



DFC Autopilot Series Installation Manual



Document Revisions

Date	Revision No.	Description
05/25/10	00	Release per ECO-10-163
06/16/10	01	Update per ECO-10-237
07/14/10	02	Update per ECO-10-270
11/05/10	03	Update per ECO-10-384
12/06/10	04	Update per ECO-10-421
11/04/11	05	Update per ECO-11-160
09/25/12	06	Update per ECO-12-195
12/06/12	07	Update per ECO-12-303
05/02/13	08	Update per ECO-13-138
09/02/14	09	Update per ECO-14-218
08/08/25	10	Update per ECO-25-110

This document is applicable to the Avidyne DFC Series of Autopilots.

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1. General Information

1.1 Introduction

This manual contains information about the physical, mechanical, and electrical characteristics for installing the Avidyne DFC90/100 Automatic Pilot System.

1.2 Product Description

The DFC90/100 is an Autopilot Control Panel (ACP) and Autopilot Computer integrated into one single unit. The front bezel of the DFC90/100 allows the Flight Crew to select the various flight modes. The DFC90/100 computer receives information from the Aircraft's Navigation and Flight Instruments to provide two axis (pitch and roll) control of the aircraft. The DFC90/100 Autopilot provides the following flight functions for piloting the aircraft:

- Straight & Level
- Heading Mode
- Navigation (NAV, APPR)
- Roll Steering (GPSS) Mode (DFC90 Only)
- Altitude Capture and Hold Mode
- Vertical Speed Mode
- Indicated Airspeed Mode
- Glideslope (GS) Mode
- VNAV Mode (DFC100 Only)
- Control Wheel Steering

1.3 Applicability

This manual applies to the following part numbers:

Component	Model Number	Aircraft	Hardware Part Number	Software Part Number
Autopilot Control Panel	DFC90	Cirrus 2X	700-00170-000 Rev. 01 (or later approved revision)	530-00213-000 Rev. 03 (or later approved revision)
Autopilot Control Panel	DFC100	Cirrus 2X	700-00170-001 Rev. 02 (or later approved revision)	530-00219-000 Rev 01 (or later approved revision)
Autopilot Control Panel	DFC90	Piper PA-46R-350T, PA-46-350P	700-00170-002 Rev. 01 (or later approved revision)	530-00213-001 Rev. 01 (or later approved revision)
Autopilot Control Panel	DFC100	Piper PA-46R-350T, PA-46-350P	700-00170-003 Rev. 00 (or later approved revision)	530-00219-001 Rev. 01 (or later approved revision)
Autopilot Control Panel	DFC90 (28VDC Unit)	Cessna 182 Series	700-00170-022 Rev. 00 (or later approved revision)	530-00213-007 Rev. 00 (or later approved revision)
Autopilot Control Panel	DFC90 (14VDC Unit)	Cessna 182 Series	700-00170-024 Rev. 01 (or later approved revision)	530-00213-008 Rev. 00 (or later approved revision)
Autopilot Control Panel	DFC100	KAI KC-100	700-00170-018 Rev. 01 (or later approved revision)	530-00219-005 Rev. 00 (or later approved revision)
Autopilot Control Panel	DFC90 (28VDC Unit)	Piper PA-32	700-00170-004 Rev. 00 (or later approved revision)	530-00213-002 Rev. 00 (or later approved revision)
Autopilot Control Panel	DFC90 (14VDC Unit)	Piper PA-32	700-00170-005 Rev. 00 (or later approved revision)	530-00213-011 Rev. 00 (or later approved revision)
Autopilot Control Panel	DFC100 (28VDC Unit)	Piper PA-32	700-00170-006 Rev. 00 (or later approved revision)	530-00219-002 Rev. 00 (or later approved revision)
Autopilot Control Panel	DFC100 (14VDC Unit)	Piper PA-32	700-00170-027 Rev. 00 (or later approved revision)	530-00219-012 Rev. 00 (or later approved revision)

Component	Model Number	Aircraft	Hardware Part Number	Software Part Number
Autopilot Control Panel	DFC90 (28VDC Unit)	Beech Bonanza Series	700-00170-025 Rev. 00 (or later approved revision)	530-00213-009 Rev. 00 (or later approved revision)
Autopilot Control Panel	DFC90 (14VDC Unit)	Beech Bonanza Series	700-00170-026 Rev. 01 (or later approved revision)	530-00213-010 Rev. 00 (or later approved revision)

Table 1: Autopilot System Product Part Numbers

1.4 System Installation

1.4.1 DFC90 Typical Installation

The following figure depicts a typical high-level system block diagram for the DFC90 Autopilot.

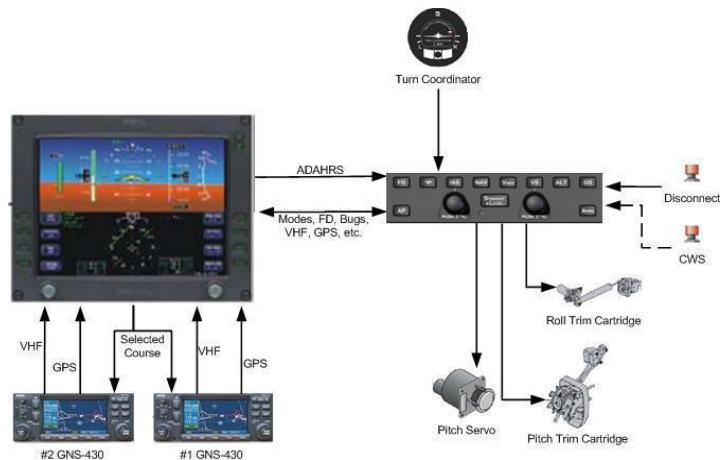


Figure 1: DFC90 System Interconnect Diagram

1.4.2 DFC100 Typical Installation

The following figure depicts a typical high-level system block diagram for the DFC100 Autopilot.

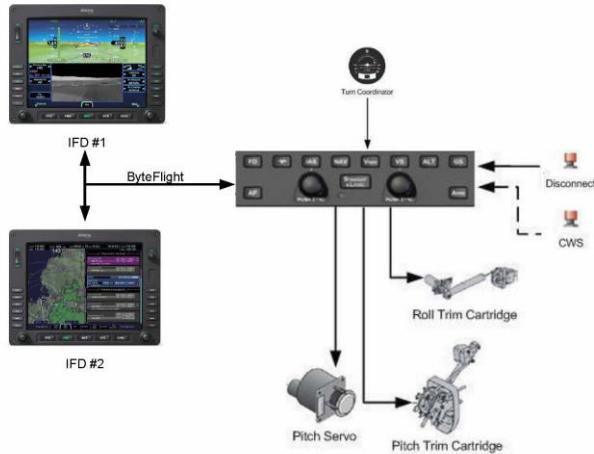


Figure 2: DFC100 System Interconnect Diagram

1.4.3 Compatible Displays

Reference Avidyne Document AVDFC-096, AVDFC-126, AVDFC-167, or AVDFC-181 for compatible displays.

1.5 Technical Specifications

Specification	Description/Requirement
Physical Characteristics	
Weight	3.0 lbs with Tray and Connectors (2.1 lbs Unit)
Height	See Appendix B
Width	See Appendix B
Depth	See Appendix B
Connectors (Aircraft Side)	M24308/2-285 (50-position female D-Sub) QTY 2
Electrical Requirements	
Voltage ¹	18 – 32 Volts DC
Current	1.5 Amps nominal, 5.0 Amps Max @ 28VDC nominal
Dimming Bus ²	28 Volt DC Aircraft Dimming Bus
Cooling Requirement	Convectively self-cooling, no external cooling required.
Interfaces	RS232, Analog & Discrete Inputs/Outputs, Byteflight (DFC100 Only)
Environmental Requirements	
DO-160	Appendix A – Environmental Qualification Form
TSOs	See Section 1.6

Table 2: DFC90/100 Technical Specifications

¹ Avidyne Autopilot P/N 700-000170-005/-024/-026/-027 requires a 28VDC input for unit power and a 14VDC input for servo power.

² Avidyne Autopilot P/N 700-00170-005/-024/-026/-027 uses a 14V Dimming Voltage.

1.6 DFC90/100 Regulatory Compliance

1.6.1 Applicable TSOs

This section identifies Technical Standard Orders (TSOs) applicable to the Avidyne DFC90/100. The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approvals for installation in aircraft. The article may be installed only if performed under 14 CFR Part 43 or the applicable airworthiness requirements.

TSO Number	Title
TSO-C9c	Automatic Pilots
TSO-C52b	Flight Director Equipment

Table 3: DFC90/100 TSO Authorizations

1.6.2 TSO Deviations

Table 4 below lists the TSO deviations and a brief description of the nature of the deviation that have been granted for those applicable TSOs.

TSO	Deviation
TSO-C9c – Autopilot	Qualified to RTCA DO-160E
TSO-C52b – Flight Director Equipment	Qualified to RTCA DO-160E

Table 4: DFC90/100 TSO Deviations

1.7 Software Design Assurance Levels

The DFC90/100 Autopilot contains software developed in accordance with RTCA DO-178B Level B design assurance levels. The following table lists the functions of the system and the corresponding design assurance level.

Function	DO-178B Design Assurance Level
Autopilot	B
Flight Director	B

Table 5: DO-178B Software Design Assurance Levels

1.8 Avidyne Supplied Material

1.8.1 Product Ship Kits

1) Cirrus 2X DFC90 Ship Kit includes:

Component	Part Number
Adhesive Back Cover Plate, Black	120-00918-000
Adhesive Back Cover Plate, Beige	120-00918-001
DFC90 Autopilot Control Panel	700-00170-000
Airplane Flight Manual Supplement, Cirrus 2X	600-00249-000
DFC90 Pilot Guide	600-00252-000
Installation Support Documentation	609-00012-000

Table 6: Cirrus 2X DFC90 Ship Kit - 850-00170-000

2) Cirrus 2X DFC100 Ship Kit includes:

Component	Part Number
Adhesive Back Cover Plate, Black	120-00918-000
Adhesive Back Cover Plate, Beige	120-00918-001
DFC100 Autopilot Control Panel	700-00170-001
Airplane Flight Manual Supplement, Cirrus 2X	600-00271-000
DFC100 Pilot Guide	600-00270-000
Installation Support Documentation	609-00012-001

Table 7: Cirrus 2X DFC100 Ship Kit - 850-00170-001**3) Piper PA-46R-350T / PA-46-350P DFC90 Ship Kit includes:**

Component	Part Number
DFC90 Autopilot Control Panel	700-00170-002
Airplane Flight Manual Supplement, Piper PA-46	600-00285-000
DFC90 Pilot Guide	600-00252-000
Installation Support Documentation	609-00016-000

Table 8: Piper DFC90 Ship Kit - 850-00170-002

4) Piper PA-46R-350T / PA-46-350P DFC100 Ship Kit includes:

Component	Part Number
DFC100 Autopilot Control Panel	700-00170-003
Airplane Flight Manual Supplement, Piper PA-46	600-00288-000
DFC100 Pilot Guide	600-00270-000
Installation Support Documentation	609-00016-001

Table 9: Piper DFC100 Ship Kit - 850-00170-003

5) Cessna 182 Series (28VDC Unit) DFC90 Ship Kit includes:

Component	Part Number
DFC90 Autopilot Control Panel	700-00170-022
Airplane Flight Manual Supplement, Cessna 182	600-00293-000
DFC90 Pilot Guide	600-00252-000
Installation Support Documentation	609-00017-000

Table 10: Cessna 182 Series DFC90 Ship Kit – 850-00170-022

6) Cessna 182 Series (14VDC Unit) DFC90 Ship Kit includes:

Component	Part Number
DFC90 Autopilot Control Panel	700-00170-024
Airplane Flight Manual Supplement, Cessna 182	600-00293-000
DFC90 Pilot Guide	600-00252-000
Installation Support	609-00017-000

Component	Part Number
Documentation	

Table 11: Cessna 182 Series DFC90 Ship Kit – 850-00170-024

7) Bonanza Series (28V Unit) DFC90 Ship Kit includes:

Component	Part Number
DFC90 Autopilot Control Panel	700-00170-025
Airplane Flight Manual Supplement, Bonanza Series	600-00297-000
DFC90 Pilot Guide	600-00252-000
Installation Support Documentation	609-00018-000

Table 12: Bonanza Series DFC90 Ship Kit – 850-00170-025

8) Bonanza Series (14V Unit) DFC90 Ship Kit includes:

Component	Part Number
DFC90 Autopilot Control Panel	700-00170-026
Airplane Flight Manual Supplement, Bonanza Series	600-00297-000
DFC90 Pilot Guide	600-00252-000
Installation Support Documentation	609-00018-000

Table 13: Bonanza Series DFC90 Ship Kit – 850-00170-026

1.8.2 Optional Ship Kits

1) DFC90/100 Autopilot Tray:

Component	Part Number

Component	Part Number
DFC90/100 Autopilot Tray	700-00172-000

Table 14: Autopilot Tray Ship Kit – 850-00213-000**2) ByteFlight Cable:**

Component	Part Number	QTY
ByteFlight Cable	033-00102-000	40 feet

Table 15: Cable Ship Kit – 820-00101-000

Note: Only required for R9 installations with 100-00394-() Rev. 00 or 100-00458-000 Rev. 00 Harness installed.

2. Installation Instructions

This Section describes the installation and interface to the DFC Series Autopilot. Prior to beginning the installation, the installer should assess the aircraft's flight control system thoroughly. This assessment should include the following: Cable Tensions, Bridle Cable Tensions, Flight Control Rigging, and Servo Clutch Torque Settings. If the installer suspects an issue in any of the above areas, the installer should reference the appropriate section of the approved maintenance data. See Appendix D - Aircraft Inspection for additional inspection details. Any aircraft deficiencies not corrected may result in poor lateral and/or vertical performance of the autopilot. See Section 4 for additional Autopilot troubleshooting information.

2.1 Installation Limitations

The following Installation Limitations must be followed during the installation of the Avidyne Automatic Pilot System.

The Installer **MUST** use the approved installation drawing(s) (e.g. 900-00XXX-XXX, 700-00170-XXX Installation) as listed in the Master Document List for the specific aircraft type.

Airframe	STC Number	Master Document List Number
Cirrus 2X	SA00296BO	AVDFC-019 (Includes both the DFC90 and DFC100)
Piper PA-46R-350T / PA-46-350P	SA00310BO	AVDFC-077 (Includes both the DFC90 and DFC100)
Cessna 182 Series ¹	SA00323BO	AVDFC-115 (DFC90 Only)
Beech Series ¹	SA00331BO	AVDFC-157 (Includes both the DFC90 and DFC100)

Table 16: Applicable STCs

¹ Reference the STC for Specific Aircraft Models

2.1.1 DFC90 Limitations

- Requires existing S-TEC Roll, Pitch and Pitch Trim servos installed per approved STC or TC.
- Requires an Avidyne Vantage12 Primary Flight Display, an Entegra Primary Flight Display with Release 8.0 software (or later) with Modification 55 installed or an Aspen PFD. Reference Avidyne Document AVDFC-096 (Cirrus and Piper PA-46 with Entegra or Aspen PFD), AVDFC-126 (Cessna), AVDFC-167 (Beech), AVDFC-181 (Cirrus with Vantage12) for appropriate PFD S/W part number.
- Any external AP/FD Annunciation/Switches from the previously installed autopilot system must be removed.
- The DFC90 can only be installed on the airframes listed in Table 16 per their respective STC. Reference the STC Master Document List for Installation and Compliance Data.
- An Electrical Load Analysis, in accordance with AC 43-13-1B, Chapter 11, must be accomplished to determine that the electrical limits of the specific aircraft are not exceeded. The Electrical Load Analysis, Functional Hazard Assessment and other certification requirements for the aircraft must remain in compliance.
- A weight and balance calculation must be performed. DFC90 Autopilot and tray weights are identified in this document. Wiring and bracket weights used for flap sensing must be determined by the installer. Alternately the airplane can be weighed to determine the new weight and balance. The aircraft's weight and balance information must be updated and made available in the airplane's AFM/POH.

2.1.2 DFC100 Limitations

- Requires existing S-TEC Roll, Pitch and Pitch Trim servos installed per approved STC or TC.
- Requires an Avidyne Integrated Flight Display System with Release 9.2.1 software (or later) installed (STC # SA00282BO). Reference Avidyne Document AVDFC-096 for appropriate R9 IFD S/W part number.
- Any external AP/FD Annunciation/Switches from the previously installed autopilot system must be removed.
- The DFC100 can only be installed on the airframes listed in Table 16 per their respective STC. Reference the STC Master Document List for Installation and Compliance Data.
- An Electrical Load Analysis, in accordance with AC 43-13-1B, Chapter 11, must be accomplished to determine that the electrical limits of the specific aircraft are not exceeded. The Electrical Load Analysis, Functional Hazard Assessment and other certification requirements for the aircraft must remain in compliance.

- A weight and balance calculation must be performed. DFC100 Autopilot and tray weights are identified in this document. Wiring and bracket weights used for flap sensing must be determined by the installer. Alternately the airplane can be weighed to determine the new weight and balance. The aircraft's weight and balance information must be updated and made available in the airplane's AFM/POH.

2.2 Installation Considerations

The following should be considered prior to starting the installation:

- Before you start, plan your installation by carefully reviewing all installation documentation, including mechanical and electrical instructions.
- Use the appendices found in this manual for guidance with system component dimensions, cutout dimensions, and wiring.
- Follow acceptable avionics installation practices per FAA AC 43.13-1B, AC 43.13-2B, or later FAA approved revisions.
- Perform the structural aspects of the installation in accordance with FAA AC 43.13-2B, Chapter 1.
- An Electrical Load Analysis, in accordance with AC 43-13-1B, Chapter 11, must be accomplished to determine that the electrical limits of the specific aircraft are not exceeded. The Electrical Load Analysis, Functional Hazard Assessment and other certification requirements for the aircraft must remain in compliance.
- The panel assembly must include placard content equivalent to that existing prior to the modification.
- Other avionics required for approved flight operations relocated during this installation must remain readily accessible to the pilot. This may require a separate approval.

2.3 Cooling

The Avidyne Autopilot Computer requires no external cooling. However, installing an external electric cooling fan will reduce the overall operating temperature of the unit. If the DFC90/100 is installed in a tightly packed avionics stack where the cooling airflow is limited, Installers should consider installing an external cooling fan.

The Autopilot should not be installed in a location that is outside the Autopilot's environmental qualifications. See Appendix A for the Autopilot's Environmental Qualifications.

2.4 Mounting

The Avidyne Autopilot is designed to be installed in an avionics tray. The tray allows the Avidyne Autopilot to be easily installed and removed as necessary. The Autopilot is installed/removed from the tray using a 3/32" Allen wrench. The Allen wrench is inserted into the hole on the front bezel of the Autopilot Computer.

The Avidyne Tray should be mounted in a position easily accessible to the Pilot using standard industry practices.

2.5 Electrical Information

2.5.1 Electrical Interface

Electrical Interfaces should be installed per the installation data for the STC.

2.5.2 ByteFlight Databus (DFC100 only)

Avidyne's Byteflight Databus has a unique set of interconnect requirements. Follow the installation instructions in the STC or contact Avidyne for more information.

2.5.3 Wire Type

Wiring aspects of design, including wire type and size selection must conform to FAA AC 43.13-1B, Chapter 11 Section 5, Electrical Wiring Rating. Wire conforming to MIL-W-22759/16 or MIL-C-27500 satisfies the burn requirements stated in Title 14 CFR §23.1359.

2.5.4

DFC90 Pin Assignments

Pin Number	P1 – Connector	P2 - Connector
1	Roll Motor 2	Not Used
2	Ground	Not Used
3	Pitch Motor 2	Roll Solenoid
4	Down Trim Limit	Not Used
5	Rate Gyro Tach	CWS Input
6	Rate Gyro Reference	Ground
7	No Connection	5 VDC Analog Reference
8	No Connection	Not Used
9	Not Used	Not Used
10	Ground	Not Used
11	Not Used	Not Used
12	Not Used	Not Used
13	Not Used	Not Used
14	Not Used	Trim Interrupt In
15	Lighting Input	Manual Trim - Down Input
16	Ground	Manual Trim - Up Input
17	Autopilot Disconnect Switch	Trim Motor Down
18	Roll Solenoid	Not Used
19	Roll Motor 1	Not Used
20	Pitch Solenoid	Not Used
21	Pitch Motor 1	Not Used
22	Up Trim Limit	Not Used
23	Ground	Manual Trim – Left Input
24	Rate Gyro Signal	RS-232 Tx
25	Not Used	RS-232 Rx

26	Not Used	RS-232 Rx
27	Not Used	Audio Out HI
28	Not Used	Flap Input
29	Not Used	Not Used
30	Not Used	Flap Position Reference (10VDC)
31	Not Used	Flap Input (10VDC max)
32	Not Used	Trim Motor Up
33	Not Used	Trim Solenoid
34	Power Input	No Connection
35	Power Ground	No Connection
36	Roll Solenoid Ground	Not Used
37	Not Used	Not Used
38	Not Used	Manual Trim – Right Input
39	Ground	Ground
40	Ground	Ground
41	Ground	Ground
42	Ground	Ground
43	Ground	Ground
44	Ground	Ground
45	Ground	Ground
46	Ground	Ground
47	Not Used	Ground
48	Not Used	Ground
49	Not Used	Ground
50	Not Used	Trim Power Input

Table 17: DFC90 Pin Assignments

2.5.5

DFC100 Pin Assignments

Pin Number	P1 – Connector	P2 - Connector
1	Roll Motor 2	Not Used
2	Ground	Not Used
3	Pitch Motor 2	Roll Solenoid
4	Down Trim Limit	Not Used
5	Rate Gyro Tach	CWS Input
6	Rate Gyro Reference	Ground
7	Byteflight A+	5 VDC Analog Reference
8	Byteflight A-	Not Used
9	Go-Around In	Not Used
10	Ground	Not Used
11	Not Used	Not Used
12	Not Used	Not Used
13	Not Used	Not Used
14	Not Used	Trim Interrupt In
15	Lighting Input	Manual Trim - Down Input
16	Ground	Manual Trim - Up Input
17	Autopilot Disconnect Switch	Trim Motor Down
18	Roll Solenoid	Not Used
19	Roll Motor 1	Not Used
20	Pitch Solenoid	Not Used
21	Pitch Motor 1	Not Used
22	Up Trim Limit	Not Used
23	Ground	Manual Trim – Left Input
24	Rate Gyro Signal	RS-232 Tx
25	Not Used	RS-232 Rx

26	Not Used	RS-232 Rx
27	Not Used	Audio Out HI
28	Not Used	Flap Input
29	Not Used	Not Used
30	Not Used	Flap Position Reference
31	Not Used	Flap Input (10VDC max)
32	Not Used	Trim Motor Up
33	Not Used	Trim Solenoid
34	Power Input	Byteflight B+
35	Power Ground	Byteflight B-
36	Roll Solenoid Ground	Not Used
37	Not Used	Not Used
38	Not Used	Manual Trim – Right Input
39	Ground	Ground
40	Ground	Ground
41	Ground	Ground
42	Ground	Ground
43	Ground	Ground
44	Ground	Ground
45	Ground	Ground
46	Ground	Ground
47	Not Used	Ground
48	Not Used	Ground
49	Not Used	Ground
50	Not Used	Trim Power Input

Table 18: DFC100 Pin Assignments

3. System Setup and Post Installation Checkout

Reference Avidyne Document AVDFC-096, AVDFC-126, AVDFC-167, or AVDFC-181 for configuring and testing the Avidyne Autopilot.

4. Troubleshooting Information

The following items present common installation problems and recommended actions for the Avidyne Autopilot System. Reference the Aircraft Maintenance Manual (AMM) for aircraft related material.

Table 19: 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 (N/A for Vantage12)	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.
Autopilot	MSR Fail is displayed on the PFD	The autopilot is unable to read or write to the internal	Repair or Replace the Autopilot.

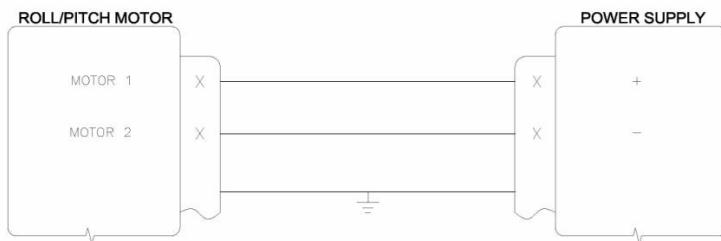
Component	Trouble	Probable Cause	Solution
		maintenance and safety recorder.	
PFD	NO PFD COMM Annunciation	Autopilot is not receiving data from the PFD.	Check Wiring between the Autopilot and the PFD.
			Repair or Replace the PFD.
			Verify Autopilot is properly seated in its tray.
			Repair or Replace 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 (N/A for Vantage12)	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.
Autopilot Annunciations on the Integrated Flight Display (DFC100 Only):			

Component	Trouble	Probable Cause	Solution
Autopilot	Autopilot INOP Annunciation	Autopilot Failure	Repair or Replace Autopilot Computer
R9 IFD	AHRS Fail Annunciation	R9 IFD AHRS Failed	Check R9 IFD annunciations for possible AHRS faults
			Cycle power and allow R9 IFD system to align
			Repair or Replace the R9 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.
R9 IFD	AHRS Aligning Annunciation	R9 IFD AHRS Aligning	Wait for the R9 IFD to finish alignment
			R9 IFD failed to Align. Press "Fast Erect" button on the R9 IFD.
R9 IFD	Autopilot INOP AHRS Comparator Fail Annunciation (Multiple R9 IFD ADAHRS installations only)	One R9 IFD AHRS is not communicating	Verify all R9 IFDs on and communicating during aircraft power up.
R9 IFD	Autopilot INOP AHRS Miscompare Annunciation	R9 IFD ADAHRS	Check R9 IFD annunciations for possible AHRS faults
			Cycle power and allow R9 IFD system to align
			Repair or Replace the R9 IFD ADAHRS
R9 IFD/ Autopilot	No Communication from the R9 IFD to the DFC Annunciation	Wiring, R9 IFD, Autopilot	Check Byteflight Wiring
			Check R9 IFD Databus Status
			Repair or Replace the R9 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
Autopilot	Audio Unavailable 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 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 (≤ 3 VDC) ¹ and Pitch Trim Motor (≤ 5 VDC) ¹ . (Reference the AMM 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. See Trim Tab Test in AVDFC-096 (Cirrus SR20s without Pitch Servo only)	Aircraft unable to hold altitude or IAS/VS target accurately at slow speed and forward cg. See Trim Tab Test in AVDFC-096 (Cirrus SR20s without Pitch Servo only)	Increase/Decrease in 1 degree increments the adjustable Pitch Trim Tab angle. Repeat the maintenance flight test.
			Verify the Cable Tensions on the Aircraft Flight Controls
			Check Start-up Voltage for Roll Motor (≤ 3 VDC) ¹
			Check Roll excessive Freeplay (> 2 degrees)
Aircraft	Aircraft unable to hold altitude or IAS/VS target accurately at slow speed and forward cg. See Trim Tab Test in AVDFC-096 (Cirrus SR20s without Pitch Servo only)	Pitch Trim Tab	Verify the Flight Controls does not have excessive amount of friction
			Increase/Decrease in 1 degree increments the adjustable Pitch Trim Tab angle. Repeat the maintenance flight test.

Component	Trouble	Probable Cause	Solution
	Tab Test in Trim Tab Test in AVDFC-096 (Cirrus SR20s without Pitch Servo only)		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
			(14-Volt Only) Pitch Trim Power is below 10.5V

¹ Connect and Measure the startup voltage for the Roll/Pitch Motor using the Power Supply as shown in the image below. This test is using the generic power supply in place of the autopilot to determine what input voltage is required to start the roll/pitch motor to start moving. There are several connector access points within the aircraft to perform this test:



For additional troubleshooting information, contact Avidyne Technical Support. See Section 5 for contact information.

5. Factory Service Policies and Procedures

5.1 Technical Support

Avidyne's website contains information that may assist the operator and installer with questions or problems with their Avidyne Autopilot System.

www.Avidyne.com

Technical support questions may be submitted via the following:

- Email: techsupport@avidyne.com
- Fax: 781-402-7599
- Voice: 888-723-7592

An Avidyne Technical Support Representative will respond as soon as possible. Avidyne business hours are:

- Monday through Friday: 8:00 AM to 5:00 PM Eastern Time

Please include the part number, revision number and serial number of the unit in all correspondences. For problem reporting, please provide as many details associated with the problem as possible.

For After Hours Technical Support, via the following:

- AOG Support: 877-900-4AOG (4264)

5.2 General Service Procedures

Repair of the DFC90/100 are performed at authorized Part 145 service centers and the Avidyne factory.

Prior to returning a unit for service, contact Avidyne at 1-888-723-7592 to obtain a Return Merchandise Authorization (RMA) number.

Securely pack the unit in the Avidyne shipping carton, write the RMA number on the outside of the carton, and return it to the address provided by the Avidyne Customer Service Representative. Include your name, complete shipping address, daytime telephone number, a complete description of the problem, the desired return date, and shipping method.

If the shipping carton or other suitable foam packing is not available, contact Avidyne to arrange for packaging materials. Avidyne is not responsible for damage due to poorly packaged returns.

6. STC Permission

Avidyne Corporation hereby grants to all National Aviation Authority (FAA, CAA, JAA) approved installers the use of data from STC SA00296BO, SA00310BO, SA00323BO, or SA00331BO to install the Avidyne DFC90/100 Autopilot Computer. This also includes any international validations of the listed STCs (e.g. EASA, ANAC, etc). Copies of the STC data are available on the Avidyne website Technical Publications page or upon request. The latest data revisions are listed in Avidyne 700-00170-XXX STC Master Document List (Ref. Table 16).

Installers must abide by the conditions and limitations stated in both the STC and in the Installation Manual in order to maintain compliance. The use of this data by itself does not constitute installation approval.

Appendix A: Environmental Qualification Forms

AUTOPILOT AUTO CONTROL PANEL PART NO: 700-00170-()

MANUFACTURER: AVIDYNE CORPORATION

ADDRESS: 55 OLD BEDFORD ROAD, LINCOLN, MA 01773

Table 20: DO-160E ENVIRONMENTAL QUALIFICATION

<i>Environmental Tests</i>	<i>RTCA/DO-160E Section</i>	<i>Conducted Test Category</i>
Temperature and Altitude		
Low Temp	4.5.1 & 4.5.2	Equipment to be qualified to Category D1
High Temp	4.5.3 & 4.5.4	Equipment to be qualified to Category D1
In-Flight Loss of Cooling	4.5.5	Equipment identified as Category X, no test required
Altitude	4.6.1	Equipment to be qualified to Category D1
Decompression	4.6.2	Equipment to be qualified to Category A1
Overpressure	4.6.3	Equipment to be qualified to Category A1
Temperature Variation	5	Equipment to be qualified to Category B
Humidity	6	Equipment to be qualified to Category A
Operational Shocks & Crash Safety	7	Equipment to be qualified to Category B
Vibration	8	Equipment to be qualified to Category S, Curves B & M
Explosion Proofness	9	Equipment identified as Category X, no test required
Waterproofness	10	Equipment identified as Category X, no test required
Fluids Susceptibility	11	Equipment identified as Category X, no test required
Sand and Dust	12	Equipment identified as Category X, no test required
Fungus Resistance	13	Equipment identified as Category X, no test required
Salt Spray	14	Equipment identified as Category X, no test required
Magnetic Effects	15	Equipment to be qualified to Category Z

<i>Environmental Tests</i>	<i>RTCA/DO-160E Section</i>	<i>Conducted Test Category</i>
Power Input	16	Equipment to be qualified to Category B
Voltage Spike	17	Equipment to be qualified to Category A
Audio Frequency Conducted Susceptibility	18	Equipment to be qualified to Category B
Induced Signal Susceptibility	19	Equipment to be qualified to Category ZC
Radio Frequency Susceptibility	20	Equipment to be qualified to Category R (Conducted), Category R (Radiated)
Emission of Radio Frequency Energy	21	Equipment to be qualified to Category M
Lightning Induced Transient Susceptibility	22	Equipment to be qualified to Category (B3/B4)K44
Lightning Direct Effects	23	Equipment identified as Category X, no test required
Icing	24	Equipment identified as Category X, no test required
Electrostatic Discharge	25	Equipment to be qualified to Category A
Fire/Flammability	26	Equipment identified as Category X, no test required

Appendix B: DFC90/100 Outline Dimensions

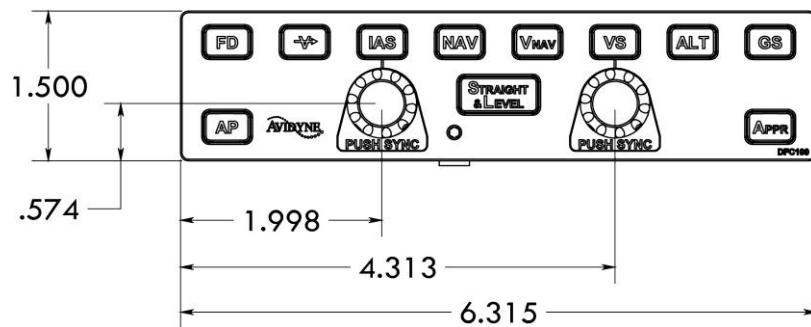


Figure B-1: Front View

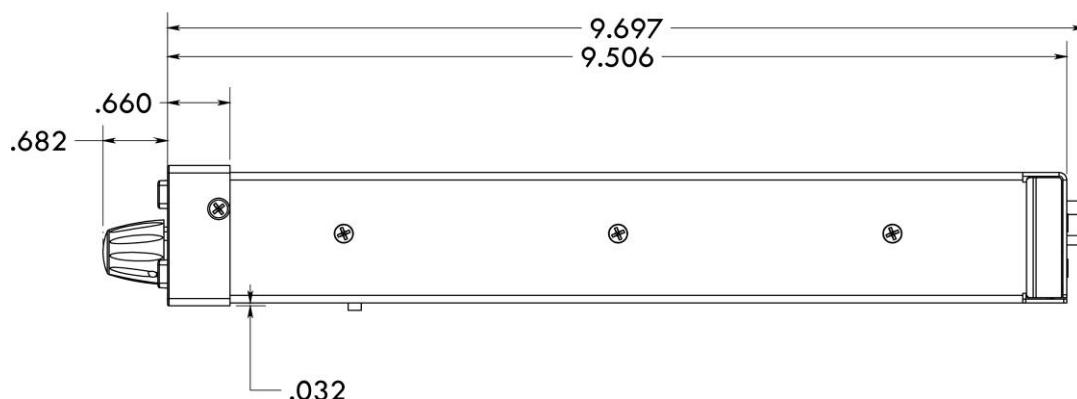


Figure B-2: Side View

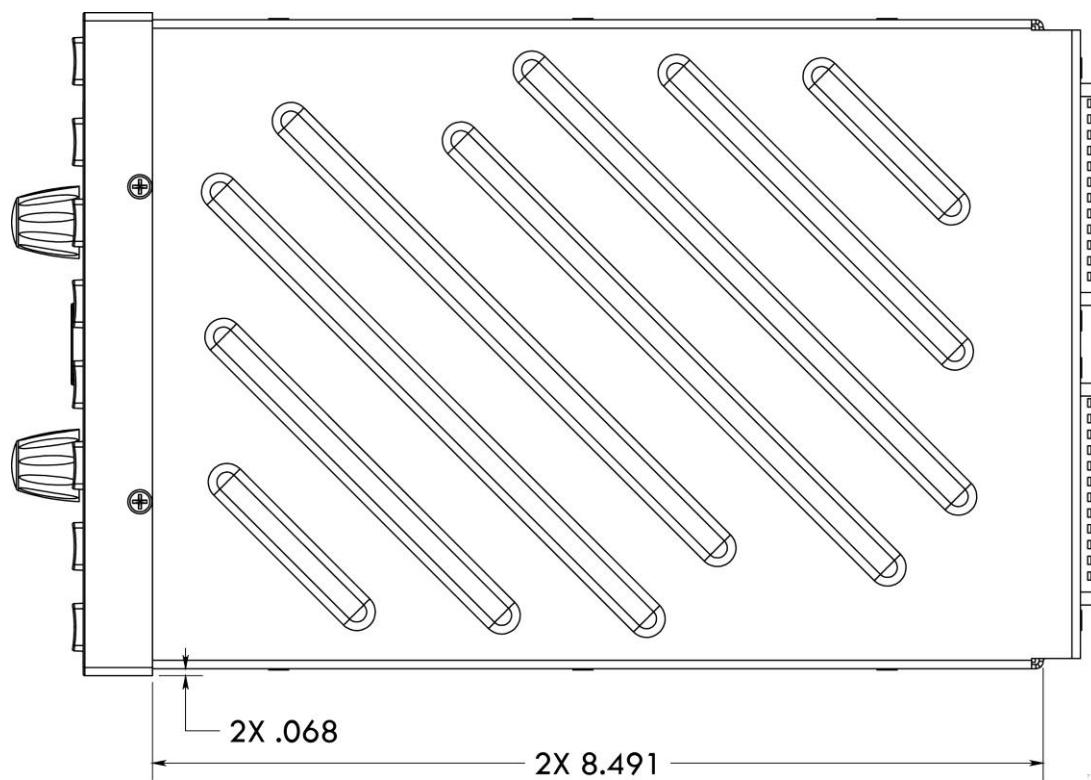


Figure B-3: Top View

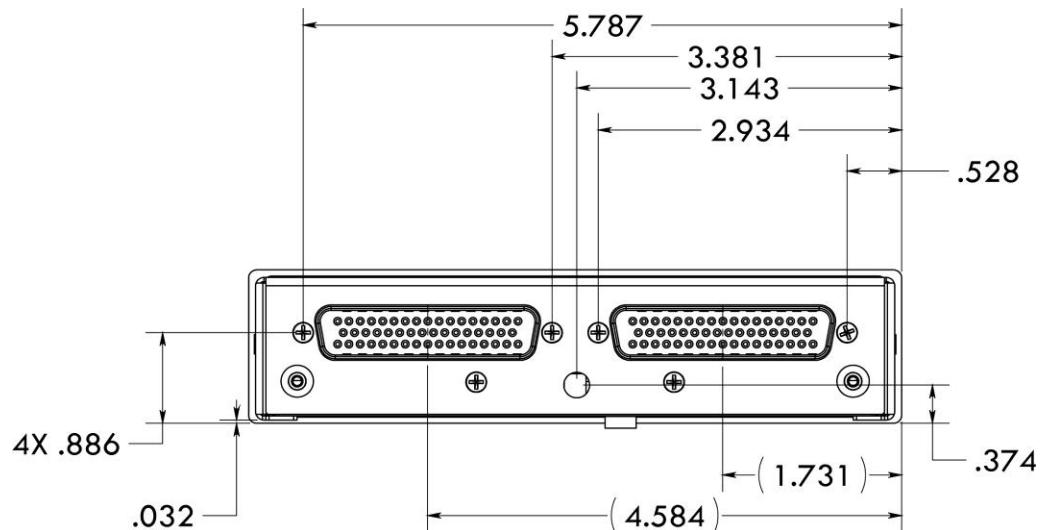


Figure B-4: Rear View

(P1 is the left connector)

Appendix C: Autopilot Tray Outline Dimensions

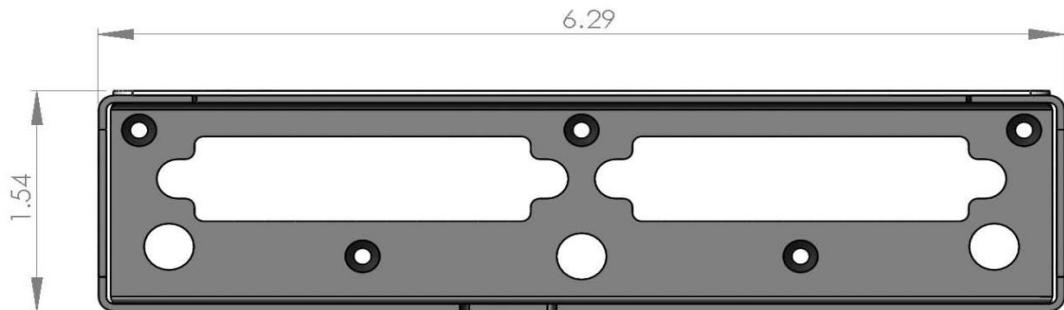


Figure C-1: Front View

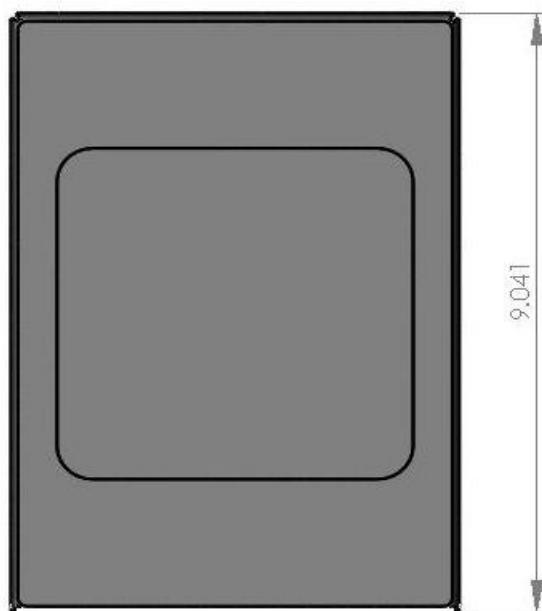


Figure C-2: Top View



Figure C-3: Side View

Appendix D: Aircraft Inspection

This Aircraft Inspection is only needed to investigate problems found during the assessment identified in Section 2. Perform steps in this section appropriate to the problem identified/suspected in Section 2. The installer should reference the appropriate section of the approved maintenance data, if needed. See Section 4 for additional Autopilot troubleshooting information.

Note: Improper aircraft rigging, such as misaligned aileron or elevator trim tabs, can cause continuous trim activity or degraded autopilot performance after DFC90 installation. This may present as excessive servo movement, poor altitude or heading hold, or instability in pitch or roll. If these symptoms are observed, consult the Cirrus Aircraft Maintenance Manual section 57-50 for rigging instructions.

1. Aircraft Flight Control Evaluation

These tests are designed to test the flight control system to ensure optimal performance of the Autopilot. Any inspection/repair/maintenance must be conducted per the Aircraft Manufacturer's Maintenance Manual or approved Service Bulletin.

a. Aileron Flight Control Evaluation

The following tests/inspections will evaluate the aircraft's aileron flight control system.

i. Aileron Cable Tension Check

Verify the aileron cable tension per aircraft maintenance manual data applicable to the test aircraft. Record the measured value below:

Aileron Cable Tension: _____

ii. Aileron Control Surface Travel Check

Verify the aileron control surface travel per aircraft maintenance manual data applicable to the test aircraft. Record the measured values below:

Left Aileron Up Travel: _____ Right Aileron Up Travel: _____

Left Aileron Down Travel: _____ Right Aileron Down Travel: _____

iii. Aileron Trim Motor Test

1. Aileron Servo Travel Check

Verify the aileron trim control surface travel per aircraft maintenance manual data applicable to the test aircraft. Record the measured values below:

Left Aileron Servo Up Travel: _____

Right Aileron Servo Up Travel: _____

Left Aileron Servo Down Travel: _____

Right Aileron Servo Down Travel: _____

2. Aileron Servo Motor Voltage Test

Note: This test is conducted using the S-TEC Autopilot. If the DFC90 Autopilot has already been installed, see the end of Table 19, Troubleshooting Table in Section 4 for an alternative test method.

This test is to evaluate the minimum voltage required to move the Aileron Trim Motor.

1. Gain access to the Aileron Roll Servo
2. Connect a Volt Meter between the motor drive lines (for Cirrus SR2X : Pins 1 and 2 at the P304 Disconnect. Note: If P304 is not accessible using an alternate location is acceptable. If using an S-TEC breakout box, measure the voltage between Pins 1 and 19 on connector P551.)
3. Turn on Autopilot power

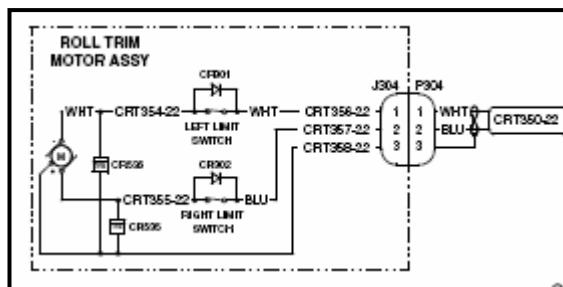


Figure 3: Roll Trim Motor Electrical Disconnect

4. Sync Heading Bug to the current heading
5. Engage the Autopilot in Heading Mode
6. Vary Heading Bug on the PFD in 1 degree increments and record the DC Voltage where the Roll Motor starts to move.

Voltage: _____

Note: Installers should inspect the flight control system for excessive friction and/or roll motor problem if greater than 3 VDC is measured.

iv. Aileron Flight Control Freeplay Measurement

This test will measure the amount of Aileron freeplay in the Flight Control System from the Roll Trim Cartridge.

Aileron Freeplay – Up Measurement

1. Center the Roll Trim for $0 \pm .5$ degrees of Roll
2. Attach Inclinometer to the Right Aileron to measure deflection angle (Ref. Aircraft Maintenance Manual)
3. Set Inclinometer to 0 degrees
4. Using both hands, move the aileron up until resistance is felt
5. Slowly remove hands allowing the aileron to center by itself
6. Record Deflection Angle (See Figure 4). Note: Deflection should be \leq 2 degrees. Inspect Flight Control System if greater than 2 degrees. Aircraft with greater than 2 degrees of Freeplay should inspect the flight control system for potential problems.

Up Aileron Freeplay: _____

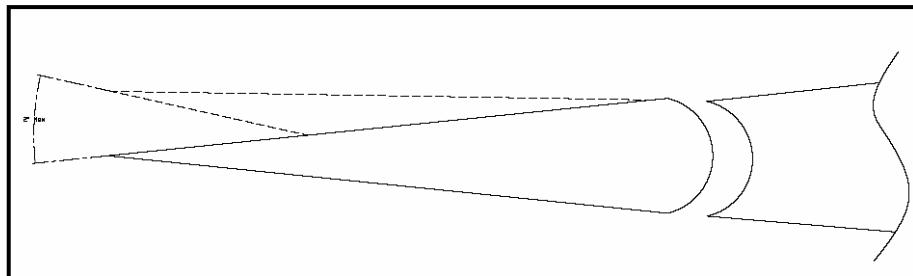


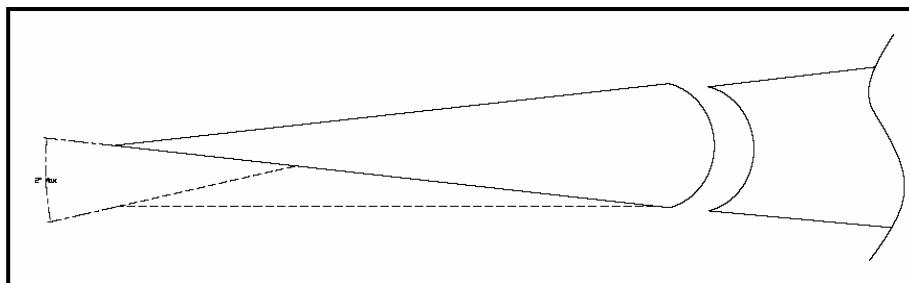
Figure 4: Up Aileron Deflection

Aileron Freeplay – Down Measurement

1. Center the Roll - ailerons $0 \pm .5$ degrees of center
2. Attach Inclinometer to the Right Aileron to measure deflection angle (Ref. Aircraft Maintenance Manual)
3. Set Inclinometer to 0 degrees
4. Using both hands, move the aileron down until resistance is felt
5. Slowly remove hands allowing the aileron to center by itself

6. Record Deflection Angle (See Figure 5). Note: Deflection should be \leq 2 degrees. Inspect Flight Control System if greater than 2 degrees. Aircraft with Freeplay greater than 2 degrees should inspect the flight controls for potential problems.
7. Down Aileron Freeplay: _____

Figure 5: Down Aileron Deflection



b. Elevator Flight Control Evaluation

The following tests/inspections will evaluate the Aircraft's elevator flight control system.

i. Elevator Control Surface Travel Check

Verify the Elevator control surface travel per the aircraft maintenance manual. Record the measured values below:

Up Travel: _____ Down Travel: _____

ii. Pitch Cable Tension Check

Verify the Pitch Cable Tension per the aircraft maintenance manual. Record the measured value below:

Pitch Cable Tension: _____

c. Autopilot Pitch Servo Check

This Section will evaluate the Aircraft's Autopilot Pitch Servo. Please note, some SRV/SR20s do not have a Pitch Servo installed, therefore, Section ii below will not apply

i. Bridle Cable Tension Check

Verify the Pitch Bridle Cable Tension per the aircraft maintenance manual.
The measured value below:

Pitch Bridle Cable Tension: _____

ii. Pitch Servo Voltage Check

This test will evaluate the minimum starting voltage for the Autopilot Pitch Servo.

Note: This test is conducted using the S-TEC Autopilot

1. Gain Access to the Pitch Servo Motor
2. Connect 28VDC from a Power Supply to the servo solenoid
3. Connect a second Power Supply between Pins 3 and 4 at the P561 Disconnect.
4. Slowly increase the voltage on the second power from 0 VDC to 5 VDC.
5. Note the Voltage the servo starts moving.
6. Record Voltage below

Voltage: _____

Note: Installers should inspect the flight control system for excessive friction and/or pitch trim motor problem for Voltages greater than 3 VDC.

iii. Cirrus SR20/SRV Pitch Trim Motor Test

Pitch Trim Travel Check

Verify the Pitch Trim control surface travel per the aircraft maintenance manual. Record the measured values below:

Pitch Trim Up Travel: _____

Pitch Trim Down Travel: _____

iv. Pitch Trim Motor Voltage Test

This test is to evaluate the starting voltage for the Pitch Servo. Use Section 1 below for SR22 and PA46 or Section 2 for a Cirrus SR20/SRV.

1. Pitch Trim Test

Note: This test is conducted using the STEC Autopilot

1. Gain access to the Pitch Trim Motor

2. Connect a Volt Meter between the servo drive lines (for Cirrus: Pins 1 and 2 at the P634 Disconnect Note: If P634 is not accessible using an alternate location is acceptable.)
3. Turn on autopilot and avionics power

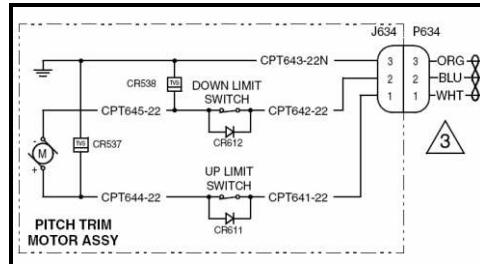


Figure 6: Cirrus SR22 Pitch Trim Motor Electrical Disconnect

4. Sync Heading Bug to the current heading
5. Set Vs Bug +300 Ft/min Climb
6. Engage the Autopilot in Heading and Vs
7. Push against the control yoke (Pitch Down) – apply pressure against the autopilot but do not override (move) the surface.
8. Press HOLD on the Voltmeter when pitch trim starts to move
9. Record Voltage below

Voltage: _____

Note: Installers should inspect the flight control system for excessive friction and/or pitch trim motor problem for Voltages greater than 5 VDC.

2. Cirrus SR20 Pitch Trim Test

Note: This test is conducted using the STEC Autopilot

1. Gain access to the Pitch Trim Motor
2. Aircraft without a Pitch Servo use Step a below. Aircraft with a Pitch Servo use Step b below:
 - a. Connect a Volt Meter between Pins 1 and 2 at the P634 Disconnect Note: If P634 is not accessible using an alternate location is acceptable. If using an S-TEC breakout box, measure the voltage between Pins 3 and 21 on connector P551.
 - b. Connect a Volt Meter between Pins 1 and 2 at the P634 Disconnect Note: If P634 is not accessible using an alternate location is acceptable. If using an S-TEC breakout box,

measure the voltage between Pins 17 and 32 on connector P552.

3. Turn on BATT 1 and Avionics Switches

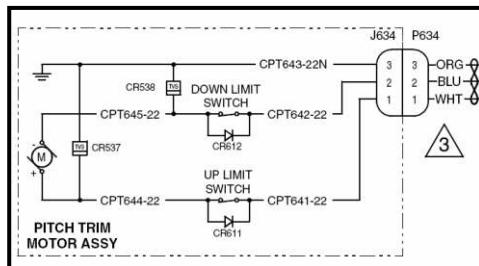


Figure 7: Cirrus SR20 Pitch Trim Motor Electrical Disconnect

4. Sync Heading Bug to the current heading
5. Set Vs Bug +100 Ft/min Climb
6. Engage the Autopilot in Heading and Vs
7. Push against the control yoke (Pitch Down) **Note:** Aircraft without a Autopilot Pitch Servo can eliminate this step.
8. Press HOLD on the Voltmeter when pitch trim starts to move
9. Record Voltage below

Voltage: _____

Note: Installers should inspect the flight control system for excessive friction and/or pitch trim motor problem for Voltages greater than 5 VDC.

v. Elevator Flight Control Freeplay Measurement

This Section will test the amount of freeplay in the Aircraft's Elevator System.

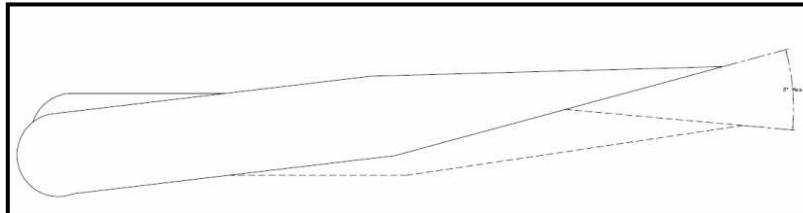
Note: For Cirrus aircraft with excessive elevator freeplay should inspect the aircraft's flight control system for any potential problems. Also, see Cirrus Service Bulletin SB 2X-27-12 R1 (or later approved additions).

vi. Elevator Freeplay – Up Measurement

1. Center the Pitch Trim for $0 \pm .5$ degrees of Pitch
2. Attach Inclinometer to the elevator to measure deflection angle (Ref. Aircraft Maintenance Manual)
3. Set Inclinometer to 0 degrees
4. Using both hands, move the elevator up until resistance is felt

5. Slowly remove hands allowing the elevator to center by itself (See Figure 8).
6. Record Deflection Angle below. Note: Deflection should be \leq 2 degrees. Aircraft with Freeplay greater than 2 degrees should inspect the flight controls for potential problems.

Figure 8: Elevator Up Deflection



Elevator Freeplay – Up: _____

Elevator Freeplay – Down Measurement

1. Center the Pitch Trim for $0 \pm .5$ degrees of Pitch
2. Attach Inclinometer to the elevator to measure deflection angle (Ref. Aircraft Maintenance Manual)
3. Set Inclinometer to 0 degrees
4. Using both hands, move the elevator up until resistance is felt
5. Slowly remove hands allowing the elevator to center by itself (See Figure 9).
6. Record Deflection Angle below. Note: Deflection should be \leq 2 degrees. Aircraft with Freeplay greater than 2 degrees should inspect the flight controls for potential problems.

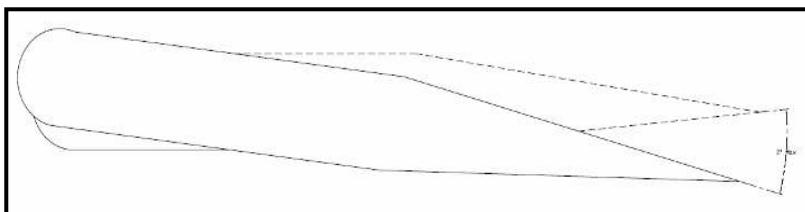


Figure 9: Elevator Freeplay - Down

Elevator Freeplay – Down: _____

AVIDYNE EXCLUSIVE LIMITED WARRANTY and LIMITATIONS ON LIABILITY

Avidyne warrants the Product manufactured by it against defects in material and workmanship for a period of twenty-four (24) months from delivery. If Avidyne's Product fails to conform to this warranty, Avidyne, in its sole discretion, will either repair or replace the Product or provide a refund of the purchase price paid for the Product. This warranty is made upon the express conditions that:

- (a) Avidyne is given prompt written notice of any claimed non-conformity in the Product, with a reasonable explanation thereof;
- (b) The Product is returned to Avidyne or to an Avidyne authorized service facility;
- (c) The Product has not been altered in any manner other than as previously authorized by Avidyne in writing; and
- (d) Repairs to the Product have not been made by anyone other than Avidyne or an Avidyne authorized service facility.

This warranty does not apply to any Product which is not installed, maintained and operated in accordance with Avidyne's written instructions or which is otherwise misused, including, without limitation, to any Product which is damaged due to improper installation, maintenance or operation, tampering, alteration of serial numbers or other manufacturers data, lightning or other electrical source, or otherwise.

If warranty protection is applicable to the Product, Avidyne will use reasonable efforts to repair or replace Product within ten (10) business days of its receipt of the Product.

Any Product that has been repaired by Avidyne or replaced by Avidyne under this warranty will be subject to remainder of the original warranty term applicable to the repaired or replaced Product or will be warranted under the warranty terms above for ninety days from the date of repair or replacement, whichever period is longer.

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