

MODEL TK91 Incremental Optical Modular Rotary Encoder



- **One step gapping lever**
- **Up to 1250 cycles per revolution (5000 counts)**
- **Frequency response up to 200 KHz all channels**
- **Operating temperature range up to + 85° C**
- **Available in both English and Metric hub sizes**
- **Many output options available from Differential Line Driver to Amplified Analog**

The Model TK91 series is an incremental optical rotary kit style encoder. The TK91 was developed to offer an easy to install, highly reliable, low profile kit encoder. The unique one step lever mechanism pre-sets the internal gap. The TK 91 measures 1.5 x .81 inches and is available with single ended TTL, Differential RS422 Line Driver, Open Collector and Differential Amplified Analog. The hub and disk assembly is captivated within the unit and is available in thirteen different I.D.'s allowing use with both English or Metric dimensioned shafts. The encoder has a standard operating temperature range of 0°C to 70°C, and has an option for operating up to +85° C. This encoder is pre-aligned and pre-gapped at the factory to make customer installation time under one minute.

ELECTRICAL

Resolution range:	Up to 1250 cycles per shaft revolution, (5000 counts after quadrature).
Light source:	Gallium aluminum arsenide L.E.D. rated @ 100,000 Hrs. MTBF (mfg's spec).
Light sensor:	Monolithic Photodiode array.
Excitation voltage:	+5Vdc, +12Vdc, and +15Vdc \pm 5%, Also variable voltage +5 to +24 Vdc.
Output format:	Two count channels (A & B) in phase quadrature with an optional ZR output.
Quadrature:	90° \pm 45° (at 10 KHz output frequency).
Symmetry:	180° \pm 18° (at 10 KHz output frequency).
Rise and fall time:	1 microsecond max. into 1,000pf load capacitance.
Frequency response:	DC to 100 KHz max. 200 KHz for output circuitry types 1 and 6.
Zero reference width:	1 \pm 1/2 cycle, 1/4 cycle or 1/2 cycle gated, depending on electronic configuration.
ZR alignment:	Full cycle: output type 1 no alignment between ZR and count channels. All other output types: Center of ZR aligns between 90° and 180° of channel A. 1/2 cycle aligns with negative transition of channel B. 1/4 cycle aligns with both A & B high.
Phase sense:	Channel A leads Channel B for counterclockwise rotation of the shaft, as viewed from the cover side of the unit.
Output:	See part number table for available output options.

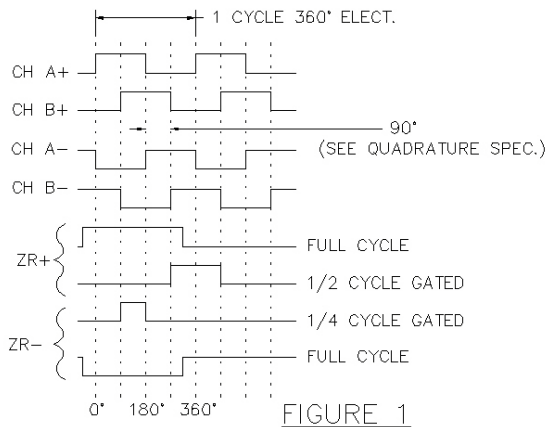
MECHANICAL

Moment of inertia:	1 x 10 ⁻⁴ oz. In. sec ² .
Max. acceleration:	5 x 10 ⁵ Radian / sec ² .
Min. shaft length:	0.67 inch. (.75 recommended).
Hub I.D. tolerance:	Nominal +.0001" to +.0005"
Weight:	1.4 oz. Max.
Shaft perpendicularity: to mounting surface:	0.002" T.I.R.
Max. shaft run-out:	0.001" T.I.R.
Max. shaft axial play rotating:	0.002" T.I.R.
Max. shaft axial play non-rotating:	+0.007" to -0.030"
Nominal gap setting:	Factory set (0.010").
Wires (type B):	26 AWG.
Cable (type C):	26 AWG multi stranded, twisted pairs, shielded, Ø .25" PVC jacket.
Mounting hardware:	If the 1.280" (32.5mm) diameter bolt circle is used, use hardware no larger than #2-56. If the 1.812" (46mm) bolt circle is used, #2-56, #4-40, or M2 can be used.

ENVIRONMENTAL

Operating temperature:	Standard -0°C to +70°C, Optional -20°C to +85°C
Storage temperature range:	-25°C TO +90°C
Shock:	50 G for 11 millisecond duration.
Vibration:	20 Hz to 2000 Hz @ 5 G.
Humidity:	To 98% R.H. (non-condensing).

DRC Encoder



CIRCUITRY	CURRENT
TYPE 1	75 mA MAX.
TYPE 2	100 mA MAX.
TYPE 3&7	150 mA MAX.
TYPE 5	110 mA MAX.
TYPE 6,8,9,&V	125 mA MAX.

FIGURE 2

DISC RESOLUTIONS		
125	400	1024
200	500	1200
250	1000	1250

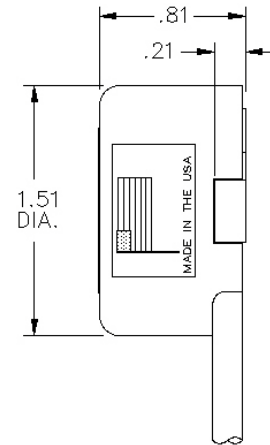
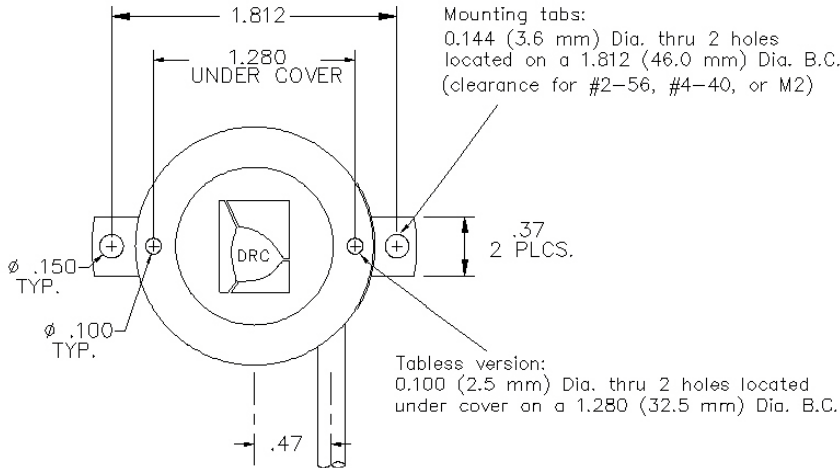
FIGURE 4

ELECTRICAL CONNECTION	
FUNCTION	WIRE COLOR
CHANNEL A+	ORANGE
CHANNEL A-	GREEN
CHANNEL B+	YELLOW
CHANNEL B-	BLUE
CHANNEL ZR+	BROWN
CHANNEL ZR-	GRAY
GROUND	BLACK
SUPPLY VDC	RED

FIGURE 3

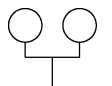
CIRCUITRY	AVAILABLE ZR OPTIONS
TYPE 1, 8, 9	0, 4
TYPE V	0, 4, 5
TYPE 5, 7	0, 1, 2, 4
TYPE 6	0, 1, 4
TYPE B, C, D	0, 4

FIGURE 5

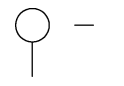


TK91

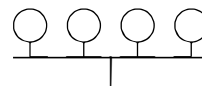
OUTPUT CIRCUITRY
 5 = DIFFERENTIAL TTL 7404 (100 kHz, 70°C)
 6 = DIFFERENTIAL LINE DRIVER (200 kHz, 85°C)
 9 = DIFFERENTIAL AMPLIFIED ANALOG A, B,
 COMPLIMENTARY SQUARE WAVE ZR
 C = 12 V SINGLE ENDED TTL LM339 (100 kHz, 70°C)



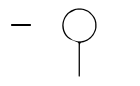
HUB I.D.
 3E = 3/16"
 4E = 1/4"
 5E = 5/16"
 6E = 3/8"
 7E = 7/16"
 8E = 1/2"
 05 = 5MM
 06 = 6MM
 07 = 7MM
 08 = 8MM
 09 = 9MM
 10 = 10MM
 12 = 12MM



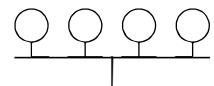
ZERO REFERENCE
 0 = WITHOUT
 1 = 1/4 CYCLE
 2 = 1/2 CYCLE
 4 = 1 CYCLE +ZR
 5 = 1 CYCLE -ZR



CYCLES PER REV
 SEE TABLE 1



TERMINATION TYPE
 B = 18" WIRES
 C = 18" CABLE
 IF NEEDED
 XXB = WIRES XX IN. LONG
 XXC = CABLE XX IN. LONG
 UNITS WITH MODS
 SPECIFY SPECIAL CABLE
 LENGTHS IN THE MOD.



MODS

TK91X SERIES INSTALLATION PROCEDURE

HUB SIZES: 3E THRU 6E, OR MM 05 THRU 08

DO NOT INSTALL UNIT WITH ELECTRICAL POWER APPLIED.

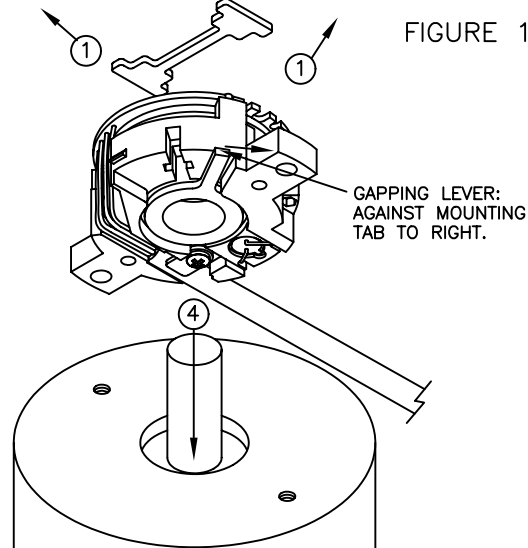


FIGURE 1

- ① Carefully unpack the unit and remove the shipping band. Make sure the gapping lever is in the position shown.
- ② Align the set screw in the hub and disc assembly with the access slot in the P.C. board. See figure 2 to right.
- ③ If the shaft is longer than .78" (20 mm), remove label from top of cover. See figure 4.
- ④ Slide the encoder assembly down over the motor shaft. The hub and disc assembly should slide freely on the shaft; if not, DO NOT force. Check for shaft interferences such as burrs, gouges, rust, etc..

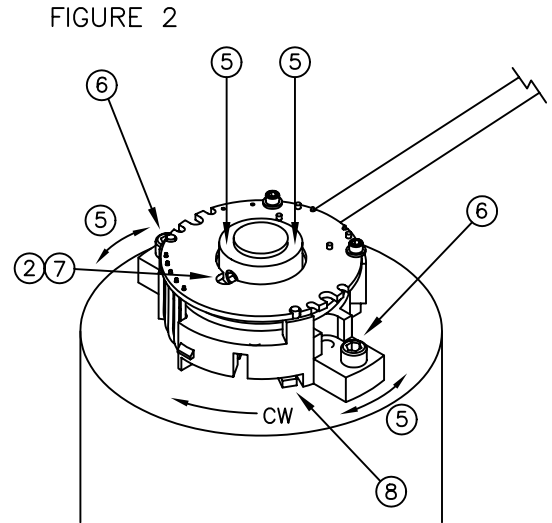


FIGURE 2

- ⑤ Apply slight downward pressure on the aluminum center hub and rotate base side to side to seat it with the hub.
- ⑥ While holding hub downward, insert and tighten two attachment screws (#4-40) through tabs of the encoder. Use #2-56 for tabless version.
- ⑦ While still maintaining downward pressure, tighten the hub set screw using a ball-end .050" hex wrench through the P.C. board access.
- ⑧ Turn the gapping lever clockwise until it stops against the housing wall.

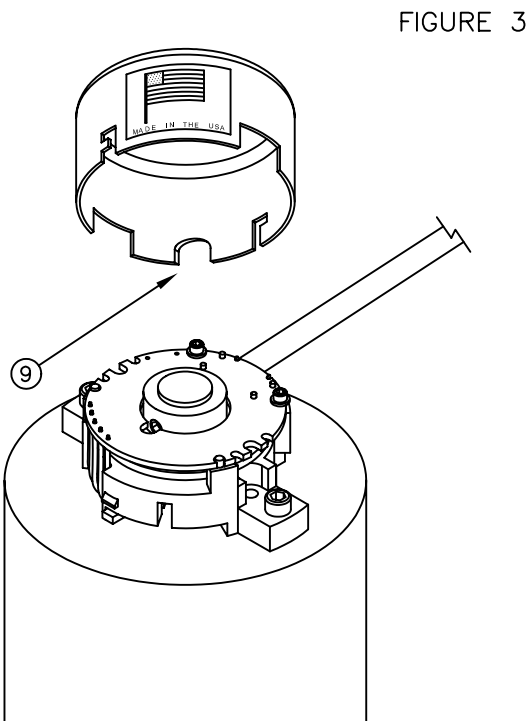
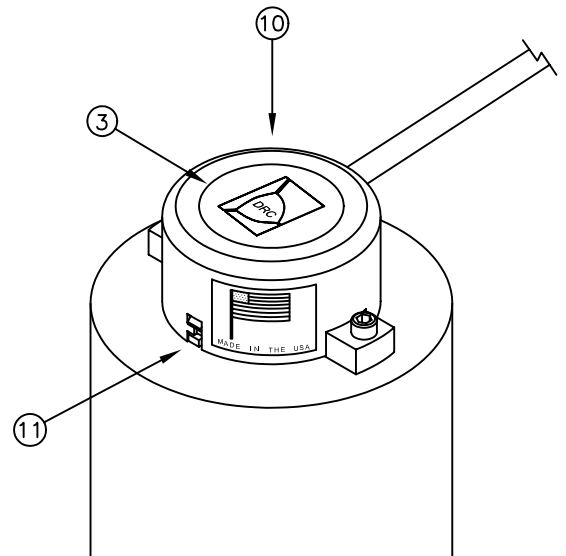


FIGURE 3

- ⑨ Position the cover over the encoder so the cable egress hole in the cover lines up with the cable.

FIGURE 4

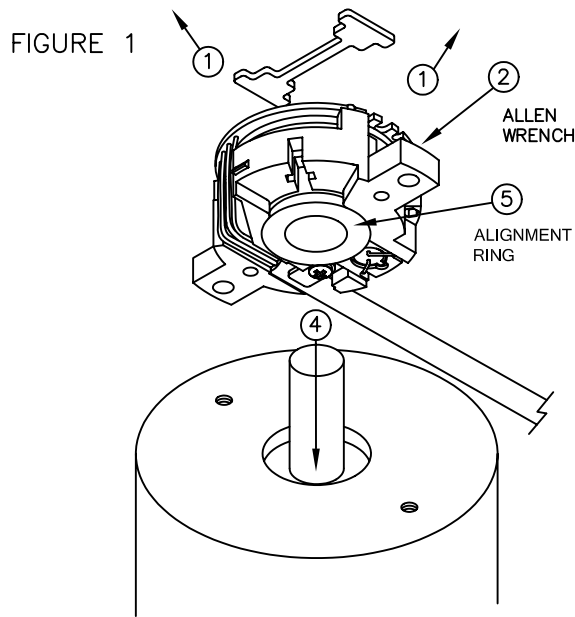


- ⑩ Push the cover down until it snaps on the encoder.
- ⑪ The cover has a retaining slot for the gapping lever when it is in the mounted position.

TK91X SERIES INSTALLATION PROCEDURE

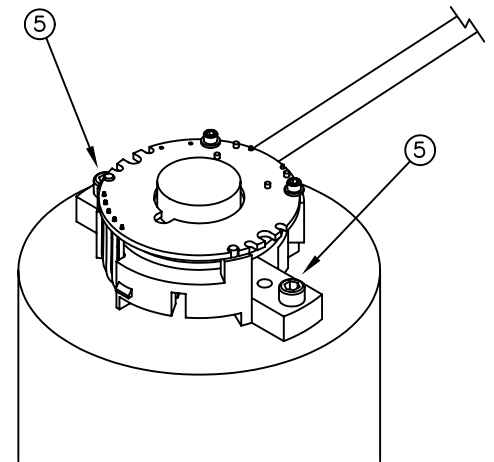
HUB SIZES: 7E, 8E, 09, 10, 12

DO NOT INSTALL UNIT WITH ELECTRICAL POWER APPLIED.



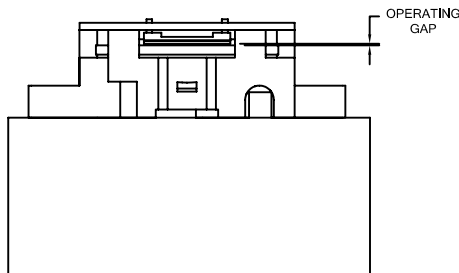
- ① Carefully unpack the unit and remove the shipping band. note that the hub and disc assembly is loose within the housing assembly.
- ② Put an allen wrench through the slot in the housing, and into one of the hub's set screw.
- ③ If the shaft is longer than .78" (20 mm), remove label from top of cover. See figure 4.
- ④ Slide the encoder assembly down over the motor shaft. The hub and disc assembly should slide freely on the shaft; if not, DO NOT force. The allen wrench should help guide the hub assembly into place.

FIGURE 2



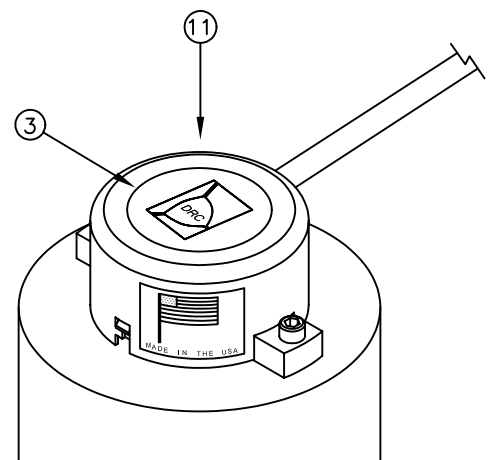
- ⑤ Using the alignment ring in the housing, center the encoder housing to the shaft. Tighten two attachment screws. The shaft should rotate without binding on the alignment ring.
- ⑥ Use the allen wrench to control the hub disc assembly.
- ⑦ Using a .0075 thick shim between the disc and the reticle, lift the hub and disc assembly and tighten the set screw when the .0075 gap is obtained. (see figure 3)

FIGURE 3



- ⑧ Turn the shaft to locate the second set screw and tighten it.
- ⑨ Check the gap between the disc and the reticle. The gap must be $.0075 \pm .002$ inches.

FIGURE 4



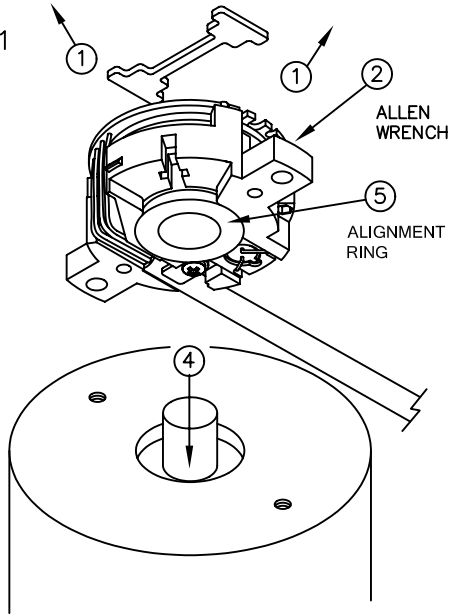
- ⑩ Position the cover over the encoder so the cable egress hole in the cover lines up with the cable.
- ⑪ Push the cover down until it snaps on the encoder.

TK91X SERIES INSTALLATION PROCEDURE

HUB SIZES: ALL WITH MOD G007

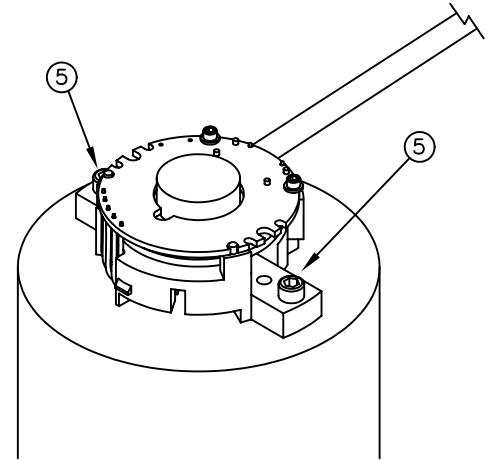
DO NOT INSTALL UNIT WITH ELECTRICAL POWER APPLIED.

FIGURE 1



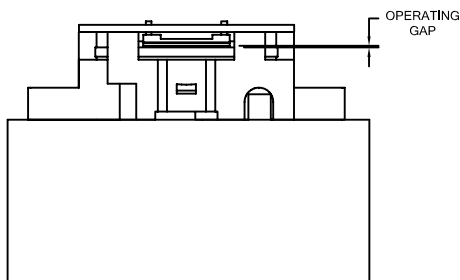
- ① Carefully unpack the unit and remove the shipping band. Note that the hub and disc assembly is loose within the housing assembly.
- ② Put an allen wrench through the slot in the housing, and into one of the hub's set screw.
- ③ If the shaft is longer than .78" (20 mm), remove label from top of cover. See figure 4.
- ④ Slide the encoder assembly down over the motor shaft. The hub and disc assembly should slide freely on the shaft; if not, DO NOT force. The allen wrench should help guide the hub assembly into place.

FIGURE 2



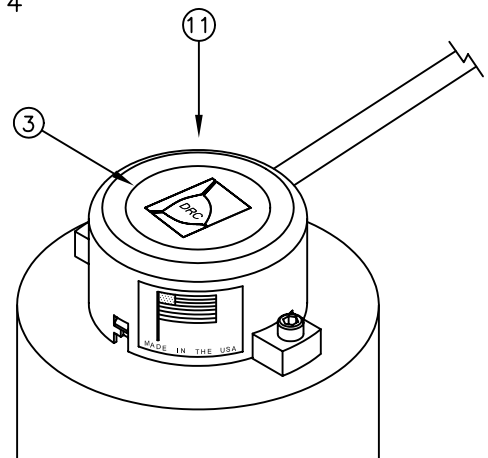
- ⑤ Engage the (2) #4 mounting screws, and thread into the mounting surface, about 1/2 turn from being tight.
- ⑥ Now hold the top of the protruding hub and push down to engage the chamfer on the hub into the centering ring. This centers the encoder.
- ⑦ While holding the hub in a downward direction, tighten the (2) mounting screws.
- ⑧ Using a .0075 thick shim between the disc and the reticle, lift the hub and disc assembly and tighten the set screw when the .0075 gap is obtained. (see figure 3)

FIGURE 3



- ⑨ Turn the shaft to locate the second set screw and tighten it.
- ⑩ Check the gap between the disc and the reticle. The gap must be $.0075 \pm .002$ inches.

FIGURE 4



- ⑪ Position the cover over the encoder so the cable egress hole in the cover lines up with the cable.
- ⑫ Push the cover down until it snaps on the encoder.