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Billings, MT 59101

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Fax: (406)656-4363

FAST-WAY LIMITED WARRANTY POLICY

Ideal Manufacturing, Inc., hereinafter referred to as “Manufacturer” warrants FAST-WAY equipment to be free from defect in material and workmanship, under normal use and service, for a period of one (1) year from the date of original purchase. Manufacturer will, at its option, replace or repair at factory in Billings, MT, any part or parts which shall appear, to the satisfaction of the Manufacturer, upon inspection at its factory, to have been defective in material or workmanship. This warranty does not obligate the Manufacturer to bear any transportation charges in connection with replacement or repair of defective parts. This warranty excludes electrical components and damage due to Acts of God, unauthorized modifications, misuse, abuse or negligence to this product.

In order to proceed with a warranty claim, Ideal Manufacturing must be notified of the problem. A new part will be shipped out prepaid (Ground UPS). If the customer requests that the part be expedited that shipping charge will be charged to the owner.

The part that is being warranted must be returned to Ideal Manufacturing postage prepaid. When the new part is shipped out, it will go out with an invoice and a warranty part return number. The defective part must be returned to Ideal Manufacturing, Inc freight prepaid, with the warranty part return number. At that time the invoice will be considered paid in full.

This warranty is exclusive and in lieu of all other obligation, liabilities or warranties. In no event shall Ideal Manufacturing be liable or responsible for incidental or consequential damage or for any other direct or indirect damage loss, cost, expense or fee.

This warranty shall not apply to any products or parts that have been altered or repaired without written consent of Ideal Manufacturing.

Labor to remove and reinstall defective product or parts will be paid from a labor rate and schedule only. Consult Ideal Manufacturing for that rate and schedule.

For further information on returning your product or questions concerning Ideal Manufacturing warranty, please contact Ideal Manufacturing.

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AUGER CEMENT SCREW
THIS MANUAL IS FOR AUGERS STARTING WITH
SERIAL NUMBER CS16A0810-107 AND UP

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SAFETY RULES

Warning: Maximum Hydraulic PSI Setting is 1800, do not exceed this pressure.

1. Follow instructions, don't take chances. If you don't know, ask. When setting up, lowering or putting equipment into traveling position, follow all instructions in operator's manual.
2. Correct or report unsafe conditions. If not sure of how to correct a hazard, report it and get help.
3. Keep everything clean and orderly. Trips or falls can cause serious injuries.
4. Use the right tools and equipment for the job. Use them safely. Replace all machine guards after repairs.
5. Report all injuries and get first aid or medical treatment promptly.
6. Use, adjust, and repair equipment only when authorized.
7. Use prescribed protective equipment. Keep it in good condition. Wear your hardhat, safety climbing devices or belt. Wear safe clothing to protect you from material being handled, cold or hot. Wear a dust mask when conditions require them. Use gloves, eye protection/safety glasses, and earplugs for noise.
8. Don't horseplay: avoid distracting others.
9. When lifting, bend your knees and get help for heavy loads.
10. Don't repair or adjust equipment while in motion. Shut off power source, gasoline engines or electric motors.
11. Comply with safety rules and signs.
12. Gasoline, L.P. gas fumes are highly explosive.

SET UP PROCEDURE CS-16 A
(Refer to Drawings CS-16 A 101 page 4 and CS-16 A 102 page 5)

- Step 1** Select a level, and solid site for setting up and operating cement screw.
- Step 2** Locate Travel Rod (page 4) ó Remove hairpin clip from the hole in the Travel Rod. Pull Travel Rod out of frame holes. Put Travel Rod in safe place for future use. Attach Discharge Boot (page 23).
- Step 3** Locate Hand Winch (page 4) ó Release cable tension from winch and spool out all cable.
- Step 4** Locate Diagonal Braces SSC111 (page 4) ó Remove brace pin from bracket on the auger tube. Use brace SSC111 and swing vertical frame forward. Two competent people should preform placement of vertical frame.
- Step 5** Locate Diagonal Brace Anchor Point (page 5) ó Align diagonal braces holes with anchor point, and insert brace pins. Secure brace pins with hairpin clips.
- Step 6** Crank hand winch handle in clockwise rotation to raise main tube to desired position (33 ½° or 45°)
- 33 ½° Position** (Refer to page 5, 33 ½° degree discharge note)
When main tube has been winched to appropriate height above 33 ½° degree discharge position install auger support bracket, (Part #SSC100). With auger support bracket placed across vertical frame supports points lower main tube so that it rests on support bracket while keeping tension on winch line for additional support.
- 45° Position** (Refer to page 5, 45° degree discharge note)
When main tube has been winched to appropriate height above 45° degree discharge position install auger support bracket, (Part #SSC100). With auger support bracket placed across vertical frame supports points lower main tube so that it rests on support bracket while keeping tension on winch line for additional support.
- Step 7** Check hydraulic oil level in tank. Hydraulic oil should be 6 to 8 inches below top of tank.
- Step 8** Check oil in engine and add fuel Gasoline and Diesel Powered Units Only. **NOTE:** Use proper fuel for the engine. Fuel line may have shut off valve located below fuel tank. Electric powered units are lifetime factory lubricated.
- Step 9** Grease all bearings on conveyor screw.

SPECIAL INSTRUCTION

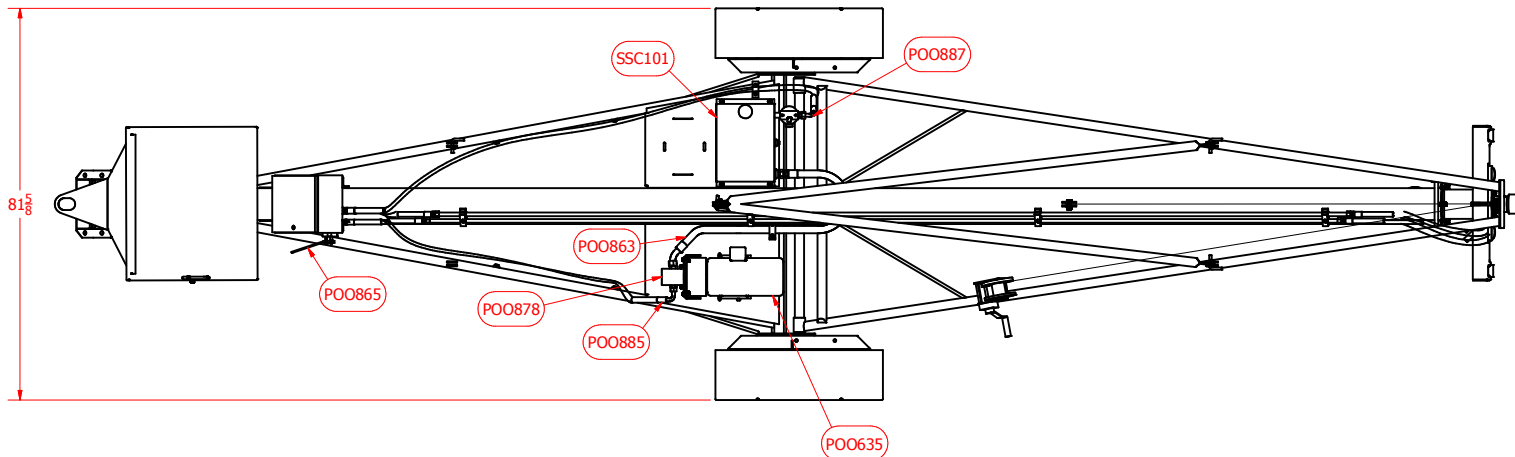
When using machine in 45° position it is recommended to either raise the hopper end approximately 16 or remove enough ground on the left side of the hopper to let cover hang free when in open position. Failure to do so may create damage to hinge area of hopper. Machine is now ready for operation. Electric powered units operate at a fixed speed. Gasoline powered units speed can be regulated by adjusting governor.

SAFETY FIRST

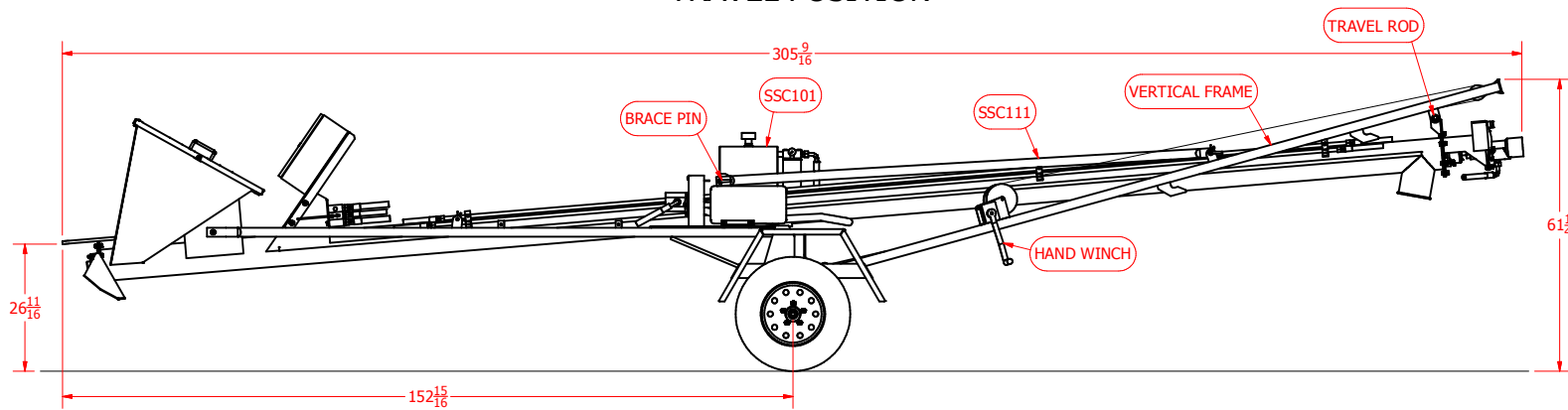
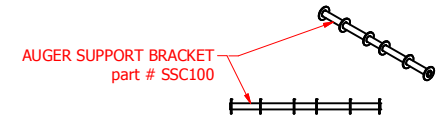
Keep coupling guard installed during operation and hopper cover closed when not in use.

MOVING & TRAVEL PROCEDURE

Reverse set up procedure starting with Step 6 and working back to Step 1. Check tires pressure. Inflate to manufacturers specifications. Machine can be towed at highway speed depending on road conditions.



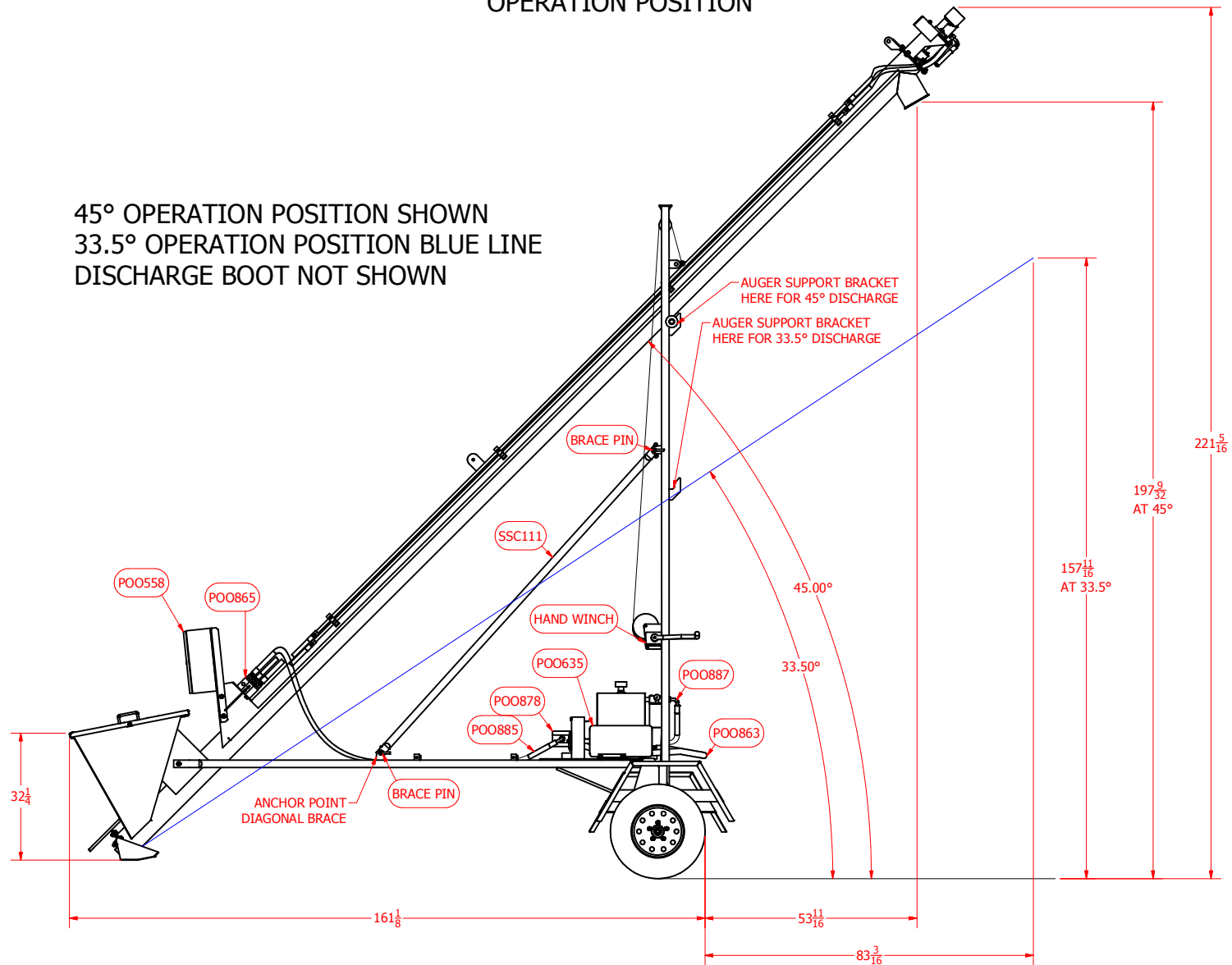
CS-16 A
TRAVEL POSITION



DRAWN	10/30/2009	IDEAL MFG., INC.		
CHECKED	7/22/2010	TITLE		
QA		CS-16 A 101 TRAVEL POSITION		
MFG		SIZE	DWG NO	REV
APPROVED		C	CS-16 A 101	
		SCALE	SHEET 1 OF 1	

CS-16 A OPERATION POSITION

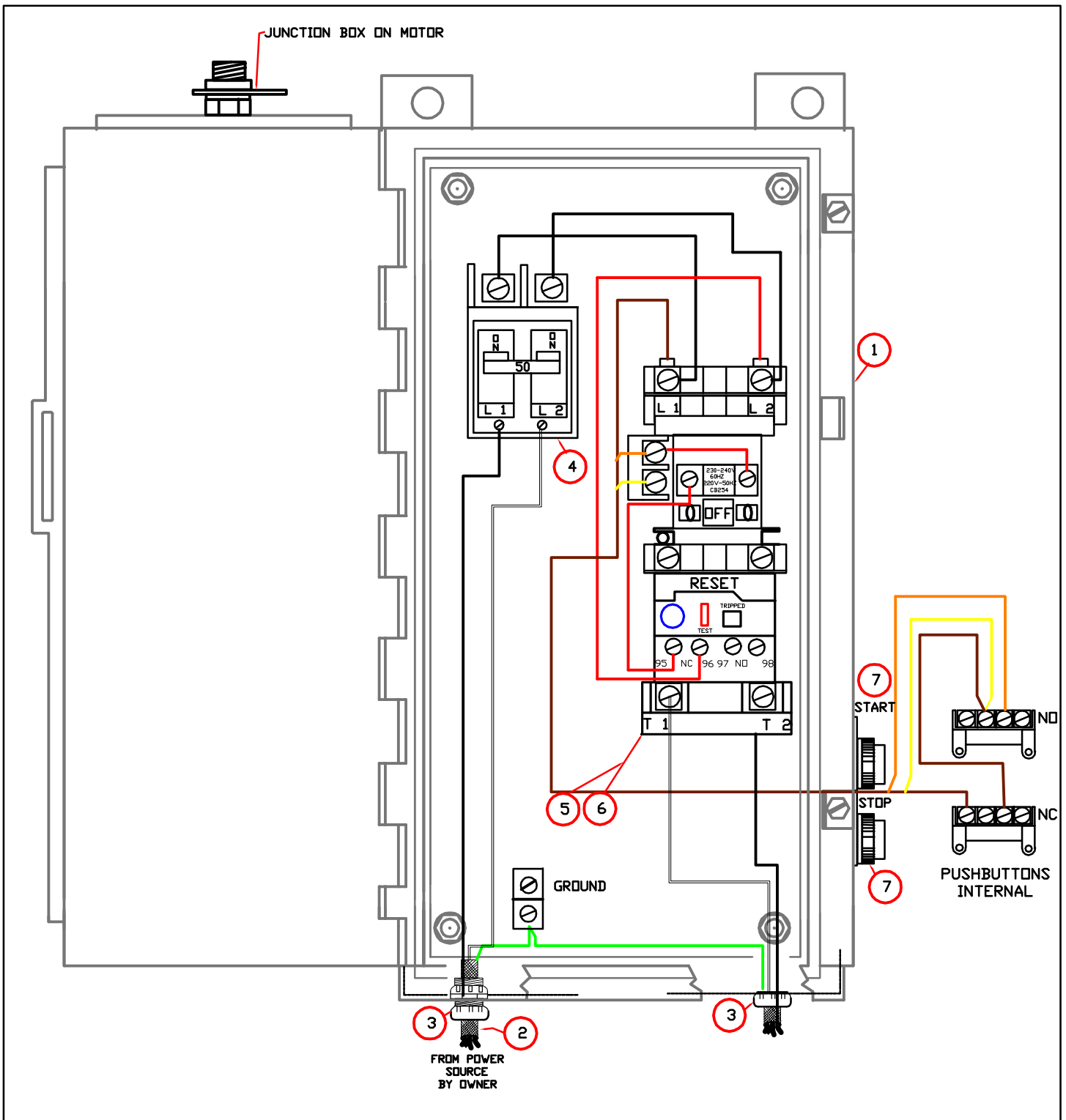
45° OPERATION POSITION SHOWN
33.5° OPERATION POSITION BLUE LINE
DISCHARGE BOOT NOT SHOWN



DRAWN	THenry	10/30/2009	IDEAL MFG., INC.	
CHECKED		7/22/2010	TITLE	
QA			CS-16 A OPERATION POSITION	
MFG			SIZE	DWG NO
APPROVED			C	CS-16 A 102
			SCALE	REV
				SHEET 1 OF 1

CS-16 A
FAST-WAY CEMENT SCREW ELECTRICAL ENCLOSURE 220
VOLT SINGLE PHASE FOR 5 HP
DRAWING #SC-16-E2

REF NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	POO558	Enclosure	1
2	N/A	Conductor Cord, 220 Volt, 12-3 S.O. (By Purchaser)	
3	N/A	Strain Relief Fitting (By Purchaser)	
4	POO565	Circuit Breaker	1
5	POO606	Contactoer Starter	1
6	POO606A	Overload Relay	1
	POO606B	Coil	1
7	POO563	Pushbutton Unit	2



1. ENCLOSURE HOFFMAN C-SD16126 W/MOUNTING PANEL CP1612
2. CONDUCTOR CORD-220 VOLT 12-3 TYPE S, 0, BY PRUCHASER
3. STRAIN RELIEF ASSEMBLY BY PURCHASER
4. CIRCUIT BREAKER ITE #ED22B040 2 POLE 40 AMP
5. CONTACTOR ALLEN BRADLEY #509CODXXX SIZE 2 COIL #CC254
6. OVERLOAD RELAY A/B 592-A2HC
7. 2 EACH PUSH BUTTON SWITCH ALLEN BRADLEY #800-A1 WITH:
 - ONE EACH 800HN 5A- RED ONE EACH # 800T-XD1 CONTACT BLACK
 - ONE EACH #800HNSB - GREEN ONE EACH # 800T-XD2 CONTACT BLACK
 - ONE EACH LEGEND PLATE - #X547 - START
 - ONE EACH LEGEND PLATE - #X550 - STOP
8. GROUND LUG - BORDER STATES SIZE 2-14 #DAZ- CU9AL

REVISIONS			IDEAL MANUFACTURING INC.	
NO	DATE	DESCRIPTION	2821 HARRISON BLVD, BELLINGHAM, WY, 09501	
			PHONE 4082404-4368 FAX 4082404-4363	
			CS-16 AUGER/CEMENT SCREW	
			ELECTRICAL	
			SINGLE PHASE POWER	
			CS-16 A E2	
			PAC	TRM
			DATE: 11-3-2007 TIME: 09:28:16-22	

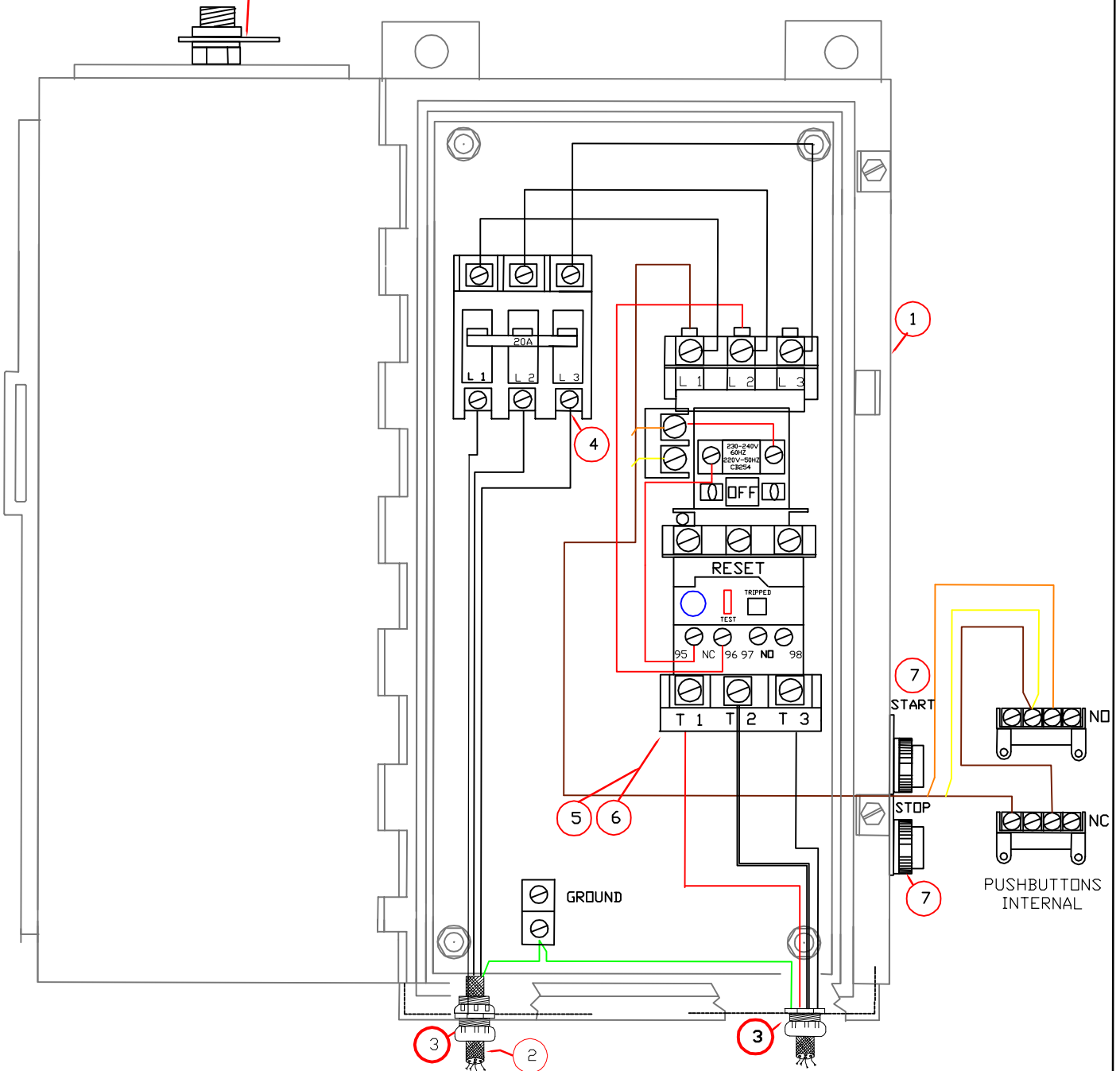
CS-16 A
FAST-WAY CEMENT SCREW ELECTRICAL ENCLOSURE
220 VOLT THREE PHASE FOR 5 HP
DRAWING #CS-16 A E3

REF NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	POO558	Enclosure	1
2	N/A	Conductor Cord, 220 Volt, 8-4 S.O. (By Purchaser)	
3	N/A	Strain Relief Fitting (By Purchaser)	
4	POO559	Circuit Breaker	1
5	POO607	Contacto Starter	1
6	POO607A	Overload Relay	1
7	POO563	Pushbutton Unit	2

CS-16 A
FAST-WAY CEMENT SCREW ELECTRICAL ENCLOSURE
440 VOLT THREE PHASE FOR 5 HP
DRAWING #CS-16 A E3

NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	POO558	Enclosure	1
2	N/A	Conductor Cord, 440 Volt, 12-4 S.O. (By Purchaser)	1
3	N/A	Strain Relief Fitting (By Purchaser)	
4	POO560	Circuit Breaker	1
5	POO561	Contacto Starter	1
6	POO561C	Overload Relay	1
7	POO563	Pushbutton Unit	2

JUNCTION BOX ON MOTOR



220 VOLT 3 PHASE 5 HP MOTOR

1. ENCLOSURE HOFFMAN C-SD16126 LP WITH MOUNTING PANEL C-P1612
2. CONDUCTOR CORD-220 VOLT 8-4 TYPE S, 0, OR EQUAL BY PURCHASER
3. STRAIN RELIEF ASSEMBLY BY PURCHASER
4. CIRCUIT BREAKER ITE #BQ3B020 220 VOLT 3 POLE, 20 AMP WITH 3 WIRE GRIP #LNIE100 & BACK MOUNT #BR9570
5. CONTACTOR "STARTER" ALLEN BRADLEY 509-B0D-XXX CB254 220 VAC COIL
6. OVERLOAD RELAY A/B 592-A2FA (ADJUSTABLE)
7. 2 EACH PUSH BUTTON SWITCH ALLEN BRADLEY #800T-A1A WITH:
 - ONE EACH BOOT - #800HN 5A RED
 - ONE EACH BOOT - #800HN 5B GREEN
 - ONE EACH LEGEND PLATE - #X547 - START
 - ONE EACH LEGEND PLATE - #X550 - STOP
 - ONE EACH 800T-X D-1 CONTACT BLACK N/D
 - ONE EACH 800T-X D-2 CONTACT BLACK N/C
8. STRAIGHT FITTING- BORDER STATES CAR #LT43D
GROUND LUG -BORDER STATES SIZE 2-14 #DAZ-CU9AL

FROM POWER SOURCE BY OWNER

12-4 WIRE 6' LONG TO MOTOR

440 VOLT 3 PHASE 5 HP MOTOR

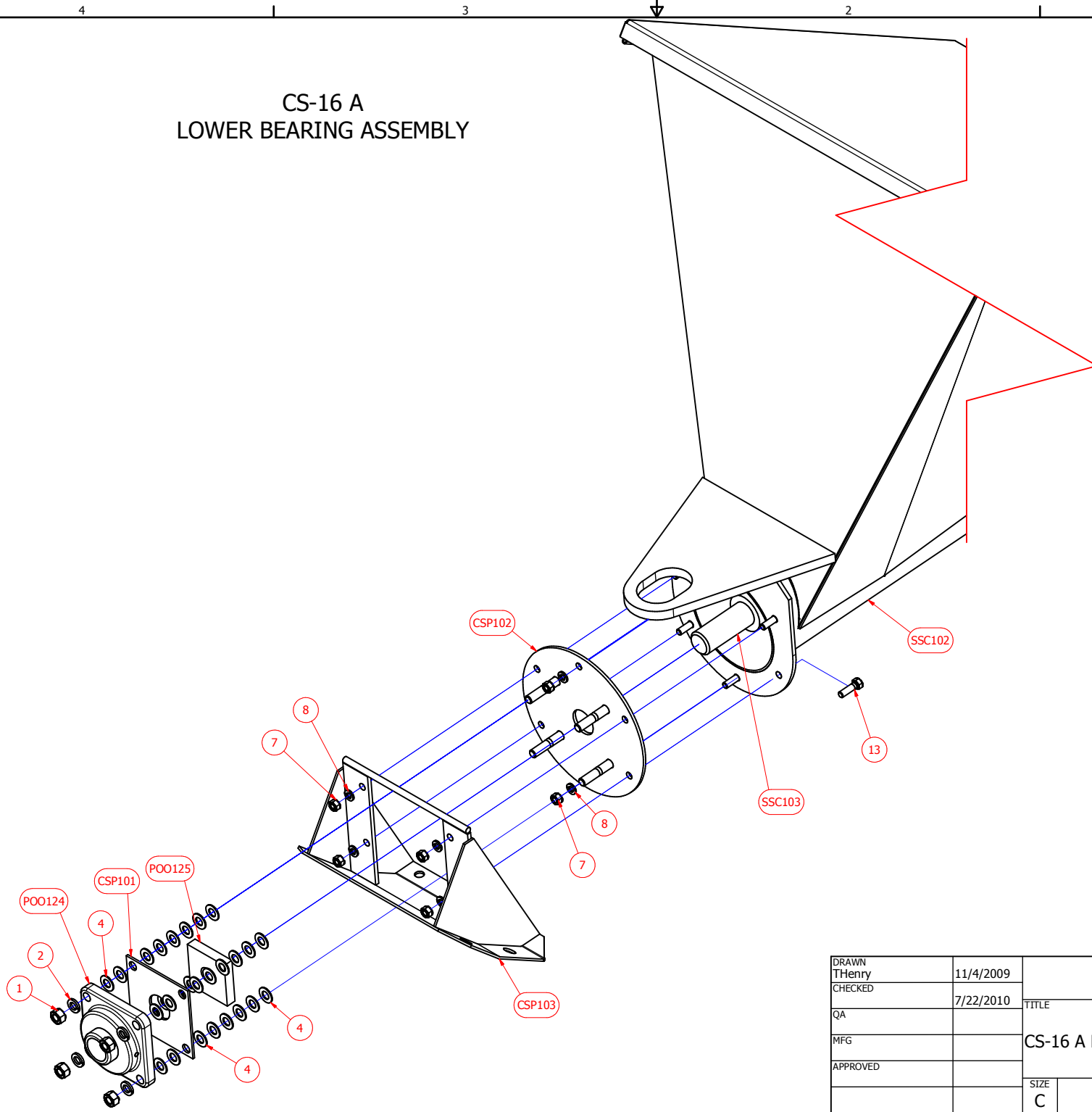
1. ENCLOSURE HOFFMAN #A-161206 LP WITH MOUNTING PANEL #C-PIG12
2. CONDUCTOR CORD-440 VOLT 12-4 TYPE S, 0, OR EQUAL BY PURCHASER
3. STRAIN RELIEF ASSEMBLY BY PURCHASER
4. CIRCUIT BREAKER ITE #ED43B020 440 VOLT 3 POLE, 20 AMP WITH 3 WIRE GRIP #LNIE100 & MOUNT SCREW KIT #MSE6
5. CONTACTOR "STARTER" ALLEN BRADLEY 509A0D XXX, CB273 440 VAC COIL
6. OVERLOAD RELAY A/B 592-A2FA
7. 2 EACH PUSH BUTTON SWITCH ALLEN BRADLEY #800T-A1A WITH:
 - ONE EACH #800HN 5A RED
 - ONE EACH #800HN 5B GREEN
 - ONE EACH LEGEND PLATE - #X547 - START
 - ONE EACH LEGEND PLATE - #X550 - STOP
 - ONE EACH 800T-X D-1 CONTACT BLACK
 - ONE EACH 800T-X D-2 CONTACT BLACK
8. STRAIGHT FITTING- BORDER STATES CAR #LT43D SIZE 1/2"
GROUND LUG -BORDER STATES SIZE 2-14 #DAZ-CU9AL

REVISIONS			IDEAL MANUFACTURING INC.	
NO	DATE	DESCRIPTION	8011 HARNISH BLVD, BILLINGS MT, 59101 PHONE: (406)556-4360 FAX: (406)556-4363	
			CS-16 AUGER/CEMENT SCREW	
			ELECTRICAL	
			THREE PHASE POWER	
			CS-16 A E3	
			DATE: 11-3-2009 DWG: MCS-16-E3I	
			PAC ACAB TWH	

CS-16 A
LOWER BEARING ASSEMBLY
REFERENCE DRAWING CS-16 A 103

REF NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	½" - 13 Nuts	4
2	N/A	½" Lock washer	4
POO124	POO124	1 ½" Bearing (Lower Conveyor Screw)	1
4	N/A	½" USS Flat Washer	24 - Seal Spacer 8 - Brg. Spacer
CSP101	CSP101	Seal Retainer Plate	1
POO125	POO125	Seal	1
7	N/A	½" - 16" Nut	6
8	N/A	½" Lock washer	6
CSP102	CSP102	Lower Bearing Holder Plate w/Bolts	1
CSP103	CSP103	Skid Foot	1
SSC102	SSC102	Auger Tube & Hopper Assembly.	1
SSC103	SSC103	Auger Flight Assembly.	1
13	N/A	1 ½" x 1 ¼" Hex Head Bolt	6

CS-16 A LOWER BEARING ASSEMBLY

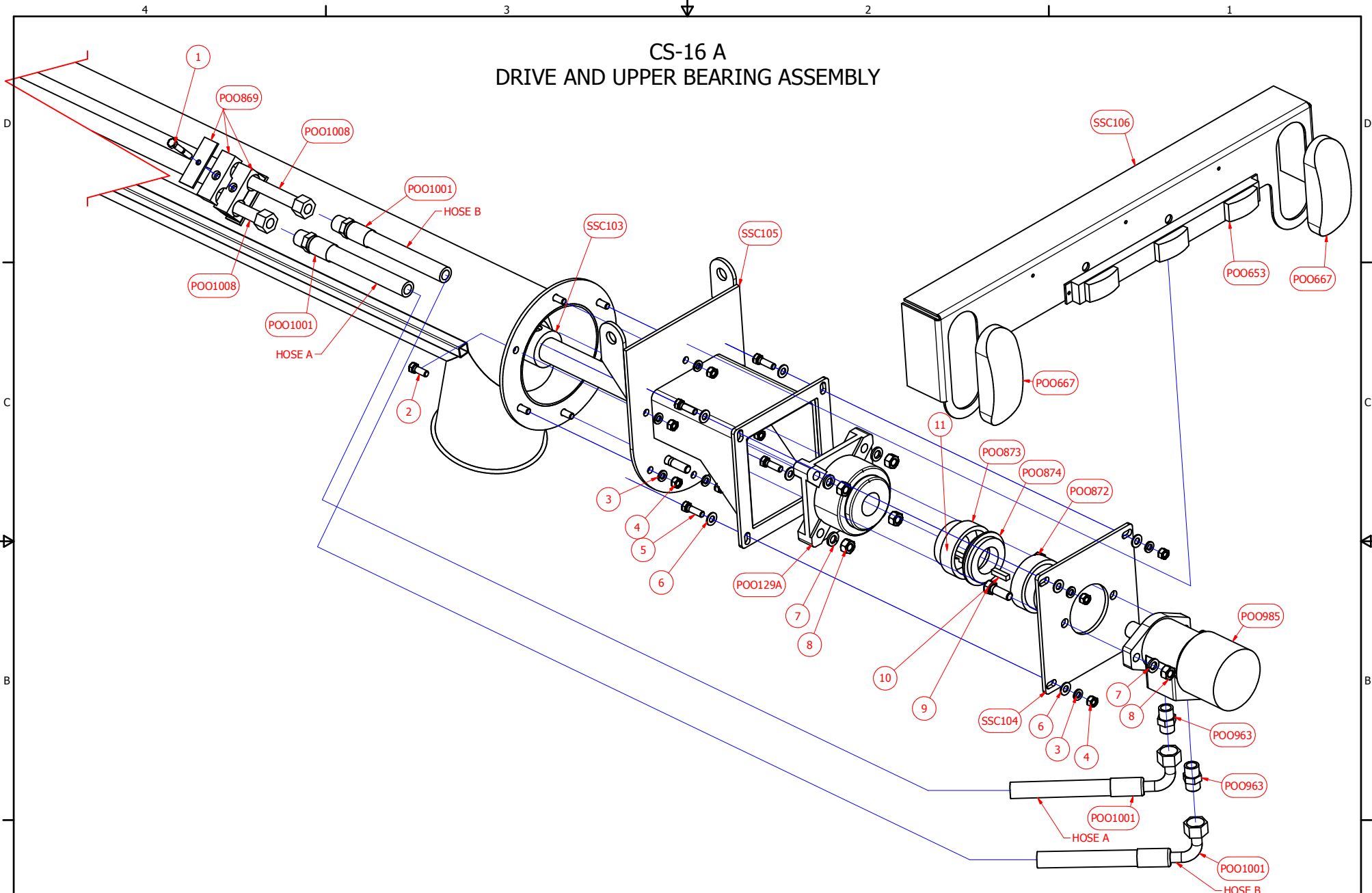


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CHECKED	QA	7/22/2010	TITLE	
MFG	APPROVED		CS-16 A LOWER BEARING ASSEMBLY	
	SCALE		SIZE	DWG NO
			C	CS-16 A 103
				REV
			SHEET 1 OF 1	

**CS-16 A
DRIVE ASSEMBLY
UPPER BEARING MOUNT
REFERENCE DRAWING CS-16 A 104**

REF NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	5/16-18 X 2 Hex Bolt	4
2	N/A	3/8-16 X 1 Hex Bolt	6
3	N/A	3/8 Lock Washer	10
4	N/A	3/8-16 Hex Nut	10
5	N/A	3/8-16 X 1 1/4 Hex Bolt	4
6	N/A	3/8 Flat Washer	8
7	N/A	1/2 Lock Washer	6
8	N/A	1/2-13 Hex Nut	6
9	N/A	1/2-13 X 1 1/2 Hex Bolt	2
10	N/A	5/16 X 5/16 X 1 1/4 Key	1
11	N/A	3/8 X 3/8 X 1 3/4 Key	1
POO129A	POO129A	Bearing	1
POO653	POO653	Center Light	1
POO667	POO667	Tail Light	2
POO869	POO869	Pipe Clamp	4
POO872	POO872	Coupling Hydraulic Motor	1
POO873	POO873	Coupling Auger	1
POO874	POO874	Coupling Insert	1
POO963	POO963	10-10 Straight JIC ORB	2
POO985	900985	Hydraulic Motor	1
POO1001	POO1001	#10 Hose X 35ö MJIC FJIC 90`	2
POO1008	POO1008	Hydraulic Tubing 191ö	2
SSC103	SSC103	Auger Flight Assembly	1
SSC104	SSC104	Hydraulic Motor Mount	1
SSC105	SSC105	Upper Bearing Mount With Bolts	1
SSC106	SSC106	Tail Light Bracket	1

CS-16 A DRIVE AND UPPER BEARING ASSEMBLY

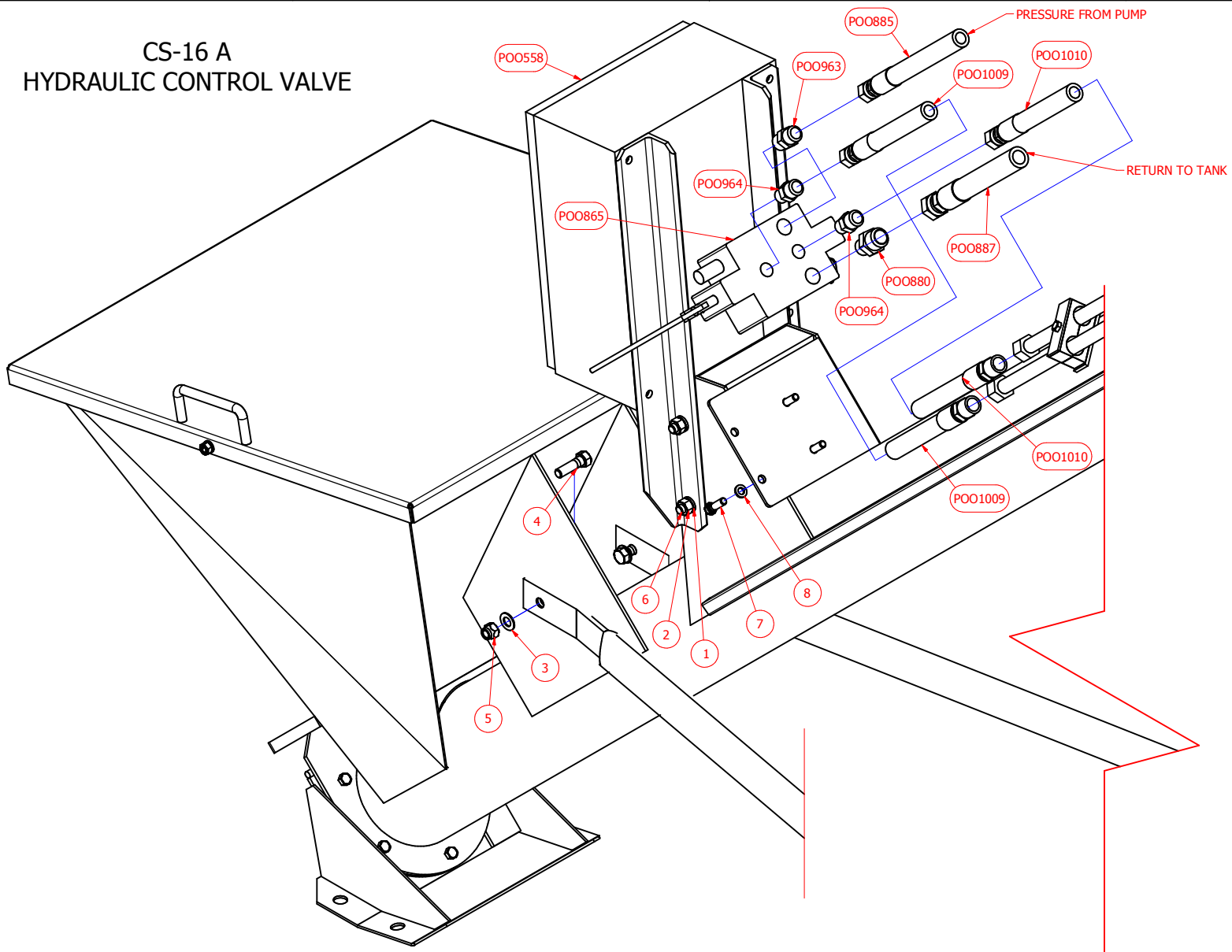


DRAWN	THenry	11/4/2009	IDEAL MFG., INC.		
CHECKED		12/3/2010	TITLE		
QA			CS-16 A DRIVE ASSEMBLY		
MFG					
APPROVED			SIZE	DWG NO	REV
			C	CS-16 A 104	
			SCALE	SHEET 1 OF 1	

CS-16 A
HYDRAULIC CONTROL VALVE
REFERENCE DRAWING # CS-16 A 105

REF NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	1/2 Lock Washer	4
2	N/A	1/2-13 Hex Nut	4
3	N/A	1/2 Flat Washer	4
4	N/A	1/2-13 X 1 3/4 Hex Bolt	2
5	N/A	1/2-13 Lock Nut	2
6	N/A	1/2-13 X 1 1/4 Hex Bolt	4
7	N/A	3/8-16 X 1 1/4 Hex Bolt	3
8	N/A	3/8 Lock Washer	3
POO558	POO558	Electrical Enclosure	1
POO865	POO865	Hydraulic Valve	1
POO880	POO880	12-10 JIC ORB	1
POO885	POO885	Hydraulic Hose Straight JIC 90 JIC	1
POO887	POO887	Hydraulic Hose Straight JIC 90 JIC	1
POO963	POO963	10-10 JIC ORB	1
POO964	POO964	10-8 JIC ORB	2
POO1009	POO1009	#10 Hose X 16ö FJIC MJIC	1
POO1010	POO1010	#10 Hose X 18ö FJIC MJIC	1

CS-16 A HYDRAULIC CONTROL VALVE



DRAWN	THenry	11/4/2009	IDEAL MFG., INC.	
CHECKED		12/3/2010	TITLE	
QA			CS-16 A HYDRAULIC CONTROL VALVE	
MFG			SIZE	DWG NO
APPROVED			C	CS-16 A 105
			SCALE	SHEET 1 OF 1

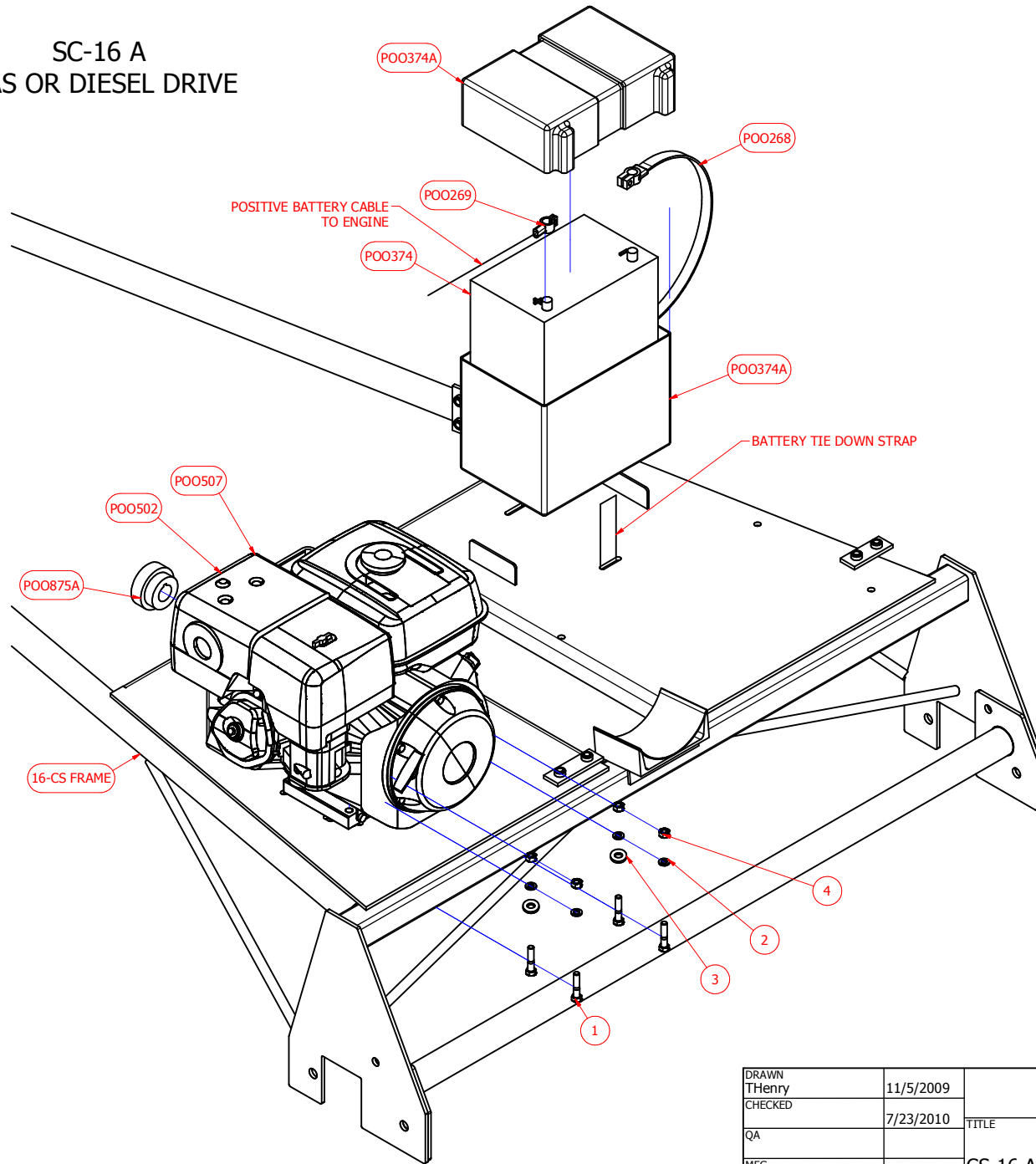
CS-16 A
HYDRAULIC PUMP ASSEMBLY
REFERENCE DRAWING # SC-16 A 106

REF NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	3/8-16 Hex Nut	14
2	N/A	3/8 Flat Washer	4
3	N/A	3/8-16 X 1 1/4 Hex Bolt	14
4	N/A	3/8-16 X 2 3/4 Hex Bolt	10
5	N/A	3/8-16 X 3 1/4 Hex Bolt	2
6	N/A	3/8 Lock Washer	26
7	N/A	5/16-18 Hex Nut	2
8	N/A	5/16-18 X 1 Hex Bolt	2
9	N/A	5/16 Lock Washer	2
10	N/A	1/4 X 1/4 X 1 1/4 Key	1
11	N/A	1/8 X 1/8 X 3/4 Key	1
POO434	POO434	1/2 NPT Plug	1
POO635	POO635	5 HP Motor	1
POO862	POO862	16-12 Straight JIC ORB Electric	1
POO862A	POO862A	16-10 Straight JIC ORB Gas/Diesel	1
POO863	POO863	1ö Hyd. Hose Straight JIC 45 JIC	1
POO864	POO864	Breather	1
POO866	POO866	Filter Housing	1
POO866A	POO866A	Filter	1
POO867	POO867	1ö Hose Clamp	1
POO868	POO868	3/4ö Hose Clamp	3
POO870	POO870	16-16 Straight JIC NPT	1
POO875	POO875	Coupler Electric Motor	1
POO875A	POO875A	Coupler Gas or Diesel	1
POO876	POO876	Coupler Hydraulic Pump	1
POO877	POO877	Coupler Insert	1
POO878	POO878	Hydraulic Pump Electric Motor	1
POO878A	POO878A	Hydraulic Pump Gas / Diesel	1
POO879	POO879	12-12 Straight JIC NPT	1
POO885	POO885	#10 Hose X 93ö FJIC 90` FJIC	1
POO887	POO887	#12 Hose X 132ö FJIC 90` FJIC	1
POO963	POO963	10-10 JIC ORB Electric Motor	1
POO964	POO964	10-8 JIC ORB Gas / Diesel	1
POO1011	POO1011	5/8ö Hose Clamp	2
SSC101	SSC101	Hydraulic Tank	1
SSC107	SSC107	Pump Guard	1
SSC108	SSC108	Hydraulic Pump Mount	1

CS-16 A
GAS OR DIESEL DRIVEN HYDRAULICS
REFERENCE DRAWING CS-16 A 107

REF NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	3/8-16 x 1 3/4 Hex Bolt	4
2	N/A	3/8 Lock Washer	4
3	N/A	3/8 flat Washer	2
4	N/A	3/8-16 Hex Nut	4
POO268	POO268	Negative Battery Cable (Ground)	1
POO269	POO269	Positive Battery Cable (To Engine)	1
POO374	POO374	12 Volt Battery	1
POO374A	POO374A	Battery Box with Tie Down Strap	1
POO502	POO502	Diesel Engine	1
POO507	POO507	Gas Engine	1
POO875A	POO875A	Coupler Gas or Diesel	1

SC-16 A GAS OR DIESEL DRIVE

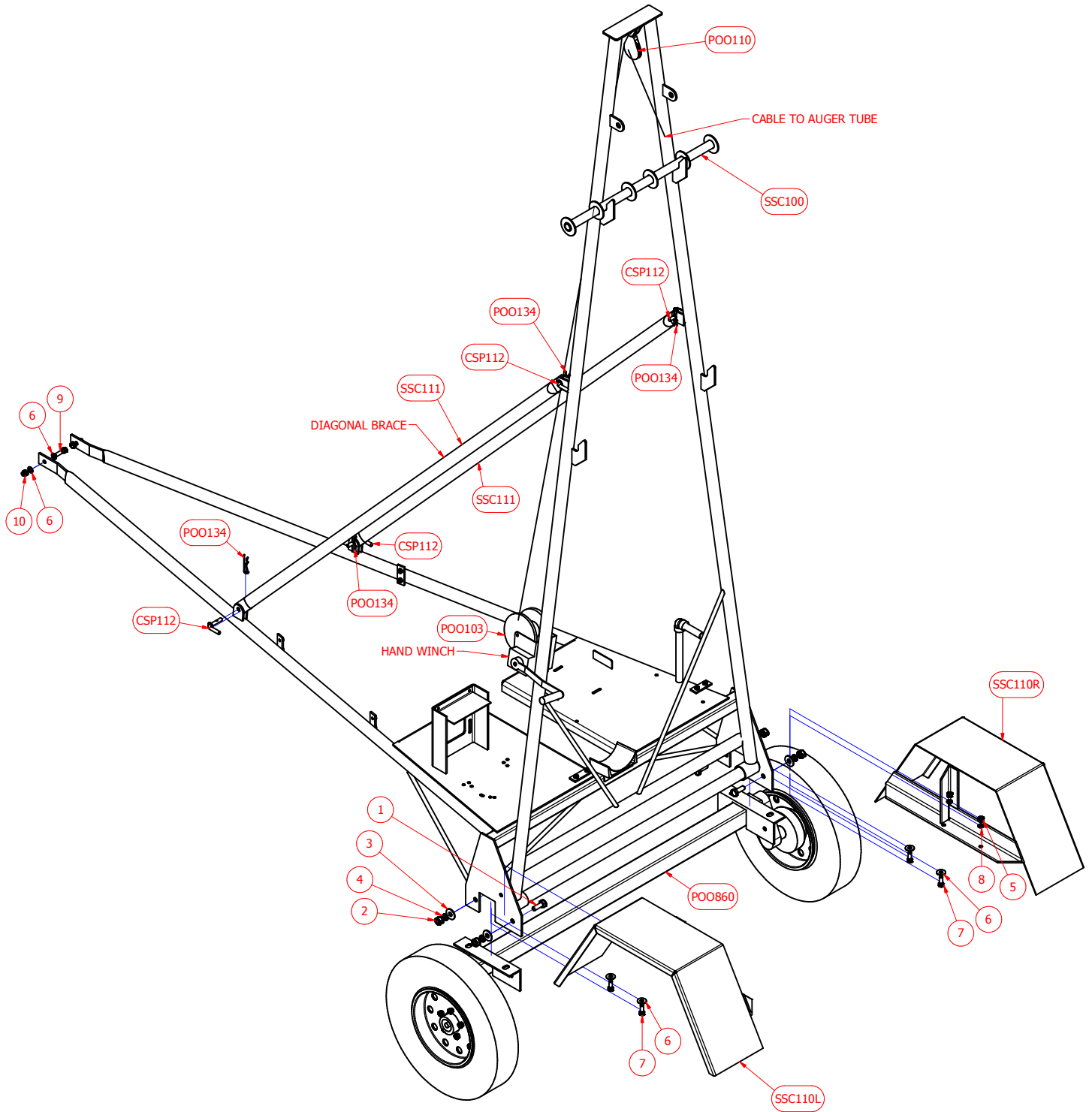


DRAWN	11/5/2009	IDEAL MFG., INC.	
THenry		TITLE	
CHECKED	7/23/2010	CS-16 A GAS OR DIESEL DRIVE	
QA		SIZE	DWG NO
MFG		C	CS-16 A 107
APPROVED		SCALE	REV
			SHEET 1 OF 1

**CS-16 A
FRAME
REFERENCE DRAWING # CS-16 A 108**

REF NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	5/8-11 X 1 3/4 Heavy Hex Bolt	4
2	N/A	5/8-11 Heavy Hex Nut	4
3	N/A	5/8 Flat Washer	4
4	N/A	5/8 Lock Washer	4
5	N/A	1/2-13 Hex Nut	4
6	N/A	1/2 Flat Washer	8
7	N/A	1/2-13 X 1 1/4 Hex Bolt	4
8	N/A	1/2 Lock Washer	4
9	N/A	1/2-13 X 1 3/4 Hex Bolt	2
10	N/A	1/2-13 Lock Nut	2
CSP112	CSP112	Diagonal Brace Pin	4
POO103	POO103	Hand Winch	1
POO110	POO110	Shell Block Pulley	1
POO134	POO134	Hairpin Clip	4
POO860	POO860	Axle Assembly	1
SSC100	SSC100	Auger Support Bracket	1
SSC109	SSC109	CS-16 Frame	1
SSC110L	SSC110L	Left Fender	1
SSC110R	SSC110R	Right Fender	1
SSC111	SSC111	Diagonal Brace	2

CS-16 A FRAME

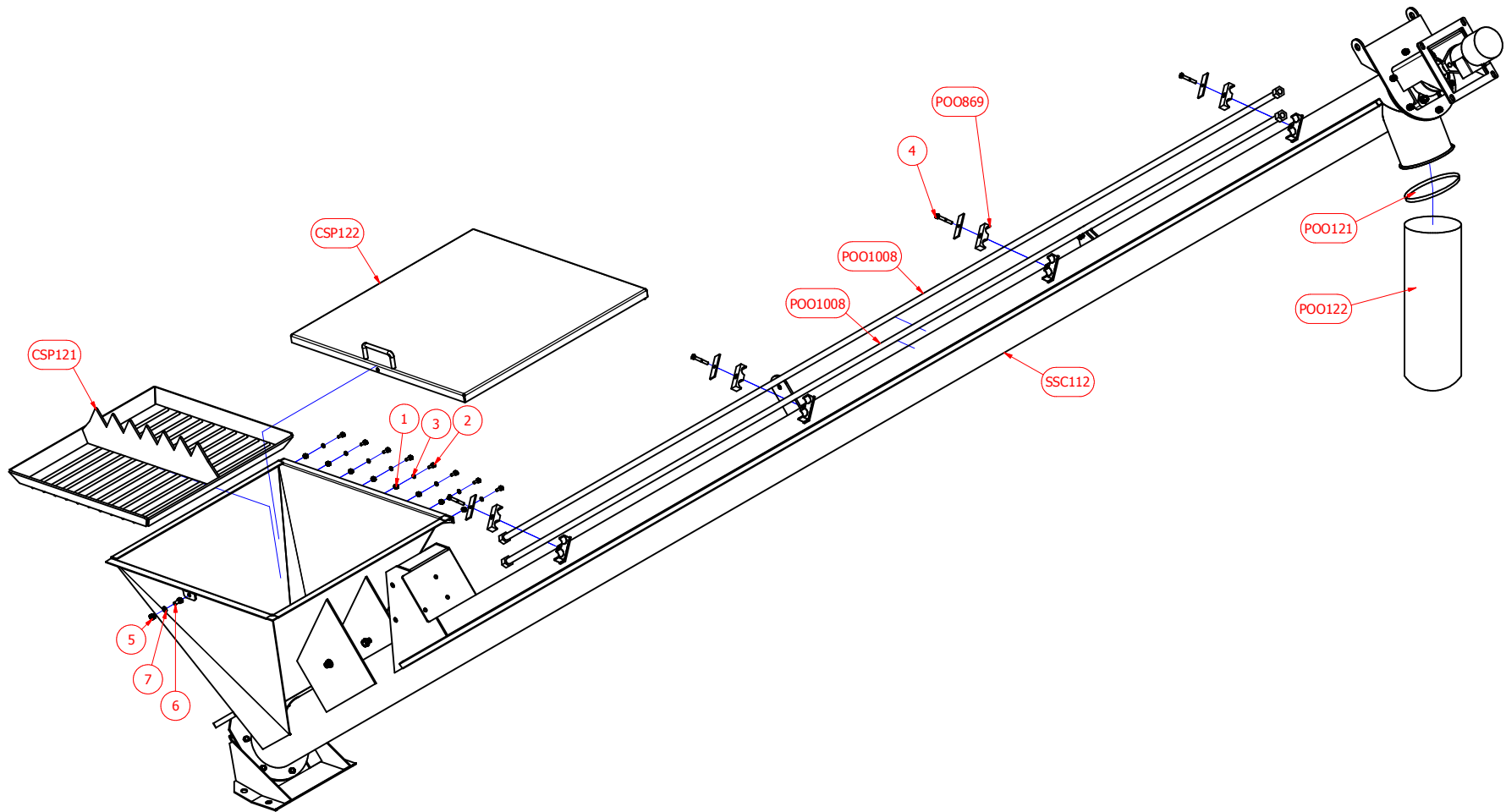


DRAWN THenry	11/5/2009	IDEAL MFG., INC.	
CHECKED	7/23/2010	TITLE	
QA		CS-16 A FRAME	
MFG		SIZE	DWG NO
APPROVED		C	CS-16 A 108
		SCALE	REV
			SHEET 1 OF 1

CS-16 A
AUGER TUBE AND HOPPER
REFERENCE DRAWING # CS-16 A 109

REF NO.	PART NO.	DESCRIPTION	REQ'D NO.
1	N/A	1/4-20 Hex Nut	8
2	N/A	1/4-20 X 5/8 Hex Bolt	8
3	N/A	1/4 Lock Washer	8
4	N/A	5/16-18 X 2 Hex Bolt	4
5	N/A	3/8-16 Hex Nut	1
6	N/A	3/8-16 X 3/4 Hex Bolt	1
7	N/A	3/8 Lock Washer	1
CSP121	CSP121	Hopper Grate and Bag Splitter	1
CSP122	CSP122	Hopper Cover with Hinge	1
POO121	POO121	Boot Clamp	1
POO122	POO122	Discharge Boot	1
POO869	POO869	Pipe Clamp	4
POO1008	POO1008	Hydraulic Tube	2
SSC112	SSC112	Auger Tube and Hopper Assembly	1
SSC113	SSC113	Hydraulic Tube	2

CS-16 A AUGER TUBE AND HOPPER



DRAWN	THenry	11/5/2009	IDEAL MFG., INC.		
CHECKED		7/23/2010	TITLE		
QA			CS-16 A AUGER TUBE AND HOPPER		
MFG					
APPROVED			SIZE	DWG NO	REV
			C	CS-16 A 109	
			SCALE	SHEET 1 OF 1	

OWNER'S MANUAL & PARTS LIST

WINCH MODEL 5352

1500 Lb. (680 kg) Maximum Rated Line Pull

WARNING: THIS EQUIPMENT SHOULD NOT BE INSTALLED, OPERATED OR MAINTAINED BY ANY INDIVIDUAL WHO HAS NOT READ ALL THE CONTENTS OF THIS OWNER'S OPERATING MANUAL.



FAILURE TO READ AND APPLY THE INSTRUCTIONS AND WARNINGS CONTAINED HEREIN CAN RESULT IN SUDDEN FAILURE OF EQUIPMENT, PROPERTY DAMAGE AND SERIOUS INJURY.

I. ASSEMBLY INSTRUCTIONS

- A. **HANDLE.** Insert handle (Item 6, Fig. 1) on threaded brake assembly shaft. Thread handle to point of engagement (touching) of brake pad.
- B. **HANDLE RETAINER ASSEMBLY.** Insert bolt (Item 1, Fig. 1) through lockwasher (Item 2, Fig. 1), flatwasher (Item 3, Fig. 1), spacer (Item 4, Fig. 1) and spring (Item 5, Fig. 1—spring will fit over spacer). Recheck Fig. 1 to insure proper order of assembly. Install bolt containing assembled retainer parts (Fig. 1) into threaded end of brake shaft and tighten bolt securely.

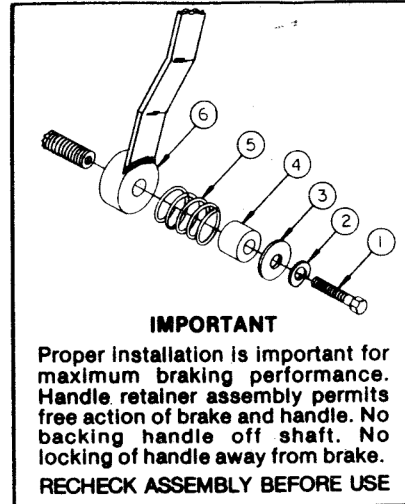


Fig. 1: Handle Retainer Assembly

II. MOUNTING INSTRUCTIONS

- A. This winch is designed to be attached to a mounting plate or structure capable of supporting the load that it is intended to pull (lift).
- B. The winch should be mounted, using three 3/8" dia. S.A.E. Grade 5 bolts (not supplied). Two bolts should attach the winch to the mounting structure utilizing the outside rear holes or slots. The third bolt should be inserted through the winch frame and mounting structure in a manner to utilize the foremost remaining frame slot (hole) (Fig. 3).

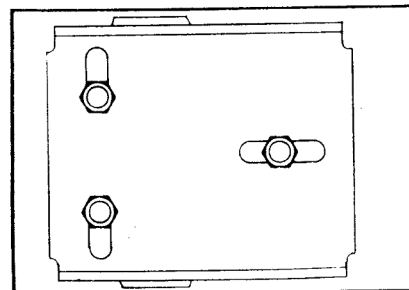


Fig. 3: Mounting Instruction

III. CABLE ASSEMBLY INSTRUCTIONS

- A. **CABLE ATTACHMENT.** Winch model 5352 is designed for up to 95 ft. of 1/4" dia., 7 x 19 galvanized aircraft-quality cable.
1. Feed cable onto top of drum (Item 7, Fig. 2). From inside drum, thread the cable through one round hole in the drum side, until it extends 1-1/2" past the two square holes.
 2. Clamp the cable to the outside of the drum with keeper parts (Items 8,9,10, Fig. 2). Be sure that carriage bolt heads are on the inside of winch drum.

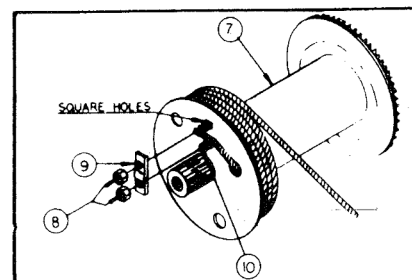


Fig. 2: Cable Installation

CAUTION:

1. Always be sure cable is strong enough to support the load to be lifted.
2. Always inspect cable and attachment hook before each use to insure they are not damaged.
3. Replace cable if worn, frayed or kinked. If cable or hook breaks, the cable can act like a whip and inflict serious injury to anyone in the path of its movement.
4. Never stand alongside winch cable, or guide the cable with your hands.
5. Never fully extend cable and ALWAYS keep three (3) complete wraps of cable around drum.
6. Always be sure cable is pulling straight off winch—not at an angle. This will prevent cable from rubbing against winch drum, avoiding cable damage.

IV. OPERATING PROCEDURE

- A. **TO REEL IN OR LIFT LOAD.** This winch is designed to lift a load (reel in) by turning the hand crank in a clockwise direction. This action will produce a clicking sound inside the winch mechanism. To LOCK the load at any desired position, release handle slowly.
- B. **TO REEL OUT OR LOWER LOAD.** To lower load (reel out), turn the hand crank in a counter-clockwise direction. To LOCK load in any desired position, turn handle crank clockwise until at least two (2) clicks (approximately 8" movement of handle) are heard inside the winch mechanism before releasing handle.

CAUTION: If hand slips off handle while turning counter-clockwise, the brake will prevent the handle from spinning rapidly backwards. NOTE: The brake is not fully locked until the handle is turned clockwise far enough to hear two (2) clicks of the ratchet.

WARNING: Sufficient load must be applied to the cable to overcome internal resistance and operate brake properly. NEVER CONTINUE TURNING THE HANDLE COUNTER-CLOCKWISE IF THE CABLE DOES NOT KEEP MOVING OUT. This will disengage the brake mechanism and can create an unsafe or hazardous condition. MINIMUM OPERATING LOAD REQUIREMENTS - Model 5352 - 100 lbs.

The brake mechanism under continuous long periods of lift and lower movement will get HOT. DO NOT TOUCH BRAKE MECHANISM UNDER THESE CONDITIONS.

V. MAINTENANCE INSTRUCTIONS

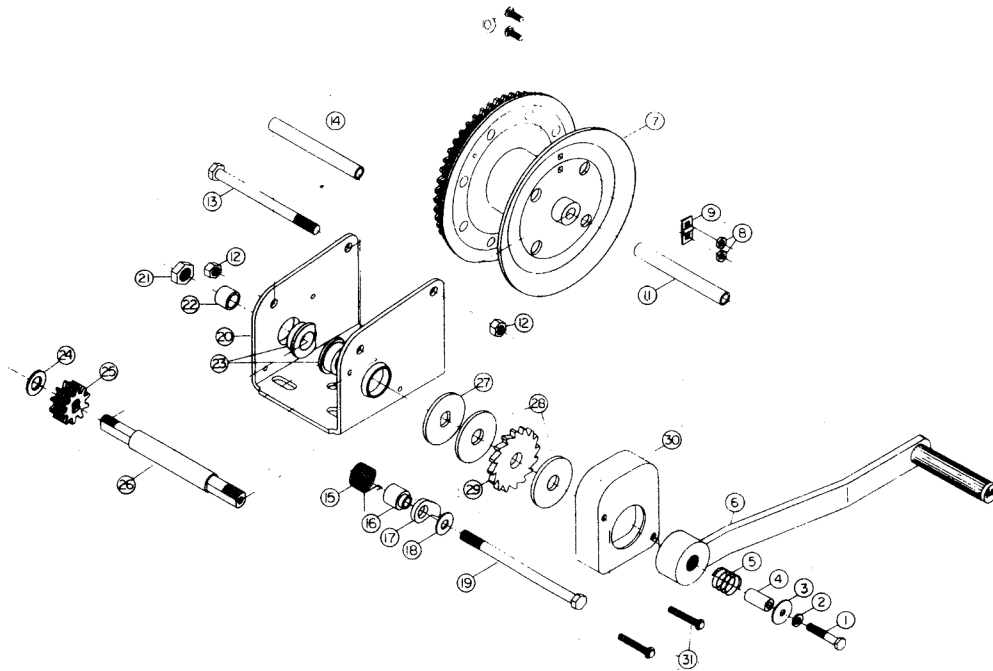
- A. **LUBRICATION.** All gears must be clean and lubricated (auto-type grease) to insure proper and safe operation.
All shafts, bushings and ratchet parts must be clean and wet with oil (auto-type 10W-30) to insure proper and safe operation.
- B. **BRAKE DISC.** Brake disc wear can be inspected by removing handle retainer assembly, handle and brake disc cover. Brake discs should be replaced if the thickness is less than 1/16", cracked or broken. DO NOT USE OIL OR GREASE ON FIBRE BRAKE FACES.

WARNING: If brake disc mechanism operates intermittently or erratically, brake disc inspection should be accomplished.

- C. **BRAKE RATCHET MECHANISM.** Check ratchet operation by listening for "clicking sound" when cable is reeled in (turn handle clockwise). Also, when the cable is reeled out, there will NOT be a clicking sound of the ratchet. Brake ratchet parts can be inspected for worn parts and unsafe conditions by removing handle retainer assembly, handle and disc cover.

CAUTION: CARE MUST BE TAKEN DURING REASSEMBLY TO INSURE THAT ALL PARTS ARE INSTALLED CORRECTLY FOR PROPER OPERATION.

VI. PARTS LIST



ITEM NO.	DESCRIPTION	PART NO.	KIT NO.
1	1/4-20x1 1/2 Hex Screw	0913-03	
2	1/4" Lockwasher	2524-03	
3	1/4" Wide Flatwasher	0917-07	5444-81
4	Handle Retainer Spacer	1907-02	
5	Spring	0940-00	
6	Handle	2089-04	
7	Reel Assembly	0560-05	
8	10-24 Hex Nut (2)	2708-03	
9	Cable Keeper	2704-03	5441-81
10	10-24x5/8 Carriage Bolt (2)	2705-03	
11	Front Frame Spacer	2610-02	
12	3/8 Locknut (2)	1873-03	
13	3/8x5 Reel Bolt	2625-03	
14	Back Frame Spacer	1867-04	
15	Pawl Spring	1909-05	
16	Pawl Spacer	1890-05	

ITEM NO.	DESCRIPTION	PART NO.	KIT NO.
17	Pawl	1891-07	
18	Washer	0904-03	
19	3/8x6 Pawl Bolt	0845-04	
20	Frame	0436-07	
21	9/16 Locknut	0673-03	
22	Bearing	2680-03	
23	Bushing (2)	2679-09	
24	Washer	0229-03	
25	Pinion Gear (5)	0776-03	
26	Pinion Shaft	1870-07	
27	Brake Backup Plate	1878-09	
28	Brake Pad (2)	0846-06	5442-81
29	Hatchet	1906-06	
30	Cover	1915-05	
31	10-32x1 1/2 Cover Screw (2)	2016-03	

Please order by specifying: Model Number
Name of Part or Kit
Part or Kit Number

Replacement parts are available from your dealer or the factory.
If kit number covers a combination of part numbers, parts are sold only by kit number.



CAUTION



THIS WINCH IS NOT DESIGNED TO BE USED FOR HOISTING OR TRANSFER OF PEOPLE OR HOISTING LOADS OVER PEOPLE-OCCUPIED AREAS.

1. NEVER leave a weight hanging by the winch while the winch is unattended, as unauthorized persons may attempt to operate the winch, thereby creating an unsafe condition.
2. NEVER exceed maximum rated line pull (stamped on winch). Exceeding this rating could cause failure of the winch, serious injury to the operator, bystanders and damage to equipment.

NOTE: Maximum rated line pull for Model 5352 is 1500 lbs. (680 kg) for the first layer (minimum of 3 wraps) of line on the drum, and 700 lbs. for full drum rating.

As more line is wrapped on the drum, the mechanical advantage of the winch is reduced and the rating will also be reduced.

3. ALWAYS keep winch maintained in accordance with this instruction sheet. REMEMBER: Worn parts cause unsafe conditions.
4. Winch components can be affected by chemicals, salts and rust and should be examined for unsafe conditions before operating.
5. NEVER alter the mechanics of the winch (Example: do not add to the handle length to make easier lifting.).
6. NEVER use two or more winch units to lift a load that is greater than the load rating of any single unit. A shifting load may place the entire load on one unit, causing sudden failure of equipment, property damage and serious injury.
7. Apply the load evenly. Do not jerk or bounce the load or allow the load to swing. Avoid violent motion and shock loads. This type of operation requires equipment with higher load ratings.
8. Each time a load is to be lifted, test winch for safe operation by lifting the load a few inches first.
9. ALWAYS keep hands away from load-bearing cables, ropes, sheaves, drums and pulleys while operating.

REMAIN CONSTANTLY AWARE THAT SAFE OPERATING IS YOUR RESPONSIBILITY.

LIMITED WARRANTY

Shelby Industries, Division of Prospect Boat Works, Incorporated, warrants its products described herein to be free from defects in material and workmanship to the original purchaser at the date of purchase at retail. If any of these products is found to be defective, it may be replaced or repaired, at the option of Shelby, when returned with proof of purchase to Shelby's manufacturing facility in Shelbyville, Kentucky. The owner shall pay all transportation and shipping charges associated with the return of said product and the returned product shall become the property of Shelby. Where Shelby determines that circumstances are such as to preclude the remedying of warranted defects by replacement or repair, Shelby shall, upon return of the products and proof of purchase, refund owner's purchase price.

In no instance shall Shelby be responsible to repair or replace a product under this limited warranty where said product was improperly installed, altered or misused, including using the product contrary to Shelby's printed instructions or instructions stamped on the product itself.

The foregoing states the sole and exclusive remedy for any breach of warranty or for any other claim based on any defect in or non-performance of, the products, whether sounding in contract, warranty or negligence, or strict liability. Shelby makes no other warranties express or implied, hereby excludes any implied warranties of mechanability or fitness.

Without limiting the generality of the foregoing, Shelby shall under no circumstances be liable for any incidental or consequential loss or damage whatsoever arising out of, or in any way relating to, any such breach of warranty or claimed defect in, or non-performance of, the products.

This limited warranty is designed to fully comply with the terms and provisions of the Magnuson-Moss Warranty Act. Some states may not allow the limitation or exclusion of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

For information or assistance regarding this product, contact your dealer or write to: Customer Service Manager, Shelby Industries, Division of Prospect Boat Works, P.O. Box 308, Shelbyville, Kentucky 40065.

NOTE: THIS PRODUCT COMPLIES WITH REGULATION V-5 AND C.S.A. STANDARD D-264.

NOTE: SOME STATES REQUIRE CLEAR VIEW OF LICENSE. REMOVE BALL WHEN NOT IN USE IF IT RESTRICTS VIEW.

NOTE: THIS PRODUCT COMPLIES WITH SAFETY SPECIFICATION & REQUIREMENTS FOR CONNECTING DEVICES & TOWING SYSTEMS OF THE STATE OF NEW YORK.

**SERVICE INSTRUCTIONS FOR THE WR [255 & 256] SERIES MOTORS**

For Use With Seal Kit: 255222001

dimensions: mm [in]

IMPORTANT NOTE: The WR(255/256) Series Motors depend on the correct orientation of parts as well as correct internal timing for proper motor operation. Before disassembling the motor, it is highly recommended that paint or a marker be used to make a “V” shaped set of lines from the endcover to the housing. This will aid in reassembling the motor components properly. It is also important that the steps involving internal parts timing be followed carefully to insure proper motor operation.

- A) Remove all shaft related components from shaft (15) (i.e. keys, nuts). To aid in reassembly of the motor, make a “V” shaped set of lines from the endcover (11) to the housing using either paint or a marker. With shaft facing down, secure motor in vise by clamping on to the housing (5).
- B) Loosen and remove seven bolts (14) holding motor assembly together. Remove endcover (11). Remove body seal (4) and discard seal. Remove rotor set assembly (9), & wear plate (8). Remove body seals (4) from rotor assembly (9) and housing (5) and discard seals. Remove drive link pin (10) and drive link (7) from motor and lay aside.
- C) Gently tap shaft (15) upward through housing (5) and remove through rear of housing. Remove housing (5) from vise. Collect thrust bearing and thrust washer from the rear of the housing while turning the housing over. Secure the housing in the vise with the flange end facing up. Gently pry dust seal (1) from housing using a small screwdriver and a hammer. Gently remove shaft seal (2) with a small screwdriver and discard it.

At this point, all parts should be cleaned in an oil-based solvent and dried using compressed air (For safety, observe all OSHA safety guidelines). All new seals should be lightly coated in clean oil prior to installation.

- D) Place shaft (15) on a clean flat surface with output end facing up. Place thrust bearing (6) then thrust washer (3) on the shaft. Install shaft seal (2) down onto shaft (15) making sure that lip on seal faces down. (See Figure (1) for shaft component orientation).

NOTE: To turn the WR Series Motors to proper operation, the rotation code of the motor must be known. The rotation code of the motor is 255 (standard) 256 (reverse timed) – the first 3 digits of the model code. If the rotational code is not known, and if port ‘A’ is pressurized, motors that are to have the shafts turning clockwise (as viewed from the shaft end) should be timed using the “255” series and motors that are to have the shafts turning counterclockwise (as viewed from shaft end) should be timed using the “256” series.

- E) Turn shaft (15) over so that output end of the shaft faces down. Lower drive link (7) into shaft making sure that the timing mark end of drive link faces up and that the timing mark on the end of the drive link (7) is aligned to the left of any short, open cutter slot on shaft (15).
- F) Turn housing (5) over so that the pilot of housing faces down and secure housing (5) in vise. Without disturbing the shaft seal (2), and drive link (7), carefully lower shaft assembly into housing. Apply pressure using an arbor press or a rubber mallet to make sure that the shaft end is flush or slightly lower than the housing bolt hole surface.
- G) Place a body seal (4) in groove in the rear surface of the housing (5). Place wear plate (8) on housing. Make sure that the seven valving slots on the wear plate line up with the seven bolt holes on the housing (5).
- H) Place a body seal (4) in the groove in the face of the rotor assembly (9). With the seal groove surface on the rotor assembly facing wear plate, lower rotor assembly (9) onto drive link (7) making sure that the timing mark on drive link is aligned with a peak on the rotor (9) for 256 series, or with a valley on the rotor (9) for 255 series (See Figure (2)). After assembling the rotor assembly on the drive link rotate the rotor assembly to line up the assembly bolt holes. Insert drive link pin (10) into end of drive link (7) making sure that concave or the indented end faces up.
- I) Place remaining body seal (4) in groove in endcover (11). Place endcover (11) onto motor making sure that end of drive link pin (10) is in hole in center of end cover (11). There is no specific orientation to assemble the end cover on the motor.
- J) Install one washer (13) on each bolt (14) from the threaded end side. Insert seven assembly bolts (14) with washers (13) into bolt holes and pre-torque to 13.6 Nm [10 ft. lb.]. Using a crisscross pattern, final torque bolts to 60 Nm [44 ft. lb.].
- K) Remove motor from vise and place on work surface with shaft (15) facing up. Making sure that lip on dust seal (1) faces up, place dust seal (1) over shaft (15). Using a sleeve and hammer, carefully drive dust seal (1) into place.

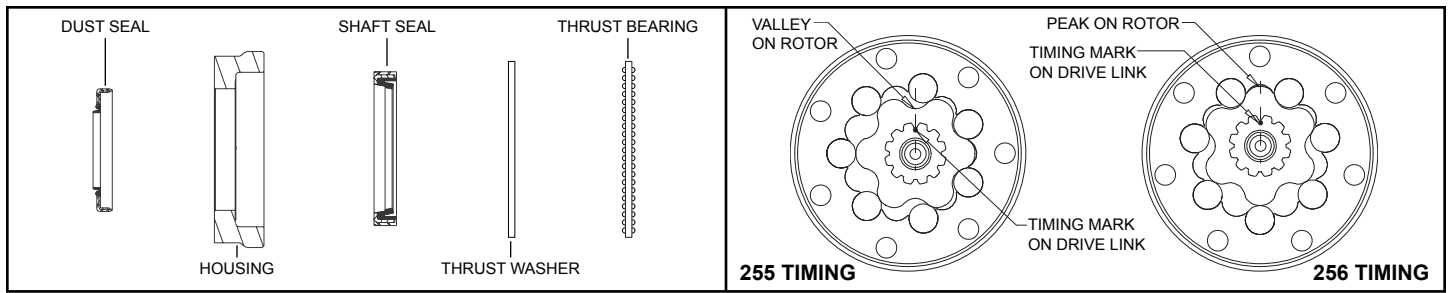
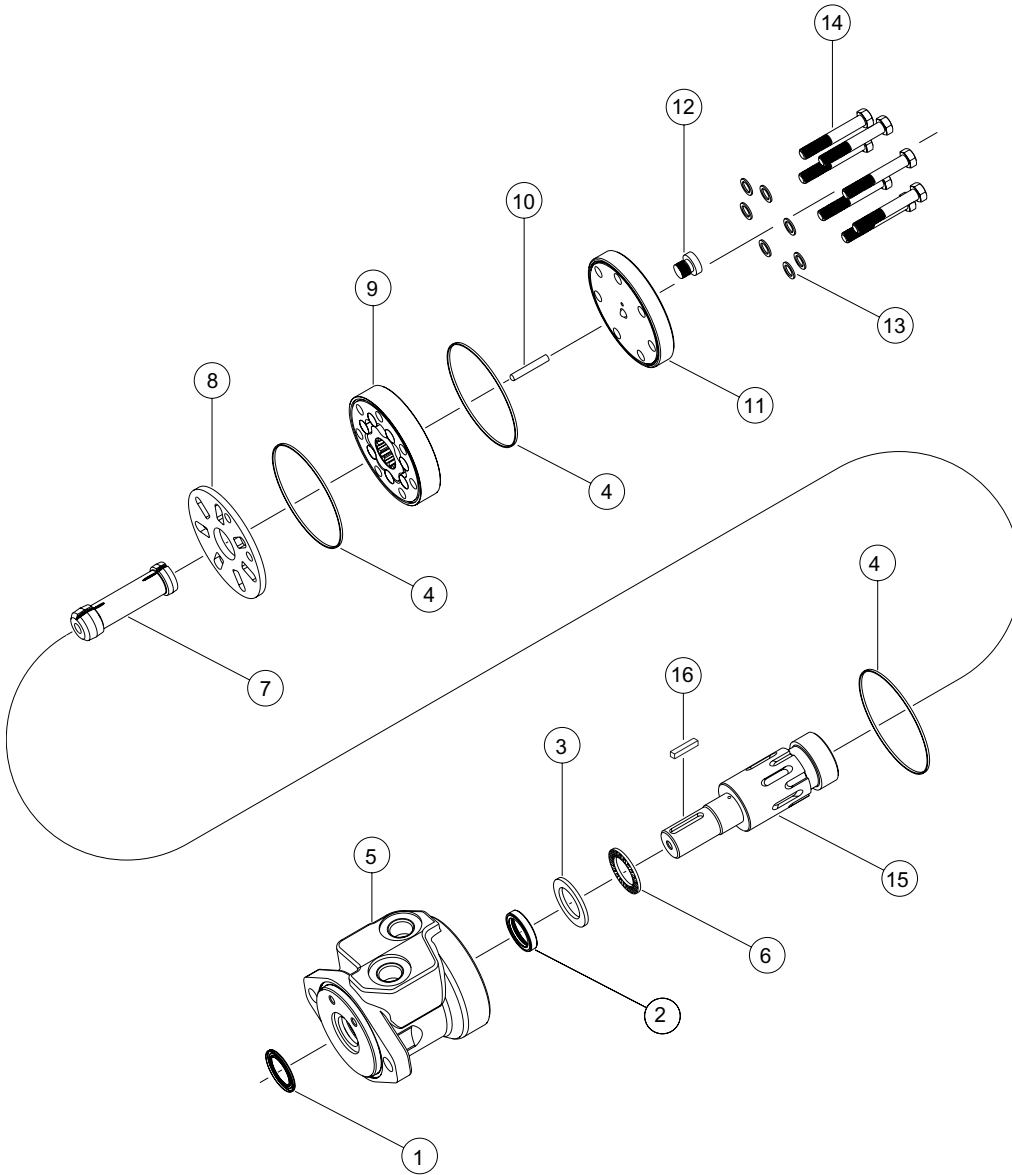


FIGURE 1

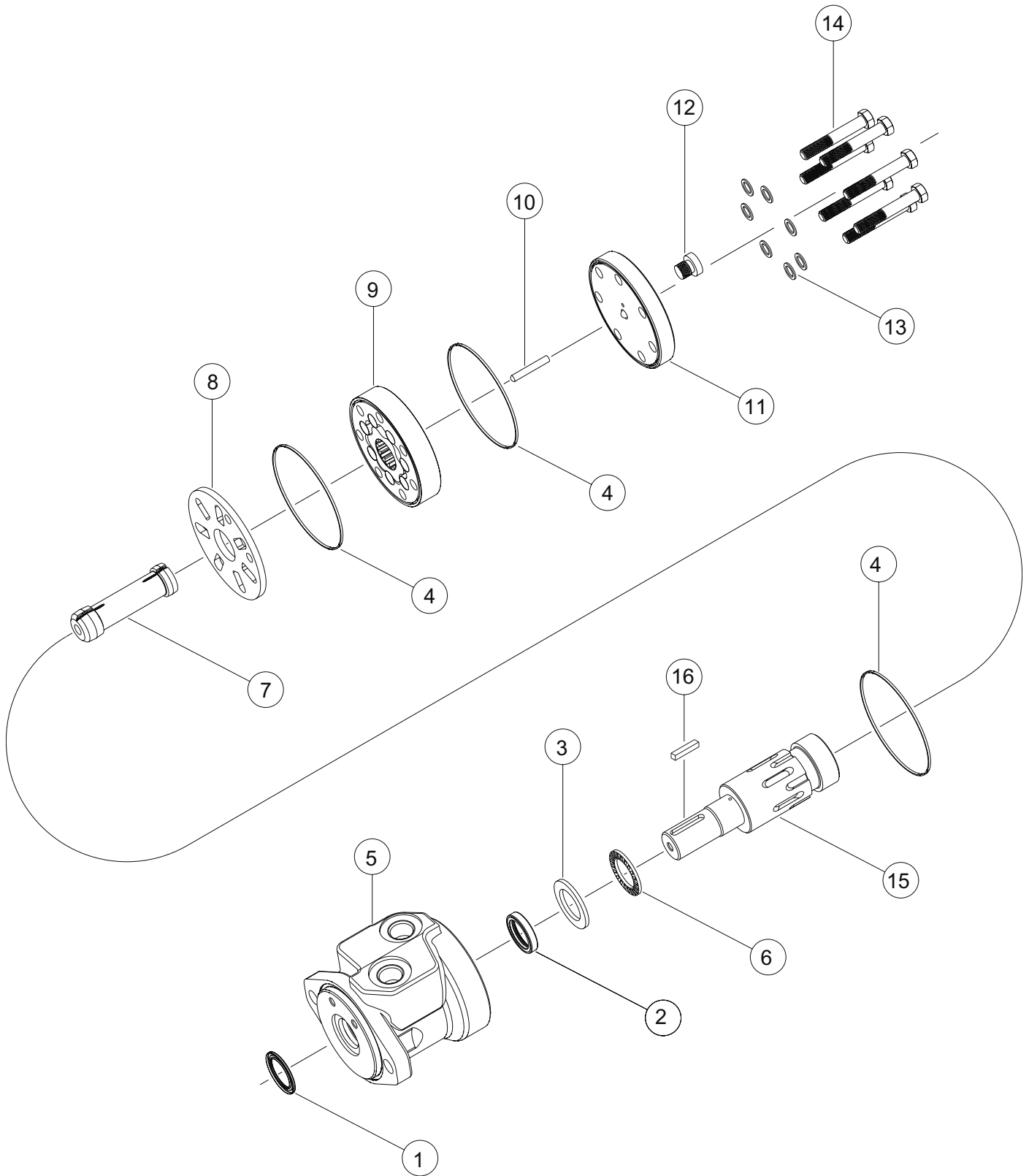
FIGURE 2



1. * Dust Seal
2. * Shaft Seal
3. * Thrust Washer
4. * Body Seals (3)
5. Housing
6. Thrust Bearing
7. Drive Link
8. Wear Plate
9. Rotor Assembly
10. Drive Link Pin
11. Endcover
12. Endcover Plug
13. Assembly Bolt Washers (7)
14. Assembly Bolts (7)
15. Shaft
16. Shaft Key

* Contained in Seal Kit 255222001

WR (255) SERIES MOTOR



WR (255) SERIES MOTOR COMPONENTS

SEAL KIT 25522001

DESCRIPTION	EXP VIEW ITEM #	KIT
DUST SEAL	1	ITEMS #1-4 INCLUDED IN SEAL KIT: 25522001
SHAFT SEAL	2	
THRUST WASHER	3	
BODY SEALS (3)	4	
		25522001EG - SEAL KIT INCLUDES ITEM #1-4 SHAFT SEAL IS VITON

MISCELLANEOUS KITS

DESCRIPTION	EXPLODED VIEW ITEM #	KIT
THRUST BEARING	6	255018011
WEAR PLATE	8	255012001
ENDCOVER WITH BSP.F DRAIN	11	255016004
ENDCOVER WITH SAE DRAIN	11	255016005
SAE STEEL PLUG	12	500018186
BSP.F STEEL PLUG	12	300018084
BOLT WASHER SET	13	255018701
1000 PSI RELIEF VALVE	NOT SHOWN	500018228
2000 PSI RELIEF VALVE	NOT SHOWN	500018231
3/4-28 SLOTTED NUT	NOT SHOWN	200229300
3/4-28 LOCK NUT	NOT SHOWN	200018077

ROTORS, DRIVE LINKS AND SPACERS, AND BOLTS

WHEN CHANGING MOTOR DISPLACEMENTS, A MATCHING DRIVE LINK KIT, DRIVE LINK PIN KIT, AND BOLT SET KIT MUST ALSO BE ORDERED.

EXPLODED VIEW ITEM #	9	9	7	10	14
DISPLACEMENT	STANDARD ROTOR KIT	FREETURN ROTOR KIT	DRIVE LINK KIT	DRIVE LINK PIN KIT	BOLT SET KIT
040	255027003	---	200014002	200224003	255018101
060	255037003	---	200014002	200224008	255018102
070	255047003	---	200014001	200224005	255018102
090	255057003	---	200014001	200224006	255018103
100	255997003	---	200014001	200224008	255018103
115	255077003	---	200014003	200224008	255018104
130	255087003	---	200014003	200224010	255018104
160	255107003	---	200014003	200224012	255018105
200	255127003	---	200014003	200224014	255018106
240	255147003	---	200014003	200224018	255018107
320	255207003	---	200014003	200224024	255018108
400	255247003	---	200014003	255018019	255018109

HOUSING KITS

(EXPLODED VIEW ITEM #5)

BECAUSE THE HOUSING AND SHAFT ARE MATCH GROUND AS A SET TO EXTREMELY TIGHT TOLERANCES AT THE FACTORY, WHITE DRIVE PRODUCTS DOES NOT RECOMMEND THAT INDIVIDUAL HOUSINGS OR SHAFTS BE ORDERED TO REPAIR A MOTOR. IT IS RECOMMENDED THAT A MATCHED SET BE ORDERED. TO ORDER A MATCHED HOUSING/SHAFT KIT, PLEASE CONTACT A WHITE DRIVE PRODUCTS CUSTOMER SERVICE REPRESENTATIVE

DESCRIPTION	HOUSING KIT	DESCRIPTION	HOUSING KIT
#A63 - 2-HOLE OFFSET MANIFOLD 1/2" BSP.F (TP)	255013101	#A33 - 4-HOLE OFFSET MANIFOLD 1/2" BSP.F	255013127
#A62 - 2-HOLE MANIFOLD 1/2" BSP.F (TP)	255013102	#F33 - 4-HOLE OFFSET MANIFOLD 1/2" BSP.F	255013116
#A62 - 2-HOLE MANIFOLD 1/2" BSP.F (TP) W/RELIEF	255013103	#F38 - 4-HOLE ALIGNED PORTS 1/2" BSP.F	255013117
#A13 - 2-HOLE OFFSET MANIFOLD 1/2" BSP.F	255013105	#F30 - 4-HOLE ALIGNED PORTS 1/2" NPT	255013118
#A12 - 2-HOLE OFFSET PORTS 1/2" BSP.F	255013106	#F37 - 4-HOLE MANIFOLD PORTS	255013119
#A1D - 2-HOLE OFFSET MANIFOLD 7/8" O-RING	255013107	#G37 - 4-HOLE MANIFOLD PORTS METRIC TAP	255013120
#A11 - 2-HOLE FRONT PORTS 7/8" O-RING	255013109	#F39 - 4-HOLE 7/8" O-RING PORTS W/RELIEF	255013121
#A10 - 2-HOLE FRONT PORTS 7/8" O-RING	255013110	#F31 - 4-HOLE ALIGNED PORTS 7/8" O-RING	255013122
#A17 - 2-HOLE MANIFOLD PORTS 1/2" DRILLED	255013111	#F3D - 4-HOLE OFFSET MANIFOLD 7/8" O-RING	255013123
#AC3 - 4-HOLE OFFSET MANIFOLD 1/2" BSP.F (TP)	255013112	#G38 - 4-HOLE ALIGNED 1/2" BSP.F METRIC TAP	255013126
#A3D - 4-HOLE OFFSET MANIFOLD 7/8" O-RING	255013113	#B11 - 2-HOLE ALIGNED PORTS 7/8" O-RING	255013124
#A31 - 4-HOLE FRONT PORTS 7/8" O-RING	255013114	#B18 - 2-HOLE ALIGNED PORTS 1/2" BSP.F	255013125
#A30 - 4-HOLE FRONT PORTS 1/2" NPT	255013115		

SHAFTS AND RELATED COMPONENTS KITS

SHAFT KITS COME WITH RELATED SHAFT COMPONENTS (i.e. keys, nuts, etc.) TO ORDER INDIVIDUAL KEYS, USE THE KEY KIT NUMBER. TO ORDER NUT KITS (FOR #13 SHAFT), SEE MISCELLANEOUS KITS LIST ABOVE.

EXPLODED VIEW ITEM #	15	16
DESCRIPTION	SHAFT KIT	KEY KIT
#05- 1" WITH .373 PINHOLE	255011004	---
#53- 1" WITH .406 PINHOLE	255011005	---
#10- 1" STRAIGHT (5/16-18 UN TAP)	255011001	255018200
#02- 6-B SPLINE (5/16-18 UN TAP)	255011008	---
#01- 13 TOOTH SPLINE	255011011	---
#12- 25MM STRAIGHT	255011006	255018201
#13- 1" TAPERED	255011013	255018203
#B1- 25MM STRAIGHT W/ WOODRUFF KEY	255011016	255018205
#04- 6-B SPLINE (M8x1.25 TAP)	255011009	---
#98- 1" STRAIGHT (3/8-16UNC-2B)	255011017	255018200
#66- 1" WITH 8MM PINHOLE	255011003	---
#15- 1" STRAIGHT SPEED SENSOR	255011014	255018200
#16- 25MM STRAIGHT SPEED SENSOR	255011015	255018201
#11- 1" STRAIGHT (M8x1.25 TAP)	255011002	255018200

HOUSING/SHAFT KITS

HOUSING/SHAFT KITS COME WITH ITEMS 5, 15, & 16

TO ORDER A MATCHED HOUSING/SHAFT KIT, PLEASE CONTACT A WHITE DRIVE PRODUCTS CUSTOMER SERVICE REPRESENTATIVE.

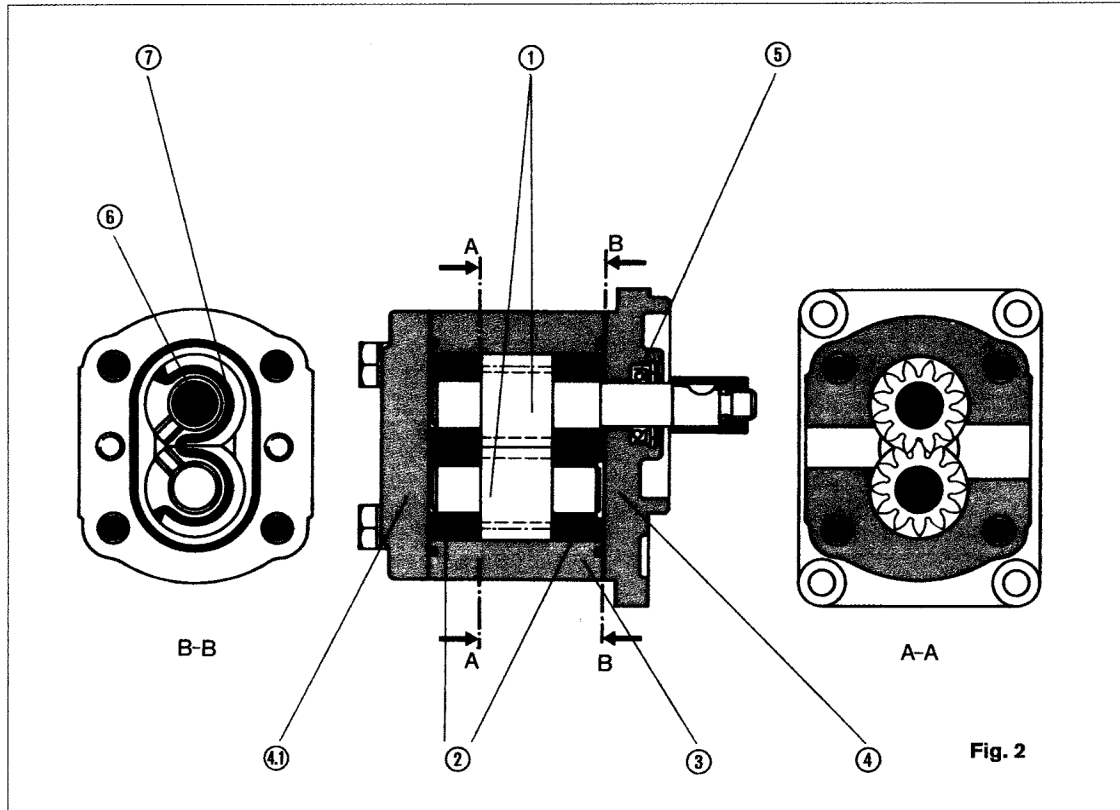


Fig. 2

There is no doubt that the gear-type pump is the most widely used design in hydraulic systems. It is simple in construction, reliable in operation and the most cost-effective way of generating hydraulic pressure.

Bosch Rexroth has been involved with the design, development and manufacture of gear pumps for many decades. Well-proven designs, the use of specially developed materials, constant testing and sophisticated mass production techniques ensure products of the very highest quality. Universal application is assured by a carefully graded range of sizes and a variety of different design options.

Basic design

The pump (see FIG. 2) consists essentially of a pair of gears ① supported in bearings ② and the body ③ with front and rear covers ④ and ④. The drive shaft protrudes from the front cover where it is sealed by the shaft seal ⑤.

The bearing forces are absorbed by special bearing-bushings with sufficient elasticity to produce surface contact instead of line contact ⑥. They also assure good operation under emergency conditions especially at low speed.

The gears have 12 teeth and this keeps both flow pulsation and noise emission to a minimum.

The internal sealing is pressure-sensitive, which provides optimum efficiency.

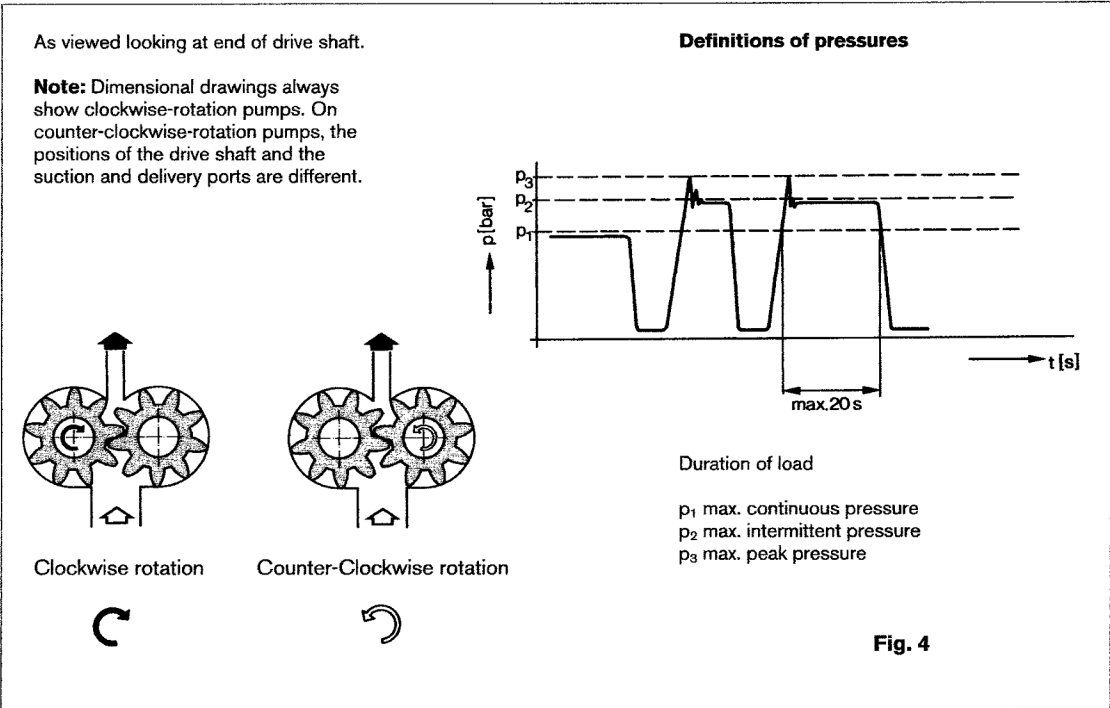
The bearings provide the seal at the ends of the gaps between the teeth, which carry the pressurized oil ②. The sealing zone between the gear teeth and the bearings is controlled by the admission of operating pressure to the rear of the bearings. Special seals ⑦ form the boundary of the zone. The radial clearance at the tips of the gear teeth is sealed by forcing them against the body.

Specifications & Ratings

General	
Construction	external gear-type pump
Mounting	flange or through-bolting with pilot
Line connections	screw, flange
Direction of rotation (Fig. 4)	clockwise or counter-clockwise The pump may only be driven in the direction indicated.
Mounting position	any
Ambient temperature range	-15 °C to +60 °C (+5°F to 140°F)
Fluid	mineral oil-based hydraulic fluids to DIN/ISO, other fluids to order
Viscosity – centistokes (mm ² /s)	12 ... 800 mm ² /s permitted range 20 ... 100 mm ² /s recommended range ... 2000 mm ² /s max. cold start
Fluid temperature range	-15 °C to +80 °C (+5°F to 176°F)
Filter **) (further informations see page 27)	contamination class 10 to NAS 1638 obtained with filter β ₂₅ = 75

**) During the application of control systems or devices with critical counter-reaction, such as steering and brake valves, the type of filtration selected must be adapted to the sensitivity of these devices/systems.

Safety requirements pertaining to the whole system are to be observed.
In the case of applications with high numbers of load cycles please check.



Drive arrangements

1. Flexible couplings

The coupling must not transfer any radial or axial forces to the pump.

The maximum radial runout of shaft pilot is 0.2 mm. Refer to the fitting instructions provided by the coupling manufacturer for details of the maximum permitted shaft misalignment.

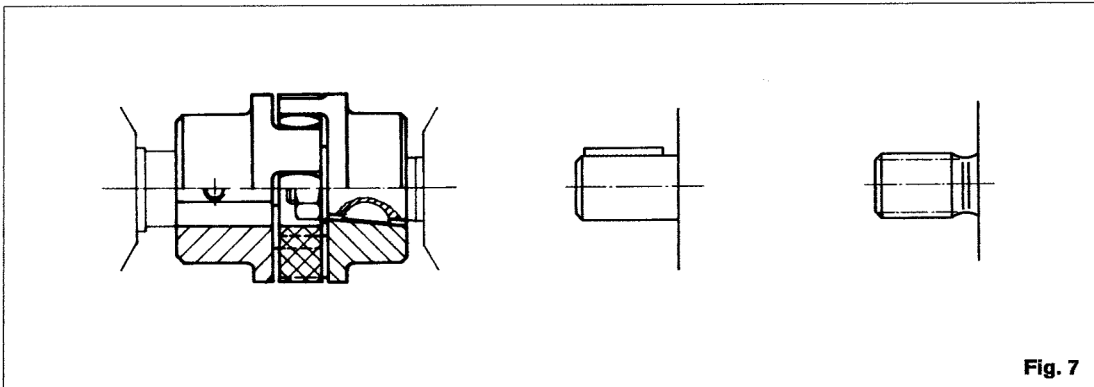
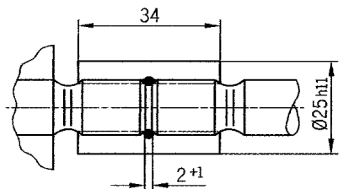


Fig. 7

2. Sleeve couplings

Used on shafts with DIN or SAE splining. **Note:** There must be no radial or axial forces exerted on the pump or sleeve coupling. The sleeve must be free to move axially. The distance between the pump shaft and drive shaft must be 2^{+1} . Oil-bath or oil-mist lubrication is necessary.



Size
B 17 x 14 DIN 5482
 $M_{\max} = 190 \text{ Nm}$

3. Tang Drive (Ref. Fig. 8 & 9)

For the close-coupling of pumps to engines, gearboxes, etc. the pump shaft has a special drive dog which combines with a center coupling ③ (included with the pumps). There is no shaft seal.

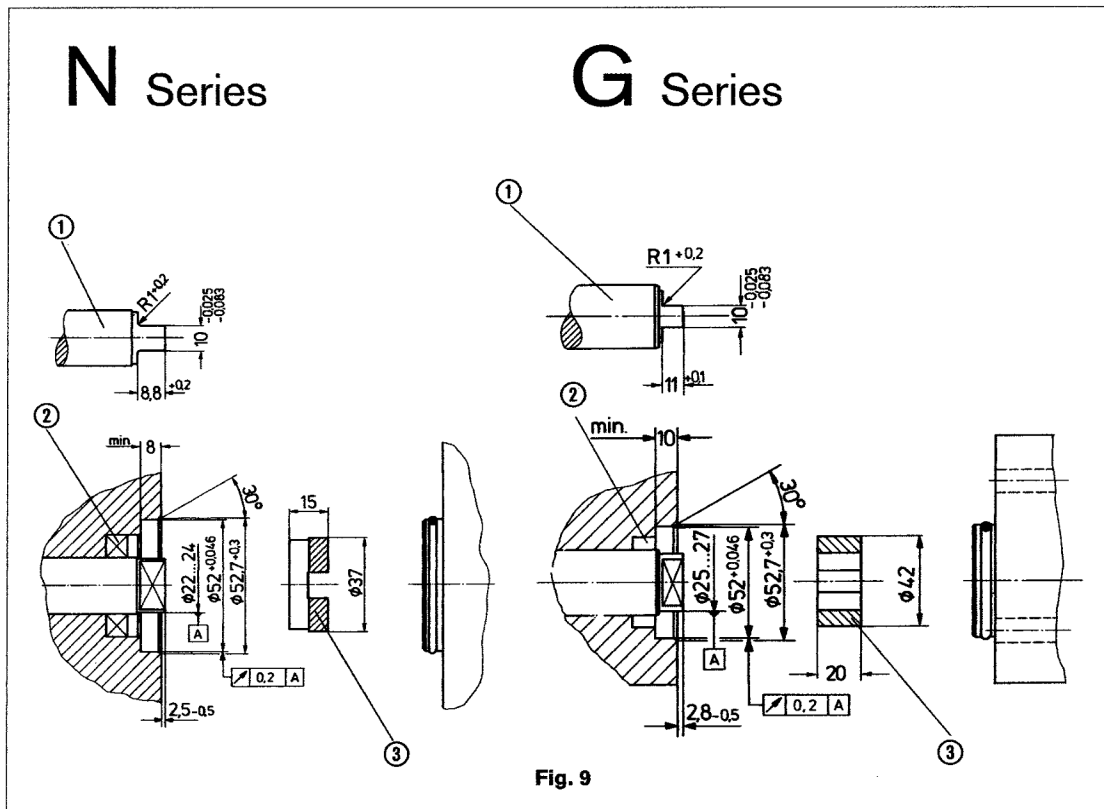
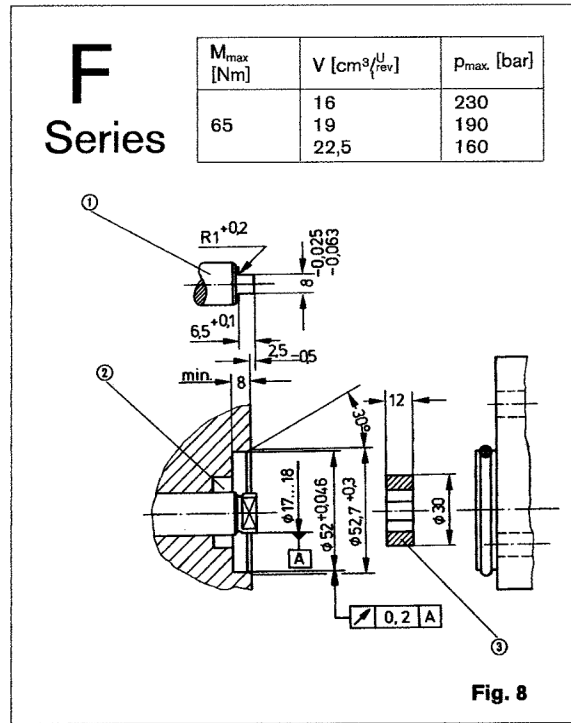
The recommended arrangements and dimensions for the drive end and sealing are as follows.

① **Drive shaft**

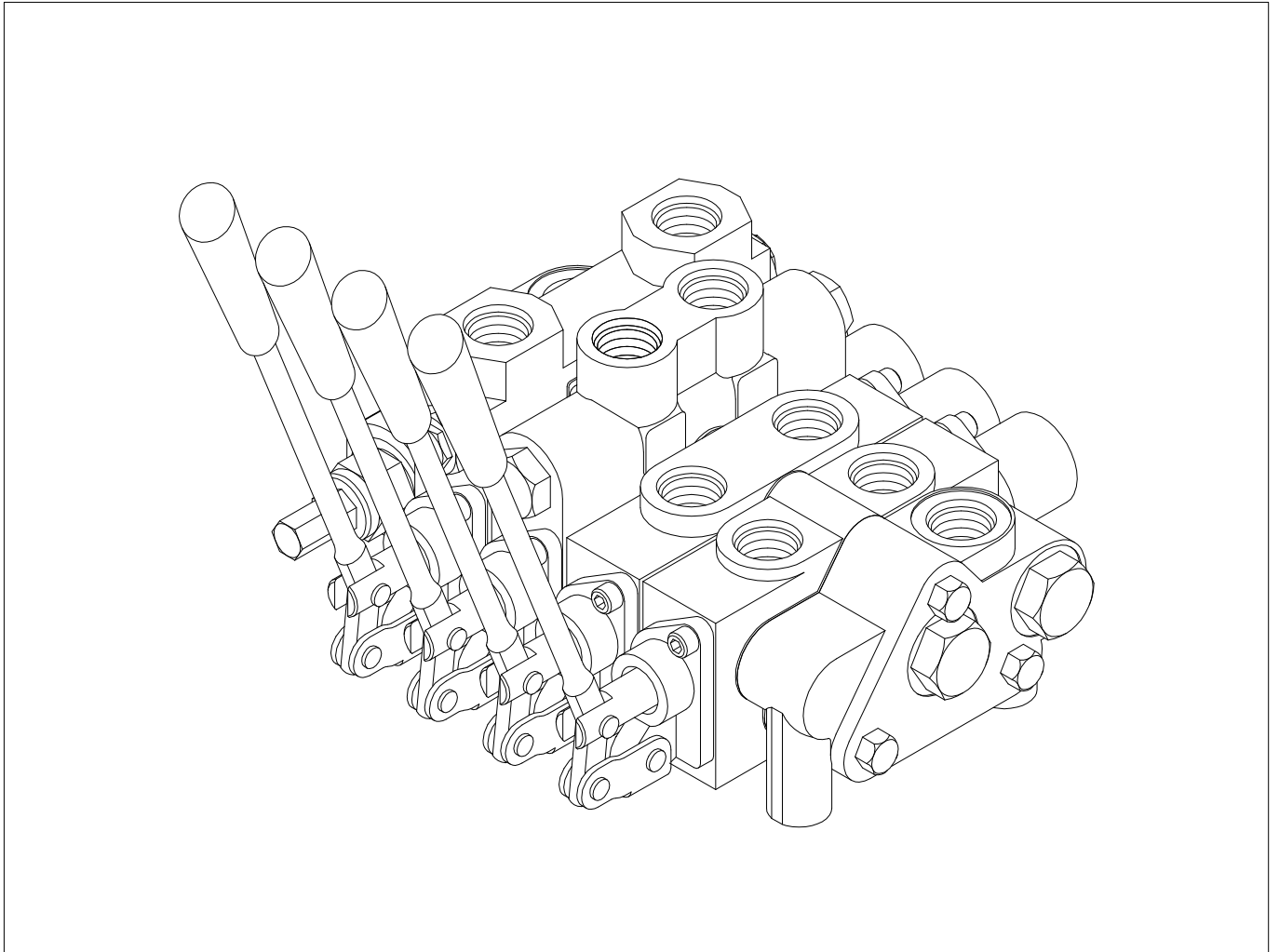
Case-hardening steel DIN 17 210
 e.g. 20 Mn CrS 5
 case-hardened 0.6 deep; HRC 60 ±3.
 Surface for sealing ring
 ground without rifling $R_t \leq 4\mu\text{m}$

② **Radial shaft seal**

Rubber-covered seal (see DIN 3760, Type AS or double-lipped ring).
 Cut 15° chamfer or fit shaft seal with protective sleeve.



MODEL SV
SECTIONAL BODY
DIRECTIONAL CONTROL VALVE
PARTS MANUAL



PRINCE MANUFACTURING CORPORATION



2ND EDITION

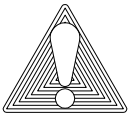
INDEX
PAGE

2	SAFETY PRECAUTIONS
3	ASSEMBLY INSTRUCTIONS PORT ID AND SPECS
4-8	WORK SECTIONS
9	SPOOL I.D. CHART
10	PORT RELIEF CARTRIDGES
11-15	SPOOL ATTACHMENT OPTIONS
16-17	JOYSTICK HANDLE
18-20	HANDLE OPTIONS
21-22	INLET AND OUTLET SECTIONS
23-25	SOLENOID OPERATED SECTIONS
26	INSTALLATION EXAMPLE

GENERAL SAFETY PRECAUTIONS FOR HYDRAULIC VALVES

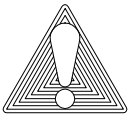
1) ALL HYDRAULIC VALVES MUST BE PROPERLY INSTALLED INTO THE HYDRAULIC SYSTEM TO PREVENT PERSONAL INJURY AND/OR PROPERTY DAMAGE. FURTHER, THE IMPROPER SERVICING OF A VALVE MAY RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE. PLEASE READ AND UNDERSTAND ALL CATALOG AND SERVICE INFORMATION BEFORE STARTING. AS WITH ALL MECHANICAL WORK THE PROPER TOOLS, KNOWLEDGE, AND SAFETY EQUIPMENT ARE REQUIRED. ALWAYS WEAR SAFETY GLASSES.

2) MAKE SURE ALL PRESSURE HAS BEEN RELIEVED IN THE HYDRAULIC LINES BEFORE INSTALLING OR SERVICING A HYDRAULIC VALVE.



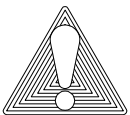
WARNING: ESCAPING HYDRAULIC FLUID UNDER PRESSURE CAN HAVE SUFFICIENT FORCE TO PENETRATE SKIN, CAUSING SERIOUS PERSONAL INJURY. DO NOT USE YOUR HAND TO CHECK FOR HYDRAULIC LEAKS.

3) BEFORE INSTALLING OR SERVICING A HYDRAULIC COMPONENT MAKE SURE ALL WEIGHT HAS BEEN REMOVED FROM THE CYLINDERS OR MOTORS BEFORE DISCONNECTING HYDRAULIC LINES.

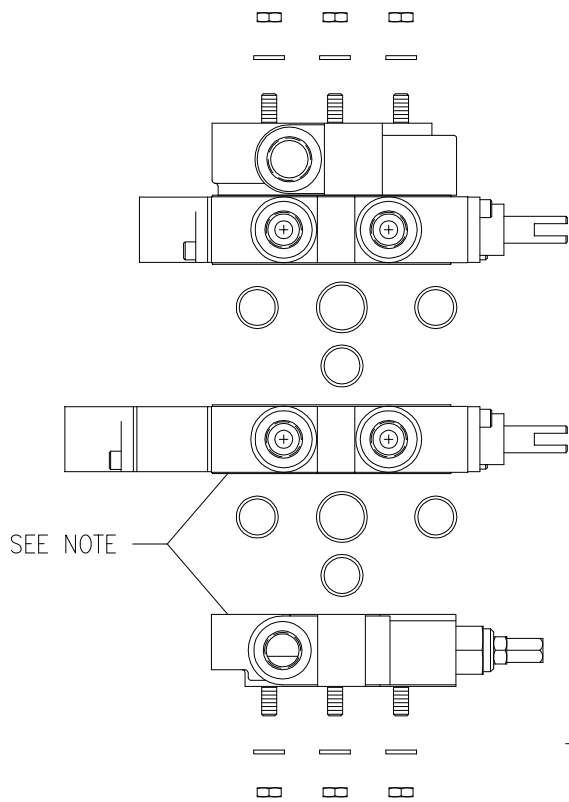


WARNING: DISCONNECTING THE HYDRAULIC LINES WHILE THE CYLINDER OR MOTOR IS UNDER LOAD MAY RESULT IN THE UNEXPECTED RAPID MOVEMENT OF MACHINE RESULTING IN SERIOUS PERSONAL INJURY.

4) DO NOT EXCEED THE OPERATING SPECIFICATIONS FOR PRESSURE, FLOW OR TEMPERATURE. ALL HYDRAULIC SYSTEMS REQUIRE A MEANS TO LIMIT THE MAXIMUM PRESSURE. THIS REQUIRES EITHER A PRESSURE RELIEF VALVE IN THE SYSTEM OR A PUMP THAT HAS PRESSURE COMPENSATION.



WARNING: OVERPRESSURE MAY CAUSE SUDDEN AND UNEXPECTED FAILURE OF A COMPONENT IN THE HYDRAULIC SYSTEM RESULTING IN SERIOUS PERSONAL INJURY. ALWAYS USE A GAUGE WHEN ADJUSTING A RELIEF VALVE.



ASSEMBLY INSTRUCTIONS

1. INSTALL NUTS AND LOCKWASHERS ON ONE END OF EACH TIEROD.
2. INSERT TIERODS THROUGH HOLES IN THE INLET SECTION
3. POSITION THE INLET SECTION WITH TIERODS INSTALLED ON ITS SIDE SO TIERODS ARE VERTICAL. PLACE O-RINGS INTO GROOVES.
4. SLIDE THE WORK SECTIONS DOWN THE TIERODS AND POSITION OVER THE INLET SECTION. PLACE O-RINGS INTO GROOVES ON WORK SECTION.
5. REPEAT FOR REMAINING WORK SECTIONS AND OUTLET. MAKE CERTAIN O-RINGS STAY IN GROOVES DURING ASSEMBLY.
6. INSTALL NUTS AND LOCKWASHERS. PROGRESSIVELY TIGHTEN TIERODS TO 150 IN-LBS \pm 6 IN-LBS (12.5 FT-LBS \pm 0.5 FT-LBS)
7. INSTALL HANDLES AND OPERATE SPOOLS. MAKE CERTAIN THAT SPOOLS DO NOT BIND AND THAT SPOOLS WITH SPRING CENTER RETURN TO NEUTRAL.
8. IF A SPOOL BINDS LOOSEN TIEROD NUTS. RETORQUE ALL NUTS TO 8 THEN 10 AND FINALLY 12.5 FT-LBS.
9. IF A SPOOL STILL BINDS CHECK FOR A SMASHED O-RING OR CONTAMINATION BETWEEN THE SECTIONS.

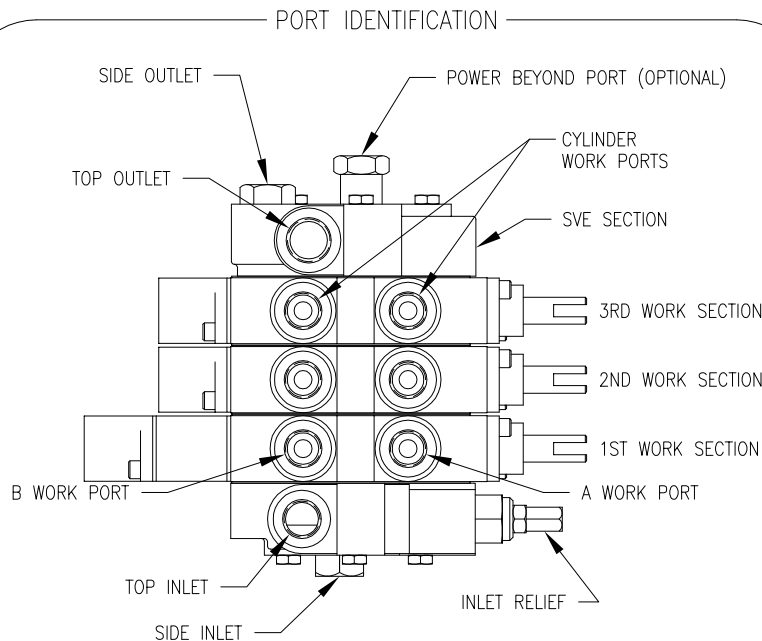
TIEROD KITS

PART NO.		PART NO.	
660401001	1 SECTION*	660401005	5 SECTION*
660401002	2 SECTION*	660401006	6 SECTION*
660401003	3 SECTION*	660401007	7 SECTION*
660401004	4 SECTION*	660401008	8 SECTION*

*NUMBER OF WORK SECTIONS

PLEASE NOTE:

BE VERY CAREFUL NOT TO NICK OR SCRATCH THE PRECISION GROUND SURFACES ON THE SECTIONS. ALSO TAKE CARE TO KEEP THESE SURFACES CLEAN DURING ASSEMBLY.



PLEASE NOTE:

UNUSED INLET AND OUTLET PORT MUST BE PLUGGED WITH STEEL PLUG. WHEN OPTIONAL POWER BEYOND IS USED AN OUTLET PORT MUST ALSO BE CONNECTED TO TANK.

MODEL SV SPECIFICATIONS

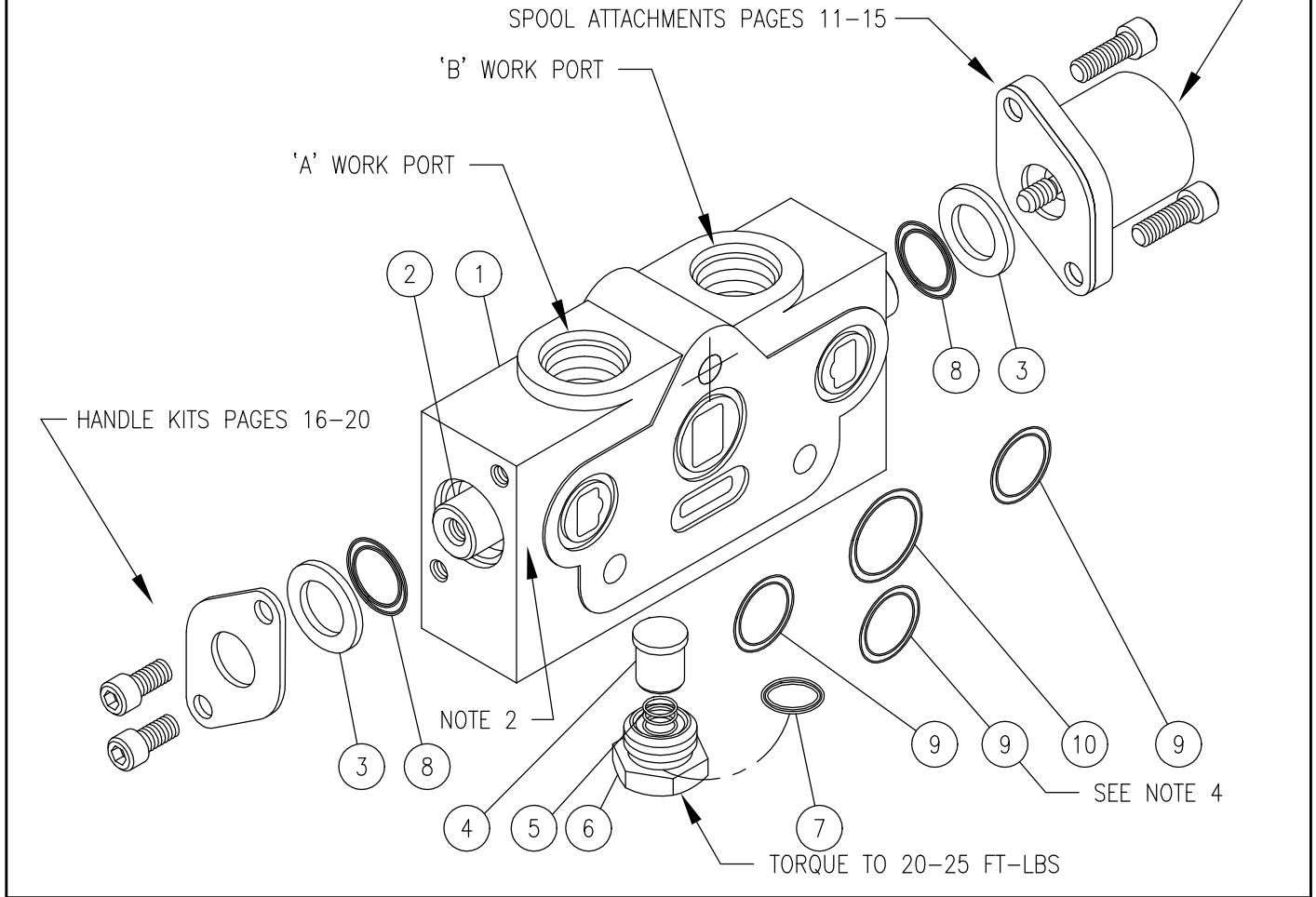
MAXIMUM OPERATING PRESSURE.....3000 PSI
 MAXIMUM TANK PRESSURE.....500 PSI
 MAXIMUM OPERATING TEMPERATURE.....180°F
 RECOMMENDED SYSTEM FILTRATION.....10 MICRON
 NOMINAL FLOW RATING.....12 GPM
 REFER TO CATALOG FOR PRESSURE DROPS

WORK SECTIONS SWW, SVH, SVL, SVM AND SVR ARE PARALLEL CIRCUIT CONSTRUCTION. WORK SECTION SVS IS SERIES CIRCUIT CONSTRUCTION.



SVW

MODEL NO. STAMPED ON END OF END CAP



SVW WORK SECTION

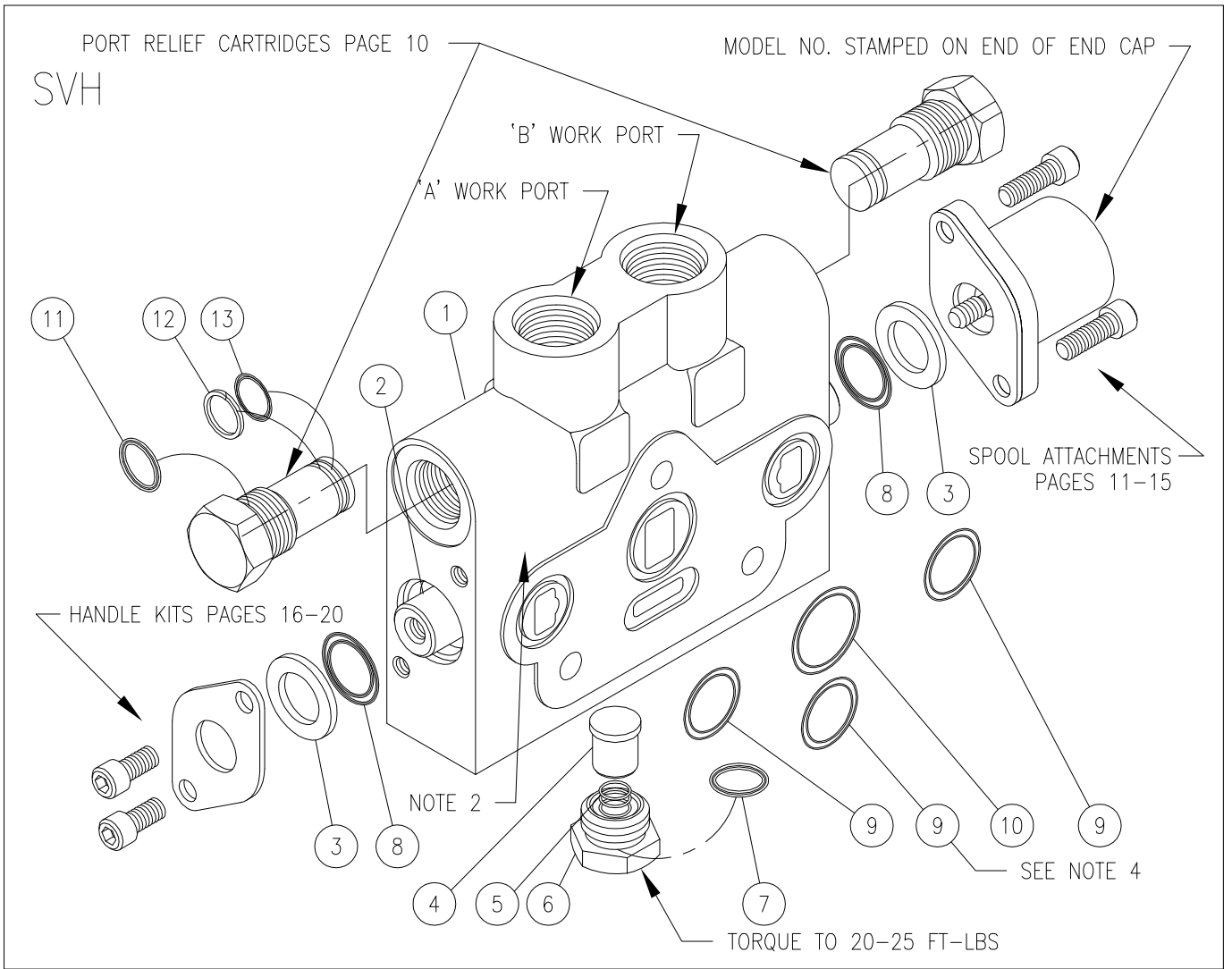
SVW WORK SECTION

ITEM	QTY	PART NO.	DESCRIPTION
1	1		VALVE BODY
2	1	SEE NOTE 1	SPOOL
3	2	670500045	SPOOL BACKUP WASHER
4	1	670100008	LOAD CHECK POPPET
5	1	670300029	SPRING
6	1	671600049	LOAD CHECK PLUG
7	1	240000908	908 O-RING
8	2	240000208	208 O-RING
9	3	240000018	018 O-RING
10	1	240000021	021 O-RING

} These are matched parts and are not sold separately.
 } LOAD CHECK KIT, NO. 660180052
 } SWW REPLACEMENT SEAL KIT NO. 660580001
 } REPLACEMENT SEAL KIT, NO. 660580004

NOTES:

1. SEE SPOOL IDENTIFICATION CHART ON PAGE 9
2. C-575 CAST ON SIDE OF BODY INDICATES SVW SECTION
3. 3 WAY SECTIONS, SPOOL OPTION 'A', HAVE STEEL PLUG PART NO. 200300040 IN 'A' WORK PORT.
4. THIS O-RING GOES INTO THE OVAL COUNTERBORE IN THE SIDE OF THE VALVE BODY.



SVH PORT RELIEF WORK SECTION

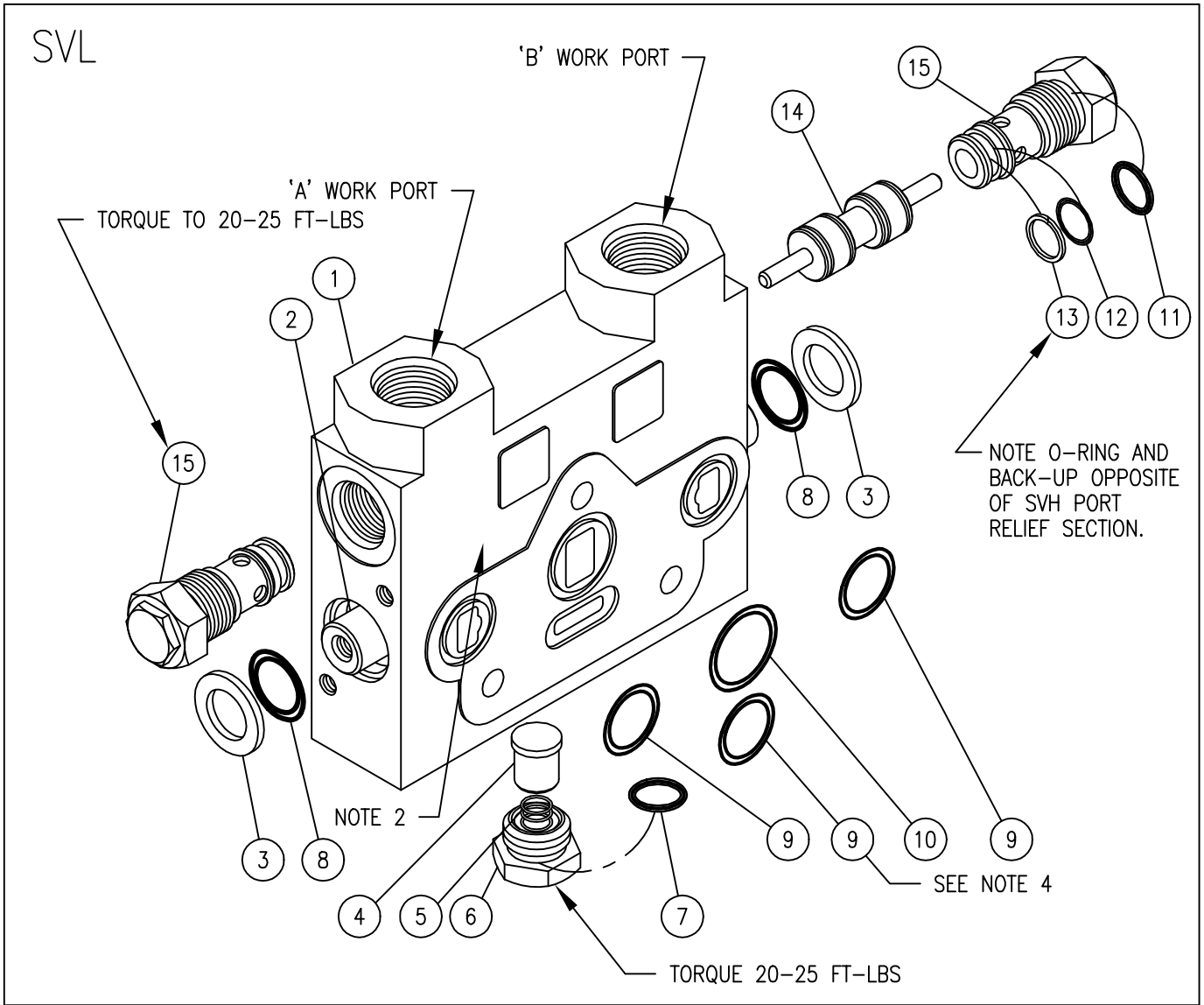
SVH PORT RELIEF WORK SECTION

ITEM	QTY	PART NO.	DESCRIPTION
1	1		VALVE BODY
2	1	SEE NOTE 1	SPOOL
3	2	670500045	SPOOL BACKUP WASHER
4	1	670100008	LOAD CHECK POPPET
5	1	670300029	SPRING
6	1	671600049	LOAD CHECK PLUG
7	1	240000908	908 O-RING
8	2	240000208	208 O-RING
9	3	240000018	018 O-RING
10	1	240000021	021 O-RING
11	2	240000908	908 O-RING
12	2	240019014	BACK-UP WASHER
13	2	240000014	014 O-RING

} These are matched parts and are not sold separately.
 } LOAD CHECK KIT, NO. 660180052
 } REPLACEMENT SEAL KIT, NO. 660580004
 } SVH REPLACEMENT SEAL KIT NO. 660580010

NOTES:

1. SEE SPOOL IDENTIFICATION CHART ON PAGE 9
2. C-589 CAST ON SIDE OF BODY INDICATES PORT RELIEF SECTION BODY
3. 3 WAY SECTIONS, SPOOL OPTION 'A', HAVE STEEL PLUG PART NO. 200300040 IN 'A' WORK PORT.
4. THIS O-RING GOES INTO THE OVAL COUNTERBORE IN THE SIDE OF THE VALVE BODY.



SVL LOCK VALVE WORK SECTION

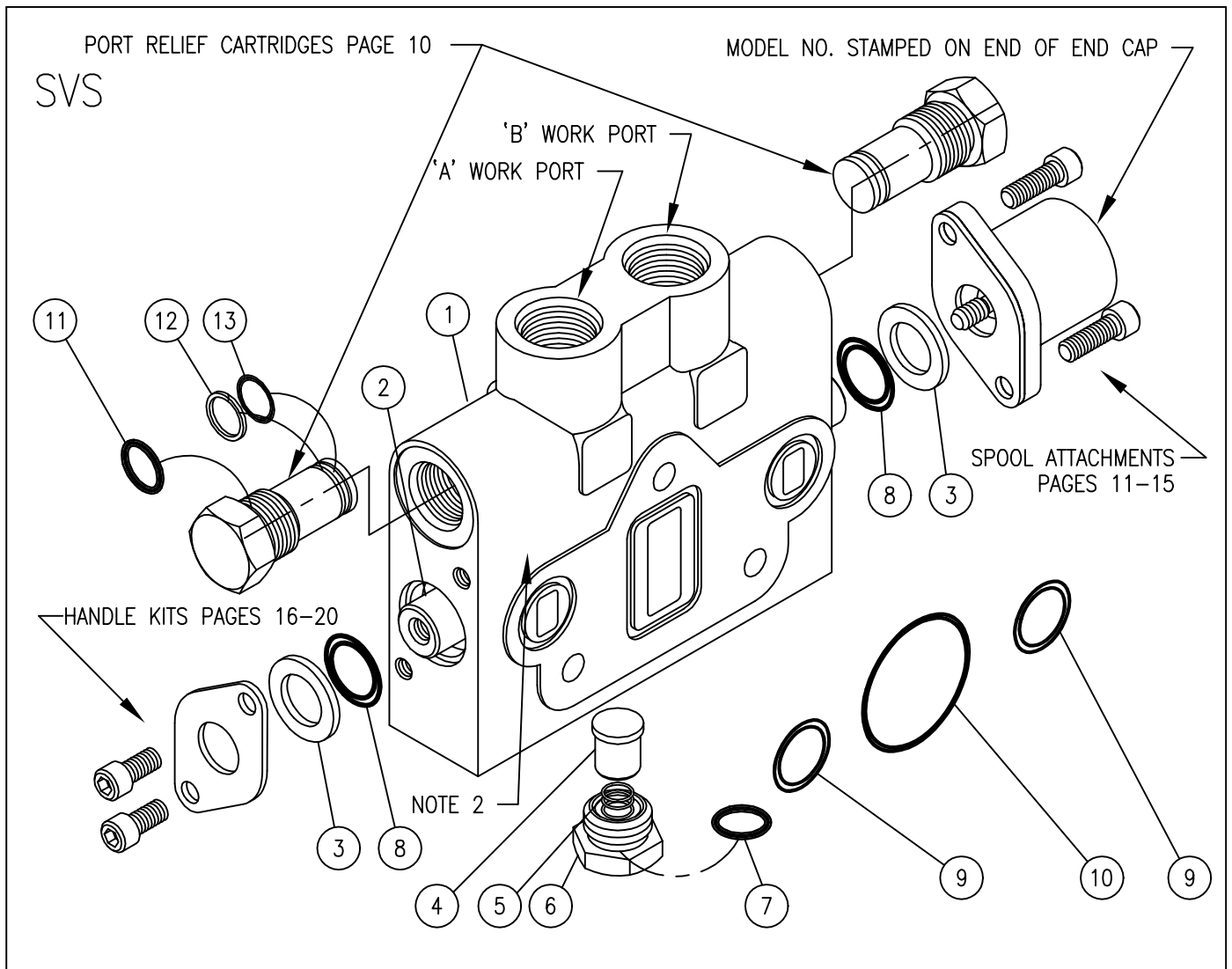
SVL LOCK VALVE WORK SECTION

ITEM	QTY	PART NO.	DESCRIPTION
1	1		VALVE BODY
2	1	SEE NOTE 1	SPOOL
3	2	670500045	SPOOL BACKUP WASHER
4	1	670100008	LOAD CHECK POPPET
5	1	670300029	SPRING
6	1	671600049	LOAD CHECK PLUG
7	1	240000908	908 O-RING
8	2	240000208	208 O-RING
9	3	240000018	018 O-RING
10	1	240000021	021 O-RING
11	2	240000908	908 O-RING
12	2	240000014	014 O-RING
13	2	240005014	BACK-UP WASHER
14	1		SHUTTLE SPOOL
15	2	660280025	LOCK VALVE CART.

Notes from diagram:
 - Items 1 and 2: These are matched parts and are not sold separately.
 - Items 4, 5, 6, and 7: LOAD CHECK KIT, NO. 660180052
 - Items 9, 10, 11, 12, and 13: REPLACEMENT SEAL KIT, NO. 660580004
 - Item 14: Matched part not sold separately.
 - Items 9, 10, 11, 12, and 13: SVL REPLACEMENT SEAL KIT NO. 660580009

NOTES:

1. SEE SPOOL IDENTIFICATION CHART ON PAGE 9
2. C-590 CAST ON SIDE OF BODY INDICATES STANDARD WORK SECTION BODY
3. THIS SECT. USES SAME SPOOL ATTACHMENTS AND HANDLE OPTIONS AS SVW
4. THIS O-RING GOES INTO THE OVAL COUNTERBORE IN THE SIDE OF THE VALVE BODY.



SVS SERIES WORK SECTION

SVS SERIES WORK SECTION

ITEM	QTY	PART NO.	DESCRIPTION
1	1		VALVE BODY
2	1	SEE NOTE 1	SPOOL
3	2	670500045	SPOOL BACKUP WASHER
4	1	670100008	LOAD CHECK POPPET
5	1	670300029	SPRING
6	1	671600049	LOAD CHECK PLUG
7	1	240000908	908 O-RING
8	2	240000208	208 O-RING
9	2	240000018	018 O-RING
10	1	240000029	029 O-RING
11	2	240000908	908 O-RING
12	2	240019014	BACK-UP WASHER
13	2	240000014	014 O-RING

These are matched parts and are not sold separately.

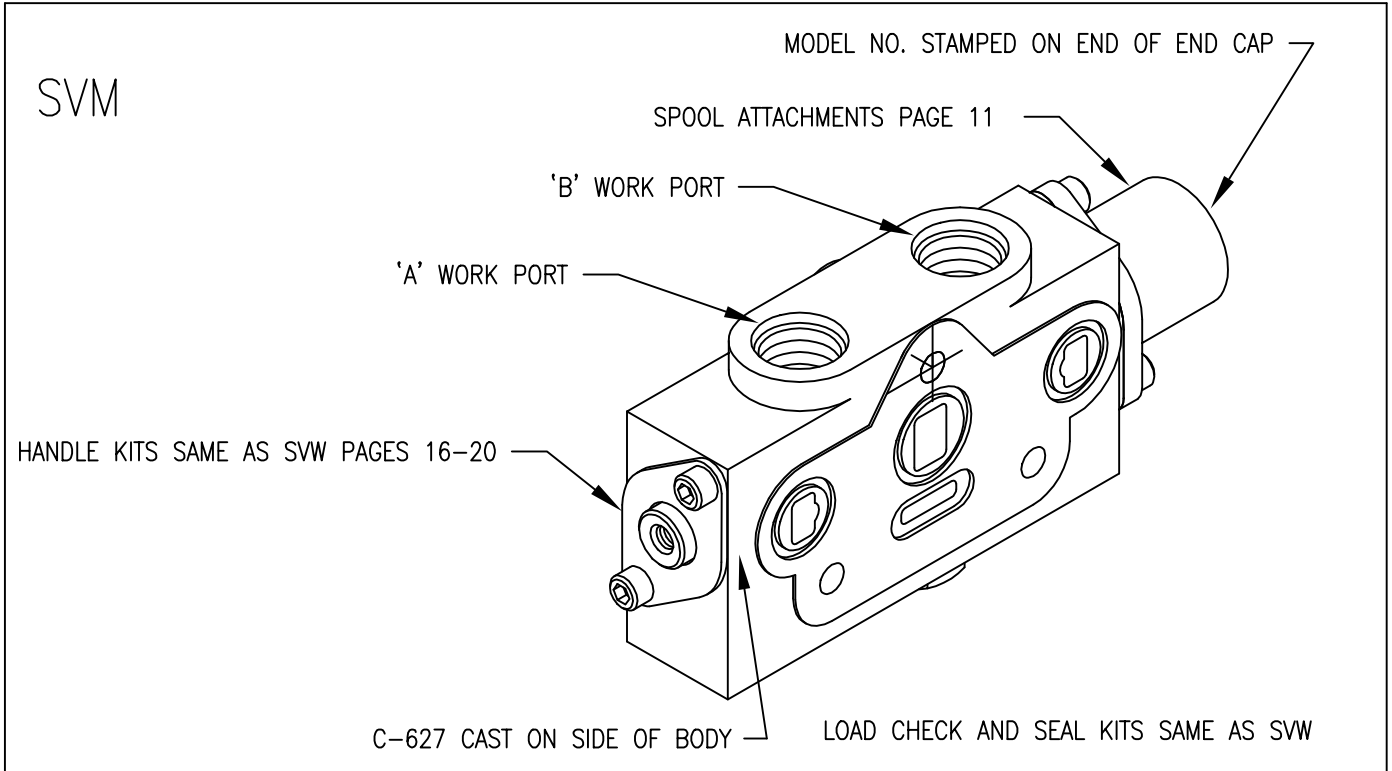
LOAD CHECK KIT, NO. 660180052

REPLACEMENT SEAL KIT, NO. 660580006

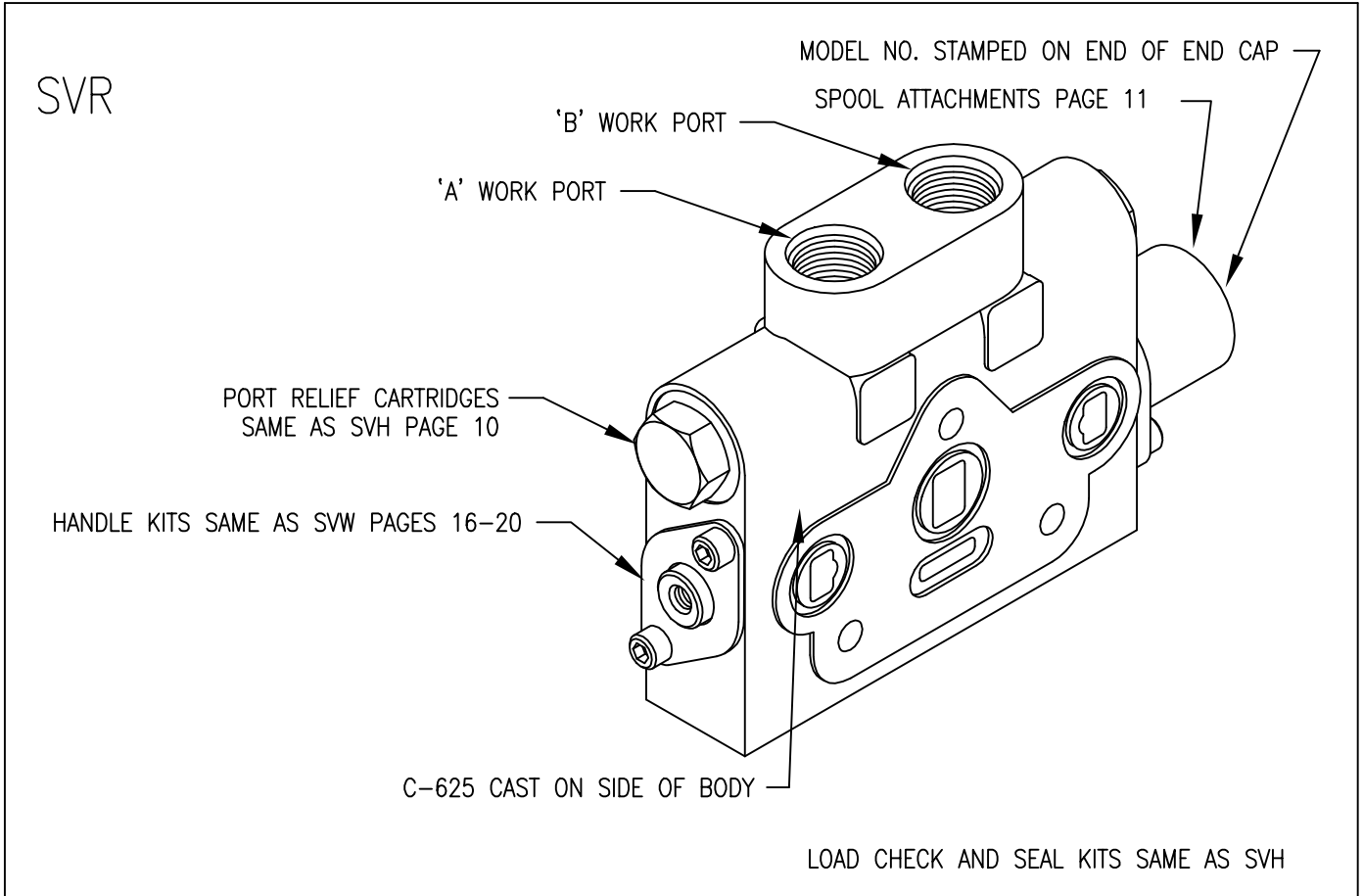
SVS REPLACEMENT SEAL KIT NO. 660580011

NOTES:

1. SEE SPOOL IDENTIFICATION CHART ON PAGE 9
2. C-656 CAST ON SIDE OF BODY INDICATES PORT RELIEF SECTION BODY
3. THE SVS WORK SECTION CAN NOT BE USED IN A CLOSED CENTER APPLICATION.
SEE CATALOG FOR APPLICATION INFORMATION.



SVM METERING WORK SECTION



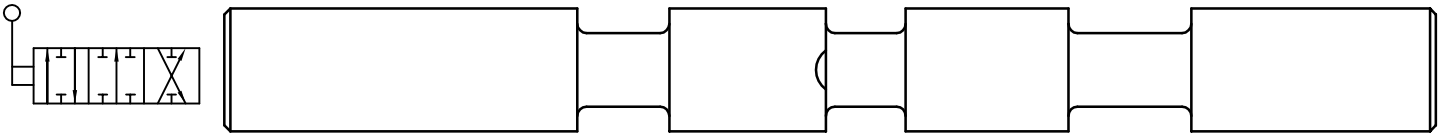
SVR METERING PORT RELIEF SECTION

MODEL SV SPOOLS

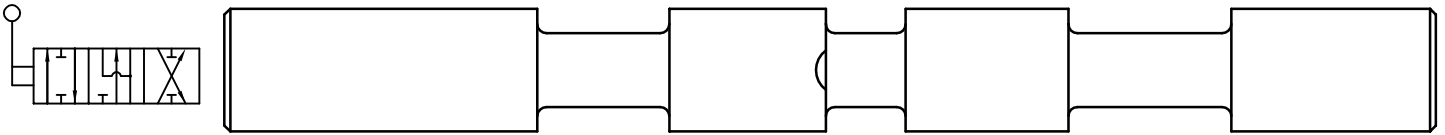
OPTION 'A' WORK SECTION SVW AND SVH, 3 WAY 3 POSITION WORK PORT BLOCKED IN NEUTRAL, A PORT PLUGGED



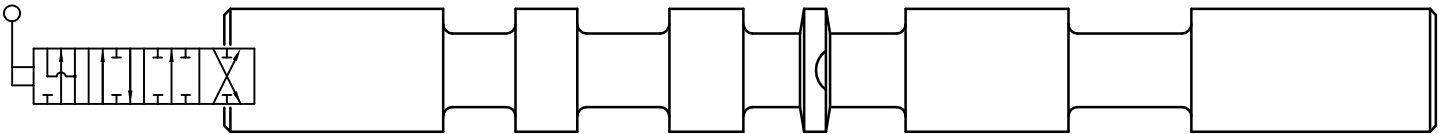
OPTION 'B' WORK SECTION SVW AND SVH, 4 WAY 3 POSITION TANDEM CENTER WORK PORTS BLOCKED IN NEUTRAL



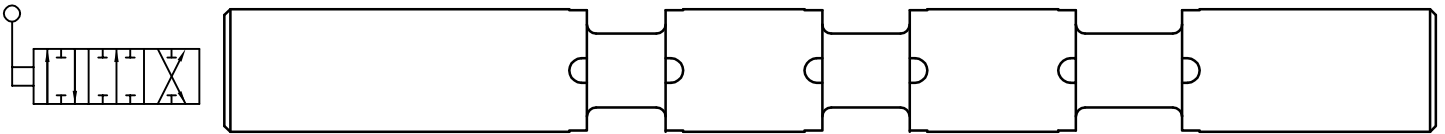
OPTION 'C' WORK SECTION SVW AND SVH, 4 WAY 3 POSITION MOTOR, WORK PORTS OPEN IN NEUTRAL



OPTION 'D' WORK SECTION SVW AND SVH, 4 WAY 4 POSITION TANDEM CENTER FLOAT, WORK PORTS BLOCKED IN NEUTRAL



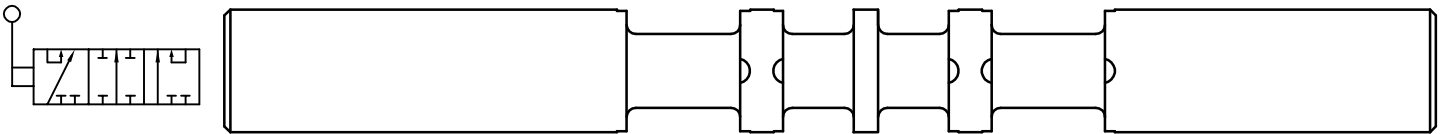
OPTION 'E' WORK SECTION SVM AND SVR, 4 WAY 3 POSITION TANDEM CENTER METERING, WORK PORTS BLOCKED IN NEUTRAL



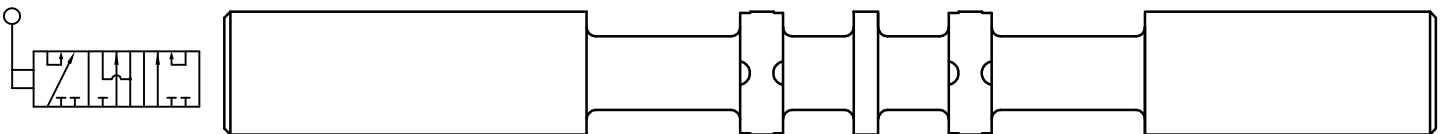
OPTION 'F' WORK SECTION SVM AND SVR, 3 WAY 3 POSITION METERING, WORK PORT BLOCKED IN NEUTRAL



OPTION 'G' WORK SECTION SVS, 4 WAY 3 POSITION SERIES, WORK PORTS BLOCKED IN NEUTRAL

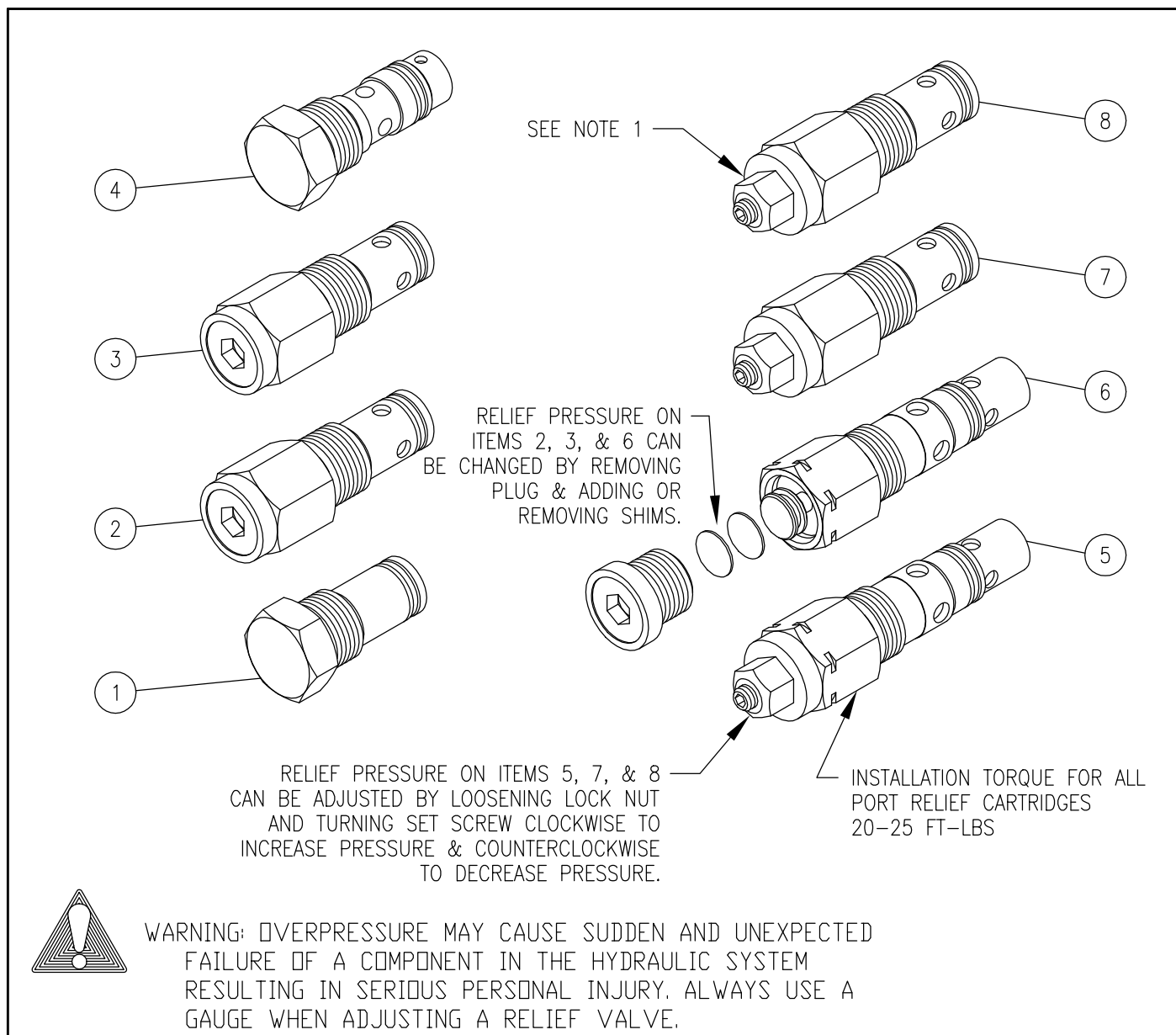


OPTION 'H' WORK SECTION SVS, 4 WAY 3 POSITION SERIES MOTOR, WORK PORTS OPEN IN NEUTRAL



NOTE:

SPOOLS ARE NOT AVAILABLE AS REPAIR PARTS. THIS INFORMATION IS FOR IDENTIFICATION PURPOSES.



PORT RELIEF CARTRIDGES.

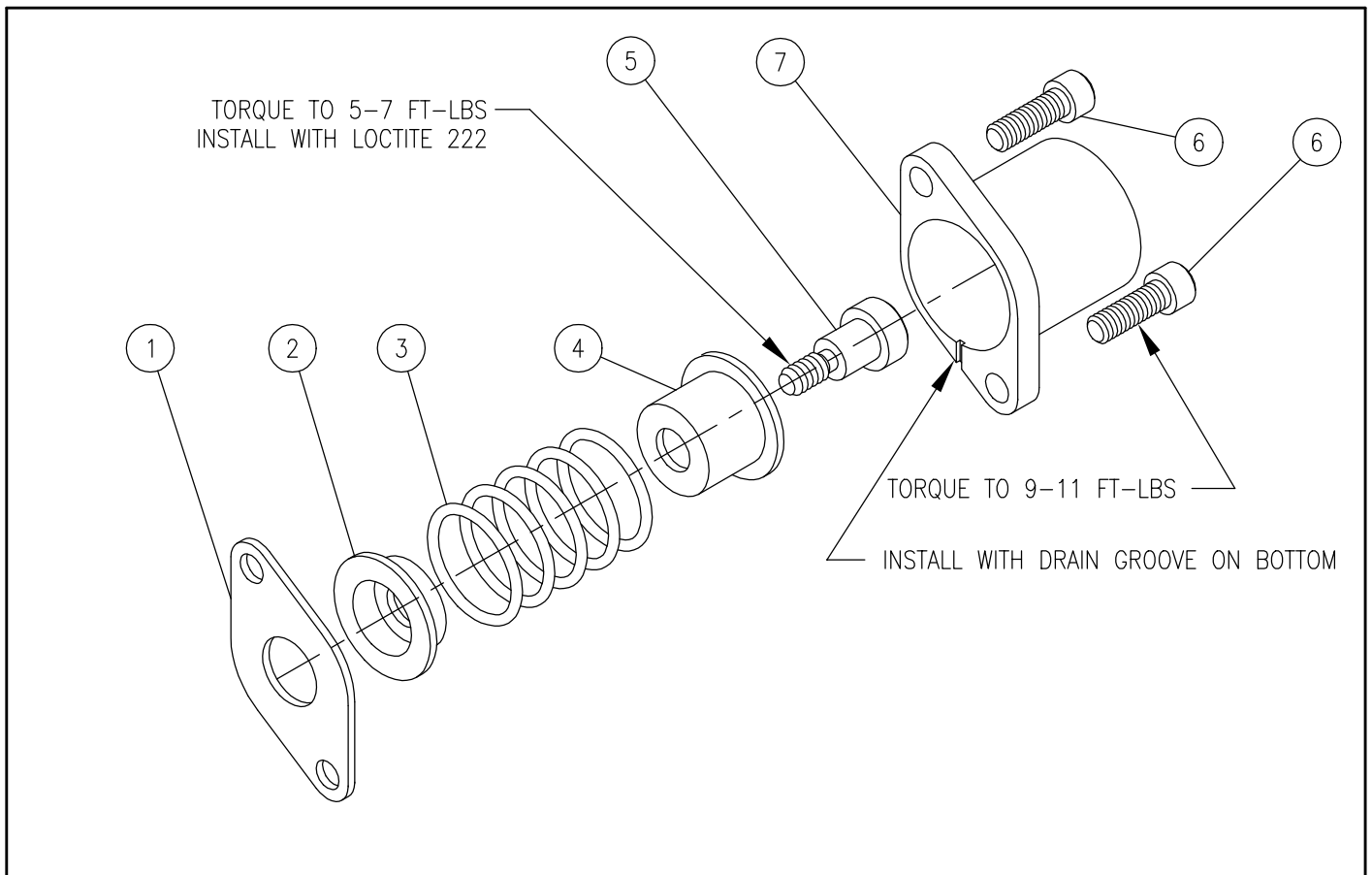
PORT RELIEF CARTRIDGES.

ITEM	PART NO.	DESCRIPTION
1	660280004	RELIEF PLUG (OPTION A)
2	660280003*	SHIM ADJUSTABLE DIRECT ACTING RELIEF 1500-3000 PSI (OPTION B)
3	660280010*	SHIM ADJUSTABLE DIRECT ACTING RELIEF 500-1500 PSI (OPTION C)
4	660280005*	ANTI-CAVITATION CHECK (OPTION D)
5	660280012*	ADJUSTABLE COMBINATION PORT RELIEF/ANTI-CAVITATION CHECK 1000-2500 PSI (OPTION E) SEE NOTE 2
6	660280008*	SHIM ADJUSTABLE COMBINATION PORT RELIEF/ANTI-CAVITATION CHECK 1000-2500 PSI (OPTION F) SEE NOTE 2
7	660280009*	ADJUSTABLE DIRECT ACTING RELIEF 1500-3000 PSI (OPTION G)
8	660280011*	ADJUSTABLE DIRECT ACTING RELIEF 500-1500 PSI (OPTION H)
	672000101	.015 SHIM
	672000102	.033 SHIM
	672000103	.060 SHIM

* CARTRIDGES ORDERED AS SEPERATE PARTS ARE NOT PRESET.

NOTE:

- 1) ADJUSTABLE CARTRIDGES ARE NOT NORMALLY USED ON WORK SECTIONS WITH FLOAT OPTION AND LEVER HANDLE DUE TO INTERFERENCE WITH HANDLE.
- 2) DO NOT USE OPTION E OR F (ITEMS 5 OR 6) IN APPLICATIONS THAT REQUIRE LOW WORK PORT LEAKAGE. MAXIMUM ALLOWABLE WORK PORT LEAKAGE FOR THESE TWO OPTIONS ONLY 6 IN³/MIN @ 1000 PSI.



SPRING CENTER SPOOL ATTACHMENT

SVW, SVH, SVL, & SVS SPRING CENTER SPOOL ATTACHMENT (OPTION A)

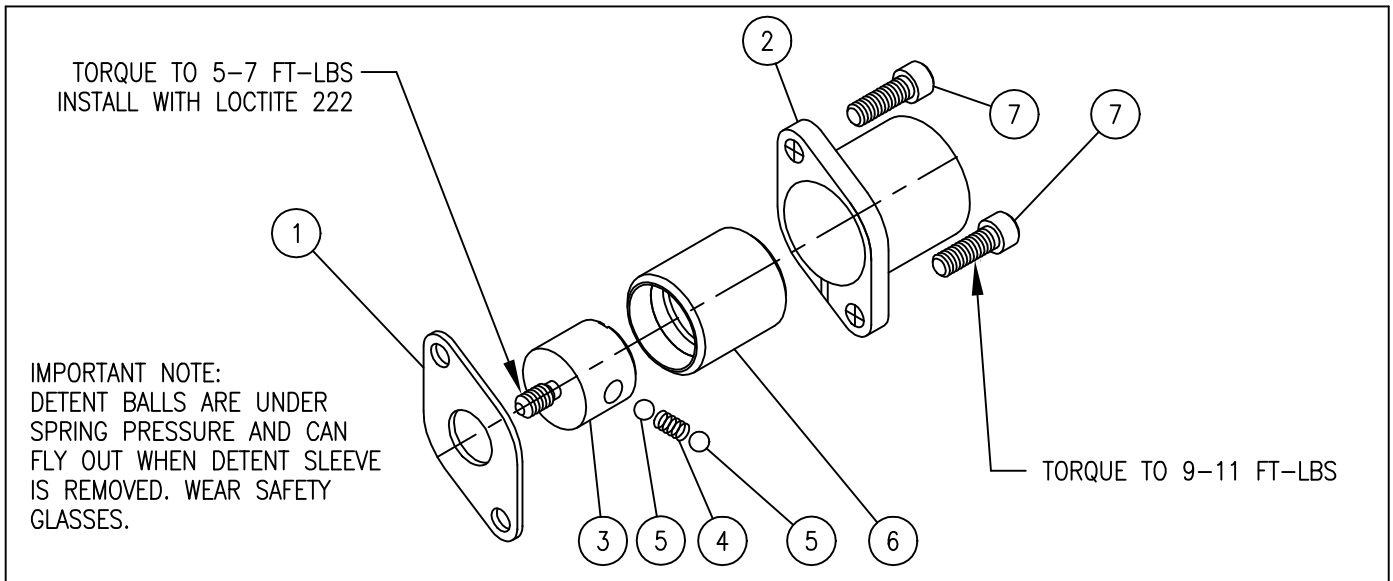
ITEM	QTY	PART NO.	DESCRIPTION
1	1	670500044	RETAINER PLATE
2	1	671400037	INNER STOP CUP
3	1	670300030*	SPRING
4	1	671400036	OUTER STOP CUP
5	1	671900010	ADAPTER
6	2	170003008	CAP SCREW (SVH, SVL, & SVS USES 170003017)
7	1	671400033	END CAP

} SPRING CENTER KIT,
NO. 660180001

* THE STANDARD CENTERING SPRING CAN BE REPLACED BY MEDIUM HEAVY SPRING 670300031, OR WITH LIGHT CENTERING SPRING 670300036.

SVM AND SVR SPRING CENTER SPOOL ATTACHMENT (OPTION S)

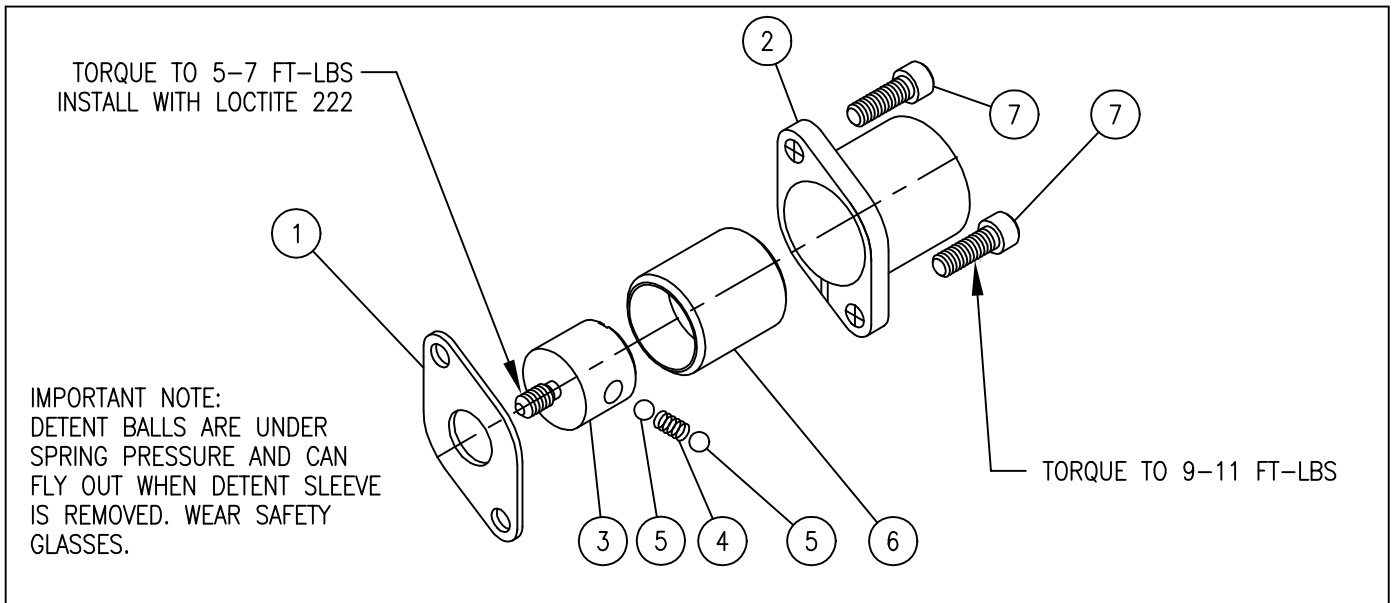
ITEM	QTY	PART NO.	DESCRIPTION
1	1	670500044	RETAINER PLATE
2	1	671400037	INNER STOP CUP
3	1	670300030	SPRING
4	1	671400075	OUTER STOP CUP (BLACK)
5	1	671900031	ADAPTER (BLACK)
6	2	170003008	CAP SCREW (SVR USES 170003017)
7	1	671400033	END CAP



3 POSITION DETENT SPOOL ATTACHMENT

3 POSITION DETENT SPOOL ATTACHMENT (OPTION B)

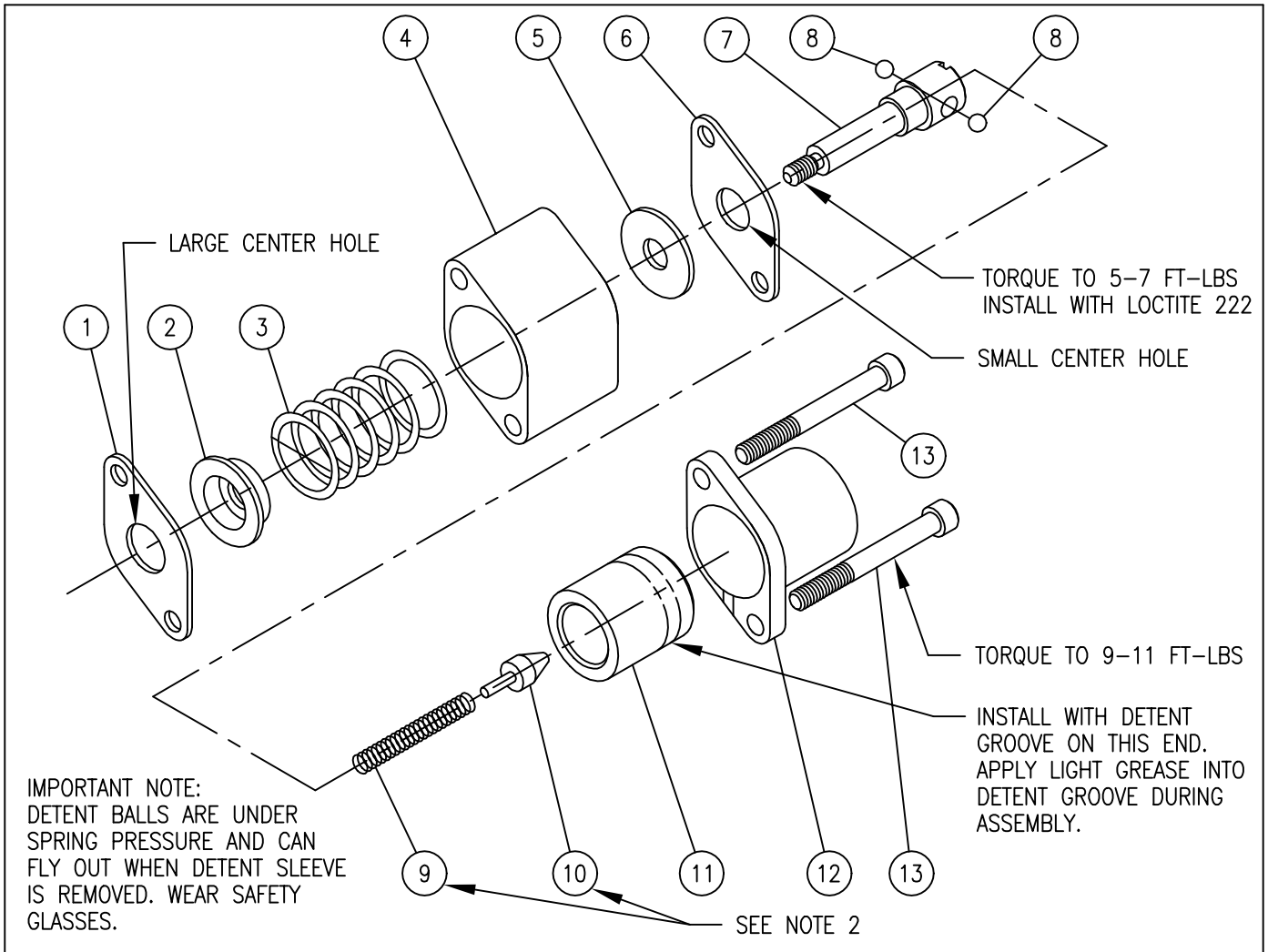
ITEM	QTY	PART NO.	DESCRIPTION
1	1	670500044	RETAINER PLATE
2	1	671400033	END CAP
3	1	670700035	DETENT RETAINER
4	1	670300025	SPRING
5	2	230009009	STEEL BALL
6	1	670700034	DETENT SLEEVE
7	2	170003008	CAP SCREW
			} 3 POSITION DETENT KIT, NO. 660180002



1 POSITION DETENT SPOOL ATTACHMENT

1 POSITION DETENT SPOOL ATTACHMENT (OPTION C)

ITEM	QTY	PART NO.	DESCRIPTION
1	1	670500044	RETAINER PLATE
2	1	671400033	END CAP
3	1	670700035	DETENT RETAINER
4	1	670300025	SPRING
5	2	230009009	STEEL BALL
6	1	670700033	DETENT SLEEVE
7	2	170003008	CAP SCREW
			} 1 POSITION DETENT KIT, NO. 660180003



SPRING CENTER FLOAT DETENT SPOOL ATTACHMENT

SVW & SVH SPRING CENTER FLOAT DETENT SPOOL ATTACHMENT (OPTION D)

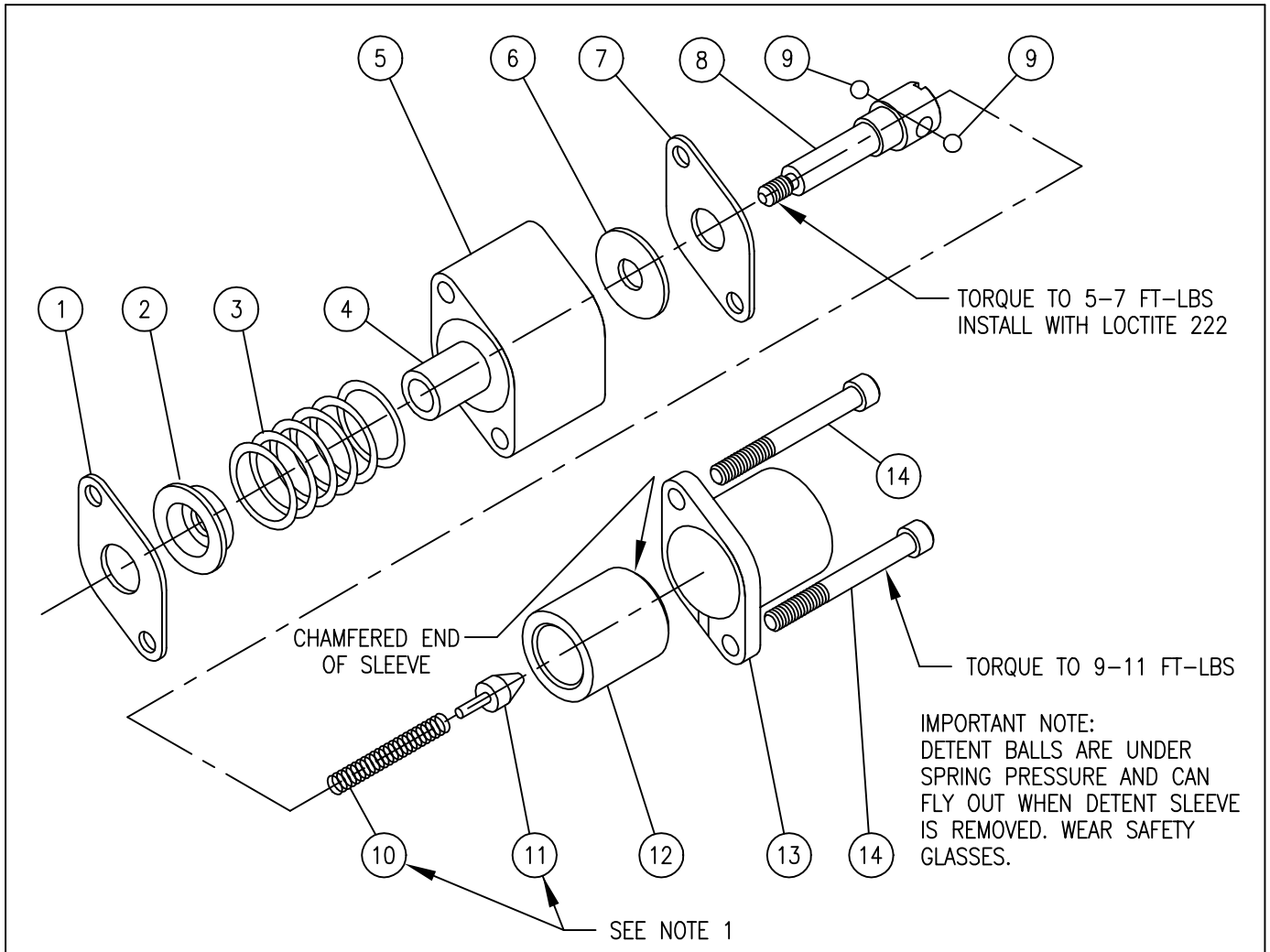
ITEM	QTY	PART NO.	DESCRIPTION
1	1	670500044	RETAINER PLATE
2	1	671400037	STOP CUP
3	1	670300031	SPRING
4	1	671200007	FLOAT SPACER
5	1	670500043	WASHER
6	1	670500048	RETAINER PLATE
7	1	670700037	FLOAT DETENT RETAINER
8	2	230009009	STEEL BALL
9	1	670300032	SPRING
10	1	670100009	FLOAT DETENT POPPET
11	1	670700036	FLOAT DETENT SLEEVE
12	1	671400033	END CAP
13	2	170003027	CAP SCREW

SEE NOTE 2

SPRING CENTER FLOAT DETENT KIT NO. 660180051

NOTES:

1. THIS OPTION CANNOT BE ADDED IN THE FIELD. MUST BE USED WITH FLOAT SPOOL OPTION 'D'.
2. INSTALL ITEMS 9 & 10 INTO ITEM 7 AND COMPRESS SPRING. INSTALL STEEL BALLS, ITEM 8, AND SLIDE DETENT SLEEVE, ITEM 11, OVER RETAINER, ITEM 7.



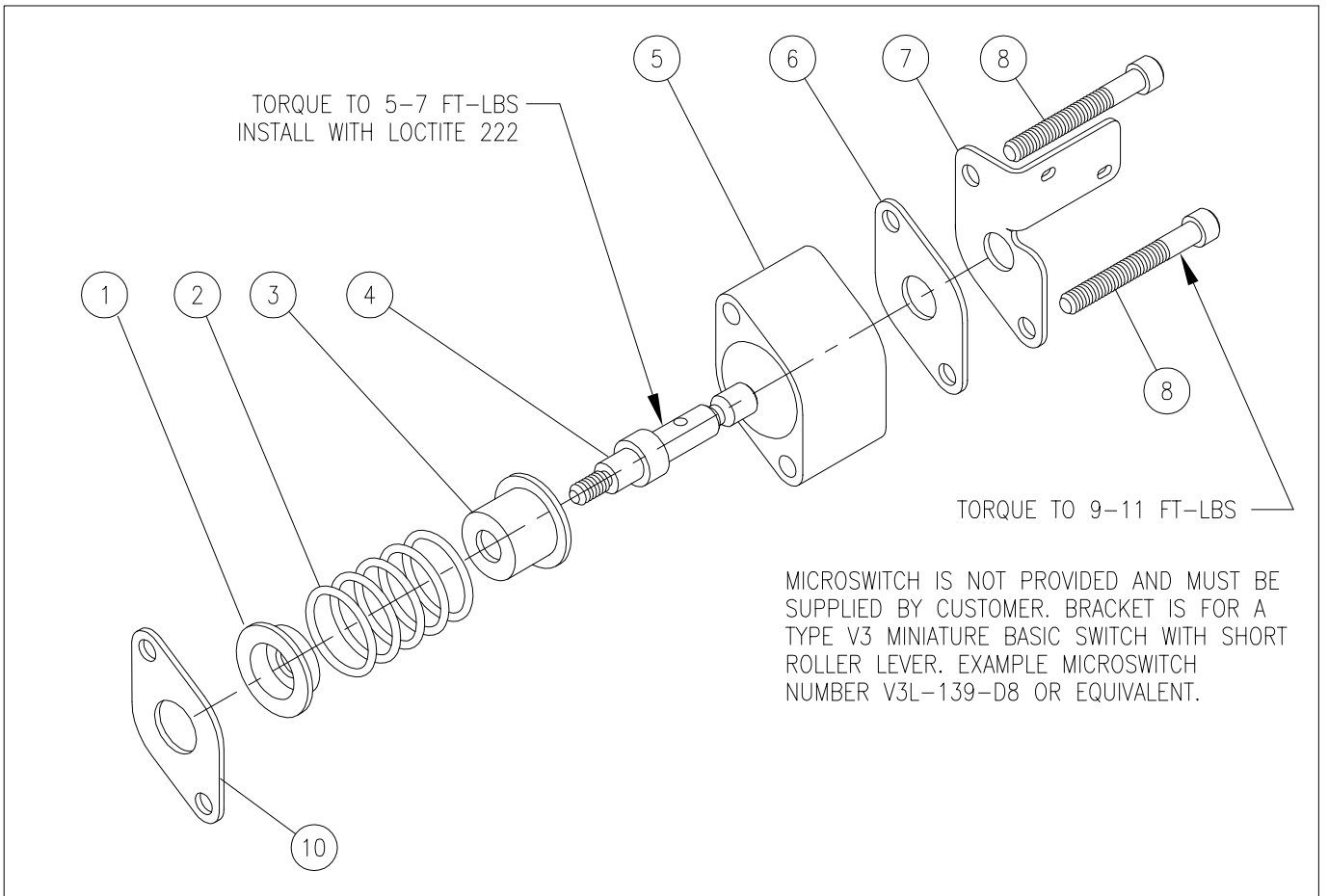
SPRING CENTER WITH DETENT IN/OUT

SPRING CENTER WITH DETENT IN (OPTION M) KIT NO. 660180036
 SPRING CENTER WITH DETENT OUT (OPTION N) KIT NO. 660180037

ITEM	QTY	PART NO.	DESCRIPTION
1	1	670500044	RETAINER PLATE
2	1	671400037	STOP CUP
3	1	670300031	SPRING
4	1	671200016	STOP RING
5	1	671200007	FLOAT SPACER
6	1	670500043	WASHER
7	1	670500048	RETAINER PLATE
8	1	670700037	FLOAT DETENT RETAINER
9	2	230009009	STEEL BALL
10	1	670300032	SPRING
11	1	670100009	FLOAT DETENT POPPET
12-M	1	670700038	DETENT SLEEVE (DETENT IN OPTION M)
12-N	1	670700045	DETENT SLEEVE (DETENT OUT OPTION N)
13	1	671400033	END CAP
14	2	170003027	CAP SCREW

NOTES:

1. INSTALL ITEMS 10 & 11 INTO ITEM 8 AND COMPRESS SPRING. INSTALL STEEL BALLS, ITEM 9, AND SLIDE DETENT SLEEVE, ITEM 12, OVER RETAINER, ITEM 8.



SPRING CENTER W/ MICROSWITCH BRACKET

SPRING CENTER W/ MICROSWITCH BRACKET SWITCHED AT 2 POSITIONS (OPTION J)

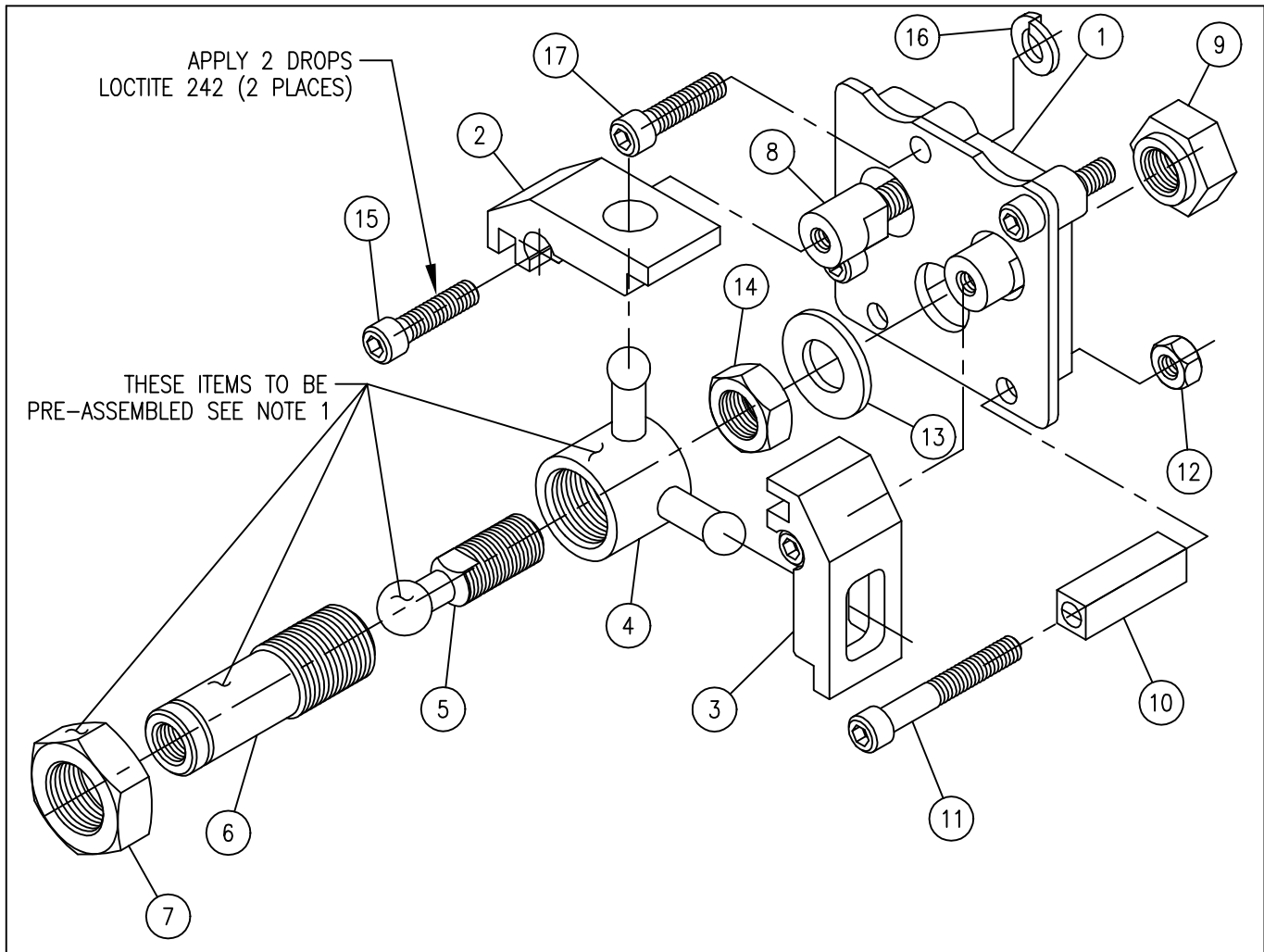
ITEM	QTY	PART NO.	DESCRIPTION
1	1	671400037	INNER STOP CUP
2	1	670300030	SPRING
3	1	671400036	OUTER STOP CUP
4	1	671900023	SPOOL ADAPTER
5	1	671200015	SPACER
6	1	670500048	RETAINER PLATE
7	1	670500051	BRACKET
8	2	170003024	CAP SCREW
9	1	671300012	BOOT (NOT SHOWN)
10	1	670500044	RETAINER PLATE

} KIT NO. 660180015

SPRING CENTER W/ MICROSWITCH BRACKET SWITCHED AT 1 POSITION, SPOOL OUT (OPTION K)

ITEM	QTY	PART NO.	DESCRIPTION
1	1	671400037	INNER STOP CUP
2	1	670300030	SPRING
3	1	671400036	OUTER STOP CUP
4	1	671900026	SPOOL ADAPTER
5	1	671200015	SPACER
6	1	670500048	RETAINER PLATE
7	1	670500051	BRACKET
8	2	170003024	CAP SCREW
9	1	671300012	BOOT (NOT SHOWN)
10	1	670500044	RETAINER PLATE

} KIT NO. 660180016



JOYSTICK HANDLE

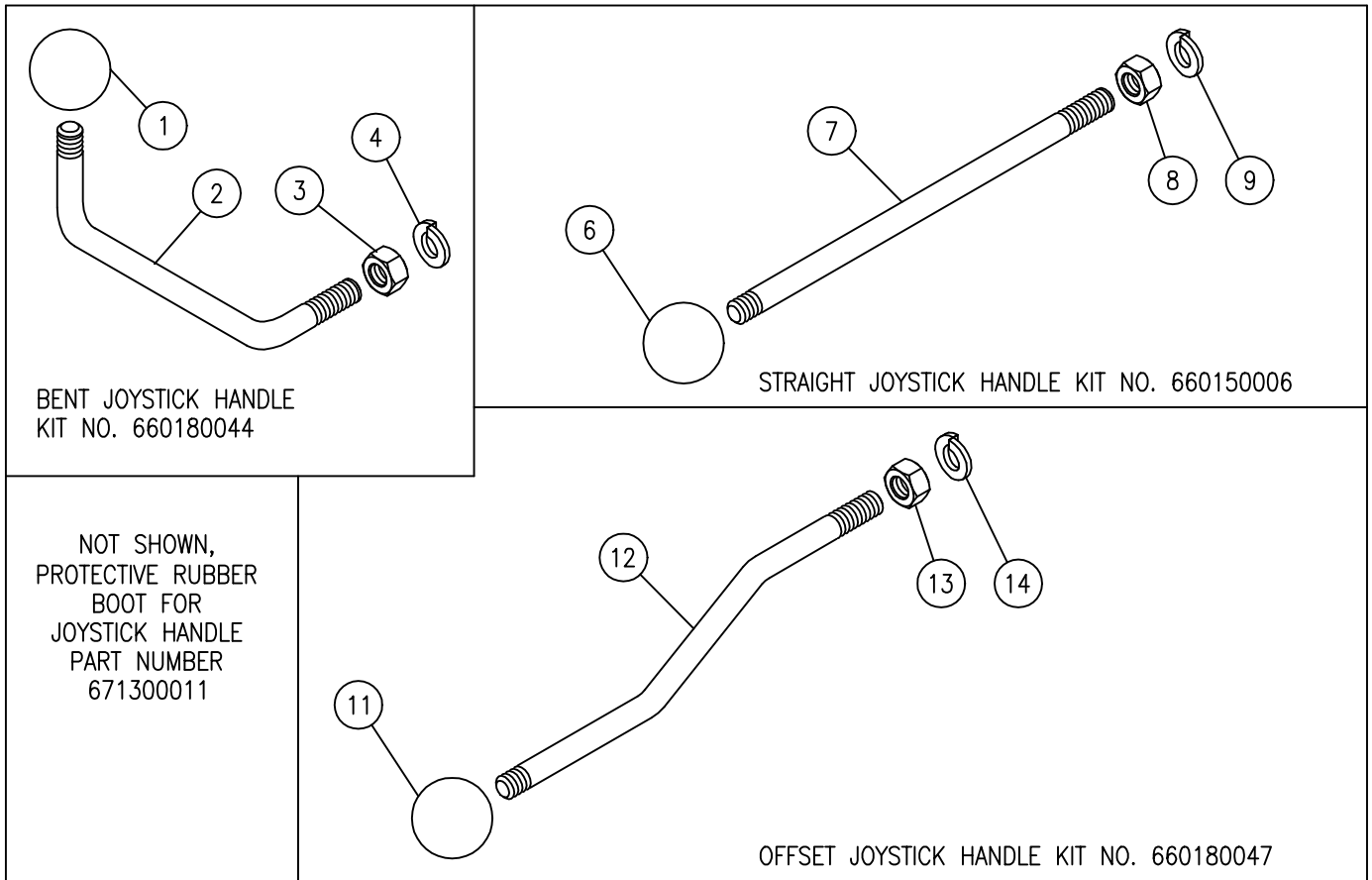
JOYSTICK SUB-ASSY, KIT NO. 660180055

ITEM	QTY	PART NO.	DESCRIPTION
1	1	671400039	END PLATE
2	1	671400045	SLIDE BLOCK
3	1	671400038	SLIDE BLOCK
4	1	671400022	PIVOT
5	1	671900015	BALL CENTER
6	1	671900008	HANDLE ADAPTER
7	1	220001308	JAM NUT
8	2	671400046	SPOOL ADAPTER
9	1	671400056	HEX PLUG
10	1	671400063	STABILIZER
11	1	170003034	HEX SOCKET CAP SCREW
12	1	220000101	HEX NUT
13	1	220001148	WASHER
14	1	220001306	JAM NUT
15	2	170003018	HEX SOCKET CAP SCREW
16	2	220001226	LOCK WASHER
17	3	170003038	HEX SOCKET CAP SCREW

NOTES:

JOYSTICK ASSEMBLY INSTRUCTIONS:

- HANDLE ADAPTER (ITEM #6) TO BE INSTALLED INTO PIVOT (ITEM #4) UNTIL IT MAKES CONTACT ON BALL CENTER (ITEM #5). TURN HANDLE ADAPTER 1/4 TURN BACK OUT AND TIGHTEN JAM NUT (ITEM #7) TO 60-80 FT-LBS. APPLY TWO DROPS LOCTITE 242 TO THREADS OF JAM NUT (ITEM #7) DURING ASSEMBLY.
- TO ADJUST HANDLE ANGLE, TURN BALL CENTER (ITEM #5) UNTIL DESIRED ANGLE IS OBTAINED. THEN TIGHTEN JAM NUT (ITEM #14).
- DURING ASSEMBLY, APPLY PERMATEx ANTI-SEIZE HIGH STRESS LUBRICANT TO BALL CENTER (ITEM #5) AND SPHERICAL ENDS OF PIVOT (ITEM #4).
- AFTER ASSEMBLY PIVOT (ITEM #4) MUST MOVE FREELY AND HANDLE MUST RETURN TO NEUTRAL FROM ALL POSITIONS.
- TORQUE ALL 1/4-20 CAP SCREWS TO 9-11 FT-LB (110-130 IN-LB).
- INSTALL CAP SCREW (ITEM #11), SUPPORT (ITEM #10), AND HEX NUT (ITEM #12) LAST. TORQUE HEX NUT (ITEM #12) TO 9-11 FT-LB (110-130 IN-LB).
- TORQUE FOR ITEM 8 TO BE 14-16 FT-LB (165-190 IN-LB), INSTALL WITH LOCTITE 242. ITEMS 8 & 16 INSTALL ONTO END OF VALVE SPOOL



JOYSTICK W/BENT HANDLE, KIT NO. 660180033

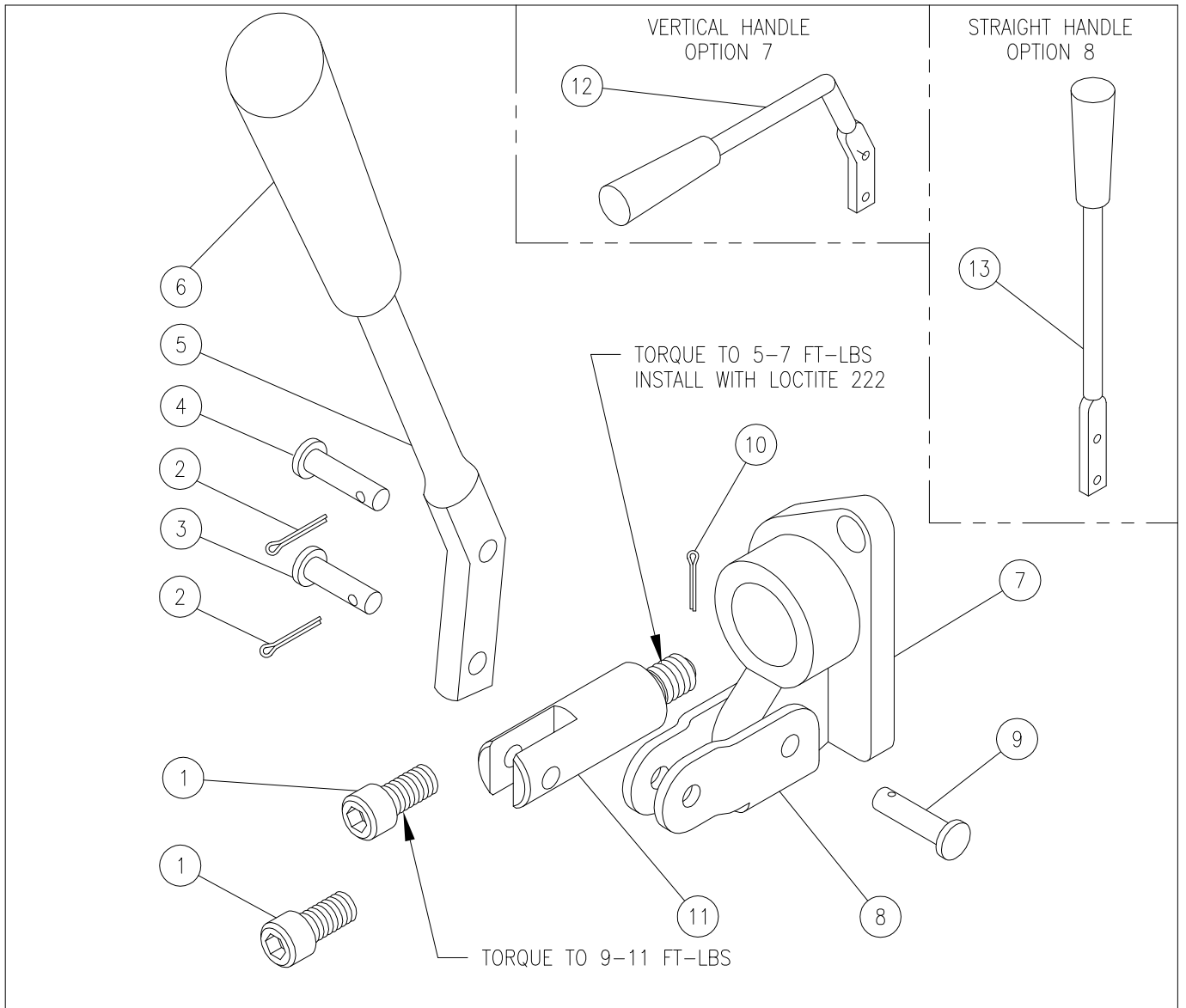
ITEM	QTY	PART NO.	DESCRIPTION
1	1	670400002	KNOB HANDLE HEX NUT LOCK WASHER JOYSTICK ASSY (FROM PREVIOUS PAGE) } HANDLE KIT NO. 660180044
2	1	670400033	
3	1	220000121	
4	1	220001004	
5	1	660180055	

JOYSTICK W/STRAIGHT HANDLE, KIT NO. 660180017

ITEM	QTY	PART NO.	DESCRIPTION
6	1	670400002	KNOB HANDLE HEX NUT LOCK WASHER JOYSTICK ASSY (FROM PREVIOUS PAGE) } HANDLE KIT NO. 660150006
7	1	670400014	
8	1	220000121	
9	1	220001004	
10	1	660180055	

JOYSTICK W/OFFSET HANDLE, KIT NO. 660180018

ITEM	QTY	PART NO.	DESCRIPTION
11	1	670400002	KNOB HANDLE HEX NUT LOCK WASHER JOYSTICK ASSY (FROM PREVIOUS PAGE) } HANDLE KIT NO. 660180047
12	1	670400023	
13	1	220000121	
14	1	220001004	
15	1	660180055	



STANDARD LEVER HANDLE KIT

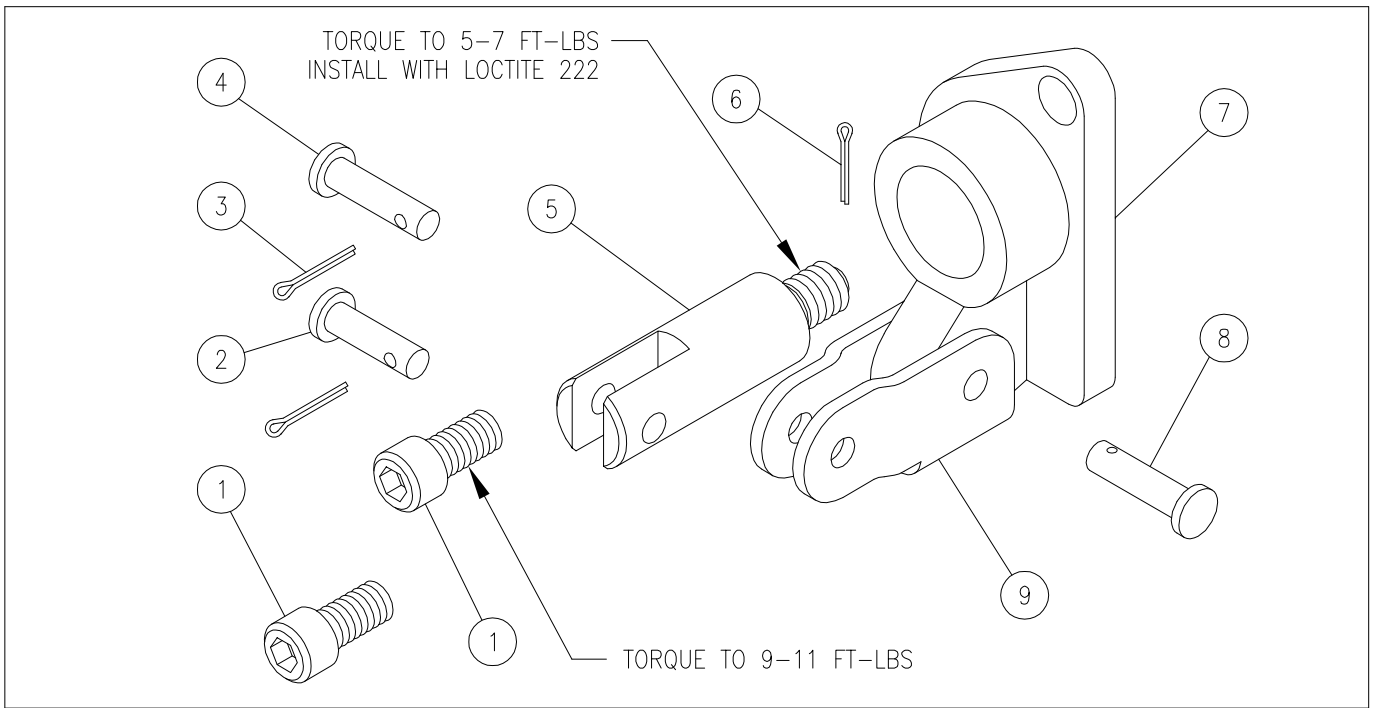
STANDARD LEVER HANDLE (OPTION 1)

ITEM	QTY	PART NO.	DESCRIPTION
1	2	170003017	CAP SCREW
2	2	220001512	COTTER PIN
3	1	671700012	CLEVIS PIN
4	1	671700014	CLEVIS PIN
5	1	670400012	HANDLE
6	1	670400020	HANDLE KNOB
7	1	671400040	CLEVIS
8	1	670500047	LINK
9	1	671700014	CLEVIS PIN
10	1	220001512	COTTER PIN
11	1	671900011	SPOOL ADAPTER

} COMPLETE HANDLE KIT NO. 660180005
 } CLEVIS SUB-ASSY KIT NO. 660180032
 } HANDLE KIT 660180004 CONTAINS ITEMS 2 THRU 6 AND 8 THRU 10.

VERTICAL HANDLE (OPTION 7) & STRAIGHT HANDLE (OPTION 8)

12		660180026	VERTICAL HANDLE KIT (INCLUDES ITEMS 2, 3, & 4)
13		660180028	STRAIGHT HANDLE KIT (INCLUDES ITEMS 2, 3, & 4); LIMITED USAGE DUE TO INTERFERENCE WITH PORT RELIEF CARTRIDGES.
		660180087	SHORT HANDLE KIT (INCLUDES ITEMS 2, 3, & 4)

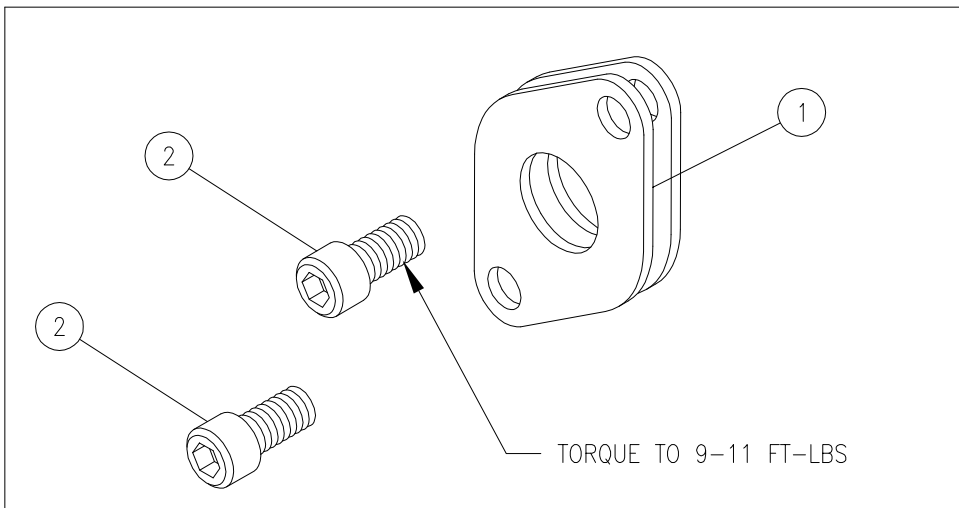


LESS HANDLE ONLY (OPTION 2)

LESS HANDLE ONLY (OPTION 2)

ITEM	QTY	PART NO.	DESCRIPTION
1	2	170003017	CAP SCREW
2	1	671700012	CLEVIS PIN
3	2	220001512	COTTER PIN
4	1	671700014	CLEVIS PIN
5	1	671900011	SPOOL ADAPTER
6	1	220001512	COTTER PIN
7	1	671400040	CLEVIS
8	1	671700014	CLEVIS PIN
9	1	670500047	LINK

} PIN KIT, NO. 660180031
} CLEVIS SUB-ASSY KIT, NO. 660180032



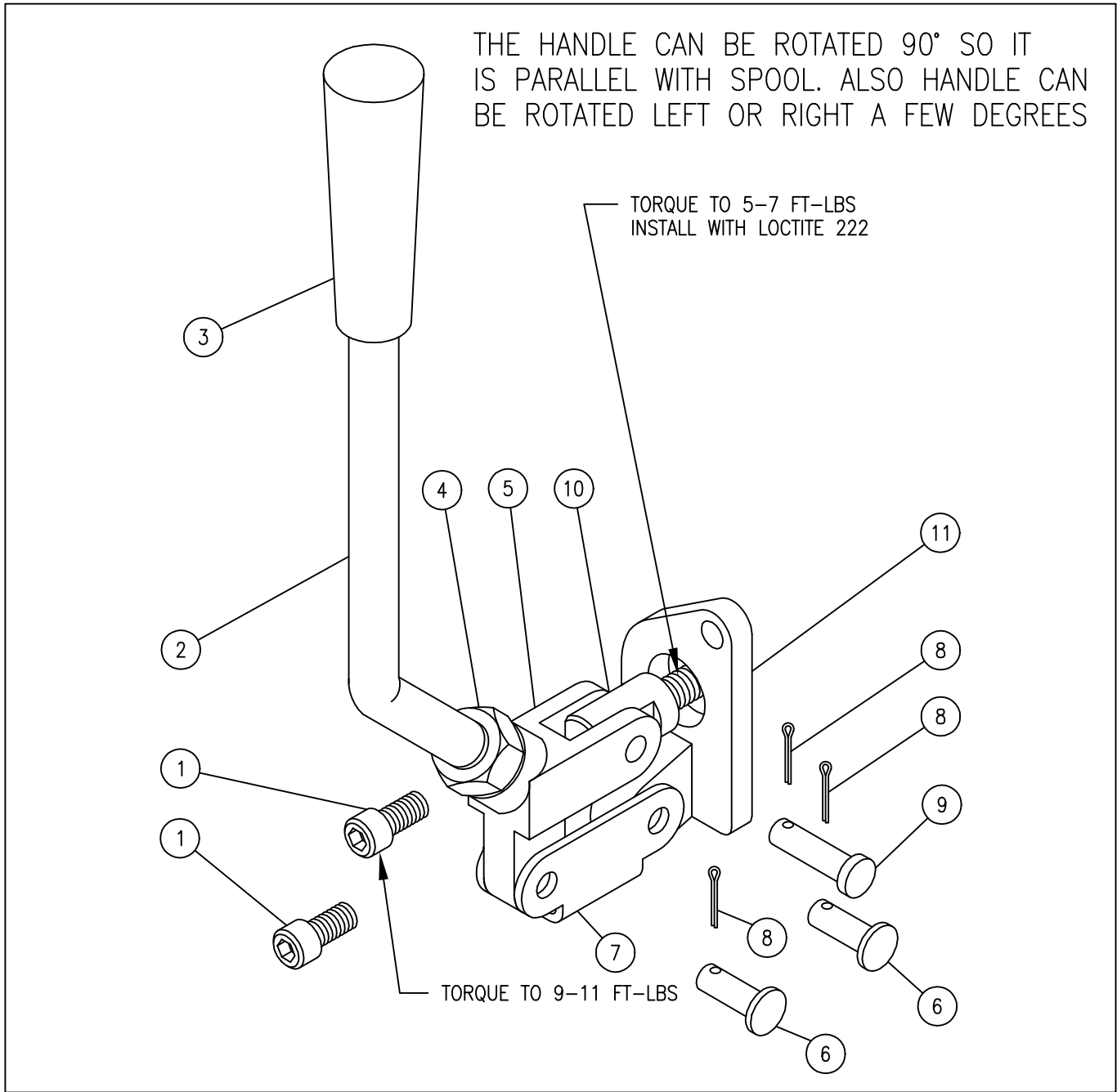
HANDLE OPTION 5: *
LESS HANDLE, TANG SPOOL END.
.250 DIA. PIN HOLE.
KIT NO. 660180144

HANDLE OPTION 6: **
LESS HANDLE, CLEVIS SPOOL
END. .187 DIA. PIN HOLE.
KIT NO. 660180145

LESS COMPLETE HANDLE (OPTION 3)

LESS COMPLETE HANDLE (OPTION 3) KIT NO. 660180143

ITEM	QTY	PART NO.	DESCRIPTION	
1	2	670500044	RETAINER PLATE	* OPTION 5 CONTAINS ITEM 1 & 2 PLUS SPOOL ADAPTER 671900012 FROM NEXT PAGE. ** OPTION 6 CONTAINS ITEM 1 & 2 PLUS SPOOL ADAPTER 671900011 FROM PREVIOUS PAGE.
2	2	170003017	CAP SCREW	



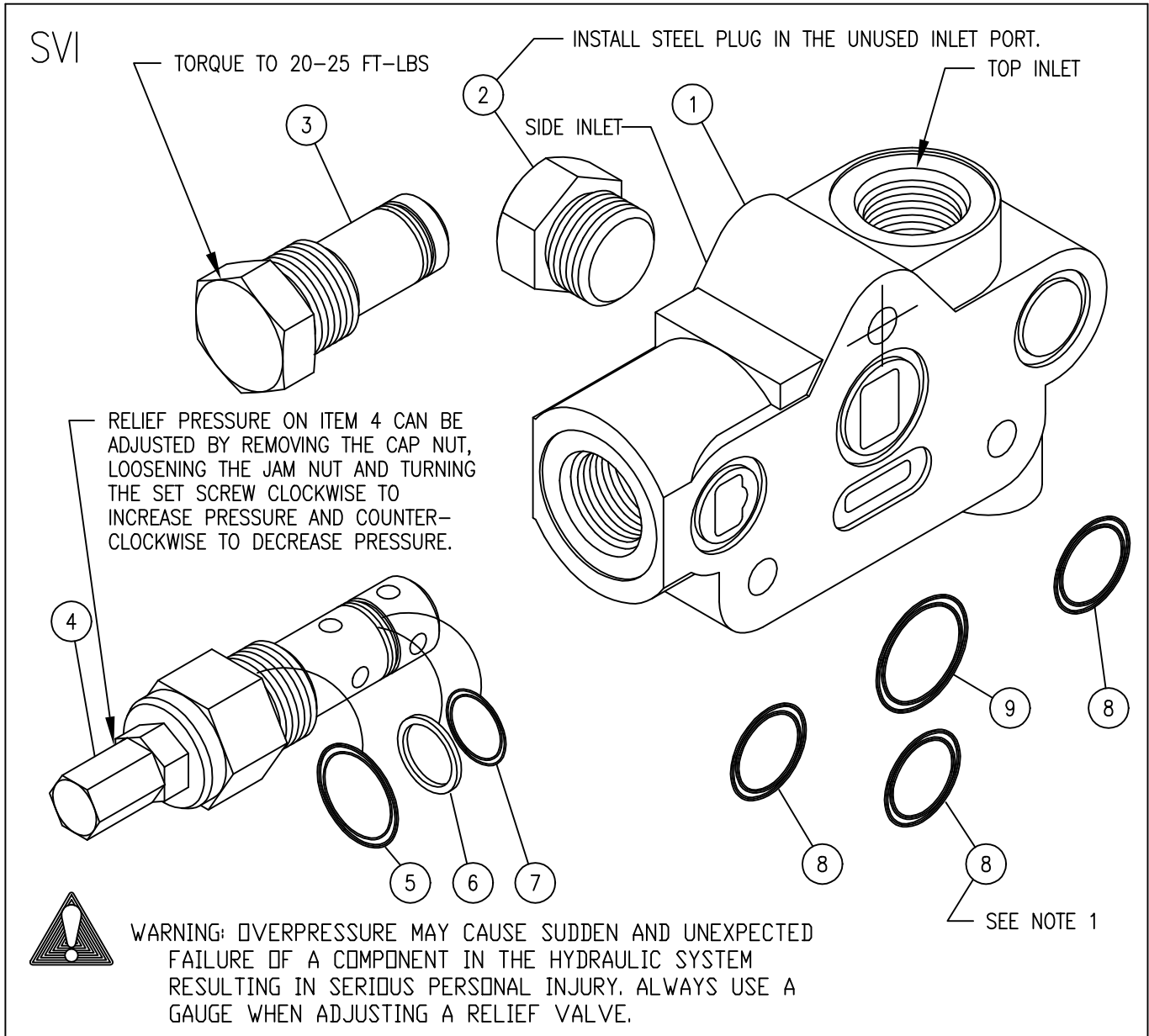
HEAVY DUTY ADJUSTABLE HANDLE, KIT NO. 660180007

HEAVY DUTY ADJUSTABLE HANDLE (OPTION 4)

ITEM	QTY	PART NO.	DESCRIPTION
1	2	170003017	CAP SCREW
2	1	670400019	ADJUSTABLE HANDLE
3	1	670400020	KNOB
4	1	220000121	JAM NUT
5	1	670400035	ADAPTER
6	2	671700017	CLEVIS PIN
7	1	670500072	CLEVIS LINK
8	3	220001512	COTTER PIN
9	1	671700015	CLEVIS PIN
10	1	671900012	SPOOL ADAPTER
11	1	671400034	CLEVIS

} KIT NO. 660180006

} KIT NO. 660180007

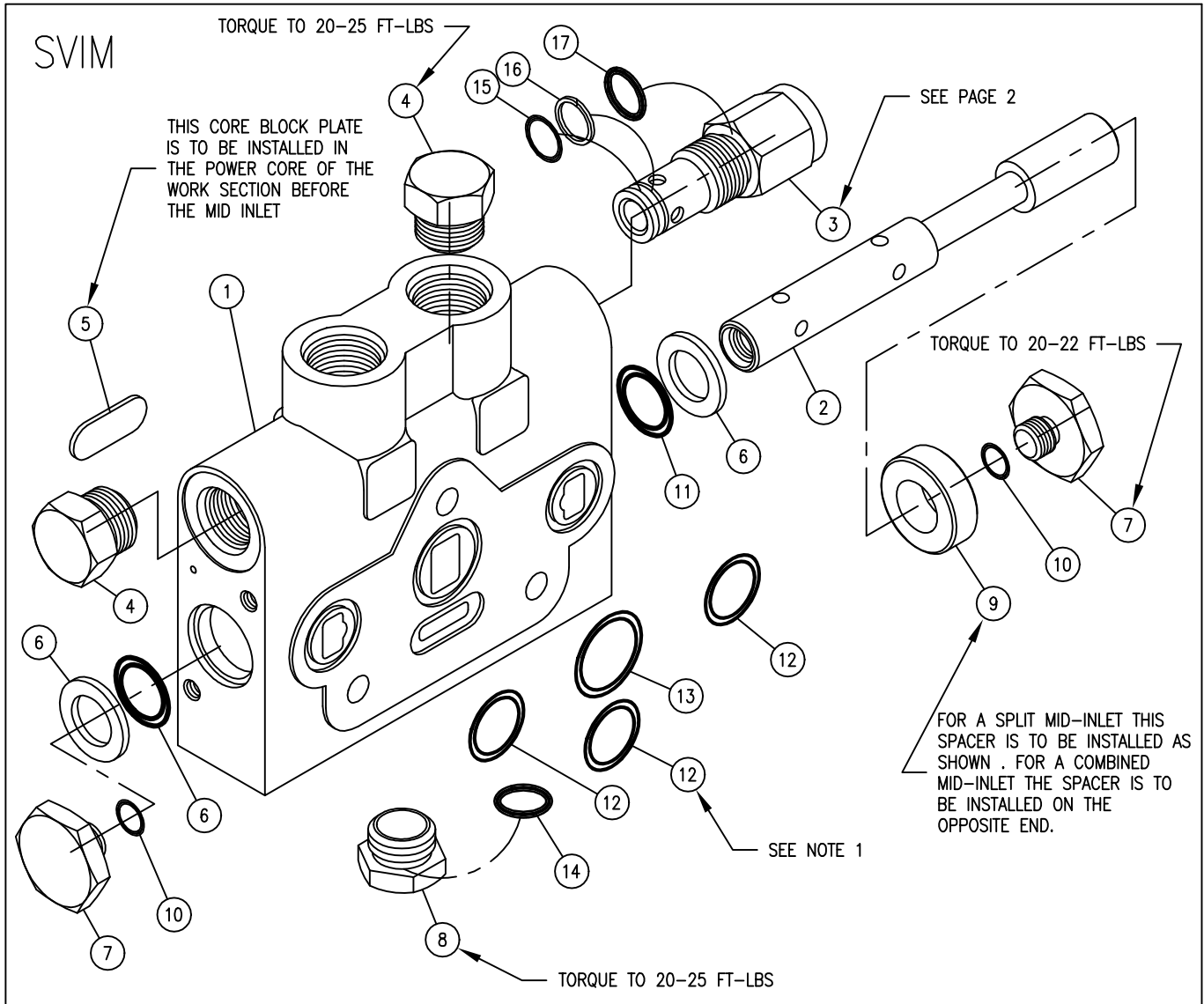


SVI INLET SECTION

SVI INLET SECTION

ITEM	QTY	PART NO.	DESCRIPTION
1	1	625764001	INLET BODY #8 SAE
1	1	625765001	INLET BODY #10 SAE
2	1	200300040	PORT PLUG (STEEL) #8 SAE
2	1	200400030	PORT PLUG (STEEL) #10 SAE
3	1	660250006	OPTION 1 NO RELIEF PLUG
4	1	660250003	OPTION 4 ADJ RELIEF CART. 500-1500 PSI (NOT PRESET)
4	1	660250002	OPTION 5 ADJ RELIEF CART. 1500-3000 PSI (NOT PRESET)
4	1	RV-0L	660250003 PRESET TO 1000 PSI
4	1	RV-0H	660250002 PRESET TO 2000 PSI
5	1	240000116	116 O-RING
6	1	240019015	BACK-UP WASHER
7	1	240000015	015 O-RING
8	3	240000018	018 O-RING
9	1	240000021	021 O-RING
			REPLACEMENT SEAL KIT NO. 660580002
			REPLACEMENT SEAL KIT NO. 660580004

NOTE:



SVIM MID-INLET

ITEM	QTY	PART NO.	DESCRIPTION
1	1		VALVE BODY
2	1		SPOOL
3	1	SEE PAGE 10	RELIEF (ITEMS 1, 2, 3, 7, & 8 ON PAGE 10)
4	2	200300040	STEEL PLUG
5	1	670500055	CORE BLOCK PLATE
6	2	670500045	SPOOL BACK-UP
7	2	671600118	PLUG
8	1	671600049	PLUG
9	1	671200035	SPACER
10	2	240000904	904 O-RING
11	2	240000208	208 O-RING
12	3	240000018	018 O-RING
13	1	240000021	021 O-RING
14	1	240000908	908 O-RING
15	1	240000014	014 O-RING
16	1	240019014	BACK-UP WASHER
17	1	240000908	908 O-RING

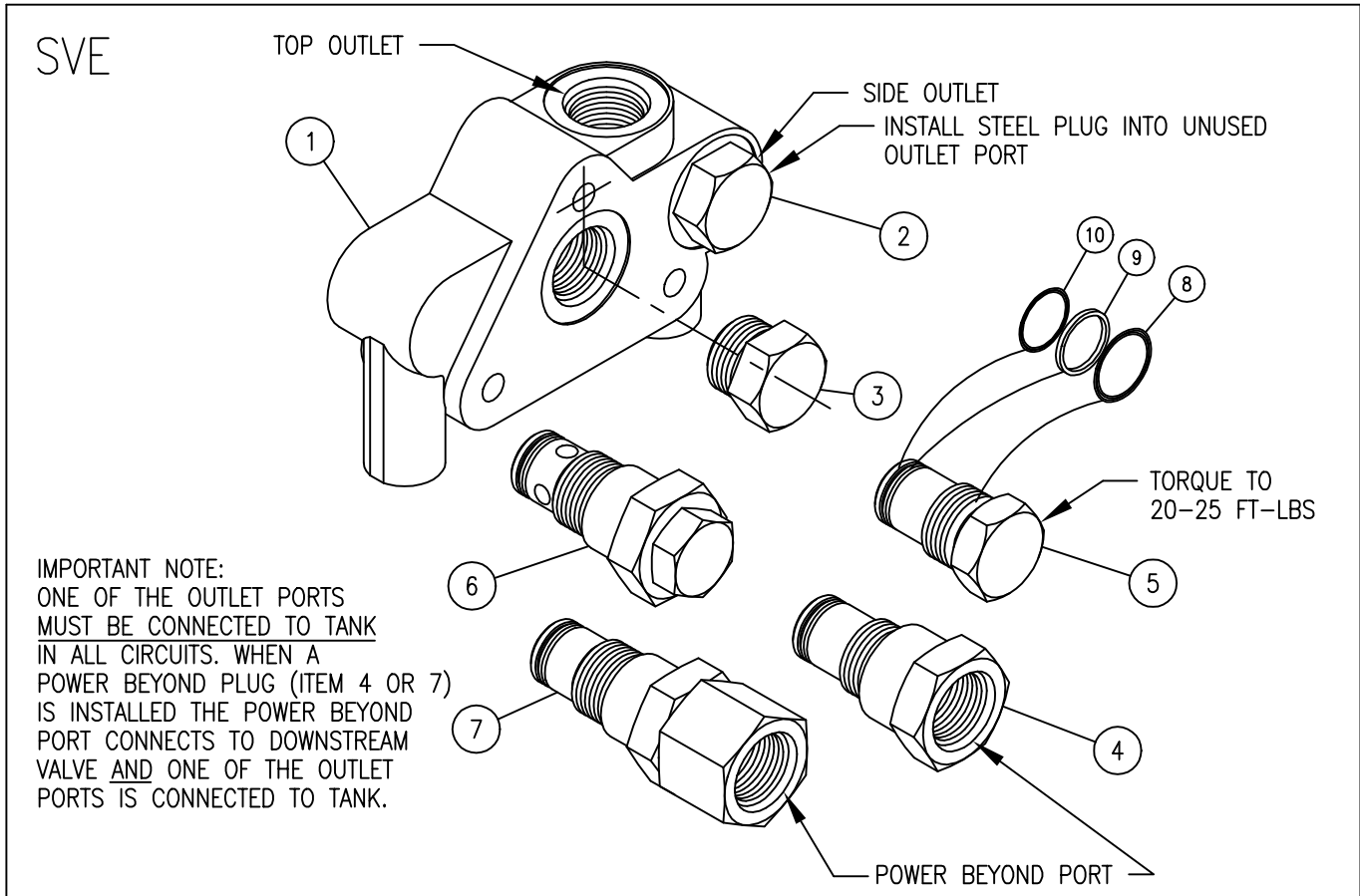
These are matched parts and are not sold separately.

REPLACEMENT SEAL KIT, NO. 660580004

SVH REPLACEMENT SEAL KIT NO. 660580010

NOTES:

1. THIS O-RING GOES INTO THE OVAL COUNTERBORE IN THE SIDE OF THE VALVE BODY.



SVE OUTLET SECTION

SVE OUTLET SECTION

ITEM	PART NO.	DESCRIPTION
1	625774001	OUTLET BODY #8 SAE
1	625775001	OUTLET BODY #10 SAE
2	200300040	PORT PLUG (STEEL) #8 SAE
2	200400030	PORT PLUG (STEEL) #10 SAE
3	200400030	OPTION 1, OPEN CENTER PLUG
4	660280001	OPTION 2, POWER BEYOND OUTLET W/ #8 SAE BEYOND PORT
5	660280002	OPTION 3, CLOSED CENTER OUTLET
6	660280018	OPTION 6, OPEN CENTER PRESSURE BUILD-UP CARTRIDGE
7	660280019	OPTION 7, POWER BEYOND PRESSURE BUILD-UP CARTRIDGE
8	240000910	910 O-RING
9	240019016	BACK-UP WASHER
10	240000016	016 O-RING

OPTION 1 STANDARD OPEN CENTER OUTLET WITH CONVERSION PLUG

This is the standard outlet option. This option allows for conversion in the field for power beyond or closed center applications. When the spools are in neutral the inlet is unloaded to tank.

OPTION 2 POWER BEYOND OUTLET WITH #8 SAE BEYOND PORT

This option provides for a high pressure power beyond port. This would be used if a valve is to be added downstream. The outlet must be connected to tank. When spools are in neutral the inlet is connected to power beyond port.

OPTION 3 CLOSED CENTER OUTLET

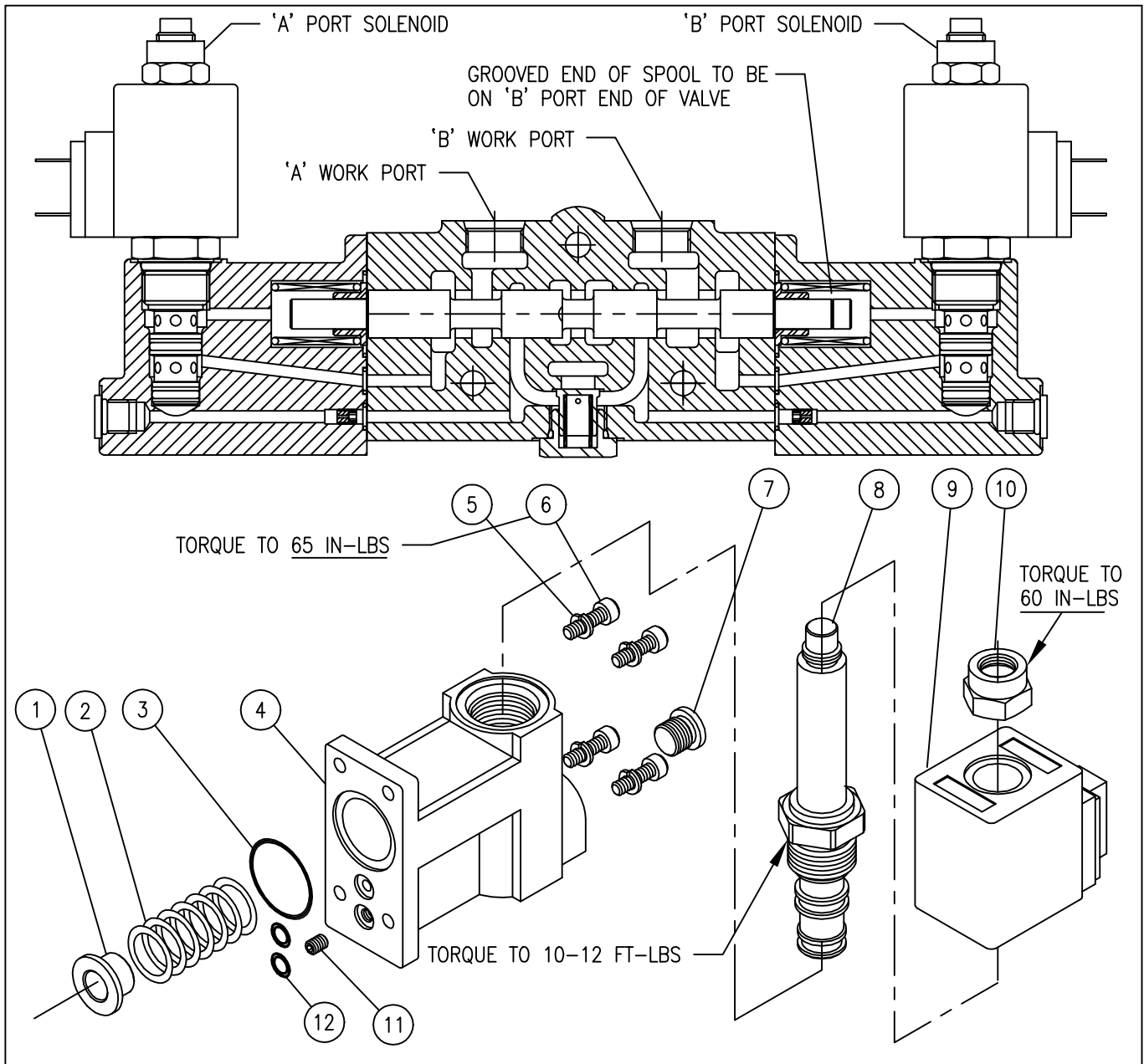
This option provides for closed center operation. This is typically used with a variable displacement pressure compensated pump or in a system with an unloading valve. When the spools are in neutral the inlet port is blocked.

OPTION 6 OPEN CENTER OUTLET PRESSURE BUILD-UP VALVE

This option directs oil from open center core thru pressure build-up valve and then to tank.

OPTION 7 POWER BEYOND PRESSURE BUILD-UP VALVE

This option directs oil from inlet thru pressure build-up valve and then downstream. The pressure build-up valve provides a #8 SAE high pressure power beyond port. The outlet must be connected to tank.



TANDEM SOLENOID ACTUATOR ASSY

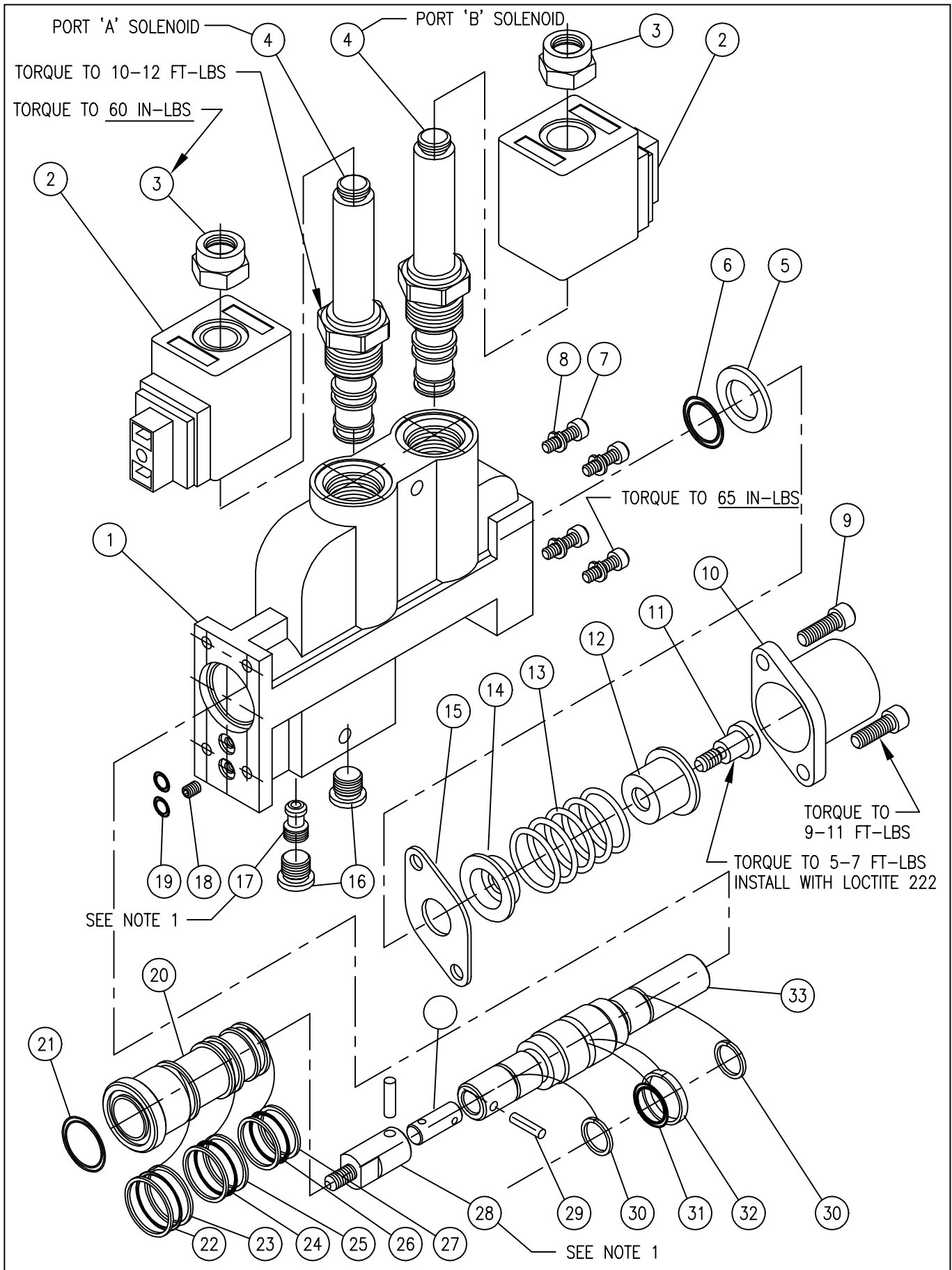
TANDEM SOLENOID ACTUATOR ASSY

ITEM	QTY	PART NO.	DESCRIPTION
1	2	671400101	SPRING END
2	2	670300063	SPRING
3	2	240000022*	022 O-RING
4	2	626350001	ACTUATOR BODY
5	8	220001010	LOCK WASHER
6	8	170003037	CAP SCREW
7	2	200200083	PLUG
8	2	660263001**	SOLENOID CART.
9	2	SEE CHART PAGE 25	SOLENOID COIL
10	2	671800021	COIL NUT
11	2	671400086	ORIFICE PLUG
12	4	240000009*	009 O-RING

PLEASE NOTE THE VALVE BODY IS MACHINED TO ACCEPT THE ACTUATOR BODY. THIS OPTION CAN NOT BE ADDED TO A STANDARD SWV1BA1 WORK SECTION.

*TANDEM SOLENOID ACTUATOR SEAL KIT
PART NO. 660580014

**SOLENOID CARTRIDGE SEAL KIT
PART NO. 660590008



SINGLE ENDED SOLENOID ACTUATOR

SINGLE ENDED SOLENOID ACTUATOR

ITEM	QTY	PART NO.	DESCRIPTION	
1	1	626230001	ACTUATOR BODY	
2	2	SEE CHART	SOLENOID COIL	SOLENOID COILS
3	2	671800021	COIL NUT	671302002 12 VDC H TYPE COIL
4	2	660263002**	SOLENOID CART.	671302003 12 VDC L TYPE COIL
5	1	670500045	SPOOL BACK UP WASHER	671322004 12 VDC Q TYPE COIL
6	1	240000208*	208 O-RING	671302006 24 VDC H TYPE COIL
7	4	170003037	CAP SCREW	671302007 24 VDC L TYPE COIL
8	4	220001010	LOCK WASHER	671322008 24 VDC Q TYPE COIL
9	2	170003008	CAP SCREW	671302009 120 VAC C TYPE COIL
10	1	671400033	END CAP	671302010 120 VAC H TYPE COIL
11	1	671400078	ADAPTER	
12	1	671400076	OUTER STOP CUP	
13	1	670300030	SPRING	
14	1	671400077	INNER STOP CUP	*SOLENOID OPERATED SEAL KIT
15	1	670500044	RETAINER PLATE	PART NO. 660580005
16	2	200100189	STEEL PLUG	**SOLENOID CARTRIDGE SEAL KIT
17	1	671600063	PLUG (SEE NOTE 1)	PART NO. 660590008
18	1	671400086	ORIFICE PLUG	
19	2	240000009*	009 O-RING	S12Q PARTS KIT NO. 660280026
20	1	671400079	SLEEVE	CONTAINS ITEMS 1-34 AND
21	1	240000019*	019 O-RING	2-671322004 COILS
22	1	240000020*	020 O-RING	
23	2	240044020*	BACK-UP WASHER	
24	1	240000019*	019 O-RING	
25	2	240044019*	BACK-UP WASHER	PLEASE NOTE THE VALVE BODY IS
26	1	240000018*	018 O-RING	MACHINED TO ACCEPT THE ACTUATOR
27	2	240044018*	BACK-UP WASHER	BODY. THIS OPTION CAN NOT BE
28	1	671900071	ADAPTER (SEE NOTE 1)	ADDED TO A STANDARD SVW1BA1
29	2	190100046	PIN	WORK SECTION.
30	2	240019014*	BACK-UP WASHER	
31	1	240000113*	113 O-RING	
32	1	240016230*	GLYD-RING	
33	1	610100011	SPOOL	
34	1	671400207	PIN	

1. ITEMS 17 AND 28 ARE INSTALLED AT FACTORY WITH LOCTITE 271 AND CANNOT BE DISASSEMBLED UNDER NORMAL CIRCUMSTANCES. ITEMS 28 AND 34 ARE THE CURRENT DESIGN. PREVIOUS DESIGN WAS 1 PIECE WITH 1 PIN ITEM 29.

The Solenoid Operated SV Work Section allows remote electrical on-off or manual control. The Solenoid Operated SV Section may be assembled with other standard SV manual work sections.

The Solenoid Operated SV Section contains two, 3 way-2 position solenoid cartridge valves and a pilot operated piston attached to the main control spool. When both solenoids are de-energized both sides of the pilot piston are open to tank pressure and the spool remains spring centered. When solenoid 'A' is energized, pilot pressure is applied to one side of the pilot piston causing the spool to shift from the neutral position to work port 'A'. when solenoid 'B' is energized, pilot pressure is applied to the other side of the pilot piston causing the spool to shift to work port 'B'.

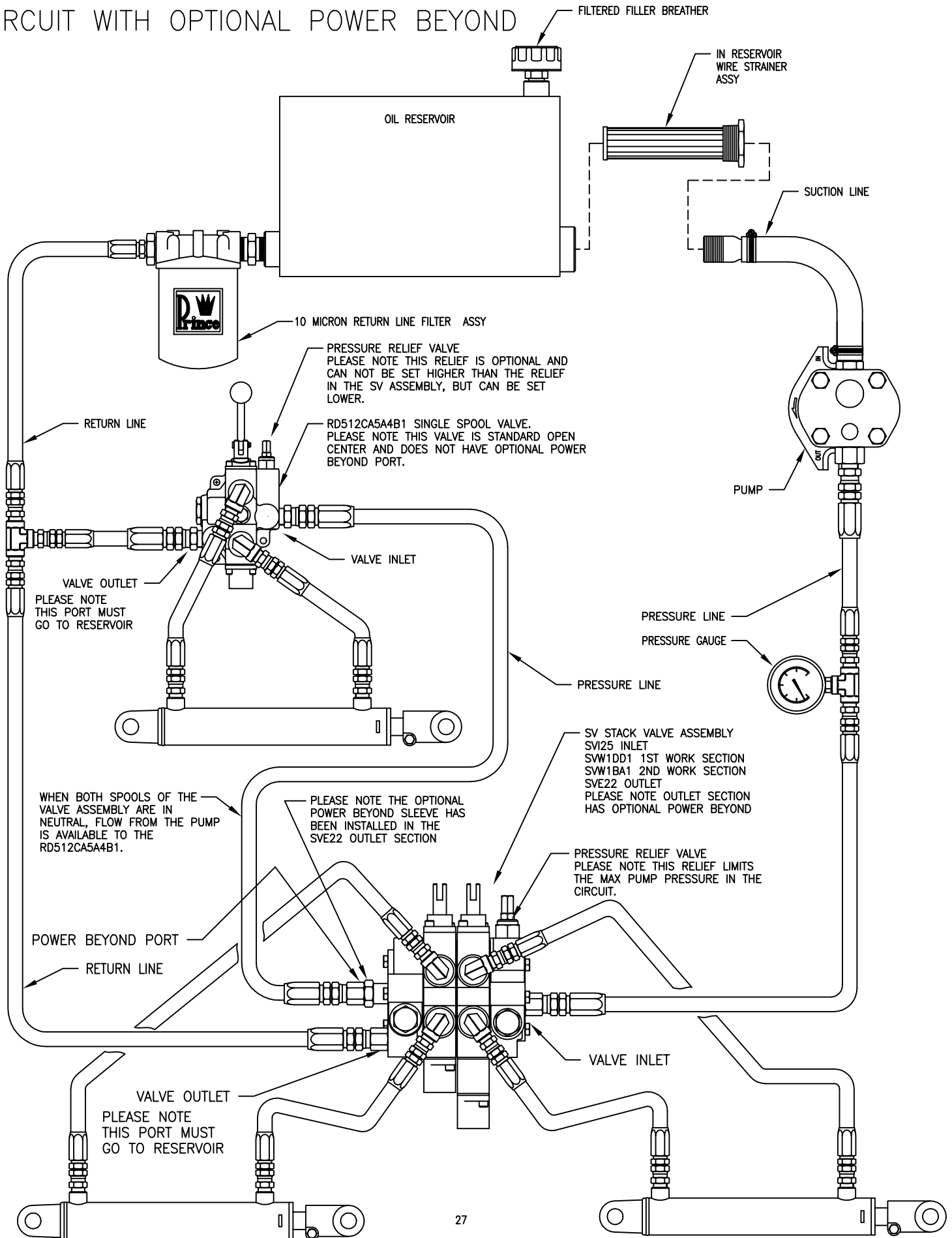
Internal pilot lines provide pilot pressure to the solenoid actuator. Pilot pressure is generated by a "Pressure Build-Up Valve" that is installed in the standard outlet section. Two versions of the Pressure Build-Up Valve are offered. The Open Center Pressure Build-Up Valve and the Power Beyond Pressure Build-Up Valve. Both versions supply 150-200 PSI pilot pressure to the solenoid actuator.

For over center or light load applications if the required work port load pressure drops below 200 PSI, the pilot pressure to the pilot piston will drop to the same pressure causing the spring to move the control spool back towards the neutral position. The spool will end up in an intermediate position between neutral and fully shifted. A restrictor installed in the work port or line may be required for this type of application.

For closed center applications the Pressure Build-Up Valve is not required. However, a system pressure of 200 PSI must be maintained in the closed center position to actuate the valve properly.

Proper operation of the solenoid actuator requires a pressure differential of 150-200 PSI above tank pressure. The maximum tank port pressure should not exceed 150 PSI. Excessive tank pressure will increase "Seal Drag" and may prohibit, the spool from shifting.

EXAMPLE SV STACK VALVE HYDRAULIC CIRCUIT WITH OPTIONAL POWER BEYOND





Prince Manufacturing Corporation

P.O. Box 7000

612 North Derby Lane

North Sioux City, SD 57049-7000

Phone: (605) 235-1220

OEM Sales Fax: (605) 235-1082 Distributor Sales Fax: (605) 217-6300

URL: www.princehyd.com

E-mail: prince@princehyd.com



INTRODUCTION

Thank you for purchasing a Honda engine. We want to help you to get the best results from your new engine and to operate it safely. This manual contains information on how to do that; please read it carefully before operating the engine. If a problem should arise, or if you have any questions about your engine, consult an authorized Honda servicing dealer.

All information in this publication is based on the latest product information available at the time of printing. Honda Motor Co., Ltd. reserves the right to make changes at any time without notice and without incurring any obligation. No part of this publication may be reproduced without written permission.


This manual should be considered a permanent part of the engine and should remain with the engine if resold.

Review the instructions provided with the equipment powered by this engine for any additional information regarding engine startup, shutdown, operation, adjustments or any special maintenance instructions.


United States, Puerto Rico, and U.S. Virgin Islands:
We suggest you read the warranty policy to fully understand its coverage and your responsibilities of ownership. The warranty policy is a separate document that should have been given to you by your dealer.


SAFETY MESSAGES


Your safety and the safety of others are very important. We have provided important safety messages in this manual and on the engine. Please read these messages carefully.

A safety message alerts you to potential hazards that could hurt you or others. Each safety message is preceded by a safety alert symbol  and one of three words, DANGER, WARNING, or CAUTION.

These signal words mean:

 **DANGER** You WILL be KILLED or SERIOUSLY HURT if you don't follow instructions.

 **WARNING** You CAN be KILLED or SERIOUSLY HURT if you don't follow instructions.


 **CAUTION** You CAN be HURT if you don't follow instructions.

Each message tells you what the hazard is, what can happen, and what you can do to avoid or reduce injury.

DAMAGE PREVENTION MESSAGES

You will also see other important messages that are preceded by the word NOTICE.

This word means:

 **NOTICE** Your engine or other property can be damaged if you don't follow instructions.

The purpose of these messages is to help prevent damage to your engine, other property, or the environment.

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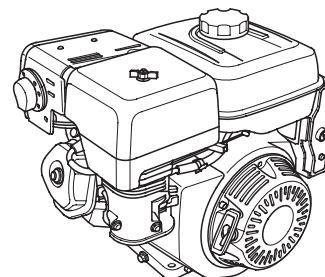
GX240UT1-GX270UT-GX340UT1-GX390UT1-GX240RT1-GX270RT-GX340RT1-GX390RT1

37Z5K604
00X37-Z5K-6040

HONDA

OWNER'S MANUAL MANUEL DE L'UTILISATEUR MANUAL DEL PROPIETARIO

GX240 · GX270 · GX340 · GX390



WARNING:

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

ENGLISH

FRANÇAIS

ESPAÑOL

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MAINTENANCE SAFETY.....7	Emission Control System Information.....17
SAFETY PRECAUTIONS.....7	Air Index.....18
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SAFETY INFORMATION

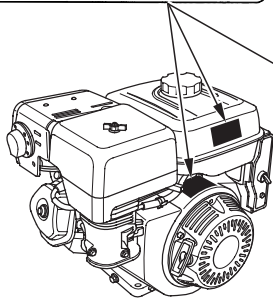
- Understand the operation of all controls and learn how to stop the engine quickly in case of emergency. Make sure the operator receives adequate instruction before operating the equipment.
- Do not allow children to operate the engine. Keep children and pets away from the area of operation.
- Your engine's exhaust contains poisonous carbon monoxide. Do not run the engine without adequate ventilation, and never run the engine indoors.
- The engine and exhaust become very hot during operation. Keep the engine at least 1 meter (3 feet) away from buildings and other equipment during operation. Keep flammable materials away, and do not place anything on the engine while it is running.

SAFETY LABEL LOCATION

This label warns you of potential hazards that can cause serious injury. Read it carefully. If the label comes off or becomes hard to read, contact your Honda dealer for replacement.



The safety label should be located either on the fuel tank, fan cover or packaged loosely with the engine to be applied by the manufacture.



The label is packaged with the engine.

See the manufacturer's instructions provided with the equipment.

For Canada:
French label is packaged with the engine.



Gasoline is highly flammable and explosive. Turn engine off and let cool before refueling.

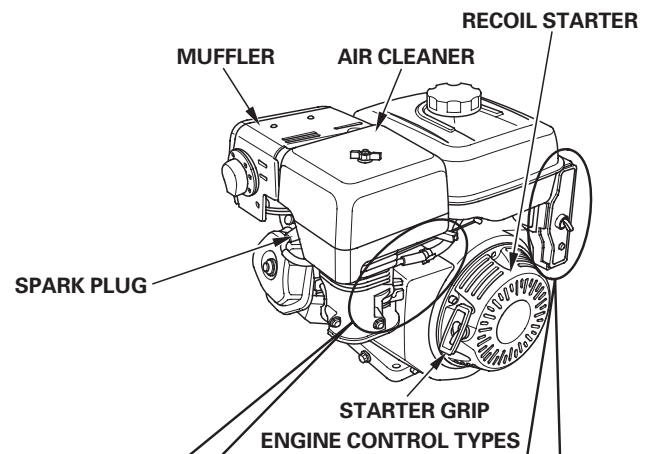
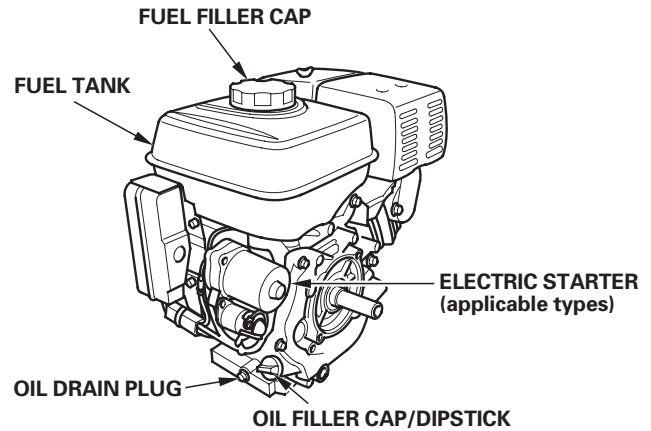


The engine emits toxic poisonous carbon monoxide gas. Do not run in an enclosed area.

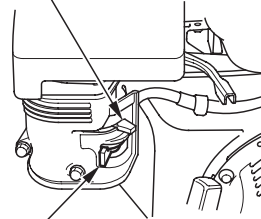


Read Owner's Manual before operation.

COMPONENT & CONTROL LOCATION

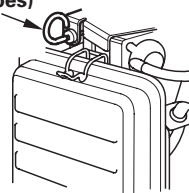


CHOKE LEVER



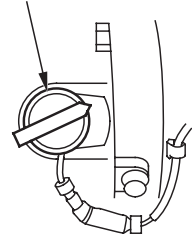
FUEL VALVE LEVER

CHOKE ROD (applicable types)

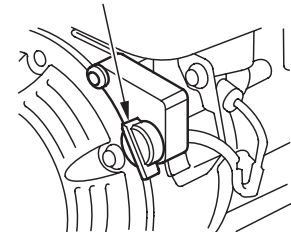


EXCEPT ELECTRIC STARTER TYPES

ENGINE SWITCH

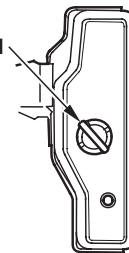


ENGINE SWITCH



ELECTRIC STARTER TYPES

ENGINE SWITCH





FEATURES

OIL ALERT® SYSTEM (applicable types)

“Oil Alert is a registered trademark in the United States”

The Oil Alert system is designed to prevent engine damage caused by an insufficient amount of oil in the crankcase. Before the oil level in the crankcase can fall below a safe limit, the Oil Alert system will automatically stop the engine (the engine switch will remain in the ON position).

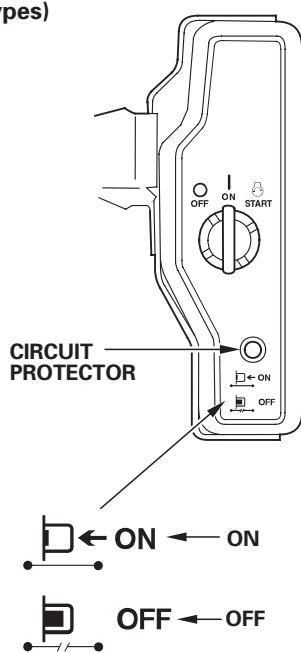
If the engine stops and will not restart, check the engine oil level (see page 9) before troubleshooting in other areas.

CIRCUIT PROTECTOR (applicable types)

The circuit protector protects the battery charging circuit. A short circuit, or a battery connected with reverse polarity, will trip the circuit protector.

The green indicator inside the circuit protector will pop out to show that the circuit protector has switched off. If this occurs, determine the cause of the problem, and correct it before resetting the circuit protector.

Push the circuit protector button to reset.



BEFORE OPERATION CHECKS

IS YOUR ENGINE READY TO GO?

For your safety, and to maximize the service life of your equipment, it is very important to take a few moments before you operate the engine to check its condition. Be sure to take care of any problem you find, or have your servicing dealer correct it, before you operate the engine.

⚠ WARNING

Improperly maintaining this engine, or failure to correct a problem before operation, can cause a malfunction in which you can be seriously hurt or killed.

Always perform a pre-operation inspection before each operation, and correct any problem.

Before beginning your pre-operation checks, be sure the engine is level and the engine switch is in the OFF position.

Always check the following items before you start the engine:

Check the General Condition of the Engine

1. Look around and underneath the engine for signs of oil or gasoline leaks.
2. Remove any excessive dirt or debris, especially around the muffler and recoil starter.
3. Look for signs of damage.
4. Check that all shields and covers are in place, and all nuts, bolts, and screws are tightened.

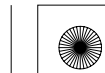
Check the Engine

1. Check the fuel level (see page 8). Starting with a full tank will help to eliminate or reduce operating interruptions for refueling.
2. Check the engine oil level (see page 9). Running the engine with a low oil level can cause engine damage.

The Oil Alert system (applicable types) will automatically stop the engine before the oil level falls below safe limits. However, to avoid the inconvenience of an unexpected shutdown, always check the engine oil level before startup.

3. Check the reduction case oil level on applicable types (see page 9). Oil is essential to reduction case operation and long life.
4. Check the air filter element (see page 10). A dirty air filter element will restrict air flow to the carburetor, reducing engine performance.
5. Check the equipment powered by this engine.

Review the instructions provided with the equipment powered by this engine for any precautions and procedures that should be followed before engine startup.





OPERATION

SAFE OPERATING PRECAUTIONS

Before operating the engine for the first time, please review the *SAFETY INFORMATION* section on page 2 and the *BEFORE OPERATION CHECKS* on page 3.

For your safety, do not operate the engine in an enclosed area such as a garage. Your engine's exhaust contains poisonous carbon monoxide gas that can collect rapidly in an enclosed area and cause illness or death.

⚠ WARNING

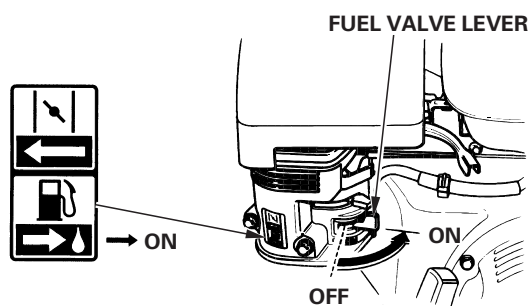
Exhaust contains poisonous carbon monoxide gas that can build up to dangerous levels in closed areas. Breathing carbon monoxide can cause unconsciousness or death.

Never run the engine in a closed, or even partly closed area where people may be present.

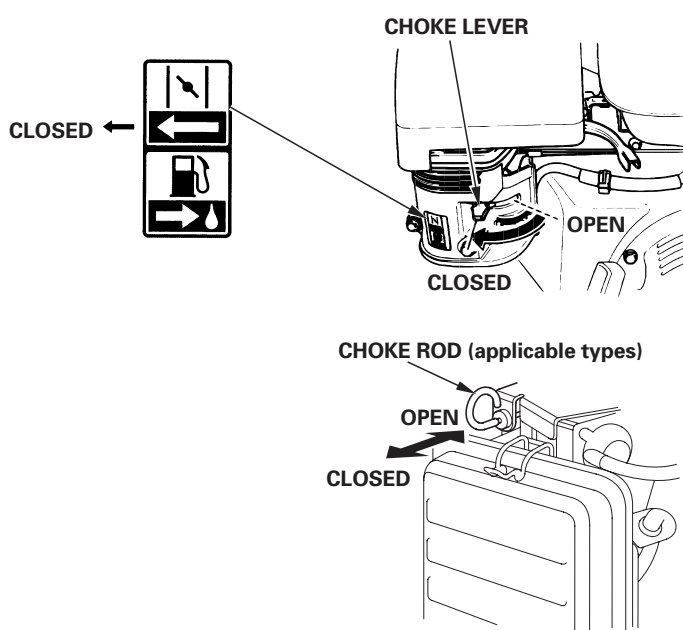
Review the instructions provided with the equipment powered by this engine for any safety precautions that should be observed with engine startup, shutdown or operation.

STARTING THE ENGINE

1. Move the fuel valve lever to the ON position.



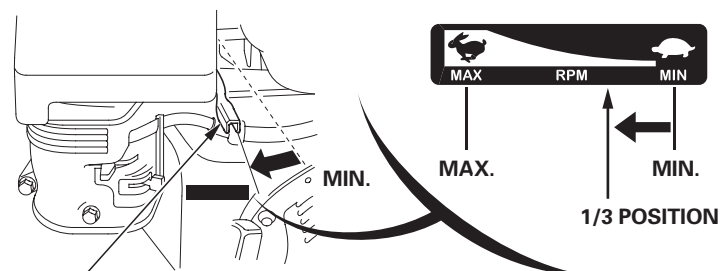
2. To start a cold engine, move the choke lever or choke rod (applicable types) to the CLOSED position.



To restart a warm engine, leave the choke lever or choke rod in the OPEN position.

Some engine applications use a remote-mounted choke control rather than the engine-mounted choke lever shown here. Refer to the instructions provided by the equipment manufacturer.

3. Move the throttle lever away from the MIN. position, about 1/3 of the way toward the MAX. position.

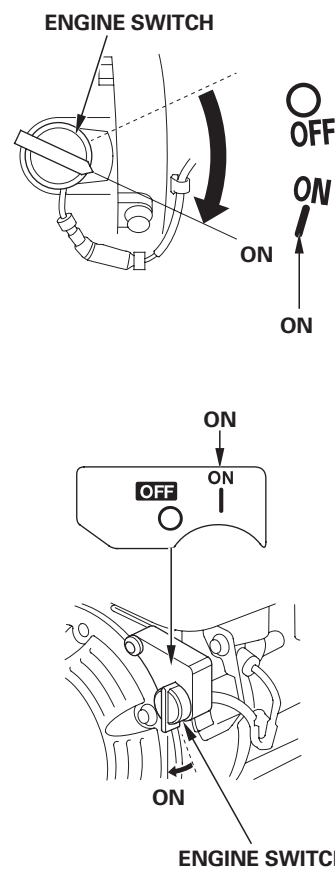


THROTTLE LEVER

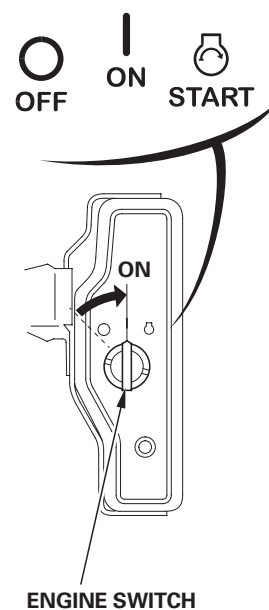
Some engine applications use a remote-mounted throttle control rather than the engine-mounted throttle lever shown here. Refer to the instructions provided by the equipment manufacturer.

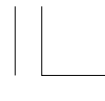
4. Turn the engine switch to the ON position.

EXCEPT ELECTRIC STARTER TYPES



ELECTRIC STARTER TYPES

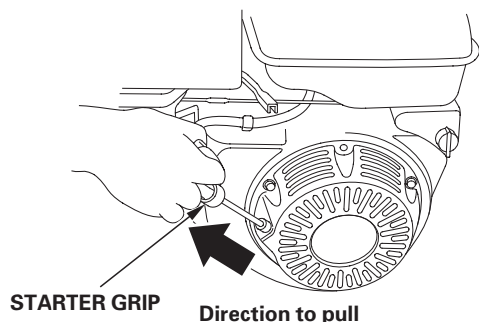




5. Operate the starter.

RECOIL STARTER

Pull the starter grip lightly until you feel resistance, then pull briskly in the direction of the arrow as shown below. Return the starter grip gently.



NOTICE

Do not allow the starter grip to snap back against the engine. Return it gently to prevent damage to the starter.

ELECTRIC STARTER (applicable types):

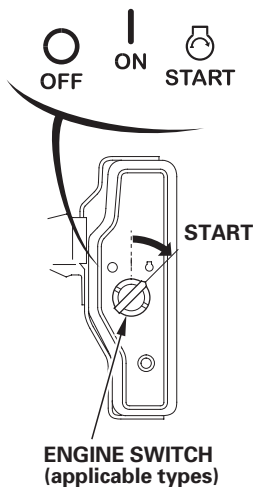
Turn the key to the START position, and hold it there until the engine starts.

If the engine fails to start within 5 seconds, release the key, and wait at least 10 seconds before operating the starter again.

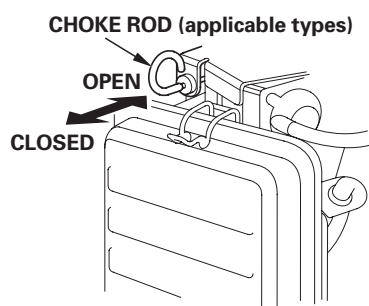
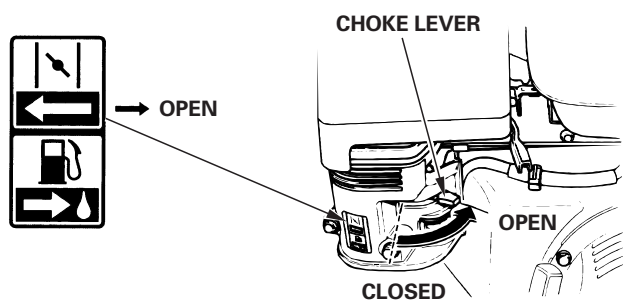
NOTICE

Using the electric starter for more than 5 seconds at a time will overheat the starter motor and can damage it.

When the engine starts, release the key, allowing it to return to the ON position.



6. If the choke lever or choke rod (applicable types) has been moved to the CLOSED position to start the engine, gradually move it to the OPEN position as the engine warms up.

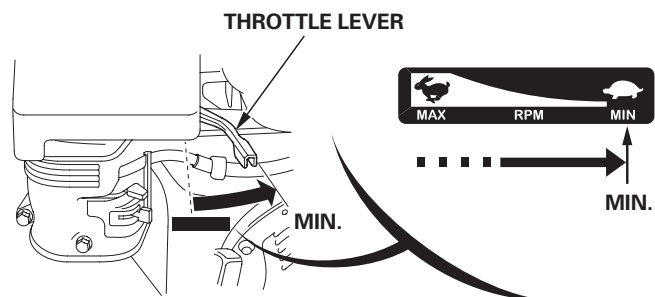


STOPPING THE ENGINE

To stop the engine in an emergency, simply turn the engine switch to the OFF position. Under normal conditions, use the following procedure. Refer to the instructions provided by the equipment manufacturer.

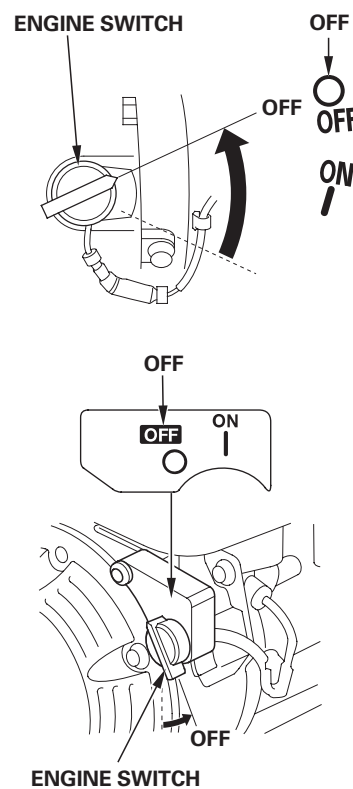
1. Move the throttle lever to the MIN. position.

Some engine applications use a remote-mounted throttle control rather than the engine-mounted throttle lever shown here.

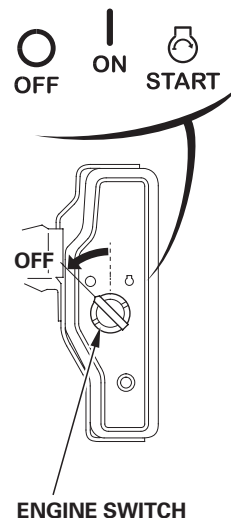


2. Turn the engine switch to the OFF position:

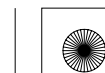
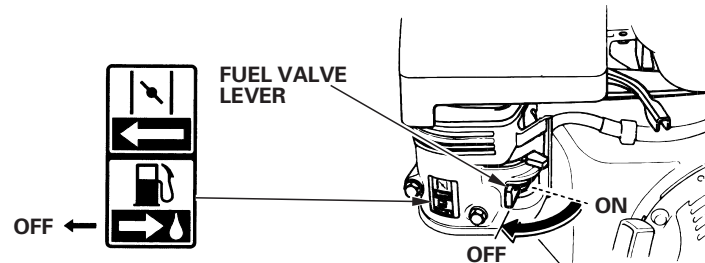
EXCEPT ELECTRIC STARTER TYPES

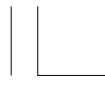


ELECTRIC STARTER TYPES



3. Turn the fuel valve lever to the OFF position.



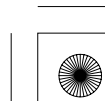
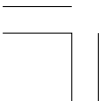
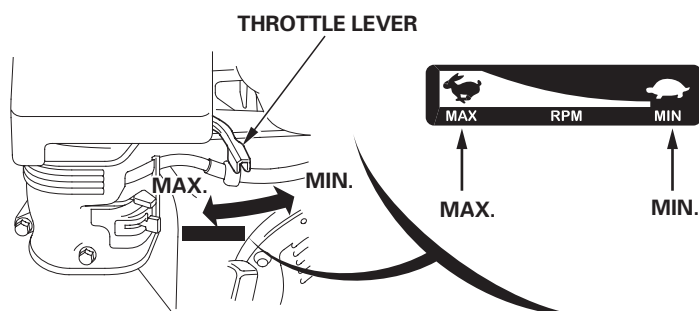


SETTING ENGINE SPEED

Position the throttle lever for the desired engine speed.

Some engine applications use a remote-mounted throttle control rather than the engine-mounted throttle lever shown here. Refer to the instructions provided by the equipment manufacturer.

For engine speed recommendations, refer to the instructions provided with the equipment powered by this engine.





SERVICING YOUR ENGINE

THE IMPORTANCE OF MAINTENANCE

Good maintenance is essential for safe, economical and trouble-free operation. It will also help reduce pollution.

⚠ WARNING

Improper maintenance, or failure to correct a problem before operation, can cause a malfunction in which you can be seriously hurt or killed.

Always follow the inspection and maintenance recommendations and schedules in this owner's manual.

To help you properly care for your engine, the following pages include a maintenance schedule, routine inspection procedures, and simple maintenance procedures using basic hand tools. Other service tasks that are more difficult, or require special tools, are best handled by professionals and are normally performed by a Honda technician or other qualified mechanic.

The maintenance schedule applies to normal operating conditions. If you operate your engine under severe conditions, such as sustained high-load or high-temperature operation, or use in unusually wet or dusty conditions, consult your servicing dealer for recommendations applicable to your individual needs and use.

Maintenance, replacement, or repair of the emission control devices and systems may be performed by any engine repair establishment or individual, using parts that are "certified" to EPA standards.

MAINTENANCE SAFETY

Some of the most important safety precautions follow. However, we cannot warn you of every conceivable hazard that can arise in performing maintenance. Only you can decide whether or not you should perform a given task.

⚠ WARNING

Failure to properly follow maintenance instructions and precautions can cause you to be seriously hurt or killed.

Always follow the procedures and precautions in this owner's manual.

SAFETY PRECAUTIONS

- Make sure the engine is off before you begin any maintenance or repairs. This will eliminate several potential hazards:
 - **Carbon monoxide poisoning from engine exhaust.**
Be sure there is adequate ventilation whenever you operate the engine.
 - **Burns from hot parts.**
Let the engine and exhaust system cool before touching.
 - **Injury from moving parts.**
Do not run the engine unless instructed to do so.
- Read the instructions before you begin, and make sure you have the tools and skills required.
- To reduce the possibility of fire or explosion, be careful when working around gasoline. Use only a non-flammable solvent, not gasoline, to clean parts. Keep cigarettes, sparks and flames away from all fuel related parts.

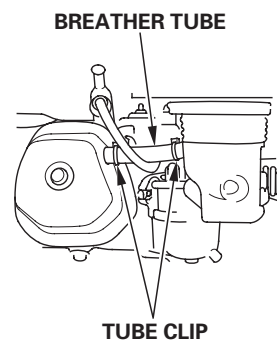
Remember that an authorized Honda servicing dealer knows your engine best and is fully equipped to maintain and repair it. To ensure the best quality and reliability, use only new Honda Genuine parts or their equivalents for repair and replacement.

MAINTENANCE SCHEDULE

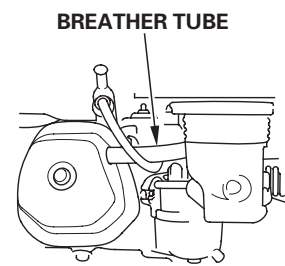
REGULAR SERVICE PERIOD (3) Perform at every indicated month or operating hour interval, whichever comes first.		Each Use	First Month or 20 Hrs	Every 3 Months or 50 Hrs	Every 6 Months or 100 Hrs	Every Year or 300 Hrs	Refer to Page
ITEM							
Engine oil	Check level	○					9
	Change		○		○		9
Reduction case oil (applicable types)	Check level	○					9
	Change		○		○		10
Air cleaner	Check	○					10
	Clean			○ (1)	○ * (1)		10 – 11
	Replace					○ * *	
Sediment cup	Clean				○		12
Spark plug	Check-adjust				○		12
	Replace					○	
Spark arrester (applicable types)	Clean				○		13
Idle speed	Check-adjust					○ (2)	13
Valve clearance	Check-adjust					○ (2)	
Combustion chamber	Clean	After every 500 Hrs. (2)					Shop manual
Fuel tank & filter	Clean				○ (2)		Shop manual
Fuel tube	Check	Every 2 years (Replace if necessary) (2)					Shop manual

- * • Internal vent carburetor with dual element type only.
- Cyclone type every 6 months or 150 hours.

INTERNAL VENT CARBURETOR TYPE



STANDARD TYPE



- * * • Replace paper element type only.
- Cyclone type every 2 years or 600 hours.

- (1) Service more frequently when used in dusty areas.
- (2) These items should be serviced by your Honda servicing dealer, unless you have the proper tools and are mechanically proficient. Refer to the Honda shop manual for service procedures.
- (3) For commercial use, log hours of operation to determine proper maintenance intervals.

Failure to follow this maintenance schedule could result in non-warrantable failures.



REFUELING

Recommended Fuel

Unleaded gasoline	
U.S.	Pump octane rating 86 or higher
Except U.S.	Research octane rating 91 or higher Pump octane rating 86 or higher

This engine is certified to operate on unleaded gasoline with a pump octane rating of 86 or higher (a research octane rating of 91 or higher).

Refuel in a well-ventilated area with the engine stopped. If the engine has been running, allow it to cool first. Never refuel the engine inside a building where gasoline fumes may reach flames or sparks.

You may use unleaded gasoline containing no more than 10% ethanol (E10) or 5% methanol by volume. In addition, methanol must contain cosolvents and corrosion inhibitors. Use of fuels with content of ethanol or methanol greater than shown above may cause starting and/or performance problems. It may also damage metal, rubber, and plastic parts of the fuel system. Engine damage or performance problems that result from using a fuel with percentages of ethanol or methanol greater than shown above are not covered under warranty.

If your equipment will be used on an infrequent or intermittent basis, please refer to the fuel section of the HELPFUL TIPS & SUGGESTIONS chapter (see page 13) for additional information regarding fuel deterioration.

⚠ WARNING

Gasoline is highly flammable and explosive, and you can be burned or seriously injured when refueling.

- Stop engine and keep heat, sparks, and flame away.
- Refuel only outdoors.
- Wipe up spills immediately.

NOTICE

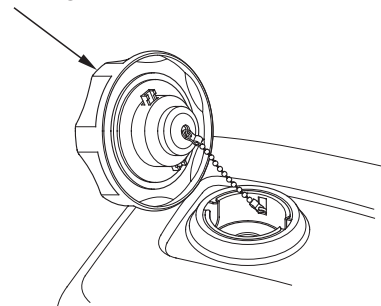
Fuel can damage paint and some types of plastic. Be careful not to spill fuel when filling your fuel tank. Damage caused by spilled fuel is not covered under the Distributor's Limited Warranty.

Never use stale or contaminated gasoline or an oil/gasoline mixture. Avoid getting dirt or water in the fuel tank.

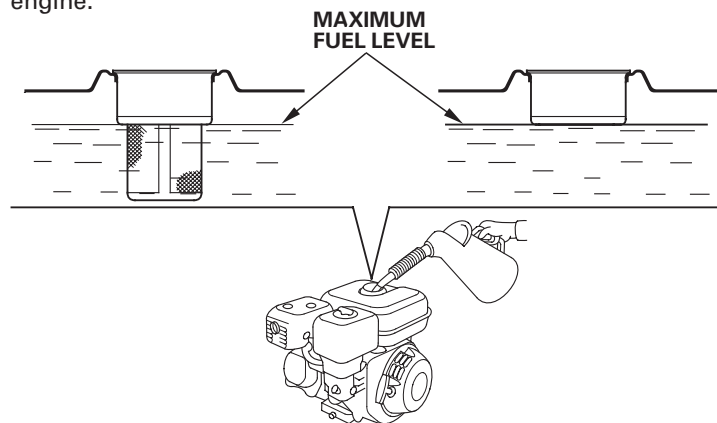
For refueling, refer to the manufacturer's instructions provided with the equipment. See the following for a Honda supplied standard fuel tank refueling instruction.

1. With the engine stopped and on a level surface, remove the fuel filler cap and check the fuel level. Refill the tank if the fuel level is low.

FUEL FILLER CAP



2. Add fuel to the bottom of the maximum fuel level limit of the fuel tank. Do not overfill. Wipe up spilled fuel before starting the engine.



3. Refuel carefully to avoid spilling fuel. Do not fill the fuel tank completely. It may be necessary to lower the fuel level depending on operating conditions. After refueling, tighten the fuel filler cap securely.

Keep gasoline away from appliance pilot lights, barbecues, electric appliances, power tools, etc.

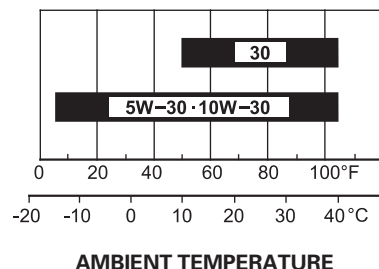
Spilled fuel is not only a fire hazard, it causes environmental damage. Wipe up spills immediately.

ENGINE OIL

Oil is a major factor affecting performance and service life. Use 4-stroke automotive detergent oil.

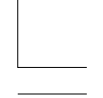
Recommended Oil

Use 4-stroke motor oil that meets or exceeds the requirements for API service category SJ or later (or equivalent). Always check the API service label on the oil container to be sure it includes the letters SJ or later (or equivalent).



SAE 10W-30 is recommended for general use. Other viscosities shown in the chart may be used when the average temperature in your area is within the indicated range.

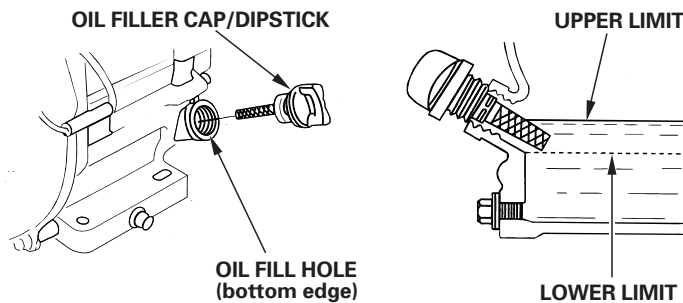




Oil Level Check

Check the engine oil level with the engine stopped and in a level position.

1. Remove the oil filler cap/dipstick and wipe it clean.
2. Insert the oil filler cap/dipstick into the oil filler neck as shown, but do not screw it in, then remove it to check the oil level.
3. If the oil level is near or below the lower limit mark on the dipstick, fill with the recommended oil (see page 8) to the upper limit mark (bottom edge of the oil fill hole). Do not overfill.
4. Reinstall the oil filler cap/dipstick.



NOTICE

Running the engine with a low oil level can cause engine damage. This type of damage is not covered by the Distributor's Limited Warranty.

The Oil Alert system (applicable types) will automatically stop the engine before the oil level falls below the safe limit. However, to avoid the inconvenience of an unexpected shutdown, always check the engine oil level before startup.

Oil Change

Drain the used oil when the engine is warm. Warm oil drains quickly and completely.

1. Place a suitable container below the engine to catch the used oil, then remove the oil filler cap/dipstick, oil drain plug and washer.
2. Allow the used oil to drain completely, then reinstall the oil drain plug and new washer, and tighten the oil drain plug securely.

Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, pour it on the ground, or pour it down a drain.

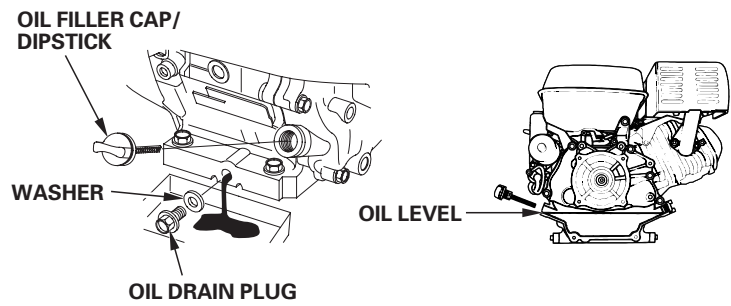
3. With the engine in a level position, fill with the recommended oil (see page 8) to the upper limit mark (bottom edge of the oil fill hole) on the dipstick.

NOTICE

Running the engine with a low oil level can cause engine damage. This type of damage is not covered by the Distributor's Limited Warranty.

The Oil Alert system (applicable types) will automatically stop the engine before the oil level falls below the safe limit. However, to avoid the inconvenience of an unexpected shutdown, fill to the upper limit, and check the oil level regularly.

4. Install the oil filler cap/dipstick and tighten securely.



REDUCTION CASE OIL (applicable types)

Recommended Oil

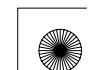
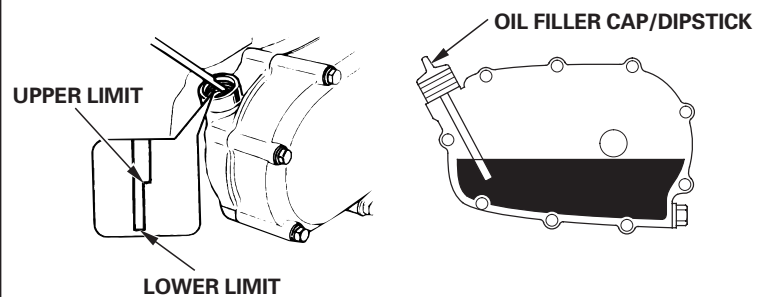
Use the same oil that is recommended for the engine (see page 8).

Oil Level Check

Check the reduction case oil level with the engine stopped and in a level position.

1/2 Reduction Case With Centrifugal Clutch

1. Remove the oil filler cap/dipstick and wipe it clean.
2. Insert and remove the oil filler cap/dipstick without screwing it into the filler hole. Check the oil level shown on the oil filler cap/dipstick.
3. If the oil level is low, add the recommended oil to reach the upper limit mark on the dipstick.
4. Screw in the oil filler cap/dipstick and tighten securely.





Oil Change

Drain the used oil while the engine is warm. Warm oil drains quickly and completely.

1. Place a suitable container below the reduction case to catch the used oil, then remove the oil filler cap/dipstick, the drain plug and washer.
2. Allow the used oil to drain completely, then reinstall the drain plug and a new washer, and tighten it securely.

Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash or pour it on the ground or pour it down a drain.

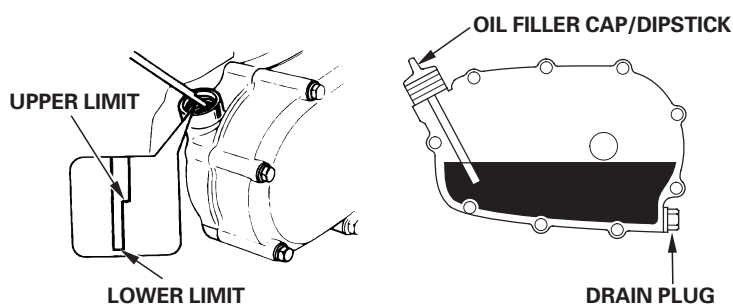
3. With the engine in a level position, fill with the recommended oil (see page 8) to the upper limit mark on the dipstick. To check the oil level, insert and remove the dipstick without screwing it into the filler hole.

Reduction case oil capacity: 0.30 L (0.32 US qt, 0.26 Imp qt)

NOTICE

Running the engine with a low reduction case oil level can cause reduction case damage.

4. Screw in the oil filler cap/dipstick and tighten securely.



AIR CLEANER

A dirty air cleaner will restrict air flow to the carburetor, reducing engine performance. If you operate the engine in very dusty areas, clean the air filter more often than specified in the MAINTENANCE SCHEDULE (see page 7).

NOTICE

Operating the engine without an air filter, or with a damaged air filter, will allow dirt to enter the engine, causing rapid engine wear. This type of damage is not covered by the Distributor's Limited Warranty.

Inspection

Remove the air cleaner cover and inspect the filter elements. Clean or replace dirty filter elements. Always replace damaged filter elements. If equipped with an oil-bath air cleaner, also check the oil level.

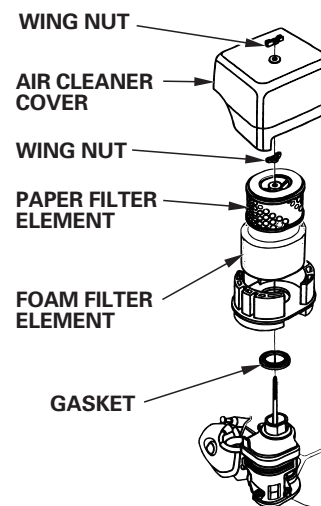
Refer to pages 10 – 11 for instructions that apply to the air cleaner and filter for your engine type.

Cleaning

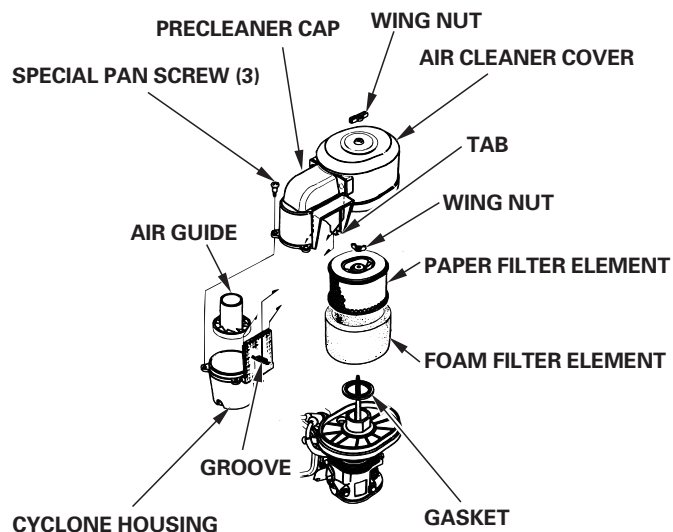
Dual-Filter Element Types

1. Remove the wing nut from the air cleaner cover, and remove the cover.
2. Remove the wing nut from the air filter, and remove the filter.
3. Remove the foam filter from the paper filter.
4. Inspect both air filter elements, and replace them if they are damaged. Always replace the paper air filter element at the scheduled interval (see page 7).

STANDARD DUAL-FILTER ELEMENT TYPE



CYCLONE DUAL-FILTER ELEMENT TYPE





5. Clean the air filter elements if they are to be reused.

Paper air filter element: Tap the filter element several times on a hard surface to remove dirt, or blow compressed air [not exceeding 207 kPa (2.1 kgf/cm², 30 psi)] through the filter element from the inside. Never try to brush off dirt; brushing will force dirt into the fibers.

Foam air filter element: Clean in warm soapy water, rinse, and allow to dry thoroughly. Or clean in non-flammable solvent and allow to dry. Dip the filter element in clean engine oil, then squeeze out all excess oil. The engine will smoke when started if too much oil is left in the foam.

6. CYCLONE TYPE ONLY: Remove the three pan-head screws from the pre-cleaner cap, then remove the cyclone housing and air guide. Wash the parts with water, dry them thoroughly, and reassemble them.

Be sure to install the air guide as shown in the illustration.

Install the cyclone housing so the air intake tab fits into the groove in the pre-cleaner cap.

7. Wipe dirt from the inside of the air cleaner case and cover using a moist rag. Be careful to prevent dirt from entering the air duct that leads to the carburetor.

8. Place the foam air filter element over the paper element, and reinstall the assembled air filter. Be sure the gasket is in place beneath the air filter. Tighten the air filter wing nut securely.

9. Install the air cleaner cover, and tighten the wing nut securely.

Oil Bath & Single-Filter Element Types

1. Remove the wing nut, and remove the air cleaner cap and cover.

2. Remove the air filter element from the cover. Wash the cover and filter element in warm soapy water, rinse, and allow to dry thoroughly. Or clean in non-flammable solvent and allow to dry.

3. Dip the filter element in clean engine oil, then squeeze out all excess oil. The engine will smoke if too much oil is left in the foam.

4. **OIL BATH TYPE ONLY:** Empty the used oil from the air cleaner case, wash out any accumulated dirt with non-flammable solvent, and dry the case.

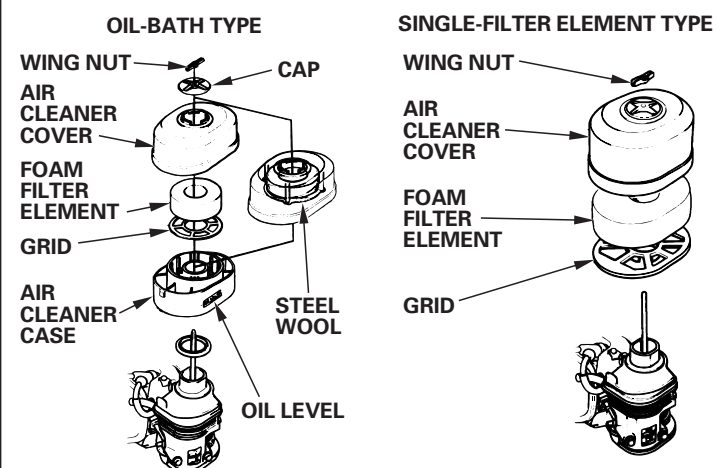
5. **OIL BATH TYPE ONLY:** Fill the air cleaner case to the **OIL LEVEL** mark with the same oil that is recommended for the engine (see page 8).

Oil capacities:

GX240/GX270: 60 cm³ (2.0 US oz, 2.1 Imp oz)

GX340/GX390: 80 cm³ (2.7 US oz, 2.8 Imp oz)

6. Reassemble the air cleaner, and tighten the wing nut securely.



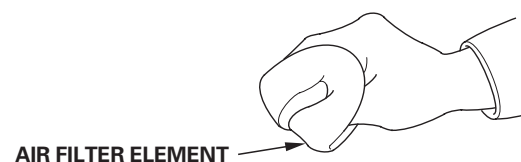
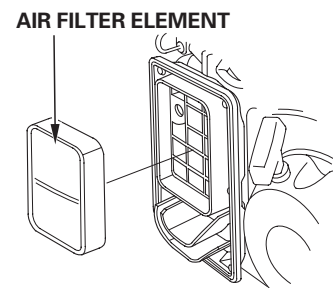
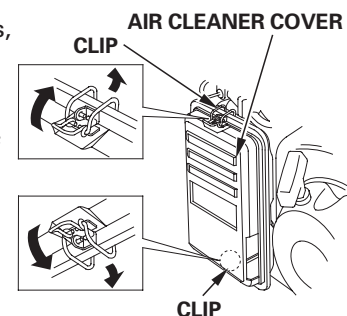
Low Profile Types

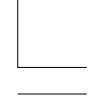
1. Unsnap the air cleaner cover clips, remove the air cleaner cover, and remove the air filter element.

2. Wash the element in a solution of household detergent and warm water, then rinse thoroughly, or wash in non-flammable or high flash point solvent. Allow the element to dry thoroughly.

3. Soak the air filter element in clean engine oil and squeeze out the excess oil. The engine will smoke during initial startup if too much oil is left in the element.

4. Reinstall the air filter element and the cover.





SEDIMENT CUP

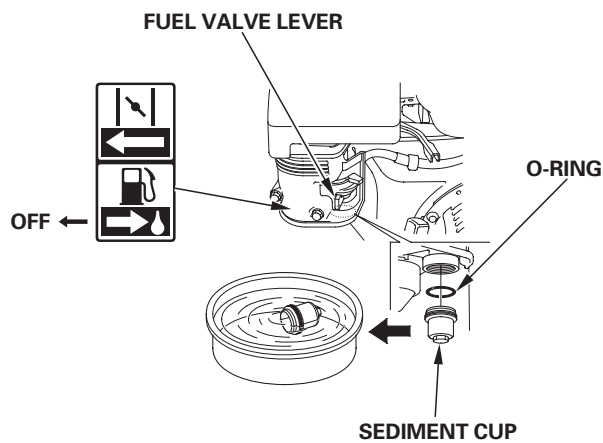
Cleaning

⚠ WARNING

Gasoline is highly flammable and explosive, and you can be burned or seriously injured when handling fuel.

- Stop engine and keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

1. Move the fuel valve lever to the OFF position, then remove the sediment cup and O-ring.
2. Wash the sediment cup in non-flammable solvent, and dry it thoroughly.



3. Place the O-ring in the fuel valve, and install the sediment cup. Tighten the sediment cup securely.
4. Move the fuel valve lever to the ON position, and check for leaks. Replace the O-ring if there is any leakage.

SPARK PLUG

Recommended Spark Plugs: BPR6ES (NGK)
W20EPR-U (DENSO)

The recommended spark plug has the correct heat range for normal engine operating temperatures.

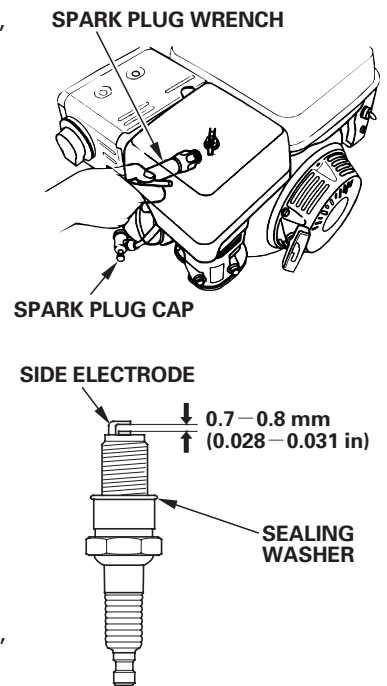
NOTICE

An incorrect spark plug can cause engine damage.

If the engine has been running, let it cool before servicing the spark plug.

For good performance, the spark plug must be properly gapped and free of deposits.

1. Disconnect the spark plug cap, and remove any dirt from around the spark plug area.
2. Remove the spark plug with a 13/16-inch spark plug wrench.
3. Visually inspect the spark plug. Replace it if damaged or badly fouled, if the sealing washer is in poor condition, or if the electrode is worn.
4. Measure the spark plug electrode gap with a wire-type feeler gauge. Correct the gap, if necessary, by carefully bending the side electrode. The gap should be: 0.7–0.8 mm (0.028–0.031 in)



5. Install the spark plug carefully, by hand, to avoid cross-threading.

6. After the spark plug is seated, tighten with a 13/16-inch spark plug wrench to compress the sealing washer.

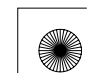
When installing a new spark plug, tighten 1/2 turn after the spark plug seats to compress the washer.

When reinstalling the original spark plug, tighten 1/8–1/4 turn after the spark plug seats to compress the washer.

NOTICE

A loose spark plug can overheat and damage the engine. Overtightening the spark plug can damage the threads in the cylinder head.

7. Attach the spark plug cap to the spark plug.





SPARK ARRESTER (applicable types)

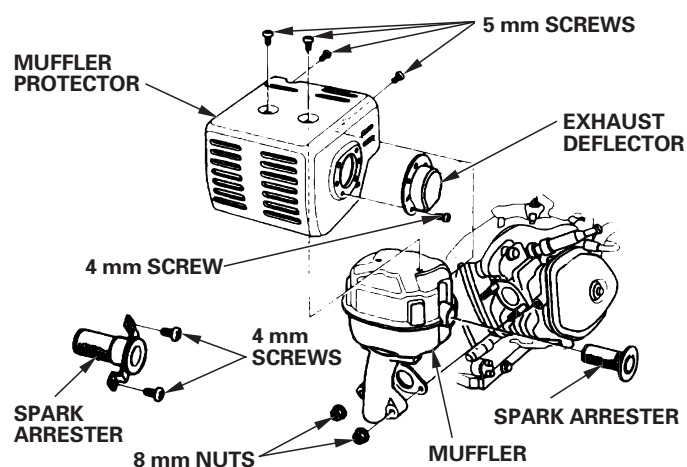
The spark arrester may be standard or an optional part, depending on the engine type. In some areas, it is illegal to operate an engine without a spark arrester. Check local laws and regulations. A spark arrester is available from authorized Honda servicing dealers.

The spark arrester must be serviced every 100 hours to keep it functioning as designed.

If the engine has been running, the muffler will be hot. Allow it to cool before servicing the spark arrester.

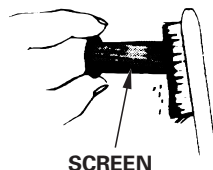
Spark Arrester Removal

1. Remove the two 8 mm nuts and remove the muffler from the cylinder.
2. Remove the three 4 mm screws from the exhaust deflector, and remove the deflector.
3. Remove the four 5 mm screws from the muffler protector and remove the muffler protector.
4. Remove the 4 mm screw from the spark arrester, and remove the spark arrester from the muffler.



Spark Arrester Cleaning & Inspection

1. Use a brush to remove carbon deposits from the spark arrester screen. Be careful not to damage the screen. Replace the spark arrester if it has breaks or holes.

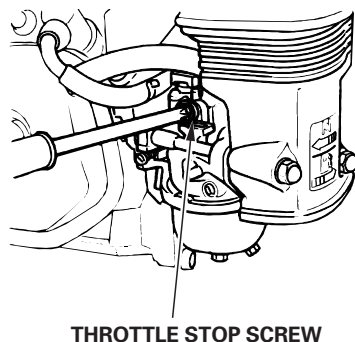


2. Install the spark arrester, muffler protector, exhaust deflector and muffler in the reverse order of disassembly.

IDLE SPEED

Adjustment

1. Start the engine outdoors, and allow it to warm up to operating temperature.
2. Move the throttle lever to its minimum position.
3. Turn the throttle stop screw to obtain the standard idle speed.



Standard idle speed: 1,400 ± 150 rpm

HELPFUL TIPS & SUGGESTIONS

STORING YOUR ENGINE

Storage Preparation

Proper storage preparation is essential for keeping your engine trouble-free and looking good. The following steps will help to keep rust and corrosion from impairing your engine's function and appearance, and will make the engine easier to start when you use it again.

Cleaning

If the engine has been running, allow it to cool for at least half an hour before cleaning. Clean all exterior surfaces, touch up any damaged paint, and coat other areas that may rust with a light film of oil.

NOTICE

Using a garden hose or pressure washing equipment can force water into the air cleaner or muffler opening. Water in the air cleaner will soak the air filter, and water that passes through the air filter or muffler can enter the cylinder, causing damage.

Fuel

NOTICE

Depending on the region where you operate your equipment, fuel formulations may deteriorate and oxidize rapidly. Fuel deterioration and oxidation can occur in as little as 30 days and may cause damage to the carburetor and/or fuel system. Please check with your servicing dealer for local storage recommendations.

Gasoline will oxidize and deteriorate in storage. Deteriorated gasoline will cause hard starting, and it leaves gum deposits that clog the fuel system. If the gasoline in your engine deteriorates during storage, you may need to have the carburetor and other fuel system components serviced or replaced.

The length of time that gasoline can be left in your fuel tank and carburetor without causing functional problems will vary with such factors as gasoline blend, your storage temperatures, and whether the fuel tank is partially or completely filled. The air in a partially filled fuel tank promotes fuel deterioration. Very warm storage temperatures accelerate fuel deterioration. Fuel deterioration problems may occur within a few months, or even less if the gasoline was not fresh when you filled the fuel tank.

Fuel system damage or engine performance problems resulting from neglected storage preparation are not covered under the *Distributor's Limited Warranty*.

You can extend fuel storage life by adding a gasoline stabilizer that is formulated for that purpose, or you can avoid fuel deterioration problems by draining the fuel tank and carburetor.

Adding a Gasoline Stabilizer to Extend Fuel Storage Life

When adding a gasoline stabilizer, fill the fuel tank with fresh gasoline. If only partially filled, air in the tank will promote fuel deterioration during storage. If you keep a container of gasoline for refueling, be sure that it contains only fresh gasoline.

1. Add gasoline stabilizer following the manufacturer's instructions.
2. After adding a gasoline stabilizer, run the engine outdoors for 10 minutes to be sure that treated gasoline has replaced the untreated gasoline in the carburetor.
3. Stop the engine.

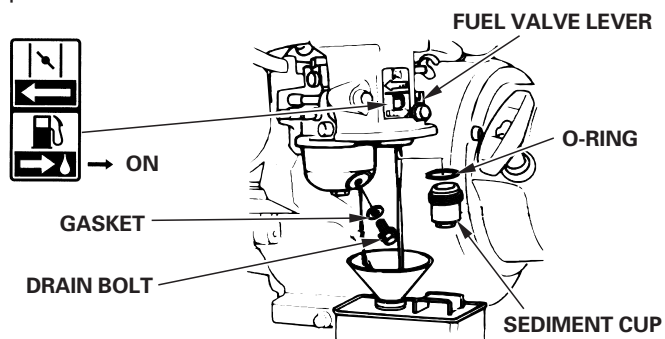


**Draining the Fuel Tank and Carburetor****⚠ WARNING**

Gasoline is highly flammable and explosive, and you can be burned or seriously injured when handling fuel.

- Stop engine and keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

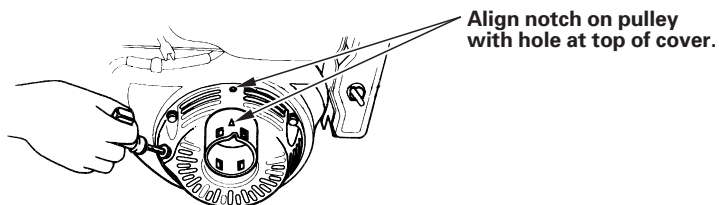
1. Move the fuel valve lever to the OFF positions.
2. Place an approved gasoline container below the carburetor, and use a funnel to avoid spilling fuel.
3. Remove the carburetor drain bolt and gasket. Remove the sediment cup and O-ring, then move the fuel valve lever to the ON position.



4. After all the fuel has drained into the container, reinstall the drain bolt, gasket, sediment cup and O-ring. Tighten the drain bolt and sediment cup securely.

Engine Oil

1. Change the engine oil (see page 9).
2. Remove the spark plug (see page 12).
3. Pour a teaspoon 5 – 10 cm³ (5 – 10 cc) of clean engine oil into the cylinder.
4. Pull the starter grip several times to distribute the oil in the cylinder.
5. Reinstall the spark plug.
6. Pull the starter grip slowly until resistance is felt and the notch on the starter pulley aligns with the hole at the top of the recoil starter cover. This will close the valves so moisture cannot enter the engine cylinder. Return the starter grip gently.

**Storage Precautions**

If your engine will be stored with gasoline in the fuel tank and carburetor, it is important to reduce the hazard of gasoline vapor ignition. Select a well-ventilated storage area away from any appliance that operates with a flame, such as a furnace, water heater, or clothes dryer. Also avoid any area with a spark-producing electric motor, or where power tools are operated.

If possible, avoid storage areas with high humidity, because that promotes rust and corrosion.

Keep the engine level in storage. Tilting can cause fuel or oil leakage.

With the engine and exhaust system cool, cover the engine to keep out dust. A hot engine and exhaust system can ignite or melt some materials. Do not use sheet plastic as a dust cover. A nonporous cover will trap moisture around the engine, promoting rust and corrosion.

If equipped with a battery for electric starter types, recharge the battery once a month while the engine is in storage. This will help to extend the service life of the battery.

Removal from Storage

Check your engine as described in the *BEFORE OPERATION CHECKS* section of this manual (see page 3).

If the fuel was drained during storage preparation, fill the tank with fresh gasoline. If you keep a container of gasoline for refueling, be sure it contains only fresh gasoline. Gasoline oxidizes and deteriorates over time, causing hard starting.

If the cylinder was coated with oil during storage preparation, the engine will smoke briefly at startup. This is normal.

TRANSPORTING

If the engine has been running, allow it to cool for at least 15 minutes before loading the engine-powered equipment on the transport vehicle. A hot engine and exhaust system can burn you and can ignite some materials.

Keep the engine level when transporting to reduce the possibility of fuel leakage. Turn the fuel valve to the OFF position (see page 5).



**TAKING CARE OF UNEXPECTED PROBLEMS**

ENGINE WILL NOT START	Possible Cause	Correction
1. Electric starting (applicable types): Check battery and fuse.	Battery discharged.	Recharge battery.
	Fuse burnt out.	Replace fuse. (p. 15).
2. Check control positions.	Fuel valve OFF.	Move lever to ON position.
	Choke open.	Move lever to CLOSED position unless the engine is warm.
	Engine switch OFF.	Turn engine switch to ON position.
3. Check engine oil level.	Engine oil level low (Oil Alert models).	Fill with the recommended oil to the proper level (p. 9).
4. Check fuel.	Out of fuel.	Refuel (p. 8).
	Bad fuel; engine stored without treating or draining gasoline, or refueled with bad gasoline.	Drain fuel tank and carburetor (p. 14). Refuel with fresh gasoline (p. 8).
5. Remove and inspect spark plug.	Spark plug faulty, fouled, or improperly gapped.	Gap or replace spark plug (p. 12).
	Spark plug wet with fuel (flooded engine).	Dry and reinstall spark plug. Start engine with throttle lever in MAX. position.
6. Take engine to an authorized Honda servicing dealer, or refer to shop manual.	Fuel filter restricted, carburetor malfunction, ignition malfunction, valves stuck, etc.	Replace or repair faulty components as necessary.

ENGINE LACKS POWER	Possible Cause	Correction
1. Check air filter.	Filter element(s) restricted.	Clean or replace filter element(s) (p. 10–11).
2. Check fuel.	Bad fuel; engine stored without treating or draining gasoline, or refueled with bad gasoline.	Drain fuel tank and carburetor (p. 14). Refuel with fresh gasoline (p. 8).
3. Take engine to an authorized Honda servicing dealer, or refer to shop manual.	Fuel filter restricted, carburetor malfunction, ignition malfunction, valves stuck, etc.	Replace or repair faulty components as necessary.

FUSE REPLACEMENT (applicable types)

The electric starter relay circuit and battery charging circuit are protected by a fuse. If the fuse burns out, the electric starter will not operate. The engine can be started manually if the fuse burns out, but running the engine will not charge the battery.

1. Remove the 6 × 12 mm screw from the rear cover of the engine switch box.

2. Remove the fuse cover, then pull out and inspect the fuse.

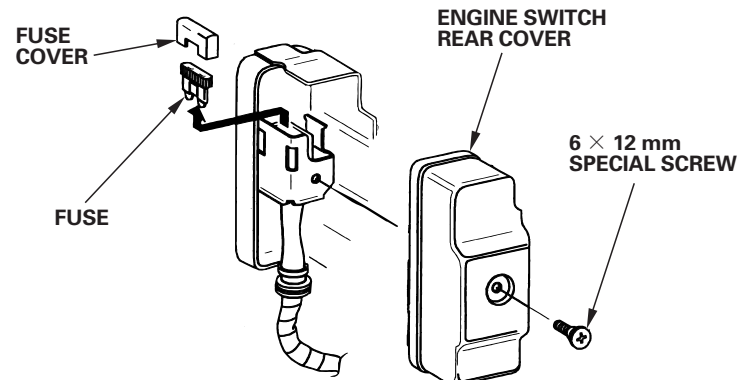
If the fuse is burnt out, discard the burnt-out fuse. Install a new fuse with the same rating as the one that was removed, and reinstall the cover.

If you have questions regarding the rating of the original fuse, contact your servicing Honda engine dealer.

NOTICE

Never use a fuse with a rating greater than the one originally equipped with the engine. Serious damage to the electrical system or a fire could result.

3. Reinstall the rear cover. Install the 6 × 12 mm screw and tighten it securely.



Frequent fuse failure usually indicates a short circuit or an overload in the electrical system. If the fuse burns out frequently, take the engine to a servicing Honda dealer for repair.

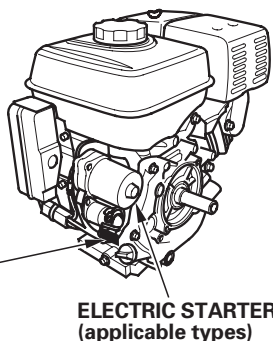




TECHNICAL INFORMATION

Serial Number Location

Record the engine serial number in the space below. You will need this information when ordering parts and when making technical or warranty inquiries.



Engine serial number: _____

Engine type: _____

Date Purchased: ____/____/____

Battery Connections for Electric Starter (applicable types)

Recommended Battery

GX240	12 V – 14 Ah ~ 12 V – 30 Ah
GX270	
GX340	12 V – 18 Ah ~ 12 V – 30 Ah
GX390	

Be careful not to connect the battery in reverse polarity, as this will short circuit the battery charging system. Always connect the positive (+) battery cable to the battery terminal before connecting the negative (-) battery cable, so your tools cannot cause a short circuit if they touch a grounded part while tightening the positive (+) battery cable end.

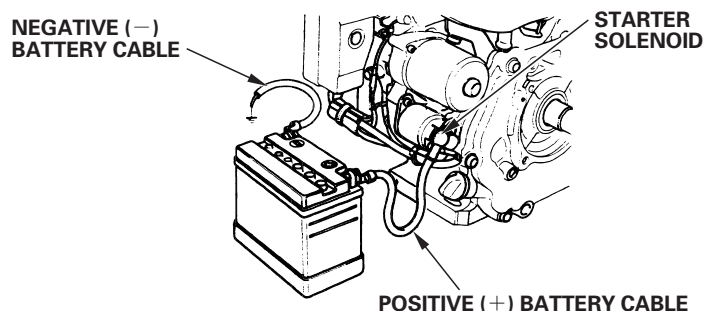
⚠ WARNING

A battery can explode if you do not follow the correct procedure, seriously injuring anyone nearby.

Keep all sparks, open flames, and smoking materials away from the battery.

WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds. **Wash hands after handling.**

1. Connect the battery positive (+) cable to the starter solenoid terminal as shown.
2. Connect the battery negative (-) cable to an engine mounting bolt, frame bolt, or other good engine ground connection.
3. Connect the battery positive (+) cable to the battery positive (+) terminal as shown.
4. Connect the battery negative (-) cable to the battery negative (-) terminal as shown.
5. Coat the terminals and cable ends with grease.

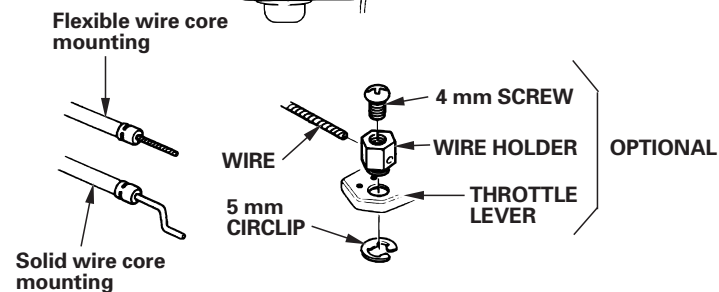
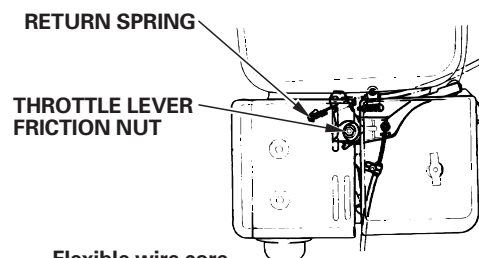


Remote Control Linkage

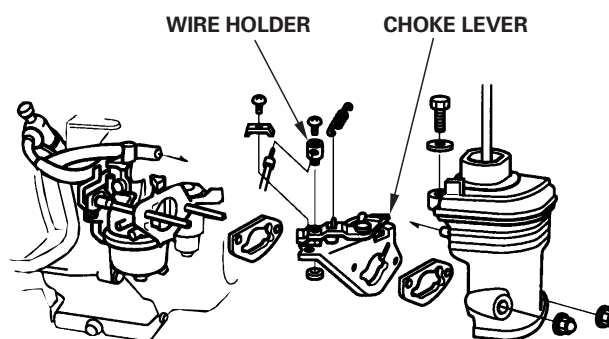
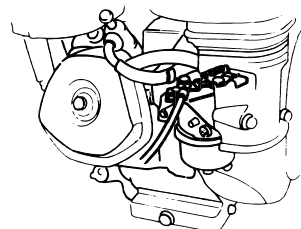
The throttle and choke control levers are provided with holes for optional cable attachment. The following illustrations show installation examples for a solid wire cable and for a flexible, braided wire cable. If using a flexible, braided wire cable, add a return spring as shown.

It is necessary to loosen the throttle lever friction nut when operating the throttle with a remote-mounted control.

REMOTE THROTTLE LINKAGE



REMOTE CHOKE LINKAGE





Carburetor Modifications for High Altitude Operation

At high altitude, the standard carburetor air-fuel mixture will be too rich. Performance will decrease, and fuel consumption will increase. A very rich mixture will also foul the spark plug and cause hard starting. Operation at an altitude that differs from that at which this engine was certified, for extended periods of time, may increase emissions.

High altitude performance can be improved by specific modifications to the carburetor. If you always operate your engine at altitudes above 1,500 meters (5,000 feet), have your servicing dealer perform this carburetor modification. This engine, when operated at high altitude with the carburetor modifications for high altitude use, will meet each emission standard throughout its useful life.

Even with carburetor modification, engine horsepower will decrease about 3.5% for each 300-meter (1,000-foot) increase in altitude. The effect of altitude on horsepower will be greater than this if no carburetor modification is made.

NOTICE

When the carburetor has been modified for high altitude operation, the air-fuel mixture will be too lean for low altitude use. Operation at altitudes below 1,500 meters (5,000 feet) with a modified carburetor may cause the engine to overheat and result in serious engine damage. For use at low altitudes, have your servicing dealer return the carburetor to original factory specifications.

Emission Control System Information

Source of Emissions

The combustion process produces carbon monoxide, oxides of nitrogen, and hydrocarbons. Control of hydrocarbons and oxides of nitrogen is very important because, under certain conditions, they react to form photochemical smog when subjected to sunlight. Carbon monoxide does not react in the same way, but it is toxic.

Honda utilizes appropriate air/fuel ratios and other emissions control systems to reduce the emissions of carbon monoxide, oxides of nitrogen, and hydrocarbons. Additionally, Honda fuel systems utilize components and control technologies to reduce evaporative emissions.

The U.S., California Clean Air Acts and Environment Canada

EPA, California and Canadian regulations require all manufacturers to furnish written instructions describing the operation and maintenance of emission control systems.

The following instructions and procedures must be followed in order to keep the emissions from your Honda engine within the emission standards.

Tampering and Altering

Tampering with or altering the emission control system may increase emissions beyond the legal limit. Among those acts that constitute tampering are:

- Removal or alteration of any part of the intake, fuel, or exhaust systems.
- Altering or defeating the governor linkage or speed-adjusting mechanism to cause the engine to operate outside its design parameters.

Problems That May Affect Emissions

If you are aware of any of the following symptoms, have your engine inspected and repaired by your servicing dealer.

- Hard starting or stalling after starting.
- Rough idle.
- Misfiring or backfiring under load.
- Afterburning (backfiring).
- Black exhaust smoke or high fuel consumption.

Replacement Parts

The emission control systems on your Honda engine were designed, built, and certified to conform with EPA, California (models certified for sale in California), and Canadian emission regulations. We recommend the use of Honda Genuine parts whenever you have maintenance done. These original-design replacement parts are manufactured to the same standards as the original parts, so you can be confident of their performance. The use of replacement parts that are not of the original design and quality may impair the effectiveness of your emission control system.

A manufacturer of an aftermarket part assumes the responsibility that the part will not adversely affect emission performance. The manufacturer or rebuilder of the part must certify that use of the part will not result in a failure of the engine to comply with emission regulations.

Maintenance

Follow the maintenance schedule on page 7. Remember that this schedule is based on the assumption that your machine will be used for its designed purpose. Sustained high-load or high-temperature operation, or use in unusually wet or dusty conditions, will require more frequent service.



**Air Index**

(Models certified for sale in California)

An Air Index Information label is applied to engines certified to an emission durability time period in accordance with the requirements of the California Air Resources Board.

The bar graph is intended to provide you, our customer, the ability to compare the emissions performance of available engines. The lower the Air Index, the less pollution.

The durability description is intended to provide you with information relating to the engine's emission durability period. The descriptive term indicates the useful life period for the engine's emission control system. See your *Emission Control System Warranty* for additional information.

Descriptive Term	Applicable to Emissions Durability Period
Moderate	50 hours (0 – 80 cc, inclusive) 125 hours (greater than 80 cc)
Intermediate	125 hours (0 – 80 cc, inclusive) 250 hours (greater than 80 cc)
Extended	300 hours (0 – 80 cc, inclusive) 500 hours (greater than 80 cc) 1,000 hours (225 cc and greater)

Specifications**GX240/GX270 (PTO shaft type S, with fuel tank)**

Length × Width × Height	355 × 430 × 422 mm (14.0 × 16.9 × 16.6 in)	
Dry mass [weight]	25.0 kg (55.1 lbs)	
Engine type	4-stroke, overhead valve, single cylinder	
Displacement [Bore × Stroke]	GX240	242 cm ³ (14.8 cu-in) [73.0 × 58.0 mm (2.9 × 2.3 in)]
	GX270	270 cm ³ (16.5 cu-in) [77.0 × 58.0 mm (3.0 × 2.3 in)]
Net power (in accordance with SAE J1349*)	GX240	5.3 kW (7.2 PS, 7.1 bhp) at 3,600 rpm
	GX270	6.0 kW (8.2 PS, 8.0 bhp) at 3,600 rpm
Max. Net torque (in accordance with SAE J1349*)	GX240	15.3 N·m (1.56 kgf·m, 11.3 lbf·ft) at 2,500 rpm
	GX270	17.7 N·m (1.80 kgf·m, 13.1 lbf·ft) at 2,500 rpm
Engine oil capacity	1.1 L (1.2 US qt, 1.0 Imp qt)	
Fuel tank capacity	5.3 L (1.40 US gal, 1.17 Imp gal)	
Cooling system	Forced air	
Ignition system	Transistor magneto	
PTO shaft rotation	Counterclockwise	

GX340/GX390 (PTO shaft type S, with fuel tank)

Length × Width × Height	380 × 450 × 447 mm (15.0 × 17.7 × 17.6 in)	
Dry mass [weight]	31.5 kg (69.4 lbs)	
Engine type	4-stroke, overhead valve, single cylinder	
Displacement [Bore × Stroke]	GX340	337 cm ³ (20.6 cu-in) [82.0 × 64.0 mm (3.2 × 2.5 in)]
	GX390	389 cm ³ (23.7 cu-in) [88.0 × 64.0 mm (3.5 × 2.5 in)]
Net power (in accordance with SAE J1349*)	GX340	7.1 kW (9.7 PS, 9.5 bhp) at 3,600 rpm
	GX390	8.2 kW (11.1 PS, 11.0 bhp) at 3,600 rpm
Max. Net torque (in accordance with SAE J1349*)	GX340	22.1 N·m (2.25 kgf·m, 16.3 lbf·ft) at 2,500 rpm
	GX390	25.1 N·m (2.56 kgf·m, 18.5 lbf·ft) at 2,500 rpm
Engine oil capacity	1.1 L (1.2 US qt, 1.0 Imp qt)	
Fuel tank capacity	6.1 L (1.61 US gal, 1.34 Imp gal)	
Cooling system	Forced air	
Ignition system	Transistor magneto	
PTO shaft rotation	Counterclockwise	

* The power rating of the engine indicated in this document is the net power output tested on a production engine for the engine model and measured in accordance with SAE J1349 at 3,600 rpm (Net Power) and at 2,500 rpm (Max. Net Torque). Mass production engines may vary from this value. Actual power output for the engine installed in the final machine will vary depending on numerous factors, including the operating speed of the engine in application, environmental conditions, maintenance, and other variables.





Tuneup Specifications GX240/GX270/GX340/GX390

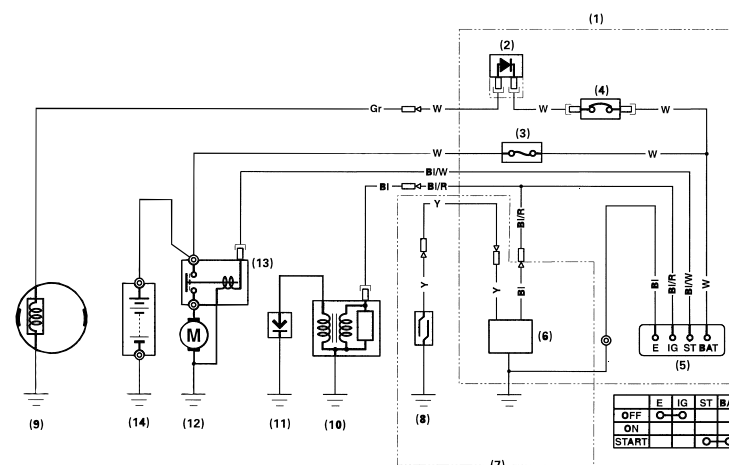
ITEM	SPECIFICATION	MAINTENANCE
Spark plug gap	0.7—0.8 mm (0.028—0.031 in)	Refer to page: 12
Idle speed	1,400 ± 150 rpm	Refer to page: 13
Valve clearance (cold)	IN: 0.15 ± 0.02 mm EX: 0.20 ± 0.02 mm	See your authorized Honda dealer
Other specifications	No other adjustments needed.	

Quick Reference Information

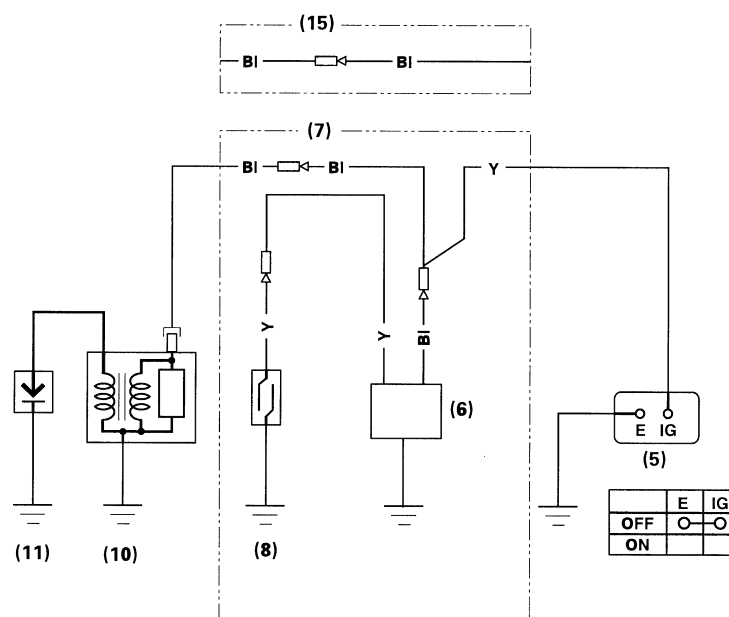
Fuel	Unleaded gasoline (Refer to page 8)	
	U.S.	Pump octane rating 86 or higher
	Except U.S.	Research octane rating 91 or higher
Engine oil	SAE 10W-30, API SJ or later, for general use. Refer to page 8.	
Reduction case oil	Same oil as engine oil, see above (applicable types).	
Spark plug	BPR6ES (NGK) W20EPR-U (DENSO)	
Maintenance	Before each use:	
	<ul style="list-style-type: none"> • Check engine oil level. Refer to page 9. • Check reduction case oil (applicable types). Refer to page 9. • Check air filter. Refer to page 10. 	
	First 20 hours:	
	<ul style="list-style-type: none"> • Change engine oil. Refer to page 9. • Change reduction case oil (applicable types). Refer to page 10. 	
	Subsequent: Refer to the maintenance schedule on page 7.	

Wiring Diagrams

With Oil Alert and Electric Starter



With Oil Alert and Without Electric Starter



- | | |
|------------------------------|----------------------------------|
| (1) CONTROL BOX | (9) CHARGING COIL |
| (2) RECTIFIER | (10) IGNITION COIL |
| (3) FUSE | (11) SPARK PLUG |
| (4) CIRCUIT PROTECTOR | (12) STARTER MOTOR |
| (5) ENGINE SWITCH | (13) STARTER SOLENOID |
| (6) OIL ALERT UNIT | (14) BATTERY (12 V) |
| (7) Type with Oil Alert unit | (15) Type without Oil Alert unit |
| (8) OIL LEVEL SWITCH | |

Bl	Black	Br	Brown
Y	Yellow	O	Orange
Bu	Blue	Lb	Light blue
G	Green	Lg	Light green
R	Red	P	Pink
W	White	Gr	Gray





CONSUMER INFORMATION

DISTRIBUTOR/DEALER LOCATOR INFORMATION

United States, Puerto Rico, and U.S. Virgin Islands:

Call (800) 426-7701
or visit our website: www.honda-engines.com

Canada:

Call (888) 9HONDA9
or visit our website: www.honda.ca

For European Area:

Visit our website: <http://www.honda-engines-eu.com>

CUSTOMER SERVICE INFORMATION

Serviceing dealership personnel are trained professionals. They should be able to answer any question you may have. If you encounter a problem that your dealer does not solve to your satisfaction, please discuss it with the dealership's management. The Service Manager, General Manager, or Owner can help. Almost all problems are solved in this way.

United States, Puerto Rico, and U.S. Virgin Islands:

If you are dissatisfied with the decision made by the dealership's management, contact the Honda Regional Engine Distributor for your area.

If you are still dissatisfied after speaking with the Regional Engine Distributor, you may contact the Honda Office as shown.

All Other Areas:

If you are dissatisfied with the decision made by the dealership's management, contact the Honda Office as shown.

«Honda's Office»

When you write or call, please provide this information:

- Equipment manufacturer's name and model number that the engine is mounted on
- Engine model, serial number, and type (see page 16)
- Name of dealer who sold the engine to you
- Name, address, and contact person of the dealer who services your engine
- Date of purchase
- Your name, address and telephone number
- A detailed description of the problem

United States, Puerto Rico, and U.S. Virgin Islands:

American Honda Motor Co., Inc.

Power Equipment Division
Customer Relations Office
4900 Marconi Drive
Alpharetta, GA 30005-8847

Or telephone: (770) 497-6400, 8:30 am - 7:00 pm ET

Canada:

Honda Canada, Inc.

715 Milner Avenue
Toronto, ON
M1B 2K8

Telephone:	(888) 9HONDA9	Toll free
	(888) 946-6329	
	(416) 299-3400	Local Toronto dialing area
Facsimile:	(877) 939-0909	Toll free
	(416) 287-4776	Local Toronto dialing area

Australia:

Honda Australia Motorcycle and Power Equipment Pty. Ltd.

1954 – 1956 Hume Highway Campbellfield Victoria 3061

Telephone: (03) 9270 1111
Facsimile: (03) 9270 1133

For European Area:

Honda Europe NV.

European Engine Center

<http://www.honda-engines-eu.com>

All Other Areas:

Please contact the Honda distributor in your area for assistance.



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