

Background

Philips Dynamalite is a highly specialized company whose principal occupation is to provide 'cutting edge' solutions for lighting control. Our achievements have been recognized worldwide and Philips Dynamalite is generally the system of choice for projects involving integration with third-party vendor's equipment and for large-scale applications.

Philips Dynamalite's philosophy is to provide the best solution possible for each and every project. This is the key to our success. Our considerable investment in Research & Development ensures that we remain at the forefront of our industry. Our position as a world leader in lighting management systems for the future is sustained through our total commitment to innovation.

We are represented around the world by distributors and dealers who are handpicked for their ability to provide the highest possible level of service.

From a stock exchange in Shanghai, to a luxury resort in Dubai, a smart home in Sao Paulo to limestone caves in New Zealand, Philips Dynamalite's innovative solutions deliver intelligent light.

Ongoing research and development has enabled Philips Dynamalite to create secure automated systems that control tens of thousands of individual light fittings in high-rise office buildings from any location anywhere in the world. Our networks are engineered to deliver instant notification of power or system failure, and report via a LAN, internet, or through an SMS gateway to a mobile phone. This provides the assurance necessary in applications where continuous operation is vital, such as road tunnels, computer servers or cold storage units.

Philips Dynamalite's modular product design philosophy also improves system flexibility. Through this approach, specific application requirements can be accommodated with greatly reduced lead times. As an industry leader Philips Dynamalite is committed to creating superior lighting control and energy management systems, setting new benchmarks in performance and efficiency.

In receiving the International Association of Lighting Designers award for Most Innovative Product, the Philips Dynamalite control system has been independently recognized as 'A user friendly and sensible modular approach, which takes it from sophisticated domestic settings to large architectural spaces'.

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About this guide

Guide Overview

This guide is designed to assist in the configuration of the DDFCUC010 and DDFCUC010 fan coil unit controllers.

A working knowledge of EnvisionProject and Dynalite commissioning processes is required to effectively use this document. For more information on EnvisionProject and commissioning processes, consult the EnvisionProject User Guide.

Parameters in this controller require information that must be sourced from third party manufacturer's device details and specifications. HVAC knowledge is required

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Product Overview

I Fan Coil Unit Controller (FCUC)

I.1 Introduction

The DDFCUC010 and DDFCUC024 Fan Coil Unit Controllers are designed to control heating, ventilation and air conditioning (HVAC) systems.

Conceptually the FCUC consists of two controllers, one for heating and one for cooling. Outputs are provided for controlling heating liquid valves and cooling liquid valves as well as relays for driving fan motors and a high capacity relay for electrical heaters.

An input is provided for a resistive type temperature sensor and the device can also use data from a networked temperature sensor such as the Philips Dynamalite DTS900. Programmable dry contact inputs are provided for peripherals such as smoke detectors, motion detectors, window open/close sensors, drip tray overflows, dirty air filters and airflow detectors.

I.2 Features

- Can be networked with other equipment via the onboard RS485 DyNet port
- Powerful Internal PLC - Custom scripts can be written to provide process control based on conditional logic
- Temperature Sensor Input - 20K NTC (Negative Temperature Coefficient). Networked temperature sensors also supported.
- Dry Contact Inputs - three programmable inputs for devices including; window sensor, motion detector, smoke detector, drip tray and air filter
- Many Control Options—Control of this device can be via a combination of methods, eg. serial control port (DyNet), relay contacts, push button wall stations, infrared receivers and time clocks
- Simple Installation—DIN rail mount facilitates installation. All connection terminals are accessible without disassembly

1.3 Connections

Both FCU controllers have the same fan, Auxiliary output, temperature sensor and input options. Therefore, the selection of fan coil unit controller will depend on the type of valve being controlled.

DDFCUC010

Modulating analogue valve, 0-10V DC.

Valve position set by applied voltage.

DDFCUC024

Electromotive (raise/lower) valve.

Valve position set by travel time.

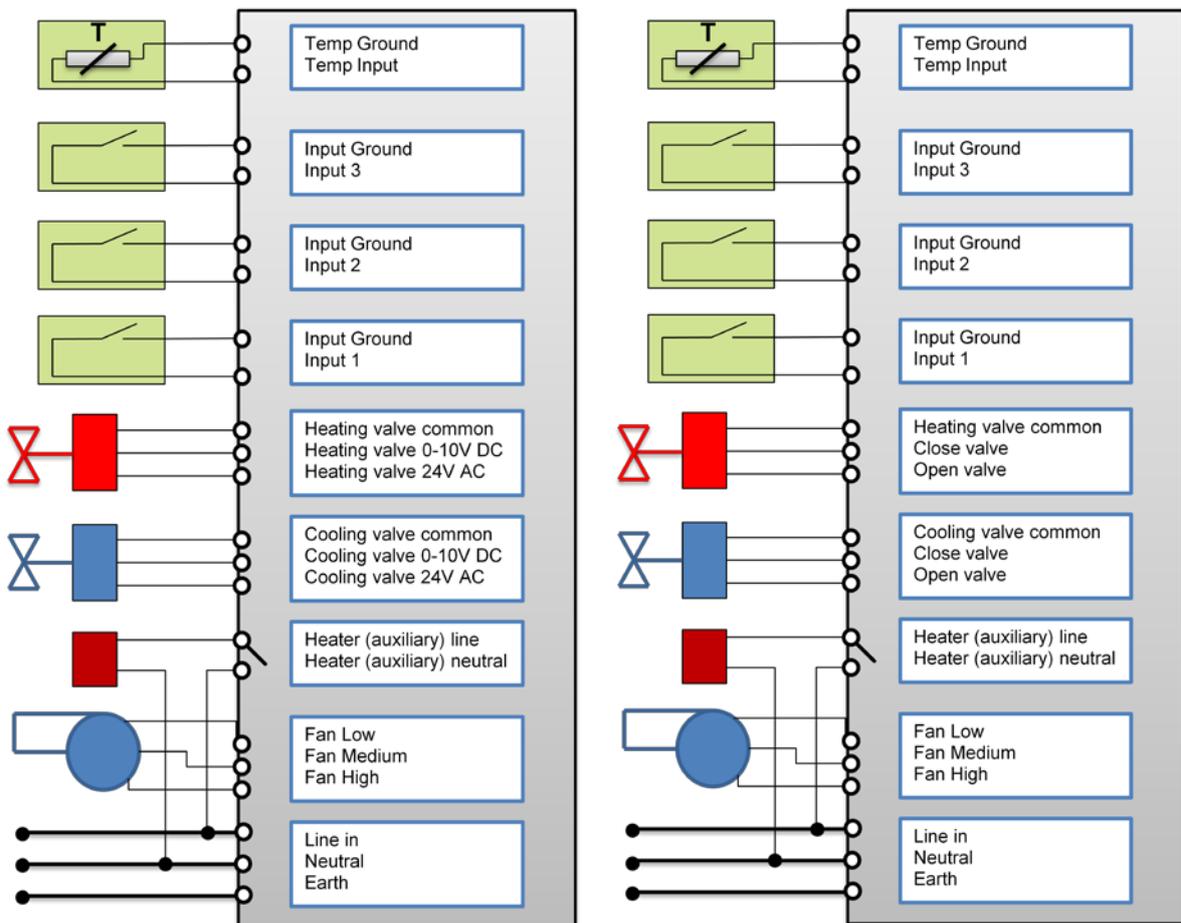


Figure 1 – Controller Comparison

The controller has the following connections:

Inputs (selectable x3):

- Airflow Sensor
- Custom
- Dirty air filter
- Drip tray overflow
- Energy Hold off for Window switch
- Fire trip for smoke detector
- Hot water on cold valve
- Preset

Outputs:

- Cold Valve Actuator
- Hot Valve Actuator
- Auxiliary Feed Through relay output(For Electric Heat Relay)
- 3 Speed Fan Relays.

Input (Dedicated):

- Temperature sensor

Connection	Description
Selectable inputs	Eight types of device can be connected to any of the 3 inputs. They must be configured using the EnvisionProject software.
Temperature Sensor	A local temperature sensor can be connected to the temp sensor input.
Hot / Cold Valves	Valve outputs provide control signals suitable for 24V AC floating or staged valve actuators (1, 2 or 3 stages). <ul style="list-style-type: none"> • For the DDFCUC010, the valve position is controlled directly by the 0-10V DC control voltage applied (floating valve only) • For the DDFCUC024, the valve position is inferred from the valve travel time specified
Heater Switch	If electric heating coil control is used, then it can be connected to the 16A feed-through heater relay. Where the electric heater is not required, this relay can be used as a general-purpose auxiliary output.
Fan speed control	A fan of up to 3 stages can be connected to the fan output; the low, medium and high outputs may be activated individually to control the airflow.
Network Connection	The RS485 DyNet port and additional RJ12 socket are located on the underside of the unit.

Note: Third party device data sheets are required for configuration.

1.4 Plant Structure

Typically, an FCU consists of a single fan, and one or more heat-exchanging coils. The coils may be fed with hot or cold water, steam or electricity.

The thermal output of the FCU can be controlled by varying fan speed, water coil flow and electric coil current. Measurement of the air temperature in the surrounding environment and comparison to a user set-point allows a feedback control system to be implemented.

The controller requires the following information about the plant

- Valve configuration
- Fan configuration
- Aux output
- Input/fault signals
- Temperature sensor data

To facilitate the use of a single platform for all electrical services the controller also integrates local HVAC control with DyNet, enabling interaction with the entire control network

Note: to save energy, simultaneous active heating and active cooling is disabled.

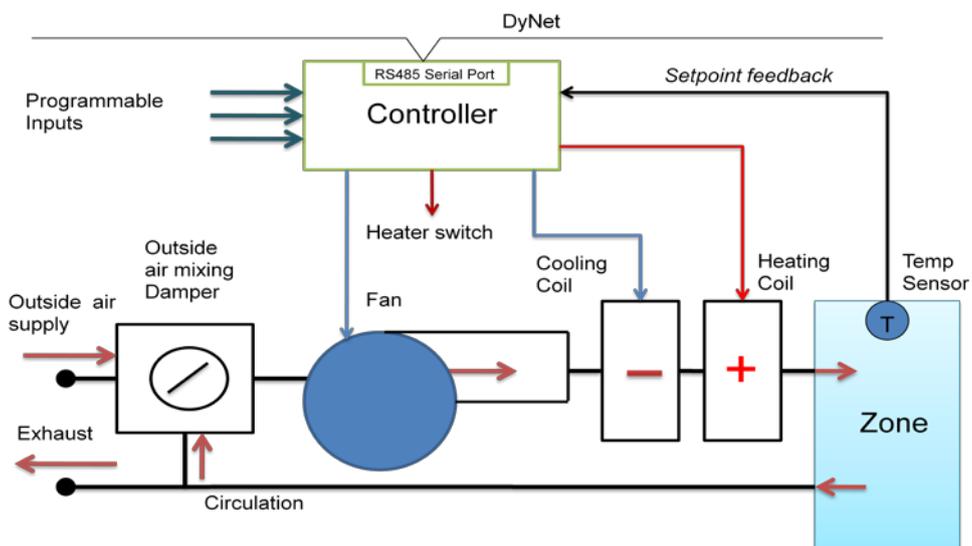


Figure 2 – Controller and Plant Structure

1.5 Commissioning

To complete the process of commissioning you will need to consider the following factors:

- Area climate specifications
- Environmental and usage factors
- Selection of areas to be controlled
- Number and location of controller units required (typically one per area)
- Plant hardware interface, capacity and limitations
- Lag times between control signal and effect
- Lower energy solutions
- Control scheme to be used
 - PID control or
 - Staged control
- Type of user interface

Note: you will need to refer to third party equipment specifications for performance parameter figures.

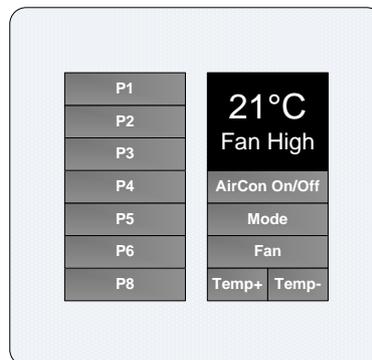


Figure 3 – Typical user interface for HVAC control

Standard setpoint range is approximately:

- 20° to 24° in winter
- 23° to 27° in summer

2 FCUC Initial Configuration

This topic covers configuration of the DDFCUC010 and DDFCUC024 Fan Coil Unit Controller using EnvisionProject. To end up with a fully configured controller perform the following tasks:

1. **Load the device**
2. **Run the Configuration Wizard, FCUC Diagnostics and PID Tuning Wizard, if required**
3. **Configure Plant**
4. **Configure Temperature Control**
5. **Configure Switches**

2.1 Load Device

Load the FCUC into EnvisionProject

1. Run EnvisionProject and open your project
2. In Network View
3. Click Insert Devices from Network  or press Ctrl+L
4. In the Search Devices tab/Search Parameters section, check Search by device code
5. Click the Product dropdown box and select Fan Coil Unit Controller
6. Click the Start Search button
7. When the FCUC device appears in the list, click the checkbox next to the device
8. Click Add Devices or Add and Load Devices

The FCUC controller now appears in the project

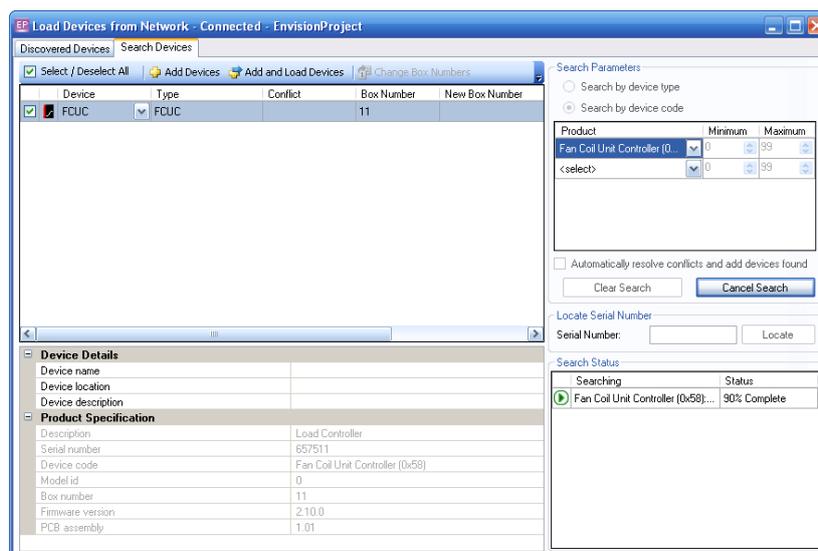


Figure 4 – Load Device Page

2.2 Run the FCUC Configuration Wizard

The controller can be configured manually or using the FCUC Configuration Wizard. The wizard can also be used initially with manually configuration performed afterwards.

Run the FCUC Configuration Wizard

1. Right-click the FCUC device in the Network View
2. Select FCUC Configuration Wizard from the shortcut menu

To simplify setup, the wizard displays the main settings required by the controller.

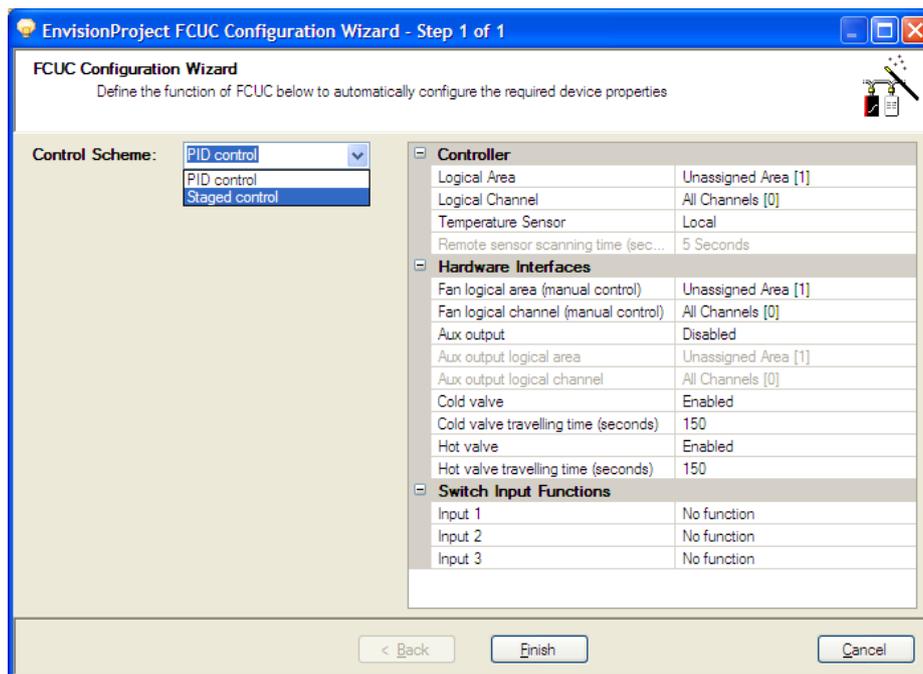


Figure 5 – FCUC Configuration Wizard

Configure the following parameters for each section of the wizard and then click the Finish button

For a detailed explanation of the following parameters refer to the Plant Configuration, Temperature Control and Switch Configuration topics.

The wizard will:

- For all logical addresses set Join = 0xFF and BLA= 0xFFFF
- Set logical addresses of the dry contact inputs to match the controller logical address
- Configure Cold and Hot valves configuration types = Floating
- Enable all types of faults / signals and set their restart counts = Infinite Restart Attempts
- All other configuration parameters will match the default (factory set) values

2.3 Control Scheme

Select the required scheme:

Control Scheme

PID control/Staged control

2.4 Controller

Define the controller parameters:

Controller logical area

Assigned logical Area for plant control

Controller logical channel

Assigned logical channel for plant control

Temperature Sensor

Local/Remote (directly connected to the controller or connected via the DyNet network).

Remote sensor scanning time (seconds)

Polling period for remote sensor(eg DTS9900). The default is 5.

2.5 Hardware Interfaces

Define the hardware interfaces:

Fan logical area (manual control)

Assigned logical Area for manual fan control

Fan logical channel (manual control)

Assigned logical channel for manual fan control

Aux output

Disabled/Manual/Heating/Cooling. If manual then specify Aux Output Logical Address

Aux output logical area (Aux output is set to Manual)

Assigned logical Area for auxiliary output

Aux output logical channel (Aux output is set to Manual)

Assigned logical channel auxiliary output

Cold valve

Enabled/Disabled

Cold valve travelling time (seconds)

Hot valve

Enabled/Disabled

Hot valve travelling time (seconds)

Enter parameter from plant manufacturers' data sheet

2.6 Switch Input Functions

Define the Switch Input Functions:

Input 1, 2 or 3

Airflow sensor/Dirty air filter/Drip tray overflow/Energy holdoff/Fire trip/Hot water on cold valve/Preset/No function

3 Configure Plant

3.1 Plant configuration tab

The Plant Configuration Tab contains settings for the Logical address, Temperature sensor, Valves, Fan, Aux output, faults/signals and runtime parameters.

The following buttons are available on the Plant Configuration toolbar.

- Displayed fields can be sorted in one of two ways by using the following buttons:



Categorized



Alphabetically

- Initially only the basic fields are shown. To reveal all fields click the **Advanced** button. Most standard setups will not require the use of advanced parameters.
- The controller remembers the current settings for the setpoint, fan, aux output and Mode. Click the **Clear Runtime Parameters** button and then press F12 (Save to Device) to reset the currently operating values back to the default.
- To create a new setpoint temperature, enter a temperature in degrees Celsius in the box on the toolbar and click the **Send Temperature Setpoint** button. This is the desired temperature given to the FCUC to maintain. The setpoint can be overridden by DyNet logical opcode 0x48 until next message or reset.

The following fields are available on the Plant Configuration page.

Note: Standard Fields are shown in ***bold italics***. Advanced fields are shown in *standard italics*.

3.2 Logical Address

Controller logical area

Set the area in which temperature control is to be used.

Controller logical channel

Set the channels to be affected. Use the channel number or use All Channels (0).

Controller join

Assign any join rows that are applicable using the join byte.

Controller BLA

Enable/Disable Base Link Area.

Temperature Sensor

Use local sensor

True for a sensor directly connected to the DDFCUC010 and False when using a DTS900 on the network (the FCU controller can send logical DyNet messages to retrieve the temperature of the area from devices like DTS900).

Type of local sensor

Type of local sensor. This option is to inform the device that, on-board temperature sensing circuitry is being used to retrieve the temperature of the area. Only NTC (Negative Temperature Coefficient) is supported at the moment

Remote sensor scanning time (Seconds)

Polling period for DTS9900

Use initial setpoint on startup

Use the initial setpoint temperature (°C) on plant start up

Initial setpoint (°C)

Initial setpoint temperature (°C). This parameter defines the (starting) temperature set point for device whenever device resets. This set point is in effect until set point is changed by DyNet message. The parameter supports temperature in 0.01°C resolution. The range is -127.99°C to +127.99°C. The default is 22.00°C.

Measured temperature offset (°C)

0.1 degree increments to offset the temperature value of the sensor. The value defined for this parameter shall be added to the measured temperature before it is used by the FCUC. The valid range is -12.7°C to +12.7°C. The default is 0.0°C

Local sensor

Enable / Disable direct sensor

Local sensor logarithmic

True for Logarithmic and False for Linear

Local sensor logarithmic constant

Value for logarithmic configuration, details available from sensor manufacturer

Local sensor logarithmic resistance

Value for logarithmic configuration, details available from sensor manufacturer

Local sensor pullup resistor

Value for local pull up resistor fitted on board, To change value; remove cover, use Jumper selection 1k or 22k (22k default)

3.3 Valves

Cold valve

Enable/Disable cold valve. This option enables cooling control in FCU controller using a cold water system which is controlled by an electronically operated valve. The default is enabled

Cold valve configuration type

Type of cold valve, choose from floating, 1 stage, 2 stage and 3 stage

- **floating valve:**
 - This is the only option for the DDFCO010
 - For the DDFCO024 this option is used to drive a valve which is controlled by two separate signals, either to open or close the valve. Specify the travel time to control the valve position and specify the ON & OFF Delay to prevent valve wear and tear.
- **1 stage valve:** This option is used where a cooling system is controlled by only two states – ON and OFF. The non-zero value will activate both output signals, while the zero value will deactivate both output signals. User enters the On & Off time delay.
- **2 stage valve:** This option is used if the cooling system has two ON stages. The zero value deactivates both output signals, 1-50% activate only one of output signal (i.e. valve open) and 51-100% activates both output signals. User enters On & Off time delay.
- **3 stage valve:** This option will be used if the cooling system has three ON stages. The zero value deactivates both output signals, 1-33% activates only one of output signals (i.e. valve open), 34-66% activates only another output signal (i.e. valve close) and 67-100% activates both output signals. User enters the On & Off time delay.

Cold valve active high state

True or false for staged valves only, used to set the default starting position for the valve

Allow hot water on cold valve

True or False to allow heating and cooling using one valve

Cold valve travelling time (seconds)

Time taken to go from fully closed to fully open. Valid time range is 1-600 seconds with 150 seconds as default. This time is used by FCUC to precisely control the valve position. The value for the parameter can be found in the valve datasheet.

Cold valve minimum on time (seconds)

Minimum time the valve must be on before turning back off to prevent valve damage. The valid value range is 0-1200 seconds with 0 seconds used as default

Cold valve minimum off time (seconds)

Minimum time the valve must be off before turning back on to prevent valve damage. The valid value range is 0-1200 seconds with 0 seconds used as default.

Cold valve scheduled overrun period (hours)

Default set to 24hrs, used to reset the valve to home position Range is 0-168 hours.

Hot valve

Enable/Disable hot valve. This option enables heating control in FCU controller using a hot water system which is controlled by an electronically operated valve. The default is enabled

Hot valve configuration type

Type of hot valve, choose from floating, 1 stage, 2 stage and 3 stage

- **floating valve:**
 - This is the only option for the DDFCO010
 - For the DDFCO024 this option is used to drive a valve which is controlled by two separate signals, either to open or close the valve. Specify the travel time to control the valve position and specify the ON & OFF Delay to prevent valve wear and tear.
- **1 stage valve:** This option is used where a heating system is controlled by only two states – ON and OFF. The non-zero value will activate both output signals, while the zero value will deactivate both output signals. User enters the On & Off time delay.
- **2 stage valve:** This option is used if heating system has two ON stages. The zero value deactivates both output signals, 1-50% will activate only one of output signals (i.e. valve open) and 51-100% will activate both output signals. User enters the On & Off time delay.
- **3 stage valve:** This option is used if heating system has three ON stages. The zero value will deactivate both output signals, 1-33% will activate only one of output signals (i.e. valve open), 34-66% will activate only another output signal (i.e. valve close) and 67-100% will activate both output signals. User enters the On & Off time delay.

Hot valve active high state

True or false for staged valves only, used to set the default starting position for the valve

Hot valve travelling time (seconds)

Time taken to go from fully closed to fully open. Valid time range is 1-600 seconds with 150 seconds as default. This time is used by FCUC to precisely control the valve position. The value for the parameter can be found in the valve datasheet.

Hot valve minimum on time (seconds)

Minimum time the valve must be on before turning back off to prevent valve damage. The valid value range is 0-1200 seconds with 0 seconds used as default

Hot valve minimum off time (seconds)

Minimum time the valve must be off before turning back on to prevent valve damage. The valid value range is 0-1200 seconds with 0 seconds used as default.

Hot valve scheduled overrun period (hours)

Default set to 24hrs, used to reset the valve to home position. Range is 0-168 hours.

Valve min control efforts (%)

Minimum % change in position required before the valve will be activated Prevents excessive valve wear

3.4 Fans

Fan

Enable/Disable. This option enables the fan control by FCUC. The default is enabled.

Fan logical area

Assigned logical Area for fan control. Only used in manual mode

Fan logical channel

Assigned logical channel for fan control. Only used in manual mode

Fan join

Fan control join byte. Only used in manual mode

Fan BLA

Enable/Disable Base Link Area for fan control. Only used in manual mode

Fan active high state

True will close the relay when driver and False will open the relay when driven

Fan configuration type

Fan type, select from 1 speed, 2 speed and 3 speed. Default option is 3 speeds.

1 speed fan: This option is used where fan only has ON and OFF control. The non-zero value will activate the Fan-L output signal, while zero value will deactivate the Fan-L output signal. Fan-M and Fan-H always remain deactivated.

2 speed fan: This option is used where fan has two ON states and OFF control. The value of 1-50% activates the Fan-L output signal, while values from 51-100% activates Fan-M output signal. Only one output signal is activated at any given time, while Fan-H will always remain deactivated.

3 speed fan: This option is used where fan has three ON states and OFF control. Values of 1-33% activate the Fan-L output signal, values from 34-66% activate the Fan-M output signal, while values from 67-100% activate the Fan-H output signal. Only one output signal can be activated at any given time.

Fan minimum on time (seconds)

Minimum time the fan must be on before turning back off to prevent fan damage. The valid value range is 0-2400 seconds with 0 seconds used as default.

Fan minimum off time (seconds)

Minimum time the fan must be off before turning back on to prevent fan damage. The valid value range is 0-2400 seconds with 0 seconds used as default.

Fan runup time (seconds)

Used to build up required air pressure in ducts, the airflow switch won't work till the overrun time expires. During the run up time, both valves remain off. The valid value range is 0-1200 seconds with 0 seconds used as default.

Fan overrun time (seconds)

The length of time the fan will run on after valve is closed. This period defines the extended period of time for which the fan will run once plant is shutdown, i.e. plant shut down request is received and both valves are in the fully closed position. Upon completion of the overrun time, the fan enters into an off delay period. This period will not apply in trip conditions. The valid value range is 0-1200 seconds with 0 seconds used as default.

3.5 Aux Output

Aux output

Enable/Disable Aux output

Aux output logical area

Assigned logical Area for Aux output. Only used in manual mode

Aux output logical channel

Assigned logical Channel for Aux output. Only used in manual mode

Aux output join

Aux output join byte. Only used in manual mode

Aux output BLA

Enable/Disable Base Link Area for Aux output. Only used in manual mode

Aux output active high state

True will close the relay when driven and False will open the relay when driven

Aux output min on time (seconds)

Minimum time the Aux output to remain on before turning back off to prevent damage. The valid value range is 0-7200 seconds with 0 seconds used as default

Aux output min off time (seconds)

Minimum time the Aux output to remain off before turning back on to prevent damage. The valid value range is 0-7200 seconds with 0 seconds used as default.

Aux Output control

Aux output control type. Choose from Manual, Temperature Controller Heating and Temperature Controller Cooling. Manual (by DyNet) is the default.

Note: If Aux Output control is set to Temperature Controller Heating/Cooling with PID control in effect, then the auxiliary output relay shall be used for heating/cooling purposes and not the hot/cold water valves.

3.6 Fault Signals

Fire trip

Enable/Disable fire trip. This input is designed to integrate smoke detector devices to FCU. If enabled, plant (i.e. FCU control operation) will be tripped when the input is active.

Fire trip auto restart count

Number of restarts allowed within one hour. This allows the plant to re-start automatically whenever fire trip condition is restored to normal

Fire trip fan off

True/False. When smoke is detected, the fan speed is set to off if true or runs at high speed if false.

Energy holdoff

Enable/Disable holdoff. This input is designed to integrate (room) window sensor to FCU controller. If enabled, plant (i.e. FCU control operation) will be tripped when input is active, i.e. window open.

Energy holdoff auto restart count

Number of restarts allowed within one hour. This allows the plant to re-start automatically whenever window is closed.

Energy holdoff fan off

True/False. When window open is detected, the fan speed is set to off if true or the fan runs at high speed if false

Air flow fault

Enable/Disable air flow fault. This input is designed to integrate air flow sensing, i.e. fan failure to the FCU. If enabled, plant (i.e. FCU control operation) will be tripped when the input is active. This fault is not active during fan runup time.

Air flow fault auto restart count

Number of restarts allowed within one hour

Air flow fault fan off

True/False, Fan speed to full

Sensor fault

Enable/Disable sensor fault. Refers to temperature sensor

Sensor fault auto restart count

Number of restarts allowed within one hour. Refers to temperature sensor

Sensor fault fan off

True/False, Refers to temperature sensor. True is fan speed to off. False is fan speed to full.

Drip tray

Enable/Disable drip tray

Drip tray auto restart count

Number of restarts allowed within one hour

Drip tray fan off
True/False, Fan speed to full

Dirty filter
Enable/Disable dirty filter

Dirty filler auto restart count
Number of restarts allowed within one hour

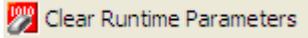
Dirty filter fan off
True/False, Fan speed to full

Note: By default all fault signals are enabled and auto restart is enabled.

Auto restart count allows the user to configure, how many reset attempts can be made before the plant is permanently shut down. The possible values are None, One, Two and Infinite. The default option is Infinite restart attempts.

Once plant permanently shuts down, then user needs to reset the fault state (to normal) by sending DyNet message (physical DyNet message opcode - 0x5B) once fault is restored and plant needs to start again.

3.7 Runtime Parameters

These parameters are read-only. They can be cleared by clicking the  button and then pressing F12 (Save to Device).

Last known valid preset
Last known preset used

Last known manual fan speed
Last known fan speed used

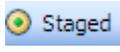
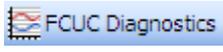
Last known aux output level
Last known aux output level used

Last known temperature setpoint (°C)
Last known temperature used

4 Configure Temperature Control

4.1 Temperature Control Tab

The Temperature Control Tab contains settings to configure temperature control using PID settings or staged settings.

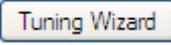
The ,  and  buttons are available on the Temperature Control toolbar.

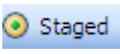
 Selecting the PID control scheme opens PID control page and reveals the following toolbar functions.

- The PID parameter settings

<p>Heating</p> <p>P: <input type="text" value="12516"/> I: <input type="text" value="170"/> D: <input type="text" value="63"/></p>	<p>Cooling</p> <p>P: <input type="text" value="12516"/> I: <input type="text" value="170"/> D: <input type="text" value="63"/></p>	<p>Sampling Time</p> <p><input type="text" value="1"/> seconds</p>
--	--	--

Refer to Tuning Wizard topic for explanation of parameters.

- The Tuning Wizard button 

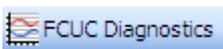
 Selecting the Staged control scheme opens the staged control page and reveals the following toolbar functions

- Displayed fields can be sorted in one of two ways by using the following buttons:

 Categorised

 Alphabetically

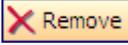
- Initially only the basic fields are shown. To reveal all fields click the  button. Most standard setups will not require the use of advanced parameters

 Selecting the FCUC Diagnostics button opens the FCUC Diagnostics page.

4.2 PID Control Scheme

PID control precisely maintains the temperature based on the PID algorithm to determine the temperature error and calculate the control effort required

The different Modes (PID settings) must be assigned to a Preset

Click the ,  or  Preset buttons to create the number of Presets required.

If no configuration is defined for a received preset then the preset is ignored and the controller will continue to operate in the same mode as it was before preset was received.

4.2.1 Modes

Each page of temperature control parameters can be assigned to a mode of operation and the controller can be configured for up to ten modes.

Each mode must be assigned to one or more presets and is launched whenever the configured preset is observed by the FCUC. Although a mode can be assigned to multiple presets, a preset can only refer to one mode. Different modes of operation can be configured for energy savings, for example:

- **Occupied mode** — the temperature may be configured to track closely to the setpoint (i.e. small setpoint offset).
- **Unoccupied mode** — the setpoint may be less rigidly followed, this allows for cost savings as air conditioning does not need to run continually (i.e. larger setpoint offset).
- **Auto mode** — setting Manual fan control to FALSE allows the fan to be controlled by the temperature control scheme (PID or Staged)
- **Manual mode** — setting Manual fan control to TRUE allows the fan to be controlled by the user over DyNet
- **Off Mode** — to turn off the FCUC:
 - for PID control, set deadband fan speed to off and disable heating control and cooling control
 - for staged control, set deadband fan speed to off and set stage counts to zero for both heating and cooling

4.2.2 General Settings

Mode

Enable/Disable PID mode

Thresholds relative to manual set point

True / False. Default is True. It is recommended to use relative thresholds to easily adapt parameters for different setpoints.

Manual fan control

True / False. False is the default value. Setting the manual fan control to true will disable PID control of the fan and fan will be controlled directly over DyNet.

Heating/Cooling switch over delay (seconds)

Time in seconds to delay switching between heating and cooling modes. If setpoint change switches over then this delay is not applied. The default is 1800 seconds and range is 0-65534 seconds.

Dead band fan speed

This field defines the fan speed when neither heating nor cooling is in operation. This typically happens when the measured temperature is between the (effective) heating & cooling set point. Refer to Cooling/Heating offset for effective dead band. The fan shall also run on dead band speed, whenever system is inside the heating/cooling switch over delay period. The possible fan speeds are High, Mid, Low or Off

4.2.3 Cooling Parameters

Cooling control

Enable/Disable

Cooling setpoint offset (°C)

Offset to temperature cooling setpoint. This parameter accepts value in units of 0.1 °C with the range of 0.0 to 10.0 °C. The default is 0.5 °C.

Cooling temperature error to run fan at low speed (°C)

Temperature differential to use low fan speed setting

Cooling temperature error to run at mid speed (°C)

Temperature differential to use med fan speed setting

Cooling temperature error to run at high speed (°C)

Temperature differential to use high fan speed setting

4.2.4 Heating Parameters

Heating control

Enable/Disable

Heating setpoint offset (°C)

Offset to temperature heating setpoint. This parameter accepts value in units of 0.1 °C with the range of 0.0 to 10.0 °C. The default is 0.5 °C.

Heating temperature error to run at low speed (°C)

Temperature differential to use low fan speed setting

Heating temperature error to run at mid speed (°C)

Temperature differential to use med fan speed setting

Heating temperature error to run at high speed (°C)

Temperature differential to use high fan speed setting

4.3 Tuning Wizard

It is recommended to use the Tuning Wizard to find and set the PID parameters.

<p>Heating</p> <p>P: <input type="text" value="12516"/> I: <input type="text" value="170"/> D: <input type="text" value="63"/></p>	<p>Cooling</p> <p>P: <input type="text" value="12516"/> I: <input type="text" value="170"/> D: <input type="text" value="63"/></p>	<p>Sampling Time</p> <p><input type="text" value="1"/> seconds</p>
--	--	--

Sampling Time

This parameter (in terms of seconds) defines time interval to run the PID algorithm, hence it defines time interval between two calculated control efforts to be transferred to plant. Valid range is 0.1-25.4 seconds. The default is 1.0 seconds.

Heating

This section defines the PID gains for heating operation.

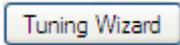
- P: This parameter defines the proportional gain for heating operation of PID. The value is in units of 1 with range of 0-65534. The default is 12516.
- I: This parameter defines the integral gain for heating operation of PID. The value is in units of 0.1 with range of 0-6553.4. The default is 170.0.
- D: This parameter defines the derivative gain for heating operation of PID. The value is in units of 0.01 with range of 0-655.34. The default is 63.00.

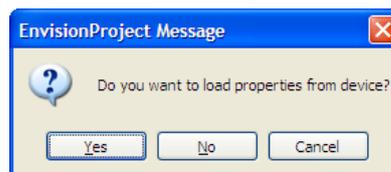
Cooling

This section defines the PID gains for cooling operation.

- P: This parameter defines the proportional gain for cooling operation of PID. The value is in units of 1 with range of 0-65534. The default is 12516.
- I: This parameter defines the integral gain for cooling operation of PID. The value is in units of 0.1 with range of 0-6553.4. The default is 170.0.
- D: This parameter defines the derivative gain for cooling operation of PID. The value is in units of 0.01 with range of 0-655.34. The default is 63.00.

Run the Tuning Wizard

1. Click the  button



2. Click yes/no to load the properties from the FCUC device or not.

When the wizard starts-up it can optionally load the temperature control settings from the device. Otherwise it will take the existing configuration from the EnvisionProject job.

The tuning of each function should be performed under real operating conditions for example, tuning for the heating function may not be appropriate during summer or tuning for cooling in winter will not simulate real operating conditions.

Tuning the controller consists of setting some initial parameters and using these parameters over a period of time to collect the measured room temperature and observe the performance of the controller.

Tuning heating and cooling cannot be performed at the same time. Active heating and cooling is not permitted by the controller.

The user inputs the initial parameters and limits for the tuning test

Step 1.

Figure 6 – FCUC Tuning Wizard Step 1

Setpoint for tuning °C

Choose a value in the middle of your expected working range. Standard range is approximately 20° to 24° in winter and 23° to 27° in summer. This is only used for tuning the controller. It should be reasonable close to your working set point. Does not automatically set the initial set point.

Setpoint offset for testing °C

Used to set the positive and negative extremes of the setpoints used for the test relative to the Setpoint for tuning °C.

Preset

This is the preset used during the tuning test.

PID parameters found during the tuning are applicable in all operating modes however, the function selected for tuning (heating or cooling) should match mode assigned to the preset.

Operation of controller is preset based and the controller must be in preset at any given time. This preset is used during the tuning

Maximum data collecting duration (minutes)

This is when the wizard will stop collecting data.

The tuning wizard looks for 3 full periods of oscillation around the setpoint for a successful test. Normally the test is completed once the test criteria are met. Otherwise the test will fail at the time limit set.

FCUC operation

Used to set the appropriate function (heating or cooling). The controller can only tune for heating and cooling independently.

Step 2.

The controller is configured to staged mode using the setpoint and FCUC operation parameters (Heating or Cooling) The tuning uses these parameters over a period of time for collecting the measured room temperature and observing the performance of the controller.

During the tuning the setpoint, temperature and filtered temperature values are plotted on the graph

Click the signal checkbox to display the chart for each signal.

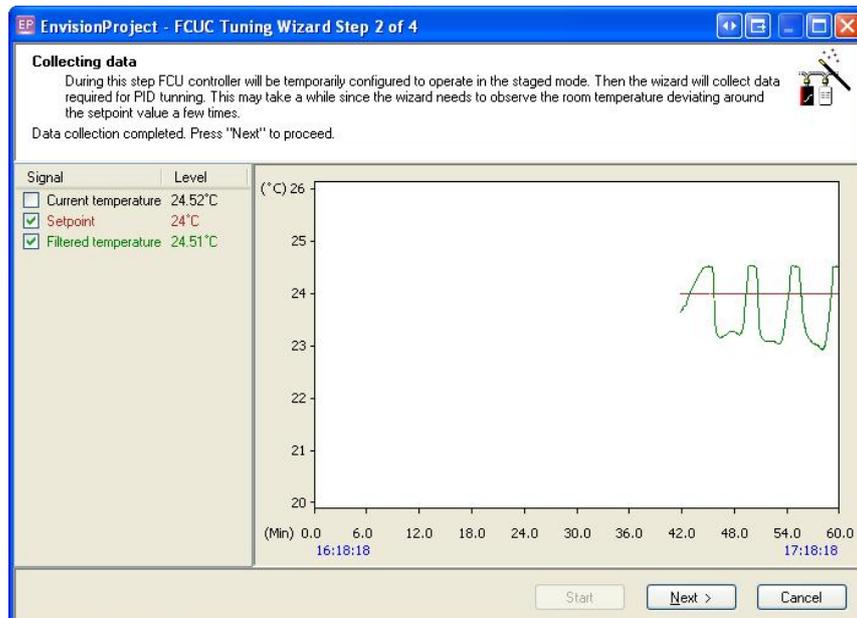


Figure 7 – FCUC Configuration Wizard Step 2

Press the Start button to begin data collection

Press the skip button to go to the next step. You can skip data collection if you already have some approximate values for PID. It will save time if you have used another tuning tool or have commissioned similar areas before.

Once the data collection is started the wizard configures FCUC to single stage mode with no hysteresis and hot or cold valves and fan set to 100 %. Then the wizard starts collecting data required to evaluate PID coefficients. This includes polling the temperature, the setpoint and status of the FCUC.

If the value of setpoint changes or the function changes between cooling and heating then the tuning wizard will stop and display an error message.

When enough data is collected then the "Next" button becomes enabled. The "Start" button remains disabled while the data is being collected.

Step 3.

The tuning wizard calculates the optimal PID values. The wizard evaluates the coefficients and presents them to the user.

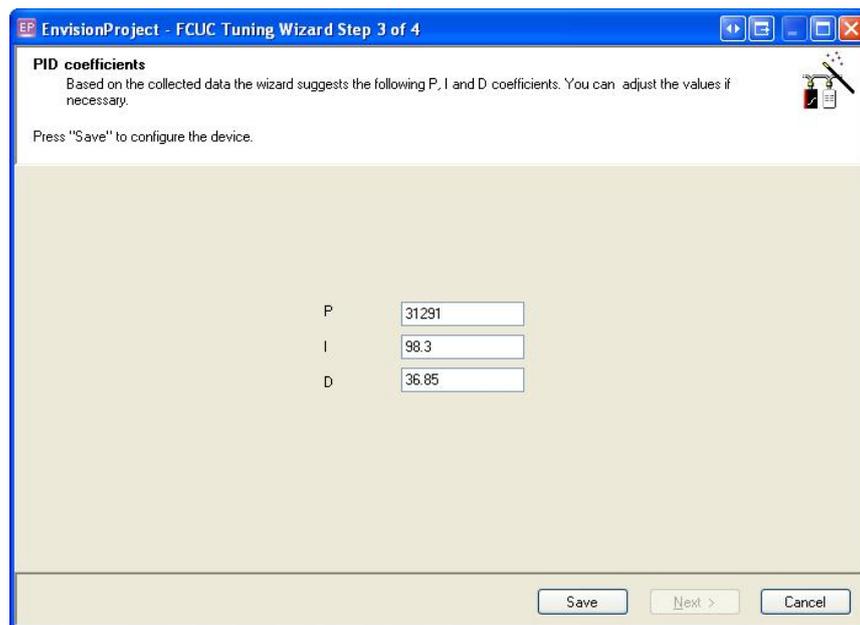


Figure 8 – FCUC Configuration Wizard Step 3

Check or edit the PID values and save them to the device.

The Next button becomes enabled after the data is saved to the controller

Step 4. In this step the controller uses the newly calculated PID values to test its ability to maintain the room temperature

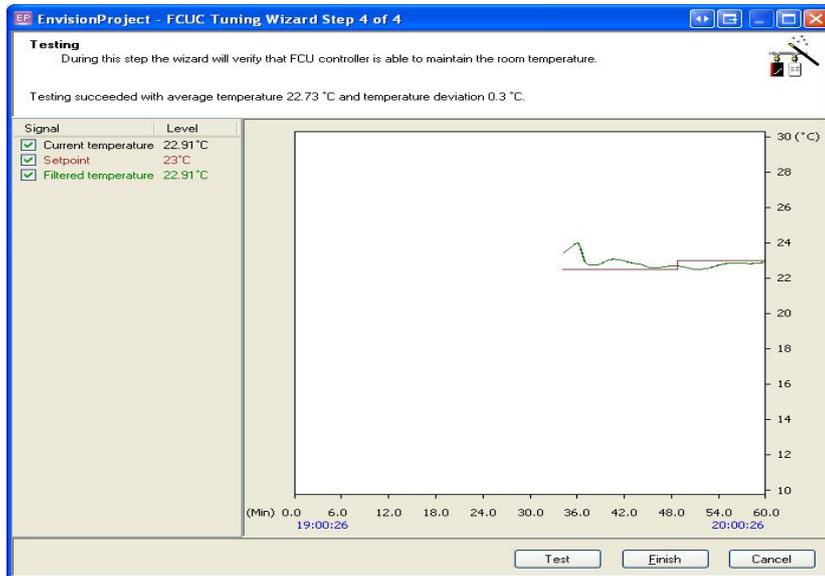


Figure 9 – FCUC Configuration Wizard Step 4

The test succeeds if the standard deviation of the temperature does not exceed the value of cooling (or heating) setpoint offset. Assuming normal distribution of the temperature readings this means that more than 66% of the temperature readings collected are within the configured setpoint offset.

The test can be repeated at anytime by pressing the test button. The extreme values for the setpoint offset alternate each time the test is run.

The test can be finished by the user at any time by the "Finish" button.

4.4 FCUC Graph Settings

The Chart scale can be changed by clicking the Tools menu and selecting Settings and FCUC.

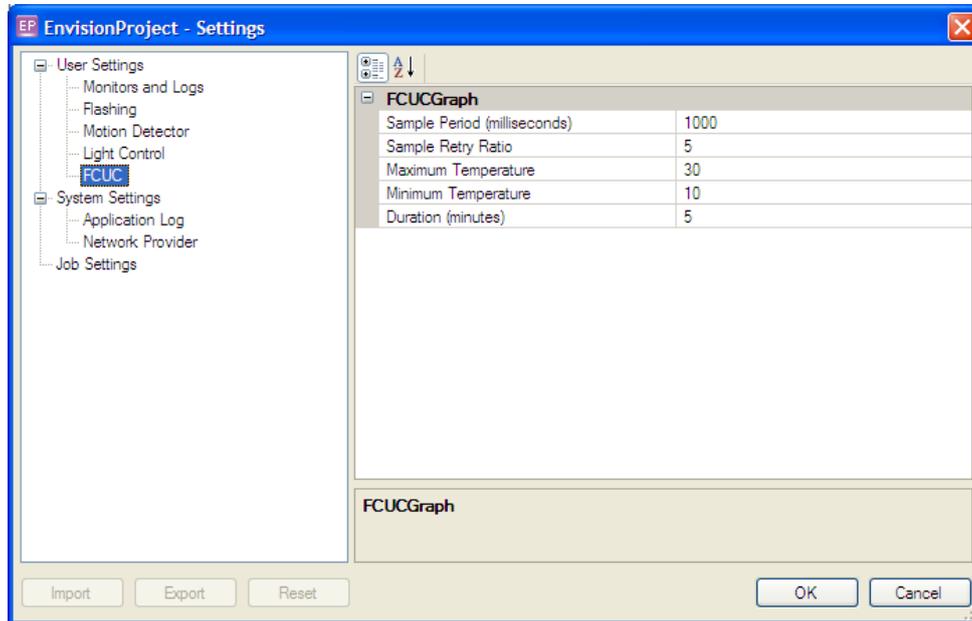
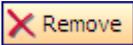
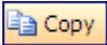


Figure 10 – EnvisionProject FCUC Graph Settings

4.5 Staged Control Scheme

Staged control operates in stages where each stage is based on the temperature error calculated by FCU controller at run-time. FCU controller allows up to 3 stages (for cooling and heating each) per configuration of stage control. Stage controller mode calculates the temperature error at the interval defined by responsiveness and will automatically jump to the stage so that desired temperature can be achieved as quickly as possible

The different Modes (Staged settings) must be assigned to a Preset

Click the  Add,  Remove or  Copy Preset buttons to create the number of Presets required.

If no configuration is defined for a received preset then the preset is ignored and the stage controller will continue to operate in the same mode as it was before preset was received.

4.5.1 Modes

Each page of temperature control parameters can be assigned to a mode of operation and the controller can be configured for up to ten modes. Each mode must be assigned to one or more presets and is launched whenever the configured preset is observed by FCUC. Although a mode can be assigned to multiple presets, a preset can only refer to one mode.

Different modes of operation can be configured for energy savings, for example:

- **Occupied mode** — the temperature may be configured to track closely to the setpoint (i.e. small setpoint offset).
- **Unoccupied mode** — the setpoint may be less rigidly followed, this allows for cost savings as air conditioning does not need to run continually (i.e. larger setpoint offset).
- **Auto mode** — setting Manual fan control to FALSE allows the fan to be controlled by the temperature control scheme (PID or Staged)
- **Manual mode** — setting Manual fan control to TRUE allows the fan to be controlled by the user over DyNet
- **Off Mode** — to turn off the FCUC:
 - for PID control, set deadband fan speed to off and disable heating control and cooling control
 - for staged control, set deadband fan speed to off and set stage counts to zero for both heating and cooling

4.5.2 General Settings

Mode

Enable/Disable

Thresholds relative to manual set point

True / False

Manual fan control

True / False

Responsiveness (seconds)

Default or time setting. This parameter defines the time delay to re-evaluate the stage. Valid range is 1-30 seconds with default of 5 seconds

Cooling stage hysteresis (°C)

The intention of heating hysteresis is to avoid oscillation between two heating stages whenever the heating stage boundary is approached. The hysteresis applies in both directions. For example, if the heating stage changes from 2nd to 3rd at 15 °C, then by adding 0.5 hysteresis the heating effort for stage-3 starts when temperature falls below 14.5°C then moves to stage-2 when the temperature rises to 15.5°C. The value is in units of 0.25°C with range of 0.0-3.5°C. The default is 0.25°C

Heating stage hysteresis (°C)

The intention of cooling hysteresis is to avoid oscillation between two cooling stages whenever the cooling stage boundary is approached. The hysteresis applies in both directions. For example, if the cooling stage changes from 2nd to 3rd at 25°C then by adding 0.5 hysteresis the cooling effort for stage-3 starts when the temperature exceeds 25.5 °C then moves to stage-2 when the temperature drops to 24.5°C. The value is in units of 0.25 °C with range of 0.0-3.5 °C. The default is 0.25 °C.

4.5.3 Stage Counts

Cooling stage count

Number of stages available for configuration (0-3). Zero disables cooling

Heating stage count

Number of stages available for configuration (0-3). Zero disables heating

4.5.4 Stages Table

The Stages Table configures the control effort required depending on the relative temperature error from the setpoint.

Enter the parameters required for each heating and cooling stage.

Stage	Threshold (°C)	Fan Speed	Valve Position (%)	Aux Output Level (%)
Heating Stage 3	4	High	75	100
Heating Stage 2	2	Mid	50	0
Heating Stage 1	1	Low	5	0
Cooling Stage 1	1	Low	5	0
Cooling Stage 2	2	Mid	50	0
Cooling Stage 3	4	High	75	0

Threshold (°C)

This parameter defines relative temperature difference with respect to setpoint temperature for the given control stage. The value shall increase as stage index increases with respect to dead band. The default values are 1 Degree Celsius, 2 Degree Celsius and 4 Degree Celsius for 3 stages in an incremental index.

Fan Speed

This parameter defines the fan speed in a given control stage or dead band. The selection can be High, Mid, Low or Off. The fan speed may be overridden by DyNet if manual fan control is enabled. That means any non-zero fan speed received over DyNet as logical channel level message shall override the value specified in stage control's configuration.

Valve Position (%)

This value defines the valve opening position in terms of percentage. For cooling stages, valve refers to cooling valve; while in heating stages, valve refers to heating valve. Value of 100% means valve is fully opened, while 0% means valve is fully closed.

Aux Output Level (%)

This value defines the state of the auxiliary output relay state. A non-zero value shall activate the relay while a zero value shall deactivate the relay.

4.6 FCUC Diagnostics

The FCUC Diagnostics page displays a real-time chart of the temperature and plant status

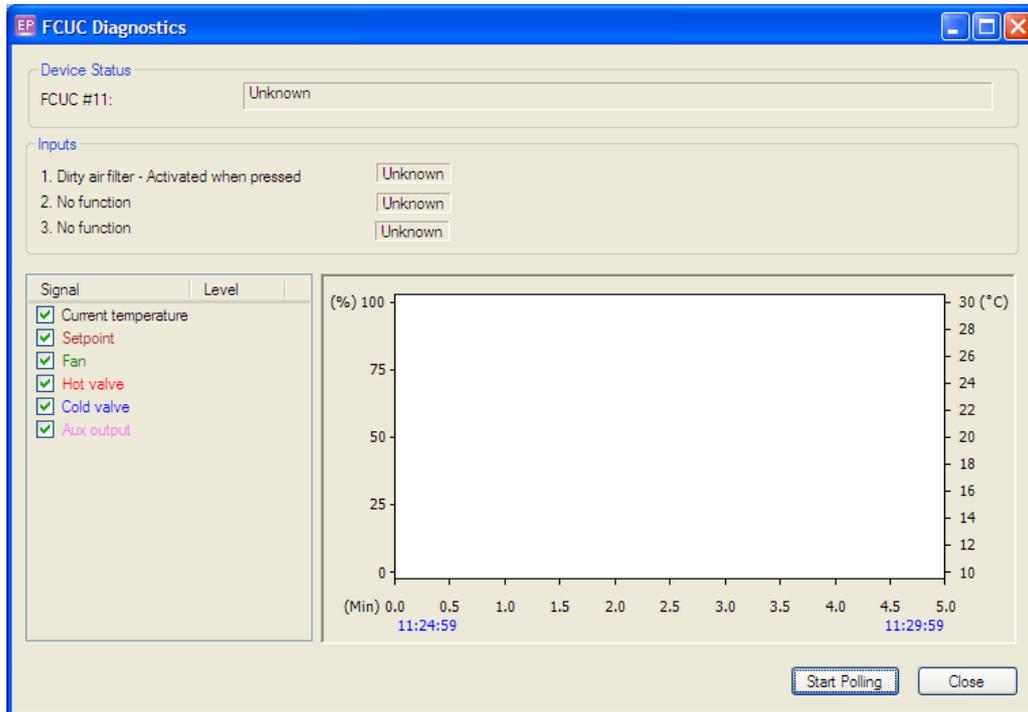
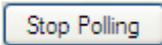
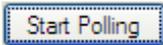


Figure 11 – FCUC Diagnostics Wizard

The information displayed by the FCUC Diagnostics page is customized to the project depending on the:

- Setpoint
- Mode selected
- Defined Switch Inputs
- Polling Period
- FCUC Graph Settings

The graph will be blank when the FCUC Diagnostics page initially loads. Polling will begin automatically and for each polling period the graph will chart the status and variables of the controller functions.

To pause and restart polling click the  and  buttons.

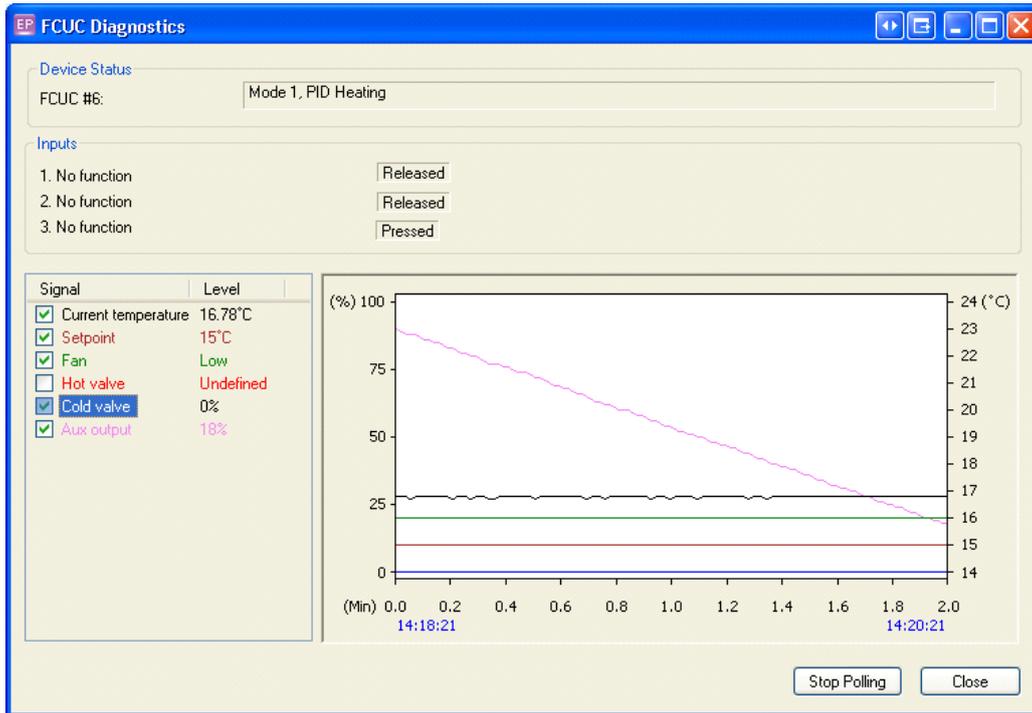


Figure 12 – FCUC Diagnostics Wizard Chart

5 Configure Switches

5.1 Switch Configuration Tab

The Switches tab contains settings to configure the input switches for the controller.

The following buttons are available on the Switch Configuration toolbar.

- Displayed fields can be sorted in one of two ways by using the following buttons:



Categorized



Alphabetically

- Initially only the basic fields are shown. To reveal all fields click the  **Advanced** button. Most standard setups will not require the use of advanced parameters.

5.1.1 General

Switches

Enable/Disable. Affects all switches

5.1.2 Logical Addresses

logical Area

Set the area where the switch will be used.

logical Channel

Set the channels to be affected. Use the channel number or use All Channels (0).

Controller join

Assign any join rows that are applicable using the join byte.

Controller BLA

Enable/Disable Base Link Area.

5.1.3 Advanced

Channel

Enable/Disable

Enabled when panel disabled

True/False. Function is still available in panic mode

Trigger at startup

True/False. Switch action is force triggered at startup. Defined action will be executed based on switch state (ie pressed or released) when device is reset.

5.1.4 Function

Select the input function from one of the following choices:

- | | |
|---|--|
|  Airflow Sensor |  Fire trip |
|  Custom |  Hot water on cold valve |
|  Dirty air filter |  Preset |
|  Drip tray overflow |  No function |
|  Energy Holdoff | |

The available parameters differ for each type of function selected

5.1.5 Airflow sensor



Function

Airflow sensor. Used to detect fan failure.

Activated when

Pressed/Released

DyNet mute

True/False. Stop DyNet messages being created by this function

5.1.6 Custom



Function

Custom. You can select from any of the options in the Action Chain Editor

Standard function name

Enable/Disable Base Link Area.

Press actions

Opens the Action Chain Editor

Release Actions

Opens the Action Chain Editor

Extended press actions

Opens the Action Chain Editor

Extended release Actions

Opens the Action Chain Editor

-  Channel Level
-  Occupancy
-  One Touch
-  Panic
-  Preset
-  Preset Offset
-  Program
-  Sign On
-  Stop Fade
-  Stop Fade Programme Preset
-  Task Local
-  Toggle Preset
-  DyNet1 Physical Message
-  DyNet1 Physical Smart Send
-  DyNet1 Logical Message
-  DyNet1 Logical Smart Send

5.1.7 Dirty air filter



Function

Dirty air filter. Used to indicate air filter is dirty and requires cleaning.

Activated when

Pressed/Released

DyNet mute

True/False. Stop DyNet messages being created by this function.

5.1.8 Drip tray overflow



Function

Drip tray overflow. The drip tray is full with water and needs draining.

Activated when

Pressed/Released

DyNet mute

True/False. Stop DyNet messages being created by this function.

5.1.9 Energy Holdoff



Function

Energy Holdoff. Also known as window switch. Used to turn off the plant when window is open to conserve energy.

Activated when

Pressed/Released

DyNet mute

True/False. Stop DyNet messages being created by this function

5.1.10 Fire trip



Function

Fire trip. Used to detect smoke.

Activated when

Pressed/Released

DyNet mute

True/False. Stop DyNet messages being created by this function.

5.1.11 Hot water on cold valve



Function

Hot water on cold valve. Used to specify that hot water is available on the cold water valve.

Activated when

Pressed/Released

DyNet mute

True/False. Stop DyNet messages being created by this function.

5.1.12 Preset



Function

Preset. Used to recall a preset function over DyNet.

Preset

Pressed/Released

Fade (rounded to 10 ms)

00:00:00:010 (hh:mm:ss:fff)

DyNet mute

True/False. Stop DyNet messages being created by this function.

5.1.13 No function



Function

No function. Switch is not used

Activated when

Pressed/Released

DyNet mute

Enable/Disable Base Link Area.

6 DyNet Interface

This section lists DyNet messages added for FCUC which are not readily accessible from EnvisionProject using the GUI. It also lists some of the other DyNet messages intended for use in typical HVAC situations.

6.1 FCUC User Preferences

The FCU controller allows the user to change plant capability and user preferences at run time. A logical DyNet message is implemented to set/retrieve the status of plant capabilities.

Message Frame	
0x1C	AREA USER PREFERENCE OPCODE DATAHI DATALO JOIN CHECKSUM

Message Frame Details	
OPCODE	
0x48	Set/Reset User Preference
0x49	Reset User Preference
0x4A	User Preference
USER PREFERENCE	
0x06	Actual Temperature, 16 bit in 0.25 deg Celsius steps
0x07	User Temperature set point, 16 bit in 0.25 deg Celsius steps
0x09	Air Conditioning Plant Capability
0x0C	Actual Temperature, 16 bit in 0.01 deg Celsius steps (Range -127.99 to 127.99)
0x0D	User Temperature set point, 16 bit in 0.01 deg Celsius steps (Range -127.99 to 127.99)
DATAHI Bit Mask	
FOR USER	b0: 1 – Heating available, 0 – Heating
PREFERENCE	b1: 1 – Cooling available, 0 – Cooling not available
0x09	b2 to b7: Unused

6.2 Fault states

Request a fault state from the device over DyNet. This also clears the fault state. A physical DyNet message is implemented to set/retrieve the fault status of plant.

Message Frame							
0x5C	0x58	BOX NUMBER	OPCODE	FAULT TYPE	FAULT STATUS	FAULT DETAILS	CHECKSUM
Message Frame Details							
OPCODE							
0x59			Request Device Fault State				
0x5A			Reply/Report Device Fault State				
0x5B			Set/Reset Device Fault State				
FAULT TYPE							
0x00			Fire Trip				
0x01			Airflow				
0x02			Energy Holdoff (i.e. Window switch)				
0x06			Temperature Sensor faulty				
0x08			Drip Tray				
0x09			Dirty Air Filter				
FAULT STATUS							
0x00			Normal				
0x01			Alarm (fault input is activated)				
0x04			Acknowledge alarm (force alarm to return to normal)				
FAULT DETAILS							
			0 – Fault not present, 1 – Fault present				
FOR			Bit 0 = Local sensor Open circuit				
0x06			Bit 1 = Local sensor Short circuit				
FAULT			Bit 2 = remote sensor time out				
TYPE			Bit 3-7 not used				

6.3 Task Port Interface

Task Port	Task Sub-port	Description
0x11	0	Bit Mask (b0: Switch 1, b1: Switch 2, b2: Switch 3, b3-b7: Unused)
0x1D	0	Measured temperature in 0.25 Degree Celsius - Lo byte (Initiate Reading at source)
	1	Measured temperature in 0.25 Degree Celsius - Hi byte
0x1E	0	Desired temperature in 0.25 Degree Celsius - Lo byte (Initiate Reading at source)
	1	Desired temperature in 0.25 Degree Celsius - Hi byte
0x1F	0	Measured temperature in 0.01 Degree Celsius - Lo byte provides integer part (Initiate Reading at source)
	1	Measured temperature in 0.01 Degree Celsius - Hi byte provides fractional part
0x20	0	Desired temperature in 0.01 Degree Celsius - Lo byte provides integer part (Initiate Reading at source)
	1	Desired temperature in 0.01 Degree Celsius - Hi byte provides fractional part

7 Field Descriptions

7.1 Plant Configuration

Field Name	Description
Logical Address	
Controller logical area	Assigned logical Area for plant control
Controller logical channel	Assigned logical channel for plant control
Controller join	Join byte
Controller BLA	Enable/Disable Base Link Area
Temperature Sensor	
Use local sensor	True for a sensor directly connected to the DDFCUC024 and DDFCUC010 and False when using a DTS900 on the network
Type of local sensor	Type of local sensor. Only NTC (Negative Temperature Coefficient) currently supported
Remote sensor scanning time (Seconds)	Polling period for DTS900 remote sensor
Use initial setpoint on startup	True - Use the initial setpoint temperature (°C) on plant start up False – use previously known setpoint
Initial setpoint (°C)	Initial setpoint temperature (°C)
Measured temperature offset (°C)	0.1 degree increments to offset the temperature value of the sensor
Local sensor	Enable / Disable direct sensor
Local sensor logarithmic	True for Logarithmic and False for Linear
Local sensor logarithmic constant	Value for logarithmic coefficient, details available from sensor manufacturer
Local sensor logarithmic resistance	Value for sensor resistance, details available from sensor manufacturer
Local sensor pullup resistor	Value for onboard pullup resistor. 1k or 22k jumper setting. Default 22k.
Valves	
Cold valve	Enable/Disable cold valve
Cold valve configuration type	Type of cold vale, choose from Floating, 1 stage, 2 stage and 3 stage
Cold valve active high state	True or False for stage type cold valve configuration
Allow hot water on cold valve	True or False to allow heating and cooling both on cold valve
Cold valve travelling time (seconds)	Time taken to go from fully closed to fully open
Cold valve minimum on time (seconds)	Minimum time the valve must remain on before turning back off to prevent valve damage
Cold valve minimum off time (seconds)	Minimum time the valve must remain off before turning back on to prevent valve damage
Cold valve scheduled overrun period (hours)	Default set to 24hrs, used to reset the valve to home position
Hot valve	Enable/Disable hot valve
Hot valve configuration type	Type of hot vale, choose from Floating, 1 stage, 2 stage and 3 stage
Hot valve active high state	For staged valves only, used to set the default starting position for the valve
Hot valve travelling time (seconds)	Time taken to go from fully closed to fully open
Hot valve minimum on time (seconds)	Minimum time the valve must remain on before turning back off to prevent valve damage

Hot valve minimum off time (seconds)	Minimum time the valve must remain off before turning back on to prevent valve damage
Hot valve scheduled overrun period (hours)	Default set to 24hrs, used to reset the valve to home position
Valve min control efforts (%)	Minimum % change in control effort required before the valve will be activated. Prevents excessive valve wear
Fan	
Fan	Enable/Disable
Fan logical area	Assigned logical Area for fan control
Fan logical channel	Assigned logical channel for fan control
Fan join	Fan control join byte
Fan BLA	Enable/Disable Base Link Area for fan control
Fan active high state	True will close the relay when driven and False will open the relay when driven
Fan configuration type	Fan type, select from 1 speed, 2 speed and 3 speed
Fan minimum on time (seconds)	Minimum time the fan must be on before turning back off to prevent fan damage
Fan minimum off time (seconds)	Minimum time the fan must be off before turning back on to prevent fan damage
Fan runup time (seconds)	Used to build up required air pressure in ducts, the airflow switch won't work till the runup time expires. Also valve cannot be operated during this period.
Fan overrun time (seconds)	The length of time the fan will continue running after valve is closed
Aux output	
Aux output	Enable/Disable Aux output
Aux output logical area	Assigned logical Area for Aux output
Aux output logical channel	Assigned logical Channel for Aux output
Aux output join	Aux output join byte
Aux output BLA	Enable/Disable Base Link Area for Aux output
Aux output active high state	True will close the relay when driven and False will open the relay when driven
Aux output min on time (seconds)	Minimum time the Aux output must be on before turning back off to prevent damage
Aux output min off time (seconds)	Minimum time the Aux output must be off before turning back on to prevent damage
Aux Output control	Aux output control type, choose from manual, temperature controller heating and temperature controller cooling
Faults/Signals	
Fire trip	Enable/Disable fire trip
Fire trip auto restart count	Number of restarts allowed within one hour
Fire trip fan off	True/False, Fan speed to full when input is activated
Energy holdoff	Enable/Disable holdoff
Energy holdoff auto restart count	Number of restarts allowed within one hour
Energy holdoff fan off	True/False, Fan speed to full when input is activated
Air flow fault	Enable/Disable air flow fault
Air flow fault auto restart count	Number of restarts allowed within one hour
Air flow fault fan off	True/False, Fan speed to full when input is activated

Sensor fault	Enable/Disable sensor fault
Sensor fault auto restart count	Number of restarts allowed within one hour
Sensor fault fan off	True/False, Fan speed to full when input is activated
Drip tray	Enable/Disable drip tray
Drip tray auto restart count	Number of restarts allowed within one hour
Drip tray fan off	True/False, Fan speed to full when input is activated
Dirty filter	Enable/Disable dirty filter
Dirty filler auto restart count	Number of restarts allowed within one hour
Dirty filter fan off	True/False, Fan speed to full when input is activated
Runtime parameters	
Last known valid preset	Last known preset used
Last known manual fan speed	Last known fan speed used
Last known aux output level	Last known aux output level used
Last known temperature setpoint (°C)	Last known temperature setpoint used

7.2 Temperature Control

7.2.1 PID control

Field Name	Description
General	
Mode	Enable/Disable PID mode
Thresholds relative to manual setpoint	True or false. True allows for relative threshold values. False allows for absolute thresholds values
Manual fan control	True or false manual fan control
Heating/Cooling switch over delay (seconds)	Number of seconds before changing between heating and cooling
Dead band fan speed	High, Mid, Low and Off
Cooling Parameters	
Cooling control	Enable/Disable
Cooling setpoint offset (°C)	Dead band for temperature cooling setpoint
Cooling temperature error to run fan at low speed (°C)	Temperature differential to use low fan speed setting
Cooling temperature error to run at mid speed (°C)	Temperature differential to use med fan speed setting
Cooling temperature error to run at high speed (°C)	Temperature differential to use high fan speed setting
Heating Parameters	
Heating control	Enable/Disable
Heating setpoint offset (°C)	Dead band for temperature heating setpoint
Heating temperature error to run at low speed (°C)	Temperature differential to use low fan speed setting
Heating temperature error to run at mid speed (°C)	Temperature differential to use med fan speed setting
Heating temperature error to run at high speed (°C)	Temperature differential to use high fan speed setting

7.2.2 Staged control

Field Name	Description
General	
Mode	Enable/Disable
Thresholds relative to manual set point	True / False
Manual fan control	True / False
Responsiveness (seconds)	Default or time
Cooling stage hysteresis (°C)	0.25 Default
Heating stage hysteresis (°C)	0.25 Default
Stage Counts	
Cooling stage count	Number of stages available for configuration
Heating stage count	Number of stages available for configuration

