





**INTRODUCTION**

Begin with a clean work area. Be sure all parts are present and have no visual damage or defects. The following tools are recommended for proper disassembly and assembly (exact wrench sizes will vary depending upon cylinder size):

- Tin Snips
- Allen Wrench Set
- Open-end or Box Wrenches and/or Sockets

**DISASSEMBLY INSTRUCTIONS**

**1. REMOVE CARRIER:** Remove Bolts (#14), Washers (#28) and Nuts (#27). Remove Carrier (#26) from Bracket (#8) by removing Screw (#29). Remove Spring (#24), Band Insert (#23), and End Cap (#22) by removing Screws (#20 and 21) at each end of Carrier. Remove Bearing Rods (#25). Remove carrier (#26).

**2. REMOVE DUST BAND:** Loosen Clamp Slug (#19) holding Band by loosening Set Screw (#17). Remove two Screws (#16) securing Band Clamp Assembly (#18). Remove Band Clamp Assembly (#18) from top of Slug, then remove Clamp Slug from top of Band (next to Head). **IMPORTANT NOTE:** Edges of Dust Band are SHARP — Use caution when handling to avoid injury! Carefully pull the Dust Band (#15) from the Tube (#9) and through the Nut Bracket Assembly (#10)

**3. DISASSEMBLE UNIT.**

Remove the four Bolts (#1) from both heads (5). Remove the Nut (#2) (and washer (30) if required) from the "live side" of the lead screw. Remove the "live side" head w/ bearing (4) (and sleeve (#3) if required). Remove the Plug (#13) from the "dead side" head. Push ring cup (#11) to expose retaining ring (#12) and remove retaining ring from groove of lead screw (#6). Remove ring cup, head w/ bearing (and sleeve (3) if required). Slide lead screw w/ nut bracket (#8) and Ball Nut (#7) out of machined tube (#9).

**A. Ball Nut Style:** DO NOT REMOVE NUT BRACKET w/ BALL NUT FROM LEAD SCREW (balls will fall out).

**B. Plastic Nut Style:** Remove nut bracket w/ Lead Screw Nut from lead screw.

**4. HEAD SUB-ASSEMBLY:** If necessary, carefully remove Bearings (#4) from both Heads (#5).

**5. SUB-ASSEMBLIES:**

**Ball Nut Style:** Caution is required if removal of nut is necessary. Contact the factory for available parts and procedures.

**Plastic Nut Style:** Plastic nuts are factory pinned into the Nut Bracket and cannot be removed. If nuts are worn, a new Nut Bracket Assy must be ordered.

**ASSEMBLY INSTRUCTIONS**

**1. AREA PREPARATION:** Ensure all parts are present and have no visual damage or defects.

**2. PREPARE HEAD SUB-ASSEMBLY:** Carefully install Bearings (#4) in both Heads (#5).

**3. ASSEMBLE UNIT:**

**A. Ball Nut Style:** Grease Lead Screw (#6) with Mobil HP grease. Install Lead Screw in machined tube. Place Head on "dead" end of Lead Screw (non-threaded end). Secure with Sleeve\* (#3), Ring Cup (#11) and Retaining Ring (#12). **NOTE:** Make sure the Snap Ring is properly seated in groove on the Lead Screw, then pull Ring Cup over Snap Ring. Install second Head, Sleeve\* (#3) and Nut (#2). Snug up,

but do not tighten the four Bolts (#1) on each Head. Place an End Plug (#13) in the "dead" side Head.

**B. Plastic Nut Style:** Grease Screw (#6) with Christolube® MCG#405, assemble Nut Bracket to Screw with the Nut end facing the "live" end (#threaded end) of the Screw. Install Screw in machined tube. Place Head on "dead" end of Screw (#non-threaded end). Secure with Ring Cup (#11) and Snap Ring (#12). **NOTE:** Make sure the Snap Ring is properly seated in groove on the lead Screw, then pull Ring Cup over Snap Ring. Install second Head, Sleeve\* (#3) and Nut (#2). Snug up, but do not tighten the four Bolts (#1) on each Head. Place an End Plug (#13) in the "dead" side Head.

**4. INSTALL CARRIER:** Thread one end of Band (#15) through slot in Bracket (#8) and press down on Band to seat in tube. Place Carrier (#26) on Tube and align with Nut Bracket. Install Bearing Rods (#25). Secure Spring (#24), Band Insert (#23), and End Cap (#22) in place by tightening Screws (#20 and 21) with Loctite #242 to each end of Carrier. Secure Carrier to Bracket with Screws (#29) with Loctite #242. Install Bolts (#14), Washers (#28) and Nuts (#27). Snug up the bolts only. **NOTE:** "Snug" means no noticeable end play by hand. If a wrench is applied to either end, both ends will turn.

**5. ALIGN HEADS:** Place Carrier next to each Head then tighten the four Head Bolts (#1) to assure proper alignment of Head and Carrier. (†When replacing the head bolts in actuators manufactured prior to July 1, 2006, the hole for the head bolt will need to be drilled 0.4" [10mm] deeper to accommodate the longer screw length.)

**HEAD TORQUE REQUIREMENTS**

Cylinder Size	In-Lbs of Torque
1" thru 1-1/2"	100-110
2"	180-195

**6. TRIM AND SECURE DUST BAND:** Locate on one Head a Slug (#19) and Band Clamp Assembly (#18). (NOTE: Width of Slug should match dust Band width.) Tighten with Screw (#16) and Loctite #242. Insert one end of Dust Band (#15) under Band Clamp assembly and Slug until it is tight to the Head. Install Set Screw (#17) into Band Clamp assembly and tighten against Slug.

With tin snips, cut the end of the Band so it nearly butts to the other Head.

Place Clamp Slug (#19) on top of Band (next to Head), then place Band Clamp Assembly (#18) over Slug. Tighten to Head with two Screws (#16) and Loctite #242. Install Set Screws (#17).

**7. TEST PROCEDURE:** The torque required to rotate the Lead Screw(#6) should not exceed the following limits.

**MAXIMUM BREAKAWAY REQUIREMENTS:**

Cylinder Size	Torque
1"	25 ounce-inches
1-1/2"	30 ounce-inches
2"	45 ounce-inches

Check and/or readjust unit to conform to specification requirements. Retest.

**8. CLEAN UNIT THOROUGHLY BEFORE INSTALLING.**

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**REVERSE PARALLEL DISASSEMBLY INSTRUCTIONS (See drawing on page 5)**

- Remove End Caps (15). Release tension on belt by breaking loose the motor fasteners (18).
- Remove RP Cover (2).
- Remove both drive pulley (8) and driven pulley (7) from their respective shafts. The belt (4) will come off with the pulleys.
- Remove motor fasteners (18) from the motor plate (12), to remove the motor from the RP case.
- Remove the RP case (13) from the head by removing fasteners (11).

**REVERSE PARALLEL ASSEMBLY INSTRUCTIONS (See drawing on page 5)**

\*Apply Loctite #242 to all fasteners upon installation

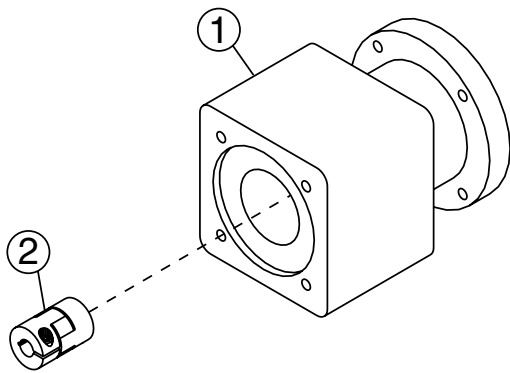
- Install RP case (13) to the head with cap screws (11). Do not fully tighten the fasteners at this time and verify that the RP case can move with respect to the head.
- Temporarily install the cover (2) with bearing (3) onto the RP case positioning the bearing over the leadscrew shaft. Hold the cover in place while tightening all of the fasteners (11) that hold the RP case to the head.
- Remove the cover (2) and finish tightening all fasteners attaching the RP case to the head.

- Install the motor to the RP case with fasteners (18). Do not tighten the fasteners at this time.
- Locate the belt (4) over the pulleys and slide the drive (8) and driven (7) pulleys over their respective shafts. Tighten each pulley to it's shaft with either trantorque or collar clamp. If trantorque, utilize torque wrench to apply appropriate torque. 1/2" hex on trantorque apply 75 in-lbs. 5/8" hex on trantorque apply 100 in-lbs.
- Verify that there is clearance between the inside of the RP case and each pulley. Verify that the pulleys are aligned to each other.
- Position the cover (2) in mating slot of the RP case and install the SHCS (1) to hold in place. Take care not to overtighten. If the cover is deflected it can interfere with the leadscrew.
- Tension the belt by pulling the motor away from the drive shaft with the appropriate force in the chart below. Tighten the motor fasteners while this force is applied to the motor.

Motor Frame	Tension Force
MRB23, MRS17/23	10 lbs
MRV23, MRS34	20 lbs
MRV34, MRB34	30 lbs

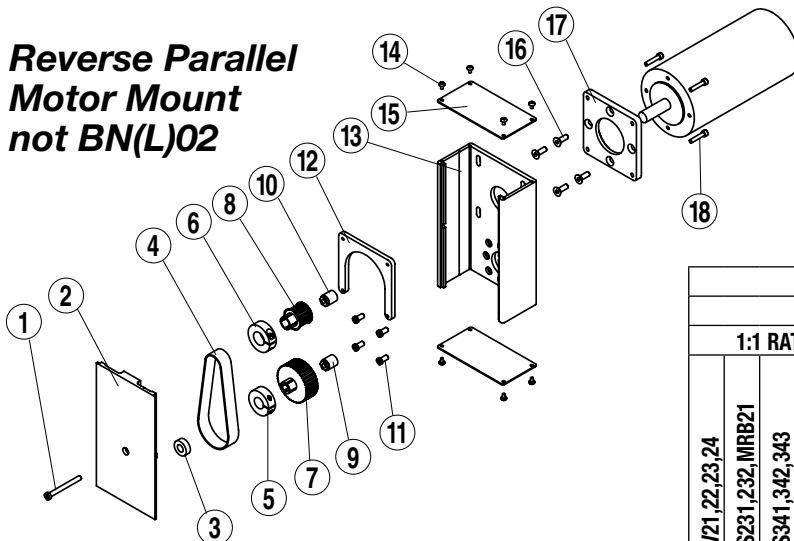
- Install both end caps (15) with the screws (14) to finalize assembly.

**Inline Motor Mount**



ITEM	PART NO.	DESCRIPTION	BN02								OTHER THAN-BN02													
			WITH GEARHEAD								WITH GEARHEAD													
			MRB2XX	MRB3XX	MRS2XX	MRS3XX	MRV2XX	MRV3XX	MRB4XX	MRB2XX	MRB3XX	MRS2XX	MRS3XX	MRV2XX	MRV3XX	MRB4XX	MRB2XX	MRB3XX	MRS2XX	MRS3XX	MRV2XX	MRV3XX	MRB4XX	
1.	3415-9202	Motor Adapter Kit	1	1					1	1					1	1			1	1				
	3415-9200	Motor Adapter Kit		1	1	1			1	1	1			1	1	1			1	1		1		
	3415-9201	Motor Adapter Kit				1					1				1						1			
	3415-9204	Motor Adapter Kit						1					1										1	
	4415-9202	Motor Adapter Kit - metric	1		1				1	1														
	4415-9200	Motor Adapter Kit - metric		1	1	1	1		1	1	1													
	4415-9201	Motor Adapter Kit - metric				1					1													
	4415-9204	Motor Adapter Kit - metric						1						1										
2.	3410-9039	Coupler	1	1				1	1															
	3600-9213	Coupler		1					1															
	3600-6163	Coupler				1	1				1	1												
	0520-9054	Coupler					1						1											
	3600-9206	Coupler				1				1			1	1			1	1						
	3600-9253	Coupler											1				1							
	3600-9207	Coupler												1				1						
	3600-6164	Coupler												1	1				1	1				
	3600-9212	Coupler													1								1	
	4520-9108	Coupler - metric	1		1				1	1														
	3600-9238	Coupler - metric		1						1														
	0602-9811	Coupler - metric				1					1													
	3600-6182	Coupler - metric					1	1				1	1											
	4520-9118	Coupler - metric						1															1	

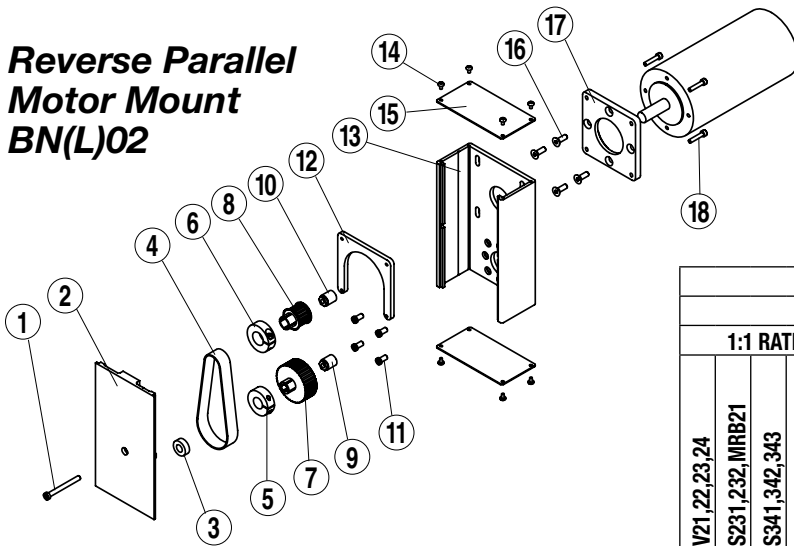
**Reverse Parallel Motor Mount not BN(L)02**



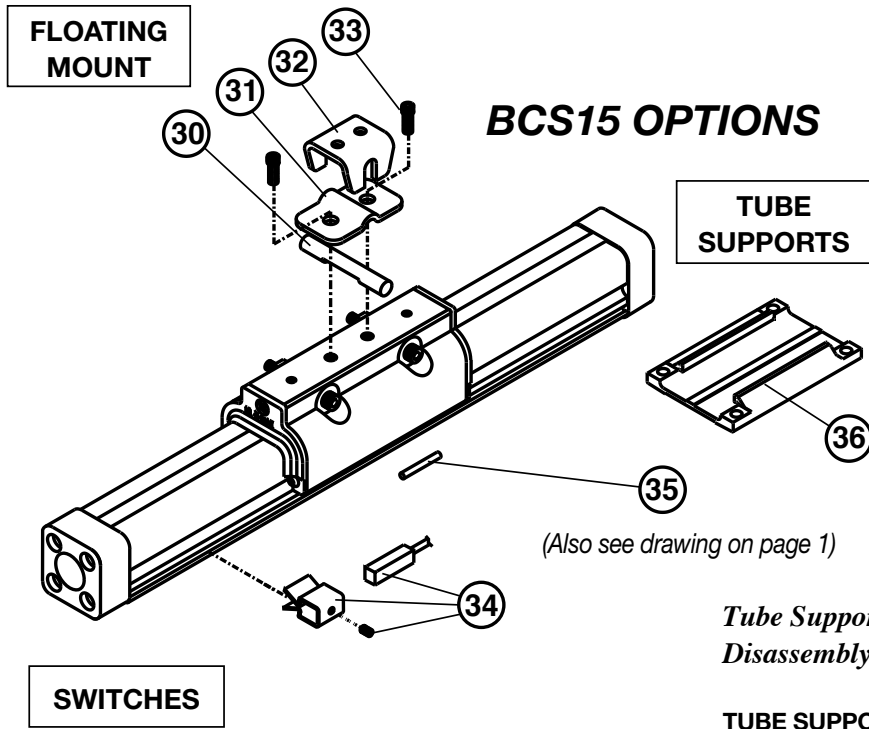
		OTHER THAN BN(L)02														
		BCS15						MCS15								
		1:1 RATIO			2:1 RATIO			1:1 RATIO			2:1 RATIO					
ITEM	PART NO.	MRV21,22,23,24	MRS231,232,MRB21	MRS341,342,343	MRV31,32,33,MRB31,32	MRB41,42	MRV21,22,23,24	MRS231,232,MRB21	MRS341,342,343	MRV31,32,33,MRB31,32	MRB41,42	MRV21,22,23,24	MRS231,232,MRB21	MRS341,342,343	MRV31,32,33,MRB31,32	MRB41,42
1.	3420-1640	SHCS, M5 X 0.8, 50 MM LONG, LOW HEAD, SST	1	1			1	1				1	1			
	3420-1641	SHCS, M6 X 1.0, 60 MM LONG, LOW HEAD, SST				1					1					1
	3420-1639	SHCS, M5 X 0.8, 55 MM LONG, LOW HEAD, SST		1	1			1	1			1	1			1
2.	0601-1619	COVER, BCS15/B3S15-23 FRAME	1	1			1	1				1	1			
	0602-1619	COVER, BCS15/B3S15-34 FRAME		1	1			1	1			1	1			1
	3420-1619	COVER, BCS15/B3S15-40 FRAME				1				1		1				1
3.	0510-1109	BEARING, BALL, RADIAL, Ø.250	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4.	0515-1199	TIMING BELT, 12.00-1/5-3/8	1	1	1	1					1	1	1	1	1	
	0520-1070	TIMING BELT, 16.00-1/5-3/8					1	1	1	1					1	1
5.	2317-1005	CLAMP COLLAR, Ø.625					1	1	1	1					1	1
	3420-1627	CLAMP COLLAR, Ø.813				1				1						1
	0520-1067	CLAMP COLLAR, Ø.688	1	1			1	1		1	1	1	1			1
7.	0515-1191	PULLEY, 18 TEETH, .38 WIDTH										1	1	1	1	
	0510-1110	PULLEY, 36 TEETH, .38 WIDTH														
	0515-1192	PULLEY, 18 TEETH, .38 WIDTH	1	1	1	1					1	1	1	1	1	
	0515-1193	PULLEY, 36 TEETH, .38 WIDTH					1	1	1	1					1	1
8.	3420-1255	PULLEY, 18 TEETH, .38 WIDTH	1	1			1	1			1	1			1	
	0515-1191	PULLEY, 18 TEETH, .38 WIDTH		1				1			1				1	
	0515-1192	PULLEY, 18 TEETH, .38 WIDTH			1				1						1	
	3420-1626	PULLEY, 18 TEETH, .38 WIDTH				1				1						1
9.	0510-1111	TRANTORQ, Ø.250									1	1	1	1	1	
	0515-1181	TRANTORQ, Ø.375	1	1	1	1					1	1	1	1	1	
10.	0510-1111	TRANTORQ, Ø.250		1				1				1			1	
	0515-1181	TRANTORQ, Ø.375			1				1						1	
11.	3420-1651	SHCS, 1/4-20, 0.50 LONG, LOW HEAD	4	4	4	4	4	4	4	4						
	3420-1648	SHCS, M6 X 1.0, 12 MM LONG, LOW HEAD									4	4	4	4	4	4
12.	0601-1053	PLATE, MOTOR, 23 FRAME	1	1			1	1			1	1			1	1
	0602-1057	PLATE, MOTOR, 34 FRAME			1	1			1	1					1	1
	3420-1611	PLATE, MOTOR, 40 FRAME				1				1						1
13.	0601-1609	HOUSING, BCS15/B3S15-23 FRAME (TOP/BOTTOM)	1	1			1	1			1	1			1	1
	0602-1609	HOUSING, BCS15/B3S15-34 FRAME (TOP/BOTTOM)		1	1			1	1			1	1			1
	3420-1609	HOUSING, BCS15/B3S15-40 FRAME (TOP/BOTTOM)				1				1						1
	0601-1659	HOUSING, BCS15/B3S15-23 FRAME (LEFT/RIGHT)	1	1			1	1			1	1			1	1
	0602-1659	HOUSING, BCS15/B3S15-34 FRAME (LEFT/RIGHT)		1	1			1	1			1	1			1
	3420-1659	HOUSING, BCS15/B3S15-40 FRAME (LEFT/RIGHT)				1				1						1
14.	0601-1625	SCREW, #6 X .25, SELF-TAPPING, SST	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	0601-1602	END CAP	1	1			1	1			1	1			1	1
15.	0602-1602	END CAP			1	1			1	1				1	1	
	3420-1602	END CAP				1				1					1	
16.	2212-1010	SFHCS, 1/4-20, .75 LONG				4				4					4	
17.	3420-1612	PLATE, ADAPTER, 40 FRAME				1				1					1	
18.	2212-1098	SHCS, M5 X 0.8, 20 MM LONG, SST		4				4			4			4		
	2212-1099	SHCS, M5 X 0.8, 25 MM LONG, SST	4		4	4	4	4	4	4	4	4	4	4	4	4



**Reverse Parallel Motor Mount  
BN(L)02**



		BN(L)02															
		BCS15						MCS15									
		1:1 RATIO			2:1 RATIO			1:1 RATIO			2:1 RATIO						
ITEM	PART NO.	DESCRIPTION	MRV21,22,23,24	MRS231,232,MRB21	MRS341,342,343	MRV31,32,33,MRB31,32	MRB41,42	MRV21,22,23,24	MRS231,232,MRB21	MRS341,342,343	MRV31,32,33,MRB31,32	MRB41,42	MRV21,22,23,24	MRS231,232,MRB21	MRS341,342,343	MRV31,32,33,MRB31,32	MRB41,42
1.	3420-1640	SHCS, M5 X 0.8, 50 MM LONG, LOW HEAD, SST	1	1				1	1				1	1			
	3420-1641	SHCS, M6 X 1.0, 60 MM LONG, LOW HEAD, SST				1					1						1
	3420-1639	SHCS, M5 X 0.8, 55 MM LONG, LOW HEAD, SST			1	1			1	1				1	1		1
2.	0601-1619	COVER, BCS15/B3S15-23 FRAME	1	1				1	1				1	1			
	0602-1619	COVER, BCS15/B3S15-34 FRAME			1	1			1	1					1	1	
	3420-1619	COVER, BCS15/B3S15-40 FRAME				1					1						1
3.	0510-1109	BEARING, BALL, RADIAL, Ø.250	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4.	0515-1199	TIMING BELT, 12.00-1/5-3/8	1	1	1	1	1						1	1	1	1	1
	0520-1070	TIMING BELT, 16.00-1/5-3/8					1	1	1	1	1					1	1
5.	2317-1005	CLAMP COLLAR, Ø.625															
	3420-1627	CLAMP COLLAR, Ø.813				1					1						1
	0520-1067	CLAMP COLLAR, Ø.688	1	1				1	1				1	1			1
7.	0515-1191	PULLEY, 18 TEETH, .38 WIDTH	1	1	1	1	1						1	1	1	1	1
	0510-1110	PULLEY, 36 TEETH, .38 WIDTH					1	1	1	1	1					1	1
	0515-1192	PULLEY, 18 TEETH, .38 WIDTH															
	0515-1193	PULLEY, 36 TEETH, .38 WIDTH															
8.	3420-1255	PULLEY, 18 TEETH, .38 WIDTH	1	1			1	1			1	1			1	1	
	0515-1191	PULLEY, 18 TEETH, .38 WIDTH		1				1			1			1			
	0515-1192	PULLEY, 18 TEETH, .38 WIDTH			1					1						1	
	3420-1626	PULLEY, 18 TEETH, .38 WIDTH				1					1						1
9.	0510-1111	TRANTORQ, Ø.250	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	0515-1181	TRANTORQ, Ø.375															
10.	0510-1111	TRANTORQ, Ø.250		1				1			1				1		
	0515-1181	TRANTORQ, Ø.375			1					1						1	
11.	3420-1651	SHCS, 1/4-20, 0.50 LONG, LOW HEAD	4	4	4	4	4	4	4	4	4	4					
	3420-1648	SHCS, M6 X 1.0, 12 MM LONG, LOW HEAD											4	4	4	4	4
12.	0601-1053	PLATE, MOTOR, 23 FRAME	1	1				1	1				1	1			
	0602-1057	PLATE, MOTOR, 34 FRAME			1	1			1	1				1	1		
	3420-1611	PLATE, MOTOR, 40 FRAME				1					1						1
13.	0601-1609	HOUSING, BCS15/B3S15-23 FRAME (TOP/BOTTOM)	1	1				1	1				1	1			
	0602-1609	HOUSING, BCS15/B3S15-34 FRAME (TOP/BOTTOM)			1	1			1	1				1	1		
	3420-1609	HOUSING, BCS15/B3S15-40 FRAME (TOP/BOTTOM)				1					1					1	
	0601-1659	HOUSING, BCS15/B3S15-23 FRAME (LEFT/RIGHT)	1	1				1	1				1	1			
	0602-1659	HOUSING, BCS15/B3S15-34 FRAME (LEFT/RIGHT)			1	1			1	1				1	1		
	3420-1659	HOUSING, BCS15/B3S15-40 FRAME (LEFT/RIGHT)				1					1					1	
14.	0601-1625	SCREW, #6 X .25, SELF-TAPPING, SST	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	0601-1602	END CAP	1	1				1	1				1	1			
	0602-1602	END CAP			1	1			1	1				1	1		
	3420-1602	END CAP				1					1					1	
16.	3420-1223	SFHCS, 1/4-20, 1.00 LONG				4					4				4		4
17.	3420-1612	PLATE, ADAPTER, 40 FRAME				1					1				1		1
18.	2212-1098	SHCS, M5 X 0.8, 20 MM LONG, SST		4				4			4			4			4
	2212-1099	SHCS, M5 X 0.8, 25 MM LONG, SST	4		4	4	4	4	4	4	4	4	4	4	4	4	4



**BCS15 OPTIONS**

**TUBE SUPPORTS**

**SWITCHES**

(Also see drawing on page 1)

*Tube Supports, Floating Mounts and Switches Disassembly and Assembly Instructions*

**TUBE SUPPORTS**

Follow cylinder assembly instructions through steps 5. Before installing second cylinder Head (#5) in step 6, slide Tube Support (#36) onto cylinder Tube (#9).

**FLOATING MOUNT**

Completely assemble cylinder. Place Pin (#30) flat side towards Carrier (#26) and between the two center holes. Place Floating Mount Clamp (#31) over Pin (#30) and secure to the Carrier (#26) with Screws (#33) and Loctite® #242. Place Floating Mount Bracket (#32) over Pin (#30) and hold in place with a rubber band.

**SWITCHES**

On assembled cylinder, Secure Switch to open port side of cylinder with a Hardware Kit (#34) clamp and screw. Cycle the carrier over the Switch by hand to ensure that the carrier does not hit the switch. See page 8 for additional switch information.

ITEM	PART NO.	DESCRIPTION	ALL BCS10 MODLES
FLOATING MOUNT			
30	0515-1009	Pin	1
31	0915-1193	Clamp	1
32	0915-9018	Bracket	1
33	0910-1199	Screw	2
SWITCHES			
34.	<b>SEE PAGE 8</b>		
35.	0915-1238	Switch Magnet	1
TUBE SUPPORTS			
36.	4515-1010	Bracket	1

SWITCH KIT	
CONFIG. CODE ORDERING	
Mounting Hardware & FE conn. included	
CODE	DESCRIPTION
BT	Switch Only, Reed, Form C, 5m
BM	Switch Only, Reed, Form C, Male Conn.
RT	Switch Only, Reed, Form A, 5m
RM	Switch Only, Reed, Form A, Male Conn.
CT	Switch Only, Triac, 5m
CM	Switch Only, Triac, Male Conn.
KT	Switch Only, Hall-effect, Sinking, 5m
KM	Switch Only, Hall-effect, Sinking, Male Conn.
TT	Switch Only, Hall-effect, Sourcing, 5m
TM	Switch Only, Hall-effect, Sourcing, Male Conn.

NOTE: When ordered by Config. Code Female connector & all mounting hardware is included

**Switch Ordering NOTES:**

To order field retrofit switch and hardware kits for all Tolomatic actuators: SW (Then the model and bore size, and type of switch required)  
**Example: SWBCS15RT**  
 (Hardware and Form A Reed switch with 5 meter lead for 1-1/2" size BCS actuator)

⚠ Mounting hardware is required if replacing switch for any actuator manufactured before 7/1/97

**3. SWITCHES**

**NOTE:** Form A Reed Switches should not be used in TTL logic circuits. A voltage drop caused by the L.E.D. indicator will result. For applications where TTL circuits are used, please contact the factory.

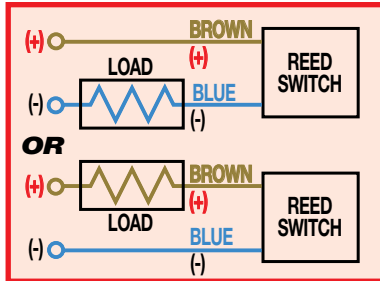
**WARNING:** An ohmmeter is recommended for testing Reed Switches. NEVER use an incandescent light bulb as a high current rush may damage the switch.

Reed and TRIAC switches are only recommended for signalling position, not directly powering solenoids. For shifting a solenoid, a relay or resistor is recommended between it and the Reed Switch. Switch ratings must not be exceeded at any time.

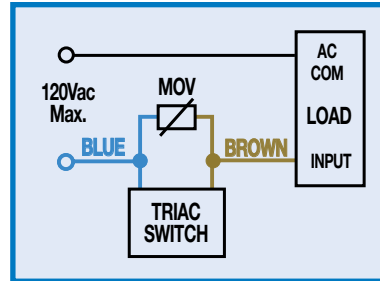
**NOTE:** For Hall Effect Switch Magnet, be sure the S pole of the magnet (indicated with black dot) is facing toward the switch (down).

**WIRING DIAGRAMS**

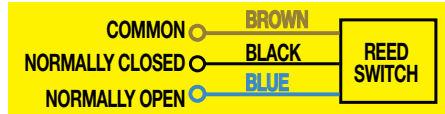
**R T & R M DC REED, FORM A**



**C T & C M AC REED, TRIAC**

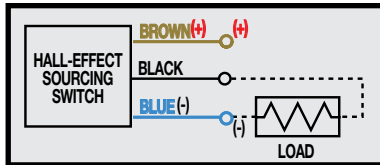


**B T & B M DC REED, FORM C**

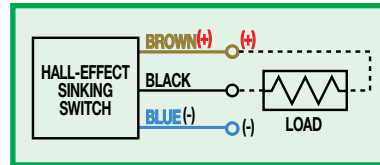


Some actuators may require switch mounting on a specific side of the assembly. Call Tolomatic for details.

**T T & T M HALL-EFFECT, SOURCING, PNP**



**K T & K M HALL-EFFECT, SINKING, NPN**



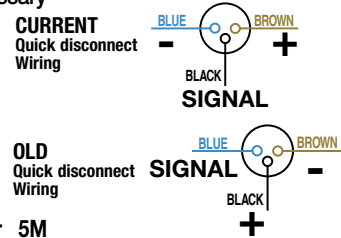
**INSTALLATION INFORMATION**



⚠ THE NOTCHED FACE OF THE SWITCH INDICATES THE SENSING SURFACE AND MUST FACE TOWARD THE MAGNET.

**REPLACEMENT OF QD SWITCHES MANUFACTURED BEFORE JULY 1, 1997:**

It will be necessary to replace or rewire the female end coupler.



Female Connector 5M



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 Phone: (763) 478-8000 • Fax: (763) 478-8080 • Toll Free: 1-800-328-2174



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