# iPro Case Controller Installation and Operation Manual


*FW Version 1.01*

**026-1738 Rev 1**

EMERSON™

Emerson
1065 Big Shanty Road NW, Suite 100
Kennesaw, GA 30144 USA

Phone 770-425-2724
Fax 770-425-9319
www.emerson.com

# CONTENTS

# 1 General Description/ Introduction

The iPro Case Controller is a microprocessor-based controller for use in controlling temperature and Superheat in refrigerated fixtures and walk-in boxes. The controller is suitable for medium and low temperature applications and can control all loads in a refrigerated box or fixture. These include lighting, fans, defrost heaters, and solenoid valves. The iPro Case Controller system is comprised of at least one iPro Case Controller and one to two XEV20D valve drivers depending on the installation. There is also an input/output expansion module supported by the software that can be used if needed, although typically the I/O available on the iPro Case Controller is adequate for most installations. When more than one case or fixture is used within the refrigeration circuit, the iPro Case Controller can communicate critical information between case controller devices via Modbus from device to device. The controller can be integrated into an EMS system controller via Modbus or BACnet MS/TP/IP and is currently integrated into the Emerson E2E rack controller using BACnet MS/TP or IP. The controller can also be configured to run completely standalone, controlling the refrigeration system with no commands sent from E2E or a higher-level EMS controller.

**Overview of Capabilities**

- Each case controller can manage control of up to three evaporators Superheat in one case with associated temperature sensors, transducers and electronic valves.
- One master case controller can communicate with up to five (5) slave case controllers within each refrigeration circuit, six (6) case lineup is the maximum configuration.
- Control one (1) EEPR for the refrigeration circuit lineup.
- Manages all loads in a refrigerated case: lighting, fans, defrost heaters, and solenoid valves.

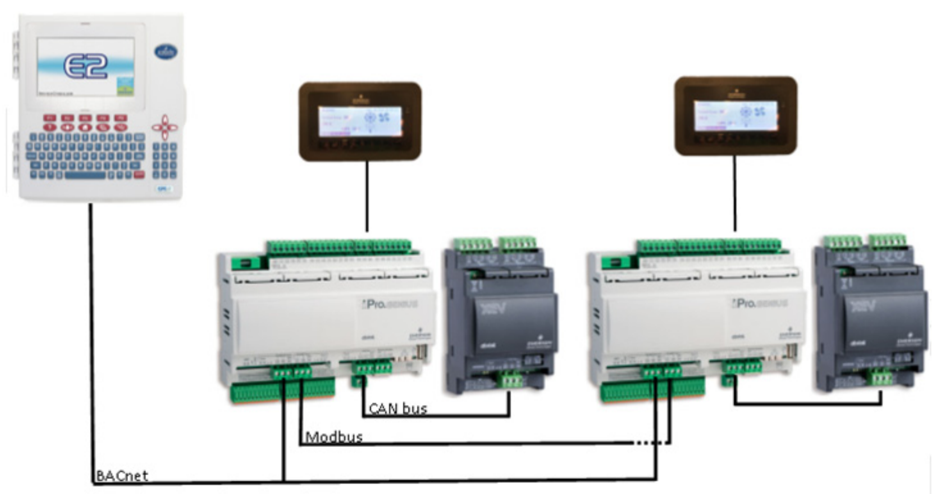



***Figure 1-1*** *- System Layout*

# 2 Ordering and Part Numbers

| Device | Emerson Part Number |
|---|---|
| iPro Case Controller | 818-9016 |
| XEV20D Dual Stepper Valve Actuator | 818-5003 |
| IPX106D Input/Output Expansion Module | 818-7000 |
| Visograph 2.0 V2IPG Display (Pre-loaded) | 818-9208 |
| 20’ Discharge Air Temperature Sensor (Green) | 501-1122 |
| 20’ Defrost Termination Temperature Sensor (Orange) | 501-1127 |
| 20’ Return Air Temperature Sensor (Purple) | 501-1128 |
| 20’ Coil Outlet Temperature Sensor (Red) | 501-1126 |
| 0-100 PSI transducer | 800-2100 |
| 100 ohm resistor for RS485 master port | 318-4000 |
| 0-5VDC 30, 60, 120 Amp Current Transducer for fan motors and defrost heaters current monitoring | 251-7000 |

***Table 2-1*** *- Ordering Information*

# 3 Mounting and Hardware Overview

## 3.1. Mounting and Dimensions

In most situations, the iPro Case Controller will arrive at the customer's site already installed within a case OEM fixture or within a pre-fabricated Emerson control panel. The installer need only make communication wiring and field sensor wiring terminations (if required). If the need arises for the installer to mount the iPro Case Controller elsewhere, the controller should always be mounted in a moisture-free environment or an environment adequately protected from moisture.

The iPro Case Controller, XEV20D and IPX106D use a DIN rail mount for installation, see figures below for dimensions.

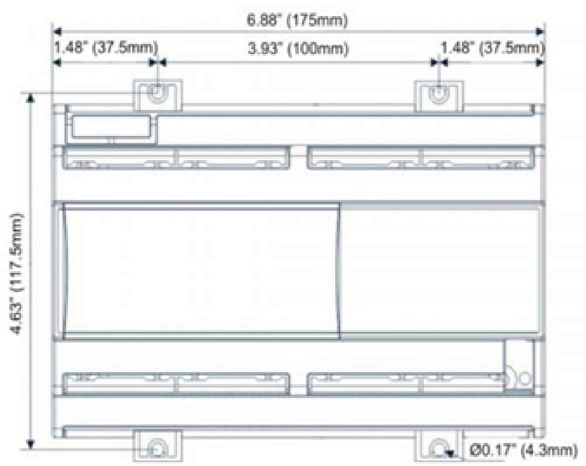



***Figure 3-1*** *- iPro DIN Mounting*

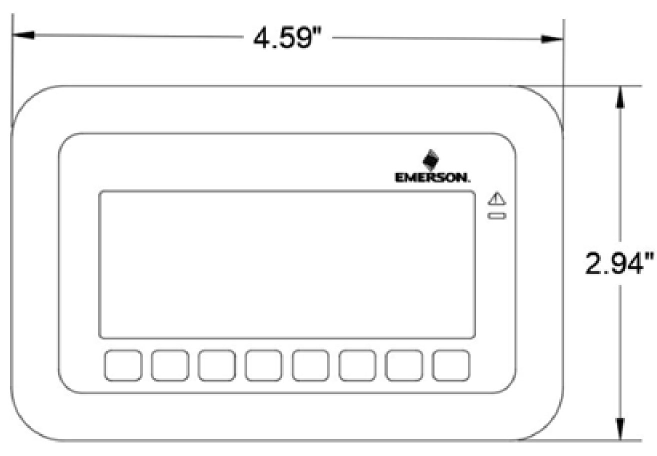



***Figure 3-2*** *- Visograph Display Dimensions*

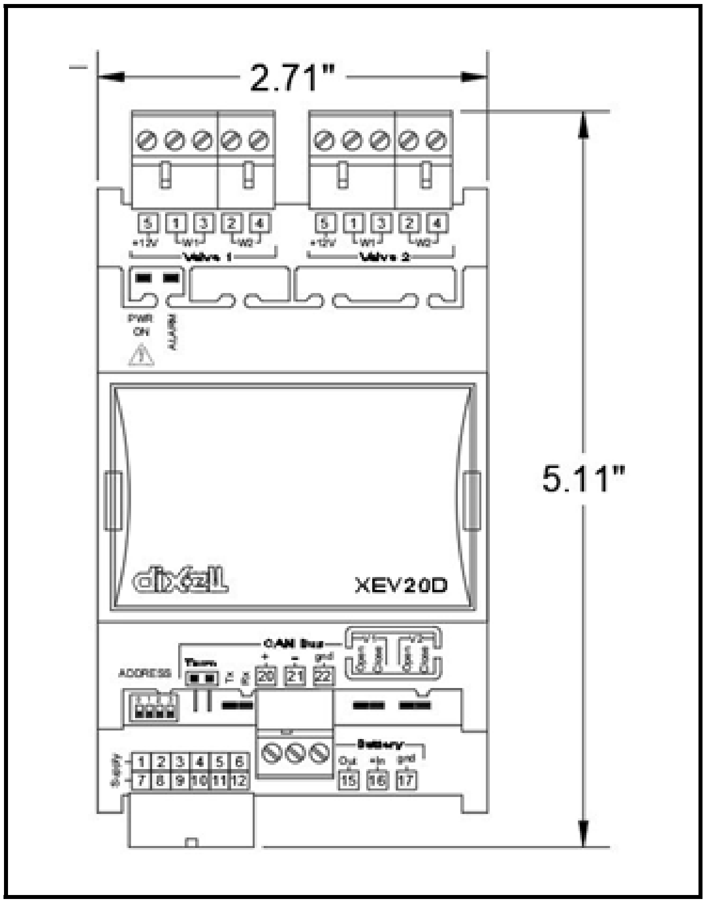


*Figure 3-3* - *XEV20D Dimensions*

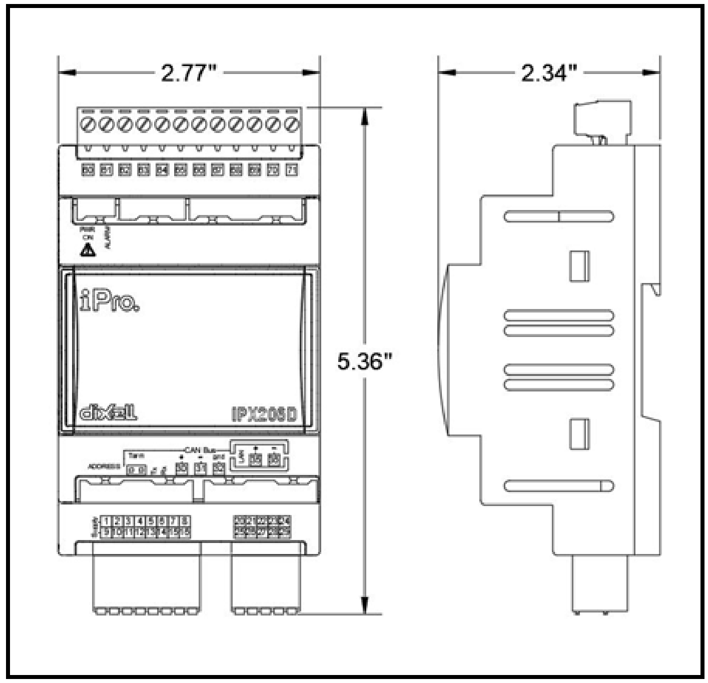


*Figure 3-4* - *IPX Dimensions*

# 4 Overview

## 4.1. iPro Hardware Overview

The iPro Case Controller is a microprocessor-based fully programmable controller. The controller is powered at 24VAC and uses a high speed performance 32-bit ARM9 (200 MHz) microprocessor. The controller has 15 digital outputs, 20 digital inputs, 10 analog inputs and six (6) analog outputs onboard. Technical specifications for onboard I/O can be found in **Section 6.1.,** *iPro Analog Inputs*, **Section 7.1.,** *iPro Digital Inputs*, **Section 8.1.,** *iPro Digital Outputs*, and **Section 9.1.,** *iPro Analog Outputs*. The iPro Case Controller has three (3) serial communication ports, one (1) TCP/IP port and one (1) USB port. The RS485 master port is used to make the BACnet MS/TP connection to E2E, and the RS485 slave port is used to connect to peer case controllers within a refrigeration circuit. The CAN Bus port is used for iPro to communicate with other peripheral devices such as the XEV20D and IPX106D.

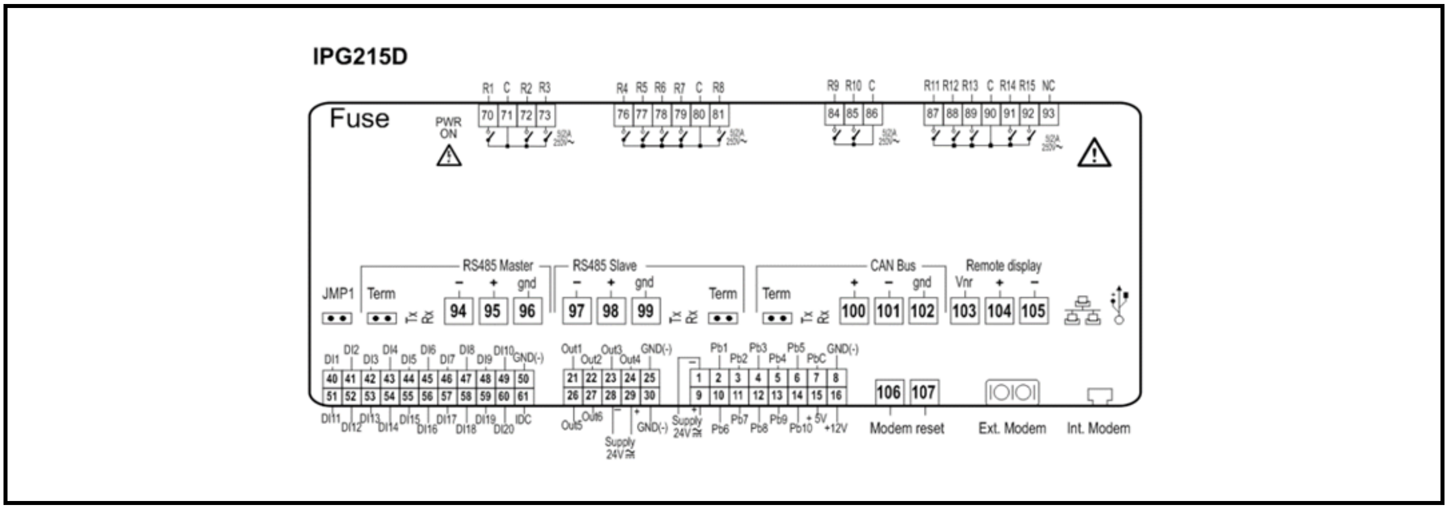



***Figure 4-1*** *- iPro Wiring and Connections*

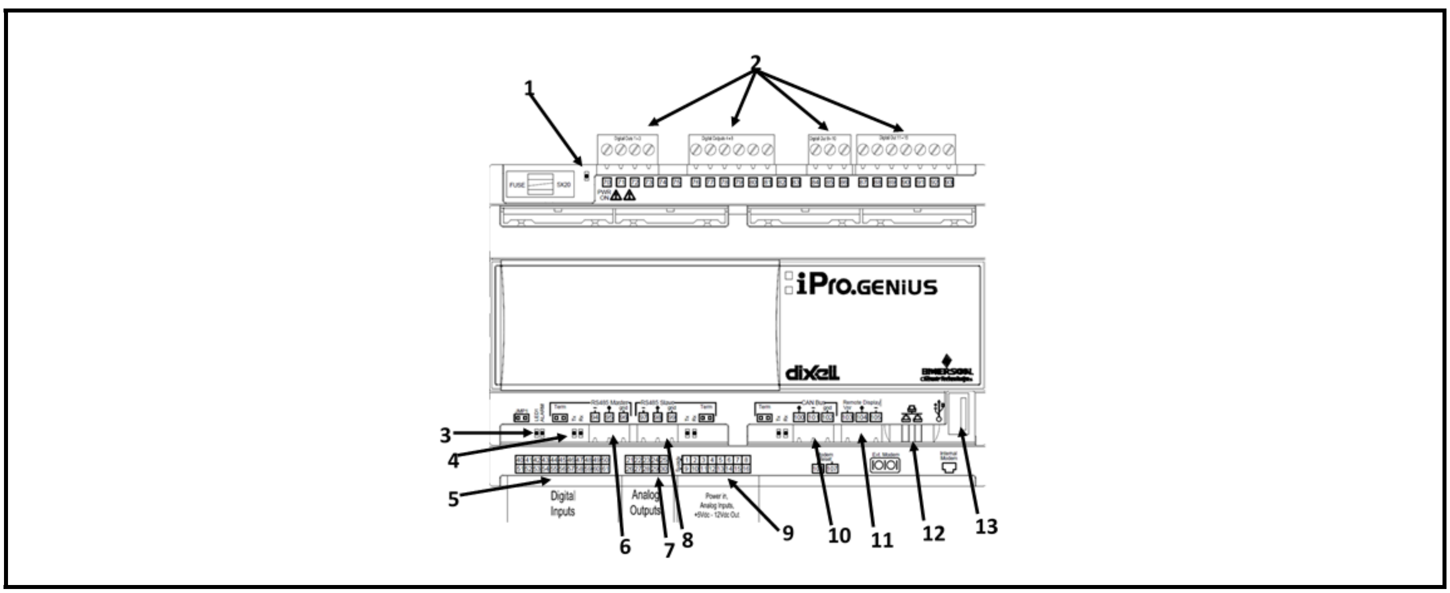



***Figure 4-2*** *- iPro Hardware*

| LEGEND | | | |
|---|---|---|---|
| **1** | GENERAL STATUS LED | **8** | RS485 SLAVE PLUG-SLAVE CONTROLLER NETWORK |
| **2** | RELAY OUTPUT CONNECTORS | **9** | ANALOG INPUTS/24VAC POWER IN CONNECTOR |
| **3** | LED 1 AND GENERAL ALARM LED | **10** | CAN BUS CONNECTION-FOR XEV20D&IPX MODULE |
| **4** | RS485 TRANSMIT/RECEIVE LED | **11** | REMOTE DISPLAY PORT-VISOGRAPH |
| **5** | DIGTIAL INPUT CONNECTOR | **12** | TCP/IP PORT-BACNET IP PORT |
| **6** | BACNET MS/TP CONNECTION | **13** | USB PORT |
| **7** | ANALOG OUTPUT CONNECTOR | | |

***Table 4-1*** *- iPro Hardware*

## 4.2. Detailed Description of Connectors for the iPro Case Controller

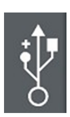
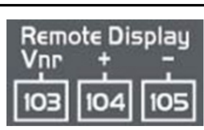
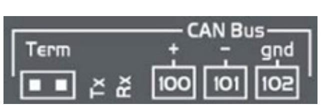
| Connector | Description |
|---|---|
|   | Connector for 24VAC/DC power supply.<br>Analog inputs (Pb1 - Pb6, PbC).<br>Additional power: +5VDC, +12VDC, Common (-)<br>Analog outputs (Out1 - Out4, Common). |
|   | Opto-insulated analog outputs (Out1 - Out6, GND)<br>24VAC/DC power supply required for the opto-insulated analog outputs |
|   | Voltage-free opto-insulated digital inputs (DI1 - DI20, IDC)<br>Opto-insulated 24VAC/DC digital inputs (DI1 - DI20, GND) |
|  | USB port for downloads (BIOS, ISaGRAF® application, maps of parameters, remote display applications, network configuration, website) and uploads (log files). |
|  | TCP/IP Ethernet port. Also used for BACnet IP connection. |
|   | Connector for remote terminal (VISOGRAPH), maximum two (2) terminals per iPro Case Controller. |
|   | CAN Bus port is used to connect the iPro Case Controller and XEV20D and IPX modules. |

***Table 4-2*** *- iPro Connections and Descriptions*

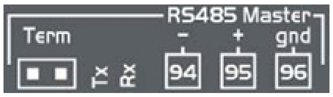
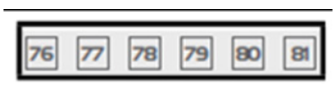
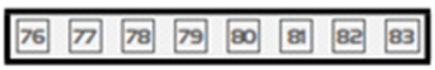
| | |
|---|---|
|   | RS485 Slave port is used to connect the Master and Slave Case Controllers Rx and Tx LED to indicate that communication is active.<br>Closed circuit terminal (Term) |
|   | RS485 Master port is used to connect iPro Case Controller and Master Supervisory Controller<br>Rx and Tx LED to indicate that communication is active Closed circuit terminal (Term) |
|   | Digital relay outputs (for digital outputs with voltage-free contacts) three (3) NO relays, one (1) common |
|   | Digital relay outputs (for digital outputs with live contacts) three (3) NO relays, one (1) common and two (2) voltage free (Neutral) |
|   | Digital relay outputs (for digital outputs with voltage-free contacts) five (5) NO relays, one (1) common |
|   | Digital relay outputs (for digital outputs with live contacts) five (5) NO relays, one (1) common and two (2) voltage free (Neutral) |
|   | Digital relay outputs<br>two (2) NO relays, one (1) common |
|   | Digital relay outputs (only for 215D versions)<br>five (5) NO relays, one (1) common and one (1) voltage free (Neutral) |
|   | Green LED to indicate the presence of power |

***Table 4-2*** *- iPro Connections and Descriptions*

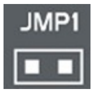
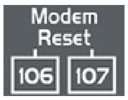
| | |
|---|---|
|  | Jumper to activate the RESCUE MODE |
|  | Yellow status LEDs (LED1) and red LED (ALARM) See relative paragraph |
|  | NOT USED IN CASE CONTROLLER |
|  | NOT USED IN CASE CONTROLLER |
|  | NOT USED IN CASE CONTROLLER |

***Table 4-2*** - *iPro Connections and Descriptions*

## 4.3. Visograph Overview

The local user interface for iPro Case Controller is Visograph 2.0 V2IPG. The Visograph is an LCD display with eight (8) keys (labeled T1-T8) on a membrane keyboard. The Visograph can be panel mounted or wall mounted as shown above in the Visograph dimensions detail. The Visograph is powered from the iPro remote display port on iPro terminals 103, 104, 105. In most installations, each iPro Case Controller will have its own Visograph display locally mounted for controller navigation and configuration. All parameters and configuration for the case controller can be edited from Visograph. The Visograph provides a quick and easy interface for viewing temperatures, alarm data, system status, valve percentages and status of outputs and loads. More on Visograph navigation is covered later in this document.


***Figure 4-3*** - *Visograph*

## 4.4. IPX106D Hardware Overview

The IPX is an input/output expansion board for use in combination with iPro Case Controller. The IPX has six (6) digital outputs, seven (7) analog inputs, three (3) digital inputs and three (3) analog outputs. The case controller supports up to two (2) IPX modules at one time. The IPX communicates with iPro Case Controller on the CAN Bus port, when XEV20D and IPX are present then the CAN Bus communication wiring is simply continued to the IPX in a daisy chain. When the IPX modules are present they communicate at address 4 and 5.


*Figure 4-4* - *IPX106D*

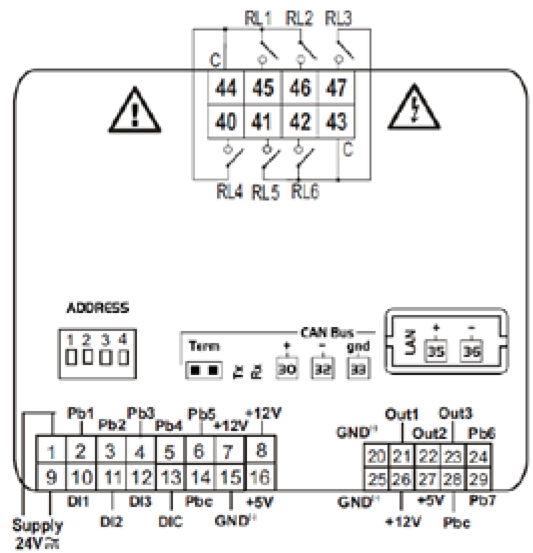



*Figure 4-5* - *IPX106D Wiring*

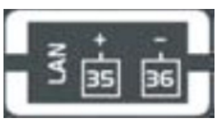
| Connector | Description |
|---|---|
|  | Connector for 24VAC/DC power supply<br>Analog inputs (Pb1 - Pb5, PbC)<br>Voltage-free digital inputs (DI1 - DI3, DIC)<br>Additional power (+5VDC, +12VDC, GND) |
|  | Analog outputs (Out1..Out3, GND)<br>Analog inputs (Pb6 - Pb7, PbC)<br>Additional power (+5VDC, +12VDC, GND) |
|  | Digital relay outputs<br>Six (6) NO relays, two (2) common |
|  | CAN Bus Connector<br>Rx and Tx LED to indicate that communication is active<br>Closed circuit terminal (Term) |
|  | LAN serial port connector - <u>*NOT USED IN THIS APPLICATION OF IPRO CASE CONTROLLER*</u> |
|  | Dip switch to set the address of the device. |
|  | Green LED to indicate the presence of power |
|  | Red status LED (ALARM) |
|  | Green LED to indicate the presence of power |

***Table 4-3*** *- IPX Connectors and Descriptions*

## 4.5. XEV20D Hardware Overview

The XEV20D is a stepper valve actuator is intended for either bipolar stepper valves or unipolar stepper valves. This device is used in combination with the iPro Case Controller to drive the electronic expansion valves and electric evaporator pressure regulator in the refrigerated case or walk in box. Each XEV20D drives two (2) valves and the iPro Case Controller system supports a maximum of two (2) XEV20D per iPro. The XEV20D communicates with the iPro Case Controller via the CAN Bus port on both devices. When driving stepper valves with this actuator, check the valve manufacturer technical specifications for the current ratings and verify if the XEV20D can drive the valve selected for the system.

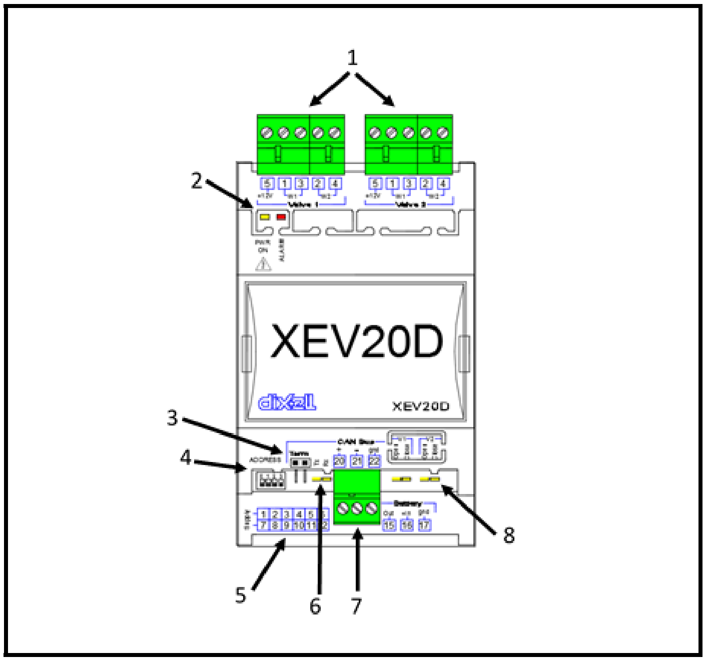



***Figure 4-6*** *- XEV20D*

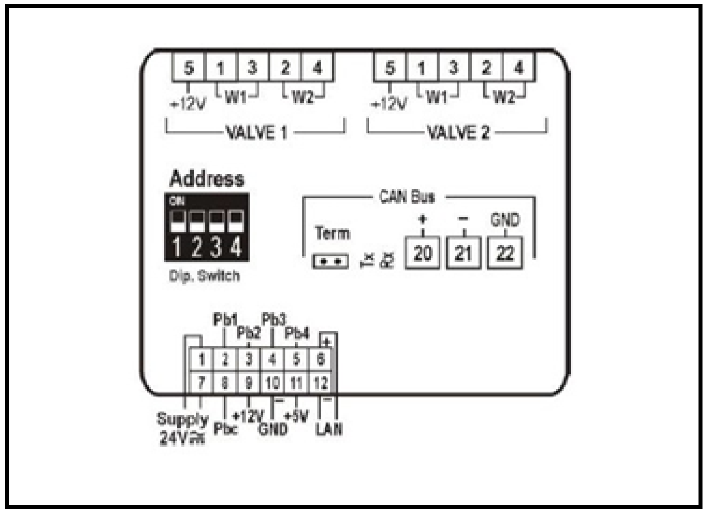



***Figure 4-7*** *- XEV20D Wiring*

| LEGEND | | | |
|---|---|---|---|
| 1 | VALVE 1 AND 2 WIRING CONNECTOR | 5 | ANALOG INPUTS/24VAC POWER |
| 2 | POWER ON AND ALARM LED | 6 | CAN BUS COMMUNICATION TX/RX LED |
| 3 | CAN BUS RS485 TERMINATION JUMPER | 7 | CAN BUS WIRING CONNECTOR |
| 4 | CAN BUS ADDRESS DIPSWITCHES | 8 | VALVE POSITION INDICATOR LED |

***Table 4-4*** *- XEV20D LED Light Descriptions*

The XEV20D driver has onboard LED lights that show device status and the valves being controlled. See ***Table 4-5*** below for LED function descriptions.

| LED | MODE | MEANING |
|---|---|---|
| **PWR ON** | On | Tells that the model is powered correctly |
| **ALARM** | On | Tells that an alarm is present |
| **TX/RX** | Blinking | CAN Bus or LAN activity, communication activated |
| **TX/RX** | On | No link |
| **OPEN V1** | Blinking | Valve 1 is opening |
| **OPEN V1** | On | Valve 1 is completely opened |
| **CLOSE V1** | Blinking | Valve 1 is closing |
| **CLOSE V1** | On | Valve 1 is completely closed |
| **OPEN V2** | Blinking | Valve 2 is opening |
| **OPEN V2** | On | Valve 2 is completely opened |
| **CLOSE V2** | Blinking | Valve 2 is closing |
| **CLOSE V2** | On | Valve 2 is completely closed |

***Table 4-5*** *- XEV20D LED Functions*

## 4.6. XEV20D Valve Connections

The wires from the valve wiring harness should be terminated at the XEV20 connectors labeled **valve 1** and **valve 2**. See ***Table 4-6*** and ***Table 4-7*** below for terminal numbers associated with each valve wire color.

| | 4 Wire Valves (Bipolar) | | | | | |
|---|---|---|---|---|---|---|
| **Terminal Numbers** | Alco EX | Alco EX5/6 | Sporlan SEI-SHE | Sporlan CDS4-17 | Danfoss ETS | Carel E2V-E7V |
| **1** | GREEN | WHITE | GREEN | GREEN | GREEN | GREEN |
| **2** | BROWN | BLACK | RED | RED | RED | YELLOW |
| **3** | YELLOW | BROWN | BLACK | BLACK | WHITE | BROWN |
| **4** | WHITE | BLUE | WHITE | WHITE | BLACK | WHITE |
| **5 - Common** | N/A | N/A | N/A | N/A | N/A | N/A |

***Table 4-6*** *- Bipolar Valve Connections*

| 5-6 Wire Valves (Unipolar) | | | |
|---|---|---|---|
| Terminal Numbers | Spolar | Saginomiya | EX3 |
| 1 | BLACK | BLACK | BLUE |
| 2 | YELLOW | YELLOW | BLACK |
| 3 | RED | RED | BROWN |
| 4 | ORANGE | ORANGE | WHITE |
| 5 - Common | GRAY | GRAY | GRAY |

***Table 4-7*** *- Unipolar Bipolar Valve Connections*

## 4.7. XEV20D Absolute Maximum Power

The XEV20D can drive a wide range of stepper valves. Indicated in the following table are the maximum values of current that the actuator can supply to the stepper wiring.

> ***NOTE: The electrical power absorption of the valve can be unrelated to refrigeration power that valve has. Before using the actuator, read the technical manual of the valve supplied by the manufacturer and check the maximum current used to drive the valve to verify that they are lower than those indicated below.***

| | | | CONFIGURATION | |
|---|---|---|---|---|
| | | | **ONE VALVE** | **TWO VALVES** |
| | | DRIVING MODE | Full step | Full Step |
| VALVE TYPE | | BIPOLAR VALVES (4 wires) | Current 0.9A max<br>Æ TF20D | Current 0.9A max for each valve<br>Æ TF20D |
| | | UNIPOLAR VALVES (5-6 wires) | Current 0.33A max<br>Æ TF20D | Current 0.33A max for each valve<br>Æ TF20D |

***Table 4-8*** *- Maximum Values of Current*

***Note: TF20D=20VA transformer, 40D=40VA***

### 4.7.1. Description of XEV20D Connections

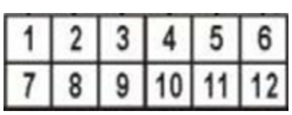
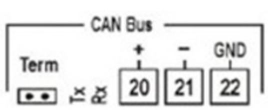
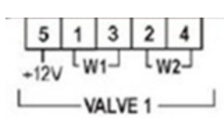
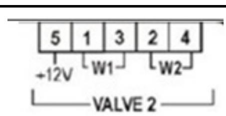
| Connector | Description |
|---|---|
|   | Connector for 24VAC/DC power supply analog inputs (Pb1 – Pb4, PbC) Additional power (+5VDC, +12VDC, GND) LAN |
|   | CAN Bus connector for connection to monitoring system. Rx and Tx LED to indicate that communication is active Closed circuit terminal (Term) |
|   | CAN Bus serial line Address |
|   | Connections to valve 1 (W1/W2) Additional power (+12VDC) |
|   | Connections to valve 2 (W1/W2) Additional power (+12VDC) |

***Table 4-9*** *- XEV20D Connection Descriptions*

## 4.8. CAN Bus Communication Connection

The XEV20D communicates with the iPro Case Controller using the CAN Bus protocol link. The CAN Bus connection will use RS485 wiring standard and the approved wire type is General Cable 92454A *(Emerson P/N 135-0600)*. The polarity of the CAN Bus connection between iPro and XEV20D is straight polarity (*see **Figure 4-9***). When two XEV20D devices are connected to the iPro Case Controller, the CAN Bus connection should be in a daisy chain with the last XEV20D device having the CAN Bus termination jumper installed, see figure 8. For successful communication to occur, the addressing dip switches on the XEV20 must be set correctly. When one (1) XEV20D driver is being used by the iPro Case Controller, then the dip switch address will be (two) 2, when two (2) XEV20D modules are being installed, the modules should be address 2 and 3. An example of how to address the device using the dip switches is shown in Figure 7.

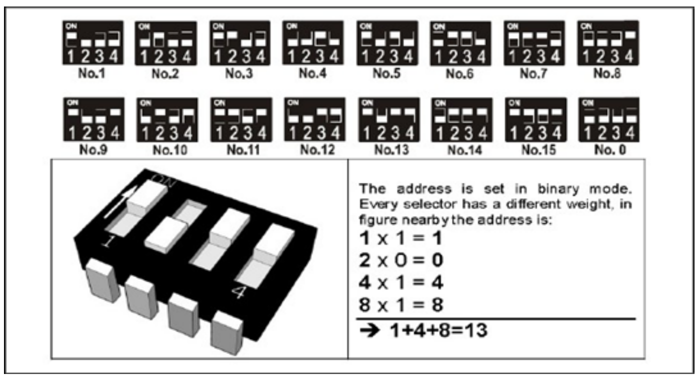



***Figure 4-8*** *- XEV20D Dip Switch Addressing*

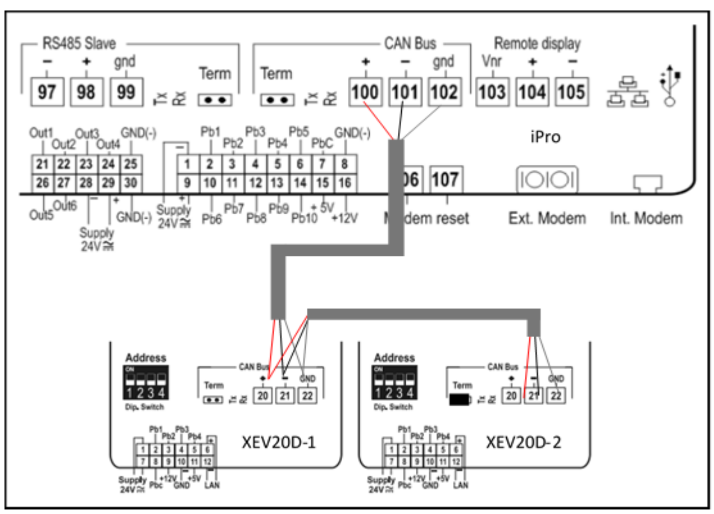



***Figure 4-9*** *- XEV20D CAN Bus Wiring*

# 5 Powering Devices and Wiring

## 5.1. Transformer Selection

The power supply voltage for iPro Case Controller, XEV20D; and IPX is 24VAC. The Visograph remote display is powered from the remote display port on the iPro. Emerson provides a variety of 24VAC non-center tapped transformers that can be used to power these devices. Transformer requirements are a minimum of 20VA for the iPro Case Controller and the iPro must not share a transformer with any other devices. The transformer power requirements of the IPX106D are a minimum of 10VA and requirements for the XEV20D are a minimum of 40VA. Each device must have its own dedicated transformer.

| Transformer Part Number | Primary Voltage | VA Rating |
|---|---|---|
| 640-0040 | 120/208-240VAC | 50 VA |
| 640-0041 | 120 VAC | 50 VA |
| 640-0042 | 220 VAC | 50 VA |

***Table 5-1*** *- Transformer Selection*

## 5.2. Wire Types and Maximum Distance

For powering iPro, XEV20D and IPX106D use only the listed wire types in Table 5-2. Two conductor non-shielded cables are the recommended wire for connecting each of the devices to the secondary of the transformer. *Shielded cable should not be used for power wiring. The center tap should be left disconnected, if present on the transformer.*

| Power Wire Types | |
|---|---|
| **14 AWG** | **Belden 9495** |
| **18 AWG** | **Belden 9495** |

***Table 5-2*** *- Power Wire Types*

The wire length from the transformer determines the wire gauge used. In most cases, the distance between the iPro Case Controller and the transformer that supplies power to it is not enough to be of concern; however, it is very important NOT to exceed this maximum wire length or the controller will not operate correctly. Use these formulas to determine if the wire gauge you are using fits within specification:

| |
|---|
| **14 AWG:** |
| Feet = 1920/VA |
| **18 AWG:** |
| Feet = 739/VA |
| (VA is the total VA rating of the controller) |
| For example, if you had an 80 VA load: |
| 14 AWG: 24 ft. |
| 18 AWG: 9 ft. (rounded down) |

***Table 5-3*** *- Power Wire Lengths*

## 5.3. Wire Selection Guidelines

| DEVICE TYPE | EMERSON WIRING GUIDELINES |
|---|---|
| ANALOG TEMP SENSOR OR DIGITAL INPUT | General Cable 92454A #22-2 SHIELDED<br>*Emerson P/N 135-0600* |
| RS485 NETWORK | General Cable 92454A #22-2 SHIELDED<br>Emerson P/N 135-0600 |
| PRESSURE TRANSDUCERS | **BELDEN #8771 #22-3 SHIELDED<br>*Emerson P/N 135-8771*<br>**#8771 for alternate 600v rated wire use BELDEN #8618 16 AWG |
| STEPPER VALVES | Use valve manufacturer's harness with a maximum length not to exceed 30 feet (10 meters). |

***Table 5-4*** *- Wiring Specifications*

## 5.4. Powering the iPro Case Controller

The iPro can be powered from one of the transformers listed in the *Table 5-1* and *Figure 5-1* shows how to connect the 24VAC wiring from the transformer to the iPro connector. The 24VAC power is connected to terminals 1 and 9 on the analog input connector. The iPro should have its own dedicated transformer for providing the 24VAC needed for supply power.

***NOTE: Neither side of the secondary should be connected to ground. Also, do not connect the center tap (if provided on the transformer) to ground. The entire secondary of the transformer should be isolated from any ground.***

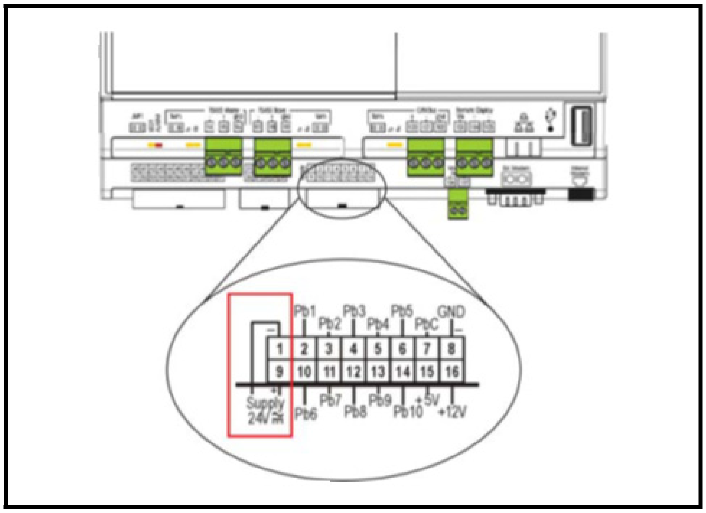



***Figure 5-1*** *- Non-Center Tapped Transformer Connection to iPro*

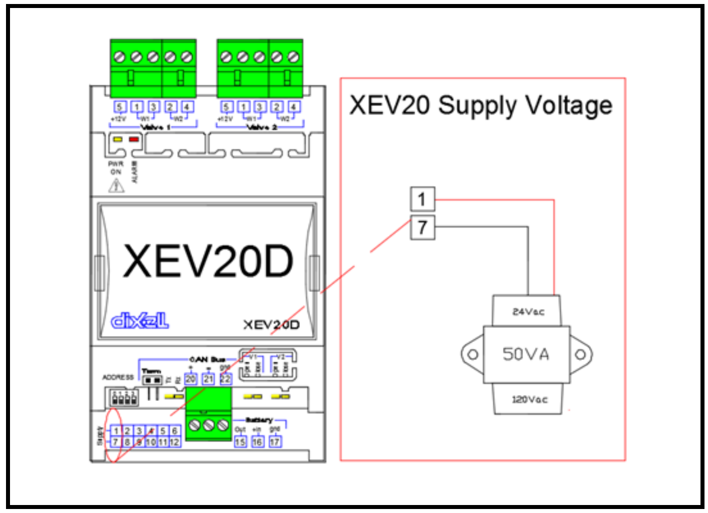



***Figure 5-2*** *- XEV20D Supply Voltage*

| | |
|---|---|
| **Power Supply:** | 24VAC +10/-15%, 50/60Hz<br>20 - 36VDC |
| **Consumption:** | 20VA (VAC), 15W (VDC) |
| **Connectors:** | Phoenix quick coupling connectors for low voltage<br>STELVIO 90° screw connectors for digital outputs (250VAC, 6A max) |
| **Microprocessor:** | AT91RM9200 32-bit 200Mhz |
| **Permanent FLASH memory:** | 128MB, in 8-bit |
| **RAM:** | 32MN o 64MB, in 16-bit |
| **Internal clock:** | standard |

***Table 5-5*** *- iPro Power Requirements*

## 5.5. Powering XEV20D

The power supply voltage for XEV20D is 24VAC and connects to terminals 1 and 7 on the wiring harness. Reference *Table 5-1* for transformer selection and part numbers. The iPro Case Controller currently supports a maximum of two (2) XEV20D. Each XEV20D should have its own dedicated transformer. ***Do not share transformers between multiple XEV20D devices***.

| **Power Supply:** | **24VAC/DC** |
|---|---|
| **Consumption:** | **40VA max** |

***Table 5-6*** *- XEV20D Power Supply*

## 5.6. Powering IPX106D

The power supply voltage for IPX106D is 24VAC and connects to terminals 1 and 9 on the device wiring harness. Use ***Table 5-1*** for selecting a transformer to power IPX. Each IPX device requires its own transformer, sharing transformers between devices is not allowed.

| | |
|---|---|
| **Power Supply:** | 24VAC +10/-15%, 50/60Hz |
| **Consumption:** | 10VA (VAC), 10W (VDC) |
| **Connectors:** | Molex connectors with low voltage wiring<br>SELECOM/CIVILUX connectors for digital outputs (250VAC, 6A max) or with a different order code:<br>Phoenix quick coupling connectors for low voltage<br>STELVIO 90° screw connectors for digital outputs (250VAC, 6A max) |

***Table 5-7*** *- IPX Power Requirements*

## 5.7. Wiring Visograph Display

The Visograph connection to iPro is made with three (3) wires from the iPro remote display port terminals 103,104,105 to the Visograph wiring connector terminals 1,2,3 located on the back side of the Visograph. The wire type used for this connection should be Belden #8771.

***CAUTION: Special care should be taken when making this connection so that no wires are incorrectly landed or crossed, a mistake in this connection likely will result in damage to either device or both devices.***

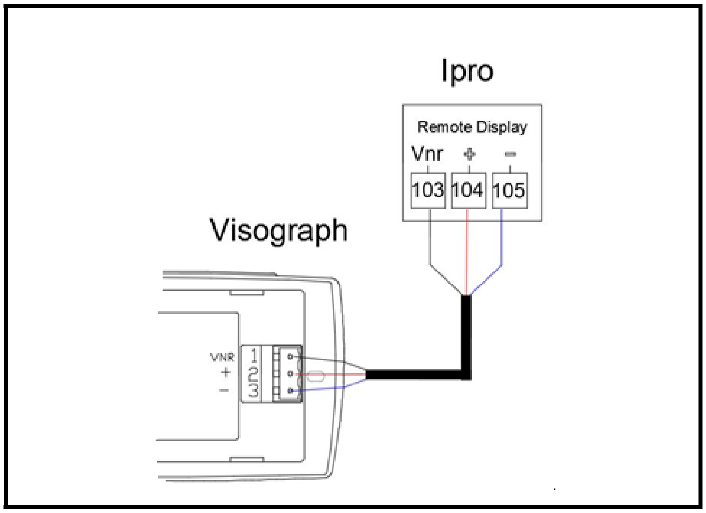



***Figure 5-3*** *- Wiring Visograph Display*

# 6 Wiring Analog Inputs

## 6.1. iPro Analog Inputs

The iPro analog inputs are located on the same connector as the controller power supply. The iPro Case Controller has 10 analog inputs available, a 5VDC power supply and a 12VDC power supply for sensors that require voltage. The 10 inputs are fully configurable through the Visograph and may be arranged per the installation requirements within the input connector. The controller has separate input commons depending on the type of sensor connected. For temperature probes, all commons should be wired to **PbC** on Terminal **7**. For Voltage output transducers, all commons should be wired to GND on Terminal 8.

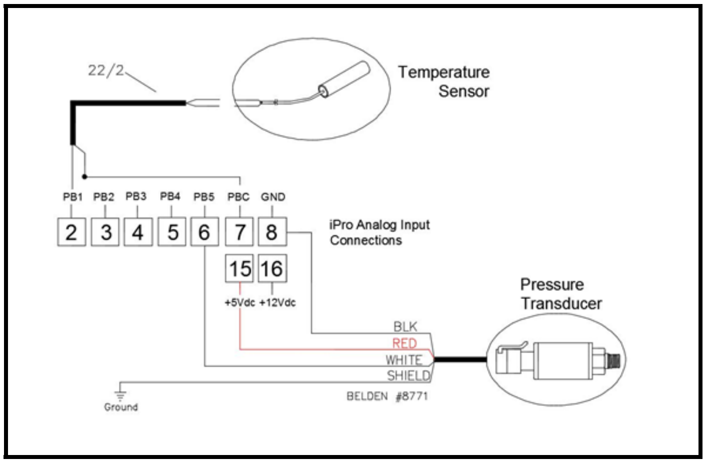



***Figure 6-1*** *- iPro Temperature Sensor and Transducer Wiring*

## 6.2. XEV20D Analog Inputs

The XEV20D analog inputs are located on the same connector as the controller power supply. The XEV20D has 4 analog inputs available, a 5VDC power supply and a 12VDC power supply for transducers that require voltage. Analog input **1** or **2** can be resistive type sensors only (**NTC/PTC**), inputs **3** and **4** can be resistive or voltage. However, inputs **3** and **4** must not have a resistive sensor and a voltage sensor connected at the same time; both sensors must be of the same type. The controller has separate input commons depending on the type of sensor connected. For temperature probes, all commons should be wired to **PbC** on Terminal **8**. For voltage output transducers, all commons should be wired to GND on Terminal **10**.

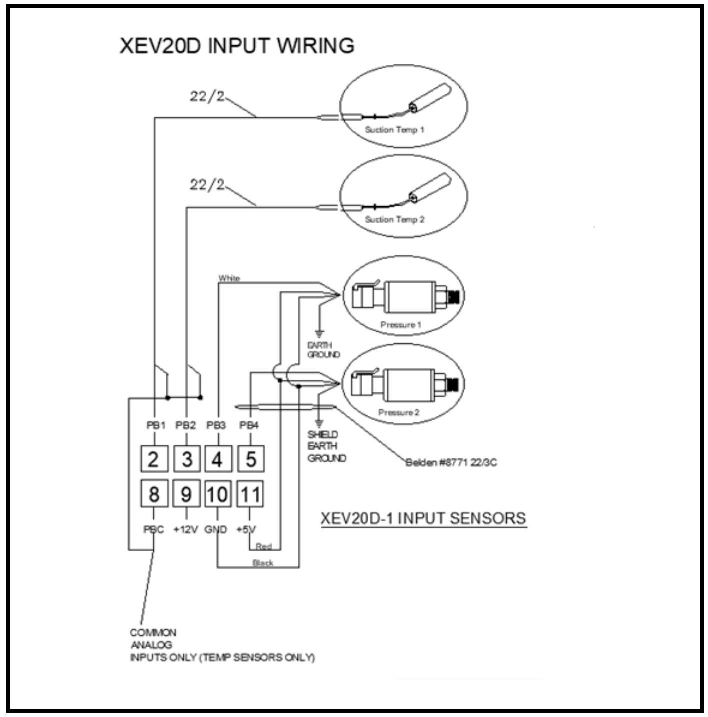



***Figure 6-2*** *- XEV20D Analog Input Wiring*

## 6.3. IPX106D Analog Inputs

The iPro Case Controller supports the use of the IPX106D expansion module. The expansion module has seven (7) analog inputs, a 5VDC and a 12VDC power supply. All the inputs are fully configurable from the Visograph display. If the installation requires input/output capacity beyond what the iPro Case Controller hardware can handle, then up to two (2) IPX expansion modules can be added. Like the iPro, the IPX has separate input commons depending on the type of sensor connected. For temperature probes, all commons should be wired to **PbC** on Terminal **14**. For voltage output transducers, all commons should be wired to GND on Terminal **15**.

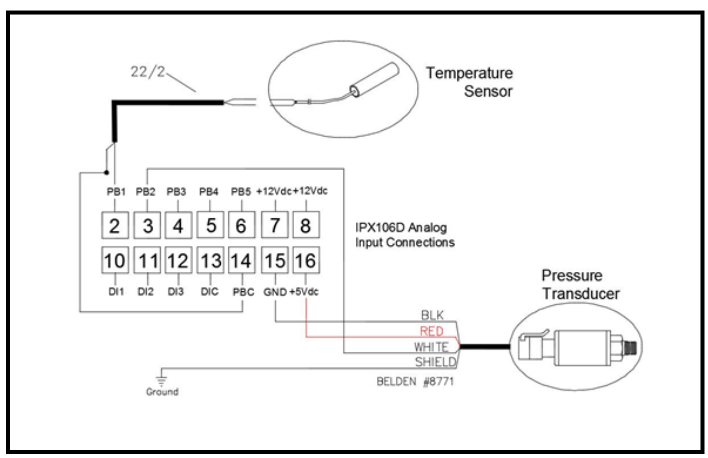



***Figure 6-3*** *- IPX106D Temperature Sensor and Transducer Wiring*

# 7 Wiring Digital Inputs

## 7.1. iPro Digital Inputs

The iPro digital inputs are located on their own 22-pin connector along the bottom of the device. The iPro provides a maximum of 20 opto-insulated digital inputs that are configurable through the Visograph display. See figures below for connection details.

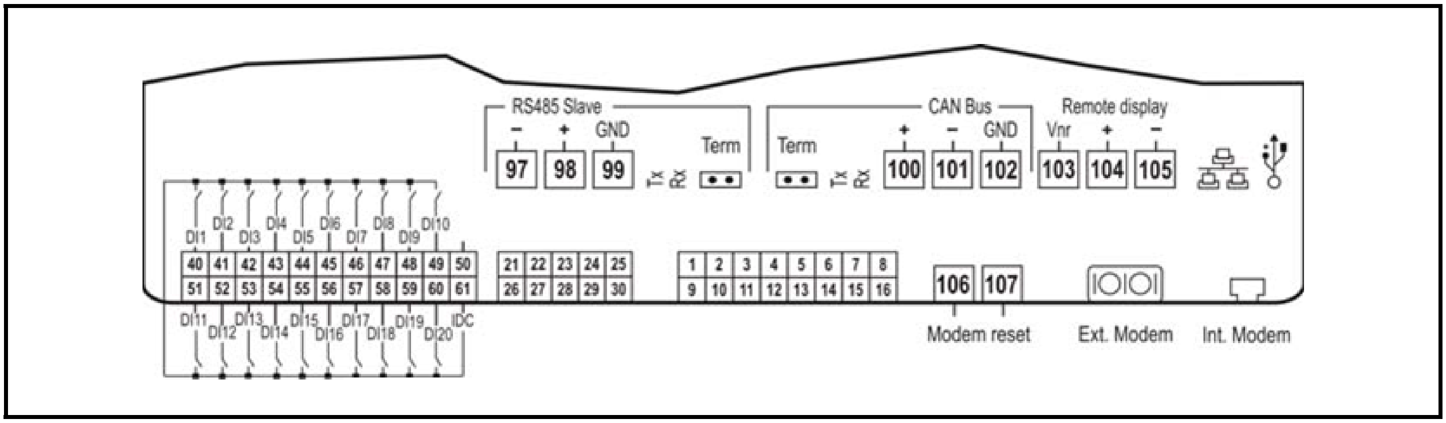



*Figure 7-1 - iPro Digital Input Wiring - Dry Contacts*

| DIGITAL INPUTS | |
|---|---|
| **TYPE:** | Opto-insulated voltage free or live contact (24VAC/DC)<br>External power 24VAC/DC ±20% |
| **NUMBER OF INPUTS:** | 20 |
| **NOTES:** | If the digital inputs are used with voltage, use another transformer (do not use the same secondary of the controller's power) in order to prevent the inputs from malfunctioning or being damaged. |

*Table 7-1 - iPro Digital Input Specifications*

## 7.2. IPX106D Digital Inputs

The IPX has a maximum of three (3) digital inputs that can be configured for use with the case controller through the Visograph display. The three (3) digital inputs have a single point for common, Terminal **13**. Connect one side of the inputs to the signal terminals 10, 11 or 12 and the other side to common Terminal **13**.

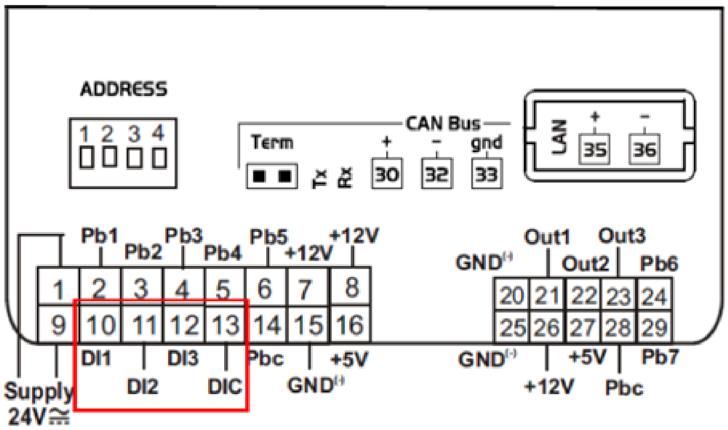



***Figure 7-2*** *- IPX106D Digital Input Wiring*

| DIGITAL INPUTS | |
|---|---|
| **TYPE:** | Opto-insulated voltage free contact |
| **NUMBER OF INPUTS:** | 3 |
| **NOTES:** | Do not use live contacts to prevent the inputs from being damaged. |

***Table 7-2*** *- IPX106D Digital Input Specifications*

# 8 Wiring Digital Outputs

## 8.1. iPro Digital Outputs

The 15 digital outputs are located across four (4) separate connectors across the top side of the iPro Case Controller. The normally open outputs on each connector share the same common and are not fused. Make sure to use the same voltage for all loads connected to these relays; do not mix voltages.

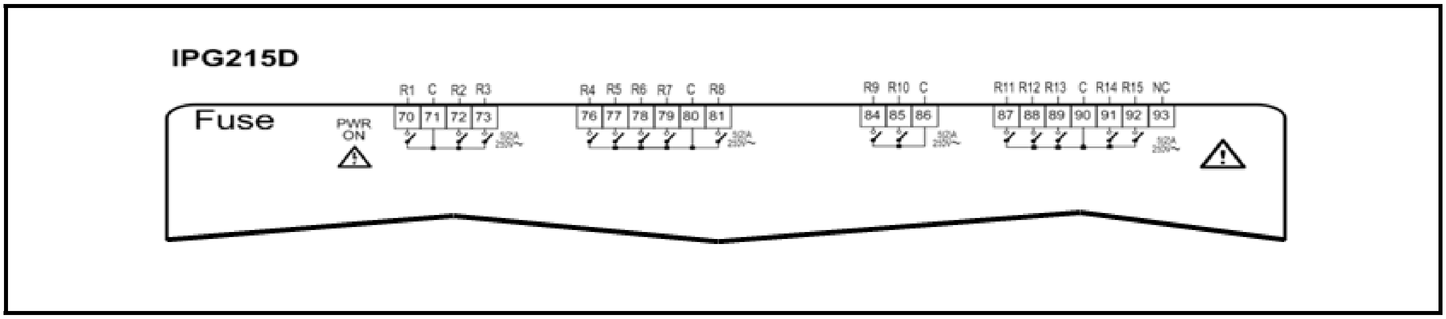



***Figure 8-1*** *- iPro Digital Output Wiring*

| DIGITAL OUTPUTS | |
|---|---|
| **TYPE:** | Relays with NO contacts |
| **NUMBER OF OUTPUTS:** | 15 |
| **TYPE OF OUTPUT:** | Relays with normally open contact |
| **MAXIMUM LOAD:** | 5A (250 VAC) SPST 5(2)A |
| **NOTES:** | Verify the capacity of the output used. There is double insulation between the digital outputs and the low voltage of the rest of the circuit. Do not use different voltages for the various groups of relays or within each group. |

***Table 8-1*** *- iPro Digital Output Specifications*

## 8.2. IPX106D Digital Outputs

The IPX106D has six (6) digital outputs with normally open contacts that can be used in addition to iPro digital outputs if required. The IPX relays are split into two different groups: terminals 40-43 and terminals 44-47, each having its own common (43 and 44).

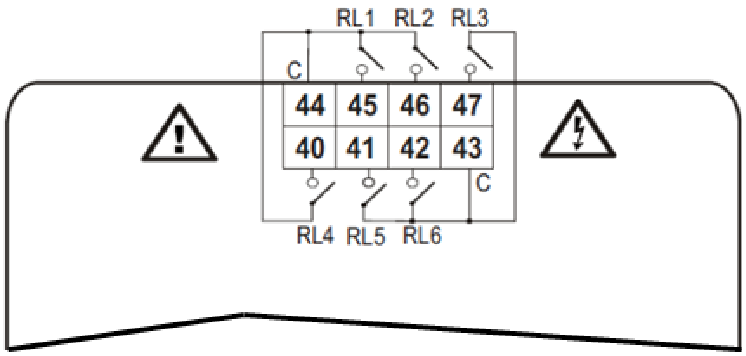



***Figure 8-2*** *- IPX106D Digital Output Wiring*

| DIGITAL OUTPUTS | |
|---|---|
| **TYPE:** | Relays with NO contacts |
| **NUMBER OF OUTPUTS:** | 6 |
| **TYPE OF OUTPUT:** | Relays with normally open contact |
| **MAXIMUM LOAD:** | 5A (250 VAC) SPST 5(2)A |
| **NOTES:** | Verify the capacity of the output used. There is double insulation between the digital outputs and the low voltage of the rest of the circuit. The common relays of the outputs are separate and split into groups. Different voltages can be used for different groups of relays but the same voltage must be used within each group. |

***Table 8-2*** *- iPro Digital Output Specifications*

# 9 Wiring Analog Outputs

## 9.1. iPro Analog Outputs

The iPro Case Controller has six (6) opto-insulated analog outputs available along the bottom side of the device on terminals 21-30. Because the analog outputs are opto-isolated, they must be powered separately from the case controller device by 24VAC at terminals 28-29.

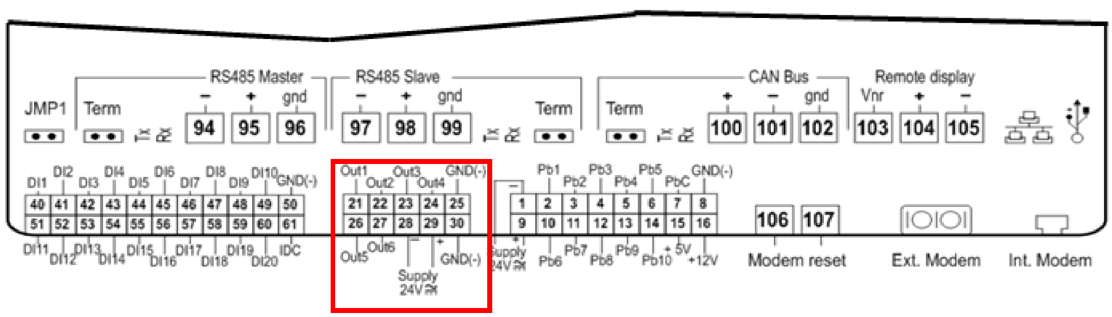



*Figure 9-1* - *iPro Analog Output Connection*

| ANALOG OUTPUTS | |
|---|---|
| **TYPE:** | Opto-insulated with separate 24VAC/DC power supply |
| **NUMBER OF OUTPUTS:** | 6 |
| **TYPE OF OUTPUT:** | 4 fixed outputs 0-10VDC (Out1 - Out4)<br>2 configurable outputs 0-10VDC, 4-20mA (Out5 and Out6) |
| **MAXIMUM LOAD:** | 40mA (Out1 - Out4)<br>20mA (Out5 and Out6) max with configured outputs 0-10VDC<br>400Ω max with configured outputs 4-20Ma<br>22Ω per live analog output |
| **NOTES:** | The electrical devices controlled by these analog outputs must be powered separately with another transformer (do not use the same secondary of the controller's power) in order to prevent the outputs from malfunctioning or being damaged. |

***Table 9-1*** - *iPro Digital Output Specifications*

## 9.2. IPX106D Analog Outputs

The IPX expansion module has (three) 3 additional analog outputs available that can be used with the case controller if needed. The outputs are located on terminals 20-23. Note that the IPX AO do not require dedicated 24VAC power like iPro analog outputs.

| ANALOG OUTPUTS | |
|---|---|
| **TYPE:** | Non opto-insulated internal power |
| **NUMBER OF OUTPUTS:** | 3 |
| **TYPE OF OUTPUT:** | 3 fixed outputs 0-10VDC (Out1 - Out3) |
| **MAXIMUM LOAD:** | 40mA (Out1 - Out3)<br>22Ω per live analog output |
| **NOTES:** | The electrical devices controlled by these analog outputs must be powered separately with another transformer (do not use the same secondary of the controller's power) in order to prevent the outputs from malfunctioning or being damaged. |

***Table 9-2*** *- IPX Digital Output Specifications*

# 10 Software Overview

## 10.1. Temperature Mode

In all control modes the controller is capable of switching between two absolute case temperature setpoints, **LTSet** and **MTSet**. The controller can be defined as either Low Temp, Med Temp or Dual Temp by the parameter **TempMode**. When Low Temp is selected, the controller always regulates to the value of **LTSet** and when Med Temp is selected, the controller always regulates to the value of **MTSet**. When Dual Temp is selected, the controller can switch between **LTSet** and **MTSet** based on a digital input or signal from E2E. To use a digital input, set up one of the available **DI** as **DualTemp**. To switch setpoints using the E2E, the case controller and E2E must be connected and online via BACnet MS/TP - the network input is **DUALTEMPSELECT**.

## 10.2. Superheat Setpoint

When the case controller is placed in a control mode that regulates an EEV (Superheat, Standard, or Superheat Suction), all three (3) of the available EEV control loops share a common superheat setpoint. There is no possibility to use unique setpoints for each of the three (3) valves. The parameter is **SupHtSet**.

## 10.3. Refrigeration Control Modes

The iPro Case Controller controls the temperature, defrost and Superheat for the refrigerated case or walk-in box based on the selection of the control mode parameter (parameter name=**CrE**). There are five different control modes available to accommodate the different refrigeration system designs that iPro can support. In general, the iPro supports systems using electric expansion valves with no suction regulation valve, electric expansion valves with EEPR suction regulation, mechanical expansion valves with EEPR suction regulation and mechanical expansion valves with no suction regulation. The five different control modes are outlined below.

### 10.3.1. Standard Control Mode

In the Standard mode, each case controller will manage case temperature and the Superheat setpoints for up to three (3) electric expansion valves per case controller. There is no suction regulation or management of EEPR stepper valves in this control mode. For EEPR valve management, select either suction or Superheat/Suction control mode described below.The management of case temperature in the Standard control mode is accomplished by the use of setpoint and deadband control of the refrigeration relay, which is typically controlling the system's liquid line solenoid valve. The control temperature in this mode is a calculated temperature value that is compared to the setpoint. When more than one (1) discharge air sensor is present, the control temperature calculation method is applied to give the final control temperature. The options for control temperature calculation are: minimum, maximum, and average. The deadband is split in half around the setpoint, so when control temperature is above setpoint plus ½ of band, the refrigeration relay is set to true/ON. When the control temperature is below setpoint minus ½ of band, the refrigeration relay is set to false/OFF. During defrost the refrigeration relay is set to OFF.

#### 10.3.1.1. Standard Mode Control Value Calculation-Parameter CTM

**Minimum** - The controller will choose the minimum value as the final control temperature among the available (configured and reading) discharge air sensors.

**Maximum** - The controller will choose the maximum value as the final control temperature among the available configured discharge air sensors.

**Average** - The controller will perform an average of the available configured discharge air sensors for the final control temperature.

***Note that if a temperature sensor fails, all the above calculation methods will disregard the failed sensor readings and only calculate based on the remaining valid sensor readings.***

### 10.3.2. Superheat-Only Control Mode

In Superheat-only mode, Superheat is controlled to a target setpoint for up to three (3) electric expansion valves. Each valve is managed by its own PID. Control of the superheat for each valve is accomplished using a suction pressure transducer and suction pipe temperature sensor (coil outlet) per evaporator to make the Superheat calculation. All three (3) EEV PID loops share the same Superheat setpoint, which is the parameter **SupHtSet** in the refrigeration group. The PID can be tuned manually or can be put into Auto-adaptive mode by setting the proportional band value=**0**. When the **P** value is set to **0**, the system monitors the stability of the evaporator superheat and dynamically adjusts the proportional band value to the optimum number. This eliminates the need for manual tuning at every system and can greatly reduce the time required to tune systems at system startup.

#### 10.3.2.1. Superheat Only-EEV Management

The Superheat control mode is designed to control the evaporator Superheat in systems using electronic expansion valves. The iPro Case Controller can control up to three (3) EEV, this is selected through the value of parameter **EEV Count**. While in the Superheat-only control mode the refrigeration relay is fixed ON during the refrigeration cycle, no cycling of this relay is managed in this mode. Refrigeration relay is fixed OFF during defrost cycle.

#### 10.3.2.2. Superheat Only Mode-Control Value Failure

In the event that a suction pressure transducer fails or suction temperature sensor fails, the EEV will be driven to the position defined by parameter SHF%.

### 10.3.3. Suction Control Mode

Selecting the Suction control mode can be done by setting parameter **CRE=suction**. The Suction mode is designed to perform temperature control and EEPR valve regulation for a lineup of refrigerated cases. Case controllers in this mode are designated as either master controllers or slave controllers, with the master controller regulating EEPR and liquid line solenoid valve for the refrigeration circuit lineup. The slave case controllers communicate with the master controller through the RS485 slave port on each device. Case temperature information from the slave controllers is shared with the master over this connection. The master case controller regulates the EEPR to maintain the case temperatures to the target setpoint. The maximum number of case controllers in a lineup is six (6), where one of the six (6) is the master controller. The EEPR regulation can be done based on the average, minimum or maximum case local temperature, where *local* means the discharge air sensors are connected to the master controller only. The EEPR regulation can also be done based on the average, minimum or maximum lineup temperature, where *lineup* means all the case controllers are connected to the RS485 slave network. The selection is made through the parameter **SSCP**.

#### 10.3.3.1. Suction Control Mode-PID

The EEPR valve regulation is accomplished by comparing control value to the target setpoint and determining a PID output value for the position of the EEPR valve. The PID control can be put into Manual or Automatic mode by setting the **P** value. When the **P** value is set to 0, the application will automatically adjust the proportional band value to find the best stable value for regulation.

| Parameter | Recommended Value |
|---|---|
| **PB** | 0-for Automatic mode |
| **INC** | 0 |
| **DER** | 0 |

***Table 10-1*** *- Recommended Settings*

#### 10.3.3.2. Configuring Controllers for Suction Control Mode

To configure the controller as a master in Suction mode, the following parameters must be set:

| Parameter | Description | Parameter Value for Master Controller |
|---|---|---|
| **CrE** | Control Type | Suction |
| **SSCP** | Superheat and suction control probe selection | User choice, Average Lineup Recommended |
| **EEV** | EEV driver | Not Present |
| **EEVCnt** | Number of EEVs in the case | 0 |
| **StandaloneCC** | Yes = Controller is standalone (no lineup)<br>No = Controller is a master or slave in a lineup | NO |
| **XEV20D-1 V1** | Valve assigned to XEV20-1 valve output 1 | EEPR |
| **S1Addr** | Modbus address of slave device 1 | 2 if 1 slave CC is present; otherwise set at 0 |
| **S2Addr** | Modbus address of slave device 2 | 3 if 2 slave CC are present; otherwise set at 0 |

***Table 10-2*** *- Master Controller Configurations for Suction Control Mode*

| | | |
|---|---|---|
| **S3Addr** | Modbus address of slave device 3 | 4 if 3 slave CC are present; otherwise set at 0 |
| **S4Addr** | Modbus address of slave device 4 | 5 if 4 slave CC are present; otherwise set at 0 |
| **S5Addr** | Modbus address of slave device 5 | 6 if 5 slave CC are present; otherwise set at 0 |
| **Modbus_Addr** | Modbus address of this controller | 1 |
| **Baud** | Baud of Modbus communication | 19200 |

***Table 10-2*** *- Master Controller Configurations for Suction Control Mode*

***Note that if the Modbus address or baud rate is changed, the controller must be rebooted.***

To configure the controller as a slave case controller in Suction mode, the following parameters must be set:

| Parameter | Description | Parameter Value for Master Controller |
|---|---|---|
| **CrE** | Control Type | Suction |
| **SSCP** | Superheat and suction control probe selection | User choice, Average Lineup Recommended |
| **EEV** | EEV driver | Not Present |
| **EEVCnt** | Number of EEVs in the case | 0 |
| **StandaloneCC** | Yes = Controller is standalone (no lineup)<br>No = Controller is a master or slave in a lineup | NO |
| **XEV20D-1 V1** | Valve assigned to XEV20-1 valve output 1 | No Valve |
| **S1Addr** | Modbus address of slave device 1 | 0 |
| **S2Addr** | Modbus address of slave device 2 | 0 |
| **S3Addr** | Modbus address of slave device 3 | 0 |
| **S4Addr** | Modbus address of slave device 4 | 0 |
| **S5Addr** | Modbus address of slave device 5 | 0 |
| **Modbus_Addr** | Modbus address of this controller | Set based on the S1-S5Addr of the master CC |
| **Baud** | Baud of Modbus communication | 19200 |

***Table 10-3*** *- Slave Controller Configurations for Suction Control Mode*

***Note that if the Modbus address or baud rate is changed, the controller must be rebooted.***

#### 10.3.3.3. Suction Mode-Refrigeration Relay Control

In Suction mode, the refrigeration relay is controlled based on the selection of the parameter SSCP. The control value is used with the case target setpoint and deadband. The control temperature sensors include the master controllers connected sensors as well as all online slave controller sensors in the lineup. If the calculated control temperature is greater than the setpoint, the refrigeration relay is on. If the control temperature is less than the setpoint plus the deadband, the refrigeration relay is off (entire deadband is applied below the setpoint). The refrigeration relay is set to OFF during defrost.

### 10.3.4. Superheat and Suction Control Mode

Selecting the Superheat and Suction control mode can be done by setting parameter **CRE=Superheat** and **Suction**. This mode is designed to manage one EEPR, one LLSV, and up to three EEV in one case. When a lineup of cases is present with EEV valves and there is one EEPR for the lineup, this mode must be selected on the master controller of the lineup, which is the controller that the EEPR is connected to. This mode manages the EEPR for the circuit and its own locally connected EEVs. Case controllers in this mode are designated as either master controllers or slave controllers, with the master controller regulating EEPR and liquid line solenoid valve for the refrigeration circuit lineup. The slave case controllers communicate with the master controller through the RS485 slave port on each device. Case temperature information from the slave controllers is shared with the master over this connection. The master case controller regulates the EEPR to maintain the case temperatures to the target setpoint. The maximum number of case controllers in a lineup is six (6), where one of the six (6) is the master controller. The EEPR regulation can be done based on the average, minimum or maximum case local temperature where *local* means the discharge air sensors connected to the master controller only. The EEPR regulation can also be done based on the average, minimum or maximum lineup temperature where *lineup* means all the case controllers connected to the RS485 slave network. The selection is done through the parameter SSCP.

#### 10.3.4.1. Superheat and Suction Control Mode-PID

The EEPR valve regulation is accomplished by comparing control value to the target setpoint and determining a PID output value for the position of the EEPR valve. The PID control can be put into Manual or Automatic mode by setting the **P** value. When the **P** value is set to **0**, the application will automatically adjust the proportional band value to find the best stable value for regulation.

### 10.3.4.2. Configuring Controllers for Superheat and Suction Mode

To configure the controller as a master in the Superheat and Suction mode, the following parameters must be set:

| Parameter | Description | Parameter Value for Master Controller |
|---|---|---|
| **CrE** | Control Type | Superheat and Suction |
| **SSCP** | Superheat and suction control probe selection | User choice, Average Lineup Recommended |
| **EEVCnt** | Number of EEVs in the case | 0-3 |
| **StandaloneCC** | Yes = Controller is standalone (no lineup)<br>No = Controller is a master or slave in a lineup | NO |
| **XEV20D-1 V1** | Valve assigned to XEV20-1 valve output 1 | EEPR |
| **S1Addr** | Modbus address of slave device 1 | 2 if 1 slave CC is present; otherwise set at 0 |
| **S2Addr** | Modbus address of slave device 2 | 3 if 2 slave CC are present; otherwise set at 0 |
| **S3Addr** | Modbus address of slave device 3 | 4 if 3 slave CC are present; otherwise set at 0 |
| **S4Addr** | Modbus address of slave device 4 | 5 if 4 slave CC are present; otherwise set at 0 |
| **S5Addr** | Modbus address of slave device 5 | 6 if 5 slave CC are present; otherwise set at 0 |
| **Modbus_Addr** | Modbus address of this controller | 1 |
| **Baud** | Baud of Modbus communication | 19200 |

***Table 10-4*** *- Master Controller Configurations for Superheat and Suction Control Mode*

***Note that if the Modbus address or baud rate is changed, the controller must be rebooted.***

To configure the controller as a slave case controller in a lineup where the master controller is Superheat and Suction mode, the following parameters must be set:

| Parameter | Description | Parameter Value for Master Controller |
|---|---|---|
| **CrE** | Control Type | Superheat only |
| **SSCP** | Superheat and suction control probe selection | User choice, Average Lineup Recommended |
| **EEV** | EEV driver | XEV20 |
| **EEVCnt** | Number of EEVs in the case | 0-3 |
| **StandaloneCC** | Yes = Controller is standalone (no lineup)<br>No = Controller is a master or slave in a lineup | NO |
| **XEV20D-1 V1** | Valve assigned to XEV20-1 valve output 1 | EEPR |
| **S1Addr** | Modbus address of slave device 1 | 0 |
| **S2Addr** | Modbus address of slave device 2 | 0 |
| **S3Addr** | Modbus address of slave device 3 | 0 |
| **S4Addr** | Modbus address of slave device 4 | 0 |
| **S5Addr** | Modbus address of slave device 5 | 0 |
| **Modbus_Addr** | Modbus address of this controller | Set based on the S1-S5Addr of the master CC |
| **Baud** | Baud of Modbus communication | 19200 |

***Table 10-5*** *- Slave Controller Configurations Where Master is Superheat and Suction Mode*

***<u>Note that if the Modbus address or baud rate is changed, the controller must be rebooted.</u>***

#### 10.3.4.3. Superheat and Suction Control-Refrigeration Relay

The management of the refrigeration relay in this mode is the same as described in ***Section 10.3.3.,*** *Suction Control Mode*.

## 10.3.5. Defrost Control and Operation

### 10.3.5.1. Initiation of Defrost

The case controller defrost is managed completely internally by the case controller and needs no instructions from a supervisory controller or E2E. The case controller has an internal schedule for defrost cycles. Based on the start time and the number per day, the controller will evenly space the defrosts based through a 24 hour day. For example, if the start time is 0:00 and the number per day is 4, the controller will schedule 4 defrosts evenly every 6 hours at 0:00, 6:00, 12:00, and 18:00. When a scheduled defrost time is reached, the controller starts the defrost cycle and drives the EEV valves to the percentage defined by **SHDef%** and drives the EEPR valve to the parameter **SuctionDef%**. The defrost relay is switched to ON and the refrigeration relay is switched to OFF.

### 10.3.5.2. Master/Slave Defrost of a Lineup

If the case controller is a device that is part of a common refrigeration circuit lineup, the controller is considered either the lead/master case or a slave case. In a lineup of masters/slaves the master manages defrost for the entire circuit. When the scheduled defrost time is reached for the circuit, the master controller will start defrost (if no lockout is present) and communicate to all slave controllers to start a defrost cycle. Once in defrost, all case controllers will execute defrost and terminate according to their own individual termination settings. The master controller will be notified when each slave controller terminates its defrost cycle. A detailed description of defrost termination is found in **Section 10.3.5.4.,** *Defrost Termination* and **Section 10.3.5.5.,** *Wait Mode*.

### 10.3.5.3. Defrost Operation of Relays and Valves

Whenever the defrost cycle begins, the case controller drives the electronic valves to their respective defrost positions as defined by parameters **SHDef%** and **SuctionDef%**. The refrigeration relay is driven to the OFF position and the defrost relay is switched to ON.

The evaporator fan operation during defrost is governed by the parameter **FanOp**. The options are shown in the table below:

| FanOp Parameter Values | Description |
|---|---|
| **OnR-OffD** | Fan relay is on during refrigeration and off during defrost cycle |
| **OnR-OnD** | Fan relay is on during refrigeration and on during defrost cycle |
| **OnF-OffD** | Fan relay is on continuously and off during defrost cycle |
| **OnF-OnD** | Fan relay is on continuously and on during defrost cycle |

***Table 10-6*** *- Evaporator Fan Operation During Defrost*

### 10.3.5.4. Defrost Termination

The defrost termination is managed locally by the case controller. The termination options are: temperature and time.

**Temperature** -When temperature termination is selected, the terminating sensor must be specified by parameter **dTS**: the options for sensors to select are: defrost termination, discharge air, or coil outlet. Once the combined termination value reaches the defrost termination setpoint, the defrost cycle is terminated and the system enters Drip mode (if drip time is programmed). Following Drip mode, the system enters Wait mode. Wait mode is only entered if the controller is a part of a master/slave lineup network. If there is no master/slave network, wait mode is skipped. During Temperature Termination mode, the case controller is always monitoring maximum time, and if the maximum time duration is ever exceeded, the defrost is terminated immediately.

**Time** -When time termination is selected, the defrost cycle runs for a time value only and then terminates. No temperature sensors are considered. Following the time termination, the case controller performs drip time if applicable and then enters Wait mode.

### 10.3.5.5. Wait Mode

When the case controllers are connected in a lineup together and one lead case is the master, the case controllers utilize Wait mode. If there is no master slave network configured, Wait mode is skipped. During Wait mode there is no refrigeration or defrost occurring - the system is idle for just a moment before entering refrigeration again. The operation of the fan is outlined by the fan parameter **FanOp**. In the refrigeration lineup, the master controller has control of certain system critical valves: the EEPR and liquid line solenoid valve. Therefore, when the entire lineup is in defrost, the slave case could possibly terminate defrost before the master case and attempt to enter refrigeration again. Because the slave cases cannot enter refrigeration without the master opening the EEPR and LLSV for the entire circuit, the slave must wait on the master to finish defrost before it can enter refrigeration again. The opposite situation also exists where the master case can terminate defrost before any of the slaves and enter refrigeration again before the slave controller defrost completes. In this situation, the master case enters refrigeration again while the slave cases are still in defrost, which results in refrigeration and defrost at the same time on the slave cases since the master controls the liquid feed for the entire circuit. In order to avoid these critical problems and synchronize defrost, the case controller utilizes a Wait mode after termination of defrost. After termination of defrost and Drip mode then the controller enters Wait mode. Once in Wait mode, refrigeration will start again once the master controller of the lineup signals **start refrigeration**. During the defrost cycle, the master controller is monitoring the Wait mode status of each of the cases in the lineup, and once all cases enter Wait mode, refrigeration is immediately started again for all cases.

### 10.3.5.6. Synchronization of Defrost Schedules

When a master/slave lineup is present, the defrost schedule of all the slave case controllers is locked from editing. Any desired changes to the defrost start time or number of defrosts per day must be made on the master controller and will then be automatically synced to all of the online slave case controllers. If a slave case controller happens to be offline when a defrost change is made, the change will be written to the offline slave controller once it returns online.

### 10.3.5.7. Defrost Heater Current Monitoring

The case controller has the ability to monitor the defrost heater RMS current of each case through the use of an external current transducer. The current transducer should be placed on the defrost circuit for the entire case. The current transducer is *Emerson P/N 251-7000* and is a 0-5VDC signal, split core sensor with a selectable range of 30, 60, and 120 amps. The case controller will monitor the defrost heater amperage once the relay call for the defrost heater is ON. Once the amperage sensed by the defrost heater CT is above a threshold for a time delay, the defrost heater status is considered ON. If the defrost heater relay call and defrost heater status are not equal, a **command failure** alarm is automatically sent to the E2E and the E2E will generate an alarm log entry.
If you do not wish to use the defrost heater current monitoring, do not set up any analog inputs for **defr amps**.

**Parameters:**

| Parameter | Description | Range |
|---|---|---|
| **defrAmpOn** | Amps required from the CT for defrost heater to be considered ON | 0-60 Amps |
| **defrAmpDel** | Time delay for defrost heater status to change to ON once the threshold is reached. | 1-90 Seconds |

***Table 10-7*** *- Defrost Amp Parameter List*

### 10.3.5.8. Defrost Heater Lockout

When connected with the E2E controller, a network of case controllers' defrost cycles can be managed by the E2E to ensure a maximum number of defrost circuits are active at any given time. To use this feature of E2E and the case controller, all case controllers must be connected and online with E2E via BACnet MS/TP. The E2E controller will need to have the Defrost Inhibitor application loaded and configured. Once the Defrost Inhibitor application is loaded and configured and all case controllers are online, the E2E can place a lockout on the case controller defrost heater relay if the maximum number of circuits in defrost has been exceeded. If the case controller defrost heater relay is locked out during defrost, a small lock icon will be displayed with the defrost icon as shown below in ***Figure 10-1***:

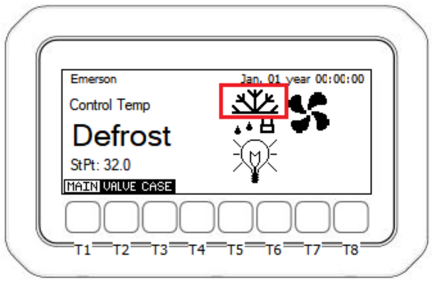



***Figure 10-1*** *- Defrost Heater Relay Lockout Indicator*

| Parameter | Description | Range |
|---|---|---|
| **DefTyp** | Defrost type | Electric/Hot gas |
| **DefDur** | Maximum defrost cycle duration | 1-360 Minutes |
| **MinDef** | Minimum runtime of each defrost cycle | 1-45 Minutes |
| **Drip** | Number of minutes of dripping time | 0-30 Minutes |
| **TermSet** | Defrost termination temperature setpoint | 0-99° Fahrenheit |
| **MinI** | Minimum time between the start of each defrost cycle | 1-255 Minutes |
| **DefDly** | Minutes of delay of each defrost cycle start | 0-30 Minutes |
| **MaxWait** | Maximum time the controller can stay in Wait mode | 0-60 Minutes |
| **dTS** | Defrost term sensor selection | Discharge Air, Defrost Term or Coil Outlet |
| **TempComb** | Defrost termination sensor value combination method | Minimum, maximum, average |
| **TermTyp** | Method of defrost termination | Time, temperature or digital inputs |
| **SHDef%** | Defrost position of the electric expansion valves | 0% or 100% |
| **SuctionDef%** | Defrost position of the EEPR | 0% or 100% |
| **SchHour** | The scheduled starting hour of the defrost cycle | 0-23 Hours |
| **SchMin** | The scheduled starting minute of the defrost cycle | 0-59 Minutes |
| **SchPerDay** | The number of defrost cycles per day | 0-6 |
| **defrAmpOn** | Amps required from the CT for defrost heater to be considered ON | 0-60 Amps |
| **defrAmpDel** | Time delay for defrost heater status to change to ON once the threshold is reached. | 1-90 Seconds |

***Table 10-8*** *- Defrost Parameter List*

## 10.4. Lighting Control Overview

The case controller will control the light relay based on an internal schedule. The scheduled on and off times are repeated every day. The controller does not depend on a supervisory controller or E2e for lights scheduling however the ON/OFF times are adjustable from E2E.

| Parameter | Description | Range |
|---|---|---|
| **LightOnHour** | Schedule time for lights ON hour | 0-23 Hours |
| **LightOnMinute** | Schedule time for lights ON minute | 0-59 Minutes |
| **LightOffHour** | Schedule time for lights OFF hour | 0-23 Hours |
| **LightOffMinute** | Schedule time for lights OFF minute | 0-59 Minutes |

***Table 10-9*** *- Lighting Control Parameters*

## 10.5. Fan Control Overview

The fan control relay will operate according to the control mode selection made for parameter **Fop**. The table below outlines the options and their descriptions:

| FanOp Parameter Values | Description |
|---|---|
| **OnR-OfD** | Fan ON with the refrigeration output ON, Fan OFF during defrost |
| **OnR-OnD** | Fan ON with the refrigeration output ON, Fan ON during defrost |
| **OnF-OfD** | Fan ON continuously; fan OFF during defrost |
| **OnF-OnD** | Fan ON continuously; fan ON during defrost |

***Table 10-10*** *- Fan Control Relay Values for Fop*

### 10.5.1. Fan Activation After Defrost Cycle

If the fan is OFF during the defrost, it turns ON once refrigeration starts using these methods:

**Temperature activation**: Following defrost, once refrigeration is active again, the defrost termination temperature must drop to a setpoint (**Fst**) minus hysteresis (**Fhy**), causing the fan relay to turn ON.

**Time**: The controller will monitor the defrost sequence to determine when defrost ends and when refrigeration is back ON. Once refrigeration is back ON following a defrost, the fan will start after a time delay (**Ftd**).

**Not Used**: The fan will start immediately after defrost with the refrigeration cycle again.

| Parameter Values | Description | Range |
|---|---|---|
| **FanOp** | Fan mode of operation | OnR-OffD, OnR-OnD, OnF-OnD, OnF-OffD |
| **FAd** | Fan activation method after defrost | Nu, time, temperature |

***Table 10-11*** *- Fan Control Parameters*

| | | |
|---|---|---|
| **FSt** | Fan temperature activation setpoint | -10 to 70° Fahrenheit |
| **FHy** | Fan temperature activation setpoint hysteresis | 1 to 30° Fahrenheit |
| **Ftd** | Fan activation time delay | 0 to 10 Minutes |
| **FanAmpOn** | Amps from CT required for fan status to be considered ON | 0 to 60 Amps |
| **FanAmpDel** | Time delay for status change once amps reach threshold | 1 to 90 Seconds |

***Table 10-11** - Fan Control Parameters*

## 10.5.2. Fan Motor Current Monitoring

The case controller has the ability to monitor the fan motor RMS current of each case through the use of an external current transducer. The current transducer should be placed on the fan circuit for the entire case. The current transducer is *Emerson P/N 251-7000* and is a 0-5VDC signal, split core sensor with a selectable range of 30, 60, and 120 amps. The case controller will monitor the fan amperage once the relay call for the fan is ON, and once the amperage sensed by the fan CT is above a threshold for a time delay, the fan motor status is considered ON. If the fan relay call and fan motor status are not equal, a **command failure** alarm is automatically sent to the E2E and the E2E will generate an alarm log entry. If you do not wish to use the fan motor current monitoring, do not set up any analog inputs for **fan amps**.

Parameters:

| Parameter | Description | Range |
|---|---|---|
| **fanAmpOn** | Amps required from the CT for the fan motor to be considered ON | 0-60 Amps |
| **fanAmpDel** | Time delay for the fan motor status to change to ON once the threshold is reached. | 1-90 Seconds |

***Table 10-12** - Fan Current Monitoring Parameters*

## 10.5.3. System Enable/Disable

The case controller can be enabled/disabled through digital input, E2E, or locally from Visograph. The controller always defaults to enabled and will disable if any of the three (3) disable signals are received. When a disable command is received the controller will:

- Disable all regulation of refrigeration
- Drive EEVs and EEPR to 0%
- Disable fans, lights, and defrost capability

There is a configurable time delay on the closing of the valves to allow the system to pump out the evaporator coil before shutting the suction valve.

# 11 Electronic Valves

## 11.1. Presence and Position

Depending on the application of the case controller, the system may be using 0-3 expansion valves or 1 EEPR valve. The position of the valves on the XEV20D driver is fully configurable and is managed by the following parameters:

| Parameter | Description |
|---|---|
| **EEV** | Defines if the EEV driver is used or not: Not present, XEV20D. If set to **not present**, the system is not using any EEVs. |
| **EEVCnt** | Enter the number of EEVs to be managed. |
| **XEV20D-1 V1** | Defines the valve to be driven from the XEV20D module 1 output 1: EEPR, EEV1-3 |
| **XEV20D-1 V2** | Defines the valve to be driven from the XEV20D module 1 output 2: EEPR, EEV1-3 |
| **XEV20D-2 V1** | Defines the valve to be driven from the XEV20D module 2 output 1: EEPR, EEV1-3 |
| **XEV20D-2 V2** | Defines the valve to be driven from the XEV20D module 2 output 2: EEPR, EEV1-3 |

***Table 11-1*** *- EEV Count Parameters and Definitions*

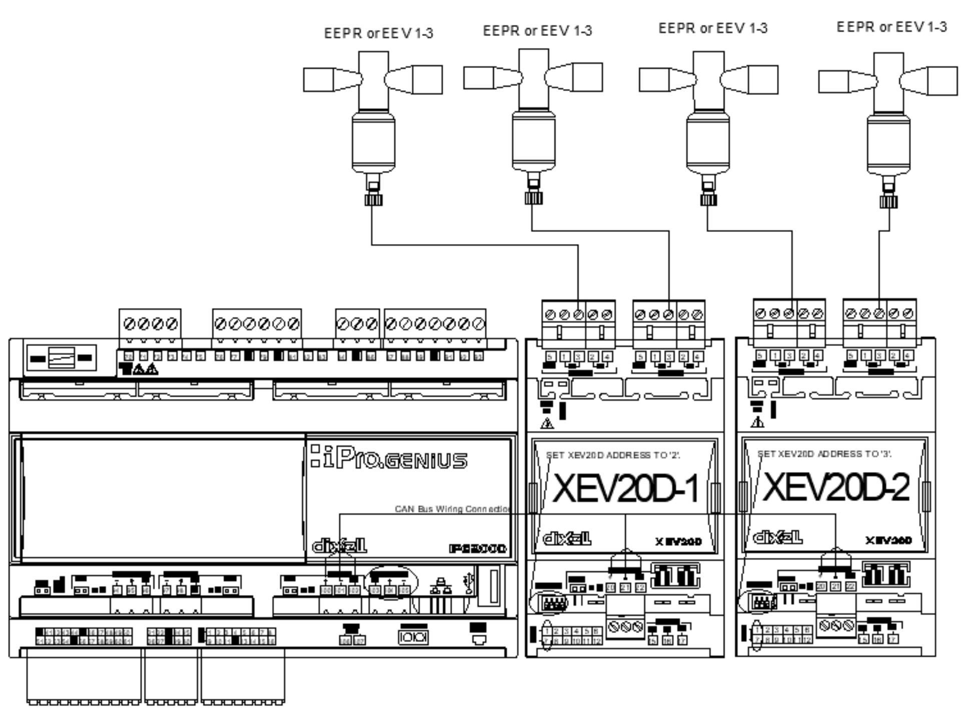



***Figure 11-1*** *- EEPR and EEV XEV20D Layout*

## 11.2. EEV and EEPR Calibration Procedure

When power is cycled to the XEV20D driver and during power-up, the driver will initiate a valve calibration procedure for both valve positions. The application will calibrate the valves during the first defrost cycle after a set number of hours depending on the value of parameter **ExtraS_Cal_Timer**. So if the timer value = 24 hours, the valves will be automatically calibrated during the first defrost for each 24 hours. Additionally, a calibration can be performed on each valve from the Visograph menu.

## 11.3. Valve Calibration From the Visograph Display

To calibrate electronic valves from the Visograph, press and hold the T4 key on the display for three (3) seconds to enter the Main Menu. ***Note that the keys are labeled T1 - T8 in these graphics only and not on the actual device.***

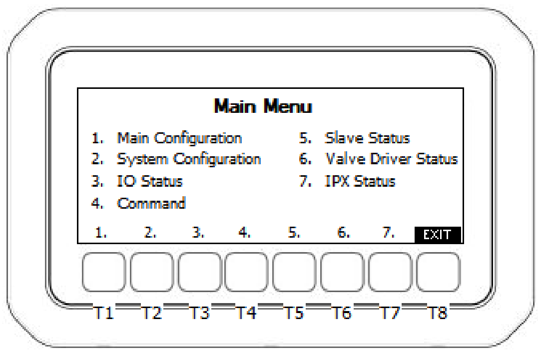



***Figure 11-2*** *- Enter the Main Menu By Holding the T4 Key*

Enter the Command menu by pressing the key labeled T4 again and use T8 to scroll all the way to the right.

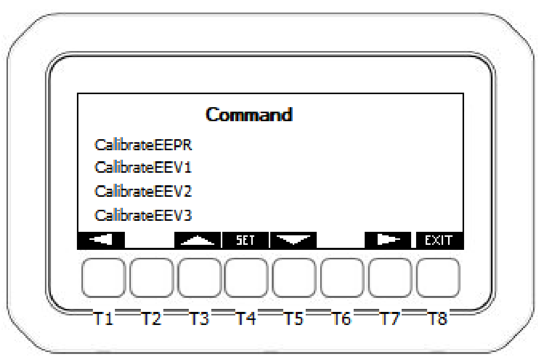



***Figure 11-3*** *- Initiate Valve Calibration*

To initiate a calibration on the valve, press the key labeled T5 to scroll down, then T4 (**SET**) to edit. Change the value from **NO** to **YES** and choose **SET** to save the selection. The value will remain at **YES** for a few seconds while the calibration is performed and will automatically toggle back to **NO**.

# 12 The BACnet Network

The case controller operates as a stand alone controller, but also can be connected to a supervisory controller as well for remote access, setpoint configuration and alarming. The case controller comes equipped with BACnet MS/TP and BACnet over IP communications. For communication with the E2E controller the case controller uses an RS485 network and BACnet MS/TP.

## 12.1. Wire Types

Emerson specs General Cable 92454A *(Emerson P/N 135-0600)* shielded twisted pair cables for use as BACnet MS/TP wiring.

## 12.2. Daisy Chain Wiring

The BACnet MS/TP connection should be wired in a daisy chain topology, *no star or T configurations are allowed*. Connect the BACnet network cable to the three terminal connector on the E2E COM port you wish to assign as BACnet MS/TP. Reverse the polarity of +/- on the RS485 cable between the E2E and the iPro Case Controller.

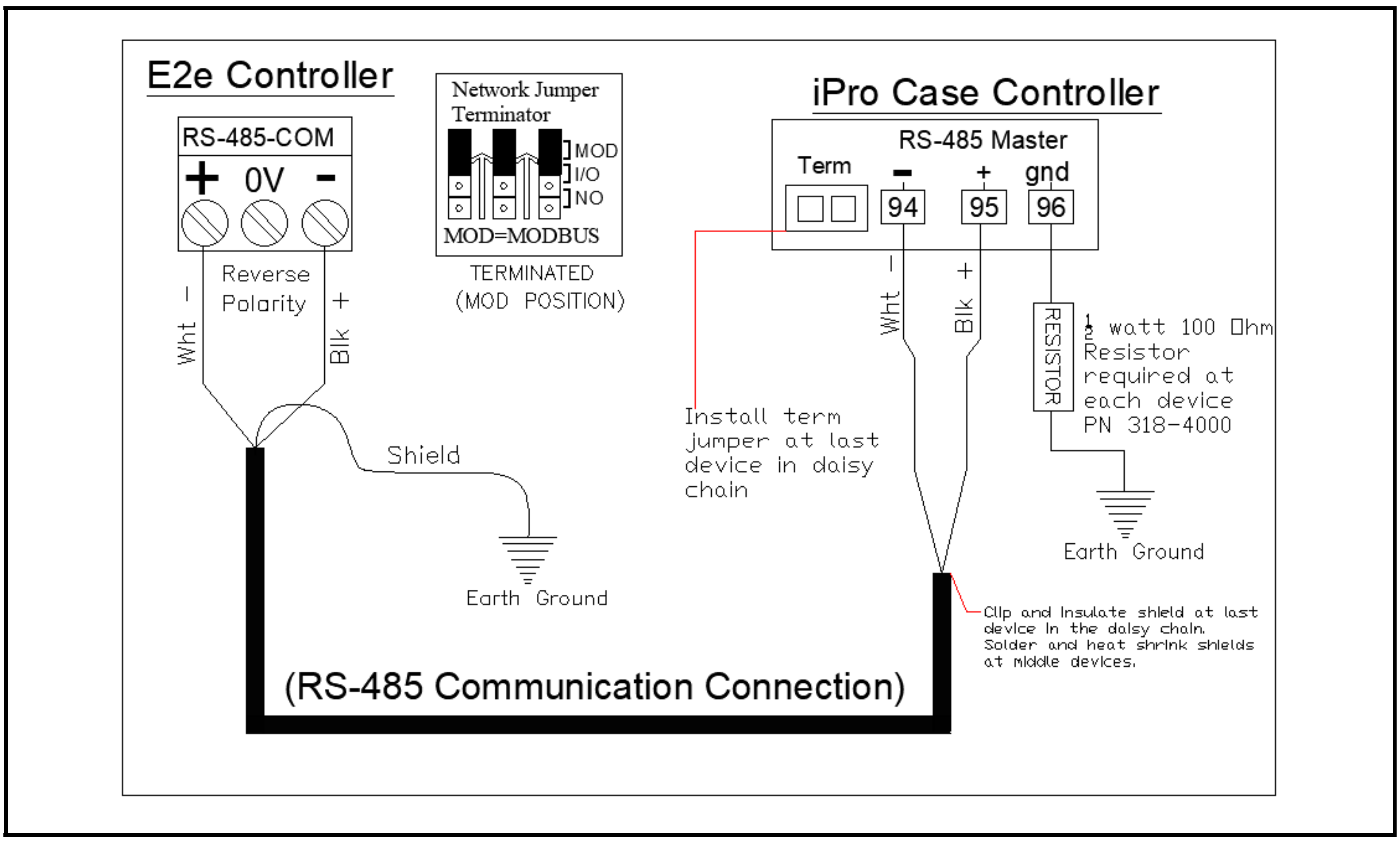



***Figure 12-1*** *- BACnet MS/TP Wiring*

## 12.3. Configuring BACnet Settings

### 12.3.1. BACnet MAC Address and Device ID

The network address and device ID makes a board unique from other boards on the network of the same type. This allows the supervisory controller to find it and communicate with it. The case controller BACnet MAC address can be set using the Visograph display. ***Note that the keys are labeled T1 - T8 in these graphics only and not on the actual device.***

Press the T4 Key for three (3) seconds to enter the Main Menu:

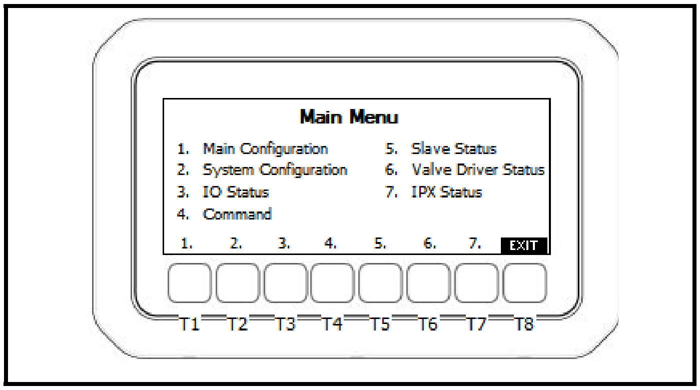



***Figure 12-2*** *- Main Menu*

1. Press the T2 key to enter System Configuration and then press T1 for **System**:

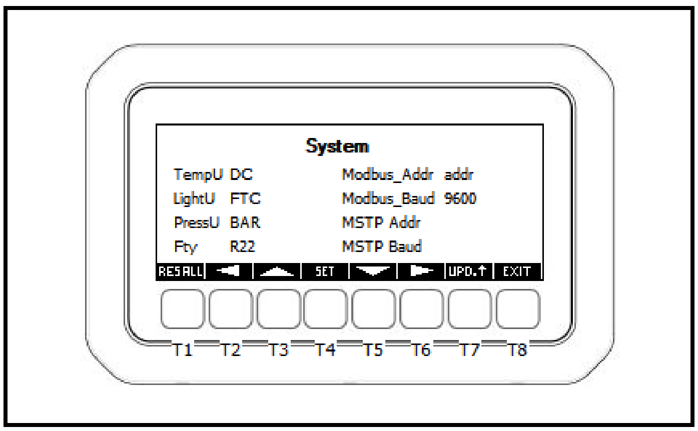



***Figure 12-3*** *- System Configuration*

2. Press the T5 key to move the cursor to the **MSTP Addr** and **MSTP Baud** fields. Press T4 **SET** to edit and use T3/T5 to move the values to the desired selection. Press T4 **SET** to save the selection. The case controller baud rate and E2E baud rate must match. Set the baud rate to 19200. ***(Note: The case controller saves and automatically reboots to re-initialize with the new address after a period of 7 minutes. Do not reboot manually.)***

3. After saving the address selection, press T6 (right arrow key) three times to change the device ID:

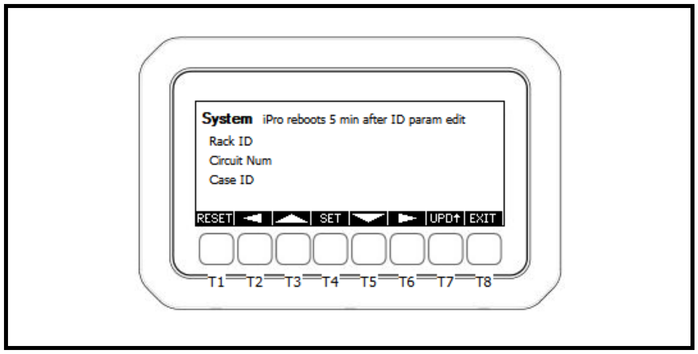



***Figure 12-4*** *- Change Device ID*

4. Press the T3/T5 keys to move to the Rack ID field. Press T4 to edit and select the Rack ID name for the system and press T4 to save.

5. Press T3/T5 to move to the circuit number and press T4 to edit and select the circuit number. Press T4 to save.

6. Select the Case ID letter and save. After all three fields have been set, the controller Device ID will automatically be set. ***(Note: The case controller saves and automatically reboots to re initialize with new address after a period of 7 minutes, do not reboot manually.)***

### 12.3.2. Setting BACnet APDU Timeout and BACnet Max Master

The BACnet APDU timeout and BACnet max master number can be set by following the instructions below.
Press the T4 Key for three (3) seconds to enter the Main Menu:

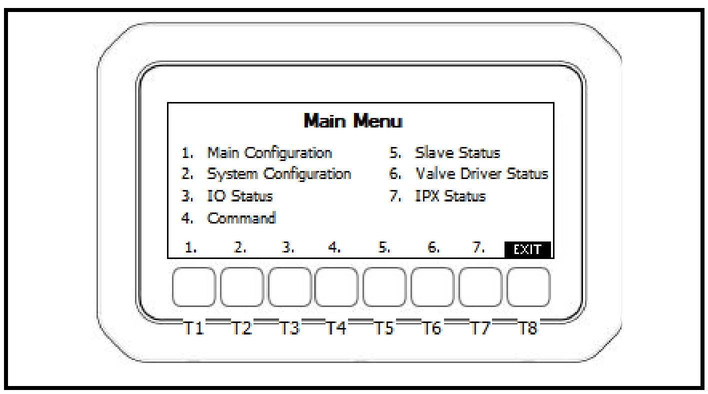



***Figure 12-5*** *- Main Menu*

1. Press the T2 key to enter System Configuration and press T1 for System.

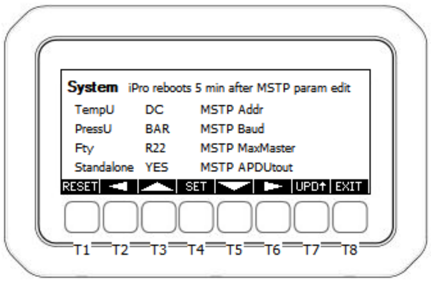



***Figure 12-6*** *- MSTP Max Master*

2. Press the T5 key to move the cursor to the **MSTP MaxMaster field**. Press T4 set to edit and use T3/T5 to move the values to the desired selection. The MSTP Max Master is the highest network address that the controller will poll for and attempt to discover. The Max Master parameter should be set equal to the highest MAC address on the MSTP network. For example: If 10 devices are all daisy chained together in an RS485 network and the MAC addresses are set as 1-10 sequentially, the BACnet Max Master number of each controller should be set to 10. Press T4 set to save the selection. ***(Note: The case controller saves and automatically reboots to re initialize with new address after a period of 7 minutes, do not reboot manually.)***
3. In the same menu, the MSTP APDU timeout parameter can be edited (**MSTP APDUtout**). The recommended value of this parameter is 30 seconds for all controllers on the network. Use T3/T5 to navigate to the parameter and T4 to edit and save.

# 13 MODBUS Networking-Master Slave Lineup

When an EEPR is used in the refrigeration system, the case controllers communicate from controller to controller within each lineup. This is done through the use of RS485 and a local MODBUS network. The device controlling the EEPR is the master controller and the other devices in the lineup are slave case controllers. The Modbus connection is a local connection that is within each refrigeration circuit. The Modbus connection does not and should not be extended to all controllers within a store.

## 13.1. Wire Types

Emerson specs General Cable 92454A (*Emerson P/N 135-0600*) shielded twisted pair cable for use as MODBUS network wiring.

### 13.1.1. Daisy Chain Wiring

The MODBUS network must be wired in a daisy chain topology, no star or T configurations are allowed. Connect the 3-wire connection from the master case controllers RS485 slave port to each slave case controllers RS485 slave port. See ***Figure 13-1*** for connection detail:

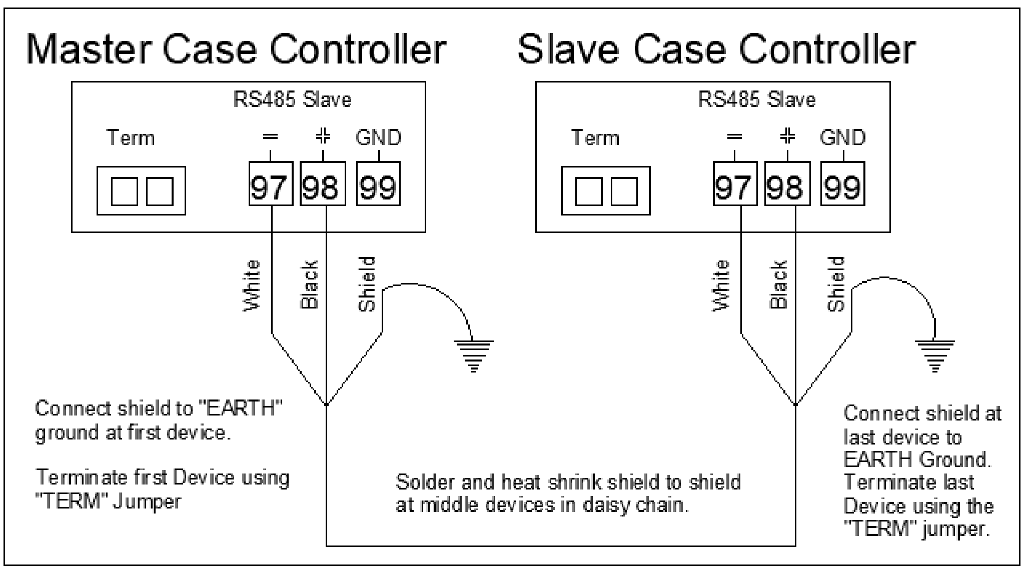



***Figure 13-1*** *- Master/Slave Wiring Detail*

### 13.1.2. Setting the MODBUS Address and Baud Rate

Each device in the local Modbus network must have a unique Modbus address. Because the connection typically begins with the master case controller and ends with the last slave case controller, the master case controllers address is set to **1**. Each slave case controller is subsequently addressed **2**, **3**, **4** and so on. A maximum of five slave case controllers can be connected to one master.

1. Press and hold the T4 key for three (3) seconds to enter the main menu:

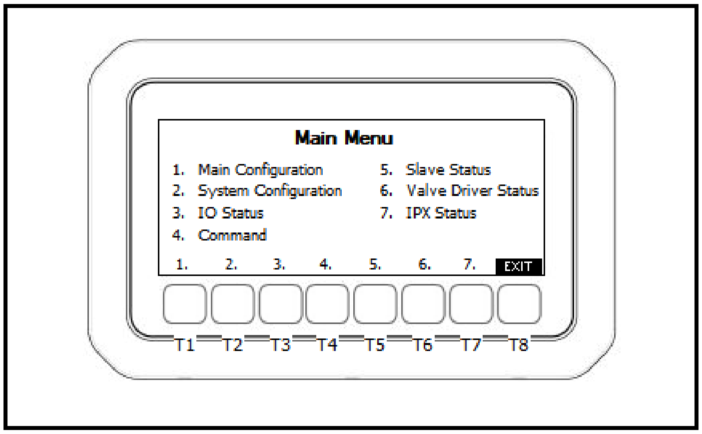



***Figure 13-2*** *- Enter the Main Menu By Pressing the T4 Key*

2. Select T2 for **System Configuration**, and then T1 for **System**:

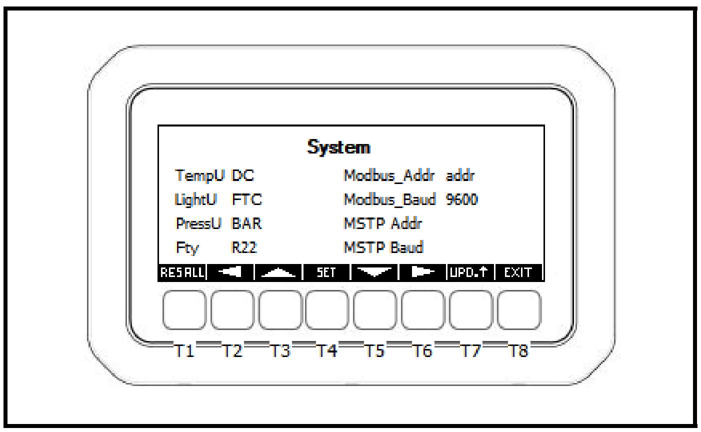



***Figure 13-3*** *- System Configuration*

3. Press the T5 key to move the cursor to the **Modbus Addr** and **Baud** fields. Press T4 (**SET**) to edit and use T4/T5 to move the values to the desired selection. Press T4 (**SET**) to save the selection.

4. After saving the address selection press the T6 (right arrow key) two times to page over to reboot:

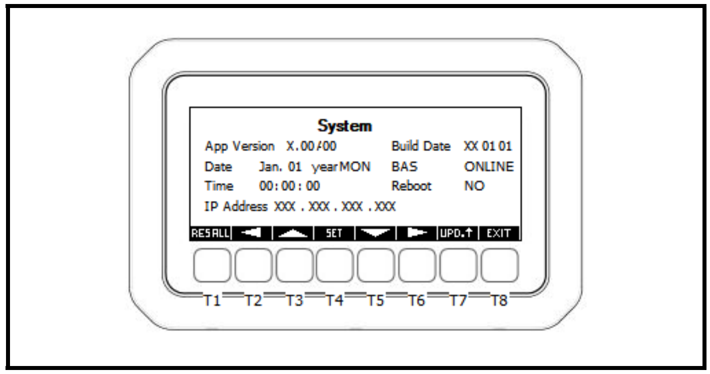



***Figure 13-4*** *- Reboot*

Arrow down until reboot **NO** is selected, press T4 to edit and change the value to **YES**. Press T4 (**SET**) to save **YES**. The device will now reboot to initialize the address and baud rate change. ***Note that any time address or baud rate is changed, a reboot is required***.

## 13.1.3. Defining Slave Case Controllers Within the Master

When a master slave lineup configuration is used, each slave case controller's Modbus address needs to be defined within the master case controller's menu. Perform the following steps to configure the slave addresses on the master case controller:

1. Press the T4 key for three (3) seconds to enter the Main Menu:

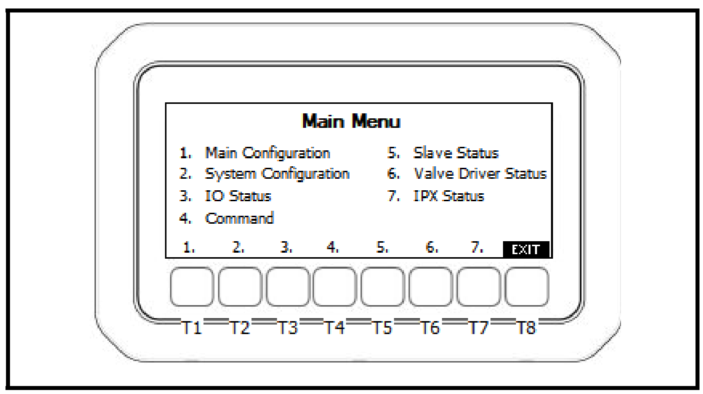



***Figure 13-5*** *- Main Menu*

2. Press the T2 key to enter System Configuration and then press T1 at the next menu to select **System**:

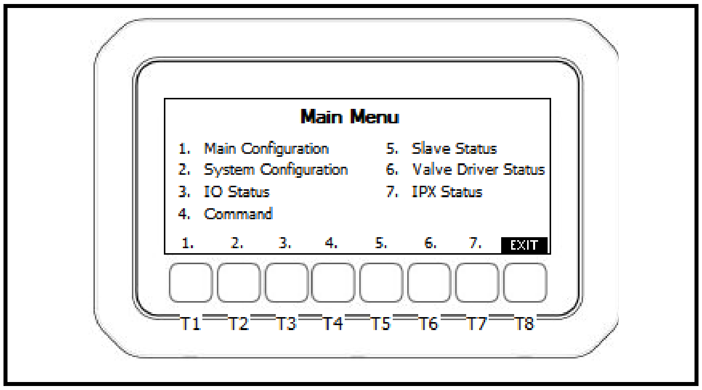



*Figure 13-6* - *Main Menu*

3. Press T5 to arrow over to the **S1-S5 Addr** screen:

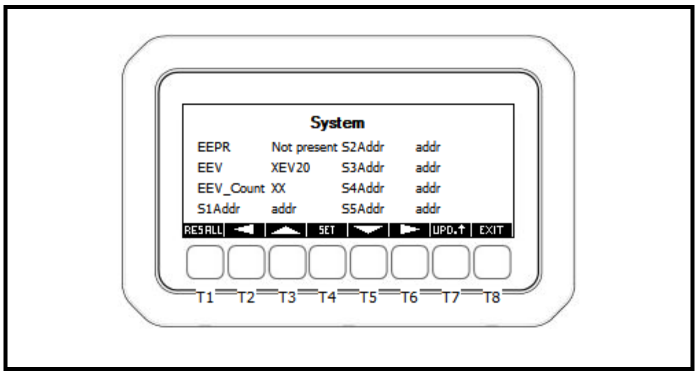



*Figure 13-7* - *S1-S5 Address Screen*

4. Move the cursor to highlight the **S1 Addr** to set the address of slave case controller 1. Press **SET** to edit and **SET** to save the selection. Repeat this process until all present slaves are addressed. Set an address of **0** for unused slave controllers.

# 14 Using the Visograph

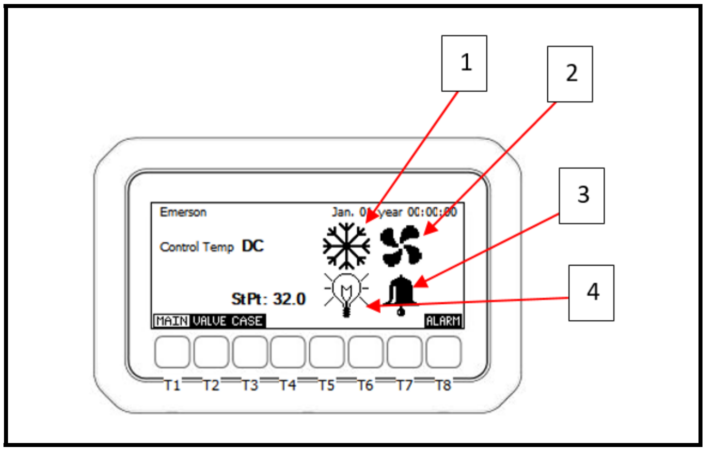



***Figure 14-1*** *- Main Status Screen*

The main status screen is used to show a quick overview of the system control temperature and loads. Icons 1-4 are defined below:

**1** - The snowflake icon represents the status of the refrigeration or defrost in the system: below are the different options and their meanings for this icon:

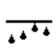
Represents the system in Refrigeration mode with refrigeration relay active; defrost OFF.

Represents the system cycled OFF when the case temperature setpoint is reached.

Represents the system is shut down on a disable command either locally or through the BACnet network.

Represents the system is in a defrost cycle.

Represents the system is in a defrost cycle but the heater relay is locked out by the E2E controller due to the maximum number of devices exceeded in defrost



Represents the system is in Drip mode following a defrost cycle.


Represents the system in a Pump-out mode where EEVs and LLSV are closed and the EEPR valve is open for a specified amount of time before closing.

**2** - The evaporator fan status icon gives the user a quick indicator if the fan is ON or OFF. A spinning icon indicates fan ON, while no spinning (idle fan) indicates the fan is OFF.

**3** - The system alarms indicator. When this icon is present it indicates there is 1 or more system alarms present. Press the T8 key to see detailed alarm information.

**4** - The case lights status indicator:

Indicates case lights are ON.

Indicates case lights are OFF.

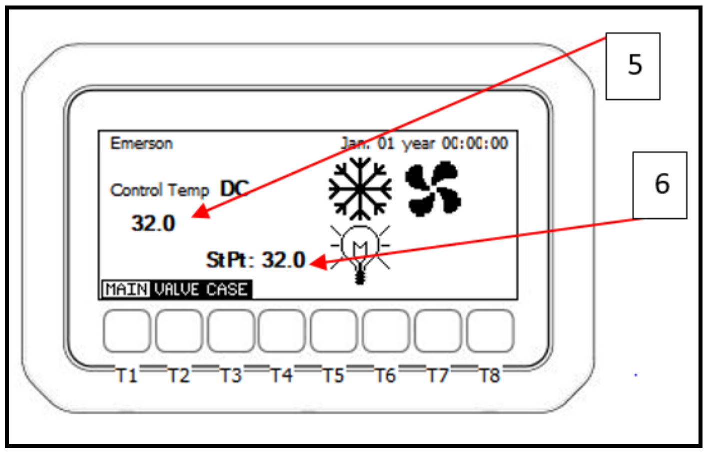



***Figure 14-2*** *- Main Status Screen*

**5** - The system control temp is displayed in this area below the label **Control Temp**. For the lead case the control temp is the average of all the discharge air sensors on the lineup. For the slave cases on the lineup, the control temp displayed here is the average of the controller's locally connected discharge air sensors.

**6** - The case temperature setpoint is displayed next to the label **St Pt**.

## 14.1. Viewing Temperature Input Status

To see an overview of temp input values, use the T3 key to access the case tab:

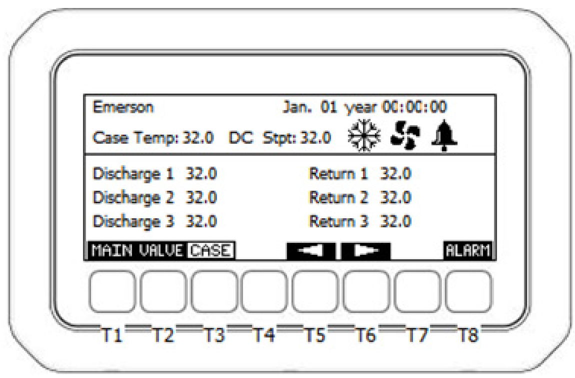



***Figure 14-3*** *- Case Tab*

Use the T5/T6 keys to scroll through the different configured inputs, and press the T1 key to return to the main tab.

## 14.2. Viewing Valve Positions and Superheat Data

To see an overview of valve positions and current system Superheat, press the T2 key from the Main Menu to access the valve overview tab:

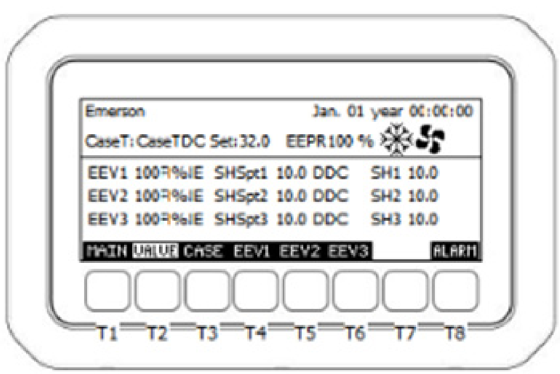



***Figure 14-4*** *- Valve Overview Tab*

To see in-depth data for a specific EEV valve, select the corresponding EEV tab with the T4-T6 keys.

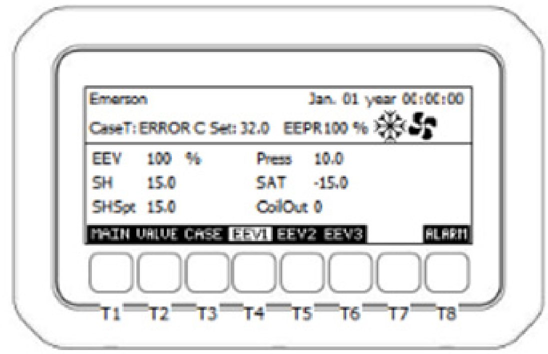



***Figure 14-5*** *- Valve Overview Tab*

Press the T1 key to jump back to the Main Menu.

## 14.3. Entering the Visograph Main Menu

To enter the Main Menu, press and hold the T4 key continuously for three (3) seconds. Then the Main Menu will appear.

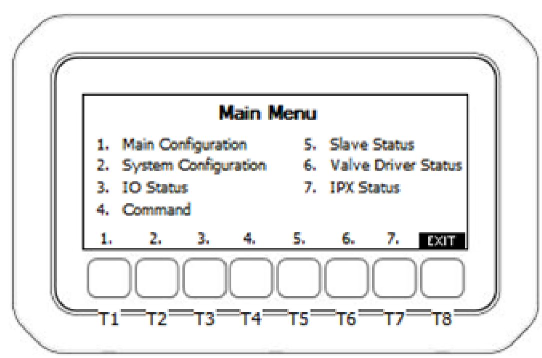



***Figure 14-6*** *- Main Menu*

The seven (7) sub menus are selectable with keys T1-T7, and key T8 can be used to exit submenus and the Main Menu back to the home screen.

## 14.4. I/O Configuration

### 14.4.1. Analog Inputs

From the Main Menu select T2 to navigate to **System Configuration** and then T2 again to enter **I/O Configuration**.

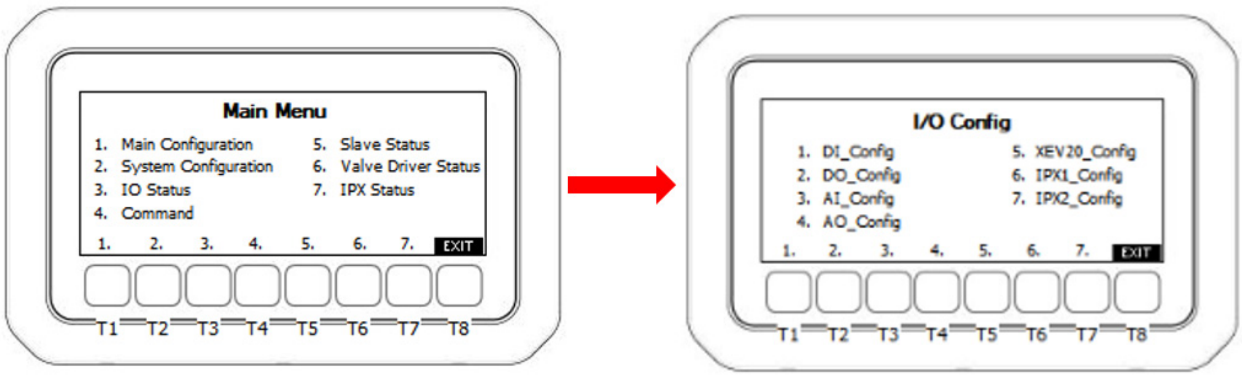



***Figure 14-7*** *- I/O Configuration*

Select T3 for iPro AI Configuration, T5 for **XEV20_Config**, T6 for Expansion 1 (**IPX1_Config**) AI Configuration or T7 for Expansion 2 (**IPC2_Config**) AI Configuration.

Example of iPro AI Configuration, press T3 for iPro **AI_Config**. The iPro analog input selections are shown below. I/O can be set by using T3/T5 keys to navigate and T4 to edit and save.

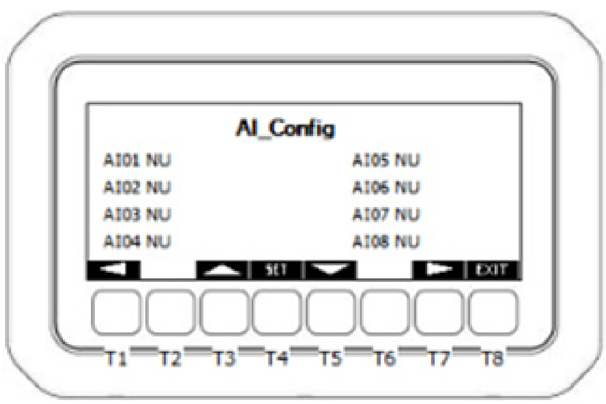



***Figure 14-8*** *- AI Configuration*

Pressing T7 advances to the next page where sensor offsets are shown by **AI01O-AI10O**, an offset for the connected sensor can be set up here.

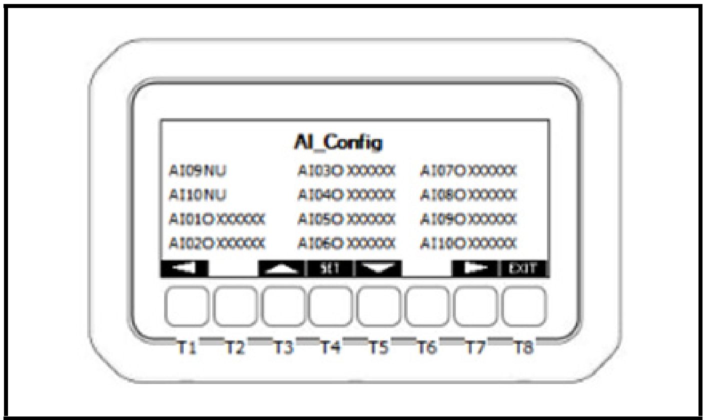



***Figure 14-9*** *- Sensor Offsets*

Press T7 to advance to the sensor type screens, the sensor type can be set up here. (NTC, PTC, 0-20mA, 4-20mA, 0-1VDC, 0-5VDC, 0-10VDC, CPC temp).

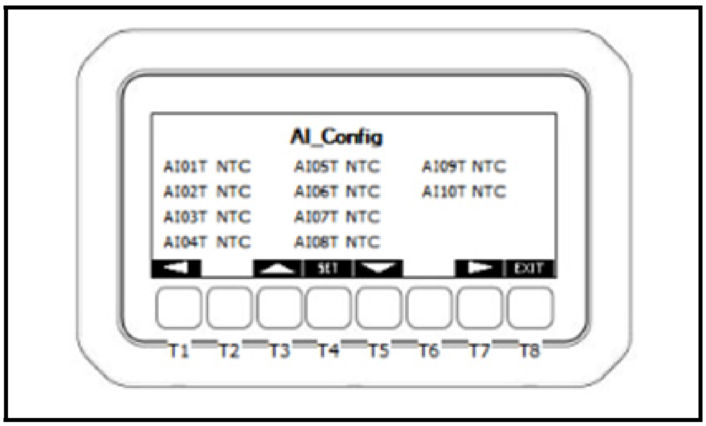



***Figure 14-10*** *- Sensor Types*

Press T7 to advance to the sensor scaling screens for pressure transducers. When a pressure transducer is set up on AI1-10, the EU scaling can be configured based on the transducers min/max ranges.

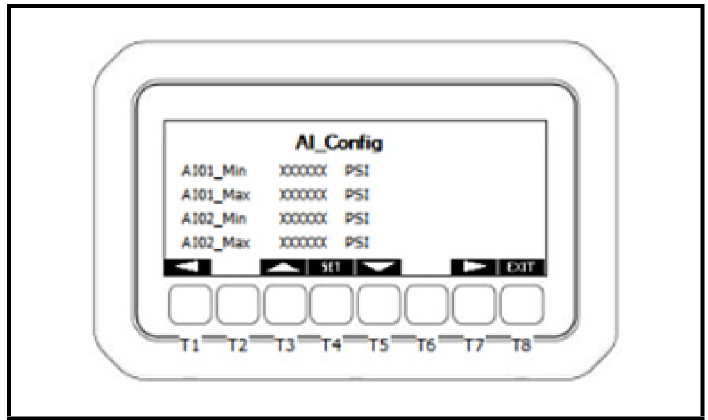



***Figure 14-11*** *- Sensor Types*

Press **EXIT** to return to the main I/O Configuration screen. Pressing T5, T6 or T7 will allow AI on XEV20 and expansion modules to be configured.

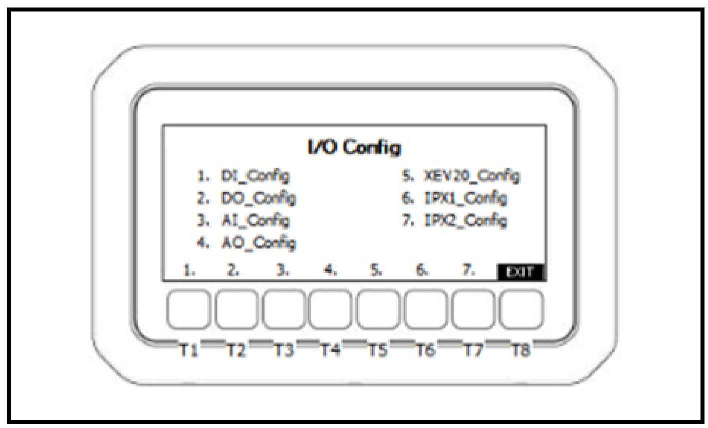



***Figure 14-12*** *- IO Config Menu*

## 14.4.1.1. Analog Input Options

| Analog Input | Description | Hardware Available |
|---|---|---|
| **Nu** | Input is not used | N/A |
| **FanAmps** | Fan amperage current transducer | iPro or IPX |
| **DefrAmps** | Defrost amperage current transducer | |

***Table 14-1*** *- Analog Input Options*

| | | |
|---|---|---|
| **Discharge Air 1** | Case temperature sensor 1 | iPro, IPX, or EXV20D |
| **Discharge Air 2** | Case temperature sensor 2 | |
| **Discharge Air 3** | Case temperature sensor 3 | |
| **Discharge Air 4** | Case temperature sensor 4 | |
| **Discharge Air 5** | Case temperature sensor 5 | |
| **Discharge Air 6** | Case temperature sensor 6 | |
| **DefrTerm1** | Defrost cycle termination temperature sensor 1 | |
| **DefrTerm2** | Defrost cycle termination temperature sensor 2 | |
| **DefrTerm3** | Defrost cycle termination temperature sensor 3 | |
| **DefrTerm4** | Defrost cycle termination temperature sensor 4 | |
| **DefrTerm5** | Defrost cycle termination temperature sensor 5 | |
| **DefrTerm6** | Defrost cycle termination temperature sensor 6 | |
| **Return1** | Case return air temperature sensor 1 | |
| **Return2** | Case return air temperature sensor 2 | |
| **Return3** | Case return air temperature sensor 3 | |
| **Pressure1** | Evaporator suction pressure transducer 1 | |
| **Pressure2** | Evaporator suction pressure transducer 2 | |
| **Pressure3** | Evaporator suction pressure transducer 3 | |
| **CoilOut1** | CoilOut1 | |
| **CoilOut2** | CoilOut2 | |
| **CoilOut3** | CoilOut3 | |

***Table 14-1*** *- Analog Input Options*

## 14.4.2. Digital Inputs

To configure digital inputs, press the T1 key from the **I/O Config** menu shown above. The DI Configuration page is now displayed.

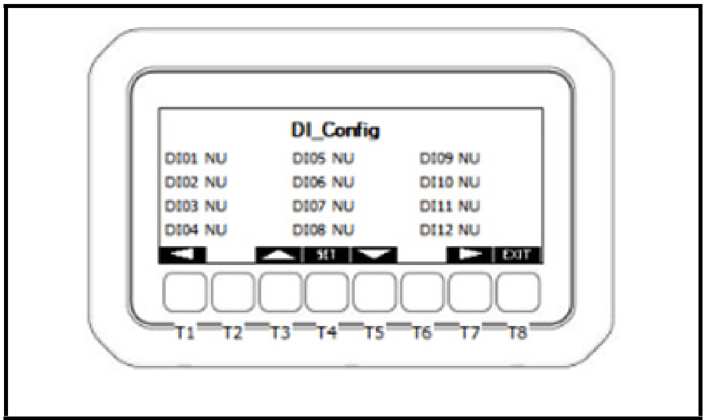



***Figure 14-13*** *- DI Configuration*

Pressing the T1/T7 keys will scroll through the screens left/right. Press T7 to scroll to the right to access the polarity settings.

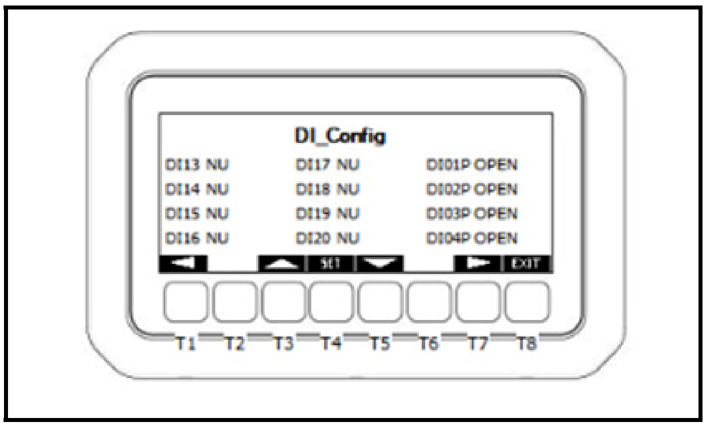



***Figure 14-14*** *- DI Polarity Settings*

The polarity of all 20 digital inputs is configurable to OPEN or CLOSE. The polarity is the active state of the input. Example: DI01P=Open, so an open signal input on digital input results in a logical value of ON/TRUE for DI1 in the logic of the controller. DI01P=Close, a closed signal input on digital input 1 results in a logical value of ON/TRUE in the logic of the controller.

### 14.4.2.1. Digital Input Options

| Digital Input | Description | Hardware Available |
|---|---|---|
| Nu | Digital Input is not used | N/A |
| Deflnit | Input to trigger a defrost cycle | iPro or IPX |
| Door | Input for the door switch | |
| Clean | Input for the clean switch | |
| DualTemp | Input for the dual temperature switch | |
| Enable | Input for the controller enable/dis-able | |
| Auxiliary 1 | Auxiliary input for misc. use | |
| Auxiliary 2 | Auxiliary input for misc. use | |

***Table 14-2*** *- Digital Inputs*

## 14.4.3. Digital Outputs

To configure digital outputs, press the T2 key from the **I/O Config** menu shown above. The DO Configuration screen is now displayed:

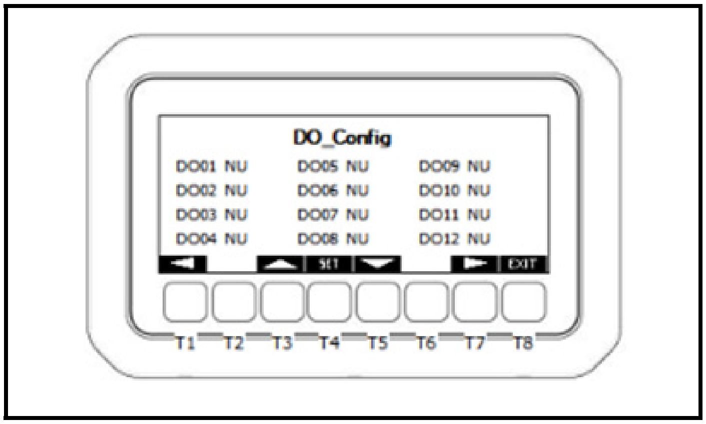



***Figure 14-15*** *- DO Configuration*

Press **SET** to change a **DO_Config**. The iPro comes defaulted with D04=Refrigeration relay, D05=Defrost, D06=Fan and D07=Lights. Press the T7 key to scroll to relay polarity.

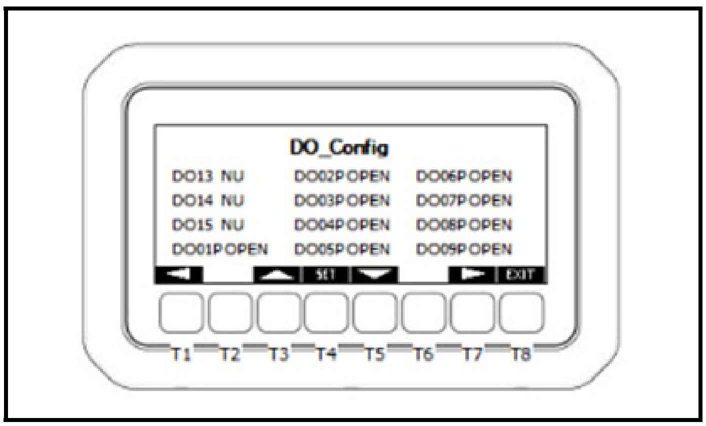



***Figure 14-16*** *- DO Relay Polarity*

Press **SET** to edit relay polarity and press **SET** again to save. The table below outlines the relay polarity operation:

| Relay Polarity | Logical Value | Physical State of Relay Contacts |
|---|---|---|
| Open | TRUE | Open relay |
| Close | TRUE | Closed relay |
| Open | FALSE | Closed relay |
| Close | FALSE | Open relay |

***Table 14-3*** *- Relay Polarity Operation*

### 14.4.3.1. Digital Output Options

| Digital Input | Description | Hardware Available |
|---|---|---|
| Nu | Digital Onput is not used | N/A |
| Light | Relay for controlling case/ box lights | iPro or IPX |
| Fan | Relay for controlling case/ box fans | |
| Defrost | Relay for controlling case/ box defrost heaters | |
| Refrigeration | Relay for controlling case/ box LLSV | |
| Alarm | Relay for controlling output of alarm signal | |
| Enable | Auxiliary relay that is enabled when controller is enabled | |

***Table 14-4*** *- Digital Outputs*

## 14.5. System Overrides

The iPro Case Controller has a menu where system relay output and electronic valve overrides can be entered. The relay output overrides and the valve overrides are active for 30 minutes before the system enters automatic regulation again.

Press and hold T4 key for 3 seconds from the main status screen to enter the Main Menu, then press T4 for the **Command** screen:

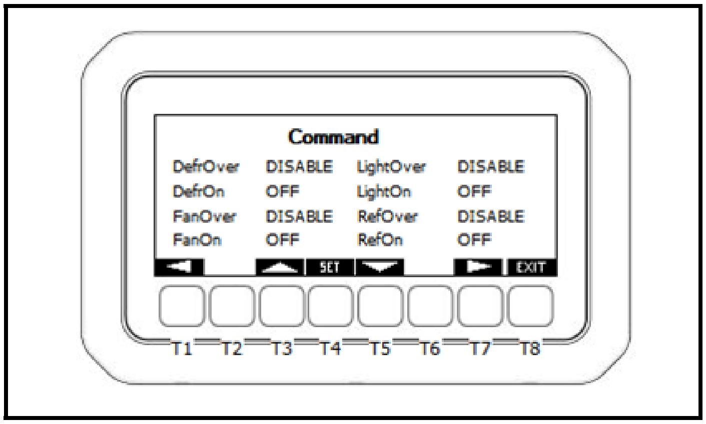



***Figure 14-17*** *- Command Screen*

For each system load there is a corresponding override enable and override value. Use the T3/T5 keys to make a selection and the T4 key to edit. Press T4 again to save.

Example of overriding the defrost relay to ON: Highlight **DefrOver** and press T4 to edit, press T3/T5 to set = enable. Use T3/T5 to highlight **DefrOn** and press T4 to edit, change from OFF to ON and press T4 to save. The relay point the defrost is assigned to is now active/ON. To remove the override, edit the **DefrOver** back to disable.

From the relay overrides page, press the T7 key to arrow over to the valves override page shown below:

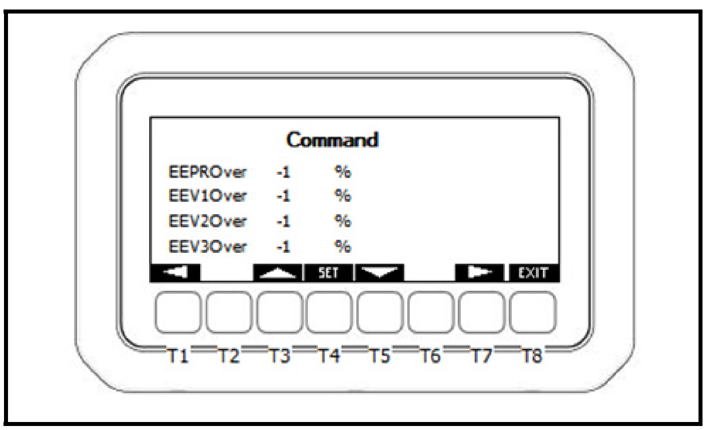



***Figure 14-18*** *- Valves Override Screen*

To override a valve, use the T3/T5 keys to highlight the desired valve. Press T4 to edit and then T3/T5 keys to change the value, press T4 to save the override value. The override will be active for 30 minutes unless manually removed. To cancel the override, edit the value to -1 and save.

## 14.6. Test Mode

The case controller has an integrated Test mode in the Visograph display. The purpose of the Test mode is to verify that sensors, inputs, relay outputs, and valve driver outputs are operational on the case/fixture prior to shipping. The Visograph display will guide the user through a series of tests in order to verify the operation of all the connected I/O and valves. The Test mode is intended to be used as a factory end of line verification, and caution should be used when re-entering test mode once the device is deployed in the field because entering Test mode disables normal system regulation.

***CAUTION: Use caution when entering Test mode in a live system. During Test mode normal system regulation is disabled and valves and loads will be put in Override during the test sequence. Take care not to cause unwanted system problems or liquid refrigerant flood-back due to overriding system valves during the test.***

1. To enter Test mode, navigate to the Main Menu by pressing and holding the T4 button on the Main status screen for three (3) seconds:

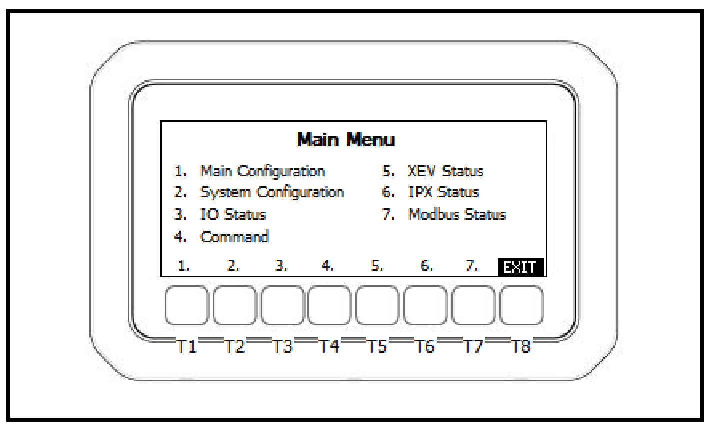



***Figure 14-19*** *- Main Menu*

2. Then press T4 for the Command screen:

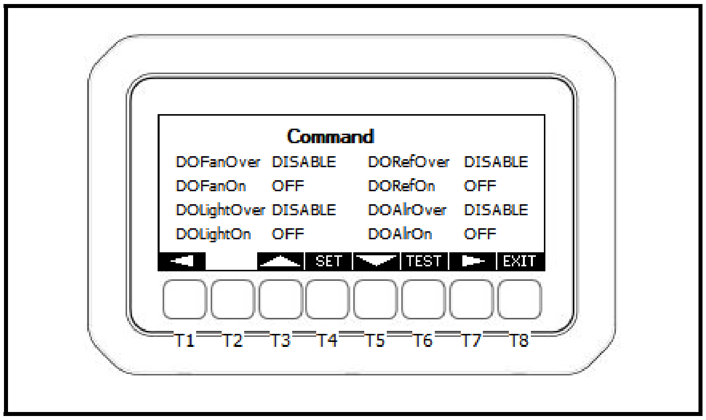



***Figure 14-20** - Command Screen*

3. Once in the Command screen, press and hold T6 **Test** for three (3) seconds to enter Test mode, the first stage is the Relay Tests.

    a. If there are no configured relays, Visograph will display a message **No Configured Relays**. Otherwise the first relay test is the **Enable** relay.

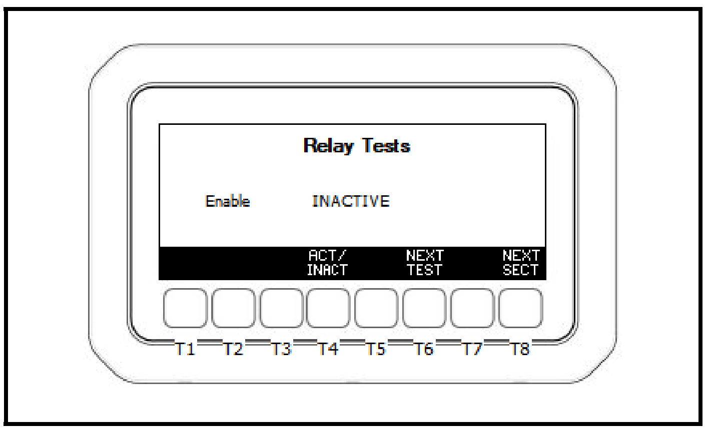



***Figure 14-21** - Relay Tests Screen*

    b. Use the T4 key to cycle the relay through active/inactive states and then check the operation of the load it is controlling, or check the relay contacts with a multimeter for operation. After finishing each relay test, use the T7 **Next Test Key** to advance to the next configured relay. At the end of the relay tests, use the T8 key to advance to the next section.

4. **Digital Inputs Test** - Use this section to verify the operation of any connected and programmed digital inputs. If there are no digital inputs configured, Visograph will display this with a message. Toggle the switch or input connected, then verify on screen that the status changes.

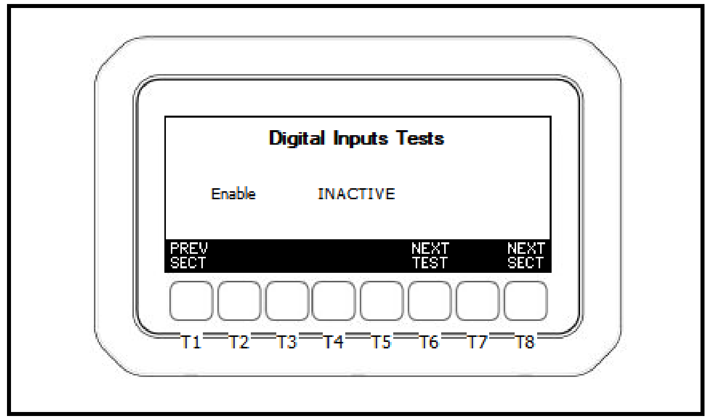



***Figure 14-22** - Digital Inputs Screen*

    a. Use the T8 key to move to the next section of tests after digital input testing is complete.

5. **Temperature Inputs Test** -This section is designed to allow the user to test each of the configured temperature sensor inputs. The test expects each sensor's temperature to be decreased by a delta of 10 degrees within 30 seconds in order to display a pass message. If you do not wish to use the delta T test, use the T6 key to advance through the sensors to check the readings. If any sensor has an error, the error will be displayed in the value box. Once Temperature input testing is complete, use the T8 key to advance to the next section of tests.

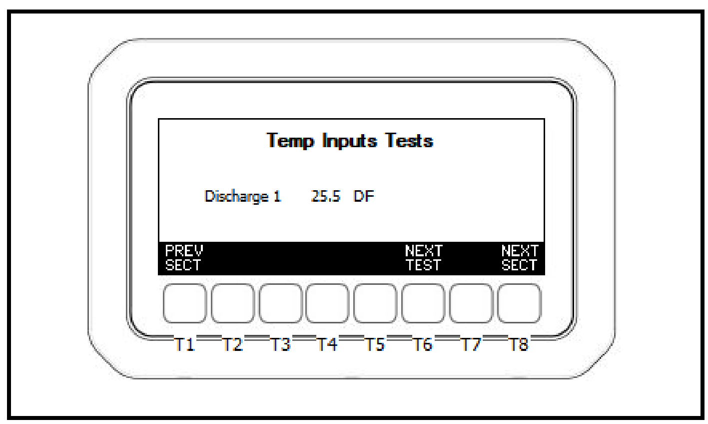



***Figure 14-23** - Temperature Input Test Screen*

6. **Pressure Inputs Tests** - This section is designed to allow the user to verify visually the value of each configured pressure transducer. The mode also verifies that a transducer is programmed. If no transducers are programmed, Visograph will display a message **No Configured Pressure Inputs**. After transducer testing is complete, use the T8 key to advance to the next section of tests.

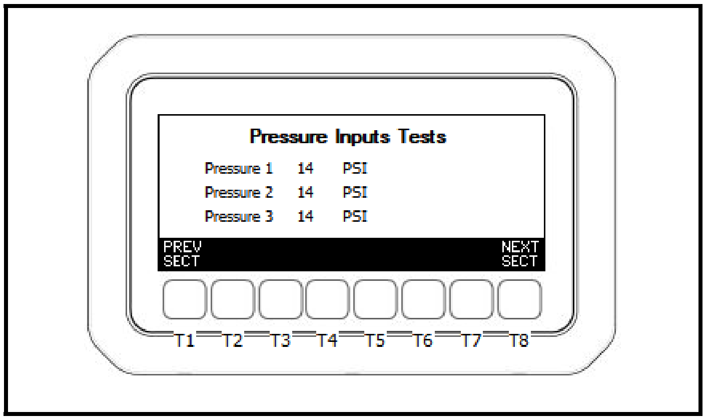



*Figure 14-24 - Pressure Inputs Tests Screen*

7. **Electronic Valve Tests** - This mode is designed to allow the user to quickly command the electronic valves to the fully open or fully closed position in order to check the operation of the valves. Use the T4 key to toggle the valve command between open/close and then verify the XEV20D open/close LED to see when the valve is fully opened/fully closed. A solid orange light on the close LED indicates the valve has completed driving closed. A solid orange light on the open LED indicates the valve has completed driving open. Use the T6 key to advance to the next valve. Once all valve testing is complete, use the T8 key to advance to the next section of tests.

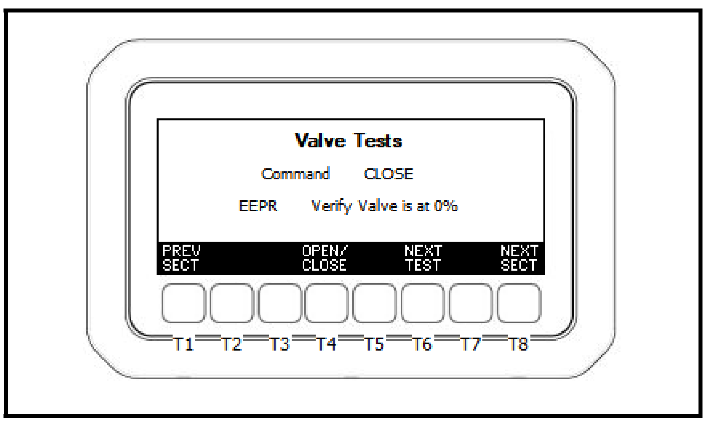



*Figure 14-25 - Electronic Valve Tests Screen*

8. **Feedback Input Tests** - This section allows the user to test and verify the current monitoring sensors for the evaporator fan and defrost heaters. For information on how to connect and configure the current transducers, see **Section 10.5.2.**, *Fan Motor Current Monitoring* and **Section 10.3.5.7.**, *Defrost Heater Current Monitoring*. Use the T4 key to activate the relay for the fan or defrost. The relay status and the current value are displayed as well as the feedback value. The feedback value is **Active** once the amperage value rises above a programmed threshold. Use the T6 key to advance to the next relay and the T8 key to advance to the next series of tests.

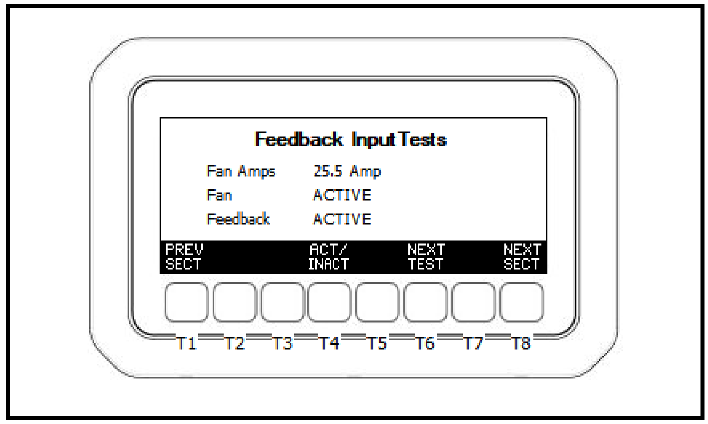
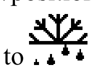



*Figure 14-26 - Feedback Input Tests Screen*

9. **Defrost Test** - The final test is a defrost cycle test. Use the T4 key to activate a defrost cycle. The controller will behave as though an actual defrost cycle has been reached and will drive all loads to the defrost state/position. The defrost cycle is active once the  changes to  and the **Defrost In Progress** message is displayed. Once the defrost cycle is active, the system loads and valves can be verified for their defrost state. Once all loads have been verified, the defrost cycle can be terminated by toggling to inactive with the T4 key. Once the defrost verifications are complete, use the T8 key to advance to the end of the test.

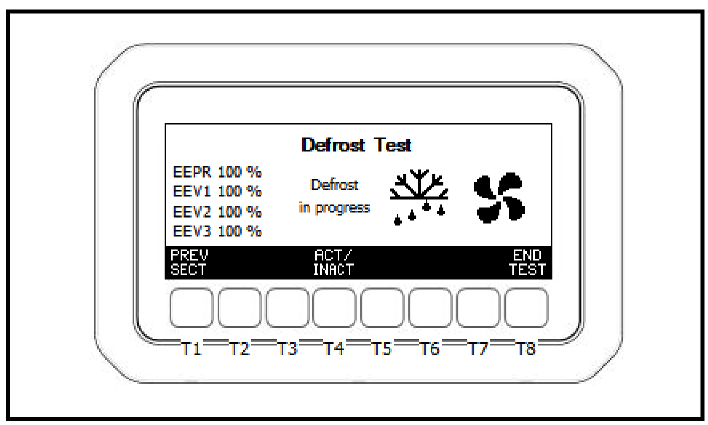



*Figure 14-27 - Defrost Cycle Test Screen*

10. **End of Test** - After the defrost test, the test mode sequence is complete. The final action taken by the controller is driving all electronic valves to the fully open position in order to prepare the fixture for evacuation at the installation site.

Verify that the open LED on the XEV20D drivers is solid orange and *not* blinking. A blinking light on the open LED indicates the valve is still driving open. After the LEDs indicate that the valves are finished driving fully open, the controller can be powered down for shipping. The T3 key can be used from this screen to start over from the beginning. The T1 key can be used to scroll to previous tests and the T6 key can be used to exit Test mode and return to normal regulation.

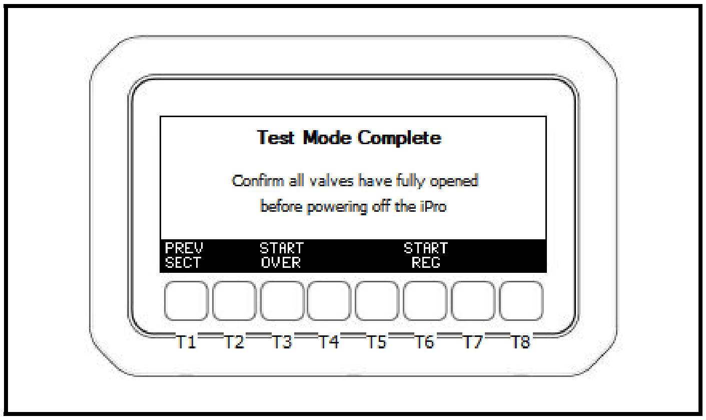



***Figure 14-28*** *- Test Complete Screen*

# 15 E2 Setup

The iPro Case Controller is capable of communicating with the E2E controller version 4.08 or above. Using the iPro Case Controller with E2E offers benefits over using the case controller as a standalone device.

- Reporting of case controller related alarms
- The ability to log case controller data in an E2E logging group
- The ability to shut down refrigeration in walk in boxes in the event of a refrigerant leak event (available if Emerson leak detection panel is used)
- Remote access to case controller status and programming from the E2E front panel
- The ability to remotely access the case controllers from UltraSite32 or Site Manager

Communication between E2E and the case controller takes place over the RS485 BACnet MS/TP network. Follow the instructions in **Section 12,** *The BACnet Network* to connect a case controller to the E2E network and comm plug connector. Then follow the instructions in this chapter to set up the case controller in the E2E. An E2E has up to three COM ports that can be assigned for BACnet MS/TP communication: COM2, COM4 and COM6 are the available RS485 ports on the E2E power interface board.

## 15.1. Set Up Network Ports and BACnet Settings

Before setting up an iPro Case Controller in the E2E, the port that has the BACnet MS/TP cable connected to it must be set up as a BACnet MS/TP port.

1. Log in to the E2E with level 4 access or higher.
2. Press **Alt-M** on the keyboard to access the serial tab of the general controller info setup screens.

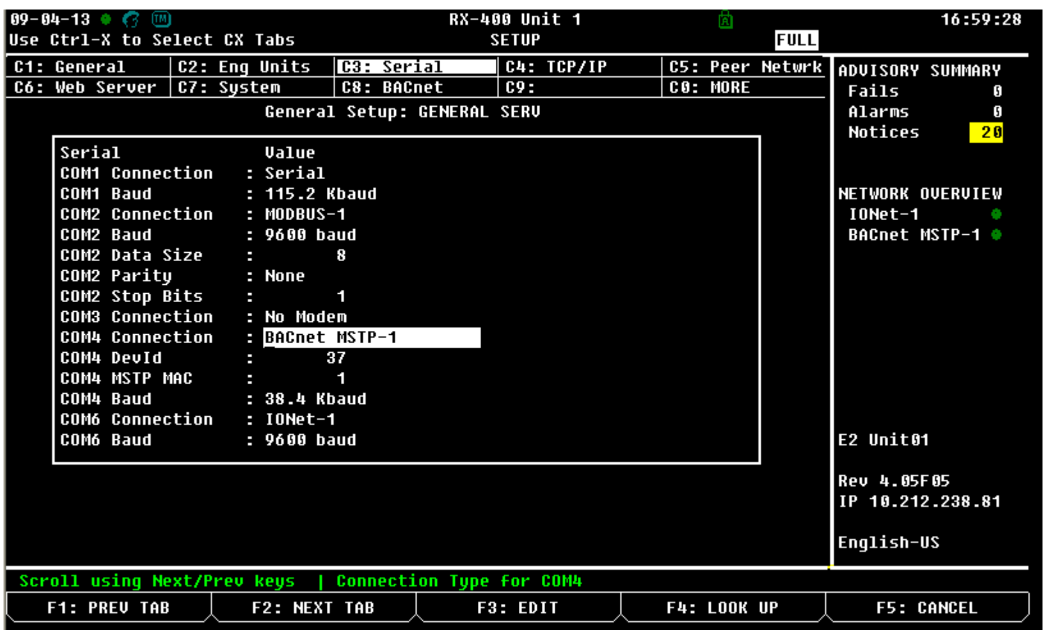



***Figure 15-1*** *- Serial Setup in General Configuration*

3. This screen will have a connection field for all available COM ports on the E2E. Highlight the COM port connection you will be using for BACnet MS/TP and press F4 **LOOKUP** and select **BACnet MS/TP** from the list of network types.

4. Three fields will become visible underneath the COM4 Connection that pertain to the way the device communicates:
   - **COM4 DevId -**This is the E2E BACnet Device ID; set this to a unique number from all other BACnet nodes on the network in the range of **0-4194303**. Usually setting the E2E Device ID the same number as the MSTP MAC is sufficient.
   - **COM4 MSTP MAC -** This is the E2E BACnet MSTP MAC address; set this to a unique number for E2E in the range of **1-127**. Each BACnet device on the network must have its own unique MSTP MAC in order to communicate.
   - **COM4 Baud -** Default setting is 9600; this must be changed to **19.2k** (all devices connected to the same COM port should be set to the same baud rate)

## 15.2. Configure E2E BACnet Settings

After setting up the BACnet MS/TP port then the BACnet network settings must be configured.

1. From the Home screen on E2E press **Alt-T** on the keypad to navigate to this screen:

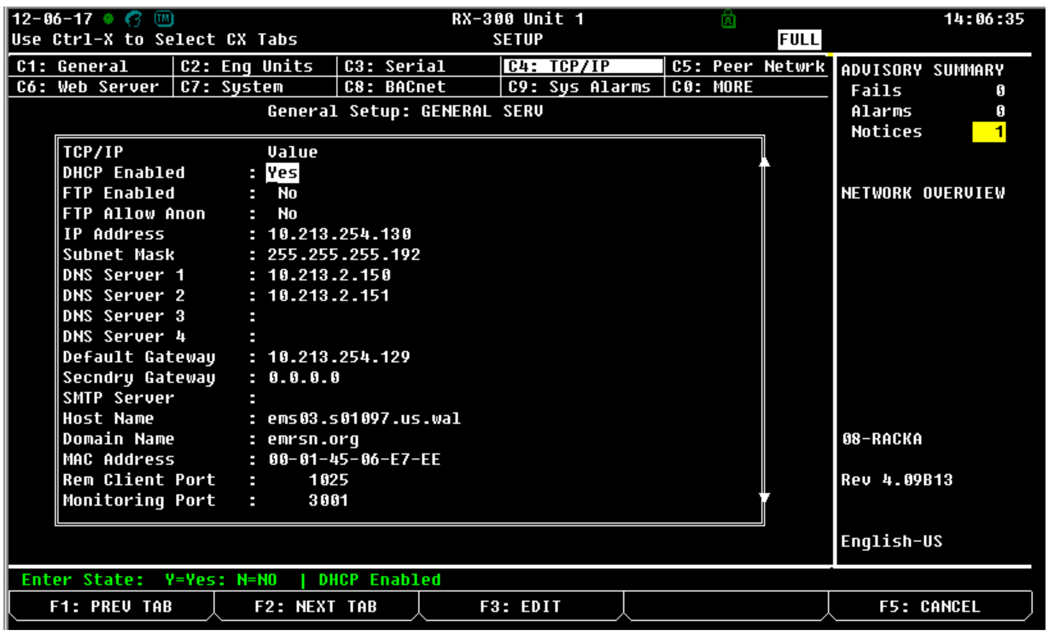



***Figure 15-2*** *- E2E TCP/IP Settings*

2. Press **Ctrl-8** to reach the **BACnet** tab:

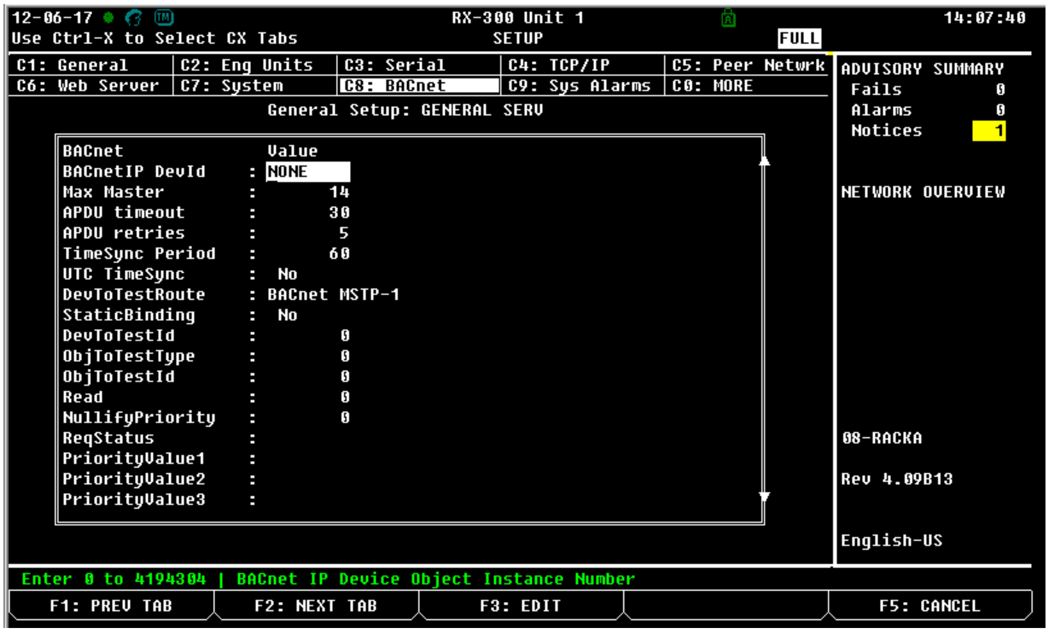


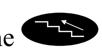

***Figure 15-3*** *- E2E BACnet Settings*

3. Three settings must be configured here:

   a. **Max Master** - The default setting is 127, edit and change the value to be equal to the highest BACnet mac address that E2E will communicate with on any of its three (3) comm ports. Determine the highest MS/TP MAC address of any device connected to any of the E2E comm ports. Set the E2E Max Master equal to the highest MAC address determined.

   b. **APDU timeout** - This is the amount of time in seconds between retransmissions of an APDU requiring acknowledgment for which no acknowledgment has been received. Enter a value of **30** in this field.

   c. **APDU retries** - This is the maximum amount of times that an APDU shall be retransmitted. Enter a value of **3** in this field.

4. After timeout, retries, and max master have been set, press the  button to save and exit.

## 15.3. Add and Connect iPro Case Controllers

To enable communications between the E2E and the iPro Case Controllers, the devices must be added to E2E and addressed.

1. Log into the E2E with level 4 access or higher.

2. Press Menu 7 7 2 to access **Connected I/O Boards and Controllers**.

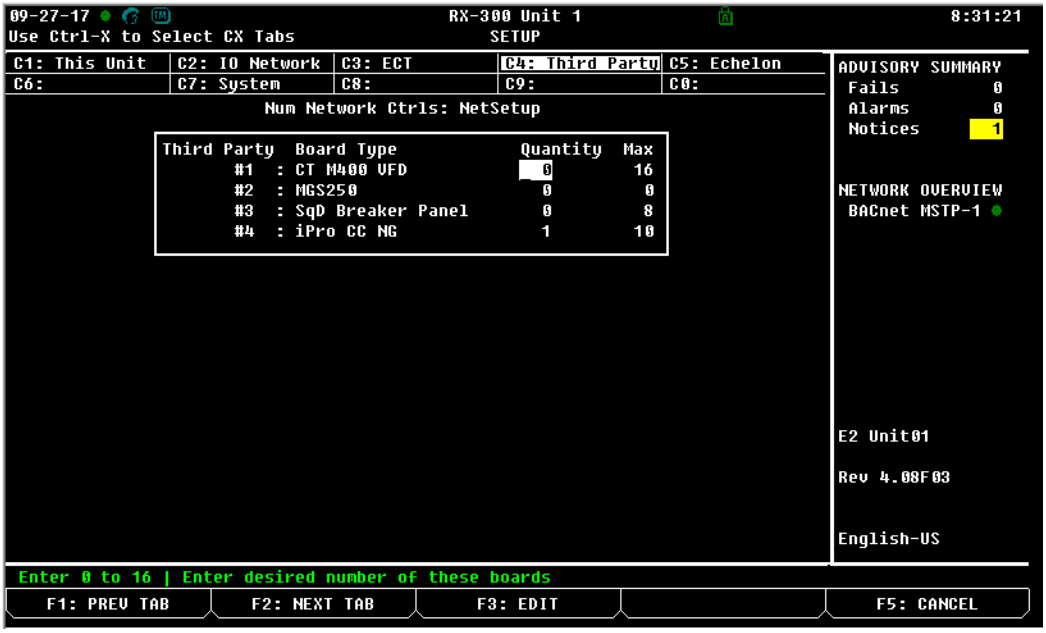



***Figure 15-4*** *- E2E Connected I/O Net Screen - Third Party Tab*

3. In the Connected I/O screen under the **Third Party** tab, enter the number of iPro CC devices in the **Quantity** field.
4. Press the button.
5. Press the button to return to the home screen.
6. Press **Alt-N** on the keyboard to access the Network Summary screen.
7. The number of iPro CC units added in Step 3 should now be visible in the Network Summary screen.

## 15.4. Commissioning the Device in E2E

1. From the network summary screen highlight the first device and press **F4** to commission the device.

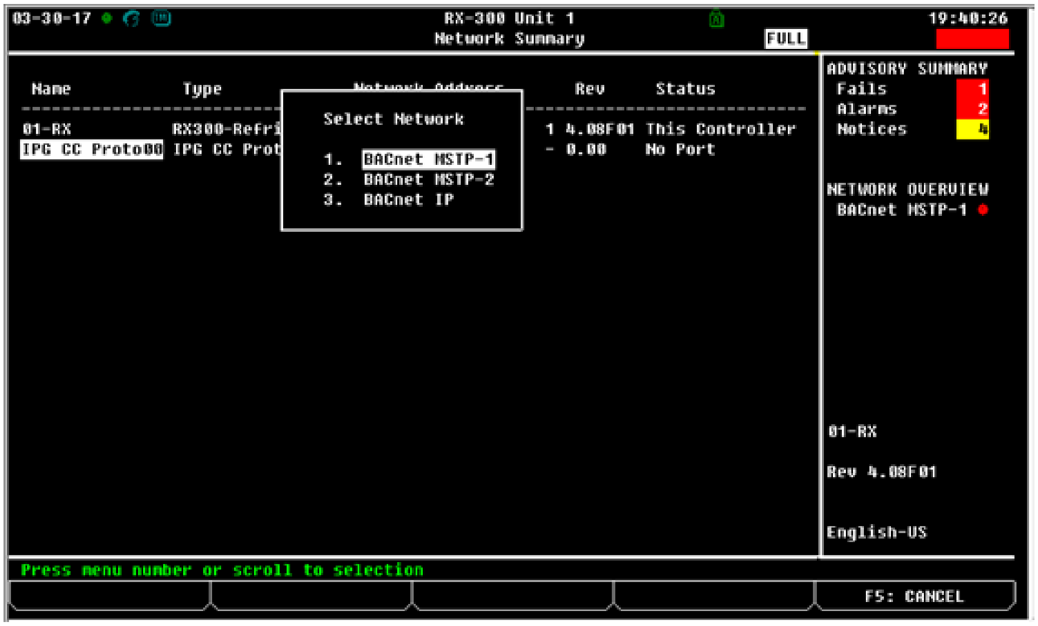



*Figure 15-5* - *Commissioning the Device - Select BACnet MSTP Network*

2. Select the BACnet MS/TP network, the E2E will then scan for available devices:

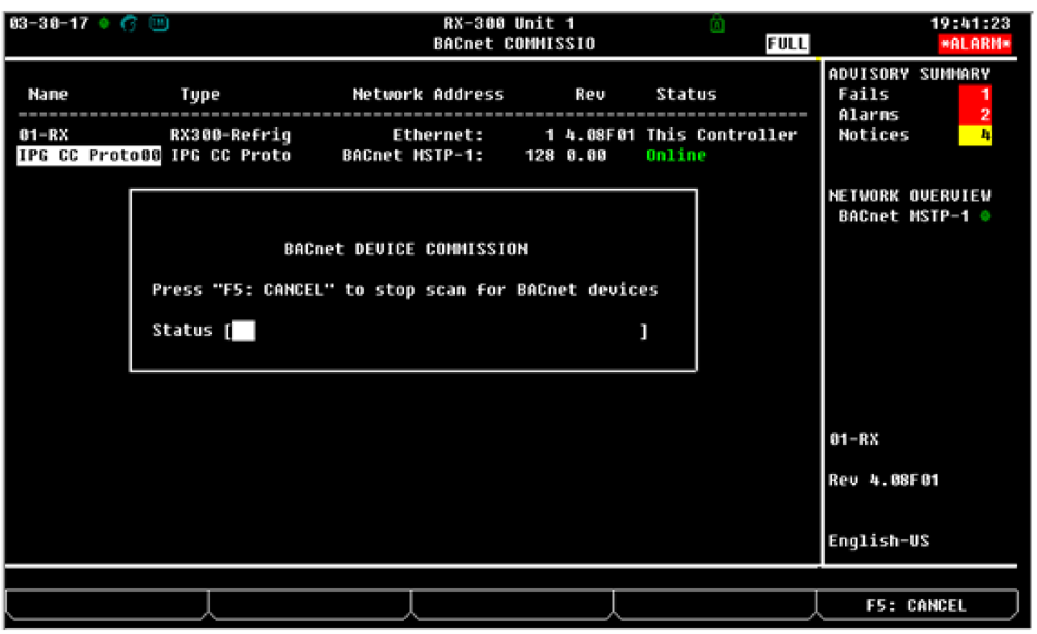



*Figure 15-6* - *E2E Scan for Available BACnet Devices*

3. The E2E will display a list of the devices discovered during the scan:

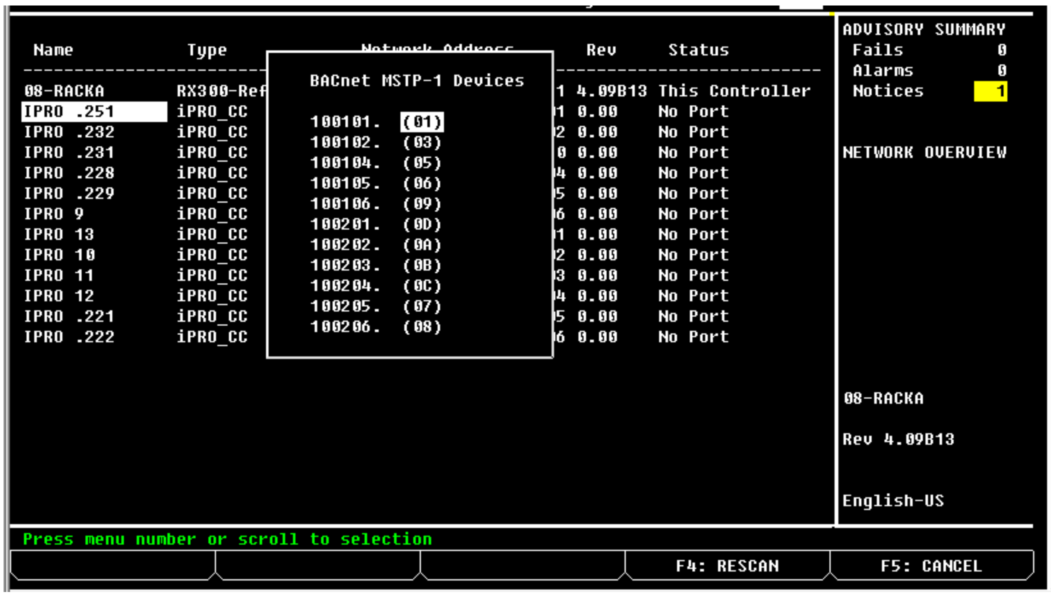



*Figure 15-7 - BACnet Devices Found*

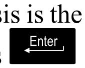
4. The number in parenthesis is the BACnet MAC address and the other number is the BACnet Device ID. Select the device you want to commission and press  on the E2E keypad.




*Figure 15-8 - Select Device to Commission*

5. Press  again on E2E keypad and then E2E will display **BACnet Device ID is set**:

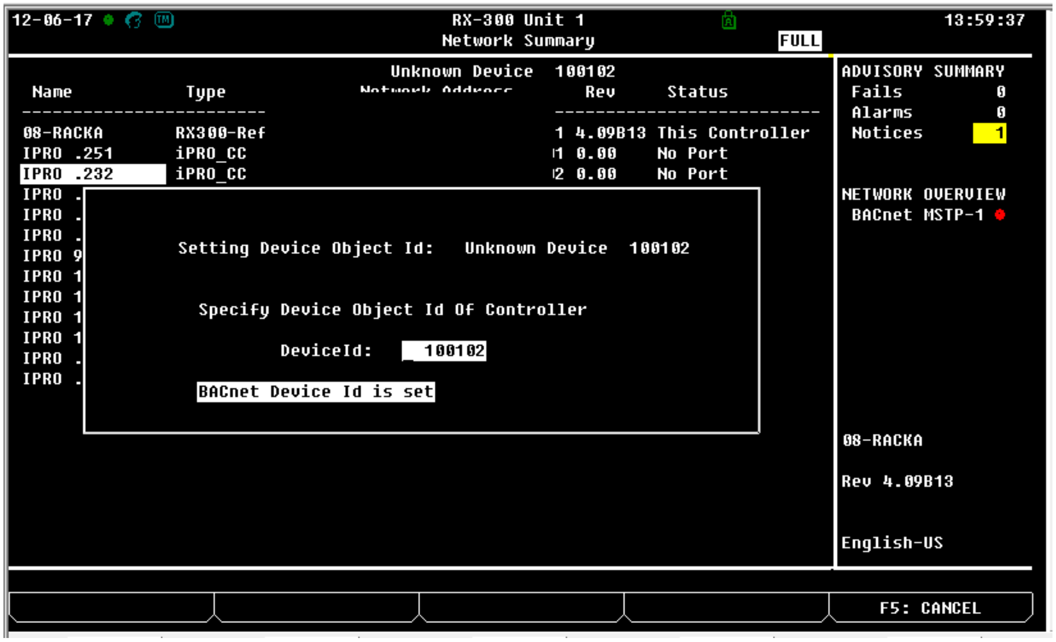
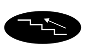



*Figure 15-9* - *BACnet Device ID Is Set*

6. Then press the  button to save and exit back to the Network Summary screen:

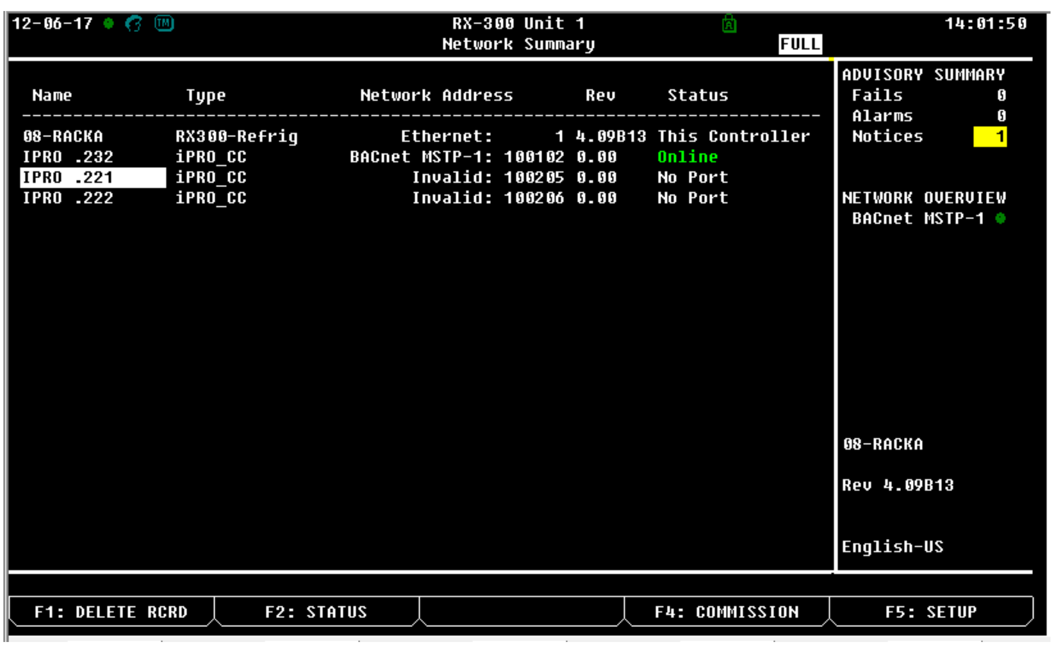



*Figure 15-10* - *Network Summary Screen*

# 16 iPro Parameter List

| Parameter Name | Description | Range |
|---|---|---|
| | **Fan Parameters** | |
| **FOp** | Fan Operation Mode: OnR-OfD-Fan on with refrigeration off defrost. OnR-OnD-Fan on Refrigeration on defrost. OnF-OfD-Fan on continuously off defrost. OnF-OnD-Fan on continuously, on defrost. | OnR-OfD, OnR-OnD, OnF-OfD, OnF-OnD |
| **FAd** | Fan After Defrost: Temperature-Activate after defrost based on Fst, Fhy. Time-Activate after defrost based on Ftd. | Temperature/Time |
| **FSt** | Fan Temp Setpoint | -10-70° |
| **FHy** | Fan Temp Hysteresis | 1-30° |
| **Ftd** | Fan Time Delay | 0:00-10:00 minutes |
| **FanAmpOn** | Amps required for Fan status to be considered ON | 0-60 amps |
| **FanAmpDel** | Time delay for status change once amps reach threshold | 1-90 seconds |
| | **Alarm Parameters** | |
| **ALU** | Maximum control temperature alarm, relative to active setpoint | 0-99° above setpoint |
| **ALL** | Minimum control temperature alarm, relative to active setpoint | -99-0° below setpoint |
| **AHy** | Alarm hysteresis | 0-20° |
| **ALd** | Alarm delay time before displaying alarm active | 0-255 minutes |
| **SHF%** | Superheat Control Temp failure-position valve is driven to in the event of superheat reading failure | 0-100% |
| **SCF%** | Suction Control Temp failure-position the valve is driven to in the event of control temperature failure | 0-100% |
| | **Analog Input Parameters** | |
| **AIC01** | Configuration of Probe 1 | Discharge 1-6, Return 1-3, Defrost Term 1-6, Coil Out 1-3, Pressure 1-3, Fan Amperage, Defrost Amperage |
| **AIC02** | Configuration of Probe 2 | |
| **AIC03** | Configuration of Probe 3 | |
| **AIC04** | Configuration of Probe 4 | |
| **AIC05** | Configuration of Probe 5 | |
| **AIC06** | Configuration of Probe 6 | |
| **AIC07** | Configuration of Probe 7 | |
| **AIC08** | Configuration of Probe 8 | |
| **AIC09** | Configuration of Probe 9 | |
| **AIC10** | Configuration of Probe 10 | |

***Table 16-1*** *- iPro Parameter List*

| | | |
|---|---|---|
| **Ofs01** | Probe 1 Offset | -100-100 |
| **Ofs02** | Probe 2 Offset | |
| **Ofs03** | Probe 3 Offset | |
| **Ofs04** | Probe 4 Offset | |
| **Ofs05** | Probe 5 Offset | |
| **Ofs06** | Probe 6 Offset | |
| **Ofs07** | Probe 7 Offset | |
| **Ofs08** | Probe 8 Offset | |
| **Ofs09** | Probe 9 Offset | |
| **Ofs10** | Probe 10 Offset | |
| **AIT01** | Sensor Type of Probe 1 | NTC, PTC, 0-20mA, 4-20mA, 0-10VDC, 0-1VDC, 0-5VDC and CPC Thermistor |
| **AIT02** | Sensor Type of Probe 2 | |
| **AIT03** | Sensor Type of Probe 3 | |
| **AIT04** | Sensor Type of Probe 4 | |
| **AIT05** | Sensor Type of Probe 5 | |
| **AIT06** | Sensor Type of Probe 6 | |
| **AIT07** | Sensor Type of Probe 7 | |
| **AIT08** | Sensor Type of Probe 8 | |
| **AIT09** | Sensor Type of Probe 9 | |
| **AIT10** | Sensor Type of Probe 10 | |
| **AI01_min** | Probe 1 value at min | Configurable depending on sensor function. Scaling only applies to voltage or current type sensors, not used for resistive type. |
| **AI01_max** | Probe 1 value at max | |
| **AI02_min** | Probe 2 value at min | |
| **AI02_min** | Probe 2 value at max | |
| **AI03_min** | Probe 3 value at min | |
| **AI03_max** | Probe 3 value at max | |
| **AI04_min** | Probe 4 value at min | |
| **AI04_max** | Probe 4 value at max | |
| **AI05_min** | Probe 5 value at min | |
| **AI05_max** | Probe 5 value at max | |
| **AI06_min** | Probe 6 value at min | |
| **AI06_max** | Probe 6 value at max | |
| **AI07_min** | Probe 7 value at min | |
| **AI07_max** | Probe 7 value at max | |
| **AI08_min** | Probe 8 value at min | |
| **AI08_max** | Probe 8 value at max | |
| **AI09_min** | Probe 9 value at min | |
| **AI09_max** | Probe 9 value at max | |
| **AI10_min** | Probe 10 value at min | |
| **AI10_max** | Probe 10 value at max | |
| **Defrost Parameters** | | |
| **dET** | Defrost Type | Electric/Hot Gas |

***Table 16-1*** *- iPro Parameter List*

| | | |
|---|---|---|
| **ddr** | Defrost Duration | 1-360 Minutes |
| **MinD** | Defrost minimum Time | 1-60 Minutes |
| **dEd** | Defrost Delay-Amount of time before activation of defrost relay | 0-30 Minutes |
| **dtT** | Defrost Termination Type | Temp/Time |
| **dPC** | Defrost Termination Temp Combination | Avg/Min/Max |
| **dSt** | Defrost Termination Setpoint | 0-99° |
| **DpT** | Dripping Time | 0-30 Minutes |
| **MWT** | Max Wait Time | 0-60 Minutes |
| **dTS** | Defrost Termination Temperature Selection | Defrost Term Sensor/Coil Out Sensor/ Discharge Air |
| **SHDef%** | SH valve defrost operation (XEV20 only) | 0% or 100% |
| **SuctionDef%** | Suction valve defrost operation | 0% or 100% |
| **MinI** | Minimum time between 2 starts of defrost | 1-255 Minutes |
| **SchHour** | Schedule defrost start (Hour) | 0-23 Hour |
| **SchMin** | Schedule defrost start (Minute) | 0-59 Minute |
| **SchPerDay** | Schedule defrost per day | 1-12 Per Day |
| **DefrAmpOn** | Amps required for Defrost status to be considered ON | 0-60 Amps |
| **DefrAmpDel** | Time delay for status change once amps reach threshold | 1-90 Seconds |
| **iPro Digital Input Parameters** | | |
| **DIC01** | Configuration of Digital Input 1 | Defrost Initiation/Door Switch/Clean Switch/Dual Temp/Enable/Aux 1/Aux 2 |
| **DIC02** | Configuration of Digital Input 2 | |
| **DIC03** | Configuration of Digital Input 3 | |
| **DIC04** | Configuration of Digital Input 4 | |
| **DIC05** | Configuration of Digital Input 5 | |
| **DIC06** | Configuration of Digital Input 6 | |
| **DIC07** | Configuration of Digital Input 7 | |
| **DIC08** | Configuration of Digital Input 8 | |
| **DIC09** | Configuration of Digital Input 9 | |
| **DIC10** | Configuration of Digital Input 10 | |
| **DIC11** | Configuration of Digital Input 11 | |
| **DIC12** | Configuration of Digital Input 12 | |
| **DIC13** | Configuration of Digital Input 13 | |
| **DIC14** | Configuration of Digital Input 14 | |
| **DIC15** | Configuration of Digital Input 15 | |
| **DIC16** | Configuration of Digital Input 16 | |
| **DIC17** | Configuration of Digital Input 17 | |
| **DIC18** | Configuration of Digital Input 18 | |
| **DIC19** | Configuration of Digital Input 19 | |
| **DIC20** | Configuration of Digital Input 20 | |

***Table 16-1** - iPro Parameter List*

| | | |
|---|---|---|
| **DIP01** | Polarity of Digital Input 1 | Open/Close |
| **DIP02** | Polarity of Digital Input 2 | |
| **DIP03** | Polarity of Digital Input 3 | |
| **DIP04** | Polarity of Digital Input 4 | |
| **DIP05** | Polarity of Digital Input 5 | |
| **DIP06** | Polarity of Digital Input 6 | |
| **DIP07** | Polarity of Digital Input 7 | |
| **DIP08** | Polarity of Digital Input 8 | |
| **DIP09** | Polarity of Digital Input 9 | |
| **DIP10** | Polarity of Digital Input 10 | |
| **DIP11** | Polarity of Digital Input 11 | |
| **DIP12** | Polarity of Digital Input 12 | |
| **DIP13** | Polarity of Digital Input 13 | |
| **DIP14** | Polarity of Digital Input 14 | |
| **DIP15** | Polarity of Digital Input 15 | |
| **DIP16** | Polarity of Digital Input 16 | |
| **DIP17** | Polarity of Digital Input 17 | |
| **DIP18** | Polarity of Digital Input 18 | |
| **DIP19** | Polarity of Digital Input 19 | |
| **DIP20** | Polarity of Digital Input 20 | |
| **iPro Digital Output Parameters** | | |
| **RLC01** | Configuration of Relay 1 | Light/Fan/Refrigeration/Defrost/Alarm/ Enable |
| **RLC02** | Configuration of Relay 2 | |
| **RLC03** | Configuration of Relay 3 | |
| **RLC04** | Configuration of Relay 4 | |
| **RLC05** | Configuration of Relay 5 | |
| **RLC06** | Configuration of Relay 6 | |
| **RLC07** | Configuration of Relay 7 | |
| **RLC08** | Configuration of Relay 8 | |
| **RLC09** | Configuration of Relay 9 | |
| **RLC10** | Configuration of Relay 10 | |
| **RLC11** | Configuration of Relay 11 | |
| **RLC12** | Configuration of Relay 12 | |
| **RLC13** | Configuration of Relay 13 | |
| **RLC14** | Configuration of Relay 14 | |
| **RLC15** | Configuration of Relay 15 | |

***Table 16-1*** *- iPro Parameter List*

| | | |
|---|---|---|
| **RLP01** | Polarity of Relay 1 | Open/Close |
| **RLP02** | Polarity of Relay 2 | |
| **RLP03** | Polarity of Relay 3 | |
| **RLP04** | Polarity of Relay 4 | |
| **RLP05** | Polarity of Relay 5 | |
| **RLP06** | Polarity of Relay 6 | |
| **RLP07** | Polarity of Relay 7 | |
| **RLP08** | Polarity of Relay 8 | |
| **RLP09** | Polarity of Relay 9 | |
| **RLP10** | Polarity of Relay 10 | |
| **RLP11** | Polarity of Relay 11 | |
| **RLP12** | Polarity of Relay 12 | |
| **RLP13** | Polarity of Relay 13 | |
| **RLP14** | Polarity of Relay 14 | |
| **RLP15** | Polarity of Relay 15 | |
| **RLd01** | Delay of Relay 1 | 0-1200 Seconds |
| **RLd02** | Delay of Relay 2 | |
| **RLd03** | Delay of Relay 3 | |
| **RLd04** | Delay of Relay 4 | |
| **RLd05** | Delay of Relay 5 | |
| **RLd06** | Delay of Relay 6 | |
| **RLd07** | Delay of Relay 7 | |
| **RLd08** | Delay of Relay 8 | |
| **RLd09** | Delay of Relay 9 | |
| **RLd10** | Delay of Relay 10 | |
| **RLd11** | Delay of Relay 11 | |
| **RLd12** | Delay of Relay 12 | |
| **RLd13** | Delay of Relay 13 | |
| **RLd14** | Delay of Relay 14 | |
| **RLd15** | Delay of Relay 15 | |
| **EEPR Parameters** | | |
| **EEPR_MinS** | EEPR - Minimum Steps | 0-50 where 1=10 Steps |
| **EEPR_MaxS** | EEPR - Maximum Steps | 0-800 where 1=10 Steps |
| **EEPR_PeakC** | EEPR - Peak Current (Bipolar only) | 0-100 where 1=10 mA |
| **EEPR_HoldC** | EEPR - Hold Current (Bipolar only) | 0-100 where 1=10 mA |
| **EEPR_StepR** | EEPR - Step Rate | 10-600 Steps |
| **EEPR_ExtraS** | EEPR - Extra Steps the valve is overdriven at each closure | 1-500 Steps |
| **EEPR_RelaxS** | EEPR - Relax Steps-The number of steps the valve is opened after Extra steps | 0-500 Steps |
| **EEPR_PressF** | EEPR - Filter on the pressure | 1-100 Seconds |
| **EEPR_TempF** | EEPR - Filter on the temperature | 1-100 Seconds |
| **EEPR_InitS** | EEPR - Steps Init Regulation | Minimum of 2, maximum adjusts based on MaxS. 1=10 steps |

***Table 16-1*** *- iPro Parameter List*

| | | |
|---|---|---|
| **EEPR_IntervU** | EEPR - Interval of updating-The time between updates for the output position of the valve | 0-60 Seconds |
| **EEPR_MaxP** | EEPR - Max Opening Percentage | 0-100% |
| **EEPR_MinP** | EEPR - Min Opening Percentage | 0-100% |
| **EEPR_TimeInit** | EEPR - Time at Init Steps at the start time | 1-200 Seconds |
| **EEPR_del** | EEPR - Delay before EEPR is 0% caused by system disable | 0-3600 Seconds |
| **EEPR_ExtraS_Cal** | EEPR - Extra steps used for the first calibration after ExtraS_Cal_-Time | 1-2500 Steps |
| **EEPR_LR** | EEPR - Min Regulation Alarm Threshold (rel) | -40-90° relative to case temperature setpoint |
| **EEPR_MR** | EEPR - Max Regulation Alarm Threshold (rel) | 0-90° relative to case temperature setpoint |
| **EEPR_HSHd** | EEPR - High Regulation Alarm Activation Delay | 0-300 Seconds |
| **EEPR_LSHd** | EEPR - Low Regulation Alarm Activation Delay | 0-300 Seconds |
| **EEPR_PB** | EEPR - Proportional Band (if 0, Regulation Auto Adaptive) of Regulation | 0-45° |
| **EEPR_DB** | EEPR - Dead Band of Regulation | -50-50° |
| **EEPR_INC** | EEPR - Integral of Regulation | 0-255 Seconds |
| **EEPR_DER** | EEPR - Derivative of Regulation | 0-255 Seconds |
| **EEPR_ThrD** | EEPR - Threshold of Integral decrease (rel) | -40-90° |
| **EEPR_PercD** | EEPR - Percentage of integral decrease below the threshold | 0-100% |
| **EEPR_ExtraCl** | EEPR - Extra % of valve close in case of low alarm | 0-500 Steps |
| **EEPR_DutyCycle** | EEPR - Valve Duty Cycle | 100% |
| **EEV 1-3 Valve Parameters** | | |
| **EEV1_MinS** | EEV1 - Minimum Steps | 0-50 where 1=10 Steps |
| **EEV1_MaxS** | EEV1 - Maximum Steps | 0-800 where 1=10 Steps |
| **EEV1_PeakC** | EEV1 - Peak Current (Bipolar only) | 0-100 where 1=10 mA |
| **EEV1_HoldC** | EEV1 - Hold Current (Bipolar only) | 0-100 where 1=10 mA |
| **EEV1_StepR** | EEV1 - Step Rate | 10-600 Steps |
| **EEV1_ExtraS** | EEV1 - Extra Steps | 1-500 Steps |
| **EEV1_RelaxS** | EEV1 - Relax Steps | 0-500 Steps |
| **EEV1_PressF** | EEV1 - Filter on the pressure | 1-100 Seconds |
| **EEV1_TempF** | EEV1 - Filter on the temperature | 1-100 Seconds |
| **EEV1_InitS** | EEV1 - Steps Init Regulation | Minimum of 2, maximum adjusts based on MaxS. 1=10 Steps |
| **EEV1_IntervU** | EEV1 - Interval of updating | 0-60 Seconds |
| **EEV1_MaxP** | EEV1 - Max Opening Percentage | 0-100% |
| **EEV1_MinP** | EEV1 - Min Opening Percentage | 0-100% |
| **EEV1_TimeInit** | EEV1 - Time at Init Steps at the start time | 1-200 Seconds |
| **EEV1_del** | EEV1 - Delay before EEV1 is 0% caused by Enable DI | 0-3600 Seconds |
| **EEV1_ExtraS_Ca** | EEV1 - Extra steps used for the first calibration after ExtraS_Cal_-Time | 1-2500 Steps |
| **EEV1_LSH** | EEV1 - Min Superheat Alarm Threshold | 0-Setpoint |
| **EEV1_MSH** | EEV1 - Max Superheat Alarm Threshold | 0-90° |

***Table 16-1** - iPro Parameter List*

| | | |
|---|---|---|
| **EEV1_HSHd** | EEV1 - High Superheat Alarm Activation Delay | 0-300 Seconds |
| **EEV1_LSHd** | EEV1 - Low Superheat Alarm Activation Delay | 0-300 Seconds |
| **EEV1_PB** | EEV1 - Proportional Band (if 0, Regulation Auto Adaptive) of Super-heat | 0-45° |
| **EEV1_DB** | EEV1 - Dead Band of Superheat | -50-50° |
| **EEV1_INC** | EEV1 - Integral of Superheat | 0-255 Seconds |
| **EEV1_DER** | EEV1 - Derivative Superheat | 0-255 Seconds |
| **EEV1_ThrD** | EEV1 - Threshold of Integral decrease | -40-90° |
| **EEV1_PercD** | EEV1 - Percentage of integral decrease below the threshold | 0-100% |
| **EEV1_ExtraCl** | EEV1 - Extra valve close in case of low superheating | 0-500 Steps |
| **EEV1_MOP** | EEV1 - Threshold of MOP | -90-90° |
| **EEV1_LOP** | EEV1 - Threshold of LOP | -90-90° |
| **EEV1_MOPLOPs** | EEV1 - Steps Close/Open in case of MOP/LOP | 1-2500 Steps |
| **EEV1_MOPLOPd** | EEV1 - Delay activation MOP/LOP | 1-300 Seconds |
| **EEV1_DutyCycle** | EEV1 - Valve Duty Cycle | 0-100% |
| **Lighting Control Parameters** | | |
| **LightOnHour** | Scheduled time for lights on (Hour) | 0-23 Hours |
| **LightOnMin** | Scheduled time for lights on (Minute) | 0-59 Minutes |
| **LightOffHour** | Scheduled time for lights off (Hour) | 0-23 Hours |
| **LightOffMin** | Scheduled time for lights off (Minute) | 0-59 Minutes |
| **Other Parameters** | | |
| **CF** | Temperature Measurement Unit | °F or °C |
| **PrU** | Pressure Measurement Unit | PSI/BAR |
| **Fty** | Gas Type | R-22/R-407c/R-134a/R-404a/R-410a/ R-507/R-744 CO2/R-407a |
| **StandaloneCC** | Y=Controller is standalone (no lineup); N=Controller is in a lineup | Yes/No |
| **S1Addr** | Configuration of slave device 1 address | 0-247 |
| **S2Addr** | Configuration of slave device 2 address | |
| **S3Addr** | Configuration of slave device 3 address | |
| **S4Addr** | Configuration of slave device 4 address | |
| **S5Addr** | Configuration of slave device 5 address | |
| **Modbus_Addr** | Configuration of iPro itself | |
| **Baud** | Baud of ModBus communication | 9600/19200 |
| **MSTPMac** | BACnet MS/TP MAC address | 0-255 |
| **MSTPBaud** | BACnet MS/TP Baud rate | 9600/19200 |
| **MSTPMaxMaster** | BACnet maximum master to poll for | 0-127 |
| **MSTPAPDUTime** | BACnet APDU Timeout value | 3-60 Seconds |
| **ExtraS_Cal_Time** | Timer used for first calibration | 0-480 Hours |
| **RackID** | Rack ID | See selection list |
| **CircNum** | Circuit number | 1-999 |
| **CaseID** | Case ID | a-i |
| **Refrigeration Control Parameters** | | |
| **LTSet** | Low Temperature Setpoint | -40-90° |

***Table 16-1*** *- iPro Parameter List*

| | | |
|---|---|---|
| **MTSet** | Medium/Dual Temperature setpoint | -40-90° |
| **DB** | Deadband | 1-45° |
| **CrE** | Control Type | Standard, Suction, Superheat Only, Superheat & Suction |
| **DrE** | Door Enable | Yes/No |
| **Drd** | Door - Refrigeration ON Delay | 0:00-20:00 min:sec |
| **DrA** | Alarm Active Delay | 0:00-20:00 min:sec |
| **CSE** | Clean Switch Active | Yes/No |
| **CSd** | Clean Switch - Refrigeration ON Delay | 0:00-60:00 min:sec |
| **TempMode** | Controller is LT, MT or Dual Temp Capable | LT, MT or Dual Temp |
| **CTM** | Control Temperature Mode-Calculation method for locally connected sensors | Average/Minimum/Maximum |
| **DrMd** | Door operation mode | Alarm/Shutdown |
| **CSMd** | Clean Switch operation mode | Normal/BackOn |
| **SSCP** | Superheat and suction control temperature calculation method | Average/Min/Max-Local or Average/Min/Max-Lineup |
| **SupHtSet** | Superheat setpoint for EEV1-3 | 1-40° |
| **Electronic Valve Parameters** | | |
| **EEV** | EEV driver | Not Used/XEV20D |
| **EEVCnt** | EEV Count | 0-3 Valves |
| **XEV20D-1 V1** | Valve assigned to XEV20_1 Valve 1 position | EEPR or EEV1-3 |
| **XEV20D-1 V2** | Valve assigned to XEV20_1 Valve 2 position | |
| **XEV20D-2 V1** | Valve assigned to XEV20_2 Valve 1 position | |
| **XEV20D-2 V2** | Valve assigned to XEV20_2 Valve 1 position | |
| | **XEV20 Parameters** | |
| **AIC01_1** | XEV20_1 - Configuration of Probe 1 | Not Used/Discharge 1-6/<br>Defrost Term 1-6/Return 1-3/Coil Out 1-3 |
| **AIC02_1** | XEV20_1 - Configuration of Probe 2 | |
| **AIC03_1** | XEV20_1 - Configuration of Probe 3 | |
| **AIC04_1** | XEV20_1 - Configuration of Probe 4 | |
| **Ofs01_1** | XEV20_1 - Probe 1 offset | -100-100 |
| **Ofs02_1** | XEV20_1 - Probe 2 offset | |
| **Ofs03_1** | XEV20_1 - Probe 3 offset | |
| **Ofs04_1** | XEV20_1 - Probe 4 offset | |
| **AIT01_1** | XEV20_1 - Sensor Type of Probe 1 | CPC Thermistor/NTC/PTC/PT1000 |
| **AIT02_1** | XEV20_1 - Sensor Type of Probe 2 | CPC Thermistor/NTC/PTC/PT1000 |
| **AI0304_TYPE_1** | XEV20_1 - Probe 3 and Probe 4 type | Resistive/Voltage/Current |
| **AIT03_1** | XEV20_1 - Sensor Type of Probe 3 | CPC Thermistor/NTC/PTC/PT1000/<br>0-1VDC/0-5VDC/0-10VDC/0-20mA/<br>4-20mA |
| **AIT04_1** | XEV20_1 - Sensor Type of Probe 4 | |
| **AI03_1_min** | XEV20_1 - Probe 3 value at min | Selectable based on probe type |
| **AI03_1_max** | XEV20_1 - Probe 3 value at max | |
| **AI04_1_min** | XEV20_1 - Probe 4 value at min | |
| **AI04_1_max** | XEV20_1 - Probe 4 value at max | |

***Table 16-1*** *- iPro Parameter List*

| | | |
|---|---|---|
| **AIC01_2** | XEV20_2 - Configuration of Probe 1 | Not Used/Discharge 1-6/<br>Defrost Term 1-6/Return 1-3/Coil Out 1-3 |
| **AIC02_2** | XEV20_2 - Configuration of Probe 2 | |
| **AIC03_2** | XEV20_2 - Configuration of Probe 3 | |
| **AIC04_2** | XEV20_2 - Configuration of Probe 4 | |
| **Ofs01_2** | XEV20_2 - Probe 1 offset | -100-100 |
| **Ofs02_2** | XEV20_2 - Probe 2 offset | |
| **Ofs03_2** | XEV20_2 - Probe 3 offset | |
| **Ofs04_2** | XEV20_2 - Probe 4 offset | |
| **AIT01_2** | XEV20_2 - Sensor Type of Probe 1 | CPC Thermistor/NTC/PTC/PT1000 |
| **AIT02_2** | XEV20_2 - Sensor Type of Probe 2 | CPC Thermistor/NTC/PTC/PT1000 |
| **AI0304_TYPE_2** | XEV20_2 - Probe 3 and Probe 4 type | Resistive/Voltage/Current |
| **AIT03_2** | XEV20_2 - Sensor Type of Probe 3 | CPC Thermistor/NTC/PTC/PT1000/<br>0-1VDC/0-5VDC/0-10VDC/0-20mA/<br>4-20mA |
| **AIT04_2** | XEV20_2 - Sensor Type of Probe 4 | |
| **AI03_2_min** | XEV20_2 - Probe 3 value at min | Selectable based on probe type |
| **AI03_2_max** | XEV20_2 - Probe 3 value at max | |
| **AI04_2_min** | XEV20_2 - Probe 4 value at min | |
| **AI04_2_max** | XEV20_2 - Probe 4 value at max | |
| **XEV20_1_VT** | XEV20_1 - Valve Motor Type | Unipolar/Bipolar Wave/Bipolar Normal |
| **XEV20_2_VT** | XEV20_2 - Valve Motor Type | |

***Table 16-1*** *- iPro Parameter List*

# 17 Appendix - iPro Connection Detail