



Touchswitch™

BELT MISALIGNMENT SENSOR



U.S. Patent #6,731,219
Other Patents Pending

INSTALLATION INSTRUCTIONS

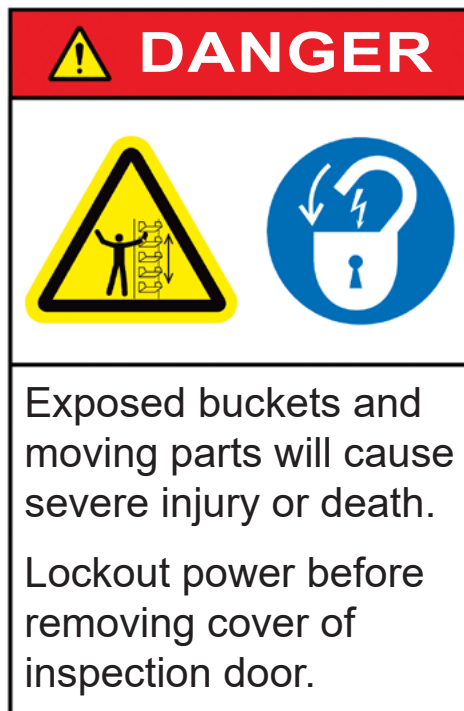
OPERATION MANUAL

BELT MISALIGNMENT SENSOR - PART NO. TS2V34CAI

www.go4b.com/usa

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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/usa). 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 24-hour hotline number 309-698-5611, contact your local distributor, or use one of the contact ways available in our website www.go4b.com/usa.

6. SERVICE REQUEST

If you have questions or comments about the operation of your unit or require the unit to be serviced please call the 24-hour hotline number 309-698-5611, contact your local distributor, or use one of the ways available in our website www.go4b.com/usa. 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 Touchswitch™ is an electro-mechanical limit switch with no moving parts, which detects tracking and misalignment problems on bucket elevators and conveyors.

When a belt misaligns 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.


The face of the sensor is made from hardened stainless steel, so that there is virtually no wear when a belt contacts it. The sensor is not affected by dust or material build up and will still work when completely covered by material. Sensors are normally installed in pairs on opposite sides of the machine. Usually a pair of sensors at each pulley is used, but additional pairs can be installed as required. An external test knob allows for quick and simple sensor / system testing.

The sensors can be connected directly to a PLC input, or for greater safety, to a central independent monitoring system, such as 4B's Watchdog Super Elite or IE-Node.

3. SPECIFICATIONS

| | |
|---------------------|--|
| Supply | 12-24 VDC |
| Current Consumption | 21 mA (relay energized) ; 15 mA (relay de-energized) |
| LED Indication | GREEN LED indicates unit is powered up and relay is energized |
| Sensing Force | Factory set to 8 lb. (3.6 kg) approximately |
| Output | Normally Open Solid State Relay; 50 mA @ 240 VAC/VDC (MAX); non-inductive |
| Construction | Hardened stainless steel (face) and seamless steel with epoxy paint (body) |
| Operating Temp. | Minimum: -4° F (-20° C) Maximum: 104° F (40° C) |
| Conduit Entry | 1/2" NPT |
| Cable | 9 ft. long (3 m) - 6 x 22 AWG Conductors |
| Weight | 3 lbs. (1.36 kg) |
| Protection | IP66 |

4. APPROVALS

| | |
|-----------------|--|
| ATEX / UKEX | Baseefa17ATEX0047X BAS21UKEX0312X  II 1D Ex ta IIIC T ₂₀₀ 125°C Da IP66 |
| IECEX | IECEX BAS 17.0032X Ex ta IIIC T ₂₀₀ 125°C Da IP66 |
| NRTL / MET Labs | AEx/Ex ta IIIC T ₂₀₀ 125°C Da IP66 Class II Div I Groups E, F & G E115704 |

PACKAGE CONTENTS

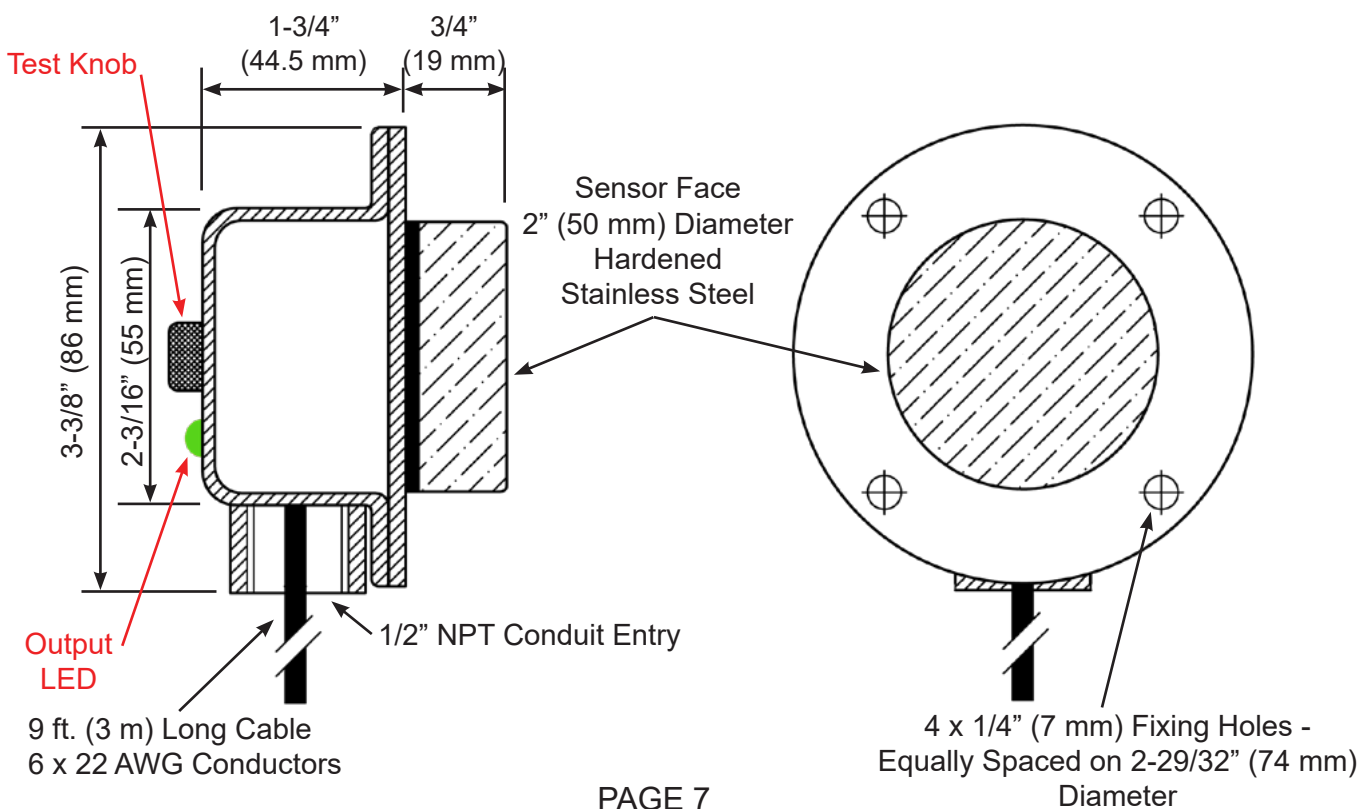


- 1. Touchswitch (Assembled)
- 2. Spacer (1)
- 3. Rubber Collar (1)
- 4. Clear Dust Cover (1)

NOTE

The Touchswitch comes assembled with the spacer, collar and protective dust cover. The spacer is optional depending on your setup, refer to the installation instructions for details.

5. DIMENSIONS



6. SPECIFIC CONDITIONS OF USE

1. The sensors/switches shall be connected to a suitable external earth via the mounting arrangement or via the flange mounting screws and suitable ring crimp lug and accessories.
2. The integral cable shall be terminated in a suitably certified enclosure or in the safe area.
3. The supply circuit of the system where the equipment is connected shall be protected by a suitably rated fuse capable of interrupting a prospective short circuit current of 10 kA.

7. INSTALLATION

The following are guidelines and suggestions for installing Touchswitches. The installer must insure that the Touchswitches are correctly mounted in order to detect a belt misalignment condition and or a pulley misalignment condition, whichever it may be. Typical Touchswitch™ mounting positions are illustrated on pages 12-17.

The Touchswitch™ hole should be cut into the housing with a 2-1/4" (57 mm) diameter hole saw (Image A), centered on the edge of the belt (Image B). The hole should be cleaned and de-burred to avoid the Touchswitch™ puck binding and giving false misalignment alarms. You can mount the Touchswitch™ with 2 of the 4 bolt holes, provided they are diagonal from one another. The supplied spacer can be used as a template to properly place the bolt holes. The Touchswitch™ needs to be mounted on a flat surface, preferably with the conduit entrance between the 3 to 9 o'clock position to minimize the entrance of condensation thru the conduit threads.

The Touchswitch™ can be mounted using one of the following three methods

1. Drill and tap the machine casing for 1/4" (6 mm) threaded bolts. Make sure that the bolts used to secure the Touchswitch™ are short enough that they do not interfere with the operation of the machine.
2. Use threaded rivet nuts for 1/4" (6 mm) threads. The length of the rivet nut will depend on the thickness of the machine's casing. Make sure that the bolts used to secure the Touchswitch™ are short enough that they do not interfere with the operation of the machine.
3. CD weld 1/4" (6 mm) x 1-1/4" (32 mm) threaded welding studs to the machine casing.

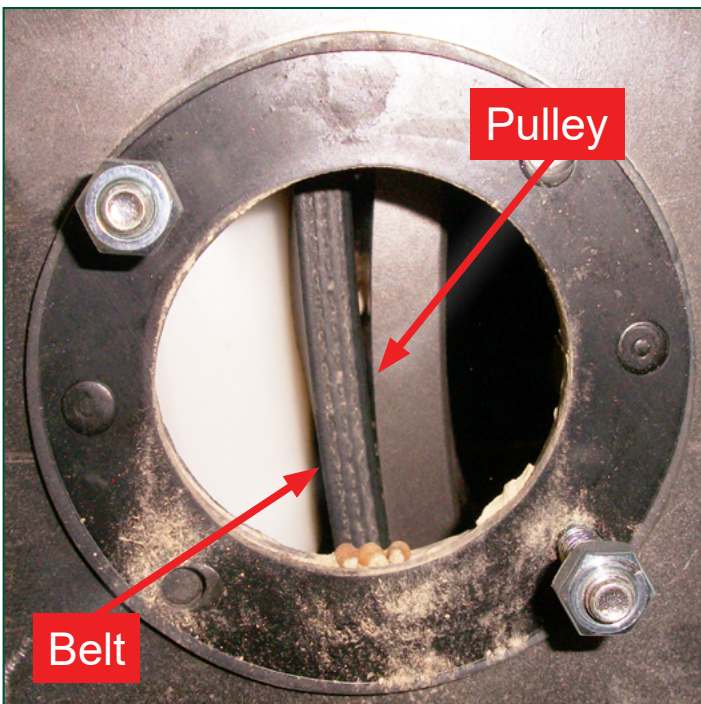


Image B - Proper Hole Position for Mounting Touchswitch™



Image A -
2-1/4 (57 mm)
Diameter

The recommended distance from the face of the Touchswitch to the belt or pulley is 1- 1/4" (32 mm) to 1-1/2" (38 mm). The supplied spacer is optional and is only needed if your belt/pulley is very close to the housing of the machine. If you are using the spacer(s) with the Touchswitch™ make certain that the belt and or pulley will make contact with the face of the Touchswitch™ before it can make contact with any other internal surface of the leg or conveyor housing.

The supplied rubber collar should always be used to properly seal the hole created for the Touchswitch and to protect the sides of the sensor from debris buildup.

When mounting on the head section of a leg or belt conveyor try to catch the belt and the pulley. On a leg, mount the 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 an inspection door, X-PAC or other obstruction. In this case, the Touchswitch™ can be mounted on the top or up side of the head pulley. Try to mount Touchswitches so they are accessible from the head section walkway. Be sure to mount Touchswitches directly across from one another. On a conveyor head section mount the Touchswitch™ forward of the head shaft in order to monitor for misalignment on the head pulley and belt. For typical mounting positions on a bucket elevator, see illustrations on pages 12-15.

On a leg boot, mount the Touchswitch™ on the up side of the tail pulley if there are no obstructions. If obstructions are encountered, use the down side of the pulley, but be sure to have the Touchswitches mounted directly across from one another. Mount the Touchswitch™ above the center line of the boot shaft at the shaft's highest possible position (see illustration - page 15). You may not be able to catch the leg boot pulley in all positions with a Touchswitch™. If desired, you can install additional Touchswitches™ along the travel of the boot pulley.

When mounting Touchswitches on open belt conveyors, brackets will usually 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 will allow the Touchswitch™ to move with the pulley when belt adjustments are made. For typical mounting positions on an open belt conveyor, see illustration - page 16.

On enclosed belt conveyor tail sections, mount Touchswitches to catch the top side of the belt on the vertical angle just ahead of tail pulley. You will not be able to catch the tail pulley with a Touchswitch™ on an enclosed belt conveyor due to the flippers on the pulley. 4B recommends that some other device be installed to catch the tail pulley, such as a surface mount temperature sensor (ADB Sensor + Lug Adapter). When installing Touchswitches on the tail section, some tail adjustment will be sacrificed. For typical mounting positions on an enclosed belt conveyor, see illustration - page 17.

When connecting liquid tight conduit to Touchswitches, limit the length to NEC requirements. However, when installed on an adjustable pulley or section be certain enough conduit is installed to allow for pulley adjustments.

WARNING

- Touchswitch™ wiring is low voltage DC.
- Use shielded cable and keep separate from high voltage cable.
- Never run Touchswitch™ cables in the same conduit as 3-phase motor cables.
- Track belts and commission plant prior to installing Touchswitches.
- Fabricated brackets must be built rigid enough to take pressure from a misaligned belt.

NOTE

Install Touchswitches on machinery only after they have been wired to a power source, and can alarm / shutdown the equipment being monitored.

8. STANDARD WIRING

All wiring must be in accordance with local and national electrical codes (such as NEC, CEC, EN IEC 60079-14) and should be undertaken by an experienced and qualified electrician.

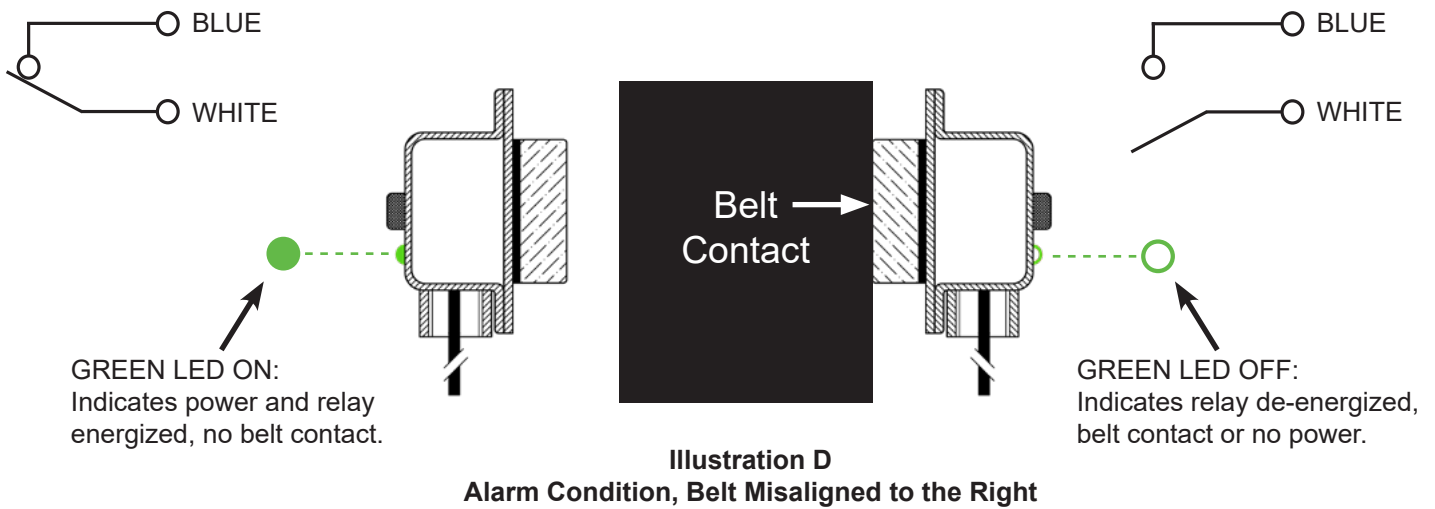
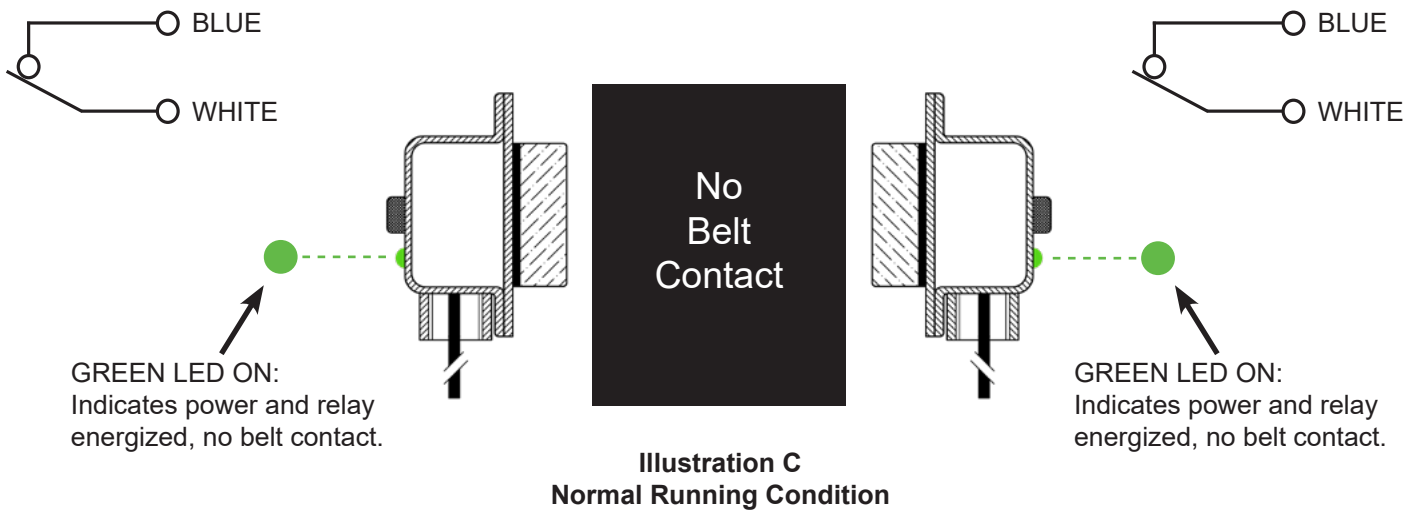
If required by local installation code, use dust/liquid tight flexible metal conduit with approved fittings to protect the sensor cables. Conduit systems can channel water due to ingress and condensation directly to sensors and sensor connections which over time will adversely affect the performance of the system. As such, the installation of low point conduit drains is recommended for all sensors when using conduits.

Mount a suitable junction box within 9 ft. (3 m) of the sensor, and using a suitable conduit to protect the cables, make the necessary wiring connections inside this junction box. A PVC coated cable connected to the sensor contains the following 22 AWG wires:

| | |
|--------|---|
| RED | 12-24 VDC |
| BLACK | 0 VDC |
| GREEN | Ground |
| WHITE | Solid State Relay Common |
| BLUE | Solid State Relay Normally Open (Sensor Output) |
| ORANGE | Not Connected |

SENSOR OPERATION:

The Touchswitch™ is an electronic limit switch that reacts when pressure is applied to the sensor face. If the pressure exceeds 8 lbs. (3.6 kg), the sensor relay goes into an alarm condition (Illustration D). Illustration C denotes normal running conditions, with no pressure applied.



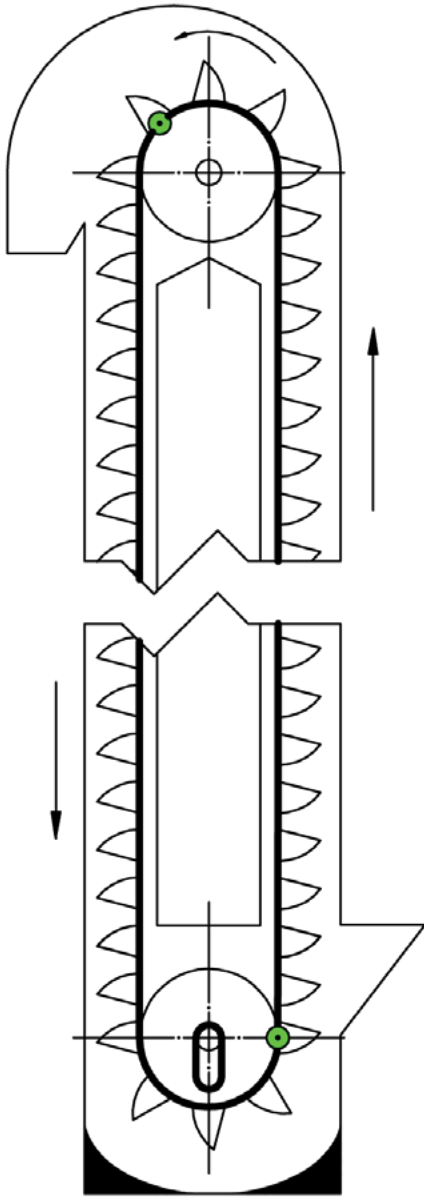
NOTE

- The Touchswitch is factory pre-calibrated and no sensitivity adjustment is necessary. The sensor is calibrated to switch to the alarm state when belt lateral force exceeds 8 lbs. (3.6 kg).
- The Touchswitch contains a non-replaceable permanent 50 mA fuse and a thermal fuse set at 169° F (76° C).
- 4B recommends that the machine shuts down when the belt contacts the Touchswitch. If the machine does not shut down and the belt is allowed to continue to rub against the face of the Touchswitch, the hardened stainless steel sensor puck may wear and the heat generated by the friction may cause the thermal fuse to blow. This fuse is non-replaceable and non-repairable.

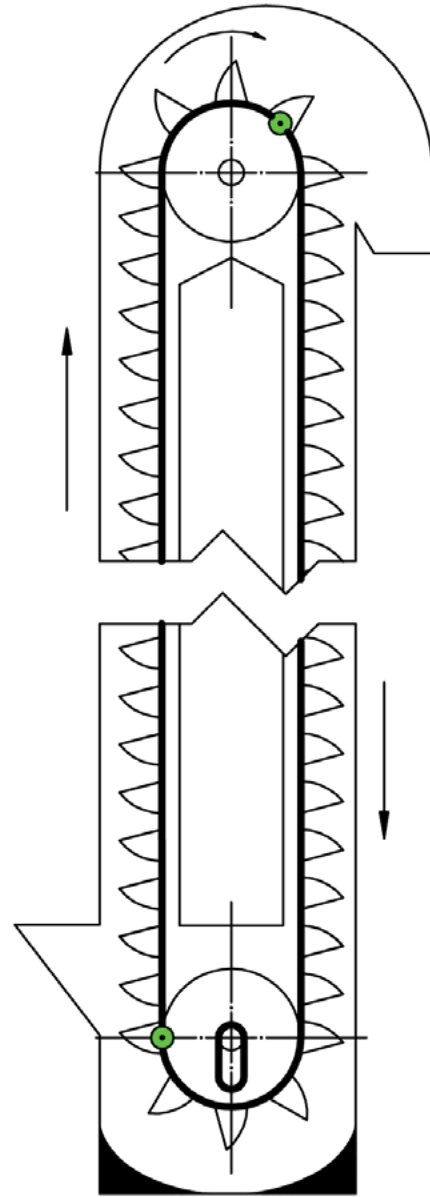
9. SENSOR PLACEMENT DIAGRAMS

DETERMINING LEFT & RIGHT SIDE OF BUCKET ELEVATOR:

VIEW OF LEFT SIDE



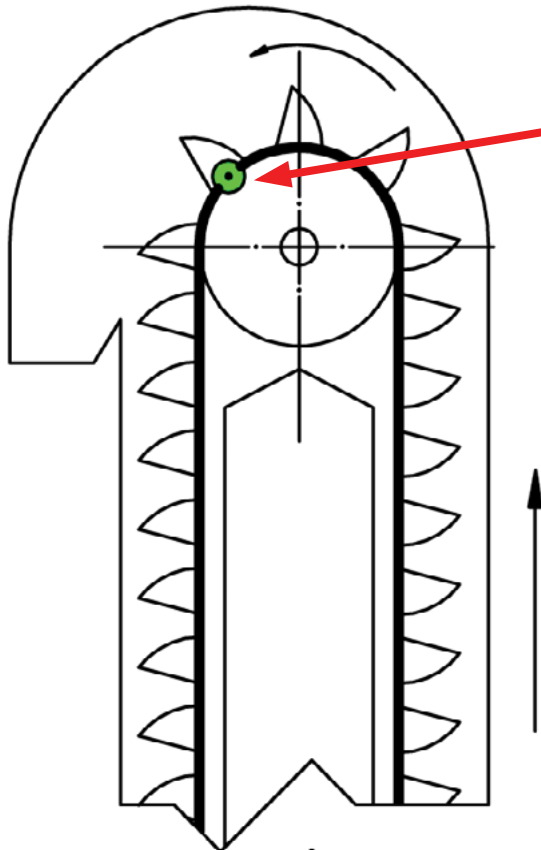
VIEW OF RIGHT SIDE



NOTE: LEFT AND RIGHT SIDES ARE DETERMINED WHEN FACING THE DIRECTION THAT THE BUCKET ELEVATOR DISCHARGES. TOUCHSWITCH™ PLACEMENT ON THE LEFT SIDE WILL MIRROR THE RIGHT SIDE.

TYPICAL 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.

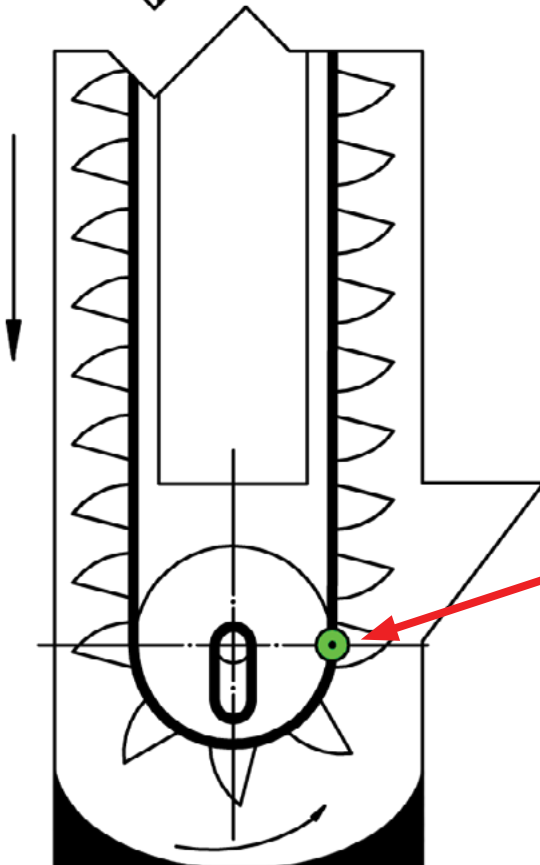


TOUCHSWITCH™ MUST BE INSTALLED ABOVE THE HEAD SHAFT BETWEEN THE 9 O'CLOCK AND 3 O'CLOCK POSITION ON THE DISCHARGE (DOWN) SIDE OF THE LEG - IF POSSIBLE.

NOTE: FOR INCREASED PROTECTION, MORE TOUCHSWITCHES CAN BE ADDED TO THE HEAD.

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

VIEW OF LEFT SIDE



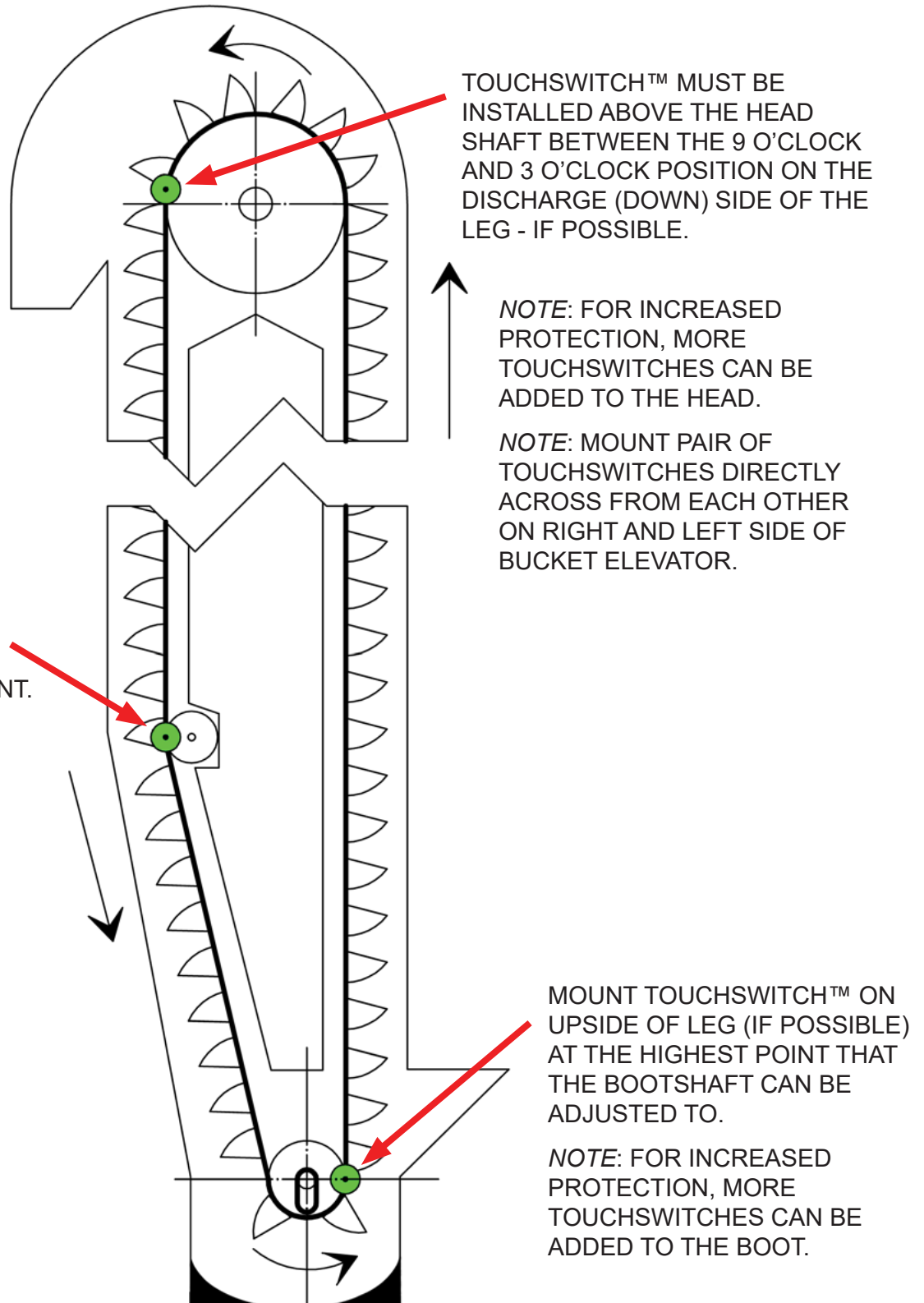
MOUNT TOUCHSWITCH™ ON UPSIDE OF LEG (IF POSSIBLE) AT THE HIGHEST POINT THAT THE BOOTSHAFT CAN BE ADJUSTED TO.

NOTE: FOR INCREASED PROTECTION, MORE TOUCHSWITCHES CAN BE ADDED TO THE BOOT.

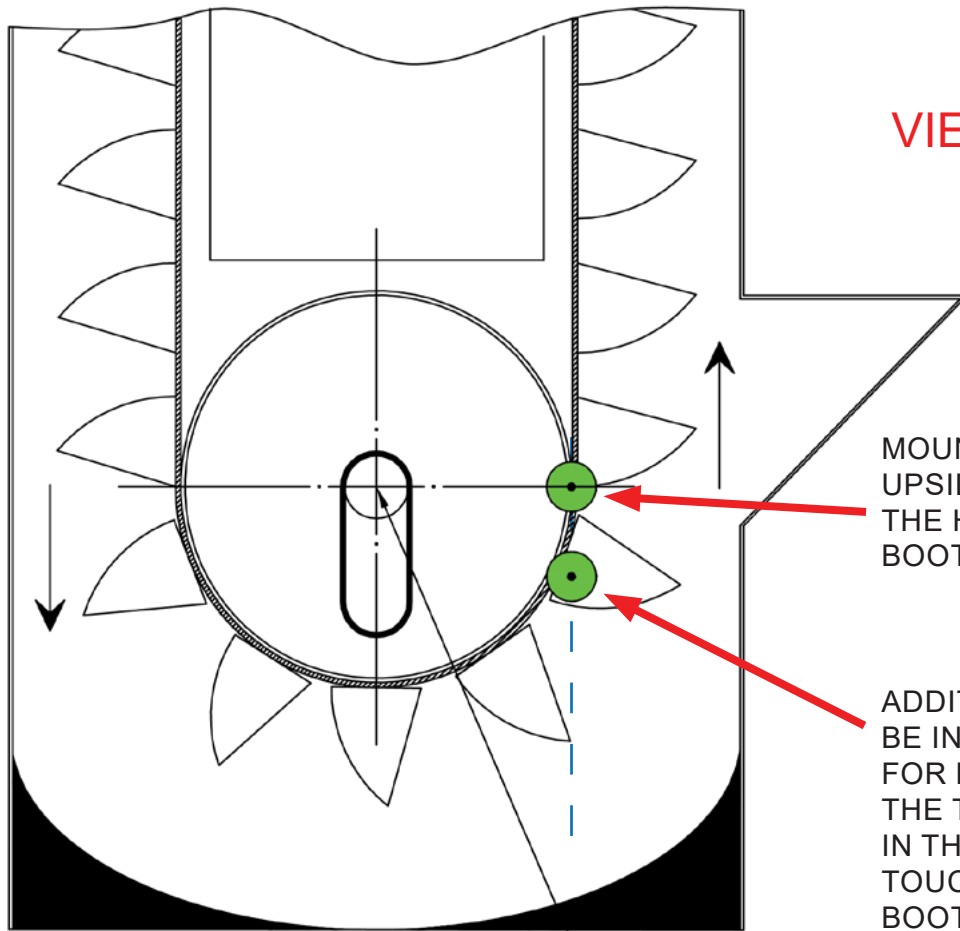
TYPICAL MOUNTING POSITIONS ON A BUCKET ELEVATOR WITH A KNEE OR BEND PULLEY:

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.

VIEW OF LEFT SIDE



TYPICAL MOUNTING POSITIONS ON TAIL/BOOT SECTION OF BUCKET ELEVATOR:

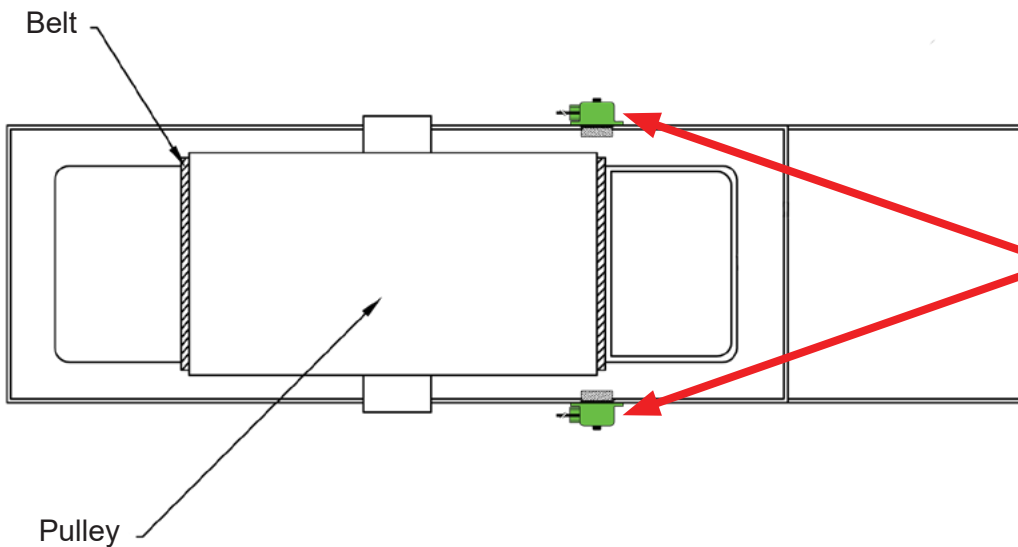


VIEW OF LEFT SIDE

MOUNT TOUCHSWITCH™ ON UPSIDE OF LEG (IF POSSIBLE) AT THE HIGHEST POINT THAT THE BOOTSHAFT CAN BE ADJUSTED TO.

ADDITIONAL TOUCHSWITCH™ CAN BE INSTALLED TO ACCOMMODATE FOR BOOT TAKE-UP. OR A SLOT FOR THE TOUCHSWITCH CAN BE MADE IN THE BOOT CASING SO THAT THE TOUCHSWITCH™ TRAVELS WITH THE BOOT TAKE -UP.

Bootshaft

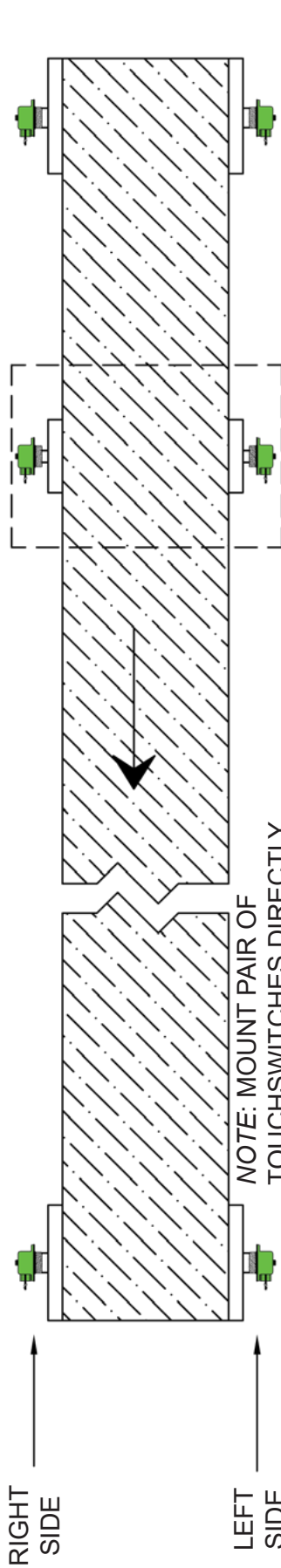


MOUNT TOUCHSWITCHES DIRECTLY ACROSS FROM EACH OTHER AND INLINE WITH THE PULLEY AND BELT TO DETECT MISALIGNMENT OF EITHER THE PULLEY OR THE BELT.

Pulley

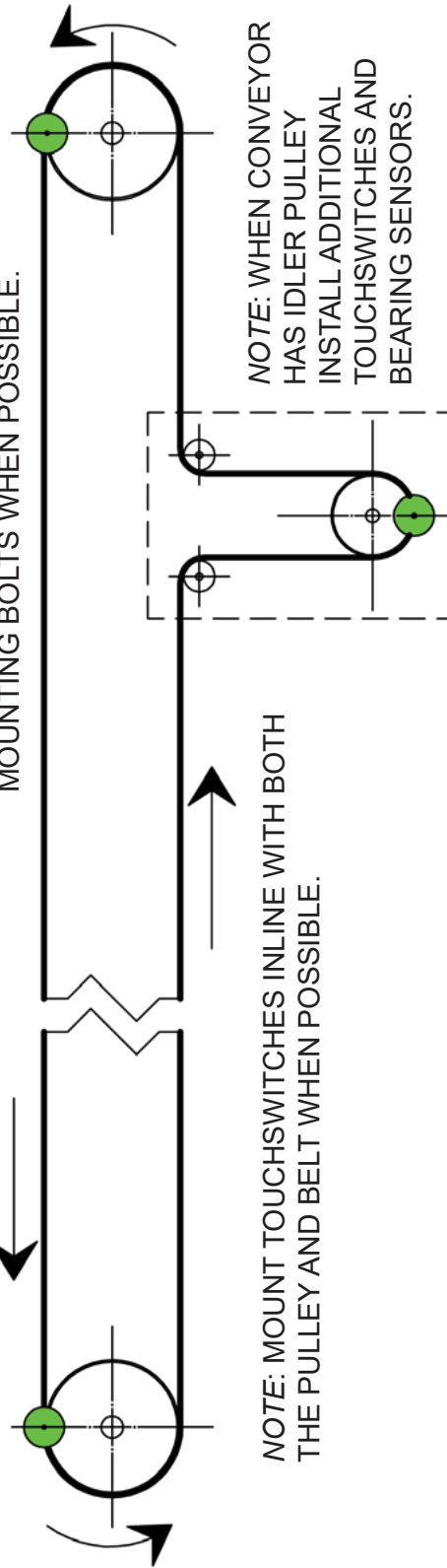
TYPICAL MOUNTING POSITIONS ON AN OPEN BELT CONVEYOR:

NOTE: TOUCHSWITCH™ MOUNTING BRACKETS WILL NEED TO BE FABRICATED TO WITHSTAND THE FORCE OF A MISALIGNED BELT.



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

NOTE: ON TAIL PULLEYS OF OPEN BELT CONVEYORS THAT ARE TAKE UP PULLEYS MOUNT THE TOUCHSWITCH™ BRACKET OFF OF BEARING MOUNTING BOLTS WHEN POSSIBLE.

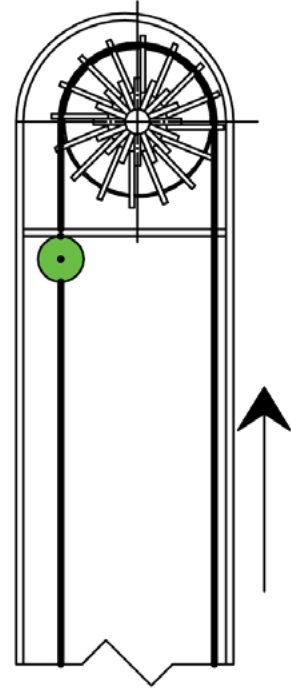
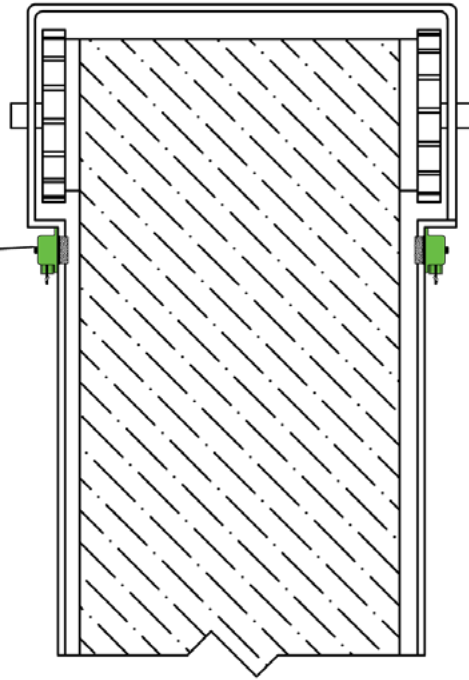


NOTE: WHEN CONVEYOR HAS IDLER PULLEY INSTALL ADDITIONAL TOUCHSWITCHES AND BEARING SENSORS.

NOTE: MOUNT TOUCHSWITCHES INLINE WITH BOTH THE PULLEY AND BELT WHEN POSSIBLE.

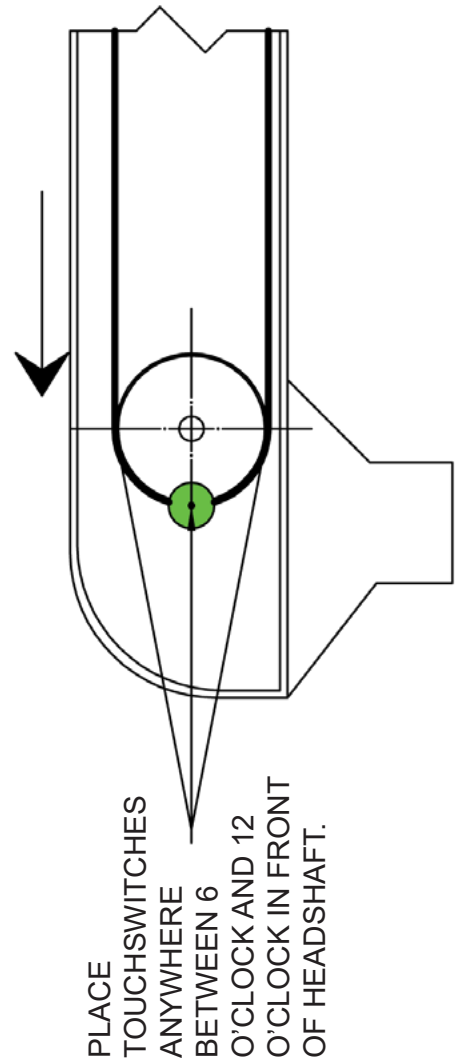
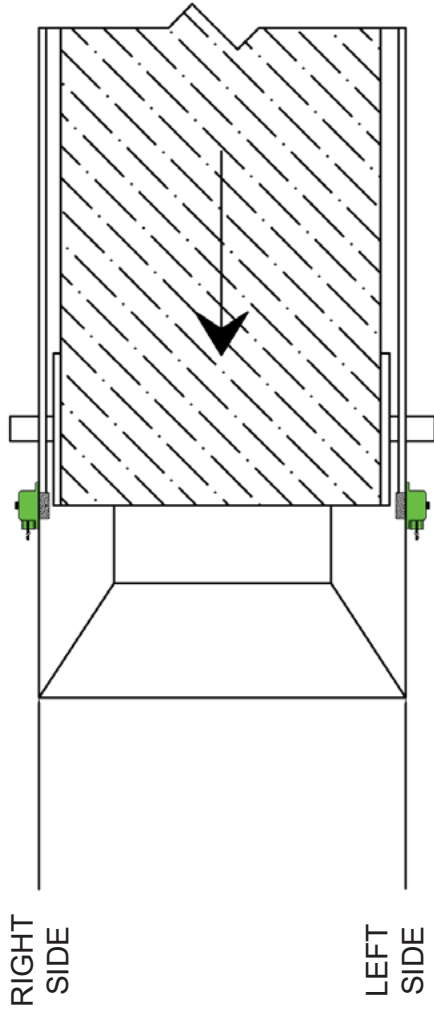
TYPICAL MOUNTING POSITIONS ON AN ENCLOSED BELT CONVEYOR:

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



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.



PLACE TOUCHSWITCHES ANYWHERE BETWEEN 6 O'CLOCK AND 12 O'CLOCK IN FRONT OF HEADSHAFT.

10. TYPICAL INSTALLATION PHOTOS



Touchswitch Face / Puck

Conveyor Belt

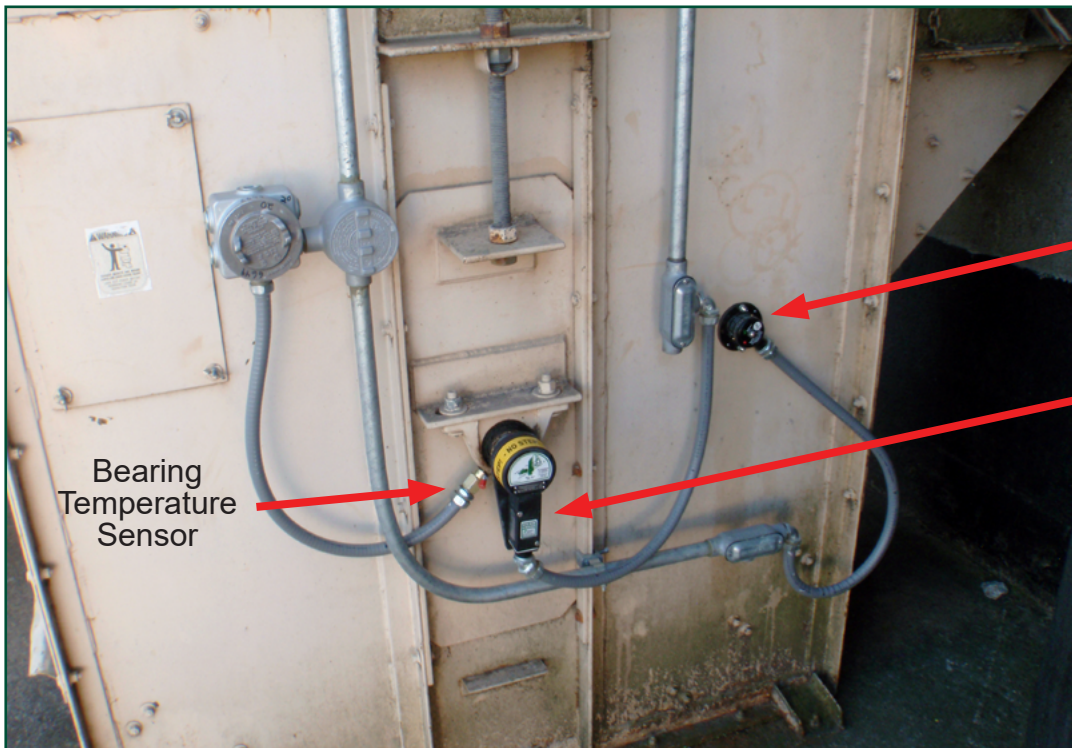
Touchswitch™ Installed at Drive End of Enclosed Belt Conveyor (Inside View)

Touchswitch Mounted to Fabricated Bracket

Pulley



Touchswitch™ Installed at Tail of Open Belt Conveyor



Touchswitch

Speed Sensor

Bearing Temperature Sensor

Touchswitch™ Installed on Bucket Elevator

11. TESTING & COMMISSIONING

As part of your ongoing maintenance program, periodically test the sensor and system, and visually inspect the contact surface of the sensor and the sealrite, the wires, junction box and conduit to ensure proper operation.

The Touchswitch™ has a built in test knob on the back of the sensor (Image E) that allows for quick and easy operation verification without removing the sensor from the mounting hole. A clear dust cover is provided with the sensor (Image D) to help protect the test knob. The testing procedure is outlined below:

1. Observe that the green output LED on the sensor housing is on and the belt or pulley is not touching the sensor.
2. Remove the dust cover and slowly turn the test knob clockwise by hand, until the LED goes out.
3. Check that the alarm and shutdown procedures work as expected.
 - a. If OK, continue to step 4.
 - b. 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.
4. Turn the test knob back to its original position (about 1/4 turn). Make sure that the knob is loose, meaning not turned all the way to the left or right.
5. Observe that the LED is now on, indicating the sensor has power and is not in alarm.
6. Replace the dust cover to help protect the test knob from dust and debris build up.



Image E (Top) - Testing Knob
Image D (Right) - Dust Cover



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.

12. TROUBLESHOOTING GUIDE

| FAULT | CAUSE | REMEDY |
|--|--|---|
| Touchswitch Signalling an Alarm Condition and / or GREEN Output LED is Off | Belt Misaligning | <ul style="list-style-type: none"> • Check Belt Alignment |
| | Touchswitch Binding Against Leg Casing | <ul style="list-style-type: none"> • Check Hole Diameter is 2-1/4" (57 mm) and is De-burred • Check Touchswitch is Centered in the Hole |
| | Test Knob Active | <ul style="list-style-type: none"> • Loosen Knob (Rotate Counterclockwise 1/4 Turn Until Loose) |
| | No Power | <ul style="list-style-type: none"> • Check that the Touchswitch has the Correct Voltage Supply (12-24 VDC) |

13. PARTS & ACCESSORIES

12 VDC Power Supply - PS3500V3

24 VDC Power Supply - PS2500V4

Optional power supplies (not shown) are available if needed to power the Touchswitch. Contact 4B from more information.



Hole Saw - TS202-CT5-2-1/4

2-1/4" (57 mm) diameter saw used to drill holes for Touchswitch installation.

Spacer - TSS2

One spacer is supplied with the Touchswitch and is optional depending on the machine's construction.



Rubber Collar - TSC2

One rubber collar is supplied with the Touchswitch to properly seal the hole created for the Touchswitch and to protect the sides of the sensor from debris buildup.

Clear Dust Cover - TSCAP

Clear protective cover used on the back of the Touchswitch to protect the test knob from dust and debris buildup.



14. PRODUCT WARRANTY

1. EXCLUSIVE WRITTEN LIMITED WARRANTY

ALL PRODUCTS SOLD ARE WARRANTED BY THE COMPANY 4B COMPONENTS LIMITED AND 4B BRAIME COMPONENTS LIMITED HEREIN AFTER REFERRED TO AS 4B TO THE ORIGINAL PURCHASER AGAINST DEFECTS IN WORKMANSHIP OR MATERIALS UNDER NORMAL USE FOR ONE (1) YEAR AFTER DATE OF PURCHASE FROM 4B. ANY PRODUCT DETERMINED BY 4B AT ITS SOLE DISCRETION TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP AND RETURNED TO A 4B BRANCH OR AUTHORIZED SERVICE LOCATION, AS 4B DESIGNATES, SHIPPING COSTS PREPAID, WILL BE, AS THE EXCLUSIVE REMEDY, REPAIRED OR REPLACED AT 4B'S OPTION.

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