



BUCKET ELEVATOR  
& BELT CONVEYOR  
MONITORING SYSTEM

INSTALLATION / OPERATION GUIDE  
**WDC3NV46C**

Revision 2 - December 2009

This guide must be used in conjunction with the official Watchdog Elite installation operation manual that is supplied with the product.



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# **1 INTRODUCTION**

## **1.1 General**

The 'Watchdog Elite' system is a user-programmable, microprocessor controlled bucket elevator and belt conveyor monitor. The control unit accepts signals of belt speed, belt alignment and bearing temperature from sensors mounted on the bucket elevator or belt conveyor and is able to sound an alarm and provide shutdown control of the elevator or conveyor, and feeding system, when a potentially hazardous condition is detected. Microprocessors and electronics are housed in a self-contained wall-mounting control unit.

## **1.2 Motion Sensing - General Features**

The Watchdog accepts input pulses from a boot or tail shaft mounted P800 proximity sensor. The Watchdog compares the speed given by these input pulses with a preset value, (the 'calibrated speed') and is able to affect an alarm or shutdown if there is a deviation from the Calibrated speed of more than the programmed percentage. These percentages are fully user-selectable. A digital display of speed is provided on the front panel of the Watchdog which can be scaled as required by a programmable Scale Factor. The Watchdog also accepts a signal from the motor starter which will initiate a programmable start-up timer. During this start-up time the speed is monitored and if insufficient acceleration is detected, (e.g. due to a blockage) a stop signal will be generated to shut down the elevator leg or conveyor. A full test feature is also provided on the Watchdog Control Unit. This test feature displays the programmed percentages and actively tests the internal and external alarm and shutdown circuits.

## **1.3 Misalignment Sensing - General Features**

Four Touchswitch sensors are mounted on the elevator (two at the head or drive end and two at the boot or tail end) in order to detect a misaligned belt. Upon detecting a belt misalignment the Watchdog control unit provides an alarm signal for external alarm horn sounding and automatic feed equipment shutdown and after a short time delay, automatic shutdown for the elevator or conveyor. NOTE: An additional pair of Touchswitches can be installed when knee/idler pulley/belt misalignment is to be monitored.

## **1.4 Temperature Sensing - General Features**

The Watchdog has inputs for up to six temperature sensors. Each of the boot/tail shaft bearings and head/drive bearings can be fitted with a temperature sensor to detect overheating. The temperature sensors have a user adjustable switching temperature, which if exceeded, causes an alarm for external alarm horn sounding and automatic feed equipment shutdown followed by an elevator or conveyor shutdown if the condition persists. Additionally, the control unit displays the temperature of the bearings. NOTE: An additional pair of temperature sensors can be installed when knee/idler bearings are to be monitored.

## **1.5 Serial Communications - General Features**

The Watchdog can be connected to a 'Host' computer or PLC via a serial link (RS422/485) which enables remote two-way communication with the Watchdog and connection to the available PC based Log/Print/PM software

## **1.6 Installation**

When installing the 'Watchdog' system we strongly advise that you employ the services of a certified and licensed electrician, who is familiar with installation of electronic controls. If assistance is required in obtaining an installation electrician please contact us and we will recommend an electrical contractor.

## 1.7 Standard Watchdog Elite System Diagram for Bucket Elevator Legs

### Hazard Monitor



#### Watchdog Elite –

Part # - WDC3NV46C  
QTY = 1 per elevator  
Class II Div. 2 (USA)  
Class II Div. 1 (Canada)

### Belt / Pulley Misalignment



#### Touchswitch –

Part # - TS2V4C  
QTY = 4 per elevator  
Class II Div. 1 (USA & Canada)

NOTE: If the leg has a knee pulley, then add 2 more Touchswitches.

### Bearing Temperature



#### WDB Series –

Part # - WDB20V3C  
QTY = 4 per elevator  
Class II Div. 1 (USA & Canada)

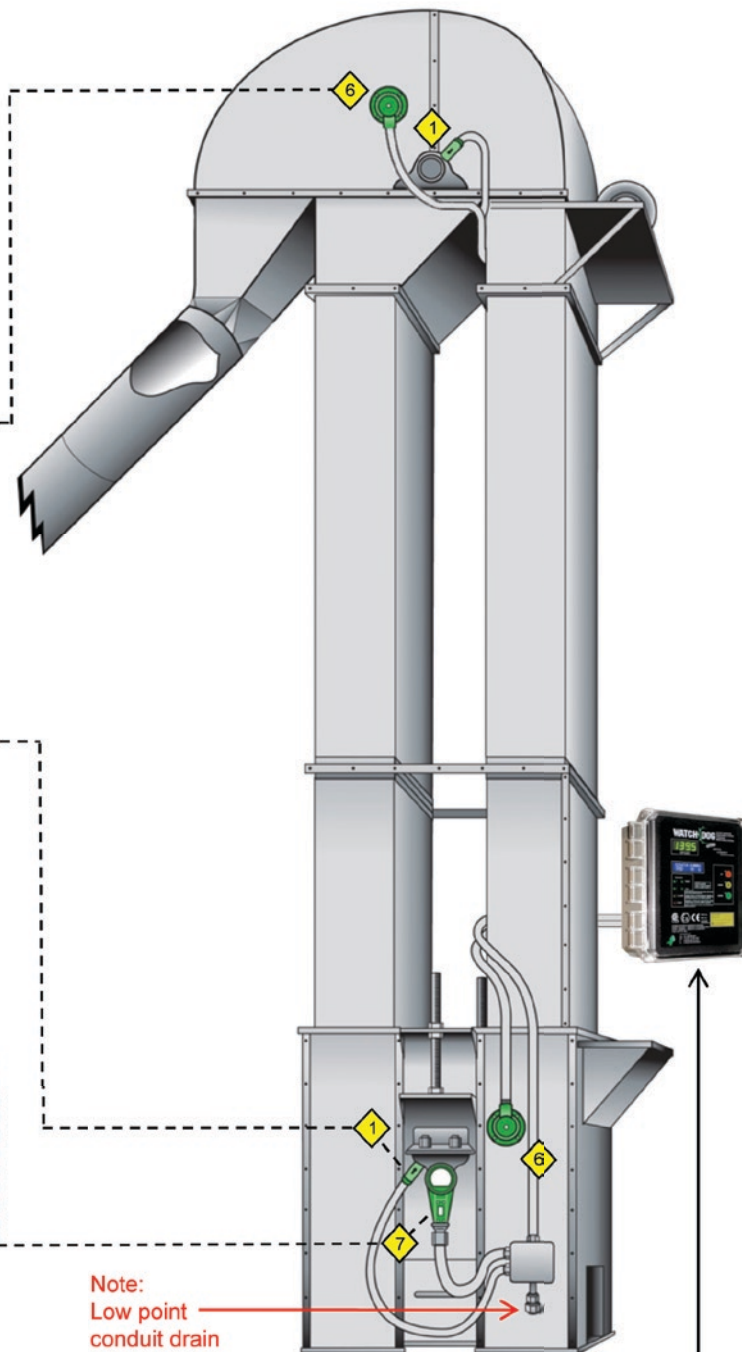
NOTE: If the leg has a knee pulley, then add 2 more bearing temperature sensors.

### Speed Monitoring



#### Proxswitch, Whirligig & MagCon –

Part #'s - P8001V34FC,  
WG1-4B-4, MAG2000  
QTY = 1 of each per elevator  
Class II Div. 1 (USA & Canada)



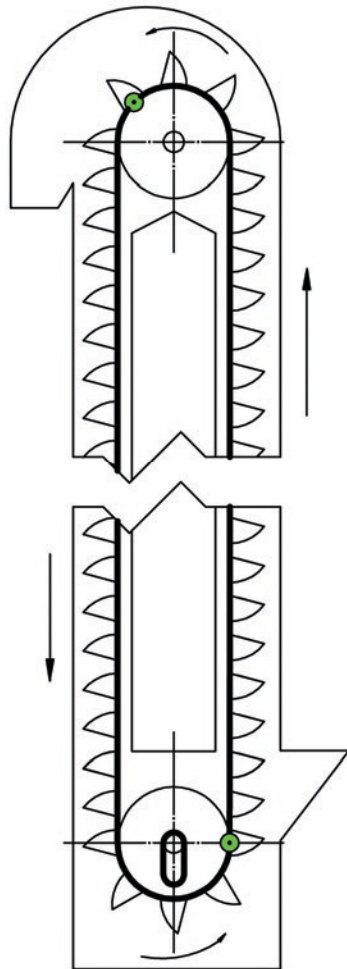
#### Important Note:

Install the Watchdog Elite hazard monitor in a control room or other suitable location where it is easily accessible. If installed outside, then use a weatherproof enclosure.



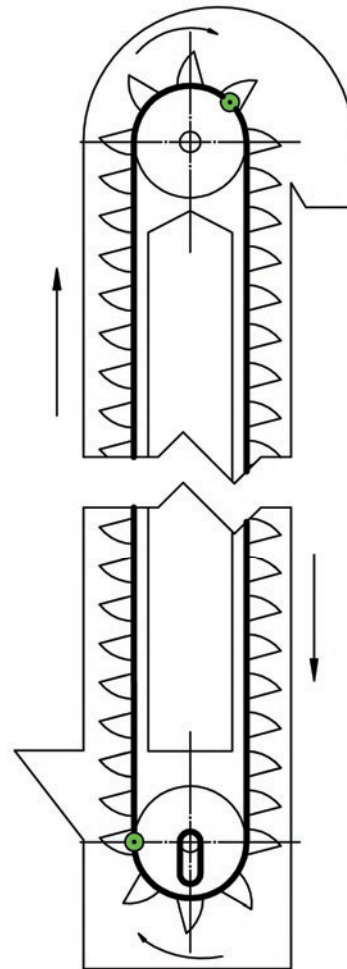
## 1.8 Determining Left & Right Side of Bucket Elevator

### VIEW OF LEFT SIDE



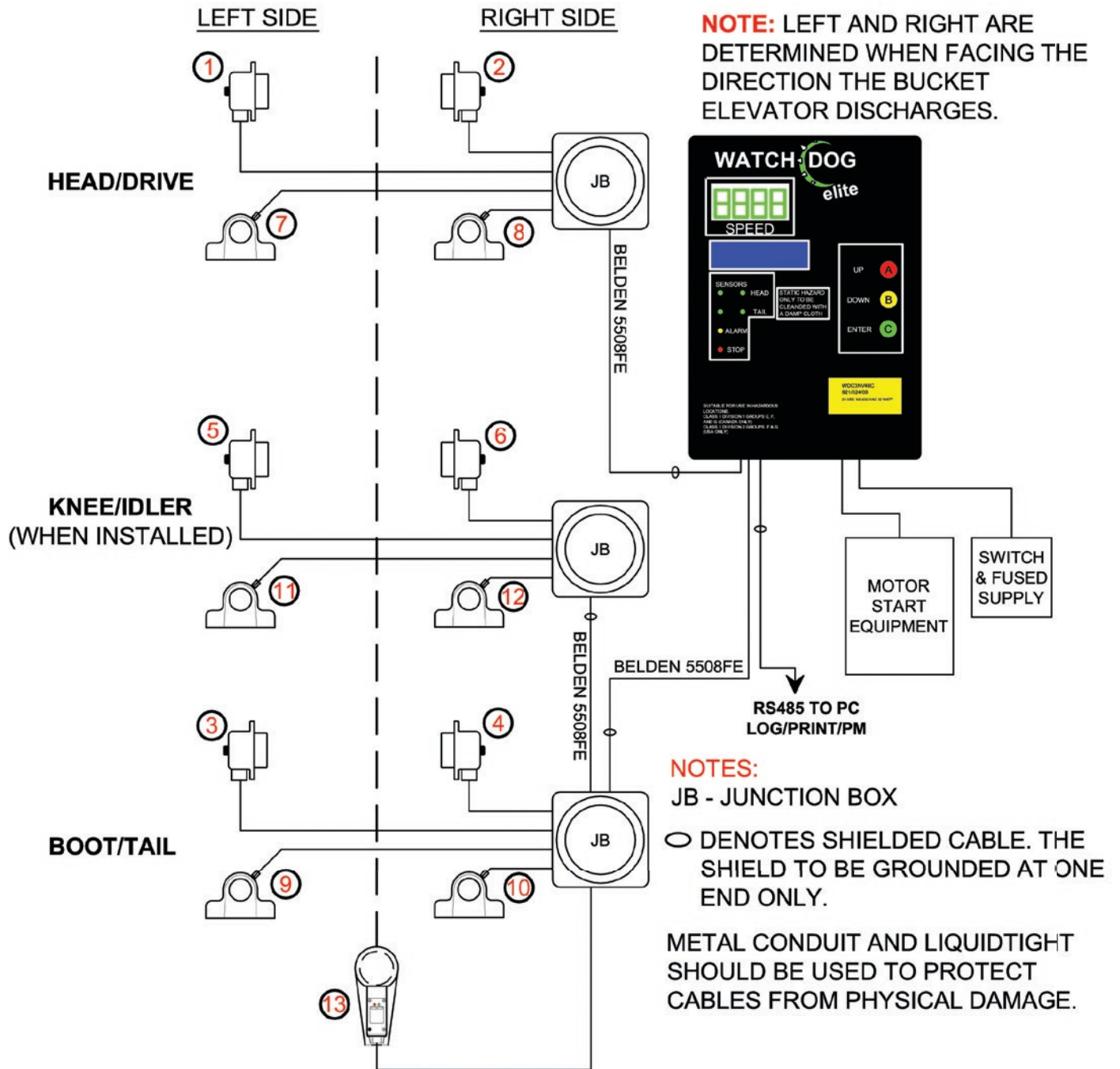
**NOTE:** TOUCHSWITCH PLACEMENT ON THE LEFT SIDE WILL MIRROR THE RIGHT SIDE.

### VIEW OF RIGHT SIDE

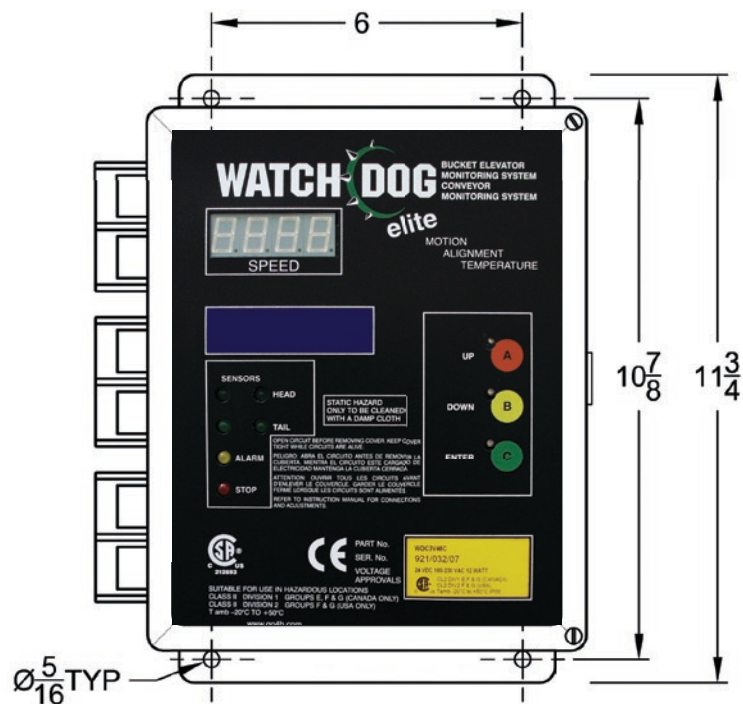


**NOTE:** LEFT AND RIGHT SIDES ARE DETERMINED WHEN FACING THE DIRECTION THE BUCKET ELEVATOR DISCHARGES.

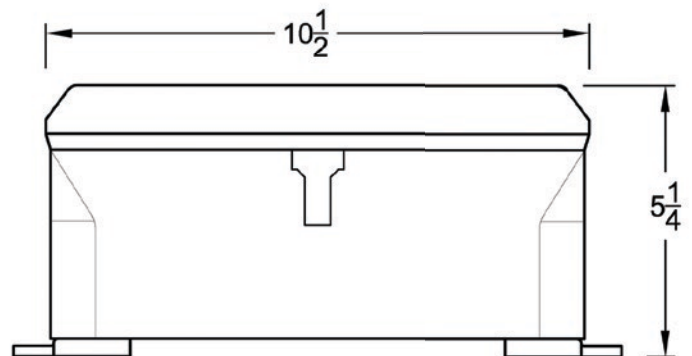
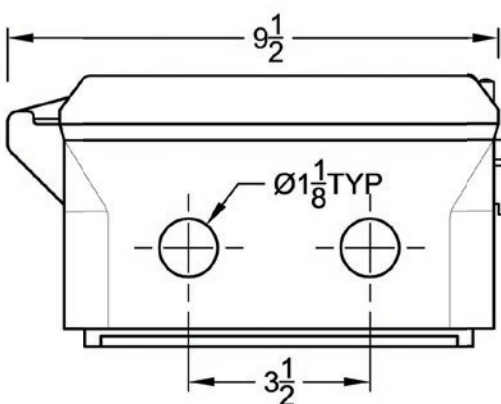
## 1.9 Watchdog Elite Block Diagram



## 1.10 Watchdog Elite Control Unit Dimensions



**NOTE:**  
ALL DIMENSIONS IN INCHES.





## 2 SPECIFICATIONS

### 2.1 The Control Unit - WDC3NV46C

A polycarbonate enclosure houses the electronics, the displays, and the terminal connectors. The watchdog contains two printed circuit boards. A lower board accommodates the power supply circuitry, output relays and opto-isolators for the input signals. The upper board is mounted in the hinged lid and houses the microprocessors and the circuitry associated with the display and touch buttons. The two boards are connected by a short ribbon cable. In normal use there are no adjustments required inside the case, all settings being performed via the front panel touch buttons.



#### CAUTION

DO NOT REMOVE COVER WHILE CIRCUITS ARE LIVE.  
REPLACE COVER AND TIGHTEN SCREWS  
BEFORE APPLYING POWER.

### 2.2 Electrical Ratings

TABLE A

Electrical Supply -	100 to 260 VAC or 24 VDC (WDC3NV46C)
Power Consumption -	12 Watts Maximum
Starter Interlock Input -	110 V +/- 10% 50/60 Hz 2.5 mA or 220 V +/- 10% 50/60 Hz 5 mA or 24 VDC
Alarm Relay Contacts -	1 Pole Changeover 240 VAC, 10 A Max.
Stop Relay Contacts -	1 Pole Changeover 240 VAC, 10 A Max.
Additional relay contacts for under speed, misalignment, and bearing temperature are available with the optional PLC interface board.	
Probe Inputs -	24 VDC Approx.
Probe Supply -	24 VDC Approx. (1A)
Approvals -	CSA Class II Div 2 Groups F and G (USA)
	CSA Class II Div 1 Groups E, F and G (Canada)

### 2.3 System Parameters

The Watchdog is normally supplied with its programmable parameters preset to default values. Table B shows these values. Each unit is supplied with an 'Engineer's' access code to enable on site programming.

TABLE B

Parameter	Units	Default Settings
Underspeed Alarm	%	10
Underspeed Stop	%	20
Over Calibrated Alarm Speed	%	10
Over Calibrated Stop Speed	%	20
Start Up Delay	Seconds	10
Number of Touchswitches	-	4
Number of NTC Bearing Sensors	-	4
Hot Bearing Temperature Alarm	Degree F	140

## 2.4 NTC Bearing Temperature Sensor - WDB20V3C

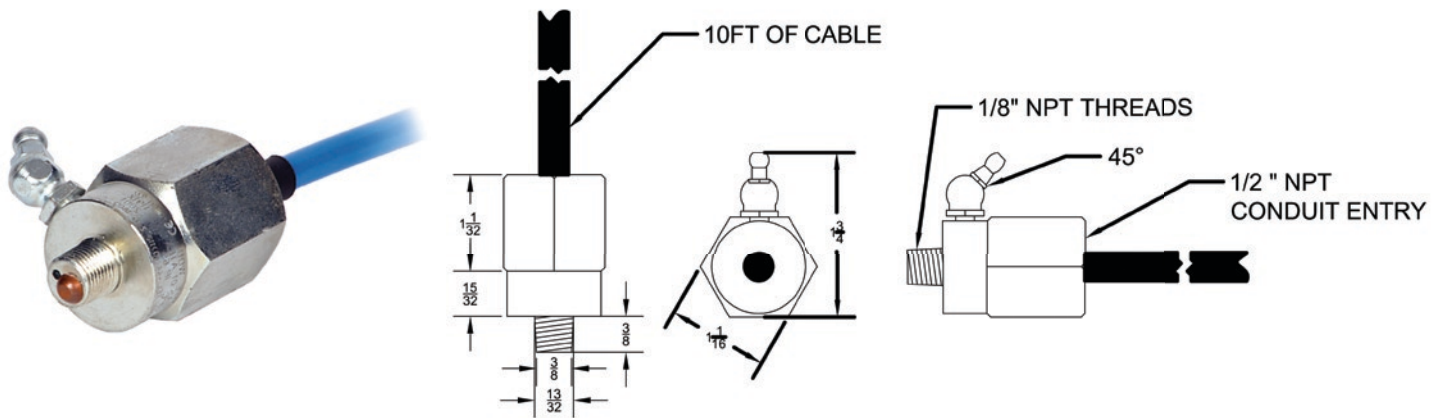


**WARNING:** Refer to bearing temperature sensor installation and operation manual.

The temperature Sensor is designed to screw into the bearing housing in a grease nipple hole or other tapped hole and will detect the temperature of the bearing housing. The sensor contains a negative temperature coefficient (NTC) Thermistor. The system fails to safe, as if the wire is broken at one of the sensors, or a wire is shorted, an alarm signal is generated. A two conductors PVC covered cable is permanently attached to the sensor body. A grease nipple is provided in the body of the sensor to allow greasing of the bearing in the normal manner.

**TABLE C - BEARING SENSORS WDB20V3C**

Switching Temperature -	140°F (user adjustable in Watchdog control unit)
Resistance at (21°C) 70°F -	12000 Ohms Approx.
Resistance at (60°C) 140°F -	2500 Ohms Approx.
Resistance at (100°C) 212°F -	680 Ohms Approx.
Sensing Voltage -	24V DC Approx.
Max. Current -	8ma
Mounting Thread -	1/8" NPTF
Conduit Entry -	1/2" NPT
Cable -	2 Conductors 9 ft. (3 Mtr.) Long
Weight -	7 oz. (0.2 Kg)
Approvals -	CSA Class II Div 1 Group E, F, and G (USA & Canada)



### Bearing Temperature Sensor Overview:

- Can accommodate between 0 and 6 WDB20V3C series NTC bearing sensors
- The sensors are connected to the Watchdog through the normal temperature sensor connections
- Temperature accuracy +/- 2°F display in whole numbers only
- Temperature alarms can be individually set for each sensor and are factory set for 140°F
- The temperatures are calculated as an average reading over 5 seconds
- Three alarms are generated, over temperature, open circuit sensor, and short circuit sensor.
- The alarm relay will operate 10 seconds (by default) after the detected alarm
- The stop relay will operate between 180 and 1 second (default is 60 seconds) after the detected alarm (persistent alarm detection) unless immediate stop on HOT bearing has been set
- Alarms remain on the display until the fault/over temperature problem is removed.
- Fail safe operation (open / short detected)
- The temperature data can be read through the Watchdog's serial port

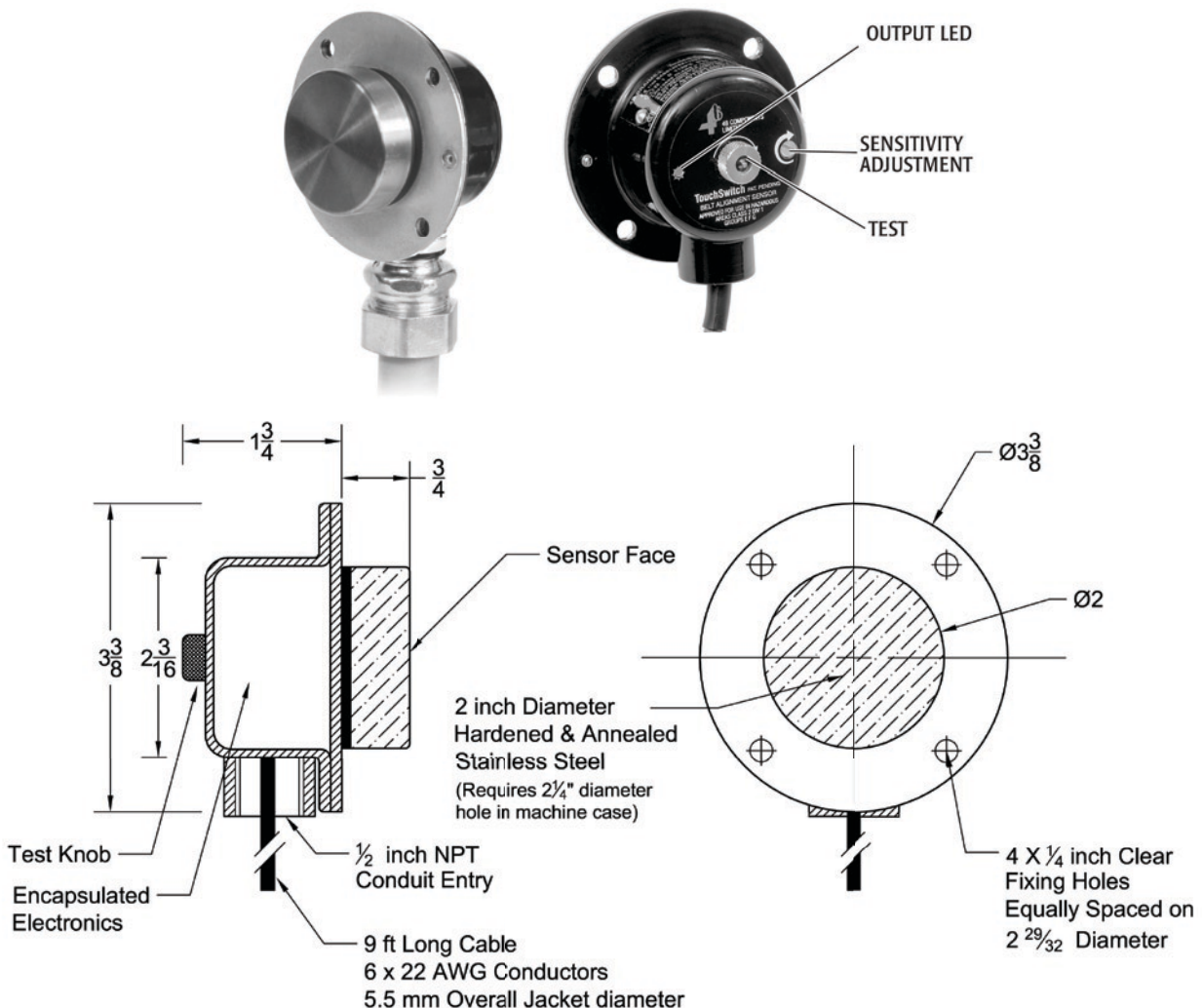
## 2.5 Touchswitch Belt Misalignment Sensor – TS2V4C

**⚠ WARNING:** Refer to Touchswitch installation and operation manual.

The Touchswitch is an electromechanical limit-switch with no moving parts, which detects tracking and misalignment problems on bucket elevators and conveyors. When a belt mis-aligns or a pulley moves over and contacts the sensor, the built in solid-state electronic circuitry detects the lateral force of the belt or pulley and activates a voltage free relay contact. This relay contact is used to immediately alarm and shutdown the machine.

**TABLE D - Touchswitch TS2V4C**

Supply -	24 VDC
Power Consumption -	50 mA
LED Indication -	Red LED indicates unit is powered up and relay is energized
Adjustment -	Factory set to 8 lb. (3.6 Kg) approx.
Output -	Voltage free changeover relay contact rated at 5A 250 VAC, non-inductive
Body Construction -	Pressed seamless steel with epoxy paint
Face Construction -	Hardened and annealed stainless steel
Conduit Entry -	1/2" NPT
Cable -	6 conductors 10ft long (only 4 conductors used with the Watchdog)
Weight -	3 lbs.
Approvals -	CSA Class II Div 1 Group E, F, and G (USA & Canada)



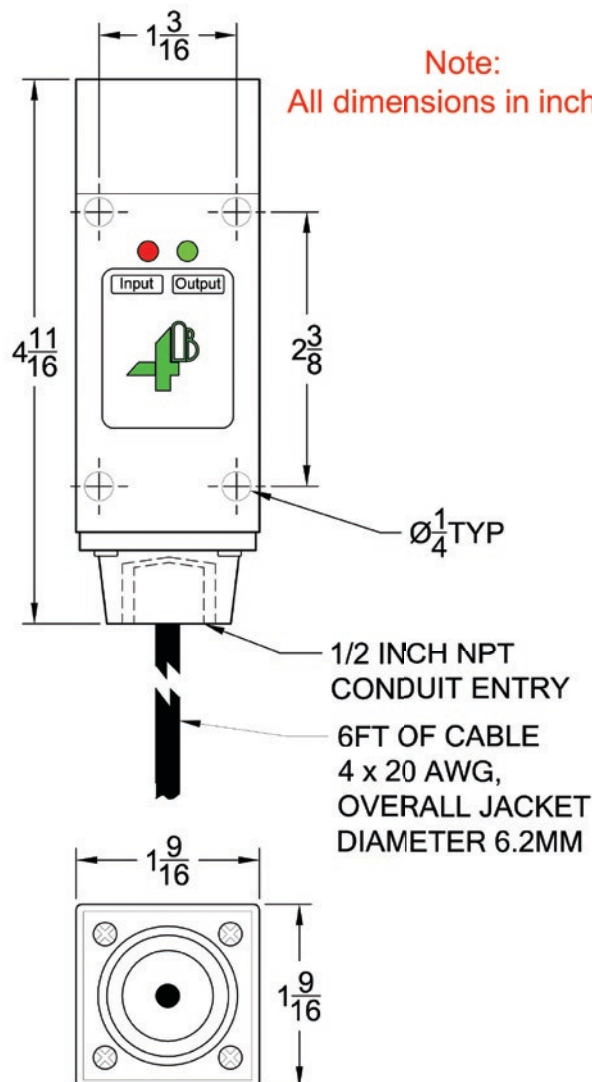
## 2.6 Proxswitch Belt Speed Monitor – P8001V34FC

**⚠ WARNING:** Refer to Proxswitch installation and operation manual.

The P800 Proxswitch is a Class 2, Division 1 approved inductive proximity sensor, which works on the damped oscillator principle. No contact is made between the sensor and the object being monitored. The P800 will detect a ferrous object at 1/2" and a non-ferrous metal object at a distance of 5/16".

**TABLE E - Proxswitch P8001V34FC**

Supply -	10 to 30 VDC
Indication -	Red and Green LED's for target detection
Output -	NPN / PNP transistor rated at 30 VDC 100 mA max.
Max Input Speed -	250 Hz (15,000 ppm)
Sensitivity -	Detect up to 8 mm
Temperature -	5°F to 122°F
Minimal Current -	1 mA
Body Construction -	Molded Polycarbonate / ABS mix
Conduit Entry -	1/2" NPT
Cable -	4 conductors 6 ft. Long
Weight -	1 lbs.
Approvals -	CSA Class II Div 1 Group E, F, and G (USA & Canada)



### 3 INSTALLATION GUIDE

#### 3.1 CONTROL UNIT

The control unit should be installed in a suitable location away from excessive heat, moisture and vibration and mounted at an eye level position so that the display and warning lights can be easily seen. There should be sufficient space to open the hinged lid for wiring.



**The Control Unit can be susceptible to static voltage. Connection of a clean ground to terminal 16 is essential for optimum performance. Prior to this connection, static handling precautions should be taken.**

**ALL WIRING MUST BE IN ACCORDANCE WITH LOCAL AND NATIONAL ELECTRICAL CODES AND SHOULD BE UNDERTAKEN BY AN EXPERIENCED AND PROFESSIONAL, QUALIFIED ELECTRICIAN.**

The certification of this product does not permit the drilling/punching of additional cable entry holes into the body of the enclosure. To do so will void both certification and warranty and may cause serious injury or death.

#### ACCESSORIES



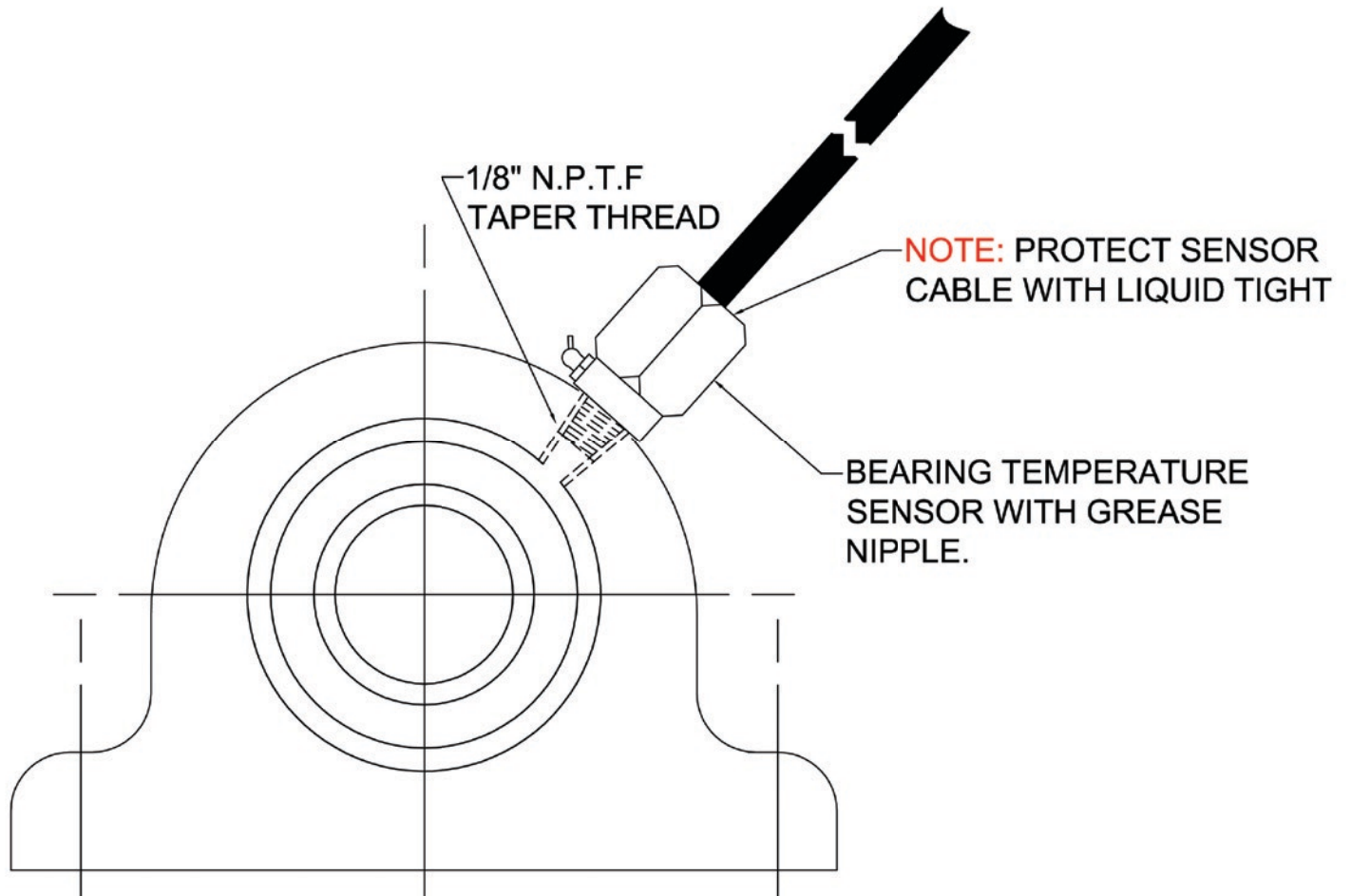
Flashing Lamp  
Part #FL1V1 (120 VDC)  
Part #FL1V34 (12 to 24 VDC)  
**Note:** General purpose use only!



Audible Alarm Horn  
Part #H350120 (Horn)  
Part #H350WP (Weather Proof Housing)  
**Note:** General purpose use only!

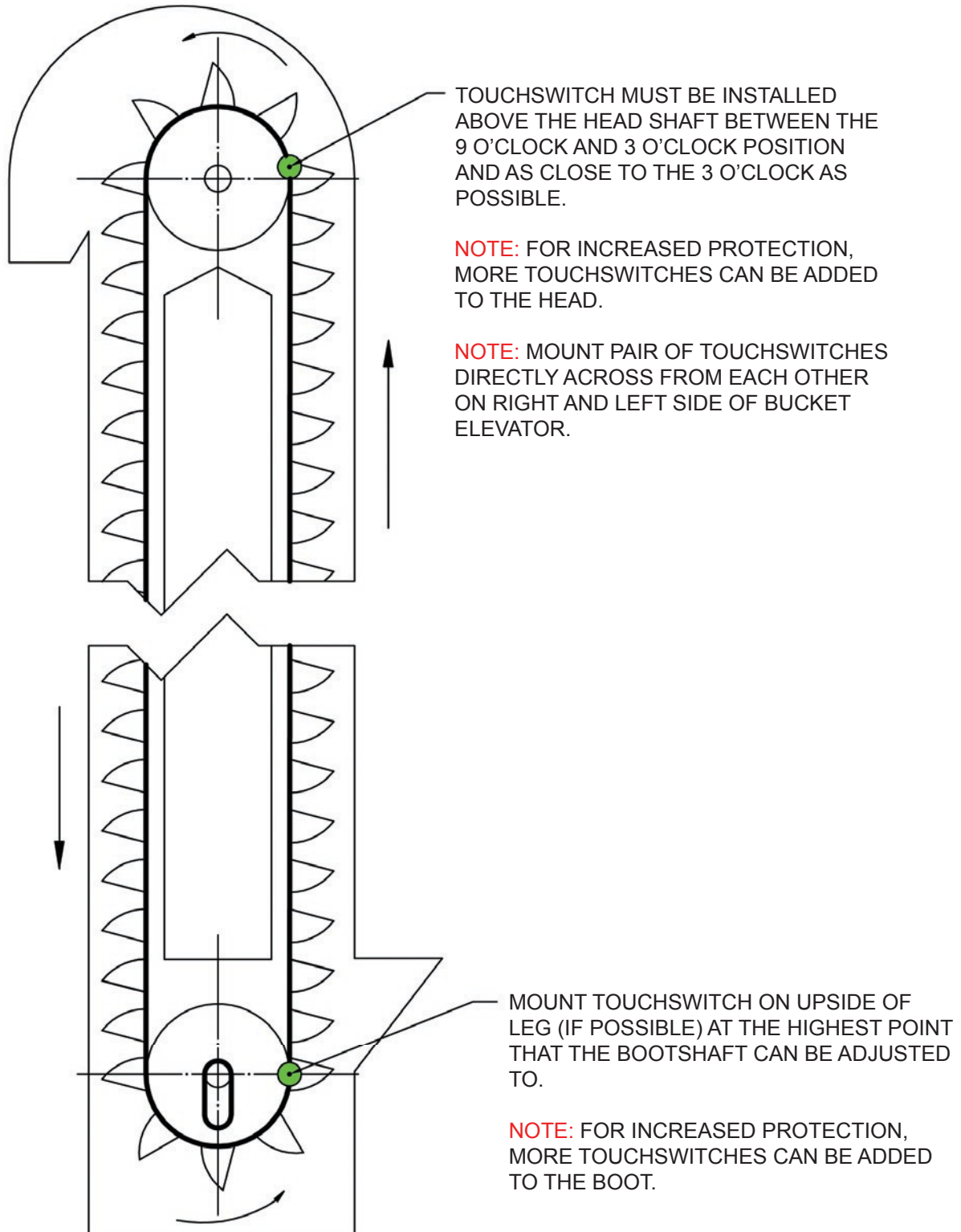


### 3.2 Installation of Bearing Temperature Sensor



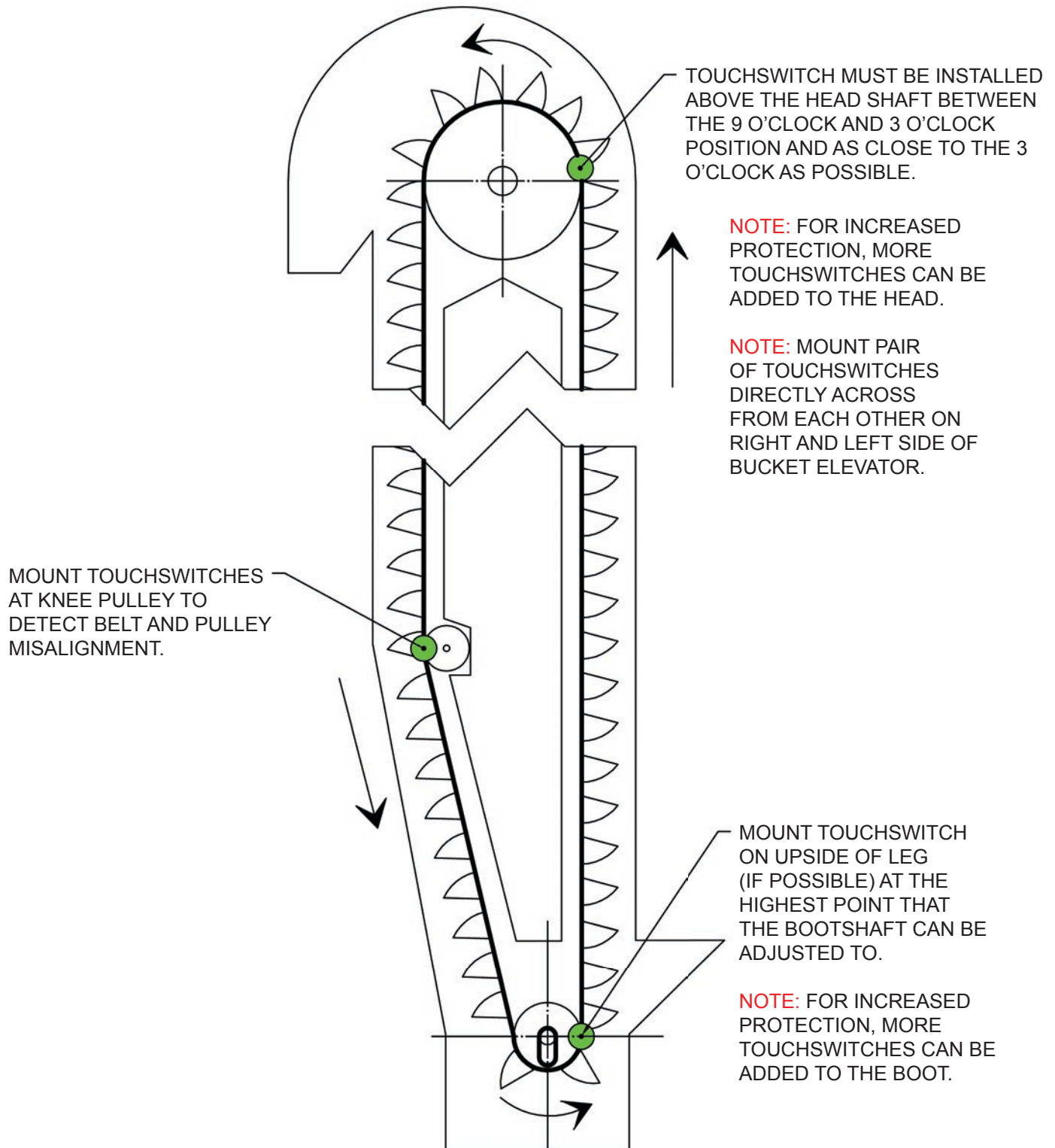
### 3.3 Typical Touchswitch Mounting Positions on a Bucket Elevator

When mounting on the head section of a leg or belt conveyor try to catch the belt and the pulley. On a leg mount Touchswitch just above the center line of the head shaft on the discharge side of the pulley when possible. Sometimes this is not possible due to inspection doors or X-pacs etc. They can be mounted on the top or up side of the head pulley if these are encountered. Try to mount Touchswitches so they are accessible from the head section walkway.

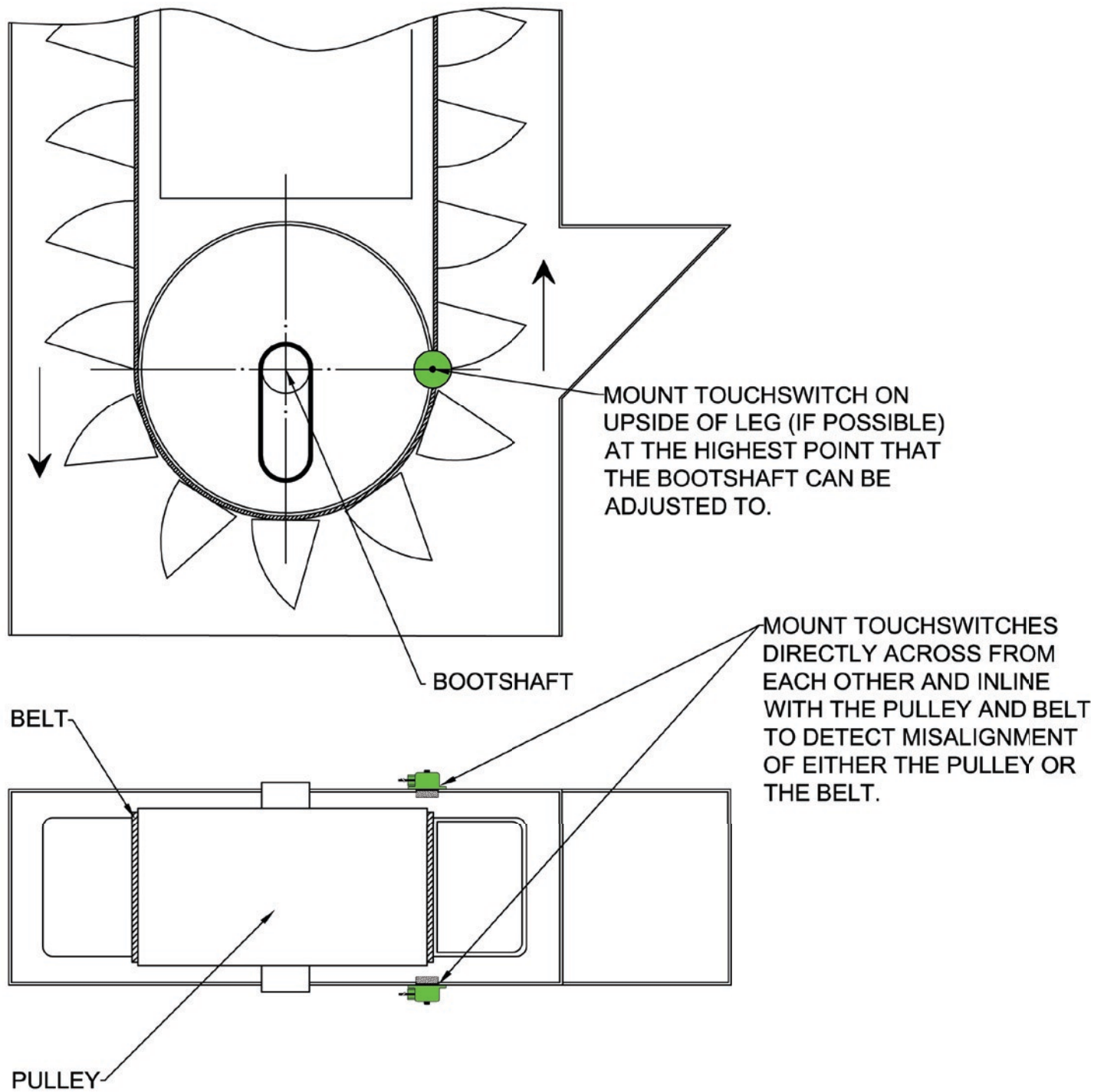


### 3.4 Touchswitch Mounting Position on a Bucket Elevator with a Knee / Idler Pulley

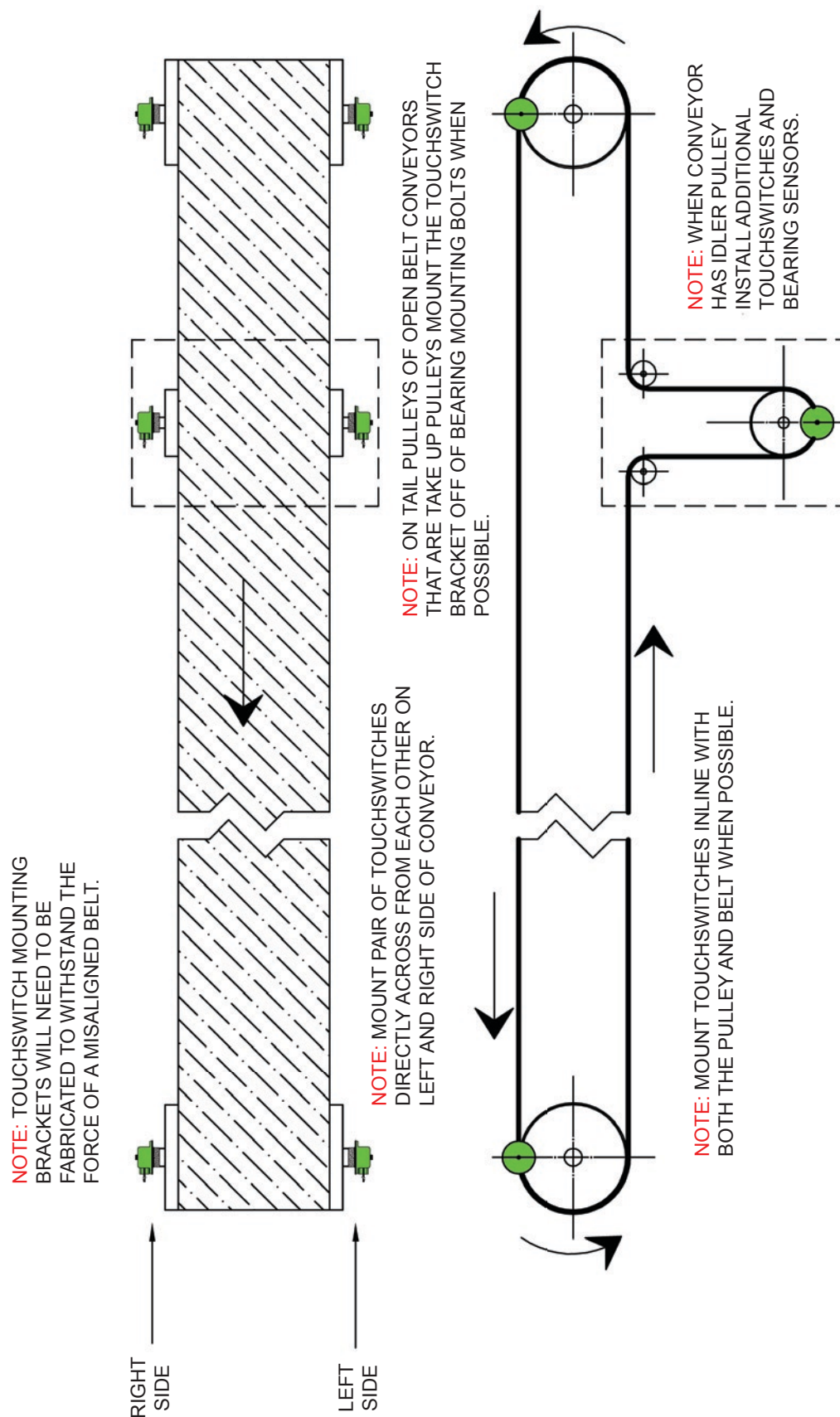
When mounting on the head section of a leg or belt conveyor try to catch the belt and the pulley. On a leg mount Touchswitch just above the center line of the head shaft on the discharge side of the pulley when possible. Sometimes this is not possible due to inspection doors or X-pacs etc. They can be mounted on the top or up side of the head pulley if these are encountered. Try to mount Touchswitches so they are accessible from the head section walkway.



### 3.5 Typical Touchswitch Mounting Positions on Tail / Boot Section of a Bucket Elevator



### 3.6 Touchswitch Mounting Positions on a Open Belt Conveyor



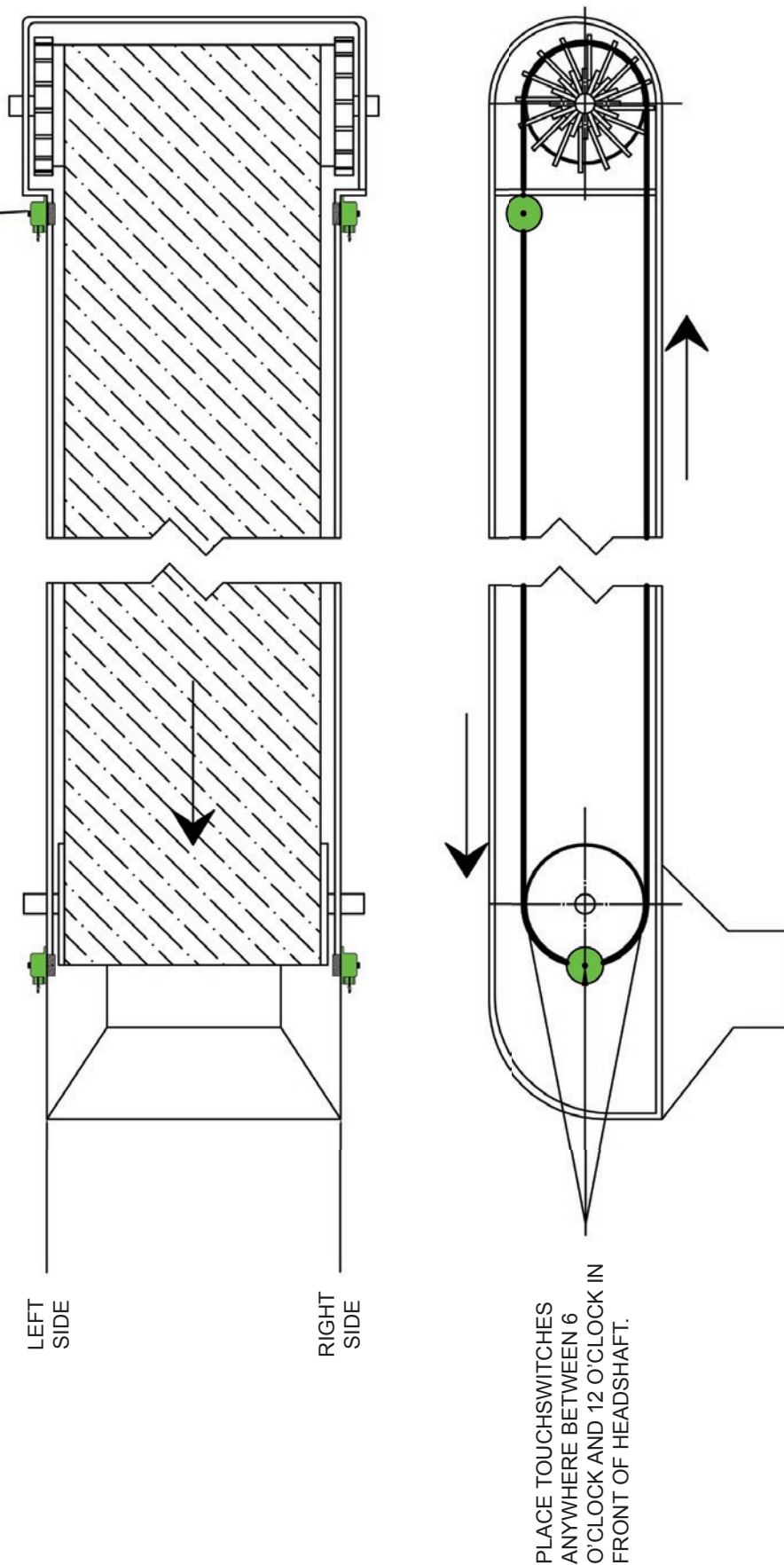


### 3.7 Touchswitch Mounting Positions on a Enclosed Belt Conveyor

**NOTE:** MOUNT PAIR OF TOUCHSWITCHES DIRECTLY ACROSS FROM EACH OTHER ON LEFT AND RIGHT SIDE OF CONVEYOR.

**NOTE:** FOR INCREASED PROTECTION ADDITIONAL TOUCHSWITCHES MAY BE ADDED TO THE HEAD AND TAIL.

ON HIGH ROLLER TAIL SECTION MOUNT TOUCHSWITCHES ALIGNED WITH TOP SIDE OF BELT ON MOVEABLE SECTION JUST IN FRONT OF VERTICAL ANGLE AHEAD OF TAIL PULLEY.



### 3.8 Hazardous Locations

The Watchdog and sensors have been designed for use in certain hazardous locations, where the hazard is known to be Ignitable Dust.

Watchdog Control Unit type WDC3NV46C is approved for use in:

- CSA Class II DIV1 Groups E, F & G (Canada)
- CSA Class II DIV2 Groups F & G (USA)

The Touchswitch TS2V4C is approved for use in:

- CSA Class II DIV1 Groups E, F & G

The Temperature Sensor Probe WDB20V3C is approved for use in:

- CSA Class II DIV1 Groups E, F & G

The Proxswitch P8001V34FC is approved for use in:

- CSA Class II DIV1 Groups E, F & G

### 3.9 GENERAL INSTALLATION TIPS:

**A Watchdog system is equipped to monitor only one bucket elevator or belt conveyor.**

**Normally the internal power supply will be used to power the sensors required by the system.**

- You must use a shielded cable for sensor wiring. Use Belden 5508FE (10 conductor shielded 22 AWG)
- Do not leave Touchswitches physically installed for an extended period of time before calibrating and bringing the Watchdog into service. Extended continuous belt /splice rub can damage the sensors.
- The Watchdog power and sensor cables should be installed in a conduit or cable tray without other cables. If it is not possible to install the cable in this way you should ensure that the cable is not installed in an area where electrical interference can be a problem. High voltage cables, high current cables, high frequency cables such as Variable Frequency Drives and microwave driers are all potential sources of interference for the Watchdog system and you should avoid using existing cabling routes if they contain any of the above.
- Label all wires to aid commissioning and fault finding. Disconnect and insulate all unused wires to avoid shorting to conduit or other wires.
- Do not install the Watchdog cables or control unit near radio transmitter aerials or cellular telephone repeaters.
- Ground the Belden 5508FE shield wire to the Watchdog end of the cable only. You must not allow the shield wire to come into contact with a ground source at any other points as this could significantly increase electrical noise by inducing ground currents.
- Do not drill extra holes into the Watchdog control unit. This will void the warranty of the product and may affect the approval rating of the enclosure.

### 3.10 Quick Tips

#### Quick Tip # 1

When using Touchswitches, ensure that you cut a 2-1/4" diameter hole through the machine casing, centered on the edge of the belt. The hole should be cleaned and de burred to avoid the Touchswitch puck binding and giving false misalignment alarms.

#### Quick Tip #2

The Watchdog requires a motor interlock input voltage signal across terminals 6 and 7. This signal controls the starting and stopping of the equipment under normal conditions. The voltage should be present when the equipment is running, and not present when the equipment is stopped.

#### Quick Tip #3

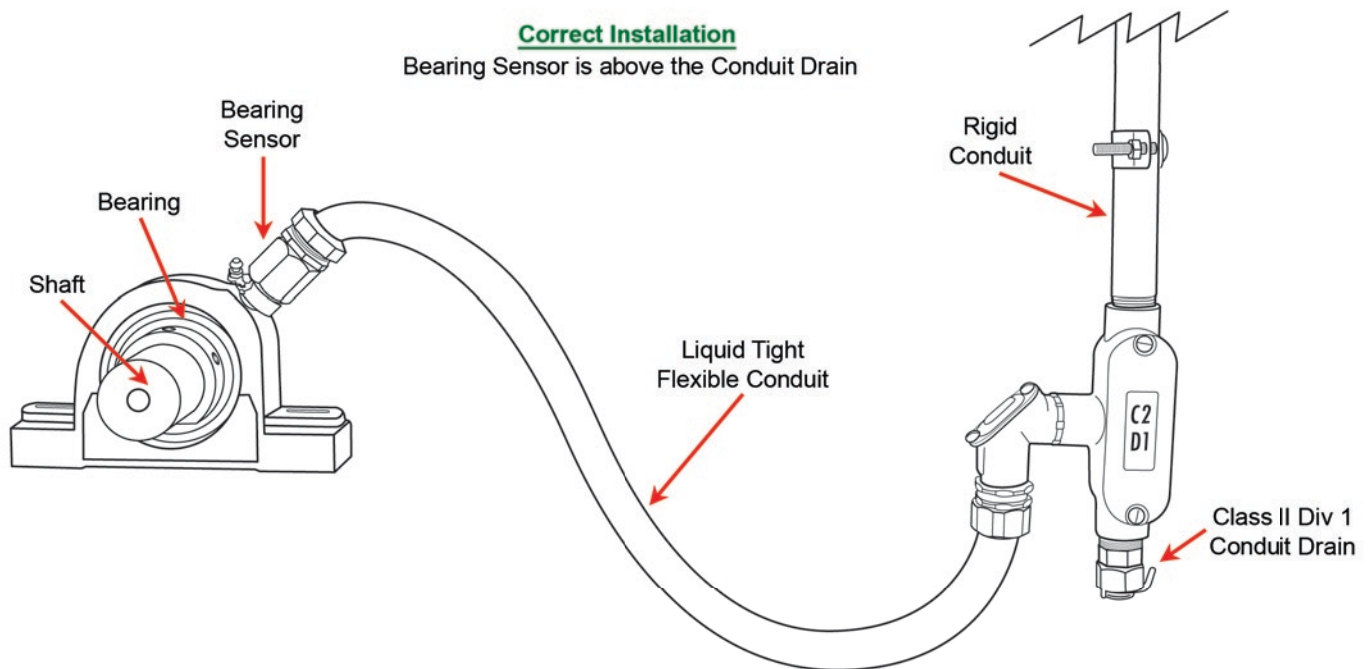
Before powering the system, measure the resistance to check that the DC supply wires are not shorted to each other and that the +24VDC is not touching any conduit.

#### Quick Tip #4

When using NTC (WDB20V3C) bearing temperature sensors, leave the default setting for the HBS zones at 0 in the Engineer Set-UP. Press A & C at the same time to enter the NTC menu to set the number of bearing sensors that you have installed (Either 4 or 6).

#### Quick Tip #5

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 (see example below).



### 3.11 Installation and Wiring - Hazardous Locations

Consult the National Electrical Code prior to installation.

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.

### 3.12 Installation of Bearing Temperature Sensors:

The following are guidelines and suggestions for installing bearing temperature sensors. The installer must take responsibly that the sensors are installed in a fashion that can detect bearing temperature as quickly and accurately as possible.

**All lockout and hotwork procedures must be followed.**

The NTC bearing sensor has a 1/8" NPT fitting with the sensor just at the base of the threads. This is where the heat is detected, so the closer this is to the actual heat source (bearing) the better detection capability this sensor will have. These sensors are designed for the bearings existing grease zerk to be removed and the sensor screwed directly into the grease zerk hole. The NTC sensor is supplied with a grease zerk installed in it.

On the majority of bearings the sensor can be directly installed. Some bearing designs require an extension be added to the sensor. When an extension is added, add the very minimum length to keep the bearing sensor as near the bearing as possible. Often times a female to male coupling can be used; this is about as short of an extension that can be purchased. It is recommended to purchase these in brass, as brass will transmit heat fairly well. Sometimes the threaded fitting in a bearing maybe 1/4" or 3/8" NPT. When this is encountered, a reduce bushing will need to be used. Use only one reduce bushing to get from bearing fitting size to the 1/8" female. This will help to keep the sensor closer to the bearing.

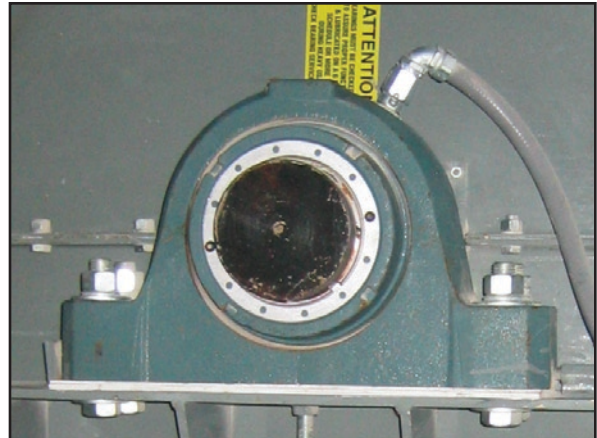
When connecting liquid tight to Bearing Temperature Sensors, limit the length to NEC requirements. However, when installed on an adjustable pulley or section be certain enough liquid tight is installed so all adjustments can be utilized.

There is also an NTC lug style temperature sensor available that is interchangeable with the screw in sensor. It maybe found that on some applications this is the style of sensor that will be able to detect heat the quickest.

## Temperature Sensor Installation Photos



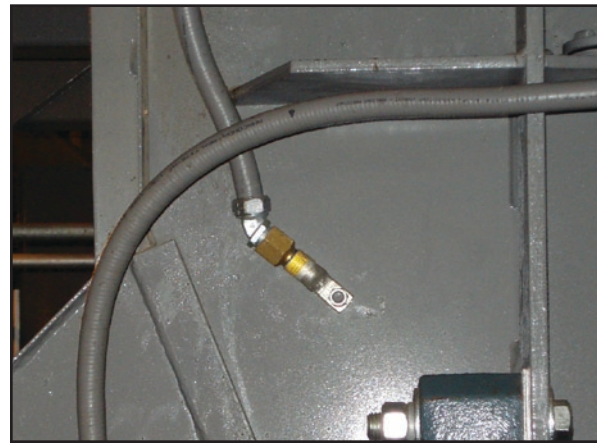
WDB20V3C bearing temperature sensor shown installed on a tail bearing of an enclosed belt conveyor.



WDB20V3C bearing temperature sensor shown installed on a head bearing of a bucket elevator.



WDB70V3C lug style temperature sensor shown installed on bearing housing.



WDB70V3C lug style temperature sensor shown installed on enclosed belt conveyor casing.



### 3.13 Installation of Touchswitches:

The following are guidelines and suggestions for installing Touchswitches. The installer must take responsibility that the Touchswitches are mounted in a position to be able to detect a belt misalignment condition and or a pulley misalignment condition, whichever it maybe.

**All lockout and hotwork procedures shall be followed.**

The Touchswitch hole should be cut into the housing with a 2-1/4" hole saw. You can mount the Touchswitch with 2 of the 4 flange holes, provided they are across from one another. The Touchswitch needs to be mounted on a flat surface, preferably with the conduit entrance (1/2") at the 3 o'clock to 9 o'clock position to minimize the entrance of water thru the conduit threads. Use 1/4" x 1-1/4" round head machine bolts with lock washers to mount them with the round head inside the leg or conveyor housing, there shall not be any screws or bolts sticking inside of the leg or conveyor housing. When placing flange shims on Touchswitch make certain belt and or pulley contacts Touchswitch face before it can contact any internal surface of leg or conveyor housing. It is best not to be any further away from the pulley then 1- 1/4 to 1-1/2" to the face of the Touchswitch. Make certain both sides are the same distance from pulley.

When mounting on the head section of a leg or belt conveyor try to catch the belt and the pulley. On a leg mount Touchswitch above the center line of the head shaft on the discharge side of the pulley when possible. Sometimes this is not possible due to inspection doors or X-pacs etc. They can be mounted on the top or up side of the head pulley if these are encountered. Try to mount Touchswitches so they are accessible from the head section walkway. Be sure to mount Touchswitches straight across from one another. On a conveyor head section mount Touchswitches forward of the head shaft in order to catch the head pulley and belt if either should become misaligned. On a leg boot mount Touchswitch on the up side of the tail pulley if there are no obstructions. If obstructions are encountered the down side of the pulley will work but be sure to have the switches mounted directly across from one another. When mounting on the boot of a leg, mount Touchswitch above center line of boot shaft at the boot shaft's highest possible position. Note where shaft is, measure how much higher it can possibly travel or be adjusted, mount Touchswitch that much higher than the shaft is sitting. You will not be able to catch the leg boot pulley in all positions with a Touchswitch. On enclosed belt conveyor tail sections mount Touchswitches to catch top side of belt on movable section just in front of vertical angle just ahead of tail pulley. You will not be able to catch the tail pulley with a Touchswitch on a enclosed belt conveyor due to the flippers on the pulley. Some tail sections have a stud welded to the side of housing just outside of the flippers to mount a lug type temperature sensor. When installing Touchswitches on the tail section of enclosed belt conveyors some tail section adjustment will be sacrificed.

When mounting Touchswitches on open belt conveyors usually brackets will need to be fabricated. These brackets must be built rigid enough to take pressure from a misaligned belt. It is best if these can be mounted so the Touchswitch can detect if the pulley and or the belt has shifted. On tail pulleys of open belts that are take-up pulleys, it is good if the Touchswitch bracket can be mounted off of the bearing mounting bolts. This allows the Touchswitch to move with the pulley when belt adjustments are made.

When connecting liquid tight to Touchswitches, limit the length to NEC requirements. However, when installed on an adjustable pulley or section be certain enough liquid tight is installed so all adjustments can be utilized.

When connecting Touchswitches, the green and orange wires in the cable will not be used. Cut both of these wires near the cable jacket, cut one longer than the other and tape them to isolate them from any power or ground. The orange wire has 24 VDC on it when the Touchswitch is powered and activated. The green wire is connected directly to ground inside the Touchswitch. This will cause problems if the wires contact each other, power, or ground.

## TOUCHSWITCH INSTALLATION PHOTOS

### Open Belt Conveyors



Touchswitch installed on take-up pulley of an open belt conveyor.



Touchswitch installed at the tail of an open belt conveyor.

### Enclosed Belt Conveyor and Bucket Elevator



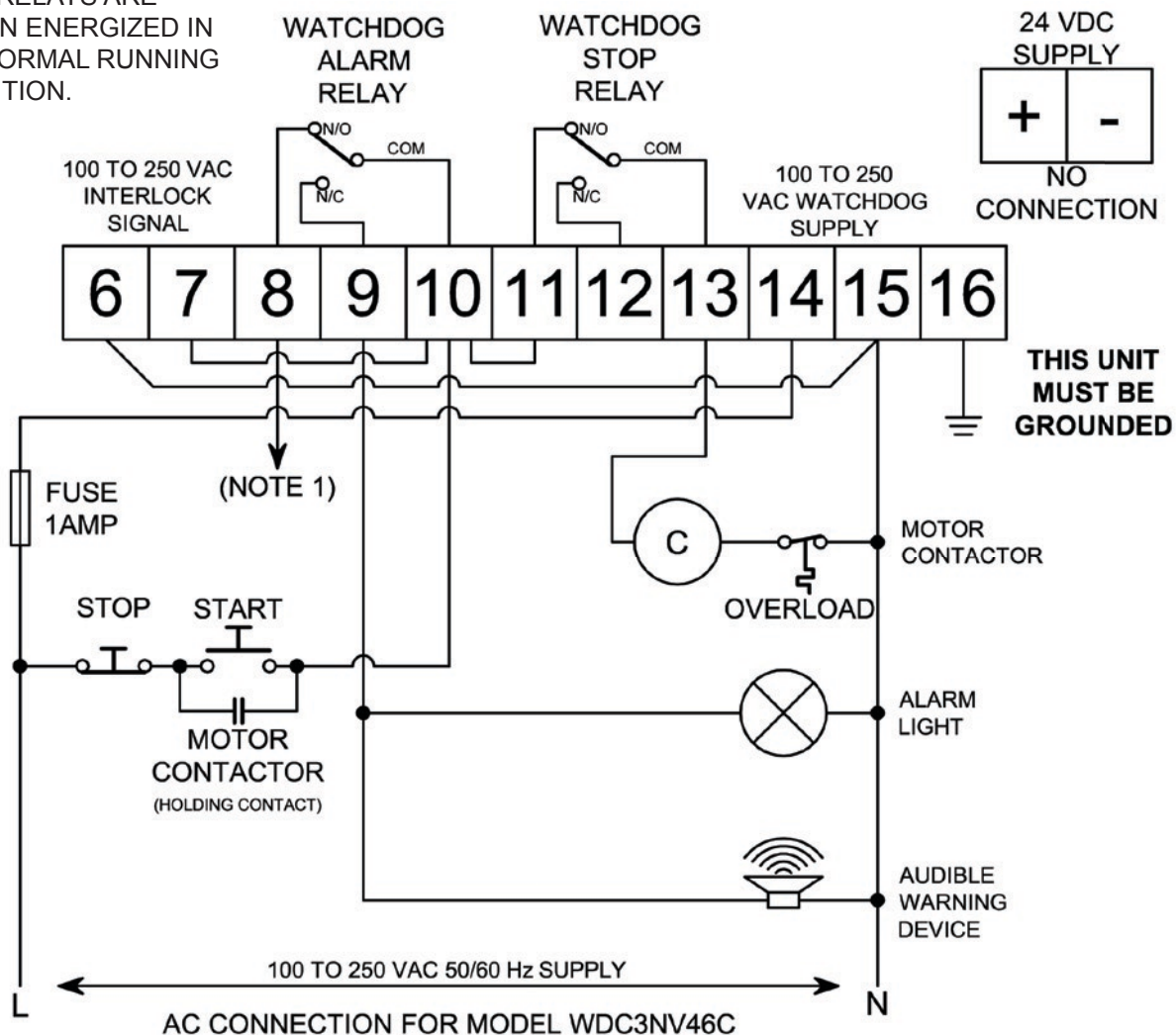
Touchswitch installed at the drive end of an enclosed belt conveyor (inside view).



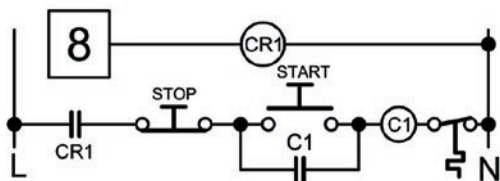
Touchswitch installed on a bucket elevator.

### 3.14 Control Wiring Diagram for Watchdog Elite

**NOTE:** ALARM AND STOP RELAYS ARE SHOWN ENERGIZED IN THE NORMAL RUNNING CONDITION.

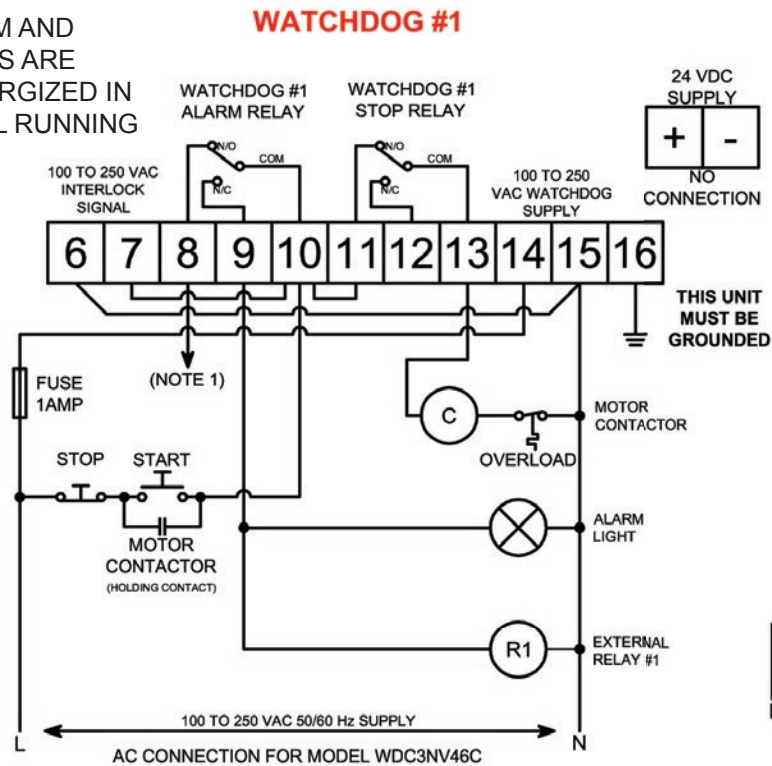


**NOTE 1:** AUTOMATIC SHUTDOWN CONTROL SIGNAL TO FEED EQUIPMENT.

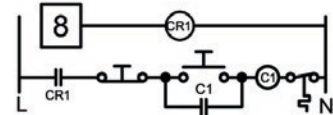


### 3.15 Control Wiring Diagram for Multiple Watchdog Elite Units to One Set of Alarms

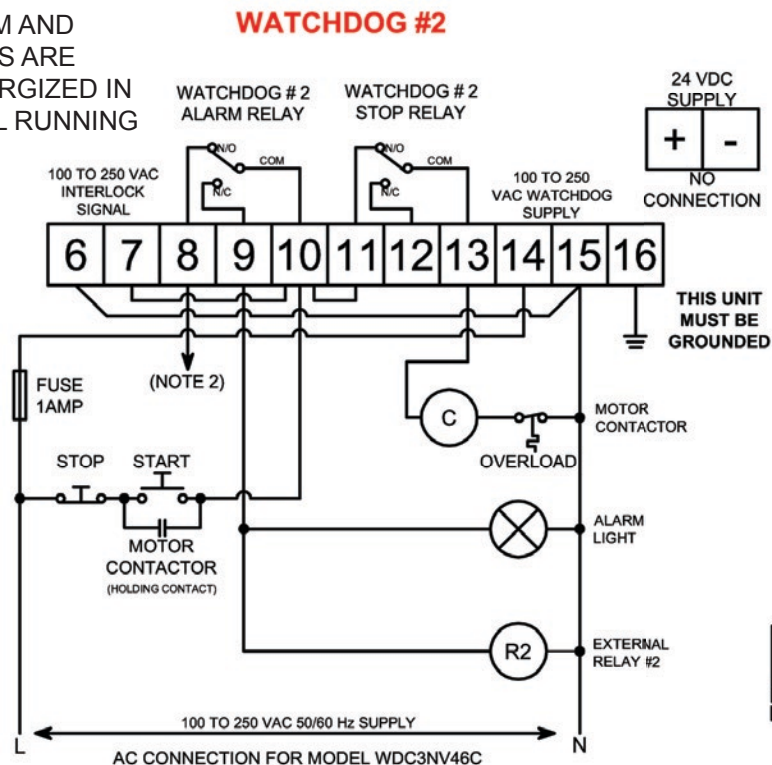
**NOTE:** ALARM AND STOP RELAYS ARE SHOWN ENERGIZED IN THE NORMAL RUNNING CONDITION.



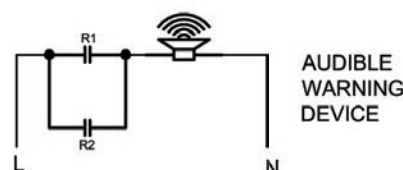
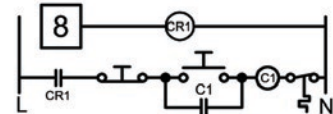
**NOTE 1:** AUTOMATIC SHUTDOWN CONTROL SIGNAL TO FEED EQUIPMENT.



**NOTE:** ALARM AND STOP RELAYS ARE SHOWN ENERGIZED IN THE NORMAL RUNNING CONDITION.



**NOTE 2:** AUTOMATIC SHUTDOWN CONTROL SIGNAL TO FEED EQUIPMENT.





### 3.16 Watchdog Sensor Wiring Diagram (No Knee or Idler Pulleys)

#### WATCHDOG ELITE

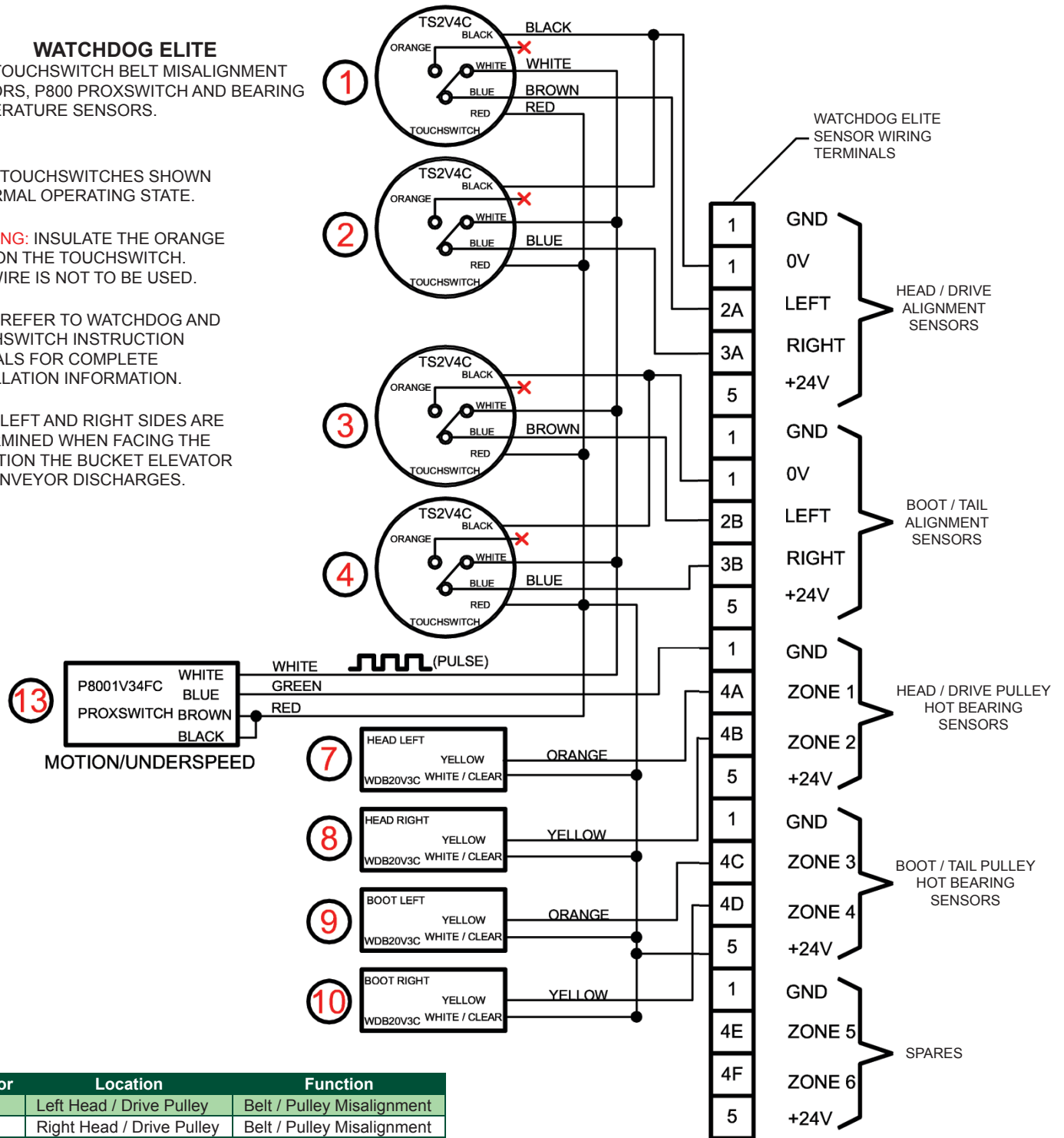
WITH TOUCHSWITCH BELT MISALIGNMENT SENSORS, P800 PROXSWITCH AND BEARING TEMPERATURE SENSORS.

**NOTE:** TOUCHSWITCHES SHOWN IN NORMAL OPERATING STATE.

**WARNING:** INSULATE THE ORANGE WIRE ON THE TOUCHSWITCH. THIS WIRE IS NOT TO BE USED.

**NOTE:** REFER TO WATCHDOG AND TOUCHSWITCH INSTRUCTION MANUALS FOR COMPLETE INSTALLATION INFORMATION.

**NOTE:** LEFT AND RIGHT SIDES ARE DETERMINED WHEN FACING THE DIRECTION THE BUCKET ELEVATOR OR CONVEYOR DISCHARGES.



Sensor	Location	Function
1	Left Head / Drive Pulley	Belt / Pulley Misalignment
2	Right Head / Drive Pulley	Belt / Pulley Misalignment
3	Left Boot / Tail Pulley	Belt / Pulley Misalignment
4	Right Boot / Tail Pulley	Belt / Pulley Misalignment
5	Not Used	N/A
6	Not Used	N/A
7	Left Head / Drive Pulley	Bearing Temperature
8	Right Head / Drive Pulley	Bearing Temperature
9	Left Boot / Tail Pulley	Bearing Temperature
10	Right Boot / Tail Pulley	Bearing Temperature
11	Not Used	N/A
12	Not Used	N/A
13	Boot / Tail Shaft	Motion / Underspeed

**NOTE:** CABLE TYPE IS BELDEN 5508FE WITH 10 CONDUCTORS EACH 22 AWG, SHIELDED. OVERALL OUTER DIAMETER IS 0.23 INCHES. PURPLE AND GREY CONDUCTORS ARE SPARES. THE SHIELD IS TO BE CONNECTED TO GROUND (TERMINAL #1) AT THE WATCHDOG ONLY.



### 3.17 Watchdog Sensor Wiring Diagram (Knee or Idler Pulleys)

#### WATCHDOG ELITE

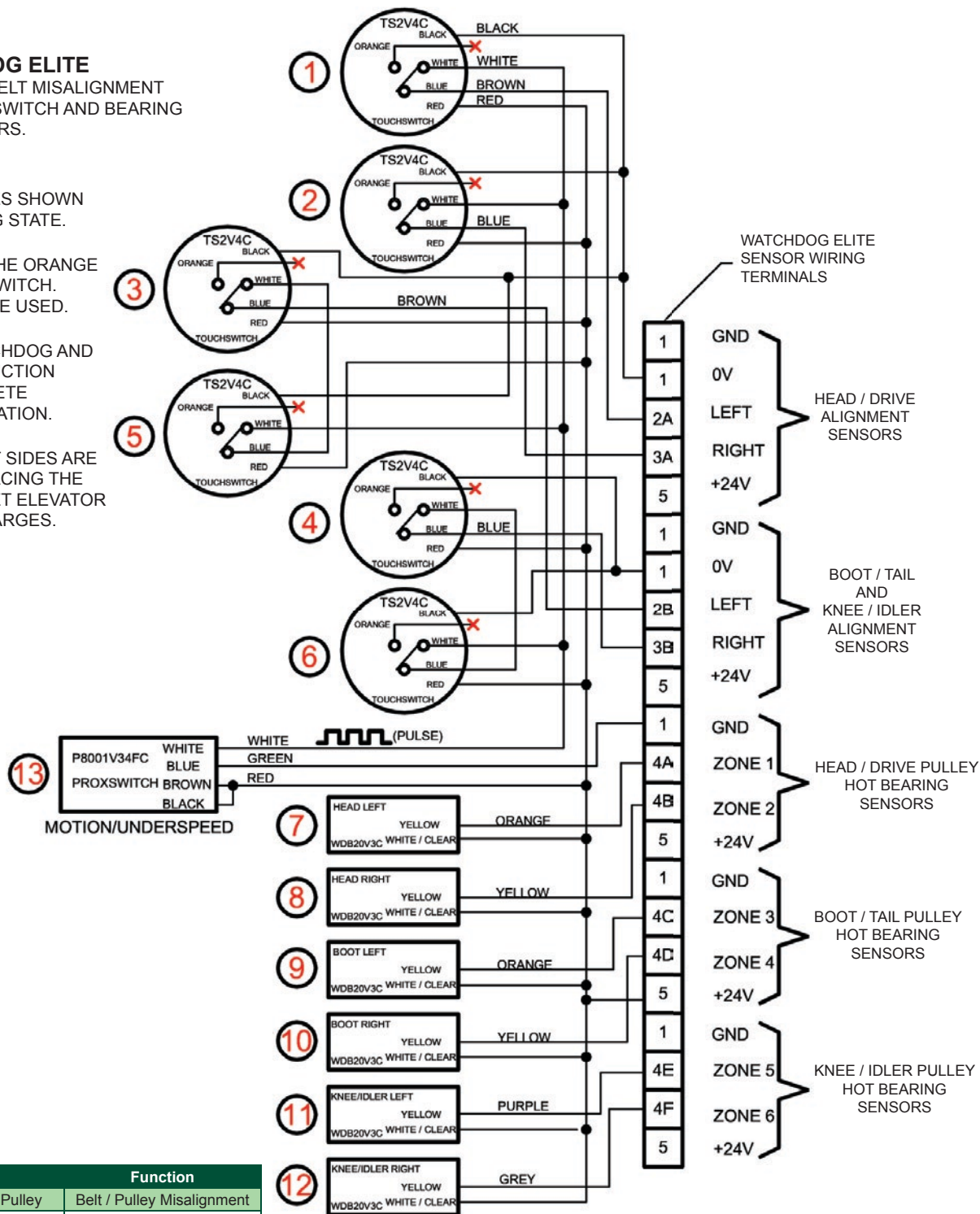
WITH TOUCHSWITCH BELT MISALIGNMENT SENSORS, P800 PROXSWITCH AND BEARING TEMPERATURE SENSORS.

**NOTE:** TOUCHSWITCHES SHOWN IN NORMAL OPERATING STATE.

**WARNING:** INSULATE THE ORANGE WIRE ON THE TOUCHSWITCH. THIS WIRE IS NOT TO BE USED.

**NOTE:** REFER TO WATCHDOG AND TOUCHSWITCH INSTRUCTION MANUALS FOR COMPLETE INSTALLATION INFORMATION.

**NOTE:** LEFT AND RIGHT SIDES ARE DETERMINED WHEN FACING THE DIRECTION THE BUCKET ELEVATOR OR CONVEYOR DISCHARGES.



Sensor	Location	Function
1	Left Head / Drive Pulley	Belt / Pulley Misalignment
2	Right Head / Drive Pulley	Belt / Pulley Misalignment
3	Left Boot / Tail Pulley	Belt / Pulley Misalignment
4	Right Boot / Tail Pulley	Belt / Pulley Misalignment
5	Left Knee / Idler Pulley	Belt / Pulley Misalignment
6	Right Knee / Idler Pulley	Belt / Pulley Misalignment
7	Left Head / Drive Pulley	Bearing Temperature
8	Right Head / Drive Pulley	Bearing Temperature
9	Left Boot / Tail Pulley	Bearing Temperature
10	Right Boot / Tail Pulley	Bearing Temperature
11	Left Knee / Idler Pulley	Bearing Temperature
12	Right Knee / Idler Pulley	Bearing Temperature
13	Boot / Tail Shaft	Motion / Underspeed

**NOTE:** CABLE TYPE IS BELDEN 5508FE WITH 10 CONDUCTORS EACH 22 AWG, SHIELDED. OVERALL OUTER DIAMETER IS 0.23 INCHES. PURPLE AND GREY CONDUCTORS ARE SPARES. THE SHIELD IS TO BE CONNECTED TO GROUND (TERMINAL #1) AT THE WATCHDOG ONLY.

## 4 OPERATING INSTRUCTIONS

The equipment should have been installed and wired in accordance with the Installation Instructions and in accordance with National and Local Codes.

### 4.1 First Time Use & Initial Calibration

The Watchdog is normally supplied UNCALIBRATED. When the unit is first connected to its supply this is indicated by a message on the display, "Not Calibrated!... See Manual!" At this time the Alarm lamp should be flashing and the Alarm relay pulsing.

 **WARNING: Prior to calibration and throughout the calibration process, ensure that the belt is tight and that there is no grain being moved by the elevator / conveyor.**

Proceed as follows:

- (i) Go to the Main Menu by touching button C (green) once. Select the Calibration option by touching button B (yellow) to move the cursor to 'CALIB'.
- (ii) Select 'CALIB' by touching button C (green). Enter the 3-character Calibration access code (A,B,C) that was supplied with the unit. If the code is accepted the LCD will indicate 'Start Elevator to Calibrate'.
- (iii) Operate the START button on the motor starter. This provides an interlock signal to the Watchdog (terminals 6 and 7) which will cause the Alarm and Stop relays to be energized and allow the machine to start. Alarm lamp will continue flashing.
- (iv) The display will indicate the start up delay time. When the start up delay has expired the Alarm lamp will extinguish and the Calibration procedure will start.
- (v) The Calibration procedure takes about 16 seconds, the progress being indicated on the display as a percentage. The Watchdog will measure the rate of input signals and store an average value of speed (the Calibrated speed) in memory.
- (vi) When the Calibration procedure is complete the unit will go into normal operation. Any change of speed or misalignment or temperature beyond the preset levels will now cause the appropriate ALARM and STOP action.

 **WARNING: A full system test should be undertaken before the elevator is used in normal operation.**

## 5 TESTING


### 5.1 Testing the Control Unit

To perform a test, go to the main menu by touching the button “C” (red). Select “TEST” from the main menu. Two options will be displayed, “Test Settings” and “Full Test”.


### 5.2 Test Settings

When selected, the test will show the value of the calibrated speed and the actual alarm and stop trip speed settings in pulses per minute on the speed display and the trip percentages on the message display. This test can be performed at any time whether the machine is running or stationary, as the relays do not operate from this test function and the normal running of the machine is unaffected.

### 5.3 Underspeed Testing and Full Test

 **WARNING: This test will deactivate the alarm and shut down relays which will shut down the elevator. The elevator must be empty and clear of all products when performing this test.**

When the full test is selected, the engineer’s access code “BBBB” will be requested. When the access code is entered, the settings will be displayed as the “Test Settings”, and in addition the alarm relay and then the alarm and stop relays will be de-activated, thus verifying the relays and external wiring. It is recommended that these tests are performed on a regular basis in order to verify correct working of the system, the external wiring, and related components. Abort test by touching button “A”.

 **WARNING: A full test should be performed on a regular basis and should be included in the preventative maintenance program for the elevator.**

Also, visually inspect the system wiring, sealite, junction boxes and conduit, making sure that all fittings are tight and secure.

### 5.4 Testing the Touchswitch:

Observe that the red LED on the sensor housing is on and the belt or pulley is not touching the sensor. Slowly turn the test knob clockwise by hand, until the LED goes out. Check that the correct “Green” Pulsed LED on the Watchdog goes off and that alarms and shutdowns work as expected. Turn the test knob back to its original position (about 1/4 turn) and make sure that it is loose. Observe that the LED is now on.

Periodically test the sensor and system, and visually inspect the contact surface of the sensor and the sealite, the wires, junction box and conduit.


### 5.5 Testing the NTC Bearing Temperature Sensor:

Observe and note the temperature readings on the Watchdog display and/or the PC Log / Print / PM software. Freeze spray each bearing sensor in turn and observe a reduction in temperature for each sensor. Check that the sensor location matches up with the correct location on the Watchdog display and/or the PC Log / Print / PM software. After a few minutes, observe that the temperature returns to normal.

Periodically test the sensor and system, and visually inspect the sensor, the sealite, the wires, junction box and conduit.


## 6 WATCHDOG ELITE AND SENSOR TROUBLESHOOTING GUIDE

FAULT	CAUSE	REMEDY
Blank and flashing screen	External sensor short	<ul style="list-style-type: none"> <li>• Check ribbon cable connection on bottom PCB</li> <li>• Remove terminal strip, remove sensor wires one at a time</li> <li>• Check fuses and make sure you have appropriate power 24VDC</li> </ul>
Hot bearing alarm	Hot bearing or incorrect set up	<ul style="list-style-type: none"> <li>• Check for hot bearing</li> <li>• Check for correct set up</li> <li>• Call 4B</li> </ul>
Stop Condition / Starting Fault	“Soft start”	<ul style="list-style-type: none"> <li>• Call 4B</li> </ul>
	No Pulses	<ul style="list-style-type: none"> <li>• Check for plugged belt</li> <li>• Check green LEDs on lid</li> <li>• Check P800 LED is flashing</li> <li>• Check Whirligig to see if still tight on shaft</li> <li>• Check for 24VDC at P800</li> <li>• Check to see if orange wire is insulated on Touchswitches</li> </ul>
Stop relay open	Interlock problem	<ul style="list-style-type: none"> <li>• Check motor starter interlock wiring at terminals 6 and 7</li> <li>• Call 4B</li> </ul>
Leg will not start “Elevator stopped ready to run”	Interlock problem	<ul style="list-style-type: none"> <li>• Check motor starter interlock wiring at terminals 6 and 7</li> <li>• Call 4B</li> </ul>
Over Speed	Incorrect calibration	<ul style="list-style-type: none"> <li>• Re-calibrate after checking belt tension and do not introduce grain!</li> </ul>
Touchswitch signalling an alarm condition and / or red led is out on Touchswitch	Belt misaligning	<ul style="list-style-type: none"> <li>• Check belt alignment</li> </ul>
	Touchswitch Binding against leg casing	<ul style="list-style-type: none"> <li>• Check hole diameter is 2-1/4 inches and is de-burred.</li> <li>• Check Touchswitch is centered in the hole</li> </ul>
	Test knob active	<ul style="list-style-type: none"> <li>• Loosen knob (rotate counterclockwise 1/4 turn until loose)</li> </ul>
	No Power	<ul style="list-style-type: none"> <li>• Check 24 VDC to Touchswitch</li> <li>• Check orange wire is insulated</li> </ul>

 **DANGER: Exposed buckets and moving parts will cause severe injury or death. In all cases, immediately stop the elevator before investigating any problem. Ensure that all lockout and tag-out procedures are adhered to.**

## 7 WARNING MESSAGE DISPLAYED ON WATCHDOG ELITE LCD

TEXT ON LCD	CAUSE	ACTION (Where Required)
Not Calibrated	Watchdog Not Calibrated	Calibrate Watchdog
Start Elevator	Calibrate option has been selected from menu	Start elevator to calibrate
Hot Bearing	Bearing at Sensor x has exceeded temperature	Check the bearing at Sensor x
HBS #x Open Circuit	Bearing sensor faulty or wiring faulty	Check bearing sensor and wiring at Zone x
HBS #x Over Range	Bearing sensor faulty or wiring faulty	Check bearing sensor and wiring at Zone x
Misalignment Upper / Lower	Belt is misaligned at top or bottom	Check elevator belt Check Touchswitch
Underspeed Alarm Delay in Seconds	Elevator belt is slipping	Check the belt tension
Overspeed Alarm Delay in Seconds or Overspeeding	Incorrect Calibration	Check the belt speed
Internal Fault Code n	Watchdog internal fault	Contact 4B
Power Fail	Supply voltage out of limits	Check supply voltage is within tolerance
Stop Condition	Elevator or conveyor failed to accelerate	Check elevator leg Check motor starting circuitry Check condition of "soft start" system
Stop Condition Underspeed Fault	Elevator speed was below preset value	Check belt tension Check belt speed
Stop Condition Over Calibration Fault	Elevator speed was above preset value	Check belt tension Check belt speed
Stop Condition Persistent Alarm	One or more alarm conditions have persisted	Check and remedy problem
Stop Relay Open Speed n	Waiting for motor to stop	None
Motor Running Speed n	Normal running	None

 **DANGER: Exposed buckets and moving parts will cause severe injury or death. In all cases, immediately stop the elevator before investigating any problem. Ensure that all lockout and tag-out procedures are adhered to.**





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