CALIFORNIA

Proposition 65

WARNING: Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer and birth defects or other reproductive harm.

WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

ANY PICTURES CONTAINED WITHIN THIS OPERATOR'S MANUAL THAT DEPICT SITUATIONS WITH SHIELDS, GUARDS, RAILS, OR LIDS REMOVED ARE FOR DEMONSTRATION PURPOSES ONLY. HAGIE MANUFACTURING COMPANY STRONGLY URGES THE OPERATOR TO KEEP ALL SHIELDS AND SAFETY DEVICES IN PLACE AT ALL TIMES.

I. SAFETY/DECALS

WARNING DECALS

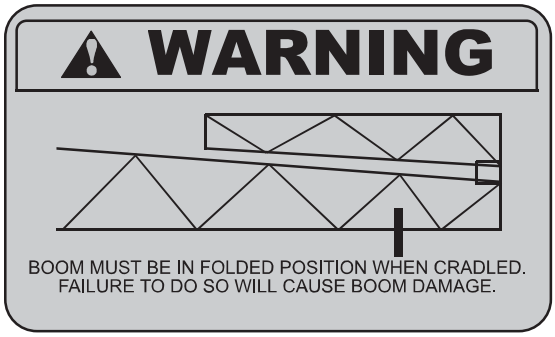
Decals warning you of avoidable danger are located on various parts of the sprayer. They are there for your personal safety and protection. DO NOT remove them. They will fracture upon attempted removal and therefore must be replaced.

Following are locations of important safety decals. Replace them if they are torn or missing. All warning decals and other instructional Hagie decals or machine striping may be purchased through the Hagie Customer Support Department. To replace decals, be sure that the installation area is clean and dry; decide on exact position before you remove the backing paper.

DECAL LOCATION

650175

Inside rear cab window on left side.



650336

Inside right-hand cab window to the rear.

III. SPECIFICATIONS

AUXILIARY HYDRAULIC SYSTEM

Type	Open
Pump type	Tandem gear
Pressure setting	2600 PSI

SPRAY SYSTEM

Booms

Type	Dry, with variable row spacing
Standard	60 ft. (3 spray sections)
Optional	60/80 or 90 ft. (5 spray sections)
Controls	Electro-hydraulic: fold/lift/level
Hydraulic level shock absorber	Hagie boom level accumulator

Hoses

Rear fill connection (male with adapter for female)	2" I.D.
Solution hose from tank	1 ½" I.D.
Boom section feeder hose	1" I.D.
Boom nozzle hose	¾" I.D.

Solution Tanks

Standard	Two 500 gal. polyethylene with sight gauge
Agitation	Mechanical - hydraulically driven with variable speed control

General Spray System

Pump	Centrifugal - hydraulically driven with variable speed control
Solution valves	Electric ball valves
Pressure gauge	100 PSI glycerin filled
Monitor	Raven 460 (GPS-ready)
Fence row nozzle	Standard

FOAM MARKING SYSTEM

Make	Hagie Foam Marker
Type	Live air

RINSE SYSTEMS

Spray system rinse (solution tanks, pump, and booms)	Standard
High pressure washing system	Optional

V. OPERATING INFORMATION

5. Turn the ignition key switch to the start position to engage the starter. If the engine fails to start after 15 seconds, turn key to “OFF”, wait one minute and repeat the procedure. If the engine does not start after three attempts, check fuel supply system. Absence of blue or white exhaust smoke during cranking indicates no fuel is being delivered.
6. When engine starts, inspect indicator lights and gauges for operation. If any lights or gauges do not operate, shut off engine and determine cause.
7. Always allow at least a five minute warm-up period before operating the engine at high RPM. This means the engine must reach operating temperature and oil pressure must stabilize in the normal operating range before it is run faster than an idle (1000 RPM or less). Cold oil may not flow in quantities adequate to prevent pump cavitation.

COLD WEATHER STARTING

USING STARTING FLUID IS NOT RECOMMENDED:

⚠CAUTION

When using jumper cables to start engine, make sure to connect the cables in parallel: positive (+) to positive and negative (-) to negative. When using an external electrical source to start the engine, turn the disconnect switch to the “OFF” position. Remove the key before attaching the jumper cables to prevent unintentional starter engagement.

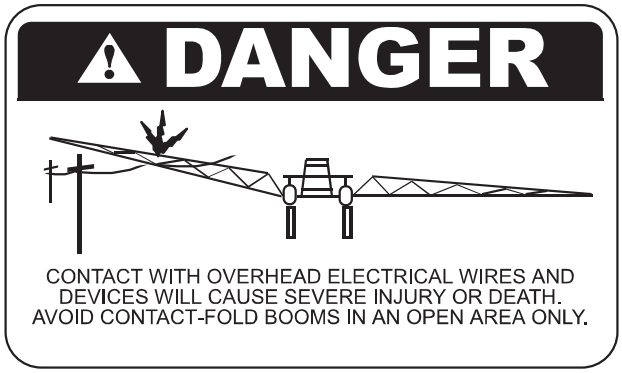
V. OPERATING INFORMATION

FIG 5.21

Fold

VERTICAL EXTENSION FOLD - To fold the boom extensions vertically in or out, machine must be in neutral position then depress the “IN” or “OUT” of the “EXTENSION” switch (fig. 5.22). This activates both extension cylinders connecting the inner boom section and the center boom section (fig. 5.21).

Fold or unfold the booms in an open area only. Make sure there are no overhead obstructions or wires to interfere with extension folding.



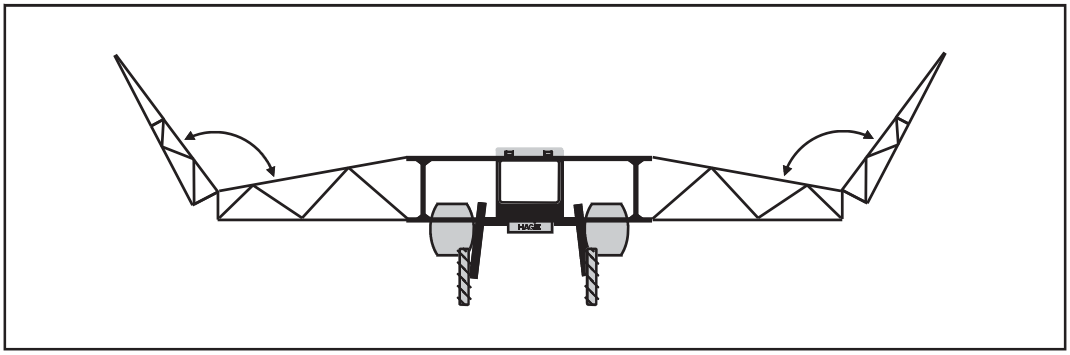


FIG 5.23

The gland packing (fig. 5.46, item 1) may require adjustment during start-up. If adjustment is required, shut off the agitation system and adjust the gland nut (fig. 5.46, item 2).

⚠ CAUTION

DO NOT adjust the gland nut with the agitation system running.

When replacing the packing, be sure to wrap the packing clockwise on the agitator shaft (reference to direction when seated in the operator's seat facing forward).

The agitator motors for the polyethylene tanks are held in place with a motor mount yoke (fig. 5.46, item 3). The yoke tap must extend through the motor mounting plate (fig. 5.46, item 4). This allows the motor to float with the agitator shaft.

NOTE:

Damage will occur to the agitator system if the motor mounting yoke is not properly installed in the motor mounting plate.

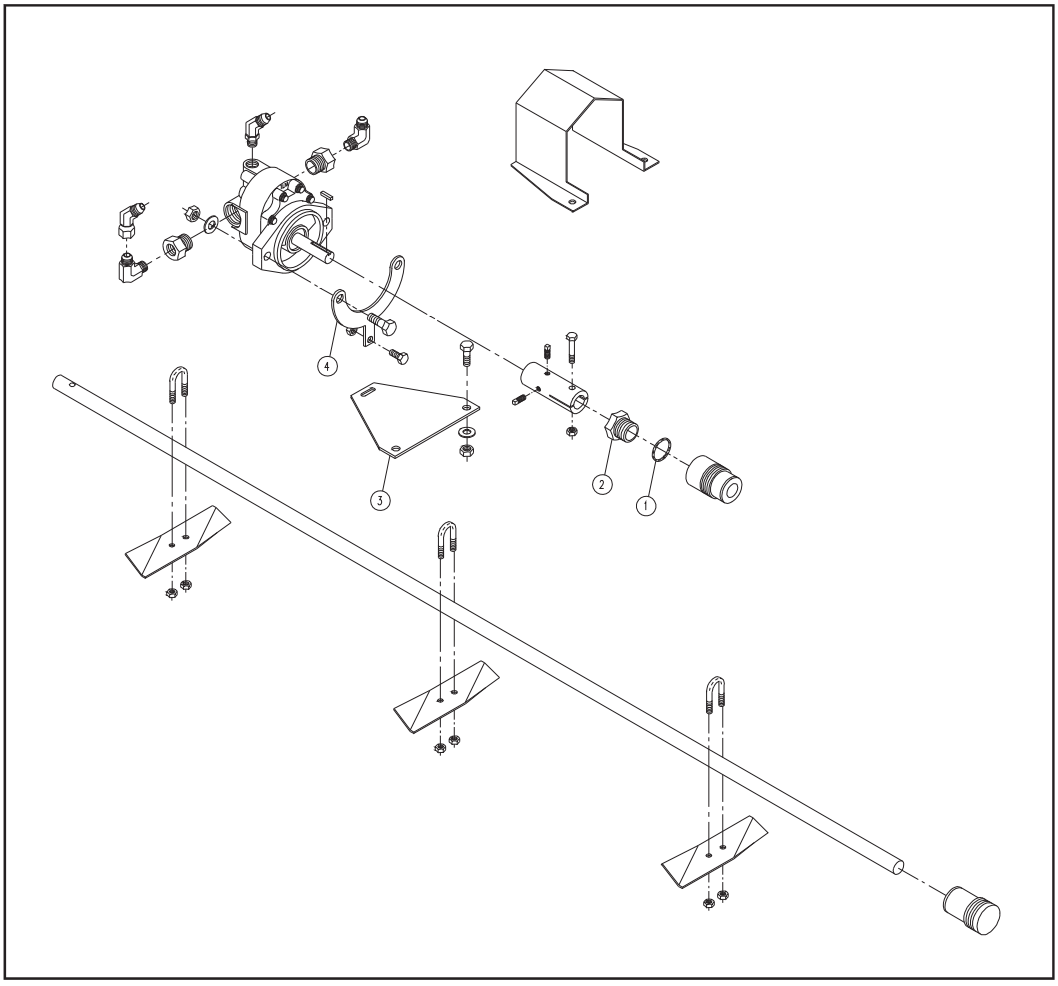


FIG 5.46

V. OPERATING INFORMATION

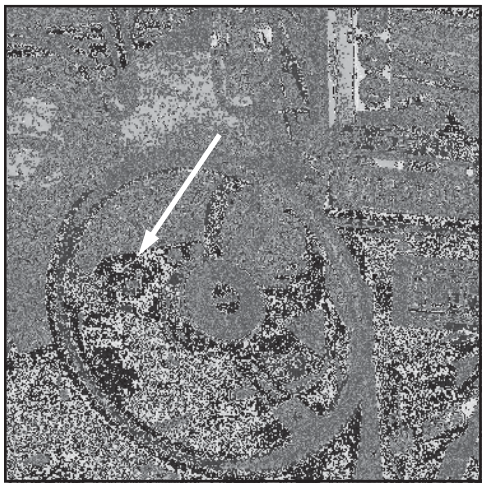


FIG 5.68

Turn Signals

To activate the front (fig. 5.70) and rear turning signals (fig. 5.71, item 2), move the turn signal lever (fig. 5.68) up to turn right and down to turn left. Steering column-mounted turn signal indicators will correspondingly flash when either side of the turn signals is activated. The turn signal lever is not a self-centering switch; you must return it to the “OFF” position by hand after completing your turn.

Hazard/Warning Lights

To activate the flashing hazard/warning lights (fig. 5.70 & 5.71, item 1), depress the “FLASHER” switch to the “ON” position (fig. 5.69). Activate the hazard/warning lights anytime traveling on a public road, day or night, unless prohibited by law.

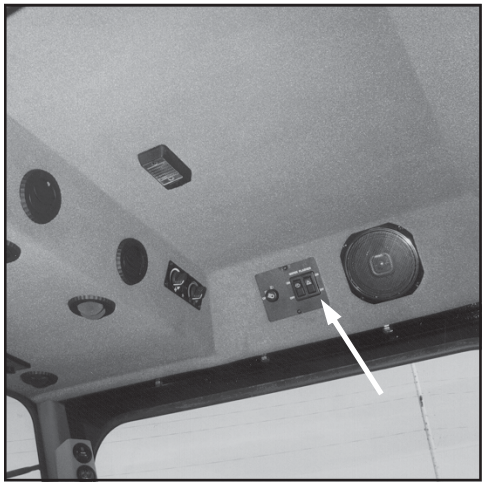


FIG 5.69

Running Lights

Activating the highway or field lights (see page 56) will also turn on the “RED” running lights on the rear of the machine (fig. 5.71, item 2).

FIG 5.70

FIG 5.71

V. OPERATING INFORMATION

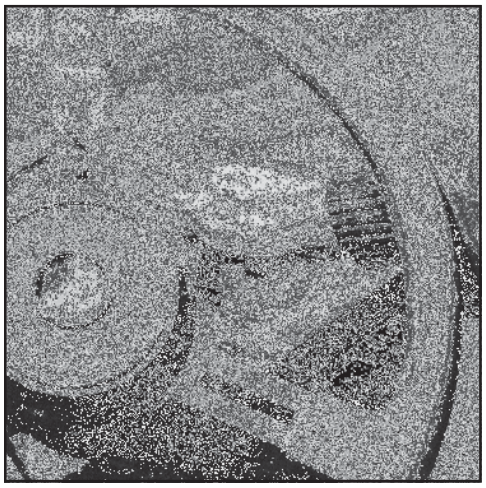


FIG 5.92

FIG 5.93

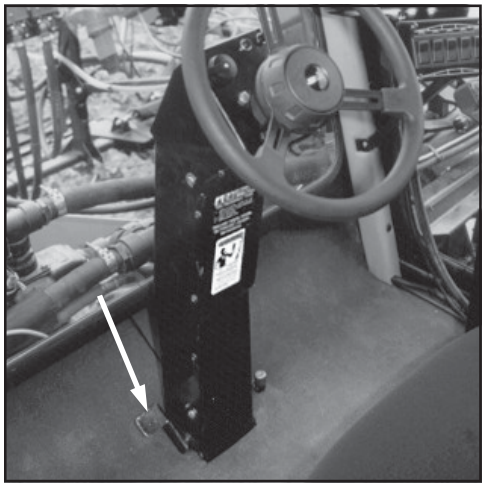


FIG 5.94

Steering Column

The Hagie DTS 10's steering column has two places for driver comfort adjustment. To adjust the upper tilt, locate the tilt lock lever on the right-hand side of the steering column (fig. 5.92); rotate the lever counterclockwise to release steering column tilt lock. Move steering column to desired position and rotate lever clockwise to lock column in place.

To ease cab exit and entry, the entire steering column tilts out of the driver's way. To operate the column base tilt, locate the foot pedal at the base of the steering column (fig. 5.94); push down on the foot pedal to release the column base lock. Pull or push the column to the desired position and release the foot pedal to re-lock the column base.

FIG 5.95

VIII. SERVICE AND MAINTENANCE

FLUIDS

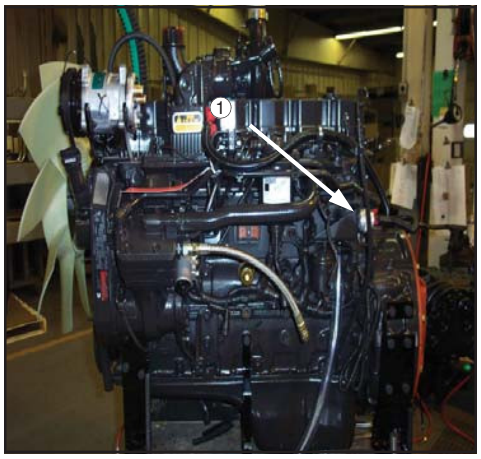


FIG 8.1

Engine oil

OIL LEVEL - The engine oil level dipstick is located on the left-hand side of the engine (fig. 8.1, item 1). Never operate the engine with the oil level below the “L” (low) mark or above the “H” (high) mark. Wait at least five minutes after shutting off the engine to check the oil level; this allows time for the oil to drain to the oil pan. Check the engine oil level daily.

CAPACITY - Low to high mark capacity is 2.0 quarts. Engine oil pan capacity is 15 quarts. Refer to Engine Operation and Maintenance manual for maintenance schedule.

NOTE:

The engine must be level when checking the oil level to make sure the measurement is correct.

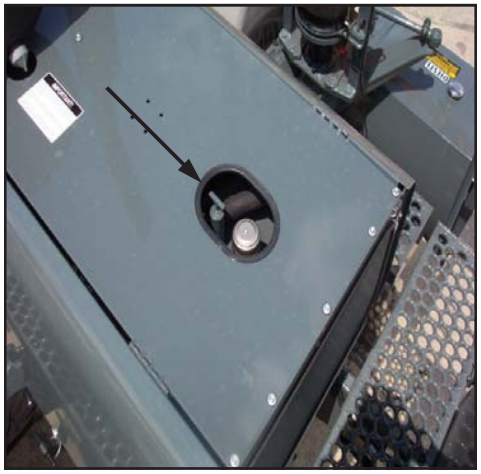


FIG 8.2

Hydraulic Oil Reservoir

OIL LEVEL - Check the hydraulic oil level in the reservoir using the dipstick (fig. 8.2) or the sight gauge on the left-hand side of the tank (fig 8.2, item 1) daily. Add just enough fluid so the level reaches the bottom tip of the dipstick or level is in the center of the sight gauge (fig. 8.3). Always check the hydraulic oil level when it is cool. Hydraulic oil will expand when heated in a system and measuring the reservoir by these levels allows for expansion.

FIG 8.3

TYPE - Premium hydraulic fluids containing high quality rust/oxidation/and foam inhibitors are required. Hydraulic oil must conform to one of the following types: anti-wear hydraulic oil, type F automatic transmission fluid, or agricultural hydraulic transmission fluid. Replace the oil in the hydraulic reservoir at 500 hours or at the beginning of each spraying season, whichever comes first.

FIG 8.29

Torque Hub® Seal Boot

Each leg has a seal boot located between the wheel motor and Torque Hub®. Grease the zerk on the wheel motor (fig. 8.29) every 50 hours.

An over-greased seal boot will leak some grease out around the seal and when heated may cause the appearance of a failed wheel motor leaking hydraulic fluid. Wipe off any excess grease after servicing.

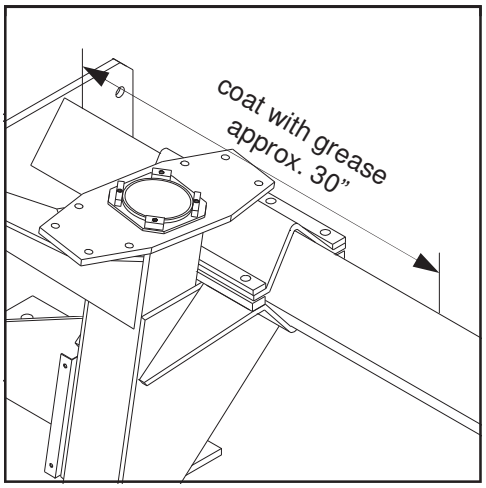


FIG 8.30

Hydraulic Tread Adjust Bearing Slide-Path

The slide-path (fig. 8.30) for the hydraulic tread adjust nylon bearings should be generously coated with an appropriate lubricant. Standard grease applied by hand over the entire length of the bearing’s range of travel should suffice.

Inspect this area often and lubricate as required. Failure to do so may cause one of the legs to hang up while the other is still sliding during adjustment. This will cause damage to the machine. Bear in mind that late season or taller crops may wipe off some or all of the exposed grease on the under-side of the mainframe.

VIII. SERVICE AND MAINTENANCE

FIG 8.50

To install wheel and tire assembly on the Torque Hub®, lubricate studs with anti-seize grease. Align the wheel bolt holes with the Torque Hub® studs and mount the wheel on the hub.

NOTE:

To achieve even torquing consistency, the tire should be completely off the ground.

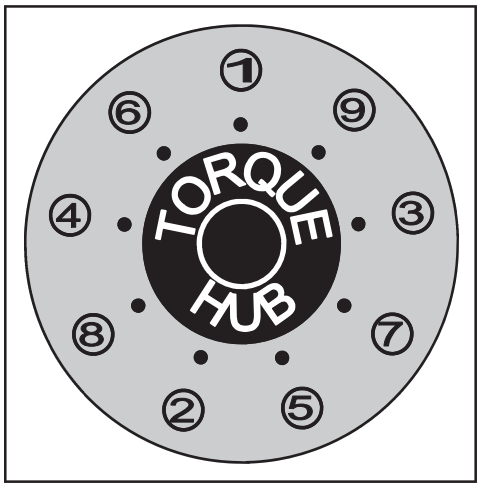


FIG 8.51

Start all of the lug nuts on and tighten them until they are just snug. Following the torque sequence in figure 8.51, first turn each lug nut to a torque value of 120 dry foot-pounds. Use slow, even pressure on the torque-wrench. Quick or jerky movements cause inaccurate values. Repeat the same sequence to 150 dry foot-pounds and again finally to 180 dry foot-pounds.

⚠CAUTION

Check lug nut torque immediately after receiving machine and every 50 hours thereafter.

If the wheel turns during lug nut torquing, lower the machine to the ground just enough for the tire to touch and prevent rotation or more preferably, place a suitable wedge between the tire and the ground.

Lower the machine and resume operation. Recheck torque after 30 minutes of operation.

11. Use a multi-purpose grease to coat exposed hydraulic cylinder rods to prevent rusting which could result in cylinder damage.
12. To winterize the spray system, it is recommended that you use an environmentally-safe type antifreeze and water mixture that will give you adequate protection to minus 30 degrees below zero. Drain any remaining solution in the system and run the antifreeze mixture through the spray system until it comes out all boom openings. Repeat the above process with both the foam marker and rinse systems.
13. If the sprayer must be stored outside, cover it with a waterproof cover.

B. Removing the sprayer from storage.

1. Inspect the condition, and test the air pressure, of all tires. Please see page 104 for information regarding proper tire maintenance.
2. Carefully unseal all openings that were sealed in the storage process.
3. Clean and reinstall the battery. Be sure to attach the battery cables to the proper terminals.
4. Tighten all belts. Inspect and replace any worn belts. For information on belts, see page 96.
5. Check engine oil, hydraulic oil, and engine coolant levels; add, if necessary. A mixture of 50/50 antifreeze and water will cool adequately in summer as well as protect in winter.

NOTE:

Protective compounds such as grease can harden Under exposure to weather conditions.

6. Completely clean the sprayer.
7. Review section eight on maintenance (pages 74-106), and perform all needed services as instructed.
8. For starting instructions, see pages 27-28 in section five on operating information.

NOTE:

See Warranty on page 117 concerning **improper storage.**

INDEX

FAIRFIELD

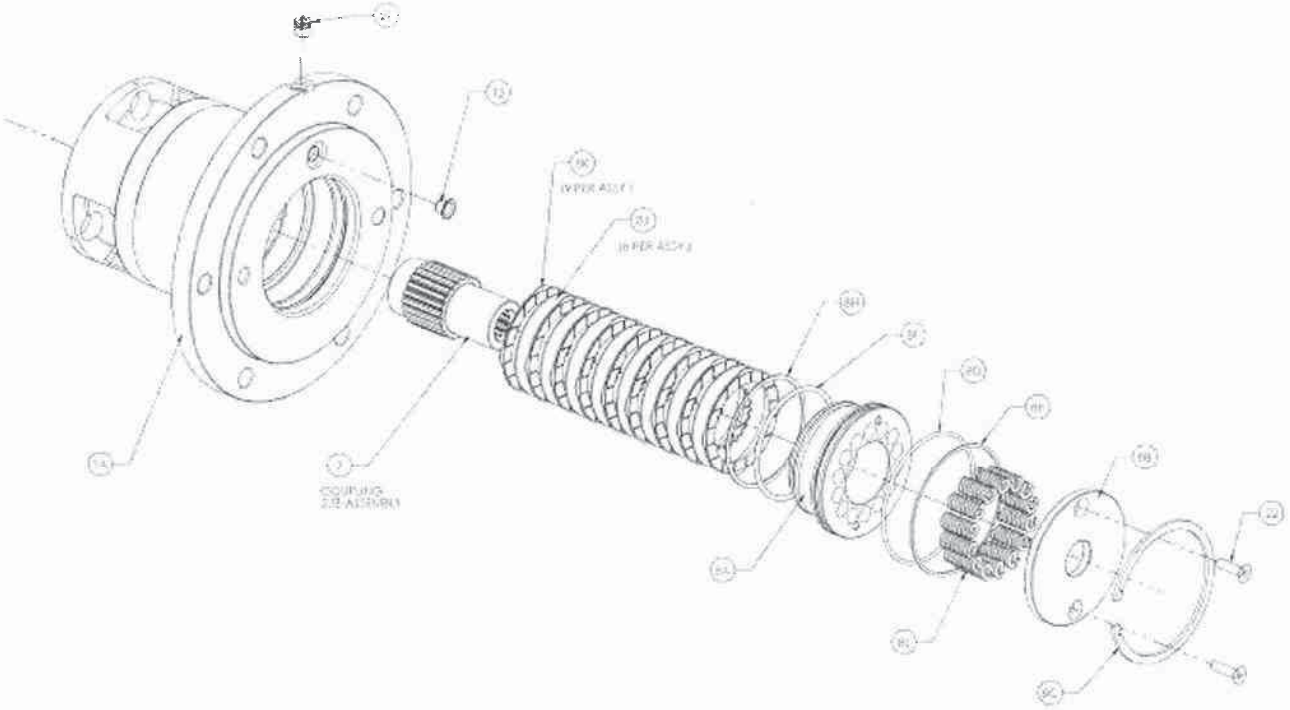
GEARED FOR EXCELLENCE

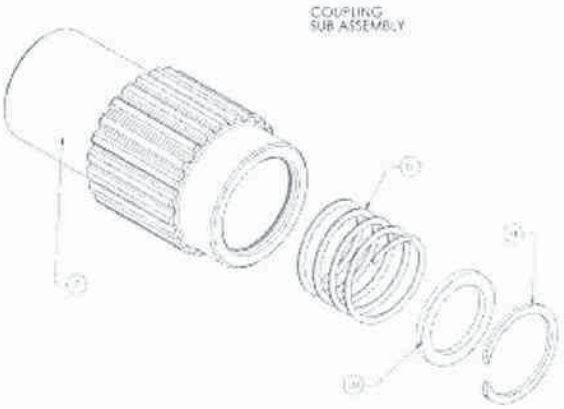
7HB(A, B, C, D, E, X) Assembly-Disassembly Manual

ISO9001

QS9000

7HB(A, B, C, D, E, X) SPINDLE-BRAKE DISASSEMBLY





NOTE: This procedure applies only to units with integral Input Brake (8).

CAUTION: Eye protection must be worn while performing the steps 1-3 in this procedure.

1. Compress the Compression Springs (8L) by installing two 1/4-20 x 5/8" Flat Head Cap Screws (22) through Pressure Plate (8B) and into Piston (8A) and tightening incrementally until spring force has been taken off of the Retaining Ring (8C).

   NOTE: Flat Head Cap Screws (22) are removed prior to shipping new units since they are for transit and service only. They are included in most brake repair kits. See details in Brake Service Kit section (p. ??)

2. Using retaining ring pliers, remove Retaining Ring (8C) from the groove in the Spindle (1A).

7HB SERIES INTEGRAL BRAKE CHECK

1. Using appropriate fittings, connect hydraulic line from hand pump to brake port.

2. Check to see that brake is set by trying to rotate Input Shaft (9). This can be accomplished by installing an appropriate tool (any tool that can locate on the splines of the Input Coupling (7), such as a mating splined shaft) into Input Coupling (7)

3. Bleed brake. Increase hydraulic pressure gradually while trying to rotate the input until brake just starts to release. Note this pressure. Make sure the pressure falls into the appropriate range below.

BRAKE CODE		JUST RELEASE PRESSURE RANGE (psi)
A		200-260
B		170-220
C		140-185
D		130-155
E		115-145

4. Increase pressure to 1,000 psi and hold for 30 seconds to check for leaks. Repair leaks if necessary.

NOTE: Make sure that brake re-engages when pressure is released.

NOTE: When done, make sure Input Coupling (7) is centered in Spindle (1A) to make installation of motor possible without release of brake.

Brake Service Kits

Lining Kit

AM7HB00A1

ITEM	DESCRIPTION	PART No.	QTY.
8J	Reaction Disc, Brake Rotor	902426	8
8K	Friction Disc, Brake Stator	902427	9
	Seal Kit	AM7HB00C1	1

Seal Kit

AM7HB00C1

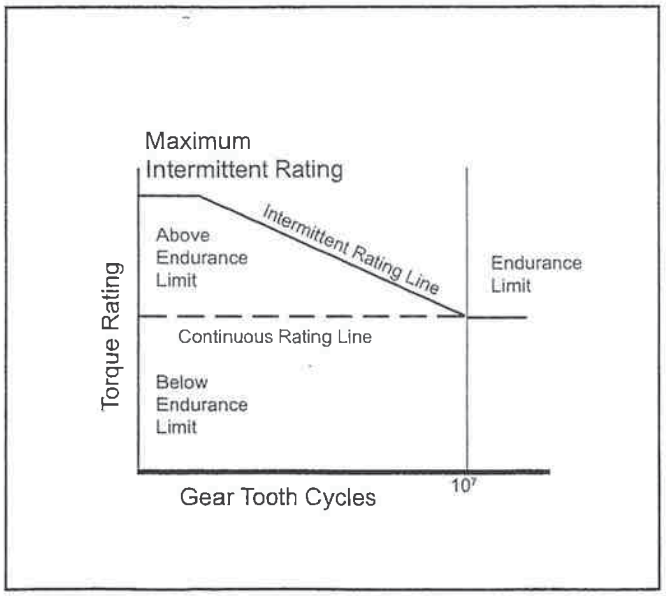
ITEM	DESCRIPTION	PART No.	QTY.
8C	Retaining Ring	9100307	1
8D	O-Ring	9400102	1
8E	O-Ring, Back-up	9400248	1
8F	O-Ring	9400250	1
8H	O-Ring, Back-up	9400249	1
	Flat Head Socket Cap Screw	930913	2

Definition of ratings

Continuous Rating - The continuous rating of a Torque-Hub® product is based upon the endurance limit of the gear material and heat treatment selected for the gears. By definition, the endurance limit means that Torque-Hub® products operated at or below the continuous torque output rating should not experience gear tooth breakage. Torque-Hub® product life will then be determined by bearing and seal wear, structural stresses or thermodynamic considerations.

Intermittent Rating - Operation of the Torque-Hub® product above the continuous rating will result in gear tooth bending stresses above the endurance limit. Therefore, gear tooth breakage will occur in a finite number of cycles. Please reference the Sn curve, shown below, for a visual explanation.

Sn curve



The maximum intermittent torque ratings listed for Torque-Hub® products represent structural limits for safe operation. Gear stresses at this level are still below the yield point for the material. Spindle shafts, hubs, and bolted connections have been designed to operate at their endurance value at the maximum intermittent torque rating.

Peak Rating - The peak rating for a Torque-Hub® product is the maximum, one-time torsional load the Torque-Hub® unit can be subjected to without failure. However, this rating should be considered as a worst case or shock load only, and should not be considered as a part of the normal duty cycle.

Horsepower Capacity - High horsepower applications are defined as applications requiring continuous high speed and high torque. The horsepower capacity of each Torque-Hub® drive is based on thermodynamic capacity of the unit and the heat dissipation characteristics of its installation. The location of a Torque-Hub® drive in your installation greatly effects the steady state temperature value of that unit. For example, if a Torque-Hub® drive is located inside a drum or other closed cavity, then the resulting internal temperature will be higher than a Torque-Hub® unit located on an open wheel because of the lack of air flowing over the unit.
In general, mobile applications experience a wide range of horsepower levels throughout a normal duty cycle. This is true of non-drawbar type vehicles such as spray tractors, combines, lift trucks, etc. Average horsepower throughout the duty cycle for these types of machines is usually acceptable if the unit is properly sized for torque and speed.

In contrast, drawbar type vehicles and industrial type applications often see long periods of continuous duty. This can result in higher continuous horsepower levels than normally experienced in mobile applications. In this case, the horsepower requirement by itself may dictate the size of the Torque-Hub® unit, rather than the torque output requirement. Forced cooling may be necessary to meet the thermal dissipation requirements of the gearbox in severe applications. Please contact a Fairfield representative for horsepower guidelines and suggestions when applying Torque-Hub® drives in high horsepower applications.

Contents

Pump Control Options

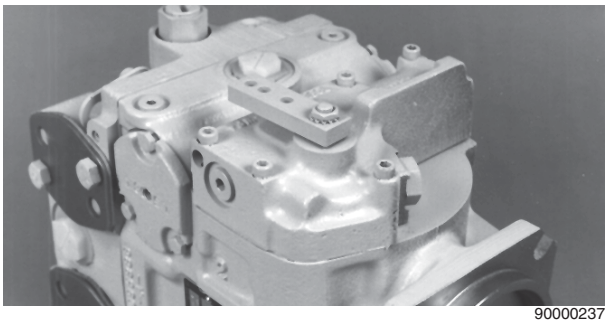
Manual Displacement Control (MDC)

The manual displacement control converts a mechanical input signal to a hydraulic signal using a spring- centered four-way servo valve. This valve ports hydraulic pressure to either side of a dual-acting servo piston. The servo piston rotates the cradle swashplate through an angular rotation of ±17°, thus varying the pump's displacement from full displacement in one direction to full displacement in the opposite direction.

The MDC is designed so the angular position of the pump swashplate is proportional to the rotation of the control input shaft.

Non-Linear MDC

The non-linear manual displacement control operates in the same manner as the regular MDC except that it is designed so the change in the angular position of the pump swashplate *progressively* increases as the control input shaft is rotated toward its maximum displacement position.



90000237

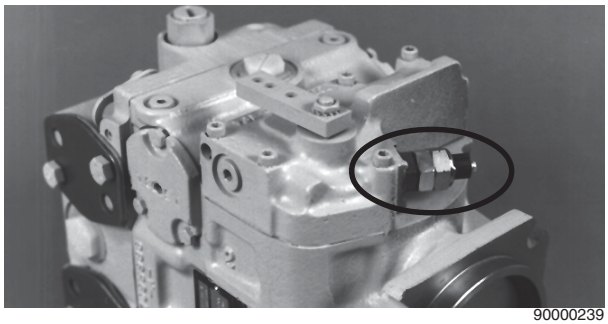
PV with Manual Displacement Control

Solenoid Override Valve for MDC

A solenoid override valve option (not shown here) is available for MDC. This safety feature will return the swashplate to zero displacement position when activated. The valve may be set in either a normally open or normally closed mode.

Neutral Start Switch (NSS)

The neutral start switch is an optional feature available with MDC. When connected properly with the vehicle's electrical system, the neutral start switch ensures that the prime mover can be started only when the control is in a neutral position.

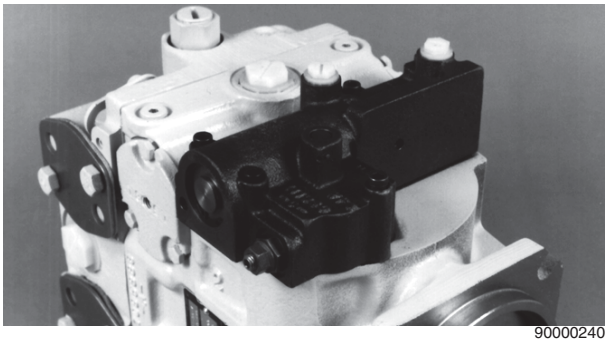


90000239

PV with Manual Displacement Control and Neutral Start Switch

Hydraulic Displacement Control (HDC)

The hydraulic displacement control uses a hydraulic input signal to operate a spring-centered four-way servo valve. This valve ports hydraulic pressure to either side of a dual-acting servo piston. The servo piston rotates the cradle swashplate through an angular rotation of ±17°, thus varying the pump's displacement from full displacement in one direction to full displacement in the opposite direction. The HDC is designed so the angular position of the pump swashplate is proportional to input pressure.



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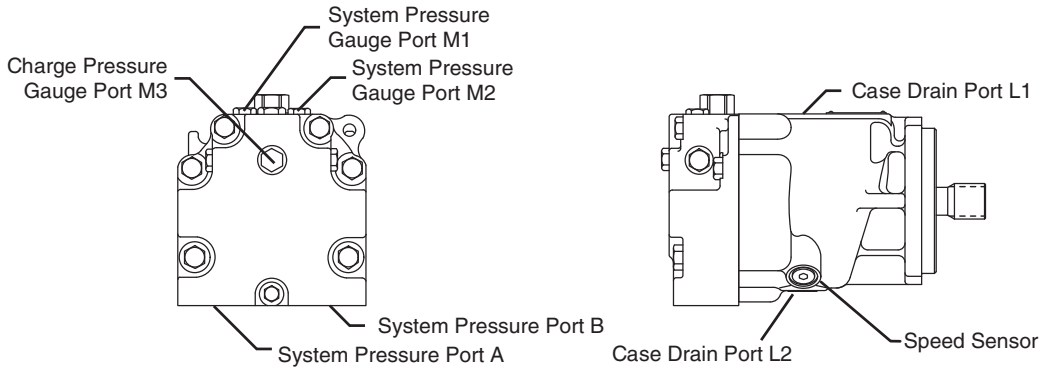
PV with Hydraulic Displacement Control

Fixed Motor

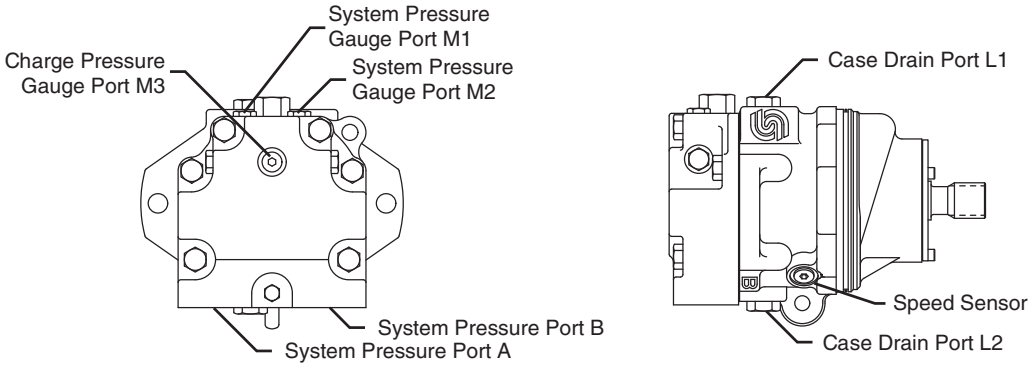
Port	Function	Gauge Size and Fitting
M1	System Pressure Port "A"	1000 bar or 10 000 psi 9/16-18 O-ring
M2	System Pressure Port "B"	1000 bar or 10 000 psi 9/16-18 O-ring
M3	Charge Pressure	50 bar or 1000 psi 9/16-18 O-ring
		T002 261E

Port	Function	Gauge Size and Fitting	
L1 **L2**	Case Pressure)	10 bar or 500 psi	
		030 042 055	7/8-14 O-ring
		075 100 130	1-1/16-12 O-ring
			T002 262E



Rear View **Left Side View**

MF with SAE Flange



Rear View **Left Side View**

90000821E

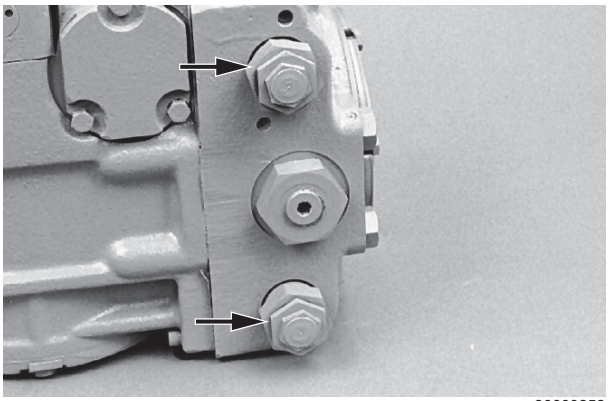
MF with Cartridge Flange

Multi-Function Valve Pressure Adjustment

Adjustment of the pressure limiter setting and the high pressure relief valve setting is accomplished simultaneously. The latter is automatically set approximately 35 bar (500 psi) above the former.

In order to adjust the pressure limiter setting, the motor output shaft must be locked so it does not rotate. This may be accomplished by locking the vehicle's brakes or rigidly fixing the work function so it cannot rotate.

WARNING
Take necessary precautions that the motor shaft remains stationary during the adjustment procedure.
S000010E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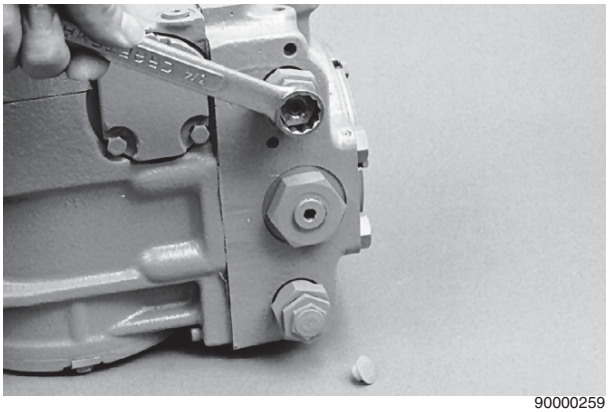
Multi-Function Valves on PV

1. Install two 1000 bar (or 10 000 psi) pressure gauges in the high pressure gauge ports (M1 and M2). Install a 50 bar (or 1000 psi) pressure gauge in the pump charge pressure gauge port (M3).

2. Start the prime mover and operate at normal speed.

3. Loosen locking nut.

Frame Size	Wrench Size
early 042 - 100	10 mm
newer 030 - 100	19 mm
early 130	13 mm
130 - 250	24 mm
	T002 268E


90000259

Loosen Pressure Adjusting Screw Lock Nut

4. Insert a internal hex wrench into the pressure adjusting screw.

Frame Size	Internal Hex Wrench Size
early 042 - 100	3 mm
newer 030 - 100	5 mm
early 130	4 mm
130 - 250	8 mm
	T002 269E

Note: A plastic dust plug is installed in the adjusting screw on 030 and late 042 through 250 units.

Neutral Start Switch Eccentric Plug Adjustment (Condition i)

The NSS deadband and the control deadband **must** be centered in relation to each other.

Since the position of the control deadband cannot be adjusted, the position of the NSS deadband must be adjusted to match it. The switch pin is located in an eccentric plug which is turned to move the center of the NSS deadband.

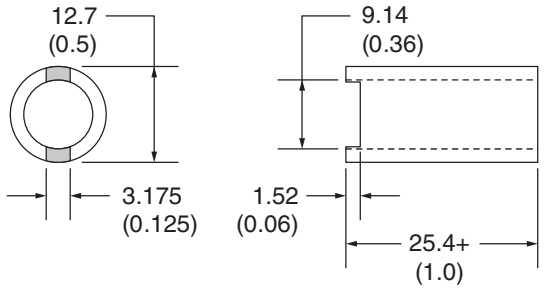
The MDC should be installed on the pump and be in its "neutral" position when adjusting the neutral start switch eccentric plug.

The accompanying drawing provides dimensions for an Eccentric Plug Adjustment Tool.

1. Hold the switch and eccentric plug from turning and use two 1-1/8 inch wrenches to loosen the locknut. Remove the neutral start switch.

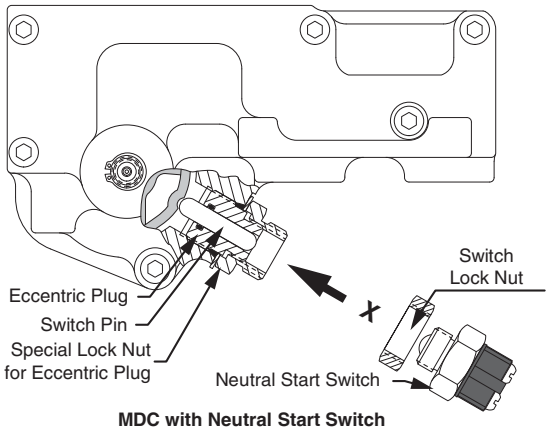
WARNING
Do not start the prime mover while the neutral start switch is removed from the control. Case pressure will force the pin out of the eccentric plug, causing oil loss.

S000032E

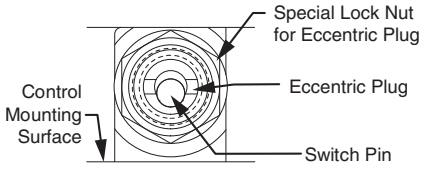


90000834E

Eccentric Plug Adjustment Tool



MDC with Neutral Start Switch



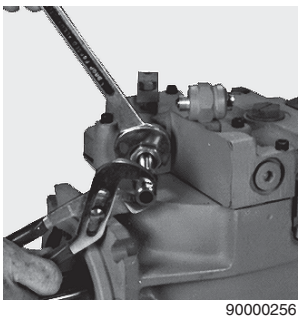
View in Direction X
(Switch and lock nut removed)

90000833E

NSS with Eccentric Plug

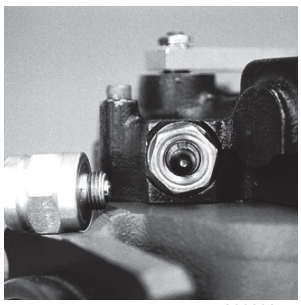
2. Note the slots on the eccentric plug for the adjustment tool. Hold the eccentric plug in place with the adjustment tool, and loosen the lock nut with a 1-1/8 inch wrench.

(continued)



90000256

Loosen Eccentric Lock Nut



90000257

NSS Removed

Pump and Motor Minor Repair

Pump / Fitting Torques

If any plugs or fittings are removed from the pump or motor during servicing, they should be torqued as indicated in the accompanying table.

Always install new O-rings before reinstalling the plugs or fittings.

Caution
Plugs or fittings installed into aluminum housings should always be torqued to the lower values specified for internal hex plugs of the same size.
S000017E

Description	Torque
7/16-20 O-ring 9/16 inch Hex Wrench	20 Nm (15 lbf•ft)
7/16-20 O-ring 3/16 inch Internal Hex Wrench	12 Nm (9 lbf•ft)
9/16-18 O-ring 11/16 inch Hex Wrench	37 Nm (27 lbf•ft)
9/16-18 O-ring 1/4 inch Internal Hex Wrench	23 Nm (17 lbf•ft)
3/4-16 O-ring 7/8 inch Hex Wrench	68 Nm (50 lbf•ft)
3/4-16 O-ring 5/16 inch Internal Hex Wrench	68 Nm (50 lbf•ft)
7/8-14 O-ring 1 inch Hex Wrench	95 Nm (70 lbf•ft)
7/8-14 O-ring 3/8 inch Internal Hex Wrench	68 Nm (50 lbf•ft)
1-1/16-12 O-ring 1 1/4 inch Hex Wrench	163 Nm (120 lbf•ft)
1-1/16-12 O-ring 9/16 inch Internal Hex Wrench	115 Nm (85 lbf•ft)
1-5/16-12 O-ring 1-1/2 inch Hex Wrench	190 Nm (140 lbf•ft)
1-5/16-12 O-ring 5/8 inch Internal Hex Wrench	129 Nm (95 lbf•ft)
1-5/8-12 O-ring 1-7/8 inch Hex Wrench	224 Nm (165 lbf•ft)
	T002 281E

6. Carefully remove the alignment pin from the charge pump parts. Install the pin in its hole in the new charge pump cover (with hole for the auxiliary coupling) and retain with petroleum jelly. Install the new charge pump cover with alignment pin into the end cap and the aligned charge pump parts.

Caution
In order to avoid loss of charge pressure in pumps with an auxiliary mounting pad, always install the charge pump cover with the pad drain hole located on the same side of the end cap as the charge inlet port. Refer to the section "Auxiliary Pad Installation" for details.

S000 020E

7. Install the charge pump cover retainer and the six hex screws and torque the screws.

Frame Size	Torque
030 - 100	13.5 Nm (10 lbf•ft)
130 - 250	32 Nm (24 lbf•ft)
	T002 288E

8. Install O-ring on end cap pilot.

9. Install the auxiliary mounting pad adapter on external pilot on rear of end cap.

10. Install four new large screws and washers through the mounting pad and end cap into the housing. Torque per the accompanying table.

Frame Size	Torque
030 - early 042	58 Nm (43 lbf•ft)
late 042	122 Nm (90 lbf•ft)
055	122 Nm (90 lbf•ft)
075 - 100	256 Nm (189 lbf•ft)
100 - 130	298 Nm (220 lbf•ft)
180 - 250	580 Nm (429 lbf•ft)
	T002 290E

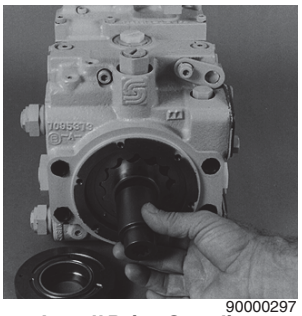
11. Install the O-ring and flange cover or auxiliary pump.

Auxiliary Pad Conversion

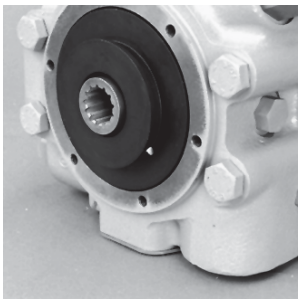
To convert an auxiliary mounting pad to a different size mounting pad, use the above procedure with the following additions:

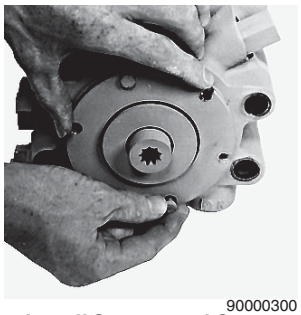
After removing the charge pump cover (step 2), remove the old auxiliary drive coupling.

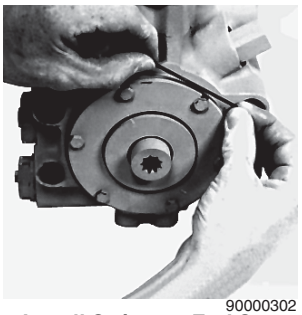
After removing the four end cap retaining screws, remove the old auxiliary mounting pad adapter.

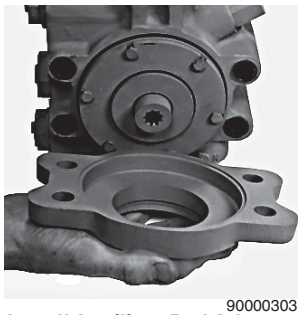

90000297
Install Drive Coupling

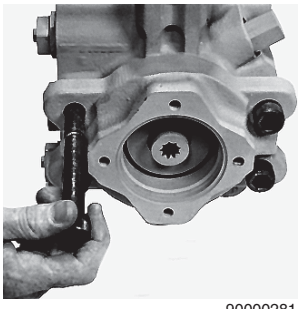

90000298
Install Alignment Pin in Cover (CCW rotation shown)


90000299
Install New Charge Pump Cover


90000300
Install Screws and Cover Retainer


90000302
Install O-ring on End Cap Pilot


90000303
Install Auxiliary Pad Adapter


90000281
Install Auxiliary Pad Adapter Screws


90000305
Torque Pad Adapter Screws

Variable Motor Displacement Limiters

1. Remove the tamper-resistant cap from the displacement limiter. Measure and note the length of the adjustment screw up to the seal lock nut. Using a 19 mm hex wrench, loosen the seal lock nut and remove the nut. Remove the limiter screw from the motor housing with a 6 mm internal hex wrench.

2. Install the limiter screw with the noted length between adjustment screw and the seal lock nut. Do not install a new tamper-resistant cap until the limiter has been adjusted.

3. Final adjustment of the displacement limiters should be performed on a test stand.

   Do not turn the limiter screws counterclockwise beyond their initial adjustment positions.

Caution
Care should be taken in adjusting displacement limiters to avoid undesirable speed conditions. The seal lock nut must be retorqued after every adjustment to prevent an unexpected change in operating conditions and to prevent external leakage during unit operation.

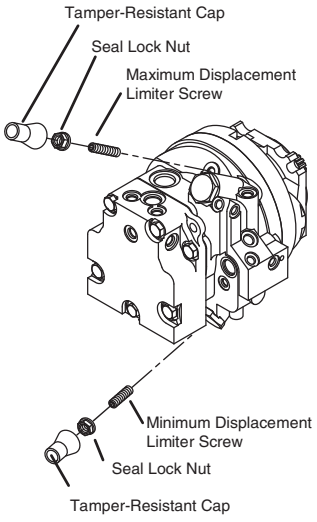
S000026E

One full turn of the displacement limiter adjustment screw will change the displacement as follows:

Frame Size	Approx Change in Disp per Rev of Adjusting Screw
055	5.6 cm^3 / Rev (0.34 in^3 / Rev)
075	7.1 cm^3 / Rev (0.43 in^3 / Rev)

T002 295E

4. Following the final adjustment, install new tamper resistant caps.



SAE Flange Version shown
(cartridge Version similar)

90000851E

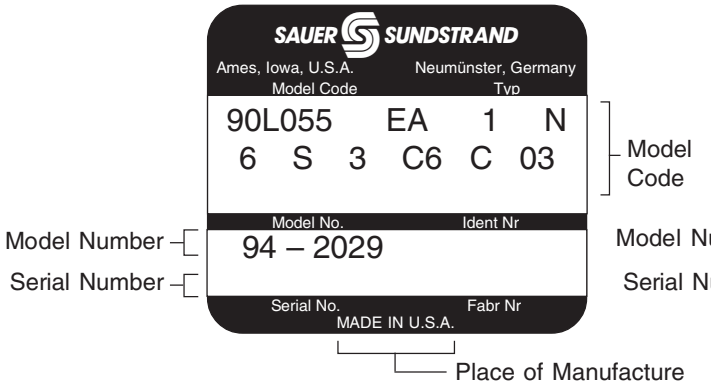
MV Displacement Limiters

Parts List Filter and Options

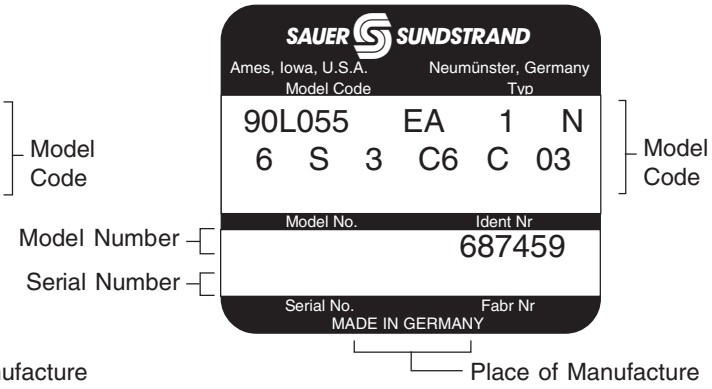
Item	Description	Qty
H05B-H	Kit - Charge pump	1
H50L	Spacer (No charge pump)	1
H30	Port plate	2
H40	Pin	1
H50	Charge pump shaft	1
H60	Key	1
H70	Retaining plate	1
H80	Screw	6
H90L	Plug	1
J00A	Aux. mtg. SAE A flange	1
J00B	Aux. mtg. SAE B flange	1
J00C	Aux. mtg. SAE C flange	1
J00D	Aux. mtg. SAE D flange	1
J00T	Aux. mtg. SAE A flange (11 T)	1
J00V	Aux. mtg. SAE B-B flange	1
J00N	Aux. mtg. flange - none	1
J10A-V	Coupling	1
J15	Charge pump cover assembly	1
J15N	Charge pump cover assembly	1
J30	Bushing	1
J50A-V	O-ring	1
J60A/T	Flange adaptor SAE A	1
J60B/V	Flange adaptor SAE B	1
J60C	Flange adaptor SAE C	1
J60D	Flange adaptor SAE D	1
J70A-V	Washer	4

Item	Description	Qty
J80A-V	Screw	4
J80N	Screw	4
J90A-V	O-ring	1
J92A-V	Cover plate	1
J95A-V	Screw	2/4
N00M	Filtration manifold kit (Int)	1
N10M	Manifold	1
N15M	O-ring	2
N20M	Nut	1
N25M	Tube	1
N35M	Plug	2
N40L	Filter	1
N40P	Filter	1
N00R	Filtration manifold kit (Rmt)	1
N10R	Manifold	1
N15R	O-ring	1
N20R	Nut	1
N25R	Tube	1
N30R	Plastic plug	2
N35R	Plug	1
N00S	Filtration kit (Suction Flt)	1
N10S	Reducer fitting (Suction Flt)	1
N35S	Plug	1

Name Plates



Name Plate (U.S.A. Production)



Name Plate (German Production)

OVERVIEW

This manual includes information for the installation, maintenance, and minor repair of the M46 motor. It includes a description of the unit and its individual components, troubleshooting information, and minor repair procedures. For information regarding general operation, operating parameters, or technical specifications, refer to Series 40 Motors Technical Information manual **520L0636**.

Performing minor repairs requires the unit to be removed from the vehicle/machine. Thoroughly clean the unit before beginning maintenance, or repair activities. Since dirt and contamination are the greatest enemies of any type of hydraulic equipment, follow cleanliness requirements strictly. This is especially important when changing the system filter and when removing hoses or plumbing.

A worldwide network of Sauer-Danfoss Global Service Partners is available for major repairs. Sauer-Danfoss Global Service Partners are trained by the factory and certified on a regular basis. You can locate your nearest Global Service Partner using the distributor locator at www.sauer-danfoss.com.

WARRANTY

Performing installation, maintenance, and minor repairs according to the procedures in this manual will not affect your warranty. Major repairs requiring the removal of a unit's rear cover or front cover voids the warranty unless done by a Sauer-Danfoss Global Service Partner.

GENERAL INSTRUCTIONS

Follow these general procedures when repairing series 40 M46 variable displacement closed circuit motors.

Remove the unit

Prior to performing major repairs, remove the unit from the vehicle/machine. Chock the wheels on the vehicle or lock the mechanism to inhibit movement. Be aware that hydraulic fluid may be under high pressure and/or hot. Inspect the outside of the pump and fittings for damage. Cap hoses after removal to prevent contamination.

Keep it clean

Cleanliness is a primary means of assuring satisfactory pump life, on either new or repaired units. Clean the outside of the pump thoroughly before disassembly. Take care to avoid contamination of the system ports. Cleaning parts by using a clean solvent wash and air drying is usually adequate.

As with any precision equipment, all parts must be kept free of foreign materials and chemicals. Protect all exposed sealing surfaces and open cavities from damage and foreign material. If left unattended, cover the motor with a protective layer of plastic.

Replace all O-rings and gaskets

It is recommended that all O-rings be replaced. Lightly lubricate all O-rings with clean petroleum jelly prior to assembly.

Secure the unit

For major repair, place the unit in a stable position with the shaft pointing downward. It will be necessary to secure the motor while removing and torquing controls and valves.

SYSTEM WILL NOT OPERATE IN ONE DIRECTION

Item	Description	Action
Motor input control pressure signal	A faulty control signal is being received at the pump. (HDC blocked or incorrectly orificed control lines)	Verify that the input signal being received is correct. Adjust, clean, repair, or replace the motor as necessary.
SCR (system check / relief) valves	The SCR valves on pump are malfunctioning or improperly set.	Verify that the SCR valves are operating properly. Repair or replace them as necessary.
Pump control	A damaged or biased pump control may be sending a signal commanding the pump to stroke only in one direction.	Verify that the pump's control is functioning properly. Repair or replace it as necessary.
Servo pressure	The drain or supply path to one side of the servo piston may be blocked.	Verify that the servo supply and drain paths are unobstructed and that any orifices are of the correct size and free of debris. Clean or repair them as necessary.
Displacement limiter	The displacement limiter may be improperly adjusted such that the servo piston is prevented from moving correctly.	Verify that the displacement limiter is adjusted properly.

SYSTEM WILL NOT OPERATE IN EITHER DIRECTION

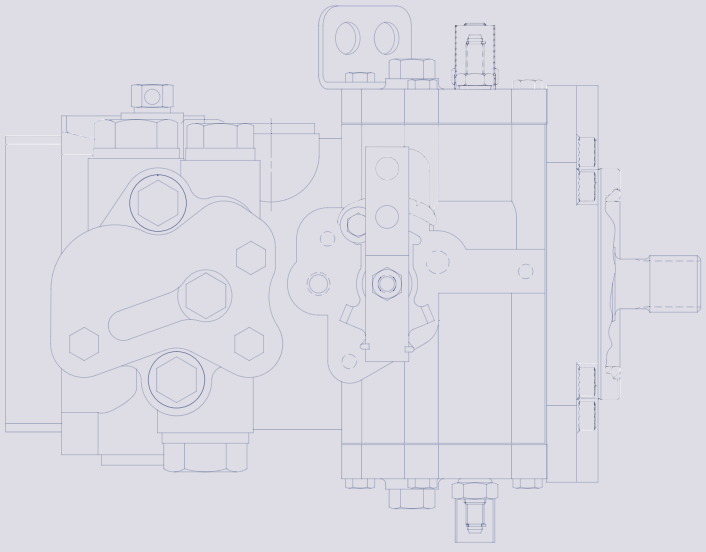
Item	Description	Action
Oil level in reservoir	There is insufficient hydraulic fluid to supply the system loop.	Fill the reservoir to the proper level with clean hydraulic oil.
Input control pressure signal	A faulty control signal being received at the pump. (HDC blocked or incorrectly orificed control lines)	Verify that the input signal being received is correct. Adjust, clean, repair, or replace the motor as necessary.
Oil filters	Clogged oil filters may result in an insufficient supply of oil to the system.	Inspect the oil filters and verify that they are still serviceable. Replace them if necessary.
Servo pressure	There is an insufficient pressure differential across the servo piston.	Check servo pressures to verify sufficient pressure delta. Verify that the servo supply and drain paths are unobstructed and that any orifices are of the correct size and free of debris. Clean, repair, or replace them as necessary.
Displacement limiter	Displacement limiter may be improperly adjusted such that the servo piston cannot move properly.	Verify that the displacement limiter is adjusted to the proper setting.

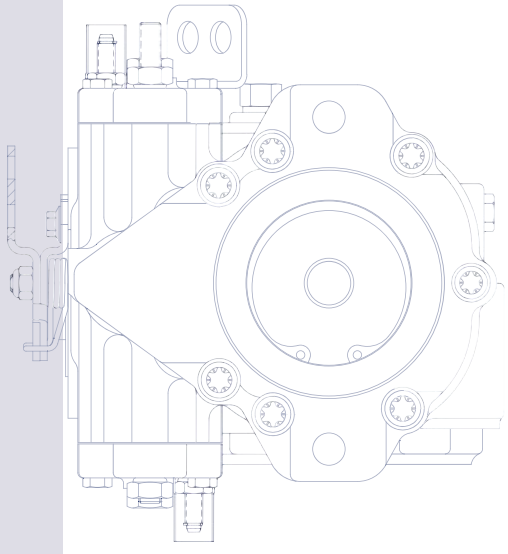
SAUER DANFOSS

Genuine Parts

Series 40 - M46 Variable Pumps

Service Manual





250 - 173

FLUID AND FILTER RECOMMENDATIONS

To ensure optimum life, perform regular maintenance of the fluid and filter. Contaminated fluid is the main cause of unit failure. Take care to maintain fluid cleanliness when servicing.

Check the reservoir daily for proper fluid level, the presence of water, and rancid fluid odor. Fluid contaminated by water may appear cloudy or milky, or free water may settle in the bottom of the reservoir. Rancid odor indicates the fluid was exposed to excessive heat. Change the fluid immediately if these conditions occur. Correct the problem immediately. Inspect vehicle for leaks daily.

Change the fluid and filter per the vehicle/machine manufacturer's recommendations or at these intervals: We recommend first fluid change at 500 hours.

Fluid and filter change interval

Reservoir type	Max oil change interval
Sealed	2000 hours
Breather	500 hours

Caution

High temperatures and pressures accelerate fluid aging. More frequent fluid changes may be required.

Change the fluid more frequently if it becomes contaminated with foreign matter (dirt, water, grease, etc.) or if the fluid is subjected to temperature levels greater than the recommended maximum.

Dispose of used hydraulic fluid properly. Never reuse hydraulic fluid.

Change filters whenever you change the fluid or when the filter indicator shows that it is necessary to change the filter. Replace all fluid lost during filter change.

Hazardous material

Warning

Hydraulic fluid contains hazardous material. Avoid contact with hydraulic fluid. Always dispose of used hydraulic fluid according to state, and federal environmental regulations.

ENGAGING THE BYPASS FUNCTION

Test bypass function with pump installed on machine. The bypass function is engaged by unscrewing the bypass valve. Do not open the bypass valve when machine is operating.

1. To engage the bypass function, use a 5/8 in. hex wrench to unthread the bypass valve. Rotate the bypass valve approximately three turns counterclockwise. Do not rotate more than 3 revolutions: additional rotation permits external leakage.

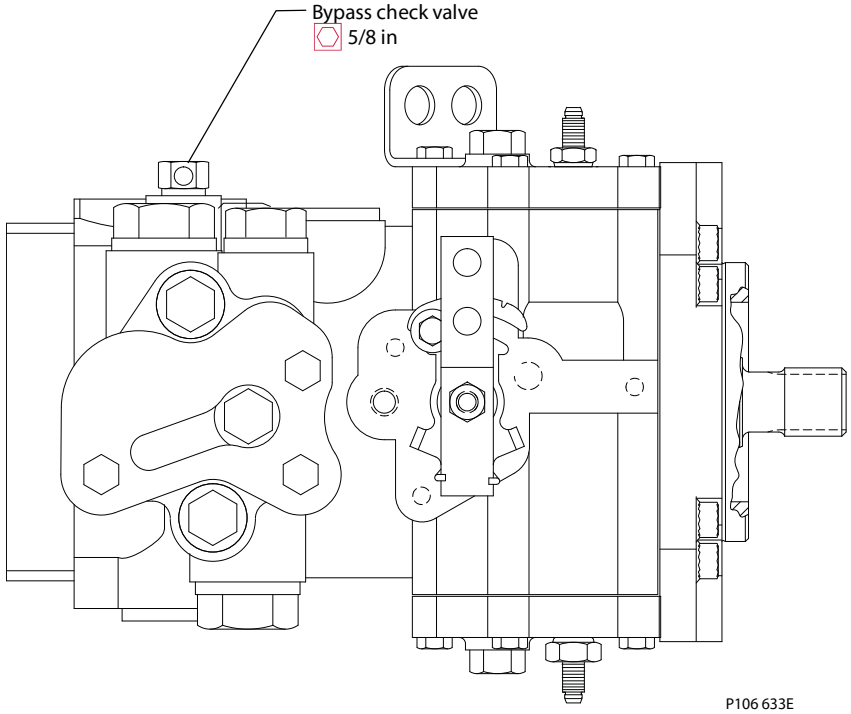
2. To close the bypass valve, rotate the bypass valve clockwise until seated. Torque to 20 N•m [15 lbf•ft].

3. Vehicle/machine should move with bypass valve open. Close valve for normal operation.

Caution

Bypass valve is not a tow-valve. Damage to pump and motor is possible when operating without charge pressure. Limit speed of movement to 20% of the vehicle/machine's maximum for no longer than 3 minutes.

Using the bypass function



CHARGE PUMP (continued)

Inspection

6. Inspect the gerotor (603) and gerotor cover (155) for wear, scratches or pitting. If any component shows signs of wear, scratching, or pitting, relpace all components. Inspect pin (604) and key (605) for damage, and replace parts if necessary. Replace O-ring (141), load ring (142), and seal (1504) whenever charge pump is disassembled.

Charge pump parts are available as a complete set

Reassemby

7. Install key (605). Lubricate and install gerotor assembly (603).
8. Install pin (604) and gerotor cover (155).
9. Lubricate and install new O-ring (141) and load ring (142). Install auxiliary pad (1503).
10 Using a 9/16 in. hex wrench, install screws (1502). Torque to 43 N•m [32 lb•ft].
11. Lubricate and press seal (1504) onto auxiliary pad (1503).
12. Install cover plate (1505). Using a 9/16 in. hex wrench, install capscrews (1506). Torque to 77 N•m [57 lbf•ft].

If a gear pump is a ttached to the auxiliary pad, install a new O-ring or gasket and gear pump

If a gear pump is attached, seal (1504), cover (1505), and bolts (1506) are not used. Replace O-ring or gasket between gear pump and M46 pump.

Subject: Torque Hub Disengagement

DTS models can be manually disengaged by removing center cover plate and reversing plate so that dimple is facing inward and reinstall. This will push shaft in just enough to disengage hub from motor.

STS models require a minimum off 125 – 175 p.s.i. charge pressure to release brakes. Anything less and brakes remain engaged. Note that normal charge pressure with machine running should be 350 – 400 p.s.i.

SAUER DANFOSS

OSPB, OSPC, OSPD Open Center Steering Units

OSPB Closed Center Steering Units

Technical Information

Code Numbers and Weights

OSPC Open Center Non-Reaction Steering Units

OSPC ON in the table below have all the following valve functions incorporated:

- check valve in P-port
- relief valve
- shock valves
- suction valves

Steering unit	Code Numbers		Pump flow range	Valve settings		Weight
	Connections			Relief valve	Shock valve	
	European version G 1/2 S**	US version 3/4-16 UNF O*	l/min [US gal/min]	bar [psi]	bar [psi]	kg [lb]
OSPC 40 ON	150N2148	-	5-18 [1.32-4.76]	140 [2030]	200 [2900]	5.2 [11.46]
OSPC 50 ON	150N2149	150N2136				5.2 [11.46]
OSPC 80 ON	150N2150	150N2137	10-30 [2.64-7.93]	170 [2465]	225 [3263]	5.3 [11.68]
OSPC 100 ON	150N2151	150N2138				5.4 [11.90]
OSPC 125 ON	150N2152	150N2139	20-50 [5.28-13.21]			5.5 [12.13]
OSPC 160 ON	150N2153	150N2140				5.6 [12.35]
OSPC 200 ON	150N2154	150N2141				5.8 [12.79]
OSPC 250 ON	150N2155	150N2168				6.0 [13.23]
OSPC 315 ON	150N2156	150N2142	20-70 [5.28-18.49]			6.2 [13.67]
OSPC 400 ON	150N2157	-				7.0 [15.43]
OSPC 500 ON	150N2158	-				7.6 [16.78]

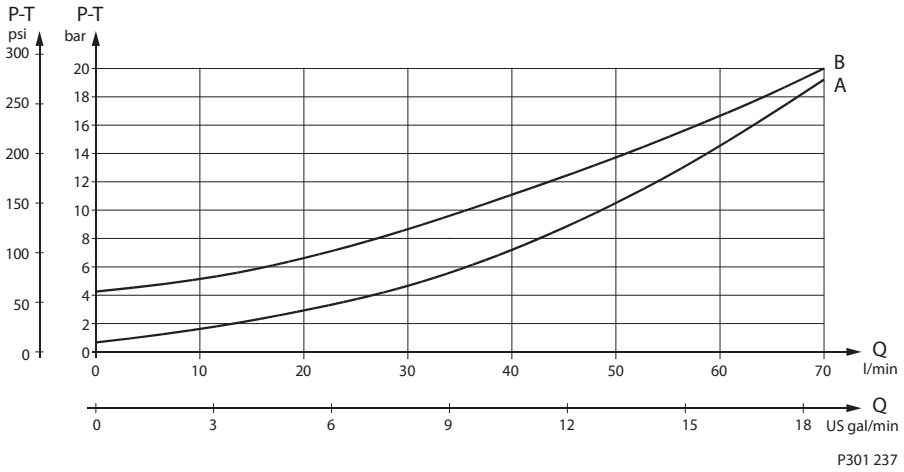
O*: O-ring chamfer on port connections
S**: Spot-face around port connections (can not be used in connection with OVR angular block).

If you wish other port connection displacements, combination of displacement and pump flow range, valve combinations and/or other valve settings, please fill in the order form on page 14 and contact the Sauer-Danfoss Sales Organisation.

Technical Data

Pressure Drop in Neutral

The pressure drop is measured on Open Center steering units, and with the steering unit in neutral position.
The pressure drop is measured from P to T.
The values are valid at an oil temperature of 50°C (122°F) and a viscosity of 21 mm²/s (100 SUS).



A: OSPB ON and OSPC ON/OR
B: OSPD ON/OR

The pressure drop curves are solely valid for selected spool sets within the recommended flow range.
E.g. OSPC 50 ON with a spool set for 5-18 l/min [1.32-4.76 US gal/min], pressure drop curve A solely applies within the interval from 0-18 l/min [0-4.76 US gal/min]. A higher flow supply to the steering unit (e.g. 30 l/min [7.93 US gal/min]) will make the pressure drop exceed the value, which curve A shows at 30 l/min [7.93 US gal/min].

worn, the entire seal should be replaced. (See instruction under MOUNTING GREASE LUBRICATED SEAL ASSEMBLY.)

TO REMOVE WEAR PLATE

After pump housing has been removed from the adapter, inspect the wear plate. If wear plate is badly worn, it should be replaced. To remove wear plate, loosen and remove acorn nuts and gaskets on the outside of the pump housing.

CAUTION
When replacing wear plate, be sure to use new gaskets under acorn nuts to seal against air leaking in on suction side during priming cycle.

INSPECTION

After pump has been disassembled, check all parts over carefully for wear or damage. When ordering parts for your pump, be sure to specify model and serial numbers shown on name plate.

REASSEMBLY

MOUNTING ADAPTER

Before mounting adapter, clean counterbore with kerosene or similar cleanser.

Clean and lubricate with light oil the synthetic rubber member on seal seat and press (do not drive) the assembly into the adapter counterbore, seating it firmly and squarely.

CAUTION
In handling, avoid dropping seat and take particular care not to scratch the lapped face.

Install adapter. Install lockwashers and tighten four nuts evenly.

MOUNTING SELF-LUBRICATED SEAL ASSEMBLY (See Fig. 1)

Mount seat and seat ring (Part 4 and 5) as outlined above. Inspect impeller sleeve for nicks and burrs. Polish sleeve with fine emery or crocus cloth. Then clean and lubricate with a clean light oil.

Slip the coil spring (Part 1) onto the impeller sleeve making certain that it is seated properly on the shoulder of the impeller.

Lubricate the inside of the washer and bellows assembly (Part 2 and 3) with a clean light oil and slide it onto the impeller drive sleeve only until it clears the chamfer.

Slide the seal bellows and washer assembly onto the impeller drive sleeve. Push the seal down over the drive sleeve with even pressure. Pull the seal head back up to the position where there is no spring load. This insures proper assembly on the drive sleeve.

Before sliding the impeller onto the drive shaft, wipe the lapped sealing faces of the floating seat (Part 4) in the adapter counterbore and the carbon washer (Part 3) on the bellows assembly perfectly clean. Then lubricate both faces with a clean light oil.

IMPORTANT

The assembly of impeller and seal to the drive shaft should take place as soon as the bellows assembly is slipped on the impeller sleeve so as to avoid bonding of the bellows to the sleeve at improper working height.

CAUTION
Foreign matter between sealing faces will cause leakage and shorten the life of the seal.

MOUNTING GREASE LUBRICATED SEAL ASSEMBLY

Lubricate the two "O" rings on the seal seat (Part 5).

Press the seal seat into the adapter firmly and squarely. Be sure the two grease holes in the seal seat are turned 90° from the grease hole in the adapter casting. (See Fig. 2).

Use a square piece of soft wood, or the end of a hammer handle to press (do not drive) seal seat in firmly and squarely.

CAUTION
Do not tear the "O" rings on the seal seat.

Turn the adapter casting upside down to observe the fit of the seal seat. Seal seat should bottom. Install the adapter. Tighten four nuts and lockwashers on the studs.

INSTALLATION

1. MOUNTING THE RAVEN RADAR SPEED SENSOR

See Appendix 1 for Wheel Drive Speed Sensor installation instructions.
See Appendix 2 for Speedometer Drive Speed Sensor installation instructions.

For mounting the radar, the following guidelines will assure proper installation: It is suggested that a large heavy mounting bracket, (P/N 107-0159-693) be attached to the vehicle frame for mounting the radar.

1) Park vehicle on level surface.

2) Select mounting site by considering the following:

- **a)** The line of sight from the lens to the ground must not be obstructed by structures or tires. Obstructions must not come closer than 20 inches to the bottom of the radar. See Figures 1 and 2.
- **b)** The radar lens must be parallel to the ground from front to back. Radar can be tilted out 0-15 degrees to provide more clearance and miss obstructions. See Figure 2.
- **c)** The radar should be mounted so that the **length** of the radar is **parallel** with direction of vehicle travel.

3) Use carpenters level to verify that mounting bracket is parallel to the ground.

4) Bolt mounting bracket to implement.

5) Bolt radar to mounting bracket using mounting hardware. See Figure 3.

6) Connect radar with Radar Interface Cable (P/N 115-0159-539), to the Console. The Red wire should be connected to the Orange cable wire. The White wire should be connected to the White cable wire (See "BATTERY CONNECTIONS").

CAUTION:	The connection of the radar power in reverse polarity could result in damage to the Radar.

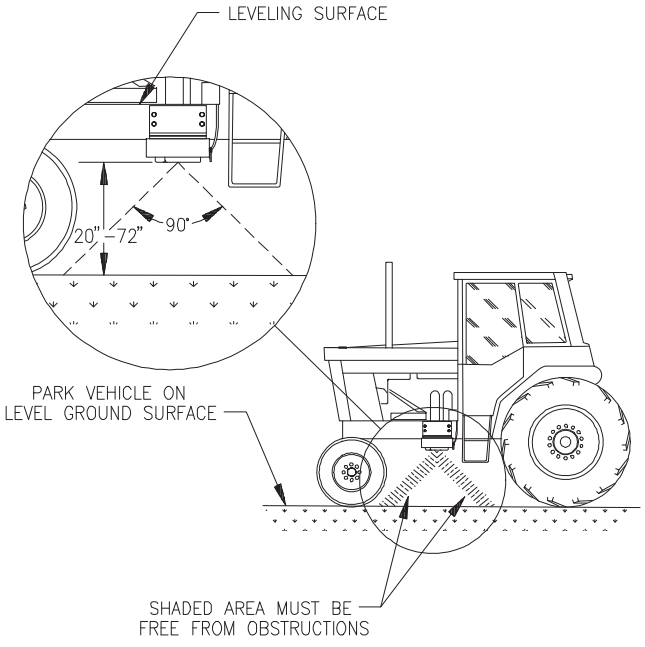


FIGURE 1

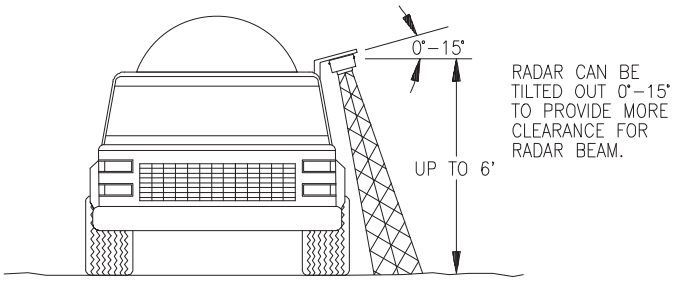


FIGURE 2

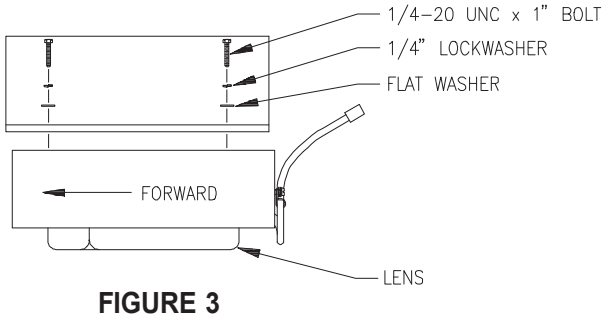
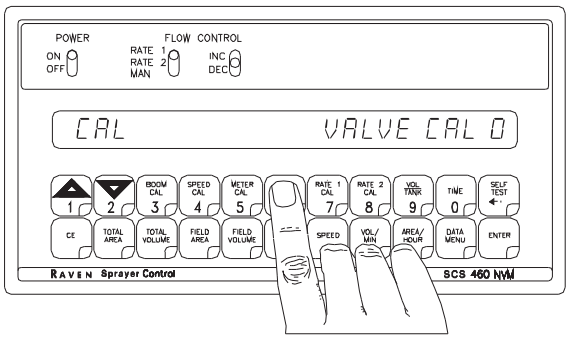


FIGURE 3

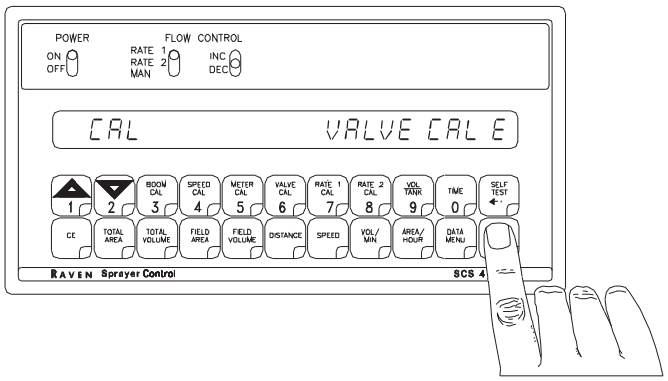
CONSOLE PROGRAMMING

When entering data into the Console, the entry sequence is always the same.

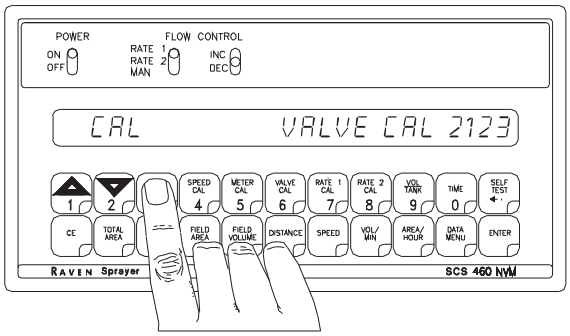
> **NOTE:** DATA MUST BE ENTERED FOR ALL BOOMS. ENTER "0" IF BOOM IS NOT USED. DATA MUST ALSO BE ENTERED IN KEYS 3 THRU 8.



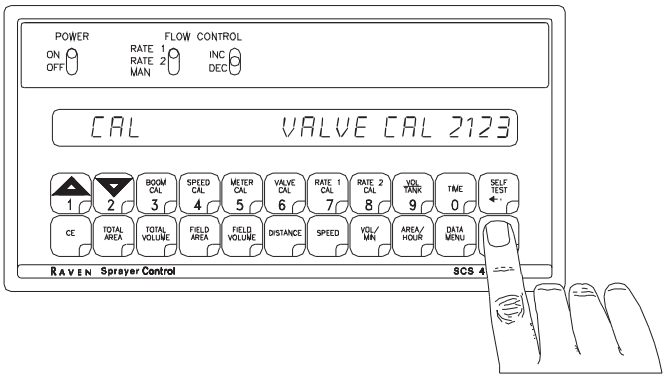
Depress the key in which you wish to enter data.



Depress the ENTER key. An "E" will illuminate in the display.



Depress the keys corresponding to the number you wish to enter (i.e. "2","1","2", "3"). The numbers will be displayed as they are entered.



Complete the entry by again depressing the ENTER key.

1. INITIAL CONSOLE PROGRAMMING

When Console power is turned on, after all installation procedures have been completed, the Console will flash CAL and US VOLUME PER ACRE. This means the console must be "calibrated", or programmed, before it can be operated. This is a one-time operation which does not have to be repeated. Turning OFF the POWER ON/OFF switch does not affect the Console memory. All data is retained.

11) DATA LOGGER TRIGGER UNITS

a) Display will show DATA LOG TRIGGER UNITS FEET [METER].

b) Depressing CE momentarily changes the display between DATA LOG TRIGGER UNITS FEET [METER] and SEC. DATA LOGGER TRIGGER VALUE has been programmed previously. (SEC means seconds has been chosed as the unit of measure.)

c) Momentarily depress ↑ 1 to advance to DATA LOGGER.

12) DATA LOGGER ON/OFF

a) The DATA LOGGER uses the communications strings listed in Appendix 9 to pass data out through the serial port. The data is sent at a set time interval or a set distance traveled, as determined by the values entered in the DATA LOGGER TRIGGER VALUE and DATA LOGGER TRIGGER UNITS. Upon each trigger, the Actual Rate string, Data Strings 1, 2, and 3, and the Time/date string are sent, in that order. When a Console calibration value is changed, the Console will automatically send out the Cal 1, 2, and 3 strings. When a Console switch is changed, the Data 1, 2, 3, Time/Date, and Cal 1, 2, 3 strings will be sent by the Console. The Data, (with Time/Date string included) and Cal strings can also be requested by the data logger using the request strings shown in Appendix 9.

NOTE: Some options within the DATA MENU LISTINGS may be unavailable if certain features are on or active. The options affected are:

CONSOLE DATA PRINTOUT:	Console Data Printout will not be available when DATA LOGGER is ON or when GPS functions are active.
GPS OPTIONS:	GPS options will not be available when DATA LOGGER is ON.
DATA LOGGER:	DATA LOGGER will not be available when GPS functions are active.

b) Display will show DATA LOG OFF.

c) Depressing CE momentarily changes the display between DATA LOG OFF and ON. A value of OFF means DATA LOGGER is disabled; a value of ON means DATA LOGGER is enabled.

d) Momentarily depress ↑ 1 to advance to PRESSURE CALIBRATION.

13) PRESSURE CALIBRATION OF THE PRESSURE TRANSDUCER

Used to set the zero point of the pressure transducer for pressure display.

a) Display will show PRESS ENTER TO CAL PRESSURE. Press ENTER.

b) Display will show ENTER SYSTEM PRESSURE.

c) Enter actual system pressure and press ENTER.

d) Momentarily depress ↑ 1 to advance to OFF RATE PERCENT 30.

2. RIM DRILLING INSTRUCTIONS FOR WHEEL DRIVE SPEED SENSOR MAGNETS

On wheels which do not have pre-punched mounting holes, proceed as follows:

RIMS WITH FOUR OR EIGHT HOLE STUD PATTERN:

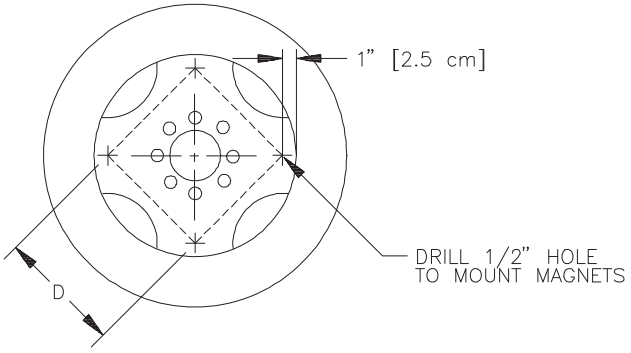
Choose stud holes that are opposite each other as shown below. Using the center of opposite holes, scribe two lines on the rim web to divide the circumference into four equal parts. Measure in one inch from the outer edge of the web on each of the lines drawn. Mark this point as the center. Drill four 1/2" holes for mounting the magnets.

> **NOTE:** Distance (D) between each set of drilled holes must be equal within 1/8 [3 mm] to ensure accuracy of system.

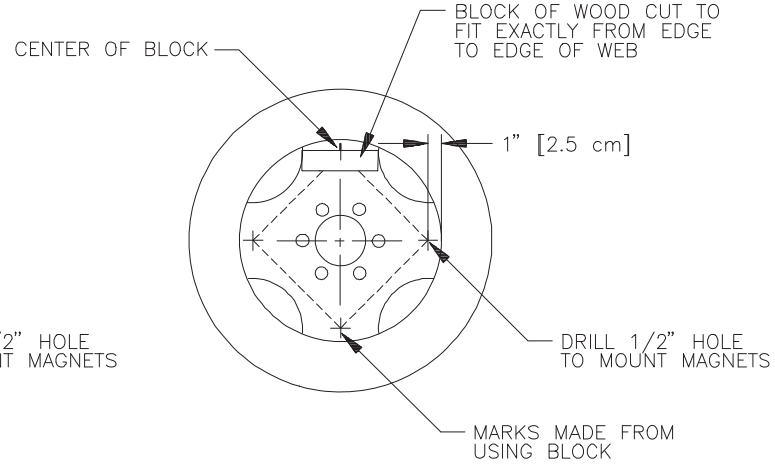
RIMS WITH SIX HOLE STUD PATTERN:

Locate the center of the holes to be drilled by using the rim webbing as a guide. Obtain a small piece of wood and cut to fit exactly over the web as shown. Measure the length of the piece of wood and mark the center on one edge. Using the center mark on the piece of wood, mark each of the four webs. Measure in one inch from the outer edge of the web on each of the lines drawn. Mark this point as center and drill four 1/2" holes for mounting the magnets.

> **NOTE:** Distance (D) between each set of drilled holes must be equal within 1/8" [3 mm] to ensure accuracy of system.



EIGHT HOLE STUD PATTERN



SIX HOLE STUD PATTERN