Timpdon Electronics

Designing Crossing Gate Controllers Using ServoSwitches Models SCS1 & SCS2

Introduction

ServoSwitches Models ***SCS1*** and ***SCS2*** provide an elegant, simple and cheap solution to the problem of generating controlled rotary motion between two end points, using standard RC servos for the control of, for example, crossing gates and semaphore signals.

Both models incorporate the following features:

- User programmable servo end points and rotation speed.
- Optional user programmable end of travel bounce levels for realistic simulation of, for example, semaphore signal arms.
- Small size.
- 4.8V to 6V battery supply.

In addition, Model ***SCS2*** incorporates an additional sense output which switches at each end of the servo travel. The use of this output permits units to be daisy-chained for sequential operation and allows a simple implementation of multi-gate crossings and crossings with distant and/or home signals.

This technical note gives wiring diagrams for a number of typical crossing gate implementations, using only ***SCS1*** and ***SCS2*** ServoSwitches.

It must be accepted, however, that there are some limitations in the complexity of operating sequences which can be implemented in this manner. These are discussed at the end of this note, together with outline details of a more advanced crossing controller available from *Timpdon Electronics*.

Simple Two Gate Crossing Controller

Figure 1 shows a simple implementation of a two gate crossing controller.

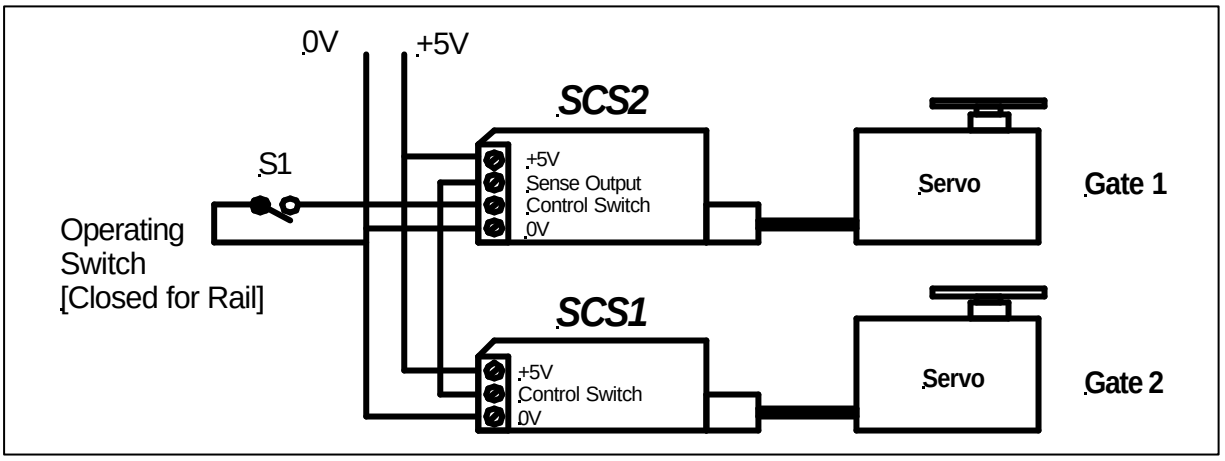


Figure 1 – Simple Two Gate Crossing Controller

When the operating switch is set to **Rail**, **Gate 1** closes first followed by **Gate 2**. When reset to **Road**, the gates open in the same order.

The **Gate 2** controller can use either an ***SCS1*** or ***SCS2*** ServoSwitch.

For additional gates, simply daisy-chain additional ***SCS2*** controllers, but remember that each gate will only start moving when the previous gate has completed its travel, and that gates will open in the same order in which they close.

Figure 2 shows a development of the simple crossing controller to include a home signal ahead of the crossing.

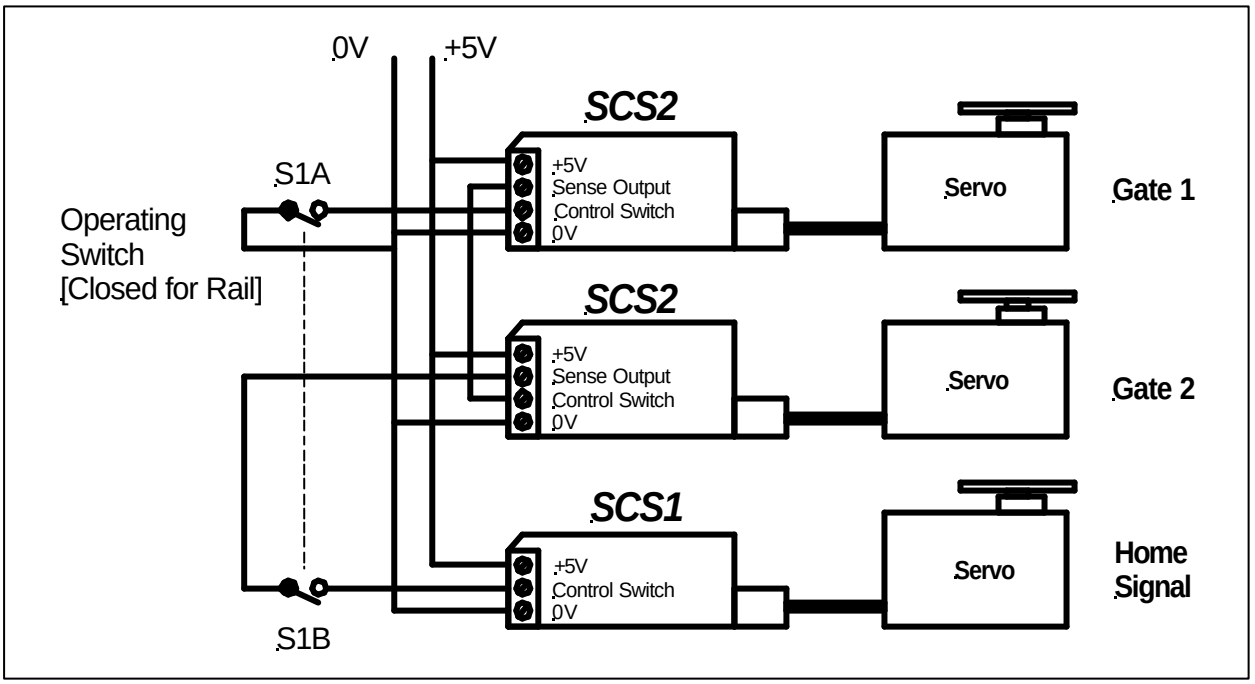


Figure 2 – Two Gate Crossing Controller with Home Signal

As before, the gates operate in sequence, but now the Home signal is cleared after **Gate 2** has finished closing, when the operating switch is set for **Rail**.

Switch **S1B** is required to ensure that the Home signal is reset as soon as the operating switch is returned to the **Road** setting, before the gates start opening.

Gates will open and close in the same order.

Figure 3 shows a further development of the crossing controller to include home signals ahead of the crossing, on both Up and Down lines.

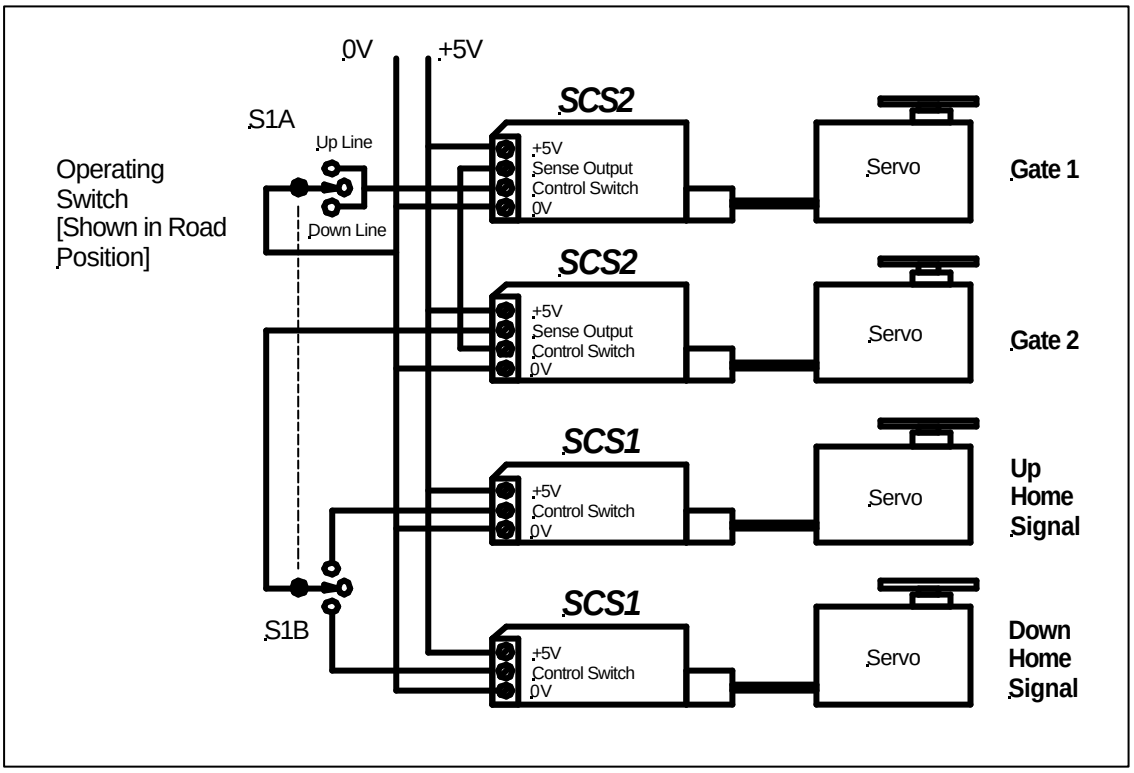


Figure 3 – Two Gate Crossing Controller with Home Signals on both Up and Down Lines

To permit differentiation between Up and Down Lines, the control switch must now be a three position **on-off-on** type.

The appropriate Home signal is triggered depending on the direction of travel. Switch **S1B** again ensures that the signal is reset immediately when the switch is set back to the **Road** position, before gates start moving.

Two Gate Crossing Controller with Home and Distant Signals on Both Up and Down Lines

Figure 4 shows a further development of the crossing controller to include distant as well as home signals ahead of the crossing, on both Up and Down lines.

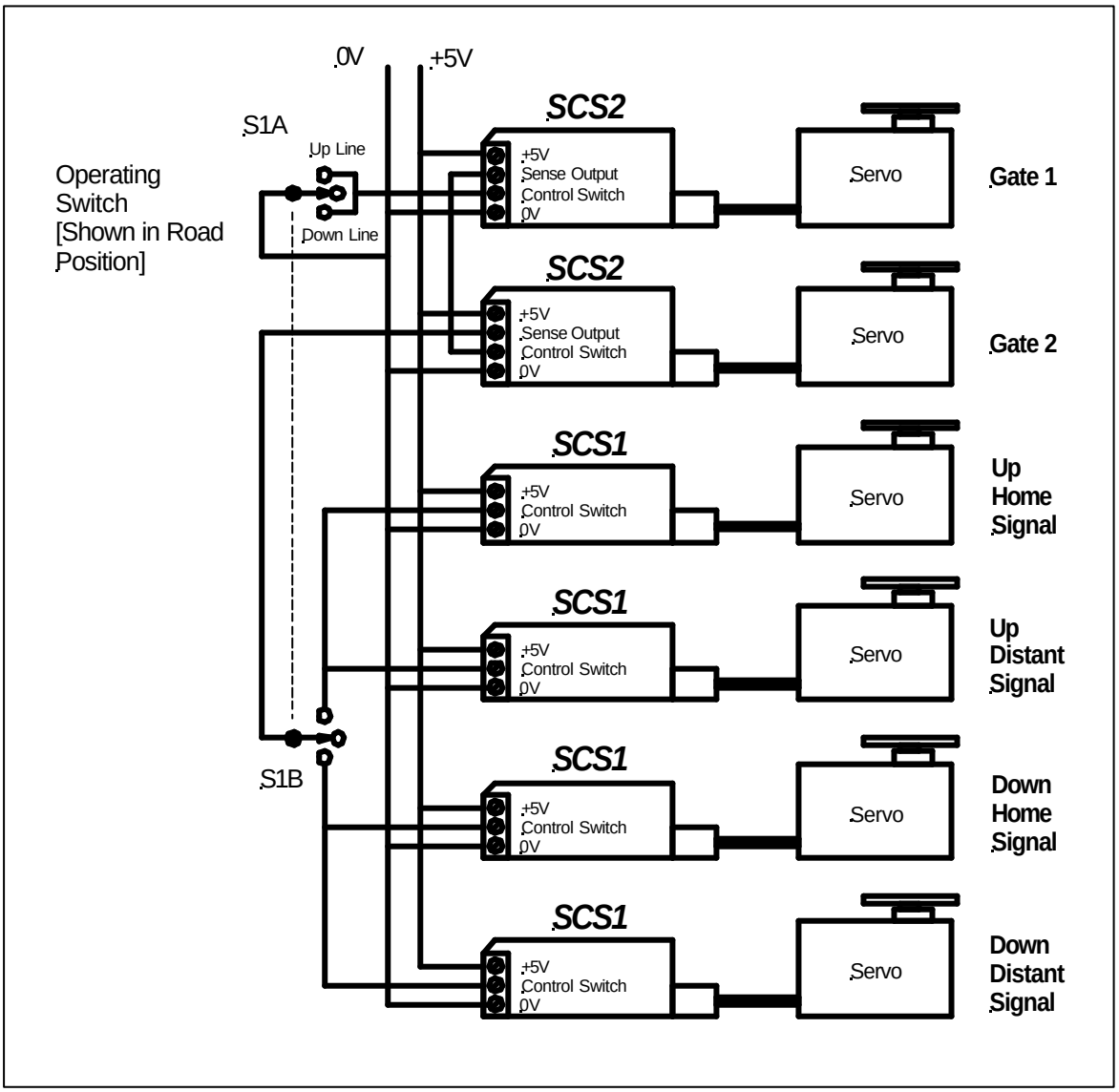


Figure 4 – Two Gate Crossing Controller with Home and Distant Signals on both Up and Down Lines

To permit differentiation between Up and Down Lines, the control switch must be a three position **on-off-on** type.

The appropriate signals are triggered depending on the direction of travel. Both Home and Distant signals operate together.

Switch **S1B** ensures that the signals are reset immediately when the switch is set back to the **Road** position, before gates start moving.

Cautionary Notes

Control Switch Delay

When a number of crossing gates are daisy chained for sequential operation, you must be careful to ensure that a gates open or gates closed sequence is not initiated from the control switch until the previous opposite sequence has completed for all gates.

This is especially important where gates overlap, as a gate clash may otherwise result.

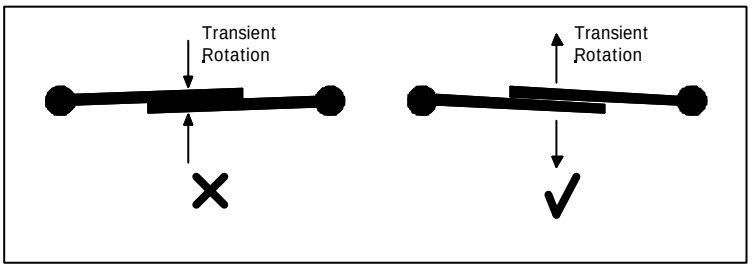
The ***SCS2*** ServoSwitch has an optional programmable control switch delay, to ensure that any change of control switch position will not be acted upon for a period of ten seconds after the completion of a servo movement. This delay permits the operation of a second gate to also complete before reversal of gate movement is possible, irrespective of when the control switch is operated, thus minimising the likelihood of an inadvertent gate clash.

You are strongly recommended to program this delay on the ***SCS2*** ServoSwitch directly connected to the control switch. Refer to the ***SCS2*** User Manual for details.

Overlapping Gates

When ***SCS1*** and ***SCS2*** ServoSwitches are energised at power up, the servos may exhibit a short transient period of rotation before stabilising at their correct position. This rotation is always in the same direction, usually clockwise when viewed on the end of the servo shaft.

If your layout has overlapping gates, you should design the overlap so that this motion separates the gates during this transient period, rather than clashing them, as shown below.



Limitations of Crossing Control Using Only Daisy-Chained ServoSwitches

There are a number of limitations in implementing complex crossing sequences using only daisy-chained ***SCS1*** and ***SCS2*** ServoSwitches. These can be summarised as follows:

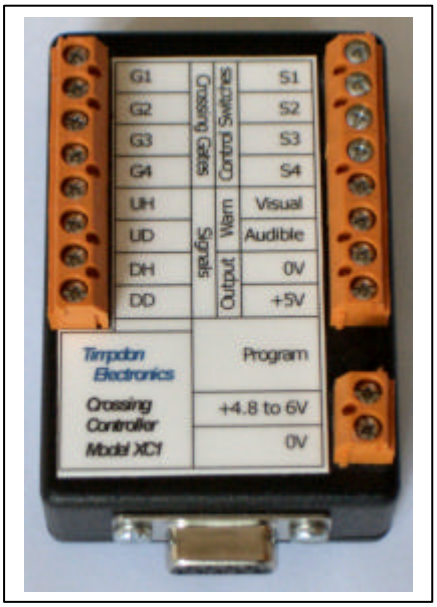
- The order of operation of daisy-chained ServoSwitches is the same in both directions of operation – this may cause problems on multi-gate crossings with overlapping gates where the opening order must be the reverse of the closing order.
- Sequential operation of ServoSwitches requires that the motion of the first must be completed before motion of the following and subsequent ServoSwitches will begin.
- It is difficult to simulate correctly the operation of home and distant signals when returning to the road position. Strictly, the Distant signal should be reset first, followed by the Home signal, before the gates start to move.

For many layout owners, these limitations will be a minor price to pay, because of the simplicity of the various circuits described above.

For those who really want exact prototypical operation, however, *Timpdon Electronics* in an advanced development stage of a more complex crossing controller, again using ***SCS1*** and ***SCS2*** ServoSwitches to provide motive power, which permits the implementation of multi-gate crossings and signals without any of the limitations described above. An outline specification of this unit is given below.

Timpdon Electronics Advanced Crossing Controller – Model XC1

Outline Specification



- Up to four independently controlled crossing gates
- Up and Down Lines
- Home and Distant Signals
- Audible and visual warnings
- Fully user programmable using custom PC program – 23 separate programmable parameters
- Exact prototypical operation
- Manual switch or train trigger operation using magnets and reed switches