Basic Instructions for the Ceptimus Single Channel Transmitter (SCTX)

This is a Single Channel Transmitter (SCTX) emulator, it will allow you to fly your (normal) airplane with the method that was popular in the 1950's and 1960's. Very retro! At that time, technology was not advanced and the control surfaces of your airplane were powered by wound up rubber bands. When the receiver detected a signal from the transmitter, it would power an electromagnet on the escapement (device powered by a rubber band) to move the control surface, (usually rudder), to turn the airplane.

For an explanation of how these things worked, have a look here:
https://www.youtube.com/watch?v=WpJZacj2v-w

The SCTX uses an Arduino for its brain, any ATmega328 compatible device will work. The Arduino UNO, Mini or Nano are all good choices. The programming of the Arduino is done with the Arduino integrated development environment (IDE). The source code and discussion is presented on the singlechannellersreunited on-line forum.

There are three versions presented:

- The first has a 'Rotary knob Encoder' with a click switch for navigating the menus. This option is activated when the // is removed from the second line of the program ("// #define ENCODER").
- The second option has a four buttons Up, Down, Left, Right and a fifth for the Click selection. It is possible to fly your airplane with the buttons but it won't be proportional.
- The third joystick version while a little more complicated to build does also offer a 'Proportional Joystick' mode for flight which is of some advantage, especially with new, untested models.

The menus are the same between all three versions. The firmware downloaded is the same and a directive is used to for compiling either version.

The SCTX also has the some basic telemetry capabilities if fitted with a TX module that supports this.

Powering up your SCTX for the first time.

On all versions, it is necessary to fit the jumper on Pin A5 when powering up for the first time. This invokes a calibration procedure for the joystick (if used) and writes default values to all memory locations. The joystick must be moved to all extremes and then the Push Button (PB) pressed to exit. This is only necessary once and the jumper may be removed.

On powering the SCTX the will display will scroll between the following screens:

Motor time 5:00	Motor time 5:00	Motor time 5:00
1 'Model Name'	Press joy starts	Battery 7.3V

The first displays the current model profile you have selected to fly (you can store settings for twenty seven profiles). The second prompts you to press the Joystick button to start the motor and begin your flight. The third displays the battery voltage in your SCTX, an alarm will sound when the battery voltage falls below a preset value.

OPERATION

Before flying your model for the first time it is necessary to make the correct SCTX settings, mostly the default settings will suffice for all but the most obscure models. Do be careful to check that the control surfaces move in the correct directions! A single PB click should cause the airplane to turn RIGHT, a double click (at the speed of the 'Button delay' setting) will cause a LEFT turn. A very quick PB click should result in the motor stopping or running, this is very important! The motor should be stopped while the timer is 'Paused' and running while it counts down.

Remember that the sensitivity of the control inputs might differ while the motor is running against when it is not running. These are different throws set under **P**ower and **G**lide settings.

The default motor run time is 5:00 minutes, this is easily altered by moving the joystick left/right and this will be add or subtract 10s at a time to the value. Clicking the joystick will begin the motor run and your flight may proceed. Pressing the Joystick again will stop the motor and return the timer to its original value. If you wish to pause the motor during flight then rather use the quick PB click. The SCTX will beep when you have 30s time remaining and again at 10s. A countdown beep will follow at 5,4,3,2 and 1 second before the motor is shut down.

Changing settings is possible while the airplane is flying, you can trim the straight and level and adjust the control throws.

Changing the settings for your airplane.

Whether you have the joystick or the button menu system, 'down' will refer to the button that causes your plane to dive, same as when the joystick is pushed forward.

From the initial screen, moving the joystick down (pushed forward) will present the following programmable options in the following order:

Press to select 1 Unused

This allows you to select a model profile. You are allowed up to twenty seven individual profiles, 'Unused' is the default name of the profile if you have no changed it. Moving the joystick left or right will select the individual profiles and a joystick click will enter it.

Press: edit name 1 Unused

This allows you to give a distinct name to each of your different model profiles. 'Unused' is the default name of the profile if you have not changed it. Click the Joystick to enter function, use the up/down, left/right to modify the name, click the joystick to exit.

Copy model to 1 Unused

This feature will allow you to copy settings for an airplane from the current location to a new one. Select the new location using left/right and click the joystick when done. The new location will become the current profile (careful if you are about to fly the model) and the original location will be untouched.

Rudder centre G 1500uS

This is the centre position of the Rudder, this value can be used for trimming your airplane. 1500us represents middle position of your servo (1000us and 2000us represent the extremes). The **G** indicates this value will be apparent while the airplane is **G**liding (motor is stopped).

Rudder centre P 1500uS

This is the centre position of the Rudder, this value can be used for trimming your airplane. 1500us represents middle position of your servo (1000us and 2000us represent the extremes). The **P** indicates this value will be apparent while the airplane is **P**owered (motor is running).

Rudder 1-press G (Right) 2000uS

This is the position of the rudder when commanded to move Right. One PB press will turn the airplane RIGHT. 2000us Represents full Right extreme, 1500us represents centre. 1750us is 50% right travel. The **G** indicates this value will be apparent while the airplane is **G**liding (motor is stopped).

Rudder 1-press P (Right) 1750uS

This is the position of the rudder when commanded to move Right. One PB press will turn the airplane RIGHT. 2000us Represents full Right extreme, 1500us represents centre. 1750us is 50% right travel. The **P** indicates this value will be apparent while the airplane is **P**owered (motor is running).

Rudder 2-press G (Left) 1000uS

This is the position of the rudder when commanded to move Left. Two PB presses in quick succession will turn the airplane LEFT, this timing is determined by the 'Button Speed' setting. 1000us Represents full left extreme, 1500us represents centre. 1000us is extreme left travel. The **G** indicates this value will be apparent while the airplane is **G**liding (motor is stopped).

Rudder 2-press P (Left) 1250uS

This is the position of the rudder when commanded to move Left. Two PB presses in quick succession will turn the airplane LEFT, this timing is determined by the 'Button Speed' setting. 1000us Represents full left extreme, 1000us represents centre. 1250us is 50% left travel. The **P** indicates this value will be apparent while the airplane is **P**owered (motor is running).

Elev centre G 1500uS

This is the centre position of the elevator, this value can be used for trimming your airplane. 1500us represents middle position of your servo (1000us and 2000us represent the extremes). The **G** indicates this value will be apparent while the airplane is **G**liding (motor is stopped).

Elev centre P
1500uS

This is the centre position of the elevator, this value can be used for trimming your airplane. 1500us represents middle position of your servo (1000us and 2000us represent the extremes). The **P** indicates this value will be apparent while the airplane is **P**owered (motor is running).

Elevator up G
2000uS

This is the amount the elevator will move up when given three PB clicks. 1000us Represents the upper extreme, 1500us represents no movement, 1750us represents 50% up travel. The earlier systems had 'kick up' elevator for power models and a 'kick down' for gliders (usually). It was not possible to do both, I don't know how this one works. The **G** indicates this value will be apparent while the airplane is **G**liding (motor is off).

Elevator up P
1750uS

This is the amount the elevator will move up when given three PB clicks. 1000us Represents the upper extreme, 1500us represents no movement, 1750us represents 50% up travel. The earlier systems had 'kick up' elevator for power models and a 'kick down' for gliders (usually). It was not possible to do both, I don't know how this one works. The **P** indicates this value will be apparent while the airplane is **P**owered (motor is running).

Elevator down G
1250uS

This is the amount the elevator will move down when given three PB clicks. 1000us Represents the lower extreme, 1500us represents no movement, 1250us represents 50% down travel. The earlier systems had 'kick up' elevator for power models and a 'kick down' for gliders (usually). It was not possible to do both, I don't know how this one works. The **G** indicates this value will be apparent while the airplane is **G**liding (motor is off).

Elevator down P
1250uS

This is the amount the elevator will move down when given three PB clicks. 1000us Represents the lower extreme, 1500us represents no movement, 1250us represents 50% down travel. The earlier systems had 'kick up' elevator for power models and a 'kick down' for gliders (usually). It was not possible to do both, I don't know how this one works. The **P** indicates this value will be apparent while the airplane is **P**owered (motor is running).

Motor off 1000uS

This is the minimum setting for your motor speed controller. This setting will suffice for all but the most obscure types. Some ESC's may require a setting lower than this to arm properly.

Motor on 1750uS

This is the maximum speed setting of your motor, the setting is measured in the width of the pulses sent to the motor, 1000us represents off and 2000us is maximum, 1750us is about 75% maximum speed.

Motor soft start 1000ms

This is the time it will take to accelerate your motor from off to full speed. A sudden start can upset your flight path or damage your gearbox if fitted.

Button speed 250ms

This setting will determine the speed that a button press will reflect in a 'double press', remember, one press is RIGHT and two is LEFT.

Motor control by quick blip? Yes

Moving the joystick left or right toggles this option. One (very) quick press of the button can stop and start the motor, the countdown timer will stop while the motor is off and the control surfaces will move with a different proportion while the motor is on compared to while it is off. These proportions are adjustable and can be set to be the same if desired.

Press Joy starts servo sweep

Pressing the joystick will sweep your servo's from one side to the other, this is good if you wish to test your servos or control surfaces for binding or other problems. A number between 1 and 9 is displayed that represents the amount of servo movement, moving the joystick left or right will increase or decrease this number. 1 Represents the minimum servo travel while 9 represents the maximum, note that if the servo travels too far it may lead to damage to your servo or control surfaces. Pressing the Joystick will exit this mode.

Press joy starts joystick mode

This will allow proportional Joystick mode for flying, to exit this mode requires switching the SCTX off and then on. Probably not best to do while flying.

Low battery alarm 6.6V

By moving the joystick left or right this value can be changed, 6.5V is the minimum allowed. It is recommended to set this a little higher as some batteries exhibit a rapid discharge when they are close to flat.

Appendix A

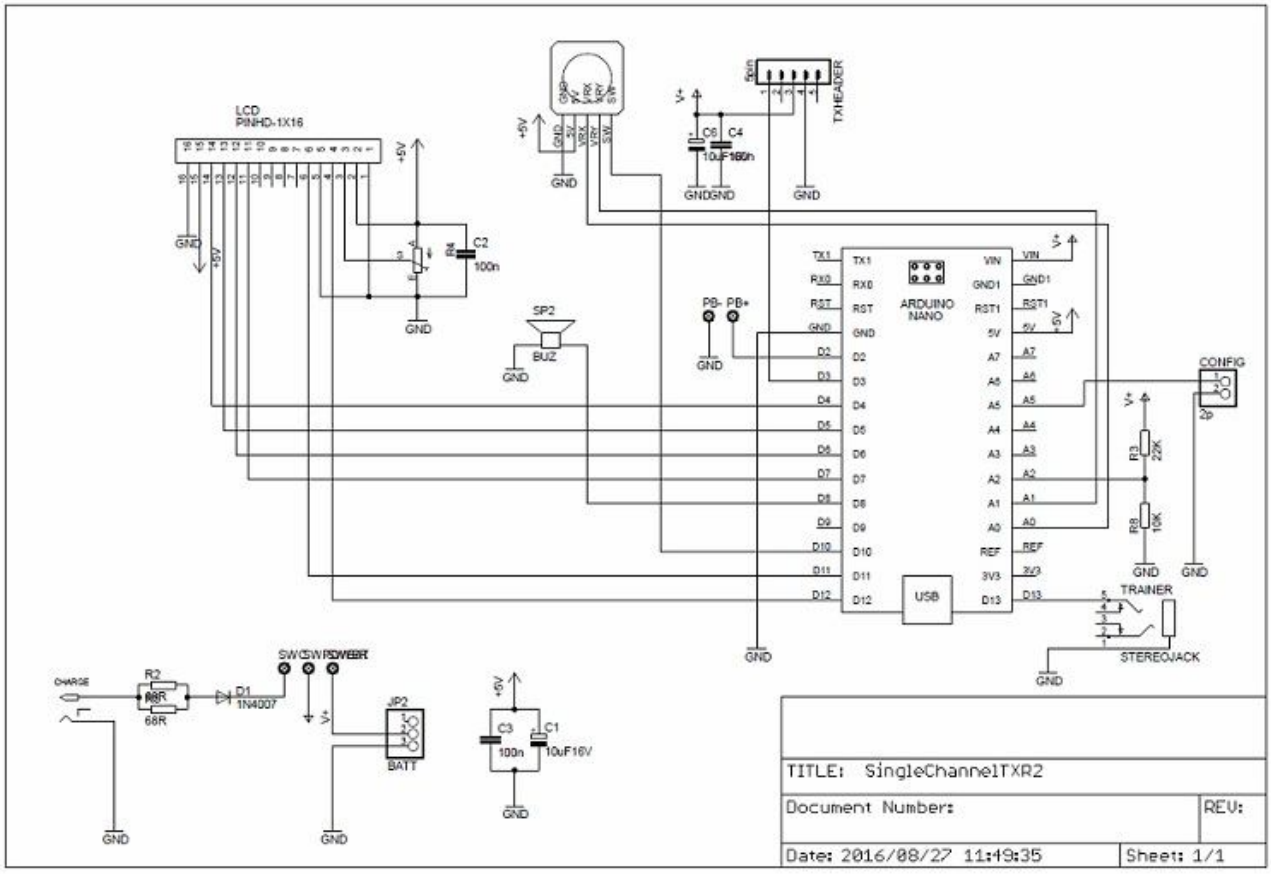
List of components required and sources:

This transmitter design is presented here:
http://singlechannellersreunited.co.uk/phpbb3/viewtopic.php?f=6&t=396

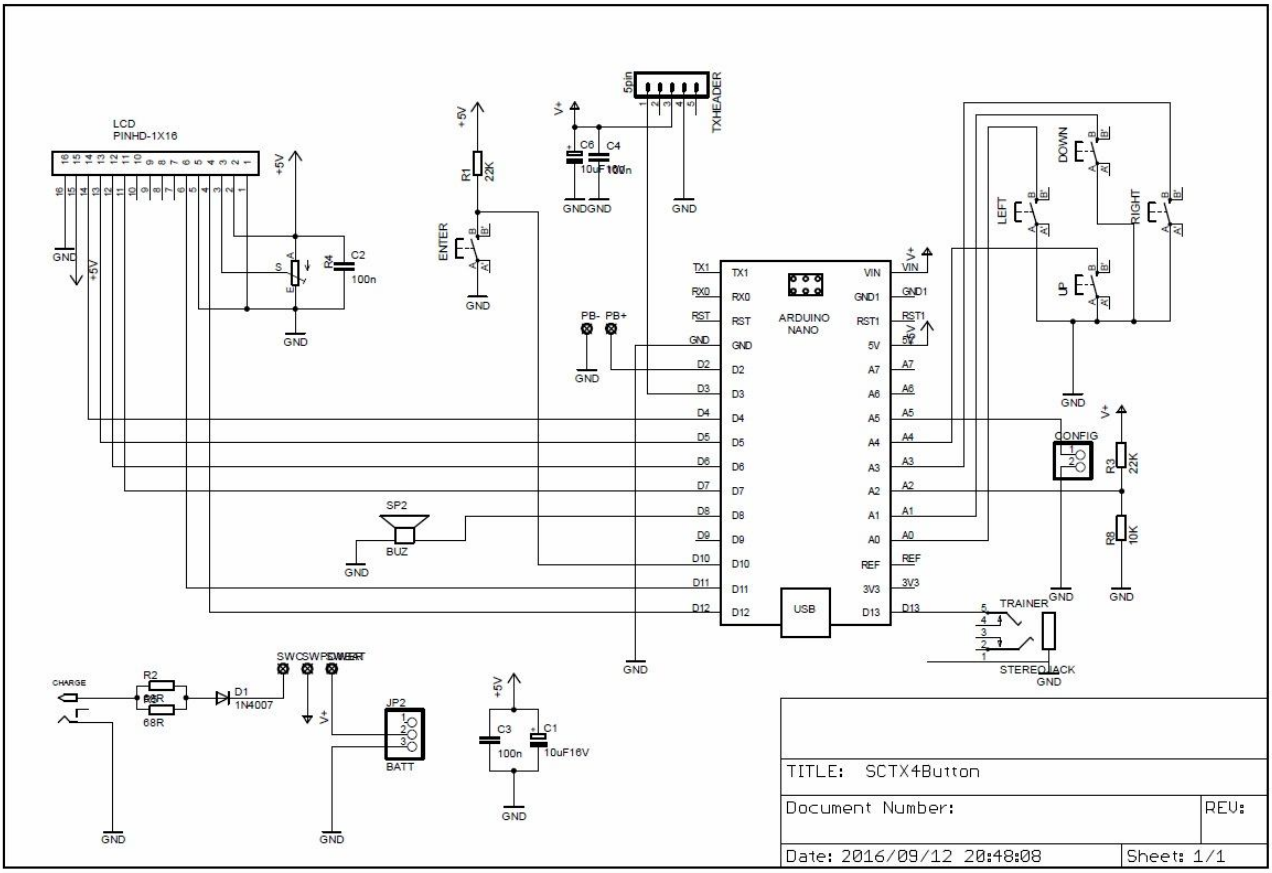
The Arduino software can be found here:www.arduino.cc

The latest version of the Arduino software was Ver1.6.8 at time of writing. There is a version for Windows, Apple and Linux. Some knowledge of programming Arduino's would be helpful but is not essential. An Arduino UNO, Nano or …. may be used in your SCTX as they all use the same microchip (ATmega328). The Arduino development software must be downloaded and installed on your PC for programming the microchip. The latest revision at the time writing of the SCTX firmware can be found here:
http://singlechannellersreunited.co.uk/phpbb3/viewtopic.php?f=6&t=396&start=220#p5725

SCTX Circuit diagram, Joystick version



SCTX Circuit diagram, button version



Enjoy your SCTX and be responsible at all times!