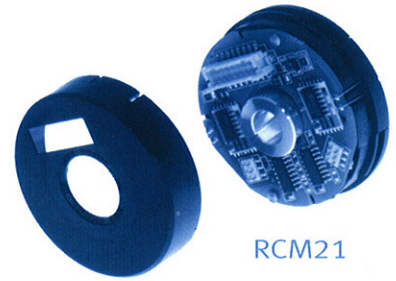


# RCM21

## Modular 2.1 Inch Commutation Encoder



**RENCO**  
E n c o d e r s



RCM21

Bulletin #77643-001 Rev. E

The **RCM21** combines brushless motor commutation pulses and incremental position feedback in a single optical encoder. The RENCO feature reduces the cost while improving the performance and reliability of the brushless motor/encoder package. With a single push on the slide/lock mechanism (patent #5057684), the RCM21 is aligned, centered, and gapped for maximum performance. No further adjustments are required and no mechanical rubbing exists once installed. A built in servo groove allows  $\pm 20^\circ$  rotation of the encoder to align the commutation tracks with the motor poles.

## Features

- 2 data channels in quadrature
- Once around index marker pulse
- Optically generated commutation outputs for brushless motors with any number of poles
- RS-422 interface
- Self-aligning
- Self-centering
- Self-gapping
- Frequency response to 200 KHz
- Differential index
- PC Board header for easy installation

## Mechanical

<b>Outer Diameter:</b>	2.1 inches
<b>Height:</b>	.84 inches ref.
<b>Moment of Inertia :</b>	18.4 X 10 <sup>-5</sup> oz-in sec <sup>2</sup> (max)
<b>Weight :</b>	2 oz (max)
<b>Slew Speed :</b>	Set by electrical performance
<b>Acceleration :</b>	1 X 10 <sup>6</sup> rads/sec <sup>2</sup>
<b>Termination :</b>	See Table 1
<b>Base &amp; Cover Material :</b>	Glass filled polycarbonate
<b>Code Disc Material :</b>	Chrome on glass (0.060")
<b>Hub Material :</b>	Aluminum (stainless steel opt.)

## Electrical

<b>Input Power :</b>	5VDC $\pm$ 5%, 12 VDC $\pm$ 10%, 15 VDC $\pm$ 10%
<b>Sink/Source Current :</b>	20 mA
<b>Output Format :</b>	Data: DS26C31TM, Comm LM2901
<b>Frequency Response :</b>	Up to 200 KHz
<b>Available ESD Protection :</b>	0.1 Joule ( AVX Multi-Guard MG064514A300)

## Environmental

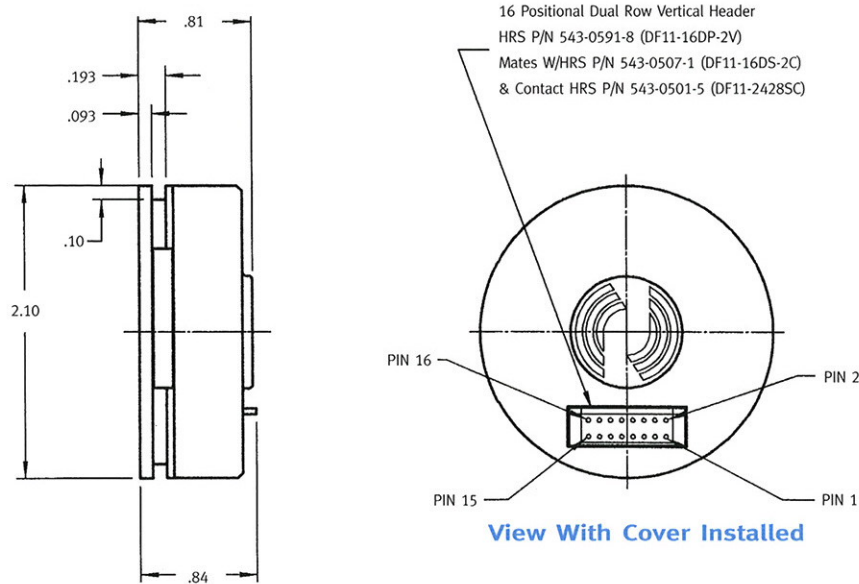
<b>Operating Temperature :</b>	-10°C to +100°C
<b>Storage Temperature :</b>	-30°C to +125°C
<b>Shock :</b>	50 G's for 11ms duration
<b>Vibration :</b>	5-2000 Hz @ 10 G's
<b>IP Rating :</b>	IP 40
<b>Relative Humidity :</b>	90% relative (non-condensing)

## Resolutions

<b>Range :</b>	256 to 2048 pulses per revolution
<b>Currently Available :</b>	<u>2 cycles/360° (2 pole pairs)</u> 1000/2, 1024/2, 2000/2 <u>3 cycles/360° (3 pole pairs)</u> 1000/3, 1024/3, 2000/3 <u>4 cycles/360° (4 pole pairs)</u> 1000/4, 1024/4, 2000/4, 2048/4 <u>6 cycles/360° (6 pole pairs)</u> 1000/6

All dimensions are in inches unless otherwise specified.  
Product specifications subject to change without notice.

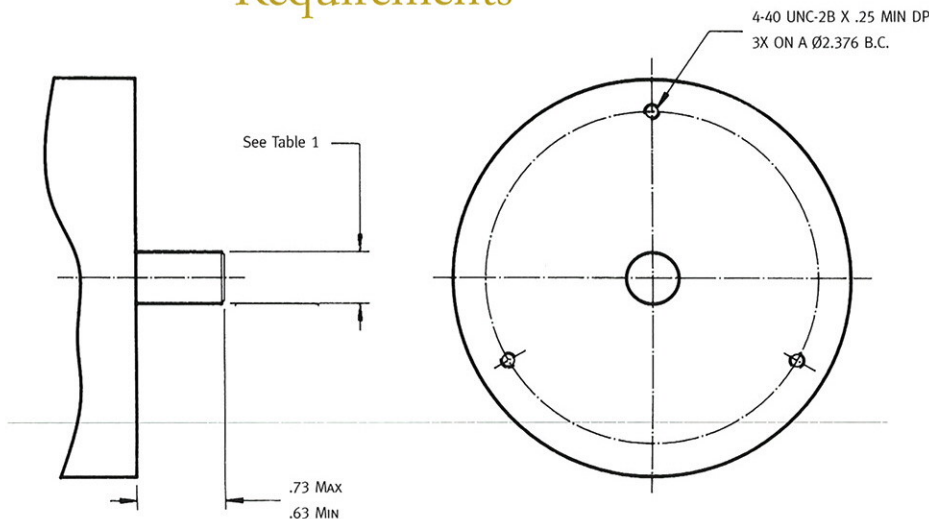
## Figure 1 Mechanical Outline



## Table 1 Hub Size

HUB BORE +.0004/-0.0000	SPECIFY
.2498	1/4
.2501	1/4+
.3748	3/8
.3751	3/8+
.4998	1/2
.5001	1/2+
.2362	6MM
.3150	8MM
.3937	10MM
.4724	12MM

## Figure 2 Mounting Requirements



## Table 2 Voltage Options

SINGLE	DUAL	MIXED
5/0	5/5	5/12
12/0	12/12	5/15
15/0	15/15	12/15

## Table 3 Interface Options

LD/LD
LD/VO
LD/VC
VC/VC

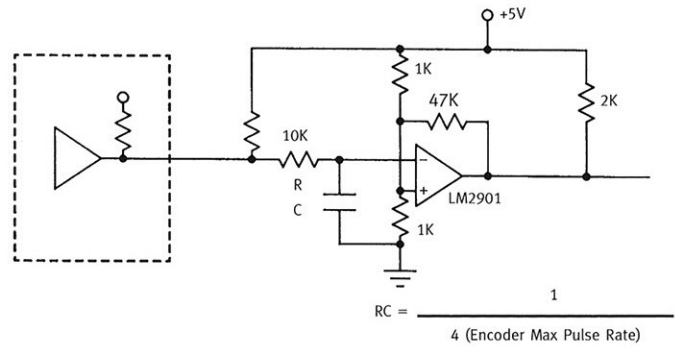
## Notes

1. Consult factory for resolutions not listed on front of data sheet.
2. Unit is sold with standard header only. Mating connector: Hirose double row socket: P/N 543-0507-1 (DF11-16DS-2C); Individual pins: P/N 543-0501-5 (DF11-2428SC); Manual crimp tool: P/N 550-0197-4 (DF11-TA2428HC).
3. Standard output is DS26C31TM LD (5V only) for data and commutation. LM2901 VC output (5V to 15V) is also available, consult factory.
4. Three phase commutation signals for brushless motors are standard. Consult factory.
5. +5V single supply is standard. Power supply current for standard unit is 270 mA nominal. (12V or 15V available on VC option only).
6. Pins 8 and 16 are not used with single supply voltage. For dual supplies, Pin 8 is VCC +5V to +15V, Pin 16 is GND, power supplies are isolated.
7. Index and commutation channels operational at 200 KHz on data channels (A and B 0-200 KHz).
8. To obtain total power requirements for encoder, add data channel and commutation channel power requirements.

## Figure 3 Output Interface

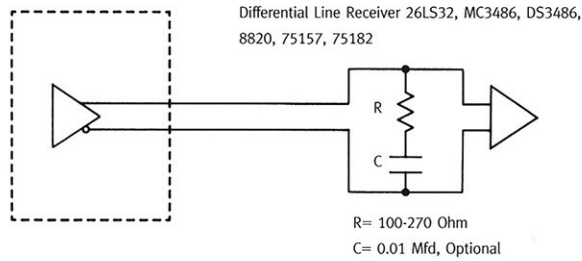
### VC (VOLTAGE COMPARATOR) VO (VC w/ OPEN COLLECTOR)

LM2901 (VC with pullup resistor)  
 No complementary signals available  
 5 VDC power input, TTL compatible (See Note 5)  
 Output sinks 6mA  
 Nominal power requirements 75mA and  
 125mA for VO option (See Note 8)



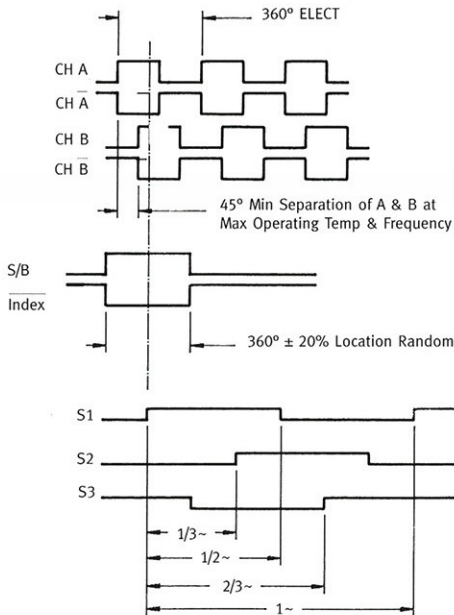
### LD (LINE DRIVER)

DS26C31TM typical output  
 26LS32 typical line receiver suggested for  
 User interface  
 Output sinks and sources 20mA  
 Nominal power requirements 135mA (See Note 8)



## Figure 4 Output Configuration

### CCW Viewing Encoder Top



### Table 4 Closure

C	Cover no Thru-Shaft
H	Cover w/ Thru-Shaft

### Table 5 Termination

PIN #	FUNCTION	OPTIONAL CABLE COLOR CODE
1	+VCC	RED
3	GND	BLK
5	CH A	YEL
7	CH A NOT	WHT/YEL
9	CH B	BLU
11	CH B NOT	WHT/BLU
13	INDEX	ORN
15	INDEX NOT	WHT/ORN
2	S1	GRN
4	S2	BRN
6	S3	WHT
8	+VCC *	VIO
10	S1 NOT	WHT/GRN
12	S2 NOT	WHT/BRN
14	S3 NOT	WHT/GRY
16	GND*	GRY

\* (No connection single supply)

## Ordering Information (to order, specify model number from tables and codes above)

<b>RCM21</b>	<b>3</b>	<b>/</b>	<b>/</b>	<b>/</b>	<b>/</b>	<b>/</b>	<b>S</b>
Dual CH = B Dual CH + Index = D	PERFORMANCE	RESOLUTION/ COMMUTATION See Front of Sheet	HUB SIZE See Table 1	INPUT POWER See Table 2 & Note 5	OUTPUT TYPE See Table 3 & Fig. 3	CLOSURE See Table 4	SPECIAL Leave Blank if Std.

Example Model No. RCM21D3-1000/4-1/2-5/0-LD/LD-C

## Mounting Instructions

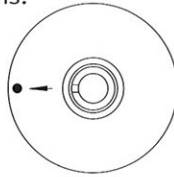
### RCM21 PREPARATION

Verify that you received the following items:

Encoder

Snap-on Cover

.050" HEX wrench

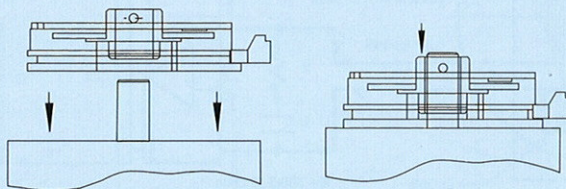


- Remove encoder from anti-static package.
- Rotate hub until setscrew aligns with reference dot or arrow on PC board as shown. (Slide lock mechanism may need to be pushed in slightly to allow hub to rotate freely).

### CAUTION: ESD Precautions Apply

- Pull slide lock mechanism out to full extended position. Push down on hub to verify that it is fully seated in encoder base. Refer to Figure 1 on preceding pages.
- Install servo cleats and screws in mounting holes and turn flats on cleats toward motor shaft so that RCM21 encoder base will clear the cleats.
- When setscrew is aligned with reference dot, S1 will be at the transition point on encoder disk.
- Energize motor for S1 track transitions by applying a voltage to the appropriate windings.

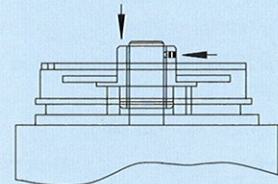
1



Align hub with shaft and gently push hub onto shaft until encoder is resting on mounting surface.

**Do not push down on encoder, push on hub only!**

2



Press down on hub to insure it is seated in centering mechanism and secure hub to shaft by rotating setscrew clockwise until setscrew makes contact to shaft.

Observe the short leg of allen wrench and rotate an additional 1/4" clockwise to apply 20 oz-in torque.

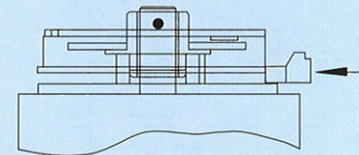
Caution: Overtightening the setscrew will cause burnelling of the shaft, which will make it difficult to remove the encoder, if necessary.

3

Rotate cleats and tighten cleat screws until contact is made with RCM21 base. Base should still be able to rotate slightly. Plug in prepared cable with Hirose connector into C1 on RCM21 PC board. Supply power to encoder power inputs. Care must be taken to prevent shorting out encoder outputs.

With the motor energized, the encoder commutation tracks can now be aligned with the motor windings. Rotate encoder base until S1 output state transitions. The commutation tracks are aligned properly when a slight twisting of the motor shaft in one direction causes S1 to transition high and a slight twist of the motor shaft in the opposite direction causes S1 to transition low. Repeat motor shaft twisting to verify S1 track alignment. The encoder may be rotated on the motor shaft if repositioning is required for alignment. No more than 10 degrees of rotation should be required.

4



Tighten the servo cleats to hold the encoder in place and push slide lock mechanism in completely.

Once installed, encoder signal S1 will be in transition, S2 will be low and S3 will be high.

Encoder commutation track S1 is now aligned with the motor windings. Tracks S2 and S3 may be checked by energizing the motor for shaft angles 60 and 120 degrees and repeating the twisting procedure in step 3.

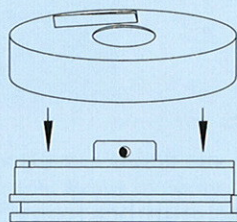
5

Remove cable assembly.

If desired, bond hub to shaft using an approved method. Consult factory.

Install snap-on cover.

Reinstall cable assembly.



### RCM21 Encoder Removal

Follow the steps below to successfully remove an installed RCM21 encoder:

- Remove cover.
- Loosen mounting hardware but do not remove. If hub was bonded to shaft, debond using recommended method. Consult factory for details.
- Loosen setscrew in hub.
- Pull slide-lock mechanism to extended position. Encoder base may need to be moved slightly to allow centering ring to engage with bottom of hub.
- Remove mounting hardware.
- Remove encoder.