



Approach

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MEGGITT / S-TEC

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SA-200 Altitude Pre-Selector

The SA-200 Altitude Pre-Selector is a product that is simple in operation, extremely accurate, and seamlessly interfaces with the Fifty Five X autopilot system. It provides the pilot with the capability to pre-select an altitude for automatic autopilot capture as well as providing audible voice and tone alerting annunciations.

Improvements over ST-360

The SA-200 has many improvements over the older S-TEC model ST-360 in all areas. Aesthetically, the box looks a lot sleeker than the older model. The size of the unit was reduced in depth by 1½ inches in length which allows for easier installation at the top of the panel where space is constrained. Lighting intensity is programmable in the setup mode and variable with the instrument dimmer.

System Overview

The SA-200 is interfaced to a System Fifty Five X autopilot via an electronic data link. The buss reliably provides both pilot selected altitude and barometric corrected altitude. Barometric altitude is calculated in the SA-200 from data provided by one of two possible sources depending on installation. The first source is from an encoding altimeter with digital barometric output. An alternate installation is using barometric data provided from an EFIS (Electronic Flight Instrument System) such as the Meggitt MAGIC system. Only one of these installations is necessary, but if both installations are used, the ADAHRS that is part of the EFIS System will provide primary data while the encoding altimeter will operate as a backup.

On a technical side, the circuit board uses state-of-the-art digital technology in order to provide a highly reliable product. Lighting is accomplished by LEDs that are extremely reliable and energy efficient. The unit auto detects bus voltage and will operate on either 14 or 28 volts. Additionally, the SA-200 was laboratory tested and found functional to over 60 g's, 40 times the FAA certification minimum requirement.

Our customers will be very impressed with the digital voice capability of this product. Professional voice actors were used to provide clear verbal annunciations and tones were digitally created for purity and comfort. These are just a few of the improvements of this product over the last model.

Installation

The SA-200 installation is simple and straight forward. If there is an ST-360 Altitude Selector/Alerter already installed, then the SA-200 can be located in the same panel slot with no mechanical changes and using the same plug. A jumper wire located on the System Fifty Five X wire harness must be opened, and encoder and barometric wires routed. If it is a new installation, wiring will



SA-200 Altitude Pre-Selector



ST-360 Altitude Selector / Alerter

Continued on Page 2

From the President's Desk



S-TEC is eager to begin the New Year. We appreciate each and every one of you and look forward to working with you this year. It is our hope that 2004 will be filled with growth and opportunity for all of us.

We'd like to take this opportunity to thank the "Top Ten Domestic Dealers" and the "Top International Dealer" for all of their hard work and support of the S-TEC autopilot.

If you are one of the eleven recipients of the "Top Ten Dealer" award, a plaque will be sent to you as a token of our appreciation for a great job done to hang proudly in your shop.

Our "2004 Autopilot Selection Guide and Price List" is available, on the web and in hard copy. Should you require additional copies, please do not hesitate to call the editor.

The second series of the training Approach newsletters is presented to you with the intent of bringing a viable training tool to your shop. Should you require additional copies, please do not hesitate to contact the editor of the Approach newsletter.

Along with the training articles, we present to you the S-TEC SA-200 Altitude Pre-Selector. This is a wonderful piece of technology to accompany an S-TEC FiftyFive X autopilot. Read it and find out.

S-TEC autopilot test kits, if you don't have one, you are missing out. You are not doing your customers justice by not being able to evaluate the autopilot to its limits. Order yours today, so your shop will be able to do the best installation available.

SA-200

Continued From Page 1

be required from the SA-200 to the autopilot, encoder and barometric lines, as well as mechanically mounting the unit to the panel. For non-EFIS installations, the altimeter will have to be replaced with an encoding altimeter with barometric output.

When power is first applied to the SA-200, it validates the encoder and barometric lines. If there is a wiring problem, "ERROR" will be displayed. At this point, the installer can reset the power and enter the "Adjust" mode where it will annunciate the problem and provide a quick method to debug any installation errors. This is a unique feature for installers of the SA-200.

Once everything appears to be functional, the last thing to do is calibration of the barometric information if an encoding altimeter is used. The calibration is performed in the "Adjust" mode and the POH (Pilot Operating Handbook) provides details to accomplish this. Additionally, while in this mode, the user may adjust voice and tone volumes independently, as well as panel and bezel lighting.

Ease of Use

Pilots will enjoy using the SA-200 for its simple and intuitive operation. A two tiered knob on the right of the bezel allows selection of thousands and hundreds of feet. Rotation of either knob one click will present the user with the current altitude being displayed on the altimeter rounded to the hundredth. Selection of the required altitude may be entered at this time. Pressing the knob in will deactivate the altitude selected.

Upon final selection of the required altitude the SA-200 waits 3 seconds for the data to become valid and will then be provided to the Fifty Five X for use. At this point, the Fifty Five X may be placed in "Dual Mode" by pressing both VS and ALT buttons. The pilot may then select the desired vertical speed in which he would like to capture the altitude. Once everything is set, the system automatically captures the selected altitude in a smooth manner. During altitude capture, the vertical speed is reduced automatically providing passenger comfort. Voice annunciations are provided at 1000ft,

200ft and capture altitudes. The pilot has the option to mute the annunciations by pressing the mute button provided on the front of the unit. If a failure in the SA-200 system occurs, muting will be overridden for immediate pilot notification. The SA-200 failure testing is only performed on it self and improper altitude reported by the encoding altimeter might be undetected which is a limitation of the GRAY code system. Any failure of the SA-200 will be annunciated as "FAIL" to the pilot and the Autopilot will drop the ALT capture and remain in VS mode. Failures of the SA-200 or the Autopilot are independent so that if one fails the other will continue to operate in a reduced functionality mode.

The SA-200 is a fine addition to the autopilot system and any user would enjoy the ease of operation. Before you sell your customer a SA-200, be sure to check the System Fifty Five X interface specifications to make sure that the hardware and software codes AC/AC appear after the serial number of the unit or on a separate code placard.

FEATURES AND FUNCTIONS	ST-360	SA-200
Available on System Fifty Five X	Yes	Yes ¹
Available on System 60-2	Yes	No
Available on System 65	Yes	No
Available on System 60 PSS	Yes	No
Digital Vertical Select for Climb or Descent	Yes	Yes
Pre-Select and Capture Altitude with Alerts	Yes (Chime)	Yes (Voice)
Alert if Aircraft Departs Selected Altitude	Yes	Yes
Monitor Outputs of Altitude Encoder	Yes	Yes ²
Automatic Vertical Speed Reduction Prior to Altitude Capture	Yes	Yes ³
Encoding Altimeter Indicator Included	No	Yes
Dimensions	1.6 x 3.42 x 6.75	1.6 x 3.42 x 5.59
Price AON ⁴	\$3,395	\$6,995

Notes:
 1. Except on some early model units or code AC/AC and later.
 2. Verify, but not continuous monitoring.
 3. Actually controlled by the System Fifty Five X.
 4. AON (Aircraft Owner Net)



Installation of S-TEC Autopilots

(A Continuing Series)

This training issue of Approach is the second in the series. We hope that these are a useful tool for you and your avionics shop staff.

We will continue to write articles of interest to specific problems, how to detect and correct them, along with articles to keep you informed on S-TEC facts.

The articles will be written to aid and assist you in your routine autopilot sales and installation business. The articles will be general to cover our entire S-TEC product line, rather than specific systems.

Below is the list of articles that will appear in the Approach newsletters over the next several months:

Installation of S-TEC Autopilots:

- A. Introduction
- B. Airframe inspection (prior to install)
 - a. Modifications installed (STC's)
 - b. Repairs
- C. **Pre-installation preparation**
 - a. **Inventory of parts**
 - b. **Autopilot interface evaluation**
(existing NAV/COMs, FD/HSI/GPS/DG)
- D. Install fundamentals
- E. List of tools
- F. Removal of old equipment
- G. Cable routing
- H. Servo installation
- I. Transducer installation
- J. Computer/Mode Selector installation

Troubleshooting & Maintenance of an S-TEC Autopilot:

- A. Introduction
 - a. ICA (Instructions for Continued Airworthiness)
- B. System basics
 - a. Electrical Systems
 - b. Mechanical Systems
- C. **Flight Line Tester Manual**
 - a. **List of test equipment**
 - b. **Use of test equipment**
- D. Problem / Symptoms evaluation
- E. Troubleshooting flow chart
- F. Airframe inspection
- G. Corrective actions
- H. System Test / Flight Test / Return to Service

Notes: *Gray Text indicates topics covered in Dec. 2003 Approach.*
Bold Text indicates topics covered in this issue of the Approach.
Normal Text *indicates topics to be covered in future issues.*

Pre-Installation Preparation *Introduction*

Pre-installation preparation is an excellent investment in saving time and trouble later. The installation of a new autopilot is more complex and involved than the average avionics installation.

When you are reviewing the installation instructions and other materials before you begin, we suggest you pay particular attention to the Wiring Diagram Notes.

Inventory of Parts

We would like to discuss the value of the installer taking a pre-installation inventory. In many facilities the receipt and unpacking of our autopilot kit is done in the Receiving Department or the Parts Department. It is not unusual for the system components to be handled by numerous persons prior to getting to the installer. Each of these "stops along the way" can be a cause for hardware or paperwork to get misplaced. While we go to extraordinary efforts to assure that we ship all the correct drawings and piece parts with the system, we also have been known to err (wish we were perfect). If you don't catch the shortage until the aircraft is in the hangar and disassembled, an unpleasant installation delay can occur while we get a new part or drawing to you.

Performing an inventory of the autopilot kit prior to the start of the installation can save time and help you keep your delivery commitments to the customer.

Each kit comes with a documentation package containing an "aircraft specific" Installation Bulletin, General Installation Bulletin, and Drawings which are necessary to complete the installation.

First, locate the aircraft specific Installation Bulletin. Check to determine that it is the correct bulletin for the autopilot system and model of aircraft targeted for the installation.

The inside front cover will contain this information at the top of the page. This is a good time to review the "Notice to the Installer" statement at the bottom of the page. Now is the time to identify any potential inconsistencies, which need to be resolved prior to proceeding.



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Installation of S-TEC Autopilots

(A Continuing Series)

Inventory of Parts

Continued From Page 3

Once it has been determined that you have the correct Installation Bulletin, proceed to reviewing the parts list. The parts list is divided into groups I, II, III, etc. Each group defines a particular portion of the autopilot system identifying the components and hardware required to complete the installation of that portion.

Check and verify that the component and hardware part numbers and quantities match what is required for the installation. If a discrepancy or shortage is discovered we can ship the parts to make the kit complete in time to have a minimal impact on schedules and delivery.

The next step after the major component and hardware inventory is complete is to insure that the proper drawings are included which define the installation. Section I of the aircraft specific Installation Bulletin gives a step by step description and refers to either specific drawing numbers or the General Installation Bulletin. It is common to have instructions contained in the General Installation Bulletin as well as on one of the drawings referenced by it, which apply to the same installation procedure.

Each step in Section I of the aircraft specific Installation Bulletin will refer to a specific drawing or to a General Installation Bulletin number. A master drawing list is provided in the aircraft specific Installation Bulletin to assist the installer. At this point verify that all of the listed drawings, as well as the General Installation Bulletin, are part of the document package you received. If there are any shortages, call S-TEC's Sales or Technical Support Department immediately so the missing or incorrect drawings can be replaced.

The time you spend on doing this inventory of the autopilot kit can prove to be a very valuable investment.

After reviewing the drawings and understanding them, go to the airplane and check to see that all of the existing avionics are compatible.

Make sure that the aircraft voltage is the same as the autopilot system, 14 or 28 volts DC.

Autopilot Interface Evaluation

(Existing NAV/Com's, FD, HSI, GPS, DG)

GPSS Compatibility ARINC 429

The S-TEC ST-901 GPSS Converter and S-TEC System Fifty Five X Flight Control Systems are only compatible with GPS receivers that have ARINC 429 outputs available with Low Speed Label 121 (Bank Angle Command) and Low Speed Label 312 (Ground Speed). Not all GPS receivers with ARINC 429 outputs have Low Speed Label 121 or Low Speed Label 312 available.

The following is a list of GPS receivers that, (to our knowledge) are compatible with the S-TEC ST-901 GPSS Converter and System Fifty Five X Flight Control Systems.

GARMIN

- 150XL
- GPS 155
- GPS 155XL
- GPS 165
- GNC 250
- GNC 250XL
- GNC 300
- GNC 350XL
- GPS 400
- GNC 420
- GNC 430
- GNC 530
- CNX 80

BENDIX/KING

- KLN90B (Must have software levels 21/10 and 22/02)

GPSS Compatibility RS232

The S-TEC ST-901 GPSS Converter is also compatible with certain GPS receivers that have RS232 outputs.

Below is a list of GPS receivers with RS232 outputs that are compatible with the S-TEC ST901 GPSS Converter. These GPS receivers must have version 3.4 software or above. These receivers are not compatible with the System Fifty Five X, which accepts only ARINC 429 without the use of an ST-901 GPSS Converter.

UPS

- GX50
- GX55
- GX60
- GX65

GPS Interface

With the growing popularity and installation of GPS navigation receivers in all types of aircraft, S-TEC's Tech Support Reps. have received an increase in questions from dealers regarding compatibility, interface, and operation.

Now is a good time to mention a few facts regarding the autopilot's relationship to the GPS and to reiterate information on the subject from previous newsletters (Technician's Bench, Sept '96, Setting The Autopilot Gain For GPS Tracking and Installation Secrets, Jan '97, Autopilot NAV Switching). Most panel mounted GPS receivers on the market provide a standard analog DC output (± 150 MV = full-scale deflection) for use with an external indicator and/or autopilot.

Most hand held units provide only serial data outputs. Although digital to analog converters exist for interconnect, the FAA approves none, to our knowledge, for use.

Prior to installation, several aspects of the Autopilot/GPS interface should be considered. Based on factory flight testing and reports from the field, we have determined that during enroute tracking and coupling using a GPS signal, autopilot tracking performance will be enhanced by utilizing a higher NAV sensitivity level than normally used with a VOR signal.

This is easily accomplished with System 40's 50's, and 55's by engaging the Approach Mode (APR). This provides an intermediate gain level (CAP SOFT) as opposed to the VOR low gain (SOFT).

System 60's and 65's however, do not allow the manual engagement of the APR mode, which is activated only by the ILS energize signal (LOC Switch) from the NAV receiver.

The roll flight guidance computer in a System 60-1, 60-2, or 65 can be instructed to remain in approach logic mode gain status without annunciating APR or enabling Glideslope functions while coupled to the GPS.

NOTE: Contact switching should occur in conjunction with the NAV/GPS select switch, either on the mechanical switch or the remote relay switch.

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Installation of S-TEC Autopilots

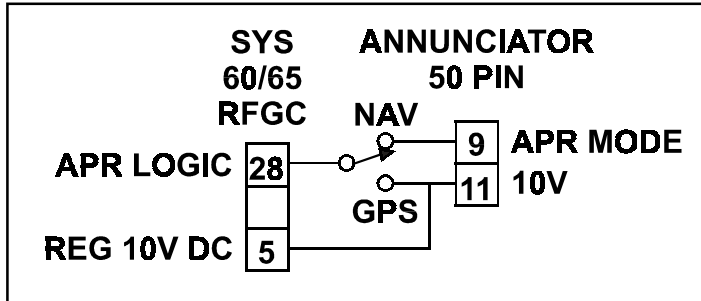
(A Continuing Series)

Autopilot Interface Evaluation

(Existing NAV/Com's, FD, HSI, GPS, DG)

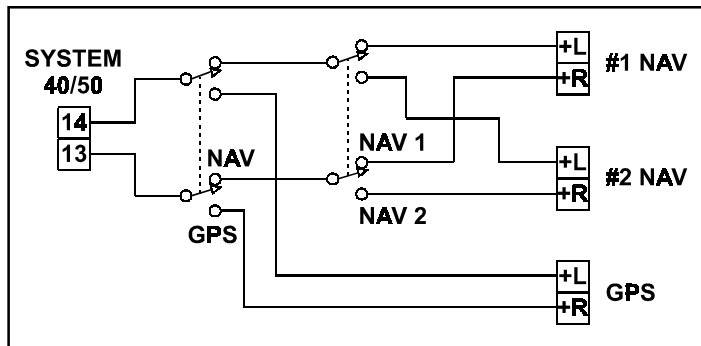
GPS Interface

Continued from Page 4



There are numerous ways to wire an autopilot to track or couple signals from multiple navigation sources. The complexity of the job is dependent on both the navigation equipment and the autopilot.

The S-TEC System 40/50 can be the easiest to wire for multiple Nav sources since the system has a radio tracker which is not dependent on course input, only on left-right deviation information. Switching from Nav 1/Nav 2/GPS, only requires two double pole toggle switches.



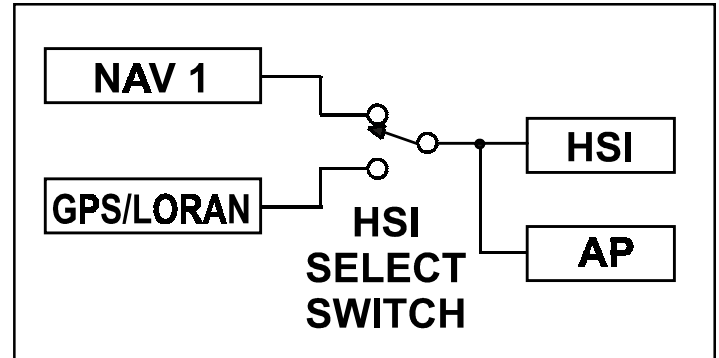
S-TEC system 55's, 60's, and 65's that are equipped with radio couplers require additional switch contacts for the additional signals being input (NAV FLAG, LOC SW).

As a function of the coupler, these systems incorporate course input in the Nav mode used for calculating intercepts and cross-wind correction angles. In an installation with a Directional Gyro, this input is supplied by the heading bug, which should be set by the pilot on the same heading as the OBS course or to the bearing shown in the GPS display. In this type of installation, the Nav switching is not affected by the course input.

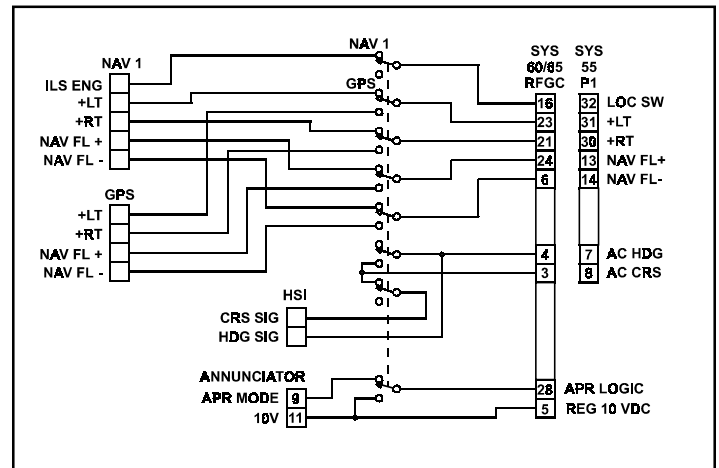
However, in an installation with a HSI, autopilot-switching between multiple Nav sources is more difficult to configure. The reason is that with an HSI, the course pointer must be placed on the desired heading regardless of where the selected left-right information is displayed.

The most common method for coupling the autopilot in a HSI installation is to display two Nav sources on the HSI using a relay switch-

ing device and a HSI select switch. Then, the pilot can choose Nav 1 or GPS for the HSI display. The autopilot is then connected directly to the HSI and will track whichever source is selected.



If it is not desirable to have the GPS deviation displayed on the HSI, the navigation signals may be switched to the autopilot only, and the HDG bug used as the course input in the GPS position. This may only be accomplished with an HSI that has equal output levels for both HDG and CRS signals. Such as an ST-180 or most AC excited heading systems. An example of this arrangement is shown in this figure:



After installation be sure to adjust Roll Centering in the Nav Soft track mode with all CRS & Radio inputs centered.

Flight Director Compatibility

The flight directors that S-TEC autopilot systems are compatible with are:

- | | |
|------------------------------------|--|
| Castleberry Instruments & Avionics | 6313-14L or 6313-28L whichever is applicable |
| Allied Signal / Bendix King | KI-256 |
| Collins | 329B-7R |

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Installation of S-TEC Autopilots

(A Continuing Series)

Autopilot Interface Evaluation

(Existing NAV/Com's, FD, HSI, GPS, DG)

DG & HSI Compatibility

Continued from Page 5

Number one on the S-TEC technical support priority list is our availability to assist S-TEC dealers with the answers to installation and maintenance questions on S-TEC autopilots. Due to high volumes of e-mail regarding which HSI's and DG's are compatible with S-TEC autopilots, we are providing you with a listing of DG's and HSI's that have been approved by S-TEC. There are other DG's and HSI's that work, but these are the ones that have interconnect documentation provided by S-TEC.

COMPATIBLE DG's

Manufacturer	System Model/Type	Output	Notes
AIM	#200-11AL,#210-13AL	AC	1
Cessna/ARC	G502A, G502B, G503A	AC	2
EDO	52D54, 52D154	AC	
EDO	52D254 (Model 4000C-5 Or -6)	DC	
RC Allen	Model RCA110-3	AC	
S-TEC	6406- () Standard DG	AC	
Sigma Tek	IU262-006-45	AC	1
Sigma Tek	IU262-014-11, -13 Sigma Tek DG	DC	
Sigma Tek	IU262-015-12, -13 Sigma Tek DG	DC	
Sigma Tek	IU262-033-5, IU262-034-6	AC	3
Sigma Tek	IU262-003-14, IU262-004-15	AC	4
Sigma Tek	IU262-014-4, IU262-015-5	DC	5
Sigma Tek	IU262-005-19, -20	AC	2

COMPATIBLE HSI's

Manufacturer	System Model/Type	Output	Notes
Aeronetics	Model 8000	AC	
Bendix	HSD 880	DC	
Century	NSD 1000	DC	7
Cessna/ARC	IG-832A, IG-832C, IG-895A	DC	7
Collins	PN-101 P/N 331A-3G	AC	6
Collins	HSI P/N 331A-6P/6R	AC	
EDO	NSD 360/360A, DG 360	DC	
King	KCS 55/55A	DC	
King	KPI 550/550A	AC	
NARCO	HSI 100/100S	AC	
Sandel	SN 3308	DC	8
Sigma Tek	HSI IU445-004-9	DC	
S-TEC	ST 180	AC	

Notes:

- 1) Same as S-TEC Standard DG
- 2) Use only for Systems Twenty, Thirty, 40 & 50
- 3) Standard DG with bootstrap
- 4) Same as 52D54
- 5) Same as 52D254
- 6) Except -006
- 7) Interface same as NSD 360
- 8) Configure for KCS 55

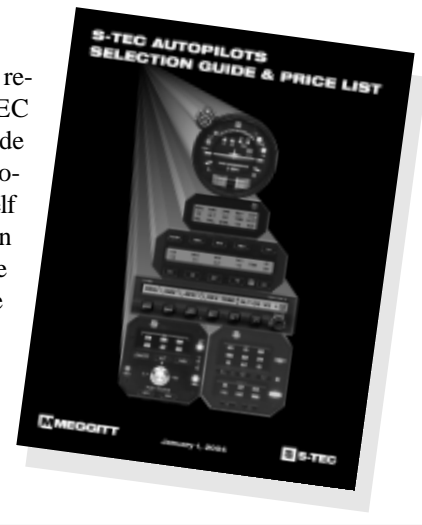
NAV / COM Compatibility

Most receivers in use today, and those manufactured for the last thirty years adhere to ARINC standards which specify a course width of +/- 150 mV.

All of the S-TEC autopilot systems work properly with the above systems.

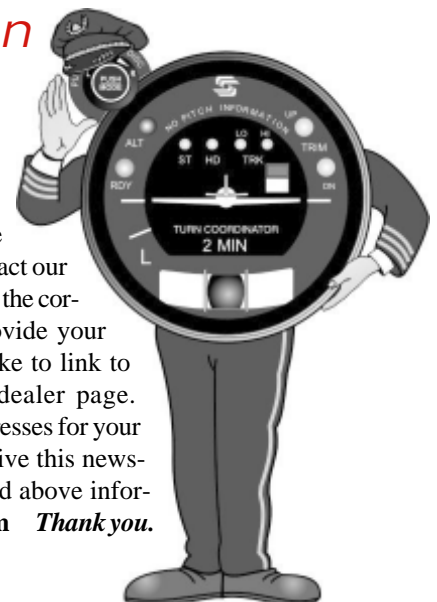
S-TEC Autopilot Selection Guide & Price List Update

By now you should have received your new S-TEC Autopilot Selection Guide & Price List. Take a moment to familiarize yourself with the new selection guide, as prices have changed. Copies were sent to you in January. If you have not received your package, please contact us.



Dealer Information Update

This is a good time to update our database. If you have a new address, phone or fax number, please contact our office so that we may make the correction. Also, please provide your website address. We'd like to link to your website from our dealer page. Lastly, provide e-mail addresses for your staff, if you'd like to receive this newsletter electronically. Send above information to: info@s-tec.com **Thank you.**



Troubleshooting & Maintenance of S-TEC Autopilots

(A Continuing Series)

Introduction

When you become an S-TEC Dealer you sign a contract, along with purchasing a Dealer package that contains a Flight Line Service Manual. The first objective in troubleshooting is to determine if the installed autopilot system is functioning properly on the ground. This is accomplished by performing the functional ground test for that particular system. No external test equipment is required.

The second objective is to isolate a failure to a system component. The equipment listed below is designed to aid in this effort:

- Flight Line Autopilot Tester
- Breakout Box
- Adapter Cables
- Extender Assembly



The Flight Line Autopilot Tester is used to simulate some of the major system components. Each of the simulators provided is removable from a suitcase for remote use about the aircraft.

Flight Line Service Manual



The Flight Line Service Manual contains eight sections detailing the use of the equipment. This manual provides flight line service information for the following S-TEC Meggitt rate based autopilots.

- System 20/30/30 ALT
- System 40/50
- System 55/55X/550
- System 60-1/60-2
- System 65
- System 60PSS

List of Test Equipment

The following items are contained in the Flight Line Autopilot Tester:

- Tool, Roll Centering Adjustment
- Simulator, Heading System *
- Simulator, Servo, Roll/Pitch/Trim
- Simulator, Altitude Transducer
- Simulator, Turn Coordinator
- Cable Assembly – Total of five
- Service Manual

* Simulates only the following heading systems:

S-TEC	DG	P/N 6406
S-TEC	HSI	P/N 6443
EDO AIRE	DG	P/N 52D54

Use of Test Equipment

As each simulator in the Flight Line Autopilot Tester is removable from the suitcase, you can test for the following situations, given a step by step procedure for each autopilot system:

- Roll Centering
- Functional Ground Tests
- Simulator Operation

System interconnect drawings are also contained in the Service Manual for your reference.

2003 Top Ten Dealers



Top Ten Sales Dealers – Domestic

(Names in Alphabetical Order)

Autopilots Central	Tulsa, OK
Aviation Classics, Ltd.	Reno, NV
Avionics West, Inc.	Santa Maria, CA
Gardner Aviation Spec., Inc.	Peachtree, GA
O & N Aircraft Modifications	Factoryville, PA
Pacific Coast Avionics Corp.	Aurora, OR
Penn Avionics	Collegeville, PA
Pippen - York, Inc.	Fredericksburg, TX
Precision Avionics Specialists	Hampton, GA
Tim Mathison Avionics	La Fayette, GA

Top International Dealer

Aircraft Instruments	Republic of South Africa
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S-TEC Dealer Kit

As you are a member of our S-TEC dealer organization, it is of the utmost importance that you have the equipment necessary to inspect and provide maintenance of our S-TEC autopilots. We have become aware that there are S-TEC dealers out in the field that do not have our test equipment at your shops. The list of equipment that is necessary for you to be proficient in your installations and repairs are the:

P/N 8722 (PK-001)	Servo Service Kit
P/N 8723 (PK-002) ..	Connector Service Kit
P/N 9524	Break Out Box
P/N 01264	Break Out Box, System 55/55X Tester
P/N 39198	System 20/30 Roll Adapter Harness
P/N 39199	System 20/30/30ALT Pitch Adapter Harness
P/N 95101	Flight Line Tester
P/N 9101	Outside Dealer Sign

We strongly encourage all of you that do not own the above equipment to call our Sales Department and order the equipment, so that you may have it in your inventory to perform quality troubleshooting, installation and maintenance of our S-TEC autopilots.

Approach

Published and copyrighted by Meggitt /S-TEC, the *Approach* is intended to provide S-TEC dealers with information valuable in the everyday selling and servicing of S-TEC Autopilots and electronic instruments.

Comments and suggestions are encouraged and welcomed. For additional copies of the *Approach* for others in your organization or for distribution to your own mailing list, contact:

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