



CHATHAM, IL U.S.A. 62629

OIL LEVEL CONTROL BOOKLET

INSTALLATION AND SERVICE INSTRUCTIONS

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HENRY TECHNOLOGIES

OIL CONTROL INSTRUCTION BOOKLET

SECTION I - INTRODUCTION

This oil control booklet covers oil control systems for reciprocating, rotary, or scroll compressors using halocarbon refrigerants only. Do not use this guide or the products contained within for screw or rotary-vane compressors or for ammonia systems.

A proper oil control system is essential to insure compressor lubrication and energy efficient cooling. An oil control system can be a very cost effective alternative to replacing expensive compressors due to loss of oil. If installed correctly, an oil control system can give years of trouble-free operation and protect compressors from lack of oil and varying oil levels with little or no maintenance. Oil traveling through the system tends to build up in the evaporator, condenser, and vessels of an air-conditioning or refrigeration system. This causes a lack of oil return to the compressor until finally, in most cases, a large amount returns as a "slug" of oil. A slug of oil down the suction line can be just as damaging to the compressor as a slug of liquid refrigerant. This delay in oil return requires an additional amount of oil to be added to the system, depending on the size of the system, the piping, the temperatures, the miscibility of the refrigerant/oil mix, and the refrigerant velocity. In many systems, this extra oil can amount to 15 gallons or more.

By removing oil from the discharge gas of compressors, not only is the oil level for each compressor more accurately controlled, the efficiency of the system is increased. Oil does not change phase from liquid to gas in an air-conditioning or refrigeration system and therefore makes a very poor refrigerant. Due to this, it will not pick up and reject heat nearly as well as refrigerant and a system will actually have to cool the oil as it tries to cool the evaporator, reducing the amount of heat the refrigerant can pick up. Oil also takes up volume through the system that otherwise could be filled with refrigerant, causing higher mass flow rates through the system. Additionally, oil tends to film the condenser tubing walls lowering heat transfer and as oil and refrigerant exits the expansion valve, the oil will foam, insulating the evaporator walls and again lowering heat transfer. In this manner, oil traveling through the system can affect efficiency very dramatically in a variety of ways.

Note, however, that an oil control system does not replace the need for proper system design. An oil control system will drastically reduce the amount of oil going through the system, however, suction traps, correct piping, and proper sizing of valves, controls, and components must still be implemented to insure the system will work properly.

GENERAL INFORMATION

In all oil control systems, a means to feed oil to the compressors without bypassing hot gas to the crankcases is needed. In single compressor or low-pressure systems, an internal float in the oil separator accomplishes this. These floats will open to feed a few ounces of oil and close once the oil level has dropped. The float cycles as needed to return as much oil as the separator separates from the discharge.

It is required that all oil systems have a **discharge check valve** installed between the oil separator and the condenser. This prevents refrigerant migration and back feeding to the oil separator during compressor off cycles. If this check valve is not installed, the separator can feed excessive liquid refrigerant to the compressor once the compressor starts, causing dilution of the oil, excessive foaming, erratic oil pressures, and possible compressor damage.

Due to the reduced amount of oil going through the system, a means to remove debris from the oil is required in the oil control system, since the oil will not travel through the suction and liquid line filters. An oil strainer can be used to pick up debris in most systems and one should be placed in each oil line to every compressor. For systems using POE oil, a filter or filter-drier must be used to prevent clogging of valves. Polyolester (POE) oil is a very good solvent and will scavenge the system of debris that mineral oil will not. This debris can lead to clogging of components in the oil control system as well as the refrigeration system as a whole. Insure that the filters throughout the whole system are changed three times in the first three months to avoid problems.

Never remove or loosen components in the system when the system is under pressure or contains refrigerant. Loss of refrigerant or personal injury may result.

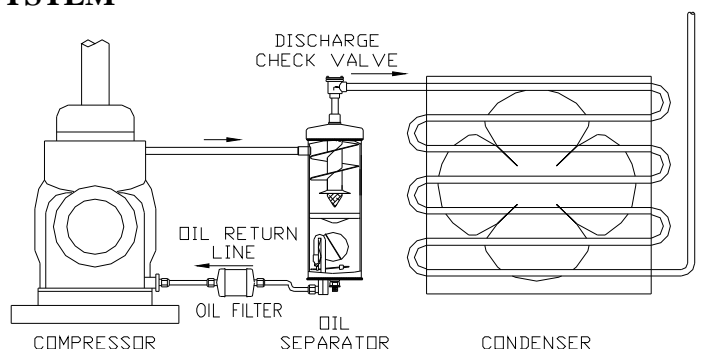
All components are labeled with a maximum working pressure that must not be exceeded. All components are built with a factor of safety before rupturing, however, permanent damage to the component may occur if the maximum working pressure for any component is exceeded.

When installing or servicing a component, always leak test and then evacuate (pull into vacuum) the system prior to adding refrigerant to insure all joints are sealed and will prevent loss of refrigerant.

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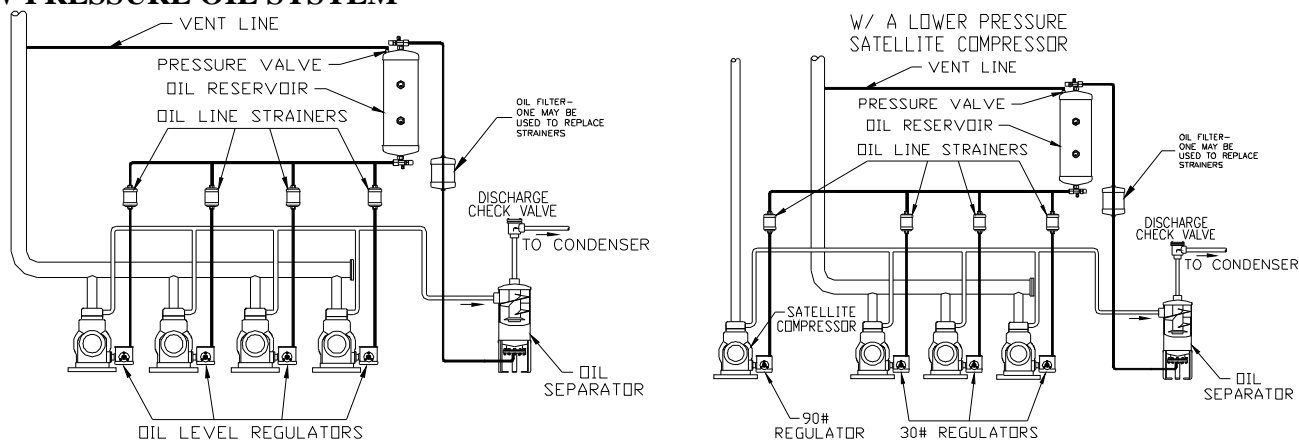
SECTION II - TYPES OF SYSTEMS

SINGLE COMPRESSOR SYSTEM



A single compressor oil system is the most basic system. The compressor discharge is piped to the inlet of an oil separator and the outlet of the oil separator is piped to the condenser. An oil return line is brought from the oil separator through an oil filter or strainer back to the compressor crankcase oil fill port or the suction line. A float in the oil separator opens and feeds a small amount of oil, bypassing the rest of the cooling system. The oil is returned under head pressure to the crankcase or suction line on compressors without crankcase connections. This float prevents hot gas from bypassing to the crankcase by closing when the oil level falls.

LOW PRESSURE OIL SYSTEM



This system is normally used for parallel compressors and uses three basic components: Oil Separator, Oil Reservoir, and Oil Level Regulators. Again, the common discharge is piped to the inlet of the oil separator and the outlet of the oil separator is piped to the condenser. An oil return line is brought from the oil separator to the top valve of the oil reservoir. A vent line is installed to the suction line with a pressure valve in line to lower the pressure in the reservoir, making a low pressure oil system. This valve will keep the reservoir pressure a set pressure above suction depending on the value of the valve, either 5 or 20 psig. This allows a constant differential pressure, which is the reservoir oil pressure minus crankcase pressure, of either 5 or 20 psig to the oil level regulator. Mechanical oil level regulators are rated for pressures ranging from 5 to 90 psig differential. The bottom valve of the oil reservoir is piped to oil level regulators mounted on the compressor crankcases. These regulators open to feed oil as the oil level drops and closes as the oil level raises to the set level. In this manner, the oil level in the compressor is kept at a constant level. Either one oil strainer per regulator or one oil filter per separator must be used to remove debris from the oil. On satellite systems, insure that all regulators see a positive oil differential pressure that falls within the range for each regulator.

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SECTION III - OIL SEPARATORS

OIL SEPARATOR INSTALLATION

(used on Single Compressor or Low Pressure Systems only)

1. S-1900, S-5200, S-5700 series oil separators - Remove the plastic shipping plug from the bottom flange of the oil separator and replace with a steel pipe plug. Use Loctite #12929 sealant or equivalent and torque to 13-15 ft-lbs.
2. A valve may be added if desired to the female 1/8" NPTF oil drain fitting on the bottom of S-1900, S-5700, S-5100, and S-5200 series oil separators. This fitting opens into the tank and will drain oil completely from the separator. This feature is useful for frequent oil change-outs
3. Precharge the oil separator with the same oil used in the system. This oil may be poured through the inlet or outlet fitting on all catalog separators. This oil precharge is the amount that is needed to just float the needle valve float. This amount of oil will stay in the oil separator when in operation and will seal the needle and prevent damage to the float mechanism. There have been instances that the float has been damaged by the turbulent hot gas bouncing the float if the separator was not precharged, which has caused the float mechanism to leak.

HELICAL MODEL NO.	OIL PRECHARGE	CONVENTIONAL NO.	OIL PRECHARGE
S-5180, S-5181	4 oz. / 11 cl	S-5500 series	12 oz. / 34 cl
S-5182, 85, 87, 88	14 oz. / 40 cl	S-5800 series	12 oz. / 34 cl
S-5190, 92, 94	40 oz. / 114 cl	S-5600 series	30 oz. / 86 cl
S-5200/S-5410 series	25 oz. / 71 cl	S-1900/S-5700 series	25 oz. / 71 cl

4. Install oil separator vertically between compressor and condenser, reasonably close to the compressor to insure that the discharge gas in the separator remains super-heated. Make sure that proper piping practices are used to prevent excessive vibration in the discharge line. If used, vibration eliminators and mufflers should be piped before the oil separator. If the oil separator has a bottom stud, the stud must be in an opening large enough to receive the stud and its weld fillet. Use as much of the bottom for bearing as possible: this tends to arrest vibration. Tighten nut to 15 ft-lbs. torque. If the separator has mounting legs, insure that the legs are properly attached to the mounting surface by bolts or welds. **DO NOT SUPPORT THE OIL SEPARATOR BY THE DISCHARGE LINE ALONE!** This will cause abnormal stress and fatigue on the line and fittings and may cause failure of the joints.
5. Attach compressor discharge line to INLET of the oil separator and the OUTLET of the separator to a discharge check valve and then to the condenser. The check valve will prevent liquid refrigerant migrating and back feeding from the condenser.
6. The oil return fitting is normally a 3/8" S.A.E. male flare fitting or a 3/8" ODS fitting on "X" versions. A 3/8" line should be installed from this fitting to either the compressor fill port or suction line on a single compressor system or the top valve on the oil reservoir in a low pressure oil system. A sight glass in the oil return line is a useful way to view oil feeding from the oil separator for trouble-shooting. A 3/8" liquid line sight glass may be used for this. If installing an oil separator in an existing single compressor system with either no oil separator or an inefficient separator, it is suggested to run the oil return line to the suction line of the compressor and install a oil drain valve either in the compressor crankcase (preferred) or in the 1/8" NPTF oil drain (if available) of the separator. This will allow you to see when excess oil is flooding the separator and compressor and to drain this oil from the system. A hand valve may also be installed in the oil return line to service the separator.
7. Silver braze the connections with a standard alloy used to join copper tubing to steel for refrigeration applications. Tin-Lead solders are NOT acceptable. Clean flux from connections after soldering/brazing. On oil separators with ODS connections located on the flange plate, care must be taken to prevent the gasket from temperatures over 300 degrees F. Place a wet rag on the header plate to keep it cool while soldering or brazing.
8. Insulate the oil separator and add a heat band when the oil separator is mounted in a potentially cold ambient area or if the oil separator is in the air stream of the condenser fans. This will prevent refrigerant from condensing in the separator while the system is running. 4" heat bands may be added to the sump of replaceable float separators.

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Heat Band #	Diam.	Voltage	Watts	Used on
S-9101	4"	110	25	S-5200, S-5410, S-1900, S-5500, S-5700, S-5800 Series, S-5182, 85, 87, 88
S-9111	4"	220	25	S-5200, S-5410, S-1900, S-5500, S-5700, S-5800 Series, S-5182, 85, 87, 88
S-9112	6"	220	50	S-5600 Series, S-5190, S-5192, S-5194

* S-5410 Series for Europe only

SECTION IV - OIL RESERVOIRS

OIL RESERVOIR INSTALLATION

(used on Low Pressure Systems only)

1. Mount the oil reservoir to a sturdy frame using the brackets supplied. It is not necessary for the oil reservoir to be mounted higher than the compressors so long as a reservoir pressure valve is installed and positive oil pressure differential is maintained. Gravity feed systems (no reservoir pressure valve) are not generally used or suggested, however, in these systems, insure that the reservoir is mounted at least 6 feet above the compressor crankcase level.
2. Oil the rotalock gaskets and install the rotalock valves. Front seat the bottom valve to prevent oil draining while filling.
3. Precharge the oil reservoir with the same oil used in the system. This oil may be fed through the inlet valve. The oil precharge will vary depending on the nature of the installation: fill to the top sight glass on new systems and to the bottom sight glass when installing into a system that has either had no oil separator or had an inefficient oil separator. A new system will lose a small amount of oil to the system and to the lines in the oil control system until it balances out. Adding a separator to an existing system will remove excess oil from the system and a means for oil to be collected and drained from the system must be used. The 1/4" flare access fitting on the bottom rotalock valve may be used for this.
4. Install the 3/8" line from the oil separator to the top (inlet) valve of the reservoir.
5. Install the 3/8" line from the bottom (outlet) valve to an oil header. The oil header should be sized to provide adequate oil feed to each oil regulator without pressure drop.
6. Install the reservoir pressure valve and vent line to the suction line on the 3/8" male flare on top of the reservoir.
7. Insure that both valves are back seated prior to running the system to allow oil flow.
8. Check the oil level frequently after the system is started. The oil level should be monitored for a few hours after start-up and should be checked again several times in the first two weeks of operation. For existing systems, remove oil if the level is above the bottom sight glass when the system is checked. It may take some time to get excess oil from the system depending on how much is present, how the system is piped and how much of full capacity the system is running. Check the system periodically until the oil remains at a fairly consistent level. For new systems, if the level is low on the next service call, oil should be added until the upper sight glass shows oil. After this, the system should balance out and oil should not be added until the level drops below the bottom sight glass. Insure that the oil level is checked during each service call and the level maintained just below the top sight glass.

RESERVOIR PRESSURE VALVE INSTALLATION

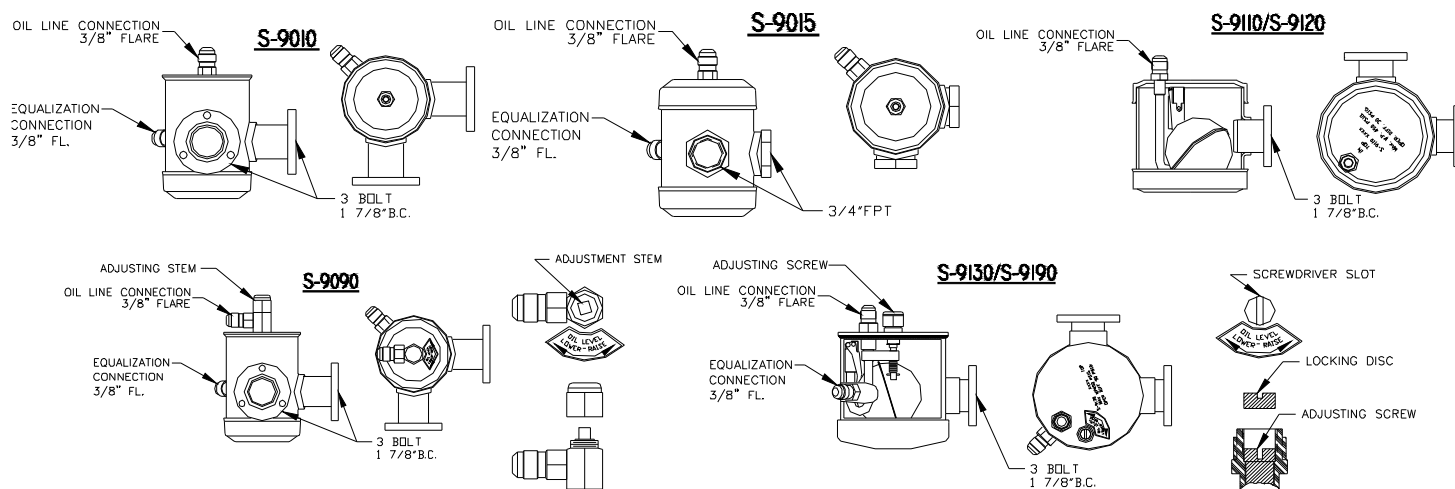
(used on Low Pressure Systems only)

1. Install pressure valve on 3/8" male flare connection on top of the oil reservoir.
2. Pipe 3/8" line to the suction line for vent.

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SECTION V - MECHANICAL OIL LEVEL REGULATORS

(used on Low Pressure Systems only)



REGULATOR MODEL NO.	CONNECTION SIZE	OPER. PRESSURE DIFFERENTIAL, psig	OIL LEVEL, SIGHT GLASS
S-9010	3 BOLT 1 7/8" B.C.	5-30	1/2
S-9010A	4 BOLT 50mm B.C.	5-30	1/2
S-9015	3/4" NPTF FEMALE	5-30	1/2
S-9090	3 BOLT 1 7/8" B.C.	5-90	ADJUSTABLE * +
S-9090A	4 BOLT 50 mm B.C.	5-90	ADJUSTABLE * +
S-9110	3 BOLT 1 7/8" B.C.	5-30	1/2
S-9120	3 BOLT 1 7/8" B.C.	5-30	1/4 +
S-9130	3 BOLT 1 7/8" B.C.	5-90	ADJUSTABLE * +
S-9190	3 BOLT 1 7/8" B.C.	30-90	ADJUSTABLE * +

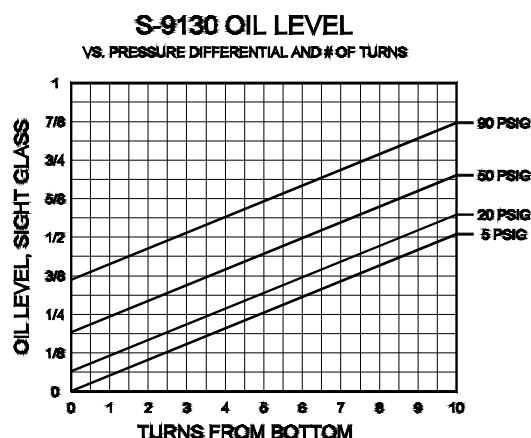
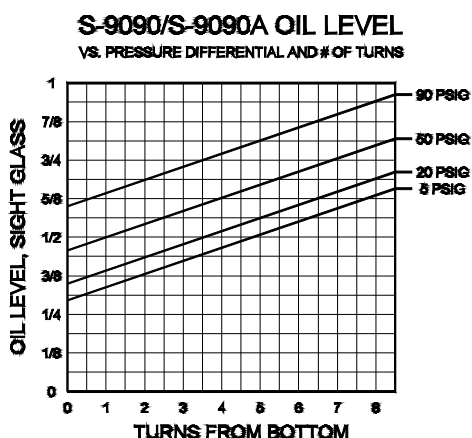
* These adjustable oil regulators are designed to feed oil between 1/4 and 5/8 glass levels at the various specified pressure differentials. The regulator may adjust beyond this range due to the actual oil pressure.

Maintain all adjustable regulator levels according to compressor manufacturer's specifications.

+ Do not operate ANY regulator at 1/4 sight glass when using an adapter with inside diameter smaller than the regulator flange port.

Note: S-9010A and S-9090A 4 bolt 50mm B.C. for European use only (Bitzer Compressors)

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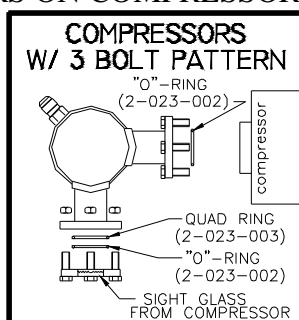


GENERAL INFORMATION

All regulators have a operating pressure differential range that should not be confused with its working pressure. The operating differential is the difference of pressure between the oil feeding into the regulator and the component where the regulator is controlling oil level. Specifically, the reservoir pressure minus the crankcase pressure. If the differential pressure is too low for that regulator, insufficient oil flow to the compressor may result. If the differential pressure is too high, the regulator will over-fill.

Adjustable regulators include an adjustment mechanism to raise or lower the oil set point. Our exclusive design eliminates the need to shut the system down and disconnect the oil feed lines in order to adjust the oil level regulator. The oil level may be adjusted while the system is under pressure and running. Adjust the oil level by removing the seal cap, the locking disk (S-9130 & S-9190 series only), and rotating the adjustment clockwise to lower, counter clockwise to raise the oil level. Replace cap and locking disk when done. Each full turn of the adjustment mechanism moves the oil level approximately 1/16". Oil levels on these regulators are typically factory set just below 1/2 sight glass.

ASSEMBLY OF OIL LEVEL REGULATORS ON COMPRESSORS WITH 3 BOLT 1 7/8" B.C.

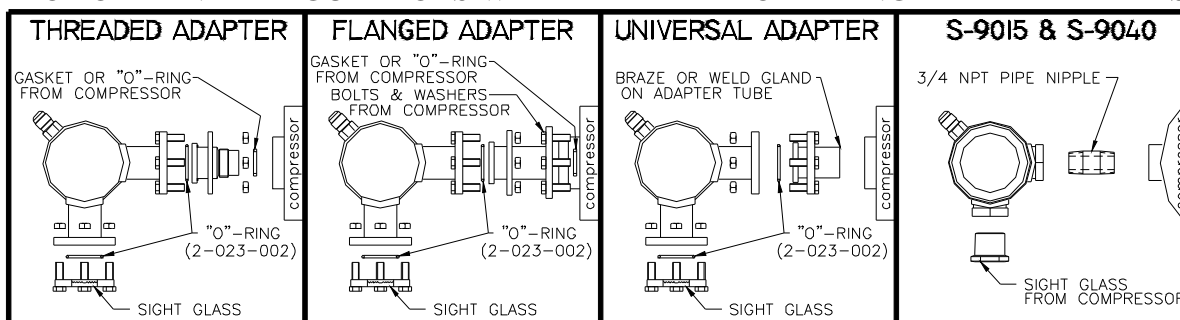


1. Remove compressor sight glass.
2. Lightly oil and insert one of the o-rings supplied in the groove of the regulator flange to be connected to the compressor. Assemble supplied bolts and nuts to the flange and evenly and alternately torque bolts to approximately 5 ft-lbs.
3. Lightly oil and insert another supplied o-ring in the compressor sight glass groove. Lightly oil and insert the supplied "quad-ring" in the regulator flange groove. The o-ring and "quad-ring" nestle within each other and together will seal the two grooves. Assemble the 3 bolt compressor sight glass to the oil regulator and install supplied bolts and nuts. Evenly and alternately torque bolts to approximately 5 ft-lbs.
4. Install oil supply line from oil reservoir to 3/8" male flare inlet on top of the regulator.
5. If an equalization connection is supplied, install oil equalization line between regulators if desired, otherwise, leave this connection sealed.
6. Insure that the regulator is level. Failure to level the regulator may cause false visual oil levels in the sight glass and can cause insufficient oil levels. If the regulator is not level, check and level the compressor as necessary.
7. Allow oil to feed and insure that the oil level matches the compressor manufacturer's suggestions. Some suggested oil levels are included below in the adapter kit table. **DO NOT LEAVE SYSTEM UNATTENDED UNTIL YOU KNOW THAT THE REGULATOR IS INSTALLED AND LEVEL CHECKED CORRECTLY.**

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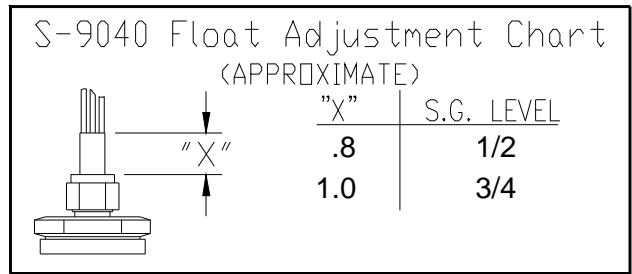
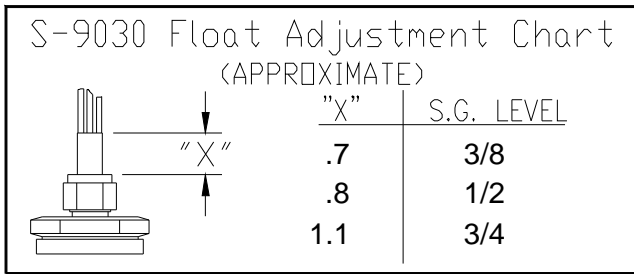
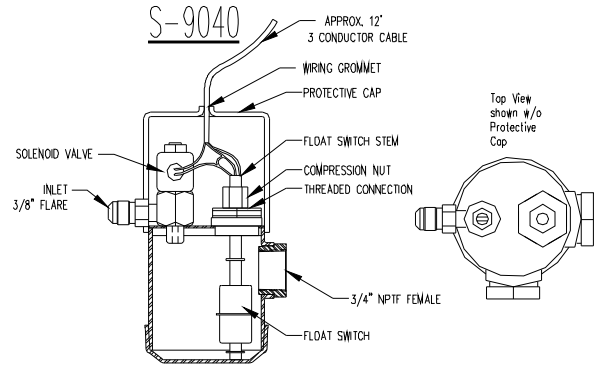
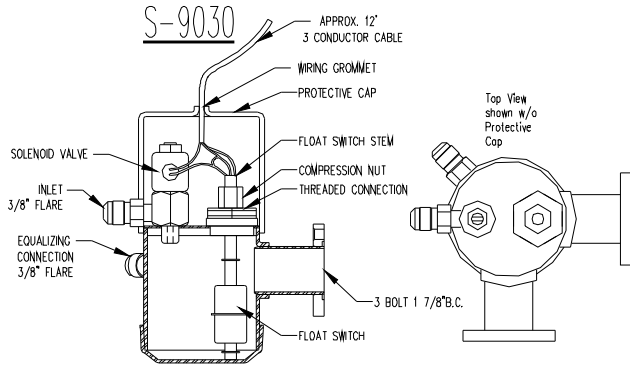
ASSEMBLY OF OIL LEVEL REGULATORS WITH THREADED OR FLANGED ADAPTER KITS



1. Remove compressor sight glass and replace with adapter kit. Use gaskets or o-rings from the compressor sight glass to install the adapter kit. Oil all gaskets and o-rings with a light coat of the same oil used in the system. Thread sealant may be used on threaded adapters. Flanged adapter bolts to the compressor should be evenly and alternately torqued to approximately 9 ft-lbs. Universal adapter kit 3-033-217 can be either welded or brazed to a blank sight glass housing or gland from the compressor sight glass. If the hole is too small to accept the 1 1/4" tube, the hole must be bored out to 1.25" diam. and 1/8" minimum depth. If the hole is too large, bush down the hole with a piece of tubing or reducing coupling. Insert the 1 1/4" od tube in the hole and insure that it is level and braze or weld all joints.
2. Lightly oil and insert one of the o-rings supplied in the groove of the regulator flange to be connected to the adapter kit. On the adapter kit, rotate the swivel flange so that when installed, the regulator is level. Assemble supplied bolts and nuts to the flange and evenly and alternately torque bolts to approximately 5 ft-lbs.
3. Lightly oil and insert another supplied o-ring in the other regulator flange groove. Assemble the 3 bolt sight glass supplied with the adapter kit to the oil regulator and install supplied bolts and nuts. Evenly and alternately torque bolts to approximately 5 ft-lbs.
4. Install oil supply line from oil reservoir to 3/8" male flare inlet on top of the regulator.
5. If an equalization connection is supplied, install oil equalization line between regulators if desired, otherwise, leave this connection sealed.
6. Level the regulator. Failure to level the regulator may cause false visual oil levels in the sight glass and can cause insufficient oil levels.
7. Allow oil to feed and insure that the oil level matches the compressor manufacturer's suggestions. Some suggested oil levels are included below in the adapter kit table. **DO NOT LEAVE SYSTEM UNATTENDED UNTIL YOU KNOW THAT THE REGULATOR IS INSTALLED AND LEVEL CHECKED CORRECTLY.**

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SECTION VI - ELECTRO-MECHANICAL OIL LEVEL REGULATORS



These sight glass levels are when using POE oil. Levels may vary with other oil types or densities.

REGULATOR MODEL #	CONNECTION SIZE	VOLTAGE	OPERATING DIFFERENTIAL	OIL LEVEL, SIGHT GLASS
S-9030	3 BOLT 1 7/8" B.C.	24 V AC 50/60 hz	5-300 psig	ADJUSTABLE
S-9040	3/4" NPTF FEMALE	24 V AC 50/60 hz	5-90 psig	ADJUSTABLE

GENERAL INFORMATION

Electro-mechanical regulators are used to regulate oil levels at both low and high pressures. These units incorporate a float switch and solenoid valve combination and feature a circuit for compressor protection from loss of oil. This alarm circuit is especially important on hermetic or scroll compressors where no external oil pressure safety switch is possible.

On S-9030 and S-9040 regulators, the float switch actually contains two switches, the top one to open and close the solenoid valve, and another 1/8" lower that can be used as an alarm output rated at 24 volt AC, 20 VA pilot duty. This output may be used to work a relay to open the compressor safety circuit, but a time delay should be installed. The regulator oil level may be adjusted by loosening the compression nut and raising or lowering the float switch, thus raising or lowering the feed and alarm set points accordingly. The compression nut should be tightened 1/4 turn past hand tight. **DO NOT OVER TIGHTEN.**

INSTALLATION

1. Follow the installation instructions for Mechanical Oil Level Regulators in Section VI to mount the regulator to the compressor.
2. Wiring to power and alarm relay should be as shown and installed by qualified personnel in accordance with federal and local codes.
3. S-9030 & S-9040 - If the alarm relay is used with a relay to shut off compressor power, it is advised to include a time delay in the circuit.

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**S-9030
WIRING
DIAGRAM**

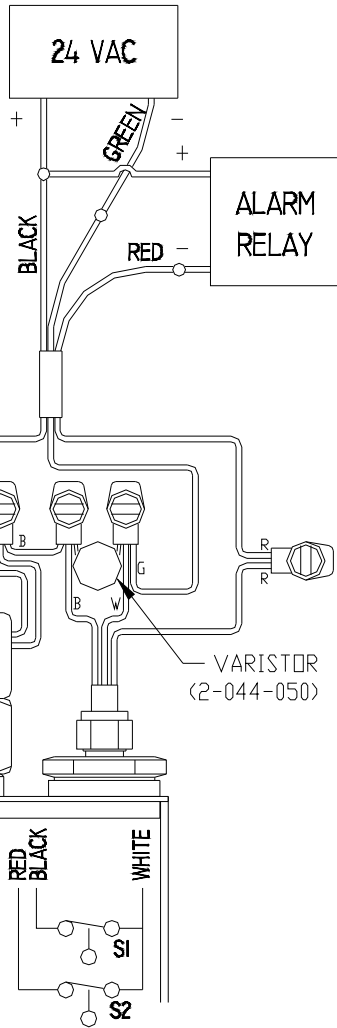
B-Black
G-Green
R-Red
W-White
W/B-White/Black Stripe
O-Orange

CONNECTOR
(2-044-051)
(6 PLACES)

4 SECOND
PULSE
MODULE
(2-044-072)

VARISTOR
(2-044-050)

S-9030 FLOAT SWITCH
DRY CONDITION (NO MEDIA)
S1 SWITCH NORMALLY CLOSED
S2 SWITCH NORMALLY CLOSED



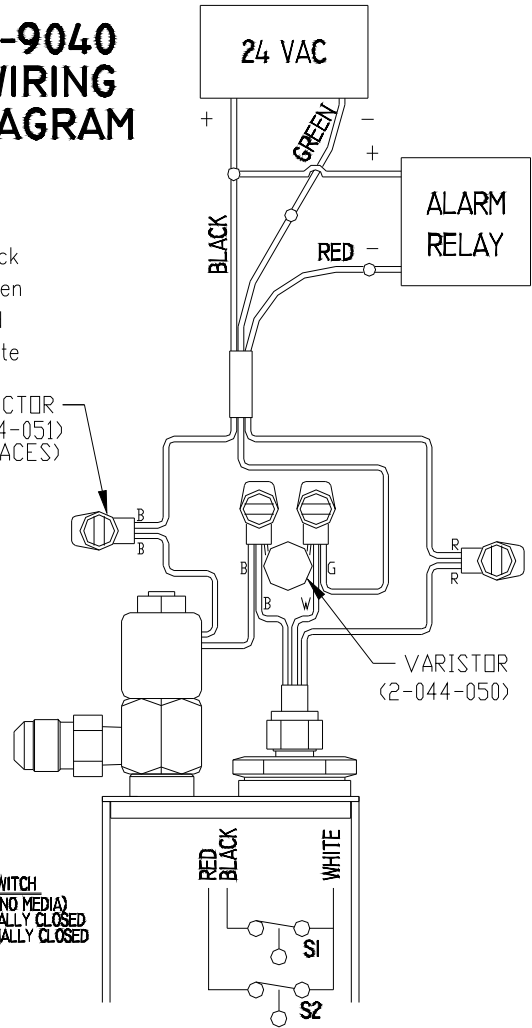
**S-9040
WIRING
DIAGRAM**

B-Black
G-Green
R-Red
W-White

CONNECTOR
(2-044-051)
(4 PLACES)

VARISTOR
(2-044-050)

S-9040 FLOAT SWITCH
DRY CONDITION (NO MEDIA)
S1 SWITCH NORMALLY CLOSED
S2 SWITCH NORMALLY CLOSED



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SECTION VII - OIL REGULATOR ADAPTER KITS

REGULATOR ADAPTER KITS BY COMPRESSOR				
Compressor Manufacturer	Model Number	Recommended Oil Level	Sight Glass Configuration	Henry Technologies Kit No.
Bitzer	-	1/2 glass	4 bolt 50mm B.C.	3-033-253
Bock	AM,F	1/2 glass	4 bolt 1 31/32" B.C.	3-033-244
Bristol	-	1/2 glass	15/16"-20 Thread	3-033-242
Carrier Carlyle	10 hp & under: DA,DR,5F,5H,06D,06CC	1/4 glass	1 1/2"-18 Thread	3-033-204
Carrier Carlyle	15 hp & over: EA,ER,06E,06CC	1/4 glass	3 bolt 1 7/8" B.C.	3-033-201*
Copeland	under 5 tons: Copelametic HA,KA,EA,3A,LA,ER,3R	1/2 glass	1 1/8"-12 Thread	3-033-202
Copeland	Discus, 2D, 3D, 4D, 6D, 9D, 4R, 6R, 9D, 9R, MD, MR, NR	1/4 glass	3 bolt 1 7/8" B.C.	3-033-201*
Copeland	older model	1/4 glass	4 bolt 2 1/8" B.C.	3-033-207
Copeland	8R, 8D	1/4 glass	3 bolt 1 7/8" B.C.	3-033-212
Copeland	8DP3	1/4 glass	3 bolt 1 7/8" B.C.	3-033-254
Copeland	Scroll	1/2 glass	3/4" NPT	3-033-218
Dunham-Bush	Big 4	1/2 glass	3 bolt 1 7/8" B.C.	3-033-201*
Dunham-Bush	D	1/2 glass	4 bolt 2 1/8" B.C.	3-033-203
Fascold	All Models	1/2 glass	3 bolt 1 7/8" B.C.	3-033-201*
Grasso Thermtrol	-	1/2 glass	1" NPT	3-033-228
Maneurop	All Models	1/2 glass	1 1/8"-18 Thread	3-033-246
Prestcold	K	1/2 glass	1 1/8"-12 Thread	3-033-202
Prestcold	C, E, R, L, & LG	1/2 glass	42mm Thread	3-033-216
Schnacke-Grasso	-	1/2 glass	2" x 16 Thread	3-033-205
Schnacke-Grasso	-	1/2 glass	1 1/4" NPT	3-033-219
Tecumseh	P, R,S,PA,RA,SA,CK,CM,CH,CG	1/2 glass	1 1/8"-12 Thread	3-033-202
Trane	M,R	1/2 glass	3 bolt 1 7/8" B.C.	3-033-201*
Trane	-	1/2 glass	5 bolt 2 1/2" B.C.	3-033-206
Trane	K	1/2 glass	3/4" NPT	3-033-218
Vilter	-	1/2 glass	1 1/2" NPT	3-033-208
Vilter	-	1/2 glass	2" NPT	3-033-209
York	GC,GS,JS	1/2 glass	3 bolt 1 7/8" B.C.	3-033-201*
York	-	1/2 glass	1" NPT	3-033-228
Any	1/4" Flare Equalization Extension (3.22" long)	1/2 glass	3 bolt 1 7/8" B.C.	3-033-221
Any	3/8" Flare Equalization Extension (3.23" long)	1/2 glass	3 bolt 1 7/8" B.C.	3-033-227
Pattern Not Listed	Universal Adapter Kit	Any	1 1/4" OD Steel Tube	3-033-217

* 3-033-201 included with all oil level regulators from Henry Technologies. Kit consists of two O-rings, one Quad ring, bolts and nuts. Note: All adapters with sight glass pattern different from 3 bolt 1 7/8 B.C. include one 3 bolt 1 7/8" B.C. sight glass. Where an extra length is needed to clear obstructions, use either 3-033-212 (2.59" long) or 3-033-254 (3.25" long)

+ Do not operate **ANY** regulator at 1/4 sight glass when using an adapter with inside diameter smaller than the regulator flange port.

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SECTION VIII – SERVICE/TROUBLESHOOTING

Very little service needs to be performed on oil control systems. Most or all service necessary will stem from debris in the oil, especially in systems using polyolester (POE) oil. Filters in POE oil systems should be changed at least three times in the first three months of operation and at least once a year after start-up.

Many of the oil separators have cleanable/replaceable floats. Drain the oil from the separator through the 1/8" NPTF fitting on the bottom of the float assembly plate on S-1900, S-5700, and S-5200 series separators. If the float is clogged shut, there will be excessive amounts of oil in the separator, be prepared to catch a few gallons of oil on larger separators. When cleaning a float, insure that all debris is removed from the area around the float, including the magnet that picks up steel filings. Back feed oil through the 3/8" flare oil return fitting with a hand oil pump to push any debris from inside the float seat. Newer S-5200 series Helical Oil Separators include a screen tube in the sump area, which catches some debris before it enters the float sump. This screen tube should be removed and cleaned and reinserted when replacing the float assembly. Always replace the header plate gasket every time the float is removed. Re-torque all bolts evenly to 35 foot pounds. The separator must be precharged with oil after replacing the float. Oil may be back-fed into the separator through the 3/8" flare oil return fitting with a hand pump. This will take about 120 psig of pressure, but a hand pump should be able to push the float open. Once the oil is in, the float valve will keep the oil in the separator.

Troubleshooting oil systems involves physically checking a few key components in the system: the oil return line from the separator, the oil reservoir level, the oil regulator levels, the oil line sight glass, and the amount of oil that can be drained from the oil separator.

The first thing to check is the oil return line. Feeling the oil return line and seeing how often it gets hot is the main way to tell if the separator is working properly. It is easier if an oil line sight glass is installed, mainly because if the oil line is hot you don't really know if it is oil or hot gas causing it to be hot. If the oil line cycles between hot and cold at least a few times per hour, the separator is most likely working properly. The float tends to open and feed a few ounces of oil at a time and shut until the oil builds back up. If the oil return is cycling, there is no need to drain the separator, look at the other oil components.

Always check the oil reservoir level during a service call. Oil levels in the reservoir will normally vary during periods of varying loads: compressors shut-down, hot-gas defrost, etc. This is normal, however if the level is consistently low or high, the oil system should be checked thoroughly.

Compressor oil levels can be deceiving. It is some times hard to tell if the regulator is feeding oil or if oil is coming down the suction line. If the reservoir has too much pressure, often times this pressure will force oil out of the regulator and show a low level, even though there is excessive oil in the compressor. Many times the best way to check the oil in the compressor is to shut off the oil feeding to the regulator and wait a few minutes. If oil is pushed out of the regulator or trapped in the motor cavity on semi-hermetics, the compressor will over-fill.

The oil line sight glass is a good way to see how the separator is working. Look for movement in the glass. If the separator is not feeding on single or low-pressure systems, the sight glass will have little or no movement and normally will appear empty, depending on how it is piped. If the separator is feeding, the sight glass will show a rush of oil and foam past the glass.

To check the oil level in the separator if the separator has a drain, shut off the oil return line to prevent further feeding, pump down the system, shut off the system, evacuate the separator, and drain the oil from the bottom. The separator should hold precharge amount plus or minus a few ounces during operation. By looking at the amount above or below the precharge, any problem with the separator or float can be determined by this amount

The Helical Oil Separators (S-5100 and S-5200 series) are not likely to fail due to debris as other types of oil separators, however, the float valve can be clogged or damaged. When a Helical Oil Separator is installed, the system load is not changed, and the separator worked fine for a while, if oil return from the separator becomes a problem, the float or other component is most likely the cause.

Note that there is no way to clean or repair an all welded oil separator. If it is determined that the float is clogged or otherwise malfunctioning, the entire oil separator must be replaced.

When the refrigerant and/or oil types are changed in a system, there is the potential for leaks around o-ring seals. Most elastomers absorb oil and refrigerant and may swell or shrink when exposed to a new oil or refrigerant. In these cases, replace the o-rings and seals in the system as needed.

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SYSTEMS S-SINGLE L-LOW PRESSURE	SEPARATOR OIL RETURN LINE	OIL RESERVOIR LEVEL	COMPRESSOR OIL LEVELS	OIL LINE SIGHT GLASS	AMOUNT OF OIL DRAINED FROM SEPARATOR	PROBABLE CAUSES	CORRECTIVE ACTION
S, L	CYCLES	STEADY	STEADY	CYCLES	PRECHARGE AMOUNT	SYSTEM WORKING PROPERLY	NONE
S, L	CYCLES	ALWAYS LOW	STEADY OR LOW	CYCLES	PRECHARGE AMOUNT	SYSTEM WORKING PROPERLY, NOT ENOUGH OIL	ADD OIL TO SYSTEM
L	CYCLES	ALWAYS LOW	HIGH	CYCLES	PRECHARGE AMOUNT	OIL LEVEL SET TOO HIGH ON REGULATORS, POSSIBLE REGULATOR LEAKING	LOWER REGULATOR LEVELS, REPLACE REGULATOR IF NECESSARY
L	CYCLES	ALWAYS LOW	HIGH	CYCLES	PRECHARGE AMOUNT	EXCESSIVE RESERVOIR PRESSURE	CHECK RESERVOIR PRESSURE VS. SUCTION
S, L	CYCLES	ALWAYS HIGH	STEADY OR HIGH	CYCLES	PRECHARGE AMOUNT	SYSTEM WORKING PROPERLY, TOO MUCH OIL	REMOVE OIL FROM SYSTEM
L	CYCLES	ALWAYS HIGH	LOW	CYCLES	PRECHARGE AMOUNT	OIL LEVEL SET TOO LOW ON REGULATORS	RAISE REGULATOR LEVELS
L	CYCLES	ALWAYS HIGH	LOW	CYCLES	PRECHARGE AMOUNT	INSUFFICIENT RESERVOIR PRESSURE	CHECK RESERVOIR PRESSURE VS. SUCTION, REPLACE RESERVOIR PRESSURE VALVE
L	CYCLES	ALWAYS HIGH	LOW	CYCLES	PRECHARGE AMOUNT	OIL STRAINERS OR REGULATORS CLOGGED	REPLACE STRAINERS OR REGULATORS
S, L	ALWAYS HOT OR VERY FREQUENTLY HOT	ANY	ANY	STREAM OF OIL	EXCESSIVE OIL	SYSTEM OIL LOGGED, SEPARATOR FEEDING MORE OIL THAN COMPRESSORS NORMALLY SHOULD EMIT	REMOVE EXCESS OIL FROM SYSTEM
S, L	ALWAYS HOT OR VERY FREQUENTLY HOT	ANY	ANY	HOT GAS OR FOAM	EMPTY	SEPARATOR FLOAT STUCK OPEN OR LEAKING	OLD SYSTEM- REMOVE FLOAT AND CLEAN/REPLACE NEW SYSTEM- INSURE OIL SEPARATOR WAS PRECHARGED
S, L	ALWAYS HOT OR VERY FREQUENTLY HOT	ANY	ANY	HOT GAS OR FOAM	EMPTY	SEPARATOR TOO SMALL EXCESSIVE VELOCITY CAUSING FLOAT TO BOUNCE	REVIEW SEPARATOR SIZING
S, L	ALWAYS ROOM TEMP	EMPTY	EMPTY	EMPTY	EXCESSIVE OIL	SEPARATOR FLOAT CLOGGED	REMOVE AND CLEAN/REPLACE FLOAT
S, L	ALWAYS ROOM TEMP	EMPTY	EMPTY	EMPTY	EXCESSIVE OIL	OIL FILTER CLOGGED	REPLACE FILTER
S, L	ALWAYS ROOM TEMP	EMPTY	EMPTY	EMPTY	PRECHARGE OR EMPTY	SEPARATOR TOO LARGE, INEFFICIENT SEPARATION	DOUBLE-CHECK SIZING
S, L	COLD, SWEATING OR FROSTING AT START UP	ANY	ANY	LIQUID REFRIGERANT & OIL	DO NOT DRAIN SEPARATOR	LIQUID REFRIGERANT BACK FEEDING OR MIGRATING TO SEPARATOR DURING COMPRESSOR OFF CYCLE	INSTALL DISCHARGE CHECK VALVE BETWEEN SEPARATOR & CONDENSER
S, L	COLD, SWEATING OR FROSTING WHILE SYSTEM RUNNING	ANY	ANY	LIQUID REFRIGERANT & OIL	DO NOT DRAIN SEPARATOR	LIQUID REFRIGERANT CONDENSING IN SEPARATOR FROM LOSS OF SUPER- HEAT, COLD AMBIENT, POSSIBLE SEPARATOR TOO LARGE	INSULATE SEPARATOR, ADD HEAT BAND REVIEW SEPARATOR SIZING

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SECTION IX – REPLACEMENT PARTS

Oil Separators

Model Number	Description	Gasket	Float	Screen	Sump Screen
S-5500 series	4" O.D. Conventional All-Welded	All-welded unit, no service possible			
S-5800 series	4" O.D. Conventional Cleanable	2-023-001	A-5000-30	Not Replaceable	None
S-5600 series	6" O.D. Conventional All-Welded	All-welded unit, no service possible			
S-5700 series	6" O.D. Conventional Cleanable	2-023-001	A-5700-30	3-010-301	None
S-1900 series	8, 10, or 12" Conventional Cleanable	2-023-001	A-1900-30	Not Replaceable	None
S-5100 series	4" or 6" O.D. Helical All-Welded	All-welded unit, no service possible			
S-5200 series	6, 8, 10, or 12" Helical Cleanable	2-023-001	A-1900-30	None	2-010-048
SN-5200 series (Europe only)	6, 8, 10, or 12" Helical Cleanable, Suitable for R-717	2-023-001	A-2900-30	None	None
S-5400 series (Europe only)	8, 10, or 12" Helical Cleanable, Suitable for R-717	2-023-001	A-2900-30	None	None

Oil Reservoirs

Model Number	Capacity	Rotalock Valve	Rotalock Gasket	Sight Glass	Qty.
S-9109	2 gal (9.1 L)	2-030-122	2-023-018	3-020-053	2
S-9108U (Europe only)	3 gal (13.6 L)	2-030-122	2-023-018	3-020-053	2
S-9108	4 gal (18.2 L)	2-030-122	2-023-018	3-020-053	3

Mechanical Oil Level Regulators

Model Number	Seal Kit	Sight Glass	Gasket	O-ring	Qty.	Quad Ring	Qty.
S-9010A, S-9090A		3-020-011	2-023-005				
All Others	3-033-201	2-020-006		2-023-002	2	2-023-003	1

Electro-Mechanical Oil Level Regulators

Model Number	Voltage	Float Switch Kit	Solenoid Valve Kit	Time Delay Module
S-9030	24 V AC	3-044-016	3-044-017	3-044-018
S-9040	24 V AC	3-044-016	3-044-017	