Service Manual

ALKOTA CLEANING SYSTEMS, INC.

216AX4

p/n 216AX-SIK003

INSTALLATION DATE

PART NUMBER

MAKE/MODEL

SERIAL NUMBER

SELLER

ADDRESS

CITY/STATE/ZIP

NOTES:

ALKOTA
OLD VALUES. NEW IDEAS.
Alcester, South Dakota 57001
1.800.255.6823 fax 1.800.325.5682 www.alkota.com

20110415

Specifications

PERFORMANCE

NOTE: All model numbers include UL and Xtreme versions, unless otherwise noted.

Discharge Volume	
	2.0 gal/m / 7.6 L/m
Pump Head Pressure	
	1600 psi / 111 bar
Temperature Rise	
	120˚F @ 2.0 gal/m / 49˚C @ 7.6 L/m
w/optional tall coil	140˚F @ 2.0 gal/m / 60˚C @ 7.6 L/m
Temperature Limit (Xtreme)	
	210˚F / 99˚C
Combustion Smoke/Bacharach Scale	
	#1 OR #2 SMOKE
Carbon Monoxide Allowed	
	0.01%
Draft/Stack Installation	
	0.2” – 0.04” WC READING

GENERAL

Minimum Inlet Water Pressure	*over 65 psi may require water inlet regulator*
	10 psi / 0.68 bar
Stack Size	
	8” OD / 203.2 mm OD
Fuel Tank Capacity	
	4.5 gal / 17 L
Spray Tip	
	(#3 - 15˚) p/n JA0-15030-2
Belt	
	p/n R02-00228
Hose Assembly	
	3/8” x 50’ P/N K02-03150E1
Trigger Gun & Wand	
	p/n J06-00158-B
- Trigger Gun	p/n J06-00158
- Trigger Wand	p/n J06-00104EZ
Coil	
Standard	14” OD x 1/2”ID x 95’ Schedule 40 (Schedule 80 on Xtreme series and 324AX4)
Coil Back Pressure (New)	
	5 psi / 0.34 bar
Coil Back Pressure Requiring Descaling	
	50 psi / 3.40 bar

ELECTRICAL

Machine Voltage	
	115v 60hz 1PH
Current	
	20 A
Temp Control, Adjustable (optional)	
	p/n F04-00830
Temp Control (Xtreme)	
	p/n F04-00845
Power Cord	
	p/n 2142-00344

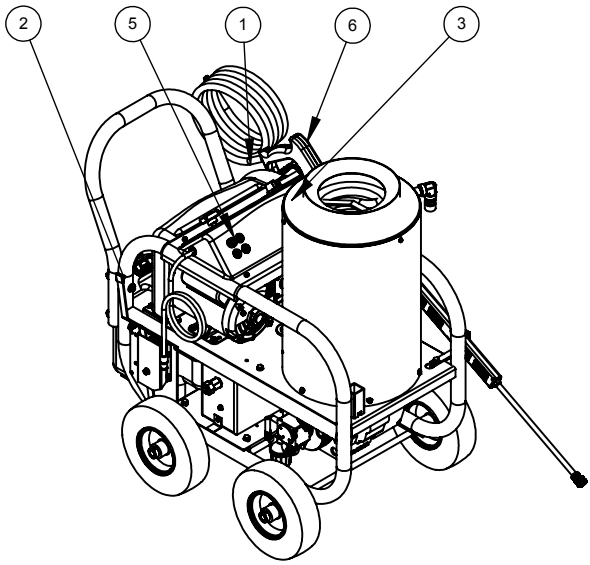
BURNER

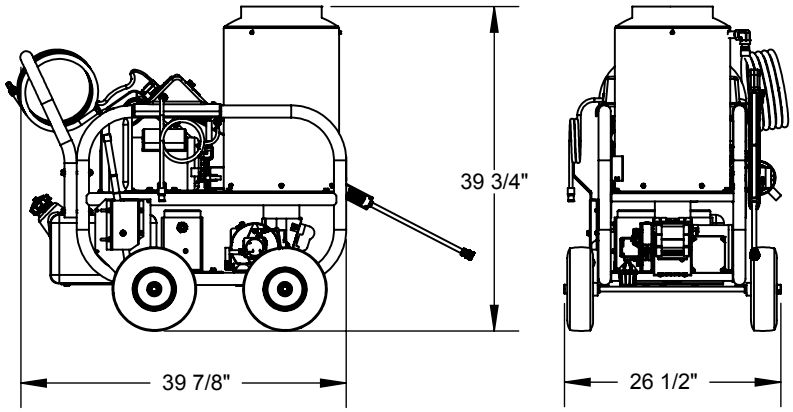
Burner Part Number	V00-173173, V00-173133
Burner Type	Pressure Atomizing
Fuel Type	Kerosene, #1 or #2 Diesel
Fuel Pressure	125 PSI / 9 BAR
Fuel Pump	(Suntec) P/N V00-14283
Motor Voltage	115v 1PH 60hz
Motor Speed	3250 RPM
Horsepower	1/5 HP

Burner Nozzle	1.10 80 Degree A
	p/n V1.10 80DA
Fuel Consumption	1.23 Gal/Hr / 4.7 L/Hr
Fuel Pressue	125 Psi

English to Metric Conversions		
1 gal/m	=	3.7843 L/m
1 hp	=	.7457 kw
100 psi	=	6.8964 bar
1 ft	=	.3048 m
1 in	=	2.54 cm
1 lb	=	.4536 kg
$\frac{(^{\circ}F - 32)}{1.8}$	=	$^{\circ}C$

Final Assembly

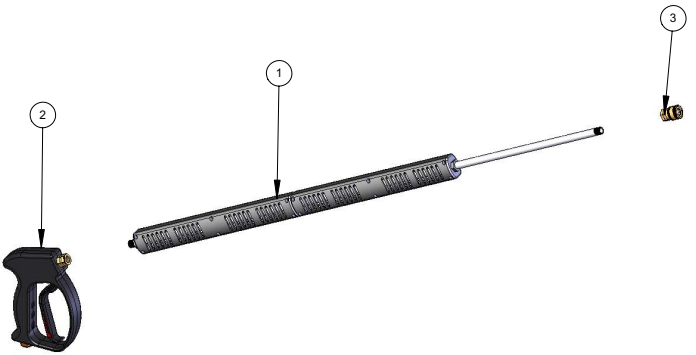




ASSEMBLY, FINAL
4/4/2008

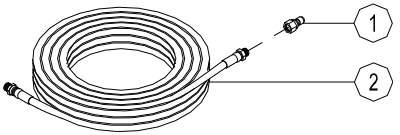
ITEM NO.	PART NUMBER	PART DESCRIPTION	QTY.
1	2102-00710	ASS'Y, HOSE - 3/8 X 50 100R1	1
2	216AX-00603	ASSEMBLY, CLEANER	1
3	D02-00001E	DECAL, SERIAL NO	1
4	H09-12500	RIVET, POP	2
5	J00-15030-2	TIP, SPRAY - #1503	1
6	J06-00158-B	ASSEMBLY, GUN & WAND - 42"	1

Trigger Gun & Wand Assembly

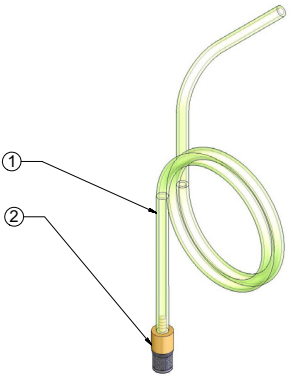


ASSEMBLY, GUN & WAND - 42"
p/n: J06-00158-B
6/2/2009

ITEM NO.	PART NUMBER	PART DESCRIPTION	QTY.
1	J06-00104E	ASSEMBLY, WAND - 42"	1
2	J06-00158	GUN, TRIGGER	1
3	W04-24225-A	COUPLER, 1/4F X 1/4FNPT	1



2102-00710 PART LIST		
ITEM	PART NUMBER	PART DESCRIPTION
1	W04-31231-B	Coupler, 3/8M X 3/8FNPT
2	K02-03150E5	Assembly, Hose – 3/8 X 50’



4120-00902P PART LIST		
ITEM	PART NUMBER	PART DESCRIPTION
1	C04-00131	Screen, Chemical
2	Z01-08413-2	Hose, Poly Braid – 84”

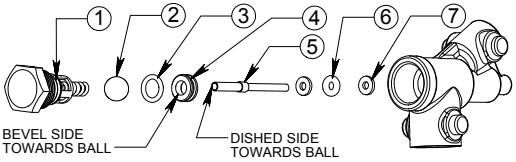
BREAKDOWN, GUN - TRIGGER

EXPLODED VIEW - P/N J06-00158

SPECIFICATIONS

MAXIMUM VOLUME.....10.0 GPM / 37.9 LPM
MAXIMUM PERSSURE.....5000 PSI / 344.7 BAR
RATED TEMPERATURE.....300 F / 150 C
WEIGHT.....1.8 LBS. / 0.8 KG
INLET.....3/8" NPT FEMALE
OUTLET.....1/4" NPT FEMALE

YG3500



REPAIR INSTRUCTIONS

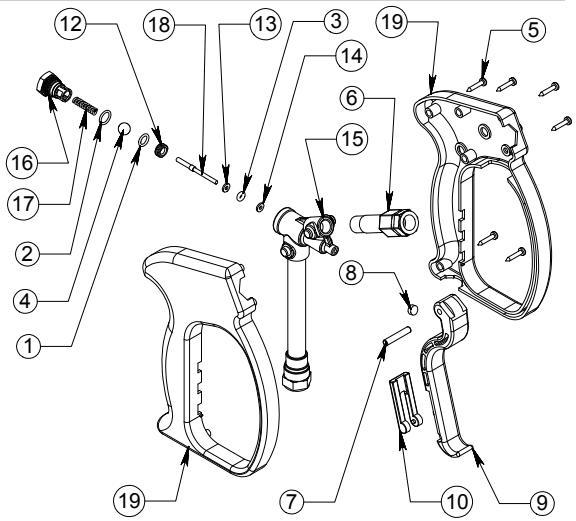
1. Remove screws from handles and remove handle housings.
2. With 18mm socket remove retainer being careful to catch the spring and ball as they fall out of the housing.
3. Remove and replace parts with those found in the kit.
4. Assembly in reverse order.

KIT, REPAIR PART - NUMBER J06-99158C

WARNING:
DO NOT USE ACID CONCENTRATES THROUGH THE GUN

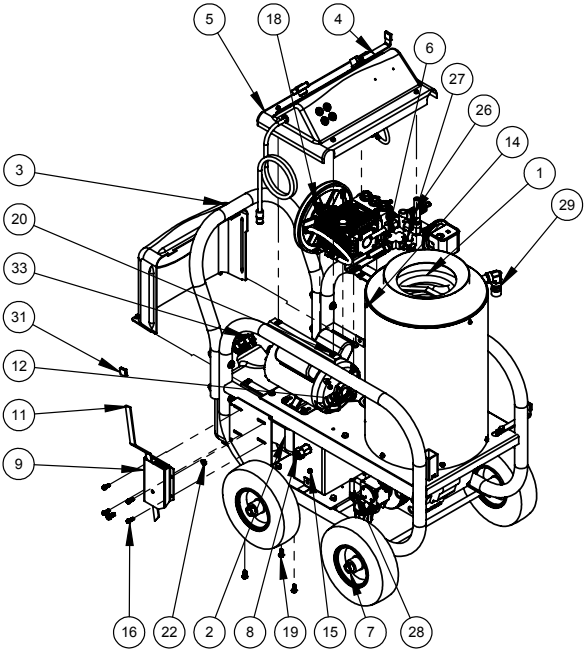
WARNING:
Never secure trigger gun in an open postion (trigger pulled back) by means other than the operator's hand. Bodilay harm may occur if the operator loses control of the trigger gun.

CAUTION:
Always engage trigger safety latch when not in use.



PART LISTS			
ITEM	***PART NUMBER***	***PART DESCRIPTION***	***QTY.***
1	C07-01300-08	O-RING - 1/16CS X 5/16ID	1
2	C07-01425	FILTER, WATER	1
3	J06-00121-07	O-RING - 3/32 CS X 1/8 ID	1
4	J06-00121-15	BALL, SS 5/16	1
5	J06-00132-19	SCREW, SELF TAP - 3.5MM X 18MM	7
6	J06-00158-01	FITTING, DISCHARGE - 1/4 FNPT	1
7	J06-00158-02	PIN, TRIGGER - 5MM X 27.5MM	1
8	J06-00158-03	CAM	1
9	J06-00158-04	TRIGGER	1
10	J06-00158-05	LATCH, SAFETY	1
11	J06-00158-06	FITTING, INLET - 3/8 FNPT	1
12	J06-00158-08A	SEAT, VALVE	1
13	J06-00158-09	WASHER, FLAT	1
14	J06-00158-10	WASHER, FLAT - BRASS	1
15	J06-00158-11	HOUSING, VALVE	1
16	J06-00158-12A	RETAINER, VALVE	1
17	J06-00158-13	SPRING, COMPRESSION	1
18	J06-00158-14	PIN, VALVE - 4MM X 44MM	1
19	J06-99158A	HOUSING, HANDLE	1

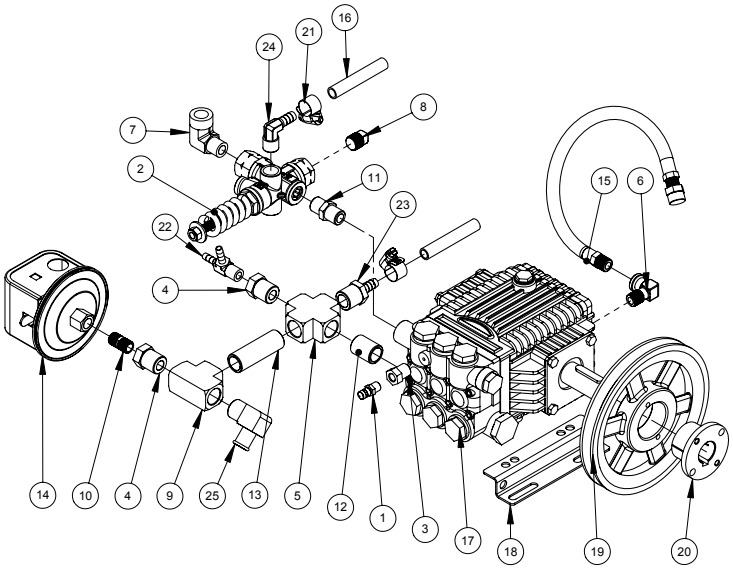
General Assembly



ASSEMBLY, GENERAL
4/4/2011

ITEM NO.	PART NUMBER	PART DESCRIPTION	QTY.
1	2122-00210	ASSEMBLY, COIL TOP	1
2	216AX-00125-P	TANK, FUEL - PLASTIC	1
3	216AX-00150-P	SHIELD, PULLEY - PLASTIC	1
4	216AX-00164F	HANGER, GUN	1
5	216AX-00302	ASSEMBLY, CONTROL PANEL	1
6	216AX-00501E	ASSEMBLY, PUMP	1
7	216AX-00657	ASSEMBLY, PRE-CLEANER	1
8	216AX-01121	ASSEMBLY, FLOAT TANK	1
9	AS14-00616-NPB	BRACKET, BRAKE	1
10	C03-00518	VALVE, RELIEF	1
11	D430M-10176R	HANDLE, BRAKE	1
12	F04-00453	GROMMET, RUBBER	1
13	H03-31302	Bolt, J	1
14	H04-19011	SCREW, SELF TAP	3
15	H04-25002	SCREW, CAP	9
16	H04-25006	SCREW, CAP	4
17	H04-25035	SCREW, SET - 1/4-20UNC x 1	3
18	H04-31306	SCREW, CAP - 5/16 X 3/4	9
19	H06-25003	NUT, HEX	7
20	H06-25007	NUT, TINNERMAN - 1/4"	7
21	H06-31300	NUT, LOCK - 5/16"	9
22	H06-31309	NUT, LOCK	1
23	K31-00900	HOSE, WATER	1
24	K60-01200	HOSE, WATER - 5/8 X 12"	1
25	R03-00125	PULLEY, V-AK25	1
26	W02-00031	CLAMP, HOSE	2
27	W02-00033	CLAMP, HOSE	3
28	W02-00033-P	CLAMP, HOSE	4
29	W04-34155-A	COUPLER, 3/8F X 1/2MNPT	1
30	Y01-00016	HOSE, PULSE	1
31	Z01-00014	CAP, VINYL	3
32	Z01-02013-2	HOSE, POLYBRAID	2
33	ZA1-00002	CAP, FILLER	1

Pump Assembly



ASSEMBLY, PUMP
P/N 216AX-00501E
08-19-2008

ITEM NO.	PART NUMBER	PART DESCRIPTION	QTY.
1	C03-00810	VALVE, AIR	1
2	C07-03700X	VALVE, UNLOADER (SILVER)	1
3	E04-00001-58	BUSHING, PIPE	1
4	E04-00005-48	BUSHING, PIPE	2
5	E07-00001-4	CROSS, PIPE	1
6	E08-00006-48	ELBOW, PIPE	1
7	E08-00011-58	ELBOW, PIPE	1
8	E09-00003-2	PLUG, PIPE	1
9	E10-00005-4	TEE, PIPE	1
10	E13-00010-2	NIPPLE, PIPE	1
11	E14-00010-68	NIPPLE, 3/8MNPT-CLOSE PS PIPE SCH80	1
12	E15-00010-48	NIPPLE, BRASS 1/2"	1
13	E15-00025-48	NIPPLE, BRASS 1/2"	1
14	F04-00761	SWITCH, VACCUM	1
15	K21-02214-1/4	ASSEMBLY, HOSE-OIL, DRAIN	1
16	K33-01300	HOSE, WATER - 3/8 X 13"	1
17	N07-00115	PUMP, WATER	1
18	N07-20046-P	MOUNT, PUMP	1
19	R03-00669	PULLEY, V	1
20	R04-00001	BUSHING, PULLEY	1
21	W02-00032	CLAMP, HOSE	2
22	W02-10016-8	BARB, HOSE	1
23	W02-10030-8	BARB, HOSE	1
24	W02-10040-8	BARB, HOSE	1
25	W02-10057-8	BARB, HOSE	1

Pump Breakdown

Performance

Discharge Volume	7.6 GPM / 6.3LPM
Pump Head Pressure	2500PSI / 172BAR

General

Crankshaft Rotation	Clockwise & Counter
Max Speed	1450/1750 RPM
Max Pumped Fluid Temp.	165˚F / 74˚C
Inlet Pressure	-9 in HG@ 75˚F to 116 PSI -0.3 BAR @ 24˚ to 8 BAR
Weight (Wet)	15.2 lbs / 6.9 kg

Lubrication

Oil Change Interval	After 1st 50 and 500 hrs
Oil Type	SAE 20, 30 (non-detergent)
Crankcase Capacity	11.8 fl oz / 0.35 LT

Torque

Valve Plug (39)	59.0 ft lbs / 80 kg M
Mount to Crankcase (24)	14.7 ft lbs / 2.0 kg M
Rear Crankcase Cover to Crankcase (12)	7.3 ft lbs / 10 kg M
Bearing Retainer to Crankcase (2)	7.3 ft lbs / 10 kg M
Rear Crankcase Cover to Plug (15)	14.7 ft lbs / 2.0 kg M
Nut to Crosshead (39)	11.0 ft lbs / 15.0 kg M
Plug to Pump Head (30,31)	29.4 ft lbs / 40 kg M
*Head to Crankcase (36)	8.8 ft lbs / 12 kg M

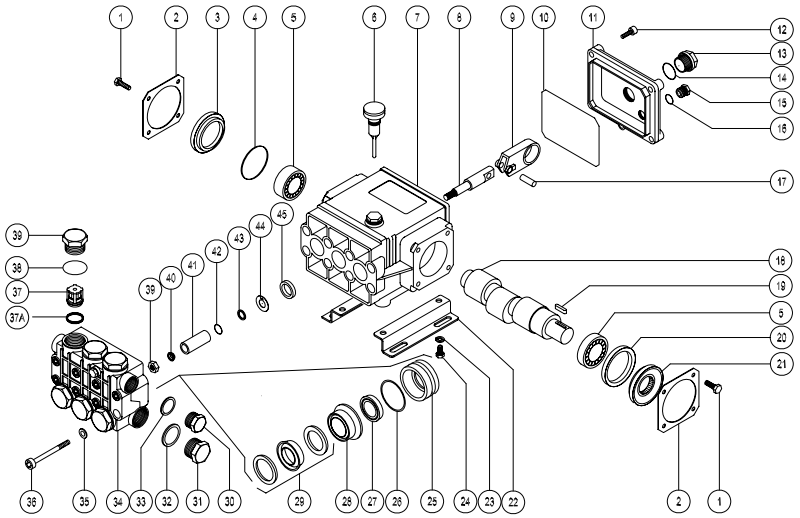
*Note: When plunger nut is removed, install a new copper washer and flinger washer to ensure proper fit and seal of ceramic plunger. Each time the plunger screw is torqued, copper washers form to plunger. If same copper washers are reused cracking or a poor seal may result.

Parts Packages

Part No.	Description	Item	Qty
N07-99123	**Valve Assemblies**		
	Ass'y, check valve	37	6
	O-Ring	37A	6
N07-99124	**Valve Plugs**		
	Plug	39	6
	O-Ring	37	6
N07-99083	**Crosshead Seals**		
	Seal, Crosshead	45	3
N07-99196	**Retainer & Seal**		
	Seal, Water – 15mm	27	3
	Packing, V – 15mm	29	3
N07-99226	**V-Packing, Adapter & Seal**		
	Retainer, Seal–15mm	24	1
	O-Ring	26	1
	Seal, Water – 15mm	27	1
	Adapter – 15mm	28	1
	V-Packing – 15mm	29	1
	Adapter, Front	27	3
N07-99200	**Seal Retainer**		
	Retainer, Seal & O-ring	25,26	3

Accessories

Oil – Case (6) One Pint Bottles	p/n N07-OILCA
Oil – Bottle (1) One Pint Bottle	p/n N07-OILCA-1
Oil – Case (24) One Pint Bottles	p/n N07-OILCA-2



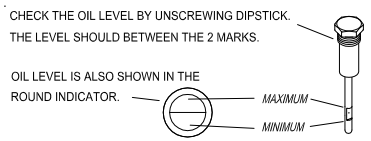
Parts List

Item	p/n	Description	Item	p/n	Description
1	N07-20018	Screw, Cap	24	N07-82083	Retainer, Seal
2	N07-20019	Retainer, Bearing	25	N07-98016	O-Ring
3	N07-40029	Cover, Crankshaft	26	N07-82063	Seal, Water – 15mm
4	N07-20021	O-Ring	27	N07-99164	Adapter, Female – Front 15mm
5	N07-20022	Bearing, Roller	28	N07-92084	Packing, V – High Press 15mm
6	N07-20024	Dipstick, Oil	29	N07-20049	Plug, Pipe
7	N07-98023	Crankcase	30	N07-20050	Plug, Pipe
8	N07-98038	Crosshead	31	N07-20051	Washer, Flat
9	N07-98034	Rod, Connecting	32	N07-20011	Washer, Flat
10	N07-29026	O-Ring	33	N07-94001	Head, Manifold 15mm
11	N07-98026	Cover, Rear	34	N07-20003	Washer, Flat
12	N07-20027	Screw, Cap	35	N07-98002	Screw, Cap – 8mm x 65mm
13	N07-98029	Indicator, Oil Level	36	N07-99123	Kit, Valve Assembly
14	N07-80009	O-Ring	37	N07-20004	O-Ring
15	N07-20030	Plug, Pipe	37A	N07-20009	O-Ring
16	N07-20028	O-Ring	38	N07-47010	Plug, Pipe
17	N07-98032	Pin, Crosshead	39	N07-12056	Nut, Hex
18	N07-17931	Crankshaft	40	N07-98085	Adapter, Plunger
19	N07-98033	Key	41	N07-47040	Plunger – 15mm
20	N07-98045	Seal, Oil	42	N07-20039	Washer, Flinger – Copper
21	N07-20046	Mount, Pump	43	N07-98028	O-Ring
22	N07-20047	Washer, Lock	44	F04-76509	Ring, Anti-Extrusion

Pump Maintenance

GENERAL PUMP MAINTENANCE

OIL LEVEL



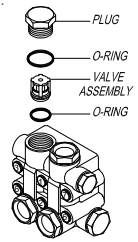
TOOL KITS

PACKING EXTRACTION KIT ..... P/N Z09-00028

COMPLETE TOOL KIT ..... P/N Z09-00021

VALVE SERVICE

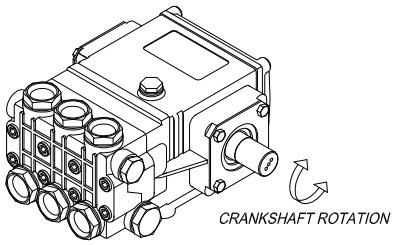
1. Remove the plugs holding the valve assemblies.
2. Remove and discard o-rings from the plugs. Clean plugs with solvent or soap and water. Allow to dry.
3. Using a needle nose pliers, fingers, or hook shaped tool, remove the valve assemblies from the head. Remove and discard the o-rings from the valve assemblies and/or head. Examine each valve assembly and discard damaged parts. Refer to the "**PUMP BREAKDOWN"** for part numbers of any replacement items.
4. Clean any accumulated debris from the valve cavities and flush with water.
5. Wash the valve assemblies in clean water and rinse. While still wet, test each valve assembly by sucking on the valve seat. A properly sealing valve will allow a good vacuum to be developed and maintained, while a malfunctioning valve will not. Good valve assemblies should be set aside for installation in step 7.



6. Malfunctioning valve assemblies must be replaced.
7. Lubricate a new o-ring with the pump crankcase oil and install into valve cavity in the head. Install a good valve assembly into the cavity as illustrated.
8. Lubricate a new o-ring with pump crankcase oil and place on a plug cleaned in step 2 above.
9. Install a plug into the pump head. Tighten plug by hand.
10. Torque the plug to the value indicated in the "TORQUE" section of the pump specifications.
11. Repeat steps 7 through 11 for remaining valve assemblies.

HEAD REMOVAL

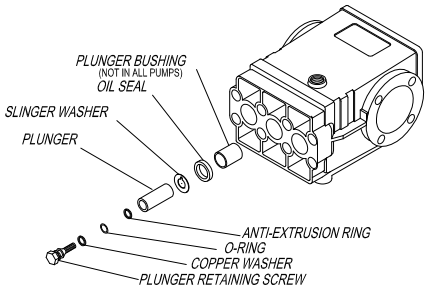
1. Remove the cap screws holding the pump head to the crankcase. A metric tool is required for this step. Be careful not to lose the washer on each cap screw.
2. Remove the head by rotating the crankshaft and tapping the head away from the crankcase with a soft mallet. Keep rear surface of the head parallel to the front surface of the crankcase to prevent binding on the plungers.
3. Once the head is removed, protect the plungers from damage.



GENERAL PUMP MAINTENANCE

PLUNGER SERVICE

1. Remove pump head per "HEAD REMOVAL".
2. Remove any packings and retainers left on the plungers by pulling them straight off.
3. Examine each plunger, looking for a smooth surface free of any scoring, cracks, or pitting. Any defective plungers should be removed per "PLUNGER REMOVAL".
4. Discard and replace any defective plungers.
5. Reinstall the plunger per "PLUNGER INSTALLATION".
6. Reinstall head per "HEAD INSTALLATION".



PLUNGER REMOVAL

NOTE: When the plunger screw is removed, it is important to install new o-ring, anti-extrusion, and copper washers.

1. Remove the plunger screw is removed, it is important to install new o-ring, anti-extrusion, and copper washers.
2. Remove the plunger retaining screw by turning counterclockwise. Remove and replace copper washer.
3. Remove and discard o-ring and anti-extrusion ring from retainer screw.
4. Remove the plunger from the cross head and examine it for cracks, scoring, or pitting.
5. Remove and discard copper flinger washer, clean with solvent and allow to dry.

PLUNGER INSTALLATION

1. Install the copper flinger washer onto the cross head.
2. Slide the plunger onto the crosshead.
3. Lubricate an o-ring with crankcase oil and install into the groove on the plunger screw. Install the anti-extrusion ring into the groove next to the o-ring. Note: The o-ring should be nearest the screw head and the anti-extrusion ring nearest the threads.
4. Apply a drop of thread sealant to the threads of the retainer screw.
5. Thread the plunger retainer screw into the cross head making sure the copper flat washer is installed onto the screw.
6. Torque the plunger retainer screw to the value indicated in the torque section of the pump specifications.

PACKING SERVICE

1. Remove the head per "PUMP HEAD REMOVAL".
2. Remove any packings and female adapters left on the plungers by pulling them straight off. Insert proper packing extractor onto the extractor hammer. Insert packing extractor and tool through the packings and adapters remaining in the head. Tighten the hammer and remove the remaining items in the head. Remove packings and o-rings from adapters. Discard the o-rings and packings.
3. Clean the packing canities in the head and rinse with clean water.
4. Clean exposed plungers. Clean male and female adapters with soap and water and allow to dry.
5. Examine male and female adapters, discard worn items. Trial fit the female adapters into the head checking for binding or damage. Discard and replace damaged items.
6. Lubricate packing cavities in the head and all packings and adapters with pump crankcase oil.
7. Lay head on the bench with packing cavities up. Install one male adapter in each cavity with the flat side down.
8. Install one v-packing into each cavity with the lips pointing down. A packing insertion too of the appropriate size is recommended for this operation.

Pump Maintenance Record

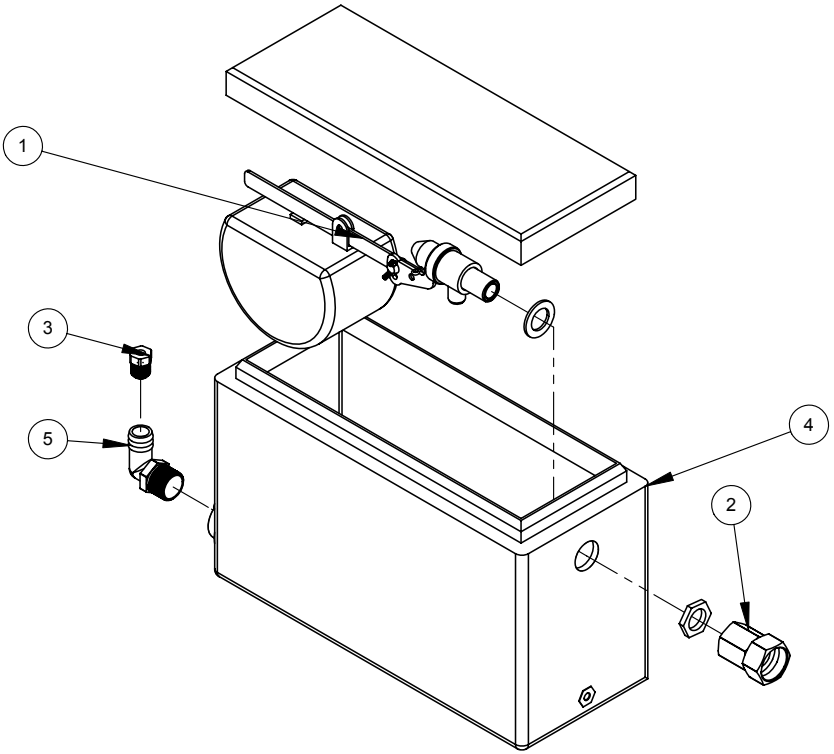
Oil Change

Month/Day/Year	Operating Hours	Oil Brand & Type

Pump Service

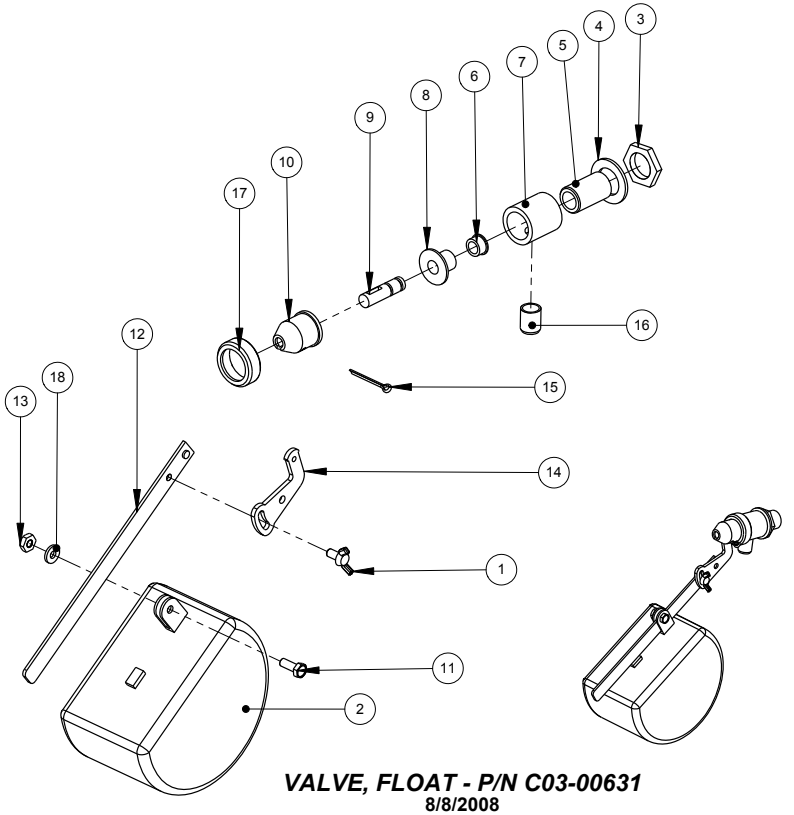
Month/Day/Year	Operating Hours	Type of Service

Float Tank Assembly



ASSEMBLY, TANK - FLOAT
216AX-01121

ITEM NO.	PART NUMBER	PART DESCRIPTION	QTY.
1	C03-00631	FLOAT VALVE	1
2	C05-00274	ADAPTER, GARDEN HOSE	1
3	E09-00002-P1	RESTRICTOR, PLUG - 1/4 ORIFICE	1
4	EM28-20200-L	TANK, FLOAT	1
5	W02-10025-P	BARB, HOSE	1



VALVE, FLOAT - P/N C03-00631

8/8/2008

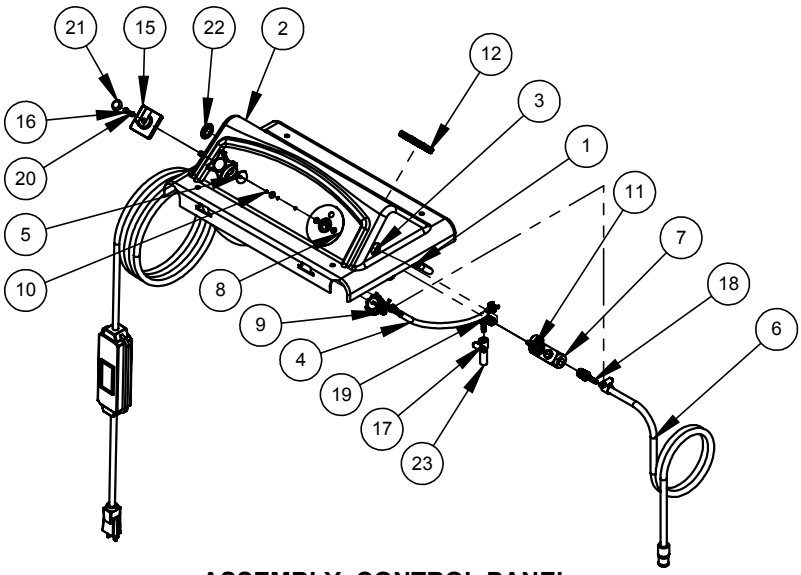
PARTS LIST

ITEM NO.	PART NUMBER	PART DESCRIPTION	QTY.
1	C03-00625-10	SCREW, WING - 10-32UNF	1
2	C03-00628	FLOAT, PLASTIC	1
3	C03-00631-01	NUT,HEX - 3/8FNPT	1
4	C03-00631-02	WASHER, FLAT - RUBBER	1
5	C03-00631-03	NIPPLE, BRASS - 3/8NPT	1
6	C03-00631-04	SEAT, VALVE-NYLON	1
7	C03-00631-05	HOUSING, VALVE	1
8	C03-00631-06	PISTON	1
9	C03-00631-07	ROD, PISTON-5/16CS X 1 1/4 PLASTIC	1
10	C03-00631-08	GUIDE, PISTON	1
11	C03-00631-10	SCREW, CAP	1
12	C03-00631-11	ARM, FLOAT	1
13	C03-00631-14	NUT, HEX - BRASS	1
14	C03-00631-16	LEVER - BRASS	1
15	C03-00631-17	KEY, COTTER	1
16	C03-00631-18	NIPPLE, TOE	1
17	C03-0631-09	NUT, RETAINER	1
18	H05-18700	WASHER, FLAT	1

SPECIFICATIONS

MAXIMUM VOLUME.....7 GPM / 26 LPM
MAXIMUM PRESSURE.....140 PSI / 10 BAR
MAXIMUM TEMPERATURE .....140° F/60° C
PORT SIZE - INLET.....3/8" NPT
DIMENSIONS...11.4 X 4.1 X 2.8 IN / 290 X 104 X 71MM
WEIGHT.....0.6 LB / 0.3 KG
HOUSING MATERIAL .....BRASS
O-RING MATERIAL.....BUNA-N

Control Panel Assembly



ASSEMBLY, CONTROL PANEL

ITEM NO.	PART NUMBER	PART DESCRIPTION	QTY.
1	2142-00344	ASSEMBLY CORD - F04-00177 W/FORKS	1
2	216AX-00301-P	PANEL, CONTROL - PLASTIC	1
3	216AX-00310-P	BOX, CONTROL - PLASTIC	1
4	216X-00343	ASSEMBLY, CORD	1
5	320AX-00342	ASSEMBLY, CORD - 16/3SO X 37 2 FORKS, 1 RING, BLACK TAPE	1
6	4120-00902P	ASSEMBLY, CHEMICAL LINE	1
7	C03-00307	VALVE, METERING	1
8	D01-00060W	DECAL, METERING VALVE	1
9	F04-00311	CONNECTOR, CONDUIT - 3/4" 0.68 - 0.80	2
10	F04-00411	BUSHING, STRAIN RELIEF	1
11	F04-00420	BUSHING, INSULATION	1
12	F04-00451	GROMMET, RUBBER	4
13	F04-00615	TERM, SPLICE	2
14	F04-00616	TERM, INSULATOR	2
15	F04-00741A	SWITCH, CAM, - 32AMPS	1
16	H04-19020	SCREW, MACHINE - 10-24UNC X 1/2 PHILLIPS PAN HEAD ZP	2
17	W02-00033	CLAMP, HOSE	2
18	W02-10019-8	BARB, HOSE	1
19	W02-10031-8	BARB, HOSE	1
20	Z01-00031	CAP, PLUG - 3/16"	2
21	Z01-00032	CAP, PLUG - 7/16"	1
22	Z01-00161	PLUG, DOMED	1
23	Z01-01713-2	HOSE, POLYBRAID	1

VALVE, METERING - P/N C03-00307

OPERATION

HANDLE-

Turning Chemical flow handle clockwise will shut off chemical flow.

FLOW ADJUSTING SCREW

Turning the flow adjusting screw clockwise lowers the chemical flow. Turning the screw counterclockwise lowers the flow.

SPECIFICATIONS

Minimum Flow ..... 0 - 20 GPH / 0 - 76 LPH
MAXIMUM TEMPERATURE .....200F° / 93°C
WEIGHT.....0.75 LBS. / 0.33 KG
INLET.....1/4 FNPT
OUTLET .....1/4 FNPT
O-RINGS.....VITON
VALVE HOUSING MATERIAL.....BRASS

MAINTENANCE

VALVE STEM REMOVAL -

1. Using screw driver remove cap (item 1A).
2. Holding handle and using socket remove nut (item 1B) and lock washer (item 1C) found inside handle.
3. Remove mounting nut (item 1E).
4. Holding valve housing (item 7), turn the valve retainer (item 2) counter clockwise be careful not to lose o-ring off bottom of retainer.
5. Holding the valve retainer (item 2) turn stem (item 4) counterclockwise until it comes out of the bottom of the retainer.

VALVE STEM INSTALLATION -

Reinstall in reverse order lubing o-rings before reinstallation.
Torque retainer (item 2) to 13 ft/lbs.

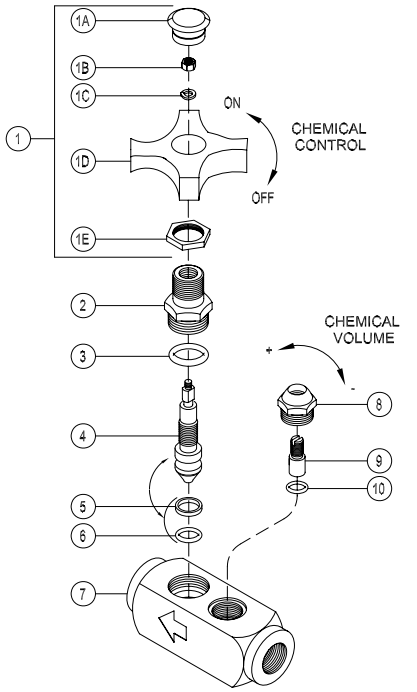
REMOVE FLOW ADJUSTING SCREW -

1. Remove the adjusting screw retainer (item 8) turning couter-clockwise.
2. Hold the retainer (item 8), using a screw driver turn the adjusting screw (item 9) clockwise until it comes out of the bottom.
3. Inspect screw for any nicks or scratches and replace as necessary.
4. Remove and replace o-ring (item 10).

REINSTALL FLOW ADJUSTING SCREW -

Reinstall in reverse order lubing o-rings before reinstallation.
Torque retainer (item 2) to 30 ft/lbs

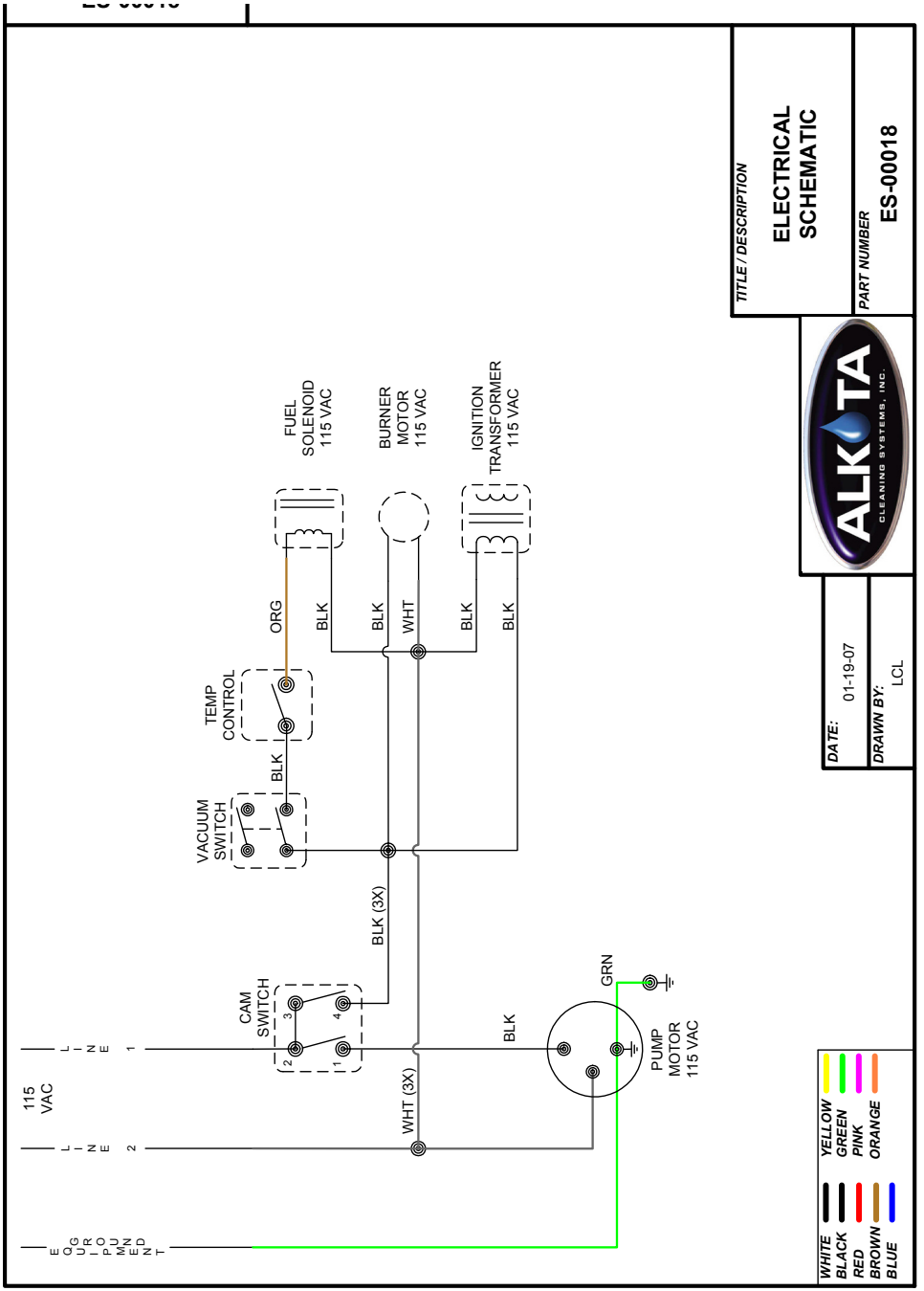
EXPLODED VIEW



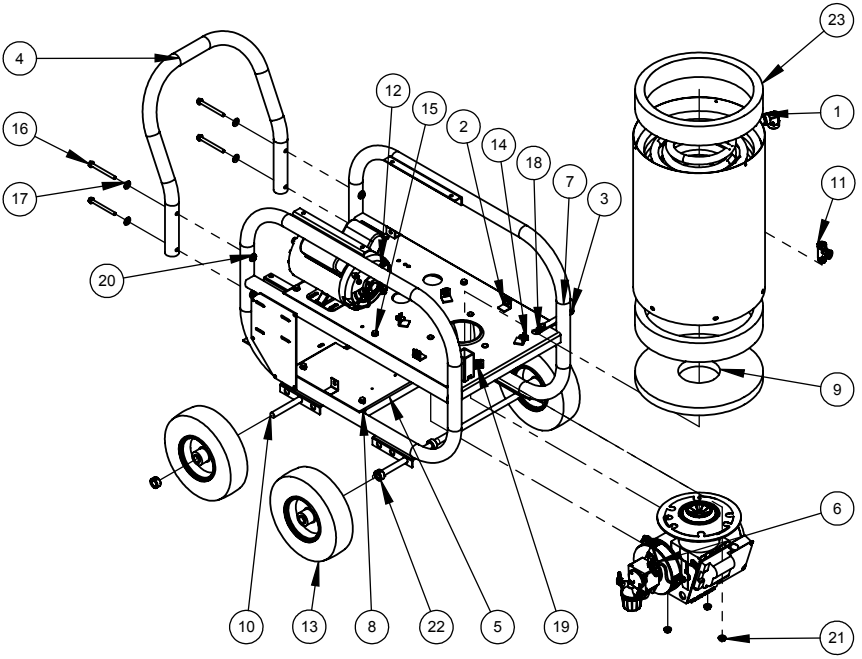
PARTS LIST

ITEM	PART NO.	DESCRIPTION
1	C07-00307-01	KIT, HANDLE
1A	----------	CAP, PLASTIC
1B	----------	NUT, HEX
1C	----------	WASHER, LOCK
1D	----------	HANDLE, ADJUSTMENT
1E	----------	NUT, HEX
2	----------	RETAINER, VALVE STEM
3	----------	O-RING - VITON 1/16CS X 3/16ID
4	----------	STEM, VALVE - SHUT-OFF
5	----------	RING, ANTI-EXTRUSOIN
6	----------	O-RING - VITON 3/32CS X 1/4ID
7	----------	HOUSING, VALVE
8	----------	RETAINER, ADJUSTING SCREW
9	----------	SCREW, ADJUSTING - FLOW
10	----------	O-RING - VITON 1/16CS X 1/8ID
	D01-00060	DECAL, METERING VALVE

Electrical Schematic



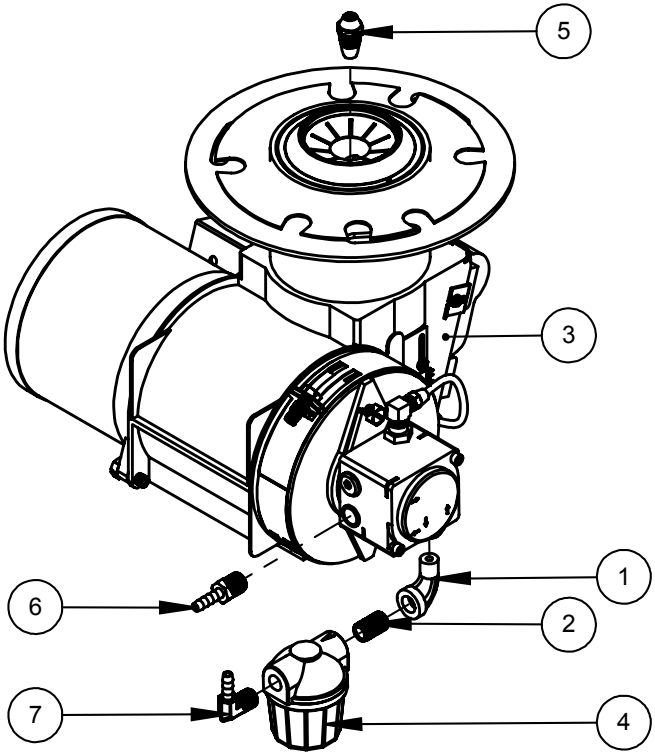
Pre-Cleaner Assembly



ASSEMBLY, PRE-CLEANER
4/8/2008

ITEM NO.	PART NUMBER	PART DESCRIPTION	Default/ QTY.
1	2142A-00207	COIL, PIPE - SHORT	1
2	216AX-00134	MOUNT, PUMP & MOTOR	1
3	216AX-00164F	HANGER, GUN	1
4	216AX-00179F	HANDLE, FRAME	1
5	216AX-00193A	WELDMENT, MOUNT - TANK	1
6	216AX-00400	ASSEMBLY, BURNER	1
7	216AX00130FL	SIDE, FRAME (LEFT) 22" X 33"	1
8	216AX00130FR	SIDE, FRAME (RIGHT) 22" X 33"	1
9	90-00119	INSULATION - 1 x 14DIA	1
10	AR58-02600	ROD, AXLE	2
11	E10-00021-58	TEE, STREE - 3/8	1
12	F02-00138-U	MOTOR, ELEC 2.3HP	1
13	G02-00018A	ASS'Y, TIRE & RIM - 10"	4
14	H04-25002	SCREW, CAP	6
15	H04-31306	SCREW, CAP - 5/16 X 3/4	10
16	H04-31331	SCREW, CAP	4
17	H05-31300	WASHER, FLAT - 5/16	8
18	H06-25006	NUT, TINNERMAN - 5/16	10
19	H06-25007	NUT, TINNERMAN - 1/4"	6
20	H06-31300	NUT, LOCK - 5/16"	4
21	H06-37500	NUT,LOCK-3/8-16UNC HEX	3
22	H06-62503	COLLAR, SHAFT - 5/8"	4
23	Z01-05043	INSULATION, CERAMIC FIBER	2

Burner Assembly



ASSEMBLY, BURNER

ITEM NO.	Part Number	PART DESCRIPTION	QTY.
1	E08-00006-2	ELBOW, PIPE	1
2	E13-00010-2	NIPPLE, PIPE - 1/4"	1
3	V00-173133	BURNER, OIL	1
4	V04-00311	FILTER , FUEL	1
5	V1.10 80DA	NOZZLE, BURNER	1
6	W02-10019-8	BARB, HOSE	1
7	W02-10031	BARB, HOSE	1

Maintenance Procedures

Priming the machine

Shut off the fuel tank valves. Spin off the clear bowl, fill with clean fuel and coat the round gasket (3) with fuel. Reinstall th clear bowl and tighten ¼ to 1/3 turns after the gasket contacts the upper housing. Turn on the fuel tank valves. Start the machine and check that there are no leaks.

Draining water

Check the collection bowl daily. Drain off water contaminants by unscrewing the clear bowl turning counter-clockwise. Start the machine and allow air to purge from the fuel system prior to operating the equipment.

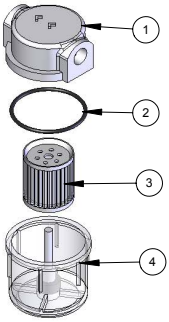
Element replacement frequency

Frequency of element replacement is determined by contamination level in the fuel. Replace the element every 50 hours.

Note: Foul smelling diesel fuel is an indication of microbiological contamination. A change in fuel source is recommended. Always carry a spare filter element as one tank full of contaminated fuel will plug the fuel filter element prematurely.

Element replacement procedure

1. Shut off the fuel tank valves.
2. Unscrew the clear bowl turning counter-clockwise.
3. Remove and discard the filter element.
4. Follow listed procedures under “PRIMING.”

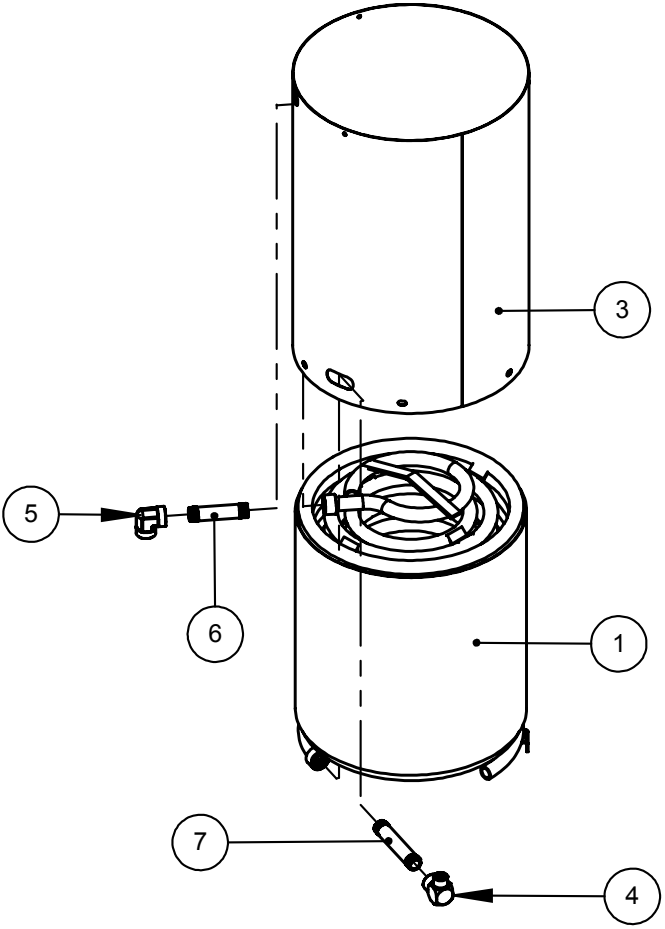


FILTER, FUEL - 1/4F X 1/4F
p/n: V04-00314
2/26/2010

ITEM NO.	PART NUMBER	PART DESCRIPTION	QTY.
1	V04-00314-1	HOUSING, UPPER-1/4F X 1/4F ALUMINUM	1
2	V04-00314-2	O-RING,	1
3	V04-00314-3	SCREEN,FILTER-SS ELEMENT	1
4	V04-00314-4	BOWL, FILTER-CLEAR PLASTIC	1

Trouble	Possible Cause	Remedy
1. Fuel bowl leaking.	A. Deteriorated gasket.	A. Remove and Replace Gasket.
	B. Housing Cracked.	B. Remove and Replace Housing.
	C. Bowl rim cracked, nicked, or scratched.	C. Remove and Replace Bowl.
	D. Gasket missing.	D. Replace Gasket.
	E. Loose Fuel Bowl.	E. Tighten Fuel Bowl Onto Filter.
2. Air leaking into system (indicated by air bubbles in bowl during operation).	A. Cracked Component.	A. Inspect Filter Bowl, Filter Housing, and Gasket.
	B. Loose Filter bowl.	B. Tighten Fuel Bowl Onto Fuel Filter.

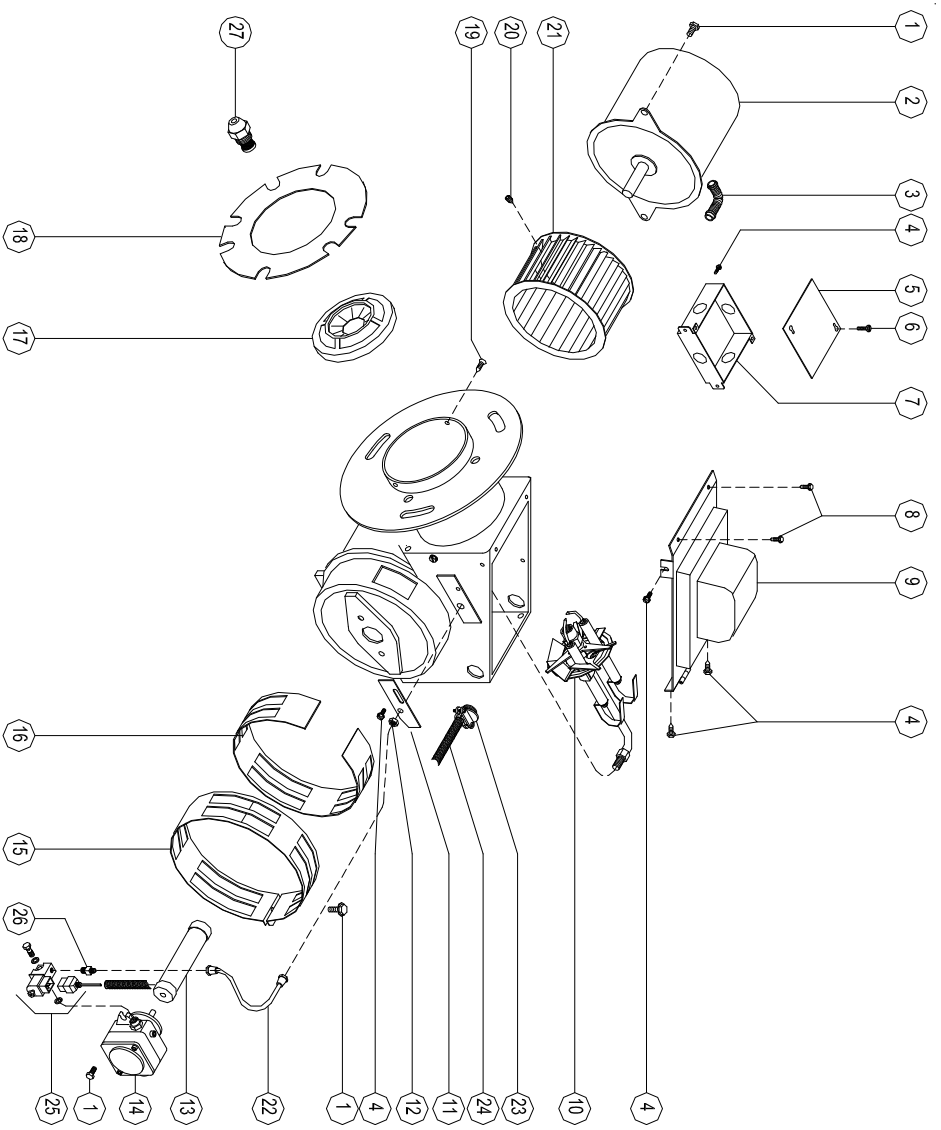
Coil Assembly



COIL, PIPE - SHORT

ITEM NO.	Part Number	PART DESCRIPTION	QTY.
1	2142A-00205	COIL - W/LIFT BRACKET	1
2	AA18-00101	ANGLE, BRACKET	1
3	AS16-04426PR	WRAPPER, COIL	1
4	E08-00012-1	ELBOW, REDUCING	1
5	E08-00016-5	ELBOW, FORGED	1
6	E15-00035-2	NIPPLE, PIPE - GS	1
7	E15-00045-2	NIPPLE, PIPE - GS	1

Burner Breakdown



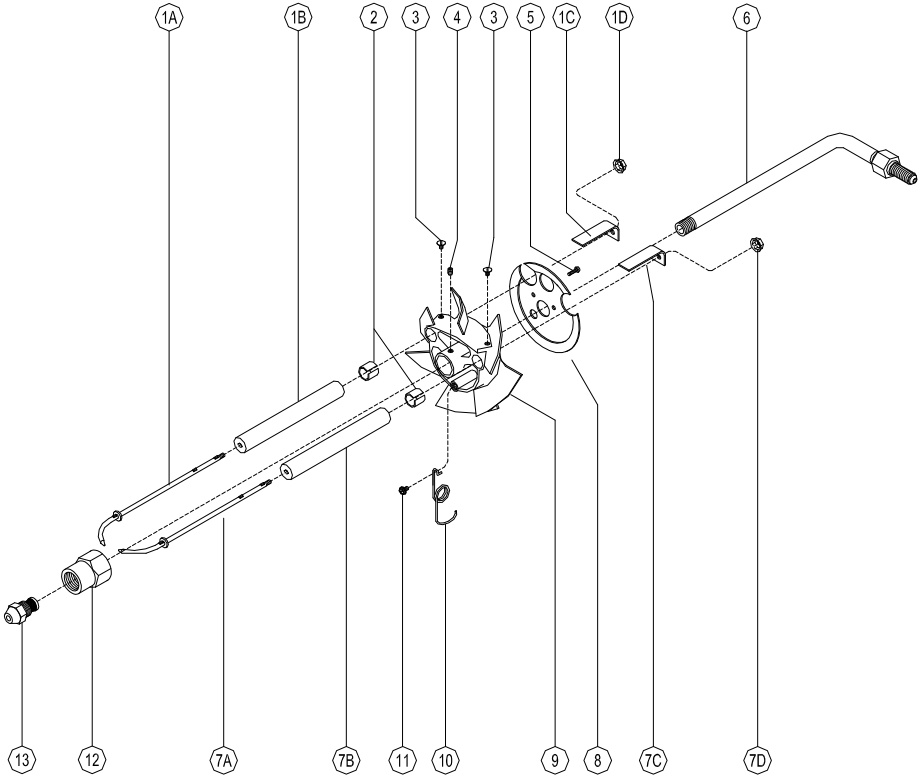
PARTS LIST					
ITEM	PART NUMBER	PART DESCRIPTION	ITEM	PART NUMBER	PART DESCRIPTION
1	V00-12701	Screw, Thread Cutting	15	V-20602-002	Band, Outer
2	V00-20627	Motor, Electric – 115V	16	V-20601-002	Band, Inner
3	V00-13121	Strain Relief, Cord	17	V00-14157	Cone, Air - #1A
4	H04-19000	Screw, Thread Cutting	18	V00-12484	Gasket, Flange
5	V00-13073	Cover, Junction Box	19	V00-14116	Screw, Machine
6	H04-16404	Screw, Thread Cutting	20	H04-31302	Screw, Set
7	V00-21319	J-Box	21	V00-21427	Fan w/ Item 27
8	V00-12699	Screw, Machine	22	V00-14451-1	Assembly, Oil Line
9	V-101121-001	Ignitor	*22	V00-14451	Assembly, Oil Line
10	V-30537-003	Assembly, Burner Gun	*23	F04-00310	Connector, Conduit
11	V00-13392	Cover, Slot	*24	F05-10310	Conduit, Electrical)
12	V00-14296	Nut, Hex	*25	F04-00974	Solenoid, Oil
13	V00-13424	Coupling, Shaft	*26	V00-13064-1	Connector, Flare
14	V00-14283	Pump, Fuel	27	----------	Nozzle – See Burner Ass'y

*Specific to P/N V00-173173 (w/ Solenoid)

ASSEMBLY, GUN - BURNER

EXPLODED VIEW - V-30537-006

30537-006



PARTS LIST

ITEM	*PART NO.*	*DESCRIPTION*	*ITEM*	*PART NO.*	*DESCRIPTION*
1	V-100772-001	ASSEMBLY, ELECTRODE - RH	7	V-100773-001	ASSEMBLY, ELECTRODE - LH
*1A	----------	STEM, ELECTRODE - RH	*7A	----------	STEM, ELECTRODE - LH
1B	V00-12574	INSULATOR, ELECTRODE	7B	V00-12574	INSULATOR, ELECTRODE
1C	V00-100004-1	BAR, BUSS - STRAIGHT	7C	V00-100004-1	BAR, BUSS - STRAIGHT
1D	V00-13110	NUT, PAL	7D	V00-13110	NUT, PAL
2	V00-12408	BUSHING, INSULATOR	8	V00-13409	PLATE, BAFFLE - 2 1/2"
3	V00-12694	SCREW, MACHINE	9	V00-14310	SUPPORT, ELECTRODE
4	H04-19002	SCREW, SET	10	V00-14442	SPRING, ELECTRODE SUPPORT
5	V00-12695	SCREW, MACHINE	11	V00-13511	SCREW, THREAD CUTTING
6	V-21410-002	ASSEMBLY, OIL PIPE	12	V00-12362	ADAPTER, NOZZLE
*ELECTRODE STEMS AVAILABLE IN ELECTRODE ASSEMBLIES ONLY			13	V1.75 90DA	NOZZLE, BURNER

OIL BURNER MAITENANCE
OIL FIRED CLEANERS

AIR BAND AJUSTMENT

NOTE: The air band adjustment on this burner has been preset at the factory (elevation approximately 1400 feet). On equipment installed where elevation is substantially different, the air band(s) must be readjusted.

1. Move the air bands as indicated below with the machine in operation.

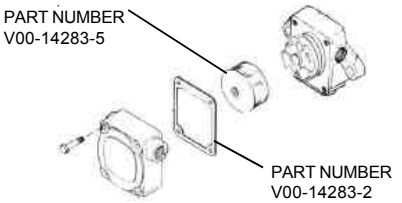
   NOTE: The air band should be set so the exhaust gives the smoke spot specified in the GENERAL section of the **MACHINE SPECIFICATIONS** on a Shell-Bacharach scale. If a smoke tester is not available, a smoky exhaust, oily odor, or sweet smell indicates insufficient air while eye-burning fumes indicate too much air.

2. Tighten the cap screw retaining the air bands.

FUEL PUMP SCREEN

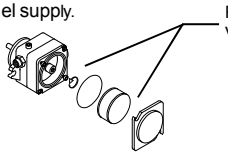
SUNSTRAND PUMP

1. Shut off fuel supply.
2. Loosen the 4 screws holding the cover to the fuel pump housing.
3. Take cover and cover gasket off and pull strainer off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Turn on fuel supply. Failure to do so will result in fuel pump damage.



DANFOSS PUMP

1. Shut off fuel supply.
2. Loosen the 2 screws with 7/64 allen wrench one turn.
3. Turn cover counter clockwise and pull strainer and cover off of pump housing.
4. Clean out any dirt remaining in the bottom of strainer cover. If there is evidence of rust inside of the unit, be sure to remove water in supply tank and fuel filter.
5. Reinstall reverse of removal.
6. Turn on fuel supply.



MACHINE UNPACKING

1. Remove burner junction box cover.
2. Turn on burner and make sure ignition transformer is receiving rated voltage.
3. Turn off burner.
4. Loosen screw and swing transformer away from burner gun assembly.
5. Turn on burner.
6. Short the high voltage terminals. **CAUTION**: Use screwdriver with a well insulated handle to avoid shock.
7. Open gap by drawing screwdriver away from one electrode while touching the other.
8. The spark should jump between 5/8 to 3/4 inches, if it does not jump, replace the transformer.
9. Turn burner off.
10. Partially close transformer. Check if buss bars align and contact transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.

11. Close transformer, reposition retainer clip and tighten.

BUSS BAR ALIGNMENT

1. With burner off, loosen screw and swing the transformer away from burner gun assembly.
2. Inspect the buss bars and transformer electrodes for pitting or corrosion.

3. Partially close the transformer. Check if the buss bars contact and are in alignment with transformer electrodes.
4. Proper adjustment is obtained by gently bending the buss bars until they spring against, parallel, and are in full contact with the transformer electrodes.
5. With buss bars aligned, carefully close and fasten the transformer.

BURNER GUN REMOVAL & INSTALLATION

1. Disconnect the fuel line from the burner gun assembly oil line fitting. Loosen the other end of the line and swing line out of the way.
2. Remove the retaining nut.
3. Loosen screw and swing transformer away from burner gun assembly.
4. Carefully remove the burner gun assembly.
   A. Check and replace electrode insulators if cracked.
   B. Clean burnt buss bars.
   C. Clean carbon off electrodes.
   D. Clean carbon off oil nozzle. (Use caution not to scratch face of nozzle or orifice.)
   E. Check for a loose oil nozzle.
   NOTE: Check with dealer and/or replace nozzle with proper nozzle.
5. Gently replace burner gun assembly in air tube. **CAUTION:** Do not force. Forcing will cause electrode misalignment
6. Reinstall the retaining nut.

   Reinstall the oil line making sure both ends are tight.
7. Partially close transformer. Check if buss bars align and contact the transformer electrodes. If buss bars do not contact, see Buss Bar Alignment.
8. Close transformer, reposition retainer and tighten screw.

ELECTRODE ASSEMBLY ADJUSTMENT

1. Loosen screws holding electrode assemblies.
2. Raise electrode tips 5/32 inches above surface plane or end of oil nozzle.
3. Place each electrode tip 5/16 inches from center of spray nozzle hole, maintaining previous measurement.
4. Spread electrode tips to 1/8-inch gap maintaining previous measurements.
5. When the proper measurements are obtained, gently tighten screws that hold electrode assembly in place.

   CAUTION: Do not over tighten, as this will cause the electrode insulator to fail.

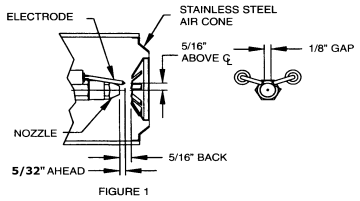


FIGURE 1

BURNER NOZZLE REPLACEMENT

1. Using the Fuel Nozzle wrench handle, place outer part of wrench over nozzle adapter and inner part of the wrench over the nozzle.
2. Turn the outer handle counter clockwise while holding the inner handle and remove the nozzle.
3. To reinstall reverse operation and tighten to "squeaky tight".

FUEL PRESSURE ADJUSTMENT

1. Remove Plug on top of the fuel pump.
2. Install a 0-200 PSI Pressure Gauge.
3. Insert a 1/8" Allen Wrench and turn clockwise to increase pressure and counter clockwise to decrease.
4. Remove Gauge and reinstall plug.

ASSESSORIES

ZO1-00090 - Allen Wrench 1/8" #8.
Z01- 00095 -Fuel Nozzle Changing Wrench
Z01-00092 -Fuel Pump Wrench (Sundstrand)
Y01-00041-Gauge-0- 200 PSI
Z09-00004 - Bacharach Smoke Tester


Z01-00095

OIL FIRED BURNER TROUBLESHOOTING

TROUBLE	POSSIBLE CAUSE	REMEDY
1. Burner will not ignite.	A. Electrodes out of alignment.	A. See “ADJUSTING ELECTRODE ASSEMBLY” in BURNER MAINTENANCE SECTION.
	B. Electrodes insulator failure.	B. Remove and replace if there are breaks, cracks, or spark trails.
	C. Water flow switch not closing.	C. Adjust, repair, or replace switch.
	D. Vacuum switch not closing.	D. Adjust, repair or replace switch.
	E. Temperature control switch not closing.	E. Adjust or replace the TEMPERATURE CONTROL.
	F. Fuel solenoid valve not opening.	F. Clean, repair, or replace solenoid.
	G. Weak transformer.	G. Clean and check transformer terminals. Check transformer for spark per “TRANSFORMER TEST” in BURNER MAINTENANCE SECTION.
	H. Faulty cad cell (if equipped).	H. Clean and test cad cell, replace if required.
	I. Faulty promary control (if equipped).	I. Replace primary control.
	J. Burner motor thermal protector locked out.	J. See “Burner motor thermal protector locked out.
	K. Wiring.	K. All wire contacts are to be clean and tight. Wire should not be cracked or frayed.
	L. Burner switch.	L. Test switch operation. Remove and replace as necessary.
	M. Pump pressure.	M. See “Low fuel pressure”.
	N. Venting.	N. A downdraft will cause delayed ignition. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	O. Sooting.	O. Soot deposits on the coil and burner can interrupt air flow, and cause shorting of the electrodes. Clean as required.
	P. No fuel.	P. See “No fuel.”
2. No Fuel	A. Clogged fuel filter.	A. Remove and replace filter per **FUEL FILTER SECTION.**
	B. Fuel leak.	B. Repair as necessary.
	C. Kinked or collapsed fuel line.	C. Remove and replace fuel line.
	D. Low fuel pressure.	D. See “Low frel pressure”.
	E. Faulty burner oil pump.	E. Adjust pressure or replace.
	F. Air leak in intake lines.	F. Tighten all fittings.
	G. Clogged burner nozzle.	G. Remove and relace (Do not clean).
3. Low fuel pressure.	A. Clogged fuel filter.	A. Remove and replace filter per FUEL FILTER page.
	B. Clogged fuel pump filter screen.	B. Remove pump cover and clean strainer using a brush and clean fuel oil, diesel oil or kerosene.
	C. Fuel oil too viscous.	C. Operate a lighter oil or in warmer area.
	D. Air leaks in intake lines.	D. Tighten all fittings.
	E. Kinked or collapsed fuel line.	E. Remove and replace.
	F. Burner shaft coupling slipping.	F. Remove and replace.
	G. Fuel Nozzle worn.	G. Remove and replace with specified nozzle on BURNER ASSEMBLY.
	H. Faulty oil pump.	H. Remove and replace.
4. Pulsating pressure.	A. Partially clogged fuel pump strainer or filter.	A. Remove and replace strainer per FUEL PUMP FILTER in **OIL BURNER MAINTNANCE** Section.
	B. Air leaking around fuel pump cover.	B. Check fuel pump cover screws for tightness and damaged gasket.
5. Unit Smokes.	A. Improper fuel.	A. Refuel with FUEL specified on **MACHINE SPECIFICATIONS.**
	B. Air to burner insufficient	B. See AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section.
	C. Fuel nozzle interior.	C. Replace nozzle.
	D. Water in fuel	D. Inspect fuel filter for water presence.
	E. Gun out of alignment.	E. Bend oil pipe to center burner nozzle.
6. Burner motor thermal protector kicked out.	A. Low voltage.	A. Voltage must match those specified in the BURNER section of the manual under MACHINE SPECIFICATIONS section.
	B. Fuel too viscous.	B. Operate in warmer conditions or with fuel adapted to cold weather conditions.
	C. Fuel pump defective.	C. Check that fuel pump turns freely.
	D. Motor defective.	D. Call service technician or take motor to repair/ warranty station.
7. Delayed ignition (rumbling, noisy starts).	A. Dirty or damaged electrodes.	A. Clean and replace.
	B. Air adjustment open too far.	B. Readjust per AIR BAND ADJUSTMENT in **OIL BURNER MAINTENANCE** section.
	C. Poor fuel spray pattern.	C. Remove and replace with fuel nozzle specifies in **BURNER ASSEMBLY.**
	D. Incorrect electrode setting.	D. Readjust per ADJUSTING ELECTRODE ASSEMBLY in **OIL BURNER MAINTENANCE.**
	E. Weak transformer.	E. See TRANSFORMER CHECK in **OIL BURNER MAINTENANCE** section.
8. Burner does not electrically come in.	A. High limit temp control reset tripped if so equipped.	A. Reset if necessary. CAUTION: Do not keep hitting the “reset button” if you have oil pressure you are just filling the burner combustion chamber with oil and if ignited will cause an explosion.
	B. Burner motor reset button tipped.	B. Reset if necessary.

Trouble Shooting

Pump

Trouble	Possible Cause	Remedy
Oil leaking in the area of water pump crankshaft	Worn crankshaft seal, bad bearing, grooved shaft, or failure of retainer o-ring.	Remove and replace.
Excessive play on crankshaft	Defective bearings.	See “Worn bearing.”
	Excess shims.	Set up crankshaft.
Loud knocking in pump	Loose connecting rod screws.	Tighten connecting rod screws per PUMP SPECIFICATIONS
	Worn connecting rod.	Replace connecting rod per PUMP MAINTENANCE.
	Worn bearings.	Replace bearings per PUMP MAINTENANCE.
	Loose plunger bushing screw.	Tighten plunger screw per PUMP SPECIFICATIONS.
Oil leaking at the rear portion of the pump	Damaged or improperly installed oil gauge window gasket or rear cover.	Replace gasket or o-ring.
	Oil gauge loosed.	Tighten oil gauge.
	Rear cover screws loose.	Tighten rear screws to torque values in PUMP SPECIFICATIONS.
	Pump overfilled with oil, displaced through crankcase breather hole in oil cap/dipstick.	Drain oil. Refill to recommended oil level as stated in OIL LEVEL in PUMP MAINTENANCE.
Water in crankcase	May be caused by humid air condensing into water inside.	Maintain or step up lubrication schedule.
	Worn or damaged plunger screw o-ring.	Remove and replace. See PLUNGER SERVICE in PUMP MAINTENANCE.
Worn bearing	Excessive belt tension.	See BELT TENSION in MACHINE MAINTENANCE.
	Oil contamination.	Check oil type and change intervals per PUMP SPECIFICATIONS.
Short bearing life	Excessive belt tension.	See BELT TENSION in MACHINE MAINTENANCE.
	Misalignment between pump and motor.	Re-align pump and motor.
	Oil has not been changed on regular basis.	Check oil type and change intervals per PUMP SPECIFICATIONS.
Short seal life	Damaged plunger bushing.	Replace plunger bushing.
	Worn connecting rod.	Replace connecting rod.
	Excess pressure beyond the pump’s maximum rating.	Match pressure stated in PUMP SPECIFICATIONS.
	High water temperature.	Lower water temperature stated in PUMP SPECIFICATIONS.

Dirty or worn check valves	Normal wear.	Remove and replace.
	Debris.	Check for lack of water inlet screens.
Presence of metal particles during oil change	Failure of internal component.	Remove and disassemble to find probable cause.
	New pump.	New pumps have machine fillings and debris and should be drained and refilled per PUMP SPECIFICATIONS.
Water leakage from under head	Worn packing.	Install new packing.
	Cracked/scored plunger.	Remove and replace plunger.
	Failure of plunger retainer o-ring.	Remove and replace plunger retainer o-ring.
Loud knocking noise in pump	Pulley loose on crankshaft.	Check key and tighten set screw.
	Defective bearing.	Remove and replace bearing.
	Worn connecting rod, crankshaft, or crosshead.	Remove and replace.
Frequent or premature failure of the packing	Scored, damaged, or worn plunger.	Remove and replace plungers.
	Overpressure to inlet manifold.	Reduce inlet pressure.
	Abrasive material in the fluid being pumped.	Install proper filtration on pump inlet pumping.
	Excessive pressure and/or temperature of fluid being pumped.	Check pressures and fluid inlet temperature. Be sure they are within specified range.
	Over pressure of pumps.	Reduce pressure.
	Running pump dry.	Do not run pump without water.
Low Pressure	Dirty or worn check valves.	Clean/replace check valves.
	Worn packing.	Remove and replace packing.
	Belt slipping.	See BELT TENSION in MACHINE MAINTENANCE.
	Improperly sized spray tip or nozzle.	See MACHINE SPECIFICATIOSN for specified spray tip or nozzle.
	Inlet filter screen is clogged.	Clean inlet filter screen.
	Pitted valves.	See VALVE SERVICE in PUMP MAINTENANCE.
Erratic pressure; pump runs rough	Dirty or worn check valves.	Clean/replace check valves.
	Foreign particles in valve assemblies.	
	High inlet water temperature.	See temperature in PUMP SPECIFICATIONS.

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Excessive vibration	Dirty or worn check valves	See “Dirty or worn check valves.”
Scored plungers	Abrasive material in fluid being pumped.	Install proper filtration on pump inlet plumbing.
Fitted plungers	Cavitation.	Decrease inlet water temperature and/or increase inlet water pressure.
Cavitation	High inlet fluid temperature, low inlet pressure.	Lower inlet fluid temperature and raise inlet fluid pressure.

Water Heater

Trouble	*Possible Cause*	*Remedy*
Machine will not rise to operating temperature	Low fuel pressure.	See BURNER on MODEL SPECIFICATIOSN for specified pressure.
	Water in fuel piping.	Drain fuel tank and remove and replace filter per FUEL FILTER INSERT.
	Fuel filter clogged.	Remove and replace fuel filter element per FUEL FILTER INSERT.
	Poor combustion.	See “Poor combustion.”
	Improper fuel supply.	Use fuel specified in BURNER section of the MODEL SPECIFICATIONS.
	Temperature control inoperative (if equipped).	See TEMPERATURE CONTROL INSERT.
Machine overheats	Insufficient water.	See “Low operating pressure” on MACHINE TROUBLESHOOTING insert.
	Temperature control inoperative.	See TEMPERATURE CONTROL INSERT.
	Improper fuel supply.	Use fuel specified in BURNER section of the MODEL SPECIFICATIONS.
Dry steam (very little moisture, very hot steam)	Insufficient water.	See “Low operating pressure” on MACHINE TROUBLESHOOTING insert.
	Improper fuel supply.	Use fuel specified in BURNER section of the MACHINE SPECIFICATIONS.
	Improper fuel pressure.	See BURNER on MODEL SPECIFICATIONS for specified pressure.
Machine smokes (sweet smelling exhaust)	Improper fuel supply.	Use fuel specified in BURNER section of MODEL SPECIFICATIONS.
	Insufficient combustion air.	See AIR BAND ADJUSTMENT on OIL BURNER MAINTENANCE insert.
	Leaking fuel system.	Correct leakage problem.
	Clogged or improper burner nozzle.	Remove (DO NOT CLEAN) and replace nozzle per BURNER ASSEMBLY INSERT.
	Loose burner nozzle.	See BURNER MAINTENANCE insert.

Machine fumes (exhaust burns eyes)	Too much combustion air.	See BURNER TROUBLESHOOTING insert.
	Improper fuel pressure.	See FUEL on MODEL SPECIFICATIONS for specified pressure.
Excessive oil dripping from laydown coil condensate.	Loose nozzle.	See BURNER TROUBLESHOOTING insert.
	Fuel pressure too high.	See FUEL PRESSURE ADJUSTMENT section on BURNER MAINTENANCE insert.
	Burner nozzle defective.	Remove and replace with appropriate nozzle found on the BURNER ASSEMBLY or BREAKDOWN insert.
	Incorrect burner nozzle.	Remove and replace with appropriate nozzle found on the BURNER ASSEMBLY or BREAKDOWN insert.
Poor combustion	Low fuel pressure.	See “Low fuel pressure” on BURNER TROUBLESHOOTING insert.
	Improper fuel supply.	See “Low fuel pressure” on BURNER TROUBLESHOOTING insert.
	Insufficient combustion air.	See AIR BAND ADJUSTMENT section on OIL BURNER MAINTENANCE.

Warranty Policy

Machines are guaranteed to be free from defects in material or workmanship under normal use and service for period of one year after delivery from the factory. Any part (other than vendor items) that is determined to be warranty will be repaired or replaced at **NO CHARGE** provided the warranty registration form is filled out in its entirety and the part is sent back freight prepaid. Any replacement parts accepted as warranty will be returned to you freight prepaid.

Our heating coil will carry a seven-year prorated warranty credit. The manufacturer will repair or replace the coil without charge for five years after delivery date from the factory for any defect in the coil that was caused by workmanship or defective steel. After the five years have expired, the credit will be prorated as follows:

First 5 years	100% Credit
Years 6 & 7	50% Credit
After 7 Years	No Credit Allowed

All parts supplied to us by other manufacturers will be subject to their guarantee and warranty. Generators, motors, and engines are required by vendors to be repaired or replaced by authorized warranty repair stations. The manufacturer will assist you in locating warranty stations around the country in cases where that is necessary. Select items carry a six-month warranty such as unloaders, triggers guns, etc.

The manufacturer, at its option, will repair or replace defective parts only, and does not allow for field labor charges for removal, installation, analysis, travel expense, or special freight expenses incurred for replacement parts.

Warranty does not apply to normal wear and tear including, but not limited to, freezing damage, freight damage, damage caused by misuse or misapplication, chemical related failures, contaminated filters and screens, moisture related fuel pump failures, stuck check valves, pump packings or seals, nozzles or orifices, paint, hoses, and gauges.

For full warranty information, contact your delivering distributor or contact the manufacturer at info@warrantysvc.com