TITAN - Energy Saving Controls – User Manual.

Guidance Notes on:

Controller Features & Operation;
Setting Controller Address & Network ID;
Configuring Stand Alone/Master/Slave;
Configuring Sensor Options;
Set-Point Adjustment.

Controller Overview:

Brief:

The Titan Controller with Diffusions Energy Saving software strategy is designed to be a cost effective multi-purpose digital control unit fulfilling the requirements for either Electric or Hot Water door curtain and heating unit types.
The control system consists of a Titan FCU-402 controller mounted within the heating unit, and a room / wall mounted RDU-4 user interface / display module; connected to the controller via an RJ11 cable.

Features:

RDU-4 LCD room / wall mounted user interface / display module.
Simple RJ11 plug connection between unit controller and room display module.
Soft-touch button control on RDU-4 for winter / summer changeover, and fan speed selections.
BACnet - RS485 cable connection between multiple units and BMS system.
RS485 network communications, BACnet protocol, for full BMS monitoring and control integration.
User adjustable engineering setting; including Supply air temperature and Room / Return air temperature.
On/off Volt free contact input for time clock or BMS control.
Display of fan speed, off coil temperature, and % heating output; and Fault conditions.

Adjustable Off Coil set-point, factory default setting of 40°C.
Return Air / Room Thermostat input to reduce or turn off heating when room temperature set-point reached.
Return air temperature measurement in place of room stat for greater flexibility
High precision supply and return air temperature sensors.

Three fan speed settings, plus off, with silent fan speed switching.
BMS controllable of fan speeds.

Summer/Winter changeover settings.
Option for outside air temperature for fully automatic Summer / Winter changeover control.

On/off input for occupancy sensed control; with adjustable run on time, default 15 minutes.

Direct PID control of valve actuators for water fed systems.
PID control of electric heating elements via external solid-state relays.
Master/slave control of heating output and fan speeds achieved with RS485 twin twisted pair cable between units / controllers.

Controller Operation Sequence:

Brief:

On / Off and Fan speed function are manually selected via the RDU-4 user interface / display module. Time clock switching or BMS connection can control these functions remotely.

Summer / Winter operating modes are manually switched selected via the RDU-4 user interface / display module.
Outside temperature sensor or BMS connection can control this function remotely.

Off coil and Return Air sensors are used to control the temperature of the air leaving the supply grill to maintain the Off Coil set-point value; for Summer or Winter mode.
However when the Return Air temperature reaches that set-point this turns the heating off; unless the Set-back temperature has been adjusted, when this feature reduces the Off Coil temperature by the Set-back value rather than turn the heating off completely.

Control Point Settings:

Feature	*Factory Setting*	*User Adjustable*
Summer Off Coil Temperature	*18.0°C*	*Yes*
Winter Off Coil Temperature	*40.0°C*	*Yes*
Summer Return Air / Room Temperature	*16.0°C*	*Yes*
Winter Return Air / Room Temperature	*25.0°C*	*Yes*
Off Coil set-back	*0.0°C*	*Yes*
PIR Sensor – Delay Off	*15 mins*	*Yes*
Outside Temperature Summer / Winter Change over		
OT Summer Set-Point Temperature	*20.0°C*	*Yes*
OT Winter Set-Point Temperature	*15.0°C*	*Yes*
Fan run on / cool down timer	*3 mins*	*Do Not Adjust*
Valve Actuator TPC time	*150 sec*	*Refer to Diffusion*

Controller & Interface Components:

Controller — *04-ELEC-6494*

Room Display Unit — *04-ELEC-6486*

Air Temp Sensor — *2Meter* — *04-ELEC-6487*
5Meter — *04-ELEC-6488*

RJ11 Cable — *5 Meter* — *04-ELEC-0139*
10Meter — *04-ELEC-0132*
20Meter — *04-ELEC-0435*
30Meter — *04-ELEC-0135*

Ceiling PIR Sensor — *04-ELEC-6496*

Room Temp Sensor — *(White)* — *04-ELEC-6497*
(Black) — *04-ELEC-6550*
(Grey) — *04-ELEC-6551*

Voltage Outside Air Temp Sensor — *04-ELEC-6495*

Index:

RDU-4 Room Display Panel

1.0 In order to enter engineering mode press all four buttons on the RDU for 3 seconds.
The RDU screen turns to a green (Maintenance Screen).
Left buttons, ▲ ▼, navigate through the menus.
Right buttons, △ ▽, select the options.
1.1 Adjustment of any kind to control parameters not covered in this document should not be made without written instruction from Diffusion.
1.2 Adjustment of the factory set Safety run-on times should not be made under any circumstances.

NOTE: ***Highlighted text identifies the RDU-4 screen colour and specific on screen wording during each stage of the configuration process.***

Setting up a Master unit:

2.0 **Maintenance Menu**; navigate ▼ to **Setup Menu** and select ▽.
Navigate ▲ **Passcode** enter **1212** by using △ to adjust the numbers, and ▽ to move cursor.
Navigate ▼ to **OK** select ▽.

2.1 **Setup Menu**; Navigate ▼ to **Unit Specific**, and select ▽.
Navigate to **FCU4** select ▽.
2.2 Change the Default **Device ID** **0000000** to **0000001** (unit 1); using △ to adjust the numbers, and ▽ to move the cursor.
2.3 Navigate ▼ to **MAC** address.
Change the Default **MAC** address **050** to **011**; using △ to adjust the numbers, and ▽ to move the cursor.
The first number should remain as **0**, the second should be the Group number **1**, and the third the unit ID number **1**.
Navigate ▲ to **Return to Previous** and select ▽, then navigate ▼ to **Return to Previous** and select ▽.
2.4 Navigate ▼ to **Control Group** and select ▽.
Default **Group Number** is **1** use △ & ▽ to adjust, Navigate ▼ to **Group Type**, default is **None**, for a Stand Alone unit, for a Master adjust to **Master** using △.
Navigate ▼ to **Return to Previous** and ▽ select.
Navigate ▼ to **Exit Menu** and select ▽.
2.5 **Save all changes ?**, Navigate ▲ to **Yes** ▽select,
Send full update to slave navigate ▼ to **No** and select ▽.

Setting up a Slave unit/s to Operate from Master:

Each Slave controller Device ID and MAC address needs to be uniquely configured.
The RDU remote control plate will need to be plug into each slave controller for programming.

3.0 **Maintenance Menu;** navigate to **Setup Menu** and select.
Navigate **Passcode** enter **1212** by using to adjust the numbers, and to move cursor.
Navigate to **OK** select.

3.1 **Setup Menu**; Navigate to **Unit Specific**, and select.
Navigate to **FCU4** select.
3.2 Change the Default **Device ID** **0000000** to **0000002** (unit 2 for second unit 3 for third etc.); using to adjust the numbers, and to move the cursor.
3.3 Navigate to **MAC** address.
Change the Default **MAC** address **050** to **012**; using to adjust the numbers, and to move the cursor.
The first number should remain as **0**, the second should be the Group number **1**, and the third the unit ID number **2** (unit 2 for second unit 3 for third etc.).
Navigate to **Return to Previous** and select, then navigate to **Return to Previous** and select.
3.4 Navigate to **Control Group** and select.
Default **Group Number** is **1** use & to adjust, Navigate to **Group Type**, default is **None**, for a Slave unit adjust to **Slave** using.
Navigate to **Return to Previous** and select.
Navigate to **Input Status** and select.

Adjusting Slave Unit Input/s Settings to Operate from Master:

Following on from section 3.0 each Slave controller requires three Inputs adjusting to Out of Service to enable referencing of the Master controller.

4.0 Input settings adjustment enabling reference to Master unit.
4.1 Navigate to **In2D** and select, navigate to **Out of Service**, alter to **Yes**.
Navigate to **Return to Previous** and select.
4.2 Navigate to **In3D** and select, navigate to **Out of Service**, alter to **Yes**.
Navigate to **Return to Previous** and select.
4.3 Navigate to **S2** and select, navigate to **Out of Service**, alter to **Yes**.
Navigate to **Return to Previous** and select.
Navigate to **Exit Menu** and select.
4.4 **Save all changes ?**, Navigate to **Yes** select,

Note

Stand alone, Master and subsequent Master units on the same network will need to be setup on separate groups.
Unit ID's can only be repeated on the same network if they are within a separate group.

Adjusting Summer & Winter Off Coil Set-Points:

Normal energy saving operation is achieved with the standard factory settings for Off Coil temperature control; Summer temperature set-point is 18.0°C, and Winter temperature set-point is 40.0°C.
These set-points are user adjustable, but should not exceed the limits detailed below:

5.0 **Maintenance Menu**; navigate to **Setup Menu** and select.
Navigate **Passcode** enter **1212** by using to adjust the numbers, and to move cursor.
Navigate to **OK** select.

5.1 **Setup Menu**; Navigate to **User Settings**, and select.
Navigate to **OCT Summer SP** and using to increase, and to decrease temperature.
Factory Setting is 18°C Recommended User Range is 15 to 20°C.
Navigate to **OCT Winter SP** and using to increase temperature, and to decrease temperature.
Factory Setting is 40°C Recommended User Range is 30 to 50°C Do not exceed 50°C.
Navigate to **Return to Previous** and select.
Navigate to **Exit Menu** and select.
5.21 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **No** and select. Without Slave unit connected.

5.22 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **Yes** and select. With Slave unit connected.

Adjusting Off Coil Set-Point RAT Controlled Set-back:

Normal energy saving operation is achieved with the standard factory setting of 0°C
By adding a set-back temperature this offsets / reduces the Off Coil Temperature by this value when the Return Air Temperature is reached; maintaining this as minimum Off Coil Temperature.
These set-points are user adjustable, but should not exceed the limits detailed below:

6.0 **Maintenance Menu**; navigate to **Setup Menu** and select.
Navigate **Passcode** enter **1212** by using to adjust the numbers, and to move cursor.
Navigate to **OK** select.

6.1 **Setup Menu**; Navigate to **Control Settings**, and select.
Navigate to **Setback Value** and using to increase, and to decrease temperature.
Factory Setting is 0°C Recommended User Range is 5 to 10°C.
Navigate to **Return to Previous** and select.
Navigate to **Exit Menu** and select.
6.21 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **No** and select. Without Slave unit connected.

6.22 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **Yes** and select. With Slave unit connected.

Adjusting Summer & Winter Return Air Temperature Set-Points:

Normal energy saving operation is achieved with the standard factory settings for Return Air temperature control; Summer temperature set-point is 16.0°C, and Winter temperature set-point is 25.0°C.
It should not be necessary to adjust these set-points; however they are user adjustable, but should not exceed the limits detailed below:

7.0 **Maintenance Menu**; navigate to **Setup Menu** and select.
Navigate **Passcode** enter **1212** by using to adjust the numbers, and to move cursor.
Navigate to **OK** select.

7.1 **Setup Menu**; Navigate to **Control Settings**, and select.
Navigate to **RAT Summer SP** and using to increase, and to decrease temperature.
Factory Setting is 16°C Recommended User Range is 14 to 18°C.
Navigate to **RAT Winter SP** and using to increase temperature, and to decrease temperature.
Factory Setting is 25°C Recommended User Range is 21 to 28°C.
Navigate to **Return to Previous** and select.
Navigate to **Exit Menu** and select.
7.21 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **No** and select. Without Slave unit connected.

7.22 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **Yes** and select. With Slave unit connected.

Reinstating a Slave unit/s Return Air Temp Sensor:

As standard the Slave unit is fitted with its own return air sensor which is disabled as standard to suit close coupled operation; should the units be mounted above separate doors the Slave return air temperature sensor can be reinstated.
The RDU remote control plate will need to be plugged into each slave controller for programming.

8.0 **Maintenance Menu;** navigate to **Setup Menu** and select.
Navigate **Passcode** enter **1212** by using to adjust the numbers, and to move cursor.
Navigate to **OK** select.
8.1 **Setup Menu**; Navigate to **Input Status** and select.
8.2 Navigate to **S2** and select, navigate to **Out of Service**, alter to **No**.
Navigate to **Return to Previous** and select.
Navigate to **Exit Menu** and select.
8.3 **Save all changes ?**, Navigate to **Yes** select,

PIR Occupancy Sensor Configuration – Stand-Alone / Master unit:

The Titan Controller strategy is pre-configured to operate with a PIR sensor using the NO contacts to enable the unit; shutting the unit off when the contacts are closed.
(This can be modified if required by following the sequence below).

9.0 **Maintenance Menu**; navigate to **Setup Menu** and select.
Navigate **Passcode** enter **1212** by using to adjust the numbers, and to move cursor.
Navigate to **OK** select.

9.1 **Setup Menu**; Navigate to **Configuration Menu**, and select.
Navigate **Passcode** enter **01510151** by using to adjust the numbers, and to move cursor.
Navigate to **Proceed** and select.
Read: ***"Please remember to update Software Name if changes are made"*** and select.
9.2 Navigate to **Configuration Menu** and select.
Navigate to **Input Status** and select.
Navigate to **In3D** and select.
Navigate to **Polarity** and amend **Reverse** to **Normal**.
9.3 Navigate to **Return to Previous** and select.
Navigate to **Return to Previous** and select.
Navigate to **Exit Menu** and select.
9.4 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **No** and select.

Setting / Adjusting PIR Occupancy time delay off:

With the PIR fitted this enables the timed delay off function; this is factory set to 15 minutes, and is fully adjustable to suit installation requirements.

10.0 **Maintenance Menu**; navigate to **Setup Menu** and select.
Navigate **Passcode** enter **1212** by using to adjust the numbers, and to move cursor.
Navigate to **OK** select.

10.1 **Setup Menu**; Navigate to **Control Settings**, and select.
Navigate to **PIR Delay Off** and using to increase time, and to decrease time.
Navigate to **Return to Previous** and select.
Navigate to **Exit Menu** and select.
10.2 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **No** and select.

Setting up a Stand Alone / Master for Time Clock:

The Titan Controller strategy is pre-configured to operate with a VFC time clock switch; Open contact shuts the unit OFF and Closed contact turns the unit ON.
(This function can be reversed if required by following the sequence below).

11.0 **Maintenance Menu;** navigate to **Setup Menu** and select.
Navigate **Passcode** enter **1212** by using to adjust the numbers, and to move cursor.
Navigate to **OK** select.

11.1 **Setup Menu**; Navigate to **Configuration Menu**, and select.
Navigate **Passcode** enter **01510151** by using to adjust the numbers, and to move cursor.
Navigate to **Proceed** and select.
Read: ***"Please remember to update Software Name if changes are made"*** and select.
11.2 Navigate to **Configuration Menu** and select.
Navigate to **Input Status** and select.
Navigate to **In2D** and select.
Navigate to **Polarity** and amend **Normal** to **Reverse**.
11.3 Navigate to **Return to Previous** and select.
Navigate to **Return to Previous** and select.
Navigate to **Exit Menu** and select.
11.4 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **No** and select.

Setting up a SA / Master for a 0-10Vdc / BMS signal for Fan Speed Control:

The Titan Controller strategy is pre-configured to adjust fan speed using the ▲ ▽ Select buttons.
Sequence: Off – Low – Medium – High.
(This can be amended to operate from a 0-10Vdc signal following the sequence below).
(Fan Off = 0V, Low Speed = 3V, Medium Speed = 5V & High Speed = 7V).

12.0 **Maintenance Menu**; navigate ▼ to **Setup Menu** and select ▽.
Navigate ▲ **Passcode** enter **1212** by using ▲ to adjust the numbers, and ▽ to move cursor.
Navigate ▼ to **OK** select ▽.

12.1 **Setup Menu**; Navigate ▼ to **Configuration Menu**, and select ▽.
Navigate ▲ **Passcode** enter **01510151** by using ▲ to adjust the numbers, and ▽ to move cursor.
Navigate ▲ to **Proceed** and select ▽.
Read: ***"Please remember to update Software Name if changes are made"*** and select ▽.
12.2 Navigate ▼ to **Configuration Menu** and select ▽.
Navigate ▼ to **Input Status** and select ▽.
Navigate ▼ to **Fan** and amend **None** to **In4A** ▲.
12.3 Navigate ▼ to **Return to Previous** and select ▽.
Navigate ▲ to **Exit Menu** and select ▽.
12.4 **Save all changes ?**, Navigate ▲ to **Yes** select ▽.
Send full update to slave navigate ▼ to **No** and select ▽.

Setting up a Stand Alone / Master for;
Voltage Out-side Temp Sensor – Summer / Winter auto changeover:

The Titan Controller settings require adjustment to allow the Winter / Summer auto changeover operation, via a 0-10Vdc signal from the VOTS.

13.0 **Maintenance Menu**; navigate to **Setup Menu** and select.
Navigate **Passcode** enter **1212** by using to adjust the numbers, and to move cursor.
Navigate to **OK** select.

13.1 **Setup Menu**; Navigate to **Configuration Menu**, and select.
Navigate **Passcode** enter **01510151** by using to adjust the numbers, and to move cursor.
Navigate to **Proceed** and select.
Read: ***"Please remember to update Software Name if changes are made"*** and select.
13.2 Navigate to **Configuration Menu** and select.
Navigate to **Input Status** and select.
Navigate to **OT Sensor** and amend **None** to **In5A**.
13.3 Navigate to **Return to Previous** and select.
Navigate to **Exit Menu** and select.
13.4 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **No** and select.

Adjusting Summer / Winter changeover temperature Set-Points:

Normal energy saving operation is achieved with the standard factory settings for outside temperatures; OT Summer temperature set-point is 20.0°C, and OT Winter temperature set-point is 15.0°C.
It should not be necessary to adjust these set-points; however they are user adjustable, but should not exceed the limits detailed below:

14.0 **Maintenance Menu**; navigate to **Setup Menu** and select.
Navigate **Passcode** enter **1212** by using to adjust the numbers, and to move cursor.
Navigate to **OK** select.

14.1 **Setup Menu**; Navigate to **Control Settings**, and select.
Navigate to **OT Summer SP** and using to increase, and to decrease temperature.
Factory Setting is 20°C Recommended User Range is 18 to 22°C.
Navigate to **OT Winter SP** and using to increase temperature, and to decrease temperature.
Factory Setting is 15°C Recommended User Range is 13 to 17°C.
Navigate to **Return to Previous** and select.
Navigate to **Exit Menu** and select.
14.2 **Save all changes ?**, Navigate to **Yes** select.
Send full update to slave navigate to **No** and select.

Operation:

RDU-4 Room Display Panel

Unit Powered, and in Standby Mode.

20.0 BMS or time clock interface signal switching unit into Off condition.

BMS / Time clock, Unit turned On.

21.0 BMS or time clock interface signal switching unit into On condition.

21.1 Press ⏶ to turn fan on – Low.

Manual Fan 3-Speed Adjustment.

22.0 Press ⏶ to increase fan speed.

22.1 Increase fan; Low – Medium – High

22.2 Press ⏷ to decrease fan speed

22.3 When the unit is connected on a BACnet BMS system the fan ON, OFF and Speed setting can be dictated via the network.

Operation- Cont.:

Winter / Summer Operation.

23.0 Press ▲ for Winter operating mode.

23.1 Press ▼ for Summer operating mode.

23.2 When the unit is connected on a BACnet BMS system the Winter / Summer operational setting can be dictated via the network.

23.3 Winter / Summer changeover is automatic wired to an outside temperature sensor.

Visual Heating Input %.

24.0 During operation the heat input required to meet duty demand is indicated by increased size of the central band across the RDU screen, and detailed as a percentage of the unit output.

Turning the Unit Off & Fan Overrun.

25.0 BMS or time clock interface signal can be used to disable the unit.

25.1 For manual control press ▽ to decrease fan speed till the fan Off position is reached.

25.2 When turned Off the unit will continue operating in the Fan Overrun state for three minutes to dissipate residual heat from the unit.

Fault Conditions & Alarms:

OCT – Off Coil Temperature Sensor Fault.

26.0 Screen indication for Off Coil Temperature fault – "OCT".
26.1 Unit turns Off, and fan overrun initiated.
26.2 Upon correction of fault, indication will automatically reset; unit will be in Off status.

RAT – Return Air Temperature Sensor Fault.

27.0 Screen indication for Return Air Temperature fault – "RAT".
27.1 Unit turns Off, and fan overrun initiated.
27.2 Upon correction of fault, indication will automatically reset; unit will be in Off status.

HTCO – High Temperature Cut-out Fault.

28.0 Screen indication for Off Coil Temperature fault – "HTCO".
28.1 Unit turns Off, and fan overrun initiated.
28.2 Upon correction of fault, indication will automatically reset; unit will be in Off status.

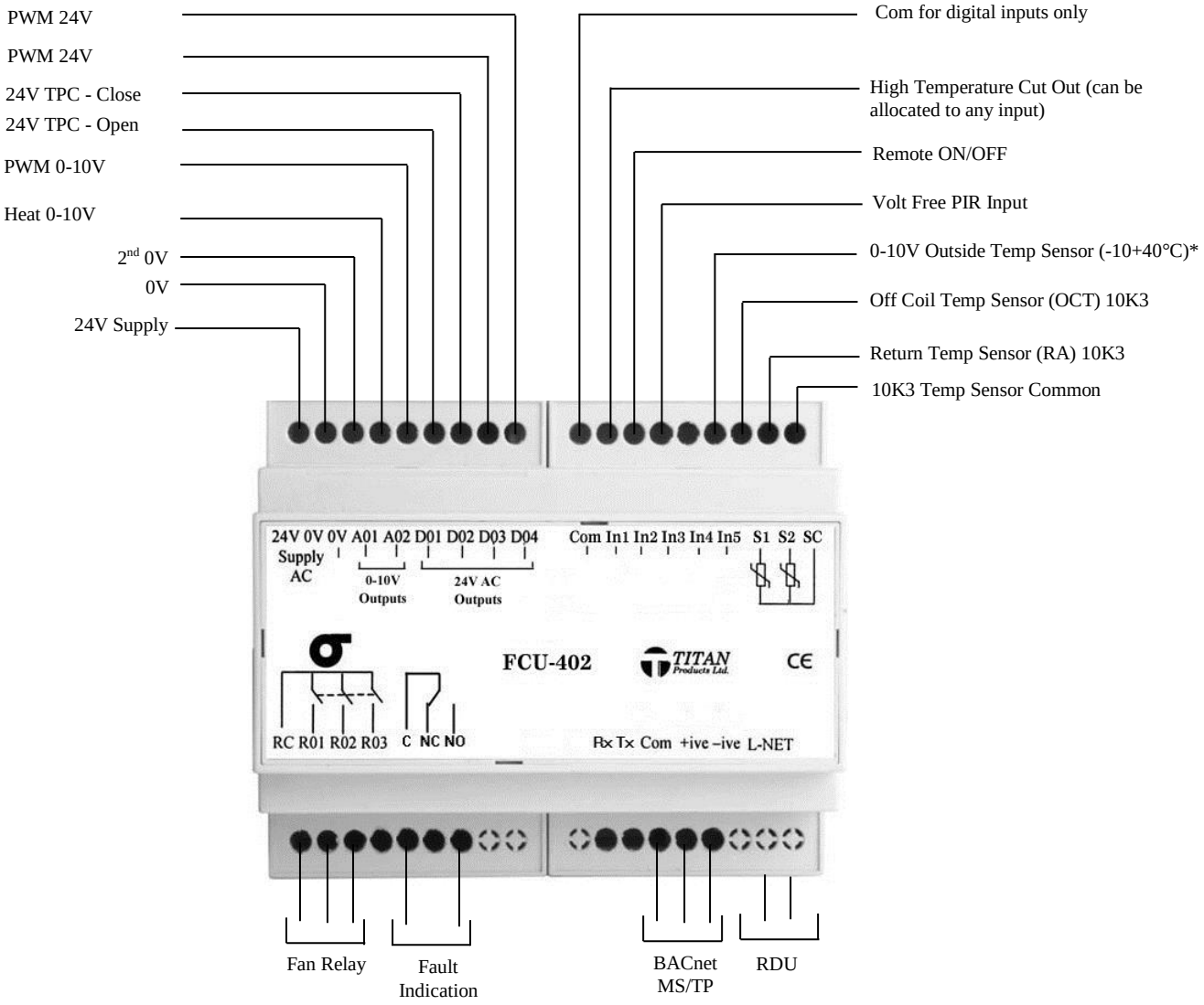
Fault Monitoring – BMS & VFC.

29.0 When the unit is connected on a BACnet BMS system any fault status indication will be visible via the network.
29.1 Additionally the controller includes a CO-VFC (changeover, Volt free contact), allowing wiring for a remote alarm indication; Alarming for all conditions as a General fault.

Controller IO's and Wiring Connection Details:

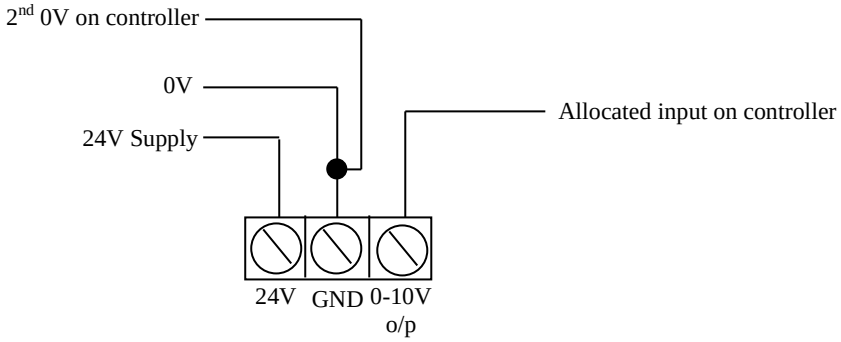
30.0 - TP1193 Diffusion Door Heater Controller – Wiring Diagram

Firmware: 4.16 Software: DHC1.2



*Allocate in configuration menu / input status if required.

30.1 - TPVOS Outside Temperature Sensor (-10+40°C) Wiring



Note: It is important to ground the sensor to the second 0V on the controller.

General Wiring Specifications for Titan BACnet Controls:

40.0 - Cable Specifications

Item	Cable Spec & Reference	Requirements
BACnet Communications to BMS Router and between Master - Slave Controllers	Belden 9841 (0.2mm2) Twisted Pair with Drain wire and foil wrap or equivalent **Must Be suitable for RS485 Standard**	Daisy Chain Network Configuration Only The cable shield must be connected to Earth ground at the network router end only.
Plug In lead between FCU4 & RDU4	Flat 6 way FCC Cable with Crimped RJ11 6P6C Plugs	Plugs crimped straight through. Max Cable length 30m
Resistive 2 Wire Temperature Sensors	2 Core twin twisted screened:- 0.75mm - 1mm Belden 8760 (0.82mm2) or Equivalent	Screen Earthed at Controller end only
0-10v Co2, Temperature or Humidity Sensors	2 Core twin twisted screened:- 0.75mm - 1mm Belden 8760 (0.82mm2) or Equivalent	Screen Earthed at Controller end only
Combined 0-10v CO2 & Temperature Sensors	4 Core Screened:- 2 x Twisted Pair:- 0.75mm -1mm Belden (0.82mm2) or Equivalent	Screen Earthed at Controller end only
ACO Auto/Open/Close Room Override & temp Sensor	6 Core Screened:- 3 x Twisted Pair:- 0.75mm -1mm Belden 9773 (0.82mm2) or Equivalent	Screen Earthed at Controller end only
Valve and Damper Actuators	4 Core Screened:- 2 x Twisted Pair:- 0.75mm -1mm Belden (0.82mm2) or Equivalent **Note: This depends on the type and number of actuators being used. Check requirements with Actuator manufacturer before installation**	Screen Earthed at Controller end only
Digital inputs :- PIR's / Condense Sensor / Fan prove/ On-Off Switch	2 Core twin twisted screened:- 0.75mm - 1mm Belden 8760 (0.82mm2) or Equivalent	Screen Earthed at Controller end only
Rain Detector	4 Core Screened:- 2 x Twisted Pair:- 0.75mm -1mm Belden (0.82mm2) or Equivalent	Screen Earthed at Controller end only

- All Low voltage cables must be segregated from any mains carrying inductors and they should not be run in the same containment system
- All low voltage cables must not run in close proximately to any mains AC inductive loads such as florescent fittings and electric motors

BACnet Network Configuration:

50.0

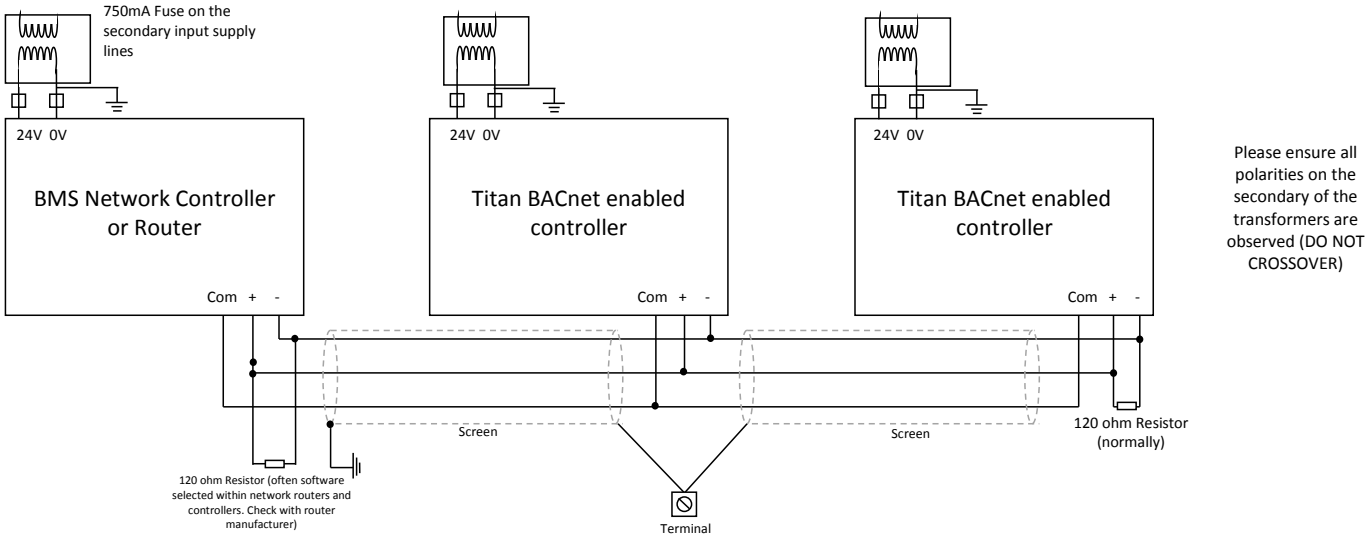
Based on the standards for RS485 networks a BACnet MS/TP network layer allows for only a daisy-chained network configuration, consisting of a single cable routed between controllers. **Star and Ring network topologies are not supported**.

The network electrically supports a maximum of 127 nodes, however BUS network size capability is determined by factors such as network traffic and BMS capabilities and we recommend maximum network size of 32 or 64 devices.

To comply with the EIA-485 standard, the maximum number of nodes per segment shall be 32 and any additional nodes will require the use of repeaters. If only Titan controllers are on the MS/TP network, the number of controllers may be increased but this will depend on the network traffic, the baud rate being used and the length/route of the cable.

A termination resistor of 120 ohms should be connected at each of the end devices, when a network is connected to a Router or BMS this becomes one of the end devices. Please check with the Router/BMS manufacturer if the 120 ohms end of line resistor is fitted internally.

50.1



The above diagram shows a typical 3-wire daisy chain configuration. For all BACnet standard wiring variants please consult ASHRAE wiring standards.

BACnet Technical Reference:

60.0 - Network Configuration

MS/TP allows for only a daisy-chained network configuration, consisting of a single cable routed between controllers. Star and Ring network topologies are not supported.

The network supports a maximum of 254 nodes; addresses 0 to 127 are valid for both master and slave nodes and addresses 128 to 254 are valid only for slave nodes.

To comply with the EIA-485 standard, the maximum number of nodes per segment shall be 32 and any additional nodes will require the use of repeaters. If only Titan controllers are on the MS/TP network, the number of controllers may be increased to 127 dependent on wiring length as specified below.

A termination resistance of 120 ohms shall be connected at each of the two ends of the segment medium.

60.1 - Cable Specifications

The cable used in an MS/TP EIA-485 network should conform to the following specifications:

Wire Size:	22-24 AWG
Cable Type:	Twisted-pair, copper wire, tinned and a ground wire which must be connected to all devices on the 485 network.
Shield:	Foil or braided
Nominal Impedance:	100 – 130 Ω
Capacitance:	< 100 pF/m distributed capacitance between conductors
< 200 pF/m distributed capacitance between conductors and shield	
Max segment length:	1200 meters (4000 feet)

The cable shield must be connected to Earth ground at the network router end only.

The recommended cable is Belden 3106A.

60.2 - Commissioning Settings

The BACnet commissioning settings can be accessed on the graphical RDU or programming tool by simultaneously pressing all four buttons. The left buttons can be used to scroll through the menu selections and the right buttons to change settings. To navigate and access the engineers settings please see supporting documentation.

The following settings need to be commissioned before connection to the MS/TP network:

60.3 - BACnet Device Object Identifier: This setting allows the entry of a unique internet work wide BACnet Device Object Identifier. With a default setting of 0000000, the device will operate on the local MS/TP network but will not dynamically bind and initiate I_Am messages. A valid Device Object ID in the range 1 to 4194302 can be entered and this will set the Device Object Name to "FCU4 *DevObjectID*".

60.4 - MAC Address: This setting corresponds to a unique MAC address on the local MS/TP network and can be in the range 1 to 127.

60.5 - Baud Rate: This setting corresponds to the MS/TP network Baud Rate and should match all other devices on the same local network. Options are 9600, 19200, 38400 and 76800.

60.6 - Object Description

The tables below indicate the Objects supported and the functions they perform.

Object ID	Object Name	Function
Inputs		
BI1	In1D	Digital input
B12	In2D	Digital input
B13	In3D	Digital input
B14	In4D	Digital input
BI5	In5D	Digital input
AI100	S1	Sensor thermistor input (Default OCT sensor)
AV100	S1 Offset	Sensor offset
AI101	S2	Sensor thermistor input (Default RAT sensor)
AV101	S2 Offset	Sensor offset
AI1	In1A	Analogue input
AI2	In2A	Analogue input
AI3	In3A	Analogue input
AI4	In4A	Analogue input
AI5	In5A	Analogue input (Default OT sensor)

Outputs		
BO1	DO1	Triac1 output (Default TPC Open)
BO2	DO2	Triac2 output (Default TPC Close)
BO3	DO3	Triac3 output (Default PWM)
BO4	DO4	Triac4 output (Default PWM)
BO5	Aux Relay	Relay output
AO1	AO1	Analogue output (Default 0-10V valve actuator)
AO2	AO2	Analogue output (Default 0-10V PWM)
MSO1	3-Stage Relay	Fan relay

Control Settings		
AV400	RAT Summer SP	Return air summer set point 0-50DegC
AV401	RAT Winter SP	Return air winter set point 0-50DegC
AV402	OT Summer SP	Outside air summer set point -10-40DegC
AV403	OT Winter SP	Outside air winter set point -10-40DegC
AV404	Setback Value	Setback temperature for OCT set point 0-50DegC
BV405	RAT Ctrl	Option for fan off / setback SP when RAT is at set point 0 – Setback 1- Fan Off
AV406	Max OCT SP	Maximum OCT setpoint 0 – 70DegC
AV407	Min OCT SP	Minimum OCT setpoint 0 – 70DegC
AV408	Pb	Heating proportional band 0 – 25DegC
AV409	It	Heating integral time 0 – 20min
AV410	Slew	Heating slew rate 0 – 300sec

AV411	PIR Delay Off	Occupancy time when the PIR is active 0 – 30min
AV412	Init Time	Time elapsed on switch on before outputs are enabled 0 – 10sec
MSV413	Fan Ctrl	Fan control when RAT setback is active: 1 – Off (Fan switches off immediately) 2 – Overrun (Fan switches off after any overrun has expired) 3 – On (Fan stays on)
AV414	Fan Overrun	Fan overrun time 0 – 60min
MSV415	Fan Position	Fan position:1 –Off, 2 – Low, 3 – Medium, 4 - High
AV416	Setback Time	The time required for any setback status change 0 – 60min

User Settings		
BV500	Mode	Mode: 0 – Winter, 1 - Summer
AV501	OCT Summer SP	Off coil summer set point 10-70DegC
AV502	OCT Winter SP	Off coil winter set point 10-70DegC

User Interface		
BV600	Occ	Occupancy: 0 – Unoccupied, 1 - Occupied
AV601	Maint Passcode	Maintenance passcode (0000)
AV602	Setup Passcode	Setup passcode (0000)
BV603	Fan Display	Fan display: 0 – Number, 1 - Text
AV604	Backlight Time	RDU backlight time after key press 0 – 500sec
BV605	Display DegC	RDU displays DegC: 0 – No, 1 - Yes
AV606	SP Adjust	OCT setpoint adjust: +/- 100DegC

Misc		
BV0	Flash store	Set True to store current values to flash memory so that they are not lost following a reboot
BV1	Build Fail	Is set to True if the primary configuration file fails to build. Unit will run on the secondary configuration until the unit is updated

Triac 1		
AV220	TPC time	Period (0-360s)
AV222	TPC Accuracy	Accuracy (0-10%)
AV223	Heat %	Current % position

Triac 2		
AV230	PWM time	Period (0-360s)
AV233	Heat %	Current % position

Control Group		
BV1200	Transmit All	Set to True to copy the master's set up to all slave units under group control
AV1200	Update Period	The time between group updates
MSV1200	Group Number	The group number (1-64)
MSV1201	Group Type	The group type of this device: 1- None, 2 – Slave, 3 - Master

70.0 - BACnet Protocol Implementation Conformance Statement

Date: 9th July 2013
Vendor Name: Titan Products Ltd.
Product Name: DHC
Product Model Number: TP1193E
Applications Software Version: DHC 1.0 **Firmware Revision:** 4.16 **BACnet Protocol Revision:** 3

BACnet Standardized Device Profile (Annex L):

☐ **BACnet Operator Workstation (B-OWS)**
☐ **BACnet Building Controller (B-BC)**
☐ **BACnet Advanced Application Controller (B-AAC)**
■ **BACnet Application Specific Controller (B-ASC)**
☐ **BACnet Smart Sensor (B-SS)**
☐ **BACnet Smart Actuator (B-SA)**

List all BACnet Interoperability Building Blocks Supported (Annex K):

DM-DDB-A/B Device Management – Dynamic Device Binding – A/B
DM-DOB-B Device Management – Dynamic Object Binding – B
DM-DCC-B Device Management – Device Communications Control – B
DM-PT-A/B Device Management – Private Transfer – A/B
DM-TS-BDevice Management – Time Synchronization – B
DM-RD-B Device Management – Reinitialize Device – B
DM-BR-B Device Management – Backup and Restore – B

DS-RP-B Data Sharing – Read Property – B
DS-RPM-B Data Sharing – Read Property Multiple – B
DS-WP-B Data Sharing – Write Property – B
DS-WPM-B Data Sharing – Write Property Multiple – B

AE-N-I-B Alarm and Event Notification Internal – B
AE-ACK-B Alarm and Event ACK – B

Segmentation Capability:

☐ Segmented requests supported Window Size _____
☐ Segmented responses supported Window Size _____

Standard Object Types Supported:

Object Type	Property	Optional	Writable	Range Restriction
Device	Object_Identifier			
	Object_Name			
	Object_Type			
	System_Status			
	Vendor_Name			
	Vendor_Identifier			
	Model_Name			
	Firmware_Revision			
	Application_Software_Version			
	Location	✓		
	Description	✓		
	Protocol_Version			
	Protocol_Revision			
	Protocol_Services_Supported			
	Protocol_Object_Types_Supported			
	Object_List			
	Max_APDU_Length_Accepted			
	Segmentation_Supported			
	Local_Time	✓		
	Local_Date	✓		
	APDU_Timeout		✓	0 to 60000ms
	Number_Of_APDU_Retries		✓	1 to 10
	Max_Masters	✓		
	Max_Info_Frames	✓		
	Device_Address_Binding			
	Database_Revision			
	Configuration_Files	✓		
	Last_Restore_Time	✓		
	Backup_Failure_Timeout	✓		
Analog Input	Object_Identifier			
	Object_Name			
	Object_Type			
	Present_Value		✓[1]	✓ (Instance dependent)
	Description	✓		
	Device_Type	✓		
	Status_Flags			
	Event_State			
	Reliability	✓		
	Out_Of_Service		✓	
	Units			
	Min_Pres_Value	✓		
	Max_Pres_Value	✓		
	Resolution	✓		
	Time_Delay	✓	✓	0 to 60000 seconds
	Notification_Class	✓	✓	NC1, NC2
	High_Limit	✓	✓	
	Low_Limit	✓	✓	
	Deadband	✓	✓	
	Limit_Enable	✓	✓	
	Event_Enable	✓	✓	
	Acked_Transitions	✓		
	Notify_Type	✓	✓	
	Event_Time_Stamps	✓		

Object Type	Property	Optional	Writable	Range Restriction
Analog Output	Object_Identifier			
	Object_Name			
	Object_Type			
	Present_Value		✓	✓ (Instance dependent)
	Description	✓		
	Device_Type	✓		
	Status_Flags			
	Event_State			
	Out_Of_Service			
	Units			
	Min_Pres_Value	✓		
	Max_Pres_Value	✓		
	Resolution	✓		
	Priority_Array			
	Relinquish_Default			
	Time_Delay	✓	✓	0 to 60000 seconds
	Notification_Class	✓	✓	NC1, NC2
	High_Limit	✓	✓	
	Low_Limit	✓	✓	
	Deadband	✓	✓	
	Limit_Enable	✓	✓	
	Event_Enable	✓	✓	
	Acked_Transitions	✓		
	Notify_Type	✓	✓	
	Event_Time_Stamps	✓		
Analog Value	Object_Identifier			
	Object_Name			
	Object_Type			
	Present_Value		✓	✓ (Instance dependent)
	Description	✓		
	Status_Flags			
	Event_State			
	Out_Of_Service			
	Units			
	Time_Delay	✓	✓	0 to 60000 seconds
	Notification_Class	✓	✓	NC1, NC2
	High_Limit	✓	✓	
	Low_Limit	✓	✓	
	Deadband	✓	✓	
	Limit_Enable	✓	✓	
	Event_Enable	✓	✓	
	Acked_Transitions	✓		
	Notify_Type	✓	✓	
	Event_Time_Stamps	✓		

Object Type	Property	Optional	Writable	Range Restriction
Binary Output	Object_Identifier			
	Object_Name			
	Object_Type			
	Present_Value		✓	
	Description	✓		
	Device_Type	✓		
	Status_Flags			
	Event_State			
	Out_Of_Service			
	Polarity		✓	
	Inactive_Text	✓		
	Active_Text	✓		
	Change_Of_State_Time	✓		
	Change_Of_State_Count	✓	✓	0
	Time_Of_State_Reset	✓		
	Priority_Array			
	Relinquish_Default			
Binary Input	Object_Identifier			
	Object_Name			
	Object_Type			
	Present_Value		✓[1]	
	Description	✓		
	Device_Type	✓		
	Status_Flags			
	Event_State			
	Reliability	✓		
	Out_Of_Service		✓	
	Polarity		✓	
	Inactive_Text	✓		
	Active_Text	✓		
	Change_Of_State_Time	✓		
	Change_Of_State_Count	✓	✓	0
	Time_Of_State_Count_Reset	✓		
	Time_Delay	✓	✓	0 to 60000 seconds
	Notification_Class	✓	✓	NC1, NC2
	Alarm_Value	✓	✓	
	Event_Enable	✓	✓	
	Acked_Transitions	✓		
	Notify_Type	✓	✓	
	Event_Time_Stamps	✓		
Binary Value	Object_Identifier			
	Object_Name			
	Object_Type			
	Present_Value		✓	
	Description	✓		
	Status_Flags			
	Event_State			
	Out_Of_Service			
	Inactive_Text	✓		
	Active_Text	✓		
	Time_Delay	✓	✓	0 to 60000 seconds
	Notification_Class	✓	✓	NC1, NC2
	Alarm_Value	✓	✓	
	Event_Enable	✓	✓	
	Acked_Transitions	✓		

Binary Value	Notify_Type	✓	✓	
	Event_Time_Stamps	✓		
Multi State Output	Object_Identifier			
	Object_Name			
	Object_Type			
	Present_Value		✓	✓ (Instance dependent)
	Description	✓		
	Status_Flags			
	Event_State			
	Out_Of_Service			
	Number_Of_States			
	State_Text	✓		
	Priority_Array			
	Relinquish_Default			
Multi-state Value	Object_Identifier			
	Object_Name			
	Object_Type			
	Present_Value		✓	✓ (Instance dependent)
	Description	✓		
	Status_Flags			
	Event_State			
	Out_Of_Service			
	Number_Of_States			
	State_Text	✓		
Notification Class	Object_Identifier			
	Object_Name			
	Object_Type			
	Description	✓		
	Notification_Class			
	Priority		✓	
	Ack_Required		✓	
	Recipient_List		✓	x1 BACnet Recipient[2]
File	Object_Identifier			
	Object_Name			
	Object_Type			
	Description	✓		
	File_Type			
	File_Size		✓	0
	Modification_Date			
	Archive			
	Read_Only			
	File_Access_Method			

[1] Present_Value only writable when Out_Of_Service True

[2] Dynamic Device Binding when BACnetRecipient ::= CHOICE { device [0] BACnetObjectIdentifier }

Data Link Layer Options:

☐ BACnet IP, (Annex J)
☐ BACnet IP, (Annex J), Foreign Device
☐ ISO 8802-3, Ethernet (Clause 7)
☐ ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
☐ ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s) _____
■ MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400, 76800
☐ MS/TP slave (Clause 9), baud rate(s):
☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s):_____
☐ Point-To-Point, modem, (Clause 10), baud rate(s): _____
☐ LonTalk, (Clause 11), medium: _____
☐ Other: _____

Device Address Binding:

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☐Yes ■ No

Networking Options:

☐ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.
☐ Annex H, BACnet Tunneling Router over IP
☐ BACnet/IP Broadcast Management Device (BBMD)
Does the BBMD support registrations by Foreign Devices? ☐ Yes ☐ No

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

■ ANSI X3.4	☐ IBM™/Microsoft™ DBCS	☐ ISO 8859-1
☐ ISO 10646 (UCS-2)	☐ ISO 10646 (UCS-4)	☐ JIS C 6226