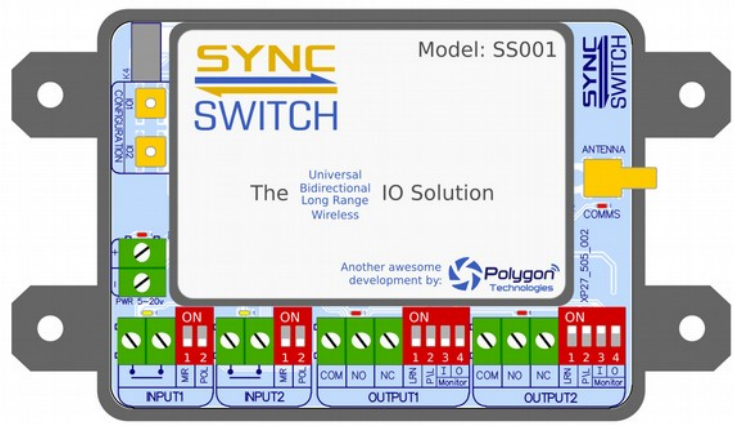
User Manual for SS001

Revision: V1.00 Last Edited XX Feb 2025



Before Attempting to connect or operate this product, please read these instructions in its entirety.

Changelog:

CDH – February 2025 – Initial Release of SyncSwitch

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1. Specifications

Model Number	SS001
Weight	100 grams
Dimensions	125 x 72 x 26 mm (including tabs)
Power Supply	5-20VDC
Power Consumption	< 1W
Operating Temperature	-10°C to +60°C
Outputs Type	2 x Relay Contact rating: 10Amp MAX
Inputs Type	2 x Dry Contact Inputs
Wireless Frequency	434MHz
Wireless Transmission Power	15dBm
Wireless Range	15km+ (Line-Of-Sight)

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2. Wireless Technology

2.1. LoRa Technology

SyncSwitch uses LoRa modulation technology at 433MHz. This technology is what allows the massive wireless range. Please note that SyncSwitch does not implement the so-called "LoraWan" specification, but instead a networking protocol known as "PolyWan".

LoRa, being a spread-spectrum technology, prevents multi-path fading, and allows the signal to sometimes reach its destination by bouncing against far-off features, and often provides reliable communication even in cases where clear line of sight is not possible.

2.2. SyncSwitch Transmissions

SyncSwitch transmissions are between paired stations only. This allows multiple SyncSwitch systems to operate in the same vicinity without any issues. It also allows multiple SyncSwitch systems to communicate via the same repeater network without any issues.

Each transmission from a paired SyncSwitch is acknowledged by the receiving SyncSwitch. This way we can be sure the message will always come through. The very first message is always sent at minimum transmit power. If no acknowledgment is received, the transmission is repeated up to 7 times, each time at a higher power level. During transmissions, the Comms LED on the SyncSwitch will turn on. Once a message is acknowledged, the sending SyncSwitch will take note of the power level that was successful and will use that in future transmissions.

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3. Installation

3.1. Mounting

SyncSwitch is supplied in a plastic housing. It is not waterproof and must be installed in a suitable location where it is not exposed to water, dust, insects etc. It has 4 x mounting tabs that make it easy to mount to any surface.

3.2. Power Supply

SyncSwitch draws a modest average current of around 15mA, but can be up to 100mA during transmissions. It normally requires a DC power supply of 5-20V. In the case of a battery supply, it is able to work down to about 4.0V.

3.3. Antenna

The SyncSwitch needs a suitable antenna to be connected to the Antenna port. It must be matched to 50ohm at 433MHz and must have an SMA (normal polarity) connector. Your SyncSwitch supplier should have a selection of Antennas available.

Magnetic Base Antenna

These Antennas should be placed on a metal surface for best results. They are generally an economical solution, but they are not really weatherproof, so they need to be installed indoors, which will degrade the range you can expect.



Rugged Outdoor Antenna

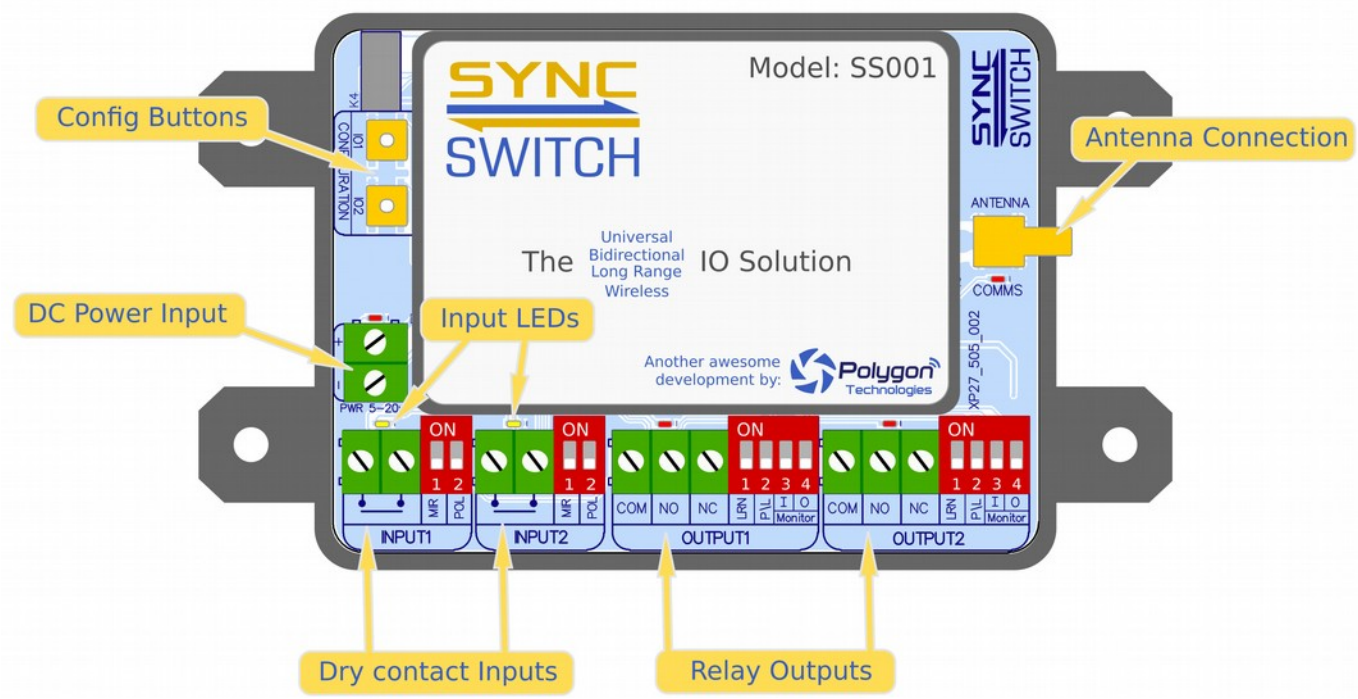
These are antennas are significantly more expensive, but delivers excellent value for money with fantastic signal characteristics and they are designed to be mounted outdoors on a pole. They are supplied with an integrated metal mounting bracket and a 2m low loss signal cable that connects directly to your SyncSwitch device. If you need long range, then this is the correct antenna.



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4. Overview

4.1. Overview - General Layout



Each output has a 4way DIPswitch associated with it.

Each input has a 2way DIPswitch associated with it.

There are also 2 x Config buttons, one for IO1 and one for IO2.

IO1 Button is used for configuring input 1 and output 1

IO2 Button is used for configuring input 2 and output 2

For inputs, the button is used for pairing and setting hold times.

for outputs, the button is used for setting pulse times

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4.2. Overview - Pairing principle

An input on one SyncSwitch device must be paired to an output on a different SyncSwitch in order to control it.

See "section 4.1 -How to pair" for how to get this done

Each input has a unique ID that is set at the factory. The outputs each have non-volatile memory to remember up to 7 IDs from inputs that are paired to it. The output needs to be in a mode where it is sensitive to incoming pair messages before it will accept pair requests. The input must be set into a special mode in order to send a pair request.

Since each input has a unique ID, and each output has its own storage space, this means that each input and each output operates independently. Any input can be paired with any output, with the exception that an input on a given device cannot be paired to an output on that same device. The fact that there are 7 memory locations for each output means that up to 7 inputs can be paired to a single output. There will operate in the OR configuration, so that (specifically when the output is set to pulse mode) any signal from any of the (up to 7) paired inputs can cause the output to be activated.

Take note: Up to 7 inputs can be paired with a single output, but each input can only be paired to a single output.

4.3. Overview - Non-volatile parameter settings

There are 5 settings that are kept in non-volatile memory, over and above the 7 input IDs that are available for pairing each of the outputs. These settings are:

* Frequency channel (defaults to channel 1: 433.3MHz)
* Input 1 hold time (defaults to 500ms)
* Input 2 hold time (defaults to 500ms)
* Output 1 Pulse time (defaults to 1sec)
* Output 2 Pulse time (defaults to 1sec)

There are ways to set each of these settings using a combination of Config buttons and DIPswitches.

4.4. Overview - Heartbeat Messages and Channel Health Monitoring

Each message from an input to an output is acknowledged by the output. This assures that the signal goes through. In the case where an input has not triggered for longer than 30 minutes, the input will send a heartbeat message, to be acknowledged by the paired output device. This allows the health of the wireless channel to be confirmed on a regular basis. The health of a wireless channel is said to have failed if an input device fails to get a response to one of its messages, or if an output device fails to receive a message from any of its paired inputs for 40 minutes or longer. The SyncSwitch can use one of its relay outputs to indicate the health of a wireless channel associated with either the adjacent output, or the respective input.

See "5.8: How to use an output to indicate channel health"

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4.5. Overview - Output Options

There are 5 main modes that each output can be in, depending on the state of its DIPswitch. These are:

* **Learn mode** - This is when the output is sensitive to incoming pair messages.
  This is used during setup/installation only.
* **Pulse mode** - Each time any paired input is triggered, the output will activate for a predetermined period.
* **Latch mode** - Each time any paired input is triggered, the output will change state

* **Input Monitor mode** - The output indicates the health of the wireless channel associated with the respective input on the same device. (If this is output 1, it will be monitoring the health of the channel associated with input 1, and the same for 2).
* **Output Monitor mode** - The output indicates the health of the wireless channel associated with the other on the same device. (If this is output 1, it will be monitoring the health of the channel associated with output 2).

4.6. Overview - Input Options

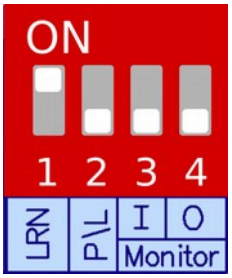
The inputs each has two DIPswitches that are used to select different options. (MIR and POL) Normally, the MIR switch enables mirror mode (discussed later) and the POL switch is used to invert the polarity of the input. When both of these are in the ON position, the input is disabled. The SyncSwitch is shipped in this state, with all inputs disabled. In the disabled state, the input will not generate heartbeat messages.

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5. How-to Section

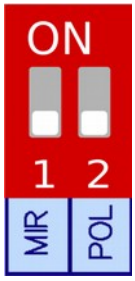
5.1. How to pair an input to an output

Place the output in Learn mode,



To place the output in Learn mode, simply switch ON the LRN DIPswitch (leave the others all in the OFF Learn position)

Place the input in pair mode



To place the input in pair mode, switch off BOTH the POL and MIR DIPswitches, and cycle power.

The input will be in pair mode ONLY for 2 minutes after power-up. Remember this!

Press the associated IO button on the input device.



Simply press the Configuration button on the input device that corresponds to the input you are intending to pair. If you are pairing input 1, then press IO1. If you are pairing input 2, then press IO2.

The input device will send a pair request to the output device that is in pair mode. The output device will save the ID of the input that sent the pair request, and will indicate success by activating the associated relay briefly.

The LED on the pairing input will also flash 3 times to indicate a successful pair. If the input was previously paired already, the pair result will still indicate success. The pair operation will fail if the pairing memory is full. A failed pair is indicated by the input LED flashing furiously quick for a second or so, and the associated output on the paired device will not activate.

After the pairing is complete, any activation on the input that exceeds the built-in hold time will cause a trigger message to be sent and the paired remote output to activate (depending on output mode you selected).

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5.2. How to clear the pair memory on an output



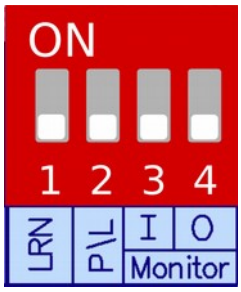
To clear the pair memory for Output 1, switch off power, and hold in IO1, while powering up the SyncSwitch device. The relay for Output 1 will activate 3 times to confirm that the memory is cleared. In the same way, you can use IO2 to clear the pair memory for Output 2.

After clearing the pair memory for an output, it will no longer respond to any trigger messages from previously paired inputs.

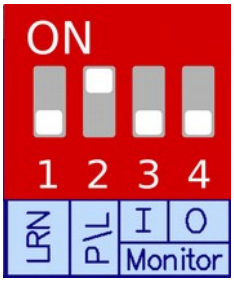
5.3. Select between pulse mode and latching mode

In pulse mode, the Output will pulse on for a specified period each time a trigger signal is received from a paired input. In latching mode, the Output will change state each time a trigger signal is received from a paired input. Assuming the Output has already been paired with one or more remote inputs, you can select between pulse and latch mode using the P/L DIPswitch.

If all DIPswitches are off (including P/L), then the output will operate in pulse mode. If you switch ON the P/L switch, the output will be in latch mode.



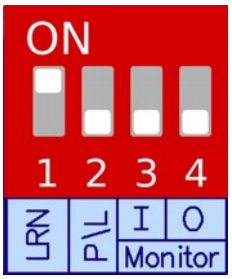
This output is in Pulse mode



This output is in Latch mode

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5.4. How to set the pulse time for an output



To set the output pulse time, you need to switch on ONLY the LRN DIPswitch for the given output, leave all the others off (this is the same state as is used to do the pairing)



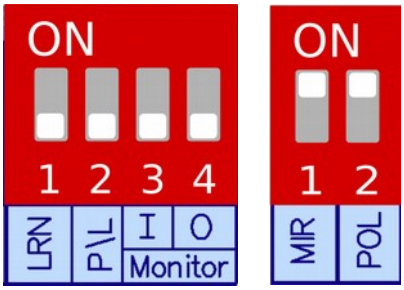
Now simply press and hold the associated IO button for the amount of time you want the output to pulse. The input LED will flash while you do this. If you are setting the pulse time for Output 1, then you will use IO1. If you are setting the pulse time for Output 2, then you will use IO2.

When you release the button, the total time is captured and saved internally.

After you are done, remember to switch OFF the LRN DIPswitch. Remember that the pulse time you just set, only has an influence if the output is in pulse mode.

5.5. How to set the input hold time

Input hold time allows you to specify a time that the input has to be active or inactive before a trigger will be produced.



To set the input hold time for Input 1, first make sure the DIPswitches for OUTPUT 1 (on the same device) are all in the OFF position.

Then switch ON both the POL and MIR DIPswitches on Input 1.



Now press and hold the IO1 button for as long as you want the hold time to be. The input LED will flash while you do this. When you release the button, the total time is captured and saved internally.

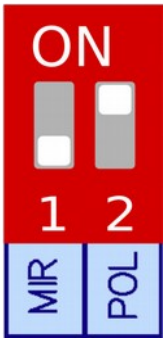
The same process applies if you are setting the hold time for Input 2. You will set Input2 and Output2 DIPswitches in the same way and you will press IO2 to set the hold time.

Remember to switch the POL and MIR DIPswitches OFF when you are done.

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5.6. How to make the input activate when it goes open-circuit?

Normally the input is considered active when the dry contact terminals are shorted. In some cases you may want this to work the other way around, where you want the SyncSwitch input to activate when the dry contact terminals becomes open circuit.

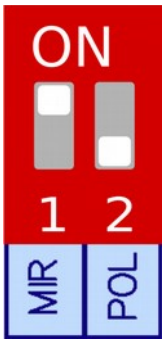


That is what the POL DIPswitch is for. When you switch it on, the input signal is inverted. For the input to now be considered active, the dry contact input terminals must be open circuit.

5.7. How to make an output follow the status of a remote input?

Sometimes you may want the output to always indicate the status of the input. If the input is active, you want the remote output to go active and stay that way for as long as the input is active.

If you need this, then the pulse or latch modes may not suffice. You need "Mirror mode"



That is where the MIR DIPswitch on the input comes in. When the MIR DIPswitch is ON, the input will send a message to the paired output each time the input goes active or inactive (for longer than the saved hold time). The paired output will mirror the input state, regardless of the state of its P/L switch. Thus, the MIR DIPswitch on the input side will override the state of the P/L DIPswitch on the output side.

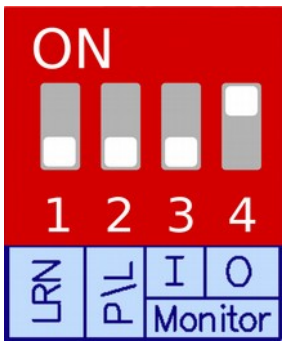
Note that the POL and MIR DIPswitch cannot both be on during normal operation, because this disables the input.

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5.8. How to use an output to indicate channel health?

Indicating Output Health

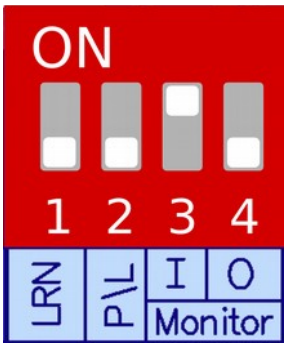
Let us imagine you are using Output 1 on a local SyncSwitch device, perhaps in pulse mode, driven by Input 1 on a remote SyncSwitch device. You want Output 2 on the local SyncSwitch to indicate that the channel associated with Output 1 is in a healthy state.



To do this, we need to set Output2 DIPswitch into "Monitor Output" mode. This is literally all that is needed. If more than 40 minutes elapses without a valid message from each of the inputs that have been paired with Output 1, then Output 2 will become active to indicate a fault. Once a valid message is again received, Output 2 will turn off again

Indicating Input Health

Let us take the previous example, and imagine that we would like to indicate the channel health from both ends. The previous example had us monitoring the channel health from the side of the output. Perhaps we needed to also indicate the health of that same channel from the point of view of the input?

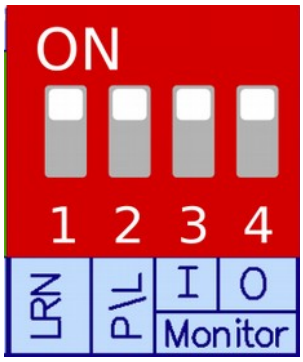


To do this, we use Input Monitor Mode on the remote SyncSwitch device. We need to set Output2 DIPswitch into "Monitor Input" mode. This is literally all that is needed. If any message from Input 1 on the remote SyncSwitch to Output 1 on the local SyncSwitch fails to be acknowledged, then Output 2 on the remote SyncSwitch will activate to indicate a fault. If a future message is successfully acknowledged, the Monitoring output will turn off again.

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5.9. How to set Channel frequency

SyncSwitch is shipped with its channel at the default 433.4MHz (Channel 1). Under 99% of applications, it is not needed (and not recommended) to change this. The only times when this is needed, is when a large number of SyncSwitches are operating within the same area, causing signal congestion.



To change the Channel Frequency, you need to switch OFF power to the SyncSwitch, and then switch ON all 4 DIPswitches on both Output 1 and Output 2. This is normally an illegal state, but if the device powers up with the DIPswitches in this state, it enters the "set Channel Frequency" mode. In this mode, the Input1, Input2 and Comms LEDs together form a display that shows the current channel selection. You can then cycle through the different options by pressing IO1 and IO2 buttons. Once you have selected the appropriate channel, you can switch the DIPswitches OFF on the two outputs. This will exit this mode and save the selected channel.

Channel Selection Table

LED States:			
IN1	**IN2**	**COMMS**	**Channel**
OFF	OFF	FLASH	Channel 0 : 433.2MHz
OFF	FLASH	OFF	Channel 1 : 433.4MHz
OFF	FLASH	FLASH	Channel 2 : 433.6MHz
FLASH	OFF	OFF	Channel 3 : 433.8MHz
FLASH	OFF	FLASH	Channel 4 : 434.0MHz
FLASH	FLASH	OFF	Channel 5 : 434.2MHz
FLASH	FLASH	FLASH	Channel 6 : 434.4MHz
SOLID	SOLID	SOLID	Channel 7 : 434.6MHz

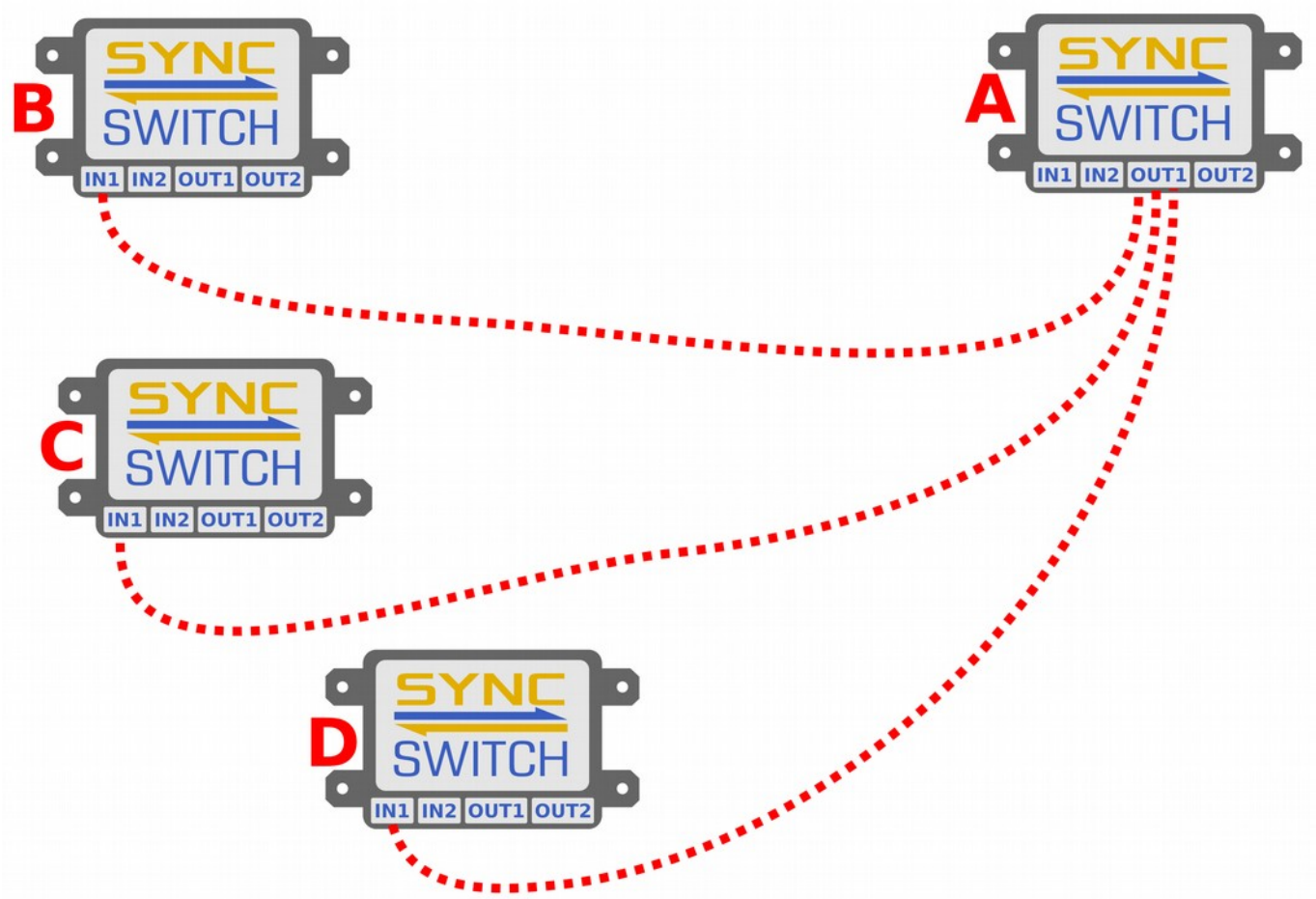
If you change the channel selection, remember that this selection is valid for all wireless channels on the SyncSwitch, so all the SyncSwitches and Repeaters that it is communicating to, will all have to be operating at the same frequency

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6. Examples

6.1. Multiple Remote Inputs controlling a single Output

Here we illustrate how a single output on one SyncSwitch (A) can be controlled by several inputs on remote SyncSwitches (B,C,D). If any of the inputs on the 3 paired SyncSwitches go active, the output on SyncSwitch A will pulse on. This illustrates only 3 devices, but in reality there can be up to 7. It is important to note that while up to 7 inputs can be paired with a single output, each input can only be paired to a single output. (You cannot control multiple outputs from the same input)



This kind of setup can be used to control a remote gate from several locations, where the remote gate is connected to the output of SyncSwitch A, and suitable push-buttons are installed to activate inputs on Devices B,C,D. In this example, we are only using a single input on devices B,C,D and only a single output on Device A.

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How would we configure this?

Step 1: Pair Input1 on Device B with Output 1 on Device A (see 4.1: How to pair an input to an output)

Step 2: Pair Input1 on Device C with Output 1 on Device A

Step 3: Pair Input1 on Device D with Output 1 on Device A

Step 4: Set Output 1 on Device A in pulse mode (All 4xDIPswitches set to OFF)

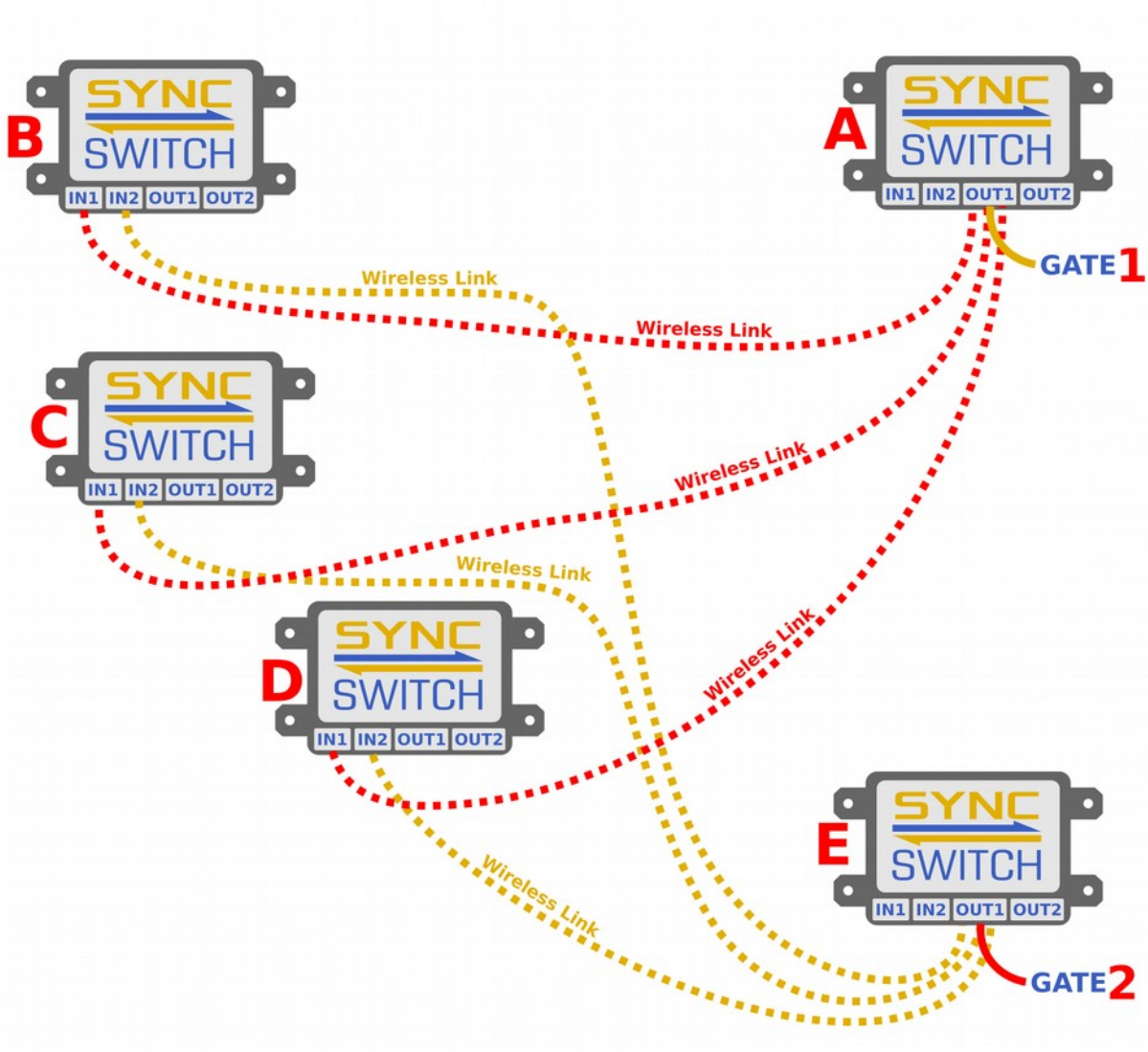
Step 5: Connect push-buttons to input 1 on device B,C,D (See Wiring examples)

Step 6: Connect Gate Motor to output 1 on device A (See Wiring examples)

We could take this example a bit further by imagining that the property in question has two remote gates, and each of them must be controlled from points B,C,D. We can very simply Add another device (E) and pair the inputs appropriately, as in the following example:

6.2. Remote inputs controlling Several Outputs

Here Input1 on devices B,C,D activates Output 1 on Device A, while Input 2 on devices B,C,D activates Output 1 on Device E. It is important to note that while up to 7 Inputs can be paired with a single Output, each Input can only be paired to a single Output. (You cannot control multiple Outputs from the same Input)



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How would we configure this?

Step 1: Pair Input1 on Device B with Output 1 on Device A (see 4.1: How to pair an input to an output)

Step 2: Pair Input1 on Device C with Output 1 on Device A

Step 3: Pair Input1 on Device D with Output 1 on Device A

Step 4: Pair Input2 on Device B with Output 1 on Device E

Step 5: Pair Input2 on Device C with Output 1 on Device E

Step 6: Pair Input2 on Device D with Output 1 on Device E

Step 7: Set Output 1 on Device A in pulse mode (All 4xDIPswitches set to OFF)

Step 8: Set Output 1 on Device E in pulse mode (All 4xDIPswitches set to OFF)

Step 9: Connect push-buttons to inputs 1,2 on device B,C,D (See Wiring examples)

Step 10: Connect Gate Motor1 to output 1 on device A (See Wiring examples)

Step 11: Connect Gate Motor2 to output 1 on device E (See Wiring examples)

What else could we do?

As you can see, we still have lots of unused Inputs and Outputs available. Let us try and think of ways to use more of these functions in the example of remote gates. At present we have 3 control points, each with two push-buttons, wired to Inputs 1 and 2 on Devices B,C,D, controlling Output on Devices A and E.

What if we had a call button installed at gates A and E, each of which should ring a bell at point B, to notify the security guard that there is a person waiting to enter? Could we do that? YES of course we can! Not only this, but many other combinations are also possible, limited only by your imagination.

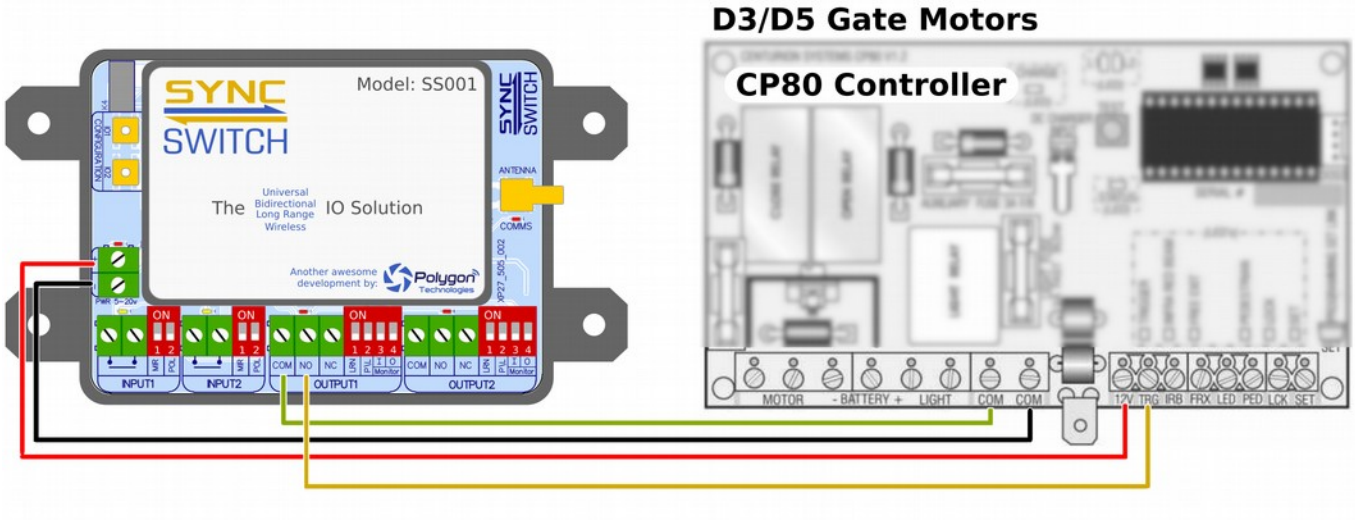
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7. Wiring Examples

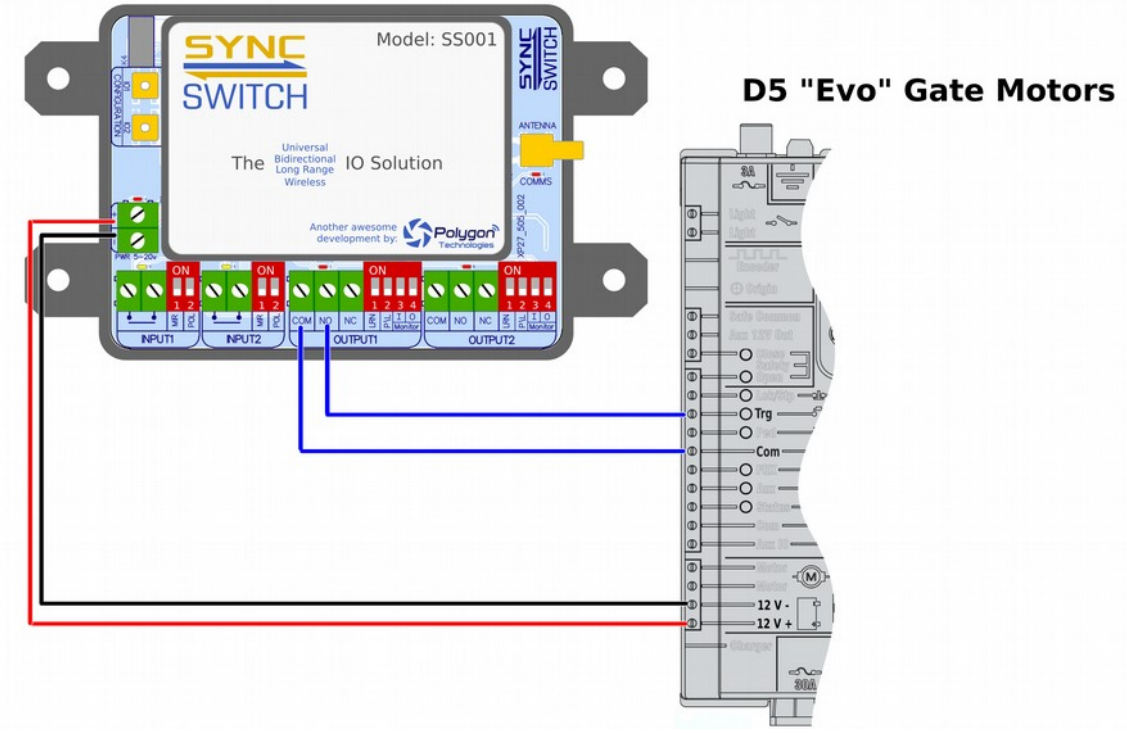
7.1. Gate Motor Wiring

In these examples the assumption is that you want Output 1 on the SyncSwitch to cause an automated gate to open. For this to work, the output must be in Pulse mode. In each case, 12v power is drawn from the gate motor controller, and the COM/NO terminals of Output 1 are wired to the trigger input on the gate controller. Each gate controller is slightly different, but they all follow the same basic principle.

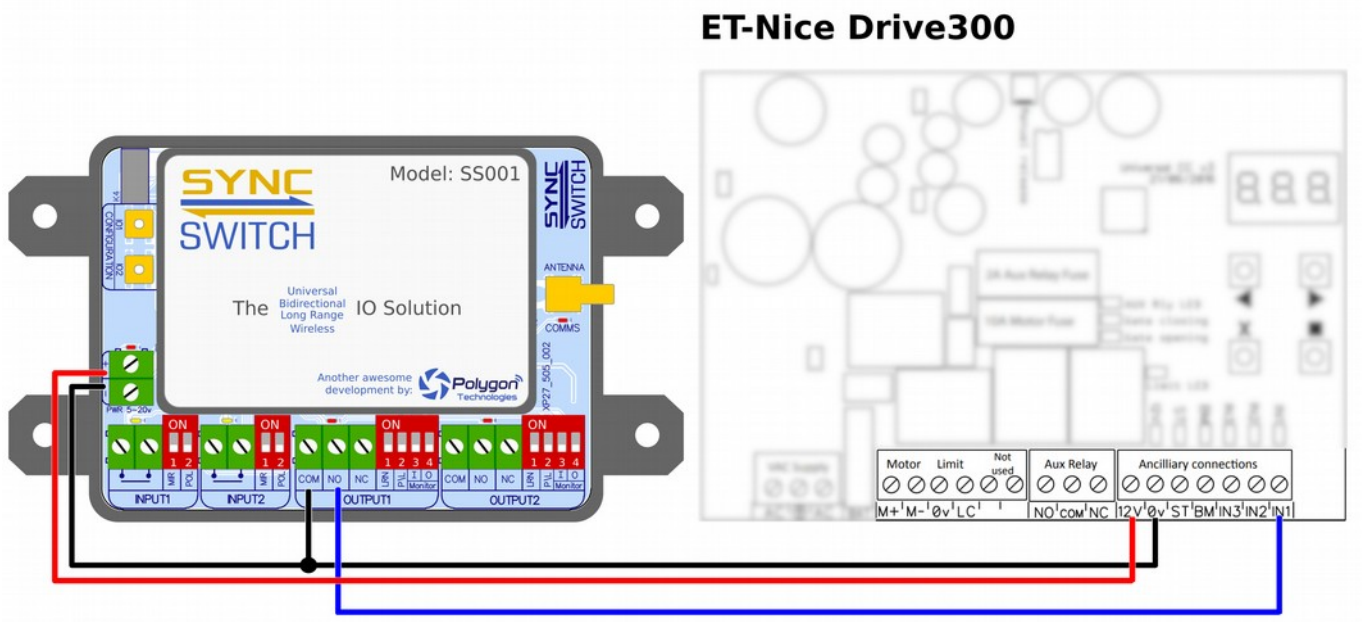
D3/D5 Gate Motors (CP80 Controller)



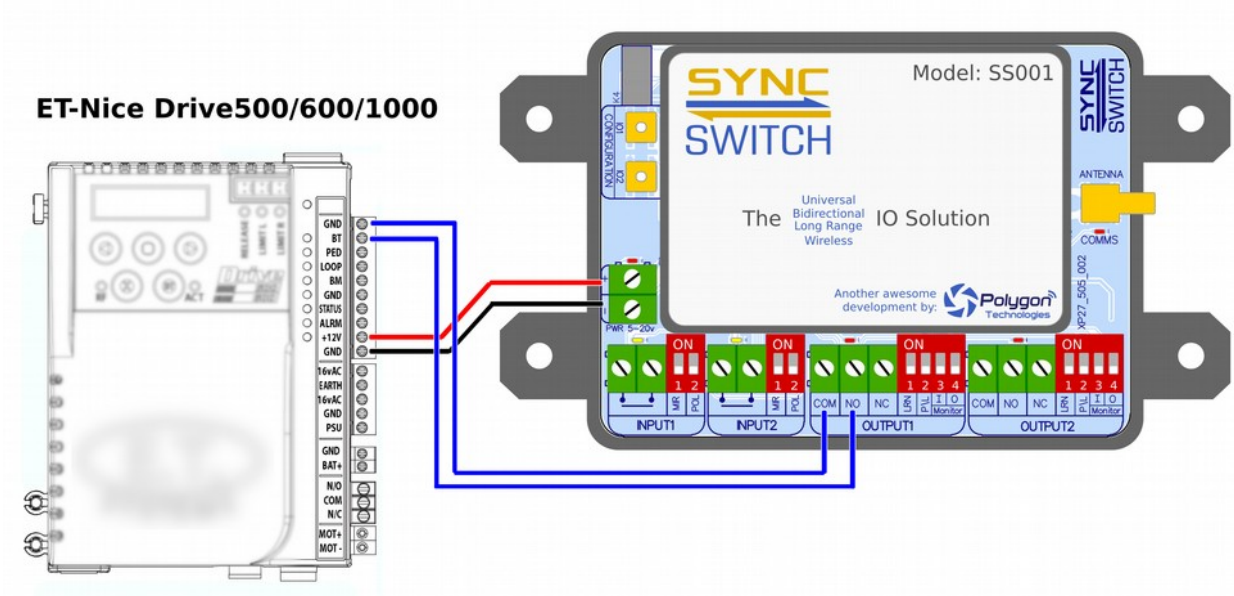
D5 "Evo" Gate Motors



ET-Nice Drive 300



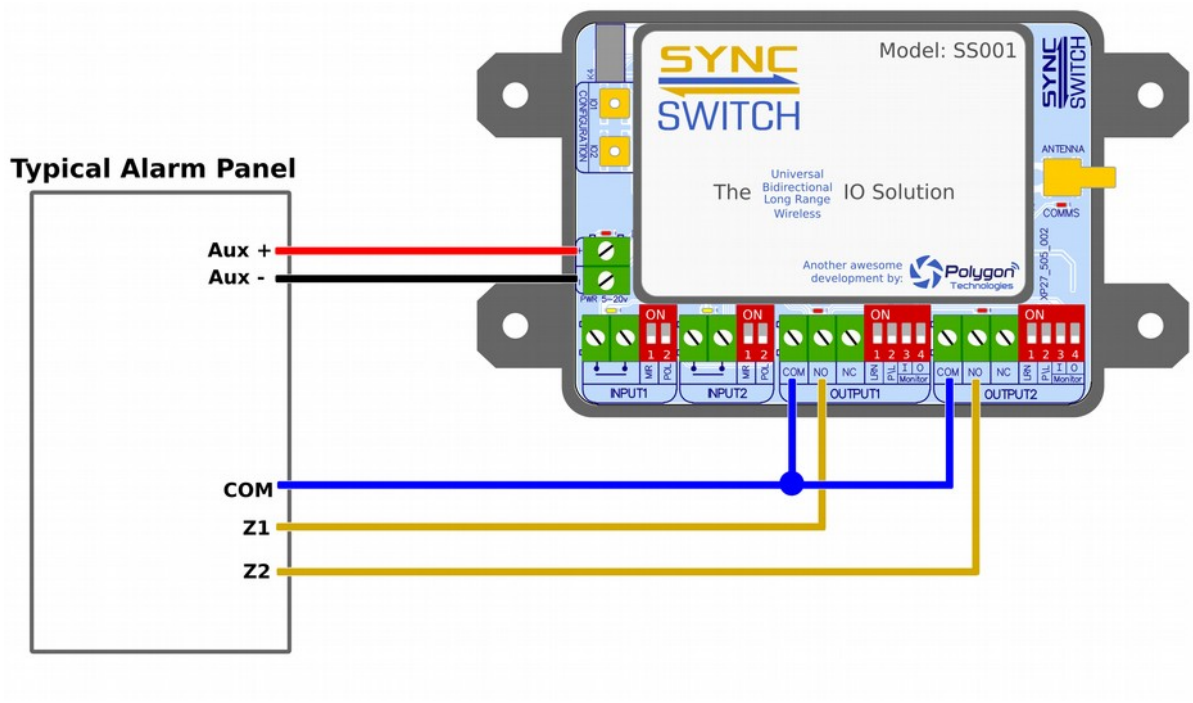
ET-Nice Drive 500/600/1000



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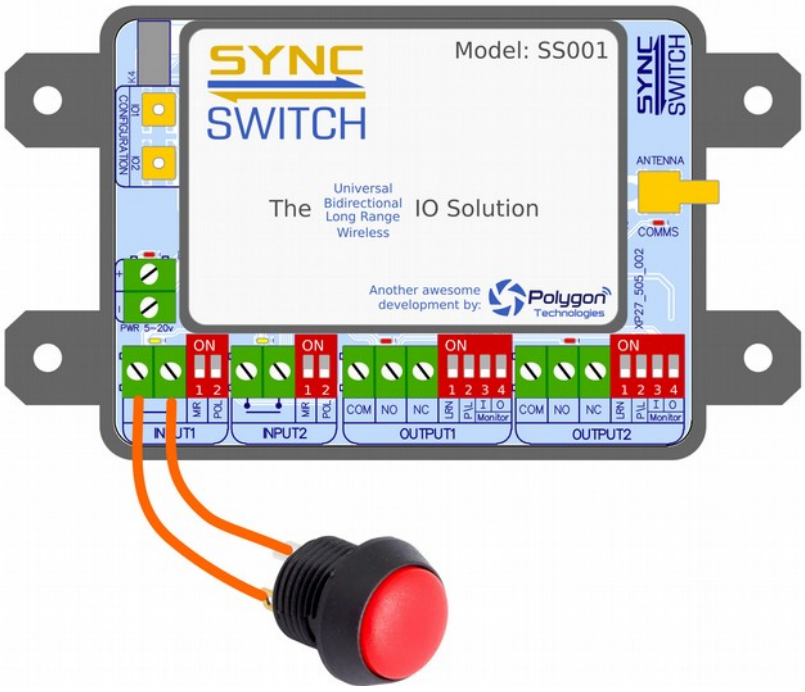
7.2. Alarm Panel Wiring

Here we assume you need Output 1 on the SyncSwitch to trigger zone 1 on an alarm panel, and Output 2 on the SyncSwitch to trigger zone 2 on an alarm panel. We are able to draw power directly from the Alarm panel.



7.3. Wiring a button to an input

It feels a bit dumb to have to include this, as it is so simple, but here goes:



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8. Guarantee

SyncSwitch is guaranteed for a period of 24 months against defects in materials or workmanship. Should your product become defective during the guarantee period it will be repaired or replaced at the sole discretion of Polygon Technologies under the following conditions:

A: The unit must not have been tampered with.

B: The guarantee does not cover damage resulting from excessive input voltages, lightning, power surges or water ingress.

A decision about issues A and B will be at the sole discretion of Polygon Technologies. This guarantee does not provide for shipping costs. This will be for the account of the user under all circumstances.

9. Important Notice / Disclaimer

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Polygon Technologies (PTY) LTD reserves the right to make changes to the contents of this manual, without notice, at any time.

10. Manufacturer Contact Details

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