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REVISION A

TRIO PRO PILOT AUTOPILOT AVIONICS ADDENDUM

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REVISIONS

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-	21 November 2017	Paul Odum	Jeff ley
A	13 December 2017	Paul Odum	Chuck Busch
ER No: 1006			

Section:	Description
All 10.0	Initial Release Added Section 10.0 – Initial Setup

TABLE OF CONTENTS

LIST OF TABLES

NO TABLE OF FIGURES ENTRIES FOUND.

LIST OF FIGURES

REFERENCES

The following documents form a part of this report. Unless a specific revision of one of these documents is specified, the revision in effect at the time of original issue of this document shall apply.

Trio Avionics Document Number 170102

Trio Avionics Document Number 171113

Trio Avionics Document Number41300007 Rev. 7

Other Data:

ER1006–STC GROUP LLC Program Engineering Record.

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

Autopilot	Trio Pro Pilot Autopilot
Clip	Part Number 1006237
C.G.	Center of Gravity
ER	Engineering Record
FAA	Federal Aviation Administration
ICA	Instructions for Continued Airworthiness
LH	Left Hand
OEM	Original Equipment Manufacturer
OTBD	Outboard
PCS	Pilot Controller Steering (Red) Button
Recover	Recover Button
RH	Right Hand
Servo	Trio Pro Pilot Gold Standard Servo
STC	Supplemental Type Certificate
WS	Wing Station

1.0 TRIO PRO PILOT AUTOPILOT AVIONICS ADDENDUM

This document is provided to answer some commonly asked questions the we receive from the field. The Document will be updated frequently and should be considered as a "living" document. Check The STC Group LLC website frequently for revisions.

www.thestcgroup.net

2.0 GENERAL

Thank you for your purchase of the TRIO Auto Pilot for your beloved aircraft.

This document has been written to answer some of the commonly asked questions we receive from owners, mechanics, and avionics professionals.

This document is intended as an addendum to the installation instructions for your aircraft type. The Avionics Addendum will ensure your installation is easy, ensures safety, and is professionally completed. Before you begin **Read All Instructions**.

Call Jeff Ley at The STC Group LLC at (661) 524-6157 call/text/phone/VM if you have questions. You may also call chuck Busch at Trio Avionics, (619) 448-4619 if you have specific Trio Pro Pilot avionics integration questions.

Drawings are denoted in the References section above and throughout these installation instructions.

Illustrated Parts Catalogs on The STC Group LLC website at www.thestcgroup.net contain detailed parts drawings and Part Number listings.

3.0 SERVO GAIN ADJUSTMENT – TRIO DOCUMENT NUMBER 170102

3.1 H NAV GAIN SETTING

Note:

If at any time during this procedure you get "lost" you can recycle power. If you change a setting and want to restore the defaults, you can accomplish a **RESTORE DEFAULTS** procedure as detailed below.

1. To ensure all autopilot (AP) gains and settings are initially at the factory defaults a **RESTORE DEFAULTS** will be the first item accomplished.
2. If you are certain that the defaults are correct you can skip this step.
3. If the RESTORE DEFAULTS is performed, you will need to reset the MINIMUM and **MAXIMUM** airspeed thresholds as also detailed below after the gain setting procedures.

Practice this procedure on the ground before flight so you won't get confused in the air.

3.2 RESTORE DEFAULTS PROCEDURE

Several of the variables used to optimize Pro Pilot are captured to EEPROM (nonvolatile memory) during initial setup. Further, tracking gains that are set for differing flight conditions are also maintained in system EEPROM.

On rare occasion these values may become corrupt if a power transient occurs during an EEPROM write procedure, or the pilot may inadvertently change settings that cause poor autopilot performance. The restore default procedure allows a quick method to restore all these values back to their factory settings.

It is good practice to record all the variable settings you change from the factory settings, so these may be replaced after the restore defaults procedure.

The **RESTORE DEFAULTS** procedure allows either one or both **HNAV** or **VNAV** parameters to be reset.

To perform the **RESTORE DEFAULTS** procedure, perform the following steps:

1. Enter the **MAINTENANCE SETTINGS** menus by pressing the **ENCODER** and **VMODE** buttons simultaneously, then select the **RESTORE DEFAULTS** display.

2. 01Press and release the **H MODE** button. The arrow will be placed at the "**ALL**" setting field. Press the encoder knob to activate the restore. All lower display parameters will flash when the function is complete.

3. If it is desired to reset only the **H NAV** defaults, Press and release the **H MODE** button to position the cursor adjacent to **HNAV**. Press the **ENCODER** knob to activate. The **HNAV** display will flash when the function is complete.
4. If it is desired to reset only the **VNAV** defaults, Press and release the **H MODE** button again to position the cursor adjacent to **VNAV**. Press the encoder to activate. The **VNAV** display will flash when the function is complete.
5. Press the **H MODE** button until the right arrow is absent from the display.
6. Cycle power on the autopilot to exit the maintenance screens.

The **RESTORE DEFAULTS** procedure is complete and the encoder can now be used to select another menu screen.

3.3 GROUND CHECKS

1. Check servo actuation, slip clutch operation and servo disconnect / release

3.4 INITIAL FLIGHT SETTINGS

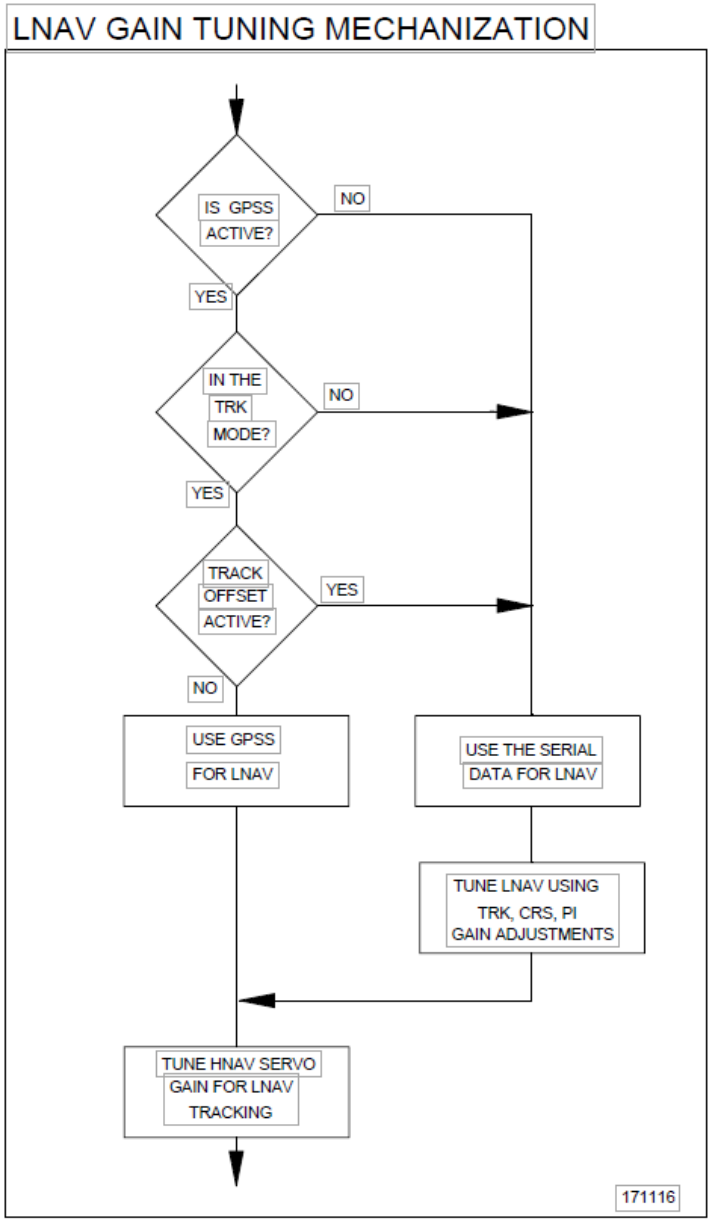
1. Be sure to turn the AP on after engine start to stabilize the internal gyro before flight. Leave the autopilot ON unless otherwise noted

Note:

It is important to adjust the CRS gain prior to adjusting the TRK gain. When the CRS gain has be satisfactorily adjusted, do not change it when adjusting the TRK gain.

2. Place the AP in the **CRS** mode and engage the servo. Let the aircraft track stabilize.
3. Enter the **MAINTENANCE SETTINGS** menus by pressing the **ENCODER** and **VMODE** buttons simultaneously, then select the **SET H NAV GAINS** screen.
4. If roll is oscillating adjust the **CRS** setting **UP** or **DOWN** to minimize.

5. If satisfactory tracking is obtained, switch the AP to the **TRK** mode and optimize the tracking using the **TRK** setting (see Section 3.5).
6. If satisfactory performance cannot be obtained return the settings to the factory defaults (TRK = 3, CRS = 3, PI = 9) and proceed to the **HNAV SERVO GAIN ADJUSTMENT** below.



3.5 H NAV SERVO GAIN ADJUSTMENT

1. Select the **CRS mode** with the **SERVO ON** and stabilize on a ground track. There may be some oscillation at this point and it should be ignored.
2. Select the **MAINTENANCE SCREENS** and sequence to the **SET SERVO GAINS** menu.
3. Press the **H MODE** button until an arrow is in front of the **HNAV** gain.
4. Use the **ENCODER** to decrease or increase the gain in steps of 4 units until the oscillation stops or is minimized.
   a. You can fine tune the gain by increasing or decreasing the gain setting by one step after bracketing the gain using 4 units.
   b. A setting that is too low will cause the AP to stabilize on a course a degree or more on one side of the selected course, or may cause a very long "hunting" from one side of the selected course to the other of more than two degrees.
   c. A setting that is too high will cause an oscillation of a shorter period across the selected course of two degrees or more.
   d. The setting is optimized when the selected course is maintained within +/- 1 degree in a very slow oscillatory fashion.

Note:

The period of this oscillation should be greater than one (1) minute.

   e. Increase or decrease the gain to suit your personal preference.
   f. The autopilot may track perfectly for several minutes, then wander - 1 degree, back to zero for a minute, etc. Once this is achieved you can repeat the **CRS** gain procedure to further refine the gains.
   g. Exit the MAINTENANCE SCREENS menu by pressing and holding the **ENCODER** until the normal navigation screens appear.

Note:

The TRK gain is not used when GPSS is providing lateral navigation. If GPSS is being used for lateral navigation you will need to enter a track offset when using the TRK mode on the autopilot. This disables the GPSS input and forces the autopilot to use the serial data stream.

5. Select the **TRK** mode.
   a. ***If GPSS is active*** enter a left or right 0.10 track offset (press and turn the ENCODER in the TRK mode).
   b. Repeat steps 2, 3, and 4 until the arrow is pointing at the **TRK** gain.
   c. Minimize the track error (XTK) by adjusting the TRK gain.
   d. A setting that is too high will cause a slow return to the center line or stabilization at an offset.
   e. A setting that is too low will cause oscillation back and forth across the DTK line in excess of 0.02 miles.

6. The **PI** (Pull In) is usually OK.
   a. If the intercept after a switch from the INT mode to the TRK mode is too aggressive, lower this setting.
   b. If the intercept is “lazy” raise this setting.

4.0 V NAV GAIN SETTING

This procedure is a method that should be used to set the Altitude Hold (AH) Vertical Speed (VS) and Airspeed (AS) gains.

Note:

It is recommended that the auto trim be disabled during these procedures. This can be accomplished by minimizing the trim speed setting in the **MAINTENANCE SETTING** screens

4.1 ALTITUDE HOLD GAIN SETTING

1. Perform all initial ground checks prior to this test.
2. Place the aircraft in a stable pitch trim neutral cruise configuration.
3. Engage the **Altitude Hold**, AH, mode by pressing the **VNAV** button.
4. If there is any oscillation, enter the **MAINTENANCE SETTINGS** menus as described in Section 3.4 above and select the **VNAV GAIN SETS** display page.
5. Press the **HMODE** button to place the arrow next to the **AH** gain setting.
6. Increase the gain setting five points and evaluate the tracking performance.
7. If the performance is degraded, lower the gain setting 10 points.
8. If the performance improves or there is no noticeable change, increase or decrease the setting an additional five points as required.
9. Continue this process until an optimum value is reached.

Note:

If satisfactory performance cannot be obtained return the settings to the **Factory Defaults**, as described in Section 3.2 above, and proceed to Section 4.2, **VNAV SERVO GAIN Adjustment** below.

10. Further gain refinement can be achieved as follows:
    a. Place the aircraft in a pitch neutral configuration and engage the Altitude Hold, AH, mode.
    b. Engage the left or right AUTO 180 MODE (press and hold either the VNAV or HNAV button for 3 seconds.
    c. While entering the 180-degree turn, observe altitude loss.
    d. If the altitude loss is greater than about 20 to 40 feet, raise the Altitude Hold, AH, gain by 5 points and repeat this process until the altitude loss is within 20 to 40 feet.
    e. If the altitude loss was less than 30 to 40 feet, the gain may be too high.
    f. If the gain is too high you may want to decrease the gain setting and note that the recommended altitude loss is observed during the turn.

4.2 V NAV SERVO GAIN ADJUSTMENT

1. Select the **CRS** mode with the **SERVO ON** and stabilize on a specific ground track.
2. Select the **MAINTENANCE SCREENS** and sequence to the **SET SERVO GAINS** menu.
3. Press the **H MODE** button until an arrow is in front of the **VNAV** gain setting.
4. Use the **ENCODER** to decrease or increase the gain in steps of 4 units until the oscillation stops or is minimized.
5. You can fine tune the gain by increasing or decreasing by one step after bracketing the gain using 4 units.
   a. A setting that is too will cause the autopilot to fail to hold the selected altitude.
   b. The autopilot may oscillate more than 20 feet above or below the selected altitude.
   c. A setting that is too high will cause an oscillation of a shorter period or result in a divergent altitude situation.
   d. The setting is optimized when the selected altitude is maintained within 20 to 30 feet in smooth air without noticeable oscillation wander - 1 degree, back to zero for a minute, etc.
   e. Once the settings are close you can go back to the Altitude Hold, AH, gain setting in Section 4.1.5 above to refine the gains.
6. Exit the **MAINTENANCE SCREENS** menu by pressing and holding the **ENCODER** until the normal navigation screens appear.

4.3 VERTICAL SPEED GAIN SETTING

1. Perform all initial ground checks and verify that the servo direction settings are correct.
2. Place the aircraft in a stable pitch trim neural cruise configuration.
3. Select the VS mode.
4. Rotate the ENCODER to set a 500 FPM climb rate.
5. **Select VNAV** on the autopilot controller and activate the climb by pressing the **ENCODER** knob.
6. The VS LED should be on steady orange

Note:

The following steps assume the aircraft is properly trimmed for the climb rate selected. The aircraft should be manually trimmed for the selected climb rate. Failure to maintain a relatively good trim may cause the autopilot control system to exhibit a slight “bucking” motion during the climb.

7. The aircraft should settle into a 500FPM rate of climb within about 10 seconds.
8. If you observe significant deviation in smooth air from the selected climb rate perform the remaining steps.

9. If there is excess oscillation or the vertical rate is not achieving the selected value, enter the MAINTENANCE SETTINGS menus and select the VNAV GAIN SETS display page
10. Press the **HMODE** button to select the **VS** gain setting.
11. Adjust the gain setting five points up and evaluate the tracking performance. If the performance is degraded, readjust the gain setting 10 points lower. If the performance improves or there is no noticeable change, increase / decrease the setting an additional five points. Continue this process until an optimum value is reached.

4.4 AIRSPEED GAIN SETTING

Note:

The aircraft vertical when entering the Airspeed, AS, mode must be greater than **+/- 200FPM**. If the vertical rate is less than this value, the system will revert to the Altitude Hold, AH, mode on release of the servo disconnect switch.

1. Perform all initial ground checks and verify servo direction settings prior to this test.
2. Place the aircraft in a stable pitch neural cruise configuration
3. Engage the Altitude Hold, AH, mode
4. Press and hold the remote servo disconnect (**PCS**) switch.
5. The **VNAV LED** will now flash.
6. Place the aircraft in either a climb or descent and release PCS switch at the desired airspeed

Note:

The following steps assume the aircraft is properly trimmed for the selected airspeed. The aircraft should be manually trimmed for airspeed.

7. The aircraft should track the desired airspeed within 2 or 3 knots in smooth air. If there is significant deviation from the selected airspeed, perform the remaining steps.
8. Enter the **MAINTENANCE SETTINGS** menus and select the **VNAV GAIN SETS** display page.
9. Press the **HMODE** button to select the **AS** gain setting.
10. Increase the gain setting five points and evaluate the tracking performance.
11. If the performance is degraded, decrease the gain setting **10 points**.
12. If performance improves or there is no noticeable change, increase or decrease the setting an additional **five points**.
13. Continue this process until an optimum value is reached.
14. Once the airspeed gain is bracketed you can increment or decrement one unit at a time to fine tune the gains.

5.0 SERVO ROTATION DETERMINATION

Note:

If this is a prototype installation. The final servo direction, CW (clockwise), or CCW (counter clockwise) is determined as part of the installation engineering process.

The servos as shipped are set for CW operation. In the event the servos must be configured for CCW rotation an internal jumper provided on the servo Printed Circuit Board (PCB) needs to be fully installed. A spare label provided on the servo cover **must** be installed over the existing label.

It easier to insert the jumper on the PCB before the servo is installed. You must read and understand paragraphs 1 and 2 before installing the servo. Based on design you can determine if the servo needs to be changed to a CCW rotation prior to actual installation.

If you need assistance please call Chuck Busch at Trio Avionics, 619 448 4619 or Jeff Ley at The STC Group, 818 266 4369.

Clockwise operation is specified if the servo rotation is CW as viewed when facing the servo hub/crankarm assembly.

To determine the servo rotation direction for this airplane, perform the following procedure:

5.1 ROLL SERVO

1. If right aileron is input manually on the control yoke (or stick) and the servo rotates in a CW direction, then servo CW drive is required.
2. In this case the PCB jumper is not installed (and not required) and the servo PN is 30000000.
3. This is the configuration (p/n 30000000) that the servo is shipped. The spare label provided on the cover should be discarded.
4. If right aileron is input and the servo rotates in a CCW direction, then servo CCW drive is required.
5. In this case the jumper must be installed on the PCB and the servo PN is 31000000.
6. The spare label provided must be placed on the servo cover over the existing label.
7. The procedure for installing the jumper is provided in paragraph 5.3 below.

5.2 PITCH SERVO

1. If an elevator command is manually input for pitch UP (to make the airplane climb) and the servo rotates in a CW direction a servo CW drive is required.
2. The PCB jumper is not required. The servo PN is 30000000.
3. CW is the configuration that the servo is shipped.
4. The spare label provided on the cover should be discarded
5. If an elevator command is manually input for pitch UP (to make the airplane climb) and the servo rotates in a CCW direction a servo CCW drive is required.
6. The jumper will need to be installed.
7. The servo PN is 31000000.
8. The spare label provided **must** be placed on the servo cover over the existing label.
9. The procedure for installing the jumper is provided in paragraph 5.3 below.

5.3 INSTALLING THE SERVO REVERSAL JUMPER

Note:

Exercise caution when performing the following procedure.

1. Carefully remove the servo cover.
2. Locate the jumper on the PCB directly behind the DB-9 connector on the PCB.
3. The jumper is located on one of the jumper pins, not across both pins.
4. Using a small pair of needle nose pliers or similar tool remove the jumper from the pin on which it is installed by pulling it straight up off the PCB.
5. Relocate the jumper over both the pins on the PCB and install it by pushing it down over both jumper pins.
6. Reinstall the servo cover.
7. Place the PN 31000000 label over the existing 30000000label.

6.0 WIRING HARNESS INSTALLATION

NOTE

Prior to plugging harness DB9 or DB37 into servos or autopilot control perform a full power, ground, and data test on the harness by ringing the wires from plug to plug using PRO PILOT WIRING HARNESS DWG 41300007. Refer to Appendix A,

The Trio Avionics CD, included with the autopilot kit, and the Trio website have links to DWG 41300007. Call Trio Avionics at 1 619-448-4619 if you have additional questions or need assistance.

6.1 ROLL SERVO HARNESS INSTALLATION

1. Remove interior trim panels on cockpit passenger side
2. Remove existing Cessna factory autopilot wiring and set aside for weighing if so equipped.
3. Route Trio Harness Roll servo wiring along same path and using the same clamps as factory autopilot wiring.
4. Take care to protect harness pins at end of harness.
5. Terminate supplied DB9 connector per Trio diagram.
6. Attach DB 9 connector to Trio Roll Servo.
7. Secure harness cable end at the servo end with supplied clamp or equivalent.

6.2 PITCH SERVO HARNESS INSTALLATION

1. Remove co-pilot seat
2. Route Trio Harness Pitch servo wiring under cockpit floor taking care to secure away from other aircraft wiring and moving components.
3. Route harness to Trio Pitch Servo location.
4. Take care to protect harness pins at end of harness.
5. Terminate supplied DB9 connector per Trio diagram.
6. Attach DB 9 connector to Trio Roll Servo.
7. Secure harness cable end at the servo end with supplied clamp or equivalent.

6.3 TRIO AUTOPILOT CONTROLLER

1. The Trio autopilot controller is ordered in Panel Mount or Instrument Mount versions.
2. Install the controller using best practices in either panel or hole locations. Refer to AC 43-13 for this step and all following steps.
3. Install the supplied 5 ampere circuit breakers within easy reach of the pilot and label.
4. If a Panel Mount unit is ordered install the supplied power switch and label.
5. Terminate supplied DB37 connector per the Trio drawing 41300007.

6. Terminate wiring with aircraft GPS or handheld.
7. If ARINC 429 is available from GPS terminate ARINC 429 connections.
8. Install the supplied PCS button on the left side of the pilots control yoke and label PCS.
9. Install Recover button in an available convenient location within easy reach of the pilot and label AP Recover.
10. Ensure that the analog alarm out is connected to the un-switched audio input on the Audio Panel.

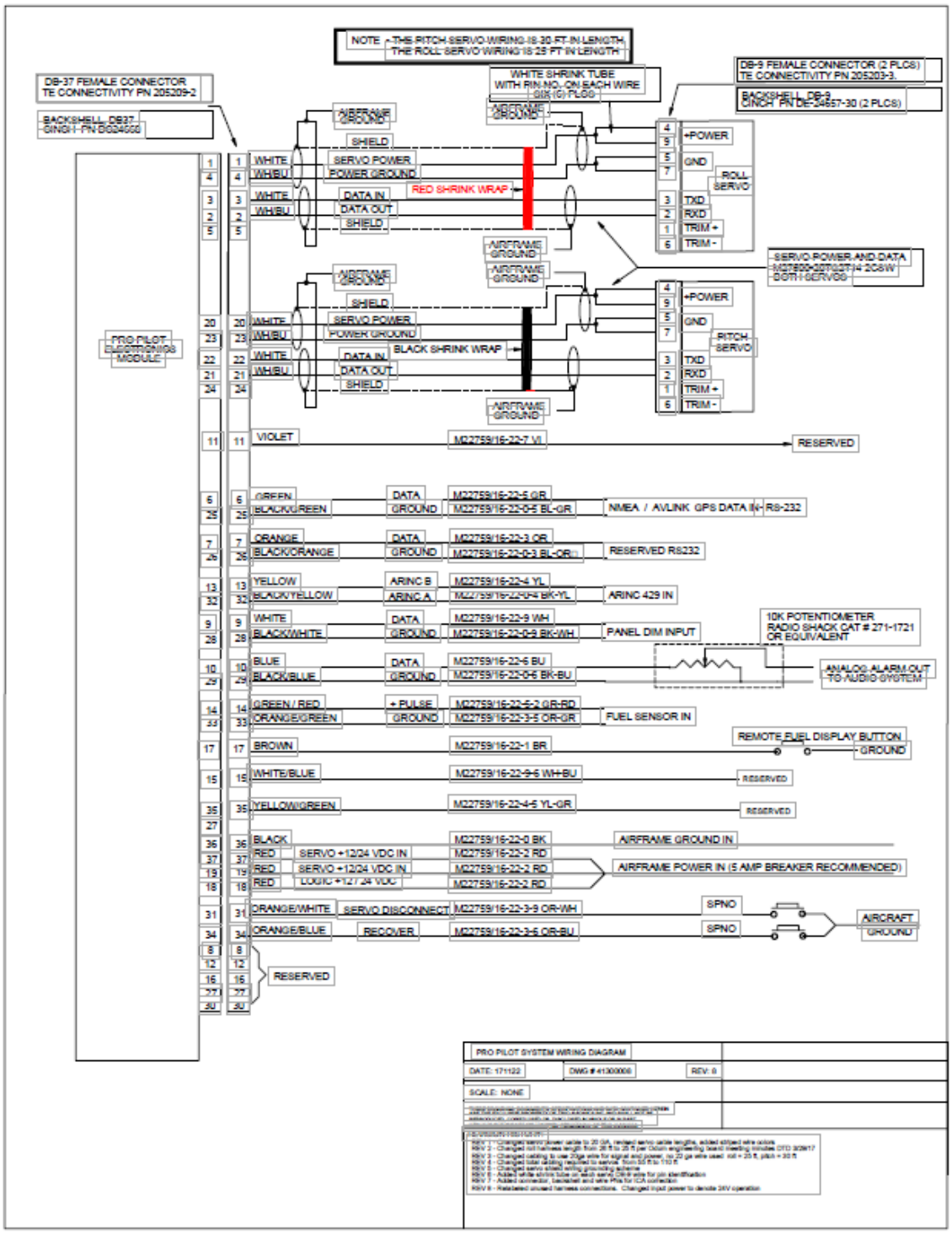
Note:

If your audio panel does not have un-switched audio input, attach the audio leads to the phone input of your intercom.

6.4 TRIO AUTOPILOT DATA CONNECTIONS

1. For the RS-232 connection set the output at the GPS unit to "Aviation w/ no altitude" or NMEA 0183 OUT.
2. If your aircraft is equipped with a GPS that has ARINC 429, set unit to output "GAMA" Low Speed.
3. Prior to making the connections to the GPS unit in the aircraft determine what else is connected. It may be necessary to parallel the connections. If parallel connections are required, verify that the lines you are connecting to use, or can use, the same data format that is required. Both the RS-232 and the ARINC 429 can be paralleled with like connections.

7.0 APPENDIX A - PRO PILOT SYSTEM WIRING DIAGRAM



8.0 QUESTIONS AND ANSWERS FROM THE FIELD

ARINC 429 and RS-232

We use both signals for the various modes in the autopilot. The RS-232 AVIATION format needs to be present at pin 6 of the autopilot.

The autopilot lateral gains (TRK, CRS, PI and HNAV SERVO GAIN) should always be accomplished before using the GPSS as the lateral navigation source. All these baseline gain settings use the serial data, no the GPSS input. In our field experience if the tracking is SAT after tuning the TRK, CRS, PI and HNAV SERVO GAIN using the serial link, the GPSS will work without any adjustment of the servo gain. In other words, the serial tuning is a baseline for using GPSS.

The TRK gain is only effective when using the serial link as the lateral navigation source. However, if the GPSS is active, GPSS automatically becomes the selected lateral navigation source in the TRK mode. GPSS provides a simple bank left - bank right control signal to the autopilot. There is no way to manipulate this input to do CRS, or INT functions so these two modes only use the serial inputs data. The TRK mode GPSS tracking tuning is only a function of the HNAV servo gain, nothing else. In order to force the serial data as the lateral tracking source in the TRK mode you can use the track offset function. Whenever there is a track offset lateral navigation is forced to the serial data. In this configuration you can adjust the TRK gain. The attached graphic helps explain the implementation

CRS Mode

Q1 We didn't saw any interface to the Directional Gyro for the Heading bug. I guest this is built-in in the autopilot computer/control head. Please confirm.

A1 The CRS mode on the autopilot allows flying vectors using GPS as the reference.

Q2 Previous autopilot was connected to the Turn Coordinator (only). Is the Trio autopilot require an external Rate and/or attitude information? ..or is the signal also built-in in the autopilot computer/control head? Please confirm. Thanks,

A2 All necessary equipment except the GPS is contained within the Pro Pilot system. No connections to any other external equipment is required.

Trim UP / DN LED's

The auto trim doesn't work quite the way you describe. The control head generates the data that is sent to the servo to generate the bi-polar trim motor drive signals.

In theory you could use a set of LEDs driven by pins 1 and 6 of the pitch servo to give you a trim indication. These pulses are of a variable duration (10ms - 990ms / sec) depending on the settings used in the trim drive setups. Since you would be driving LEDs rather than a trim motor you could set the trim pulse width to a maximum setting, so the LED would be readable.

These bi-polar signals work as follows:

NO TRIM REQD - Both pins 1/6 at ground potential

TRIM UP Pin 1 at ground, pin 6 at airframe power*

TRIM DN Pin 6 at ground, pin 1 at airframe power*

* these can be reversed in the trim drive setups.

Depending on the airframe voltage and the LED current drive requirements you would have to select a current limiting resistor in series with the LED to control the LED current

A basic description other circuit would be:

Pin 1(6) --------->current limiting resistor---->LED anode-------LED cathode---------->ground

We have never used the outputs like this so I cannot say with certainty they would satisfy your requirements.

Automatic Trim

The trio pitch servo generates a bi-polar DC trim motor drive signal on pins 1 and 6 of the DB-9 connector. The auto trim capability is in place when the system is sold. The problem with implementation is regulatory, not technical.

The STC group has had discussions with the FAA regarding implementing auto trim and the FAA indicated to do this would require opening up the existing STC to add this feature. This process would likely result in a complete re-evaluation of the current STC. This would be a very timely and costly process. I believe The STC Group can confirm that are working with the FAA to come up with a plan to do the auto trim implementation without opening the existing STC.

There is some additional information on the auto trim implementation available on the Trio Website Experimental Manual V 3.8. Adding this feature to a certified airframe is not allowable under the current STC.

Garmin GNC 300XL

The GNC 300 will in fact drive the lateral navigation aspects of the autopilot. Works fine for that function. The GNC 300 being a pre-WAAS design will not generate the data we used for the IFR GPS guidance function. A receiver capable of providing the data required for full autopilot GPS approach capability would be the Garmin 4XXW, 5XXW, GTN6XX, GTN7XX, or similar Avidyne products.

Stratus

The WAAS GPS receiver typically used to qualify the Stratus probably is not sufficient for full functionality of the autopilot. The autopilot approach capability uses a certified WAAS enabled panel mount that can generate the digital guidance data (ARINC 429 GAMA 117G) required for GPS approaches.

I do not have the Stratus specifications or installation documentation, so I cannot say for sure, but I'm about 99.9% certain it will not drive the autopilot.

9.0 TRIO PRO PILOT GAIN SETTINGS

9.1 CESSNA AIRCRAFT CORPORATION

9.1.1 CESSNA 172

9.1.1 Cessna 182

9.1.1.1 1975 182P W/IO-550D CONVERSIÓN

HNAV 16

VNAV 16

9.1.1.2 1973 182P

HNAV 15

VNAV 24

9.1.3 Cessna 177

HNAV 16

VNAV 16

9.2 PIPER

9.2. PA28-181 ARCHER II

HNAV 30

VNAV 18

10.0 AVIONICS GROUND TESTING - INSTRUCTIONS FOR GROUND TESTING OF THE TRIO AUTOPILOT SERVO INSTALLATION

Perform the following testing after the autopilot system has been installed to verify correct servo operation and control authority.

1. Turn OFF the GPS attached to the autopilot.
2. Apply power to the autopilot system
3. When ELEVATION set is displayed, set the current field elevation and then press the ENCODER knob
4. Simultaneously press the ENCODER knob and the V MODE buttons
5. When MAINTENANCE SCREENS appear release the ENCODER and VMODE buttons.

10.1 VNAV Servo Testing

1. Using the ENCODER sequence to the VNAV SERVO SETS screen either by pressing the ENCODER or rotating the ENCODER clockwise.
2. Once on the VNAV SERVO SET screen press the lower left HMODE button.
3. An arrow should appear on the lower right display field before NM (or RV).
4. Move the elevator control to place the number field in the display to approximately 00.0.
5. Turn on the VNAV servo by pressing the upper right VNAV button.
6. The angular display should read 0.00 +/- 1.0 degrees.

NOTE

The elevator loads on the ground may cause the servo to slip when the servo is turned ON. In this case you will need to counterbalance the elevator to unload the imbalance. You may also manually place the elevator control at approximately 0.00 degrees and observe that the pitch servo motor is not running (servo clutch is not slipping).

7. Rotate the ENCODER clockwise and observe that the elevator is driven in a direction that puts the aircraft in a climb (yoke drives rearward).
8. This verifies that the servo direction is correct.
9. Rotate the ENCODER counterclockwise and observe that the elevator is driven in a direction that puts the aircraft in a dive (yoke dries forward).
10. This verifies that the servo direction is correct.
11. Press the ENCODER button. This drives the elevator control back to a zero-servo angle.

NOTE

The following steps verify that the servo slip clutch is functioning correctly and that the servo drives the control system adequately.

12. Manually move the controls forward to the control system mechanical stop.
13. The servo will run with the clutch slipping when overridden.
14. Release the controls.
15. Verify the controls return to the zero position
16. Manually move the controls rearward to the control system mechanical stop.
17. The servo will run with the clutch slipping when overridden.
18. Release the controls.
19. Verify the controls return to the zero position.

20. Turn the VNAV servo OFF by pressing the VNAV button.
21. Press the HMODE button to remove the arrow from the display screen.

10.2 HNAV Servo Testing

1. Using the ENCODER sequence to the LNAV SERVO SETS screen either by pressing the ENCODER or rotating the ENCODER clockwise.
2. Once on the LNAV SERVO SET screen press the lower left HMODE button.
3. An arrow should appear on the lower right display field before **NM** (or **RV**).
4. Move the roll control to place the number field in the display to approximately 00.0
5. Verify that the ailerons are in their neutral position.
6. **If not, perform the following steps. Otherwise proceed to step 27**.
7. Move the roll control to place the ailerons in their exact neutral (**in trail**) position.
8. Observe that the **angular display readout is +/- 5.00 degrees**.
9. ***If the reading in step 26 is more than five degrees***, the roll linkage should be shortened or lengthened to obtain less than 5 degrees.
10. This can usually be accomplished by adjusting the rod end bearings on the roll servo control linkage.
11. Repeat steps 20 through 26 until this reading is as specified.
12. Turn on the HNAV servo by pressing the upper right HNAV button.
13. The angular display should read 0.00 +/- 1.0 degrees.
14. Rotate the ENCODER clockwise and observe that the controls are driven in a direction that puts the aircraft in a right turn.
15. This verifies that the servo direction is correct.
16. Rotate the ENCODER counterclockwise and observe that the controls are driven in a direction that puts the aircraft in a left turn.
17. This verifies that the servo direction is correct.
18. Press the ENCODER button.
19. This drives the roll controls back to a zero-servo angle.

NOTE

The following steps verify that the servo slip clutch is functioning correctly and that the servo drives the control system adequately.

20. Manually move the controls full right to the control system mechanical stop.
21. The servo will run with the clutch slipping when overridden.
22. Release the controls.
23. Verify the controls return to the zero position.
24. Manually move the controls full left to the control system mechanical stop.
25. The servo will run with the clutch slipping when overridden.
26. Release the controls.
27. Verify the controls return to the zero position.
28. Turn the HNAV servo OFF by pressing the HNAV button.
29. Press the HMODE button to remove the arrow from the display screen.