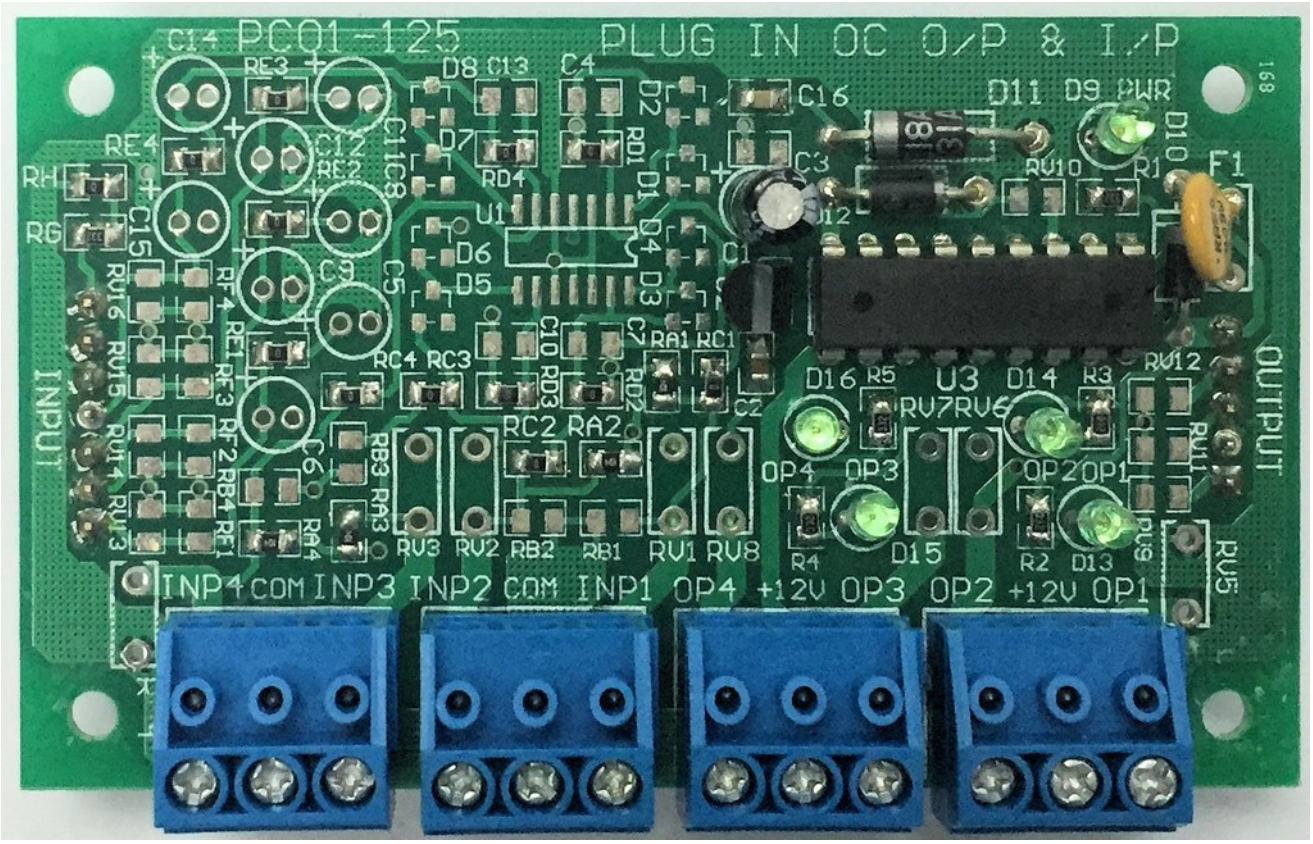
IRIO ISM Submodules

This manual describes the Installation and programming of the following submodules for IRIO;

- ISM01 Digital I/O Submodule
- ISM02 Digital Output/Analog Input Submodule
- ISM03 IR submodule
- ISM06 Relay NC/NO Submodule
- ISM07 Relay I/O Submodule
- ISM08 IRIO-IO General IO (in Din Rail Enclosure)
- ISM09 (PT100)

This manual is to be read in conjunction with the IRIO Manual at
http://www.cytech.biz/irio_module.html
IRIO-TWS and IRIO-Blinds are described in separate manuals

ISM01 Digital I/O Submodule



ISM01 Digital Output/Digital Input Submodule for IRIO consists of 4 Open-collector Outputs and 4 Digital Inputs.

Connections

OP1/+12V/OP2 Output 1,2 connections. Centre is +12V
OP3/+12V/OP4 Output 3,4 connections. Centre is +12V
The Outputs are open-collector outputs, ie transistor outputs which pull down to ground when turned on.

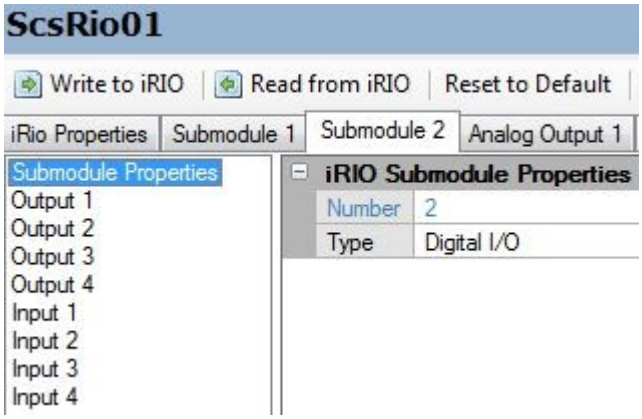
INP1/COM/INP2	Input 1,2 Connections. Centre common ground
INP3/COM/INP4	Input 3,4 Connections. Centre common ground

Specifications

Outputs:	Open Collector Darlington Transistor drivers limited to 500 mA Max each
Current Limit	Resettable Fuse 0.6 Amps at 12V supply to Outputs (combined)
Inputs:	Input voltage limited by Varistor 30V

Comfigurator Programming

Refer to the IRIO manual for instructions on setting the IRIO ID and meaning of the LEDs.
If the Digital Output/Input Submodule is installed in the IRIO, Read from IRIO will detect the Submodule in position 1 or 2. Select the Submodule 1 or 2 which has the Digital I/O Submodule plugged in.



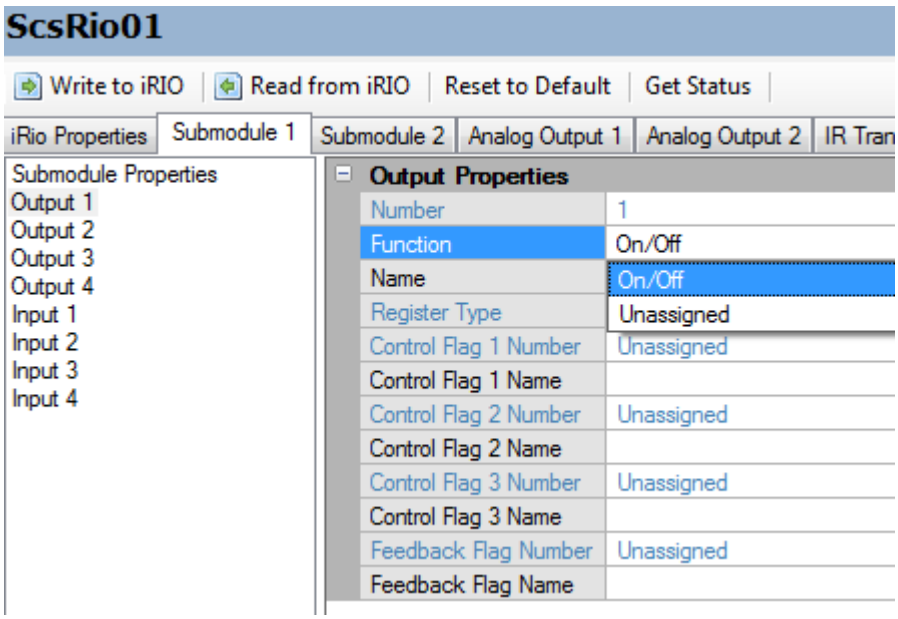
Output functions available for selection for each Output include:
- On/Off
- Unassigned

Input Functions available for selection for each Input include:
- Digital
- Pulse Counter
- Dimmer Switch 0-10V
- Temp Sensor
- Resistive Sensor
- Unassigned

Note that the Output function is selected first. The Input function is then selected based on whether the Output function uses any Inputs for itself.

Output Functions

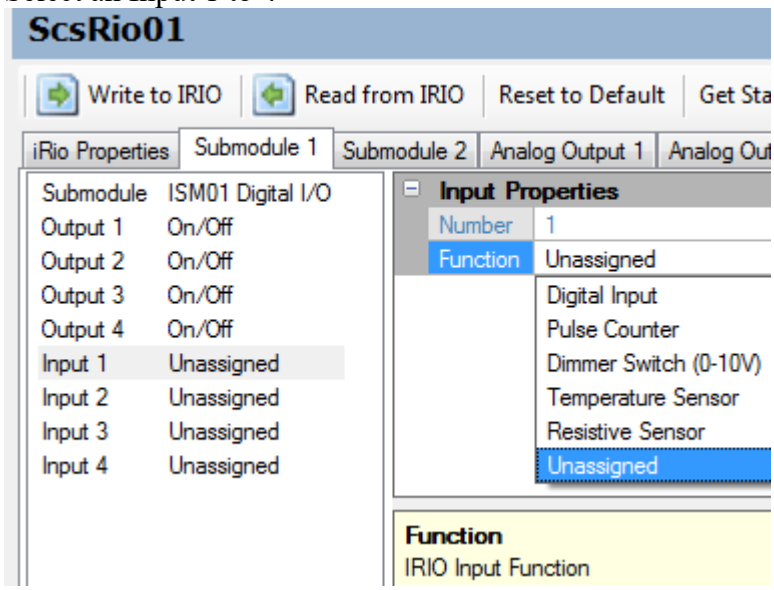
Select an Output 1 to 4.
For each output, the applicable functions are On/Off and Unassigned (default)



Information on programming the On/Off Functions can be found in the main IRIO Manual, since the functions are common to other modules.

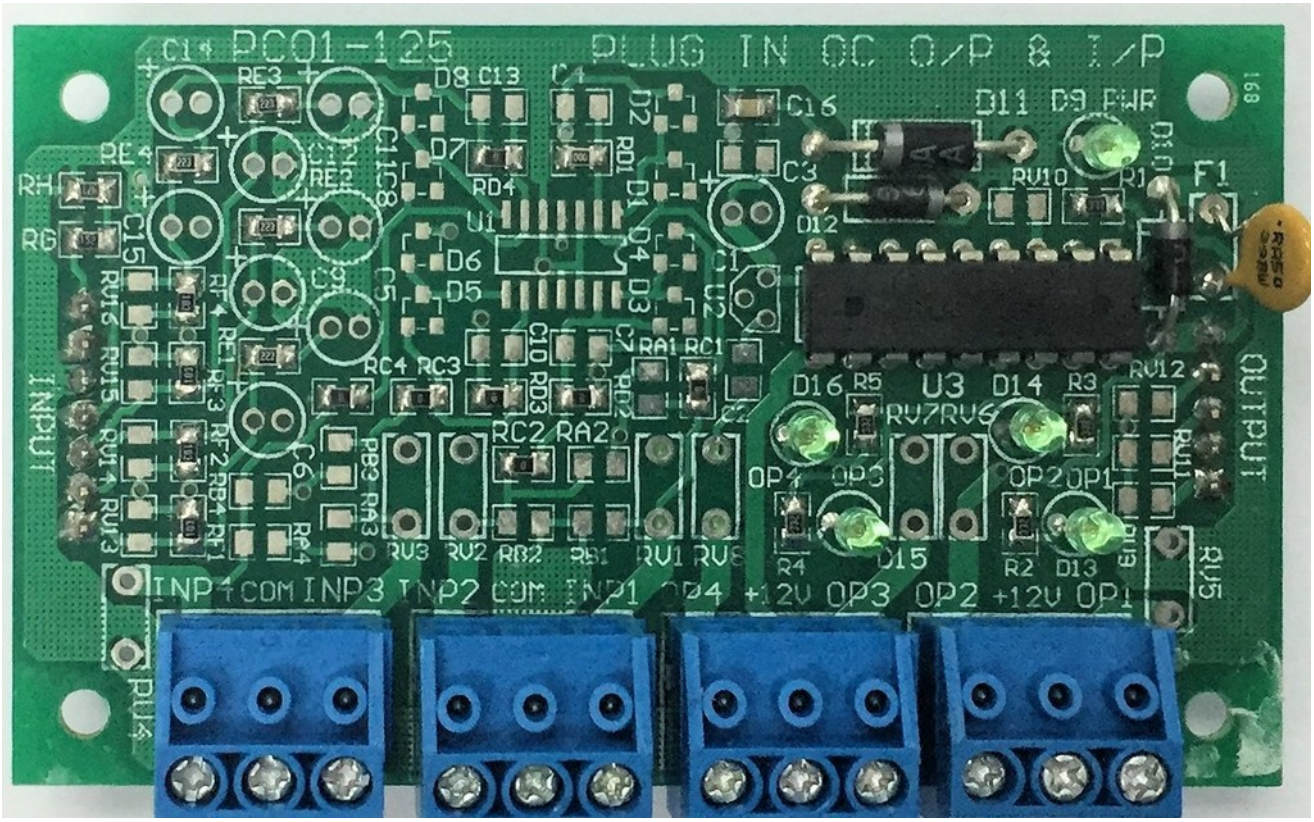
Input Functions

Select an Input 1 to 4



Select an Input Function; Digtal Input, Pulse Counter, Dimmer Switch 0-10V, Temperature Sensor, Resistive Sensor or Unassigned (default)
Information on programming the Input Functions can be found in the main IRIO Manual, since the functions are common to other modules.
For Input Function Temp Sensor, a TSM Thermistor is required.

ISM02 Digital OP/Analog IP Submodule



ISM02 Digital Output/Analog Input Submodule of IRIO has 4 Open-collector and 4 Analog (0-10V) Inputs.

Connections

OP1/+12V/OP2	Output 1,2 connections. Centre is +12V
OP3/+12V/OP3	Output 3,4 connections. Centre is +12V

The Outputs are open-collector outputs, ie transistor outputs which pull down to ground when turned on.

INP1/COM/INP2	Input 1,2 Connections. Centre common ground
INP3/COM/INP4	Input 3,4 Connections. Centre common ground

Specifications

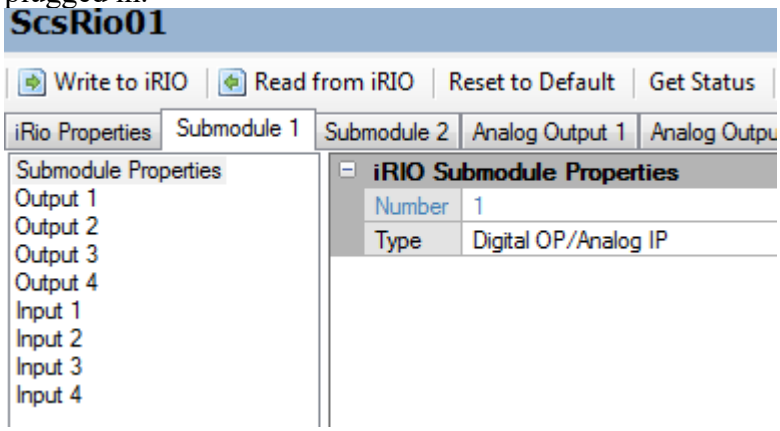
Outputs:	Open Collector Darlington Transistor drivers limited to 500 mA Max each
Current Limit	Resettable Fuse 0.6 Amps at 12V supply to Outputs (combined)
Inputs:	Analog Input voltage limited by Varistor 30V

The analog input has an input impedance of 32 Kilo-ohms. Note that if the input voltage has a source impedance, this could reduce the voltage measured according to the resistive divider.

Comfigurator Programming

For Comfigurator 3.11.8 or above

Refer to the IRIO manual for instructions on setting the IRIO ID and meaning of the LEDs.
If the Digital Output/Analog Input Submodule is installed in the IRIO, Read from IRIO will detect the Submodule in position 1 or 2. Select the Submodule 1 or 2 which has the Digital OP/Analog IP plugged in.

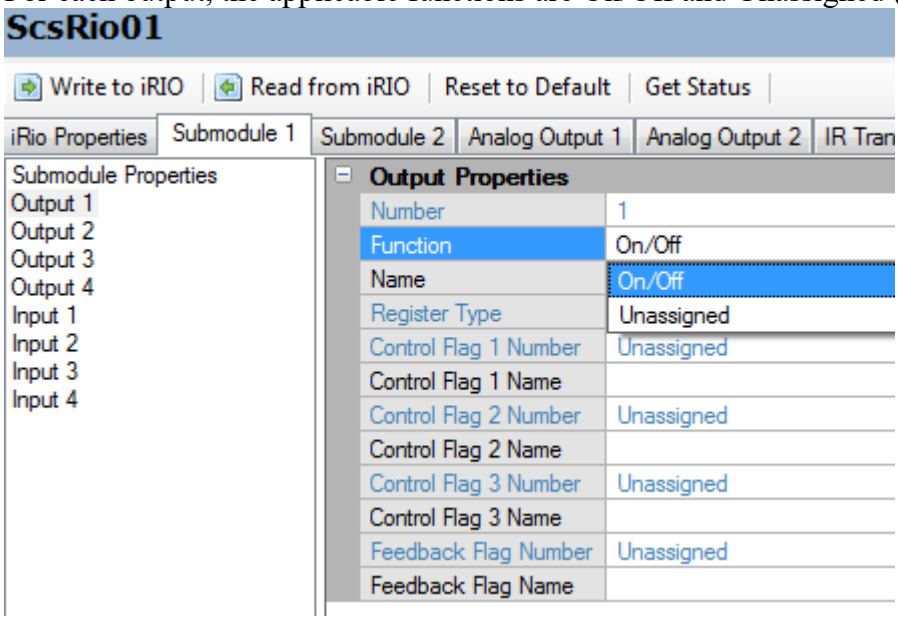


Output functions available for selection for each Output:
- On/Off
- Unassigned

Input Functions available for selection for each Input
- Analog (0-10V)
- Unassigned

Output Functions

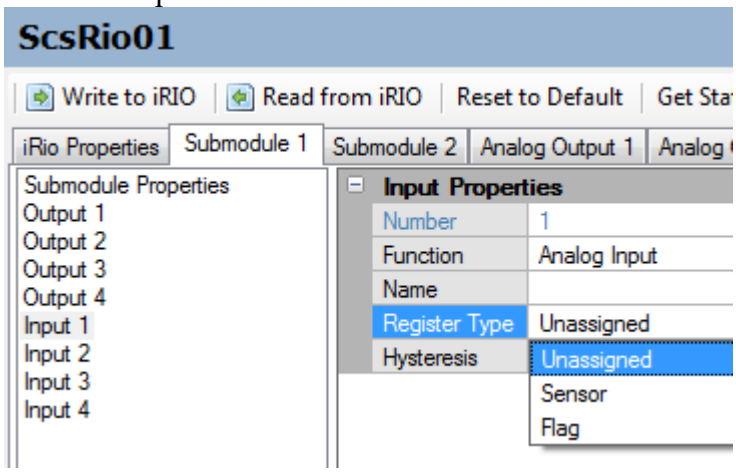
Select an Output 1 to 4.
For each output, the applicable functions are On/Off and Unassigned (default)



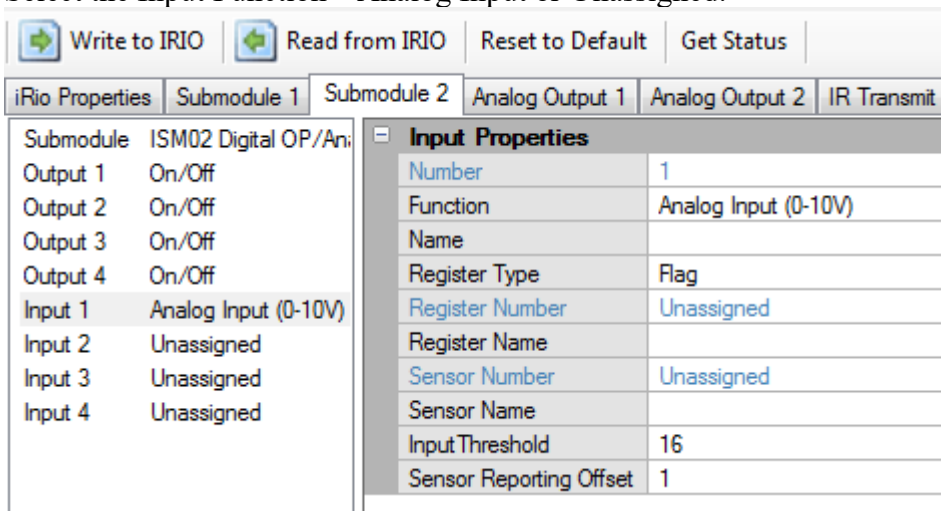
Information on programming the Output Functions can be found in the main IRIO Manual, since the functions are common to other modules.

Input Functions

Select an Input 1 to 4



Select the Input Function – Analog Input or Unassigned.



Analog Input

Select an Register Type; Sensor, Flag or Unassigned (default)

Sensor

A sensor can be mapped to the analogue input. The measured voltage is converted to a value from 0 to 255 and saved in the sensor. This can be used for testing purposes or monitoring the voltage so as to be able to set the threshold value.

Sensor Reporting Offset

This is used in conjunction with the Sensor mapping. The hysteresis value determines the change in sensor value before the change is saved to the sensor, to prevent excessive reporting to Comfort

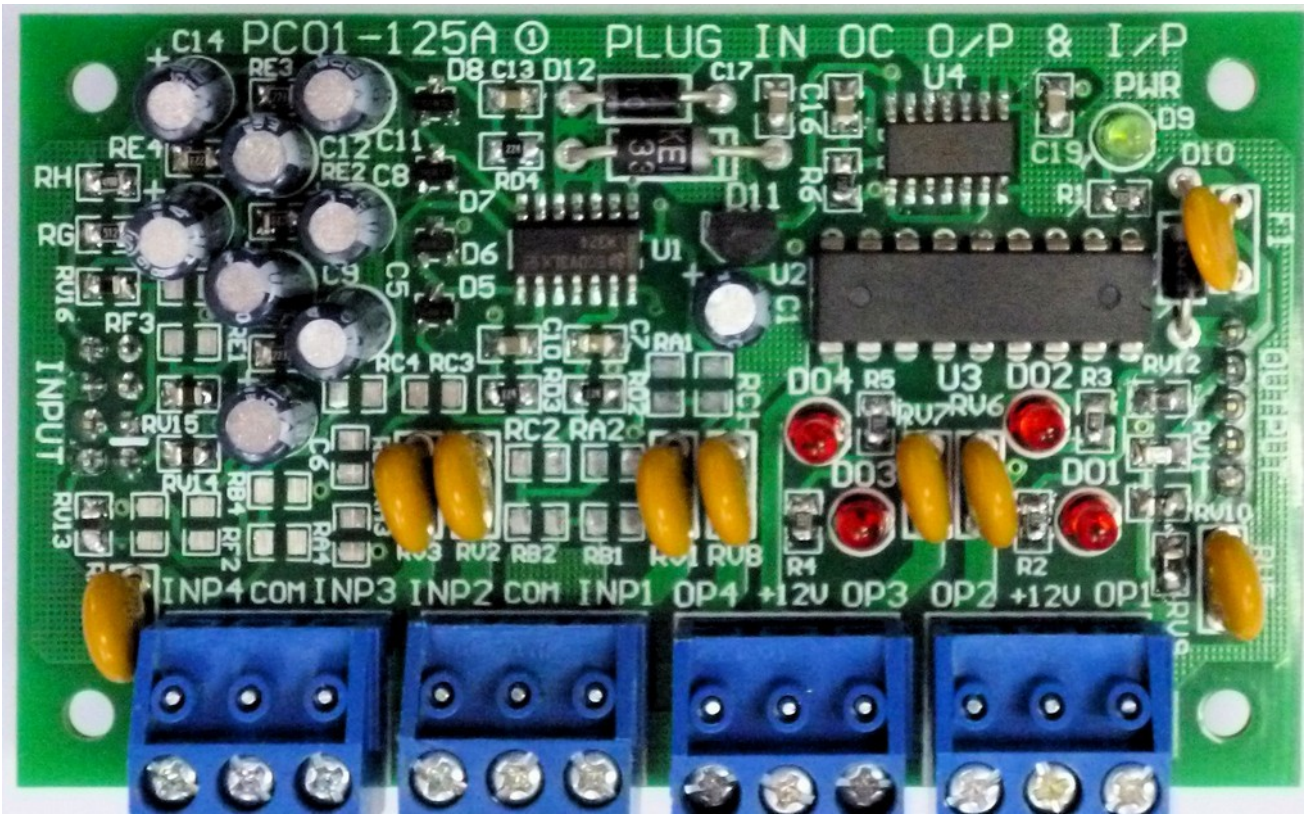
Flag

Map to a Flag for Status of the output. The flag can be the same as one of the control flags, or may be different, but cannot be the same as any other function's feedback flag. The feedback flag provides the actual status of the appliance monitored on the analog input.

Threshold

This is the voltage threshold from 0 to 255 to detect whether the appliance is on or off. The ability to set threshold ensures that any type of light can be detected by the current sensor when it the light is turned on.

ISM03 Infrared Submodule



ISM03 Infrared Submodule for IRIO allows learned Infrared signals to be transmitted to any of the 4 outputs in the submodule. The 4 Inputs on the submodule can be connected to external CSM03-CT current sensors to detect the current to the controlled device.
2 functions are available for selection for each of the 4 Outputs on the submodule; IR Signal, and IR with Feedback
IR Signal: The Output can be used to send learned Infrared signals via an Infrared Transmitter (not included). One of the Inputs can optionally be connected to the CSM03-CT Current Sensor to provide feedback for the remote controlled device.
IR with Feedback: The Output can be used to send learned Infrared signals via an Infrared Transmitter. The corresponding Input is dedicated to the external CSM03 Current Sensor to provide feedback for the remote controlled device so that the control and feedback can be mapped to Flags

IR Transmitters

One of the following IR transmitters can be used with ISM03 (ordered seperately);

1. IR01W IR transmitter with series resistor – for short range 1 meter transmission
2. IR01L IR transmitter without series resistor – for long range up to 1 meters
3. IR03W IR transmitter with stick-on emitter and visible LED indicator LED.

Connections

OP1/+12V/OP2 Output 1,2 connections. Centre is +12V
OP3/+12V/OP3 Output 3,4 connections. Centre is +12V
The Outputs are open-collector outputs, ie transistor outputs which pull down to ground when turned on.
IR Transmitters IR01W, IR03W or IRM01 can be connected to any of the Outputs in order to send the IR signals to the receiver.

INP1/COM/INP2 Input 1,2 Connections. Centre common ground
INP3/COM/INP4 Input 3,4 Connections. Centre common ground
Inputs can be connected to CSM03-CT current sensors for detecting current flow (if required). The Live wire of the appliance or airconditioner goes through the centre hole of the CSM03-CT current sensor . The CSM03 wires are connected to the input terminals. Polarity of CSM03 wires is not important.
Note: Use separate CAT5 cables for each IR transmitter, especcially when controlling the same model of appliance. It is possible for te IR signals to be induced in neighbouring wires,

LEDs

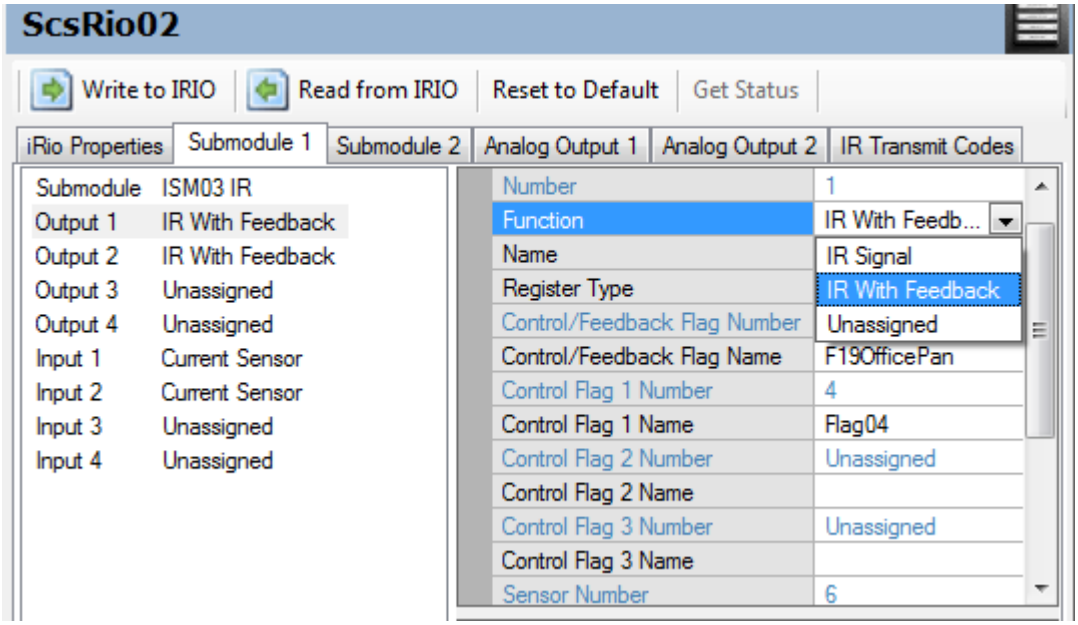
D01 to DO4 are connected to the Outputs so they will blink whenever an IR signal is sent through the corresponding output 1 to4. However this does not guarantee that the correct IR signal is sent to the output

Specifications

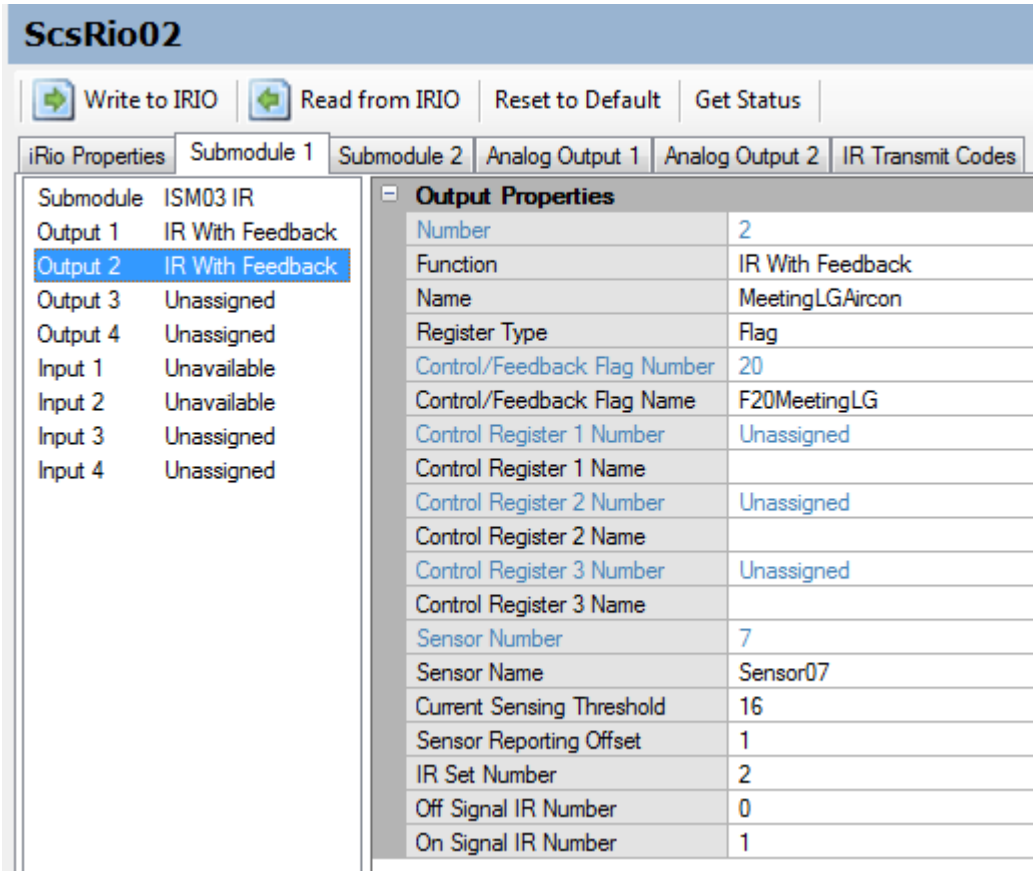
Outputs:	Open Collector Darlington Transistor drivers limited to 500 mA Max each
Current Limit	Resettable Fuse 0.6 Amps at 12V supply to Outputs (combined)
Inputs:	Input voltage 0 to 3 V limited by Varistor 30V

Comfigurator Programming

Comfigurator 3.12.15 or above. Refer to the IRIO manual for instructions on setting the IRIO ID and meaning of the LEDs.
If the IR Submodule is installed in the IRIO, Read from IRIO will detect the Submodule in position 1 or 2. Select the Submodule 1 or 2 which has the IR Submodule plugged in.
There are 4 outputs and 4 inputs in the IR submodule.
Select one of the Outputs on the left as shown above. For the selected output, in Function, select IR Signal or IR with Feedback. The default is Unassigned.



IR Signal with Feedback Function



For the IR with Feedback function, Flags are mapped to the function (instead of counters). The corresponding inputs is fixed as Current sensor, ie a CSM03-CT current sensor must be connected to the Input to provide feedback status. For this function, only 2 signals can be selected, the ON signal and Off signal. It is easy to control the infrared device using this function; Just Set the flag to turn on the device and Clear the flag to turn off the device – It is not necessary to check the status of the Flag. It is also easy to link the device to other systems like KNX and Cbus by mapping a group address to one of the control flags – There is no need to use a Counter and activate a Counter Response.

Use IR with feedback when the appliance has the same On and Off Infrared signal, eg most TVs and some airconditioners. This means that the ON and OFF signals are often the same, but assigned to both ON and OFF IR signals in IRIO. Sending of the ON/OFF signal depends on the Current sensor feedback. If the feedback status of teh apliance is ON, sending ON will not have any effect abd vice versa.

Control/Feedback Flag Name

Select the Flag that is used to Control the Infrared device as well as provide the On/Off Feedback. Setting the Flag causes the IR ON Code to be sent from the IR set.
In this example, setting Flag 19 turns on the device by sending the ON IR signal to the device, and clearing Flag 19 turns off the device. Flag 19 has the correct feedback status of the device.

Control Flag 1 Name, Control Flag 2 Name, Control Flag 3 Name

Up to 3 flags can be optionally assigned to control the IR device. This can be used by different scenes. Eg Flag 4 can be used by a scene to control several devices besides this IRIO. In this example setting and clearing Flag 4 (Control Flag 1 Name) turns on and off the device. However the 3 control Flags do not give the feedback status

Sensor Name

A sensor can be mapped to the measured current. The measured Current is converted to a value from 0 to 255 and saved in the Sensor Register. This can be used for testing purposes or monitoring the current used by the appliance so as to be able to set the threshold value.
In this example sensor 6 gives the value of the sensor 0 to 255. For example when the device is off, the sensor value may be 10 (residual current) and when the device is on the sensor value may be 200. This gives information about the range of current detected, and shows what value of Threshold can be set.

IR Set Number

Select IR Set Number 1 to 4 for this Output. This means that all the IR signals which can be sent from the selected output will be from this set. Only 2 signals can be assigned to the ON and OFF signals as determined by the On Signal IR Number and Off Signal IR number

Current Sensing Threshold

This is the Thresold for the current sensor reading that determines whether the Infrared device is On or Off. Default is 16. sensor values below 16 are considered off and values greater than or equal to 16 are On

Sensor Reporting Offset

This value determines the change in sensor value before the change is saved to the sensor, to prevent excessive reporting to Comfort.

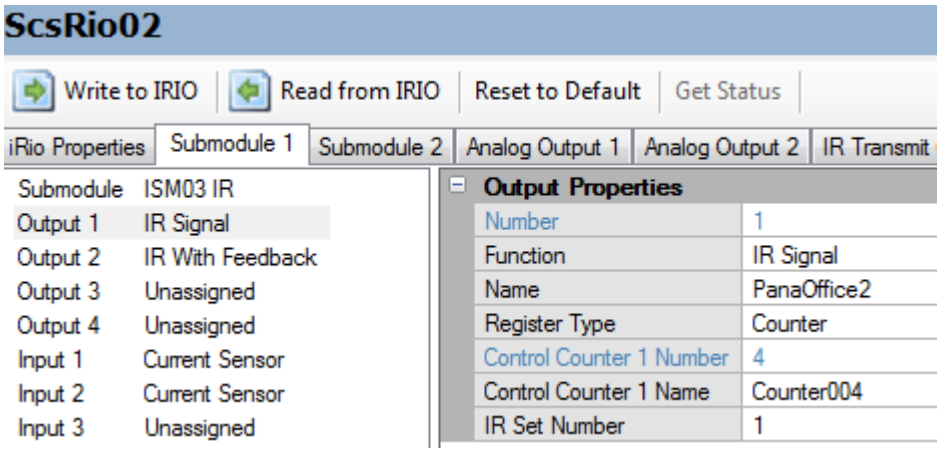
Off Signal IR Number

The IR Number from the selected set that turns off the device. Default is IR signal 0.

On Signal IR Number

The IR Number from the selected set that turns on the device. Default is IR Singal 1.

IR Signal Function



The IR signal function can be used instead of IR with Feedback function when the appliance to be controlled has individual On and Off IR signals, not a common On/OFF signal (like Tvs). It is also used to set different settings for an airconditioner eg different temperatures The current sensor feedback is not needed to determine which IR signal to send, unlike the IR with feedback function). Current sensor feedback is useful for status indication only.

Register Type

Select Flag or Counter to map to the IR signal. Up to 3 control registers of the same register type can be selected for mapping. There is no built in feedback. However the corresponding Input can be selected as Current sensor to provide feedback via current sensor.

Counter

The counter value corresponds to the IR code number 0 to 63 for the IR set selected. Setting the value of the counter will cause the signal for the corresponding IR number to be sent from the IR output. For example, IR Set a has IR Number 0 = off signal, IR Number 1 = on 18 Deg High Fan, IR Number 2 = 20 Deg High Fan, IR Number 3 = 22 deg High Fan etc. for an IR Set used for an air-conditioner. Hence setting a counter value means the IR signal number is activated for the IRIO output mapped to the counter using the selected IR signal set. Note that a counter value >63 (eg Counter value 255)will activate IR Number 1 ie ON signal
In the above example, the output is mapped to Counter 4 so setting Counter 4 = 0 means the Off signal for the air-conditioning system is sent to the output, and setting Counter 4 = 1 means the On signal 18 deg High Fan signal is sent to the output, Counter 4 = 2 means 20 degrees High Fan signal is sent to the output.

Flag

If Flag is selected, the Flag is mapped to the OnOff control. Turning on the flag will turtn on the appliace abd vvice versa. The control flag does not indicate the status of the appliance because a handheld remote control may control the appliance independently. Use the Input function for Current sensor to provide feedback to another flag

IR Set Number

Select IR Set Number 1 to 4 for this Output. This means that all the IR signals which can be sent from the selected output will be from this set.

Input for IR Signal Function

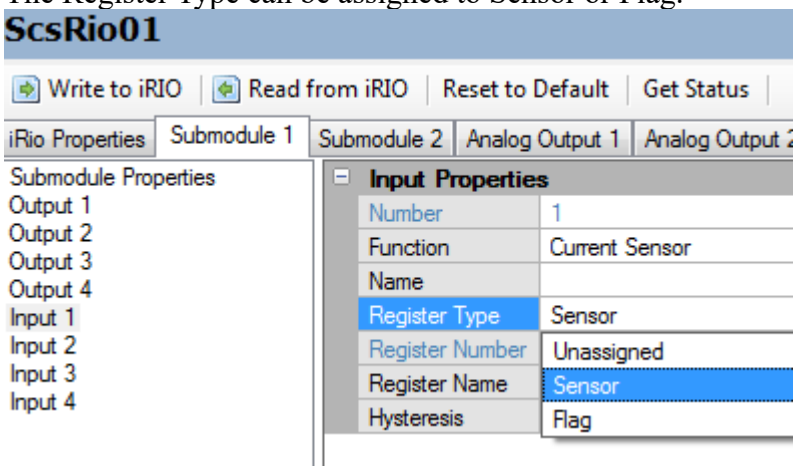
There are 4 Inputs on the IR Submodule. These are meant for connection to Current sensors (CSM03-CT) to monitor the state of the appliance which is being controlled by the IR signals. When the IR Signal Function is selected, the corresponding Input can be selected as Current Sensor or left as Unassigned. If the IR with Feedback function is selected, the Input is fixed as Current sensor and the properties of the Input are not available

For Input when IR Signal Function is selected for the corresponding Output'

Select the Input number 1 to 4.

The available function is Current Sensor or Unassigned.

The Register Type can be assigned to Sensor or Flag.



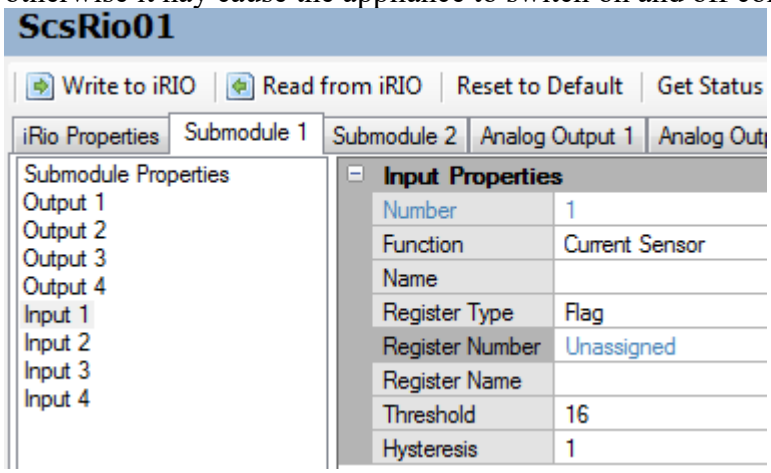
Sensor

A sensor can be mapped to the measured current. The measured Current is converted to a value from 0 to 255 and saved in the Sensor Register. This can be used for testing purposes or monitoring the current used by the appliance so as to be able to set the threshold value.

Hysteresis - This is used in conjunction with the Sensor mapping. The hysteresis value determines the change in sensor value before the change is saved to the sensor, to prevent excessive reporting to Comfort

Flag

Map to a Flag for Status of the appliance monitored by Currrent Sensor. The flag cannot be the same as any other function's feedback flag. Do NOT use the same Flag number as the Control Flag, otherwise it nay cause the appliance to switch on and off continuosly.



Threshold - This is the current sensing threshold from 0 to 255 to detect whether the monitored

appliance is on or off. When the current exceeds the threshold, the mapped Flag will be set, and when the current is below the threshold, the mapped flag will be cleared. The ability to set threshold ensures that any type of appliance can be detected by the current sensor when the appliance is turned on.

If CSM03-CT current sensor is connected to Input 1 and mapped to Flag 1, the IR signals can be sent based on the state of the Flag

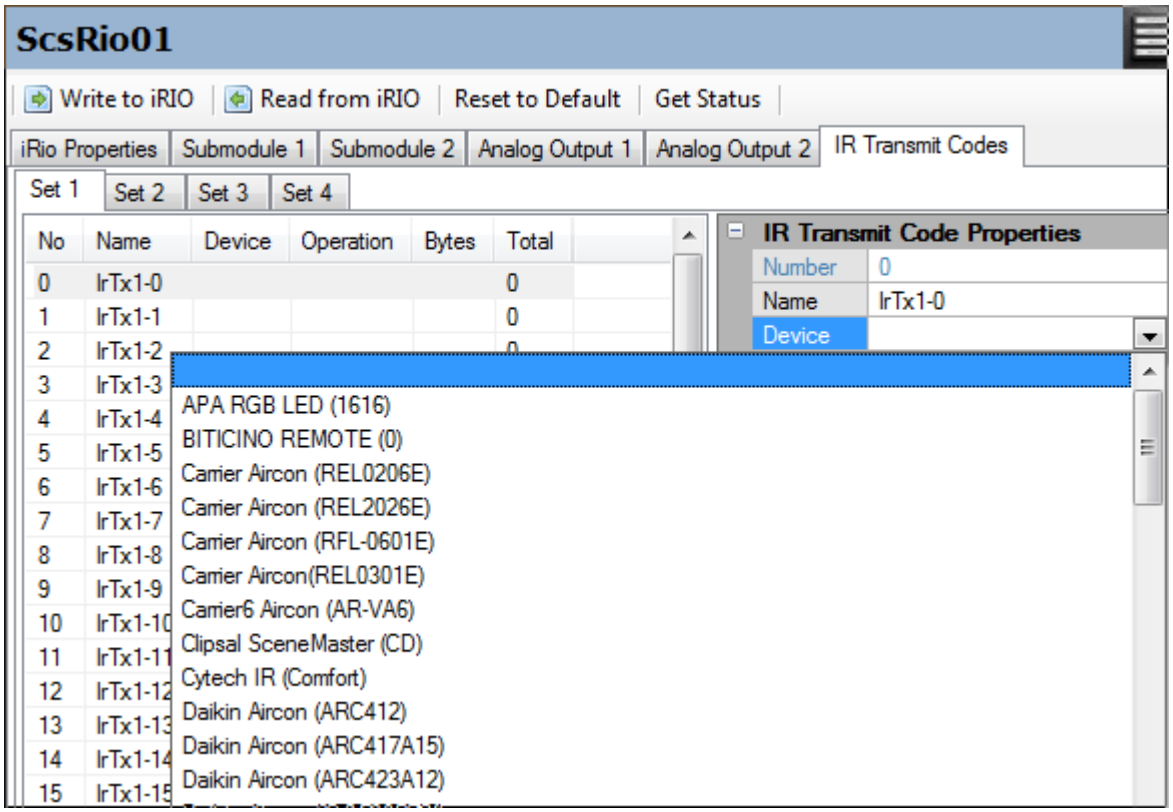
eg

Aircon Off:
If Flag Flag01 > 0 Then
  Set Counter001 = 0
End If

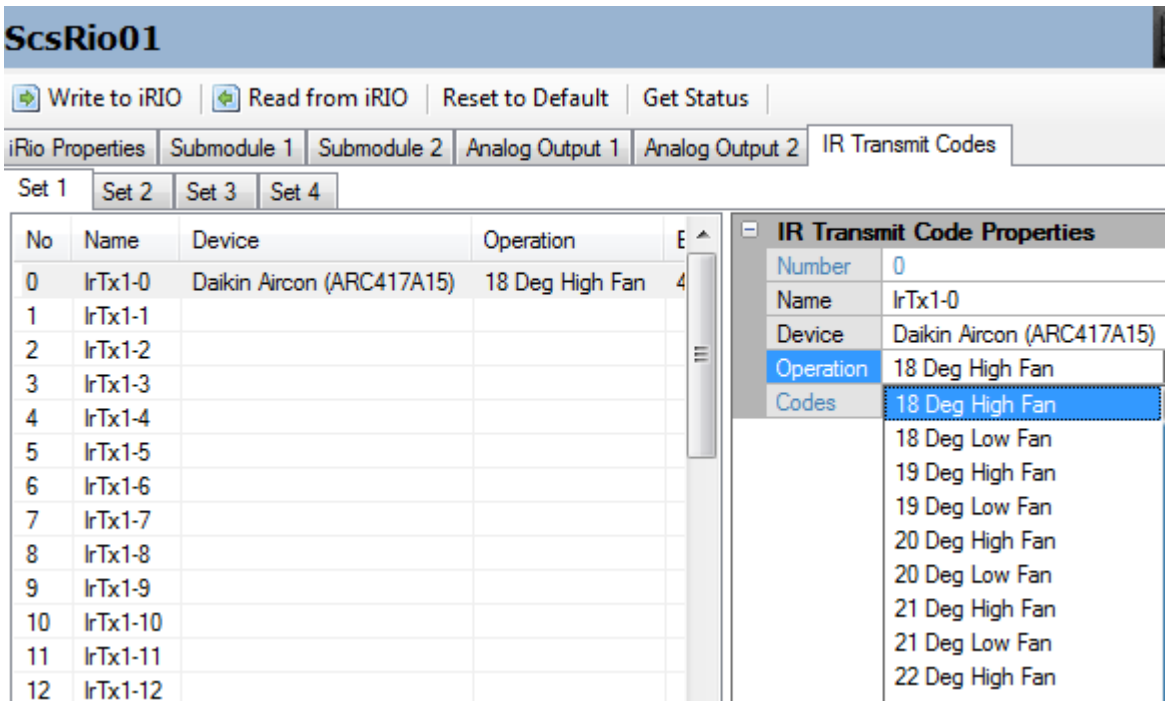
Turn on Aircon On at 16 deg if the current state is off:
If Flag Flag01 = 0 Then
  Set Counter001 = 1
End If

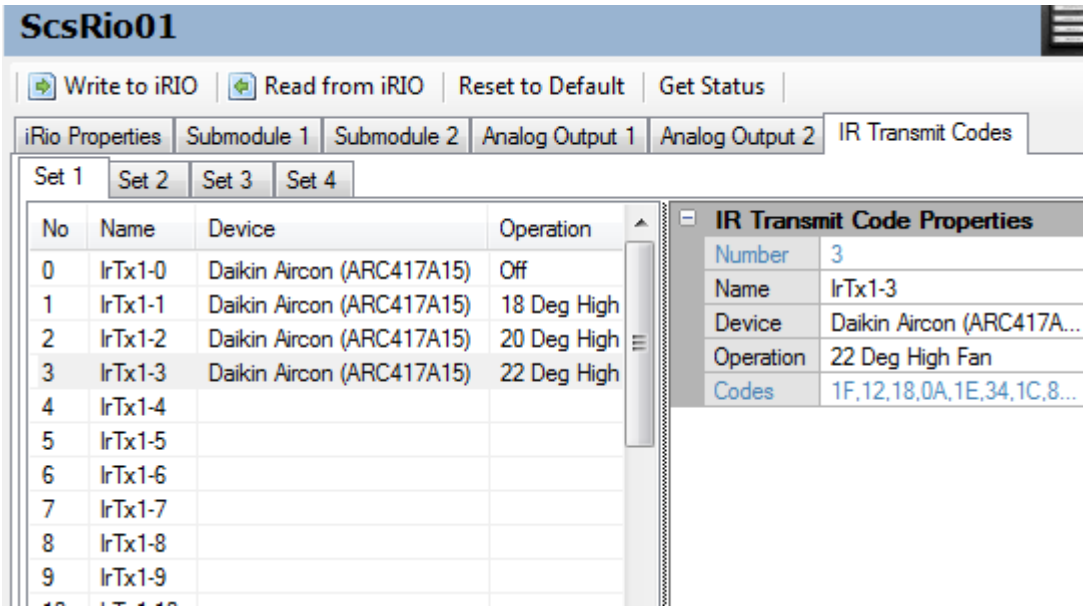
IR Transmit Codes

Up to 4 sets of Infrared signals of 64 codes each can be stored in the IRIO for transmission to any output. The 4 sets of IR signals are shared among all the IR outputs on the same IRIO. Select the IR Transmit Codes Tab. 4 Sets of IR codes can be selected as shown below.



For each IR signal in a set, select a Device from the Drop-down list
Next select an Operation for the device

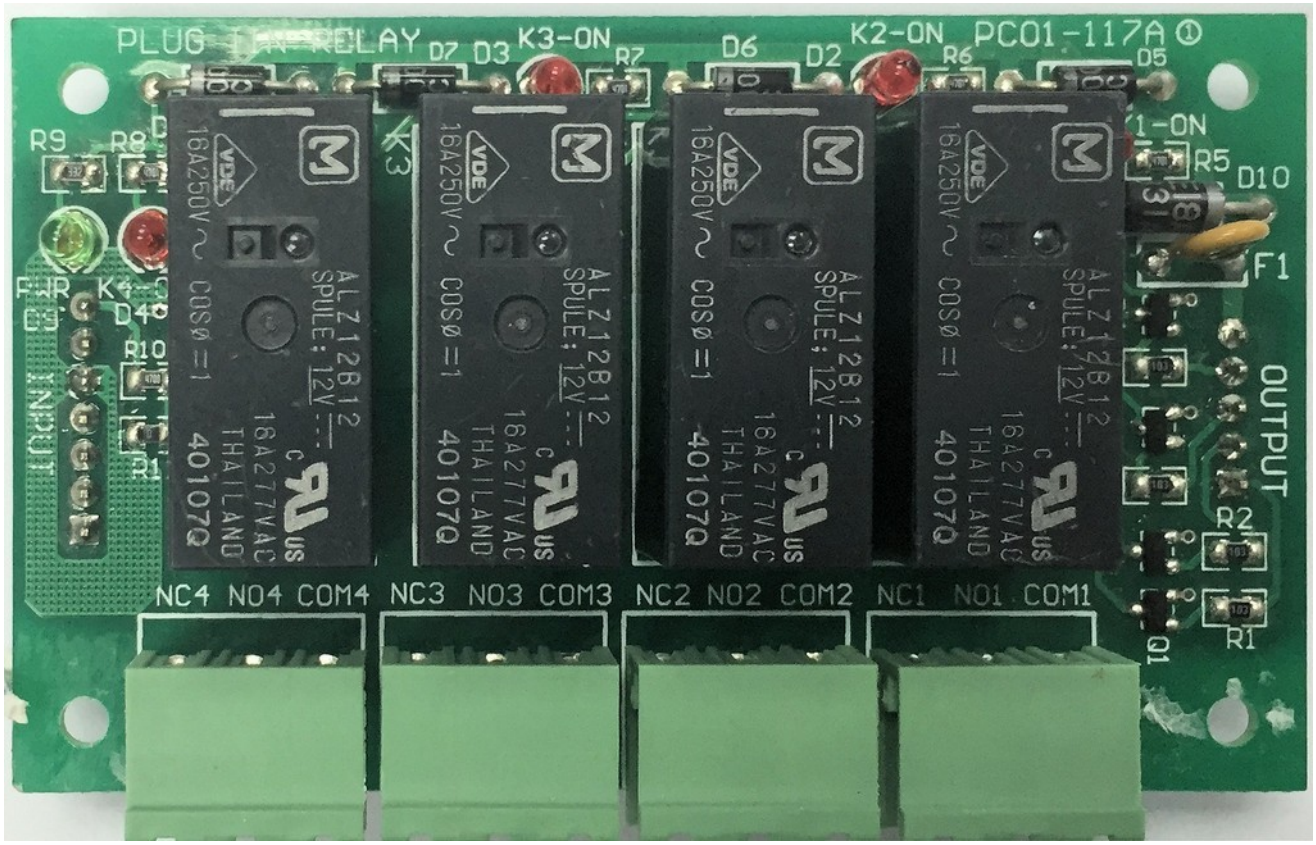




Learning IR Codes

If the IR code is not in the library supplied with Comfigurator, the UCM/USB or UCM/ETH03 with built-in Infrared Learner can be used to learn the Infrared signal from a handheld remote control.Please refer to the UCM Manual (download from http://www.cytech.biz/ucm_manual.html) for instructions.

ISM06 NO/NC Relay Submodule



The ISM06 Relay NO/NC has 4 outputs (Relays) and 0 Inputs in this module
Output functions available for selection for each Output:

- On/Off
- Heating
- Cooling
- Heating + Cooling
- 2 speed fan
- 3 speed fan
- Unassigned

Each Output is connected to a change-over Relay with 3 terminals COM, NO (Normally Open), NC (Normally Closed)

The ISM06 and ISM07 Relays should be used for low voltages < 30 VDC/VAC only. due to the lack of insulation distance between the ISM06 and the IRIO Base board. Use IRIO-IO with RLE02 for high voltage eg 230VAC

Relay Specifications

Relay Arrangement:	1 Form C (with Open/Close contacts)
Breakdown Voltage (Contact – Coil)	5000VRMS 1 min
Switching Capacity	250VAC, 16A (Note: 6A max for Relay on Submodule)
Mechanical Life	10 million cycles
Electrical Life	100000 cycles
Coil Resistance	360 Ohms (33 mA operating current from 12V)

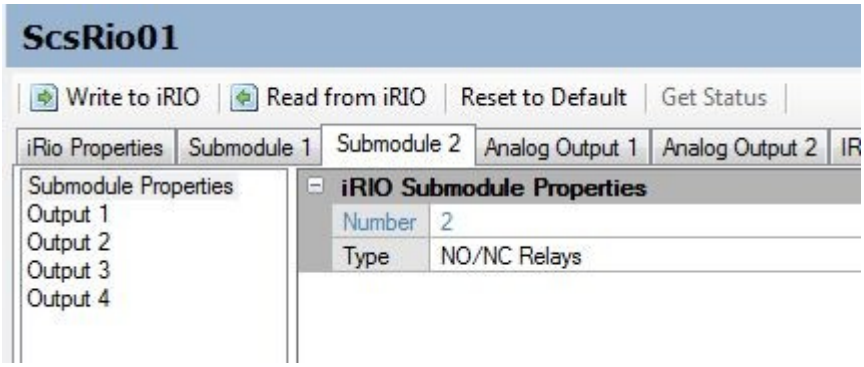
Maximum current from 12V with 4 relays switched On = 133 mA

Connections

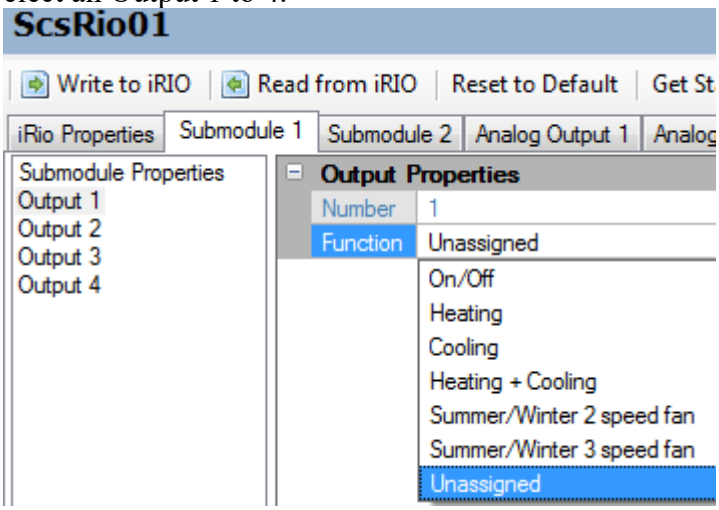
NC 1-4: Normally Closed Relay Contact for Outputs 1 to 4
NO 1-4: Normally Open Relay Contact for Outputs 1 to 4
COM 1-4: Common Relay Contact for Outputs 1 to 4

Comfigurator Programming

Refer to the IRIO manual for instructions on setting the IRIO ID and meaning of leds.
If the NO/NC Relay Submodule is installed in the IRIO, Read from IRIO will detect the Submodule in position 1 or 2. Select the Submodule 1 or 2.

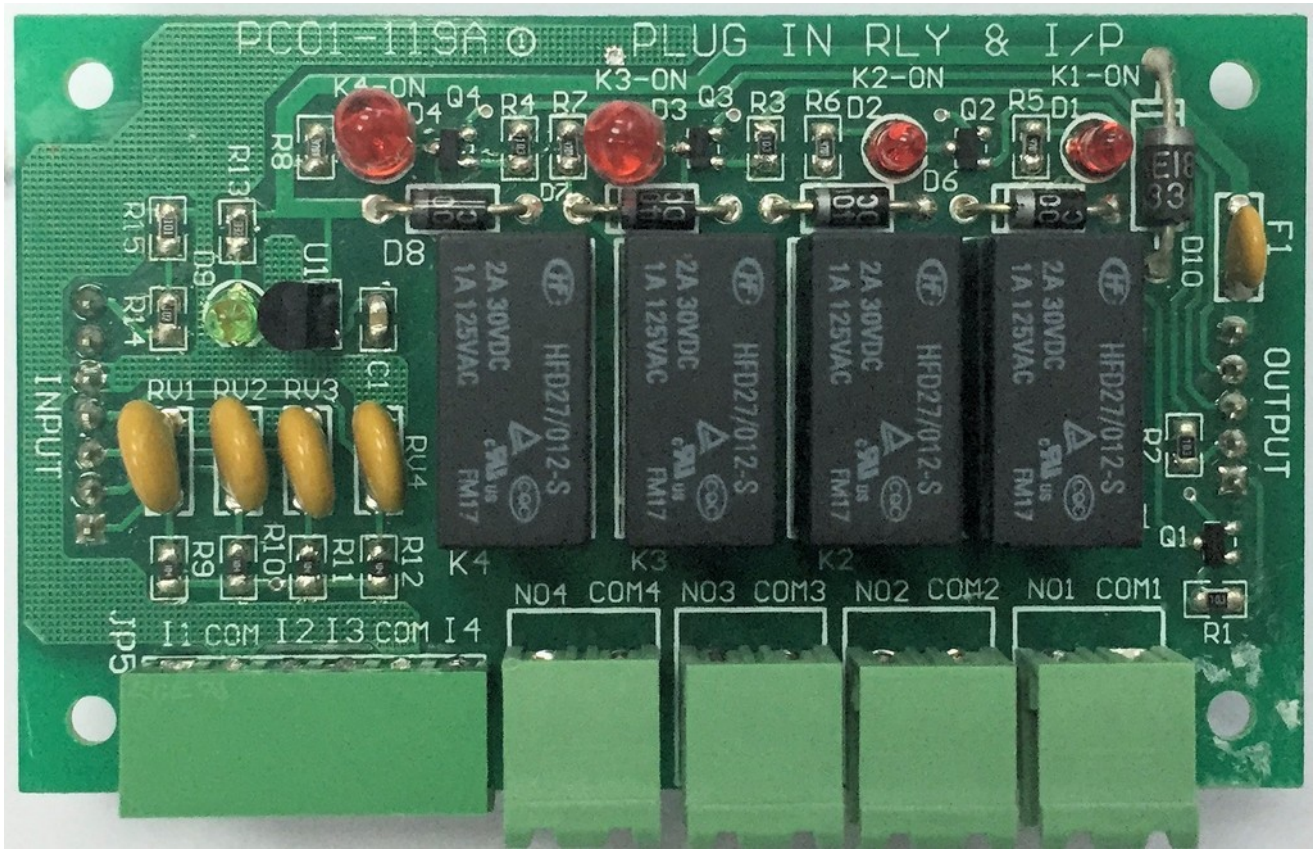


Select an Output 1 to 4.



For each Output, assign a Function from the drop-down list. Default is Unassigned, ie No Function.
Information on programming the Output Functions can be found in the main IRIO Manual, since the functions are common to other modules.

ISM07 Relay I/O Submodule



The ISM07 Relay I/O submodule for IRIO has 4 Relay outputs and 4 Digital Inputs.
Output functions available for selection for each Output:

- Aircon Interface Relay
- On/Off
- Heating
- Cooling
- Heating + Cooling
- 2 speed fan
- 3 speed fan
- Blinds DC
- Unassigned

Each Output is connected to a Normally Open Relay with 2 terminals COM, NO (Normally Open)

The ISM06 and ISM07 Relays should be used for low voltages < 30 VDC/VAC only. due to the lack of insulation distance between the ISM06 and the IRIO Base board. Use IRIO-IO with RLE02 for high voltage eg 230VAC

Relay Specifications

Breakdown Voltage (Contact – Coil)	1500VAC 1 min
Insulation Resistance	1000 Mohms
Switching Capacity	240VAC, 2A
Mechanical Life	100 million cycles
Electrical Life	100000 cycles
Coil Resistance	720 Ohms (17 mA operating current from 12V)

Maximum current from 12V with 4 relays switched On = 68 mA

Connections

NO1/COM1: Normally Open Relay Contact for Output 1
NO2/COM2: Normally Open Relay Contact for Output 2
NO3/COM3: Normally Open Relay Contact for Output 3
NO4/COM4: Normally Open Relay Contact for Output 4

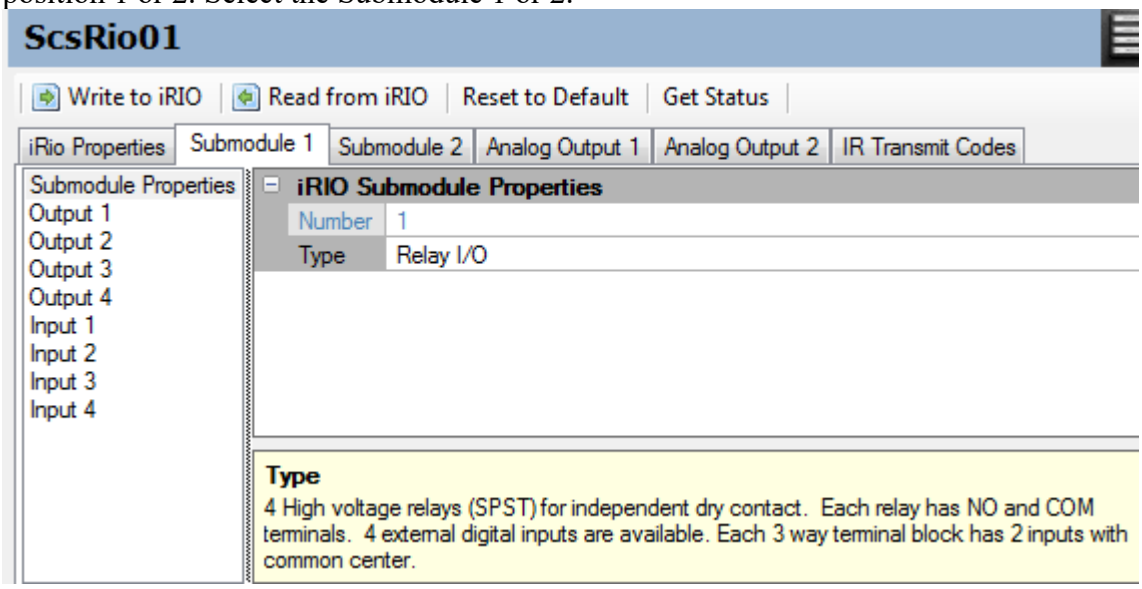
I1: Digital Input 1
COM: Ground for Inputs
I2: Digital Input 2
13: Digital Input 3
COM: Ground for Inputs
I4: Digital Input 4

LEDs

K1-On (red) Indicates that Relay 1 is in the ON state
K2-On (red) Indicates that Relay 2 is in the ON state
K3-On (red) Indicates that Relay 3 is in the ON state
K4-On (red) Indicates that Relay 4 is in the ON state
PWR Indicates that 12V power is present

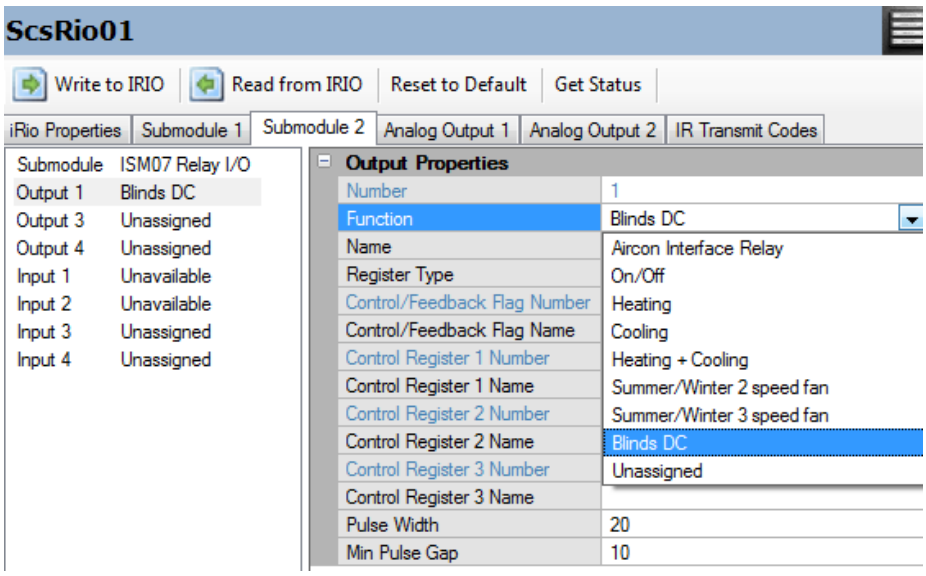
Comfigurator Programming

Refer to the IRIO manual for instructions on setting the IRIO ID and meaning of leds.
If the Relay I/O Submodule is installed in the IRIO, Read from IRIO will detect the Submodule in position 1 or 2. Select the Submodule 1 or 2.



Output Functions

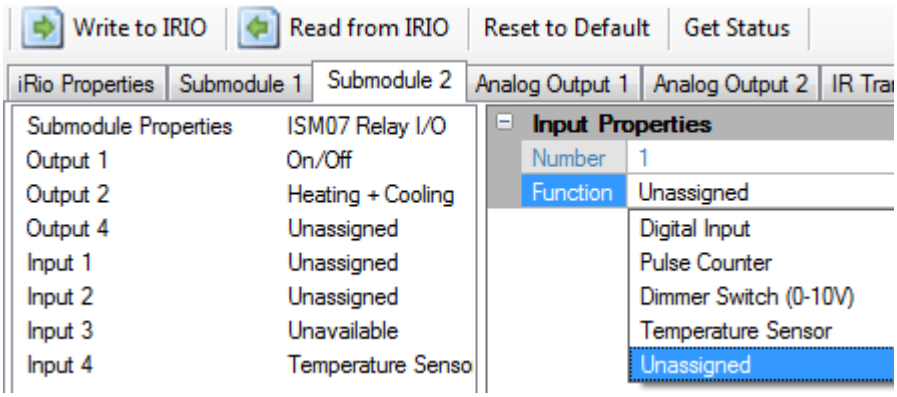
Select an Output 1 to 4.



For each Output, assign a Function from the drop-down list; Aircon Interface Relay, On/Off, Heating, Cooling, Heating + Cooling, Summer/Winter 2 speed Fan, Summer/Winter 3 speed fan, Blinds DC, Unassigned (default).
Information on programming the Output Functions can be found in the main IRIO Manual, since the functions are common to other modules.

Input Functions

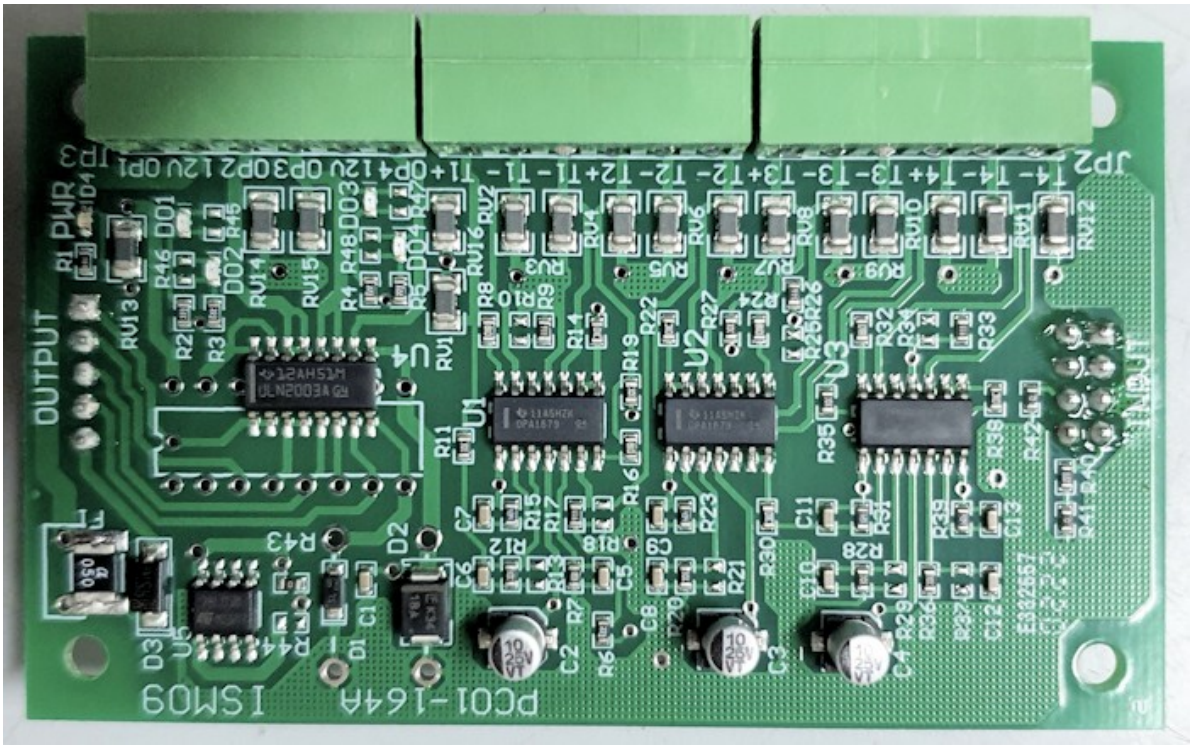
Select an Input 1 to 4
For each Input, assign a Function from the list; Digital, Pulse Counter, Dimmer Switch (0-10V), Temperature Sensor or Unassigned (Default)



Refer to the IRIO manual for descriptions of these Input functions as they are common to other modules

ISM09 (PT100)

The ISM09 PT100 submodule is for Temperature measurement using a standard PT100 Temperature Sensor. A PT100 sensor is not included in ISM09, it should be obtained seperately. Note that ISM09 works only with IRIO01 and IRIO02 from December 2022.



PT100 Platinum Resistance Sensor

A 3 wire PT100 sensor with alpha = 0.00385 should be used. Other va;ues of alpha eg 0.00392 wil not give accurate results. For a PT100 resistance temepartre calculator see https://www.fluke.com/en/learn/tools-calculators/pt100-calculator . The 3rd negative wire is connected to the - terminal of ISM09 to compensate for errors due to wire resistance. See https://www.omega.com/en-us/resources/rtd-2-3-4-wire-connections for a full explanation.

LEDs on ISM09

- PWR (D4) Green. Turns on when Power is applied to the IRIO and ISM09 is plugged in correctly

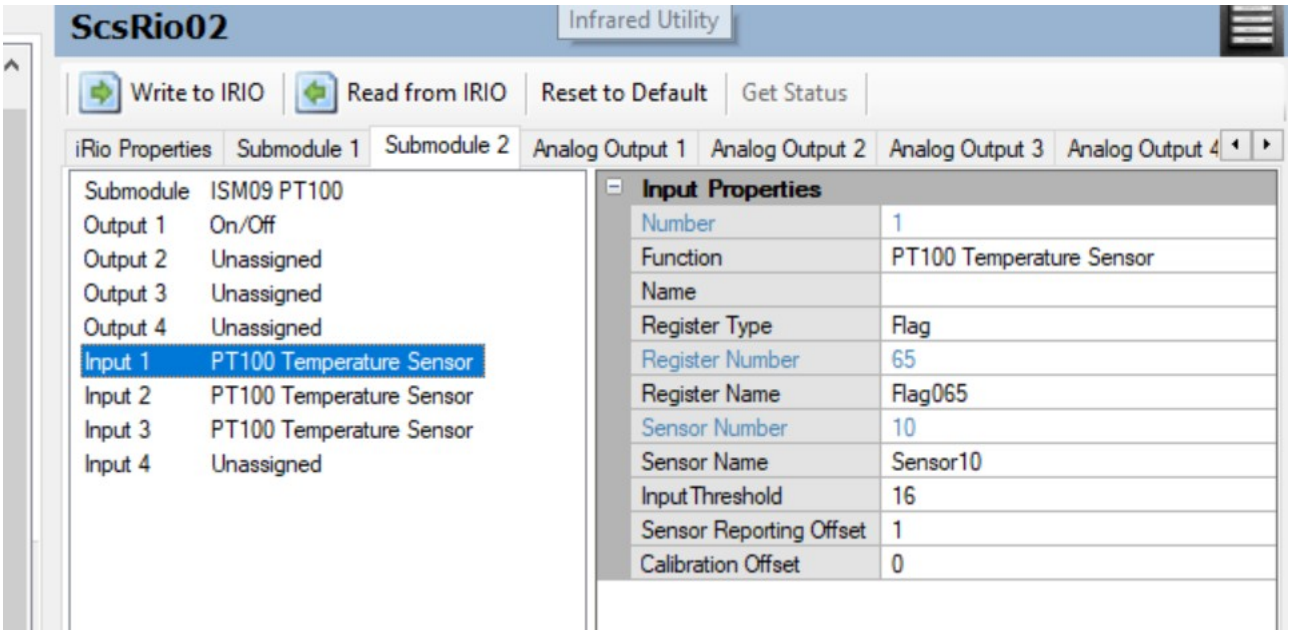
- DO1 to DO4 (Red). Each of the red leds indicates when the respectiove Output OP1 to OP4 are turned on

Connections

- I1+/I1-/I1 to I4+/I4-/I4- Input terminals for 4 PT100 sensors. I1+ is connected to the positive (RED) wire of the PT100. the 2 I1- wires are connected to the Black - wires of the PT100 sensor.. The same applies to the other 3 PT100 terminals. DO NOT short rthe I- terminals directly.
- OP1, OP2, OP3, OP4 are the Active Low outputs in ISM09. The common 12V output is the positive side of the Output connections

Comfigurator Programming

Refer to the IRIO manual for instructions on setting the IRIO ID and meaning of leds.
Read from IRIO will detect the Submodule in position 1 or 2. Select the Submodule 1 or 2.

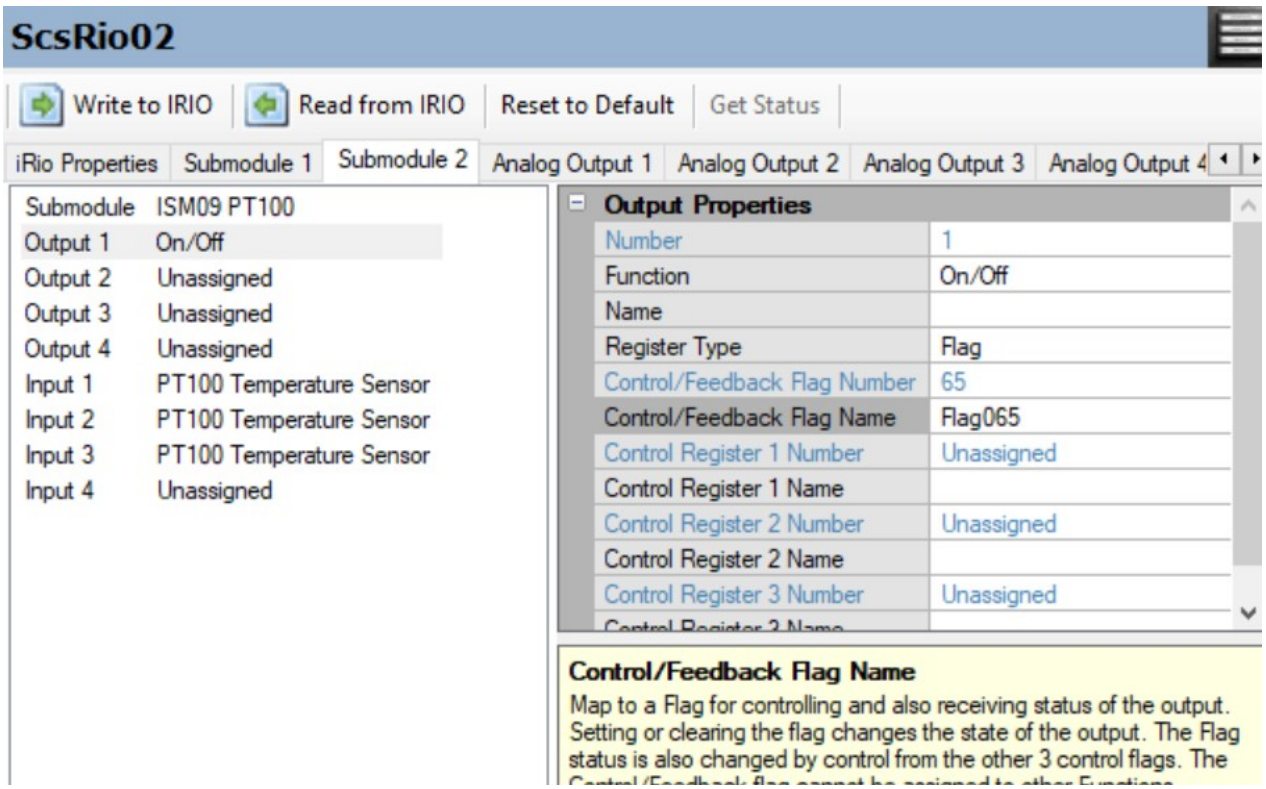


Output Functions

Select an Output 1 to 4.
Output functions available for selection for each Output include:

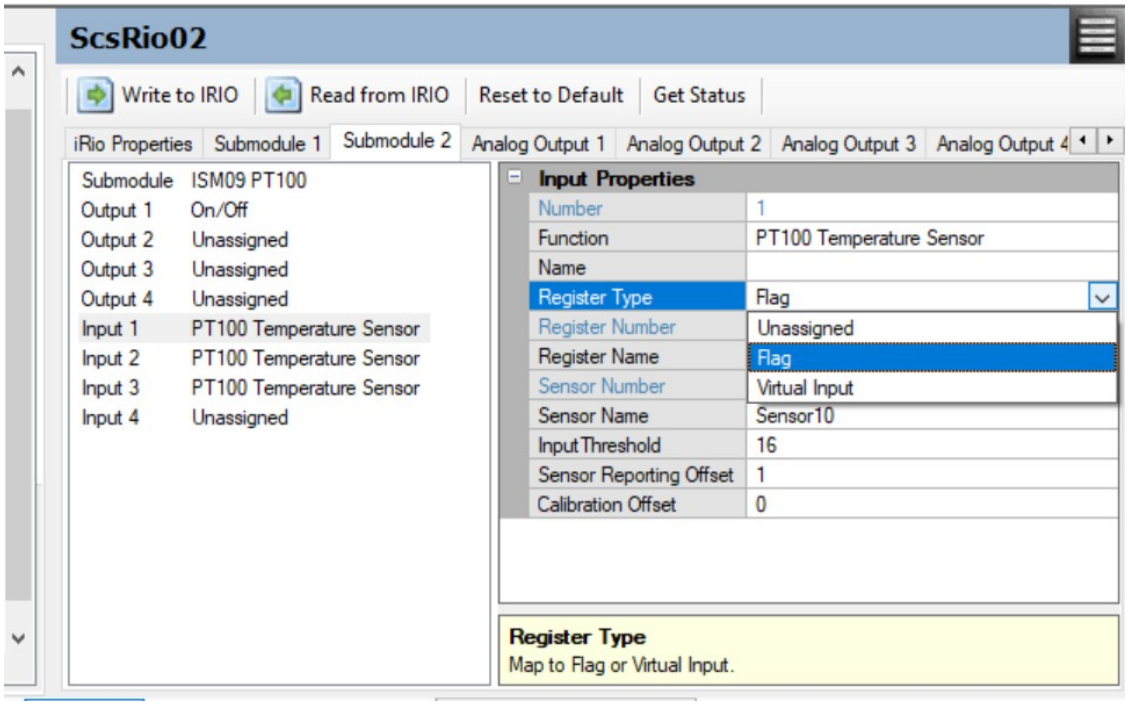
- On/Off
- Unassigned

Information on programming the On/Off Functions can be found in the main IRIO Manual, since the functions are common to other modules. This is the same as ISM01.



Input Functions

Select an Input 1 to 4
For each Input, assign a Function from the list; PT100 Temperature Sensor or Unassigned (Default)



Register Name

Select Flag or Virtual Input and assign the Flag Name/Number or Virtual Input number which will be activated when the Sensor value exceeds the threshold.

Sensor

A sensor should be mapped to the PT100 input. The measured voltage is converted to a value from 0 to 255 and saved in the sensor. This can be used for monitoring the voltage so as to be able to set the threshold value.

Sensor Reporting Offset

This is used in conjunction with the Sensor mapping. The hysteresis value determines the change in sensor value before the change is saved to the sensor, to prevent excessive reporting to Comfort

Threshold

This is the voltage threshold from 0 to 255 to detect whether the Flag or Virtual Input is on or off.

Calibration Offset

This is an offset in Degrees (positive or negative value) to be added to the sensor value to adjust the value of the PT100 temperature reading

Document History

30 May 2016 – Draft
8 March 2017 – Combined ISM01, ISM02, ISM03, ISM06, ISM07
31 December 2019 - ISM06 and ISM06 are for ELV (low voltage only)
2 April 2021 – Updated ISM03 IR signal advice
27 August 2022 - added ISM09
27 Sept 2024 – amended for ISM03 Infrared
28 December 2024 - ISM09 compatible with IRIO01 from Dec 2022
9 ebrauary 2025. PT100 should be alpha = 0.00385

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