



S-TEC CORPORATION
RT. 3, BLDG. 946
WOLTERS INDUSTRIAL COMPLEX
MINERAL WELLS, TEXAS 76067

PILOT'S OPERATING HANDBOOK AND FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

CESSNA MODEL R182 AND TR182

WITH

S-TEC SYSTEM 60 TWO AXIS
AUTOMATIC FLIGHT CONTROL SYSTEM
(28 VOLT SYSTEM)

REG. NO. 737LM

SER. NO. 00848

This supplement must be attached to the applicable FAA Approved Airplane Flight Manual when S-TEC System 60 Autopilot Model ST-044 is installed in accordance with STC SA4397SW. The information contained herein supplements the information of the basic Airplane Flight Manual; for limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

SECTION I

GENERAL

This manual is to acquaint the pilot with the features and functions of the System 60 Two Axis and to provide operating instructions for the system when installed in the listed aircraft model(s). The aircraft must be operated within the limitations herein provided when the autopilot is in use.

The System 60 Two Axis Autopilot is comprised of the following elements:

<u>ELEMENT</u>	<u>LOCATION</u>
Electric Turn Coordinator Instrument	Instrument Panel
Air Driven Directional Gyro (3") (STD)	Instrument Panel
Mode Programmer/Annunciator	Instrument Panel
Roll Flight Guidance Computer	Aft Radio Rack
Pitch Flight Guidance Computer	Aft Radio Rack
Roll Servo Actuator	Left Outer Wing
Pitch Servo Actuator	Fuselage Aft
Master Switch and Control Wheel	Instrument Panel and
Disengage Switch	Control Wheel
Altitude Transducer	Near Altimeter, Forward of Instrument Panel

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SECTION II

OPERATING LIMITATIONS

1. Autopilot operation not authorized above 160 KIAS.
2. Flap extension limited to 10° and 95 KIAS or below, when optional autotrim system is not installed.
3. Flap extension limited to 20° maximum and 10° between 140 KIAS and 95 KIAS, when optional autotrim system is installed and operating.
4. Go-arounds or missed approach maneuvers not authorized.
5. Autopilot use prohibited during take-off and landing.
6. Category I operations only.

SECTION III

EMERGENCY OPERATING PROCEDURES

In the event of an autopilot malfunction, or any time the autopilot is not performing as expected or commanded, do not attempt to identify the system problem. Immediately regain control of the aircraft by overpowering the autopilot as necessary and then immediately disconnect the autopilot. Do not reengage the autopilot until the problem has been identified and corrected.

1. Autopilot

The autopilot may be disconnected by:

- a. Depressing the "AP Disconnect" Switch on the left horn of the pilot's control wheel.
- b. Placing the "AP Master Switch" in the "OFF" position.

2. Trim

- a. In the event of a trim failure, manually control aircraft and DEPRESS AND HOLD, "Trim Interrupt/AP Disconnect Switch" on control wheel.
- b. Place trim master switch in "OFF" position, pull circuit breaker, release interrupt switch.
- c. Retrim aircraft. Leave trim system OFF until corrected.

3. Altitude loss during a malfunction:

- a. An autopilot or autotrim malfunction during climb, cruise or descent with a three second delay in recovery initiation could result in as much as 55° bank and a 550 ft. altitude loss. Maximum altitude loss recorded in descent.
- b. An autopilot or autotrim malfunction during an approach with one second delay in recovery initiation could result in as much as a 20° bank and a 80 ft. altitude loss. Maximum altitude loss measured with flaps down 10°, gear down and operating either coupled or uncoupled.



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4. System Failure and Caution Annunciations:

The System 60 Autopilot includes a number of automatic failure and caution annunciations to advise the pilot of operational problems. Following is a list of annunciations, their cause and recommended pilot actions:

	<u>ANNUNCIATION</u>	<u>CONDITIONS</u>	<u>ACTION</u>
A.	Flashing "RDY" for 5 seconds	Indicates autopilot disconnect. All annunciations except RDY are cleared.	N/A
B.	Flashing "RDY" then extinguished	Turn Coordinator gyro rotor RPM low. Autopilot disconnects, cannot be re-engaged.	Check instrument power, conduct other system checks as necessary.
C.	Flashing "NAV" or "REV"	Indicates Off Course by 50% needle displacement.	Use "HDG" mode until problem is identified. Cross check Raw NAV Data, Compass HDG, D.G. and radio operation.
D.	Flashing "NAV" or "REV" with steady "FAIL"	Indicates invalid radio navigation signal	Check navigation radio. Use "HDG" mode until problem is corrected. On ILS Approach, initiate go-around inform A.T.C.
E.	Flashing "GS"	Indicates off glide slope center line by 50%	Check attitude and power. Add or reduce power as appropriate.
F.	Flashing "GS" with steady "FAIL"	Indicates invalid glide slope radio navigation signal	Initiate go-around - Inform A.T.C.
G.	Flashing "VS"	Indicates excessive vertical speed error over selected VS (usually in climb).	Reduce command VS and/or adjust power
H.	Flashing "GS" Steady "DSBL"	Indicates manual glide slope disable	To re-enable glide slope, select "NAV" mode again.



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NOTE: If any of the above annunciations occur at low altitude or during an actual instrument approach disconnect the autopilot, execute a go-around and inform ATC of the problem (IFR). Do not attempt to trouble shoot or otherwise ascertain the nature of the failure until a safe altitude and maneuvering area is reached.

SECTION IV

NORMAL OPERATING PROCEDURES

4-1 SYSTEM DESCRIPTION

The System 60 is a pure rate autopilot using an inclined rate gyro in the turn coordinator instrument as the primary roll and turn rate sensor and an absolute pressure transducer as the primary pitch rate sensor. The turn coordinator includes an autopilot pick-off, a gyro RPM detector and an instrument power monitor. Low electrical power will cause the "flag" to appear while low RPM will cause the autopilot to disconnect, flashing the "RDY" annunciator for five seconds and then extinguishing all annunciations. The autopilot cannot be engaged unless the RDY annunciator is illuminated. The standard D.G. provided with the system is a 3" diameter vacuum or pressure air driven instrument. Directional information is provided to the autopilot by a heading bug in the D.G. instrument. The autopilot may also be used with an HSI type instrument providing both heading and course outputs.

Pitch axis control is provided by deriving vertical speed, altitude position, altitude error and rate of vertical speed (acceleration) from a solid state absolute pressure transducer. The basic pitch modes provided are vertical speed, for use in climbs and descents, and altitude hold for maintaining a selected altitude (pressure) level. Pitch attitude changes to accomplish commands are limited by acceleration in operation, providing a very slow, comfortable, maneuvering rate.

The programmer unit includes an ambient light sensor which automatically adjusts annunciator and knob light intensity for prevailing ambient conditions.

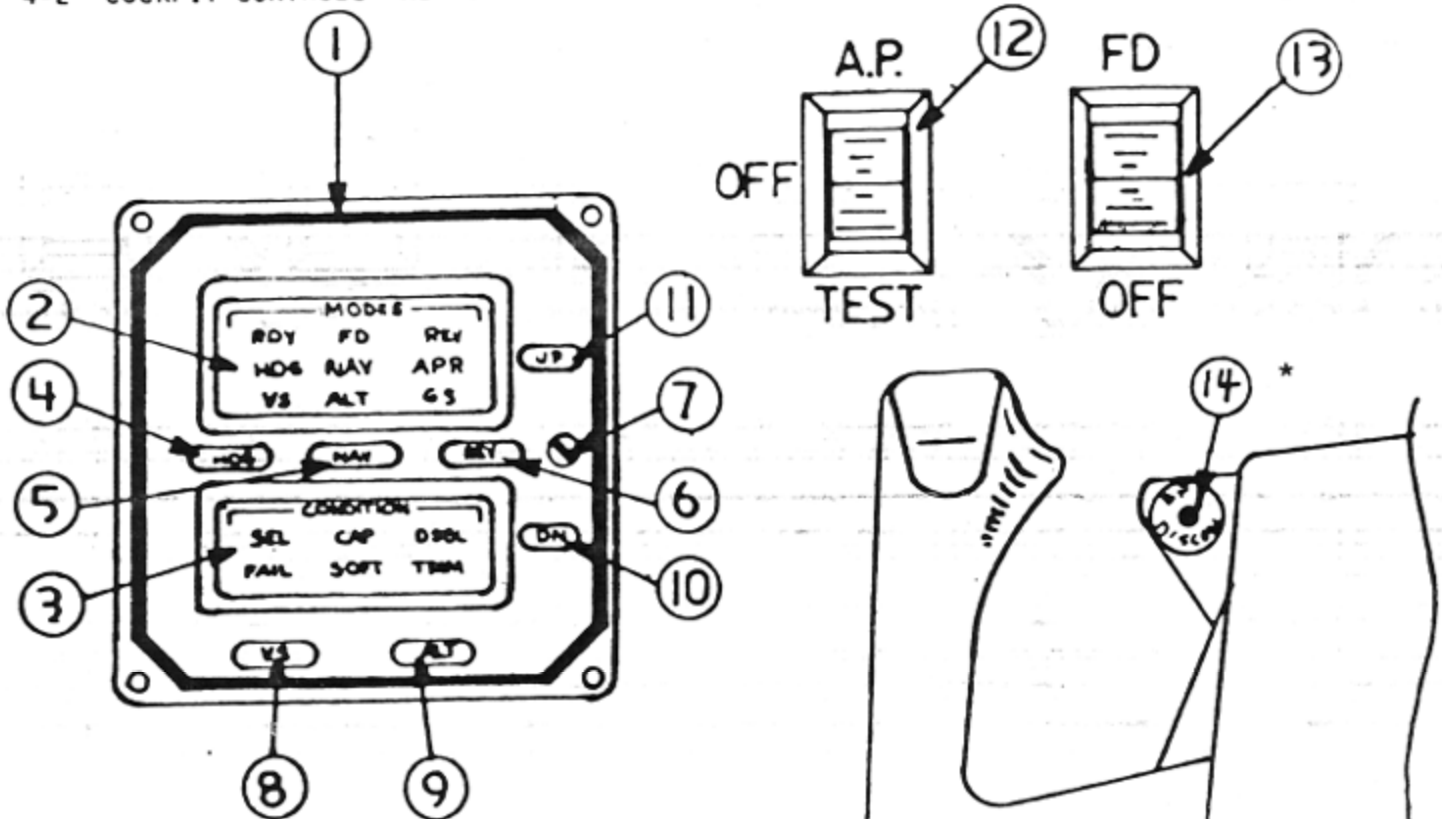
Other than the D.G. instrument, the system is entirely electrical and operates with very low power consumption.

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4-2 COCKPIT CONTROLS AND FUNCTIONS



*Optional Trim Interrupt/AP Disconnect Switch, Trim Master Switch and Trim Manual Control Switch Not Depicted.

1. Mode Programmer and Annunciator Unit - Provides mode switches and annunciation for the system.
2. Mode Annunciation Window - Displays mode in use and armed modes.
3. Condition Annunciator Window - Displays NAV mode tracking gain conditions, NAV failure, G/S "DSBL" (Disable) and out of trim annunciations. "SEL" indicates the optional vertical speed selector is in use.
4. HDG Mode Switch - Momentary actuation engages "HDG" mode causing autopilot to track HDG bug on D.G. or H.S.I. instrument.
5. NAV Mode Switch - Momentary actuation engages navigation mode and illuminates NAV mode annunciator. If an ILS frequency is channeled on the NAV Radio the "APR" mode (approach) annunciator will also illuminate indicating localizer gain.
6. REV Mode Switch - Momentary actuation engages "REV" (reverse) mode for back course tracking. For ILS "APR" annunciator will illuminate as in NAV mode.

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NOTE: VOR NAV mode includes three separate dynamic gain schedules which will be annunciated as follows during VOR-Navigation mode use:

- | | |
|----------|---|
| CAP | Indicates navigation course capture with high rate gain schedule and providing 90% of standard rate turn capability. |
| CAP SOFT | Approximately fifteen seconds after capture of the VOR radial, the system will shift to an intermediate gain level indicated by annunciation of the "CAP" and "SOFT" annunciators. The rate gain is reduced and the system is now limited to bank angles to produce approximately 45% of a standard rate turn. |
| SOFT | Approximately ninety seconds after course capture the third gain level is initiated and the "CAP" annunciator will extinguish. The system is now in the cross country track condition with low VOR needle sensitivity and is capable of bank angles to produce 15% of a standard rate turn (usually approx. 2° - 3° of bank). |

During NAV-APR and REV-APR (ILS Localizer) tracking the "SOFT" mode is inhibited providing only capture and Capture-Soft dynamic conditions. When tracking VOR or Localizer and the system develops a 50% course error, the in-use NAV mode will flash indicating an off course condition. During VOR tracking operations and when a 50% course error occurs, the system will automatically revert to CAP-SOFT after approximately one minute to allow more rapid recapture. This condition will normally occur only if a course change is made at the station and the appropriate NAV Mode is not manually reselected.

7. Ambient light sensor - will adjust annunciator lamp and knob recognition lamp intensity automatically for optimum brilliance level.
8. "VS" (Vertical Speed) Mode Switch - Momentary actuation engages vertical speed mode. If installation is equipped with an optional VS selector the autopilot will maneuver the aircraft to track the selected vertical speed. If not equipped with a vertical speed selector, engagement will synchronize the autopilot to the vertical speed existing at engagement.

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NOTE: The vertical speed limits of the autopilot are \pm 1500 FPM.
If the autopilot is engaged above 1500 FPM, it will
maneuver to produce 1500 FPM.

9. "ALT" (Altitude) Mode Switch - Momentary actuation engages the altitude hold mode at the altitude existing at engagement.
10. Down (DN) Pitch Modifier Switch - The down modifier switch is used to modify the commanded vertical speed in VS mode or the altitude in altitude mode.

VERTICAL SPEED

In VS mode the down modifier will increase a down vertical speed, or decrease a climb vertical speed, approximately 160 FPM per each second of actuation, i.e. a three second actuation will provide a VS change of approximately 500 FPM.

ALTITUDE CHANGE

In "ALT" mode the down modifier will lower the altitude reference 20' per each second of actuation.

11. UP Pitch Modifier Switch - The Up pitch modifier switch is used to increase climb vertical speed and decrease descent vertical speeds. In altitude hold mode it will cause an increase in the reference altitude. The rates of change are explained above for the down modifier (Item 10).
12. AP Master Switch - Master power switch for the system. A three position switch having "AP", "OFF", and "TEST" positions. When the master switch is on ("AP") the turn coordinator gyro is functioning properly, the "RDY" light will appear in the mode annunciator window. When the optional flight director instrument (A.D.I.) is installed the master switch activates both the A/P and Flight Director functions. The "APFD" position will cause the pitch steering bar to disappear until a pitch mode is selected.
13. Flight Director Switch (FD) - Optional - When the optional flight director instrument (Attitude Director Indicator - A.D.I.) is installed, selection of the FD Switch only (without the AP Switch) will allow use of the flight director for manual aircraft control. To engage the autopilot, simply place the AP Master Switch to "AP" which will engage the servoes in the existing modes.
14. AP Disconnect Switch - The AP Disconnect Switch is a momentary type mounted in the left horn of the pilot's control wheel. When depressed it will disconnect the autopilot and clear the annunciator windows of all previously existing modes and conditions. When the optional autotrim is installed, the disconnect switch will also interrupt all electric trim operation when depressed and held. When released it will automatically restore trim operation.

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4-3 PRE-FLIGHT PROCEDURES

NOTE: During system functional checks the system must be provided adequate D.C. voltage (12.0 VDC minimum).

1. AP Master Switch - Push to "TEST" position - observe all messages illuminate. Position switch to - "AP" observe "RDY" light on.
2. Rotate HDG knob on D.G. to position bug under lubber line.
3. Engage HDG Mode - Move bug left and right and observe control wheel moves in direction of bug displacement. Return HDG bug to center.
4. Overpower - Grasp control wheel and manually overpower roll servo left and right.
5. Radio Check - A. Turn on NAV Radio, with valid NAV signal, engage NAV mode and move VOR O.B.S. so that VOR needle moves left and right - control wheel should follow the direction of needle movement.
B. Select REV Mode - the control wheel should rotate in opposite direction of the NAV needle.
C. Channel a VOR that has an invalid NAV signal - "NAV" annunciator should flash and the "FAIL" annunciator should be steady (If the radio signal has a NAV flag output).
6. Move control wheel to level flight position - Engage VS Mode - Depress UP Modifier Switch and hold - Observe control wheel moves slowly OUT. Depress DN Modifier Switch and hold - Observe control wheel moves slowly - IN.
7. Overpower Pitch By Pulling Control Wheel Out - Observe that "TRIM" Annunciator illuminates and "DN" modifier illuminates with audio - Overpower by pushing control wheel IN - Observe that "TRIM" annunciator illuminates and "UP" modifier illuminates with audio, (If optional Autotrim is installed, Trim Master Switch must be "OFF" for trim indicators to function)

NOTE: There will be approximately a 2-3 second delay between the overpower and the trim indication. If the trim lights do not function the pitch section of the autopilot should not be used until the problem is corrected.
8. Disconnect - Momentarily depress the control wheel mounted disconnect switch. Move control wheel to assure freedom of the controls and check the "RDY" lamp flashes for approximately five seconds indicating AP disconnect.



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9. Pitch Limiter Check (Once Per Flight Day):

- A. Select "TEST" position on Master Switch
- B. Engage HDG Mode
- C. Move Control Wheel To Center - Engage VS
- D. Hold Control Wheel - Depress "UP" Modifier-
Pitch should disconnect. Release UP modifier
Pitch should re-engage.
- E. Repeat Item D, using "DN" modifier.

If pitch servo does not disengage controls when the UP and DN modifier are momentarily selected, the limit accelerometer may have failed. The pitch section of the autopilot should not be used until the problem is corrected.

10. Electric Trim Check (If Optional Autotrim is installed)

Manual Electric Trim - Test Prior to Each Flight

- A. Trim Switch and A/P Master Switch - ON
- B. Operate Manual Trim Switch (Both Knob Sections)
Nose DN - Check trim moves nose down and trim in motion indicator ("TRIM") in A/P Programmer flashes. Operate trim switch NOSE UP - Check Trim moves nose up and for "in motion" light.
- C. With trim operating nose up and down - grasp manual trim control and overpower electric trim.
- D. Operate each half of the trim switch separately - trim should not operate unless both switch knob segments are moved together.
- E. With Trim Operating - Depress trim interrupt switch - Trim motion should stop while interrupt switch is depressed - when released trim should operate normally.

Autotrim

- A. Engage HDG and VS modes of the autopilot.
- B. Grasp control wheel and apply forward pressure (nose down) - After approximately three (3) seconds trim should run NOSE UP.
- C. Apply aft pressure (Nose UP) to control wheel - after approximately three (3) seconds trim should run NOSE DOWN.
- D. Move manual trim switch UP or DN - Autopilot should disconnect and trim operates in the commanded direction. (Trim Switch will disconnect autopilot only when pitch is engaged.)
- E. Re-engage autopilot HDG and VS modes and depress trim interrupt/AP Disconnect Switch - autopilot should disconnect.
- F. Retrim aircraft for take-off - Check all controls for freedom of motion and to determine that the autopilot and trim have disconnected.

If either the manual electric or autotrim fails any portion of the above check procedure, move the trim master switch "OFF" and do not attempt to use the trim system until the fault is corrected. With the trim master switch "OFF" the autopilot trim indicators and audio system will return to operation. If the electric trim system suffers a power failure in flight, the system will automatically revert to the indicator lights and audio horn. If this occurs turn the trim master switch "OFF" and trim manually, using the indicators, until the fault can be located and corrected.

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4-4 IN FLIGHT PROCEDURES

ROLL AXIS MODES

1. Master Switch - "AP" - Check "RDY" light on.
2. Trim aircraft for existing flight conditions.
3. Set HDG bug to desired heading.
4. Depress HDG Mode Switch.
5. Select headings, as desired.

VOR INTERCEPT AND TRACK (Standard Directional Gyro)

1. Tune Navigation Receiver and select VOR radial.
2. Move HDG bug to match the course of the radial selected, in direction of desired travel.
3. Engage NAV Mode. If the VOR needle is full scale, the autopilot will cause a turn to a 45° intercept HDG. As the aircraft approaches the selected radial, the autopilot will cause a turn to join the radial. The point at which this turn begins is variable and depends upon the aircraft position and closure rate to the radial, however, the turn will always start between a 100% (full scale) VOR needle off set and 50% of full scale.
4. During the intercept sequence the system will operate with maximum gain and sensitivity to VOR needle rate and position. When the selected course is intercepted, the "CAP" annunciator will illuminate indicating course capture and the initiation of the tracking gain program. (See Page 6).
5. Course changes - if a course of 10° or more is required at the enroute VOR, select the new course and re-select NAV mode to reinitiate the capture sequence.

VOR APPROACH

1. For the most rapid recapture of the VOR radial after station passage, during a VOR approach, it is recommended that the NAV Mode Switch be selected again just after TO-FROM reversal. This will return the system to capture dynamics and reinitiate the gain schedule.

LOCALIZER INTERCEPT AND TRACK - (STANDARD DIRECTIONAL GYRO)

1. When a localizer frequency is channeled and NAV mode selected, the autopilot will automatically change gains for additional localizer sensitivity and the "APR" annunciator will illuminate.
2. Set the HDG bug to the inbound localizer course and engage NAV mode to intercept and track the front localizer course inbound or back course outbound.
3. REV Mode - Reverse mode is used to track the front course outbound or the back course inbound to the airport. The HDG bug must be set to the direction of travel.

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VOR LOCALIZER INTERCEPT AND TRACK - HSI COMPASS (OPTIONAL)

An H.S.I. type integrated VOR-Compass display provides the autopilot with both VOR left-right information and course information when the O.B.S. is set to the desired VOR radial or localizer course. The HDG bug is not used during radio tracking. Simply set the desired radial or localizer course with the O.B.S. and select the appropriate NAV mode.

~~ILS/Localizer approaches with an H.S.I. require that the inbound front course be set on the OBS for all approach operations, either front or back course. Select NAV mode to track inbound on the front course or outbound on the back course. Select REV mode to track outbound on the front course and inbound on the back course.~~

DUAL MODE INTERCEPT

During operations with an HSI compass all angle intercept capability is provided by simultaneously selecting HDG and NAV modes. The autopilot will follow the HDG bug until the proper on course turn point and then switch from HDG to NAV automatically. Selected angle intercepts may be used during VOR, localizer front courses or localizer back course (REV) operations.

Localizer intercept angles higher than 45° will usually result in some course overshoot depending upon distance from the station and aircraft velocity. Generally, intercept angles higher than 45° should not be used.

PITCH AXIS MODES

VERTICAL SPEED

1. Engage HDG or NAV Mode.
2. Engage VS Mode. Vertical speed mode will synchronize to the vertical speed existing at engagement if it is less than 1500 FPM. If the VS at engagement is more than 1500 FPM, the system will hold 1500 FPM.
3. To modify (change) vertical speed - Depress the desired UP-DN modifier switch as necessary. The UP-DN modifier switch will change the reference vertical speed approximately 160 FPM per each second of actuation. Thus to increase VS 500 FPM it will be necessary to hold the UP Modifier for approximately three (3) seconds.

NOTE: The autopilot response to a command VS change is slow. When the modifier switch is depressed the aircraft will change attitude very slowly in the direction commanded. Do not hold the modifier switch depressed until the attitude change looks correct - remember the amount of modification is time related, 160 FPM per second of actuation.



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ALTITUDE HOLD

1. At the desired altitude, depress the "ALT" Mode Switch. The ALT Hold will engage at the precise pressure level existing at engagement, it is not necessary to "lead" the desired altitude. In the event that a difference exists between the altitude engage point and the altimeter the altitude may be modified.
2. To modify the selected altitude, depress the UP-DN modifier switch, in the direction of desired change, for the required time period. The UP-DN modifier will change the reference altitude 20 feet per second of switch activation, i.e. if a barometric change requires a 40' climb to return to the desired altitude, depress the "UP" modifier switch for approximately two seconds. The aircraft will slowly change altitude to the new reference.

NOTE: The total range of the modifier in "ALT" mode is 200 feet of change. If more than 200 feet of change is required after "ALT" mode engagement, it will be necessary to return to VS mode and reselect "ALT" mode when the desired altitude is reached.

GLIDE SLOPE COUPLING

AUTOMATIC ARM-ENGAGE

To arm the automatic glide slope capture feature, the following conditions must be met:

1. NAV Receiver tuned to a localizer frequency.
2. GS signal must be valid - no flag.
3. Autopilot must be in "NAV-APR" mode and in "ALT" mode.
4. Aircraft must be under the GS centerline and be within 50% radio deviation of the localizer centerline.

Glide Slope arming will occur when the above conditions have been met for approximately ten (10) seconds and will be indicated by lighting the "GS" annunciator while the "ALT" annunciator remains lighted.

Glide Slope capture is indicated by the extinguishing of the "ALT" annunciator.

MANUAL ARM-AUTOMATIC ENGAGE

If approach vectoring results in the aircraft being above the glide slope at the intercept point, the system may be manually armed by selecting the "ALT" mode switch to engage altitude and then selecting "ALT" a second time to command arming. If all other conditions have been met, "GS" will immediately engage, extinguishing "ALT".



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GLIDE SLOPE FLIGHT PROCEDURE

Approach the GS intercept point (usually the O.M.) with the flaps set to approach deflection of 10° - 20° (See Limitations Section) and with the aircraft stabilized in altitude hold mode. At the glide slope intercept, lower the landing gear and adjust power for the desired descent speed. For best tracking results make power adjustments in small, smooth increments to maintain desired airspeed. At the missed approach point or the decision height, disconnect the autopilot for landing or for the go-around maneuver. (See Limitations Section). If a missed approach is required, the autopilot may be re-engaged after the aircraft has been reconfigured for and established in a stabilized climb.

ELEVATOR TRIM INDICATOR

The autopilot pitch servo contains a sensor to detect the out of trim loads being imposed on the autopilot during maneuvers producing a trim change. When the out of trim force exceeds a preset amount, the "TRIM" annunciator in the caution window will illuminate along with the UP-DN modifier switch button to indicate the direction of required trim. The annunciators will be accompanied by a low level audio signal and will be steady for approximately five seconds and will flash thereafter, until the aircraft is retrimmed. For instance, if the "TRIM" and "UP" lights are illuminated, you must TRIM "UP" to extinguish the lights and restore trim.

NOTE: If the trim indicator is illuminated and the autopilot is disconnected there will be a residual out of trim force at the control wheel - be alert for this condition if you disconnect the system with the trim lights "ON".

AUTOTRIM (IF OPTIONAL AUTOTRIM IS INSTALLED)

If the autopilot is equipped with the optional electric autotrim system, the aircraft elevator trim will be maintained automatically when the "TRIM" Master Switch is "ON" and a pitch mode is selected. When the trim master switch is "ON", the trim indicator lights are disabled. Should the trim power fail or the switch be "OFF", the indicator lights will return to operation automatically. Refer to Section 4-3 Pre-Flight Procedures for check out information. The S-TEC electric trim system is designed to accept any type of single failure (either electrical or mechanical) without uncontrolled operation resulting. To assure that no hidden failures have occurred, conduct the trim pre-flight check prior to each flight.

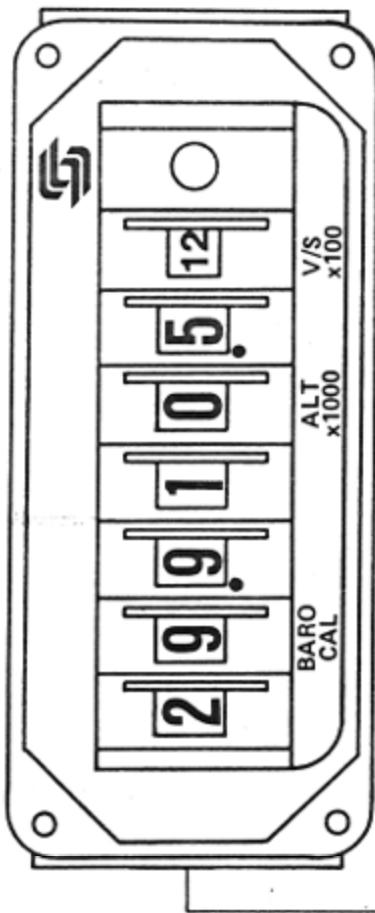
NOTE: With optional autotrim system installed, do not overpower autopilot pitch axis for more than three (3) seconds because autotrim will operate to oppose the pilot causing an increase in overpower loads. If necessary to overpower the pitch axis, immediately disconnect the autopilot using the control wheel disconnect switch.

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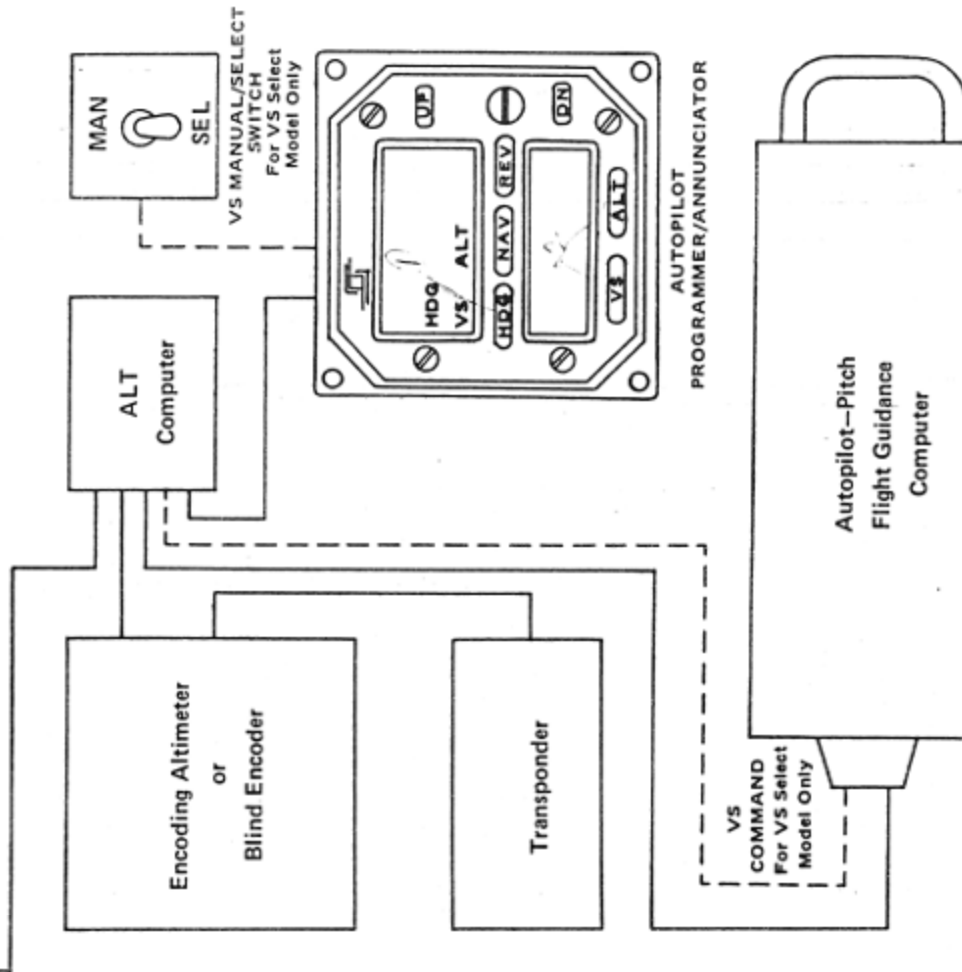


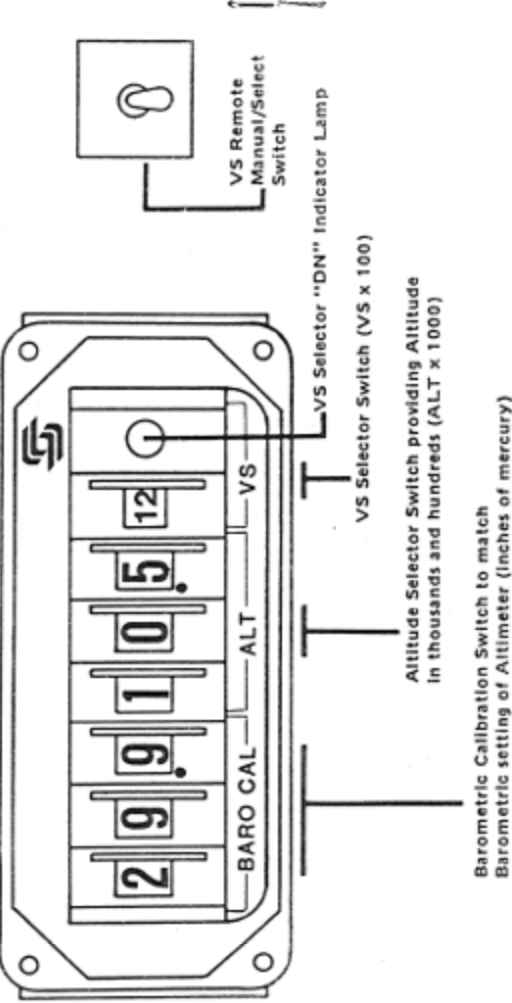
ALT or ALT/VS PROGRAMMER

THEORY OF OPERATION

In both the Altitude Selector System and the combination Altitude/Vertical Speed Selector System, the altitude information from the altitude encoder is decoded by the altitude computer. This decoded altitude information is then compared to the settings of the barometric calibration (BARO CAL) and altitude select (ALT) switches on the selector programmer. When the information from the selector programmer switches matches the decoded altitude information, the altitude computer signals the autopilot to engage altitude hold mode.

The combination ALT/VS Selector System includes an additional vertical speed command switch and VS "down" indicator light on the programmer, and a remote vertical speed Manual (MAN)/Select (SEL) Switch. With the remote switch in the SEL position the autopilot will maneuver the aircraft to maintain the vertical speed selected with the VS digital thumbwheel switch on the selector programmer when the autopilot VS mode is engaged. When SEL position is chosen, the autopilot UP/DN modifier switches are disabled in the VS mode and all vertical speed commands must be entered with the selector programmer thumbwheel switches. With the remote VS MAN/SEL switch in the MAN position the autopilot remains in normal VS mode operation via the UP/DN modifier switches.





In normal use it is not uncommon for encoders and/or altimeters to vary in calibration. When this occurs the altitude selector will engage the Altitude Hold Mode (ALT) on the autopilot at an altitude that is higher or lower than that selected. These calibration variations can be compensated for as follows:

If the altitude at which the selector engages ALT on the autopilot is higher than the altitude selected, adjust the BARO CAL setting for a larger (higher) number than the current altimeter setting. If ALT engages at a lower altitude than is selected, adjust BARO CAL for a smaller (lower) number. An adjustment of .1 (1/10 in. Hg.) will provide an altitude adjustment of approximately 100 ft.

In normal operation the altitude selector will engage the Altitude Hold Mode of the autopilot 50 ft. prior to arrival at the selected altitude either climbing or descending. Due to hysteresis in the altimeter this may change slightly in use, but proper barometric calibration should always result in ALT hold engagement within 100 ft. of the selected altitude.

ALTITUDE SETTING:

The Altitude thumbwheel switches provide settings in thousands of feet and hundreds of feet. To select 10,500 ft. set the switches to 10.5 (altitude x 1000). To select 2200 ft., set the switches to 02.2 (altitude x 1000).

COMBINATION ALT/VS SELECTOR

VS SELECT:

The VS Select function on the combination ALT/VS selector is controlled by an additional thumbwheel switch on the programmer for selection of the vertical speed desired for climb or descent. The indications in the VS thumbwheel window are color coded White for Climb and Amber for Descent and indicates VS in ft. x 100 (a white 6 indicates a 600 fpm climb, an amber 12 indicates a 1200 fpm descent). When a descent VS is selected an Amber indicator lamp adjacent to the thumbwheel will also illuminate, an additional reminder that a descent is selected.

Vertical speeds are selected in 200 fpm increments from 200 to 1600 fpm UP or DN. DN. No zero selection is provided because that would represent an altitude hold. Selection of VS may be changed as desired during a climb or descent by simply selecting the new climb or descent rate with the thumbwheel

INTERNAL LIGHTING

The ALT selector or ALT/VS selector programmer is provided with internal blue/white flood lighting which is powered from the aircraft instrument light system and is controlled by the appropriate instrument light rheostat. Adjustment of instrument panel light intensity will automatically adjust the selector programmer light intensity.

FEATURES AND FUNCTIONS
(Combination ALT/VS Selector Version Shown)

NOTE: The Altitude Selector (only) version is identical except the VS thumbwheel switch, VS DN indicator lamp and remote MAN/SEL switch are eliminated.

ALTITUDE SELECTOR

BARO CAL:

Encoding altimeters provide altitude information referenced to a standard pressure of 29.92 inches of mercury. Conversion of this information to provide altitude referenced to mean sea level (MSL) is done by the ATC computer in the Air Traffic Control Centers by applying the local altimeter setting, corrected to sea level. The BARO CAL switches allow the pilot to provide a current altimeter setting. This is used in the altitude computer to convert the altitude encoder output to MSL.

ADJUSTMENT: Barometric Calibration

If the altitude encoder is in proper adjustment, simply set the BARO CAL switches to match the current altimeter setting, in the Kollsman window of the altimeter, to the nearest 1/10 of an inch of mercury.

OPERATION

The ALT selector or ALT/VS selector systems are engaged by use of the VS and ALT switches on the regular autopilot programmer. For VS select, with the ALT/VS system, place the remote VS MAN/SEL switch in the SEL position, set the VS thumbwheel for the desired vertical speed and depress the VS switch on the autopilot programmer. For altitude pre-select, set the ALT thumbwheels to the desired altitude and depress both the VS and the ALT switches on the autopilot programmer simultaneously. This will engage VS (either manual or select mode) and "arm" ALT to automatically engage Altitude Hold Mode once the designated altitude is reached.

PREFLIGHT

1. Autopilot Circuit Breaker — IN, AP Master Switch — ON (powers autopilot and ALT selector)
2. Encoder — ON (If provided with separate switch)
3. Transponder — ON (Transponder must be ON and functional for ALT selector to function)
4. Altimeter — Set to local altimeter setting or field elevation.
5. Altitude Selector —
 - A. Set ALT thumbwheels to an altitude 300 or 400 lower than the indicated altitude.
Example: For 760' indicated on the altimeter set ALT thumbwheels to 00.4, for 1520' on altimeter set ALT to 01.2.
 - B. Set the BARO CAL thumbwheels to the barometric reading in the Kollsman window of the altimeter to the nearest .1 in. Hg.
Example: For 30.01 set 30.0
For 29.87 set 29.9

6. Autopilot —

- A. Engage HDG mode.
- B. Simultaneously depress VS and ALT switches on the autopilot programmer. (VS and ALT annunciations will both illuminate)
- C. Move ALT select thumbwheels toward the indicated altitude in 100' steps. VS annunciation on autopilot programmer should extinguish when ALT setting on ALT selector or ALT/VS selector programmer is within 100' of indicated altitude on altimeter. Extinguishing of the autopilot VS annunciation with the ALT annunciation remaining on indicates the altitude hold mode has been engaged.

NOTE: If altitude hold engagement does not occur within 100' of indicated altitude, readjust the BARO CAL thumbwheel switches as described in the features and functions — Altitude Selector Section (Page 4).

7. Disengage Autopilot — Adjust Altitude Selector to the first desired altitude to be used after take-off.

INFLIGHT

1. Encoder and transponder — ON (Selector will not operate if the transponder is not ON and functional.)
2. Remote VS MAN/SEL switch — SEL (if available)

NOTE: The remote VS MAN/SEL switch allows the use of the VS selector or Manual VS modification via the UP/DN modifier switches on the autopilot programmer. When this switch is in the SEL position, SEL will be annunciated in the condition window of the autopilot programmer anytime a Roll mode is engaged. This annunciation is to remind the pilot that the VS selector is in use and when the VS mode is engaged the autopilot will follow the VS selected on the VS selector programmer.

3. Check BARO CAL setting.
4. Select altitude on ALT selector programmer.
5. Select VS on ALT/VS selector programmer or if not equipped with the vertical speed selector establish desired VS manually with aircraft controls or after engagement (Step 6) with UP/DN modifiers.
6. Engagement — Simultaneously depress VS and ALT switches on autopilot programmer. This will engage VS mode and arm the altitude hold mode for actuation by the selector.

IMPORTANT

When using the Altitude Selector always be sure the selected altitude is above the existing altitude when climbing or below the existing altitude when descending; The Selector cannot capture an altitude higher than the original altitude when descending and vice-versa.

EMERGENCY PROCEDURES

The Altitude Selector System provides only switching information to the autopilot and cannot, therefore, contribute to an autopilot malfunction. If for any reason the selector system does not function properly, do not attempt further use until it has been checked by service personnel. The Altitude Selector system is a very low power device which is essentially dormant unless acutely in use (by selection of the VS and ALT modes on the autopilot simultaneously). It is powered by the autopilot circuit breaker. The autopilot altitude hold mode (ALT) will override the Altitude Selector when the ALT mode is manually selected by depressing the ALT switch on the autopilot programmer. The VS Selector may be completely removed from the autopilot system by placing the remote MAN/SEL switch in MAN. When this switch is in the MAN position the autopilot resumes all normal VS functions.