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M-131-07R
Supersedes M-131-07

Black-Topper®
CENTENNIAL Series,
S-2000 Series

Updates & Service Material

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Updates & Service Manual

Black-Topper Centennial Series, S-2000 Series

M-131-07R

Contents

⚠ Cationic Emulsion Notice ⚠

Certain Cationic Emulsions are known to be corrosive to carbon steel, aluminum, and even some grades of stainless steel. Hydrocloric acid is often used in cationic emulsions to produce the electronic charge that makes the emulsion cationic. Cationic emulsions may be identified by the “C” at the beginning of the product name or identification number, such as “CRS-2” or “CSS-1”. Cationic emulsions with low amounts of residual asphalt, (below 60%) such as “CSS-1” have been found to cause corrosion to a greater extent than those containing a higher percentage of asphalt.

Tanks used in cationic emulsion service may experience unexpected corrosion inside the tank,piping and spray bar system. This corrosion may be worse if the tank is left loaded with a cationic emulsion containing a low asphalt content, over extended periods of time, or in continuos use.The effects of this corrosion activity may be lessend by alternating cationic emulsions with other products in the tank, such as anionic emulsions, cut backs, or asphalt cements. Take necessary precautions whenever changing types of asphalt to avoid boiling the water from emulsions when loading “HOT” asphalt cement.

Periodic inspection of tank should be performed in the normal course of operation. It becomes even more important in the case of cationic emulsions. Visual inspection of the inside of the tank should be performed regularly. Removal of the spray bar end caps will allow visual inspection of the spray bar. If any corrosion is noted, the tank, piping, and spray bar should be flushed with a cut back asphalt, such as an “MC” grade or with an asphalt cement.

⚠ Warning ⚠
Fluoroelastomer Handling

Some O-rings and seals used in this vehicle are made from fluoroelastomers, When used under design conditions, fluoroelastomers do not require special handling. However, when fluoroelastomers are heated to temperatures beyond their design temperature (around 600º Fahrenheit), decomposition may occur with the formation of hydrofluoric acid. Hydrofluoric acid can be extremely corrosive to human tissue if not handled properly.

A degraded seal may appear as a charred or black sticky mass, Do not touch either the seal or the surrounding equipment without wearing neoprene or PVC gloves if degradation is suspected. Wash parts and equipment with 10% lime water (calcium hydroxide solution) to neutralize any hydrofluoric acid.

If contact with the skin occurs, wash the affected areas immediately with water. Then rub a 2.5 calcium gluconate gel into the skin until there is no further irritation, while seeking prompt medical attention.

Note to Physicians: For advice or treatment of HF burns, call the DuPont Medical Emergency number, 1-800-441-3637

Etnyre Spraybar Nozzles

1

3353788

2

3351008

3

3351009

4

3352368

5

3351015

6

3352204

7

3352205

8

3352210

9

3351014

10

3351010

Ref.	Part No.	Description	Application Gallons Per Square Yard	Application (Metric) Liters Per Square Meter	Flow Gallons Per Minute Per Foot
1	3353788	V Slot Tack Nozzle	.05 – .20	.19 – .75	3.0 to 4.5
2	3351008	S36-4 V Slot	.10 – .35	.38 – 1.30	4.0 to 7.5
3	3351009	S36-5 V Slot	.18 – .45		7.0 to 10.0
4	3352368	Multi-Material V Slot	.15 – .40	.57 – 1.50	6.0 to 9.0
5	3351015	3/32” Coin Slot	.15 – .40	.57 – 1.50	6.0 to 9.0
6	3352204*	Multi-Material V Slot	.35 – .95	1.30 – 3.60	12.0 to 21.0
7	3352205*	Multi-Material V Slot	.20 – .55	.75 – 2.08	7.5 to 12.0
8	3352210	End Nozzle (3352205)	.20 – .55	.75 – 2.08	7.5 to 12.0
9	3351014	3/16” Coin Slot	.35 – .95	1.30 – 3.60	12.0 to 21.0
10	3351010	1/4” Coin Slot	.40 – 1.10	1.50 – 4.16	15.0 to 24.0

* Recommended nozzles for seal and chip with emulsified asphalts.

Adjusting the Spray Bar Nozzles

WARNING

To prevent possible burns from hot asphalt spray: Do not stand, or allow anyone to stand, where accidental opening of a valve may cause contact with hot asphalt.

Spray bar nozzles have a limited flow range at which optimal performance will be achieved. Flow rates greater than this optimal range will cause excessive fogging. Rates that are too low will cause the fan to sag and cause heavy edges. Refer to the nozzle selection chart in the operator's manual to select the nozzles appropriate for your conditions.

Adjusting the Spray Bar Nozzle Angle

Adjust the nozzles to obtain an angle of approximately 30 degrees with the spraybar centerline. Every nozzle should be at the same angle. A nozzle adjustment wrench is supplied with each new unit.

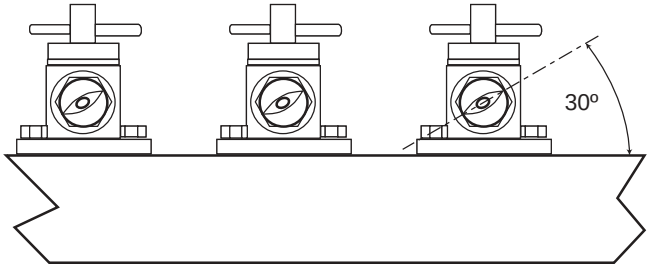


Figure 6. Adjusting the Spray Bar Nozzles

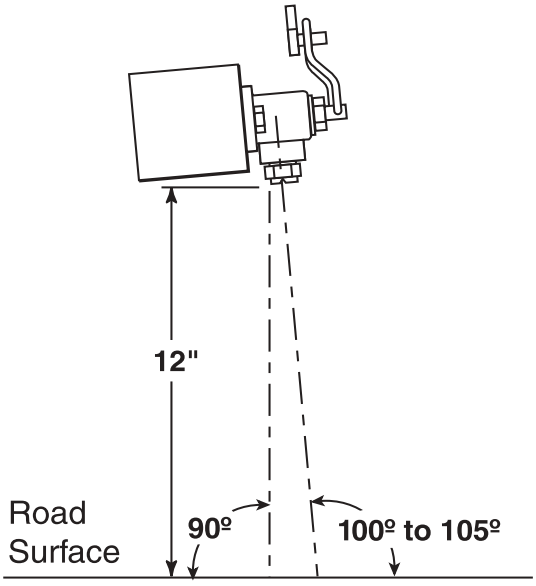
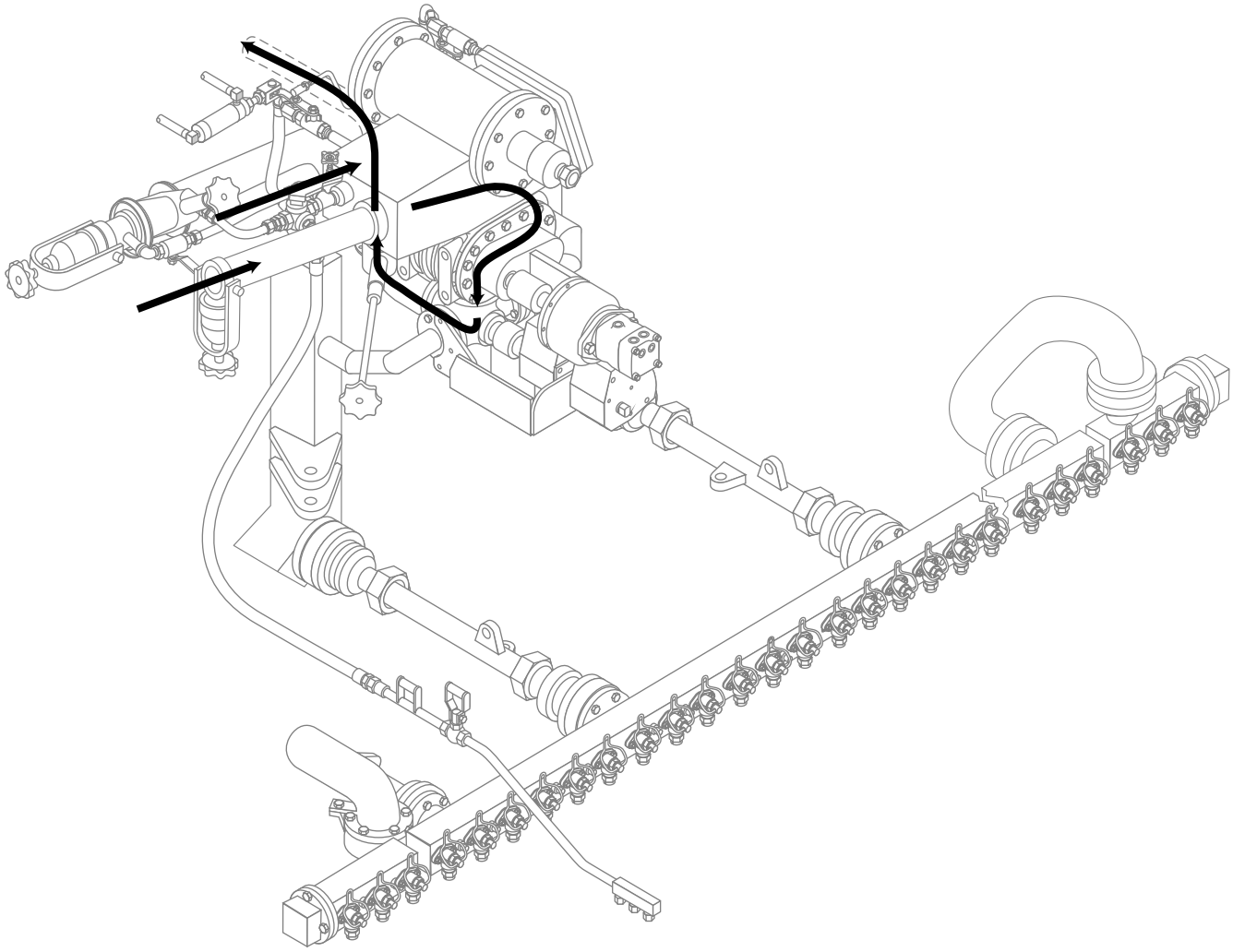


Figure 7. Adjusting the Spray Bar Height.

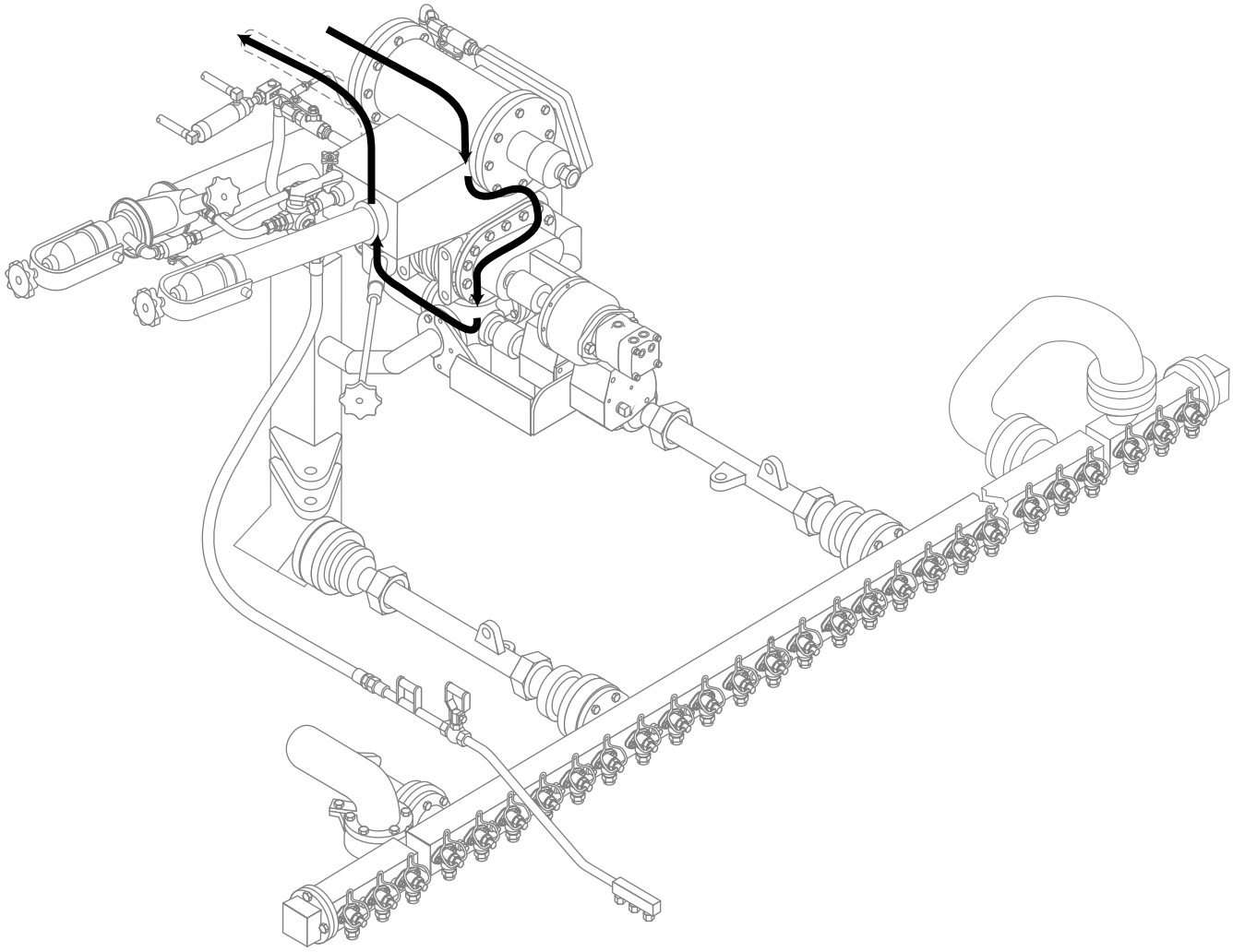
Filling from Supply (Loading)

Centennial Flow Diagram



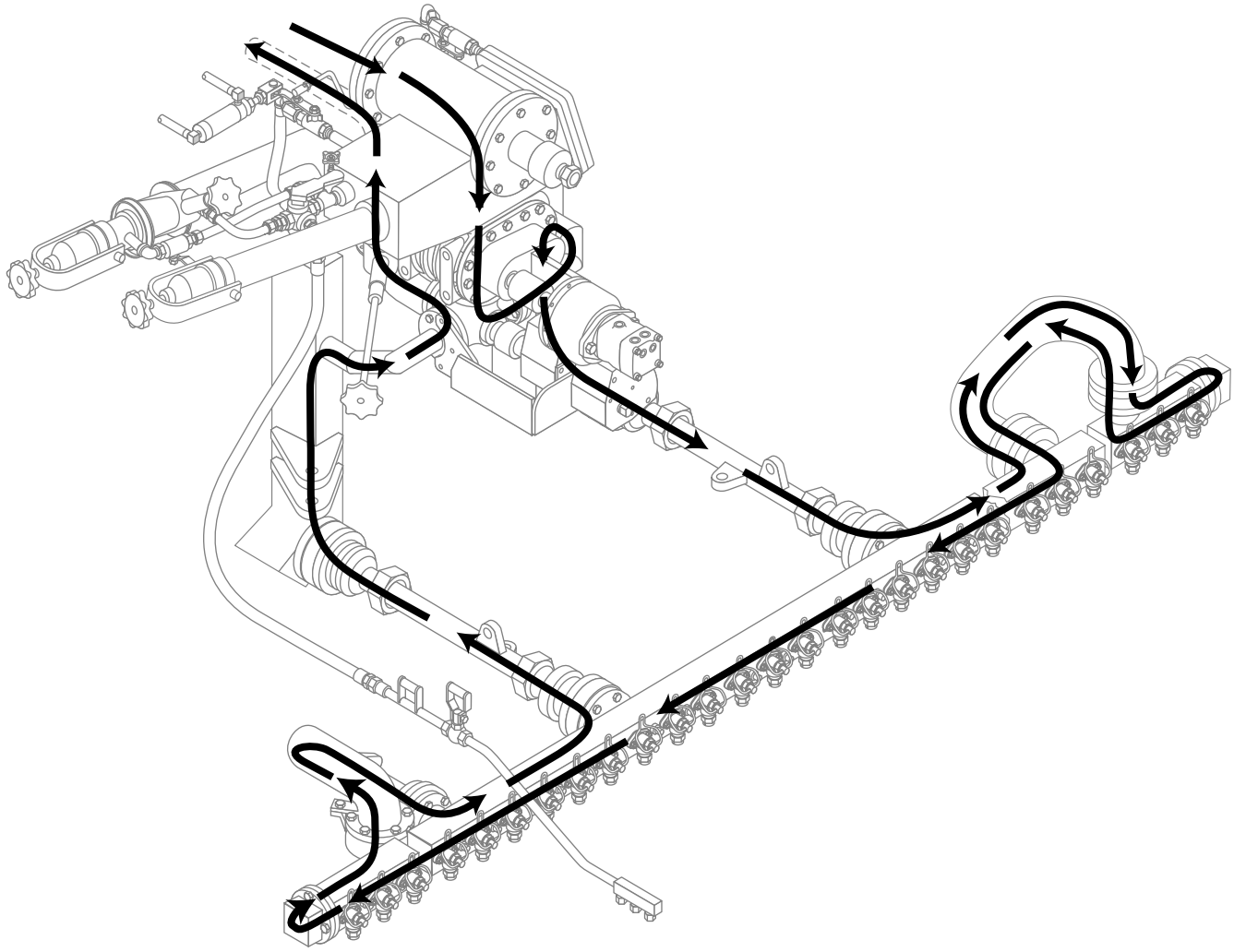
Circulate In Tank

Centennial Flow Diagram



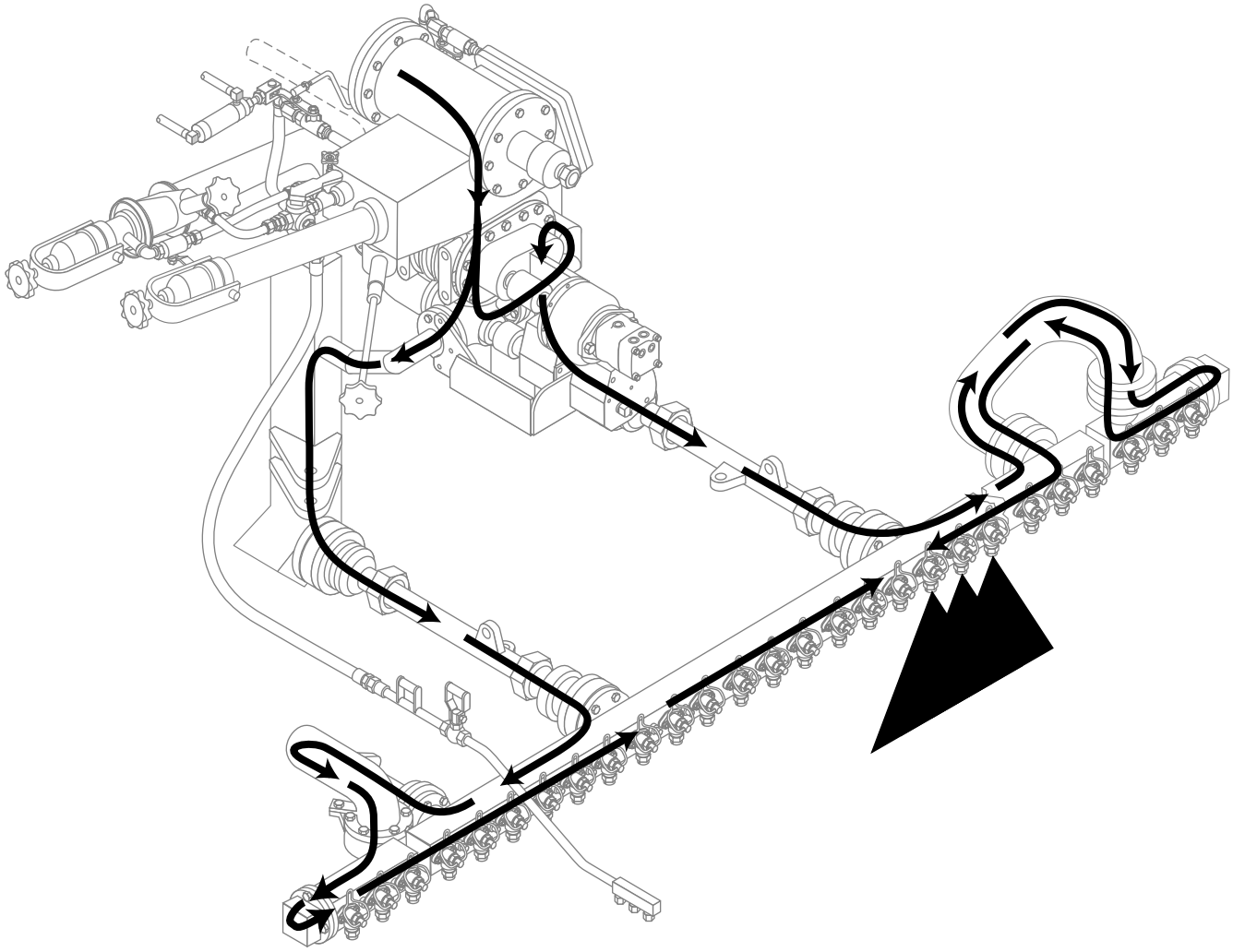
Circulate In Bar

Centennial Flow Diagram



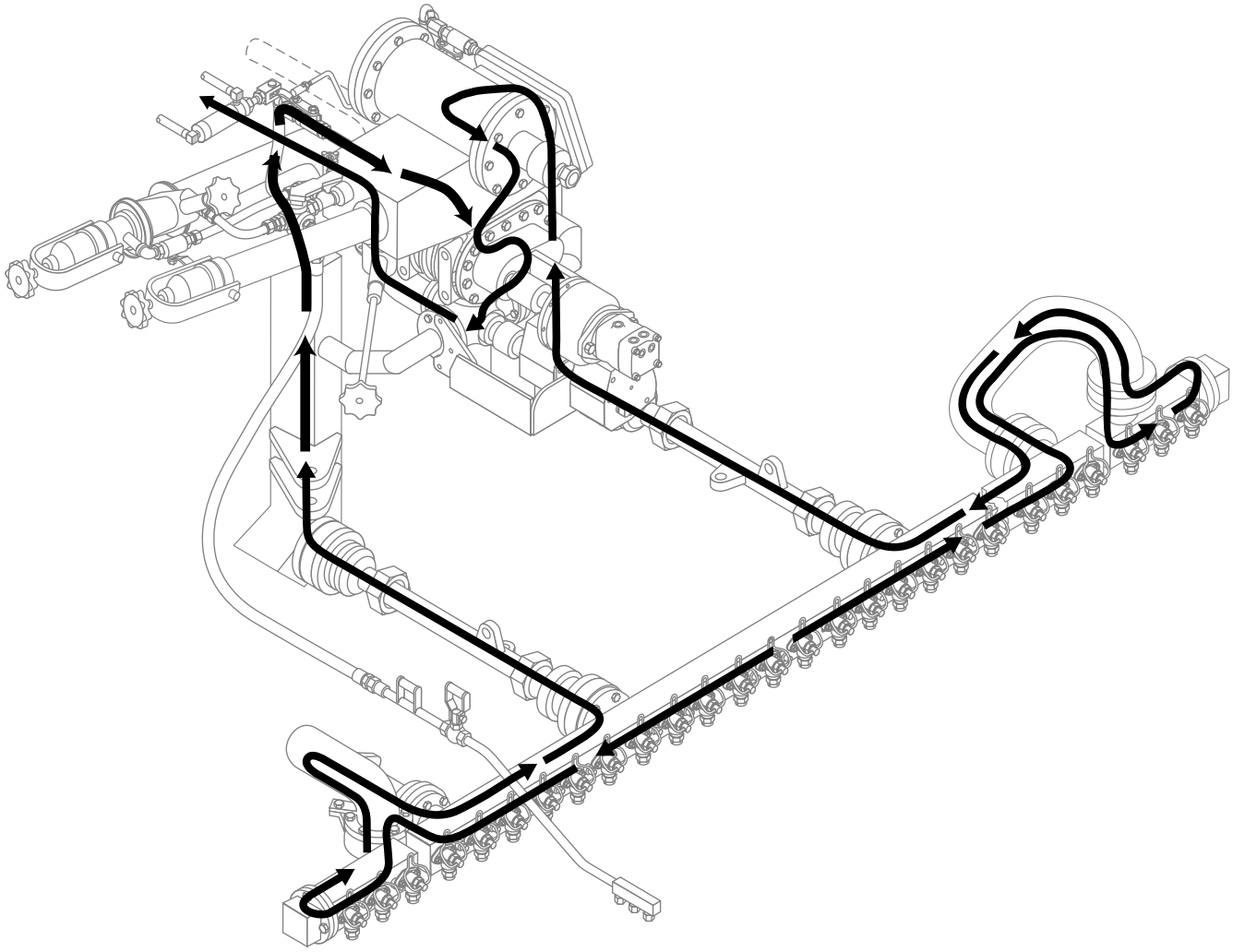
Spraying

Centennial Flow Diagram



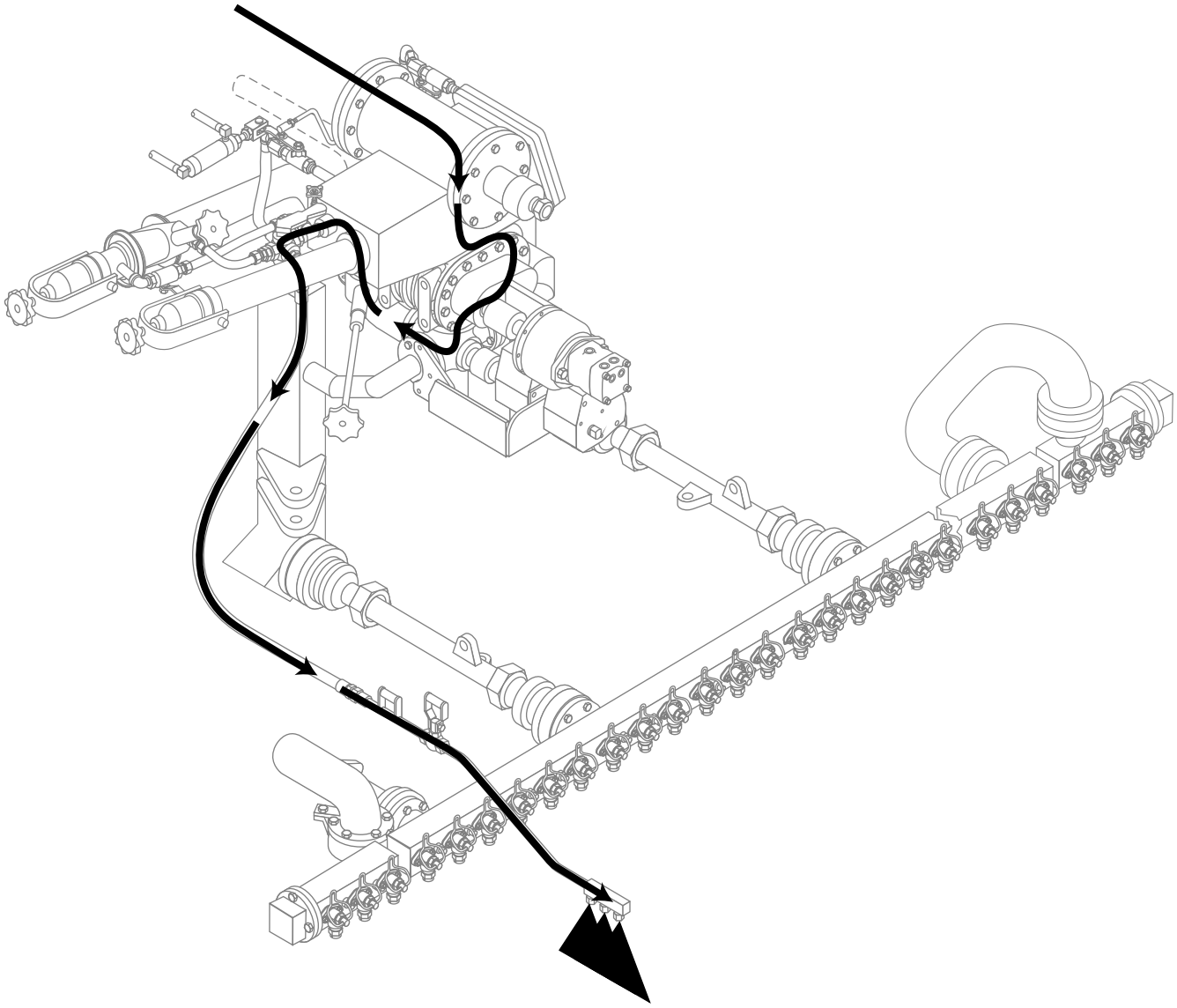
Suckback Spraybar

Centennial Flow Diagram



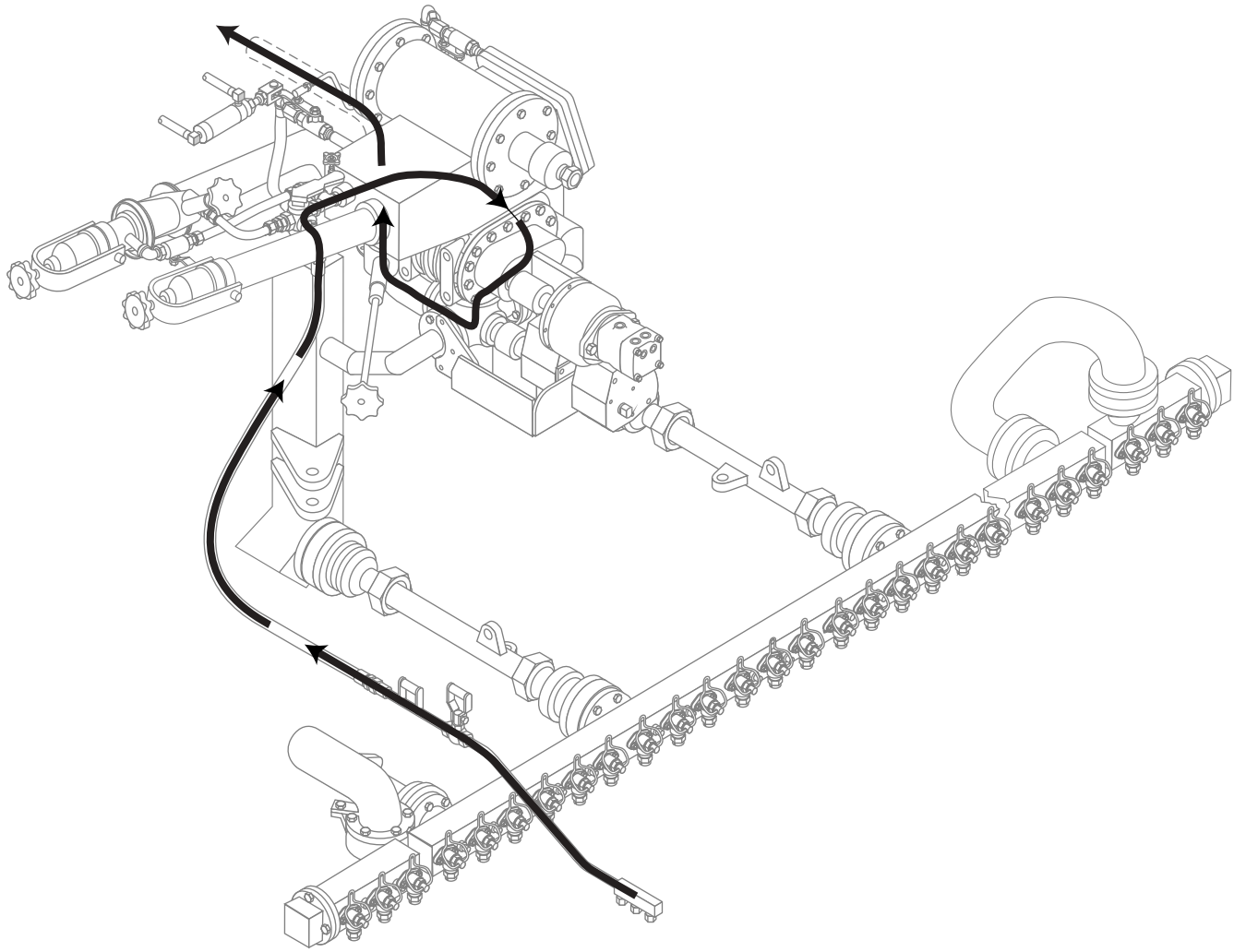
Handspray

Centennial Flow Diagram



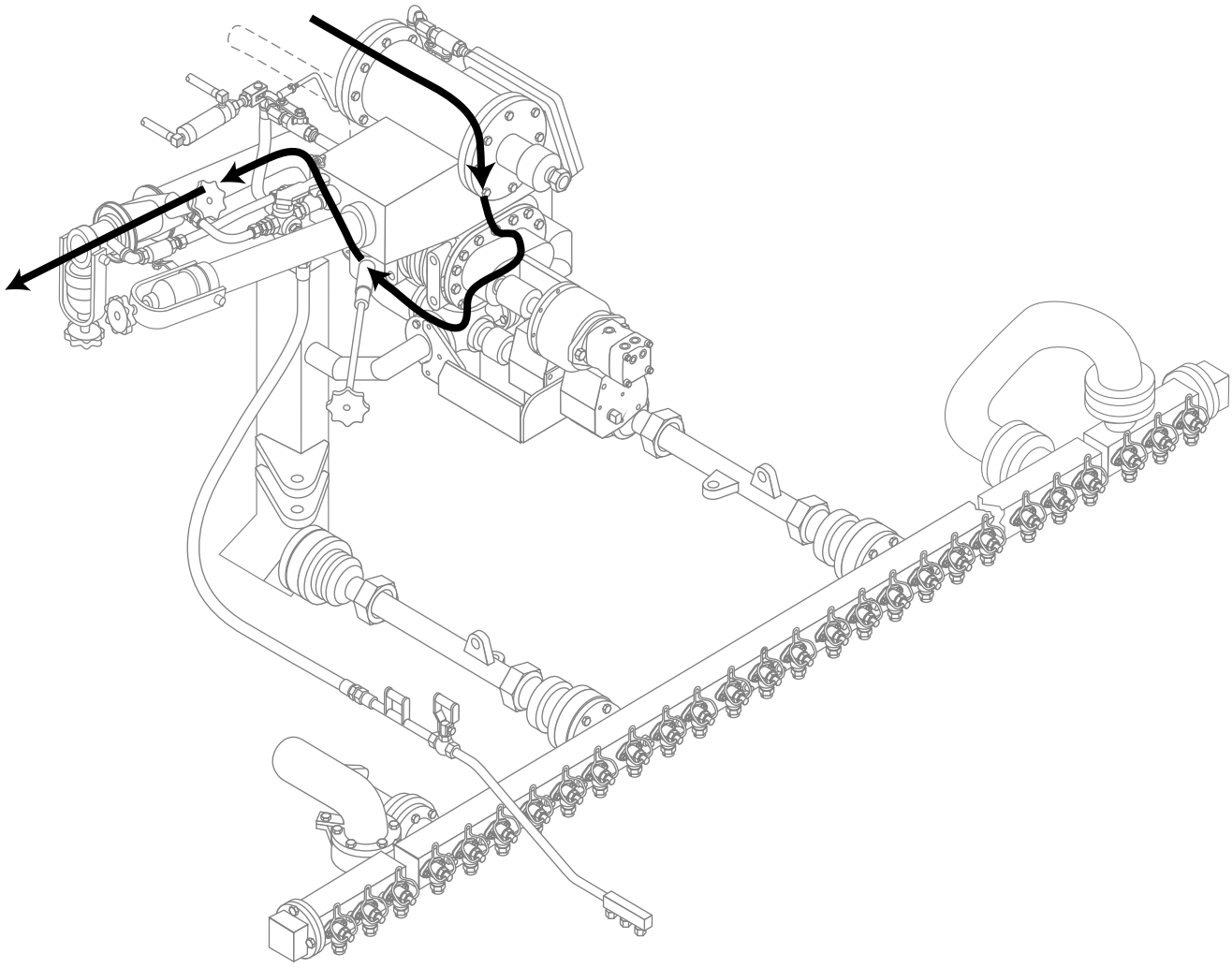
Suckback Handspray

Centennial Flow Diagram



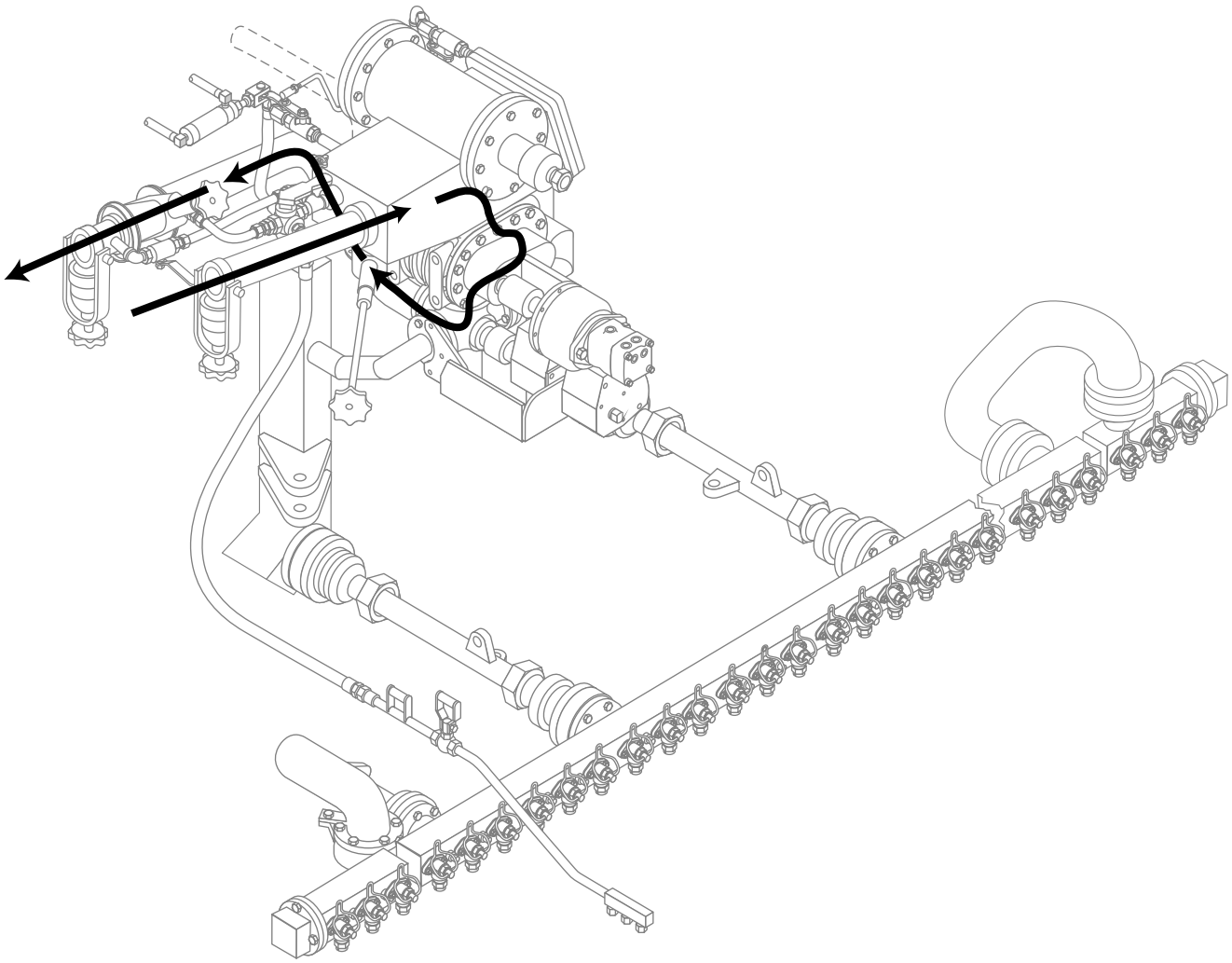
Pump Off

Centennial Flow Diagram



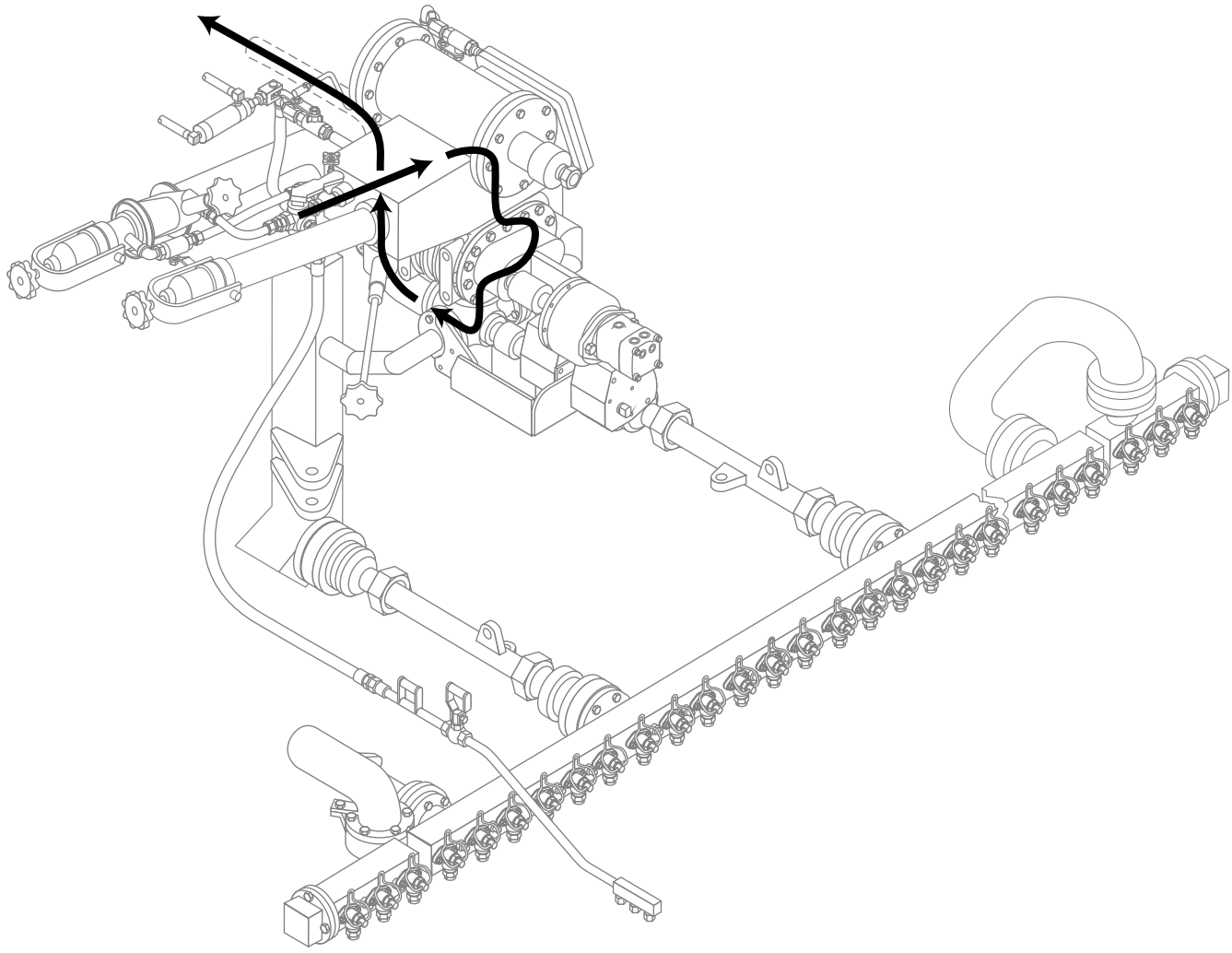
Transfer

Centennial Flow Diagram



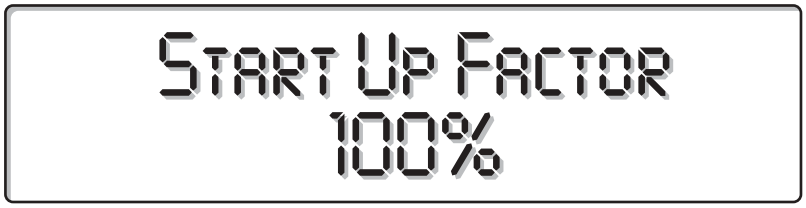
Flushing

Centennial Flow Diagram



Start Up Factor

The Start Up Factor screen looks like this:



You can get to the start up factor screen by pushing the "change display" button on the control panel and stepping through the GPM/FPM screen, the feet and gallons traveled screen, and the temperature screen. The next screen is the start up factor screen.

Change the start up factor by pushing the application rate switch up to increase or down to decrease.

A higher number will make for a "harder", more aggressive start when the spray bar is first turned on.

A lower number will make for a "softer", more gentle start when the spray bar is first turned on.

You may need to change the start up factor by 25% to 30% to see much change in the spray. That means if you want a harder start, set the start up factor to 125%. If you want a softer start, set the start up factor to 75% as a first try. You may then adjust again up or down as you like.

DC2 Self Diagnostics

DC2 Self Diagnostics

The DC2 is equipped with a self diagnostics system that may display messages on the LCD. Some of the more common messages are described below.

Under Application

Indicates that the distributor is applying less than the pre—selected application rate. This could be caused by travelling too fast for the application selected when the hydraulic pump is operating at full stroke.

Over Application

Indicates that the distributor is applying more than the pre—selected application rate. This could be caused by travelling too slowly for the application selected.

No Pump CK PR SW

Indicates that the rear pump override switch is still in the rear position.

Pump Signal at Max

Indicates that the pump is at full stroke.

Pump Signal at Min

Indicates that the pump is not stroking.

Pump Sensor Error

Indicates that the pump sensor is not reading. This could be due to sensor failure or the sensor is positioned too far from the cog gear. Reset or replace sensor.

Radar Speed Error

Indicates that the radar sensor is not working. Replace the sensor.

Pump Control Short

Indicates that the pump stroke wire is loose or shorted to ground. Inspect the cable for proper installation. Replace if necessary.

Low Battery Voltage

Indicates that the truck's voltage has dropped below 9 VDC. Inspect the truck power supply or the voltage to the DC2 Controller. Make repairs as necessary.

RAM Replace 6702191

Indicates the computer has failed. Consult a factory dealer or the factory for information on computer replacement.

ROM Replace 6702191

Indicates the computer has failed. Consult a factory dealer or the factory for information on computer replacement.

PROM Replace 6702191

Indicates the computer has failed. Consult a factory dealer or the factory for information on computer replacement.

The signal is sent from the pot to the EDC. Measure the signal from the pots to the EDC with an amp meter. Connect the amp meter leads to the red and black wires at the pump stroker on the EDC. The amp meter should register between 0 and 119 milliamps. The 119 milliamp reading correlates to the pumps full stroke operation.

The pump can be manually overridden by selecting the rear pump controller pot or completing the electrical circuit with a 9 volt transistor battery. Consult the factory before installing a 9 volt battery.

Other Electrical Controls

All other electrical controls and problems can be troubleshot with the electrical schematic .

S-2000 With Digital Gauges

Hydrostatic Pump Controller EDC with DC2 Controller

The DC2 controller sends electrical signals to the hydraulic pump controller (EDC). The signal can be checked by disconnecting the red wire and connecting the digital amp meter in series. The signal should read between 0 at neutral and 119 milliamps on full stroke.

Radar Sensor

If the LCD on the controller is not registering the ground speed, check the power to the radar sensor. The red wire is 1 2VDC and the black wire is ground. If the power to the sensor checks out, check the voltage on the green signal wire. The signal should be 7 VAC while the unit is moving. Replace the sensor if the signal wire does not register 7 VAC.

Asphalt Pump Sensor

If the LCD is not registering the asphalt pump speed, check the power across the red and black wires to the sensor. The red wire is the hot wire and the black wire is ground. The voltage should measure 1 2 VDC across the red and black wires. If the power to the sensor checks out, check the voltage on the white signal wire. The signal wire should register 7 VAC while the asphalt pump is turning. Replace the sensor if the signal wire does not register 7 VAC.

Electronic Controls

The DC2 is a blue, notebook sized, self-contained electronic control module located under or behind the operator's seat. A green light should be illuminated on the controller. Inspect the three plugs into the controller if the light does not illuminate. If the plugs are inserted tightly, check the controller input voltage. The voltage should measure 1 2 VDC across the red wire labeled El on the 18 pin controller and ground.

A red light on the controller usually indicates a non-serviceable condition. The DC2 will most likely have to be replaced. Consult the dealership or the factory for more information.

LCD Display Problems

Verify that 5 VDC is present at the inverter attached to the LCD Driver Board.

SERVICE TIP: A row of dots across the LCD (usually below the characters) is caused by a short between the connector on the circuit board and the board itself.

LCD Not Sharp

The LCD may not be dark and sharp when viewed from an angle. The LCD can be adjusted with a small phillips head screwdriver. First, use a small, right angle screwdriver to loosen the driver board from its standoff and lift slightly. Use the phillips screwdriver to turn the adjustment screw on the blue pot on the back of the LCD driver board. Turn the screw clockwise to darken the characters or counterclockwise to lighten the characters.

LCD Does Not Work

Check for 5 VDC across the red/white wire on the main circuit board 20 pin connector in the main control panel. Also check for the presence of 5 VDC to the inverter on the blue/white wire. If voltage is present at the inverter but not the 20 pin connector, the display driver board is most likely faulty If voltage is not present at the inverter, check the blue/red wire on the 30 pin connector at the DC2 controller box. Replace the controller if less than 5 VDC is present at the controller output.

Checking: DC-2 Computer EDC Threshold

Threshold is determined by how many milliamps it takes to put the hydraulic pump on stroke.

a) Disconnect red wire from center terminal post of front / rear asphalt pump control switch (located in rear control panel).

b) Attach multi-meter leads (in series) to read DC milliamps.

c) Turn asphalt pump control switch to rear.

d) Adjust pump control pot (CW) until asphalt pump shaft just starts to turn. The reading on the meter is what threshold should be set at.

Normally 16 to 19 milliamps.

e) Reconnect red wire to center terminal post of front / rear asphalt pump control switch.

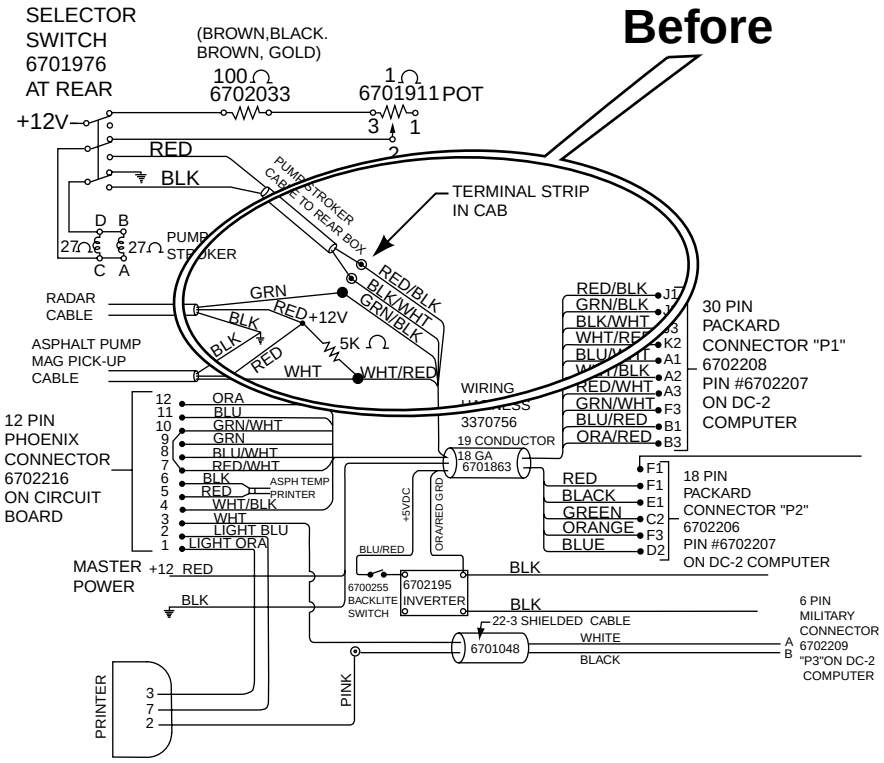
f) Check and adjust the EDC Threshold in computer set-up if needed.

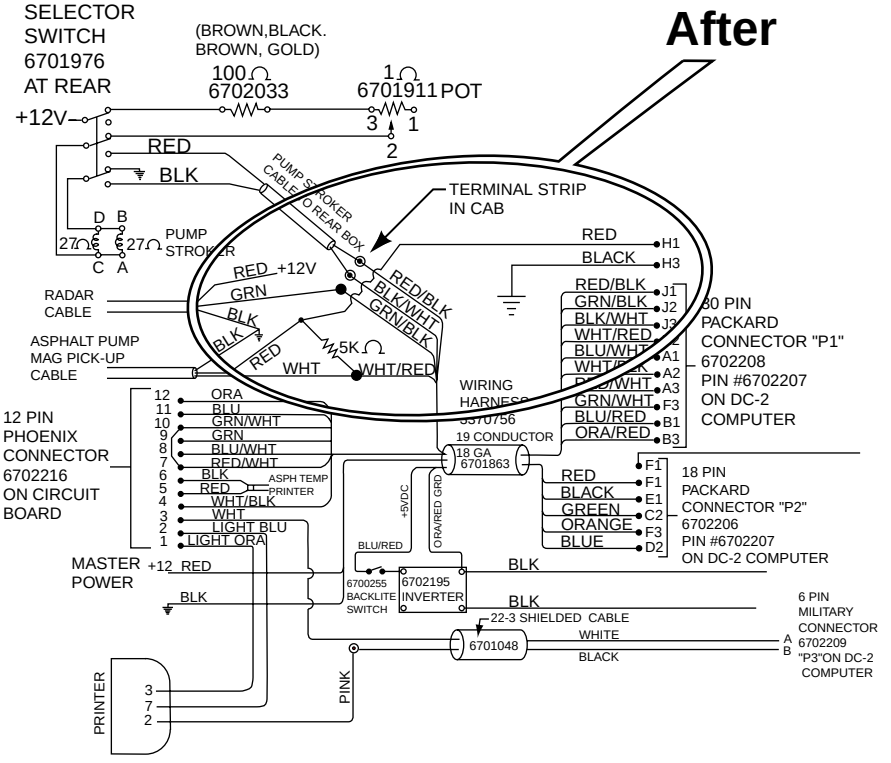
Speed Sensor Repair Kit

Part # 7050221

Instructions to change speed sensor from 12V to 5V controlled voltage for all distributors

1. Turn off power.
2. Disconnect 30 pin connector from computer.
3. The Red and Black wires will be added to the connector by first inserting the wires into the proper pin location and pulling the wires through the connector until the pin is properly seated in the connector. Insert the Black wire in “H3” and the Red wire in “H1”.
4. Reconnect the 30 pin connector.
5. Pull the Red and Black wires up into the cab control box.
6. Replace the portion of the +12V power wire that is before the pull up resistor (usually found at the first white terminal strip). For the speed sensor with the new Red wire (remove the old Black wire).
7. Connect the Black wire to the speed sensor ground (this wire may be connected to the ground stud if the speed sensor ground is connected there, if so use ring terminal - part number 6700146).





Tach Calibration

Instructions for calibrating pump speed for units with 309 pulses per gallon only (hydraulic motor #6603157 with 4.39 to 1 ratio gearbox).

For coarse calibration:

Setting "8"

1

Select setting 8 on back of pump tach.

Hex Wrench

2

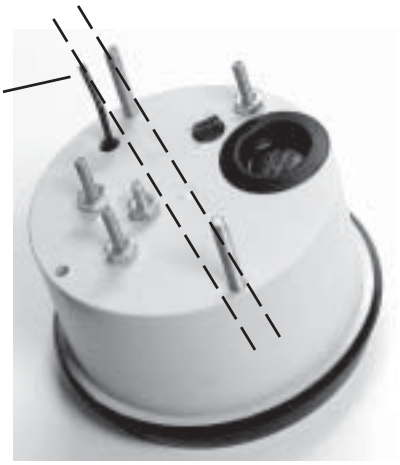
Using 5/64 inch or 2 mm hex wrench turn calibration fully clockwise.

Hex Wrench

3

Remove wrench and reinsert with wrench leg directly on top of mounting thread.

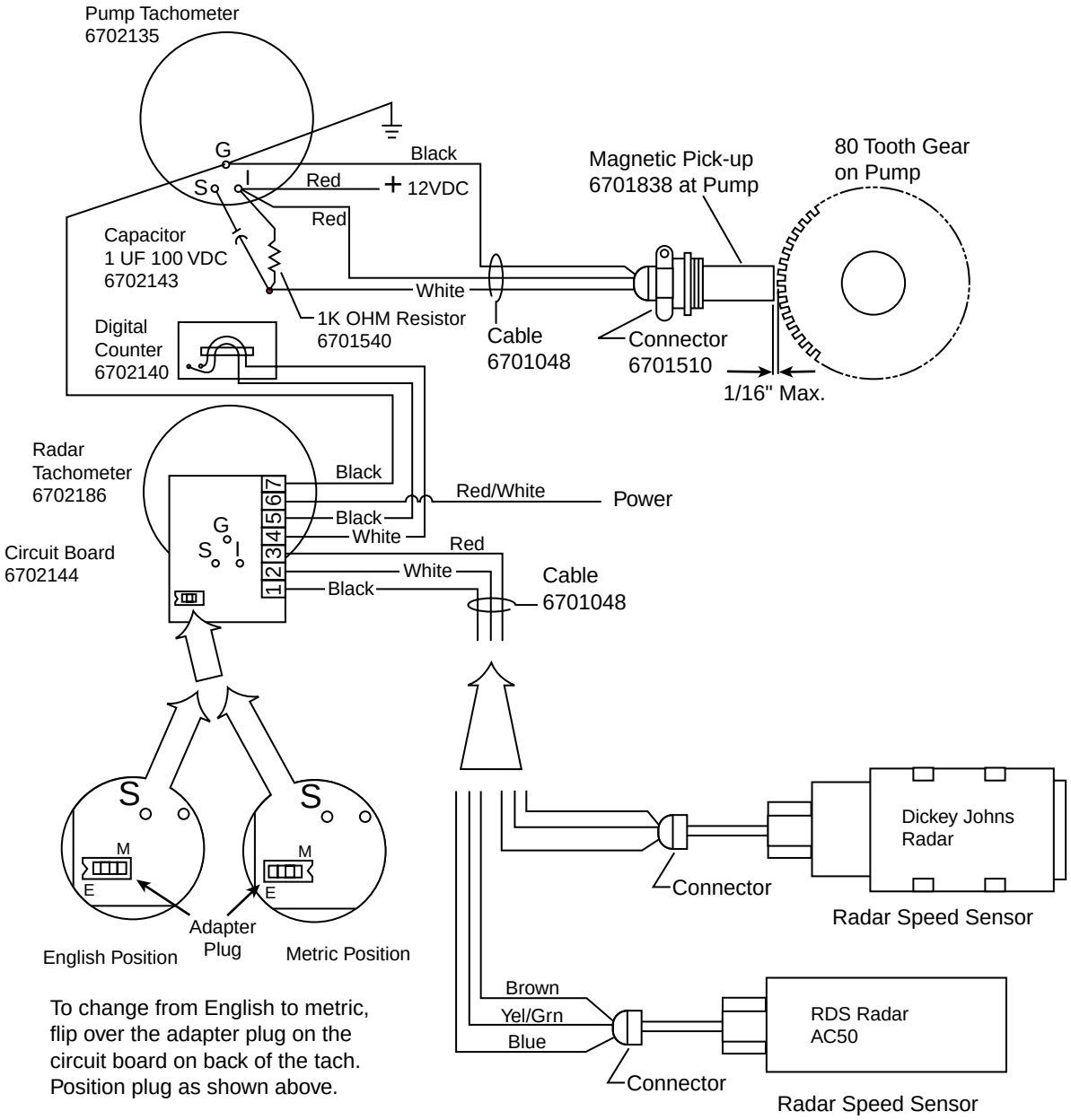
Hex Wrench



4

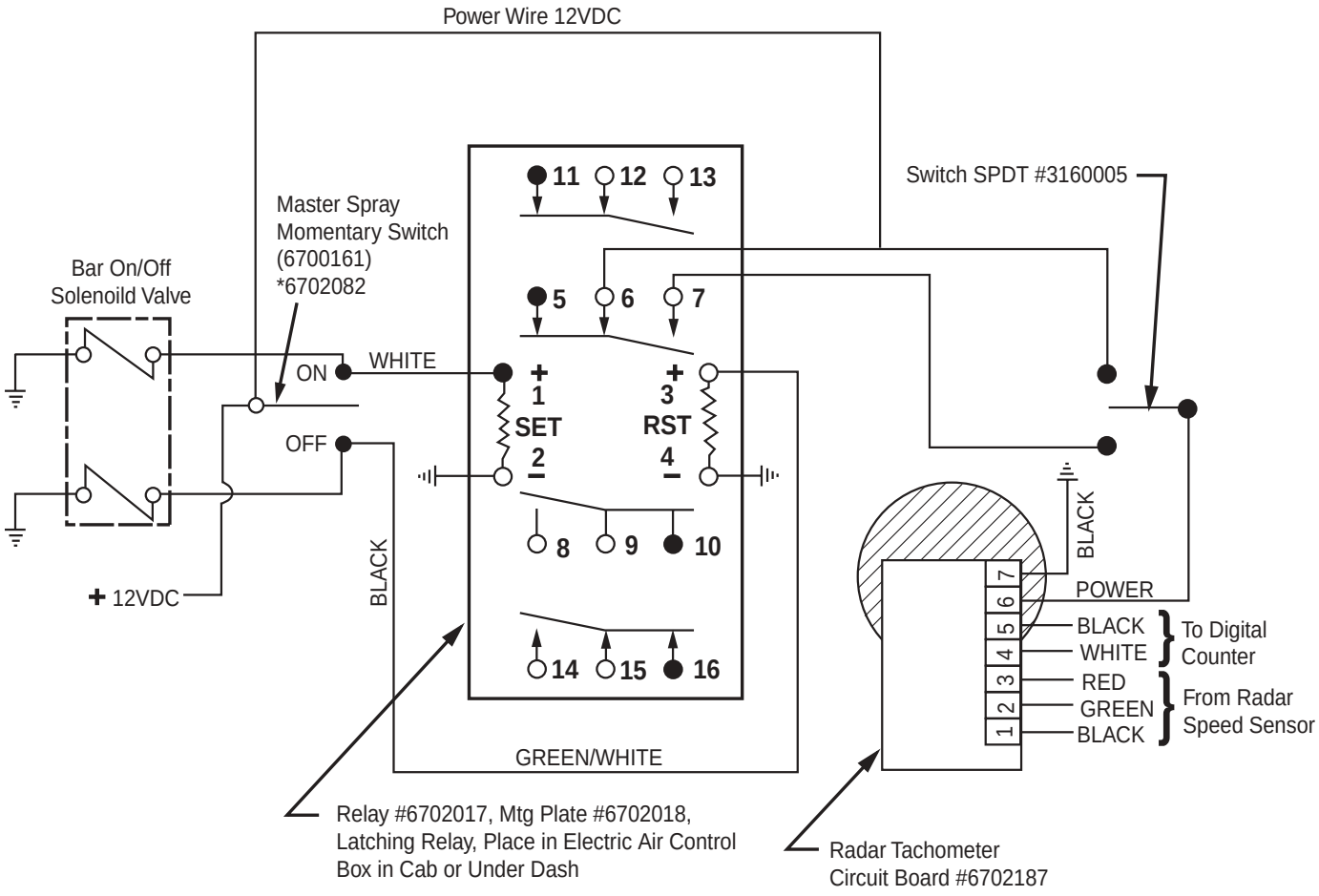
Turn calibration counterclockwise until parallel with both mounting threads.

Wiring - Radar and Pump Tach

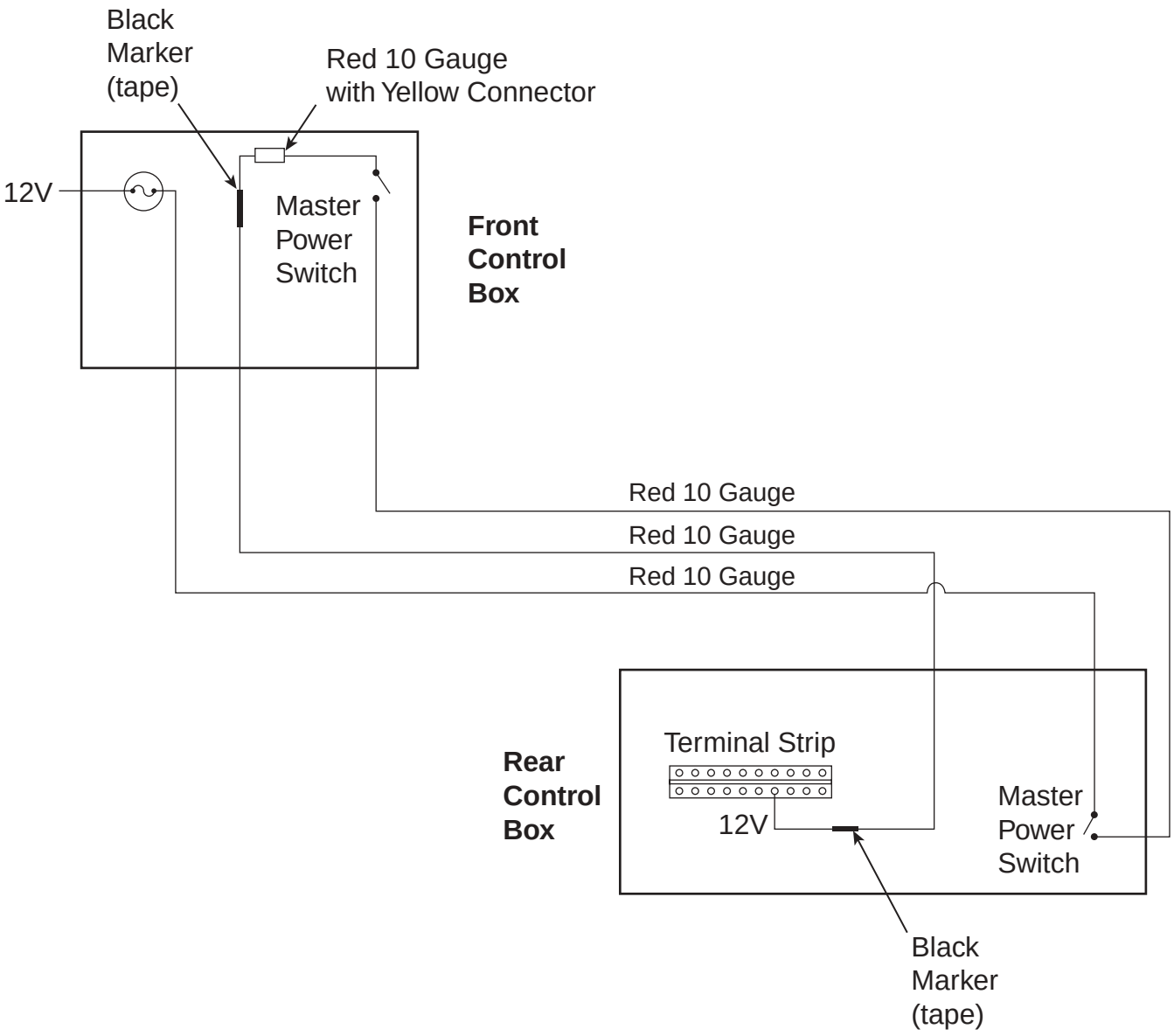


To change from English to metric, flip over the adapter plug on the circuit board on back of the tach. Position plug as shown above.

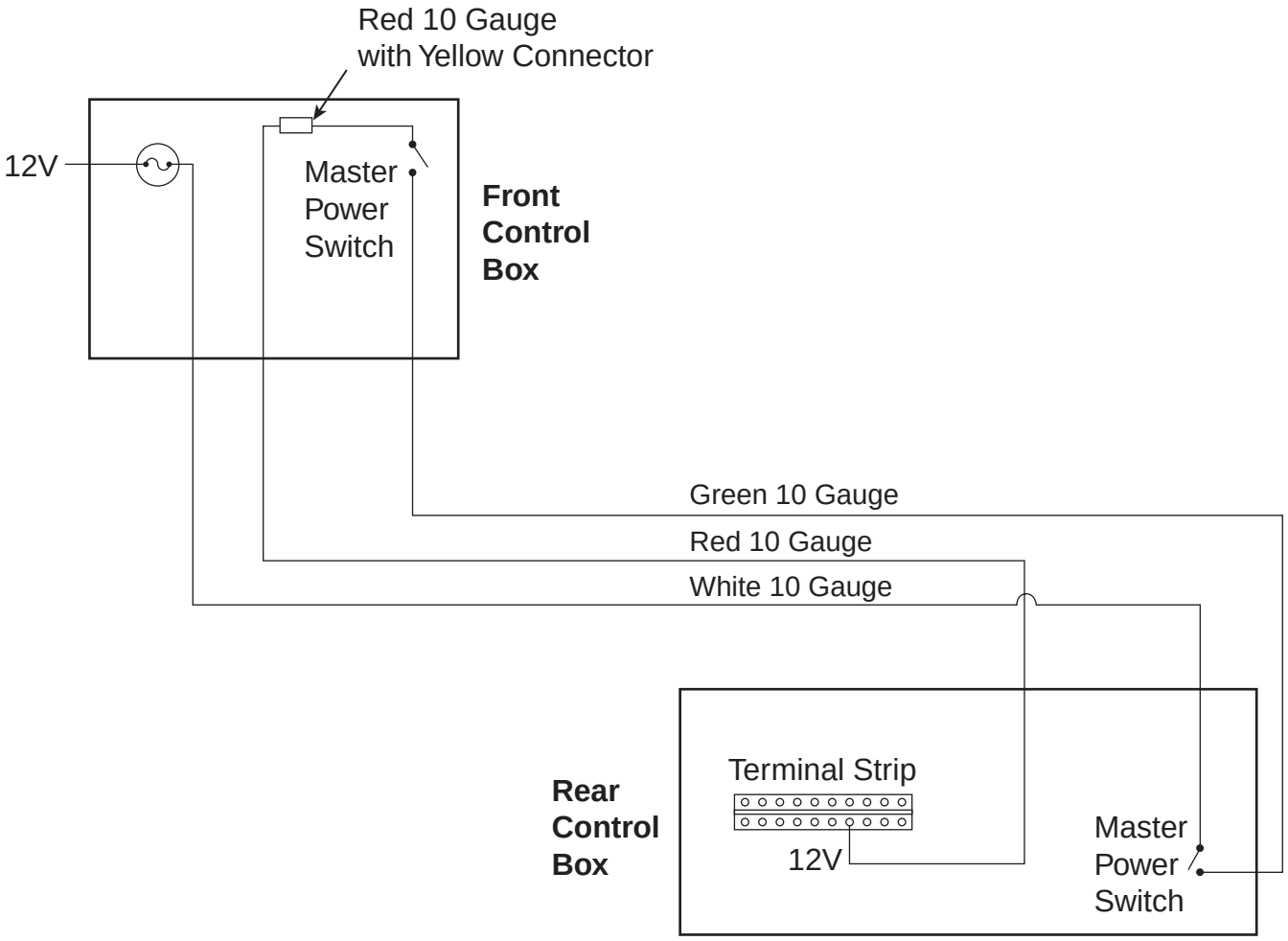
Dickey Johns Radar
Wiring Diagram - Kit, Radar Analog
7510025



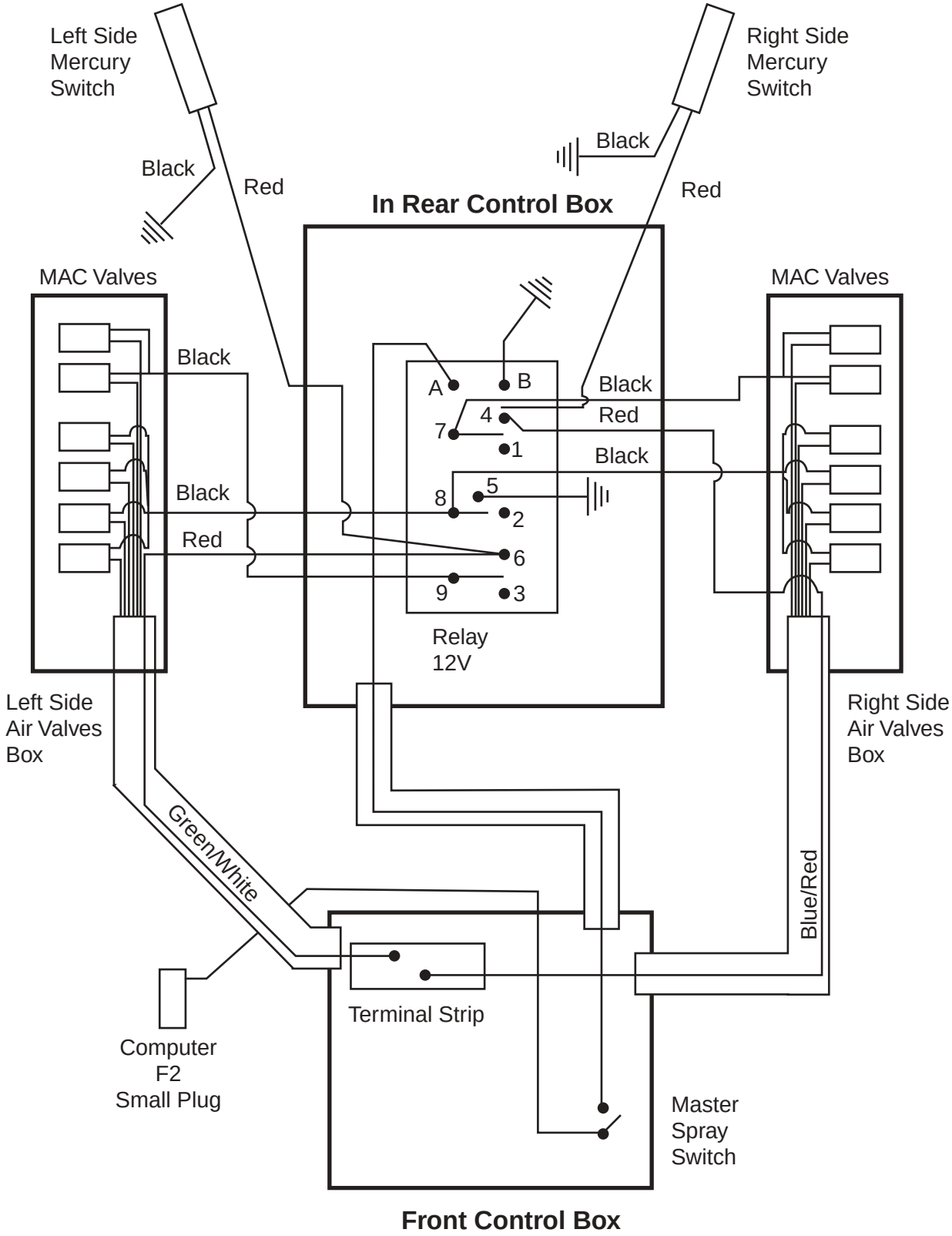
12 Volt Power Supply



12 Volt Power Supply
Centennial with new style wiring harness

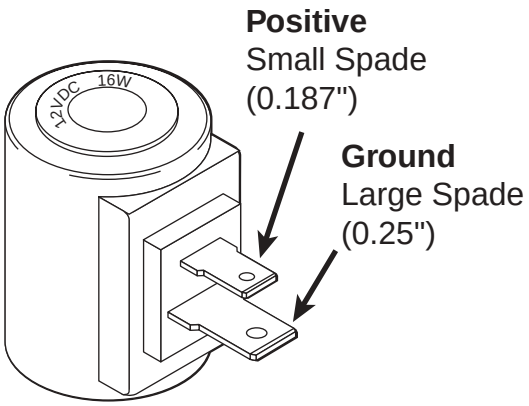


12 Volt Relay in Rear Control Box without Spray Delay Switch

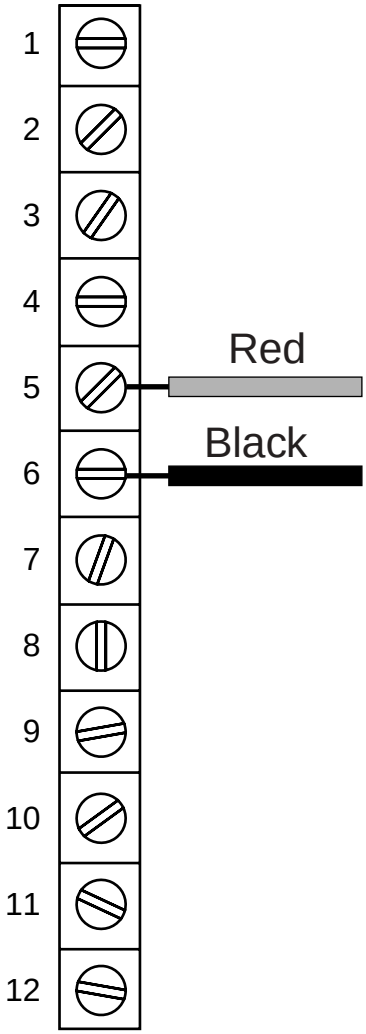


Solenoid Valve Coils with built-in Diodes

Solenoid valve coils made with built-in diodes suppress electronic noise which can interfere with computer controls. These solenoids on Deltrol valves can be identified by the fact that the spade terminals on the coil are not the same size. The larger, 1/4 inch spade must be used for the ground and the smaller, 3/16 inch spade must be used for the power or hot lead. Connecting otherwise will destroy the diode, losing the protection it would have provided. The diodes equipped coil is shown below. Production of Distributors with this feature will begin late in calendar year 2000.



Electronic Temperature Probe
DC-2 Computer

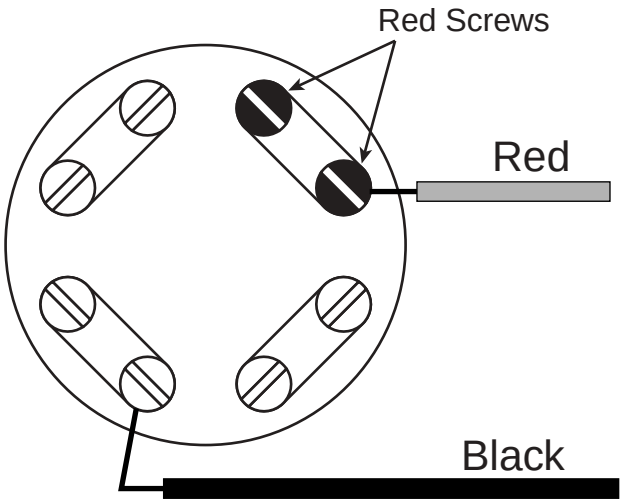


Printed Circuit Board
Inside Cab Control Box

Disconnect wires and measure resistance between Red and Black wires at terminals #5 and #6.

Resistance should match chart for temperatures shown.

A loose connection (or broken wire) at the probe will make for increased resistance and higher temperature reading.



3370234 Probe

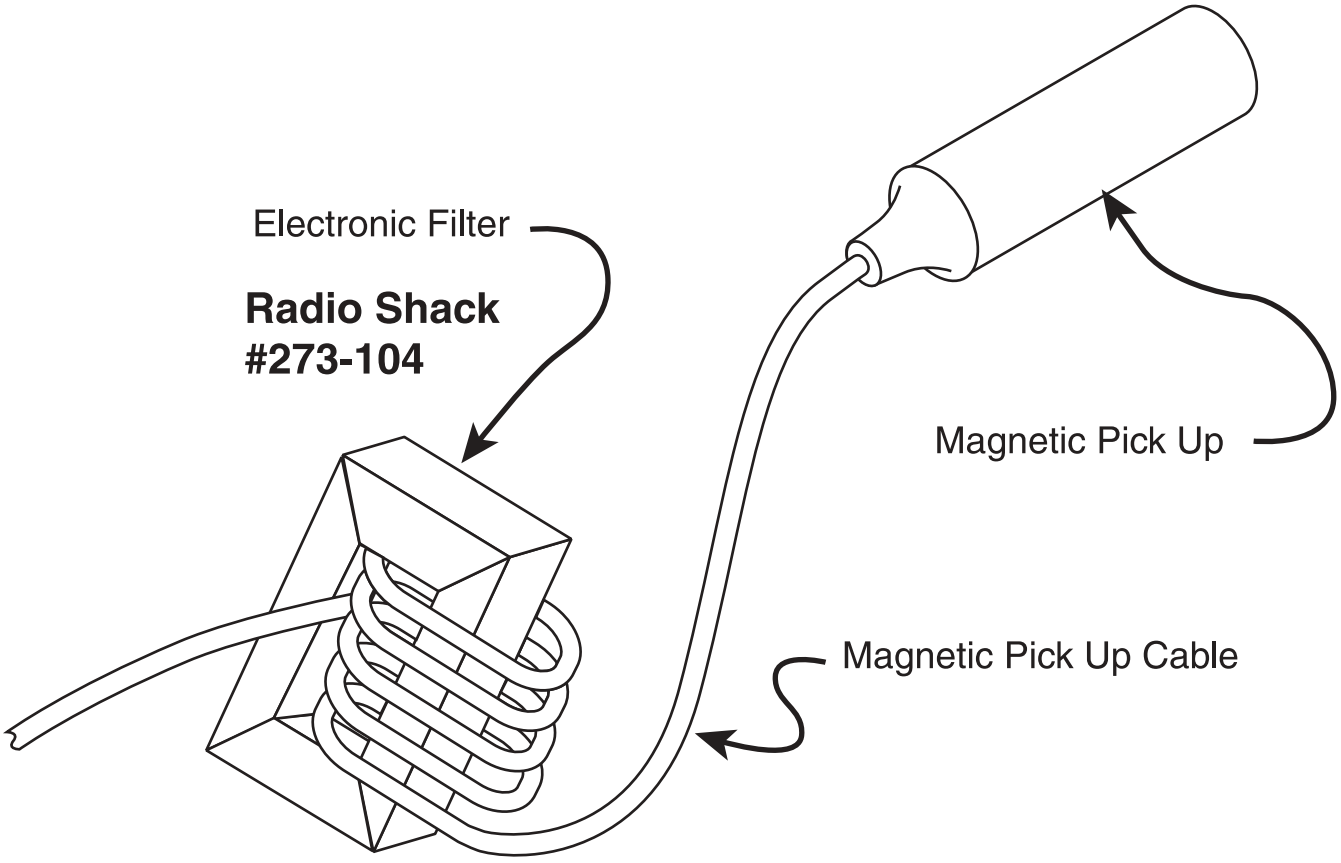
Temperature Conversion - Resistance of RTD Temperature Probe
Omega PR-14-2-100-1/4-9-E 3370234

Temp ° F	Temp ° C	Resistance OHMS
50	10.0	103.9
55	12.8	104.9
60	15.6	106.0
65	18.3	107.1
70	21.1	108.1
75	23.9	109.2
80	26.7	110.3
85	29.4	111.3
90	32.2	112.4
95	35.0	113.5
100	37.8	114.5
105	40.6	115.6
110	43.3	116.7
115	46.1	117.8
120	48.9	118.8
125	51.7	119.9
130	54.4	121.0
135	57.2	122.0
140	60.0	123.1
145	62.8	124.2
150	65.6	125.2
155	68.3	126.3
160	71.1	127.4
165	73.9	128.4
170	76.7	129.5
175	79.4	130.6
180	82.2	131.7
185	85.0	132.7
190	87.8	133.8

Temp ° F	Temp ° C	Resistance OHMS
195	90.6	134.9
200	93.3	135.9
205	96.1	137.0
210	98.9	138.1
215	101.7	139.1
220	101.4	140.2
225	107.2	141.3
230	110.0	142.4
235	112.8	143.4
240	115.6	144.5
245	118.3	145.6
250	121.1	146.6
255	123.9	147.7
260	126.7	148.8
265	129.4	149.8
270	132.2	150.9
275	135.0	152.0
280	137.8	153.0
285	140.6	154.1
290	143.3	155.2
295	146.1	156.3
300	148.9	157.3
305	151.7	158.4
310	154.4	159.5
315	157.2	160.5
320	160.0	161.6
325	162.8	162.7
330	165.6	163.7
335	168.3	164.8

Temp ° F	Temp ° C	Resistance OHMS
340	171.1	16.9
345	173.9	166.9
350	176.7	168.0
355	179.4	169.1
360	182.2	170.2
365	185.0	171.2
370	187.8	172.3
375	190.6	173.4
380	193.3	174.4
385	196.1	175.5
390	198.9	176.6
395	201.7	177.6
400	204.4	178.7
405	207.2	179.8
410	210.0	180.9
415	212.8	181.9
420	215.6	183.0
425	218.3	184.1
430	221.1	185.1
435	223.9	186.2
440	226.7	187.3
445	229.4	188.3
450	232.2	189.4
455	235.0	190.5
460	237.8	191.5
465	240.6	192.6
470	243.3	193.7
475	246.1	194.8

Radio Frequency Interference Filter Installation

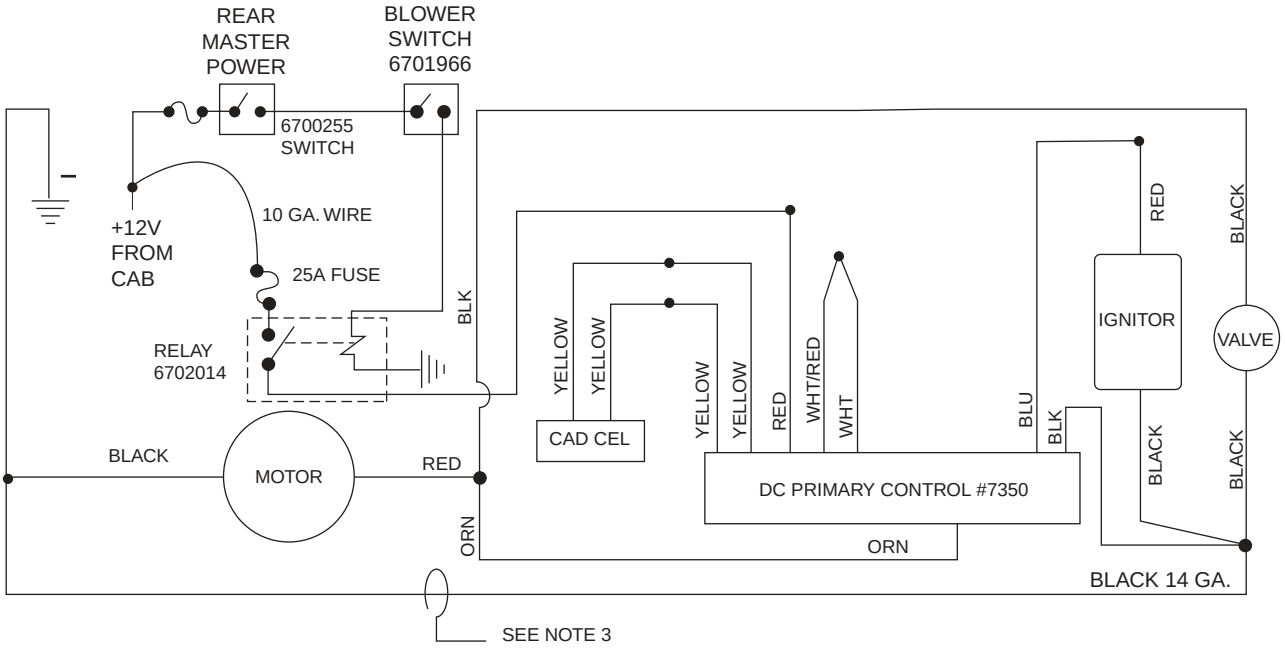


Gather together some slack from the magnetic pick up cable. Unfold the filter case and wrap the slack cable through the filter forming five loops. Close the filter case and tie it shut with a wire or tape.

Wiring Schematic – Fuel Oil Burners with Built-In Fuses

WIRING DIAGRAM WITH PRIMARY CONTROL

(1) BURNER SHOWN



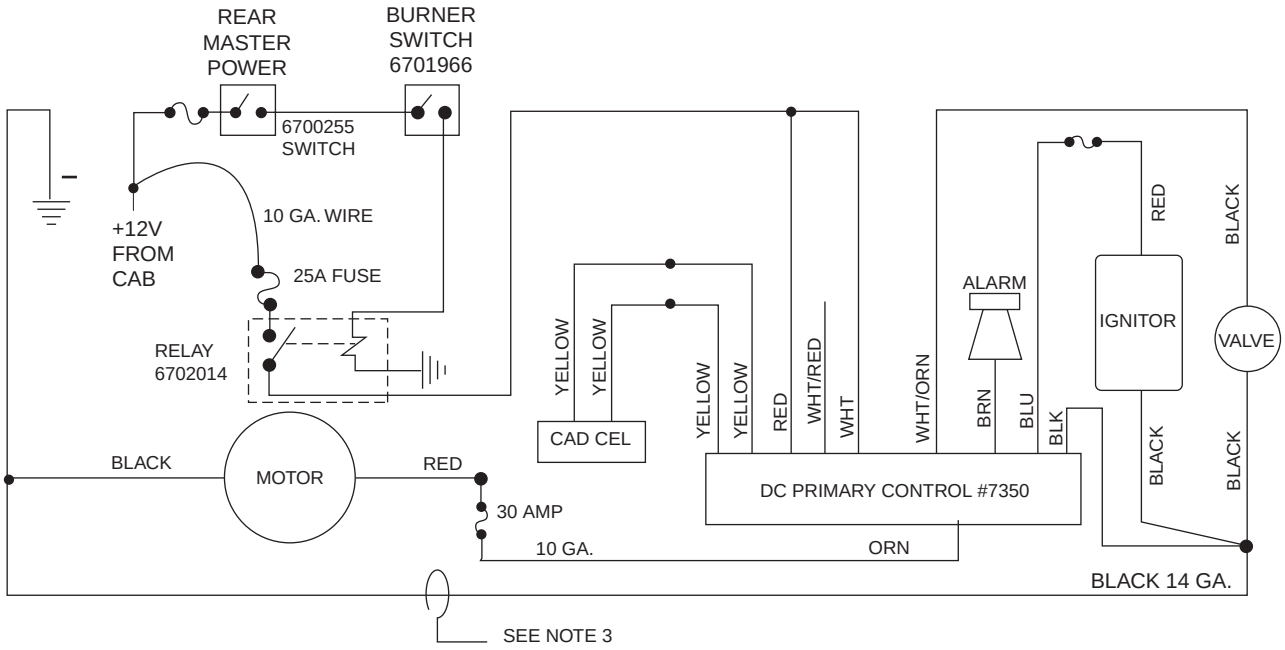
NOTES:

1. All wires to be 14 gauge minimum or as required to prevent voltage drop between battery and burner.
2. Fuse recommendation:
   Motor - 30A
   Control - 10A
3. Hard wire ground to battery. **Do Not Use Chassis Ground System.**

Wiring Schematic – Fuel Oil Burners with External Fuses

WIRING DIAGRAM WITH PRIMARY CONTROL

(1) BURNER SHOWN



NOTES:

1. All wires to be 14 gauge minimum or as required to prevent voltage drop between battery and burner.
2. Fuse recommendation:
   Motor - 30A
   Control - 10A
3. Hard wire ground to battery. **Do Not Use Chassis Ground System.**

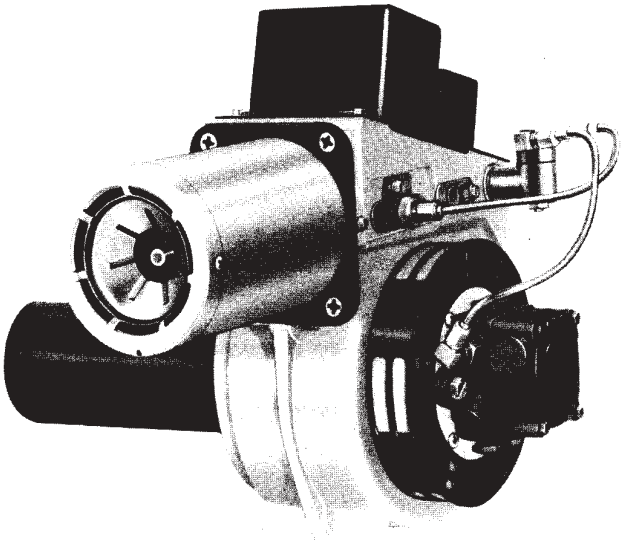
Beckett Fuel Oil Burner Instruction Manual

RWB Beckett

INSTRUCTION MANUAL

model SDC

OIL BURNER



INSTRUCTION MANUAL INDEX

SPECIFICATIONS

Capacities.....Model SDC Burner
.....1.75 to 5.50 gallons per hour
.....245,000 to 770,000 BTU/HR input

DIMENSIONS

Height.....12-1/2"
Width.....14-7/8"
Depth.....8-1/2"

FUELS

No. 1 or No. 2 Heating Oil (ASTM D396) Only. **NEVER** use gasoline in your heating appliance. Gasoline is more combustible than fuel oil and could result in a serious explosion. **NEVER** use crankcase or waste oil in your heating appliance. Fuel unit malfunction could result from contamination.

ELECTRICAL CHARACTERISTICS

Power Supply.....Automotive Battery and Appropriate Charging System
Operating Load.....25 Amps
Actual amp draw could be less dependent upon application.
During trial for ignition.....18-25 Amps
Ignition (sec.).....20KV PK 28mA
Interrupted duty, or optional continuous duty, solid-state ignition system.

FIRING RATE CHART

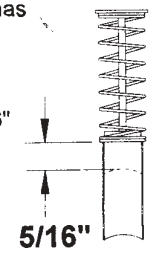
HEAD	F-22	F-310
MIN. FIRING RATE	1.75	2.50
MAX. FIRING RATE	3.50	5.50

MOTOR

Specifications
12 VDC, 1/4 HP, 18.75 Amps (max.), 3450 RPM, CCW from shaft end, N.E.M.A. "M" flange. Replaceable brushes.
Note: If polarity is reversed motor will run backwards.

Lubrication
The motor is permanently lubricated and has no provision for oiling.

Brushes
Check every 300 hrs. of operation. If either of the brushes are shorter than 5/16" replace them. At no time allow the brushes to become shorter than 1/4"



FUEL UNIT

.....Suntec, Webster or Danfoss
..... Pump Pressure Set @ 100 PSI

NOZZLE FLOW CHART
RATED GPH

@ 100 PSI	@ 140 PSI
1.75	2.07
2.00	2.37
2.25	2.66
2.50	2.96
2.75	3.24
3.00	3.55
3.50	4.13
4.00	4.70
4.50	5.30
5.00	5.90
5.50	6.50

FIG. 3

Install nozzle recommended by manufacturer.

VENTING PROCEDURES

TWO PIPE:

On a two pipe system from the oil tank, there is no need to vent the fuel supply system but the by-pass plug must be installed.

ONE PIPE:

1) Attach a clear plastic hose over the vent plug.
2) Loosen the plug one (1) turn ccw. Start the burner and catch the oil in an empty container. Vent until all air bubbles disappear.
3) Continue to vent the system for 15 seconds after the last air is seen from the vent plug. (To be certain the suction line is air free.)
4) If the burner does not start or runs erratic, additional venting may be required. Repeat the venting procedure.

Fuel Contamination: Water, dirt or other contaminants in the fuel supply may cause improper burning and will cause the fuel pump to fail.

For additional pump information refer to the pump manufacturer's instructions attached to the pump.

REPLACEMENT OF THE "F" AIR TUBE COMBINATION

1) Remove the old air tube assembly.
2) Remove electrode assembly. If necessary loosen the escutcheon plate.
3) Slide flange and gasket, (if used), onto new air tube then attach air tube to burner using four sheet metal screws provided.
4) Install nozzle recommended by manufacturer into nozzle line.
5) Check and set electrodes as shown in FIG. 4.
6) Loosen escutcheon plate if not already performed in step 2 and insert nozzle line electrode assembly into tube using the "Z" dimension shown in FIG. 5 to position the assembly.
7) Secure the assembly by tightening the escutcheon plate to the side of the housing and by tightening the knurled lock nut onto the nozzle line. (Lock nut's recessed side faces out).
8) Attach connector tube assembly to pump and nozzle line.

CONCEALED DAMAGE

If any damage to the burner that is found during unpacking, notify the carrier at once and file the appropriate claim.

Beckett warrants its equipment specifically to those who have purchased it for resale, including your dealer. In the event of any problems with your equipment or its installation, you should contact your dealer for assistance.

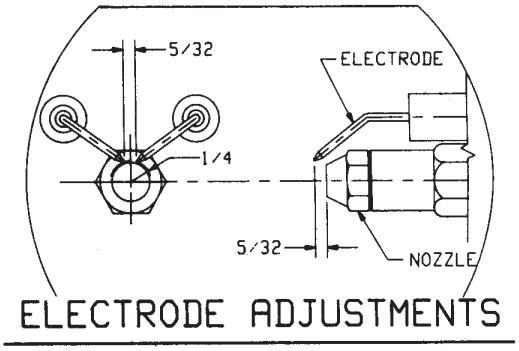


FIG. 4

TO THE SERVICE MAN

Before you begin to service the burner take time to work through the following simple checklist.

* Make sure there is oil in the tank and all the valves are open.
* Make sure the thermostat and the flow switch are calling for heat.
* Make sure that all connections are properly terminated and that the battery power is delivered to each individual part being checked.
* Make sure that the blower housing, fan and ignition assembly are free from dirt and moisture.
* For replaceable motor brushes check brush wear approx. every 300 hrs. of machine operation.
* Make sure gas engine is running at approx. 3600 rpm's for proper charge current.

AIR TUBE COMBINATION DETAILS

DIMENSIONAL RELATIONSHIPS

"A"=Useable Air Tube Length "Q"="A" + 1-13/16"		"L"="A" + 5/8" "Z"=1-1/8" "E"=1-5/8"	
"S" dimension	1⅜"	1⅝"	2-13/32"
Tube "A" dimension	2⅝-3"	3⅝-4½"	over 4⅞"

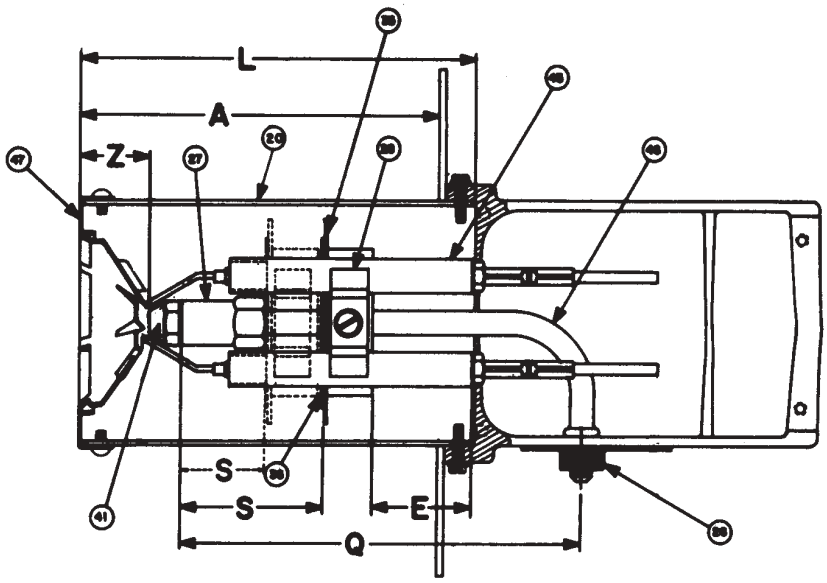


FIG. 5

AIR TUBE COMBINATION PARTS

20	Air Tube	Note
26	Lock Nut, Nozzle Line Fitting	3666
27	Nozzle Adapter - Single	213
28	Electrode Clamp	149S
35	Centering Spider	5653
36	Static Plate (See special A.T. Combs)	3383
	Static Plate Holding Screws	4352
41	Nozzle	
43	Electrode Insulator Assy.	Note
46	Nozzle Line and Vent Plug	Note
47	Burner Head, (one piece head and shield) Type F-310	

Note: Specify Burner model number "SDC," part description; air tube combination with air tube length (Dimension "A" and firing rate.

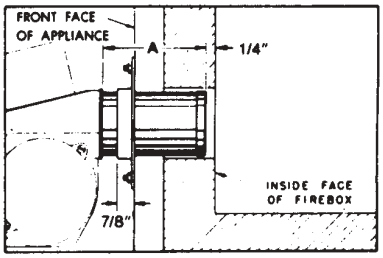
NOZZLES

UNIT APPLICATIONS: When burner is supplied as an integral component of a heater the best nozzle choice will have been determined by extensive testing. The heater manufacturers recommendation should be closely followed.
UPGRADING OR CONVERSION: Use 80° Solid Cone Nozzle to start.

Air Tube Combination Table

FIRING RATE MIN.-MAX. GPH	BURNER HEAD	USABLE AIR TUBE LENGTH "A"				
		6-5/8"	7-1/4"	9"	13"	16"
1.75 - 3.25	F22	SF65FPDC	SF72FPDC	SF90FPDC	SF130FPDC	SF160FPDC
2.50 - 5.50	F310	SF65FTDC	SF72FTDC	SF90FTDC	SF130FTDC	SF160FTDC

To Determine Air Tube Length



The Air Tube Length (Dimension A) is the distance from the front of the burner housing to the drain hole in the burner head.

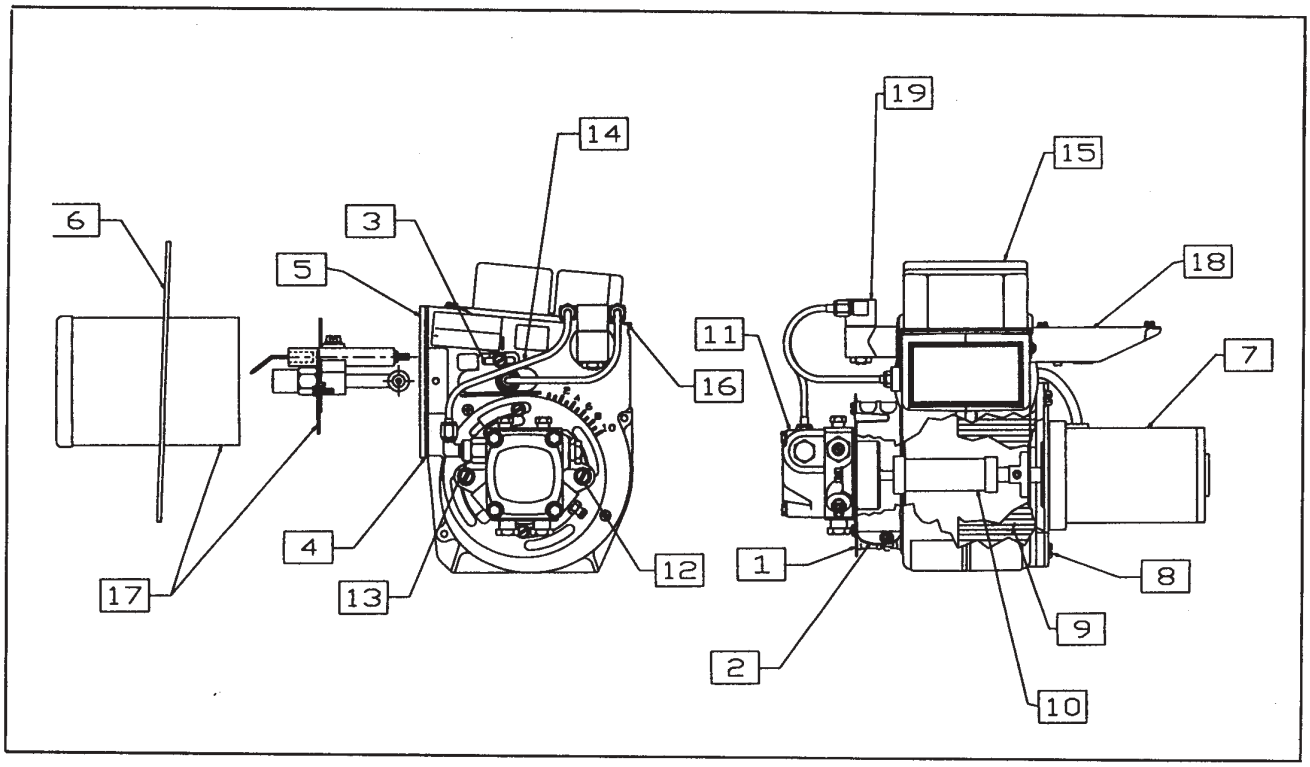


FIG. 10

WHEN ORDERING PARTS—STATE BURNER MODEL, PART DESCRIPTION AND PART NUMBER

REF.	DESCRIPTION	PART NO.
1	Air Shutter	3215
2	Air Band	3819
3	Escutcheon Plate ..... Front	3493
	Escutcheon Plate ..... Rear	3818
4	Gasket, Square Plate	3380
5	Square Plate	3399
6	Flange	Specify
7	Motor	21539
	Replaceable Brush Kit	51572
8	Motor Mounting Screws 5/16-18NC	482
9	Blower Wheel (R.W.B. Only) (5¾")	21545
	(6¼")	21540

REF.	DESCRIPTION	PART
10	Coupling	21541
11	Fuel Unit	Specify
12	Mounting Screws 5/16-18NC	482
13	Pump Nozzle Port Fitting	2256
14	Connector Tube Assembly	5394
15	Ignition Transformer Assembly	
	With Interrupted Ig.	51506
	With Continuous Ig.	51504
17	Air Tube Combination	Specify
18	Junction Box Kit	5770
19	Oil Valve	7304

BURNER START-UP

STARTING THE BURNER

* **Precautions:** Do not attempt to start the burner when excess oil has accumulated in the chamber area or when the appliance is full of vapor.

* Refer to the Original Equipment Manufacturers manual before using the following adjustment procedures.

ADJUSTING THE BURNER

* **Initial air adjustments:** Allow sufficient air to obtain a clean burning flame by loosening the lock screws and moving the air shutter and if necessary the air band.

Reduce the air supply until the flame tips appear slightly smoky, then increase the air just enough to cause the flame tips to appear absolutely clean.

* **Final air adjustments:** Allow at least ten minutes for warm-up, and longer if the appliance is new, in order to burn off the oil deposits on the heat exchanger and other surfaces.

Using suitable test instruments for smoke and CO_2 (or O_2) set the air settings to obtain a trace of smoke. Measure the CO_2 (or O_2) at this point and add sufficient air to reduce the CO_2 by one percent (1%) or increase the O_2 by one percent (1%) as an insurance margin, reducing the smoke to zero unless otherwise specified by the appliance manufacturer's instructions.

EXAMPLE: 13% CO_2 @ a trace of smoke reduced to zero at 12% CO_2.

Tighten all the locking screws after the final adjustments are made.

Start and stop the unit several times to make sure there are no significant rumbles or pulsations.

Check and adjust all controls in accordance with the Appliance Manufacturer's instruction sheets.

WIRING PROCEDURES

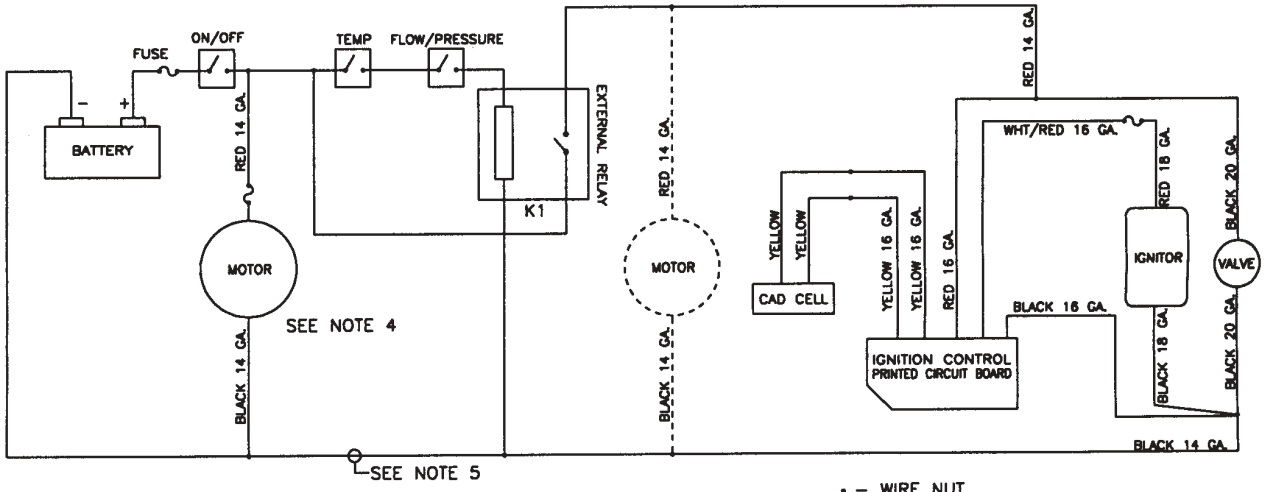
* All wiring must be in accordance with National Electric Code and local codes and regulations. Refer to diagram below for correct connections.

*Procedures

1. Make sure red wires are connected to the (+) positive battery terminal and the black wire is connected to the (-) battery terminal.

* Power supply wires to the motor must be at least 14 gauge.

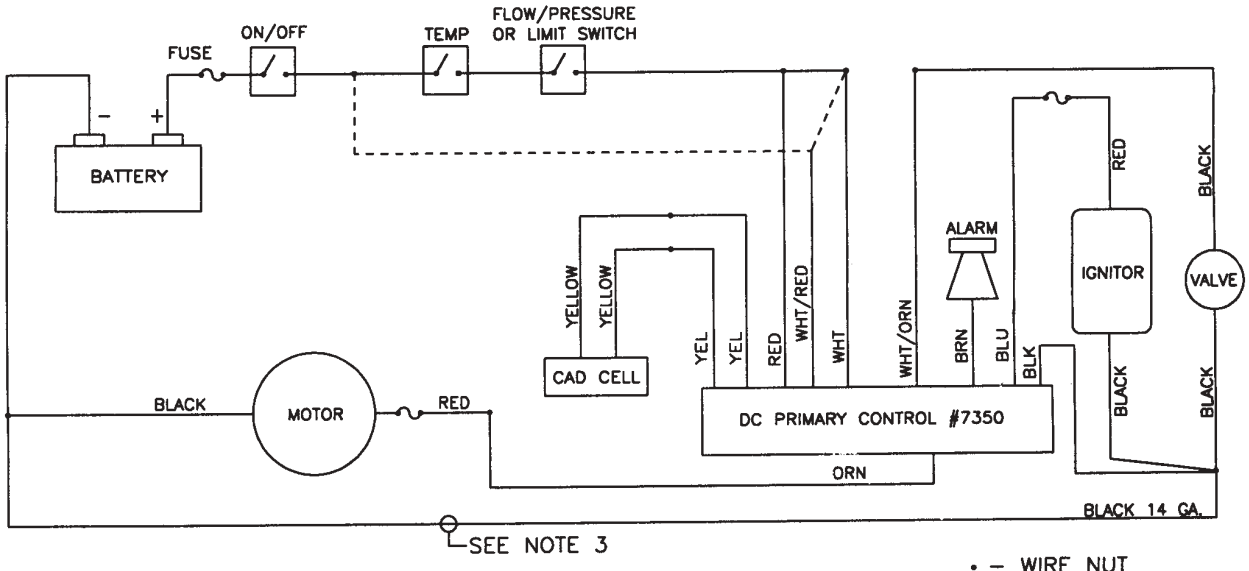
WIRING DIAGRAM WITH OUT PRIMARY CONTROL



NOTES:

1. All wires to be 14 GA. minimum or as required to prevent voltage drop between battery and burner.
2. Fuse recommendation:
   Motor - 30A
   Control - 10A
3. Dotted line is optional motor location. Motor cycles with trigger. K1 relay required: to be S.P.S.T., N.O. relay contacts not less than 135 Amps. @ 12VDC. Potter Brumfield #VF7-41-F11 or equivalent.
4. Motor shown as continuous operation. K1 relay required: to be S.P.S.T., N.O. relay contacts not less than 5 Amps@ 12VDC.
5. Hard wire ground to battery. **DO NOT USE CHASSIS GROUND SYSTEM.**

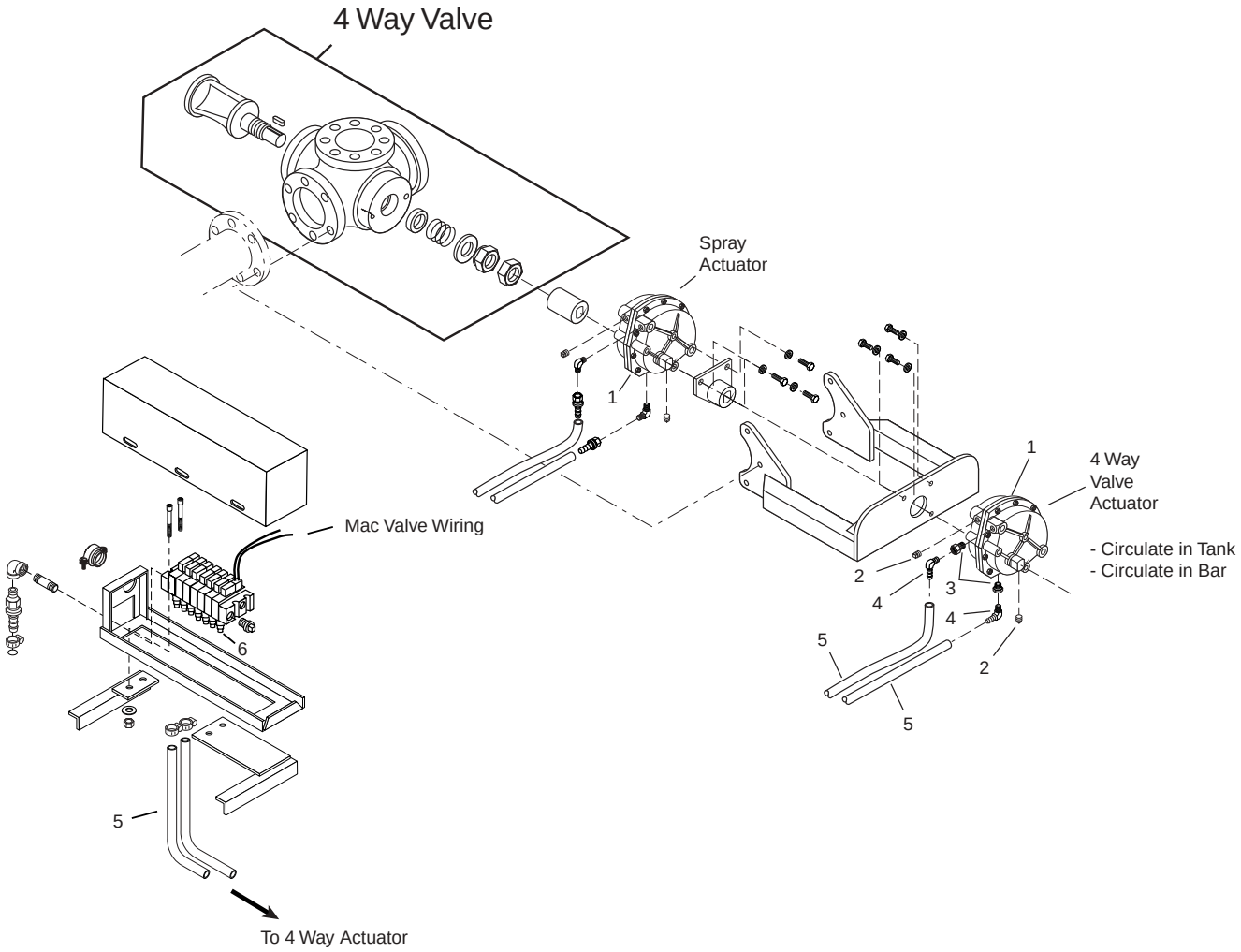
WIRING DIAGRAM WITH PRIMARY CONTROL



NOTES:

1. All wires to be 14 GA. minimum or as required to prevent voltage drop between battery and burner.
2. Fuse recommendation:
   Motor - 30A
   Control - 10A
3. Hard wire ground to battery. **DO NOT USE CHASSIS GROUND SYSTEM.**
4. ----------Optional Wiring.

4 Way Valve Rotary Actuator Modification

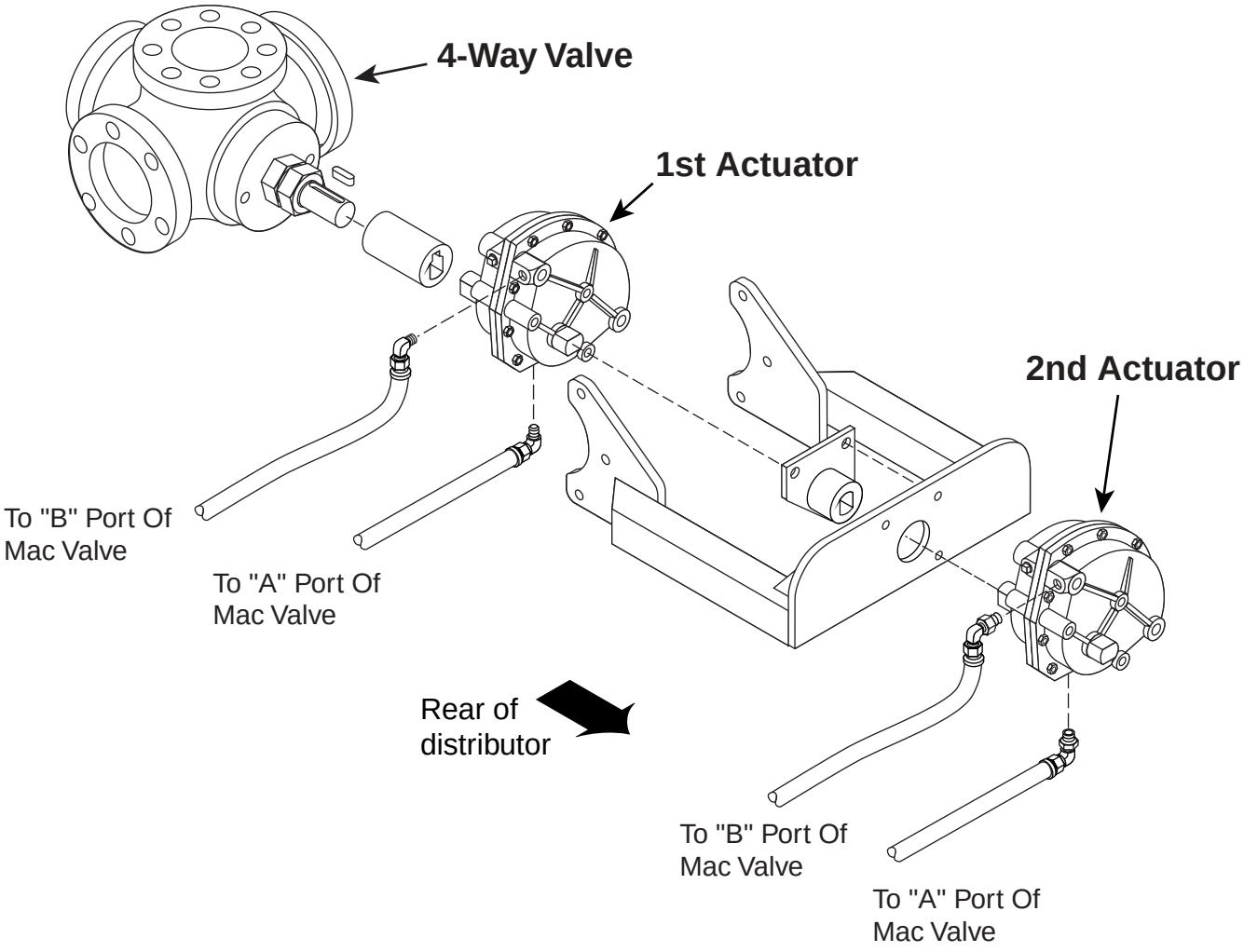


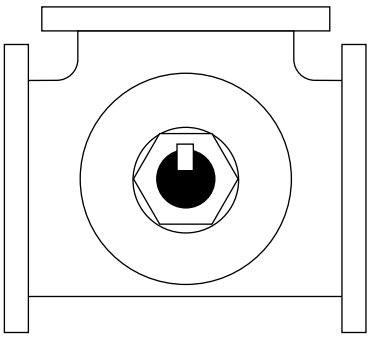
1)	6603023	4 Way Valve Rotary Actuator	
2)	0219189	1/4 NPT Pipe Plug	(2) Required
3)	0144035	1/4 x 1/8 NPT Bushing	(2) Required
4)	6602242	3/16 x 1/8 MP90 Hose Barb Fitting	(2) Required
5)	6309255	3/16 Hose	(order as needed)
6)	6602575	3/16 x 1/4 NPT Hose Barb Fitting	(2) Required

Modification Instructions:

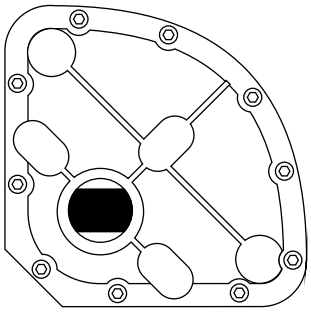
a) Install all needed parts shown
b) Locate and remove mac valve cover.
c) Locate the wires that activate the mac valves for (spray) & (circulate in tank / circulate in bar).
d) Switch the wires on the mac valves so the front actuator operates with the master spray switch.
e) Reinstall mac valve cover.
f) Secure hoses.

Installation of Actuators

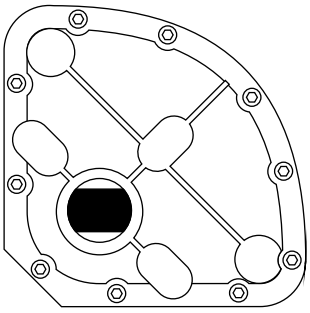




4-Way Valve

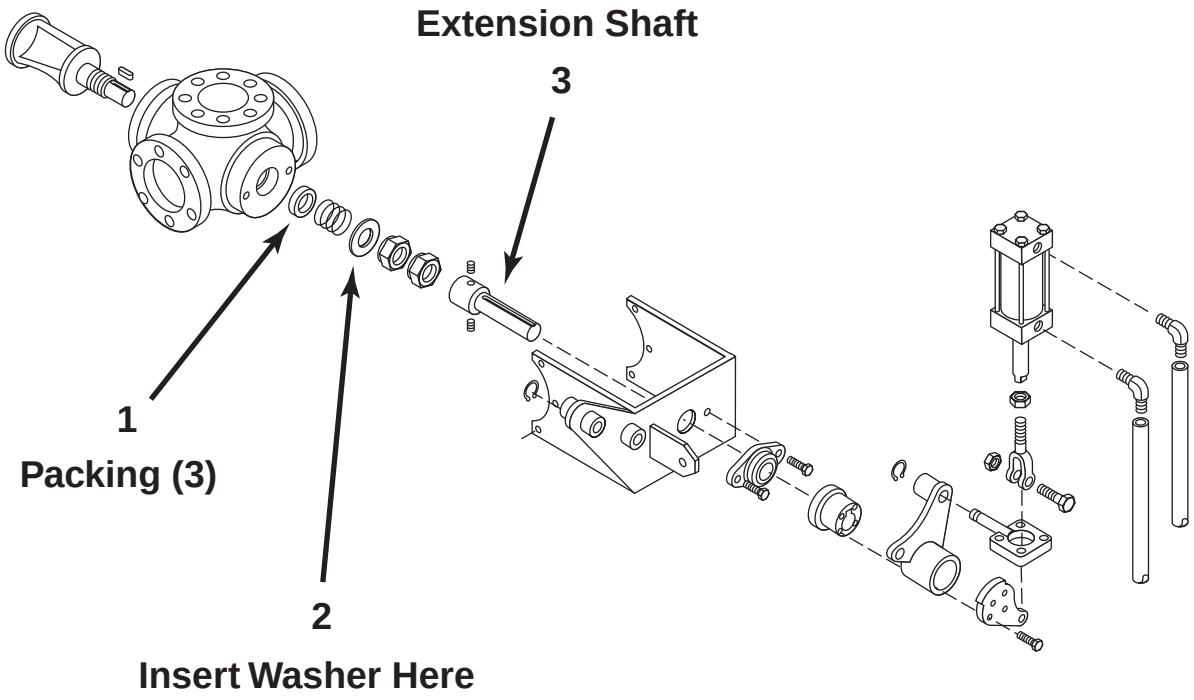


1st Actuator
(viewed from rear)



2nd Actuator
(viewed from rear)

4 Way Valve Modification



1)	3340029	Pump Packing	(3) Required
2)	0197070	1 3/8 in. Washer	(1) Required

Install all needed parts shown:

a) Loosen set screw on Extension Shaft and slide shaft back far enough to allow removal of lock nuts from 4 Way valve shaft.

b) Remove lock nuts from 4 Way valve shaft.

c) Remove spring.

d) Remove old packing

e) Install (1) lock nut on shaft, pry back shaft to insure no asphalt material is trapped behind packing. (Heat may be required if material is set up inside 4 Way valve).

f) Remove lock nut.

g) Install (3) new pump packing

h) Install spring

i) Install new washer

j) Install (1) lock nut, tighten (CW) till washer is tight against the case of the valve.

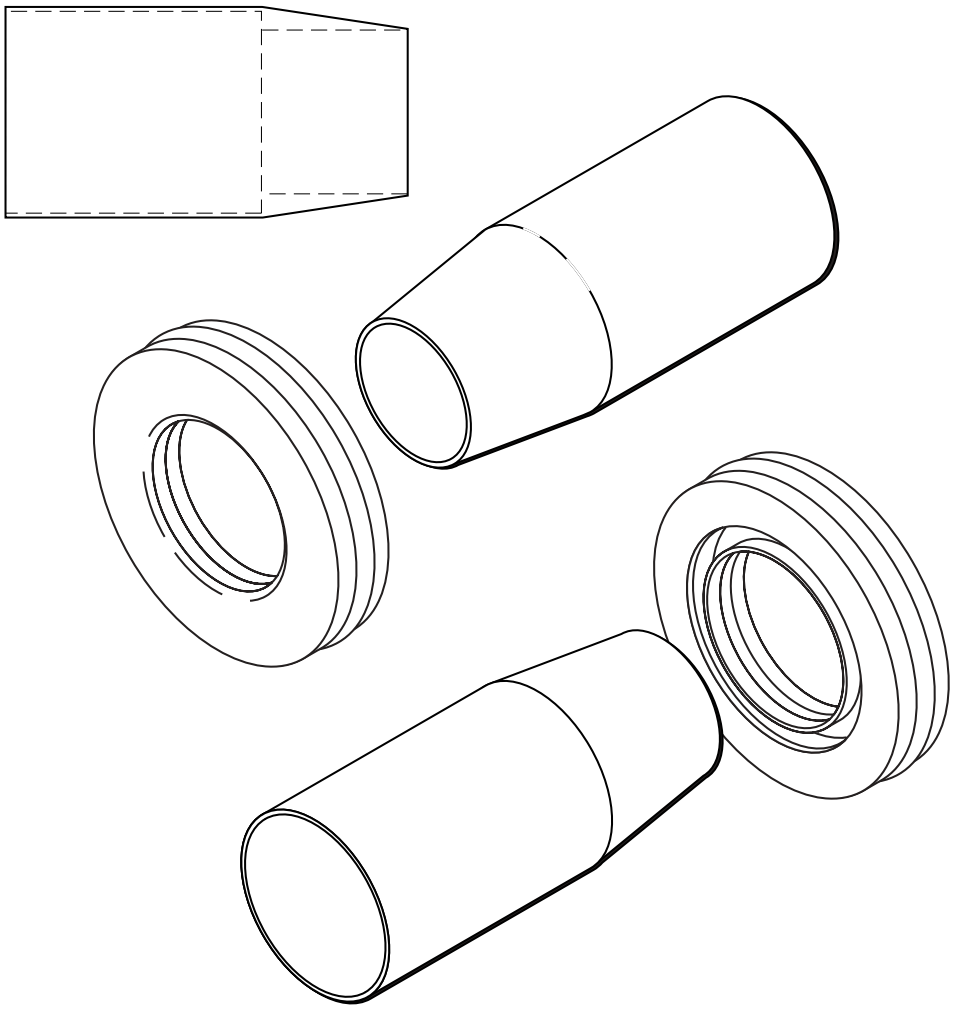
k) Back off first lock nut 1/4 turn (CCW) this is the preload on the nut

l) Install (2nd) lock nut (CW) lock against (1st) nut.

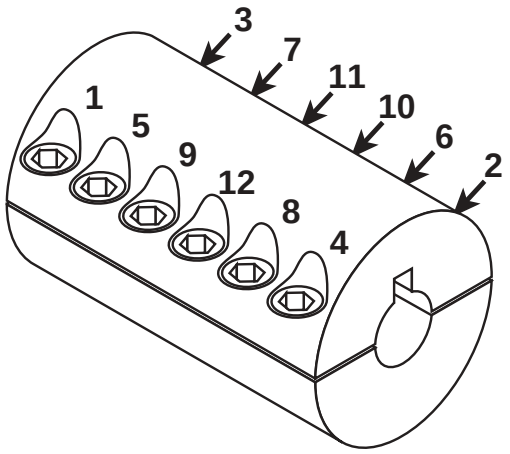
m) Install Extension Shaft and tighten set screw.

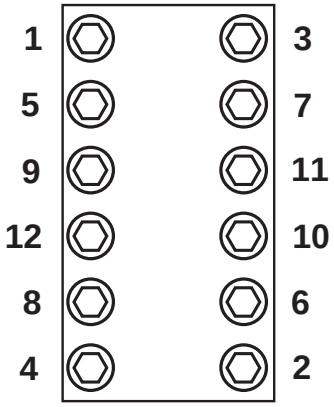
Asphalt Pump Shaft Seal Installation Tool (3321447)

Required to install (new style) Seal #6420231



Instructions for installing (6445090) Shaft Coupling between Asphalt Pump and Gearbox on Centennial Distributors

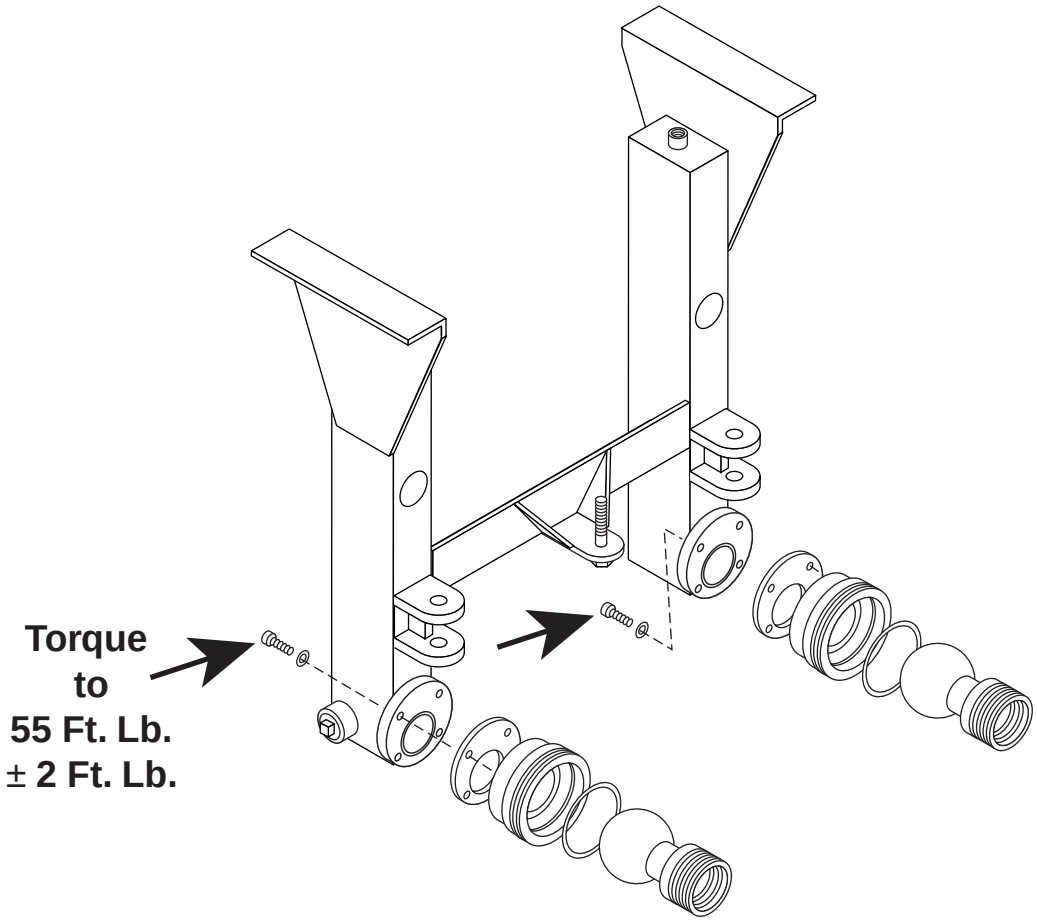




1. Coat all coupling bolts with anti-seize before installing.
2. Align the asphalt pump shaft keyway to top dead center.
3. Install shaft key in asphalt pump shaft.
4. Slide coupling onto asphalt pump shaft. The asphalt shaft and coupling engagement should be a minimum of 3.03 inches. Note: It works best to loosen the screws in the coupling just enough for the coupling to just slide on to the shaft.
5. With the key installed in the gearbox shaft, insert the gearbox shaft into the coupling until the gearbox mounting flange firmly touches the asphalt pump faceplate. Shaft engagement in step three should be maintained. Note: Again it works best to loosen the screws in the coupling just enough for the gearbox shaft to be inserted while maintaining the same fit between the asphalt pump shaft and the coupling.
6. Align the gearbox for proper port location and so that two of the mounting holes align with both tapped holes in the asphalt pump faceplate. Install two 5/16” grade 8 bolts into the tapped holes in the faceplate. Note: Do not tighten the mounting bolts but install them so that they support the weight of the gearbox and maintain contact between the gearbox and the pump faceplate.
7. The gap between the halves of the coupling should be equal. To maintain the desired gap, 1/32” shim stock can be inserted by the first bolt tightened and then can be pulled out when the opposite side is tightened.
8. With the socket head cap screws at the top dead center, start the tightening sequence at 66 ft/lbs. Note: When facing the asphalt pump there are six rows of screws the first being closest to the gearbox. The tightening sequence is to start in row six (at the top left) then to row one (the lower right then to the lower left) and then to row six (the upper right). Use this same pattern for rows five and two and also rows four and three.
9. Repeat the tightening sequence in step seven at 133 ft/lbs.
10. Repeat step eight for verification.
11. Tighten gear box mounting bolts to 25 ft/lbs.

Correct installation can be verified when hydraulically driving the asphalt pump. If the hydraulic motor and gearbox assembly move due to misalignment of the shafts and coupling the coupling should be removed and inspected for internal damage and then should be reinstalled. If movement of the gearbox and motor cannot be corrected engineering should be notified and the particular unit should not be shipped.

Ball Case Screw Tightening Procedure



NOTE: Torque **All** Ball Case Screws to 55 Ft. Lb. ± 2 Ft. Lb.

Ball Joint Tightening and Locking

Clean oil from both the male and female threads.

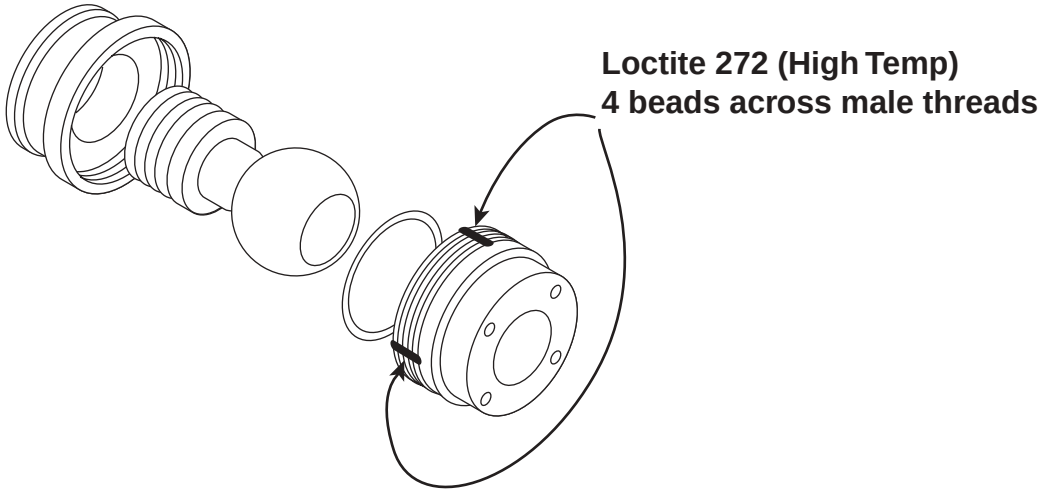
Prime both threads with Loctite Primer "N" (Etnyre #6800030).

Allow to dry for three to five minutes.

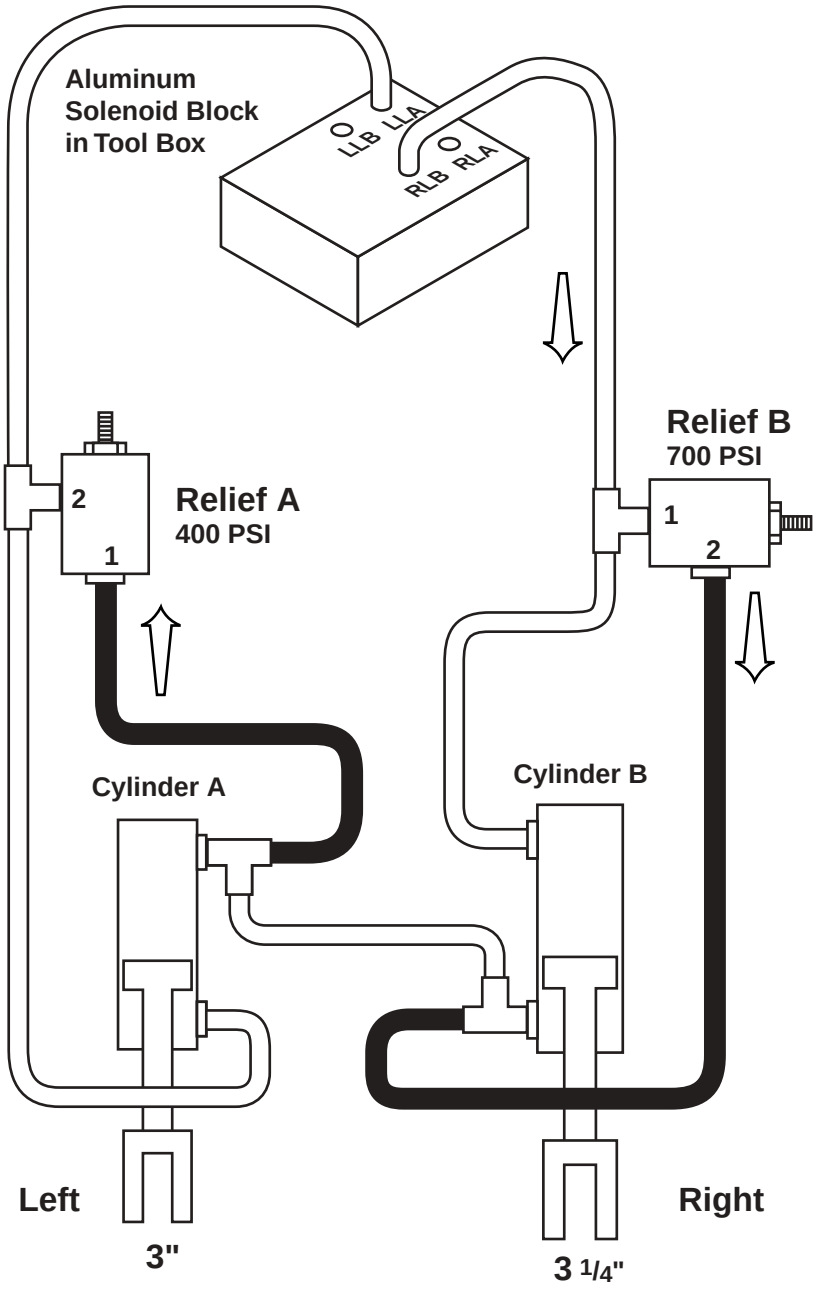
Apply four beads of Loctite "272" thread locker (Etnyre #6800047), about 1⁄8" wide, equally spaced, to the male threads as shown below.

Grease the ball liberally on the surface that contacts the case, o-ring and nut with chiksaw #11 high temperature grease. Tighten the nut until the o-ring is fully compressed and the free-play between the ball and the case is removed. The ball will be difficult to swivel in the case at this point. Back the nut off 1/4 turn to provide approximately .010" running clearance between metal plate.

Once the Loctite has cured, heating the joint will be required for disassembly.



Heavy Duty Bar Raise



When lifting bars, if cylinder "B" bottoms before Cylinder "A", Relief "A" will pop taking pressure off of Cylinder "B". This will still move Cylinder "A".

When lowering bar, if Cylinder "B" bottoms before Cylinder "A", Relief "B" pops allowing flow to move Cylinder "A". If Cylinder "A" bottoms first, Relief "A" pops allowing Cylinder "B" to bottom out.