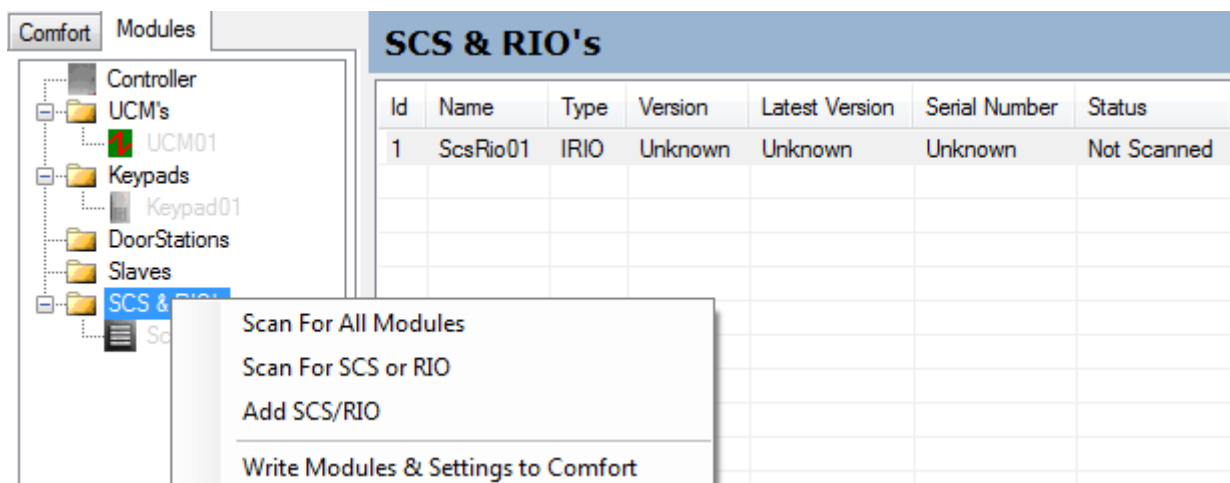


Introduction

Please download the IRIIO Quick Start Guide and the ISM Manual from http://www.cytech.biz/product_details.php?item_id=438

The IRIO Quick Start Guide has the Introduction, Specifications, Installation, Setup instructions for IRIO. The ISM Manual has instructions for the ISM

Programming IRIO by Using Configurator



IRIO Minimum Firmware 7.022

Comfigurator version 3.13.8.1 minimum

If there are more than 1 IRIO or SCS in the system, set the ID of the IRIO so that it is unique and consecutive among IRIO, RIO and SCS modules. Go to the Modules Tab, Right click and "Scan for All Modules" or "Scan for SCS or RIO". This will automatically detect all IRIO if the IDs are set correctly without any conflict with other IRIOs, RIOs and SCS.

"Add SCS/IRIO" allows you to manually add an IRIO if not currently connected to Comfort, i.e. when doing programming off-line.

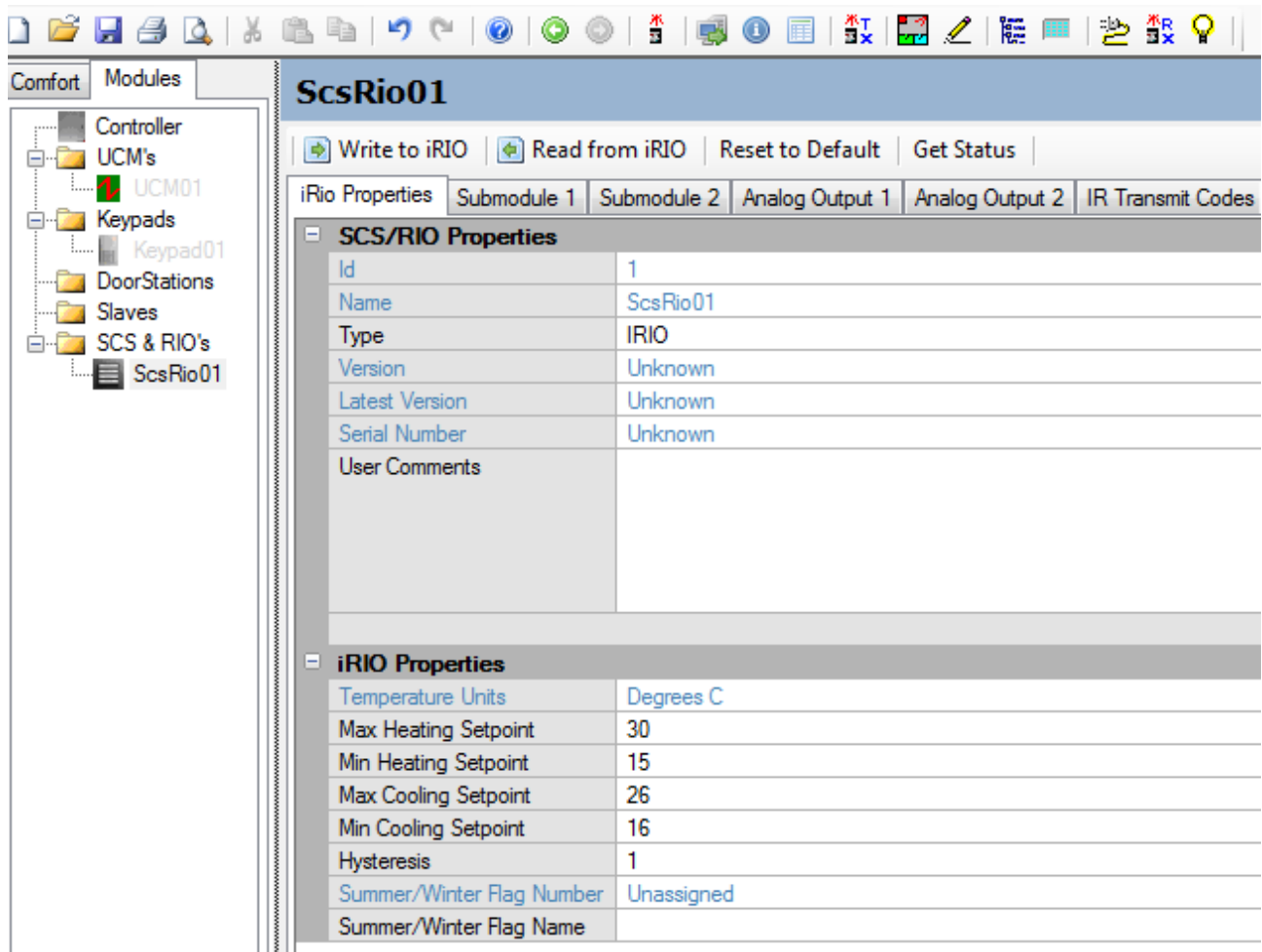
If the IRIO ID is detected during the module scan its properties should be displayed.

Type, Version, Latest Version , Serial Number are described below.

"Status" shows the status of IRIO on the bus. It is 'Polled' when the IRIO is detected and matches the number of IRIOs programmed. 'Not Polled' will be displayed when the IRIO is detected by scanning but the number of IRIOs programmed is less than the IRIO ID. 'Not Found' is shown when the IRIO is not connected to Comfort when scanning is done.

Click on the IRIO on the left pane. This brings up the Configurator screen as shown below;

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IRIO Properties

SCS/RIO Properties

ID	1 to 15 *
Name	as in Modules> IRIO
Type	IRIO *
Version	Firmware version eg 7.001 *
Latest Version	Released version available when internet connection is present.
Serial Number	Electronic serial number of IRIO (if implemented.)
User Comments	Enter comments

If the IRIO was manually added instead of being scanned, the firmware information will not appear.

* means Read Only

IRIO Properties

Max Heating Setpoint	Maximum Heating Setpoint for Heating/Cooling Function
Min Heating Setpoint	Minimum Heating Setpoint for Heating/Cooling Function
Max Cooling Setpoint	Maximum Cooling Setpoint for Heating/Cooling Function
Min Cooling Setpoint	Minimum Cooling Setpoint for Heating/Cooling Function
Hysteresis	Hysteresis in degrees for Heating/Cooling function
Summer/Winter Flag	Flag for Summer/ Winter Fan Mode 1=Winter, 0=summer

Menu Bar

The menu items are; Write to IRIO, Read from IRIO, Read Properties, Reset to Default, Get Status.

Write to IRIO

This writes the IRIO configuration in IRIO

Read from IRIO

This reads the data from IRIO and displays the data on screen.

Reset to Default

This clears all the data in the IRIO to default settings, but does not write any data to IRIO (after clearing, prompt "Write to IRIO? " should be seen")

Get Status

The Get status button causes the IRIO Module status to be shown on the status bar on bottom left

"Normal/No error"

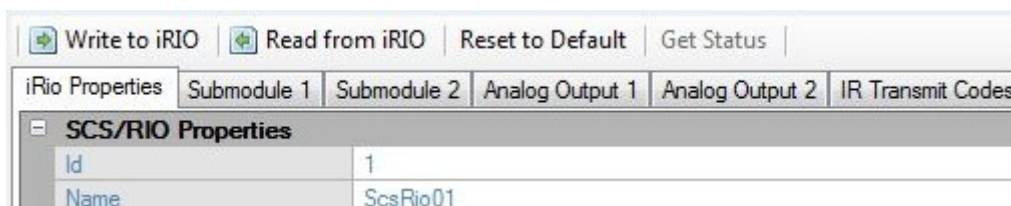
"Data Invalid"

"Communication error between baseboard and sub-module 1"

"Communication error between baseboard and sub-module 2"

When the cursor is moved away from the IRIO screen, Get status is automatically turned off, and when the cursor is on the IRIO screen the get status function is turned on if Configurator is logged in.

IRIO Tabs



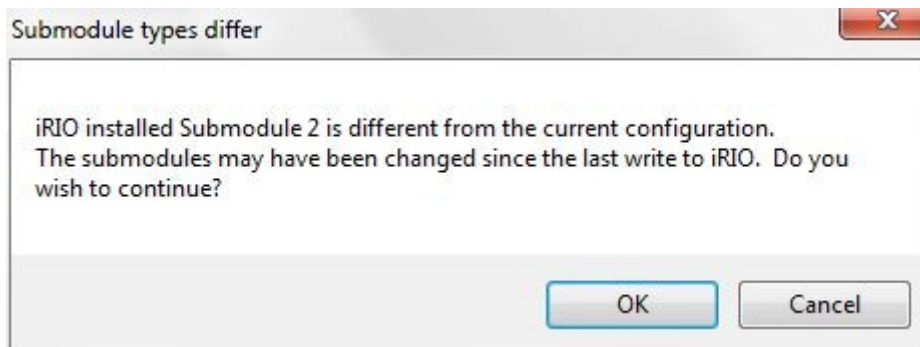
- IRIO Properties – described above
- Submodule 1 – properties of 1st submodule
- Submodule 2 – properties of 2nd submodule
- Analog Output 1 – properties of 1st Analog Output
- Analog Output 2– properties of 2nd Analog Output
- IR Transmit Codes – Assign IR transmit codes to ISM03 IR Submodule

Detecting Submodules

The submodules installed on the IRIO can be discovered by doing a Read from IRIO. There may be a warning message if the installed Submodules are different

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from the submodules in the IRIO configuration, for example if the submodule is changed. This is a warning to avoid overwriting the old configuration in Comfigurator. **Always do a Read from EEPROM before making any changes in order to detect the submodules**



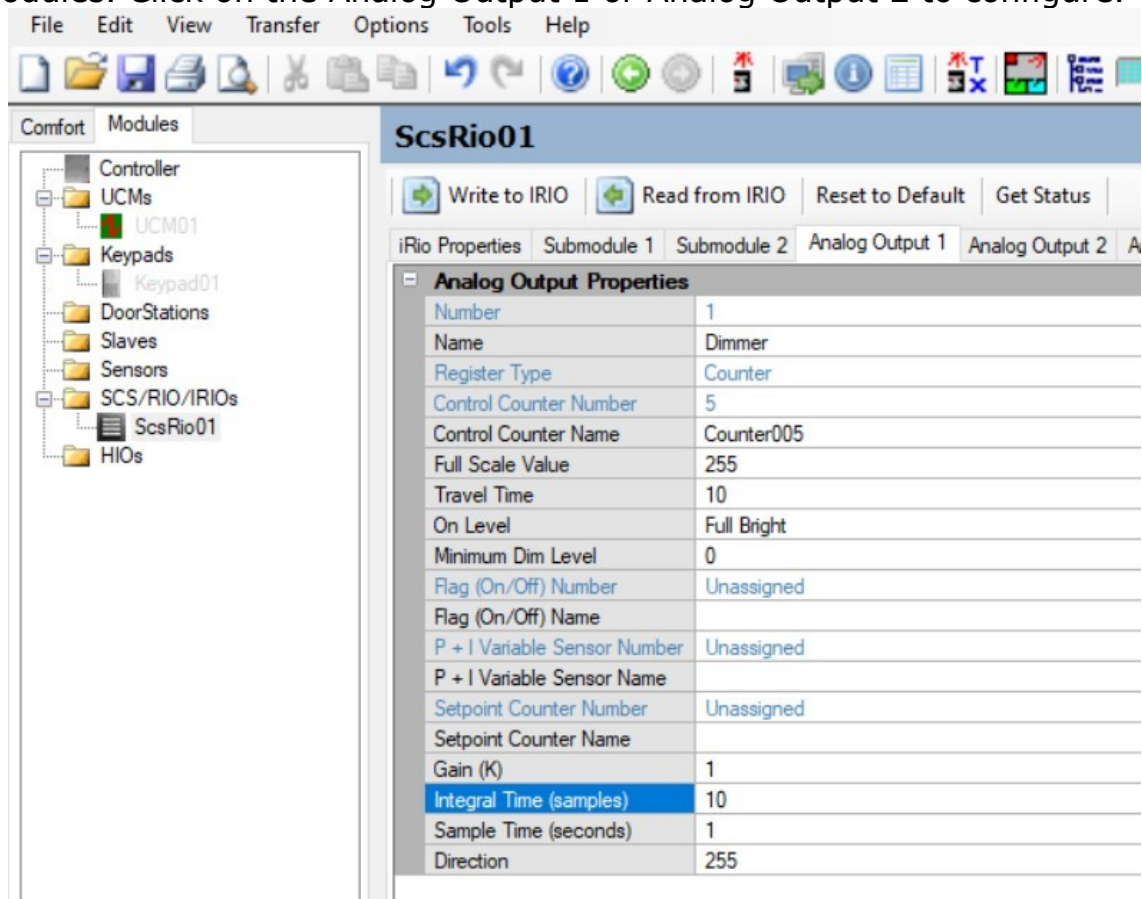
Press Yes to go ahead to read from IRIO.

After reading from IRIO, the Submodule 1 and Submodule 2 tabs will show the information relating to the detected submodule. After changing the parameters and register mappings, do not forget to WRITE to IRIO.

The details for configuring each submodule are described in the individual instruction sheets for the submodules.

Analog Outputs

The IRIO has 2 built-in Analog Outputs on the baseboard which do not require submodules. Click on the Analog Output 1 or Analog Output 2 to configure.



The Analog Output is mapped to a Comfort Counter which can be selected from a

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pulldown list. Setting a value in the mapped counter will set the analog output to the assigned value.

- Register Type is fixed at Counter
- Control Counter is the Counter that is mapped to the Analog Output. Counter value of 0 to 255 (0 to 99 depending on Full Scale Value) is converted to 0 to 10 Volts proportionately.
- "Full Scale Value" is either 255 or 99. Setting the counter to the full scale value will set the output to 10 V. The analog output is limited to 10V, even if the counter value is higher than the full scale value.
- "Travel Time" is the time taken to dim or brighten from minimum to maximum level or vice versa when using the Dimmer Switch 0-10V Input function to press and hold. This does not apply for control by Counter value, which will be immediate. **Travel Time also limits output voltage for the Proportional + Integral (P+I) Control**
- "On Level" is selected between "Full Bright" and "Last Value". This refers to the brightness level when the Dimmer Switch 0-10V Input function is used to switch on the light. Either the light turns on to full brightness or to the last level before switching off.
- "Minimum Dim Level" is the lowest dimming level (0-255) below which the light is switched off to prevent the light having low dim levels which cannot be seen.

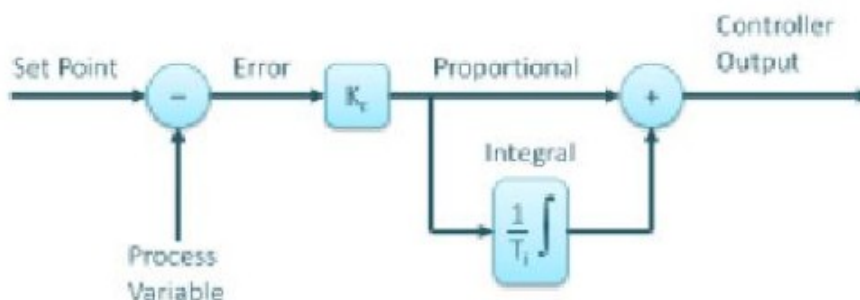
The Parameters Flag (On/OFF), P+I Variable Sensor, Setpoint Counter, Gain (K), Integral Value (Samples), Sample Time (Seconds), Direction are for Proportional + Integral (P+I) Control, to be described below.

Proportional + Integral (P+I) Control using Analog Outputs

The Analog Outputs can be used for Proportional + Integral P+I control. Minimum IRIO Firmware 7.018 and Configurator 3.13.6 is required.

P+I Control is used for industrial control applications iike Heating and Cooling.

$$CO = K_C \left(E + \frac{1}{T_I} \int E dt \right)$$



The P+I equation is

$$CO = \text{CO}_{\text{Bias}} + K \left(E + \frac{1}{T_i} \int E dt \right)$$

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where

CO = controller Output (0-10V)

CO_{Bias} = controller bias (set by bumpless transfer as explained below).

This is the CO value required to maintain the PV at setpoint. Strictly speaking, CO_{bias} is the value of the CO that, in manual mode, causes the PV to work at the setpoint.

E = Error between Setpoint and Process Variable (PV)

K = Gain

Ti = Integral time in seconds

The Controller Output (CO) is 0-10V output on IRIO

Another method Proportional + Integral + Derivative (P+ID) is also used for controlling processes but this is more complex. Derivative Control is usually not required for Heating/Cooling and Process control.

Analog Output Properties for P+I Control

The screenshot shows the ScsRio01 software interface. At the top, there are buttons for 'Write to IRIO', 'Read from IRIO', 'Reset to Default', and 'Get Status'. Below these are tabs for 'iRio Properties', 'Submodule 1', 'Submodule 2', 'Analog Output 1', and 'Analog Output 2'. The 'Analog Output 1' tab is selected, and the 'Analog Output Properties' section is expanded. The properties are listed in a table-like format:

Number	1
Name	heating Valve
Register Type	Counter
Control Counter Number	1
Control Counter Name	HeatingValue
Full Scale Value	255
Travel Time	10
On Level	Full Bright
Minimum Dim Level	0
Flag (On/Off) Number	4
Flag (On/Off) Name	HeatingValve
P + I Variable Sensor Number	7
P + I Variable Sensor Name	AHUTemp
Setpoint Counter Number	10
Setpoint Counter Name	AHUSetpoint
Gain (K)	0.13
Integral Time (samples)	250
Sample Time (seconds)	1
Direction	1

The meaning of the parameters below have a different use from Dimming Control.

- Control Counter is the Counter that shows the Analog Output value. Changing the value of the Control counter will set the Analog Output, but the analog output will then change automatically according to the P+I operation.
- "Travel Time" is the time taken to change from minimum to maximum level or vice versa during P+I Control. Note that in Manual Control (Control Flag=0), and the value of the Control Counter is manually changed, the

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rate of change is limited by this parameter, but the slow change is not seen in the Control Counter value. For example in Manual mode, if the control counter value is changed from 0 to 255, the control Output voltage will change from 0 to 10 Volts according to the Travel time. However the Counter value will show 255 immediately. **TravelTime also limits the rate of change of Output voltage in P+I Control to prevent valves from being damaged when switching from Manual to Automatic Control. Ensure that Travel Time is NOT set to 0**

- Flag (On/OFF): This Flag is assigned for P+I Control. Set the Flag to ON for Automatic P+I Control, and clear the Flag Off for Manual Control. For Automatic P+I control, the user should not manually change the Control Counter Value. For Manual Control, the Control Counter can be changed manually using (Comfort Register > Register Monitor).
- P+I Variable Sensor: This is the sensor which is mapped to the P+I Sensor which may be temperature, pressure or other variable. The sensor value can be obtained from MSM01, ISM02, KP04A, KNX, Modbus etc
- Setpoint Counter: This is the Counter that determines the setpoint of the process. Changing the value of the Counter will change the setpoint accordingly. **In Automatic Mode, the P+I Control will automatically adjust the Control Counter value to minimise the Error or difference between the P+I Sensor value and the Setpoint Counter. (NOTE- Bumpless Transfer has been removed from firmware 7.022)**
- Gain (K): This is the Proportional Gain of the P+I control. Select a value from 0 to 31.765 from the dropdown list. In Manual Mode the Setpoint Counter has no effect.
- Integral Time (Samples); This is the Integral time in Samples for the P+I Control. The Actual Integral Time is this value multiplied by Sample Time in seconds.
- Sample Time (Seconds): This determines the interval for each calculation of the Control Value in P+I Mode
- Direction: This determines the Direction of P+I Control. Select 0 for Down, 1 for Up, 255 for direction depending on the Summer/Winter Flag. Down = 0 is for Cooling (Sensor > Setpoint increases Control Value). Up = 1 is for Heating (Sensor < Setpoint increases Control Value). 255 means the Direction depends on the Summer/Winter Flag in IRIO Properties (Summer is for Cooling, Winter is for Heating)

Note: Bumpless Transfer for IRIO Firmware < 7.022 Only - This is removed in 7.022. Bumpless Transfer is not appropriate for IRIO, as it means the Setpoint would be automatically changed to match the temperature. That means the setpoint must be changed by Response which means additional complexity in programming

The P+I control implements "Bumpless Transfer". This means that when the P+I Control Mode changes from Manual (Control Flag=0) to Automatic (Control Flag=1), the Control Output will start at the same value in order to prevent a sudden change that may damage valves. In order to achieve this, the Setpoint Counter will take the value of the P+I Variable Sensor so the error starts at zero. The Control Output is the Controller Bias in the P+I equation. At this point the user should change the setpoint counter to the desired value. Similarly when changing from Automatic Mode to Manual Mode (Control Flag from 1 to 0), the

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Control Counter Value remains at the last value before the change. In Manual Mode the Control Counter can be changed manually. In actual operation, it is suggested that the user start in Manual mode and adjust the Control Counter in order to get the P+I Sensor value close to the desired Setpoint. Then the user switches to Automatic Control and let the P+I control take over.

In IRIO Firmware 7.022 and above "Bumpless Transfer has been removed. When switching from Manual to Automatic Control (ie set Control Flag), the Setpoint Counter will not change to the sensor value. Instead the Travel Time >0 will limit the rate of change of Output to achieve the same aim of protecting the valves from damage by sudden change in value

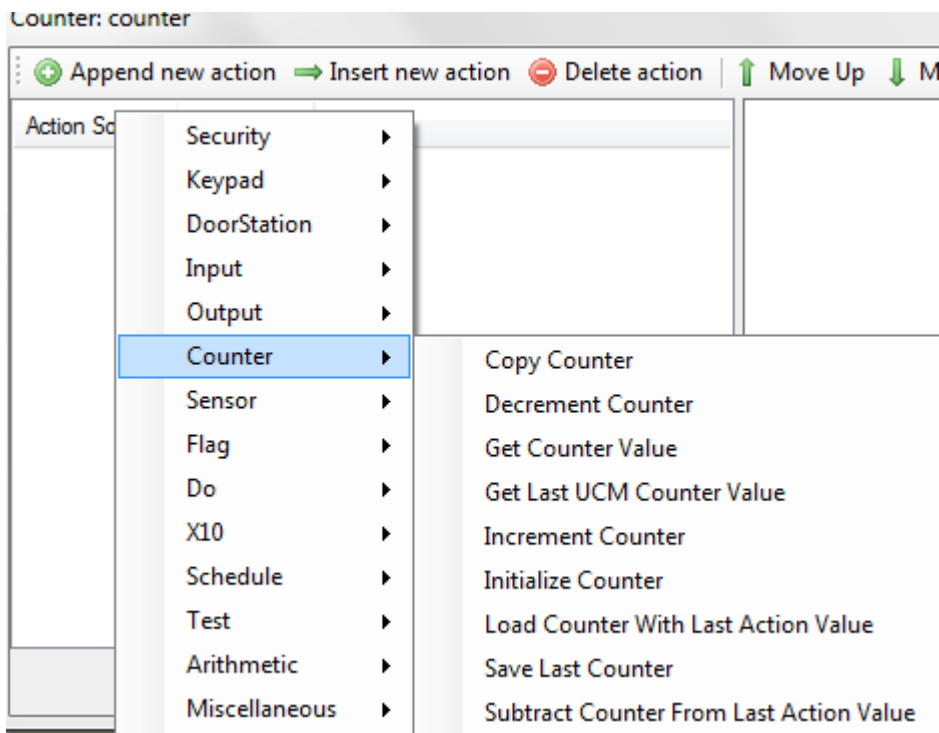
Use the Register Monitor Feature in Configurator > Comfort Registers to monitor the Counters, Sensors and Flags used. This is a very useful tool to monitor P+I control.

Mapping IRIO to Comfort Registers

The IRIO functions interface to Comfort via Comfort Registers, eg Counters, Flags, or Sensors. This allows comfort to send commands to and to read values from IRIO easily. For example, when a Counter is mapped to an analog output. Setting the value of the mapped counter between 0 and 255 will set the analog output between 0 to 10 Volts.

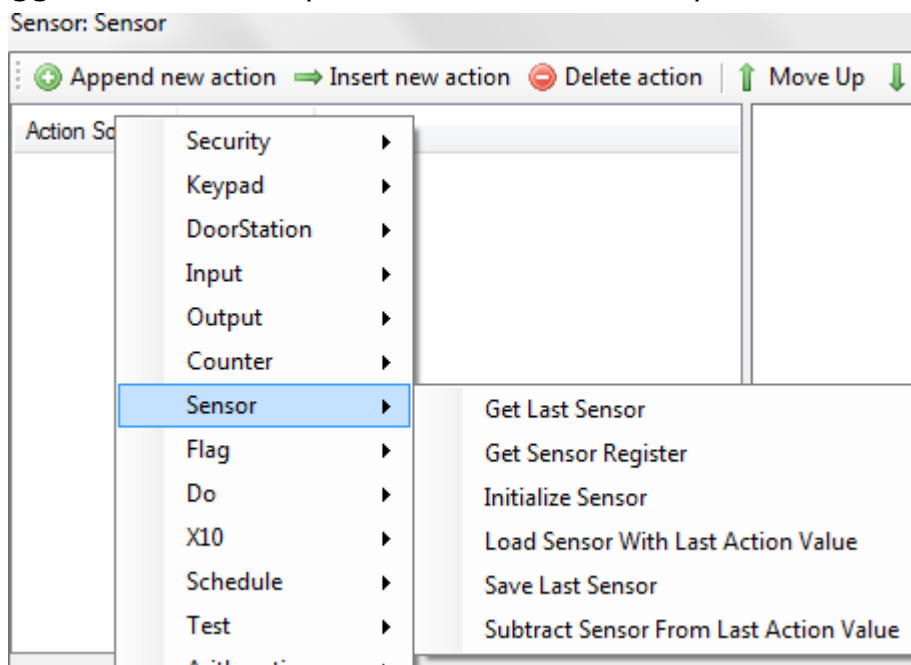
Mapping to Counters

Counters are used for level control and status. Loading a counter with a value from 0 to 255 puts the same value into the IRIO function, eg Analog Output, Heating/Cooling Setpoint, Blinds position, Infrared command. Counters can be added or subtracted from other values (using Actions within Responses) to implement arithmetic operations. IRIO Input functions like Digital Inputs (0 or 255 value) can be mapped to Counters to trigger Counter Responses to handle the input. Counters can be a way to link or synchronise the state of external devices. For example a Counter that is mapped to a Cbus or KNX group address can be controlled by an IRIO function mapped to the same Counter, where a 8 bit value is used eg for dimming.



Mapping to Sensors

Input functions like Temperature, Analog Input, Current sensor and Pulse Counter can be mapped to Sensors. The value in the sensors is 0 to 255 will trigger a Sensor Response which is used to process the input.

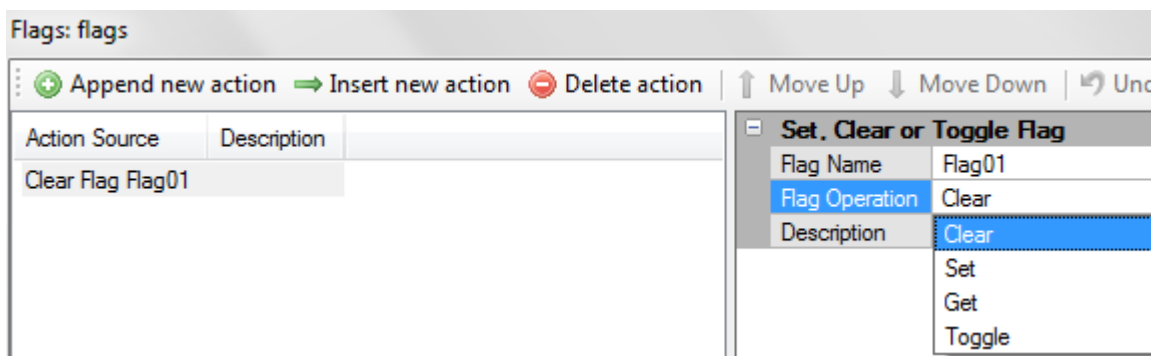
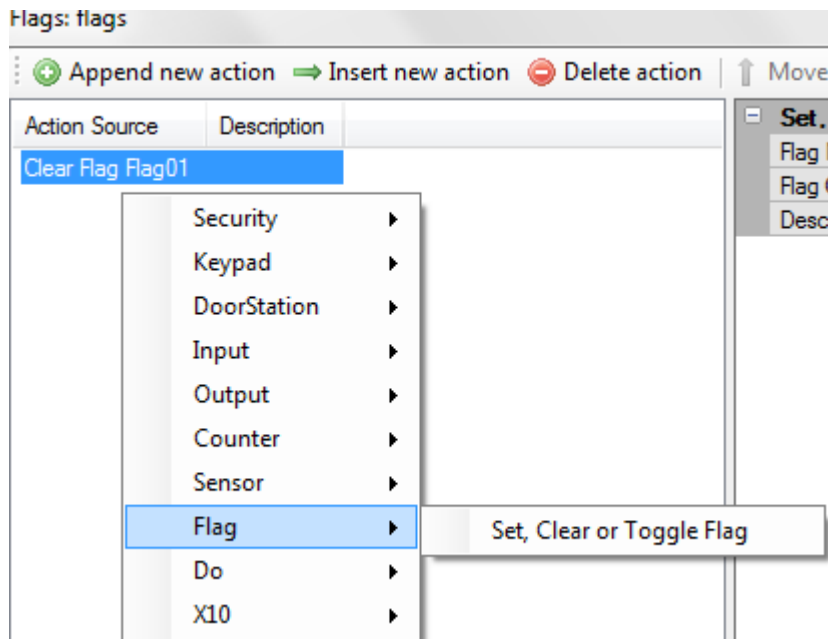


Mapping to Flags

Flags are used for On/Off control and status. Output functions like Output On/Off, Two Way Switch, Blinds Up/down can be mapped to Flags (which have 2 states – On and Off). Setting or clearing the flag will cause the function to turn on or off respectively. Feedback Input or Output functions can also be mapped to Flags so

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the Flag is synchronised to the function state. Flags can be a way to link or synchronise the state of external devices. For example a Flag that is mapped to a Cbus or KNX group address can be controlled by an IRIO function mapped to the same flag.



Control and Feedback Registers

IRiO Output functions can be assigned to one **Control/Feedback Flag** and 3 additional optional **Control Registers**.

For example the On/Off Function can be mapped to Flag 1 as Control/Feedback register. Setting and clearing Flag 1 will switch the output on or off respectively. The function can be mapped to flags 2, 3, 4 as additional Control Registers. This means that changing the state of any of these flags will also affect the state of the output as well as update the state of Flag 1 (the main control/feedback register). The 3 Control Flags allow the different flags to be used to implement Scenes; for example Flag 1 can be for Kitchen Lights, Flag 2 can be used for Downstairs lights including Kitchen Lights, Flag 3 can be for Cooking Scene. The Control/feedback flag can be used to provide status to other systems eg KNX, Cbus, Zwave etc. If a flag is mapped to an IRIO function as well as to a KNX 1-bit object, then the KNX object can control the IRIO function.

The Control/Feedback Flag must NOT be Black, it must be assigned to a flag even if it is not needed, otherwise Configurator (3.13.7) bug will cause the ISM Module programming to be blank - 1/4/2022

Duplication of Comfort Registers

The Control/Feedback Register must not be the same as a Control/feedback register in another function (so that only 1 device is giving the feedback to the register). However, the 3 Control Registers need not be unique ie the same Control Register can be used for different functions.

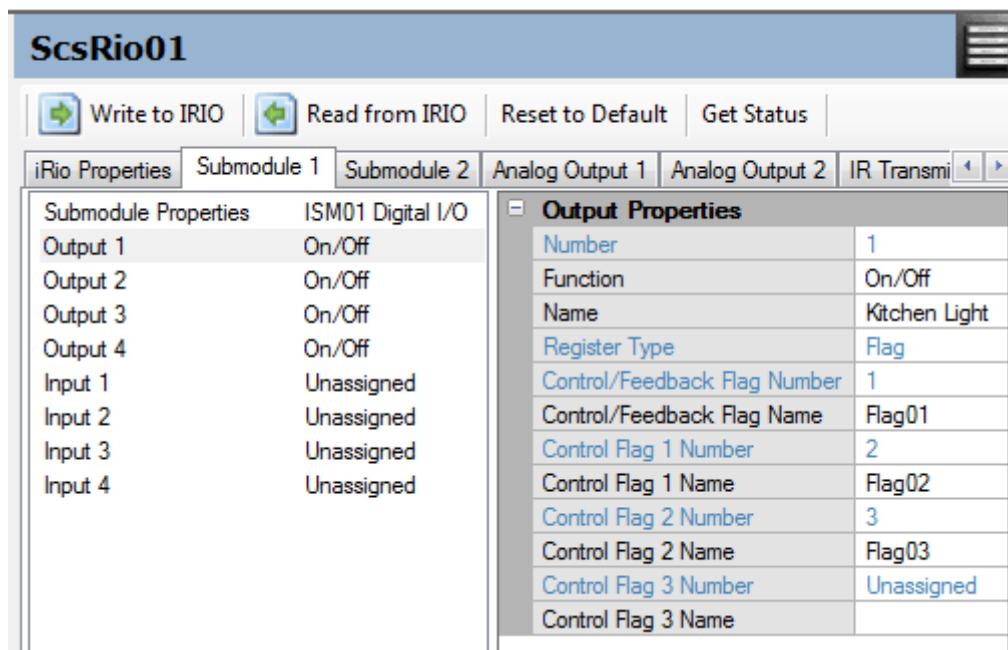
Output Functions

On/Off Function

This function is used for switching Outputs or Relays on and off.

Applicable to

- ISM01 Digital I/O submodule
- ISM02 Digital Outputs/Analog Inputs submodule
- ISM05 Two Way Switch submodule
- ISM06 NO/NC relay submodule
- ISM07 Relay I/O submodule
- ISM08 General I/O – This is for IRIO-IO



Control/Feedback Flag

Map to a Flag for Control and Feedback Status of the output. This flag cannot be the same as any other function's Control/feedback flag. Setting or clearing the flag turns on and off the Output.

Control Flags

3 additional control flags can be mapped for on/off control of the output. Setting

or clearing any of the control flags turns on and off the Output and updates the Control/Feedback flag. The additional control flags can be used to implement scenes.

Inputs

The On/Off Output function does not require any Inputs so the Inputs on the submodule can be assigned to any applicable Input function for the submodule.

Aircon Interface Relay Function

The Aircon Interface Relay Function is used to control airconditioner interface cards of various manufacturers. These interface cards have a dry-contact input which toggles the aircon state when a pulse is applied, and has a relay output which gives the status of the aircon (ie closed contact for On, open for off). A short pulse on the IRIO output toggles the aircon on and off. An Input from the aircon card gives the state of the aircon, ie Open for Off and Closed for On.

Applicable to;

- ISM07 Relay I/O submodule
- ISM08 General I/O Submodule

The screenshot shows the SCSRio01 software interface. At the top, there are buttons for 'Write to IRIO', 'Read from IRIO', 'Reset to Default', and 'Get Status'. Below these are tabs for 'iRio Properties', 'Submodule 1', 'Submodule 2', 'Analog Output 1', 'Analog Output 2', and 'IR Transmit Codes'. The 'Submodule 2' tab is selected, showing a list of properties for 'ISM07 Relay I/O'. The 'Output Properties' section is expanded, showing the following configuration:

Output Properties	
Number	1
Function	Aircon Interface ...
Name	bedroom
Register Type	Flag
Control/Feedback Flag Number	4
Control/Feedback Flag Name	Flag04
Control Flag 1 Number	5
Control Flag 1 Name	Flag05
Control Flag 2 Number	Unassigned
Control Flag 2 Name	
Control Flag 3 Number	Unassigned
Control Flag 3 Name	
Pulse Width	20
Min Pulse Gap	10

Control/Feedback Flag

Map to a Flag for Control and feedback Status of the air-con. This flag cannot be the same as any other function's Control/feedback flag. Setting or clearing the control flag changes the state of the aircon by sending a pulse on the relay if the state is different from the desired state. There is no action if the air-con is already in the desired state.

Control Flags

Map to 3 additional flags for control of the Aircon. This can be used to implement scenes. The Control/Feedback flag is updated with the current state of the aircon

Pulse Width

Pulse width in 50 ms units for the control pulse to change the state of the aircon. Typically 20 = 1 second.

Min Gap between Pulses

Minimum gap in 50 ms units between consecutive pulses to toggle the state of the aircon, to prevent pulses from being too close together which may appear as a continuous pulse. Typically 10 = 500 ms

Input

The corresponding input is "Unavailable" ie it is used by the Aircon Interface Function (see screenshot above)

Heating, Cooling Functions

The Heating function and Cooling function is for water based systems using valves which allow Hot (or cold) water to flow. The valve is controlled by switching the submodules built-in relay on or off. In addition, the ISM07 Relay I/O submodule can have one of its inputs connected to a TSM Thermistor as Temp sensor Input function to obtain the temperature for the heating/cooling function.

Applicable to

- ISM05 TWS Submodule
- ISM06 NO/NC relay submodule
- ISM07 Relay I/O submodule (preferred) as Temp Sensor Input function is available
- ISM08 General I/O Submodule

The screenshot below is applicable for both Heating and Cooling functions.

ScsRio01

Write to IRIO | Read from IRIO | Reset to Default | Get Status

iRio Properties | Submodule 1 | Submodule 2 | Analog Output 1 | Analog Output 2 | IR Transmit Codes

Submodule Properties	
Output 1	Aircon Interface Relay
Output 2	Heating
Output 3	Unassigned
Output 4	Unassigned
Input 1	Unavailable
Input 2	Unassigned
Input 3	Unassigned
Input 4	Unassigned

Output Properties	
Number	2
Function	Heating
Name	bath
Register Type	Flag
Control/Feedback Flag Number	6
Control/Feedback Flag Name	Flag06
Control Flag 1 Number	Unassigned
Control Flag 1 Name	
Control Flag 2 Number	Unassigned
Control Flag 2 Name	
Control Flag 3 Number	Unassigned
Control Flag 3 Name	
Sensor Number	1
Sensor Name	Sensor01
Heating Setpoint Counter Number	1
Heating Setpoint Counter Name	Counter001

Control/ Feedback Flag

Map to a Flag for Control and feedback Status of the Heating or Cooling. This flag

cannot be the same as any other function's Control/feedback flag. Setting or clearing the control flag enables or disables the heating or cooling function.

Control Flags

Map to 3 additional flags for control of the Heating or cooling function. The Control/Feedback flag is updated with the current state of the heating or cooling.

Sensor

The Temperature of the system is mapped to a Sensor number. The sensor obtains the system temperature from another external device like the TSM01 Temperature sensor module, or from a KNX or Cbus temperature sensor, or using a TSM Thermistor connected to an input programmed as Temp Sensor Input Function (for ISM07 Relay I/O or ISM01 Digital I/O). The sensor value is sent to the Heating/cooling function so that the IRIO can determine whether to switch on or off the heating/cooling relay.

Note: If the IRIO with Heating or Cooling function also has the TSM Thermistor connected in the ISM07 Relay I/O or ISM01 Digital I/O submodule, then the heating or Cooling function can operate in stand-alone mode, i.e. without Comfort controller.

Setpoint Counter

The Heating or Cooling setpoint can be mapped to a Counter. The value that is put into the mapped counter will be the setpoint for the function.

For the Heating function, the heating relay switches off if the temperature (sensor value) exceeds the setpoint by the value of the hysteresis (in IRIO Properties). The heating relay switches on if the temperature (sensor value) is lower than the setpoint.

For the Cooling function, the cooling relay switches off if the temperature (sensor value) is lower than the setpoint by the value of the hysteresis (in IRIO Properties). The cooling relay switches on if the temperature (sensor value) is higher than the setpoint.

Inputs

The Heating or Cooling Output function do not require any Inputs so the Inputs on the submodule can be assigned to any applicable Input function for the submodule. **The Temp Sensor Input function can be assigned to provide the temperature for the Heating/cooling function.**

Heating+Cooling Function

This function is for water based systems using valves which allow for both heating and cooling by turning on hot and cold water valves. The heating and cooling valve is controlled by switching the submodules built-in relays on or off. Heating and Cooling outputs are in adjacent relay outputs on the submodule. For a combined heating/cooling system, 2 adjacent outputs are used, with the 1st output being the heating output, followed by the 2nd output for Cooling. For example, Output 2 is heating, output 3 is cooling.

Applicable to;

- ISM05 TWS Submodule

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- ISM06 NO/NC relay submodule
- ISM07 Relay I/O submodule (preferred) as Temp Sensor Input function is available.
- ISM08 General I/O Submodule

Rio Properties	Submodule 1	Submodule 2	Analog Output 1	Analog Output 2	IR Transmit Codes
Submodule Properties	ISM07 Relay I/O				
Output 1	Aircon Interface Relay				
Output 2	Heating + Cooling				
Output 3	Unassigned				
Output 4	Unassigned				
Input 1	Unavailable				
Input 2	Unassigned				
Input 3	Unassigned				
Input 4	Unassigned				

Output Properties	
Number	2
Function	Heating + Cooling
Name	bedroom
Register Type	Flag
Control/Feedback Flag Number	6
Control/Feedback Flag Name	Flag06
Control Flag 1 Number	Unassigned
Control Flag 1 Name	
Control Flag 2 Number	Unassigned
Control Flag 2 Name	
Control Flag 3 Number	Unassigned
Control Flag 3 Name	
Sensor Number	1
Sensor Name	Sensor01
Heating Setpoint Counter Number	1
Heating Setpoint Counter Name	Counter001
Cooling Setpoint Counter Number	2
Cooling Setpoint Counter Name	Counter002

Control/ Feedback Flag

Map to a Flag for Control and feedback Status of the Heating/Cooling. This flag should not be the same as any other function's Control/feedback flag. Setting or clearing the control flag enables or disables the heating/cooling function.

Control Flags

Map to 3 additional flags for control of the heating/cooling function. Setting or clearing any of the control flags enables or disables the function. The Control/Feedback flag is updated with the current state of the heating or cooling.

Sensor

The Temperature of the system is mapped to a Sensor number. The sensor obtains the system temperature from another external device like the TSM01 Temperature sensor module, or from a KNX or Cbus temperature sensor, or using a TSM Thermistor connected to an input programmed as Temp Sensor Input Function (for ISM07 Relay I/O or ISM01 Digital I/O). The sensor value is sent to the Heating/cooling function so that the IRIO can determine whether to switch on or off the heating/cooling relay.

Note: If the IRIO with Heating or Cooling function also has the TSM Thermistor connected in the ISM07 Relay I/O or ISM01 Digital I/O submodule, then the heating or Cooling function can operate in stand-alone mode, i.e. without Comfort controller.

Setpoint Counter

There are separate setpoints for Heating and Cooling. The setpoints are mapped to Counters. The value that is put into the mapped counter will be the heating or cooling setpoints.

For the Heating function, the heating relay switches off if the temperature

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(sensor value) exceeds the setpoint by the value of the hysteresis (in IRIO Properties). The heating relay switches on if the temperature (sensor value) is lower than the setpoint.

For the Cooling function, the cooling relay switches off if the temperature (sensor value) is lower than the setpoint by the value of the hysteresis (in IRIO Properties). The cooling relay switches on if the temperature (sensor value) is higher than the setpoint.

The Heating and Cooling outputs are interlocked, ie both outputs will never be on at the same time. This is the advantage of using this function compared to individual Heating and Cooling functions.

Inputs

The Heating/Cooling Output function do not require any Inputs so the Inputs on the submodule can be assigned to any applicable Input function for the submodule. **The Temp Sensor Input function can be assigned to provide the temperature for the Heating/cooling function.**

Summer/Winter 2 Speed Fan

This function is used in HVAC systems where hot or cold air is blown through the fan. In Summer Mode, cool air is generated, and in Winter Mode, hot air is generated. A Flag is assigned to Summer/Winter mode in IRIO Properties which is set to 1 for Winter and is 0 for Summer. The summer/winter Flag can be determined by Time programs in Comfort.

IRIO Properties	
Temperature Units	Degrees C
Max Heating Setpoint	30
Min Heating Setpoint	15
Max Cooling Setpoint	26
Min Cooling Setpoint	16
Hysteresis	1
Summer/Winter Flag Number	71
Summer/Winter Flag Name	Flag071

Applicable to;

- ISM05 TWS submodule
- ISM06 NO/NC relay submodule
- ISM07 Relay I/O submodule (preferred) as Temp Sensor Input function is available.
- ISM08 General I/O Submodule

IRIO Programming Manual

iRio Properties	Submodule 1	Submodule 2	Analog Output 1	Analog Output 2	IR Transmit Codes
Submodule Properties	ISM07 Relay I/O				
Output 1	Summer/Winter 2 speed				
Output 3	Unassigned				
Output 4	Unassigned				
Input 1	Unassigned				
Input 2	Unavailable				
Input 3	Unassigned				
Input 4	Unassigned				

Output Properties	
Number	1
Function	Summer/Winter
Name	
Register Type	Flag
Control/Feedback Flag Number	3
Control/Feedback Flag Name	Flag03
Control Flag 1 Number	Unassigned
Control Flag 1 Name	
Control Flag 2 Number	Unassigned
Control Flag 2 Name	
Control Flag 3 Number	Unassigned
Control Flag 3 Name	
Sensor Number	2
Sensor Name	Sensor02
Setpoint Counter Number	2
Setpoint Counter Name	Counter002
High/Low Speed Flag Number	2
High/Low Speed Flag Name	Flag02

There are 2 possible speeds; Low and High Speed controlled by individual relays. Low speed fan is fixed to the 1st Output 1 High Speed Fan to the 2nd Output on the submodule. Thus each submodule can support 2 such 2-speed fan functions.

Control/ Feedback Flag

Map to a Flag for Control and feedback Status of the function. This flag should not be the same as any other function's Control/feedback flag. Setting a control flags starts the function. Clearing a control flag turns off the high and low speed fan.

Control Flags

Map to 3 additional flags for control of the function for scene control. Setting or clearing any of the control flags enables or disables (switch off) the function. The Control/Feedback flag is updated with the current state.

Sensor

The Temperature of the system is mapped to a Sensor number. The sensor obtains the system temperature from another external device like the TSM01 Temperature sensor module, or from a KNX or Cbus temperature sensor, or using a TSM Thermistor connected to an input programmed as Temp Sensor Input Function (for ISM07 Relay I/O or ISM01 Digital I/O). The sensor value is sent to the Heating/cooling function so that the IRIO can determine whether to switch on or off the heating/cooling relay.

Note: If the IRIO with Heating or Cooling function also has the TSM Thermistor connected in the ISM07 Relay I/O or ISM01 Digital I/O submodule, then the heating or Cooling function can operate in stand-alone mode, i.e. without Comfort controller.

Setpoint Counter

The setpoint mapped to a Comfort Counter. The fans stop if the temperature exceeds this value in Winter or is lower than this value in Summer. If the counter number is undefined ie 255, it means the function is inactive.

High/Low Speed Flag

The flag state determines the Fan speed. If the flag state=0, low speed fan is on. If Flag state =1, the high speed fan is on. Both fans cannot be on at the same time

In IRIO Properties, Max Heating setpoint Min Heating Setpoint, Max Cooling setpoint, min cooling setpoint, Hystereris are global settings applicable to all IRIO submodules. As the setpoint is common for heating and cooling, the max setpoint is the maximum cooling setpoint and the minimum setpoint is the minimum heating setpoint

Inputs

This Output function do not require any Inputs so the Inputs on the submodule can be assigned to any applicable Input function for the submodule. **The Temp Sensor Input function can be assigned to provide the temperature.**

Summer/Winter 3 Speed Fan

This function is used in HVAC systems where hot or cold air is blown through the fan. In Summer Mode, cool air is generated, and in Winter Mode, hot air is generated.

A Flag is assigned to Summer/Winter mode in IRIO Properties which is set to 1 for Winter and is 0 for Summer. The summer/winter Flag can be determined by Time programs in Comfort.

Applicable to;

- ISM06 NO/NC relay submodule
- ISM07 Relay I/O submodule (preffered) as Temp Sensor Input function is available.
- ISM08 General I/O Submodule

IRIO Programming Manual

iRio Properties	Submodule 1	Submodule 2	Analog Output 1	Analog Output 2	IR Transmit Codes
Submodule Properties	ISM07 Relay I/O				
Output 1	Summer/Winter 3 speed				
Output 4	Unassigned				
Input 1	Unassigned				
Input 2	Unavailable				
Input 3	Unavailable				
Input 4	Unassigned				

Output Properties	
Number	1
Function	Summer/Winter
Name	
Register Type	Flag
Control/Feedback Flag Number	3
Control/Feedback Flag Name	Flag03
Control Flag 1 Number	Unassigned
Control Flag 1 Name	
Control Flag 2 Number	Unassigned
Control Flag 2 Name	
Control Flag 3 Number	Unassigned
Control Flag 3 Name	
Sensor Number	2
Sensor Name	Sensor02
Setpoint Counter Number	2
Setpoint Counter Name	Counter002
Fan Speed Counter Number	12
Fan Speed Counter Name	Counter012

There are 3 possible speeds; Low, Medium and High Speed controlled by individual relays. Low speed fan is fixed to the 1st Output, medium speed to the 2nd output and High Speed Fan to the 3rd Output on the module. Thus each submodule can support only one 3-speed fan function.

Control/ Feedback Flag

Map to a Flag for Control and feedback Status of the function. This flag cannot be the same as any other function's Control/feedback flag. Setting a control flags starts the function. Clearing a control flag turns off the fans.

Control Flags

Map to 3 additional flags for control of the function. Setting a control flags starts the function. Clearing a control flag turns off the fans. The Control/Feedback flag is updated with the current state.

Sensor

The Temperature of the system is mapped to a Sensor number. The sensor obtains the system temperature from another external device like the TSM01 Temperature sensor module, or from a KNX or Cbus temperature sensor, or using a TSM Thermistor connected to an input programmed as Temp Sensor Input Function (for ISM07 Relay I/O or ISM01 Digital I/O). The sensor value is sent to the Heating/cooling function so that the IRIO can determine whether to switch on or off the heating/cooling relay.

Note: If the IRIO with Heating or Cooling function also has the TSM Thermistor connected in the ISM07 Relay I/O or ISM01 Digital I/O submodule, then the heating or Cooling function can operate in stand-alone mode, i.e. without Comfort controller.

Setpoint Counter

The setpoint mapped to a Comfort Counter. The fans stop if the temperature

IRIO Programming Manual

exceeds this value in Winter or is lower than this value in Summer. If the counter number is undefined ie 255, it means the function is inactive.

Fan Speed Counter

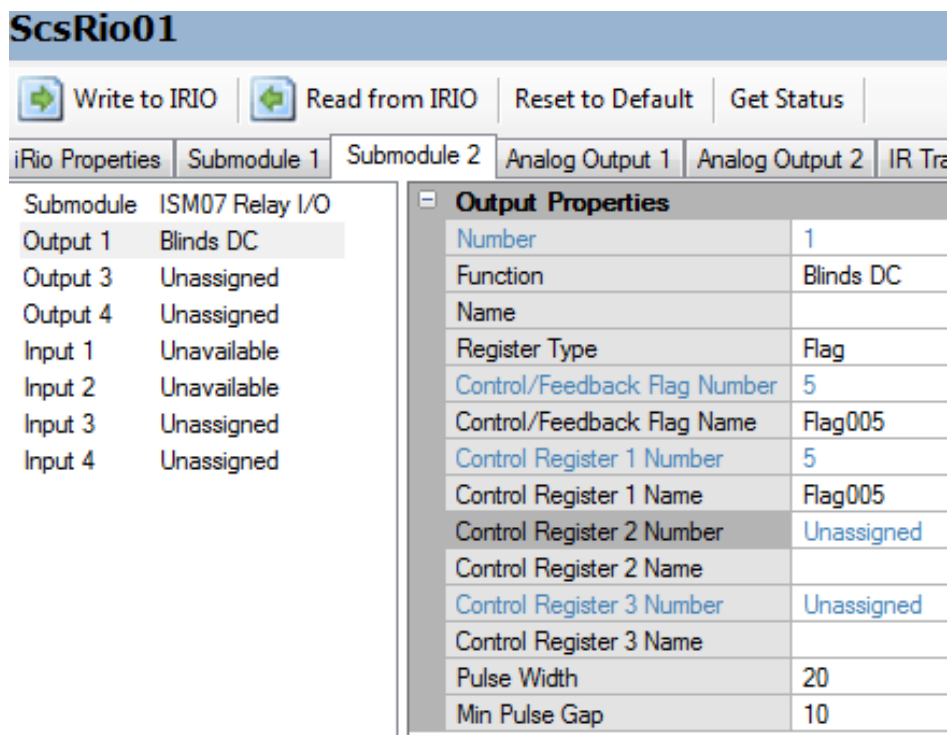
The counter value determines the Fan speed. Counter value =0 means low speed fan. Counter value =1 means medium speed fan, Counter value = 2 or more means high speed.

Inputs

This Output function do not require any Inputs so the Inputs on the submodule can be assigned to any applicable Input function for the submodule. **The Temp Sensor Input function can be assigned to provide the temperature.**

Blinds DC Function

The Blinds DC Function requires 2 outputs and 2 inputs for Up and Down control and Buttons.



ScsRio01

Write to IRIO Read from IRIO Reset to Default Get Status

iRio Properties Submodule 1 Submodule 2 Analog Output 1 Analog Output 2 IR Tra

Submodule	ISM07 Relay I/O
Output 1	Blinds DC
Output 3	Unassigned
Output 4	Unassigned
Input 1	Unavailable
Input 2	Unavailable
Input 3	Unassigned
Input 4	Unassigned

Output Properties

Number	1
Function	Blinds DC
Name	
Register Type	Flag
Control/Feedback Flag Number	5
Control/Feedback Flag Name	Flag005
Control Register 1 Number	5
Control Register 1 Name	Flag005
Control Register 2 Number	Unassigned
Control Register 2 Name	
Control Register 3 Number	Unassigned
Control Register 3 Name	
Pulse Width	20
Min Pulse Gap	10

The Blinds DC Function 2 Output and 2 Inputs. This is for control of blinds/curtains with a Blinds controller. The blinds controller has 2 dry contact inputs for up and down. Each submodule can control 1 sets of blinds (up and down).

Output 1 = UP control. Output 2 = Down control

Input 1 = Input 1 = Up button, Input 2 = Down button

The Up and Down Inputs should be connected to pushbuttons for manual control of the blinds.

The iRIO can be used standalone for blinds control when CM9001 is disconnected

Setting the flag sends a pulse on Output 2 to move down the blinds. Clearing the flag sends a pulse to Output 1 to move up the blinds.

There is no control over the position of the blinds and no STOP function. Some

IRIO Programming Manual

blinds controllers accept another press on the Up or down buttons as Stop command and some require a simultaneous press on the Up and Down buttons to stop the blinds. Some controllers have Short and Long press for Nudge and Full travel. This can be done manually using the pushbutton inputs. There is no STOP command which is sent by IRIO

The Up and down Inputs when pressed just pass on the state to the Up and Down Outputs, ie when the button is pressed, the output is turned on, and when the button is released the output is turned off.

Control/Feedback Flag

Map to a Flag for Control and Feedback Status of the output. This flag cannot be the same as any other function's Control/feedback flag. Setting the flag sends a pulse on Output 2 to move down the blinds. Clearing the flag sends a pulse to Output 1 to move up the blinds. The feedback Flag state gives the current position of the Blinds, ie Flag On = Down, Flag Off = Up

Control Flags

3 additional control flags can be mapped for Blinds Control. Setting the flag sends a pulse on Output 2 to move down the blinds. Clearing the flag sends a pulse to Output 1 to move up the blinds. The current state is copied to the Control/Feedback Flag.

The additional control flags can be used to implement scenes. Note that the state of one of the Control Flags may not be the current state of the flags due to control by other Control Flags.

Inputs

The Inputs are used for the Blinds DC Function and cannot be used for any other function.

IR, IR with Feedback Function

The IR function and IR with Feedback Functions are described in the ISM03 Submodule manual as only that submodule supports the Infrared functions

TWS (Two Way Switch) Function

The TWS function is described in the ISM04 submodule manual as only that submodule supports the TWS function.

Blinds AC Function

The Blinds AC function is described in the ISM05 Submodule manual as only that submodule supports the function.

IRIO Input Functions

IRIO Inputs can be configured for the following functions according to what submodule is connected. The availability of Input functions depends on the submodule and the output function assigned.

IRIO Programming Manual

IRIO inputs may be

1. Used by the Output function on the Function eg Blinds and Aircon configured in the Output function. These are not independent inputs, ie they are required by the Output function.
2. Independent - these inputs are not part of the output functions eg Digital, Current sensor, Pulse count, Analog Input, Temp Sensor.

The following Independent Input functions are available

- Digital Inputs Function
- Current Sensor Function
- Analog Input Function (0-10V)
- Pulse Count Function
- Temp Sensor
- Resistive Sensor
- PT1000 Temperature Sensor

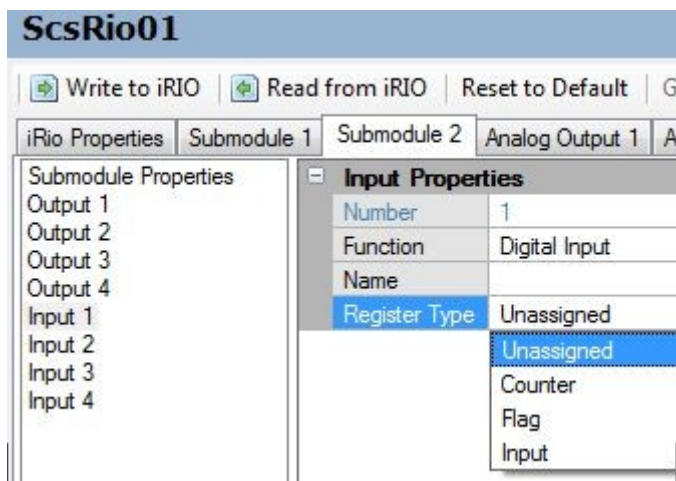
Digital Input Function

Applicable to

- ISM01 Digital I/O Submodules
- ISM07 Relay I/O Submodule
- ISM08 General I/O Submodule
- ISM09 PT1000 Submodule

Each of the applicable submodules have 4 digital inputs which can accept Open and Close contacts (voltage-free).

A digital Input can be mapped to Counter, Flag or Input



Map to Counter

If mapped to a Counter, when the Input is On, it will put value 255 into the mapped Counter. When the Input is Off, it will put value 0 into the mapped Counter. The Counter Response for the mapped Counter will be activated which can cause different things to be performed by Comfort depending on the change of Input state.

Eg

If Counter NNN = 0 then
Do Response XXX

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```
Else
    Do Response YYY
EndIf
```

Map to Flag

If mapped to a Flag, the flag will be set or cleared based on the Input state. Flags do not activate Responses as in the case of Counters. Instead Flags can be used for Conditional programming or they can be used to send commands to other systems. For example a KNX or Cbus Group address can be mapped to the same Flag as the Input. This allows the Input to control the external Group address. Also another IRIO function like Heating or Blinds can be mapped to the same Flag to allow the Input to control the mapped Heating or Blinds

Map to Input

If mapped to an Input, this triggers the Response for the IRIO Input in the same way as the old RIO Input Response. The Input numbers are as follows;

IRIO ID	Input No	IRIO ID	Input No	IRIO ID	Input No	IRIO ID	Input No
1	129-136	5	161 - 168	9	193 - 200	13	225 - 232
2	137-144	6	169 - 176	10	201 - 208	14	233 - 240
3	145-152	7	177 - 184	11	209 - 216	15	241 - 248
4	153-160	8	185 - 192	12	217 - 224		

Pulse Counter Input Function

Applicable to

- ISM01 Digital I/O
- ISM07 Relay I/O
- ISM08 General I/O Submodule

Each Input on the above modules can be assigned as a Pulse Counter function. The Pulse Counter Function is able to count pulses from one of 4 digital Inputs on the applicable modules. The digital Input accepts a voltage-free contact (Open or close).

ScsRio01

Write to iRIO
Read from iRIO
Reset to Default
Get Status

iRio Properties

Submodule 1

Submodule 2

Analog Output 1

Analog Output 2

Submodule Properties

Output 1

Output 2

Output 3

Output 4

Input 1

Input 2

Input 3

Input 4

Input Properties

Number	1
Function	Pulse Counter
Name	
Register Type	Sensor
Register Number	Unassigned
Register Name	
Counting Interval	60
Min Limit	0
Max Limit	65535
Alarm	FamilyCare

Alarm
 Alarm to be activated when count is outside limits.

The Pulse Counter Input can be mapped to a Comfort Sensor.

Map to Sensor

If mapped to a Sensor, the number of pulses counted during the Counting Interval (see below) is saved to the mapped sensor. The sensor value can be read by Responses or it can be sent to external devices for further processing. A Sensor Response is activated whenever a new value is saved in the sensor.

Eg

```

If Sensor NNN >= 100 then
    Do Response XXX
Else
    Do Response YYY
EndIf
  
```

Counting Interval

This is the interval for counting pulses. Eg if set to 60 seconds, that means that the pulses are counted every minute and the results for counter or sensor reported every minute to comfort. If set to 0, it means every change in count is reported.

Min Limit

The minimum pulse count for the Counting Interval. Currently there is no action when the counter is below this limit. This is for future use.

Max Limit

The maximum pulse count for the Counting Interval. Currently there is no action when the counter is below this limit. This is for future use.

Alarm

This is for future use and currently has no function.

Analog Input Function (0-10V)

Applicable to

- ISM02 Digital O/P + Analog Input Submodule

This shall be described in the IRIO Analog Input/Digital Output Submodule instruction leaflet as the function is only available in that submodule

Current Sensor Input Function

Applicable to

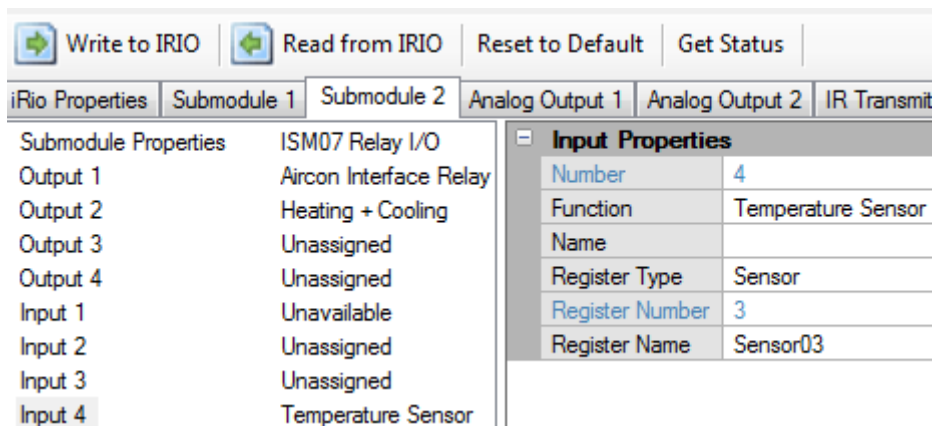
- ISM03 Infrared Submodule

This shall be described in the IRIO Infrared Submodule leaflet as the function is only available in that submodule

Temp Sensor Input Function

Applicable to

- ISM01 Digital I/O Submodule
- ISM07 Relay I/O Submodule

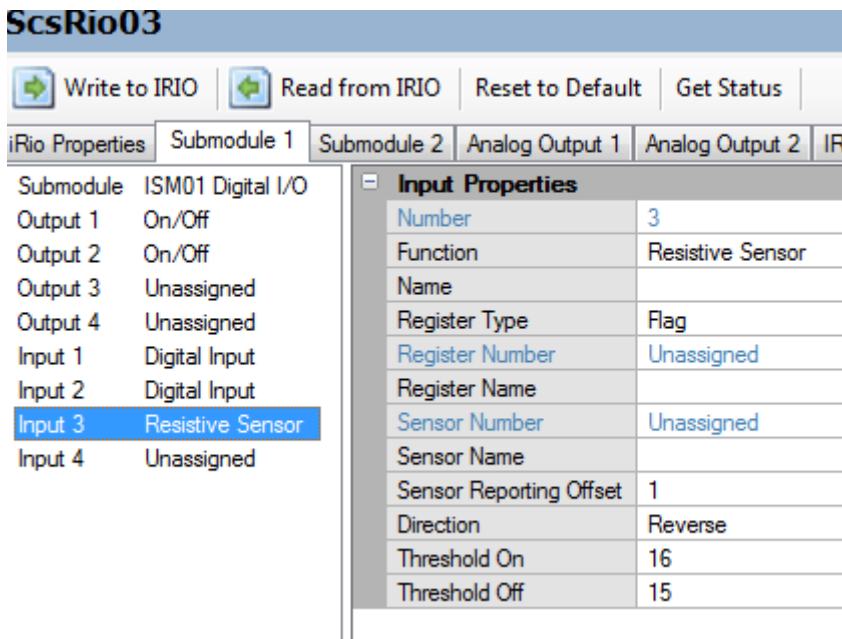


This requires the TSM Thermistor (which is also used for the TSM01 Thermostat module) connected to the Input. The Temperature is assigned to a Comfort Sensor. The value of the temperature in degrees Celcius is saved in the sensor whenever the temperature changes. Note that there is no hysteresis value like that of the Current sensor so every change in temperature reading is reported to the Sensor. The Temp Sensor Input function can be used to provide temperature values to the heating and cooling functions.

Resistive Sensor Input Function

Applicable to

- ISM01 Digital I/O Submodule
- ISM07 Relay I/O Submodule



The Resistive Sensor function caters to a Resistive sensor (like the Thermostat) which changes its resistance according to the sensing value. This is mapped to a Flag as well as a sensor. The Sensor Reporting Offset applies to the Sensor, and is the minimum change in the sensor value before the sensor gets sent to the Controller. A small value will result in very frequent updating of the sensor value on the Rs485 Bus and should be avoided. The Threshold On value is the value which determines if the mapped flag is considered on The Threshold Off value is the value which determines if the mapped flag is turned off. Threshold ON must be greater than or equal to Threshold Off. The Direction determines whether the Raw value of the analog value is saved to the sensor or whether the reading is reversed, ie full scale – reading is saved to the sensor.

PT100 Input Function

Applicable to

- ISM09 PT100 Submodule

Please refer to the ISM manual for PT100

Stand-alone IRIO Operation

Some configurations allow the IRIO to operate in stand-alone mode, ie without Comfort. This is possible when the functions share some Comfort registers for Input and Output functions.

For example Submodule 1 is an ISM05 TWS Lighting Submodule and Submodule 2 is ISM01 Digital I/O module.

The ISM05 TWS submodule is used to control lights. The ISM01 Digital I/O submodule has Inputs configured as Digital Input function connected to mechanical switches. If the same flag or flags are mapped to the TWS function as well as the Digital Input functions then the digital Input can be used to control the lights via the mapped flag.

The ISM07 can be used as Heating/Cooling or Summer/Winter 2/3 speed fan with the TSM Thermistor connected to an input as Temp sensor Input function.

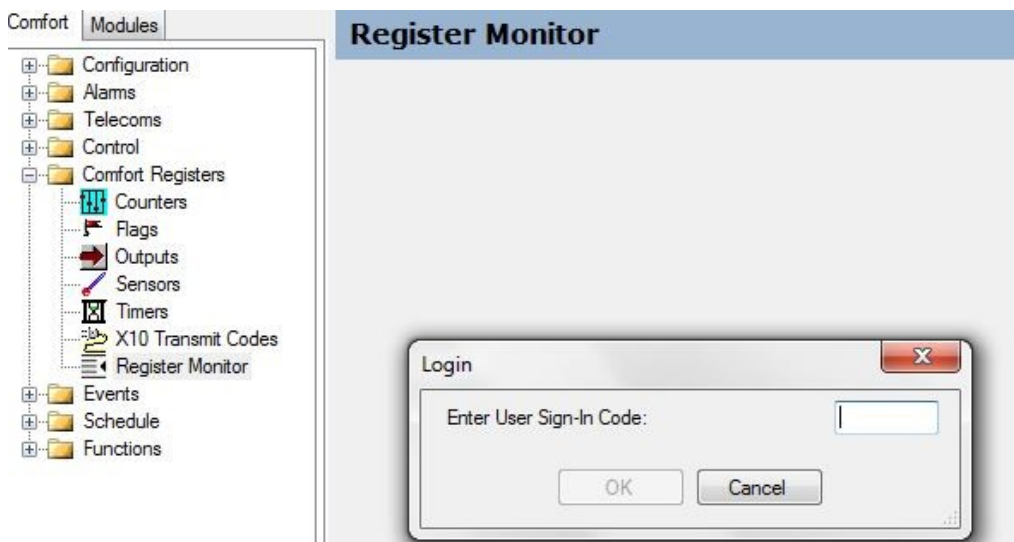
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Another input can be assigned to Flag for On/off to enable to disable the function. The heating or cooling setpoint is ampped to a counter. As the setpoint value by counter requires a Controller the heating/cooling function cannot be fully stand-alone, but if the Controller loses connection, the heating and cooling will stil continue with the same setpoint.

Register Monitor

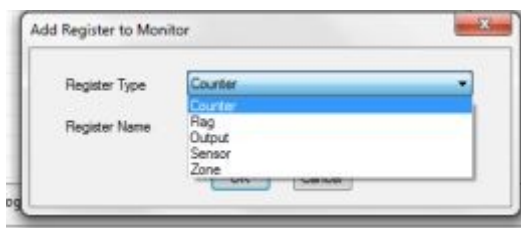
The Register Monitor feature in Configurator 3.13.X is very useful when you want to monitor a range of Comfort registers; Zones/Inputs, Outputs, Counters, Flags, and Sensors. Before this, you had to go to Zones to monitor zones, Outputs to monitor outputs, Counters to monitor counters, etc. This feature allows all required registers to be monitored in a single window.

Go to Comfort Registers > Register Window.



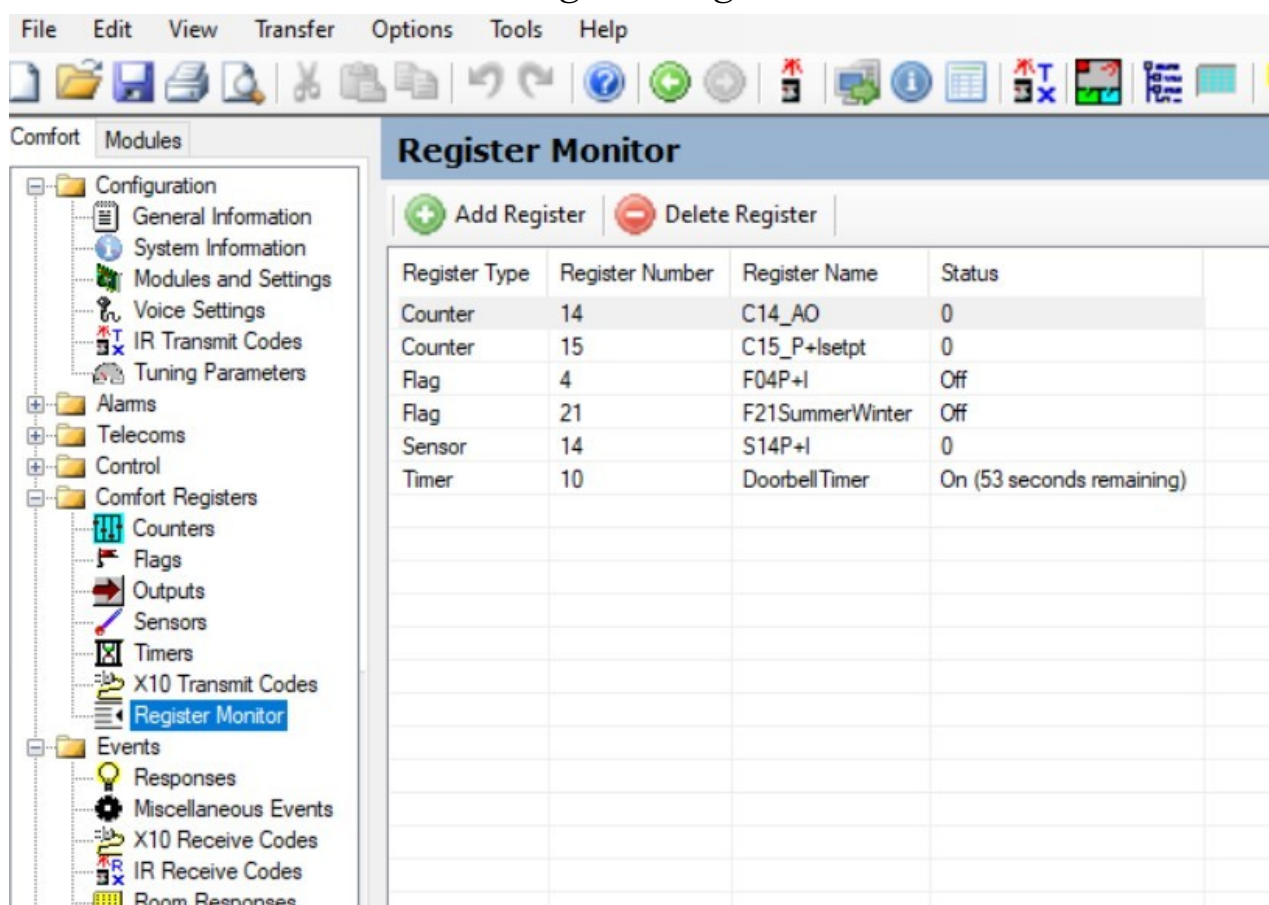
The Login window appears. Enter a valid user code.

If the login is correct, a new window appears "Add Register to Monitor"



Select Counter, Flag, Output, Sensor, Zone, or Timer. Then select the register number according to the register type selected
Continue adding registers to the monitor window as required.

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The real time status of the Registers are shown. You can change the value of the register by clicking on Status.

Document History

31 August 2015 - 1st Draft

6 March 2016 – initial release

22 May 2016 – added new features for Comfigurator 3.11.3

4 Nov 2016 – Hysteresis renamed Sensor Reporting Offset, changes to Resistive sensor for IRIO firmware 7.005 and Comfigurator 3.11.8

12 Dec 2017 – 12V/COM green terminal block cannot supply power to other modules

10 Oct 2019 – added Blinds DC function

30 October 2020 - Added ISM08, ISM09, PT100, IRIO P+I, Register Monitor

1/4/2022 The Control/Feedback Flag must NOT be Blank, it must be assigned to a flag even if it is not needed, otherwise Comfigurator (3.13.7) bug will cause the ISM Module programming to be blank

27 August 2022 - improved description of P+I control

Split up IRIO Manual into Quick Start Guide and Programmming Manual

**25/10/22 - P+I control removed Bumpless Transfer use Travel time
IRIO 7.022**

15 Feb 2023 - revisions to P+I, corrected errors

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