ROSCO®

A LeeBoy Company

Operations, Service, and Parts Manual

RA-400 Spray Patcher

Manual No. 1014010-01

This manual applies to Serial Number 130973 and above.

Thank you for purchasing the Rosco RA-400 Spray Patcher. We wish you many years of safe and efficient operation of your Spray Patcher.

READ THIS MANUAL PRIOR TO OPERATING the machine. It is an important part of the machine and should be kept with in the dedicated storage container provided at all times. Though you may be familiar with similar equipment, you MUST read and understand this manual before operating the machine to help prevent injury or damage.

This manual is intended as a guide for the safe and efficient use of your machine, including procedures for proper operation and maintenance. Use it with all related supplemental books, engine, transmission manuals, and any other manuals supplied by other manufacturers. Related Service Bulletins should also be reviewed to provide information regarding some of the recent changes. If any questions arise concerning this publication or to order a replacement manual, contact your authorized LeeBoy dealer.

This manual contains information that was available at the time of printing and is subject to change without notice.

Section 1 - Safety: Contains general and specific safety guidelines for product and safety label locations.

Section 2 - Information and Specifications: Contains warranty, contact information, machine specification tables, and machine dimensions.

Section 3 - Component Location: Contains overview of major component locations and functions.

Section 4 - Operation: Contains instructions for safe operation and information for optional equipment.

Section 5 - Maintenance: Contains routine maintenance procedures, mechanical adjustments, component replacement and troubleshooting charts for common problems and corrections. (For specific engine maintenance procedures, refer to the engine manufacturer manual.)

Section 6 - Schematics: Contains electrical and hydraulic schematics for product functionality.

Section 7 - Illustrated Parts List (IPL): Contains parts numbers and illustrations for serviceable components.

LeeBoy is proud to be ISO 9001 certified. The International Standards Organization (ISO) establishes guidelines to ensure that products and services are safe, reliable, and of good quality. ISO certifies companies who demonstrate compliance with all aspects of product safety, customer satisfaction, efficiency, environmental stewardship and social responsibility. Our teams work hard to deliver quality industrial machines that exceed customer expectations and we strive for continuous improvement in everything we do. The LeeBoy family of companies is committed to total quality management with a strong focus on meeting customer needs.

LeeBoy is also proud to be an accredited ANAB manufacturer, which is a certification process comprised of quality standards established by the American National Standards Institute (ANSI) and the American Society for Quality (ASQ). The ANSI-ASQ National Accreditation Board plays an important role in ensuring the safety and quality of goods and services, along with protecting the environment.

Operating Precautions

- Always comply with local regulations regarding moving equipment on public roads and highways.
- Know and use the hand signals required for a particular job. Know who has the responsibility for signaling.
- Make sure that all lights and reflectors comply with state and local regulations. Make sure that they are clean, in good working order, and can be seen clearly by all traffic.
- DO NOT ride on attachments.
- Check all gauges and warning instruments for proper operation. If malfunctions are found, shut down the machine and report the problem for resolution. If the failure causes loss of steering control, loss of brake control, or loss of engine power, stop paver motion as quickly as possible.
- Drive the machine with care. Make sure speed is compatible with conditions. Use caution on rough ground, slopes, and while turning.
- Be alert for hazards and obstructions such as ditches, trees, cliffs, overhead power lines, and areas where there is danger of a slide.
- Be aware of and understand the job site traffic flow patterns.
- Obey flagmen, road signs, and signals.
- Watch for bystanders. Never allow anyone to be under the machine during operation. Never allow anyone to reach into the machine during use.
- Operator must understand which circumstances require using signals when working in traffic zones. Use tail lights, slow moving vehicle signs, and warning beacon as needed when traveling on public roads.

Storage Precautions

- Store machine in an area away from human activity.
- Do not permit children to play on or around the stored machine. Serious injury or death can occur from improper/unauthorized use of the machine.
- Make sure the unit is stored on a surface that is firm, level, and free of debris.
- Store the machine inside a building or cover securely with a weatherproof tarpaulin.

Maintenance Precautions

- DO NOT attempt repairs unless trained to do so. Refer to manuals and experienced repair personnel for help.
- Before working on the machine, securely block the machine and any components that may fall. Block any working components to prevent unexpected movement while repairs are being made.
- Always wear safety glasses and other required safety equipment when servicing or making repairs.
- Disconnect battery before working on the electrical system.
- Avoid lubrication or mechanical adjustments while the paver is in motion or while engine is operating.
- If lubrication or mechanical adjustment is necessary, use extreme caution.
- Never make repairs on pressurized components such as fluid lines, the fuel system, or mechanical items until the pressure has been relieved.
- When servicing or replacing hardened pins, use a brass drift or other suitable material between the hammer and pin.
- Keep brake and steering systems in good operating condition.

TORQUE SPECIFICATIONS

The following tables list torque values for standard hardware. This is a guide for average application involving typical stresses and machined surfaces. Values are based upon physical limitations of clean, plated and lubricated hardware. Under more extreme conditions, individual torque value should be followed.

Conversion formulas are provided below:

Conversion	Formula
ft-lb to N•m	[ft-lb]*1.3558 = [N•m)
ft-lb to in-lb	[ft-lb]*12 = [in-lb]
N•m to in-lb	[N•m]*8.8508 = [in-lb]

Standard Inch Fasteners

Table 2-12. Torque Specifications For Standard Inch Fasteners

SIZE	THREAD	CAPSCREWS: SAE GRADE 5				CAPSCREWS: SAE GRADE 8			
		TORQUE (ft lb)		TORQUE N•m		TORQUE (ft lb)		TORQUE N•m	
		Dry	Lubed	Dry	Lubed	Dry	Lubed	Dry	Lubed
1/4	20 UNC	8	6	11	8	12	9	16	12
	28 UNF	10	7	14	9	14	10	19	14
5/16	18 UNC	17	13	23	18	25	18	34	24
	24 UNF	19	15	26	20	27	20	37	27
3/8	16 UNC	31	23	42	31	44	33	60	45
	24 UNF	35	26	47	35	49	37	66	50
7/16	14 UNC	49	37	66	50	70	52	95	71
	20 UNF	55	41	75	56	78	58	106	79
1/2	13 UNC	75	57	102	77	106	80	144	108
	20 UNF	85	64	115	87	120	90	163	122
9/16	12 UNC	109	82	148	111	154	115	209	156
	18 UNF	121	91	164	123	171	128	232	174
5/8	11 UNC	150	113	203	153	212	159	287	216
	18 UNF	170	127	230	172	240	180	325	244
3/4	10 UNC	267	200	362	271	376	282	510	382
	16 UNF	297	223	403	302	420	315	569	427
7/8	9 UNC	429	322	582	437	606	455	822	617
	14 UNF	474	355	643	481	669	502	907	681
1	8 UNC	644	483	873	655	909	681	1232	923
	14 UNF	722	542	979	735	1020	765	1383	1037
1-1/4	7 UNC	1121	840	1520	1139	1817	1363	2464	1848
	12 UNF	1241	930	1683	1261	2012	1509	2728	2046
1-1/2	6 UNC	1950	1462	2644	1982	3162	2371	4287	3215
	12 UNF	2194	1645	2975	2230	3557	2668	4823	3617

MACHINE OVERVIEW

Figure 4-3. Machine Components Overview

ITEM NO.	CONTROL NAME	FUNCTION
1	Sprayer Boom	Working hydraulic arm for spraying emulsion and aggregate.
2	Heated Emulsion Tank	Heats and stores emulsion.
3	VORTEC System	Aggregate storage and air flow delivery system.
4	Arrow Board (Optional)	Optional arrow board to alert and direct traffic while patching.
5	Sprayer Boom Nozzle	Discharge nozzle that sprays emulsion and aggregate.

Status Icons

The Status icons are color-coded and illuminate when communicating to the operator. Pay close attention to any Status icon and color if it appears.

Table 4-3. Status Icons

Status Icon	Description
	Check Engine — When this lamp is illuminated, a fault exists within the control system. The engine may continue to operate, however, it is unable to perform DPF cleaning either automatically or manually. ⚠WARNING **Take action immediately to correct the fault.**
	Parking Break Switch — The park icon displays when the parking brake is applied. **NOTE: To perform a Parked Regeneration, the "P" and "N" lamps must be illuminated.**
	Transmission Neutral — The neutral icon displays when the transmission is in neutral. **NOTE: To perform a Parked Regeneration, the "P" and "N" lamps must be illuminated.**
	Engine Exhaust High Temperature Lamp — This lamp illuminates during the regeneration cycle to warn of high exhaust temperatures. This lamp will turn off when normal operating temperatures are reached after the regeneration cycle. ⚠WARNING **Be sure engine exhaust is away from combustible materials when this is illuminated.**
	Diesel Particulate Filter Lamp — A solid lamp is the initial warning that soot levels are rising in the DPF. A flashing lamp indicates a DPF Regeneration is needed (on some systems, the lamp will become red when flashing). The lamp will turn solid again when a regeneration is initiated. Any time the lamp begins flashing, the operator should increase the loading on the engine so regeneration is possible. ⚠WARNING **If increased load does not cause an automatic regeneration to occur, the operator should immediately perform a parked, manual regeneration.**
	DPF Regeneration Set to Inhibit — The user may choose to inhibit the regeneration if conditions are too hazardous for high exhaust temperatures. When this lamp is illuminated, a regeneration cannot be performed and soot levels will continue to rise. ⚠WARNING **Unless hazardous conditions exist, the regeneration inhibit switch and this lamp should remain off.**

Glossary of Terms and Acronyms

CAN - Controller Area Network

DM1 - Diagnostic Message 1, Active Diagnostic Trouble Codes

DM2 - Diagnostic Message 2, Previously Active Diagnostic Trouble Codes

DM3 - Diagnostic Message 3, Diagnostic Data Clear/Reset for Previously Active DTCs

DM4 - Freeze Frame Parameters

DPF - Diesel Particulate Filter

DTC - Diagnostic Trouble Code

ECU - Engine Control Unit

FMI - Failure Mode Identifier

PGN - Parameter Group Number

SPN - Suspect Parameter Number

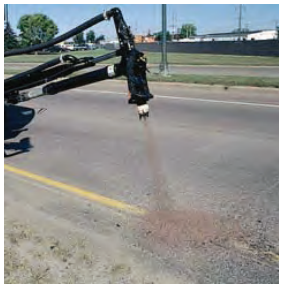
- Never mix different classes, types or grades of emulsified asphalt. Even emulsions of the same grade designation from different manufacturers can be very different chemically and in performance.
- Add warm water SLOWLY if diluting emulsified asphalt. Check the compatibility of the water and emulsion first by testing in a container before adding warm water to the emulsion tank.
- Asphalt trucks should be equipped with baffle (surge) plates to prevent sloshing while loading the material.
- Use pumps with proper internal clearances for handling asphalt. Pumps with tight internal clearances can bind and seize.
- Warm pumps to about 150° F (65° C) to facilitate start-up. DO NOT use open flames to warm pumps.
- Pump with the suction line placed at the bottom of the storage tank to minimize contamination from skinning that may have formed (see following section).
- Avoid repeated pumping and recycling since the viscosity may drop and air may become entrained, causing the emulsion to be unstable.
- Mix emulsions that have been in prolonged storage by circulation prior to application.

Storing Emulsified Asphalt

A skin of asphalt can form on the surface of emulsions when they are exposed to air. For this reason, tall vertical storage tanks are best. If a horizontal tank is used for short-term field storage, skinning can be reduced by keeping them full.

- Use insulated storage tanks to store emulsified asphalts at 50° - 185° F (10° - 85° C), depending upon the grade of emulsion and its intended use, to prevent asphalt from freezing. High viscosity rapid-set spray grades are stored at 125° F - 185° F (52° C - 85° C).
- Tanks may be circulated from top to bottom with a pump, but avoid over-pumping. Storage tanks that are not equipped with propellers or a circulating system, a very light film of kerosene or oil on the surface of the asphalt can reduce skin formation.
- Storage tanks with large, slow-turning propellers situated about three feet from the bottom of the tank are best for preventing skin formation.

Aggregate



The RA-400 Patcher is designed for use with a variety of aggregate types, but certain sizes and shapes produce the most durable patch. Use the following guidelines when choosing aggregate:

- Use clean aggregate. Dirty aggregate or excessive fines will retard the patch curing process, shorten the life of the patch, and limit adhesion of emulsion to the aggregate. Use a 200-grade sieve to test your aggregate for excessive fines. No more than three (3) percent should pass through.
- The largest aggregate particle should not exceed twice the size of the smallest particle.
- Smaller aggregate is recommended to help limit loose rock damage to vehicles. For most patching applications (i.e., potholes, cracks and thin overlays), aggregate of 1/4- or 5/16-inch (6.35 or 7.94 mm) grades are recommended. For larger areas and deeper repairs, aggregate up to 1/2-inch (12.7 mm) may be used.
- Finer grade material is recommended for patching, as it will have fewer voids. Coarse grades may be used under special conditions, such as base stabilization.
- The aggregate shape is also important. Angular particles with rough surface texture, such as crushed aggregate, will produce an interlocking effect and relatively low absorption. This commonly produces the best patch.
- Consider the availability of suitable liquid asphalts, and their electrical charge, before selecting aggregate:
    - Anionic emulsions with a negative (-) charge on the asphalt droplets perform best with aggregates that have positive (+) surface charges (such as limestone and dolomite).
    - Cationic emulsions with a positive (+) charge on the asphalt droplets perform best with aggregates that have negative (-) surface charges (such as siliceous or granite aggregates).

To fill the emulsion tank:

1. Close the emulsion tank air regulator valve (left valve) located between the emulsion tank and hopper. **(Figure 4-43)**

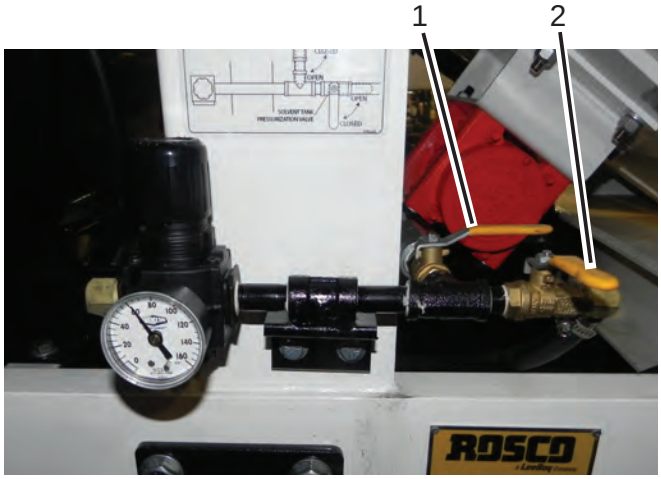


Figure 4-44. Air Regulator Valves

1 - Emulsion Tank Air Regulator Valve

2 - Solvent Tank Air Regulator Valve

2. Open the emulsion tank vent valve on top of the tank to relieve pressure. The pressure gauge must read 0 PSI before filling. **(Figure 4-45)**

***Figure 4-45.* Emulsion Tank Vent Valve**

3. Fill the emulsion tank to the desired level with quality liquid asphalt.

4. Pressurize the emulsion tank by reopening the emulsion tank air regulator valve and closing the emulsion tank vent valve. When the emulsion tank gauge reaches 60 PSI, the tank is now pressurized and ready for use.

NOTICE **For best results, fill the emulsion tank daily to reduce sludge build-up on the inside of the tank.**

Solvent Tank

Keeping the asphalt delivery system clean is an important part of operation. Because of the wide variety of liquid asphalts available for use in the RA-400 Spray Patcher, consult your asphalt supplier for the proper solvent for the specific asphalt product you're using.

Keep the solvent tank full so the asphalt delivery lines and system can be flushed and cleaned whenever needed. Be sure to flush the system at the end of each work day.

DANGER **This is a pressurized system, therefore, it is important to relieve all pressure before opening or filling the solvent tank to prevent injury.**

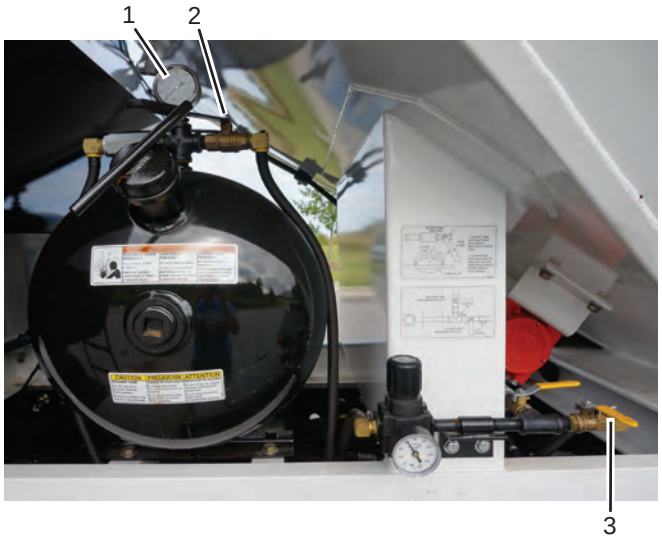


Figure 4-46. Solvent Tank and Air Regulator Valve

1 - Solvent Tank Pressure Gauge

2 - Solvent Tank Vent Valve

3 - Solvent Tank Air Regulator Valve

MAINTENANCE SCHEDULE

Before performing any maintenance procedures on the RA-400 Spray Patcher, review the safety information in **Section 2**.

⚠WARNING **Always use the appropriate and correct-sized tools for the task at hand to prevent damage or possible injury.**

⚠WARNING **Always wear heat-resistant gloves when handing hot components.**

Following the maintenance schedules and procedures will maintain the machine in top operating condition and provide years of trouble-free operation. This manual provides maintenance procedures only for the auxiliary engine and hydraulic components. Refer to the truck operator and other manuals accompanying your machine for service information pertaining to the truck components..

When performing any routine maintenance, always include the previous routine maintenance hours in the higher hourly schedule.

NOTICE **Changing oil and cleaning the machine should only be done in a designated area where the oil and chemicals can be contained. These by-products should be discarded in accordance with environmental regulations.**

Table 1-1. Periodic Maintenance Schedule

SYSTEM	ITEM	Every 10 Hours Daily	Every 50 Hours Weekly	Every 100 Hours Monthly	Every 250 Hours Quarterly	Every 500 Hours Semi-Annually	Every 1000 Hours Annually
Auxiliary Engine	Check oil level.	X					
	Check coolant level.	X					
	Check air filter.		X				
	Change air filters.				X		
	Replace fuel filter.				X		
	Change oil and oil filter. **(Initial 50 Hours)**				X		
	Drain water separator. (As needed)		X				
	Clean water separator.				X		
	Check main engine belt.			X			
Hydraulic	Check hydraulic oil level.	X					
	Change hydraulic oil and filters.				X		
	Lubricate boom components.			X			
	Check hose fittings. Replace if needed.		X				
	Replace strainers in hydraulic tank.						X
Mechanical	Rotate discharge hose.				X		
	Replace discharge hose.					X	
	Check air blower oil level.	X					
	Change air blower oil and filter.					X	
	Check air blower coupler for tightness and wear.		X				

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⚠CAUTION Use extreme caution when removing the filler cap to prevent any foreign matter from entering the hydraulic reservoir. This can cause damage to hydraulic components.

- Fill tank to the black fill line on sight gauge.
- Clean the fill cap strainer and reinstall it.

Change Hydraulic Oil and Filter

Changing the hydraulic oil removes the accumulation of dirt, water and mechanical wear particles from the hydraulic oil reservoir and system. The chemical structure of hydraulic oil changes after continuous use, therefore, new oil is important to ensure correct operation of the hydraulic system.

NOTICE Never let the hydraulic oil reservoir tank run dry. Pump damage will occur.

Condensation can also build up in the hydraulic system and clog the filter elements. This could lead to insufficient hydraulic oil at the pump and degrade performance, causing damage to components.

Change the hydraulic oil and filter after the first 100 hours of use, then every 500 hours or seasonally, whichever comes first. Also remove and clean the suction strainer at the 500-hour intervals.

Use the following procedures to change the hydraulic oil and filter:

1. Stop the engine. Allow the hydraulic oil to cool until it is at a warm temperature. Slowly loosen and remove the hydraulic oil reservoir filler cap. Put a clean, lint-free cloth over the reservoir fill tube opening and secure in place with tape.

⚠WARNING DO NOT drain the hydraulic oil from the reservoir when it is HOT. Hot hydraulic oil can cause serious injury. Drain at a warm temperature only.

2. Carefully remove the plug from the hydraulic tank. Use a drain collection container of sufficient capacity to collect the hydraulic oil underneath. Allow all of the hydraulic oil to drain into the container.
3. Check the hydraulic suction strainer in bottom of the hydraulic oil tank. Clean if necessary.
4. Install the hydraulic oil reservoir drain plug and tighten securely.
5. Unscrew hydraulic oil filter and remove. **(Figure 5-9)**

Figure 5-62. Hydraulic Oil Filter Components

1 - Filter Cover/Strainer

2 - Filter Element

3 - Filter Cover

6. Discard filter properly in accordance with government environmental regulations.
7. Reinstall new hydraulic oil filter.
8. Carefully remove the cloth from the hydraulic oil reservoir fill tube opening.
9. Refill the hydraulic oil reservoir (recommend Citgo All Weather/All Temperature Multiviscosity hydraulic oil).

NOTICE DO NOT fill the hydraulic oil reservoir with new hydraulic oil until the suction strainer has been cleaned. (See next section.)

NOTICE DO NOT overfill the hydraulic oil reservoir with oil.

10. Check the oil level at the sight gauge and add more if needed.
11. Replace the hydraulic oil fill strainer cap onto the reservoir filler neck and tighten securely.
12. Start the engine and operate hydraulic controls several times.
13. Check the hydraulic system for any leaks.

SYMPTOM	CAUSE	REMEDY
Poor or uneven aggregate flow.	Aggregate is wet or is "bridging."	Use clean, dry rock. Turn on vibrator and swing boom side to side rapidly to cause material to move to the bottom of hopper.
	Delivery hose is clogged.	Remove and clean hose. Flush nozzle. Flush delivery system with water.
	Insufficient air volume.	Check blower RPMs (should be 800 - 1500 RPMs). Clean blower air filter (or replace if needed). Check for air leaks in discharge piping and at aggregate hopper lid, slide gate and in hoses.
No aggregate flow.	Delivery hose plugged.	Check air pressure gauge--any reading above 5 psi indicates a problem). Increase engine RPMs while monitoring blower pressure but DO NOT exceed 7 psi. Open coupling on boom and clean. Disconnect hose at the rock gate, remove from hangers, and clean. The machine may have been driven with the aggregate tank slide gate open allowing rock into the hose. Be sure the Rock ON/OFF switch is set to OFF when traveling.
	Valve not activated to open rock gate.	Activate valve.
	Insufficient air volume.	Check blower RPMs (should be 800 - 1500 RPMs). Check blower air filter. Clean if needed. Check for air leaks in discharge piping and at aggregate hopper lid, slide gate and hoses.
	Slide gate jammed or frozen shut.	If frozen, use heat to thaw. If gate is jammed due to limestone buildup, spray with high-pressure water to clean. Increase relief pressure to 1200 psi, open gate, and cycle several times. Then reset relief pressure to 850 psi.
	Cap still on discharge nozzle.	Remove cap.
	Buildup on inside walls of hose.	Use clean aggregate. Carefully use a rubber hammer to tap on outside of hose to loosen buildup.
Aggregate lid settles.	Pressure setting on counter-balance valve set too low.	Lower or raise lid so the rear edge is open 4 - 6 inches. Loosen jam nut and turn adjusting screw until lid no longer settles. Turn an additional 1-1/2 turns.
	Hydraulic cylinder seals leaking.	Replace seals.
	Counter-balance valve and/or seals are worn or damaged.	Replace valve or seals.

Section 6

SCHEMATICS

RA-400 IN-CAB CONTROLS (4 OF 9)

Schematic #1013951

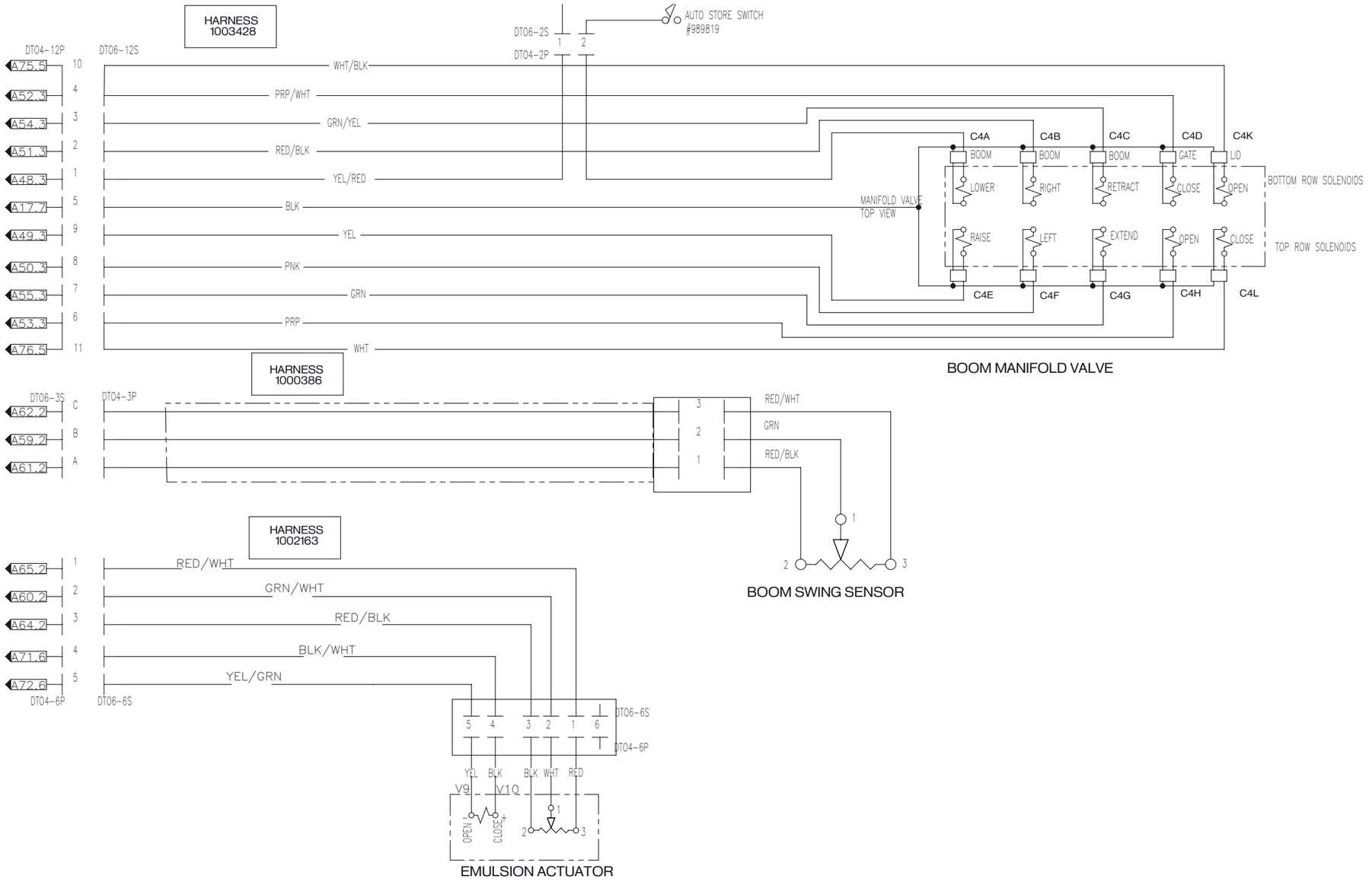


Figure 6-5. In-Cab Controls (4 of 9)

RA-400 IN-CAB CONTROLS (9 OF 9)

Schematic #1013951

CONNECTOR INFORMATION			
ID	MANUFACTURER	PART NUMBER	COMMENTS
CN2	TYCO	2821911	ALL WIF
CN3	KUBOTA	19838-65831	ALTERNATOR
CN5	KUBOTA	19838-65831	KUBOTA PUMP
	DELPHI	12015792	40285 PUMP
CN6E	DEUTSCH	HDP26-24-29SE-L015	CUSTOMER CON ENG SIDE
CN13	DELPHI	12040977	MATE 15300003
CN15	DELPHI	12110293	MATE 12129615
CN17	MOLEX	33472-1606	MATE ON ENGINE
CN18	MOLEX	19432-0013	MATE ON ENGINE
CN19	MOLEX	19433-0013	MAIN POWER
CN20	MOLEX	19432-0013	MAIN PWR FROM CUSTOMER
CN21	MOLEX	19418-0002	GLOW & ALT PWR
CN22	MOLEX	19419-0002	GLOW & ALT

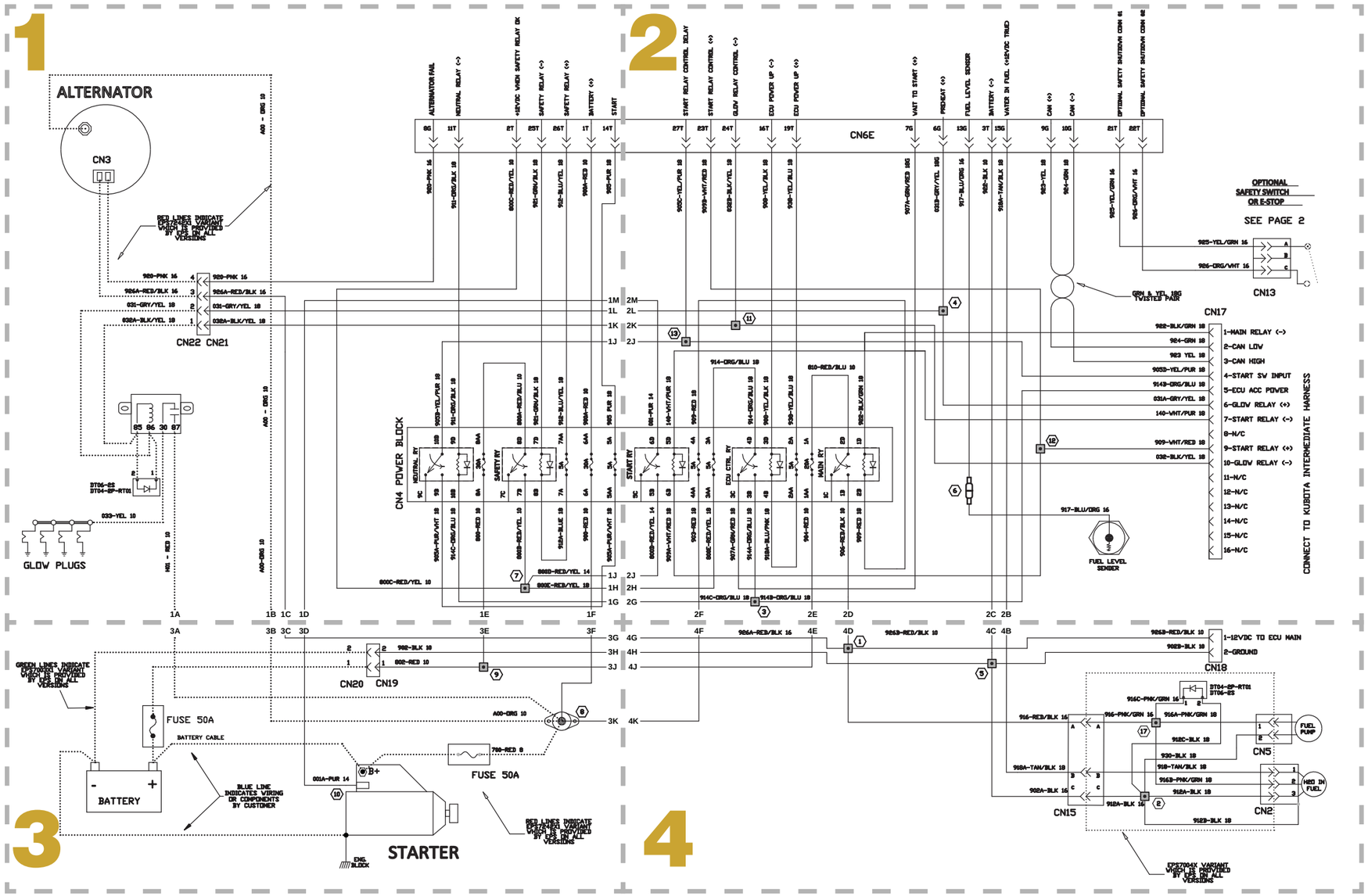


Figure 6-10. In-Cab Controls (9 of 9)

HYDRAULIC SCHEMATIC (1 OF 4)

Schematic #1011334

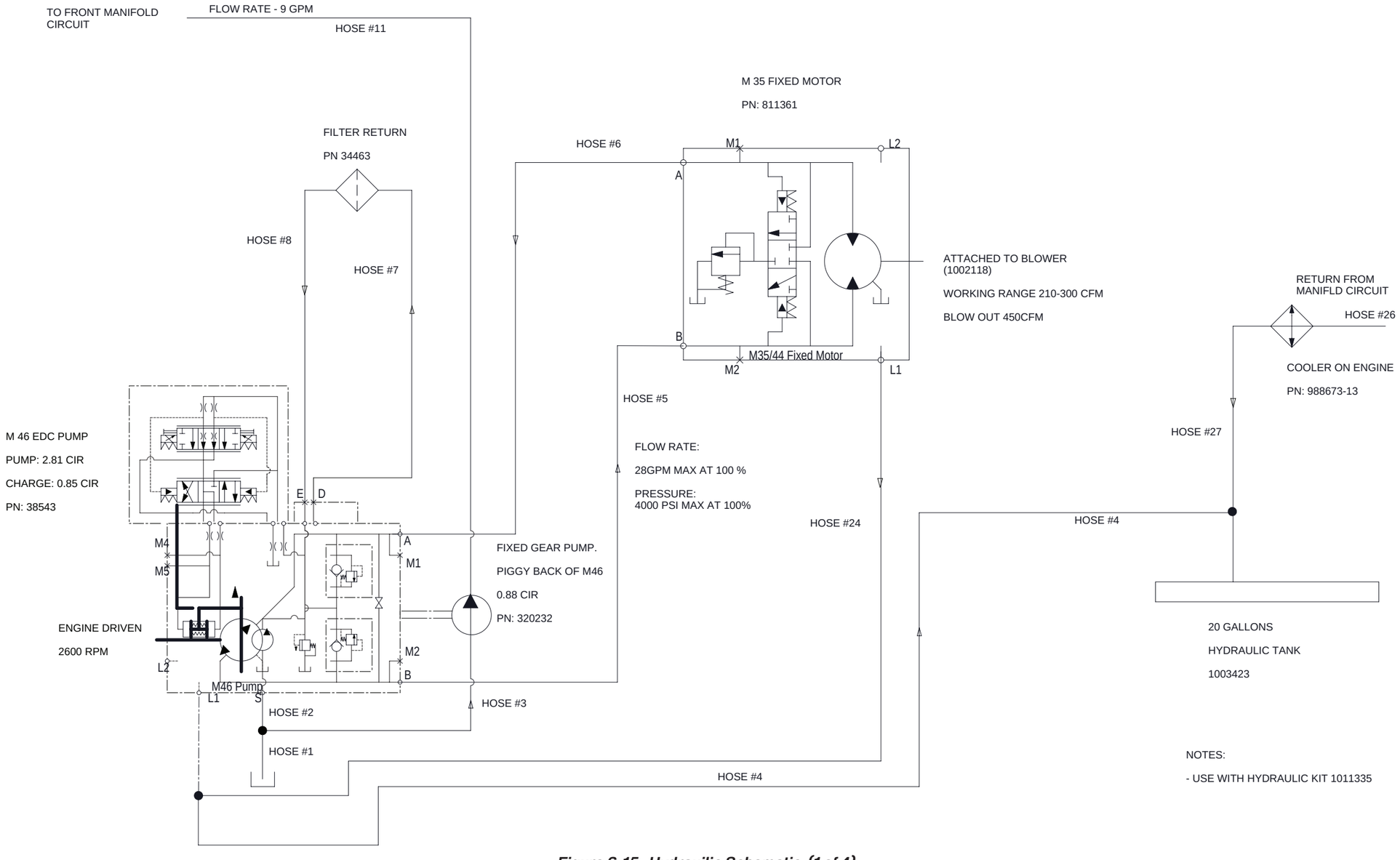


Figure 6-15. Hydrauilic Schematic (1 of 4)

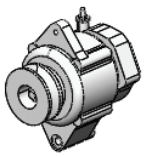
QUICK REFERENCE

FILTERS/STRAINERS		
Engine	**Description**	**Part #**
	Oil Filter	986537-03
	Water Separator	1009253-19
	Fuel Filter	1009253-19
	Air Cleaner, Primary	38385-01
	Air Cleaner, Secondary	1009253-16
Hydraulic		
	Hydraulic Filter Element	980350-01
	Charge Filter	290030
	Suction Strainer	1007095
	Charge/Return Filter Head	982940
Spray Down		
	Pump and Strainer Kit	1011738
	Strainer	1011738-1

ELECTRICAL COMPONENTS		
	Description	**Part #**
	FUSE KIT: • 25 Amp (1) • 10 Amp (2) • 5 Amp (1) • 20 Amp (14)	 37303 36340 36746 36342
	Terminal Block	685060
	Breaker, 10 Amp	986546

HEATING ELEMENTS		
	Description	**Part #**
	Main Heating Element (4)	1007276SRV
	Extensions (2)	1007278SRV

Specifications and designs may change without prior notice. These illustrations do not necessarily show the standard versions.

AUXILIARY ENGINE COMPONENTS		
	Description	**Part #**
	Engine Belt	1009253-20
	Alternator	1009253-21
	Starter	1001166-03

7

Electrical System

Item No.	Part Number	Qty.	Description	Remarks
GRP	1013982		Electrical System	
1	1002163	1	Harness, Boom, RA300	
2	1000386	1	Harness, Cylinder Cable 20 FT 90	
3	1011411	1	Harness, Manifold, RA400, 5 Station	
4	1013953	1	Harness, Cab, RA400	
5	1011355	1	Harness, External Hopper Switch, 5 Station	
6	1000386-01	1	Harness, Cylinder Cable, 30 FT, 90	
7	1013952	1	Harness, Main, RA400	
8	1001191	1	Harness, DP200 Panel, RA400	
REF	1006718SRV	1	Controller, Plus 1, RA400 EDC	Not Shown
REF	1002361	0	Schematic, Electrical, RA400	See Section 6
REF	1013846	1	GROUP, Assembly, Console, RA400	See Figure 7-6
REF	1003484	1	GROUP, Relay/Breaker, RA400	See Figure 7-7
REF	1003487	1	GROUP, Solenoids/Fuses, RA400	See Figure 7-8

Hydraulic Tank Assembly - 20 Gallon

Item No.	Part Number	Qty.	Description	Remarks
GRP	100812SRV1		Assembly, Hydraulic Reservoir, 20 Gallon, RA400 EDC	
1	22489	1	Reservoir, 20 Gallon	
2	2501-16-20	2	Adapter, Elbow, 90°, -16 JIC / -20 NPTF	
3	2406-16-12	1	Adapter, Reducer, -16 JIC / -12 JIC	
4	6602-12-12-12	1	Adapter, Run Tee, Swivel, -12 JIC/-12 JIC/-12 JIC	
5	6500-12-12	1	Aadpter, Elbow, 90°, Swivel, -12 JIC/-12 JIC	
6	5406-8-4	1	Adapter, Reducer, Pipe, -8 / -4	
7	35368	1	Sender, Temperatire Gauge, 04 MP	
8	27046	2	Spacer, Hydraulic Tank Mount	
9	33148	1	Strainer, Suction, 2 NPT, 25 GPM, 100 Mesh	
10	70444	1	Pipe, Plug, 2.00, Square Head	
11	50070	1	Gauge, SIght Level/Temperature, Hydraulic Oil	
12	37680	1	Cap w/Strainer, Hydraulic Filler	
13	100-8-13-12-5F	4	CSHH, 1/2-13 x .75, GR5, FT	
14	302-8	4	Washer, Lock, 1/2	

Emulsion Tank Insulate

Item No.	Part Number	Qty.	Description	Remarks
GRP	1002077	1	Group - Emulsion Tank, Insulate, RA400	
1	1001846	1	Tank, Pessure, 300 Gallon, 36” OD x 76” Long	
2	6352	66	Hose, 08, Push-On, 250 PSI	
3	33163	5	Clamp, Hose, #08	
4	31046	1	Flitting, Straight 08MP-08HB, Push-On	
5	36622	1	Valve, Ball, 1/2” NPT, T Handle	
6	99596	2	Pipe, Nipple, 1/2 “ x Close	
7	99498	1	Pipe, Cross, 1/2”, MI	
8	99980	2	Pipe, Bushing, 08MP-04FP, STL	
9	36656	1	Gauge, Pressure, 0-160 PSI, 2.50	
10	33750	1	Valve, Air Safety, 125 PSI, 04 NPT	
11	38579	15	Hose, 06, Low Pressure Push-On	Per Foot
12	31959	1	Fitting, Straight, 06MP-06HB, Push-On	
13	99450	1	Bushing, Pipe, 08MP-06FP, MI	
14	99569	1	Tee, Pipe, 08FP, MI	
15	99670	1	Nipple, Pipe, 1/2” x 7.00”	
16	853210683	1	Pipe, 08 x 18.00”	Threaded both ends
17	99512	1	Elbow, Pipe, 90°, 1/2”, MI	
18	81160	192	SDSHH, 1/4-20 x 1.00, GR5	
19	24509	1	Weldment, Overflow Drain	
20	33169	1	Clamp, Hose, #28	
21	34501	7.5	Hose, 24, Hydraulic Suction	Per Foot
22	26981SRV	1	Thermowell, 08 x 30.25 w/End Slug	
23	480052	1	Pipe, Red, 08FP-04FP, MI	
24	5470	1	Thermometer, Dial, 5.0 FACE, 500° F	
25	33328	4	Fitting, 90° 08MP-08HB, Crimped	
26	910150	2	Valve, Drain Cock, 1/4” NPT	
27	99535	2	Pipe, Plug, 1/4”, Square Head, MI	
28	24490	2	Weldment, Flange, Water Tube	
29	36684	2	Gasket, Flange, 6.00, Non-ASB	
30	1002190	4	Insulate, Thermal, Cel, 4.00, RA400	
31	34069	4	Buckle, Band-It, 5/8”, Stainless Steel	

Solvent Tank Assembly

Item No.	Part Number	Qty.	Description	Remarks
GRP	24327		Group - Solvent Tank	
1	36537	1	Tank, Solvent, 30 Gallon, 100 PSI	
2	99596	3	Pipe, Nipple, 2.00 X 5.00	
3	99498	1	Pipe, Cross 08FP, MI	
4	99980	2	Pipe, Bushing, 08MP-04FP, Steel	
5	36656	1	Gauge, Pressure, 0-160 PSI, 2.50 OD	
6	32874	1	Valve, Ball, 1/2" (BRASS)	
7	36871	1	Valve, Check, 1/2" FPT, 5 PSI	
8	33750	1	Valve, Air, Safety, 125 PSI, 04 NPT	
9	99537	1	Pipe, Plug, 08MP, Square Head	
10	20954	1	Weldment, Cap, 2.00 NPT	
11	7250-8-8	2	Adapter, Elbow, 90°, -8 LOC/- 8 RMP	
12	1008971	1	Weldment, Holder, Solvent Pail	
13	300-6	4	Washer, Flat, SAE, 3/8"	
14	100-6-16-28-5	4	CSHH, 3/8-16 X 1.75, GR5	
15	300-8	2	Washer, Flat, SAE, 1/2"	
16	100-8-13-28-5F	2	CSHH, 1/2-13 X 1.75, GR5, FT	
17	7250-6-8	1	Adapter, Elbow, 90°, -6 LOC/- 8 RMP	
18	38579	-	Hose, 06, Low Pressure Push-On	
19	6352	2 FT	Hose, 08, Push-On, 250 PSI, Black	
20	6352R	6 FT	Hose, 08, Push-On, 250 PSI, Red	

Vibrator Assembly

Item No.	Part Number	Qty.	Description	Remarks
GRP	1003276		Group - Vibrator Assembly, RA400	
1	1003091SRV	1	Weldment, Crossover, Vibrator, RA400	
2	1002041	1	Mount, Vibrator Bracket, RA400	
3	37985	1	Vibrator, DC 1600 w/Switch Kit	
4	100-8-13-24-5	4	CSHH, 1/2-13 x 1.50, GR5	
5	100-8-13-20-5F	4	CSHH, 1/2-13 x 1.25, GR5, FT	
6	300-8	12	Washer, Flat, SAE, 1/2”	
7	80354	12	Nut, Flexloc, 1/2-13, Full, LT	
8	100-8-13-96-5	4	CSHH 1/2-13 x 6.00, GR5	
9	302-8	12	Washer, Lock, 1/2”	Not Shown

Lighting Packages

Item No.	Part Number	Qty. Per Assembly	Description	Remarks
GRP	24358		Lights and Reflector Group	
1	35663	1	Light Bar, Red, 3 Light	
2	5096	4	Light, Clearance Red w/Reflector	
3	5037	2	Reflector, Amber	
4	81160	8	SDSHH, #10 x 1.00, #3 PT	
5	80798	4	MSPH, #10-24 x 1.00	
6	80995	4	Washer, Flat, USS, #10	
7	81005	4	Nut, Flexloc, #10-24, Full, LT	
8	37596	2	Beacon, Amber, Dual Mirror, Rotating	
9	38238	1	Arrow Board, 30" x 60", w/40 ft. Cable	Includes items 10 - 14
10	38238-11	13	Light, PAR36 Lamp	
11	38238-10	13	Gasket, Arrow Board	
12	38238-04	13	Hood, Light, Arrow Board	
13	38238-08	1	Controller, Remote, In-Cab	Not Shown
14	38238-09	1	Controller, In-Board	Not Shown
REF	5036	2	Reflector, Red	Not Shown
REF	6352	1	Harness, Wire, Lights, RA300	Not Shown
REF	37686	1	Arrow Board, LED 30" x 60", w/40 ft. Cable	Optional, Not Shown
REF	36819	1	Arrow Board, 48" x 96", w/40 ft. Cable	Optional, Not Shown
GRP			ATTACHING PARTS	
REF	988940	2	Weldment, Support, Arrow Board (Left)	Not Shown
REF	988941	2	Weldment, Support, Arrow Board (RIght)	Not Shown
REF	985623	1	Arrow Board, 48" x 96"	Not Shown
REF	985427	1	Mount, Strobe Light, Base	Not Shown
REF	985428	1	Mount, Strobe, Llight, Hood	Not Shown
REF	100-8-13-20-5F	8	CSHH, 1/2-13 x 1.25, GR5, FT	Not Shown
REF	300-8	8	Washer, Flat, 1/2	Not Shown
REF	217-8-13	8	Nut, Flexloc, 1/2-13, Full, LT	Not Shown
REF	100-6-16-16-5F	9	CSHH, 3/8-16 x 1.00, GR5, FT	Not Shown
REF	300-6	9	Washer, Flat, 3/8	Not Shown
REF	217-6-16	9	Nut, Flexloc, 3/8-16, Full, LT	Not Shown
REF	988969	9	Washer, Special - Arrow Board	Not Shown

Description	Part Number	Figure Number	Item Number
MSPH, #10-32 x 1.00	80891	7.28	11
MSPH, #8-32 x .75	80926	7.13	20
Mud Flap, 24" x 24"	27737	7.25	4
Muffler, 4.00 ID Inlet/Outlet	36534	7.21	17
-N-			
Nipple, 1/4" X Close	99591	7.18	13
Nipple, Pipe, 1.00 x Close	99606	7.15	35
Nipple, Pipe, 1/2" x 7.00"	99670	7.15	15
Nipple, Pipe, 2.00" x 5.00"	99436	7.15	37
Nipple, Pipe, Close, 1/2 NPT	99596	7.16	4
Nozzle, Emulsion Spray, .078	24594-078	7.4	16
Nozzle, Full Jet, 06MP, Brass	36849	7.28	8
Nut, Flexloc, #10-24, Full, LT	81005	7.29	7
Nut, Flexloc, 1/2-13	217-8-13	7.27	6
Nut, Flexloc, 1/2-13, Full, LT	217-8-13	7.13	18
Nut, Flexloc, 1/2-13, Full, LT	217-8-13	7.15	41
Nut, Flexloc, 1/2-13, Full, LT	80354	7.24	7
Nut, Flexloc, 1/2-13, Full, LT	217-8-13	7.29	REF
Nut, Flexloc, 1/4-20, Full, LT	217-4-20	7.30	4
Nut, Flexloc, 3/4-10, Full, LT	217-12-10	7.13	15
Nut, Flexloc, 3/4-10, Full, LT	217-12-10	7.15	45
Nut, Flexloc, 3/8-16	217-6-16	7.28	32
Nut, Flexloc, 3/8-16, Full, LT	217-6-16	7.20	15
Nut, Flexloc, 3/8-16, Full, LT	217-6-16	7.29	REF
Nut, Flexloc, 5/16-18	217-5-18	7.25	6
Nut, Flexloc, 5/16-18	217-5-18	7.28	21
Nut, Flexloc, 5/8-11, Full, LT	217-10-11	7.20	20
Nut, Flexloc, 5/8-11, Full, LT	217-10-11	7.25	11
Nut, Float Rod Pivot, .188 Seal	29093	7.14	5
Nut, Hex, #8-32	80793	7.13	23
Nut, Hex, 1/4-20, GR5	200-4-20-5	7.6	28
Nut, Hex, 1/4-20, GR5	200-4-20-5	7.13	11
Nut, Hex, 1/4-20, GR5	200-4-20-5	7.14	9
Nut, Hex, 1/4-20, GR5	200-4-20-5	7.28	25
Nut, Hex, 3/8-16, GR5	200-6-16-5	7.2	30
Nut, Hex, 3/8-16, GR5	200-6-16-5	7.21	13
Nut, Hex, Flexloc, 3/8-16	217-6-16	7.22	20
Nut, Hex, Heavy, 1/2-13, GR8	201-8-13-8	7.21	15
Nut, Hex, Slotted, 5/16-18, GR5	206-5-18-5	7.9	16