

# Touchswitch<sup>™</sup> BELT MISALIGNMENT SENSOR





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

**INSTALLATION INSTRUCTIONS** 

# OPERATION MANUAL

BELT MISALIGNMENT SENSOR - PART NO. TS2V4C & TS2V3C

# www.go4b.com/usa

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

Lockout power before removing cover of inspection door. Dear 4B Customer:

Congratulations on your purchase. 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.

### 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.

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

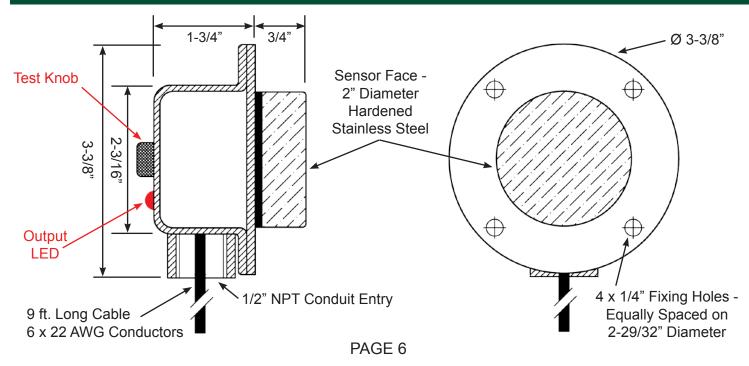
# **PRODUCT OVERVIEW**

The Touchswitch<sup>™</sup> is an electronic limit switch. 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.

# SPECIFICATIONS

Supply -	24 VDC (TS2V4C) / 12 VDC (TS2V3C)		
Power Consumption -	50 mA (TS2V4C) / 60 mA (TS2V3C)		
LED Indication -	Red LED indicates unit is powered up and relay is energized		
Sensing Force -	Factory set to 8 lb. (3.6 Kg) approximately		
Output -	Voltage free changeover relay contact rated at 5A - 250 VAC, non-inductive		
Construction -	Hardened stainless steel (face) and seamless steel with epoxy paint (body)		
Conduit Entry -	1/2" NPT		
Cable -	9 ft. long (3 m) - 6 x 22 AWG Conductors		
Weight -	3 lbs.		
Protection -	NEMA 4X, IP66		
Approvals -	CSA Class II Div 1 Group E, F, and G (USA & Canada) ATEX and CE (Versions Available)		

# DIMENSIONS



# INSTALLATION

The following are guidelines and suggestions for installing Touchswitches. The installer must take responsibly 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 may be. Typical Touchswitch<sup>™</sup> mounting positions are illustrated on pages 10 - 15.

The Touchswitch<sup>TM</sup> hole should be cut into the housing with a 2-1/4" diameter hole saw (Image A), centered on the edge of the belt. The hole should be cleaned and de-burred to avoid the Touchswitch<sup>TM</sup> puck binding and giving false misalignment alarms. You can mount the Touchswitch<sup>TM</sup> with 2 of the 4 flange holes, provided they are diagonal from one another. The enclosed flange shims can be used as a template to properly place the flange holes. The Touchswitch<sup>TM</sup> 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 water 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" threaded bolts. Make sure that the bolts used to secure the Touchswitch<sup>™</sup> are short enough that they do not interfere with the operation of the machine.
- 2. Use threaded rivet nuts for 1/4" 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<sup>™</sup> are short enough that they do not interfere with the operation of the machine.
- 3. CD weld 1/4" x 1-1/4" threaded welding studs to the machine casing.

When placing flange shims on Touchswitch<sup>™</sup> make certain belt and or pulley contacts the Touchswitch<sup>™</sup> 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 than 1- 1/4 to 1-1/2" to the face of the Touchswitch<sup>™</sup>.



Image B Proper Hole Position for Mounting Touchswitch™

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<sup>™</sup> 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<sup>™</sup> 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<sup>™</sup> 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 10 - 13.

On a leg boot, mount the Touchswitch<sup>™</sup> 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<sup>™</sup> above the center line of the boot shaft at the shaft's highest possible position (see illustration - page 13). You may not be able to catch the leg boot pulley in all positions with a Touchswitch<sup>™</sup>. If desired, you can install additional Touchswitches<sup>™</sup> 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<sup>™</sup> 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<sup>™</sup> bracket can be mounted off of the bearing mounting bolts. This will allow the Touchswitch<sup>™</sup> to move with the pulley when belt adjustments are made. For typical mounting positions on an open belt conveyor, see illustration - page 14.

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<sup>™</sup> 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 (WDB70V3C). 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 15.

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.

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- Touchswitch<sup>™</sup> wiring is low voltage DC.
- Use shielded cable and keep separate from high voltage cable.
- Never run Touchswitch<sup>™</sup> 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.

# **STANDARD WIRING**

All wiring must be In accordance with local and national electrical codes and should be undertaken by an experienced and qualified electrician.

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.

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

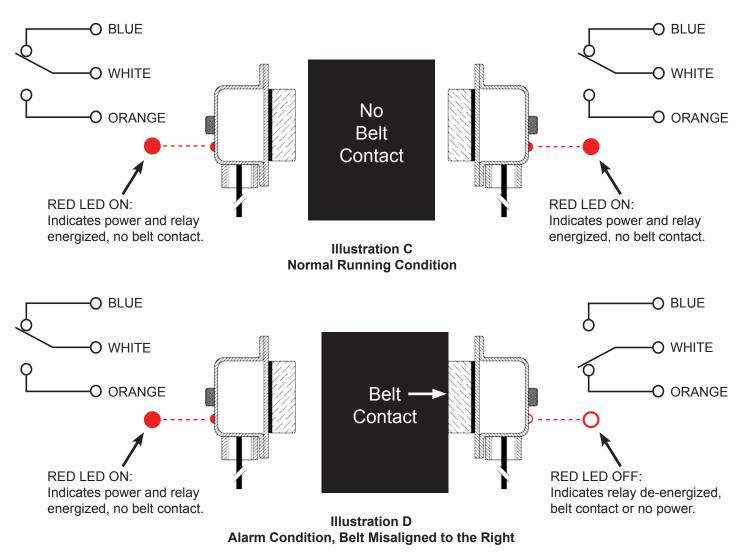
RED -	24 VDC (TS2V4C) or 12 VDC (TS2V3C)		
BLACK -	0 VDC		
GREEN -	Ground		
WHITE -	Relay Common Connection		
BLUE -	Relay Contact, Normally Open (Sensor Output)		
ORANGE -	Relay Contact, Normally Closed (Not Normally Used)		

### NOTE

The orange wire is not normally used and should be cut back and insulated.

#### SENSOR OPERATION:

The Touchswitch<sup>M</sup> 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.

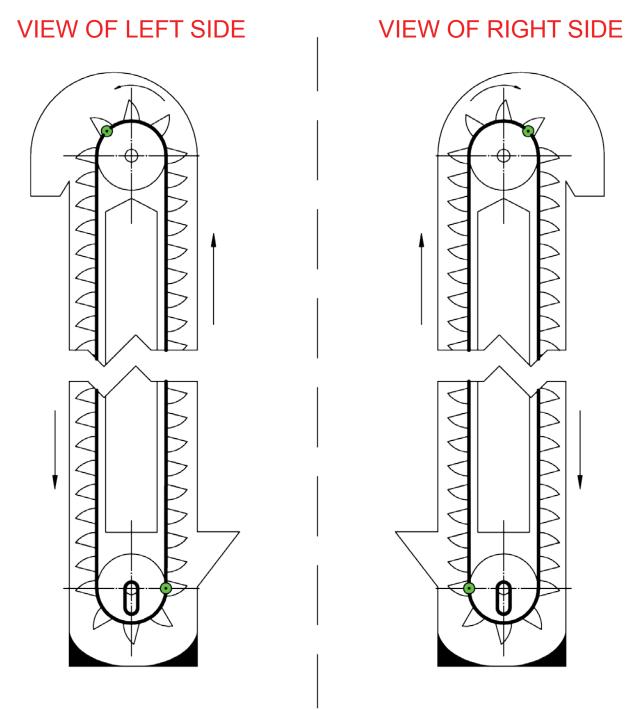


### NOTE

- 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 160 mA fuse and a thermal fuse set at 163° F (73° 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.

## SENSOR PLACEMENT DIAGRAMS

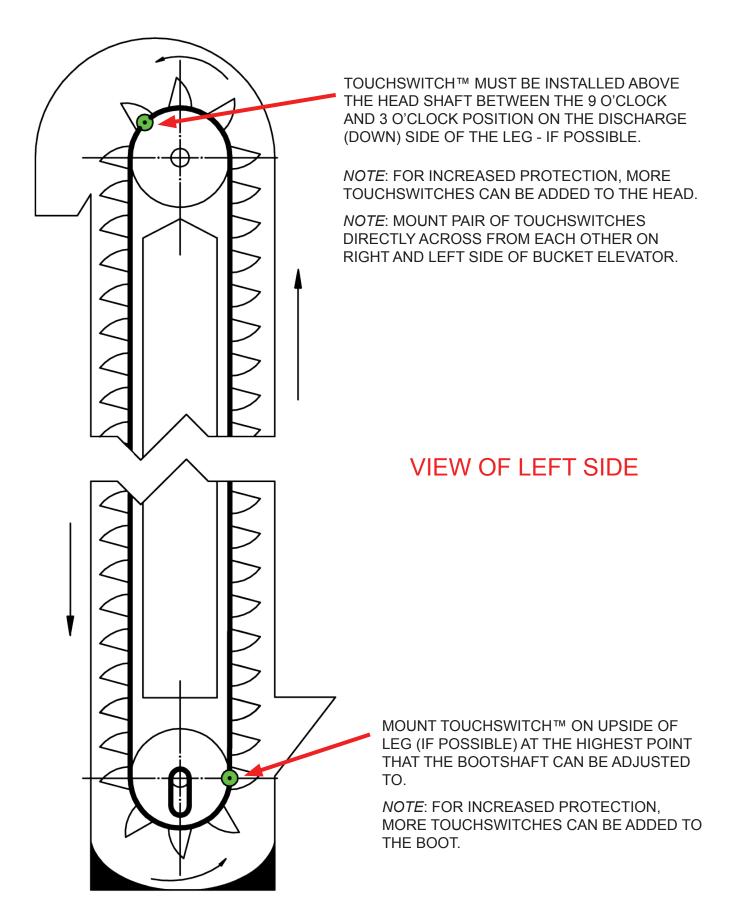
#### DETERMINING LEFT & RIGHT SIDE OF BUCKET ELEVATOR:



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:

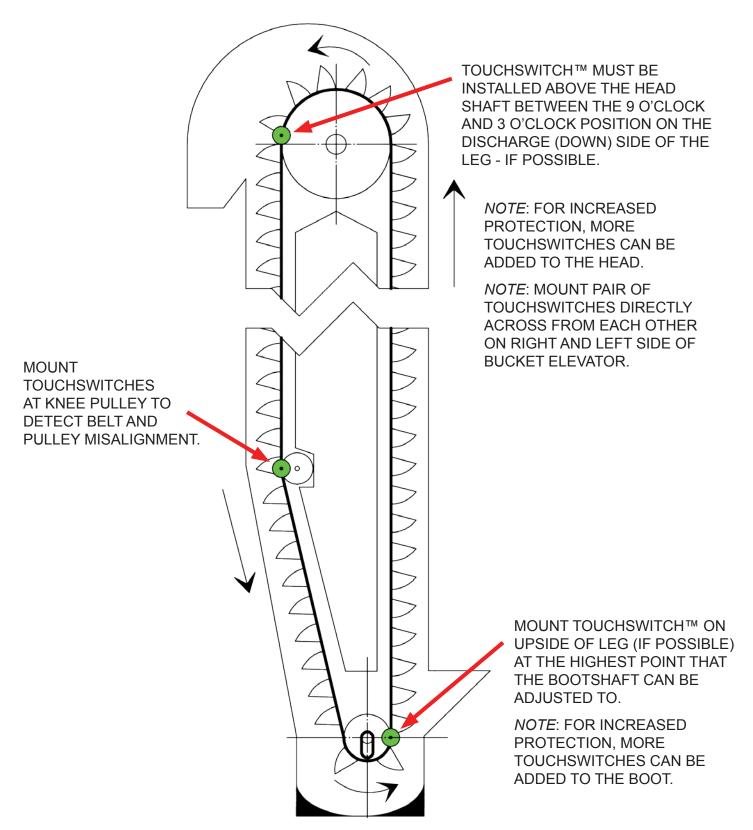
When mounting on the head section of a leg or belt conveyor try to catch the belt and the pulley. On a leg mount Touchswitch<sup>™</sup> just above the center line of the head shaft on the discharge side of the pulley when possible. Sometimes this is not possible due to inspection doors or X-pacs etc. 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.

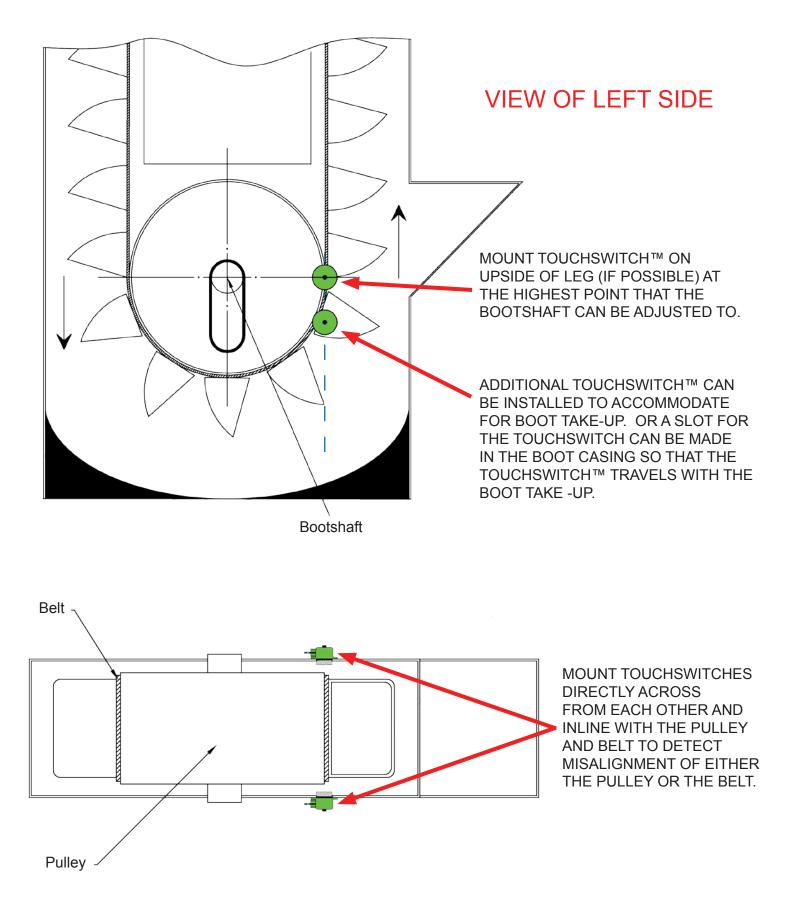


#### TYPICAL MOUNTING POSITIONS ON A BUCKET ELEVATOR WITH A KNEE OR BEND PULLEY:

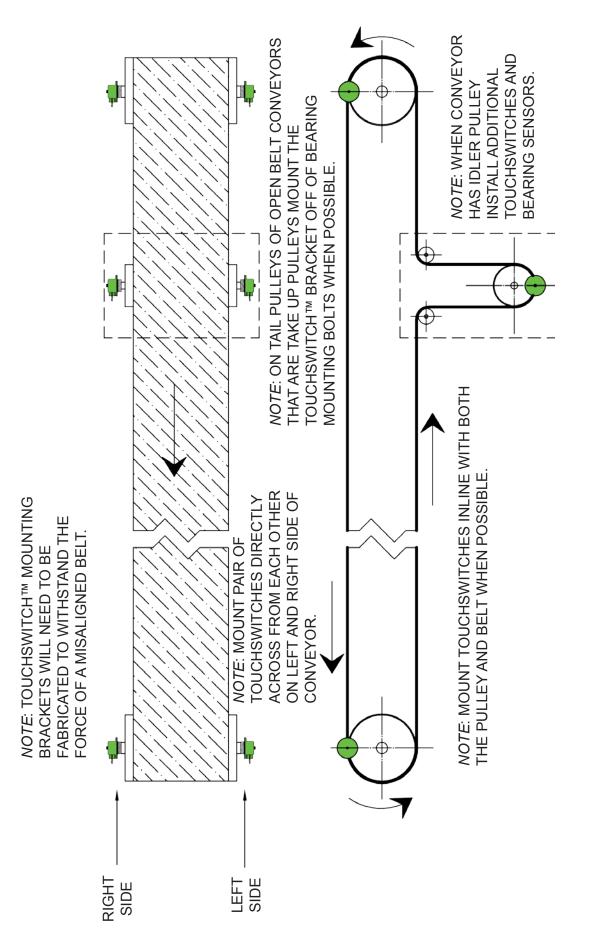
When mounting on the head section of a leg or belt conveyor try to catch the belt and the pulley. On a leg mount Touchswitch<sup>™</sup> just above the center line of the head shaft on the discharge side of the pulley when possible. Sometimes this is not possible due to inspection doors or X-pacs etc. 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.

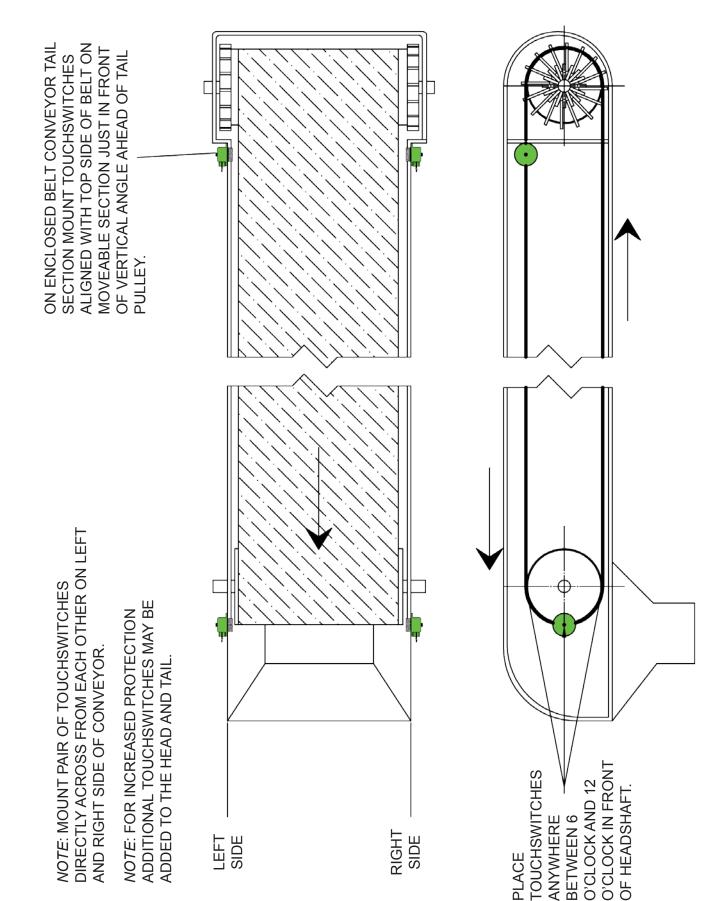






#### TYPICAL MOUNTING POSITIONS ON AN OPEN BELT CONVEYOR:





#### TYPICAL MOUNTING POSITIONS ON AN ENCLOSED BELT CONVEYOR:

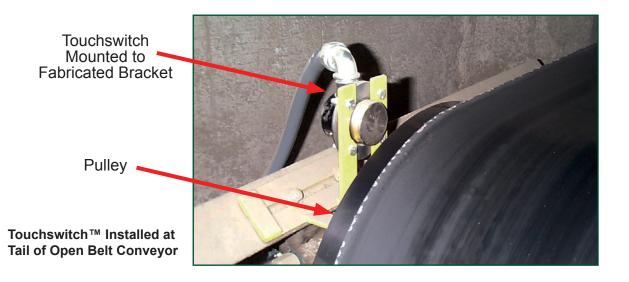
# **TYPICAL INSTALLATION PHOTOS**

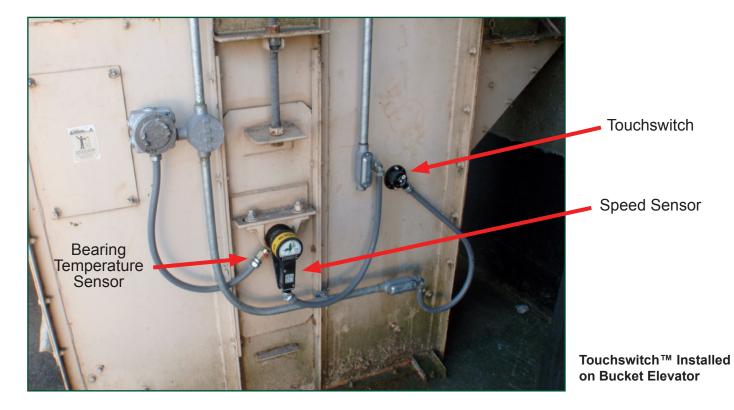


Touchswitch Face / Puck

**Conveyor Belt** 

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





## **TESTING & COMMISSIONING**

Periodically test the sensor and the system to ensure both are operating correctly.

The Touchswitch<sup>™</sup> has a built in test knob that allows for quick and easy operation verification without removing the sensor from the mounting hole. The testing procedure is outlined below:

- 1. Observe that the red output LED on the sensor housing is on and the belt or pulley is not touching the sensor.
- 2. 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.

As part of your ongoing maintenance program, periodically test the sensor and system, and visually inspect the contact surface of the sensor and the sealtite, the wires, junction box and conduit.

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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.

# TROUBLESHOOTING GUIDE

FAULT	CAUSE	REMEDY
Touchswitch™ Signalling an Alarm Condition and / or Red Output LED is Off	Belt Misaligning	Check Belt Alignment
	Touchswitch™ Binding Against Leg Casing	<ul> <li>Check Hole Diameter is 2-1/4 Inches and is De-burred</li> <li>Check Touchswitch<sup>™</sup> is Centered in the Hole</li> </ul>
	Test Knob Active	<ul> <li>Loosen Knob (Rotate Counterclockwise 1/4 Turn Until Loose)</li> </ul>
	No Power	<ul> <li>Check that the Touchswitch<sup>™</sup> has the Correct Voltage Supply (24 VDC - TS2V4C or 12 VDC - TS2V3C)</li> <li>Check Orange Wire is Insulated</li> </ul>

# NOTES

### **PRODUCT WARRANTY**

### **1. EXCLUSIVE WRITTEN LIMITED WARRANTY**

ALL PRODUCTS SOLD ARE WARRANTED BY THE COMPANY (4B COMPONENTS LIMITED, (4B) BRAIME ELEVATOR COMPONENTS LIMITED, AND (4B) S.E.T.E.M. Sarl 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.

### 2. DISCLAIMER OF IMPLIED WARRANTY

NO WARRANTY OR AFFIRMATION OF FACT, EXPRESSED OR IMPLIED, OTHER THAN AS SET FORTH IN THE EXCLUSIVE WRITTEN LIMITED WARRANTY STATEMENT ABOVE IS MADE OR AUTHORIZED BY 4B. 4B SPECIFICALLY DISCLAIMS ANY LIABILITY FOR PRODUCT DEFECT CLAIMS THAT ARE DUE TO PRODUCT MISUSE, ABUSE OR MISAPPLICATIONS, AS AUTHORIZED BY LAW, 4B SPECIFICALLY DISCLAIMS ALL WARRANTIES THAT THE PRODUCT IS FIT OR MERCHANTABLE FOR A PARTICULAR PURPOSE.

### 3. NO WARRANTY "BY SAMPLE OR EXAMPLE"

ALTHOUGH 4B HAS USED REASONABLE EFFORTS TO ACCURATELY ILLUSTRATE AND DESCRIBE THE PRODUCTS IN ITS CATALOGS, LITERATURE, AND WEBSITES, SUCH ILLUSTRATIONS AND DESCRIPTIONS ARE FOR THE SOLE PURPOSE OF PRODUCT IDENTIFICATION AND DO NOT EXPRESS OR IMPLY A WARRANTY AFFIRMATION OF FACT, OF ANY KIND OR A WARRANTY OR AFFIRMATION OF FACT THAT THE PRODUCTS WILL CONFORM TO THEIR RESPECTIVE ILLUSTRATIONS OR DESCRIPTIONS. 4B EXPRESSLY DISCLAIMS ANY WARRANTY OR AFFIRMATION OF FACT, EXPRESSED OR IMPLIED, OTHER THAN AS SET FORTH IN THE EXCLUSIVE WRITTEN LIMITED WARRANTY STATEMENT ABOVE, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

### 4. LIMITATION OF DAMAGES

ANY LIABILITY FOR CONSEQUENTIAL, INCIDENTAL, SPECIAL, EXEMPLARY, OR PUNITIVE DAMAGES, OR FOR LOSS OF PROFIT WHETHER DIRECT OR INDIRECT, IS EXPRESSLY DISCLAIMED. With subsidiaries in North America, Europe, Asia, Africa and Australia along with a worldwide network of distributors, 4B can provide practical solutions for all your applications no matter the location.



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REV032316