SeaChange

Consumer Module

Data Sheet F1

Fan Coil Controller - 3 Relay Outputs

Main Features

2 Pipe Fan Coils:

- Heating Only + Fan Enable
- Cooling Only + Fan Enable

4 Pipe Fan Coils:

- Airside Damper + Fan Enable
- Thermal Valves + Fan Enable

Works in conjunction with other SeaChange Controllers via “Plug-and-Play”

Detailed Features

General

2 pipe fan coil controller (type / 001, / 002) for heating only or cooling only applications with fan enable.

4 pipe fan coil controller (type / 003) for fan coils utilising an airside damper with fan enable.

4 pipe fan coil controller (type / 004) for use with thermal valves including fan enable, an external 24V AC supply is required.

These types can be inter-mixed with other styles as required.

Operation

A SeaChange Zone Controller is used to set the operating times and temperatures for its group of fan coils and to provide an override push button to extend operation outside normal hours. One Zone Controller has the flexibility to control from 1 to 200 fan coil units at any one time on a single network.

This makes the SeaChange system equally suited to controlling numerous fan coils in a single open plan office zone as it is to providing effective one to one unit zone control for cellular office or hotel bedroom applications.

Because it is modular and incorporates plug and play engineering, a SeaChange fan coil control system can be easily and inexpensively adapted to cope with additional zones or fan coils changed to work in different zones as offices “churn” over time.

Temperature Control

Temperature control is normally based on the fan coil unit’s return air temperature. If a supply air sensor is fitted, off coil temperature can be reset within limits as a cascaded control system.

The Second Input can be alternately employed for reset control. A remote setpoint and local override unit can be applied so that the temperature can be adjusted and the unit turned On/Off locally. Other fan coil controllers can then be controlled as slaves. Diagrams showing these connections are shown on page 3.

Demand from the fan coils for hot and/or cold water is co-ordinated so that the main plant chillers or boilers and distribution plant run only on demand from the Zone Controller.

F1 Features

Temperature Indicator
indicates how far the controlled temperature is from setpoint.
Green = close to setpoint.
Amber = above setpoint.
Red = below setpoint.

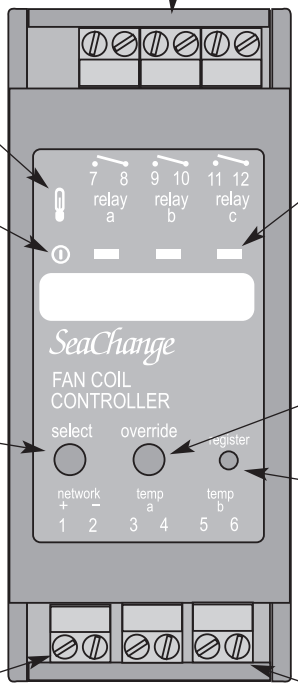
Status Lamp
indicates that the Controller is receiving demand signals from other controllers if lit steadily, also indicates that controller is in Configuration Mode (slow flashing) or Maintenance Mode (rapid flashing).

Select
is used during commissioning to allow a Zone Controller to display the Engineering Parameters of this controller. Also used to set stroke time for Heating and Cooling Valves (see Commissioning Guide for details).

Terminals
are all of two-part construction to facilitate wiring connections.

Connections
for network. Twisted pair, unscreened cable is required.

Relay Output Connectors
for connection to the controlled devices.



Latches
for retaining controller to DIN rail may be released using a screwdriver.

Relay status lamps
indicate when the output relays are energised

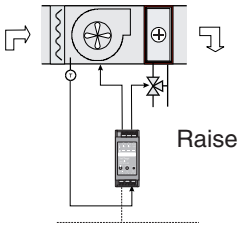
Override
is used to change from Normal to Maintenance mode; Maintenance mode will allow the plant to run without demand signals from the Zone Controllers, which is useful for plant maintenance purposes. (see Detailed Features in this Data Sheet for further information).

Registration Button
is used during the commissioning process to build logical links between controllers

Connections
for return/space or optional supply temperature sensors. Twisted pair, unscreened cable is required.

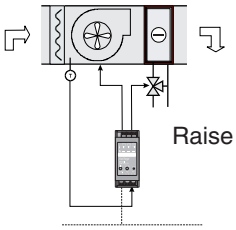
Typical Applications

2 - Pipe Fan Coil - Heating Only + Fan Enable



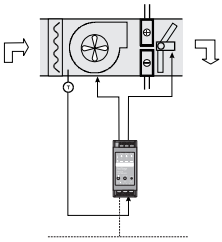
Uses Driver Type / 001

2 - Pipe Fan Coil - Cooling Only + Fan Enable



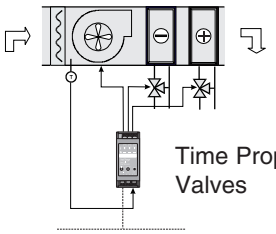
Uses Driver Type / 002

4 - Pipe Fan Coil - Airside Damper + Fan Enable



Uses Driver Type / 003

4 - Pipe Fan Coil - Thermal Valves + Fan Enable



Uses Driver Type / 004

Master / Slave Operation

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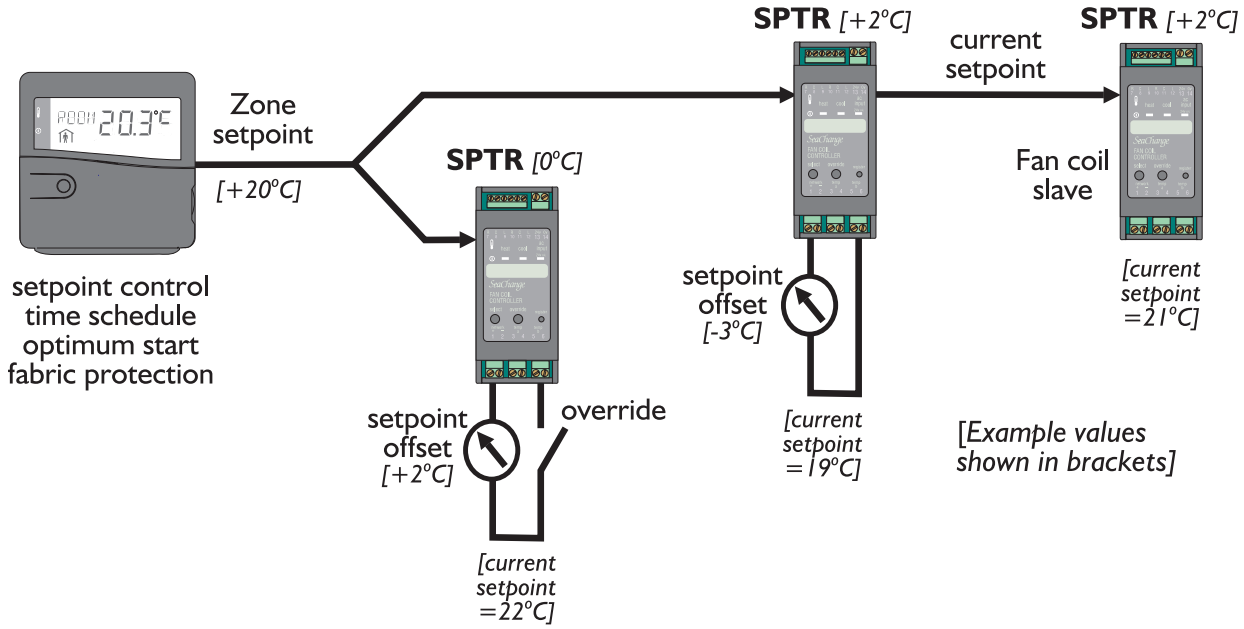
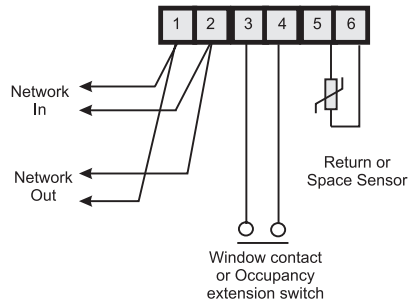
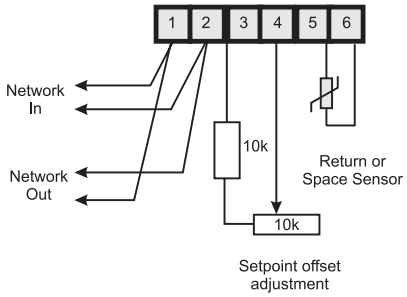


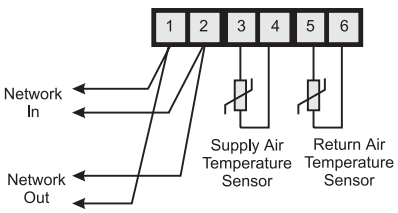
Current setpoint used by a Fan Coil = Supervising devices' setpoint + **SPTR** setpoint trim (internal parameter range +/-10°C) + external setpoint offset - if present (range +/- 5°C)

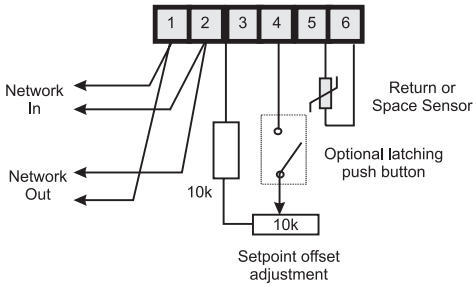
External Input Options

F1









Detailed Features

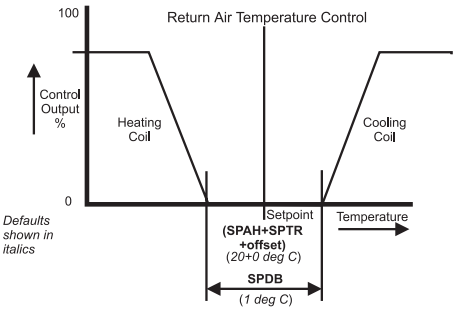
Temperature Control

Return Air Control

A Return Air (or Space) Temperature sensor must be fitted. The FCU Controller will control Return Air temperature to a fixed setpoint set using Configuration parameter **SPFC**, or an adjustable setpoint, using a Zone Controller (see **Registration**, later). A deadband may be set (using the **SPDB** parameter) which will prevent cycling between heating and cooling and reduce energy usage.

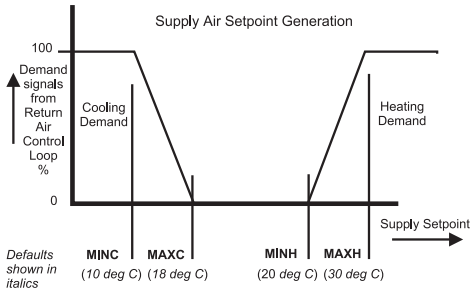
Return Air Control with Supply Air Limits

Supply and Return Air (or Space) temperature sensors must be fitted. Instead of directly acting on the control valves / damper etc. the Return Air Control Loop will produce internal demand signals that will adjust the Supply Air Temperature setpoint of the Supply Air Control Loop (this is called *Cascade Control*). Limits to the Maximum and Minimum Supply Setpoints can be set on **MAXH**, **MINH**, **MAXC** and **MINC** (see diagram).



Supply Air Control from a Zone Controller or another Fan Coil Controller

If a Supply Air Temperature Sensor only is fitted, the Supply Air Setpoint will be derived from the Heating and Cooling Demand signals from a Zone Controller, or another Fan Coil Controller acting as a “master” in an open-plan area. The setpoint will be calculated according to the settings on **MAXH**, **MINH**, **MAXC** and **MINC** (see diagram).



Slave Control

With no Sensor fitted, the Fan Coil Controller will adjust its heating and cooling outputs to the valves etc. on the basis of the demand signals received from the Zone Controller or “Master” Fan Coil Controller, i.e. if the Zone Controller is demanding 50% Heat, the heating valve will be driven to 50% open. (This is called *Open-Loop Control*).

Setpoint Supervision and Local Setpoint Adjustment

A Zone Controller may be used to determine the Setpoint for one or many Fan Coil Controllers. This is called **Setpoint Supervision**, (typically 20 Deg C).

A Fan Coil Controller may have a **Local Setpoint Adjuster** which is a simple wall-mounted potentiometer wired directly into the Fan Coil Controller’s input terminals; adjusting this will adjust the **offset** value (limited to +/-5 Deg.C). The **offset** value and a value set on the internal parameter **SPTR** are added (or subtracted if the value is negative) to the setpoint set on **SPFC** to produce the operating setpoint for the controller. Note that using a simple potentiometer means that some of the energy saving benefits given by the Zone Controller (e.g. resetting the setpoint to a default value at the start of each occupancy period) are not possible.

A Fan Coil Controller can also be used to provide **Setpoint Supervision** for a group of “Slave” Fan Coils; this would be used when an Open-Plan area is fed by several Fan Coils, and only one Local Setpoint Adjuster is required. The Local Setpoint Adjuster is wired to one of the Fan Coil Controllers, which then becomes the “Master” of the group. It will send its setpoint set on **SPFC** plus the **offset** applied by the Setpoint Adjuster plus any value set on **SPTR** to all of the “Slave” Fan Coils registered to it (see Master/Slave diagram) which will then use the resultant value as their own **SPFC** value. Individual trims to this setpoint can be set up in each “Slave” using its **SPTR** parameter, if desired.

Occupancy Times and Local Override

Occupation times for one, or many Fan Coil Controllers (up to 200) are set at a Zone Controller. The Occupancy Times may be overridden by the Override pushbutton on the Zone Controller in the usual way, giving configurable timed extension to occupancy (see Zone Controller Data Sheet).

Additionally, a local switch may be used in order to put the Fan Coil Controller into an Occupied State; this can either be used exclusively to control occupancy (e.g. a Meeting Room) or it can be used in conjunction with a Zone Controller to provide an extension to occupancy. In either case, the Controller requires a maintained contact closure (latching switch) in order to give an Occupied State; if a timed extension is desired, an external timed latching contact must be used. The parameter **INMD** is used to determine whether the external signal is to be used exclusively, or as an OR function with a Zone Controller’s Occupation Times.

Window Contact, General Alarm or Monitoring

A Volt-free window contact may be wired into the Controller's input terminals and used to disable the Fan Coil if the Window is opened, preventing energy wastage. This function could also be applied to other inputs which would require the Fan Coil to shut down, e.g. Condensate Tray Full signal from a level switch. Alarms to the supervisor can be enabled or disabled using the **ALRM** parameter; the **ALST** parameter is used to set the contact sense. I.e. whether an opening or closing contact will generate an alarm.

The Input may be alternatively used for general monitoring, either with or without alarm generation (e.g. filter blocked)

The correct mode of operation is determined by the **INMD** parameter.

Registration

Registration is the simple process by which logical connections are made between Controllers in a SeaChange system; it is done during commissioning and involves pressing buttons on the Controllers in a specific sequence.

For further details of the registration process, see our 'Commissioning Guide' publication.

Address Allocation and System Housekeeping

Like all SeaChange Controllers, the Fan Coil Controllers must be registered with other modules in order to create a working system; one or more of the following registration procedures must be followed. During each of these procedures, the address of each Controller is allocated by the module that contains *System Housekeeping.* This could be a SeaChange Boiler Controller or a AHU Controller (for up to 100 Zone + FCU Controllers) or a Floor Controller (for up to 200 Zone + FCU Controllers). It is essential, therefore, that any SeaChange System contains one module with System Housekeeping; for more details, see Boiler, AHU or Floor Controller Data Sheets.

Occupancy Control, only from Zone Controller

The **SPTY** parameter in the FCU Controller must be set to 0, the Zone Controller is then put into Configuration Mode and the FCU Controller is registered to it. When the Zone Controller enters its occupancy mode, the FCU Controller's registered to it will be enabled and will control to their occupied setpoints.

Occupancy Control + Setpoint Supervision from Zone Controller

The **SPTY** parameter in the FCU Controller must be set to 1, the Zone Controller is then put into Configuration Mode and the FCU Controller is registered to it. When the Zone Controller enters its occupancy mode, the FCU Controller's registered to it will be enabled and will control to the setpoint in the Zone Controller.

Occupancy Control + Setpoint Supervision from a 'Master' Fan Coil Controller

The 'Master' Fan Coil Controller must be operating in **SPTY** 0 or 1 with its own return air sensor. 'Slaves' may have local sensors, but do not need them (see Setpoint Supervision and Local adjustment). The 'Slave' FCU Controller **SPTY** parameter must be set to 2 then the 'Master' FCU Controller is put into Configuration Mode registering the 'Slave' FCU Controller to it.

Occupancy of the 'Slaves' will now be taken from the 'Master'; any setpoint change made at the 'Master' (whether from a Local Setpoint adjuster, or Setpoint Supervision change from a Zone Controller) will be reflected at the 'Slaves'.

Demand Collation - Heat and Cool Sources

Heating and Cooling demand signals from the Fan Coil Controllers are automatically collated and are fed back to a provider of heat (or 'cool') - for instance, the Boiler Controller or a CT Pumpset. This is done by putting the Heat (or Cool) source into Configuration Mode and registering the FCU Controller to it.

For systems where the main plant is not controlled by SeaChange, the Floor Controller may be used to collate Heating and Cooling demand signals and present them as a series of volt-free contacts which can be used as inputs to the Legacy System in order to enable heating and/or cooling as appropriate. The Floor Controller is put into Configuration Mode and the FCU Controllers are registered to it.

For further details of the Floor Controller, see appropriate Data Sheet.

Alarm Handling

The FCU Controller may be set to ignore alarm conditions, report them to a SeaChange Doorway Supervisor (either locally connected to the system, or via an autodialling modem), or to both report alarms and take some control action. The **ALRM** parameter is used to select the desired Alarm Mode, whilst **ALST** is used to set the sense (ie. whether a closing or opening contact generates an alarm).

The FCU Controller generates an alarm if the sensor fails and also if the external alarm input is used.

The FCU Controller may be set to respond to the **STOP** System Stop Alarm which is generated by a Boiler Controller; this can be used to shut down the entire control system, or parts of it, if a particularly critical event occurs.

F1 Configuration Parameters

Label	Doorway Code	Description	Units	Default Value	Range
SPFC	C1	Occupied Return temperature Setpoint	Deg C	20	10 to 35
SPDB	C2	Setpoint Deadband	Deg C	1.0	0 to 10
SPTR	C3	Setpoint Trim	Deg C	0	-10 to +10
SPTY	C4	Setpoint type 0: Local from C1, occupancy controlled from 1 or more Zone Controllers 1: Setpoint (and occupancy) supervised from master Zone Controller 2: Room control from remote Zone Controller FCU Supply controlled from Heat%, Cool%	-	1	0 to 2
INMD	C5	Input mode for terminals 'temp a' 0: Supply temperature 1: Time clock AND window contact (short = occupied) 2: Time Clock OR internal clock 3: External Occupation signal only 4: Alarm Input	-	0	0 to 4
MAXH	C6	Supply maximum heating setpoint	Deg C	30	0 to 90
MINH	C7	Supply minimum heating setpoint	Deg C	20	0 to 90
MAXC	C8	Supply maximum cooling setpoint	Deg C	18	2 to 30
MINC	C9	Supply minimum cooling setpoint	Deg C	10	2 to 30
MIND	C10	Supply minimum demand, used for switching between heating and cooling	-	4	0.0 to 10.0
OCCO	C11	When set, controller will only run during the Occupied Period	-	0	0 to 1
HPRD	C12	Heating valve period or minimum time	Secs/10	6	1 to 60
HDLY	C13	Heating interlock delay. Negative value delays fan (or pump) On after heating starts, positive value causes run-on of fan after heating shuts down	Minutes	0	-30 to + 30
CPRD	C14	Cooling Valve period or minimum On time	Sec/10	6	1 to 60
CDLY	C15	Cooling Interlock delay. Negative value delays fan (or pump) On after cooling starts, positive value causes run-on of fan after cooling shuts down	Minutes	0	-30 to +30
FPRD	C16	Fan Period, minimum time to change fan speed steps	Secs/10	12	1 to 60
FRPT	C17	Frost Protection 0 = No Action, 1 = Open Heating Valve to 50% 2 = Open Heating Valve to 50% and run fan (pump)	-	0	0 to 2
MANL	C18	Manual Level from Doorway	-	0	-100 to +100
HTSC	C19	Heat Source	-	0	-1 to 100
CLCS	C20	Cool Source	-	0	-1 to 100
MXCT	C21	Maximum CT Setpoint when AHU demanding 100% heating	Deg C	70	20 to 100
MNCT	C22	Minimum CT Setpoint	Deg C	50	20 to 100
ALRM	C23	Alarm Mode 0: Ignore alarms 1: Alarms reported no other action 2: Control output set to zero on alarm 3: STOP alarm recognised control set to zero	-	1	0 to 3
ALST	C24	Not used in this application			

Pre Commissioning Checks

Power Up

On initial power up of the module there will be delay of between 10 to 60 seconds before the temperature LED lights. This delay has been incorporated so that when many fan coils are controlled on the same circuit their power requirements will be spread over this period. Once start up has been initiated, the valve outputs sequence to close the valves before control is initiated and until that process is completed (HPRD + CPRD) the manual override as described will be in-effective.

Setting the Stroke Time for Actuators.

If the Select button is held pressed for a few seconds the status lamp will flash and the 'B' relay will energise to close the valve. When the valve is noted as closed and the Select button pressed again, the 'A' relay will energise causing the valve to open and start the timing cycle. When the valve reaches full stroke open, the Select button is pressed to record the Stroke Time and return the controller to the automatic mode. (For controllers with TP heating and cooling a similar process times both the heating and cooling valves).The times can also be checked and adjusted using the **(H or C)PRD** parameter (recorded in tens of seconds).

Monitoring Parameters

F1

Label	Doorway Code	Description	Units	Default Value	Range
INPA	C30	Input A status	-	-	0 to 1
OCCD	C31	Occupied	-	-	0 to 1
COOL	C34	Cooling Status	-	-	0 to 1
RLYA	C35	Relay 'A' Status	-	-	0 to 1
RLYB	C36	Relay 'B' Status	-	-	0 to 1
RLYC	C37	Relay 'C' Status	-	-	0 to 1
AUTO	C38	Automatic/Manual Status	-	-	0 to 1
OVRD	C39	Override	-	-	0 to 1
SERV	W7	Service Pin Message (to Doorway)	-	-	-
CGST	C45	Configuration Mode Status	-	-	0 to 1
SPLA	S1 C50	Supply Air Temperature	Deg C	-	-
RTNA	S2 C51	Return Air Temperature	Deg C	-	-
HCOP	S3 C52	Heat Cool Output Valves	%	-	0 to 100
SPSL	C53	Current Supply Setpoint	Deg C	-	-
SPRT	C54	Current Return Setpoint	Deg C	-	-
HDMD	C55	Heat Demand from Room Loop	%	-	0 to 100
CDMD	C56	Cool Demand from Room Loop	%	-	0 to 100
SPOC	K1 C60	Occupation Setpoint	Deg C	20	5.0 to 35.0
SPNO	K2 C61	Non-Occupation Setpoint	Deg C	10	5.0 to 20.0
SPSV	K3 C62	Supervised Setpoint from Master Controller	Deg C	-	0 to 35.0
SPTR	K4 C63	Setpoint Trim	Deg C	0	-10.0 to +10.0

Accessing Configuration and Monitoring Parameters

Generally, Configuration Parameters are used to adjust settings from their factory defaults; Monitoring Parameters are used to monitor internal readings (such as temperature readings) during the Commissioning process.

The Parameters may be viewed, and in the case of Configuration Parameters, adjusted by one of two methods; either by using a Zone Controller connected to the network, or by using the SeaChange Doorway Supervisor.

Using the Zone Controller:

a) The Zone Controller must be connected to the network and *registered* (see Commissioning Guide for further details).

b) Put the Zone Controller into Configuration Mode by depressing Select and Override buttons for 10 seconds, until the CNFG legend appears on the display.

c) Press Select button momentarily on the target device (in this case, the selected Fan Coil Controller).

d) Hold down Select button on the Zone Controller, and rotate the rotary knob:

clockwise to view Monitoring Parameters

anticlock to view Configuration Parameters

e) When desired Configuration Parameter appears, release Select, hold down Override and turn knob to adjust the parameter (some Monitoring Parameters cannot be adjusted).

Using SeaChange Doorway:

Data Points may be added to a Doorway page to access/adjust any Configuration or Monitoring Parameter. Graphs of the Input Parameters and Heat/Cool output are also available. The code used to access an FCU Controller is **Z*n***, where *n* is the Fan Coil Zone number. The code for each parameter is shown in the adjacent tables.

Further details of how to set up Doorway pages may be found in the SeaChange Doorway Manual, or in the online help facility supplied with SeaChange Doorway

The PC running SeaChange Doorway can be connected locally via a Serial Adaptor Module, or remotely using standard High-Speed Modems.In this manner all parameters can be monitored and adjusted remotely.

Manual Override

Allows the outputs to be exercised during commissioning and maintenance activities. Holding the Manual Override button pressed until the Status Lamp flashes green will cause the controller to be switched from automatic to manual control and the Fan will run.

Subsequent pressings of the manual override button will cause:

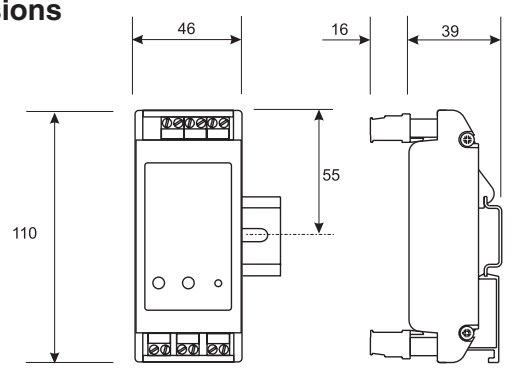
Press	Temp Lamp	Relay Output
1	Red	Htg Valve Open
2	Yellow	Htg Close, Clg Open
3	Green	Clg Close and returns to Auto Control

As this feature does not time out, care should be exercised to ensure the module is returned to the automatic mode on completion of the commissioning or maintenance activities.

Override can also be achieved via Doorway when AUTO can be set to manual mode and MANL used to set the output condition.

F1 Specification

Dimensions



all dimensions in mm

Electrical

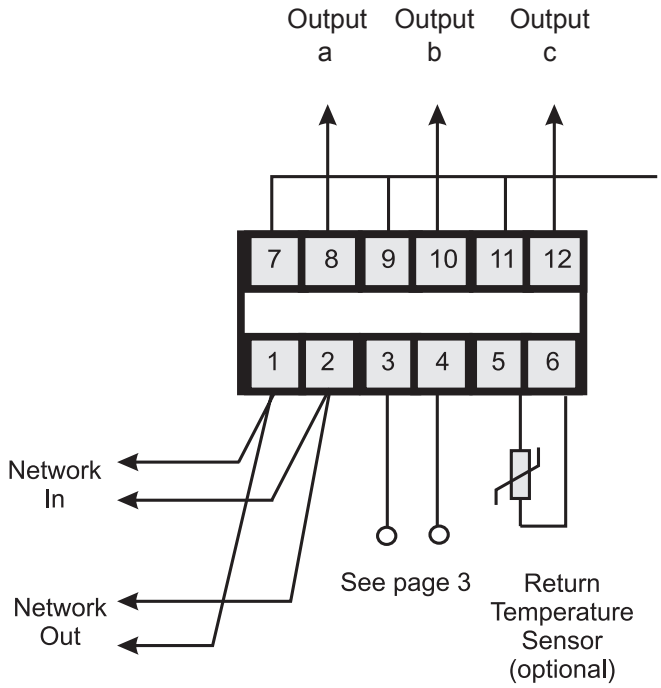
Inputs	2 Thermistors or 1 thermistor and VFC.
Outputs	3 Triacs - 1A at 230V
Consumption	25mA from network

Physical

Weight	0.15 kg
Cover Material	PC/ABS alloy Self extinguishing to UL 94 V0/1.60
Base Material	Polyamide 6.6 Self extinguishing to UL 94 VO
Colour	Dark Grey to Pantone 425

CE Conformant product

Wiring Information



250Vac maximum supply voltage. dc voltage not suitable

IMPORTANT
All network and sensor cables from to be unscreened, twisted pair cable 20AWG

Options and Product Codes

3T Fan Coil Controller

FCU / DIN / 3T / [*driver option*]

Options	Output A	Output B	Output C
/001	for Raise/Lower Heating valve		fan enable
/002	for Raise/Lower Cooling valve		fan enable
/003	for Raise/Lower airside damper		fan enable
/004	for Thermal Heating and Cooling valves		fan enable
/005	for 2 pipe Heat/Cool Systems		fan enable

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