees
    d. Verify the Aircraft's Flight Controls move correctly
    e. Press the Autopilot Disconnect Button on the Pilot's control yoke, verify a disconnect tone is heard

2. Vs Mode
    a. Center the Vs bug
    b. Select Vs on the Autopilot
    c. Turn the Vs knob to +300 ft/min climb
    d. Verify the Aircraft's Flight Controls move correctly
    e. Turn the Vs knob to -300 ft/min descent
    f. Verify the Aircraft's Flight Controls move correctly
    g. Press the Autopilot Disconnect Button on the Pilot's control yoke, verify a disconnect tone is heard

After successfully completing the above tests, the aircraft maintenance logbook should also be updated to reflect any changes made to the Autopilot System hardware or software.

7.3.2 Maintenance Test Flight

This section is only required if the Autopilot Computer is replaced with a new or exchanged unit. Test the Autopilot System in the following modes:

- Heading Mode
- Nav Mode
- GPSS Mode (DFC90 Only)
- IAS Mode
- Vs Mode
- Alt Hold/Capture Mode
- APPR Mode (Both GPS and VHF Nav)
- VNAV (DFC100 Only)

7. Removal and Replacement Information

Removal and replacement instructions, including system set-up and installation verification, are contained in Avidyne Document AVDFC-096. Unit removal, installation, setup and checkout should be performed by an Avidyne Authorized Service Center.

Caution: Prior to removing any piece of electronic equipment, aircraft power must be removed from the system.

7.1 Removal

1. Set BAT 1, BAT 2, and AVIONICS master switch to the OFF positions
2. Pull Autopilot circuit breaker
3. Insert a 3/32" hex wrench into the hole on the front panel on the Autopilot Computer and engage locking screw
4. Turn the locking screw counter-clockwise to loosen locking cam. Cam will move the transceiver unit out ¼" and disengage the electrical connectors.
5. Pull the Autopilot Computer from the tray.

7.2 Installation

1. Set BAT 1, BAT 2, and AVIONICS master switch to the OFF positions
2. Slide the Autopilot Computer into the tray until the locking cam starts to engage
3. Turn the locking screw clockwise to tighten the locking cam until the autopilot is flush to the tray. **Caution: Do not over-tighten.**
4. Reset the Autopilot Computer circuit breaker
5. Perform Post-Installation verification per Section 7.3.
6. Perform a maintenance test flight if the Autopilot Computer was replaced with a new or exchanged unit, Reference Section 7.3.2.

7.3 System Setup and Checkout

After any maintenance activity involving the Autopilot System, the post-installation checkout must be performed as described below.

After allowing the PFD/IFD to align, test the Autopilot System in the following modes:

7.3.1 Autopilot

- Control Wheel Steering (if equipped)

NOTE: All autopilot discrepancies must be corrected prior to returning the aircraft to service, reference Section 4 in the DFC90/100 Installation Manual for troubleshooting information if needed.

8. Diagrams

See Chapter 27 in the Aircraft's Wiring Diagram Manual and/or Installation Data Listed in the STC Master Document List, Avidyne Document Number AVDFC-019.

9. Application of Protective Treatments

This section is not applicable.

10. Data

This section is not applicable.

11. List of Special Tools

No special tools are required for this installation.

12. For Commuter Category Aircraft

This section is not applicable.

13. Recommended Overhaul Periods

No overhaul periods are required for this installation.

14. Airworthiness Limitations Section

There are no Airworthiness Limitations as defined in 14 CFR § 23, Appendix G. The Airworthiness Limitations section is FAA approved and specifies maintenance required under § §43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

15. Revision

Revisions to this document shall be coordinated through the Boston Aircraft Certification Office, the Kansas City AEG, and the STC holder. If you would like to be notified of future revisions to this manual please furnish the information listed below:

Name

Address

City, State, and ZIP Code

Part Number of Manual

Current Revision Status of the Manual

E-mail address

Phone Number

Please submit this information to:

Avidyne Corporation

55 Old Bedford Road

Lincoln, MA 01773

16. Assistance

For questions or assistance regarding this ICA, contact Avidyne Corporation.

17. Implementation and Record Keeping

This ICA is to be made apart of the applicable sections 91.409 or 135.419 aircraft inspection program for this aircraft.

Appendix A: Compatible Flight Displays

Table 4 below lists Compatible Displays for the DFC90/100 Autopilot. All new installations must have the following Software installed on the Display. Reference Appendix B for previous Display Software Compatibility.

Table 4: Compatible Flight Display

Autopilot Part Number	Avidyne PFD[1] P/N 700-00006-XXX Software P/N	Avidyne IFD P/N 700-00083-XXX ACR Software P/N	Aspen EFD1000 P/N 910-00001-XXX
700-00170-000, DFC90 with S/W 530-00213-000 Rev. 02	530-00214-XXX Rev. 04 (or later)		302-00007-( ) Rev. 2.6 (or later)
700-00170-001, DFC100 with S/W 530-00219-000 Rev. 01		530-00220-XXX Rev. 04 (or later)	
700-00170-002, DFC90 with S/W 530-00213-001 Rev. 00	530-00214-XXX Rev. 04 (or later)		
700-00170-003, DFC100 with S/W 530-00219-001 Rev. 00		530-00220-XXX Rev. 02 (or later)	

Appendix B: Feature List

Autopilot	Display Software	DFC90 Autopilot Function							
		Flap Overspeed[1]	Envelop Protection [2]	Envelop Alerting [2]	Excessive Bank	AHRS-TC Miscompare disconnects AP	Servo Limit Alert [3]	Audio Fail Alert	CWS
700-00170-000 Autopilot with S/W 530-00213-000 Rev. 00 (Release 1)	700-00006-XXX with S/W 530-00214-000 Rev. 02		✓			✓			
	700-00006-XXX with S/W 530-00214-000 Rev. 03		✓			✓			
	700-00006-XXX with S/W 530-00214-000 Rev. 04		✓			✓			
700-00170-000 Autopilot with S/W 530-00213-000 Rev. 01 (Release 2)	700-00006-XXX with S/W 530-00214-000 Rev. 02		✓	✓	✓		✓	✓	

		DFC90 Autopilot Function							
Autopilot	Display Software	Flap Overspeed[1]	Envelop Protection [2]	Envelop Alerting [2]	Excessive Bank	AHRS-TC Miscompare disconnects AP	Servo Limit Alert [3]	Audio Fail Alert	CWS
	700-00006-XXX with S/W 530-00214-000 Rev. 03		✓	✓	✓		✓	✓	
	700-00006-XXX with S/W 530-00214-000 Rev. 04	✓	✓	✓	✓		✓	✓	
	910-00001-XXX with S/W 302-00007-( ) Rev. 2.6 (or later)	✓	✓	✓	✓		✓	✓	✓
700-00170-002 Autopilot with S/W 530-00213-001 Rev. 00	700-00006-003 with S/W 530-00214-000 Rev. 04	✓	✓	✓	✓			✓	✓

[1] Requires Flap Position Input

[2] Envelop Alerting and Envelop Protection is more conservative without flap position input. Envelop Alerting is not available in Autopilot Standby (AP Ready) if flap input is not connected.

[3] Aircraft with Roll Trim Only.

Autopilot	Display Software	DFC100 Autopilot Function							
		Flap Overspeed[1]	Envelop Protection [2]	Envelop Alerting [2]	Excessive Bank	AHRS-TC Miscompare disconnects AP	Servo Limit Alert	Audio Fail Alert	CWS
700-00170-001 Autopilot with S/W 530-00219-000 Rev. 00 (Release 1)	700-00083-XXX with S/W 530-00220-000 Rev. 02 or 03 [(4)]		✓	✓	✓	✓	✓		
700-00170-001 Autopilot with S/W 530-00219-000 Rev. 01 (Release 2)	700-00083-XXX with S/W 530-00220-000 Rev. 04 (or later)	✓	✓	✓	✓		✓	✓	
700-00170-003 Autopilot with S/W 530-00219-001 Rev. 00	700-00083-XXX with S/W 530-00220-000 Rev. 02 (or later)	✓	✓	✓	✓				✓

[1] Requires Flap Position Input

[2] Envelop Alerting and Envelop Protection is more conservative without flap position input. Envelop Alerting is not available in Autopilot Standby (AP Ready) if flap input is not connected.

[3] Aircraft with Roll Trim Only.

[4] Integrated Flight Display's with Software Release 9.2, 9.2.1, or 9.2.2 installed can only use DFC100 Autopilot Computer with Software P/N 530-00219-000 Rev. 00 installed.

AVIDYNE

Document Number:	600-00257-000
Title:	Return Instructions for Stec-55 Autopilot and Unused AP/FD Switch Cover Plates
Revision:	01
Date:	07 September 2010

1. General Information

As part of the upgrade to the Avidyne DFC90 Digital Autopilot, the STec System 55X/55SR autopilot must be removed and returned to Avidyne. A return shipping label is included in the DFC90 ship kit.

In the event a dealer or end customer wishes to retain the removed System 55X/55SR, there will be a core charge. Approval for this, and payment for, must be arranged via Avidyne Sales at 1-800-AVIDYNE.

Additionally, any unused AP/FD cover plates (part number 120-00918-000 and 120-00918-001) must be returned to Avidyne in that same box as the STec autopilot.

2. Return Instructions

Place the removed STec System 55X/55SR unit in the same ESD bag that the DFC90 came in, seal it up and place back in the original shipping box. Before sealing the original box, place any unused instrument panel cover plates (part numbers 120-00918-000 and/or 120-00918-001). Use the return address shipping label that was part of the DFC90 shipping materials, affix to the outside of the original shipping box and mail back to Avidyne.

The return is expected to be completed within 7 days of DFC90 installation.