Timpdon Marine

User programmable servo scaling.

For Channels with centre detent joystick
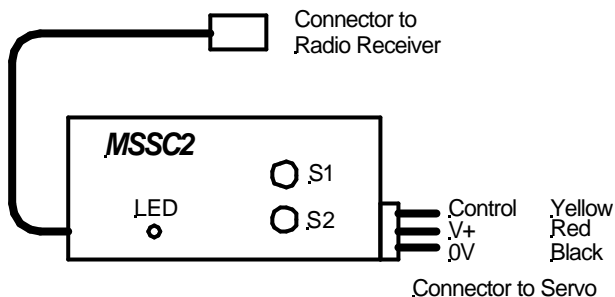
Inline adaptor - fitted between RC receiver and servo.

Powered from RC receiver

Features

- Three user programmable servo positions, corresponding to RC transmitter joystick **minimum**, **centre** and **maximum**, with proportional linear control between.

- Can be re-programmed in-situ at any time, using built-in push button switches.

- Programmed settings retained when power removed.

- Ideal for precise control of helm servos and electronic speed controllers.

- Accommodates servo position and transmitter pulse widths in range 0.8 ms to 2.3 ms.

- Digital microprocessor controlled.

- Small size – 45mm x 18mm x 12mm.

- Mounted inline between RC receiver and servo – powered from receiver.

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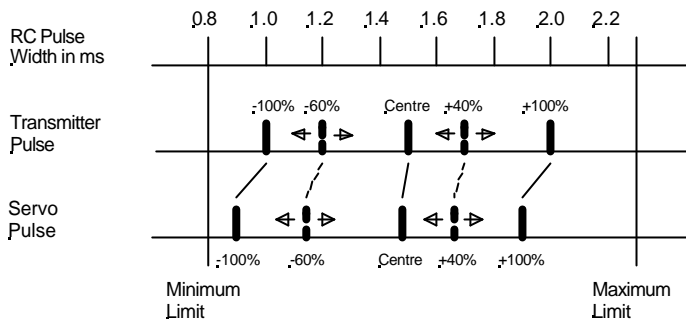**EMail marine@timpdon.co.uk**

Installation and Wiring

1   Connect the flying lead to the selected channel of radio receiver.

2   Connect your servo to the 3 pin plug on the *MSSC2*, with the black servo lead adjacent to edge of unit, and the yellow or white data lead towards the middle.

3   Power up both the receiver and the transmitter.

4   There is a four second delay on start-up to permit the receiver to bind to the transmitter. During this period, the **LED** will flash.

5   Check that, once the receiver has bound to the transmitter, the **LED** on the *MSSC2* illuminates continuously. This indicates that the *MSSC2* is receiving valid RC pulses.

6   Check that, as the transmitter joystick is moved from **minimum** to **maximum**, the servo rotates smoothly between two end positions, with the **centre** position approximately halfway between.

7   Now program the *MSSC2*, as described below, for the required servo **minimum**, **centre** and **maximum** positions on your system.

      On completion of programming, the programmed settings will be saved in non-volatile memory, and the system will automatically re-boot in normal operation mode.

8   Your system is now ready for use.

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Principles of Operation

1   In a standard RC system, with a centre detent joystick, the output
        from each receiver channel is a variable width pulse, nominally
        between 1.0 ms and 2.0 ms in width, repeated at intervals of
        approximately 20 ms.

2   A pulse width of 1.0 ms corresponds to the transmitter joystick at
        minimum, 1.50 ms to **centre** and 2.0 ms to **maximum**. The servo
        rotation between **maximum** and **minimum** is usually
        approximately 90°, for a standard servo.

3   Within the *MSSC2*, you can calibrate the unit so that the pulse
        widths output to the servo at the **minimum** , **centre** and
        maximum transmitter joystick positions correspond to different
        pulse widths from those transmitted.

4   These pulse widths can be set anywhere within the limits 0.8 ms to
        2.3 ms, thus permitting either a smaller or larger servo rotation
        than standard for a given movement of the transmitter joystick.

5   In addition, to accommodate non-standard transmitters, the *MSSC2*
        will also accommodate transmitted pulse widths in the range 0.8 ms
        to 2.3 ms.

6   Once the *MSSC2* has been programmed, then every time a new
        transmitter pulse is received, once every 20 ms, the output pulse
        width to the servo is re-calculated using the formulae below, and
        transmitted to the servo.

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For joystick positions between **minimum** and **centre**:

$$OPW = OP_{ctr} - \frac{(IP_{ctr} - IPW)}{(IP_{ctr} - IP_{min})} * (OP_{ctr} - OP_{min})$$

For joystick positions between **centre** and **maximum**:

$$OPW = OP_{ctr} + \frac{(IPW - IP_{ctr})}{(IP_{max} - IP_{ctr})} * (OP_{max} - OP_{ctr})$$

Where

IP_{min}	=	Input pulse width in ms at joystick **minimum**
IP_{ctr}	=	Input pulse width in ms at joystick **centre**
IP_{max}	=	Input pulse width in ms at joystick **maximum**
IPW	=	Current input pulse width In ms
OP_{min}	=	Servo output pulse width in ms at joystick **minimum**
OP_{ctr}	=	Servo output pulse width in ms at joystick **centre**
OP_{max}	=	Servo output pulse width in ms at joystick **maximum**
OPW	=	Current servo output pulse width in ms

The values of IP_{min}, IP_{ctr}, IP_{max}, OP_{min}, OP_{ctr} and OP_{max} are determined during the calibration programming procedures, and are stored in non-volatile memory.

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                          EMail marine@timpdon.co.uk

7   The net result of these calculations is that, as the joystick is moved between **minimum**, **centre** and **maximum** positions, the servo output will move smoothly between the calibrated **minimum**, **centre** and **maximum** output positions. The servo output **centre** position will always correspond to the programmed joystick **centre** position.

Programming

Programming or re-programming may be performed at any time, using push button switches **S1** and **S2**, with indication provided by the **LED.**

Programming is performed in three steps, in order – **Set Minimum Joystick Position**, **Set Centre Joystick Position** and **Set Maximum Joystick Position**

The **minimum**, **centre** and **maximum** positions of both the joystick and the servo outputs may be set anywhere within their operating ranges, subject to a limitation of RC pulse widths of 0.8 ms to 2.3 ms, as described above . In addition, the **centre** position must lie **between** the **minimum** and **maximum** positions.

Programming Procedure

First, ensure that the transmitter is on, that the receiver is bound to the transmitter, and that the **LED** on the *MSSC2* is **on**, indicating that valid pulses are being received.

Then press and hold both switches **S1** and **S2** together.
The **LED** will flash rapidly for about 5 seconds, and then go off.
Then release both switches.

If you release either switch before the LED stops flashing, the unit will remain in normal operation.

1   You are now in **Step 1 – Program Joystick Minimum**

The **LED** will flash with **short** flashes, and the servo will move to the current **minimum output** position.

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Adjust the required **minimum output** position using either **S1** to increase the servo position or **S2** to decrease it. The actual rotation direction is servo dependent.

When satisfied, ensure that the transmitter joystick is in the required minimum input position.

Then press and hold both switches **S1** and **S2** together.

The **LED** will flash rapidly for about 2 seconds, and then go on continuously.
Then release both switches.

If you release either switch before the LED stops flashing, the unit will remain in program Step 1.

The unit will then determine and save the values of IP_{min} and OP_{min} to non-volatile memory, and automatically proceed to program **Step 2**.

2   You are now in **Step 2 – Program Joystick Centre**

The **LED** will flash with **equal** flashes, and the servo will move to the current **centre output** position.

Adjust the required **centre output** position using either **S1** to increase the servo position or **S2** to decrease it. The actual rotation direction is servo dependent.

When satisfied, ensure that the transmitter joystick is in the required centre input position.

Then press and hold both switches **S1** and **S2** together.

The **LED** will flash rapidly for about 2 seconds, and then go on continuously.
Then release both switches.

If you release either switch before the LED stops flashing, the unit will remain in program Step 2.

The unit will then determine and save the values of IP_{ctr} and OP_{ctr} to non-volatile memory, and automatically proceed to program **Step 3**.

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3   You are now in **Step 3 – Program Joystick Maximum**

The **LED** will flash with **long** flashes, and the servo will move to the current **maximum output** position.

Adjust the required **maximum output** position using either **S1** to increase the servo position or **S2** to decrease it. The actual rotation direction is servo dependent.

When satisfied, ensure that the transmitter joystick is in the required maximum input position.

Then press and hold both switches **S1** and **S2** together.

The **LED** will flash rapidly for about 2 seconds, and then go on continuously.
Then release both switches.

If you release either switch before the LED stops flashing, the unit will remain in program Step 3.

The unit will then determine and save the values of IP_{max} and OP_{max} to non-volatile memory.

The **LED** will then flash rapidly for about 4 seconds to indicate completion of programming, and then the *MSSC2* will automatically reboot in normal operation mode, with the new programmed settings operational.

The *MSSC2* is now ready for use.

Notes on Programming

1   Once you have entered programming mode, there is no exit until all programming steps have been completed. If you enter programming mode inadvertently, and you do not wish to re-program the unit, remove and re-apply power, to restart in normal operation mode.

2   Remember that new values of IP_{min} and OP_{min} are saved as soon as you exit programming **Step 1**.

Therefore, once you reach program **Step 2,** you must complete the programming procedure. Otherwise, the programming may not give you the results you want.

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                        EMail marine@timpdon.co.uk

3   Remember that, on exit from each program step, the unit reads the current **minimum**, **centre** or **maximum** joystick position and assigns the setting read to IP_{min}, IP_{ctr} or IP_{max}, as appropriate.

You must ensure that the transmitter joystick is correctly set to the required **minimum**, **centre** or **maximum** position in each case, **before** pressing both the **S1** and **S2** switches to exit a programming step, or the programmed results will not be valid.

If you make an error during programming, simply repeat the programming procedure after the unit has re-booted in normal operation mode.

4   Remember that both the joystick and output **centre** settings **must be between** their respective **minimum** and **maximum** settings.

In addition, both input and output **maximum** and **minimum** settings must have pulse widths differing by no more than 0.75 ms from their respective **centre** settings. This restriction limits slightly how far you may program each **centre** setting from its true mid position.

If you attempt to exceed this level on any setting, the respective joystick or servo setting **maximum** or **minimum** setting will be restricted automatically to the 0.75 ms difference value.

5   If you set the transmitter joystick **minimum** and/or **maximum** positions to positions other than their appropriate end stops, the programming will still be valid between the programmed positions.

In this case, however, moving the joystick outside the programmed **minimum** and **maximum** positions, in normal operation, will have no effect, and the servo output position will remain at either the programmed **minimum** or **maximum** position, as appropriate.

Timpdon Marine   **Tel   0161 - 980 8054**   Issue 2 – May 2011
                          Web www.timpdon.co.uk
                          EMail   marine@timpdon.co.uk