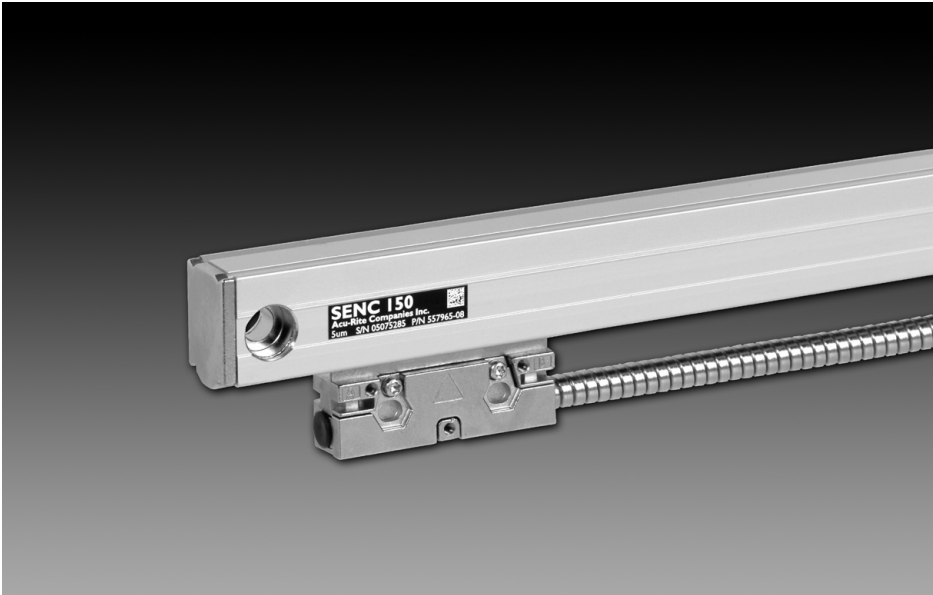


SENC 150

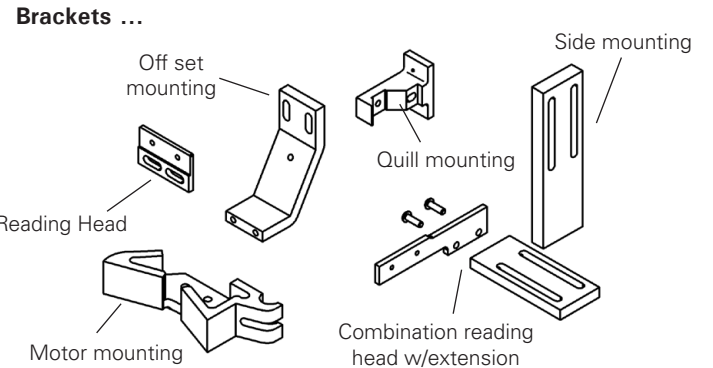
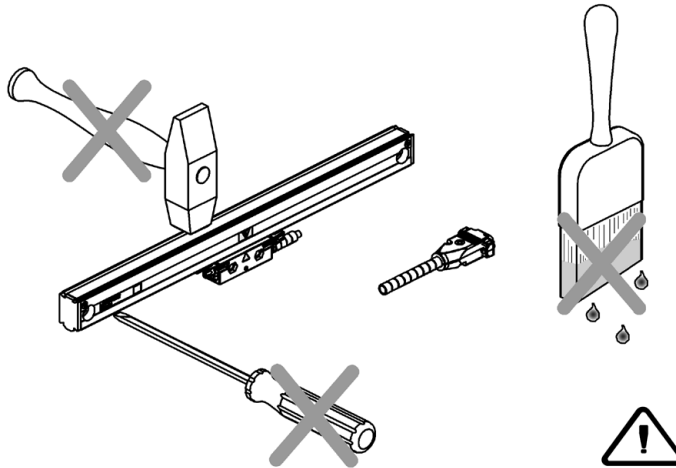


REFERENCE MANUAL

ACU-RITE®

	Page
Introduction / Supplied items	2
Mounting Preparation	3
Mounting Information	4
Encoder Dimensions	5
Backup Spar Dimensions [mm]	6
Backup Spar Dimensions inch	7
Mounting Requirements	8
Typical Mounting (s)	9
Encoder Installation Procedure	10

Spar Installation Procedure	12
Checking the Installation	14
Electrical Shielding	15
Troubleshooting	16
Mechanical Specifications	17
Output Signals and Pin-Outs	18
Electrical Specifications	19
Warranty	20



- Installation brackets and kits are available.
- Your Authorized Distributor can assist you with the proper selection of these for your installation.

The SENC 150 precision glass scale linear encoder provides the accuracy and reliability of an **ACU-RITE®** measuring system with digital output (analog output available). Features and options include:

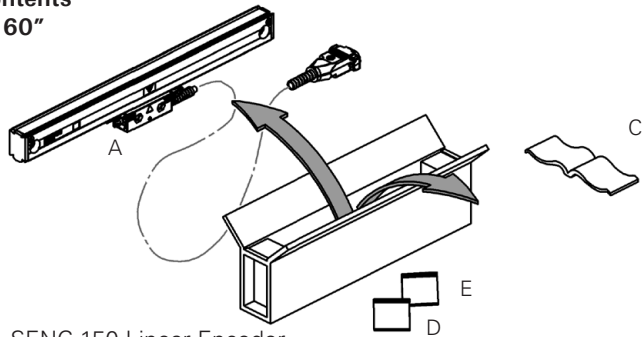
- Resolutions of 0.5, 1, or 5 μm .
- Accuracy grades of ± 3 , and $\pm 5 \mu\text{m} / 1000 \text{ mm}$.
- Vinyl or Armor cables of 5, 13, and 19 ft. length.
- Position Trac or 50mm Interval Reference Mark
- Fasteners, center supports, and backup spars.
- Brackets and accessories.

Contact your Authorized Distributor for assistance with the selection of product options and accessories.

For future ordering information or warranty service, record the linear encoder catalog number located on the scale assembly tag, and the serial number from the reading head tag.

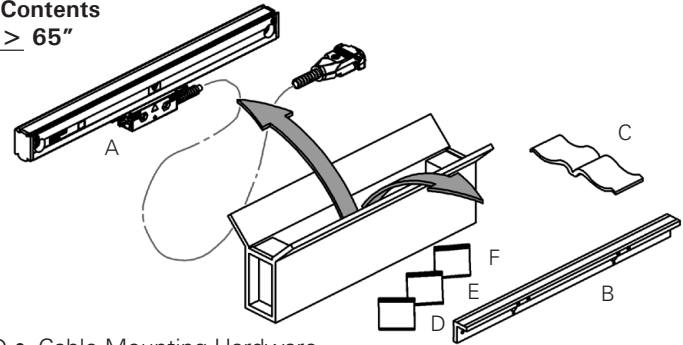
	Catalog No.	Serial No.
Axis # 1:	_____	_____
Axis # 2:	_____	_____
Axis # 3:	_____	_____
Axis # 4:	_____	_____
Date of purchase:	_____	
Distributor:	_____	
Address:	_____	
Telephone:	_____	

Contents
≤ 60"




- A • SENC 150 Linear Encoder
- B • Backup Spar
- C • Reference Manual

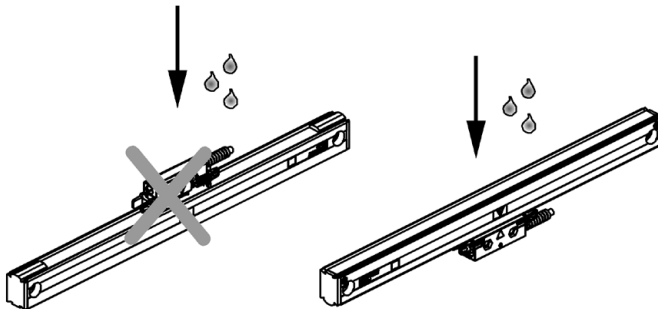
Contents
> 65"



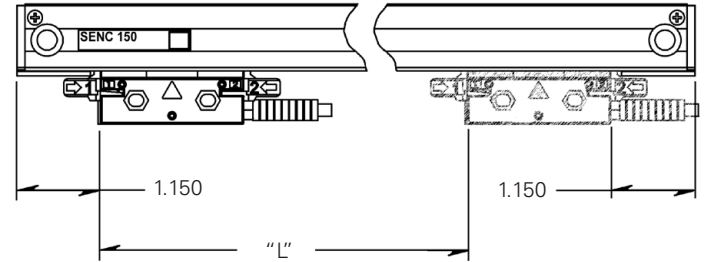
- D • Cable Mounting Hardware
- E • Linear Encoder Mounting Hardware
- F • Backup Spar Mounting Hardware

Please follow these preparation guide lines.

- Understand your mounting requirements.
- Mount with lip seals down and away from the work area.
- Brackets should be kept as short as possible and rigid.
- Surfaces must be in good condition, clean, and free of dirt. Remove paint from machined mounting surfaces.
-  Alignment brackets must not be removed until instructed.



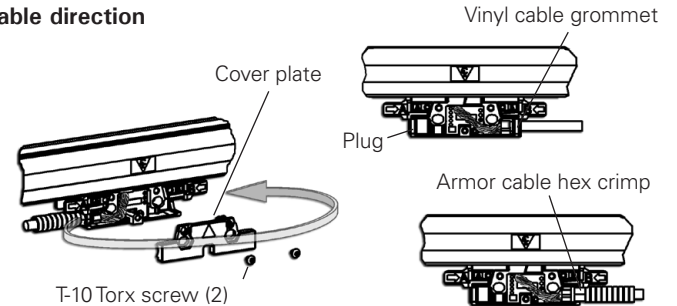
- Never mount with lip seals upward or towards work area.



"L" = Measuring length + 1.75" nominal over travel

- Machine travel can not exceed the encoder measuring length.
- Either limit machine travel or obtain correct length scale.

Cable direction

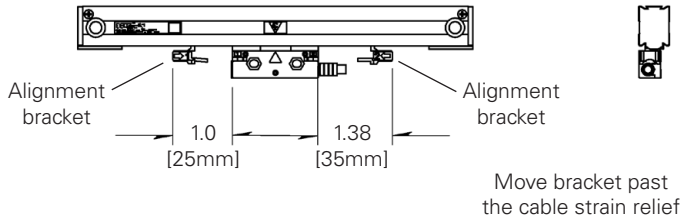


- Determine cable exit direction before installing the encoder.
- To change the cable exit direction; remove the cover plate and rotate the cable 180°.

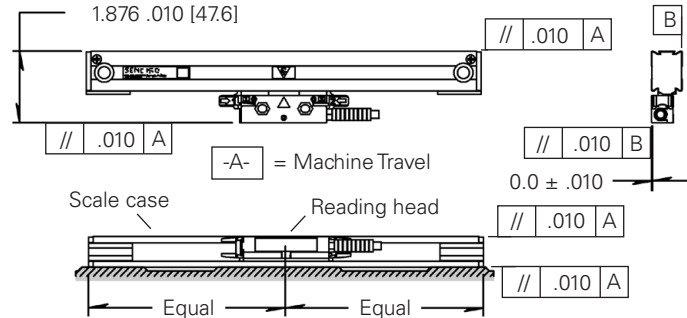
Use this information to plan your linear encoder installation.

- Mount the linear encoders close to machine guide ways to ensure system accuracy.
- One side of the linear encoder addresses flush mounting surfaces, and the opposite side addresses offset mounting surfaces.
- If space between the reading head and the mounting surface exceeds .18", use a spacer or mounting bracket to reduce space.
- **ACU-RITE®** bracket kit instructions provide step by step installation procedures.

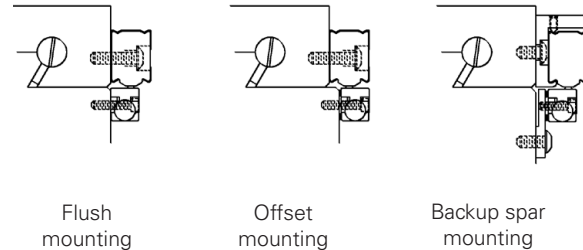
Alignment bracket removal clearance



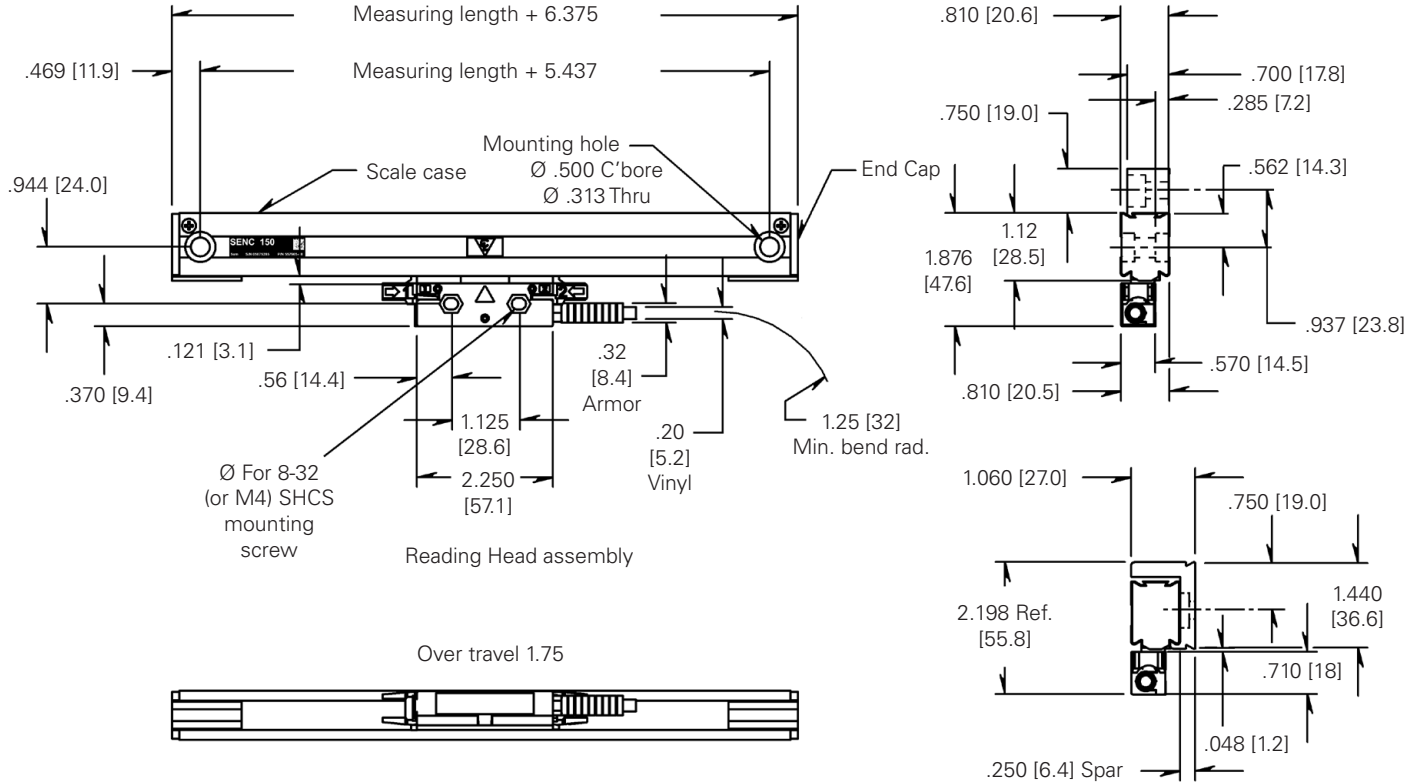
- Allow clearance for alignment bracket removal.
- Alignment brackets must not be removed until instructed.



- Tolerances of .010" TIR apply to all mounting dimensions.
- Center support mounting surface required for 24" through 60" linear encoder measuring lengths mounted without a spar.



- Use reading head leveling set screws when surfaces are not flush.
- Reading head bracket required for a space >.18"

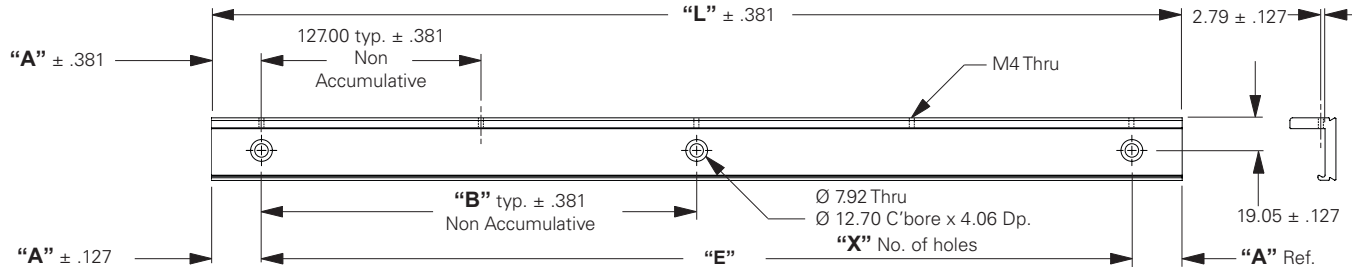


Backup Spar Dimensions [mm]

SENC 150

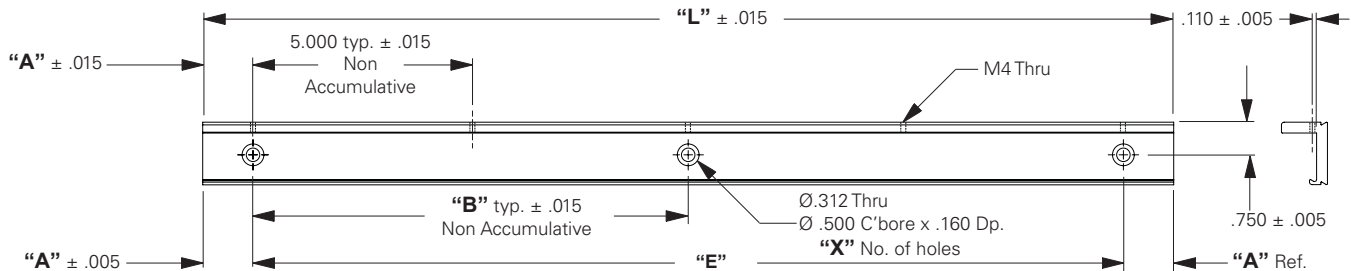
Backup Spar Part Number	Linear Encoder Measuring Length	L	A	X No. Places	B
680116-01	25.40	185.72	29.36	2	127.00
680116-02	50.80	211.12	42.06	2	127.00
680116-03	76.20	236.52	54.76	2	127.00
680116-04	101.60	261.92	67.46	2	127.00
680116-05	127.00	287.32	80.16	2	127.00
680116-06	152.40	312.72	29.36	2	254.00
680116-07	177.80	388.12	42.06	2	254.00
680116-08	203.20	363.52	54.76	2	254.00
680116-10	254.00	414.32	80.16	2	254.00
680116-11	279.40	439.72	92.86	2	254.00
680116-12	304.80	465.12	105.56	2	254.00
680116-13	330.20 (Special)	490.52	36.58	2	417.32
680116-14	355.60	515.92	130.96	2	254.00
680116-15	381.00	541.32	16.66	3	254.00
680116-16	406.40	566.72	29.36	3	254.00
680116-18	457.20	617.52	54.76	3	254.00
680116-20	508.00	668.32	80.16	3	254.00
680116-22	558.80	719.12	105.56	3	254.00
680116-24	609.60	769.92	130.96	3	254.00
680116-26	660.40	820.73	29.36	4	254.00
680116-28	711.20	871.53	54.76	4	254.00

Backup Spar Part Number	Linear Encoder Measuring Length	L	A	X No. Places	B
680116-30	762.00	922.33	80.16	4	254.00
680116-31	800.10	965.96	101.98	4	254.00
680116-32	812.80 ("E" 884.23)	906.45	11.10	4	254.00
680116-33	838.20	998.53	118.26	4	254.00
680116-35	889.00 ("E" 1027.10)	1049.32	11.10	5	254.00
680116-36	914.40	1074.73	29.36	5	254.00
680116-38	965.20	1125.53	54.76	5	254.00
680116-40	1016.00	1176.33	80.16	5	254.00
680116-42	1066.80	1227.13	105.56	5	254.00
680116-48	1219.20	1379.53	54.76	6	254.00
680116-52	1320.80	1481.13	105.56	6	254.00
680116-54	1371.60	1531.93	130.96	6	254.00
680116-60	1524.00	1684.33	80.16	7	254.00
680116-65	1651.00	1811.33	143.66	7	254.00
680116-72	1828.80	1989.13	105.56	8	254.00
680116-78	1981.20	2141.53	54.76	9	254.00
680116-84	2133.60	2293.93	130.96	9	254.00
680116-90	2286.00	2446.33	80.16	10	254.00
680116-91	2540.00	2700.33	80.16	11	254.00
680116-92	2794.00	2954.33	80.16	12	254.00
680116-93	3048.00	3208.33	80.16	13	254.00



Backup Spar Part Number	Linear Encoder Measuring Length	L	A	X No. Places	B
680116-01	1	7.312	1.156	2	5.000
680116-02	2	8.312	1.656	2	5.000
680116-03	3	9.312	2.156	2	5.000
680116-04	4	10.312	2.656	2	5.000
680116-05	5	11.312	3.156	2	5.000
680116-06	6	12.312	1.156	2	10.000
680116-07	7	13.312	1.656	2	10.000
680116-08	8	14.312	2.156	2	10.000
680116-10	10	16.312	3.156	2	10.000
680116-11	11	17.312	3.656	2	10.000
680116-12	12	18.312	4.156	2	10.000
680116-13	13 (Special)	19.312	1.44	2	16.43
680116-14	14	20.312	5.156	2	10.000
680116-15	15	21.312	.656	3	10.000
680116-16	16	22.312	1.156	3	10.000
680116-18	18	24.312	2.156	3	10.000
680116-20	20	26.312	3.156	3	10.000
680116-22	22	28.312	4.156	3	10.000
680116-24	24	30.312	5.156	3	10.000
680116-26	26	32.312	1.156	4	10.000
680116-28	28	34.312	2.156	4	10.000

Backup Spar Part Number	Linear Encoder Measuring Length	L	A	X No. Places	B
680116-30	30	36.312	3.156	4	10.000
680116-31	31.5	38.030	4.015	4	10.000
680116-32	32 ("E" 34.812)	35.687	.437	4	10.000
680116-33	33	39.312	4.656	4	10.000
680116-35	35 ("E" 40.437)	41.312	.437	5	10.000
680116-36	36	42.312	1.156	5	10.000
680116-38	38	44.312	2.156	5	10.000
680116-40	40	46.312	3.156	5	10.000
680116-42	42	48.312	4.156	5	10.000
680116-48	48	54.312	2.156	6	10.000
680116-52	52	58.312	4.156	6	10.000
680116-54	54	60.312	5.156	6	10.000
680116-60	60	66.312	3.156	7	10.000
680116-65	65	71.312	5.656	7	10.000
680116-72	72	78.312	4.156	8	10.000
680116-78	78	84.312	2.156	9	10.000
680116-84	84	90.312	5.156	9	10.000
680116-90	90	96.312	3.156	10	10.000
680116-91	100	106.312	3.156	11	10.000
680116-92	110	116.312	3.156	12	10.000
680116-93	120	126.312	3.156	13	10.000



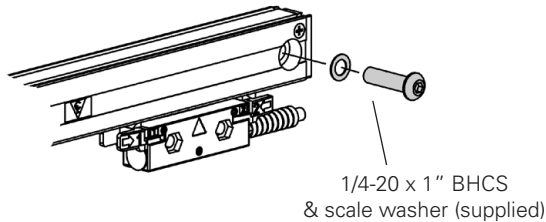
Mounting Requirements

SENC 150

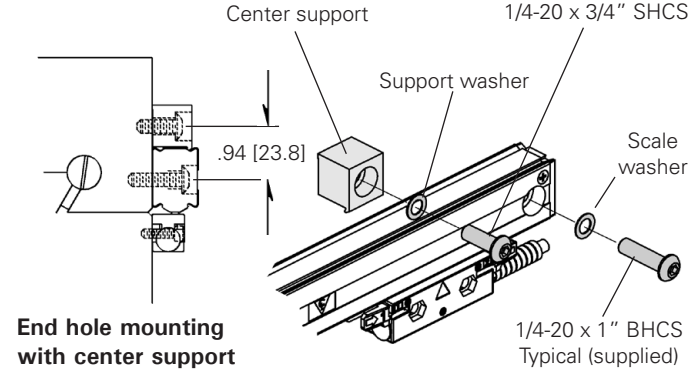
Mounting options can be adapted to machine mounting surfaces using spacers, standoffs, or leveling set screws.

- Measuring length and mechanical configuration of your machine determine your options.
- Backup spar mounting is an option but not required for lengths up to 60".
- Fastener lengths described on this page are included with the encoder or the backup spar.

End hole mounting

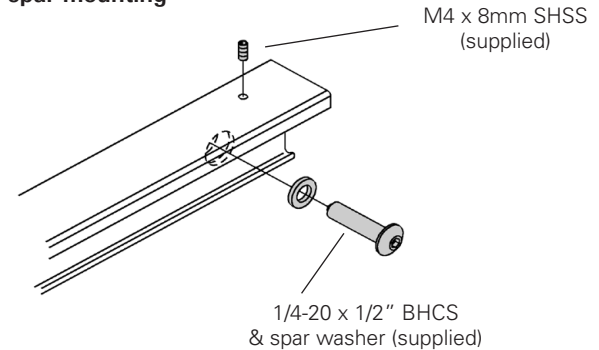


- Less than 24" : Use end mounting holes.



- 24" to 60" : Use end mounting holes with center support.

Backup spar mounting

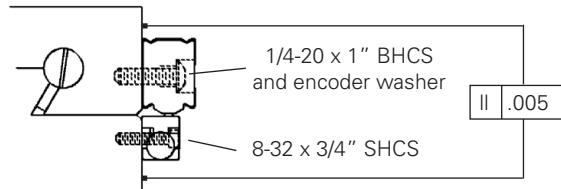


- Over 60" : A backup spar is required.

A variety of mounting conditions can be accommodated.

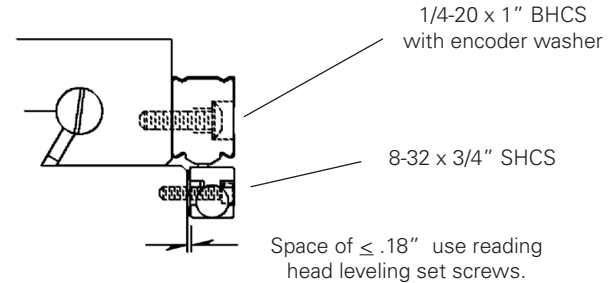
- The machine configuration determines the brackets required to install the linear encoder.
- Three typical mounting conditions are shown; flush, offset, and backup spar (as shown previously on page 4).
- The 8-32 SHCS fastener lengths shown on this page are supplied with the encoder hardware.
- The 8-32 SHCS for mounting the reading head is a standard low head style fastener.

Flush surfaces



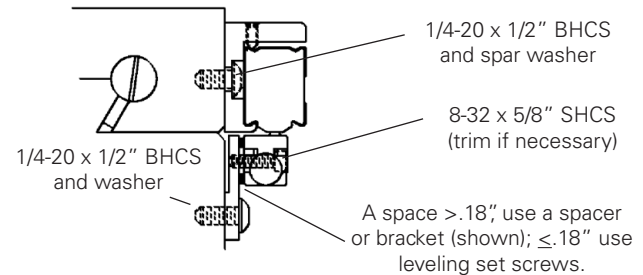
- Mounting surfaces are flush within .005"
- The reading head leveling screws are not required.

Offset surfaces



- Mounting surfaces are offset.
- Installation without backup spar.
- Use leveling screws in place of spacers or shims.

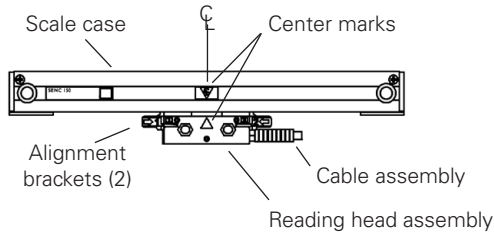
Backup spar with bracket



- Flush or offset mounting surfaces with a backup spar.
- Bracket used to reduce head to mounting surface gap.
- Use reading head leveling set screws.

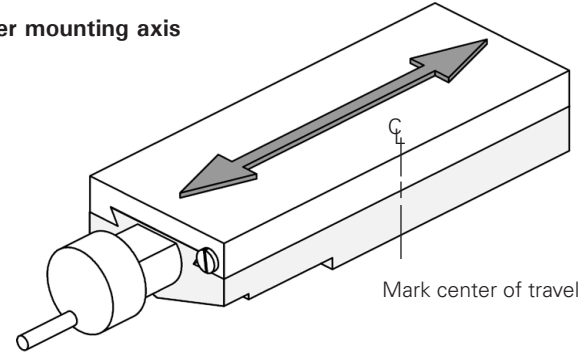
These steps apply to all encoder mounting conditions, if a spar is being used, go to "Spar Installation Procedure" on page 11.

- **ACU-RITE**® bracket kit instructions supercede this section.
- Adjust drill depths and fastener lengths as required.
- When instructed on page 10: Adjust the leveling set screws as follows:
 1. Insert, but do not tighten 8-32 (M4) reading head screws.
 2. Place a .001"-.003" shim between the leveling set screws and mounting surface.
 3. Adjust each set screw until a slight drag is felt on the shim.
 4. Evenly tighten the 8-32 (M4) reading head mounting screws.
- Contact your Authorized Distributor should you require additional assistance.

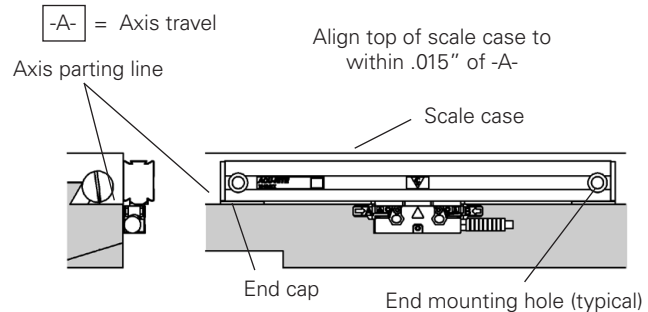


- Align the center marks on the reading head and scale assembly by sliding the reading head and brackets along the case.

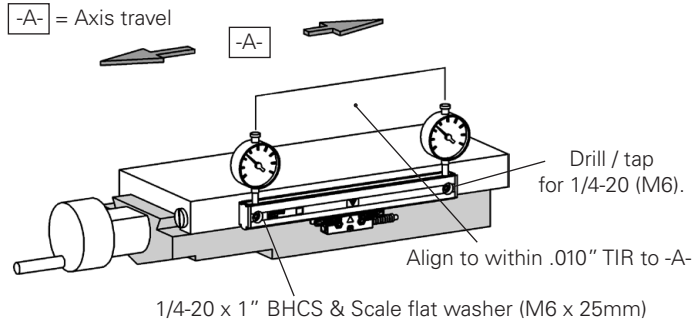
Center mounting axis



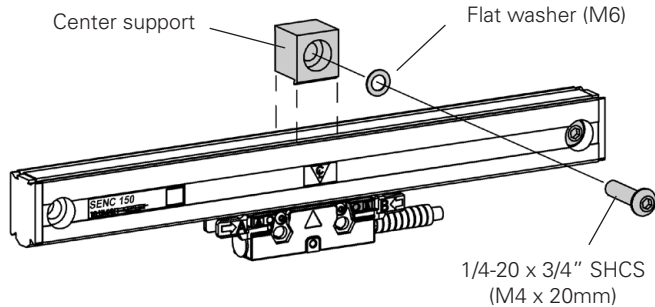
- Move the machine axis to its center of travel.
- Mark the axis for quick return to center.
- Configure the encoder cable exit direction (see page 3).



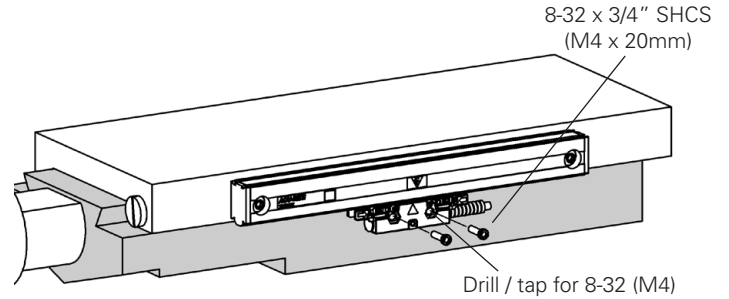
- Locate the scale case so underside of end caps are flush with the axis parting line.
- Mark one end mounting hole location.



- Drill / tap the first end mounting hole / attach the linear encoder.
- Align to within .010" TIR. to -A-, drill / tap second end hole.
- Attach the linear encoder / align to within .010" TIR. to -A-.



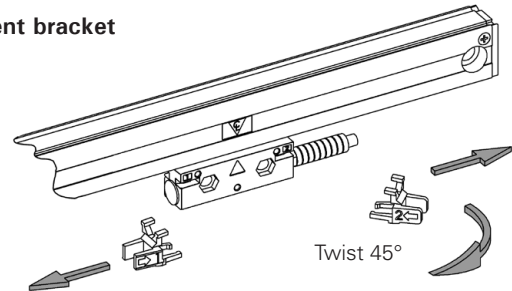
- Use the center support(s) when provided.
- Place supports at equal intervals along the encoder's length.



⚠ Do not tighten prior to adjusting leveling set screws

- Center the axis and mark the reading head mounting holes.
- Move axis, drill / tap holes for 8-32 (M4).
- Attach head to axis / Set leveling screws / Secure fasteners.

Alignment bracket removal



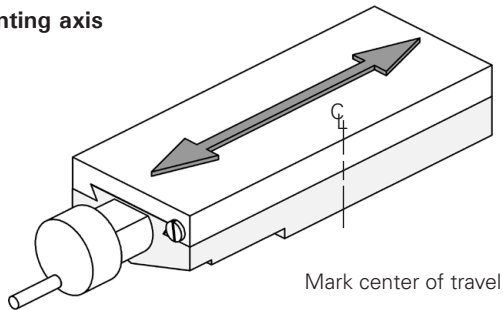
Slide brackets away from reading head and cable.

- Slide the brackets away from the reading head.
- Remove the alignment brackets and save for future use.
- Proceed to page 13, "Checking Your Installation"

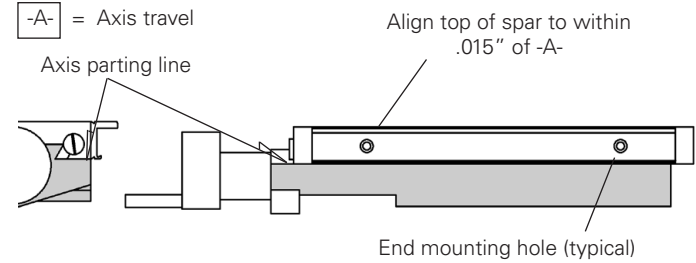
These steps apply to all spar mounting conditions.

- **⚠ ACU-RITE®** bracket kit instructions supercede this section.
- Adjust drill depths and fastener lengths as required.
- When instructed on page 12: Adjust the leveling set screws as follows:
 1. Insert, but do not tighten 8-32 (M4) reading head screws.
 2. Place a .001"-.003" shim between the leveling set screws and mounting surface.
 3. Adjust each set screw until a slight drag is felt on the shim.
 4. Evenly tighten the 8-32 (M4) reading head mounting screws.
- Contact your Authorized Distributor should you require additional assistance.

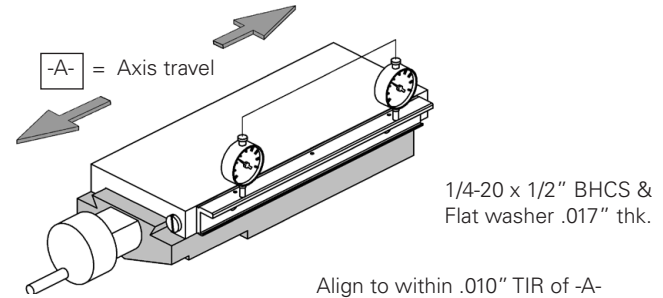
Center mounting axis



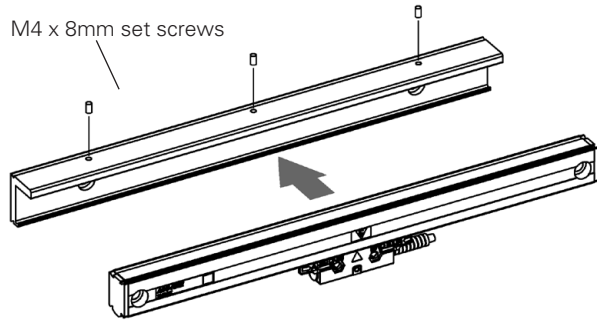
- Move the axis to its center of travel.
- Mark the axis for quick return to center.
- Determine encoder cable exit direction and adjust (see page 3).



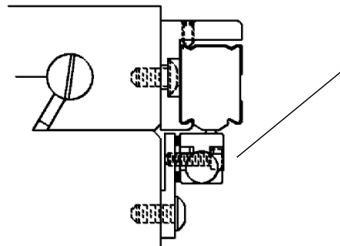
- Locate the spar with the underside flush with the axis parting line.
- Mark one end mounting hole location.



- Drill / tap the first end mounting hole / attach the spar.
- Align to within .010" TIR. to -A-, drill / tap second end hole.
- Attach the spar / align to within .010" TIR. to -A-.

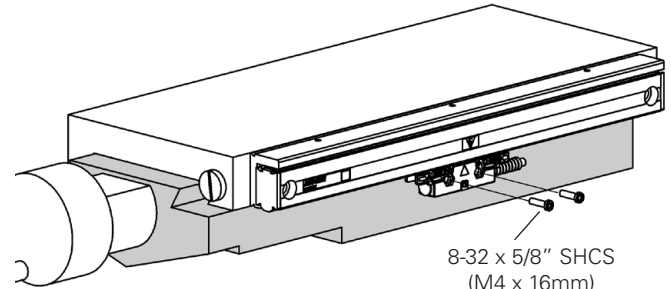


- Insert the encoder into the spar.
- Center the encoder from end to end with the spar.
- Lock in place by tightening the M4 set screws.



Reading head bracket
8-32 x 5/8" SHCS
(trim if necessary)

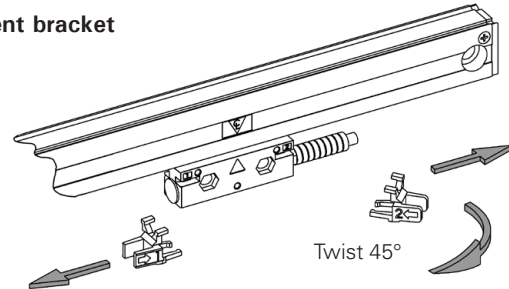
- To locate the reading head bracket, attach it to the reading head.
- Center the axis and mark the bracket mounting holes.
- Remove the bracket, drill / tap holes for 1/4-20 (M6).



⚠ Do not tighten prior to adjusting leveling set screws.

- Attach the bracket to the machine.
- Align the reading head mounting holes with the bracket holes.
- Attach head to bracket / Set leveling screws / Secure fasteners.

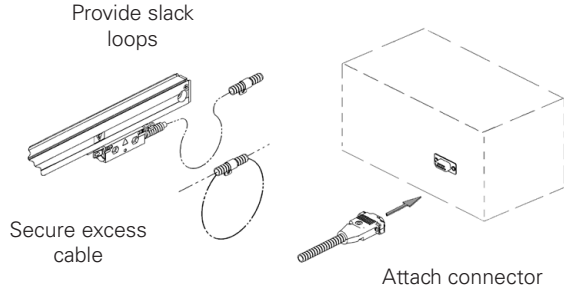
Alignment bracket removal



Slide brackets away from reading head and cable.

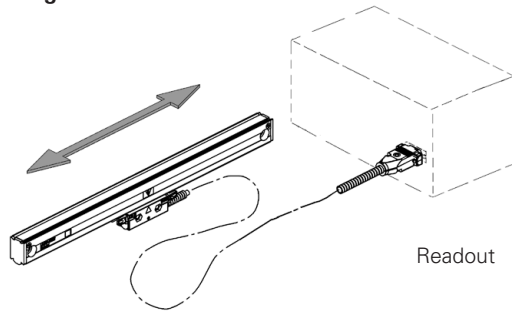
- Slide the brackets away from the reading head.
- Remove the alignment brackets and save for future use.
- Proceed to page 13, "Checking Your Installation."

Connecting



- Route the cables with slack loops to allow for axis motion.
- Secure excess cable by fastening with clips or ties.
- Attach the linear encoder connectors to the readout.

Counting Test



- Move the axis and compare the display to the movement.
- Move the axis 20mm (.79") to check reference mark operation.

These steps will confirm proper operation of your installation. The Counting Test confirms proper electrical operation. The Repeatability Test checks the installation integrity.

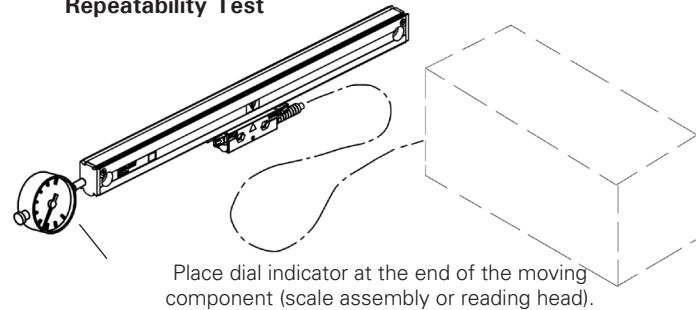
Counting Test:

- Configure the readout's encoder and display resolution (see manual).
- Move the axis and compare the display to the movement.
- Configure readout for sensing reference marks.
- Move each axis a minimum of 20mm (axis display should zero).

Repeatability Test:

- Locate an indicator on one end of the encoder and zero the readout and indicator.
- Move the axis through the full travel and return to dial zero.
- Readout should read zero \pm 1 count.

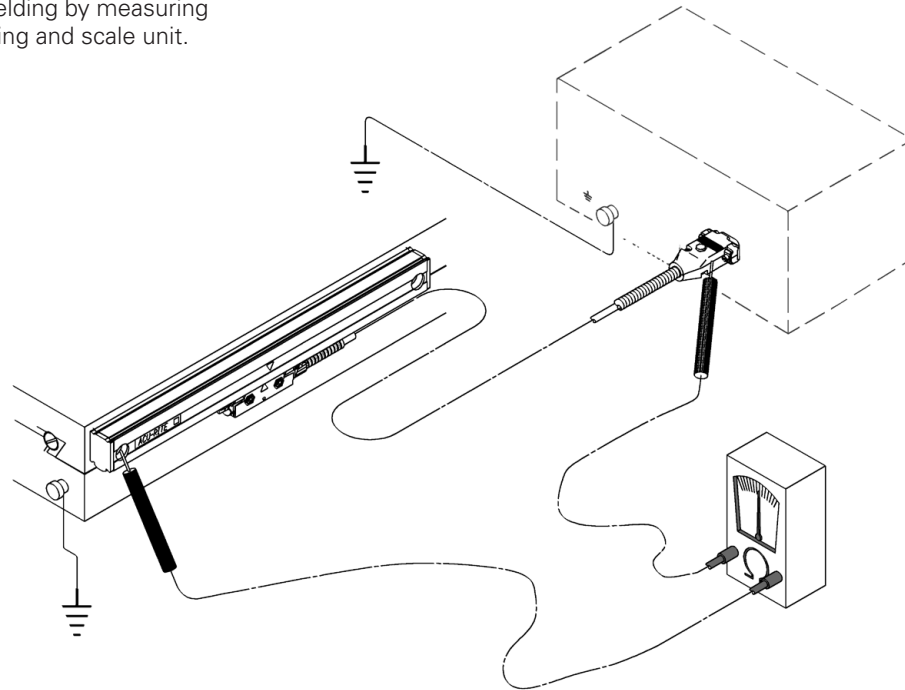
Repeatability Test



- Zero the display and indicator.
- Move axis to the end of its travel return to dial zero.
- Readout should read zero \pm 1 count.

Connect a ground wire from the terminal on the back of the readout to the machine or earth ground. Attach a ground wire from the machine to a solid earth ground.

With the encoder attached to the machine and the cable connected to the readout, check shielding by measuring resistance between connector housing and scale unit. Desired value: 1 Ω max.



If you experience difficulties with your installation, do the following to determine the problem.

Checking the Readout

Difficulties on more than one axis are usually associated with the readout. Follow these steps to determine if your difficulties are associated with the readout:

- Insure that the linear encoder connectors are correctly seated.
- Swap linear encoder cables at the readout to see if the problem is still shown in the same display.
- If the problem remains in the same display, the readout is in error.
- If the problem follows the connection change, the linear encoder may be in error.

If the Readout is at fault, refer to “What to do” to arrange for the parts necessary to repair your system. If a linear encoder appears to be at fault, proceed with “Checking the Linear Encoders.”

Checking the Linear Encoders

Problems on a single axis are usually associated with the linear encoder or its installation. Difficulties can be caused by improper installation, loose or misaligned bracketry, or a damaged or inoperable encoder.

Follow these steps to determine the cause of your system difficulties:

- Confirm that your bracketry and installation does not interfere with other machine structures through the entire length of the linear encoder travel.
- Check for loose fasteners. If you find loose fasteners, first confirm that the linear encoder is installed to the tolerances specified and then retighten the fasteners as required.
- Confirm that the linear encoder is installed to the required tolerances by checking the alignment tolerances specified on Page 4. If the installation does not meet the tolerances, reinstall the encoder according to the “Installation Procedure.”
- Perform a Repeatability Test as described on Page 13. If the linear encoder is installed to the required tolerances, the bracketry and encoder have been checked for interferences and loose fasteners, and the encoder fails the repeatability test, the encoder is likely at fault.

Do not attempt to repair the reading head or scale assembly. The SENC 150 is field serviceable by assembly replacement only. Attempts to repair the encoder can permanently damage it and void the warranty.

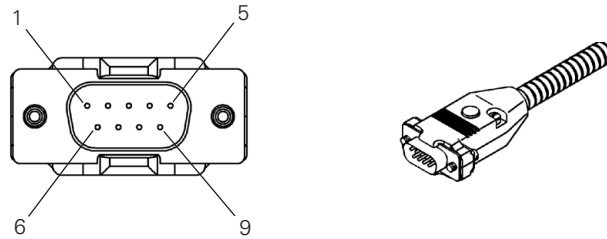
What to do

If an **ACU-RITE**® linear encoder or readout is found to be at fault, please contact your Authorized Distributor for instructions prior to removing the encoders or readout.

Mechanical Specifications	Digital			Analog
Resolution	0.5 μm	1 μm	5 μm	
Grating pitch	20 μm			20 μm
Scale medium	Light transmission reflective off of nickel coated glass			
Accuracy (@ 20° C) / 1000mm	$\pm 3\mu\text{m}, \pm 5\mu\text{m}$			
Max. slew speed	40 inches/sec			
Force required to move reading head	≤ 0.75 lbs			
Operating Environment Temperature Relative Humidity	0° to 50° C 25% to 95% (non-condensing)			
Storage Environment Temperature Humidity	- 20° to 70° C 20% to 95% (non-condensing)			
Weight w/armor	1.4 + 0.5 lbs/in of measuring length			
Connecting cable armored or vinyl	Length = 5, 13, and 19 ft. Connector: DE-9P			
Max. cable length	35 ft			70 ft
Measuring lengths	2" - 120"			
Reference pulse interval	50mm fixed or Position-Trac™			
Operating current	220 ma	180ma	75ma	
Protection (IEC 529)	IP 53 when installed as per instructions IP 64 with air Purge			

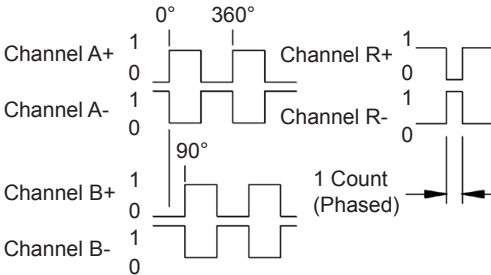
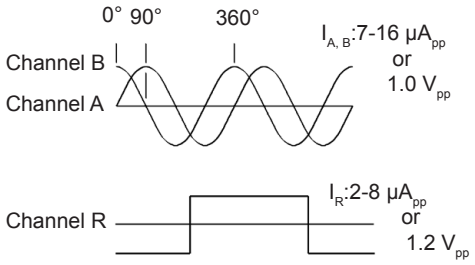
Digital Differential

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
N/C	Green	Yellow	Blue	Red	White	Brown	Pink	Gray
N/C	Channel A+	Channel A-	Channel B+	Channel B-	Ground	Vcc, + 5.1 ± 0.1 VDC	Channel R+	Channel R-



Analog Differential

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
White	Green	Yellow	Blue	Red	N/C	Brown	Pink	Gray
Ground	Channel A+	Channel A-	Channel B+	Channel B-	N/C	Vcc, + 5.0 ± 0.1 VDC	Channel R+	Channel R-

Parameter	Digital	Analog
Output Signals	<p> I_{OH}=(High level output current) = 20mA V_{OH}=(High level output voltage) >2.5Vdc I_{OL}=(Low level output current) = -20mA V_{OL}=(Low level output voltage) < 0.6Vdc </p> 	
Incremental signals	<p>Square-wave voltage signals. Channels A and B, in 90° quadrature relationship</p>	<p>Similar phasing, but differential sinusoidal current or 1 volt peak to peak</p>
Signal levels	<p>TTL-level</p>	<p>7-16μA_{pp} or 1.0 V_{pp} output w/1 K Ohm load</p>
Reference Mark signals	<p>Square-wave pulse</p>	<p>Differential current or 1 volt peak to peak</p>
Signal level	<p>TTL-level</p>	<p>2-8μA_{pp} or 1.2 V_{pp} output w/100 K Ohm load</p>
Power Supply	<p>5.1 ± 0.1 VDC @ 220 mA max.</p>	<p>5.0 ± 0.1 VDC @ 75 mA max.</p>