



IE-NODE

INDUSTRIAL ETHERNET NODE 1
8 CONTACT/NTC TEMPERATURE INPUTS &
2 PULSED/4-20 mA INPUTS

COMMUNICATION PROTOCOLS -
PROFINET, ETHERNET/IP & MODBUS TCP/IP



INSTALLATION INSTRUCTIONS

OPERATION MANUAL

Part No.'s - ETH-NODE1V46C, ETH-NODE1V4C

Hardware Version R4 - Software Version 4.1.X - Ethernet 00.02.X

www.go4b.com/usa

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⚠ DANGER



Exposed buckets and moving parts will cause severe injury or death.

Lockout power before removing cover or inspection door.

⚠ WARNING



Moving parts can crush and cut.

Lockout power before removing guard or servicing.

Do NOT operate with guard removed

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1. CUSTOMER SAFETY RESPONSIBILITIES

4B appreciates your business and is pleased you have chosen our products to meet your needs.

Please read in its entirety and understand the literature accompanying the product before you place the product into service. Please read the safety precautions carefully before operating the product. With each product you purchase from 4B, there are some basic but important safety considerations you must follow to be sure your purchase is permitted to perform its design function and operate properly and safely, giving you many years of reliable service. Please read and understand the Customer Safety Responsibilities listed below. Failure to follow this safety directive and the Operation Manuals and other material furnished or referenced, may result in serious injury or death.

SAFETY NOTICE TO OUR CUSTOMERS

- A. In order to maximize efficiency and safety, selecting the right equipment for each operation is vital. The proper installation of the equipment, and regular maintenance and inspection is equally important in continuing the proper operation and safety of the product. The proper installation and maintenance of all our products is the responsibility of the user unless you have asked 4B to perform these tasks.
- B. All installation and wiring must be in accordance with Local and National Electrical Codes and other standards applicable to your industry. (Please see the article "Hazard Monitoring Equipment Selection, Installation and Maintenance" at www.go4b.com.) The installation of the wiring should be undertaken by an experienced and qualified professional electrician. Failure to correctly wire any product and/or machinery can result in the product or machine failing to operate as intended, and can defeat its design function.
- C. Periodic inspection by a qualified person will help assure your 4B product is performing properly. 4B recommends a documented inspection at least annually and more frequently under high use conditions.
- D. Please see the last page of this manual for all warranty information regarding this product.

CUSTOMER SAFETY RESPONSIBILITIES

1. READ ALL LITERATURE PROVIDED WITH YOUR PRODUCT

Please read all user, instruction and safety manuals to ensure that you understand your product operation and are able to safely and effectively use this product. If the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

2. YOU BEST UNDERSTAND YOUR NEEDS

Every customer and operation is unique, and only you best know the specific needs and capabilities of your operation. Please call the 24-hour hotline at 309-698-5611 for assistance with any questions about the performance of products purchased from 4B. 4B is happy to discuss product performance with you at any time.

3. SELECT A QUALIFIED AND COMPETENT INSTALLER

Correct installation of the product is important for safety and performance. If you have not asked 4B to perform the installation of the unit on your behalf, it is critical for the safety of your operation and those who may perform work on your operation that you select a qualified and competent electrical installer to undertake the installation. The product must be installed properly to perform its designed functions. The installer should be qualified, trained, and competent to perform the installation in accordance with Local and National Electrical Codes, all relevant OSHA Regulations, as well as any of your own standards and preventive maintenance requirements, and other product installation information supplied with the product. You should be prepared to provide the installer with all necessary installation information to assist in the installation.

4. ESTABLISH AND FOLLOW A REGULAR MAINTENANCE AND INSPECTION SCHEDULE FOR YOUR 4B PRODUCTS

You should develop a proper maintenance and inspection program to confirm that your system is in good working order at all times. You will be in the best position to determine the appropriate frequency for inspection. Many different factors known to the user will assist you in deciding the frequency of inspection. These factors may include but are not limited to weather conditions; construction work at the facility; hours of operation; animal or insect infestation; and the real-world experience of knowing how your employees perform their jobs. The personnel or person you select to install, operate, maintain, inspect or perform any work whatsoever, should be trained and qualified to perform these important functions. Complete and accurate records of the maintenance and inspection process should be created and retained by you at all times.

5. RETAIN AND REFER TO THE OPERATION MANUAL FOR 4B'S SUGGESTED MAINTENANCE AND INSPECTION RECOMMENDATIONS

As all operations are different, please understand that your specific operation may require additional adjustments in the maintenance and inspection process essential to permit the monitoring device to perform its intended function. Retain the Operation Manual and other important maintenance and service documents provided by 4B and have them readily available for people servicing your 4B equipment. Should you have any questions, please call the free 24-hour hotline number (309-698-5611).

6. SERVICE REQUEST

If you have questions or comments about the operation of your unit or require the unit to be serviced please contact the 4B location who supplied the product or send your request via fax (309-698-5615) or call us via our 24-hour hotline number in the USA (309-698-5611). Please have available product part numbers, serial numbers, and approximate date of installation. In order to assist you, after the product has been placed into service, complete the online product registration section which is accessed via our website www.go4b.com/usa.

⚠ WARNING

- Rotating machinery can cause serious injury or death
- Always lockout and tagout the machine prior to installation

2. PRODUCT OVERVIEW

The Industrial Ethernet Node 1 (IE-NODE) is a remote sensor monitoring device designed to work alongside a PLC or other control systems. The unit has 10 total sensor inputs - 8 shared contact or NTC temperature inputs, and 2 configurable pulse or 4-20 mA (current loop) inputs.

However, the IE-NODE can be expanded up to 16 sensor inputs with the installation of an optional expansion board. The board provides space for 6 additional NTC, contact or 4-20 mA inputs.

The IE-NODE operates by reading its sensor inputs and sending processed data when requested by another system (e.g. PLC). The unit is equipped with an RJ45 Ethernet socket and supports PROFINET, EtherNet/IP and Modbus TCP/IP protocols for easy integration with Siemens, Allen-Bradley Rockwell, Modicon and other PLC's or automation devices.

The IE-NODE can be used with the following 4B sensors:

Temperature (Bearing & Surface) -

- ADB Series (NTC Type)
- Milli-Temp Series (4-20 mA)

Belt Alignment -

- Touchswitch (Contact)

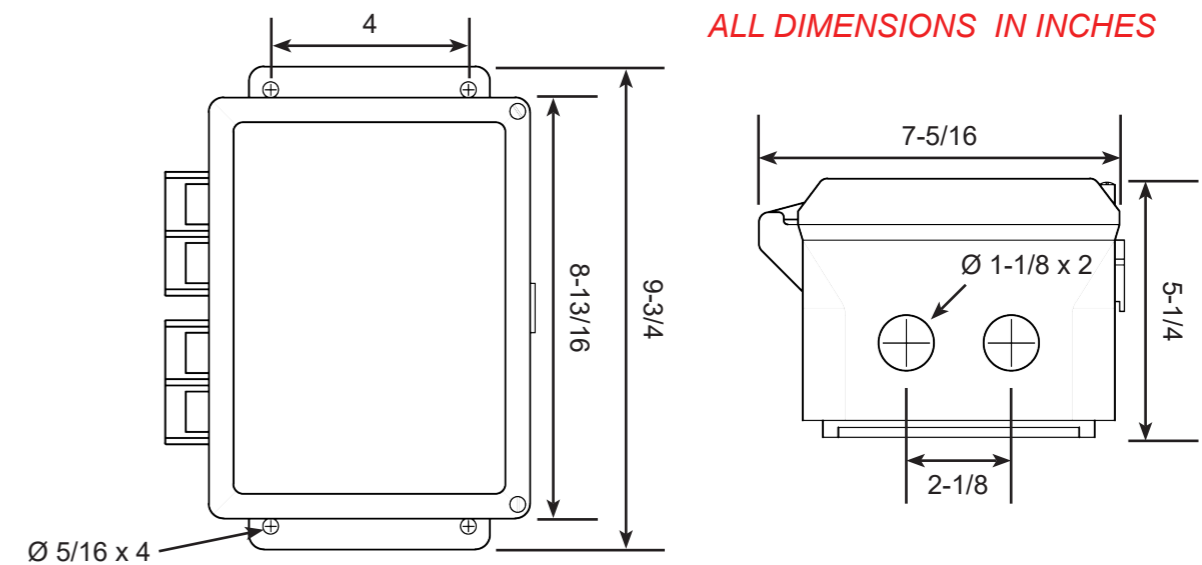
Speed Switch -

- Milli-Speed Switch (4-20 mA)
- M800 Elite Speed Switch (Pulse)
- P300 Proximity Sensor (4 Wire Version - Pulse)
- P800 Proximity Sensor (4 Wire Version - Pulse)

3. SPECIFICATIONS

Supply Voltage -	120 to 240 VAC (ETH-NODE1V46C) 24 VDC (ETH-NODE1V4C)
Power Dissipation -	12 Watts Maximum
Sensor Supply -	24 VDC @ 800 mA (Across Fuse 1 - Fuse 4)
Power Terminals -	14 AWG / 2.5 mm ²
Signal Terminals -	16 AWG / 2.5 mm ²
Communication Protocols -	PROFINET, EtherNet/IP and Modbus TCP/IP
Height -	9.7 in. (246 mm)
Width -	7.4 in. (188 mm)
Depth -	4 in. (102 mm)
Fixing Centers -	8.75 x 4 in. (222 x 102 mm)
Cable Entry -	2 Holes - 1-1/8 in. (28 mm) Diameter - 3/4 in. Conduit
Weight -	2.5 lbs / 1.1 kg
Protection -	IP66
Approvals -	CSA Class II Div 2 Groups F and G T130°C Tamb -20°C to +50°C ATEX & CE (Versions Available)

4. DIMENSIONS



5. INSTALLATION

The IE-NODE should be installed in an area with network Ethernet access.

ENCLOSURE INSTALLATION -

1. Use the correct cable, glands and sealing arrangement in accordance to local installation codes.
2. Where other certified components are used as part of the assembly or installation procedure, the user must take in to account any limitations which might be listed on the relevant certificates.
3. The box is supplied with 2 x 1-1/8 inch (28 mm) pre drilled holes in the bottom face. All unused entry apertures must be sealed using component certified stopping plugs.

NOTE: Special Consideration when installed in a Class II, Div 2 environment: In order to connect conduit to the control unit enclosure, use a CSA and/or UL certified Class II conduit hub (for example, a Myers™ hub) with a suitable bonding (grounding) connection that is rated for the installation environment.

4. The enclosure must not be modified in any way, as this will invalidate the certification.
5. All wiring must be carried out in accordance with relevant codes of practice and / or instructions.

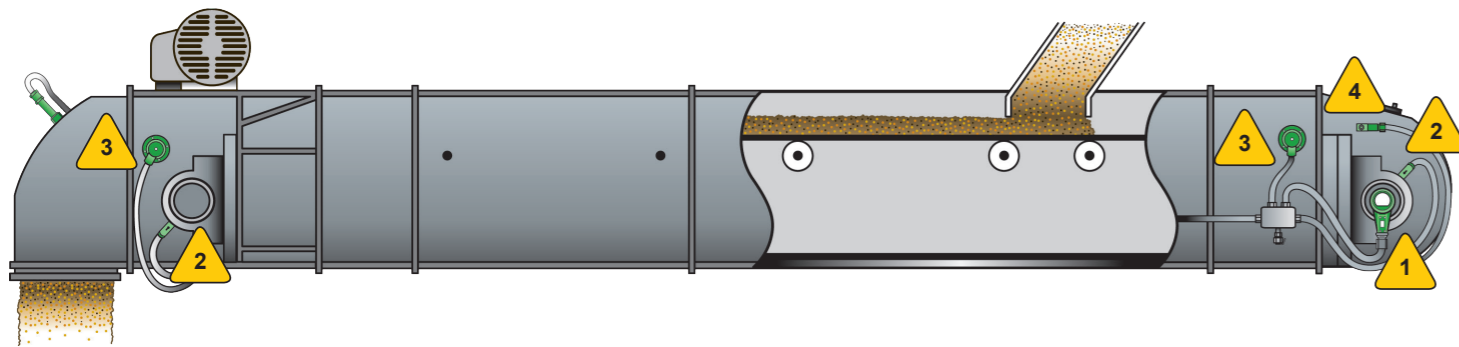
NOTE: Special Consideration when installed in a Class II, Div 2 environment: Power input and output (I/O) wiring shall be in accordance with Class II, Div 2 wiring methods per the National Electrical Code (NFPA70) for installations within the US and per the Canadian Electrical Code (CEC) for installations in Canada.

6. The voltage, current and maximum power dissipation on the units label must not be exceeded.
7. The wiring installation must extend to within 1 mm of the metal face of the terminal, and all leads must be insulated for the appropriate voltage.
8. Not more than one or multiple strand cable is to be connected to any terminal unless multiple conductors have previously been joined in a suitable manner (e.g. boot lace ferrule) such that they present a single connection point to the terminal.
9. The sensor terminals use a screwless push in spring design, a small flat-head or straight screwdriver can be used to gently push in the tab to terminate the sensor wires.

SENSOR INSTALLATION -

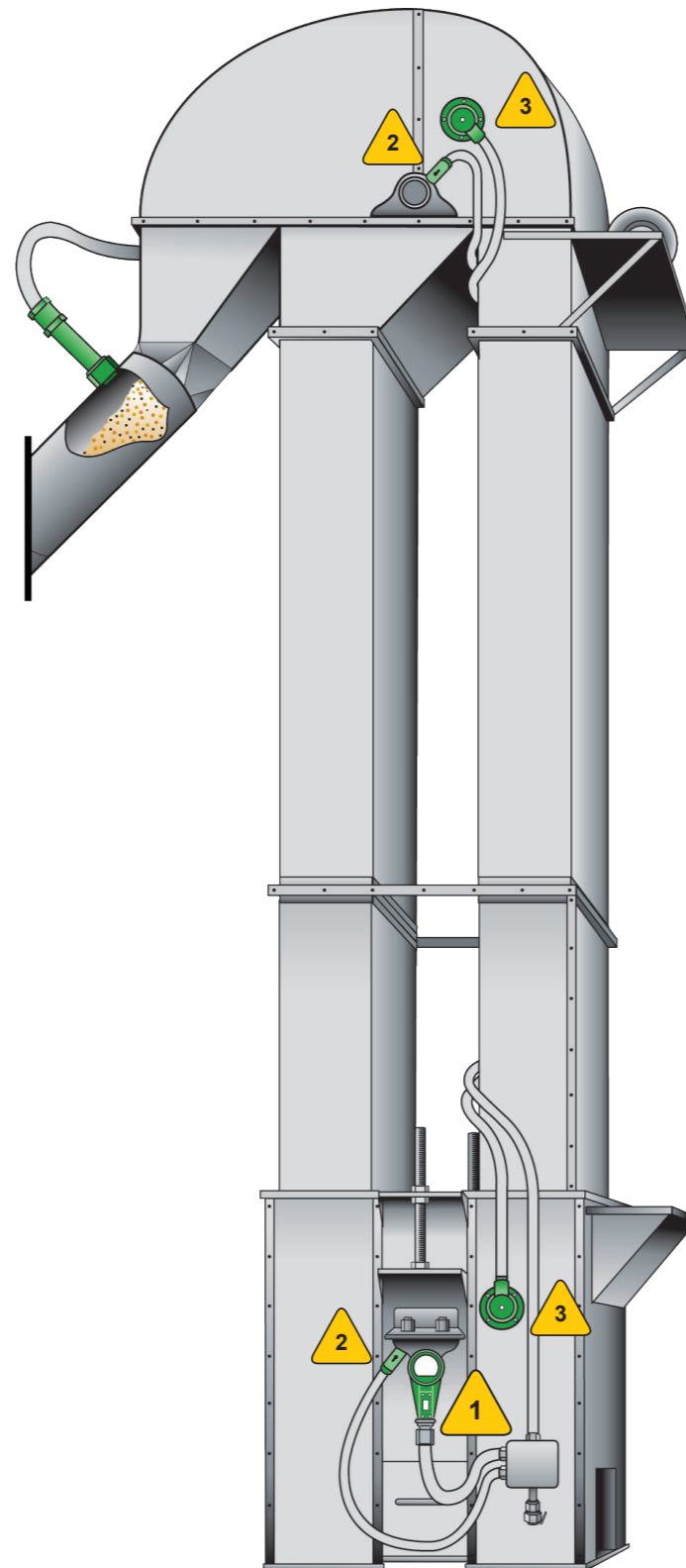
Follow the installation instructions for each sensor as provided in each individual product manual.

6. SENSOR PLACEMENT DIAGRAMS



TYPICAL SENSOR PLACEMENT FOR BUCKET ELEVATORS & ENCLOSED BELT CONVEYORS

- 1** SPEED MONITORING
Qty 1 - One sensor located on either side of the tail or boot shaft.
- 2** BEARING TEMPERATURE
Qty. 4 - One sensor for the bearings at each end of the drive and tail or head and boot shafts.
- 3** BELT MISALIGNMENT
Qty. 4 - Sensors work in pairs, one for each side of the belt on the drive and tail or head and boot sections.
- 4** TAIL PULLEY MISALIGNMENT (Enclosed Belt Conveyor)
Qty. 2 - One sensor located on each side of the housing on the conveyor tail section.



! WARNING

The Control Unit is susceptible to static voltage, static handling precautions should be taken. Connection of a clean ground to terminal 23 is essential for optimum performance.

Since the enclosure is a static hazard, it should only be cleaned with a damp cloth.

7. ELECTRICAL CONNECTION

All wiring must be in accordance with local and national electrical codes and should be undertaken by an experienced and qualified electrician. All equipment should be properly grounded prior to operation.

Additional wire used during the installation must have a temperature rating of 158° F (70° C) or above, and be at least 24 AWG. 4B recommends using shielded cable to reduce electromagnetic interference (EMI) to maintain signal integrity. Never run sensor cables in the same conduit as three phase motor cables.

Always use dust/liquid tight flexible metal conduit with approved fittings to protect the sensor cables. Use rigid metal conduit to protect the cables from the sensors to the control unit. Conduit systems can channel water due to ingress and condensation directly to sensors and sensor connections which over time will adversely affect the performance of the system. As such, the installation of low point conduit drains is recommended for all sensors.

All electrical connections are shown in image 1.

FUSE RATINGS -

In order to maintain the product certification, all fuses MUST be replaced with equivalent fuses at the same rating. Failure to do so will invalidate the certification and any warranties which may exist.

Model ETH-NODE1V46C

- F1 - F4 and F6 2 Amp.
- F5 200 mA.

Model ETH-NODE1V4C

- F1 - F4 AND F5 200 mA

SENSOR INPUTS -

TERMINAL	SENSOR	MINIMUM	MAXIMUM
T#1 - T#8	Temperature (NTC)	-40 °F (-40 °C)	230 °F (110 °C)
T#1 - T#8	Belt Alignment (Contact)	0 Volts	24 Volts
A#1 - A#2	Speed (Pulse)	20 PPM	5,000 PPM
A#1 - A#2	Speed/Temperature (4-20 mA)	0 mA	20 mA

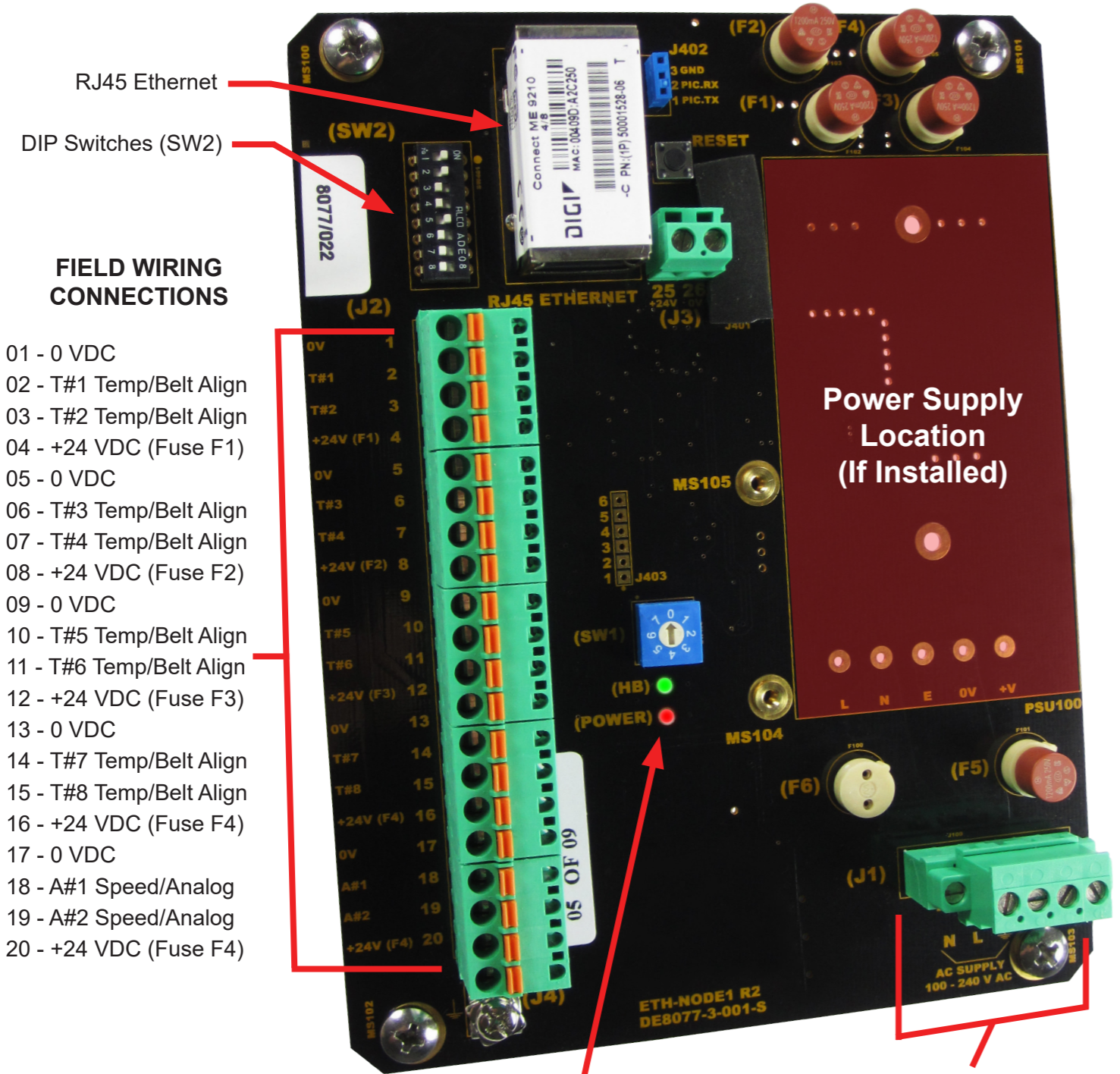
PPM = Pulses Per Minute

NOTE

Recommended cable type is Belden 5508FE with 10 conductors each 22 AWG, shielded. Overall outer diameter is 0.23 inches. Belden 5508FE wire colors are used in all of the sensor wiring diagrams.

⚠ WARNING

The unit should ONLY be powered with either a main supply (ETH-NODE1V46C model) OR a 24 VDC (ETH-NODE1V4C) NOT BOTH (see specifications).



FIELD WIRING CONNECTIONS

- 01 - 0 VDC
- 02 - T#1 Temp/Belt Align
- 03 - T#2 Temp/Belt Align
- 04 - +24 VDC (Fuse F1)
- 05 - 0 VDC
- 06 - T#3 Temp/Belt Align
- 07 - T#4 Temp/Belt Align
- 08 - +24 VDC (Fuse F2)
- 09 - 0 VDC
- 10 - T#5 Temp/Belt Align
- 11 - T#6 Temp/Belt Align
- 12 - +24 VDC (Fuse F3)
- 13 - 0 VDC
- 14 - T#7 Temp/Belt Align
- 15 - T#8 Temp/Belt Align
- 16 - +24 VDC (Fuse F4)
- 17 - 0 VDC
- 18 - A#1 Speed/Analog
- 19 - A#2 Speed/Analog
- 20 - +24 VDC (Fuse F4)

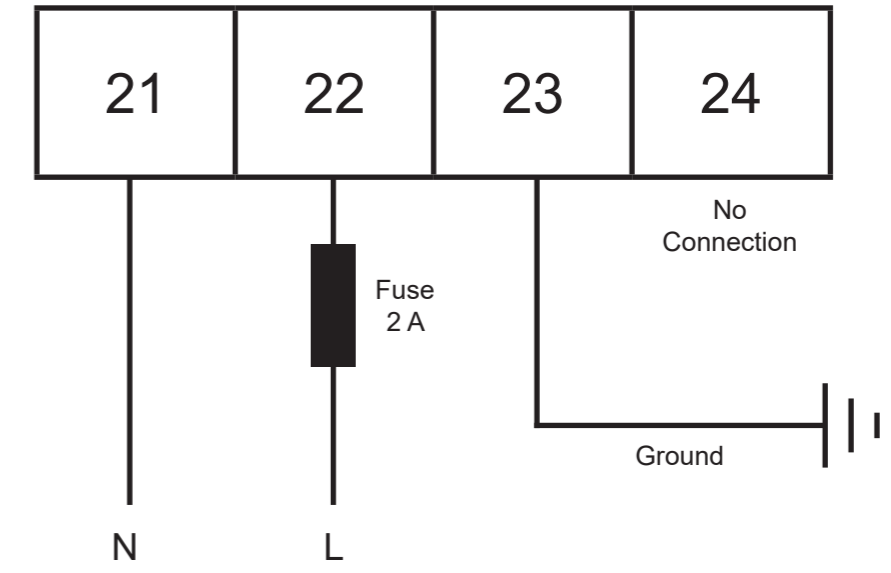
POWER CONNECTIONS

- 21 - VAC Neutral Connection
- 22 - 120 to 240 VAC Connection
- 23 - 0 VDC & Ground Connection
- 24 - (+) 24 VDC Connection

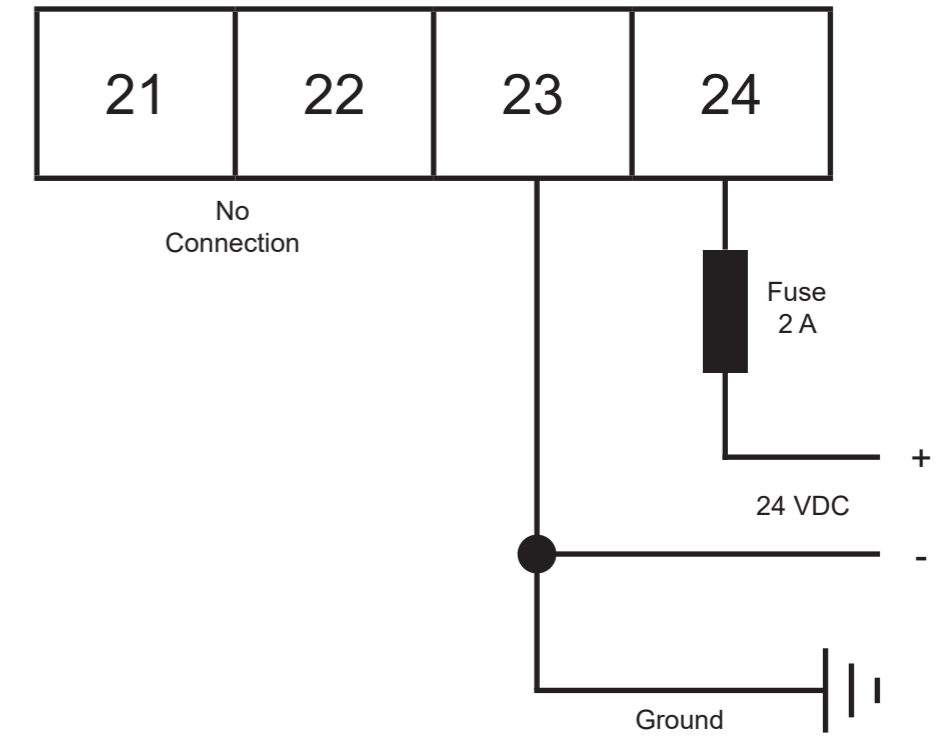
Image 1 - Control Board - No Internal Power Supply

8. WIRING DIAGRAMS

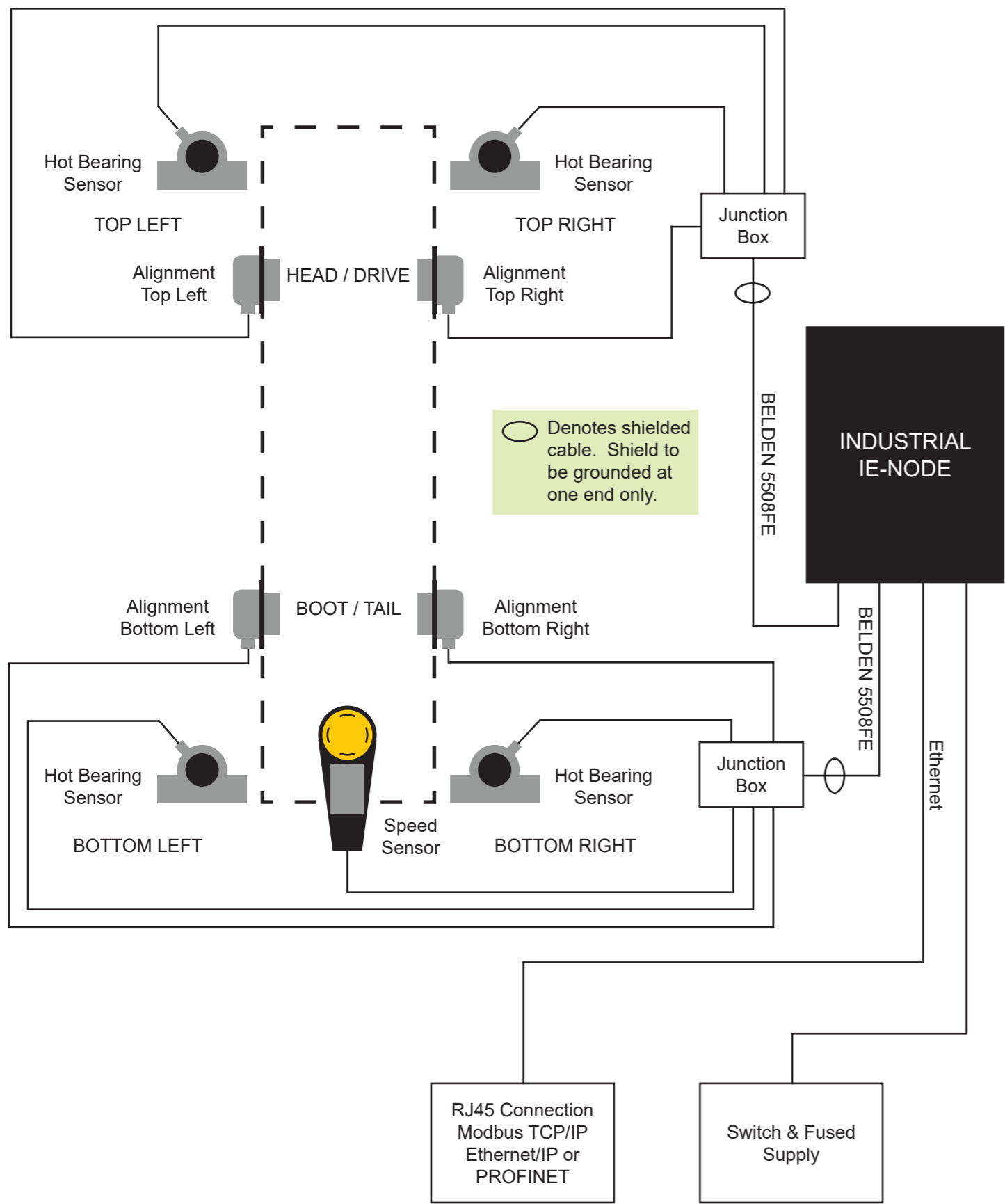
8.1 SUPPLY VOLTAGE WIRING (120 TO 240 VAC)



8.2 SUPPLY VOLTAGE WIRING (24 VDC)



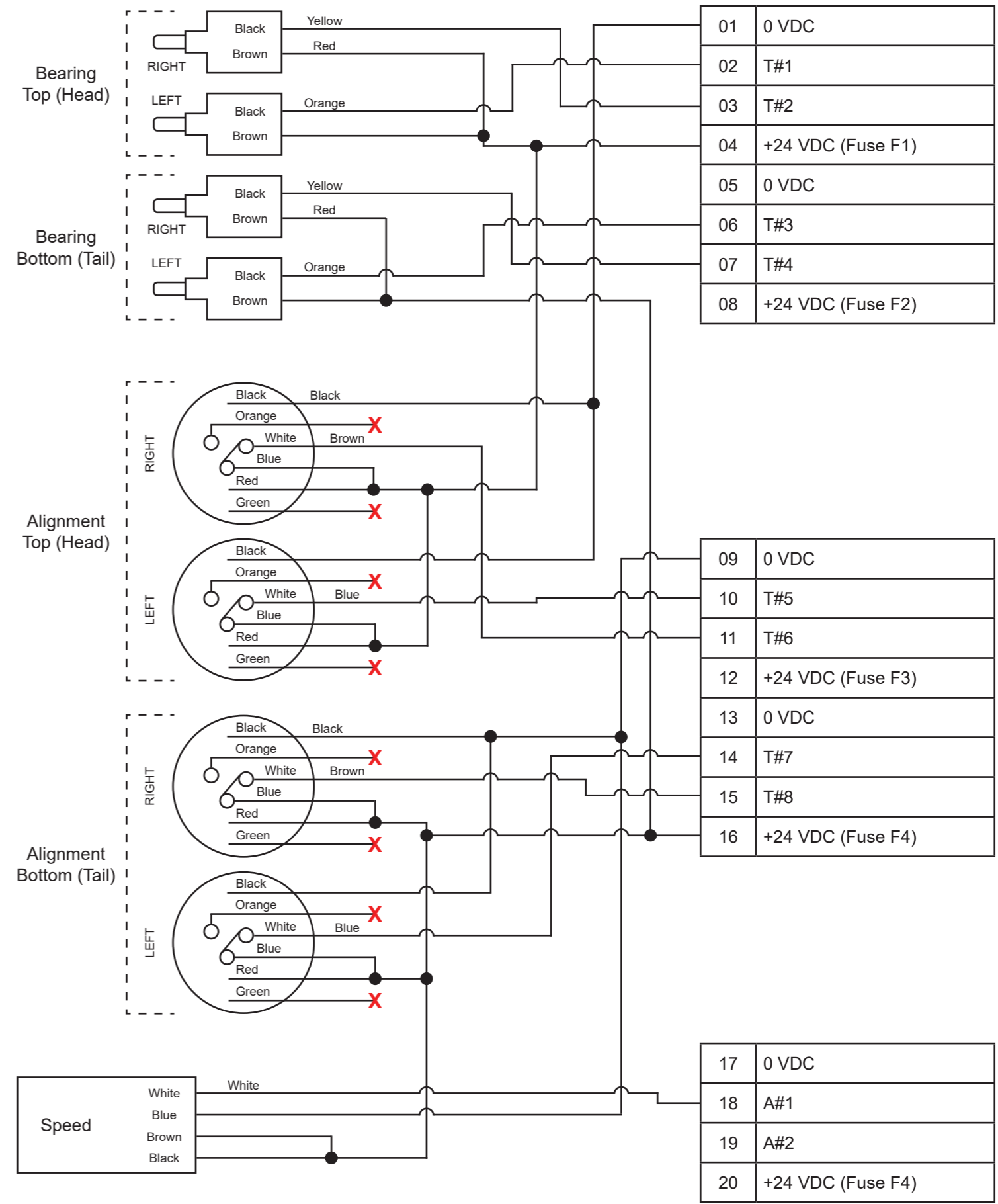
8.3 WIRING BLOCK DIAGRAM FOR BUCKET ELEVATOR & BELT CONVEYOR -



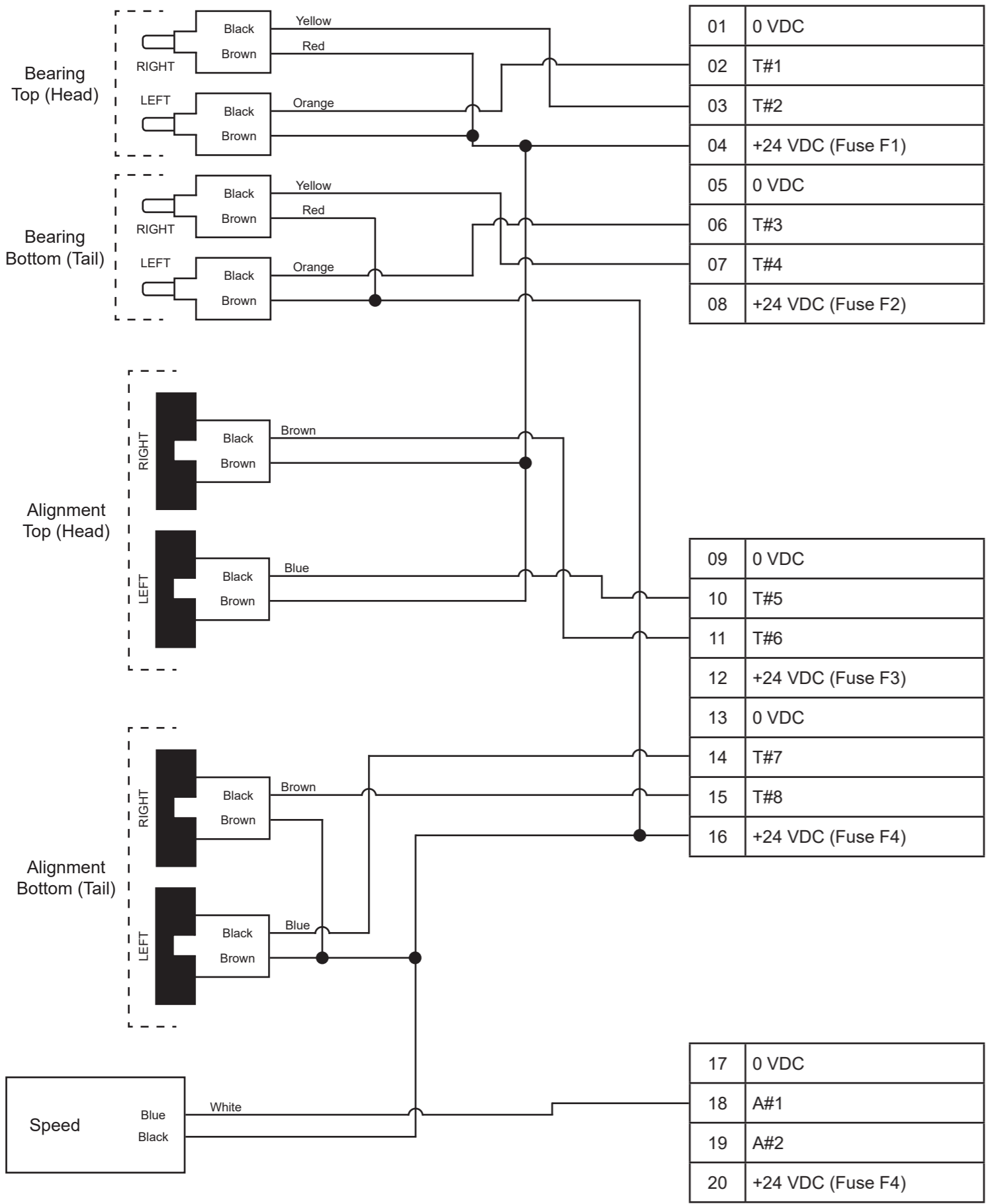
NOTE

- Metal conduit and liquid tight should be used to protect the cables from physical damage.
- Left and right are determined when facing the direction the bucket elevator discharges.

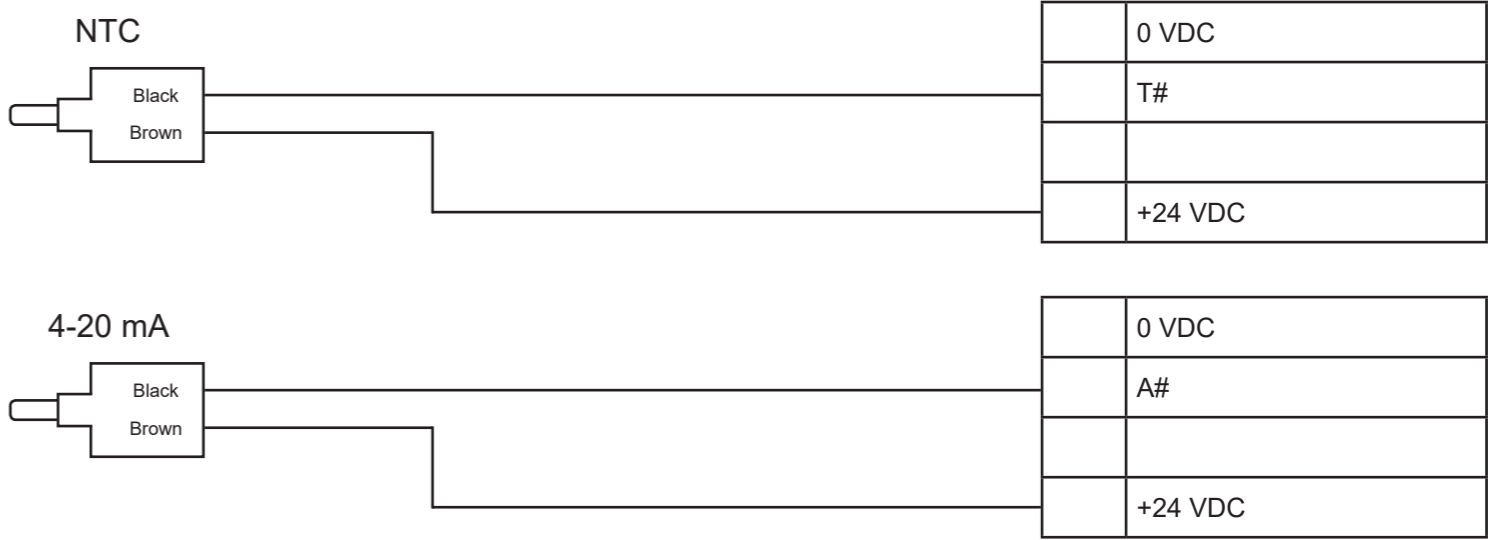
8.4 STANDARD SENSOR WIRING DIAGRAM A:
 - NTC SENSORS (BEARING TEMP), TOUCHSWITCHES (ALIGNMENT) & P800 (SPEED)



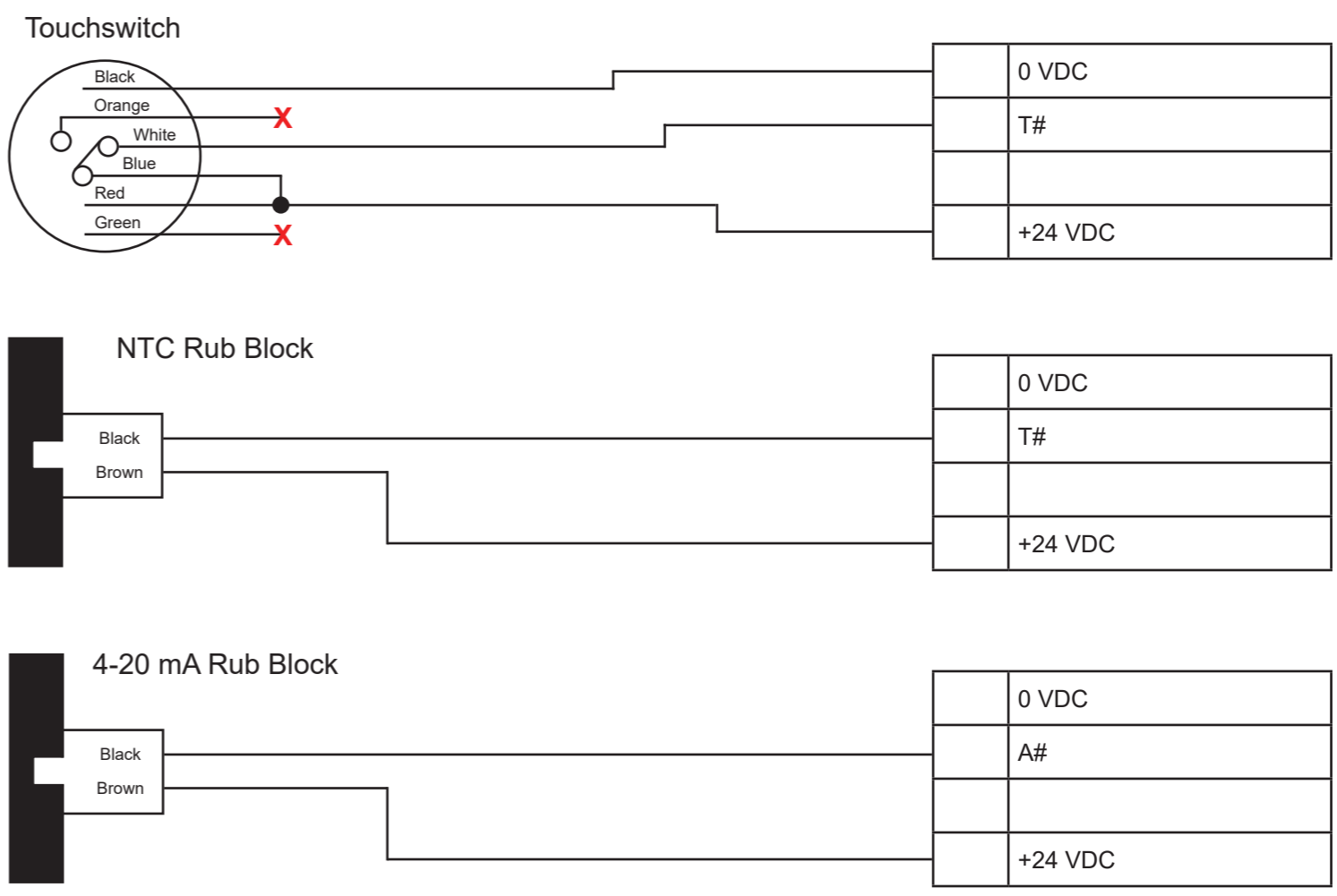
8.5 STANDARD SENSOR WIRING DIAGRAM B:
 - NTC SENSORS (BEARING TEMP), RUB BLOCKS (ALIGNMENT) & MILLI-SPEED (SPEED)



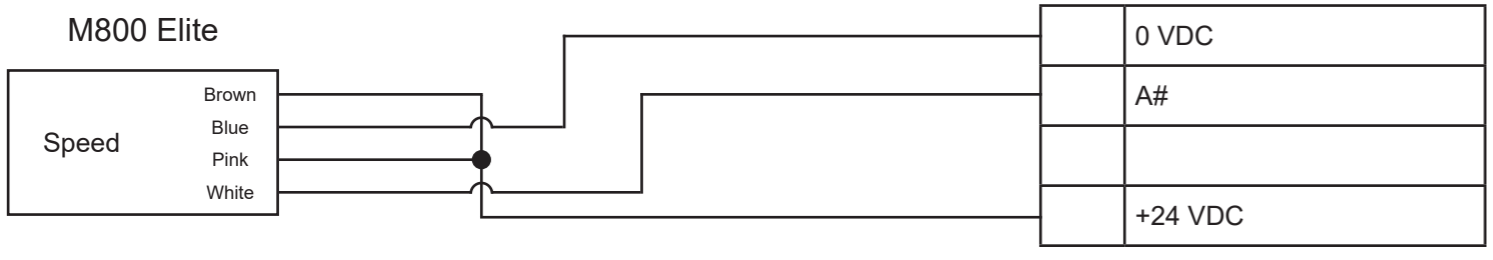
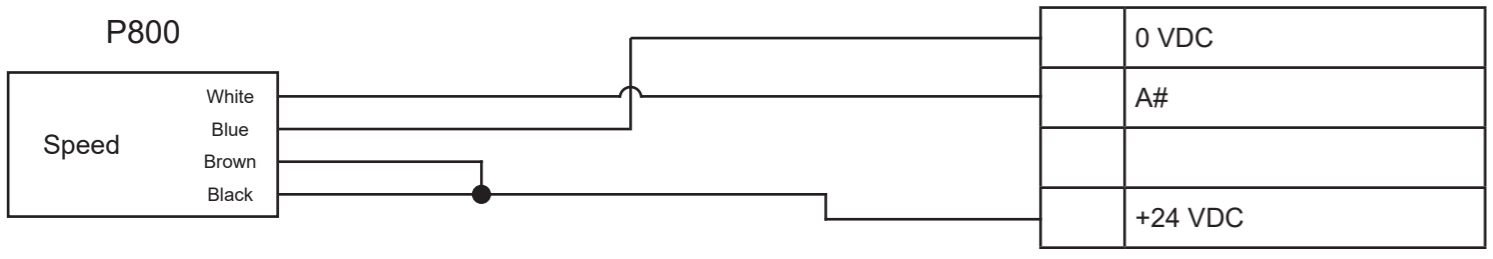
8.6 INDIVIDUAL BEARING SENSOR WIRING DIAGRAMS:



8.7 INDIVIDUAL BELT ALIGNMENT SENSOR WIRING DIAGRAMS:

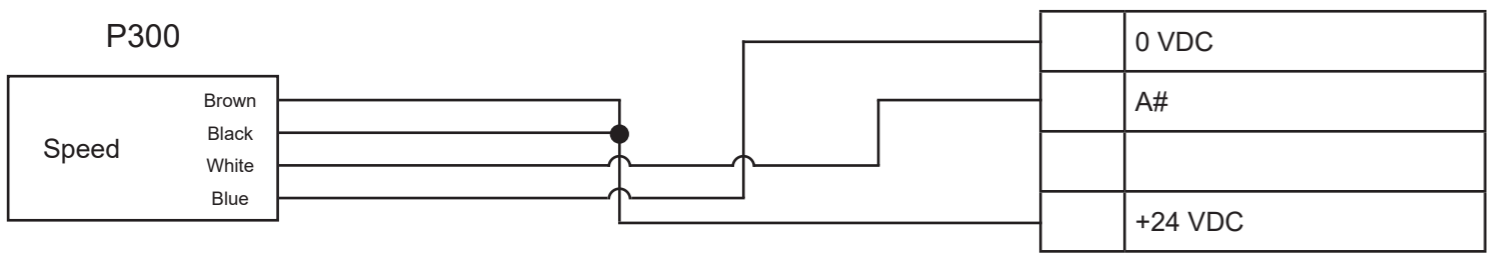
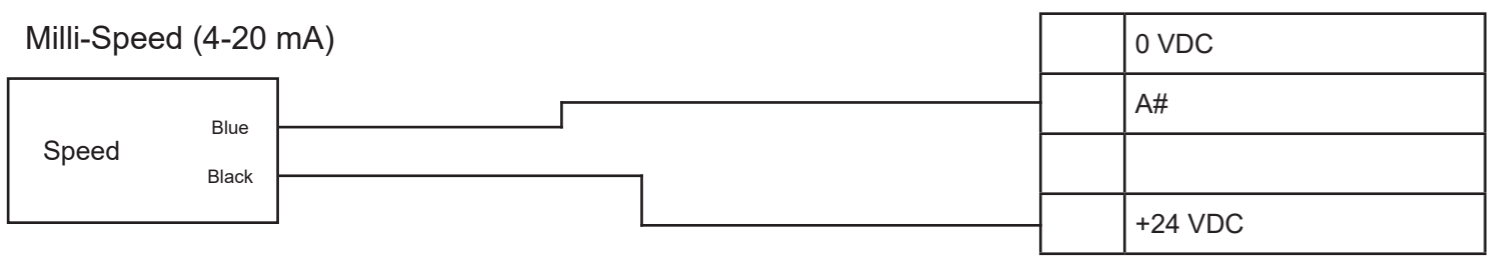


8.8 INDIVIDUAL SPEED SENSOR WIRING DIAGRAMS:



NOTE

The M800 Elite is an 8 wire switch. The diagram above illustrates the IE-NODE connection only, the remaining wires are for the alarm and shutdown relays.



9. IE-NODE OPERATION

The Industrial Ethernet Node is designed to sample data from several sensors and provide this data to remote users or PLC's on request. It is only a reporting system, and does not control any other system or device.

9.1 STARTUP OPERATION -

After all sensor and power connections have been made, locate the POWER and HB (Heart Beat) LED's on the IE-NODE's control board (See Image 1). When the unit is powered on, the red power LED should be solid and the green HB LED should begin flashing.

The HB LED will behave in one of four ways -

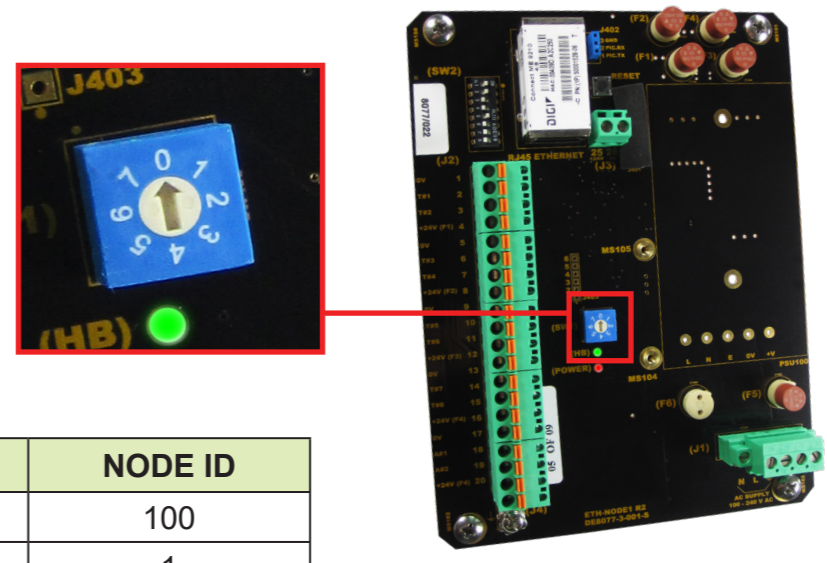
HB LED	DESCRIPTION
Off	No internal communications, indicates an issue with the firmware or hardware.
On	Normal operation, no external communications from a PLC or other device.
Flashing	Normal operation, external communication detected from a PLC or other device.
Fading	Bootloader mode (allows for software updates)

9.2 ROTARY SWITCH (SW1) -

The rotary switch on the IE-NODE (Image 2) is used for setting the node slave ID when using one of the optional expansion boards that support RS485. Refer to the expansion board manual for installation and setup.

If SW1 Node ID functionality is not enabled, the default Modbus ID number is derived from the last 2 digits of the product serial number. For example, if the last 2 digits of the serial number are '00' then the ID number becomes '100' given that the ID number ranges from 1 to 100.

Image 2 - Control Board Rotary Switch (SW1)



POSITION	NODE ID
0	100
1	1
2	2
3	3
4	4
5	5
6	6
7	7

9.3 DIP SWITCHES (SW2) -

The IE-NODE has a set of eight DIP switches to change settings (Image 3). Each switch setting is described in the table below. If a switch setting is changed, the unit must be restarted for the change to take effect.

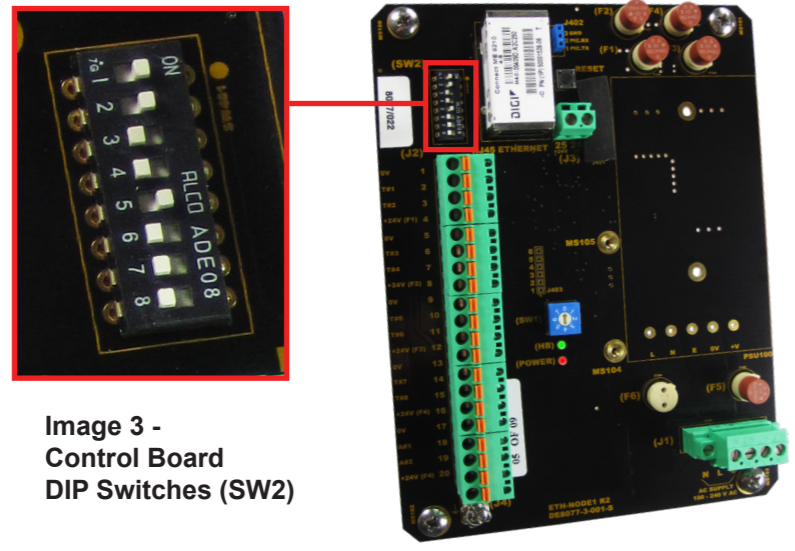


Image 3 - Control Board DIP Switches (SW2)

SWITCH	DESCRIPTION	OFF (LEFT)	ON (RIGHT)
1	PLC Protocol Selection	PROFINET	EtherNet/IP
2	Temperature Unit	°C	°F
3	Terminal A#1 Setup	4-20 mA	Pulse - PNP
4	Terminal A#2 Setup	4-20 mA	Pulse - PNP
5	Bootloader Selection	Allowed	Disabled
6	HazardMon.com Setup	Enabled	Disabled
7	Reserved - Not Used (No Effect)	----	----
8	RTU Node ID Source	Rotary Switch (SW1)	Internal

9.4 PLC PROTOCOL SELECTION -

The IE-NODE will always have Modbus TCP/IP enabled, but it can also communicate over PROFINET or Ethernet/IP (selectable).

9.5 TEMPERATURE UNIT -

The IE-NODE output temperature readings can be set as degrees Celcius or Fahrenheit.

9.6 TERMINAL A#1 SETUP -

The A#1 channel can be set up to accept either a current loop input of up to 20 mA or a pulse (PNP) input of up to 5000 PPM.

9.7 TERMINAL A#2 SETUP -

The A#2 channel can be set up to accept either a current loop input of up to 20 mA or a pulse (PNP) input of up to 5000 PPM.

9.8 BOOTLOADER SELECTION -

This switch selects whether bootloading for software updates is permitted or not. The switch is set to OFF from the factory.

9.9 RTU NODE ID SOURCE -

This switch enables the Node ID settings for RS485 Modbus RTU. If the rotary switch (Off - Left) is chosen, the node address is set from the rotary switch (Section 9.2). If internal (On - Right) is chosen, then the node address is set from the IE-NODE Network Configurator Software (Section 11).

9.10 INTERNAL TEMPERATURE SENSOR -

In addition to the 10 sensor inputs, the IE-NODE is fitted with an internal NTC temperature sensor. This device is mounted to the IE-NODE PCB and will therefore provide the temperature of the electronics. If an IE-NODE is mounted in the field, it could be used to approximate the local ambient temperature, but will report temperatures approximately 10°F (5°C) higher than local ambient. For a more accurate ambient temperature reading, an ambient temperature sensor can be wired to one of the 10 sensor inputs.

10. COMMUNICATIONS OPTIONS

The IE-NODE comes with a standard RJ45 Ethernet Socket. The unit is sent out from the factory with the following IP address settings pre-set:

FACTORY SETTING	VALUE
IPV4 Address	192.168.1.100
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
Primary DNS Server	0.0.0.0
Secondary DNS Server	0.0.0.1

The IE-NODE supports PROFINET and EtherNet/IP communication protocols. The data allocation is exactly the same for both the protocols and detailed information can be found in the IE-NODE Data Format document.

The byte order within words is dependent on the selected protocol. For PROFINET it is Little-Endian and for EtherNet/IP it is Big-Endian.

Modbus TCP is supported in addition to PROFINET and EtherNet/IP. The Modbus TCP information contains equivalent information to the PROFINET and EtherNet/IP array type communications.

11. EXPANSION BOARDS

Two expansion boards are available for the IE-NODE to expand total sensor inputs from 10 to 16.

1. The ETH-NODE-AUXI-6NTC expansion board allows for the support of up to 6 extra NTC temperature sensors or 6 contact sensors, or any combination of 6.
2. The ETH-NODE-AUXI-6AN expansion board allows for the support of up to 6 extra 4-20 mA (current loop) sensors.

Both boards add the capability to allow for an RS485 Modbus RTU connection to be made to access all onboard sensor information. Refer to the expansion board manual(s) for installation and setup.

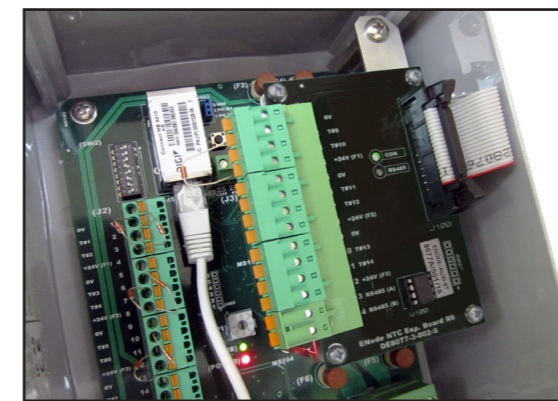


Image 4 - Expansion Board Installed

12. IE-NODE NETWORK CONFIGURATOR SOFTWARE

The IE-NODE network configurator software provides you with a visual view of all devices on the network. It allows for easy identification for each unit on the network, and allows you to change network settings as needed.

The software does not ship with the unit, it is available as a free download from 4B's website (see the IE-NODE product page).

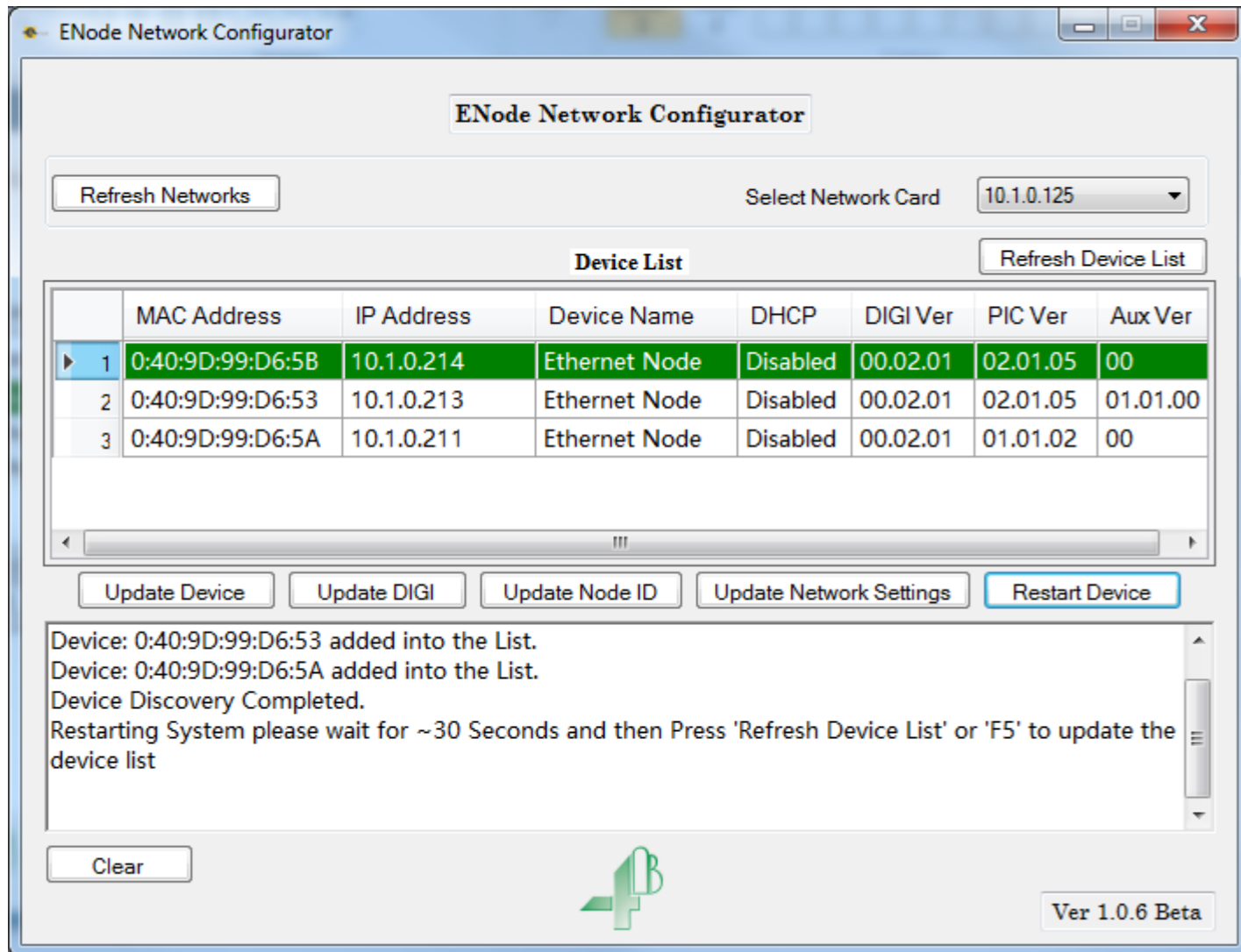
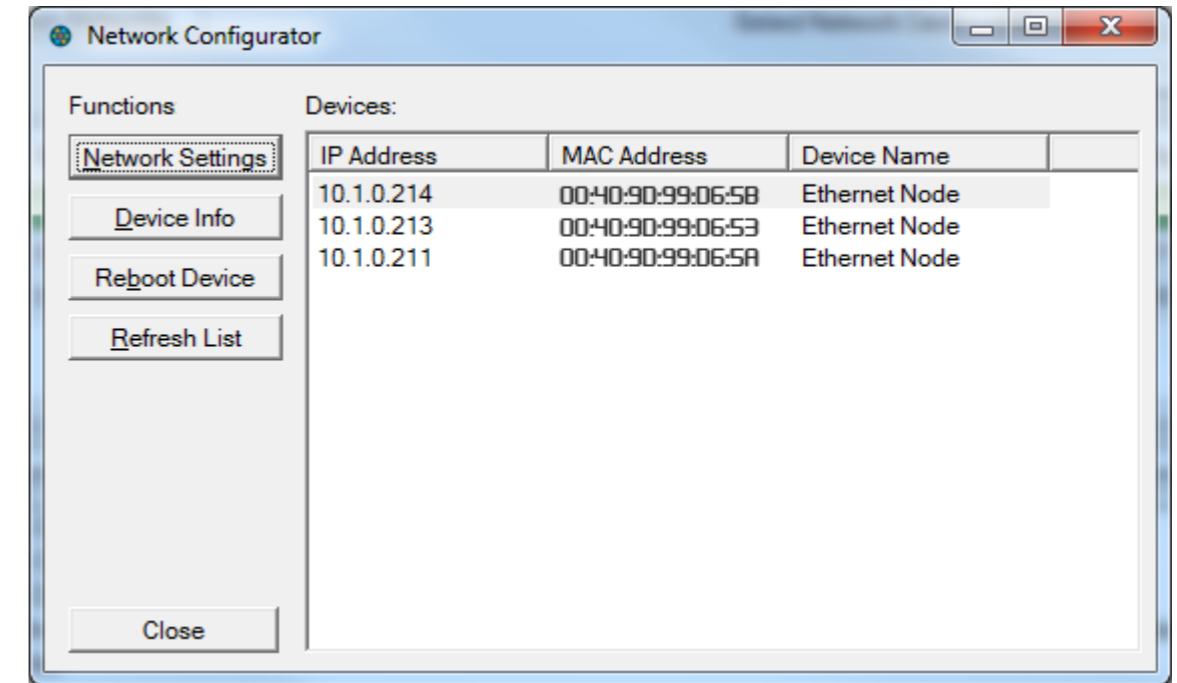


Image 5 - Network Configurator Main Menu

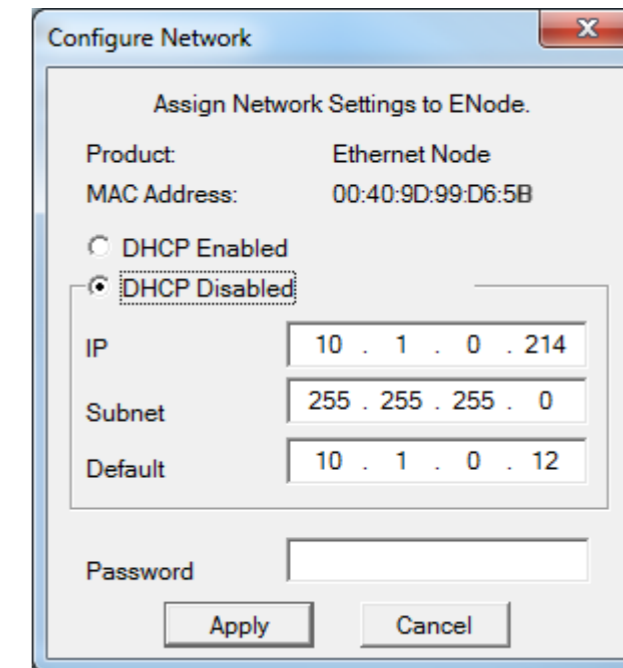
When opened, the software will automatically scan the network (Image 5). If the IE-NODE is on a different network card than the one selected, you can change the selection in the dropdown menu and select "Refresh Device List". If you add or remove a network device after the software is opened, you can select "Refresh Networks" to update the list of network cards in the dropdown menu.

To change the network settings of one of the nodes, highlight the node and select "Update Network Settings"

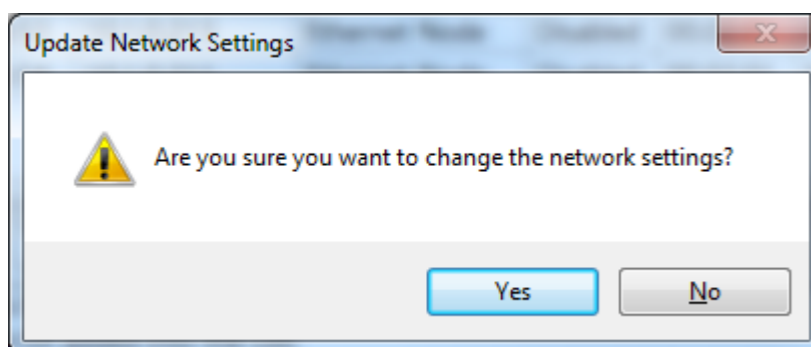
A "Network Configurator" will launch and rescan the network -



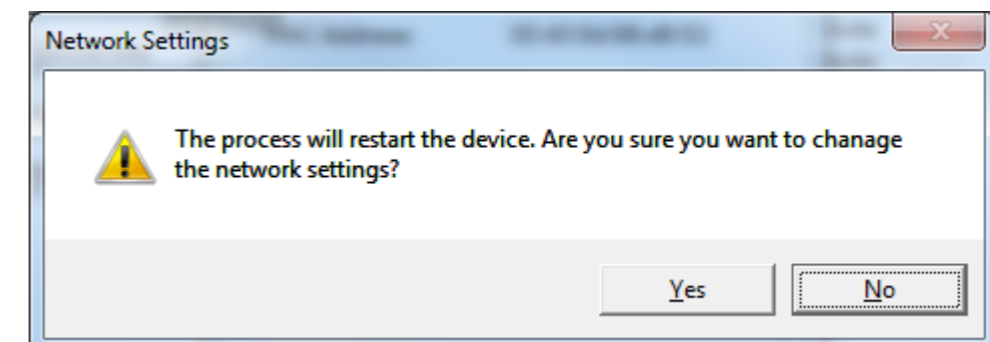
If nothing is found, try updating your computer's network settings to the same IP address range as the IE-NODE and select "Refresh List". To change the network settings of an IE-NODE, highlight it from the device list and select "Network Settings"



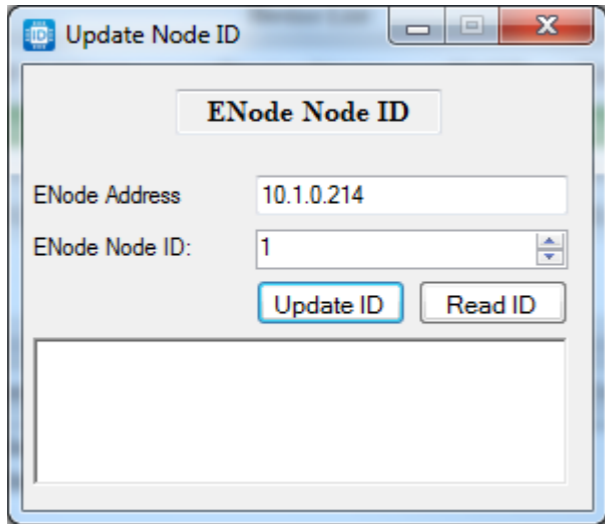
Enter the network changes followed by the password "BBBB" then select "Apply". You will be prompted if you want to continue, select "Yes" to restart the device and apply the new settings.



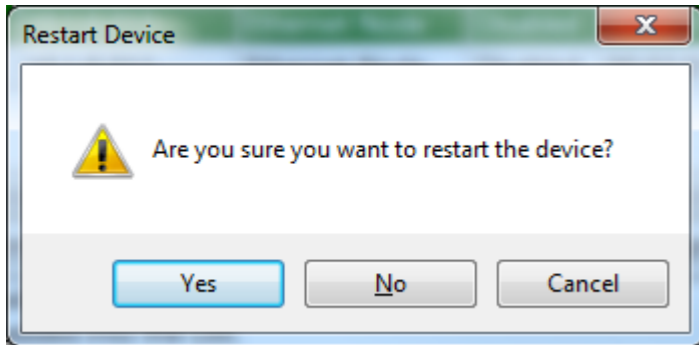
Select "Yes" to continue with the update.



If you are using an expansion card with a Modbus RTU connection, you can update the Modbus RTU ID of the IE-NODE by selecting "Update Node ID" from the main menu (Image 5).



You can interrogate the device for its current ID by selecting "Read ID". You can also enter a new ID and update the ID of the IE-NODE by selecting "Update ID". Note that this ID will only be used if dipswitch 8 is in the ON (Right) position. Otherwise, the rotary switch will override the address in memory.



Select "Yes" to restart, "No" or "Cancel" to end the update.

Unless instructed by 4B, do not use "Update Device" or "Update DIGI" (Image 5) as these options are used for firmware updates.

13. TROUBLESHOOTING GUIDE

CONDITION	SOLUTION
Power LED is Off	<ol style="list-style-type: none"> 1. Check that power is applied to the unit on appropriate terminals (21 - 24). 2. Check that the mains input fuse F6 is not damaged. 3. Check that the internal circuitry fuse F5 is not damaged.
No power to the sensors	<ol style="list-style-type: none"> 1. Check that the field power fuses (F1 - F4) are not damaged. 2. Check the field wiring to make sure +24 VDC supply is delivered to the sensors. 3. Replace faulty fuses and sensors as necessary.
4-20 mA (current loop) sensor in short circuit	<ol style="list-style-type: none"> 1. Check if the sensor is powered correctly (+24 VDC). 2. Check that the sensor is wired correctly. 3. If needed, replace the faulty sensor.

14. TESTING AND MAINTENANCE

Below is the procedure that the end user must adhere to in order to maintain the system in a safe state.

1. Inspect that all the cabling is in good state and that all the electrical connections, including the terminal blocks in the junction boxes are secure and in good order.
2. Make sure there is no water damage to the inside of the node or any junction boxes used.
3. Verify that the configuration switches of the IE-NODE are set as intended.
4. Verify that the LED marked (HB) is flashing at a regular rate.
5. Test sensor settings, check for PLC communication loss, etc. to ensure the controller is behaving as expected.

⚠ WARNING

If the system does not immediately shutdown as expected or alarm as required, then remove the machine from service until the problem has been diagnosed and corrected.

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4B COMPONENTS LTD.

625 Erie Avenue
Morton, IL 61550
USA
Tel: 309-698-5611
Fax: 309-698-5615

**4B BRAIME
COMPONENTS LTD.**

Hunslet Road
Leeds LS10 1JZ
United Kingdom
Tel: +44 113 246 1800
Fax: +44 113 243 5021

4B DEUTSCHLAND

9 Route de Corbie
Lamotte Warfusée
F-80800
France
Tel: +49 700 2242 4091
Fax: +49 700 2242 3733

4B ASIA PACIFIC

Build No. 899/1 Moo 20
Soi Chongsiri, Bangplee-Tam Ru Road,
Tanbon Bangpleeyai, Amphur Bangplee,
Samutprakarn 10540
Thailand
Tel: +66 2 173-4339
Fax: +66 2 173-4338

4B FRANCE

9 Route de Corbie
80800 Lamotte Warfusée
France
Tel: +33 3 22 42 32 26
Fax: +33 3 22 42 37 33

4B AFRICA

14 Newport Business Park
Mica Drive, Kya Sand
2163 Johannesburg
South Africa
Tel: +27 11 708 6114
Fax: +27 11 708 1654

4B AUSTRALIA

Building 1, 41 Bellrick Street
Acacia Ridge, 4110
Queensland
Australia
Tel: +61 7 3216 9365
Fax: +61 7 3219 5837

4B CHINA

F1, Building 5A,
8 West Lake Road,
Wujin High & New Technology
Development Zone,
Changzhou 213164, Jiangsu Province,
China
Tel: +86 519-88556006

www.go4b.com