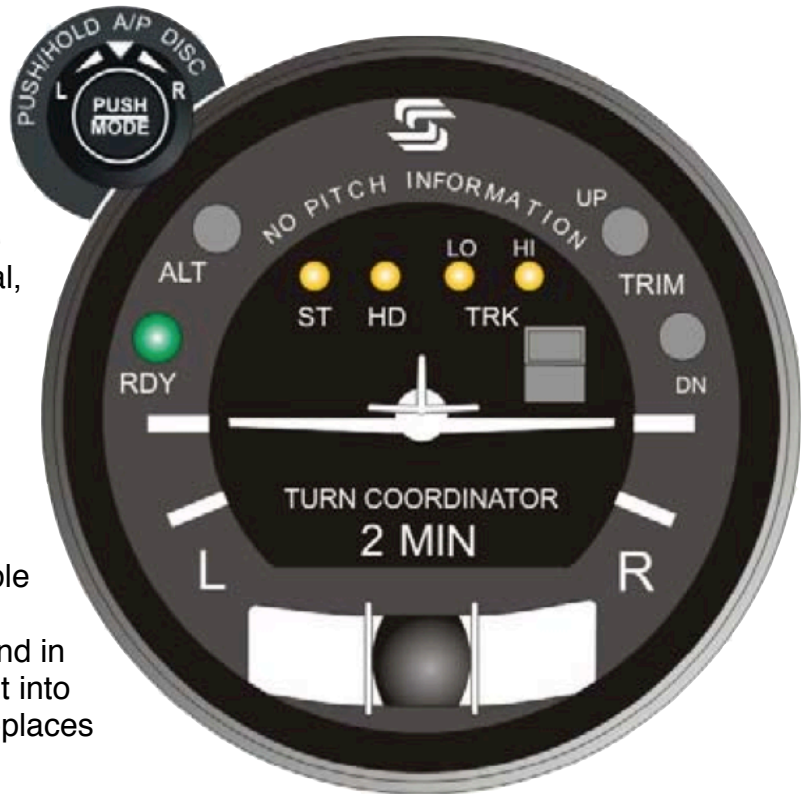


Archer N6004H S-TEC System Twenty Autopilot System Overview

The S-TEC autopilot is a more functional and modern replacement than the original Piper Autocontrol IIIb autopilot installed in our aircraft.

While the old autopilot was “state-based” in that it sensed the angle of the aircraft’s orientation in relation to vertical, the S-TEC is “rate-based” and senses the rate of roll and turn. This results in much smoother and more accurate corrections to the ailerons while the autopilot is in control, and also means that when a turn needs to be made under autopilot control, it happens at standard rate rather than at unpredictable bank angles. To sense roll and turn rate requires a turn coordinator (TC) gyro, and in fact a turn coordinator instrument is built into the autopilot and the entire assembly replaces the TC on the instrument panel.



The TC component of the autopilot operates exactly as the instrument it replaces, complete with a red flag indicating that electrical power to the instrument has been lost. The TC powers up along with the battery master as usual.

The autopilot component is powered separately and has its own power switch, so both the battery master *and* the AP MASTER switch need to be on for the autopilot to power up. It takes many seconds for the autopilot to become ready after power-on, because it has to wait for the TC to become stable and align its own platform in addition to performing its own computer self-checks. The expected sequence of indications at power-up is given in the Power-Up Test below.

Our autopilot does not have pitch axis control, but since it was an option, pitch control lights appear on the face of the instrument. Do not be confused by their presence; there is no altitude or pitch control capability and the ALT and TRIM UP/DN lights will remain off at all times.

The ability of the autopilot to provide optimum assistance and performance is directly proportional to the pilot's knowledge of its operating procedures. Therefore, pilots should develop a thorough understanding of the autopilot and its operating procedures in practice flight under Visual Meteorological Conditions (VMC) prior to using it IFR or in busy airspace with heavy pilot workloads.

Controls

Controls for the autopilot appear in three places in the cockpit:

- On the **front of the autopilot** bezel itself is a L/R TURN knob used to manually command turns while the autopilot is in stabilization mode. Pressing on this knob also cycles the autopilot through its four modes of operation, discussed below.
- The **left seat control yoke** has been modified to include an AP MODE SEL switch, which performs the exact same function as the mode select button on the autopilot bezel, and a red AP DISC switch which will immediately disconnect the autopilot. The push-to-talk switch for the radios has been moved to the left side of the yoke.
- On the **instrument panel where the old autopilot was located** (beneath the oil pressure and temperature gauges) are two switches. AP MASTER is the power switch for the autopilot. Next to it is an AP NAV SELECT switch which controls which navigation radio is to be used for the course tracking modes. This functions similarly to the DME SELECT switch on the panel, indicating whether the top (NAV 1) or bottom (NAV 2) radios and CDIs are to be used.

Pilots should remember to turn the AP MASTER switch ON as a part of normal engine start when the autopilot is to be used, and also to turn it OFF before shutting down the engine. Pilots should add this step to the shutdown checklist immediately before turning the avionics master switch off.

Engaging the Autopilot

After power-on via the AP MASTER switch (and executing the power-up tests as recommended), the green RDY light should be illuminated. To engage the autopilot in any of its flight modes, press either the AP MODE SEL switch on the yoke, or the L/R TURN knob (also labeled PUSH MODE) on the autopilot bezel. Pressing AP MODE SEL sequences the autopilot through its four operational modes.

If use of the autopilot during a flight is not anticipated, it is recommended that the autopilot remain powered off (AP MASTER switch left in the OFF position).

Modes of Operation

The S-TEC System Twenty autopilot has four modes of operation. The active mode is displayed on the face of the autopilot by a yellow lamp. When the autopilot is disengaged (not in control of the roll axis), all these lamps will be off, and only the green RDY lamp will remain lit.

The four modes are as follows:

Mode	Use
Stabilizer (ST)	Used to hold wings level, or to perform manually-commanded left or right turns by rotating the L/R TURN knob
Heading (HD)	Used to fly along a heading as selected by the heading bug on the directional gyro. Since the autopilot is rate-based, it is possible to move the heading bug to a new heading while the autopilot is engaged; the autopilot will command a standard-rate turn to the new heading.
Low-sensitivity course track (LO TRK)	Used to fly along a navigation course selected by one of the NAV radio CDIs. Use the AP NAV SELECT switch to select the NAV1 or NAV2 CDI for tracking. Low sensitivity means the autopilot will ignore short term needle excursions due to radio interference or VOR station passage. Maneuver the aircraft to a heading within $\pm 10^\circ$ of the selected course with the CDI no more than one dot deflected from center before engaging the autopilot in this mode.
High-sensitivity course track (HI TRK)	Also used to fly along a navigation course selected by one of the NAV radio CDIs. High sensitivity means the autopilot will track with maximum authority making this mode ideal for VOR or Localizer approaches but less so for VOR tracking since the autopilot will track all needle excursions and may behave badly during VOR station passage. Maneuver the aircraft to a heading within $\pm 10^\circ$ of the selected course with the CDI no more than one dot deflected from center before engaging the autopilot in this mode.

Disengaging the Autopilot

The autopilot can be disengaged normally by any of the following three actions:

- Pressing the red AP DISC switch on the yoke
- Pressing and holding for three seconds the AP MODE SEL switch on the yoke
- Pressing and holding for three seconds the L/R TURN knob on the autopilot bezel

The RDY light will flash rapidly for five seconds to indicate that the autopilot has disengaged. In addition, a beeping audio alert issues while the RDY light flashes to call further attention to the disengagement. However, in flight with a noise-canceling headset, the audio alert may not be loud enough to be audible.

Using the AP MASTER switch to remove power from the autopilot will also disengage the roll servo, but this should be considered only as an emergency procedure should the three normal methods fail to disengage the autopilot.

Again, be sure to turn AP MASTER switch OFF before engine shutdown; the autopilot power is not removed when the avionics master switch is turned off. It's a good idea to add this as a separate item on the shutdown checklist.

Power-Up Test for Archer N6004H

<p>If Autopilot will not be used during the flight (i.e. for touch-and-gos or VFR airwork), leave AP MASTER switch OFF.</p>
<p>If Autopilot will be used during flight, turn AP MASTER switch ON after AVIONICS MASTER switch is turned ON during the engine startup checklist.</p>
<p>It is recommended that the Power-Up Test be executed (and <i>highly recommended</i> that the items highlighted in pink be performed) to ensure proper operation of the autopilot. It is NOT practical nor recommended to execute the Power-Up Test in flight.</p>

Action	Response
Turn AP MASTER switch ON	<p>All lamps on autopilot (RDY, ST, HD, LO TRK, HI TRK) illuminate for seven seconds, then extinguish, indicating computer self-test has passed.</p> <p>Within three minutes, RDY light alone will illuminate, indicating autopilot readiness.</p>
Move yoke left and right to sense normal freedom of movement	—
Set L/R TURN knob to neutral position	—
Press AP MODE SEL once to engage stabilization (wing leveler) mode	ST lamp alone illuminates, indicating stabilization (wing leveler) mode active
Move yoke left and right to sense servo and verify manual override	<p>Yoke should resist movement indicating autopilot servo is engaged.</p> <p>Verify that autopilot servo can be overridden by stronger pressure on yoke. If NOT, turn AP MASTER switch OFF and DO NOT USE AUTOPILOT.</p>
Turn L/R TURN knob to the left	Yoke should turn to the left under servo control.
Turn L/R TURN knob to the right	Yoke should turn to the right under servo control.
Return L/R TURN knob to neutral position	Yoke movement should stop.
Set DG heading bug under lubber line	—

Action	Response
Press AP MODE SEL once to engage heading mode	HD lamp alone illuminates, indicating heading track mode active
Turn DG heading bug to the left side of the lubber line	Yoke should turn to the left under servo control.
Turn DG heading bug to the right side of the lubber line	Yoke should turn to the right under servo control.
Set DG heading bug under lubber line	Yoke movement should stop.
Select local VOR frequency on NAV1 radio	—
Set AP NAV SELECT switch to NAV1	—
Turn NAV1 OBS until CDI needle is centered	—
Press AP MODE SEL once to engage low tracking mode	LO TRK lamp alone illuminates, indicating low-sensitivity course track mode active
Press AP MODE SEL once to engage high tracking mode	HI TRK lamp alone illuminates, indicating high-sensitivity course track mode active
Turn NAV1 OBS until CDI needle is deflected 2 dots right of center	Yoke should turn to the right under servo control.
Turn NAV1 OBS until CDI needle is deflected 2 dots left of center	Yoke should turn to the left under servo control.
Turn NAV1 OBS until CDI needle is centered	Yoke movement should stop.
Disconnect autopilot using one of the following means: <ul style="list-style-type: none"> • Press red AP DISC button on yoke • Press and hold AP MODE SEL on yoke for three seconds • Press and hold L/R TURN knob on autopilot bezel for three seconds 	RDY lamp flashes rapidly and audible alert sounds for five seconds (alert may not be audible if ANR headset is being used) After five seconds, audible alert stops and RDY lamp illuminates steadily. All other lamps are off.
Move yoke left and right to sense freedom of movement	Yoke should no longer resist movement and should move freely, indicating that autopilot servo has disengaged.