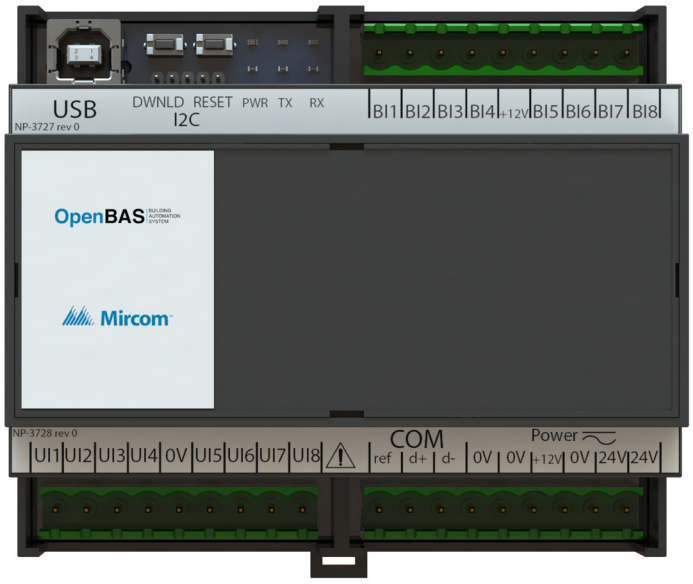
Mircom™

OpenBAS | BUILDING AUTOMATION SYSTEM

# OpenBAS-HV-NXSF

## Building Automation Controller and HVAC Automation Solution




Installation Manual

LT-6600 Rev. 0
June 2017

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# 1.0 Introduction

This document provides information on installing the OpenBAS-HV-NXSF Building Automation Controller.

## 1.1 OpenBAS-HV-NXSF Building Automation Controller

Mircom's OpenBAS-HV-NXSF Series building automation controller is an HVAC controller with an integrated PLC (programmable logic controller) and scheduler. It includes 16 hardware input points, 1 RS-485 field bus connection, 1 USB bus, and 1 $I^2C$ bus. Current transformers can be added to 8 universal inputs to measure current and power.

## 1.2 Features

Mircom's OpenBAS-HV-NXSF Building Automation Controller integrates into Mircom's unified platform for automating HVAC and mechanical rooms as well as incorporating energy management features and lighting control to offer building owners and managers a seamless operation with the following features:

- Modular design to cover any small, medium or large project.
- Industry standard field bus protocols to integrate into any existing BAS system such as: BACnet, Modbus, Optomux, N2-Open, ECM, and ASCII.
- Advanced Networking to integrate into IP networks and use the most advanced features and protocols such as distributed computing, USB and Cloud storage, HTML5, JavaScript, XML, Ajax, SMS, and GSM.
- Universal inputs to connect any industry standard sensors.
- Modular add-ons for every Building Automation System solution.
- The OpenBAS software which provides owners and managers a single solution for managing all their building's automation needs.

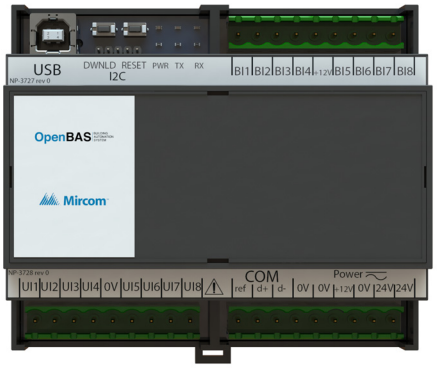
**Caution: Consult this document to learn about potential hazards. Hazards are marked on the controller with the symbol on the left.**

# 2.0 Overview

## 2.1 OpenBAS-HV-NXSF Components

### 2.1.1 Controllers

**Table 1 OpenBAS-HV-NXSF Controllers**

| Picture | Model | Description |
|---|---|---|
|  | OpenBAS-HV-NXSF | HVAC controller<br>• Integrated programmable logic controller and scheduler<br>• 16 hardware input points<br>• 1 RS-485 field bus connection which can be mapped to COM1 or COM2 in the configuration software<br>• Current transformers can be added to 8 universal inputs to measure current and power |

### 2.1.2 Accessories

Accessories are powered from the controller.

**Table 2 OpenBAS-HV-NXSF Accessories**

| Model | Description |
|---|---|
| OpenBAS-ACC-RS485 | Optically isolated RS-485 converter |
| OpenBAS-ACC-RS232 | RS-232 converter |
| OpenBAS-ACC-DB9 | DB9 adapter |
| OBS-ACC-32K128 | 128 KB plus 32 KB memory expansion |
| OpenBAS-ACC-TE1K | 1000 Ω resistive silicon temperature sensor |

### 2.1.3 Compatible Modules

Compatible modules are mounted separately from the controller.

**Table 3 OpenBAS-HV-NXSF Compatible Modules**

| Model | Description |
|---|---|
| OpenBAS-HV-RF433R | Wireless 433 MHz RF receiver that integrates up to 10 wireless transmitters and thermostats into OpenBAS-HV-NXSF controllers<br>Mounts in a DIN rail-mounted box |

**Table 3 OpenBAS-HV-NXSF Compatible Modules (Continued)**

| Model | Description |
|---|---|
| OpenBAS-NWK-ETH3 | Ethernet controller with support for multiple protocols<br>• 2 field bus connections<br>• Mounts in a DIN rail-mounted box<br>• Powered separately |

# 3.0 Installation

**Attention:** **Installation of OpenBAS-HV-NXSF automation controllers should be in accordance with the Canadian Electrical Code or the National Electrical Code, and comply with all local regulations. Final acceptance is subject to the Local Authority Having Jurisdiction (AHJ).**

**If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**

**The safety of any system incorporating this equipment is the responsibility of the assembler of the system.**

**Note:** In case of malfunction or damage, do not make any attempts at repair.

Do not dismantle this product.

This product does not require cleaning and should not be cleaned.

## 3.1 Parts of the Enclosure

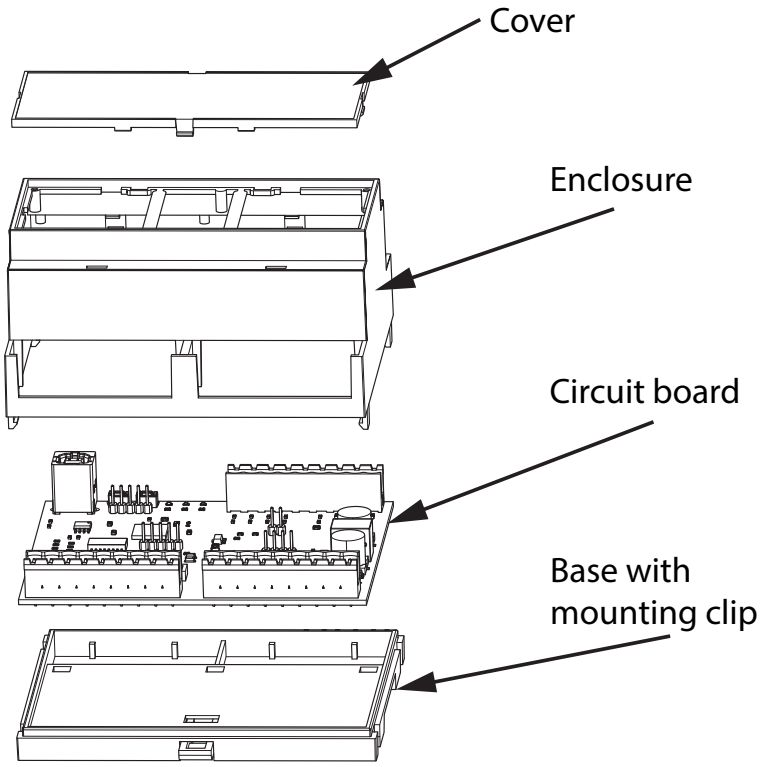



**Figure 1 Parts of the enclosure**

### To remove the circuit board from the enclosure

**Caution:** **Risk of Electric Shock.** Disconnect the mains power and disconnect the controller from all wiring before opening the enclosure.

**Attention:** **Always hold circuit boards by the edges to prevent damage from static electricity. Always wear an anti-static bracelet when handling circuit boards.**

1. Insert a flathead screwdriver in one of the slots on the cover and lever the cover open.
2. Insert a flathead screwdriver under the tabs on the enclosure, shown in Figure 2, in order to lift the tabs and remove the base.

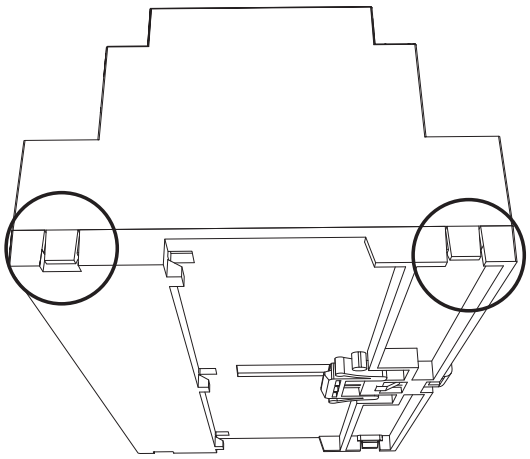


**Figure 2 Tabs on enclosure**

3. Hold the circuit board with one hand, and with the other hand lift the tabs so that you can remove the circuit board from the enclosure. See Figure 3.

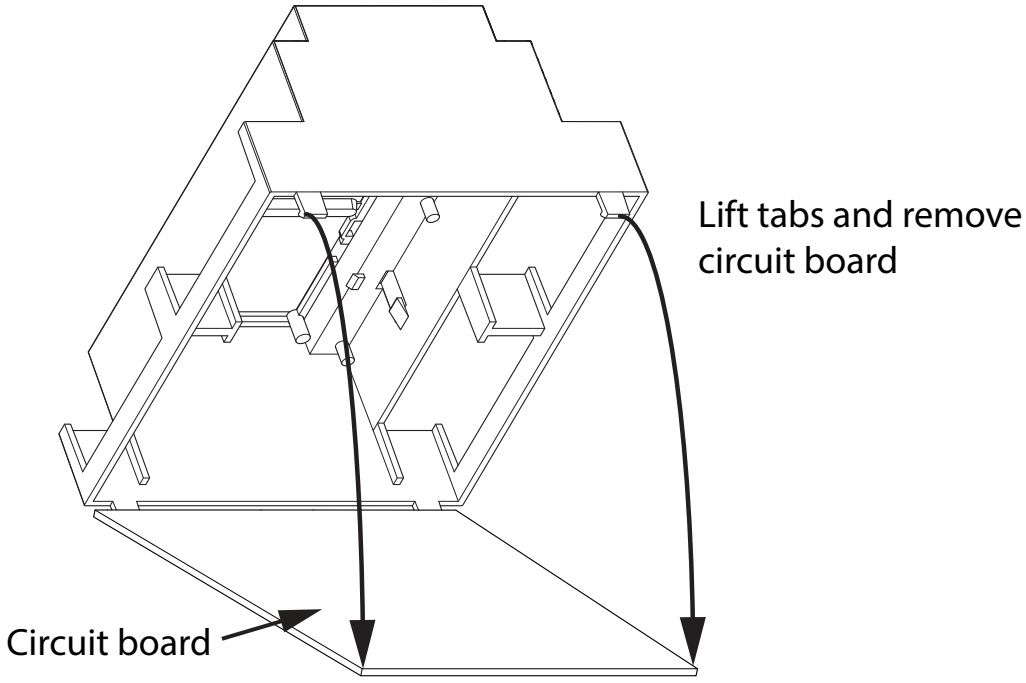



**Figure 3 Lift tabs and remove circuit board**

**Attention: Be careful not to break the tabs. Do not apply excessive force.**

## 3.2 Controller Board Connections

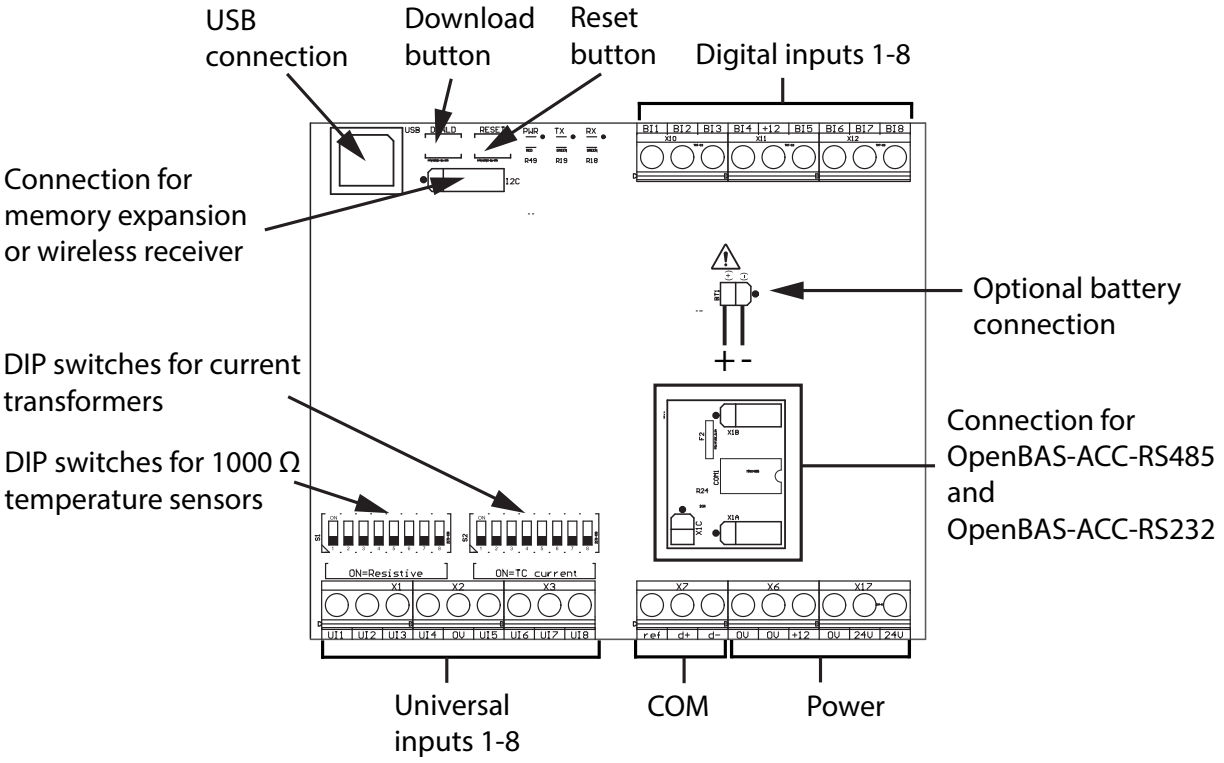



**Figure 4 Board connections**

## 3.3 Installing Accessories

**Attention: This job must be performed only by a certified technician as dangerous voltages might be present inside of the enclosure.**
**Always disconnect the power before installing accessories.**

### 3.3.1 Communication Converters (OpenBAS-ACC-RS485, OpenBAS-ACC-RS232)

By default, the field bus communication terminal (COM in Figure 4) is configured as RS-485 through a factory-installed module. It can be changed to RS-232 or optically isolated RS-485 by removing the factory-installed module and installing the OpenBAS-ACC-RS232 or OpenBAS-ACC-RS485 converter.

Figure 5 shows the location of the factory-installed module.

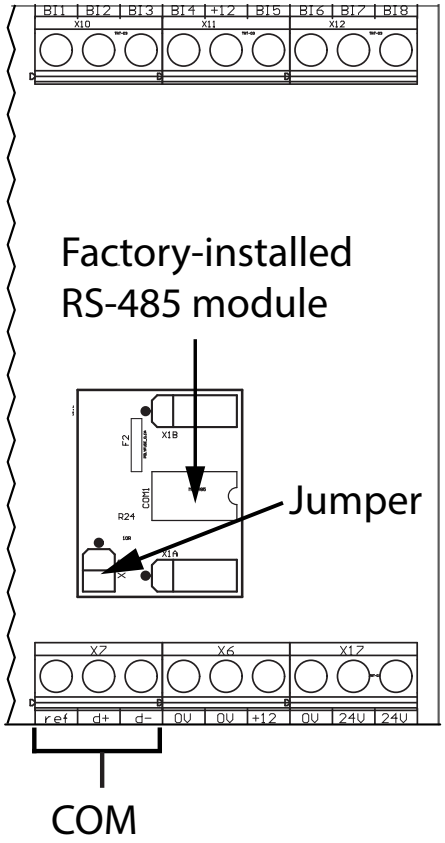



**Figure 5 Location of the factory-installed module and jumper**

### To install a communication converter

1. Open the jumper.
2. Remove the factory-installed RS-485 module.

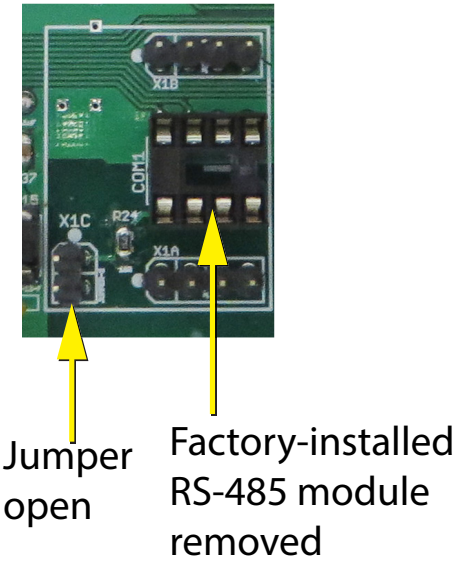



**Figure 6 The jumper and RS-485 module are removed**

3. Install the communication converter.

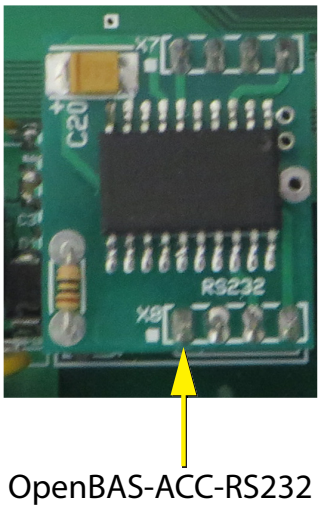



**Figure 7 OpenBAS-ACC-RS232 is installed**

### 3.3.2 Memory Expansion Card (OBS-ACC-32K128) and Wireless Receiver (OpenBAS-HV-RF433R)

Connect the memory expansion card or wireless receiver to the terminal shown in Figure 4. It is labeled I2C.

**Note:** When connecting the I2C ports on 2 devices, connect pin 1 on the first device to pin 1 on the second device. Pin 1 is marked by a dot or a “1”.

## 3.4 DIP Switches

The ON position is up. The DIP switches are set at the factory in the OFF position.

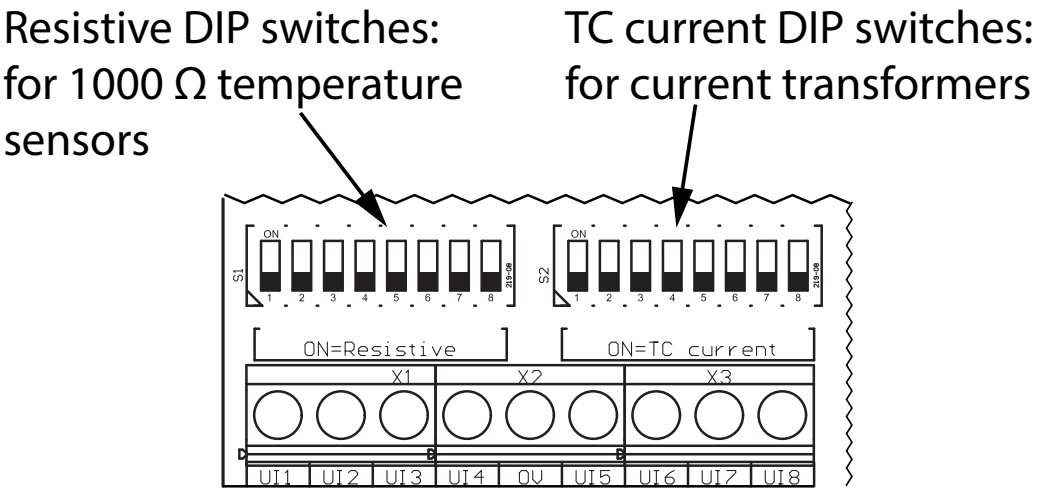



**Figure 8 DIP switches**

### 3.4.1 Resistive DIP Switches: for Resistive 1000 Ω Temperature Sensors

Set the **Resistive** DIP switch on ONLY when the corresponding universal input is connected to a resistive 1000 Ω temperature sensor as described in section 4.3.3 on page 30.

In all other cases, make sure that the **Resistive** DIP switches are off.

If the universal input is connected to a temperature sensor, then the corresponding **TC current** DIP switch must be off.

For example, if you connect universal input 1 to a resistive 1000 Ω temperature sensor, turn on **Resistive** DIP switch 1, and turn off **TC current** DIP switch 1.

In Figure 9, Universal Input 1 is connected to a resistive 1000 Ω temperature sensor, so **Resistive** DIP switch 1 is on and **TC current** DIP switch 1 is off.

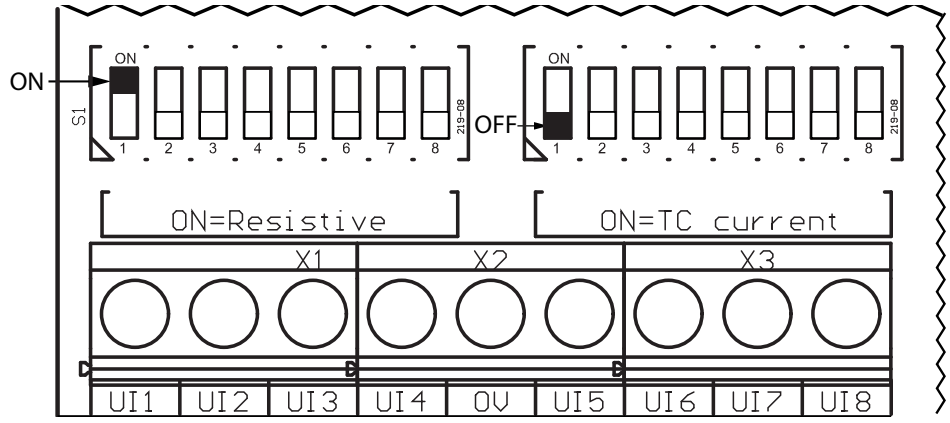



**Figure 9 Universal Input 1 is connected to a resistive 1000 Ω temperature sensor**

### 3.4.2 TC current DIP Switches: for Current and Power Metering

Set the **TC current** DIP switch on ONLY when the corresponding universal input is used to measure current and is connected to a current transformer as described in section 4.3.4 on page 30.

In all other cases, make sure that the **TC current** DIP switches are off.

If the universal input is connected to a current transformer, then the corresponding **Resistive** DIP switch must be off.

For example, if you connect universal input 1 to a current transformer, turn on **TC current** DIP switch 1, and turn off **Resistive** DIP switch 1.

In Figure 10, Universal Input 1 is connected to a current transformer, so **Resistive** DIP switch 1 is off and **TC current** DIP switch 1 is on.

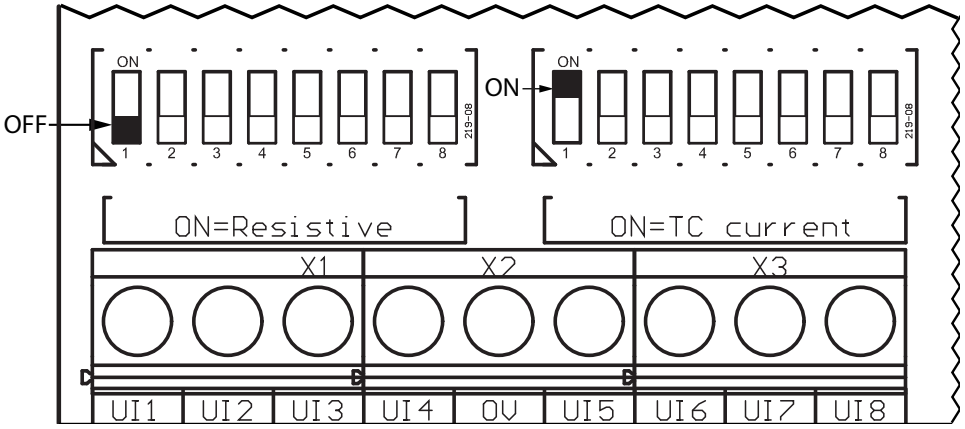



**Figure 10 Universal Input 1 is connected to a current transformer**

### 3.4.3 Set the DIP Switches Off for Analog Voltage Inputs

Set both DIP switches off when the corresponding universal input is used as an analog voltage input as described in section 4.3.2 on page 25.

For example, if you connect universal input 1 to a 12 VDC powered transducer with 1-10 VDC output, turn off **TC current** DIP switch 1, and turn off **Resistive** DIP switch 1.

In Figure 11, Universal Input 1 is connected to a 12 VDC powered transducer with 1-10 VDC output, so **Resistive** DIP switch 1 is off and **TC current** DIP switch 1 is off.

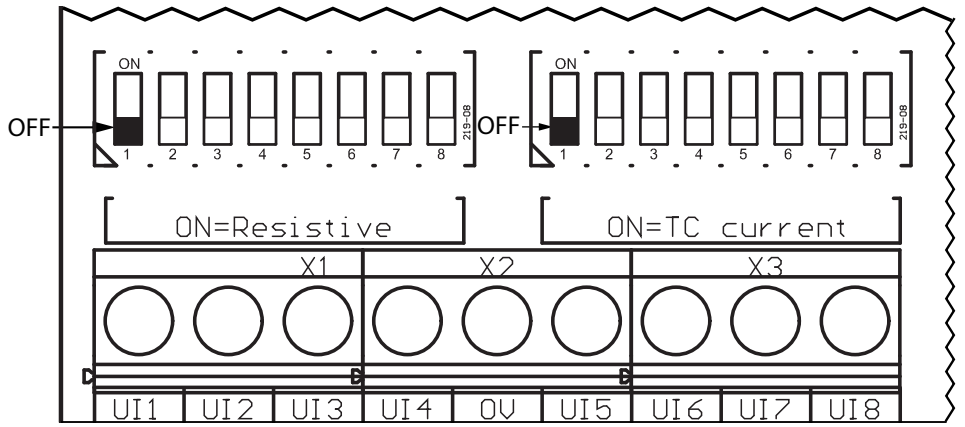



**Figure 11 Universal Input 1 is used as a voltage input**

## 3.5 USB

The full speed USB 2.0 connection is shown in Figure 4. Connect a computer to this port in order to configure the controller.

## 3.6 Reset and Download Buttons

Press the **RESET** button to restart the controller.

The **DWNLD** button is used for loading firmware on to the controller.

Refer to the OpenBAS Programming Manual for information on upgrading controllers.

## 3.7 Optional Battery

**Caution:** **Risk of Electric Shock.** Disconnect the mains power and open the mains breaker before making connections to the OpenBAS-HV-NXSF.

The OpenBAS-HV-NXSF has a connection for an optional battery, shown in Figure 4. Since the OpenBAS-HV-NXSF is normally configured as a slave, it receives the time from the master, so it does not require a battery. Connect a battery if the unit is configured as a master. The Mircom part number for the battery is BT-025.

**Attention:** **Caution – The battery used in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble, heat above 60°C (140°F), or incinerate. Replace battery with FDK Corporation ML2430 batteries only. Use of another battery may present a risk of fire or explosion.**

### To install or replace the battery

1. Disconnect the mains power and open the mains breaker.
2. Disconnect all wiring from the unit.
3. Remove the cover as described on page 11.
4. Disconnect the old battery.
5. Dispose of the used battery promptly. Keep away from children. Do not disassemble and do not dispose of in fire.
6. Connect the new battery to the connector shown in Figure 4. Pay attention to polarity.

## 3.8 Enclosure Dimensions

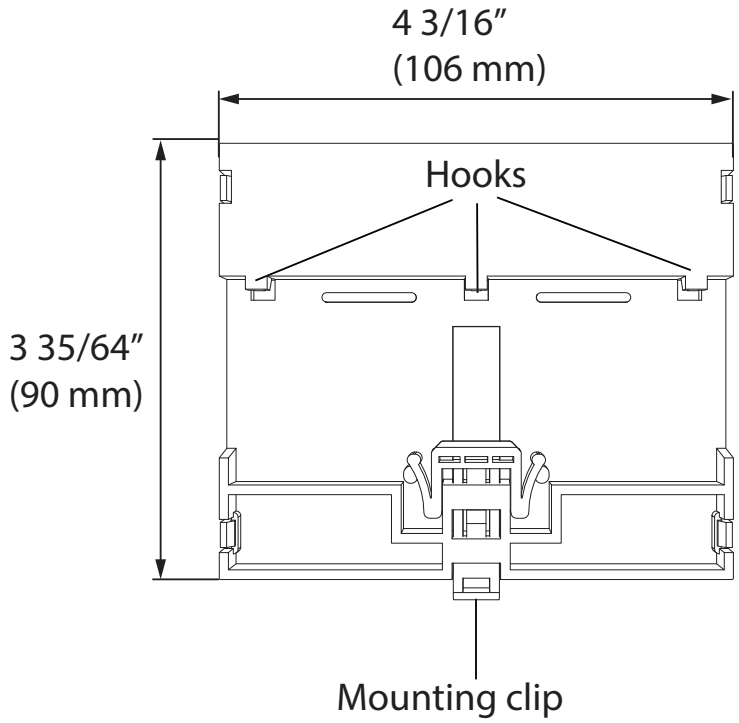



**Figure 12 Enclosure (back view)**

## 3.9 Assembly

### To put the circuit board in the enclosure

1. Hold the circuit board with one hand, and with the other hand lift the tabs so that you can fit the circuit board into the enclosure as shown below.

**Note:** Make sure that the board is the right way up: the terminal labels on the enclosure must match the terminal labels on the circuit board.

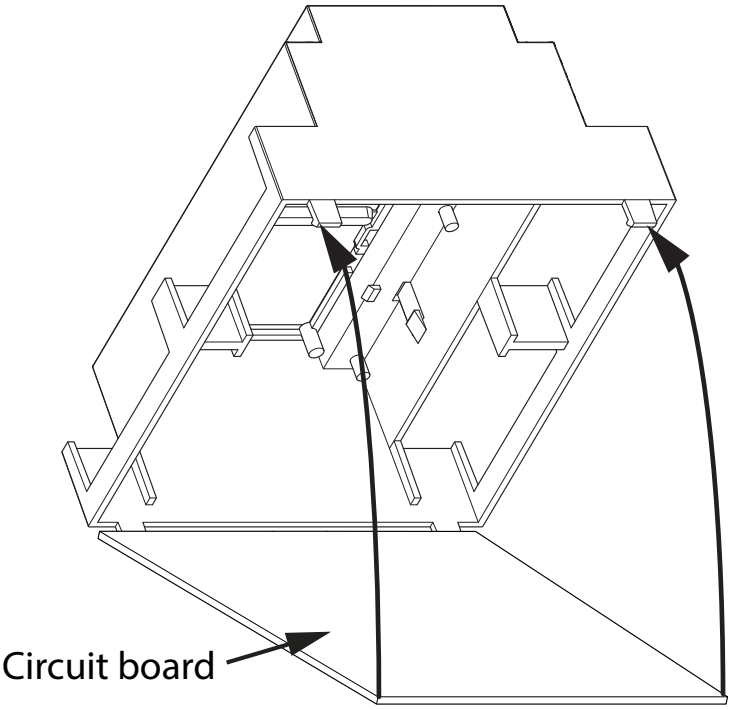



**Figure 13 Fit the circuit board in the enclosure**

2. Snap the base onto the enclosure. Make sure that the mounting clip is on the bottom.
3. Snap the cover onto the enclosure. Make sure that the Mircom logo is the right way up.

**Attention: Always hold circuit boards by the edges to prevent damage from static electricity. Always wear an anti-static bracelet when handling circuit boards.**

## 3.10 Mounting the Enclosure

**Attention: The OpenBAS-HV-NXSF may not be installed in a panel where it exceeds 75% of the wiring space of any cross-sectional area within the panel.**

**Mount the controller 9.6 mm away from adjacent equipment or 12.7 mm away from metal.**

**Mount in a National Recognized Test Laboratory certified enclosure.**

**Do not drill holes in the enclosure or modify the enclosure in any way.**

### To mount the enclosure on a DIN rail

Mount the enclosure with the terminal labels the right way up and the mounting clip on the bottom.

1. Mount a section of DIN rail so that there is enough space for the enclosure to be mounted.
2. Slide the hooks under the rail and push the enclosure to secure it on the DIN rail. The mounting clip locks it in place.

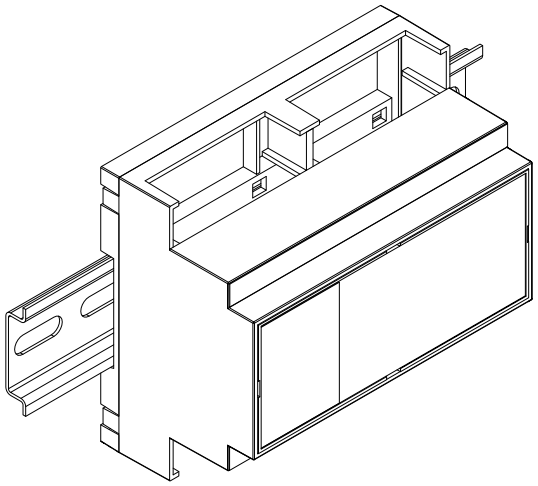


**Figure 14 Enclosure mounted on DIN rail (circuit board not shown)**

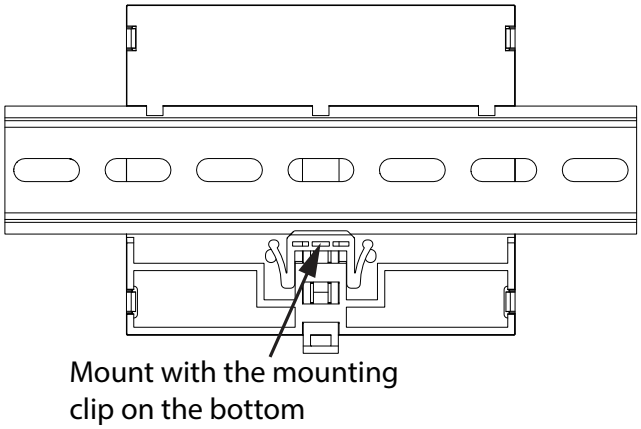



**Figure 15 Enclosure mounted on DIN rail (back view)**

### To remove the enclosure from the DIN rail

- With your hands or with a small flathead screwdriver, pull the mounting clip to release the enclosure from the DIN rail, and carefully pull the enclosure off the DIN rail.

# 4.0 Field Wiring

**Caution:** **Risk of Electric Shock.** Disconnect the mains power and open the mains breaker before making connections to the OpenBAS-HV-NXSF.

**Caution:** Installation of OpenBAS-HV-NXSF controllers must be in accordance with the Canadian Electrical Code or the National Electrical Code, and comply with all local regulations. Appropriate wiring and conduit should be used in compliance with local regulations. Final acceptance is subject to the Local Authority Having Jurisdiction (AHJ).

Due to the high voltages present only certified technicians should install and service the controller.

An appropriate UL listed Class 2 or LPS power supply or transformer with necessary protection devices such as fuses or breakers should be used to limit the risk of fire.

**Attention:** **If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**

## 4.1 Wiring Requirements

Figure 4 on page 13 shows the location of the terminals. The terminals are depluggable for ease of wiring.

Use twisted pair copper wire, 12-24AWG, stripped to 7-8mm and torqued to 0.5 Nm max.

### 4.1.1 Required Tools

Tools needed:

- Precision or jeweler's screwdriver set
- Wire cutter
- Wire stripper

### 4.1.2 Installation Tips

- Perform visual inspection of circuit board and parts for obvious issues.
- Use a wire tie to group wires for easy identification and neatness.

## 4.2 Power Supply Connection

**Caution:** **Risk of Electric Shock.** Disconnect the mains power and open the mains breaker before making connections to the OpenBAS-HV-NXSF.

The OpenBAS-HV-NXSF controller can be powered 3 different ways.

- 24 Vdc, 150 mA max., or 24 Vac 50/60 Hz, 275 mA max., or 12 Vdc, 250 mA max.

When the controller is powered from the **24V** terminal, it can provide 12 VDC power to field devices through the **+12** terminals. In this case, the **+12** terminals provide up to 100 mA combined. The second **+12** terminal is shown in Figure 21 on page 32.

- Use either of the terminals labeled **0V** to connect the negative side of the power supply.
- Use the **+12** or **24V** terminals to daisy chain a shared supply between more than one controller.

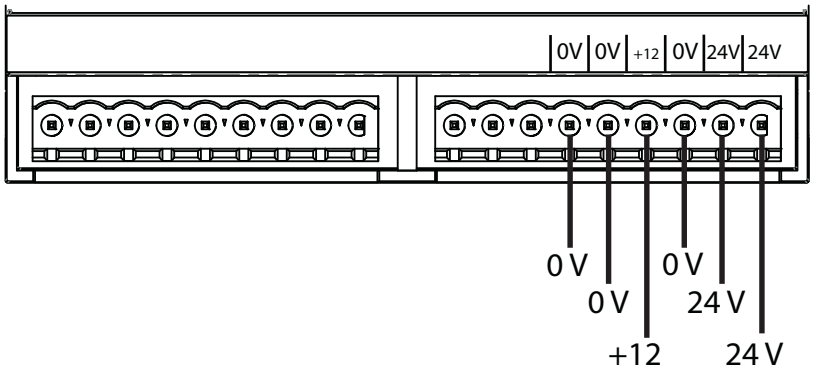



**Figure 16 Power supply - 24 VAC, 24 VDC, +12**

**Caution:** **An appropriate UL listed class 2 power supply or transformer with necessary protection devices such as fuses or breakers should be used to limit the risk of fire. All local codes and regulations for installation must be observed.**

## 4.3 Universal Inputs

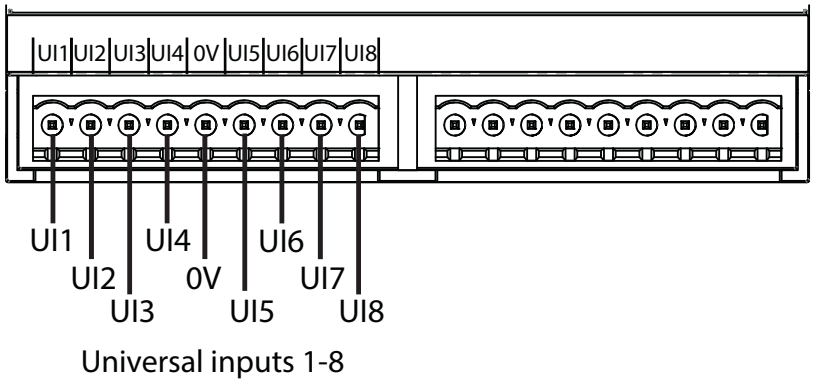



**Figure 17 Universal inputs 1-8**

The controller has 8 universal inputs. Depending on the application, the universal inputs can be used as:

- Analog Voltage Inputs (section 4.3.2 on page 25): 0-10 VDC<br>0-5 VDC<br>0.5-4.5 VDC ratiometric<br>0-20 mA<br>4-20 mA<br>Thermocouple input with x200 amplifiers
- Input for a resistive 1000 Ω temperature sensor (section 4.3.3 on page 30)
- Current and power meters (section 4.3.4 on page 30)
- Digital (binary) inputs for dry contacts being fed by 12 VDC (section 4.5 on page 32)
- Pulse counters active PNP 12 VDC for dry contacts being fed by 12 VDC (section 4.5 on page 32)

### 4.3.1 Tips for Universal Inputs

- Use 18 AWG stranded wire.
- The absolute maximum voltage is 15 VDC. Up to 30 volts can be measured with a 15 kΩ resistor in series (see section section 4.3.4 on page 30).
- Fit the end of the wire with terminal connectors to provide a solid connection that can withstand temperature changes and vibration without becoming loose.
- Connect the common wires of sensors to the **0V** terminals. Use either of the **0V** terminals to connect the common wires of sensors.
- Turn the corresponding **ON=Resistive** DIP switch on ONLY when using resistive 1000 Ω temperature sensors. See section 3.4 on page 15.
- When using 2 or more external power supplies, connect the negatives or commons of both power supplies to the 0V terminal of the controller.

To ensure that the universal inputs operate correctly, follow these guidelines:

- Limit the distance between the analog sensor and the controller to 10 m (30 ft). Mircom recommends shielded wire for noisy environments.
- If this distance is not possible, longer wire runs with shielded wire are allowed up to 30 m (100 ft). Connect the shield to any **0V** terminal on the controller, making sure to isolate the shield on the other end. Failing to do so creates ground loops.
- When possible, route the wiring inside metal piping and ground the piping for better results.
- Avoid running any analog signals near sources of electric noise such as: motors, ballasts, fluorescent lamps, variable frequency drives, high energy contacts, RF (radio frequency) transmitters, microwave ovens, and any other equipment that generates electromagnetic interference.
- Keep a minimum distance of 30 cm (1 ft) between analog input wiring and any conductor carrying more than 24 VAC.
- Follow good wiring and installation practices, and follow all local regulations and electrical codes.

### 4.3.2 Analog Voltage Inputs

Connect any sensor or transducer that outputs 0-5 V, 0.5-4.5 V ratiometric, or 0-10 V directly to the universal inputs when they are configured as analog voltage inputs.

### To use the universal inputs as analog voltage inputs

1. Turn off the corresponding **TC current** DIP switch, and turn off the corresponding **Resistive** DIP switch as described in section 3.4.3 on page 17.
2. Connect the appropriate analog signal to the universal input according to the diagrams below.
3. Configure the analog input type and then calibrate using the OpenBAS software.

**Terminal Labeling on Field Devices**

The positive terminal on field devices might be labeled one of the following:

+ +24 +PWR 24 +DC AC PWR

The negative terminal on field devices might be labeled one of the following:

- 0V GND Neg COM

Table 4 shows how to connect different devices to the analog inputs.

**Attention: When using 2 or more external power supplies, connect the negatives or commons of both power supplies to the 0V terminal of the controller.**

**Table 4 Analog Input Wiring**

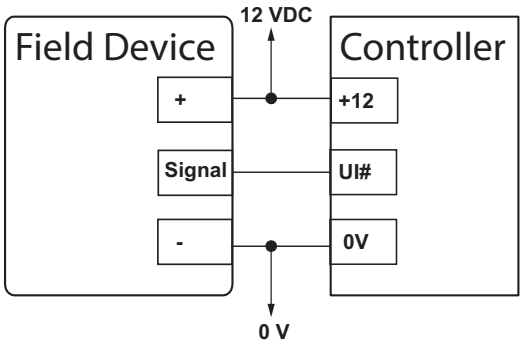
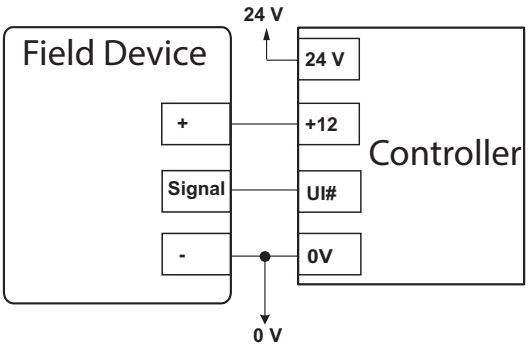
| Type of field device | Power source | Wiring diagram |
|---|---|---|
| 12 VDC powered transducer with 1-10 VDC output | 12 VDC power supply common to field device and controller. |  |
| 12 VDC powered transducer with 1-10 VDC output | 24 VAC or VDC power supply to controller.<br>The controller provides the 12 VDC and a maximum current of 100 mA to the field device. |  |

**Table 4 Analog Input Wiring (Continued)**

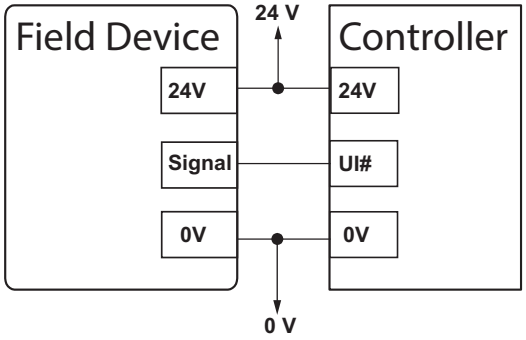
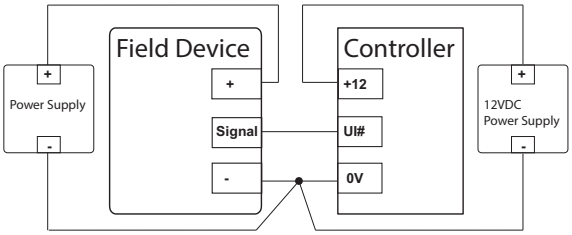
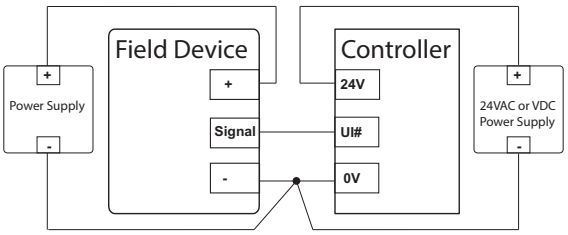
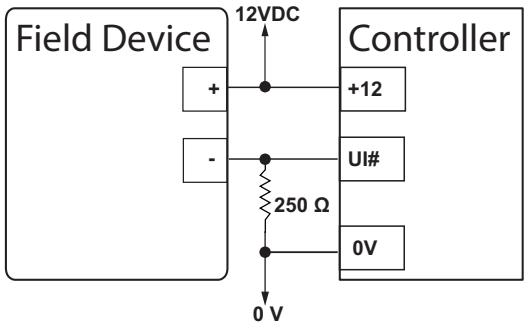
| Type of field device | Power source | Wiring diagram |
|---|---|---|
| 24 V powered transducer with 1-10 VDC output | 24 V external power supply common to field device and controller. Power can be 24 VDC or VAC as required by the field device. |  |
| Transducer with 1-10 VDC output | External power supply for field device (depends on field device requirements) and 12 VDC external power supply for controller.<br>Connect the negative or common of both power supplies to the **0V** terminal of the controller. |  |
| Transducer with 1-10 VDC output | External power supply for field device (depends on field device requirements) and 24 V external power supply for controller.<br>Connect the negative or common of both power supplies to the **0V** terminal of the controller. |  |
| 2-wire transducer with 4-20 mA or 0-20 mA output<br>Connect an external 250 Ω ½ Watt 1% load resistor in parallel between the universal input terminal and **0V** to provide a return path for the transducer signal current. | 12 VDC power supply common to field device and controller. |  |

**Table 4 Analog Input Wiring (Continued)**

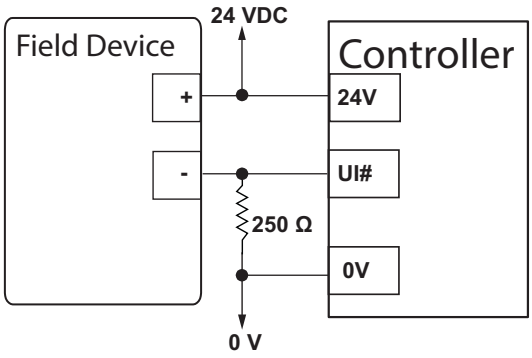
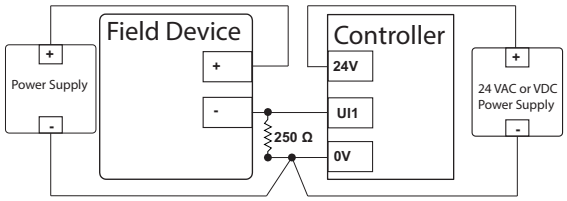
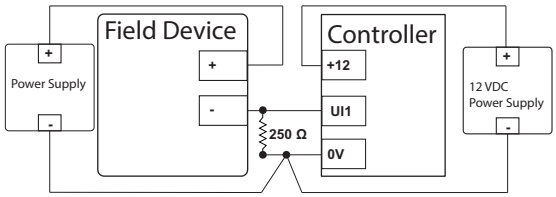
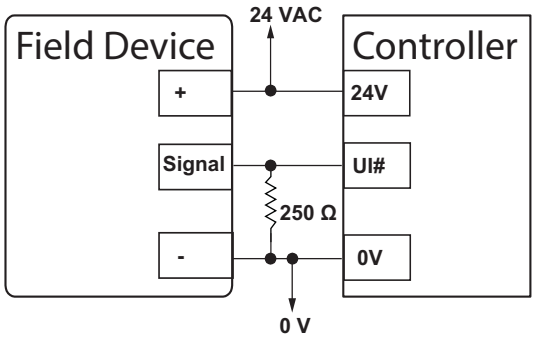
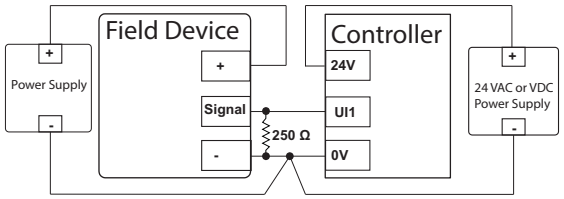
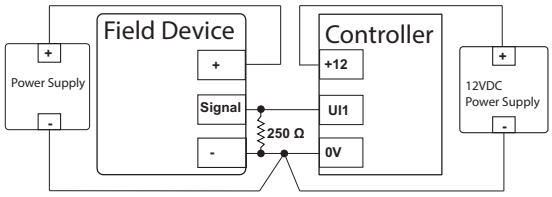
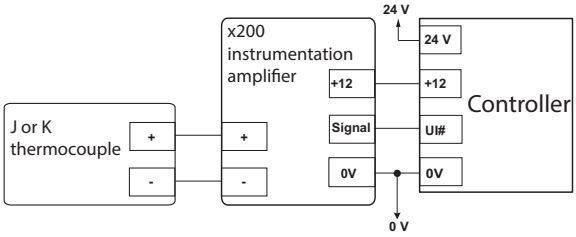
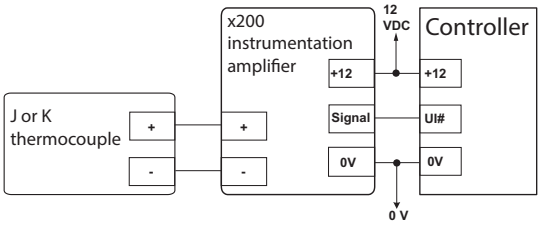
| Type of field device | Power source | Wiring diagram |
|---|---|---|
| 2-wire transducer with 4-20 mA or 0-20 mA output<br>Connect an external 250 Ω ½ Watt 1% load resistor in parallel between the universal input terminal and **0V** to provide a return path for the transducer signal current. | 24 VDC power supply common to field device and controller. |  |
| 2-wire transducer with 4-20 mA or 0-20 mA output<br>Connect an external 250 Ω ½ Watt 1% load resistor in parallel between the universal input terminal and **0V** to provide a return path for the transducer signal current. | External power supply for field device (depends on field device requirements) and 24 V external power supply for controller.<br>Connect the negative or common of both power supplies to the **0V** terminal of the controller. |  |
| 2-wire transducer with 4-20 mA or 0-20 mA output<br>Connect an external 250 Ω ½ Watt 1% load resistor in parallel between the universal input terminal and **0V** to provide a return path for the transducer signal current. | External power supply for field device (depends on field device requirements) and 12 VDC external power supply for controller.<br>Connect the negative or common of both power supplies to the **0V** terminal of the controller. |  |
| 3-wire transducer with 4-20 mA or 0-20 mA output<br>Connect an external 250 Ω ½ Watt 1% load resistor in parallel between the universal input terminal and **0V** to provide a return path for the transducer signal current. | 24 VAC power supply common to field device and controller. |  |

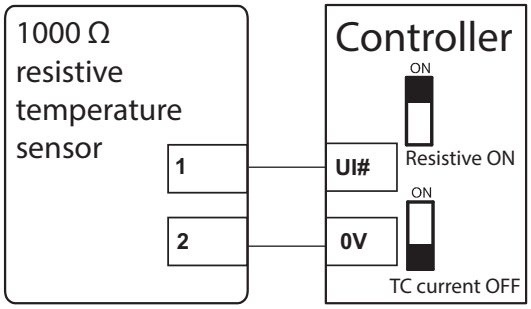
**Table 4 Analog Input Wiring (Continued)**

| Type of field device | Power source | Wiring diagram |
|---|---|---|
| 3 wire transducer with 4-20 mA or 0-20 mA output<br>Connect an external 250 Ω ½ Watt 1% load resistor in parallel between the universal input terminal and **0V** to provide a return path for the transducer signal current. | External power supply for field device (depends on field device requirements) and 24 V external power supply for controller.<br>Connect the negatives or commons of both power supplies to the 0V terminal of the controller. |  |
| 3 wire transducer with 4-20 mA or 0-20 mA output<br>Connect an external 250 Ω ½ Watt 1% load resistor in parallel between the universal input terminal and **0V** to provide a return path for the transducer signal current. | External power supply for field device (depends on field device requirements) and 12 VDC external power supply for controller.<br>Connect the negatives or commons of both power supplies to the 0V terminal of the controller. |  |
| J or K Thermocouples<br>When using J or K thermocouples, install a x200 low offset amplifier. | 24 VAC or VDC power supply to controller.<br>The controller provides the 12 VDC and a maximum current of 100 mA to the field device. |  |
| J or K Thermocouples<br>When using J or K thermocouples, install a x200 low offset amplifier. | 12 VDC power supply common to field device and controller. |  |

### 4.3.3 Resistive 1000 Ω Temperature Sensor

For resistive temperature sensors, the corresponding **Resistive** DIP switch must be ON and the **TC current** DIP switch must be off. See section 3.4.1 on page 16.

**Table 5 Wiring a 1000 Ω temperature sensor**

| Type of field device | Power source | Wiring diagram |
|---|---|---|
| 1000 Ω nickel or silicon resistive temperature sensor, for instance OpenBAS-ACC-TE1K or a positive temperature coefficient | N/A |  |



### 4.3.4 Current and Power Meters

**Note:** Use UL Listed Energy Monitor Current Transformers rated at 100 mA max. secondary.

Connect 18 AWG min., 600 V min. insulated wiring for Line voltages and Neutral to the appropriate locations in the breaker panel, in accordance with all national and local electrical codes.

The neutral of the mains supply system monitored by the OpenBAS-HV-NXSF must be earthed.

**Caution:** **Risk of Electric Shock.** Disconnect the mains power and open the mains breaker before making connections to the OpenBAS-HV-NXSF.

**Attention:** **When you use the universal inputs to measure current, set the corresponding Resistive DIP switch off and set the corresponding TC current DIP switch on. See section 3.4.2 on page 17.**

Universal inputs 1 to 8 can also be used to measure current and power. They can accept a secondary current of 100 mA.

Figure 18 shows a current transformer connected to universal input 1. In this case, **Resistive** DIP switch 1 must be off, and **TC current** DIP switch 1 must be on.

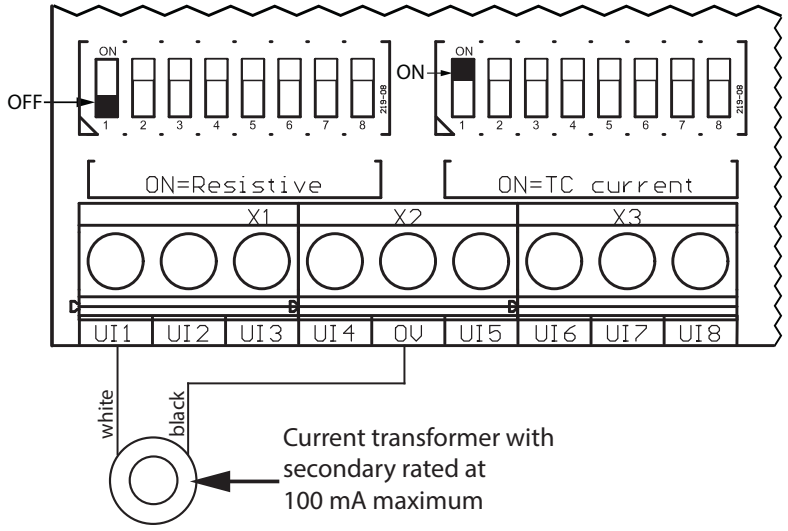



**Figure 18 Wiring for 1 current transformer**

Figure 19 shows 2 current transformers connected to universal inputs 1 and 2. **Resistive** DIP switches 1 and 2 are off, and **TC current** DIP switches 1 and 2 are on.

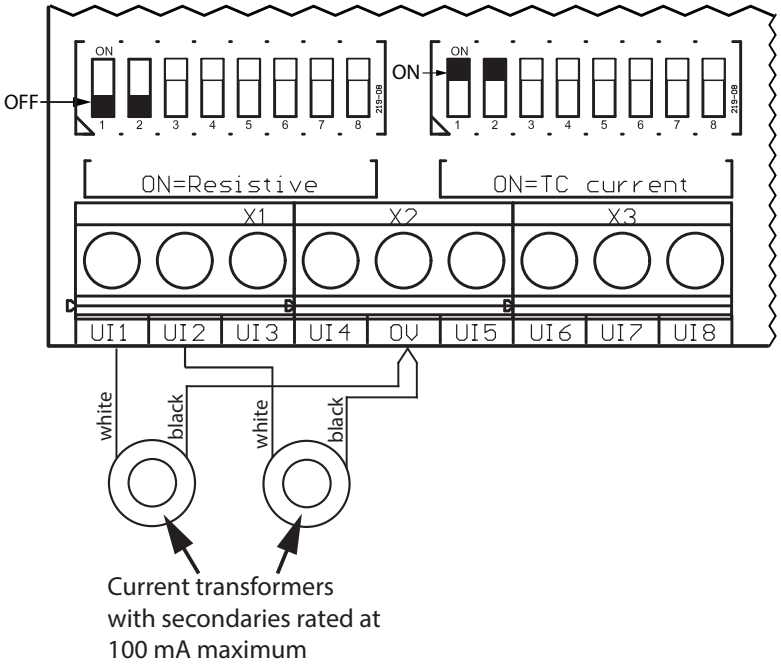



**Figure 19 Wiring for 2 current transformers**

## 4.4 Measuring up to 30 VDC with Universal or Digital Inputs

If you want to measure 24 VDC voltages, add a 15 kΩ ½ Watt 1% resistor in series with the higher voltage to be measured. See Figure 20.

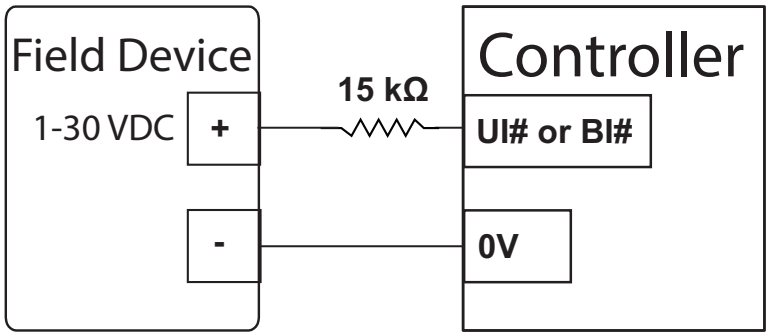



**Figure 20 Measuring up to 30 VDC**

**Caution: Only DC voltages can be connected to the inputs. Applying AC voltages or inverting the polarity will provide incorrect readings, and can eventually damage the inputs.**

## 4.5 Digital Inputs

In addition to the 8 universal inputs, the controller has 8 additional inputs which are digital only, for a maximum of 16 digital inputs. This section applies to **both** the 8 digital-only inputs shown in Figure 21, and to the 8 universal inputs when they are configured as digital inputs.

The digital inputs can receive up to 30 volts with a 15 kΩ resistor in series.

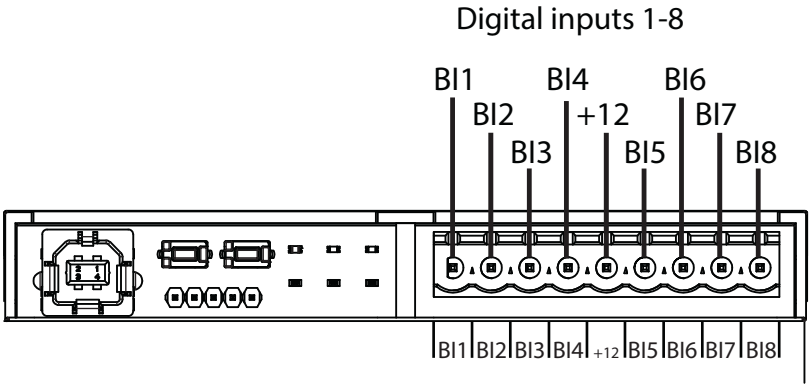



**Figure 21 Digital inputs 1-8**

The digital inputs have the following ranges:

- **ZERO (0)** is valid for an input voltage between 0 to 4 VDC
- **ONE (1)** is valid for an input voltage between 8 to12 VDC

Any voltage that lies between 4.1 to 7.9 V can give ambiguous results and must be avoided. See Figure 22.

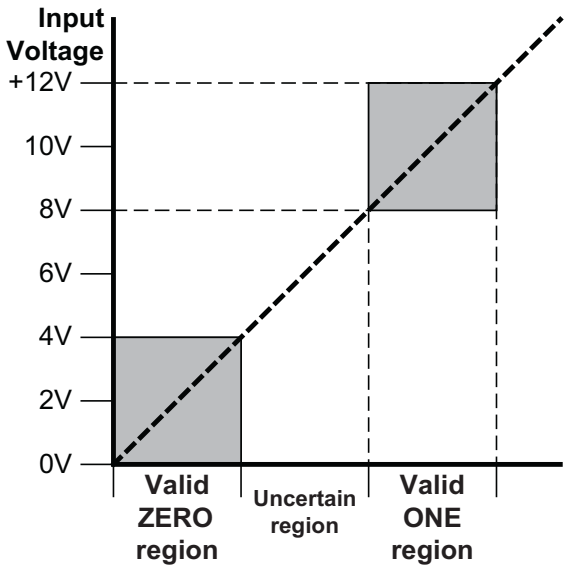



**Figure 22 Digital input voltage range**

The digital inputs can be used as frequency or pulse counters with these specifications:

- Digital inputs 1-2 can measure square wave or pulsed signals. The maximum measurable frequency is 250 Hz (15,000 pulses per minute). The minimum pulse width detectable is 2 milliseconds.
- Digital inputs 3-8 can measure frequencies up to 10 Hz (600 pulses per minute). The minimum pulse width detectable is 50 milliseconds.

Dry contact, push buttons, magnetic reed switches or PNP transistors must supply voltage to the digital input for correct operation.

**Table 6 Digital Input Wiring**

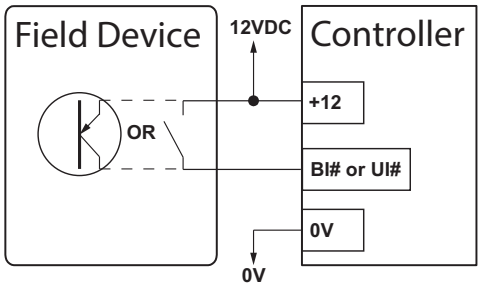
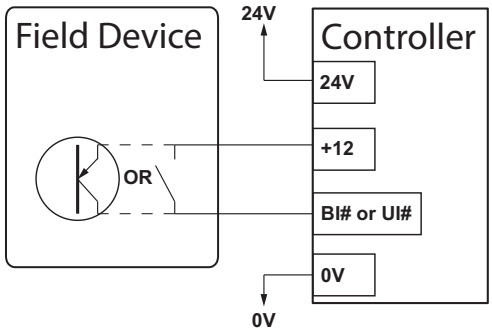
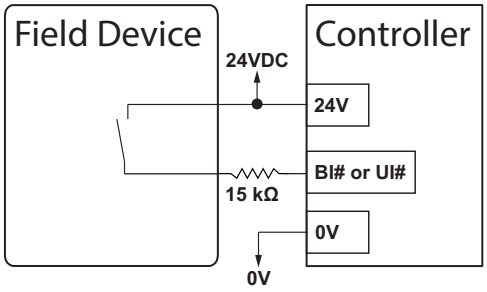
| Type of field device | Power source | Wiring diagram |
|---|---|---|
| Dry contact switch or high switched PNP transistor<br>**Note:** If you use a PNP transistor, the voltage must be DC. | External 12 VDC power supply to feed the dry contact switches |  |

**Table 6 Digital Input Wiring (Continued)**

| Type of field device | Power source | Wiring diagram |
|---|---|---|
| Dry contact switch or high switched PNP transistor<br>**Note:** If you use a PNP transistor, the voltage must be DC. | 12 VDC generated by the controller |  |
| Dry contact switch | 24 VDC power supply to feed the dry contact switches |  |

## 4.6 Field Bus Connection

The field bus connection is shown in Figure 23.

The port can be mapped to COM1 or COM2 in the configuration software depending on the protocol. The list of supported protocols is in chapter 5.

This connection allows the field replacement of the RS-485 modules with the OpenBAS-ACC-RS485 optically isolated RS-485 module or OpenBAS-ACC-RS232 conversion module. See section 3.3.1 on page 13.

To avoid intermittent communication blackouts, the isolation provided by the OpenBAS-ACC-RS485 module is highly recommended for noisy environments, and to prevent damage to the boards in extreme cases, especially if the OpenBAS-HV-NXSF controller is inside an enclosure containing high voltage wiring.

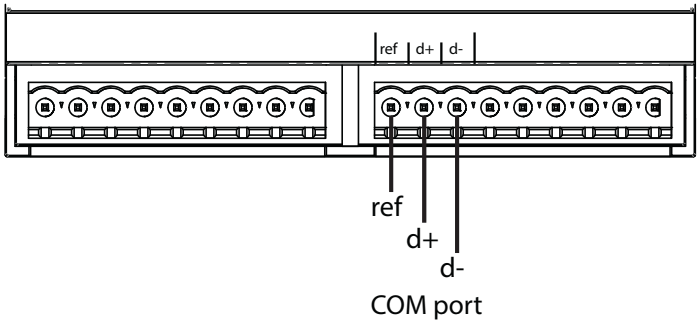



**Figure 23 COM port**

### 4.6.1 OpenBAS-ACC-DB9

OpenBAS-ACC-DB9 is a DB9 adapter which is installed in the COM port.

## 4.7 Networking

Figure 24 shows how to add a controller to a network with OpenBAS-NWK-ETH3.

OpenBAS-NWK-ETH3 connects to the RS-485 connection on the OpenBAS-HV-NXSF controller. See section 4.7.1 for information on the RS-485 ports.

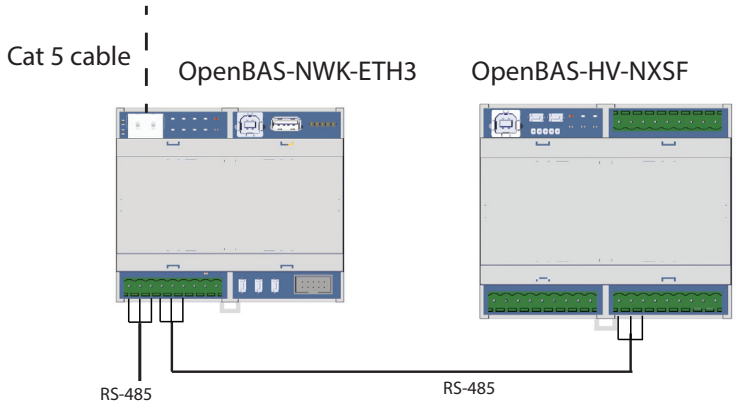



**Figure 24 Networking with OpenBAS-NWK-ETH3**

### 4.7.1 RS-485 Details

Figure 25 shows 3 controllers networked with RS-485 on the COM port.

- 22 AWG twisted pair
- Maximum length: 1219.2 m (4000 feet)
- Mircom recommends shielded cable

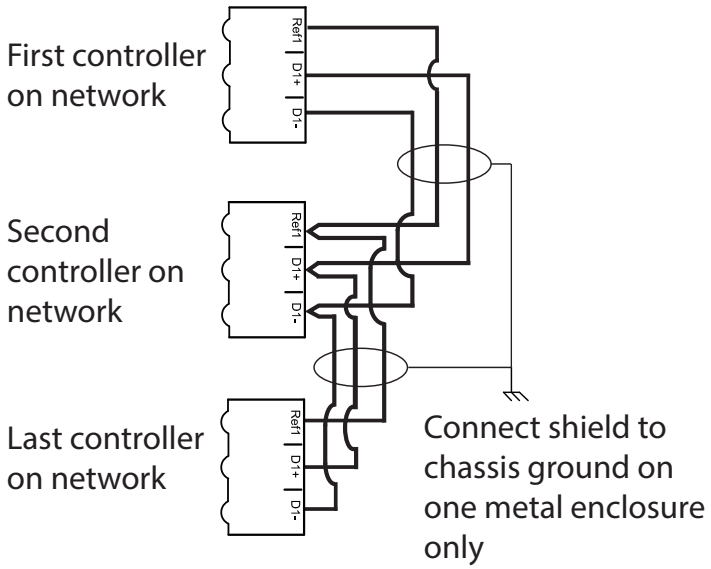



**Figure 25 Networking with RS-485**

## 4.8 LEDs

- PWR: Is red when the unit is powered
- TX and RX: Flash green to indicate communication through the field bus port

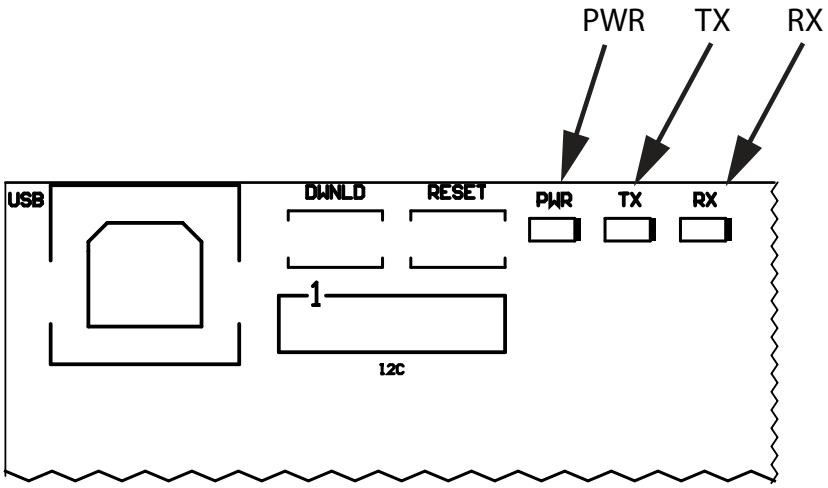



**Figure 26 LEDs**

# 5.0 Specifications

| | |
|---|---|
| **Standards:** | UL 61010-1, 3rd Edition, May 11, 2012, Revised July 15 2015<br>CAN/CSA-C22.2 No. 61010-1-12, 3rd Edition, Revision dated July 2015<br>IEC 61010-1:2010 (Third Edition)<br>IEC/EN 61010-1:2010 (Third Edition) |
| **Input:** | ≂ 24 Vdc, 150 mA max., or 24 Vac 50/60 Hz, 275 mA max., or 12 Vdc, 250 mA max.<br>Overvoltage Category II<br>Mains supply voltage fluctuations not to exceed ± 10 percent of the nominal voltage |
| **Output:** | 12 Vdc, 100 mA max. (when 24V powered) |
| **Power Supply Protection:** | Resettable fuse 0.30 A |
| **Optional Battery:** | FDK Corporation ML2430<br>Type: lithium<br>Nominal capacity: 100 mAh<br>Nominal voltage: 3 V<br>Mircom part number: BT-025 |

| | |
|---|---|
| **8 Universal Inputs:**<br><br>**Class 2 / LPS Limited Energy** | **Used as analog inputs:**<br>• 0-10 VDC<br>• 0-5 VDC<br>• 0.5-4.5 VDC ratiometric<br>• 0-20 mA<br>• 4-20 mA<br>• 1000 Ω temperature sensor<br>• Thermocouple input with x200 amplifiers<br>**Used as digital inputs**<br>• 0-12 VDC<br>• The absolute maximum voltage is 15 VDC. Can receive up to 30 VDC with the addition of a 15 kΩ ½ Watt 1% resistor in series<br>**Used as frequency or pulse counters:**<br>• Digital inputs 1-2 can measure square wave or pulsed signals. The maximum measurable frequency is 250 Hz (15,000 pulses per minute). The minimum pulse width detectable is 2 milliseconds.<br>• Digital inputs 3-8 can measure frequencies up to 10 Hz (600 pulses per minute). The minimum pulse width detectable is 50 milliseconds.<br>**Used as current and power meters:**<br>• Measurement Category CAT III<br>• Use UL Listed Energy Monitor Current Transformers rated at 100 mA max. secondary<br>**Used to measure voltages:**<br>• The absolute maximum voltage is 15 VDC. Can measure up to 30 VDC with the addition of a 15 kΩ ½ Watt 1% resistor in series with the higher voltage to be measured |
| **8 Digital Inputs:**<br><br>**Class 2 / LPS Limited Energy** | **Range:**<br>• 0-12 VDC<br>• The absolute maximum voltage is 15 VDC. Can receive up to 30 VDC with the addition of a 15 kΩ ½ Watt 1% resistor in series<br>**Used as frequency or pulse counters:**<br>• Digital inputs 1-2 can measure square wave or pulsed signals. The maximum measurable frequency is 250 Hz (15,000 pulses per minute). The minimum pulse width detectable is 2 milliseconds.<br>• Digital inputs 3-8 can measure frequencies up to 10 Hz (600 pulses per minute). The minimum pulse width detectable is 50 milliseconds.<br>**Used to measure voltages:**<br>• The absolute maximum voltage is 15 VDC. Can measure up to 30 VDC with the addition of a 15 kΩ ½ Watt 1% resistor in series with the higher voltage to be measured |

| | |
|---|---|
| **Communication Ports:** | 1 RS-485 port supporting the following protocols:<br>• BACnet/MSTP<br>• Modbus/RTU-Slave<br>• Modbus/RTU-Master<br>• N2-Open<br>• Optomux<br>• N2/O22-master<br>• ASCII<br>• ECM<br>Can be configured as RS-232 or optically isolated RS-485<br>BAUD Rate: 2400, 4800, 9600, 19200, 38400, 76800<br>1 USB 2.0 port supporting the following protocols:<br>• Optomux<br>• ASCII<br>1 $I^2C$ port for memory expansion or OpenBAS-HV-RF433R |
| **Physical Characteristics:** | Weight: 0.14 kg (0.30 lb)<br>Enclosure dimensions: 106 mm x 90 mm x 58 mm (4 3/16" x 3 35/64" x 2 17/64”) |
| **Ambient Conditions:** | Operating Temperature: 0° to 40°C (32° to 104°F)<br>Maximum Relative Humidity: 80 percent for temperatures up to 31°C decreasing linearly to 50 percent relative humidity at 40°C<br>Indoor Use Only |
| **Mounting:** | Mount the controller 9.6 mm away from adjacent equipment or 12.7 mm away from metal<br>Mount in a National Recognized Test Laboratory certified enclosure |
| **Cleaning:** | This product does not require cleaning and should not be cleaned |
| **Pollution Degree:** | 2 |

# 6.0 Master Warranty and Warning Information

## Terms & Interpretation

In this document the term **MGC System** refers to all fire alarm, nurse call, and building automation products manufactured by Mircom Group of Companies, Mircom Technologies Ltd., MGC Systems Corp or subsidiaries and affiliates and includes specific systems such as MiCare™, OpenBAS™, and FlexNet™. Moreover, the term **MGC System** extends to cover all component parts and software used within such products.

## Warning Please Read Carefully

All **MGC Systems** are subject to terms and conditions of sale as follows:

## Note to Installers

This warning contains vital information. As the only individual in contact with system users, it is your responsibility to bring each item in this warning to the attention of the users of this MGC System. Failure to properly inform system end-users of the circumstances in which the system might fail may result in over-reliance upon the system. As a result, it is imperative that you properly inform each customer for whom you install the system of the possible forms of failure.

## System Failures

All **MGC Systems** have been carefully designed to be as effective as possible. However, there are circumstances where they may not provide protection. Some reasons for system failure include:

***Inadequate Installation***

All **MGC Systems** must be installed in accordance with all the applicable codes and standards in order to provide adequate protection. National standards require an inspection and approval to be conducted by the Local Authority Having Jurisdiction following the initial installation of the system and following any changes to the system. Such inspections ensure installation has been carried out properly.

***Inadequate Testing***

Most problems that would prevent an alarm a **MGC System** from operating as intended can be discovered by regular testing and maintenance. The complete system should be tested by the Local Authority Having Jurisdiction immediately after a fire, storm, earthquake, accident, or any kind of construction activity inside or outside the premises. The testing should include all sensing devices, keypads, consoles, alarm indicating devices and any other operational devices that are part of the system.

**IMPORTANT NOTE:** End-users of the system must take care to ensure that the system, batteries, telephone lines, etc. are tested and examined on a regular basis to minimize system failure.

***System Users***

It is important that all system users be trained in the correct operation of the alarm system and that they know how to respond when the system indicates an alarm.

A **MGC System** may not function as intended during an emergency situation where the user is unable to operate a panic or emergency switch by reason of permanent or temporary physical disability, inability to reach the device in time, unfamiliarity with the correct operation, or related circumstances.

***Insufficient Time***

There may be circumstances when a **MGC System** will operate as intended, yet the occupants will not be protected from the emergency due to their inability to respond to the warnings in a timely manner. If the system is monitored, the response may not occur in time enough to protect the occupants or their belongings.

Moreover, smoke detectors may not provide timely warning of fires caused by carelessness or safety hazards such as smoking in bed, violent explosions, escaping gas, improper storage of flammable materials, overloaded electrical circuits, children playing with matches or arson.

***Power Failure***

Some **MGC System** components require adequate electrical power supply to operate. Examples include: smoke detectors, beacons, HVAC, and lighting controllers. If a device operates only by AC power, any interruption, however brief, will render that device inoperative while it does not have power. Power interruptions of any length are often accompanied by voltage fluctuations which may damage **MGC Systems** or other electronic equipment. After a power interruption has occurred, immediately conduct a complete system test to ensure that the system operates as intended.

***Battery Failure***

If the **MGC System** or any device connected to the system operates from batteries it is possible for the batteries to fail. Even if the batteries have not failed, they must be fully charged, in good condition, and installed correctly.

**MGC Systems** with wireless transmitters use replaceable batteries. The system is designed to provide several years of battery life under normal conditions. The expected battery life is a function of the device environment, usage and type. Ambient conditions such as high humidity, high or low temperatures, or large temperature fluctuations may reduce the expected battery life. While each transmitting device has a low battery monitor which identifies when the batteries need to be replaced, this monitor may fail to operate as expected. Regular testing and maintenance will keep the system in good operating condition.

***Physical Obstructions***

Motion sensors that are part of a **MGC System** must be kept clear of any obstacles which impede the sensors' ability to detect movement. Signals being communicated by a **MGC System** may not reach the receiver if an item (such as metal, water, or concrete) is placed on or near the radio path. Deliberate jamming or other inadvertent radio signal interference can also negatively affect system operation.

Moreover, **MGC Systems** may fail to operate as intended if motion, heat, or smoke sensors are not triggered. Sensors in a fire system may fail to be triggered when the fire is in a chimney, walls, roof, or on the other side of closed doors; and, smoke and heat detectors may

not detect smoke or heat from fires on another level of the residence or building. In this situation the control panel may not alert occupants of a fire.

Sensors in a nurse call system may fail to be triggered when movement is occurring outside of the motion sensors' range. For example, if movement is occurring on the other side of closed doors or on another level of the residence or building the motion detector may not be triggered. In this situation the central controller may not register an alarm signal.

***Other Impairments***

Similarly, Alarm Notification Appliances such as sirens, bells, horns, or strobes may not warn or waken a sleeping occupant if there is an intervening wall or door. It is less likely that the occupants will be alerted or awakened when notification appliances are located on a different level of the residence or premise.

Audible notification appliances may be interfered with by other noise sources such as stereos, radios, televisions, air conditioners, appliances, or passing traffic. Audible notification appliances, however loud, may not be heard by a hearing- impaired person.

***Software***

Most **MGC Systems** contain software. With respect to those products, MGC does not warrant that the operation of the software will be uninterrupted or error-free or that the software will meet any other standard of performance, or that the functions or performance of the software will meet the user's requirements. MGC shall not be liable for any delays, breakdowns, interruptions, loss, destruction, alteration or other problems in the use of a product arising out of, or caused by, the software.

***Telephone Lines***

Telephone service can cause system failure where telephone lines are relied upon by a **MGC System**. Alarms and information coming from an **MGC System** may not be transmitted if a phone line is out of service or busy for a certain period of time. Alarms and information may not be transmitted where telephone lines have been compromised by criminal tampering, local construction, storms or earthquakes.

***Component Failure***

Although every effort has been made to make this **MGC System** as reliable as possible, the system may fail to function as intended due to the failure of a component.

***Security and Insurance***

Regardless of its capabilities, no **MGC System** is a substitute for property or life insurance. Nor is the system a substitute for property owners, renters, or other occupants to act prudently to prevent or minimize the harmful effects of an emergency situation.

Moreover, building automation systems produced by MGC are not to be used as a fire, alarm, or life safety systems.

# Warranty

## Limited Warranty

Mircom Technologies Ltd., MGC Systems Corp. and MGC System International Ltd. together with their subsidiaries and affiliates (collectively, MGC) warrants the original purchaser that for a period of three years from the date of manufacture, proprietary manufactured product shall be free of defects in materials and workmanship, under normal use. During the warranty period, MGC shall, at its option, repair or replace any defective product upon return of the product to its factory, at no charge for labor and materials. **Non-proprietary, third party or OEM product shall be warranted in accordance with the warranty period of the manufacturer. Any replacement and/or repaired parts are warranted for the remainder of the original warranty or ninety (90) days, whichever is longer.** The original owner must promptly notify MGC in writing that there is defect in material or workmanship, such written notice to be received in all events prior to expiration of the warranty period.

## International Warranty

The warranty for international customers is the same as for any customer within Canada and the United States, MGC shall not be responsible for any customs fees, taxes, or VAT that may be due.

## Conditions to Void Warranty

This warranty applies only to defects in parts and workmanship relating to normal use. It does not cover:

- damage incurred in shipping or handling;
- damage caused by disaster such as fire, flood, wind, earthquake or lightning;
- damage due to causes beyond the control of MGC such as excessive voltage, mechanical shock or water damage;
- damage caused by unauthorized attachment, alterations, modifications or foreign objects;
- damage caused by peripherals (unless such peripherals were supplied by MGC);
- defects caused by failure to provide a suitable installation environment for the products;
- damage caused by use of the products for purposes other than those for which it was designed;
- damage from improper maintenance;
- damage arising out of any other abuse, mishandling or improper application of the products.

## Warranty Procedure

To obtain service under this warranty, please return the item(s) in question to the point of purchase. All authorized distributors and dealers have a warranty program. Anyone returning goods to MGC must first obtain an authorization number. MGC will not accept any shipment whatsoever for which prior authorization has not been obtained. NOTE: Unless specific pre-authorization in writing is obtained from MGC management, no credits will be issued for custom fabricated products or parts or for complete fire alarm system. MGC will at its sole option, repair or replace parts under warranty. Advance replacements for such items must be purchased.

Note: MGC's liability for failure to repair the product under this warranty after a reasonable number of attempts will be limited to a replacement of the product, as the exclusive remedy for breach of warranty.

## Disclaimer of Warranties

This warranty contains the entire warranty and shall be in lieu of any and all other warranties, whether expressed or implied (including all implied warranties of merchantability or fitness for a particular purpose) and of all other obligations or liabilities. MGC neither assumes nor authorizes any other person purporting to act on its behalf to modify or to change this warranty, or to assume for it any other warranty or liability concerning this product.

This disclaimer of warranties and limited warranty are governed by the laws of the province of Ontario, Canada.

## Out of Warranty Repairs

MGC will at its option repair or replace out-of-warranty products which are returned to its factory according to the following conditions. Anyone returning goods to MGC must first obtain an authorization number. MGC will not accept any shipment whatsoever for which prior authorization has not been obtained.

Products which MGC determines to be repairable will be repaired and returned. A set fee which MGC has predetermined and which may be revised from time to time, will be charged for each unit repaired.

Products which MGC determines not to be repairable will be replaced by the nearest equivalent product available at that time. The current market price of the replacement product will be charged for each replacement unit.

The foregoing information is accurate as of the date of publishing and is subject to change or revision without prior notice at the sole discretion of the Company.

WARNING: MGC recommends that the entire system be completely tested on a regular basis. However, despite frequent testing, and due to, but not limited to, criminal tampering or electrical disruption, it is possible for this product to fail to perform as expected.

**NOTE: UNDER NO CIRCUMSTANCES SHALL MGC BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES BASED UPON BREACH OF WARRANTY, BREACH OF CONTRACT, NEGLIGENCE, STRICT LIABILITY, OR ANY OTHE LEGAL THEORY. SUCH DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, LOSS OF PROFITS, LOSS OF THE PRODUCT OR ANY ASSOCIATED EQUIPMENT, COST OF CAPITAL, COST OF SUBSTITUTE OR REPLACEMENT EQUIPMENT, FACILITIES OR SERVICES, DOWN TIME, PURCHASER'S TIME, THE CLAIMS OF THIRD PARTIES, INCLUDING CUSTOMERS, AND INJURY TO PROPERTY.**

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www.mircomgroup.com

TECHNICAL SUPPORT
North America
Tel: (888) Mircom5
(888) 647-2665
International
Tel: (905) 647-2665

U.S.A
4575 Witmer Industrial Estates
Niagara Falls, NY 14305
Tel: (888) 660-4655
(905) 660-4655
Fax: (905) 660-4113

CANADA - Main Office
25 Interchange Way
Vaughan, ON L4K 5W3
Tel: (888) 660-4655
(905) 660-4655
Fax: (905) 660-4113