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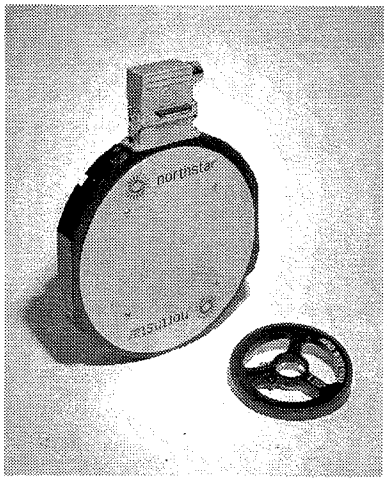
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Find the *Danaher / Dynapar / North Star SLIM Tach SL85* at our website: *Click HERE*

Instruction Manual

SLIM Tach® SL85
Magnetoresistive Encoder

Designed for use in
0.625" to 3.000" (16mm to 76mm)
Shaft Diameters



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LIMITED WARRANTY

NorthStar Technologies, Inc. (henceforth NorthStar), the manufacturer, warrants this product for a period of twelve (12) months from the date of shipment. During the warranty period, under authorized return component parts to NorthStar freight prepaid, the company will repair, or at its option replace, any part found to be defective in material or workmanship, without charge to the Owner for parts, service labor, or associated customary shipping cost. Replacement or repaired parts will be warranted for only the unused portion of the original warranty.

This warranty is limited to NorthStar products purchased and installed in the United States. This same protection will extend to any subsequent owner during the warranty period. It does not apply to damage caused by accident, misuse, fire, flood or acts of God, or from failure to properly install, operate, or maintain the product in accordance with the printed instructions provided.

THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE EXPRESSLY EXCLUDED. THE OWNER AGREES THAT NORTHSTAR'S LIABILITY WITH RESPECT TO THIS PRODUCT SHALL BE SET FORTH IN THIS WARRANTY, AND INCIDENTAL OR CONSEQUENTIAL DAMAGES ARE EXPRESSLY EXCLUDED.

WARRANTY RETURN POLICY

If you experience any technical problems with NorthStar's products, please contact our Technical Support Department at (614) 891-2245 from 8:00 A.M. to 5:00 P.M. Eastern Standard Time (EST), Monday through Friday or in writing to fax: (614) 891-6909, or email to service@northstar-tec.com. Please be ready to provide your customer number, item description, serial number, invoice number, date of purchase, and the specifics of the problem.

A representative will attempt to solve your problem over the telephone by running a few diagnostics. If it is determined by our representative in conjunction with the Customer that the product requires to be returned to NorthStar's factory for warranty repair, a Return Goods Authorization (RGA) number will be issued. For control purposes, only those items identified with an RGA number may be returned to NorthStar. Please make sure that the RGA number is clearly marked on the shipping label. Packages missing an RGA number cannot be accepted by our Receiving Department and must be returned to the sender freight COD. Ship returned products to NorthStar PRE-PAID and insured for its full value.

EXPRESS SERVICE IS OFFERED ON ALL WARRANTY REPAIRS WHERE AN RGA NUMBER HAS BEEN ISSUED. IF THE SAME WARRANTY PART THAT IS BEING RETURNED IS IN STOCK, NORTHSTAR WILL IMMEDIATELY SHIP OUT A NEW REPLACEMENT PART, INVOICE THE REPLACEMENT PART AND ISSUE A CREDIT INVOICE WHEN THE RGA NUMBER WARRANTY PART IS RECEIVED AT NORTHSTAR AND IS CONFIRMED TO BE A WARRANTY REPAIR. NORTHSTAR WILL EXPRESS SHIP THE PRODUCT PRE-PAID, USING THE SAME METHOD BY WHICH THE WARRANTY PART WAS SHIPPED TO NORTHSTAR, (i.e., IF THE RGA WARRANTY PART WAS SHIPPED OVERNIGHT, NORTHSTAR WILL SHIP IN THE SAME MANNER.)

There is a 15% restocking fee on all items returned for credit to NorthStar. This includes all items in that are returned for exchange. All replacement parts must be purchased before they are sent out to the customer. If credit needs to be issued it will be issued upon the return of the product if the unit is in good condition.

TRADEMARK ACKNOWLEDGMENT

Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this manual and NorthStar was aware of a trademark claim, the designations have been printed in initial capital letters and the ™ or ® symbol used.

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CHAPTER 1

INTRODUCTION

1.0 Safety Summary

High current, voltage, and rotating parts can cause serious or fatal injury. The use of electric machinery, like all other uses of concentrated power and rotating equipment, may be hazardous. Installing, operating, and maintaining electric machinery should be performed by qualified personnel, in accordance with applicable provisions of the National Electrical Code and sound local practices. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. NorthStar Technologies, Inc. assumes no liability for the customer's failure to comply with these requirements.

Rotating Machinery

Avoid contact with rotating parts. Avoid by-passing or rendering inoperative any safety guards or protection devices. Avoid extended exposure in close proximity to machinery with high noise levels. Use proper care and procedures in handling, lifting, installing, operating and maintaining the equipment.

Before Installation

Safe maintenance practices with qualified personnel is imperative. Before starting maintenance procedures, be positive that, (1) equipment connected to the shaft will not cause mechanical rotation, (2) main machine windings have been disconnected and secured from all electrical power sources, and (3) all accessory devices associates with the work area have been de-energized. If high potential insulation test is required, follow procedures and precautions outlined in NEMA standards MG-1.

Grounding

Improperly grounding the frame of the machine can cause serious or fatal injury to personnel. Grounding of the machine frame and structure should comply with the National Electrical Code and with sound local practices. Check wiring diagram before connecting power.

Do Not Operate In An Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes. Operating any electrical instrument in such an environment constitutes a definite safety hazard.

Keep Away From Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. To avoid injuries, always disconnect power and discharge circuits before touching them.

Do Not Substitute Parts Or Modify Instrument

Do not install substitute parts or perform any unauthorized modification to the instrument. Introducing additional hazards is dangerous. Return the instrument to an authorized NorthStar Technologies, Inc. representative for service and repair to ensure that safety features are maintained.

Dangerous Procedure Cautions

A CAUTION heading precedes potentially dangerous procedures throughout this manual. Instructions in the warnings *must* be followed.

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1.1 General

These instructions do not claim to cover all details of variation in equipment or to provide for every possible contingency or hazard to be met in connection with installation, operation, and service. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, please contact NorthStar Technologies, Inc., or one of its designated representatives.

1.2 Description

The NorthStar SLIM Tach® SL85 is a modular digital encoder. This magnetoresistive encoder sensor-based unit was designed for fast, easy mounting onto a standard NEMA 8.5 inch motor face. The basic design philosophy follows. The encoder frame is mounted onto the C-Face flange of a motor. This positions the sensor and contains the electronics. The magnetic pulse wheel on the motor shaft has magnetic pulses imprinted on its outside surface. As the motor spins, the passing magnetic pulses actuate the magnetoresistive sensor. The resulting electronic signals are processed into square wave signals by the internal electronics.

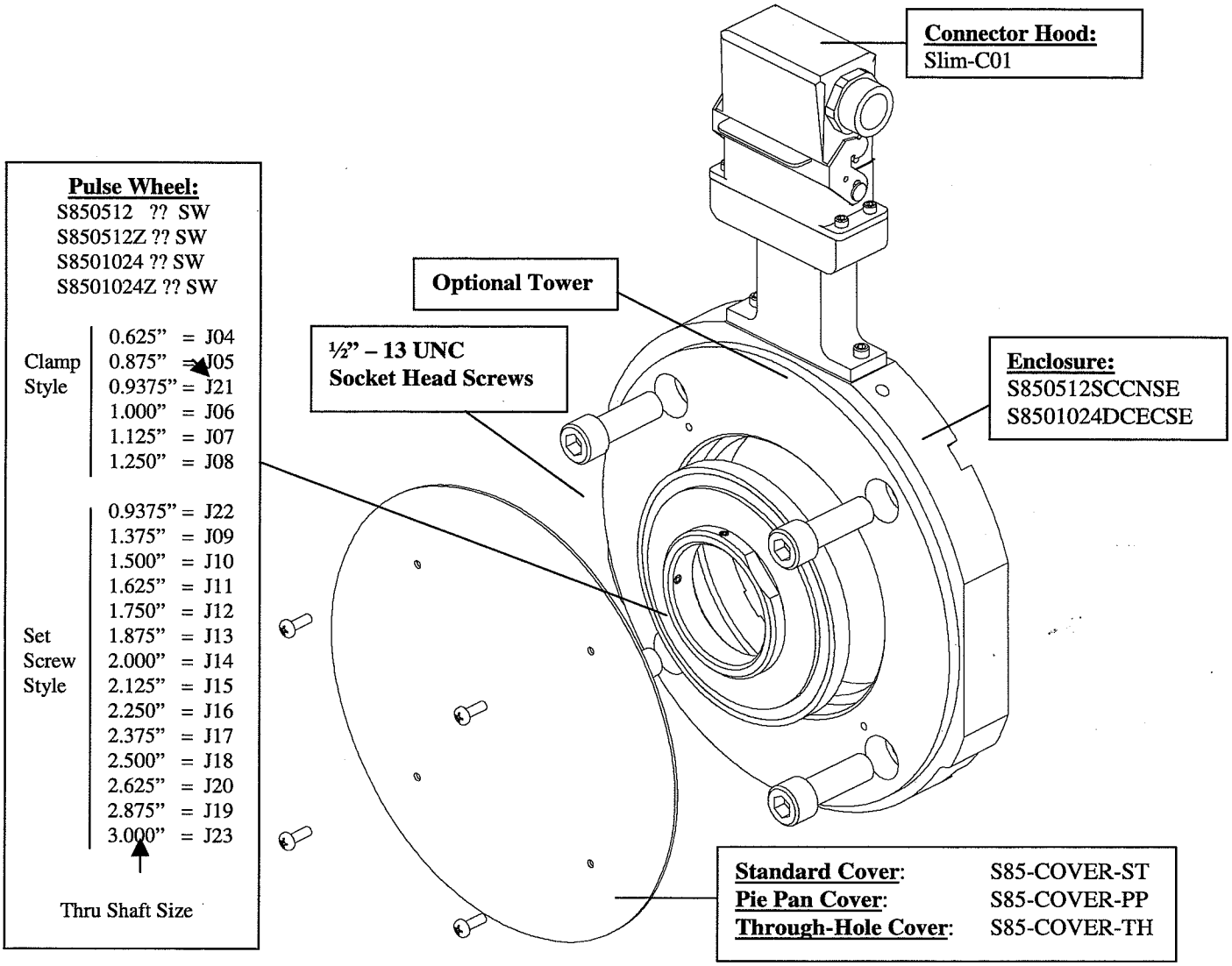


Figure 1: SLIM Tach® SL85 Thru-Shaft Exploded View w/ Spare Parts (Shown w/ Optional Tower)

NOTE: If you have further questions, please call NorthStar customer service (614) 818-1150+ext. 282 or 278 with serial number ready.

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1.3 Specifications

Electrical Specifications	
Resolution	512, 512Z, 1024, 1024Z, 2048 PPR
Frequency Response	0 to 120KHz Max.
Pulse Code	Incremental, marker, quadrature, complements ($\overline{A}$, $\overline{B}$, $\overline{Z}$)
Output Channels	A & B (incremental), Z (marker)
Duty Cycle	50 ± 15% (within defined mechanical specs)
Quadrature Accuracy	A-B 90° ± 22°
Output Type	High Speed, Differential Driver
Rise and Fall Time	Less than 500 ns @ 10,000 pf (typical)
Current Consumption	40 mA typical plus line driver load
ESD Protection	2 kV
Output Current Capability	150 mA typical [350 mA maximum (worst case)]
Connector	10 pin Epic style, NEMA 4, 12 industrial connector
Suggested Cable	22 AWG, 8 conductor, 18" length, 4 twisted shield pairs
Input Voltage	+5.0 to +15.0 VDC
Mechanical Specifications	
Maximum Operational Speed	5,000 RPM
Nominal Air Gap	0.019 ± 0.008 inch
Shaft Axial End Play	Up to ± 0.045 inch maximum
Enclosure Configuration	4.5 - Inch Diameter, 56 C motor face or accessory flange to meet NEMA MG1-4 standards
Slew Rate	12,000 RPM per second
Approximate Box Weight	4lbs. (1.81 Kg)
Box Dimension	17.5" x 10.75" x 2.75"
Common Environmental Specifications	
Operational Temperature	-40° to + 90° C
Operational Humidity Range	Maximum of 98%
Chemical Resistance	Salt Spray, Most Solvents, Mild Acids and Bases
Vibration	Minimum 18 g's RMS, 5-2000 Hz
Shock (Encoder Housing)	1 meter drop tested, min 30 g's shock spectrum

Specifications subject to change without notice

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CHAPTER 2

INSTALLATION

2.0 Inspection and Unpacking

Inspect shipping container for external damage. All claims for damage (apparent or concealed) or partial loss of shipment must be made in writing to NorthStar within (5) days from receipt of goods. If damage or loss is apparent, please notify the shipping agent immediately.

Open shipping container and locate the packing list. The packing list is included to verify that all components, accessories, and manual were received. Please use the packing list to check off each item as the unit is unpacked. Inspect for damage. NorthStar recommends that the shipping container be retained for future shipping, storage, or return to factory purposes.

If any equipment was damaged in transit, be sure to file proper claims promptly with the carrier and insurance company. Please advise NorthStar Technologies of such filing. In case of parts shortages, advise NorthStar immediately. NorthStar cannot be responsible for any missing parts unless notified within 60 days of shipment. The standard NorthStar Technologies, Inc. warranty is included on page 2 of this manual.

2.1 Motor Facing and Shaft for Thru-Shaft SL85

To prepare the motor facing and shaft for installation, perform the following steps. See Figure 2.

1. Clean outer rim and mounting surface of motor facing and shaft of paint, grease, dirt, and other debris where SLIM Tach® SL85 unit contacts motor or accessory. Also ensure that mating surfaces have not been damaged and that unit will fit squarely on motor.

2. Apply a thin layer of corrosion preventative or oil to motor facing and shaft to aid assembly and provide some corrosion protection.

CAUTION!

Ensure there is no paint, burrs, protrusions, or deformations on the motor facing or shaft. If the enclosure does not fit squarely on the motor facing, the alignment between the encoder frame and the magnetic pulse wheel may be degraded.

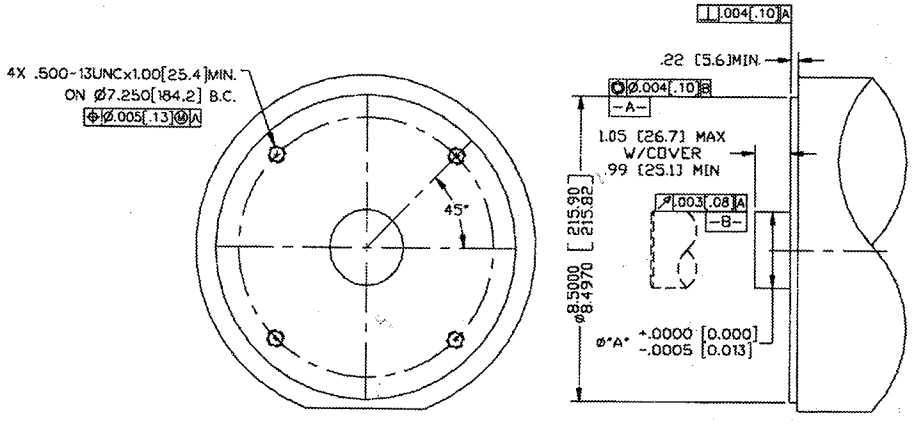


Figure 2: Typical 8.5-Inch Diameter Type C Face Motor Thru-Shaft Application

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2.1.1 Encoder Frame Installation

To install the encoder frame, perform the following steps.

1. Orient the encoder frame so the 8.5 inch I.D. surface will fit over the 8.5 inch C flange (encapsulated side toward the motor). Mount frame onto the motor flange. Insert the four 1/2 inch x 13 UNC socket head cap screws through the frame and into the motor frame. Use a 3/8 inch hex wrench to tighten a nominal 25 foot pounds. See Figure 3.

NOTE

On End-of-Shaft units, one may wish to mount the encoder frame after mounting the pulse wheel. See page 10.

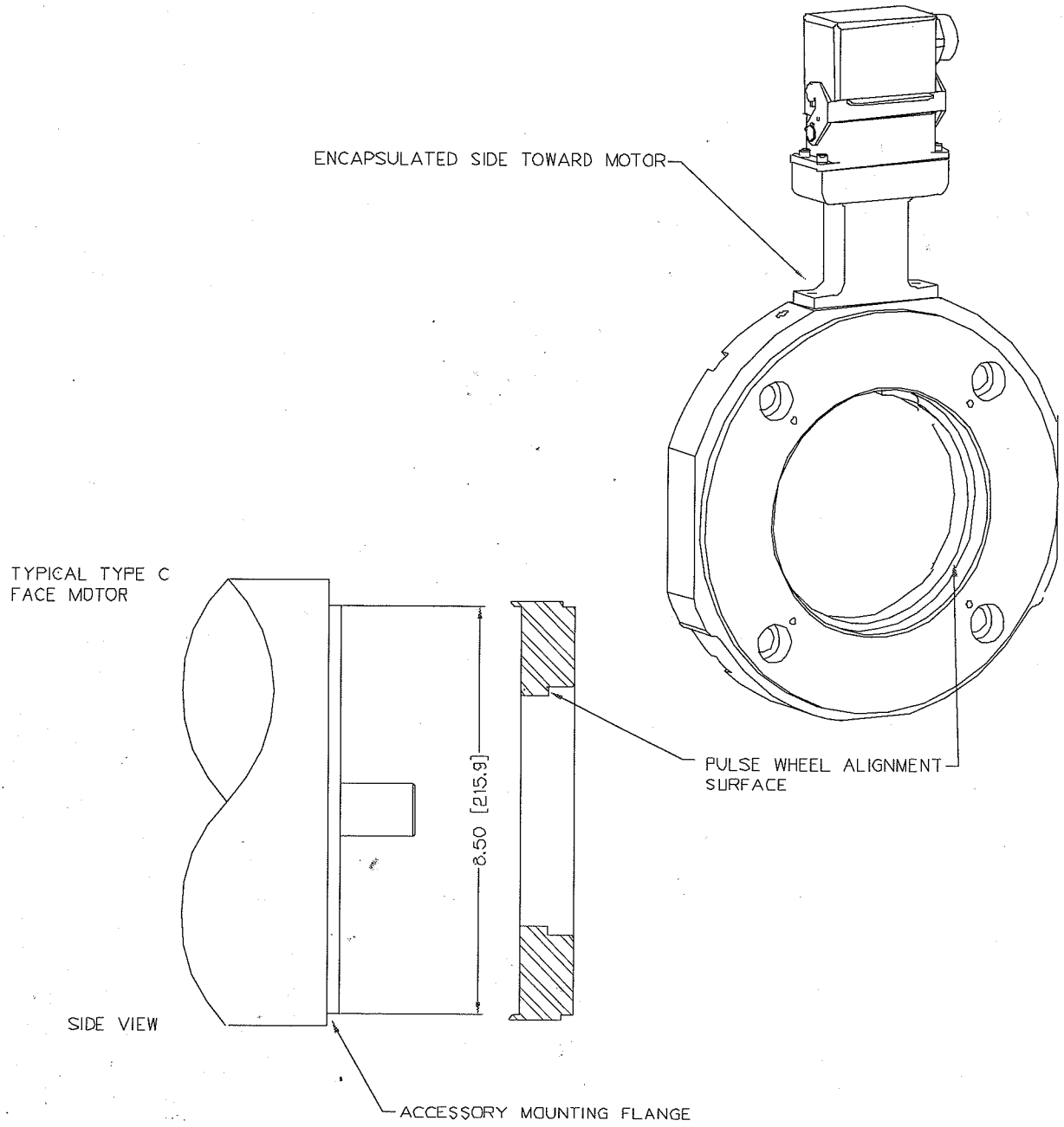


Figure 3: Typical Motor Mounting

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2.1.2 Thru-Shaft Pulse Wheel Installation

1. Rotate the pulsewheel so the stamped letter "Z" or "This Side Out" is visible, away from the motor. Slide the pulse wheel onto the motor shaft. Push the wheel along the shaft until the edge of the pulsewheel is flush with the machined recess in the encoder frame. See Figure 4. It is recommended to use a straight edge for this purpose. For best results, align the two surfaces to within ±0.010 inch. The purpose of this step is to properly center the pulsewheel under the sensor.

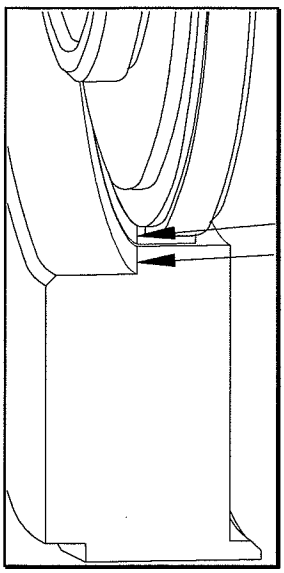
   a. Clamp Style
      With the pulsewheel properly aligned, use a 9/64 inch hex wrench to tighten the #8 socket head cap screw in the pulsewheel clamp to a nominal 30 inch-pounds.
   b. Set Screw Style
      With the pulsewheel properly aligned, use a 9/64 inch hex wrench to tighten (2) 8-32 UNC set screws with nominal torque.

3. Be sure the wheel does not have excessive wobble greater than 0.010 inch. Rotate the motor shaft by hand. It should freely rotate and not touch the frame at any time. If everything is mechanically correct, the resulting sensor to pulsewheel air gap will be a nominal 0.019 inch.

4. Position the encoder cover over the mounted encoder frame. Insert and tighten four Phillips head screws. This completes the mechanical mounting of the unit.

NOTE

The picture below shows how to align the pulse wheel on the SL85. The pulse wheel is aligned the same way for both the End-Of-Shaft and Thru-Shaft models. Be sure the letter "Z" and "This Side Out" are visible on the face of the pulse wheel after installation.



Detail of surfaces that must be flush.

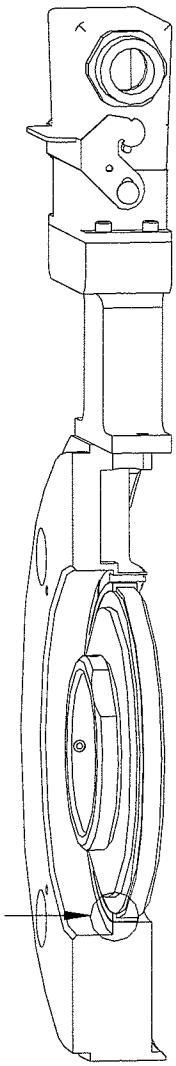


Figure 4: Pulse Wheel Orientation

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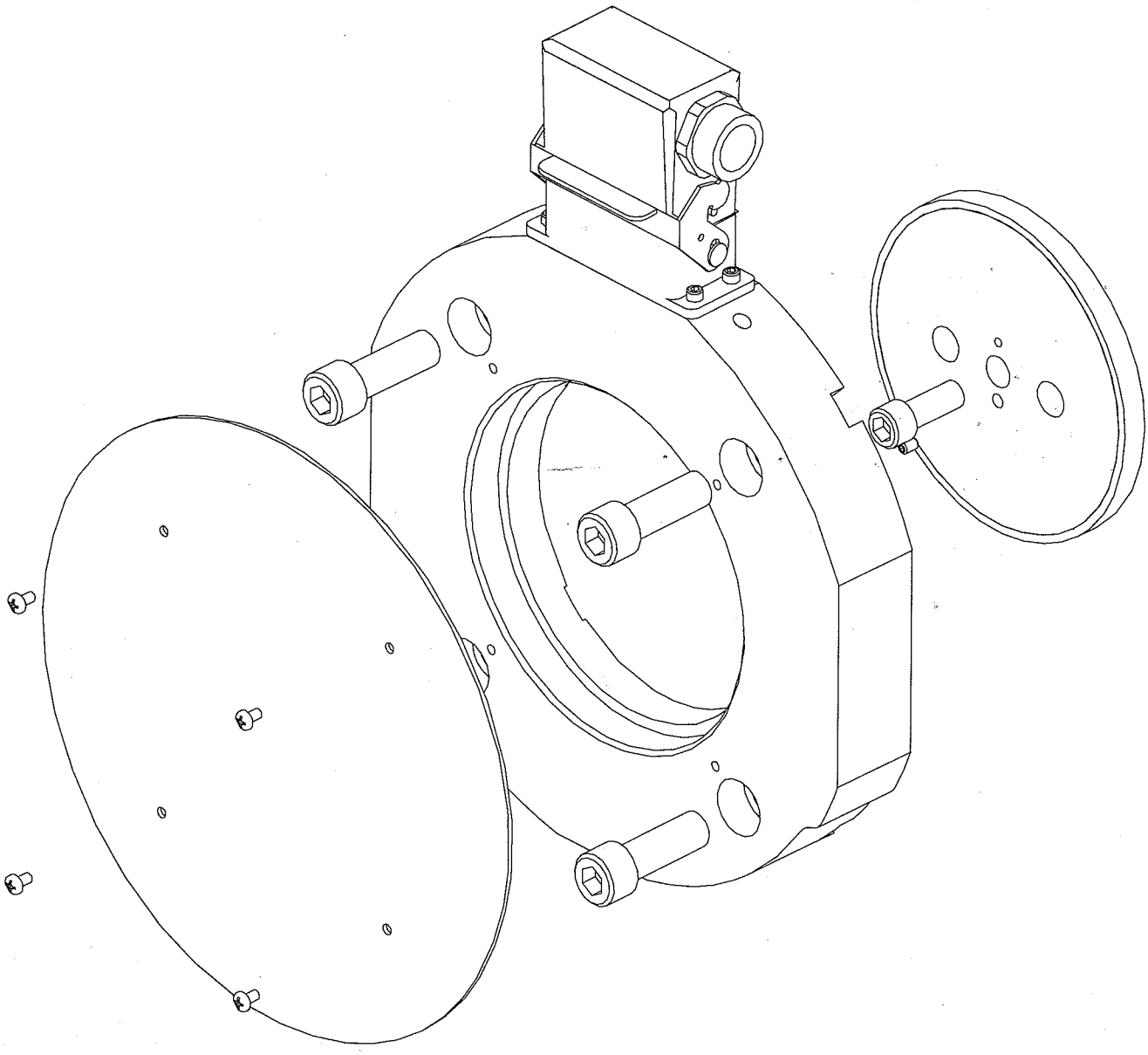


Figure 5: SLIM Tach® SL85 End-of-Shaft Exploded View

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2.2 Motor Facing and Shaft for End-of-Shaft SL85

To prepare the motor facing and shaft for installation, perform the following steps. See Figure 6.

1. Clean outer rim and surface of motor facing and shaft of paint, grease, dirt, and other debris where SLIM Tach® SL85 unit contacts motor or accessory. Also ensure that mating surfaces have not been damaged and that unit will fit squarely on motor.

2. Apply a thin layer of corrosion preventative or oil to motor facing and shaft to aid assembly and provide some corrosion protection.

NOTE

Ensure there is no paint, burrs, protrusions, or deformations on the motor facing or shaft. If the enclosure does not fit squarely on the motor facing, the alignment between the sensor module and the magnetic pulse wheel may be degraded.

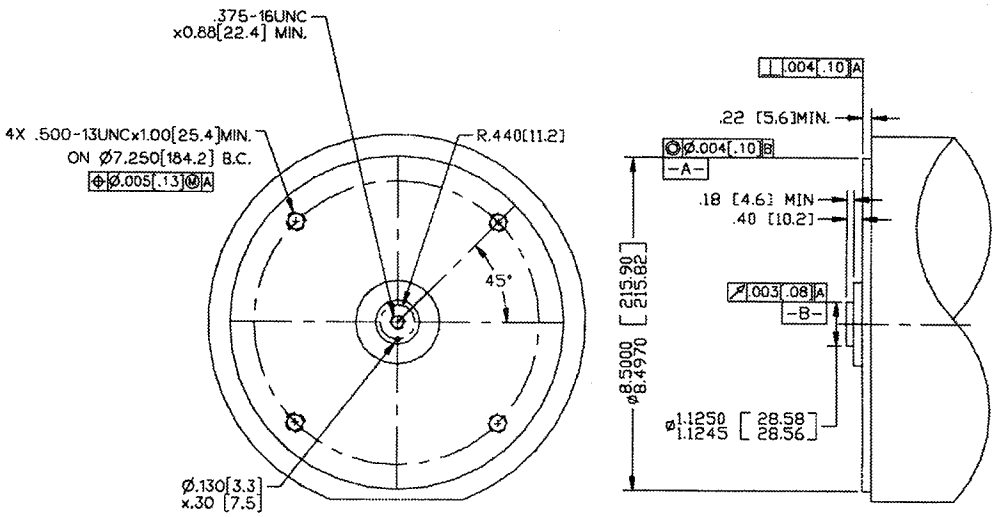


Figure 6: Typical 8.5-Inch Diameter Type C Face Motor End-Of-Shaft Application

2.2.1 Encoder Frame Installation: see page 8

2.2.2 End-of-Shaft Pulse Wheel Installation

To prepare the pulse wheel assembly for installation, perform the following steps. See Figure 7 .

CAUTION!

Caution must be used when handling the pulse wheel assembly. The surface of the pulse wheel outer rim is sensitive to scratches and impacts. The magnetic properties of the pulse wheel material can also be distorted or erased by exposure to strong magnetic fields.

1. Remove pulse wheel assembly from packaging.

2. Place one spacer washer into the shaft recess of the pulse wheel.

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NOTE

The pulse wheel is designed to use one spacer washer for a motor shaft length of 0.400 ±0.010 inch. If the motor shaft is a different length, please refer to page 14 for axial adjustment procedure.

3. Place pulse wheel shaft recess over the end of the motor shaft. Rotate the wheel so that the mounting bolt holes line up with the shaft tapped holes. Press the wheel assembly onto the shaft until it seats. Light tapping on the steel hub may be required.

NOTE

Some motor shafts do not have anti-rotation mounting holes. Instead, they have only one center tapped hole. For these cases, please review the Non-Standard End-of-Shaft Mounting Procedure on page 12.

4. Insert and snug mounting bolts into the wheel. If the pulse wheel has not already seated, alternate tightening each bolt until it is seated. (E01 Pulse Wheel [1.125 inch shaft] units require only one center mounting bolt. After complete tightening the pulse wheel, tighten the 10-32 anti-rotation set screw.)

5. Tighten each bolt to the proper torque: 15 foot-pounds for 10-24 bolts, and 30 foot-pounds for 3/8-16 bolts.

CAUTION!

The pulse wheel should be seated flat against the motor shaft. The wheel should not appear to wobble if the motor shaft is turned by hand. Excessive wobble (0.020" TIR) can damage the pulse wheel and sensor modules.

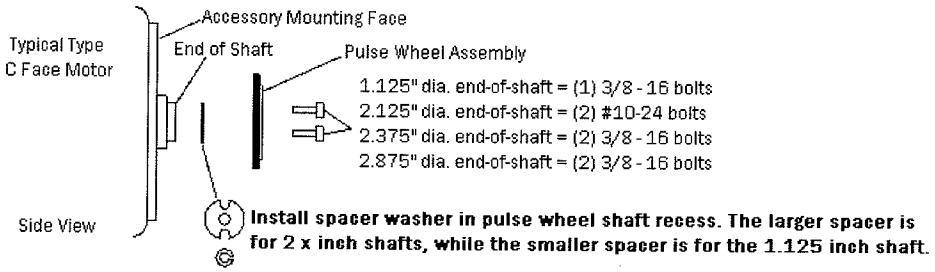


Figure 7: Pulse Wheel Assembly

2.3 Electrical Installation

Electrical connections are made to the sensor module through a standard 1/2 inch NPT liquid tight flexible conduit. The nipple length may be changed to extend the outlet box if desired. Interconnection cable recommendations are as follows: stranded copper, 22 through 16 gage, braided or foil with drain wire shielding 0.05 µF maximum total mutual or direct capacitance, outer sheath insulated. Shrink tubing may be placed over any wires without insulation. For lengths over 100 feet, use 18 gage or larger, to a maximum of 1000 feet. If shielded twisted pair wire is used, do not cross channels. Keep each pair of complementary channel outputs together in a single twisted pair (e.g., A and A complement).

CAUTION!

Reversing power and common will not damage the unit. However, applying power to any of the sensor outputs may cause damage.

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Table 1. Signal Coding Table

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	F
B	2	Green	B
A	3	Blue	A
Z *	4	Violet	C
No Connection	5	-----	E
Vcc (5-15 VDC)	6	Red	D
/B	7	Yellow	I
/A	8	Gray	H
/Z *	9	Orange	J
Shield	10	Braid	G

* Applies only to units with index pulse capability.
\# Pinouts are for the sensors with the MS 3102E18IT connector

NOTE

The shield in the sensor module is isolated from the frame of the encoder. For maximum noise immunity, the shield wire or pin should be connected to the shield of the cable and that of the drive or other receiving device.

2.3.1 Quick Release Connector Hood Wiring

To install the Quick Release Connector, perform the following steps.

1. Remove the four screws from the mating connector housing that hold the terminal block in place. Remove terminal block from housing.

2. Insert wiring through liquid tight flexible seal and mating connector housing. Leave enough wire exposed to comfortably reach the terminal block. Wire to terminal block according to wire code in Table 1. A similar wiring list is attached to enclosure.

NOTE

There are two orientations of the connector hood. The terminal block can be inserted either way so the connector hood points up or down. Choose the direction best for your application.

4. Tighten Liquid Tight fitting on housing. **OPTIONAL**: In some hostile environments, seal between connector body and Sensor Module can be improved by smearing a sealant (silicone grease, etc.) on the neoprene seal of the connector.

5. Mate connector into place on sensor mount and snap the two latches into place. If only one sensor is being installed, ensure cover plate is installed over other sensor hole.

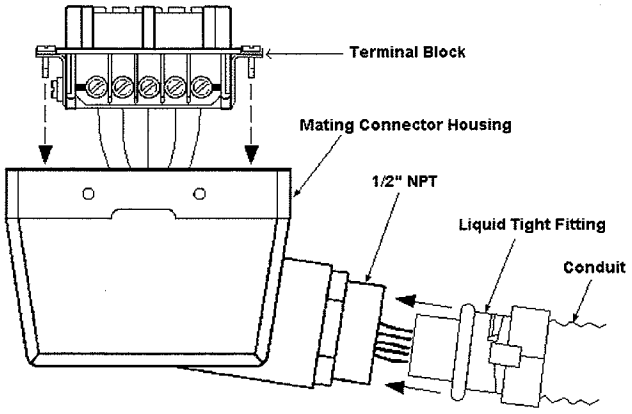


Figure 8: Sealed Industrial Latching Connector

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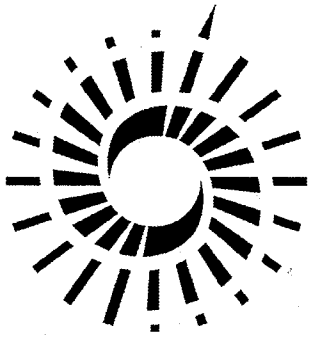
2.3.2 Returning Equipment to NorthStar

If it is necessary to return the unit for repair or replacement, a Return Goods Authorization (RGA) number must be obtained from a factory representative before returning the equipment to our service department. When returning an instrument for service, the following information must be provided before NorthStar can attempt any repair.

1. Instrument model and serial number
2. User's name, company, address, and phone number
3. Malfunction symptoms
4. Description of system
5. Returned Goods Authorization number

Consult the factory for shipping instructions.

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