STX 165 Transponder

A New Standard For Mode C Transponders


Photo Courtesy NASA Hubble

Small And Light Weight
Low Power Consumption
Built-in Encoder
Pressure Altitude Display
Three Timer Functions
Optional OAT Probe Input
> **Outside Air Temperature Display**
> **Density Altitude Readout**
> **Icing Alert**

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STX 165 Mode C Transponder

The STX165 elevates transponder capabilities to a new level while reducing both wight and size. The solid state transmitter design provides 200 Watts nominal output with no warm up time. And because it's all solid state, power requirements are at an absolute minimum.

The STX165 is a panel mount unit that uses a 1/2 3ATI panel cutout, just like equipment found in top of the line business aircraft. Behind the panel depth is only 6 1/4' (not including connectors). With a built in Altitude Encoder, installation time and cost is greatly reduced. When the optional STP 78 OAT probe is installed the STX165 displays Outside Air Temperature, Density Altitude and even alerts the pilot when the temperature is conducive to icing conditions.

A remote version, the **STX165R** is available for interface with existing navigation management systems. The STX165R will accept either Gilham Gray Code or RS-232 altitude input for Mode C operation. The STX165R can be mounted with or without the mounting tray either vertically or horizontally. All functions of the STX165R are
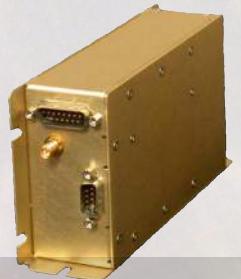
Technical Specifications

	STX 165 Panel Mount	STX 165R Remote
Electrical		
Input Voltage	11-33Vdc	11-33Vdc
Current Requirements:	430 mA @ 14 Vdc	360 mA @ 14 Vdc
	210 mA @ 28Vdc	180 mA @28 Vdc
	(500PRF and 7777Code)	(500PRF and 7777Code)
Power Output:	200 Watts Nominal	200 Watts Nominal
Transmitter Freq:	1090 KHz	1090 MHz
Receiver Freq:	1030 MHz	1030 MHz
Receiver Sensitivity:	-74dBm Nominal @90% reply rate	-74dBm Nominal @90% reply rate
Mechanical:		
Dimensions	1/2 3ATI Panel Cutout	3"H x 1.8"W x 6.9"L
Behind Panel Dim.	1.78"H x 3.5"W x 7.34"L	
	4.52cm x 8.89cm x 18.64cm	8.89cm x 4.57cm x 17.53cm
Weight	1.30 lbs (.59kg)	1.16 lbs (0.526kg)
Inputs		
Alt Encoder	Built-in 35K Encoder	Grey Code
	External RS-232 (Optional)	RS-232
OAT Probe	SANDIA STP78 (Optional)	N/A
Environmental:		
Temperature:	-20° to +55° C	-20° to +55° C
Altitude	-1000 to 35,000 Ft	-1000 to 35,000 Ft
Certification:	DO160F	DO160F
	DO 178B Level C	DO178B Level C
	TSO C74d	TSO C74d
	TSO D88b (Encoder)	

SANDIA aerospace   3700 Osuna Rd NE   Suite 711   Albuquerque, NM 87109   www.sandia.aero

STX 165
User Manual

Revision	Date	Description	Approval
IR	20120222	MR102	L.Harrison
A	20130311	DRN 434	L. Harrison

STX 165 Operation

The STX 165 is a Mode C transponder capable of transmitting 4096 different codes in response to ground radar interrogations. All operations of the STX 165 are controlled through the front panel controls. The controls are as follows:

Power/Mode Control

Data Knob
Enter Pushbutton

VFR Pushbutton

Select Knob

Ident Pushbutton

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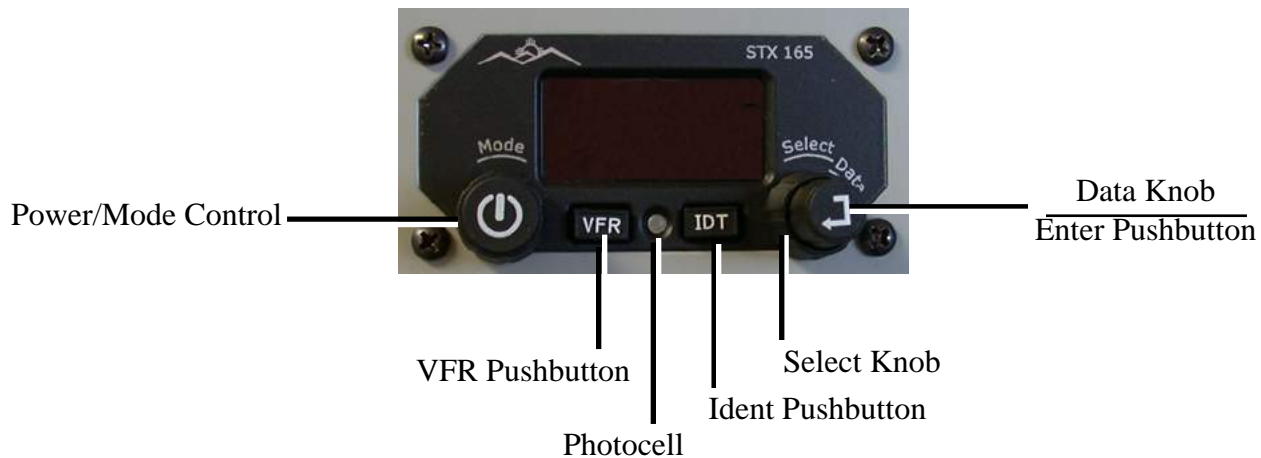
The Power/Mode Control

The STX 165 will come on anytime power is applied to the rear connector. It is recommended that power to the STX 165 be supplied through a panel mounted avionics master switch. The STX 165 can be turned off by pressing and holding the Power button for three seconds. It can be turned on again by momentarily depressing the Power button.

The Power button has two additional functions. One is as an Escape mode. If the operator is in a programing mode and wishes to escape to the main page, he can press the Power button momentarily. This will cancel all programming and show the normal display page.

The power pushbutton is also used to start the counters. This is explained in the counter section.

SBY: The STX 165 is in standby mode and will not respond to radar interrogations.

ON: The STX is on and responding to radar interrogations but is not reporting altitude. This is often referred to as Mode A

ALT: The STX 165 is responding to radar interrogations with altitude information. This is often referred to as Mode C

**Data Knob
Enter Pushbutton**

These are dual concentric knobs with a pushbutton action. The larger Select knob is a momentary switch that is spring loaded. It can be turned clockwise and counter clockwise and will return to center when released. It is used to move the cursor during Code selection and to toggle through the display options in the lower left display (PALT, DALT and OAT). Note that DALT and OAT are only available if the optional Sandia OAT probe model STP 78 is installed.

The smaller inner knob is the Data knob and is used to select the digit value when programing the squawk code and to select the counter function in the lower right display when not in the code selection mode.

The VFR Pushbutton is use to select the VFR Squawk code. Pressing it a second time will recall the previous code.

VFR

The VFR pushbutton has an additional function. Pressing and holding it for three seconds will enlarge the squawk code display. When in this mode the functions on the bottom portion of the display screen will no longer be displayed. Pressing and holding the VFR Pushbutton for three seconds again will exit this mode. This function is useful in high sunlight conditions, particularly with bubble canopies.

IDT Pushbutton

IDT

The IDT is the Ident pushbutton and is depressed when requested by ATC to Ident. The STX 165 remains in the Ident mode for 22.5 seconds. When transmitting Ident, ID will be displayed in the left portion of the display.

When power is first applied to the STX 165, the SANDIA aerospace logo will be displayed along with the unit version number (the last two digits of the part number), the Display software version (D) and the Main software version (M). The current software versions can be seen on the SANDIA aerospace web site at www.sandia.aero.

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After the software versions are displayed, the STX 165 display will revert to the normal operating mode. The upper left portion of the display will show the current transmitter Mode. The upper right portion of the display will show the last code that was selected prior to shut down, the Pressure Altitude (PALT) is displayed in the lower left and Elapsed Flight Time (EFT) in the lower right of the display. The built-in encoder requires a warm up time and the PALT value will show dashes until the proper internal temperature is reached.

The user can set the mode to come on in the ALT mode at start up or at a predetermined altitude differential after takeoff. The same is true for the EFT display. See User Set Up for a discussion of these features.

Code Selection

To select a new squawk code you will use the Data/Select knob and pushbutton:

> Note: The select knob is a spring load alternate action knob. It can be turned both clockwise and counter clockwise and will then return to center.

Press the Enter Pushbutton, the first digit in the squawk code will blink.
Rotate the smaller Data knob until the value of the codes first digit is displayed.
Rotate the larger Select knob clockwise to the stop and then release. The second digit of the squawk code will be blinking, indicating that it can be changed.
Continue repeating the above steps until you have selected the desired squawk code and then Press the Enter Pushbutton.
The new squawk code has been selected and is now being reported to ATC.

Mode Selection

To select the Mode of Operation you will use the Mode Control knob.

Rotate the Mode Control knob to select one of three transmitter Modes.
    SBY   Standby. The STX 165 is on but not responding to ATC interrogations
    ON   The STX 165 is on and replying in Mode A (No Altitude Reporting)
    ALT   The STX 165 is on and replying in Mode C (Altitude Reporting)

Altitude/Temperature Displays

Altitude and temperature information is displayed in the lower left display quadrant. The operator can cycle through the different information by turning the Select knob (the large right side knob).

Pressure Altitude   The STX 165 has a built-in TSO'd altitude encoder. The output of the encoder is pressure altitude and is displayed as PALT. It can be displayed in either feet or meters depending on the user set up configuration

Density Altitude   If an optional SANDIA aerospace OAT probe is installed with the STX 165 it will display Density Altitude, DALT. DALT is based on the current OAT and Pressure Altitude. DALT will be displayed in either feet or meters depending on the user set up configuration

OAT   If an optional SANDIA aerospace STP 78 OAT probe is installed with the STX 165, it will display the current Outside Air Temperature in either degrees Fahrenheit or Celsius depending on the User Set Up selection.

Icing Alert   If an optional SANDIA aerospace STP 78 OAT probe is installed with the STX 165, it will display an Icing Alert in the upper right hand corner of the display when the temperature reaches a user defined temperature. The Snow Flake symbol will blink for ten seconds once the Icing Alert temperature is reached, then remain on solid until the temperature goes above the preset temperature.

| Pressure Altitude	Density Altitude	Outside Air Temp	Icing Alert

Timers

The STX 165 has three timer functions that are displayed in the lower right hand corner of the display. These are Elapsed Flight Time (EFT), an up counter (CNT UP) and a down timer (CNT DOWN). To select a timer rotate the Data knob either clockwise or counter clockwise.

Elapsed Flight Time   When the STX 165 is first turned on the timer function will be initialized on the Elapsed Flight Time (EFT) page. The EFT will begin counting at system turn on or at a predetermined altitude set by the pilot in the User Set Up mode. (Note that this is the differential altitude from when the STX 165 was first turned on.). The EFT can only be reset by turning the unit off.

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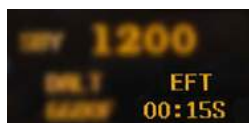
Counter Up

The Counter Up (CNT UP) allows the pilot to time various auxiliary functions. It can be activated and reset at any time. To use the CNT Up function:

1.   Rotate the Data Knob until CNT UP is displayed. It will initialize on 0:00 if has not been used since system start up.
2.   To start the CNT UP, press the Power/Mode control pushbutton.
3.   Press the Power/Mode control pushbutton again and the timer will discontinue counting, and hold the elapsed time.
3.   To start a new timer function press, the Power/Mode control. The CNT UP will reset to zero and begin counting up.
4.   Pressing and holding the Enter pushbutton for three second will reset and hold the CNT UP at 0:00.

Counter Up

Counter Down

The counter down (CNT DOWN) allows the pilot to enter a specific time and then be alerted when that time has expired. This timer is especially useful for timed approaches. When activated, the down timer will count down to zero and then begin counting up. During the counting up phase, the time will be preceded by a plus symbol (+).

1.   Rotate the Data Knob until the CNT DOWN legend is displayed. You will note that the CNT DOWN time default is one minute and zero seconds.
2.   To program a new time, press and hold the Data knob for three seconds. The seconds will begin to blink.
3.   Turn the Data knob to enter the new time. Note that you can program seconds and minutes from the seconds position as the time rolls over whenever you reach 60 seconds. You can also rotate the Select knob to the minutes position if desired.

Counter Down

User Configuration

The STX 165 allows the user to select certain parameters to fit their preferences. It is recommended the user only change these configurations when on the ground. This will keep from interfering with pilot duties and ensure uninterrupted response to ATC radar interrogations.

1.   To enter the User Set UP mode the STX 165 must be in the SBY (Standby) mode.
2.   Press and hold the IDT pushbutton while turning and holding the Select knob counterclockwise for 3 seconds (Note that the select knob will go to a hard stop when rotated approximately an eighth of a turn). The display will read "USER SETUP MODE. PRESS ENTER TO CONTINUE.
3.   Press the Enter pushbutton. Note that if the Enter Pushbutton is not pressed within ten seconds the STX 165 will exit the set up mode.

> **Note: The STX 165 must be in SBY mode to enter the User Set Up Function.**

The first page displayed when entering the user Set Up mode is ALTITUDE UNIT. To access subsequent set up pages, rotate the Data knob.

ALT UNIT   The STX 165 can display altitude in either meters or feet. The category default is feet. To select a different altitude value:
1.   Select the ALT UNIT page.
2.   Rotate the Select knob Counterclockwise to select Meters and Clockwise to select Feet.

TEMP UNIT   The STX 165 will display temperature in either degrees Fahrenheit or degrees Celsius. The factory default setting is Fahrenheit. To select a different temperature unit: While on the TEMP UNIT page rotate the Select knob counterclockwise to select Celsius and clockwise to select Fahrenheit.

ICING ALERT

If a SANDIA aerospace STP 78 OAT probe is installed with the STX 165 the unit will provide an icing alert. The icing alert is a snow flake that appears in the upper right corner of the display whenever a user preset temperature is reached. To set the Icing Alert temperature:

1. Rotate the Data knob to select the ICING ALERT page.
2. Press the Enter Pushbutton. The brackets will extinguish and the Temperature will blink
3. Rotate the Data knob until the desire Icing Alert temperature is displayed.
4. Press the Enter Pushbutton.

EFT START ALT

The STX 165 starts with the EFT displayed in the lower right hand corner of the display. The user can set the EFT to begin counting at turn on or at a specified Alt above the turn on altitude. It the EFT is set at 0, then the EFT will begin counting at turn on. To set the EFT start altitude:

1. Rotate the Data knob to select the EFT START ALT page.
2. Press the Enter Pushbutton. The EFT start altitude will be blinking.
3. Rotate the Data knob to select the desired Auto On Altitude. The altitude will change in 25 foot or 10 meter increments.
4. Press the Enter Pushbutton

A UTO MODE-C ALT

The STX 165 is designed to turn on in the Standby (SBY) Mode. The user can select an altitude at which the STX 165 will automatically select Mode-C (ALT) Mode. This altitude is the differential altitude from when the STX 165 was first turned on. To select an Auto On altitude:

1. Rotate the Data knob to select the AUTO MODE C ALT page.
2. Press the Enter Pushbutton. The Auto Alt On altitude will be blinking.
3. Rotate the Data knob to select the desired Auto On Altitude. The altitude will change in 25 foot or 10 meter increments.
4. Press the Enter Pushbutton

> **Note: If 0 (zero) feet or meters is selected in AUTO MODE C ALT, the STX 165 will turn on in the ALT Mode. This is generally not recommended. If OFF is selected, the pilot will be required to select the ON or ALT Mode.**

> **Note: The Auto On Altitude and the EFT Altitude are the differential Altitudes from when the STX 165 is turned on. For example if the Auto On altitude is set for 200 feet and the STX 165 is turned on at 1200 feet, the STX 165 will automatically select ALT Mode at 1400 feet.**

MIN BRIGHTNESS

The STX 165's digital display automatically adjusts to ambient light conditions. The minimum intensity to which the STX 165 will adjust is set by the user. To set the minimum intensity:

1. Rotate the Data knob to select the MIN BRIGHTNESS page.
2. Press the Enter Pushbutton. The brackets will extinguish indicating the Min Brightness can be adjusted.
3. Rotate the Data knob clockwise to increase the minimum brightness and counterclockwise to decrease the minimum brightness.
4. Press the Enter pushbutton to select the new setting.

Default VFR

The STX 165 comes preset with 1200 as the VFR squawk code. In some instances a different code is desirable for the VFR squawk. To change the VFR squawk code:

1. Rotate the Data knob to select the DEFAULT VFR page.
2. Press the Enter knob. The brackets will extinguish and the first digit of the squawk code will be blink, indicating it can be programmed.
3. Rotate the Data knob to select the first digit of the desired squawk code.
4. Rotate the Select knob. The first digit will go solid and the second digit will blink indicating it can be changed.
5. Continue as above unit all digits are changed to the desired code.
6. Press the Enter Pushbutton. The blinking will stop and the brackets will return indicating the code has been selected

> **Note: It is the pilot's responsibility to insure that the proper squawk code is selected.**

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