MODEL SS-3 SHAFT SENDER INSTALLATION

Introduction:

The Aetna Engineering Model SS-3 shaft sender functions as a sensing device for the Aetna Engineering line of Precision Sensitive Digital Tachometers. The SS-3 gives an output pulse whenever a magnetic pole comes close to the sensing face of the SS-3. The SS-3 should be mounted in a position so that it senses the passage of "Tach-Tape" on a crankshaft pulley, propeller shaft or other rotating object. The pulses created by the passage of the magnetic poles are then processed by the tachometer to generate accurate RPM information. In addition, the SS-3 determines the rotational direction and provides a signal to Aetna Engineering Precision Sensitive Digital Tachometers with the directional indicating modification to indicate "F" or "R" for forward or reverse.

1. The SS-3 should be mounted in a position so that the magnetic poles pass in a "slide by" configuration with a clearance distance of approximately one sixtenth of an inch. The maximum distance allowable is a function of the strength and size of the magnetic pole. The minimum distance is limited to that spacing which will assure that no contact will occur between the sensor and the rotating device when allowances are made for runout, end play, vibration and eventual paint build-up or corrosion. *Caution: any physical contact with the sensing surface of the Model SS-3 by the rotating equipment may cause permanent damage to the sensor and is not covered under warranty.*

2. The tachometer must be matched to the number of pulses per revolution. Our standard tachometers will give the correct indication when there are two, three, four, six or eight pulses per revolution. Aetna Engineering can supply custom tachometers for other pulse ratios. The poles should be evenly spaced throughout the rotation to provide an even pulse train during operation.

3. The SS-3 sensor should be mounted by positioning it in a 15 mm hole in a customer furnished bracket. The bracket should be of sufficient rigidity to prevent vibration or movement which would cause erroneous readings or permit the sensor to contact the rotating equipment. Preferably the bracket should be mounted to the structure of the rotating machinery in order to minimize movement in relative position between the sensor and the machinery being measured. Use very little force (less than 8 foot-pounds) when tightening sender fittings. The sender must be rotated so that the 'Orientation groove' is aligned with the direction of travel of the rotating surface. Some minor field adjustment of the orientation may be necessary for best performance.

4. The cable for the Model SS-3 should be securely dressed to a clean dry location where the five conductors may be joined in junction block to a four conductor 18 gauge (or heavier) shielded cable which is routed to the Precision Sensitive Digital Tachometer(s). The sensor draws 35 mA and is rated at 9.0 to 15 Volts D.C. The electrical connections should be made from the sensor to the tachometer as follows:

Sensor wire (connects to)	Tachometer terminal
Red	+12V (IGN.)
Green	POINTS (SIG.)
White	DIRECTION
Black	GROUND (NEG.)
Shield (drain)	No Connection to tach.

Caution: Note: be extremely cautious that all connections are made correctly as listed above. Even momentary incorrect connection may permanently damage the sensor.

The connections should be made using accepted standard practice for shipboard wiring and should be well insulated and protected from any accumulation of dirt or moisture. The wiring shields should be connected together and attached to the vessels ground at one point only!

5. The 9-15 volt power should be connected into the system at the tachometer. If an installation includes two tachometers, the tachometers should be connected in parallel; Ground to Ground, Points to Points, Direction to Direction, and +12V to +12V with power connected into just one of the tachometers. The SS-3 sensor will drive four tachometers in parallel.

6. After the sensor and tachometer(s) are installed and wired, the system may be checked and adjusted. Apply power to the tachometer without starting the machinery. The function of the sensor may be checked by observing the output of the signal (green) terminal using a voltmeter. It should alternate between ground and the + voltage as a pole pair passes the face of the sensor by slowly rotating the machinery. If the sensor fails to give any indication with this test, adjust the gap and the orientation for optimum response. Should no response be noted, remove the sensor from the bracket and slide the round shaft of a small screwdriver along the face of the sensor in a direction aligned with the orientation groove. The output on the green wire should toggle as this test is performed. If not, check the wiring and voltage supplied to the sensor. If these are correct, the sensor is faulty and must be replaced.

REVISIONS			
LTR	DESCRIPTION	DATE	APPR
-	INITIAL RELEASE	01-23-97	J.
A	ECN 3506 THREAD WAS M14	07-25-00	J.

Drawing Approval Signature:
Company: AETNA ENG
Date: 8 AUG 00

SPECIFICATIONS

ELECTRICAL

Vcc: +12Vdc±12%
Icc: 35mA MAX.
I_{OL} 3.6mA MAX.
V_{OL} .65V MAX @ I < 1.2mA
V_{OH}: 3.9V MIN., 5.5V MAX.
FREQUENCY: 0 TO 12KHZ
Vcc OVERVOLTAGE: 20Vdc
Vcc REVERSE VOLTAGE: -60Vdc
LOAD DUMP: 60 VOLTS
SHORT CIRCUIT PROTECTION:
ANY LEAD TO ANY LEAD
DUTY CYCLE: 40% TO 60%

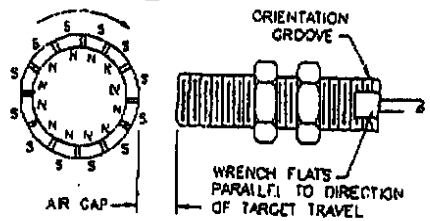
ENVIRONMENTAL

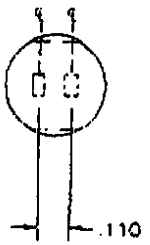
TEMPERATURE: -40°C TO +125°C
RH: 0 TO 100%

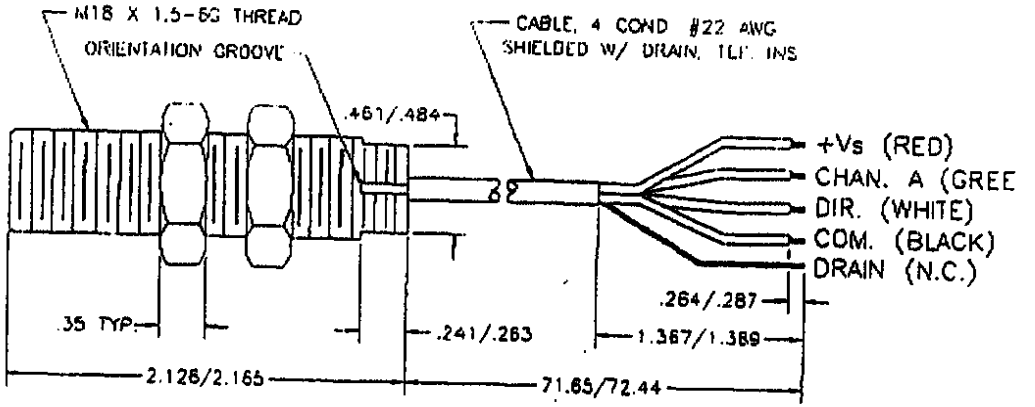
MECHANICAL

CASE AND NUT MATERIAL: 303 STAINLESS STEEL
TARGET: MAGNETIC ENCODED FLEXABLE STRIP ON FERROMAGNETIC SUBSTRATE
AIR GAP: .059" MAX. DEPENDING ON TARGET

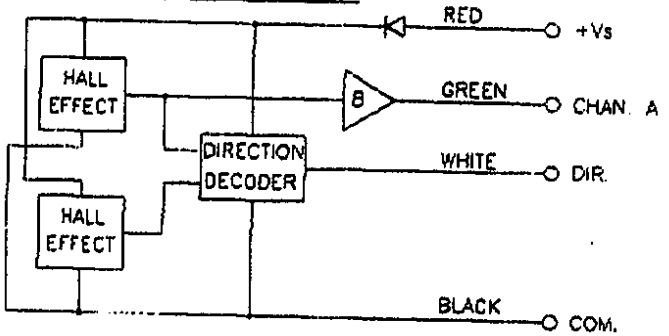
ORIENTATION

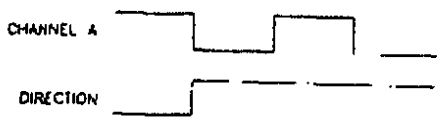






BLOCK DIAGRAM





TOLERANCE UNLESS NOTED		
.XX	+.01	-.01
.XXX	+.005	-.005
.XXXX	+.0005	-.0005
DRILLED HOLES	+.003	-.000
FORMED ANGLES	+1/2	-1/2

UNLESS OTHERWISE SPECIFIED

ALL DIMENSIONS ARE IN INCHES AND INCLUDE PLATING WHEN SPECIFIED.

ALL MACHINED SURFACES TO BE 63 FINISH.

REMOVE ALL BURRS AND BREAK ALL SHARP EDGES .005R OR CHAM.

ALL DIAMETERS TO BE CONCENTRIC WITHIN .005 T.I.R. UNLESS NOTED

	9941-008	41121-006
NEXT ASSEMBLY	FINAL ASSEMBLY	

APPLICATION

DRAWN	J.C.	DATE 01-23-87
CHECKED		DATE
APPROVED		DATE
APPROVED		DATE
CUST. P/N	SS-3	
PREV. DWG. NO.		

AETNA Engineering
Grand Rapids, MI 49544

OUTLINE & SPECIFICATIONS HALL EFFECT SENSOR

SIZE		DWG. NO.
A		41121-006

SCALE: NONE

TT-100
Tach Tape
INSTRUCTIONS

TT
Diam. x 3.1416 PI = Circum.
Circ. x .45 = PPR

SPECIFICATIONS

Temperature range: -30 F to +160 F. (-35 C to +70 C)

Gear pitch equivalent: approximately 7 diametral pitch.

Maximum continuous length: 100 feet (30 meters)

Caution: Do not expose tape to strong AC or DC magnetic fields

FUNCTION:

Provides a convenient, simple and low-cost means to activate magnetic pickups in speed and frequency measurements.

USE:

An inexpensive substitute for large split gears, slots in shafts, drilled holes in flywheels, etc., for magnetic pickup speed sensing.

DESCRIPTION & CHARACTERISTICS:

Tach Tape is a strip of flexible magnetic polymer. On one side it has a pressure-sensitive adhesive protected by a peel-away backing. This adhesive will adhere to a wide variety of surfaces, including most plastics and metals.

Because of its unique magnetization and arrangement of slots, a series of alternate magnetic poles are generated along the length of the tape. A magnetic pickup becomes activated when placed perpendicular to the tape surface.

Figure 1 demonstrates that the tape performance is better than an 8-pitch gear when the air gap is larger than .050 inch (1.2MM). This is especially welcome in cases where a small air gap is difficult to maintain or space is too restricted to install split gears because the Tach Tape- pickup combination is so well suited to large air gaps.

Because of centrifugal forces acting upon the tape when rotating, a safe maximum speed should be observed (shown in Table 1). If greater speeds are required, a fiberglass reinforced plastic tape (such as one inch wide strapping tape #ST-40, Superior Insulating Tape Company) may be wrapped over the magnetic tape (two layers as shown in Figs. 2&3), which quadruples the maximum safe speed. (Pickup senses through reinforcing tape)

The tape should not be exposed to strong AC or DC magnetic fields and should only be used with magnetic pickups to prevent possible de-magnetization.

TABLE 1, MAXIMUM SAFE SPEED

SHAFT DIAMETER	WITHOUT REINFORCED TAPE	WITH REINFORCED TAPE
3 IN (7.5 cm)	2500 RPM	10,000 RPM
6 IN (15 cm)	1800 RPM	7,200 RPM
9 IN (23 cm)	1500 RPM	6,000 RPM
12 IN (30 cm)	1200 RPM	4,800 RPM
24 IN (60 cm)	900 RPM	3,600 RPM
36 IN (90 cm)	700 RPM	2,800 RPM

3.

This table assumes the Tach Tape has been applied according to the instructions which follow.

AVAILABLE FROM
AETNA ENGINEERING
17731 Candia Court
Granada Hills, CA 91344
800-776-7962

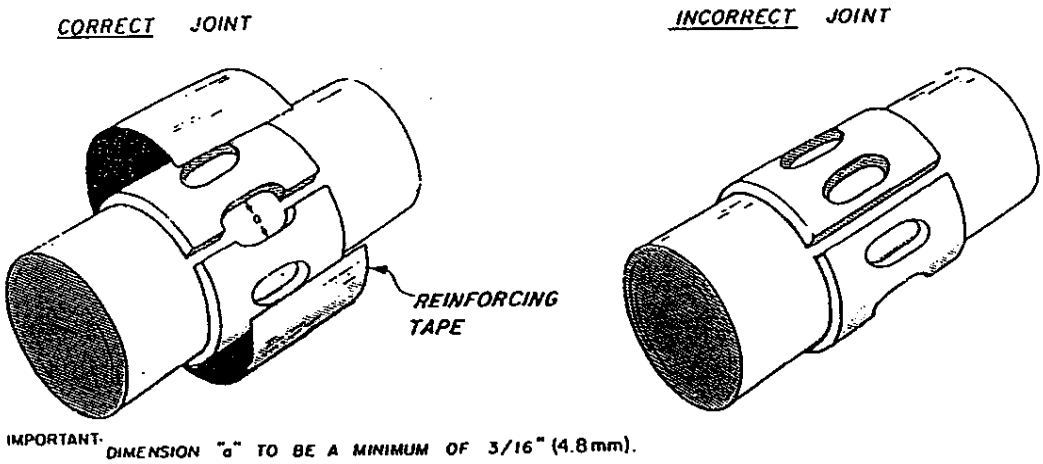


Figure 2

Model TT-100
Tach Tape

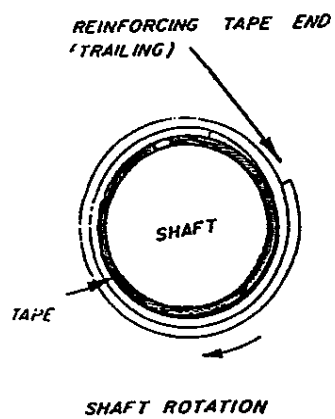


Figure 3

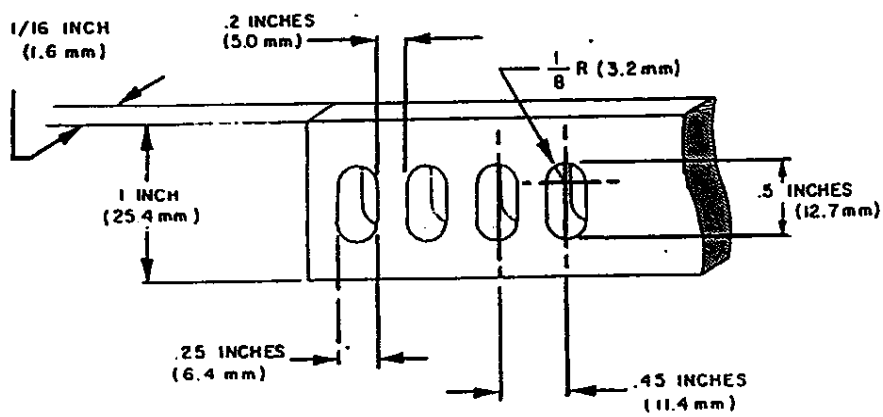


Figure 4

ADDITIONAL NOTES ON USING TT-100 TACH TAPE

Field experience has shown that the greatest difficulty in using Tach Tape is that the adhesive will weaken due to the heat and various solvents present. The result is that the Tape will lift off the shaft resulting in subsequential problems. One solution has been to secure the ends of the Tach Tape in place by applying a wrap of filament type strapping tape in place over the Tape.

An additional method of securing the ends has been devised which probably merits some field testing. It consists of bonding the ends together so that they can not lift. This has been done successfully on the bench using a cyanoacrylate adhesive more commonly known as instant adhesive or Crazy Glue. The key to a successful bond is cutting the ends so they are in perfect compliance with one another.

This can be done by overlapping the ends by one hole when applying the Tape to the shaft. Then cut through both layers at the center of the overlapped hole using a single edge razor blade. Because the two layers are temporarily joined as one, the resulting joint ends will be at exactly the same angle, regardless of whether the razor was perfectly square and perpendicular to the Tape.

Apply just a fraction of a drop to one end of the Tape. Just enough to wet the end. Carefully position the ends and apply pressure to force the ends together. Pressure can be developed by using appropriately sized pliers in the holes adjacent to the joint. The adhesive will cure in about a minute. At that time the pressure may be removed but additional time should be allowed to allow the joint to develop full strength. It may be useful to practice using scrap pieces of Tape on the bench first. Our tests have shown that the resulting joint has almost as much strength as the original Tape. For safety reasons, we recommend continuing use of the filament tape.

Please let us know how this method works out for you.

AETNA ENGINEERING 17731 Candia Court, Granada Hills, CA 91344 (818) 831-0607 Fax (818) 366-7896