DOC# 0001315
Initial Release
March 27, 2009

MRL
MILLER COMPANY, INC.

Plural Component Design Striping Truck

Operator's Manual E-19

Static Mix Epoxy Truck

TABLE OF CONTENTS

GENERAL INFORMATION

TO THE NEW OWNER

Congratulations on your purchase of our MRL Plural Component Striper. We are pleased that you have selected one of our machines as your business partner. We would like you to know that every possible effort has been made by our highly skilled workforce to insure that this truck will serve you in your business in a most productive way. We welcome your input and comments. People like you have helped us to design and build the equipment our industry has come to expect. Please do not hesitate to call; our Sales and Service lines are ready to assist you.

1-406-869-9900

This equipment is designed by experienced striping professionals with careful consideration given to ease of operation, serviceability, and dependability.

The purpose of this manual is to assist owners and operators in maintaining and operating the MRL Plural Component Striper. Please read it carefully; information and instructions in this manual will assist you in safe, efficient operation of the truck.

Separate Manuals for non-MRL parts and equipment used on this truck are included with your Owner's Manual. The Manuals contain additional information that will not be repeated here. You are advised to read them before operation or repair of any components of this unit.

It is the ***owner's responsibility*** to make certain that all personnel read and understand this manual before operating this machine. It is also the ***owner's responsibility*** to make certain that all personnel are properly trained in the safe operation of this equipment.

USING THIS MANUAL

General operation, start-up, and shutdown procedures, safety precautions and maintenance guidance are outlined in this manual.

Directions used in this manual, for example RIGHT/EDGELi NE or LEFT/CENTERLINE, refer to directions when seated in the operators' chair facing forward, unless otherwise stated.

WARRANTY

Any components manufactured by **MRL EQUIPMENT CO., INC.,** shall be warranted for twelve (12) months from its completion date. All other parts, pieces and equipment shall be covered according to their manufactured policies. MRL Equipment disclaims all other warranties, whether express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose. This warranty does not apply to defects caused by damage, improper or abusive use while in the possession of the consumer. Seller shall not be liable for consequential damages of any kind.

A IMPORTANT A

Any unauthorized modifications or alterations voids the warranty and releases MRL Equipment Company, Inc. from any liability arising from subsequent use of this equipment.

PARTS AND SERVICES

Use original replacement parts only. These parts are available through MRL Equipment Company, Inc.

Consult information included in your Owner's Manual for additional details.
For further assistance, contact
MRL Equipment Company, Inc. at 1-406-869-9900

SAFETY PRECAUTIONS

This manual contains numerous "Notes", "Cautions" and "Warnings" intended to protect the operator from injury or death and the equipment from damage. The "Notes", "Cautions" and "Warnings" are not, however, all-inclusive. Extreme care must be exercised when operating or servicing this equipment.

AwARNING A

INCORRECT USE OF THIS EQUIPMENT MAY RESULT IN SEVERE INJURY OR DEATH.

PERSONNEL OPERATING AND MAINTAINING THIS EQUIPMENT MUST BE TRAINED IN THE PROPER USE. OPERATORS AND CREW MEMBERS SHOULD READ AND FULLY UNDERSTAND ALL INFORMATION INCLUDED IN THE OWNER'S MANUAL BEFORE ATTEMPTING TO START, OPERATE, ADJUST OR SERVICE THIS EQUIPMENT.

It is the ***owner's responsibility*** to make certain that the operators and crewmembers read and understand this manual before operating this machine. It is also the ***owner's responsibility*** to make certain that the operators are properly trained in the safe operation of this equipment.

AwARNING A

1. **Do not operate this equipment without proper instruction and training.**
2. **Before maintenance, repair, or driving while not on a job, remove all stored energy from equipment. This can include air pressure, hydraulic pressure, paint pressure, gravity, thermal and electrical energy.**
3. **Always keep safety shields and covers in place, except when servicing by a trained professional.**
4. **Always reinstall guards before testing or operating any repaired item.**
5. **Always observe traffic laws while driving truck from one location to another.**
6. **Always keep engine and equipment clean. Remove accumulated dirt and or other material from equipment.**
7. **Always wear approved eye protection when operating or servicing the equipment.**
8. **Do not operate equipment if any components are determined to be faulty during start-up procedure.**
9. **Do not operate equipment in an enclosed area unless exhaust is vented to the outside. Exhaust gases contain carbon monoxide, which is odorless and deadly.**
10. **Do not refuel equipment while engine is running. Extinguish all burner flames prior to refueling.**
11. **Do not attempt to make any adjustments or repairs to equipment while it is running.**
12. **Do not attempt to replace or repair any part in hydraulic system while pressure is present in the system.**
13. **Do not by-pass any safety device.**
14. **Avoid bodily contact with hot fluids and hot surfaces.**
15. **Operator is to be seated with seat belt properly secured while truck is in motion.**

SAFETY LABELS

Look for these safety labels, which point out potential hazards associated with the maintenance and operation of the equipment. Read and understand this manual and all labels thoroughly.

DANGER

Indicates the presence of a hazard which **WILL** cause serious injury, death or property damage, if ignored.

WARNING

Indicates the presence of a hazard which **CAN** cause serious injury, death or property damage, if ignored.

CAUTION

Indicates the presence of a hazard which **MAY** or can cause injury or property damage, if ignored.

Read and follow instructions contained in this Operator's Manual and other documentation contained in the Owner's Manual.

Wear appropriate eye protection to reduce the risk of eye injury while operating or servicing this equipment.

Wear appropriate hearing protection while operating this equipment to reduce the loud noise hazard.

Be aware of potential pinch points. Keep hands and feet clear of moving parts.

The hydraulic system cooling fans may start unexpectedly. Remove sources of power when servicing fans.

Be aware of hot surfaces such as engine exhaust

Disconnect ground terminal of all batteries prior to welding on chassis to minimize the chance of electrical equipment damage.

Operator is to be in the seat with the seat belt fastened when the truck is in motion. The operator's area shall not be occupied when traveling at highway speeds.

Do not use as a step.

Help promote product safety and operator awareness; replace worn or damaged safety labels. For new labels contact MRL's Sales and Service personnel at:

1-406-869-9900

SYSTEM OVERVIEW

Thorough knowledge and proper maintenance of all systems are critical for safe operation of this equipment. The following paragraphs contain a brief overview of the major systems on your paint striping truck.

MATERIAL SYSTEM

Your Plural Component Striper truck material system consists of components that are designed to load, store, transfer, heat, pressurize, mix and apply plural component materials. Descriptions of key material system components are contained in the following paragraphs.

Load Pumps - Hydraulically driven rotary pumps or air driven diaphragm pumps and load hoses are used to transfer catalyst and resin from totes or barrels to material storage tanks on the truck. Load pump switches and flow control valves are located adjacent to the pumps. Refer to page 25 for a material loading procedure.

Material Storage - Catalyst and resin materials are stored in ASME certified pressure vessels. Air pressure is used to transfer material from storage tanks, through heat exchangers and to the high-pressure material pumps. Material tank size may vary depending on equipment models. Each tank has a jacketed bottom for preheating material with glycol and water from the heat system. Petcocks, located at the lower section of each tank, allow venting of trapped air in the water jacket.

Heat System - Three separate diesel fired heaters and circulation pumps are used to heat the catalyst and resin to proper temperature for effective impingement mixing. Refer to material manufacturer's temperature vs. viscosity information for optimum material temperatures.

A 50/50 water/glycol mixture is circulated through the tube and shell heat exchangers, jacketed material tanks, high-pressure heat exchanger, and trace heating lines to the guns. Digital temperature controllers, located in the operator's console, provide indication of system temperatures and heating system set points.

In order to minimize material system heat losses, the pump cabinet is heated with a small radiator and electric blower. The switch for the blower motor is in the operator's console.

Refer to heat system schematics contained in the Owner's Manual for additional heat system information.

Recirc System - The recirc system allows continuous flow of material from the high - pressure pumps back to material tanks when not applying material to the road. Recirculation helps to reduce warm-up time and keeps the system at a constant temperature when spraying is temporarily interrupted. Restrictor valves contain orifices that are sized to create the same pressure drop as spraying material through the guns.

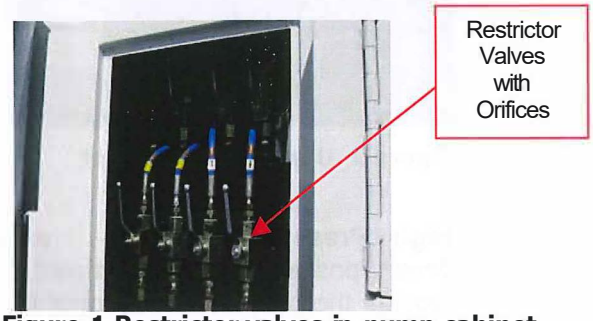

Figure 1 Restrictor valves in pump cabinet

A ATTENTION A

AVOID RECIRCULATING MATERIAL AT HIGH PRESSURE FOR LONG PERIODS OF TIME. EXCESSIVE RECIRCULATING WILL CREATE AIR BUBBLES IN THE MATERIAL AND CAUSE PREMATURE PUMP WEAR.

Significant change in resin or catalyst material pressure while recirculating indicates a plugged orifice. The following is a procedure for clearing restrictor orifices:

1. Determine which orifice is plugged by monitoring material pressures.
2. Locate the corresponding restrictor valve in the front left pump cabinet.
3. Turn the corresponding restrictor valve 180° to clear the orifice. The steps may have to be repeated to clear the orifice.

Accumulators - The purpose of the accumulators is to compensate for the material pressure loss when high-pressure pumps change direction. Resin accumulators should be charged to 1,100 should be 900 to 1000 psi. Use compressed nitrogen for charging accumulators. Material accumulators are located in the upper section of the pump tower.

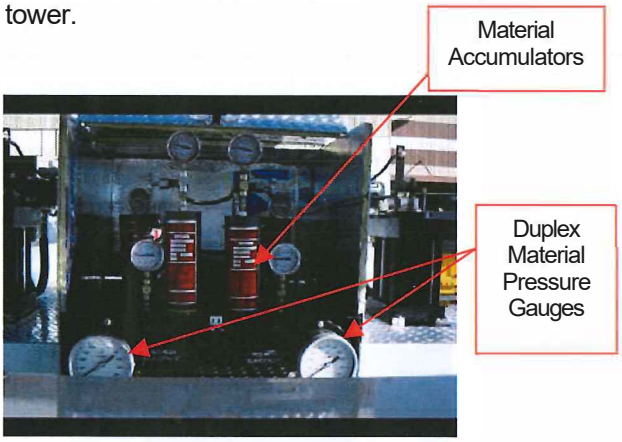

Figure 2 Upper pump cabinet

High Pressure Pumps - Hydraulically driven, positive displacement piston pumps provide the pressure and proper mix ratios for plural component striping materials. Mix ratios of 2:1 or 3:1 can be accommodated with minor changes to the pump tower and material pump sizes. MRL recommends material pressures of at least 2500 psi for proper impingement mixing of catalyst and resin.

Pumps require periodic adjustment to upper packings to minimize leaking. Pumps must be rebuilt when packings become excessively worn or damaged. When resin pump maintenance is required, both pumps need to be rebuilt. The catalyst pump does not require maintenance as often due to the lack of abrasive compounds in the material. Frequency of pump rebuild depends on the quality and quantity of material used.

AwARNING A

KEEP ALL PUMP CABINET DOORS IN PLACE WHILE OPERATING EQUIPMENT.

High Pressure Filters - The high-pressure filters filter out particles in the paint that could plug the mix chamber orifices. Frequency of filter maintenance depends on the quality and quantity of material used. the rear pump cabinet.

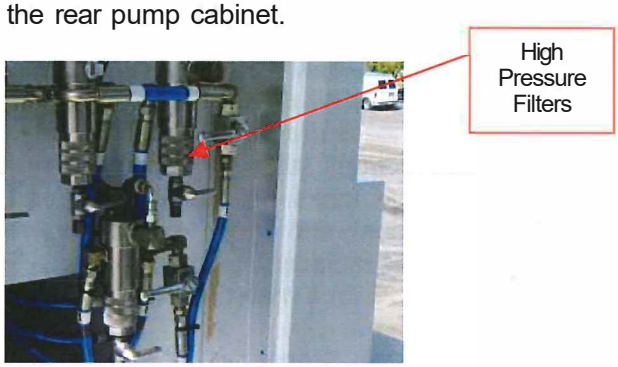

Figure 3 High pressure filters

High Pressure Material Hoses - Plural Component Striping trucks use specially designed high-pressure material hoses that are key to the safe, reliable operation of your plural component striping truck. Use of alternate hose material may result in hose failure, equipment damage or personnel injury. Material hoses are rated for 3,600 psi working pressure and 12,000 psi burst pressure.

AwARNING A

ONLY USE HOSES SPECIFICALLY DESIGNED FOR USE ON MRL PLURAL COMPONENTTRUCKS. USEOF ALTERNATE HOSE MATERIAL MAY RESULT IN HOSE FAILURE, EQUIPMENT DAMAGE OR PERSONNEL INJURY.

Y-Strainers - Y-strainers, with fine wire mesh filters, are used to filter the material between the tank and the high-pressure pumps. The Y-strainers are normally located above the rear axle fenders. Remove and clean the wire mesh filters on a periodic basis.

AwARNING A

KEEP HANDS AND FEET AWAY FROM GUN SPRAY TIP. HIGH PRESSURE STREAM CAN PENETRATE SKIN.

ELECTRICAL SYSTEM OVERVIEW

There may be as many as three separate 12-volt DC electrical systems on the truck. Each system consists of a power unit (engine), batteries and an alternator charging system. These systems consist of:

Chassis Electrical System - Warning lights installed on the truck are powered from the truck chassis electrical system. Video systems, if installed, are also powered by the truck chassis electrical system. The truck ignition switch must be on for these systems to be operational.

The Auxiliary Engine Electrical System The auxiliary engine's alternator and battery supplies power for the hydraulic cooling fans, engine throttle solenoid and diesel furnaces. The master switch must be on to enable operation of the throttle solenoid and heat system furnaces.

Compressor Engine Electrical System The compressor engine's alternator and battery supplies electrical power to the main electrical box via a 100 amp circuit breaker located in the compressor. The main electrical box provides power distribution via fuses and circuit breakers to all remaining electrical components of the striping system. The master switch in the truck cab must be turned on to supply power to the main electrical box.

Operation of the electrical system for extended periods requires the engines be running to utilize the charging system and avoid draining the batteries. When trouble shooting an electrical problem, it is easier to shut off all engines and unnecessary electrical functions and troubleshoot the electrical circuit with the fault.

110V GENERATOR

(Optional Equipment)

Some striping equipment models are equipped with a hydraulically powered 110V generator. The generator system and associated wiring provides power to high intensity halogen lights for night work and to electrical outlets for power tools. The on/off switch for the generator is located in the console. Refer to the hydraulic system setup sheet located in the Owner's Manual for proper hydraulic pressure and flow settings.

AwARNING A

USE CARE WHEN WORKING WITH ELECTRIC POWER TOOLS. ONLY USE POWERTOOLSTHATAREPROPERLY GROUNDED.

TIMING SYSTEM

The timing system turns on solenoids for material guns, bead guns, blow airs, cart lifts and some relays as applicable. These devices are turned on by applying a ground at the appropriate terminal on the slave box in the main electrical box. The solenoids have power applied to them via fuses when the master switch is turned on.

For additional timing system information, refer to the timing system manual that is included as a supplement in the back of this manual. A copy of the timing system manual is also supplied with the Owner's documentation.

OPERATOR'S SWITCH BOX

The operator's switch boxes provide the operator with a series of switches to control the spray guns and bead guns. Stainless enclosures protect the switch boxes from the elements. Close and latch the cover when not in use. Brief descriptions of the switch box functions are contained in the following paragraphs.

Guns Up/Down Switches - Raise or lower spray guns to adjust line width.

Flow - Paint/Circ Switches - Control air operated actuators that open or close ¼" high-pressure ball valves located in the front pump cabinet on the edgeline (right) side.

a. **CIRC** opens the ball valves; materials (resin and catalyst) flow through the valves to the MRL heat exchanger, restrictor valves and to the material tanks.
b. **PAINT** closes the ball valves stopping flow to the tanks; hydraulic oil flow to the motor on top of the high-pressure pumps is also shut off until the spray guns are turned on.
   Note: Spray guns will not operate when **CIRC** is selected.

Glass - Auto/Off/Test Switches

a. **AUTO** while in **SOLID** - Bead guns turn on/off with the spray guns.
   AUTO while in **SKIP** - Bead gun on/off is adjusted to ensure full bead coverage, using the Bead +/- switches on the console.

Air - Auto/Off/Test Switches - Control operation of blow air solenoids located under the deck between the operator stations.

Gun On Pushbuttons - Turns the spray gun on, if it is in **PAINT,** regardless of **SOLID/SKIP** and **START/STOP** switch positions. Bead guns and blow air solenoids will not operate when using the **GUN ON** push buttons.

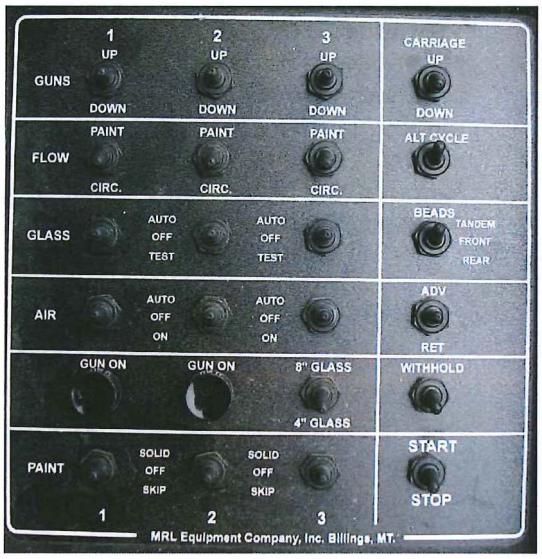

Figure 4 Operator's switch box

Paint- Solid/Off/Skip Switches -

a. **SOLID** - Spray gun is on and the Timer system counts footage when **PAINT/CIRC** switch is in **PAINT** and **START/STOP** is in **START.**
b. **SKIP** - Spray gun comes on with the **START** switch, sprays length and cycle set and displayed on the console.

4" Glass - Outside bead guns come on with #1 yellow and #3 white. Inside bead guns come on with #2 yellow.

8" Glass - Outside and inside bead guns come on with any spray gun.

Carriage Up - Controls hydraulic directional valves used to lift the carriages.

Carriage Down - Releases hydraulic lift pressure and applies compressor system air pressure to the top of the lift cylinder. Solenoid and regulator assembly are located near the carriage lift directional valves.

Alt Cycle - The Timer system remembers two skip cycle settings for each switchbox. Toggle the **ALT CYCLE** switch to display and set skip cycles at the console.

Beads - Tandem/Front/Rear - Select double drop or single drop bead gun operation for application and calibrating.

Adv/Ret - Lengthen or shorten skip cycle for retrace application.

Withhold - Interrupts spray, bead, blow air and footage counter operation while maintaining skip cycle.

Start/Stop - Allows spray, auto bead, auto blow air and footage counter operation

CONSOLE SWITCH BOX

Console switchbox controls functions for:

a. Skip length, cycle length and skip bead application.
b. Footage displays and calibration parameters.
c. Meter reset options.

All skip functions have two sets of controls and two sets of displays:

a. Four switches to the left of center are used for centerline carriage guns (#1 yellow, #2 yellow and #3 white).
b. Four switches to the right of center are used for edgeline carriage guns.

STRIPE switch is used to lengthen or shorten the length of the applied stripe.

a. Set length will normally be 0.2 to 0.5 feet longer than desired actual length of the applied stripe. This is because the gun turns off faster than it turns on. If Gun Factor option has been installed it can be adjusted so that actual stripe length will match set length, refer to Skipline manual for calibration procedure.
b. Cycle is the distance from start of a skip to start of the next skip.
c. Actual applied cycle should match the CYCLE setting exactly. If it doesn't, the Skipline calibration needs to be checked.

The **STRIPE/CYCLE** display is the default display when the Master switch is turned on. Truck speed is displayed in the upper right-hand corner of the **STRIPE/CYCLE** display. If Cycle setting doesn't match applied cycle distance, then the displayed truck speed will also be incorrect.

Figure 5 Console switch box

BEADS - BEGIN/END switches control bead gun on/off in relation to spray gun.

a. A "+" displayed at Begin or End means the bead guns will turn on/off before the spray gun turns on or off.
b. A "-" displayed at Begin or End means the bead guns will turn on/off after the spray gun turns on or off.
c. Bead registration will have to be adjusted when changing between centerline white and yellow skips, and, if application speed changes.

The bead registration function works only when timer is in skip. To get bead coverage on the end of solid lines place the bead gun to TEST until after the spray gun is shut off.

Protect the console switch box from moisture; it is not rated for wash down. Protect switch box by keeping console cover in place when not in use.

SLAVE BOX

The slave box is located in the upper section of the main electrical box. Multi conductor phone style plugs and wires are the system's communication cables. There is one cable for each of the operator's switchboxes, one for the console switchbox, one for the printer in the cab and one for cab switchbox option.

The green terminal strips are numbered 1 through 46 and A through L. Source and destination for all terminals is listed in the electrical schematic located on the main electrical box door and in the Owner's Manual.

Electrical surges and spikes can damage the slave box. Unpluq the qreen terminal strips and the communication plugs before welding on the vehicle.

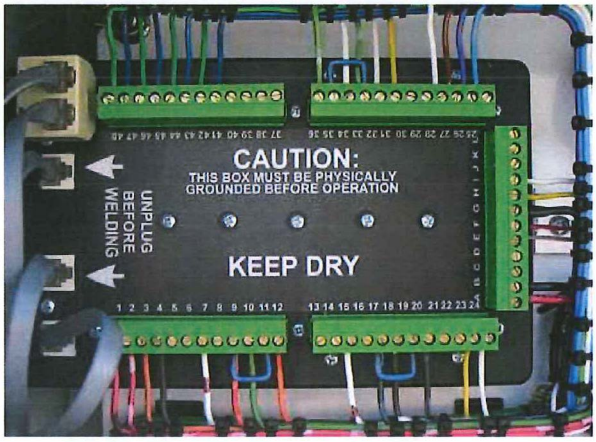

Figure 6 Slave box

The slave box activates functions by completing the circuit to ground. When troubleshooting an inactive function, the electrical circuit should be energized if using a test light to ground.

If the electrical circuit is complete to the corresponding terminal on the slave box, the function can be activated by using a jumper wire from the terminal screw to ground. The jumper wire can be used to isolate the system problem to a communication cable or a slave box problem.

A CAUTION A

Protect Equipment While Welding

1. **Protect chassis electrical according to manufacturers recommendations**
2. **Protect Skip Timer by un-plugging the five green terminal strips and the phone connectors from the "slave box" in the main electrical box**
3. **Keep the ground lead as close as possible to the area to be welded**
4. **Check for wiring or hose behind rails and inside tubing before striking an arc.**

HALL EFFECT SENSOR

Timing signals for the SKI PLINE system are generated by a Hall Effect sensor and a magnetic collar located on the chassis drive shaft. Loss of the timing signal may be caused by a dirty or damaged Hall Effect sensor or by a improperly positioned sensor. The sensor should be mounted approximately 3/8" away from the magnetic collar for proper operation.

HYDRAULIC SYSTEM OVERVIEW

Fluid power is used to operate several systems on a plural component striping truck. Pumps mounted on an auxiliary engine or chassis transmission may supply power for the various hydraulic systems. Depending on options, additional hydraulic pump(s) may be mounted on the air compressor engine. Refer to the hydraulic schematics located in the Owner's Manual for more detailed information. Major components of the hydraulic system include:

Hydraulic pumps - The size and number of hydraulic pumps will vary depending on the various options selected on your truck. Refer to the hydraulic schematics for proper pressure settings.

Hydraulic reservoir - Check oil level on a daily basis and fill with clean AW46 grade hydraulic oil as necessary to maintain proper level. Replace oil and filter per maintenance schedule.

Oil cooler - The hydraulic oil cooler is a critical component in keeping your hydraulic system operating at the proper temperature. Excessive oil temperature due to a dirty cooler or damaged cooler will cause premature breakdown of oil and lead to pump/motor damage and seal failure. Oil system operating temperature should be 170° F to 190° F

Gun carriage extension cylinders Lateral extension of the gun carriages is controlled by hydraulic cylinders and the orbitals (steering wheels at the operator's stations)

Front guide wheel lift cylinder - Guide wheel lift is provided by a hydraulic cylinder. The switch for raising/lowering the guide wheel is located next to the master switch in the chassis cab.

A ATTENTION A

WHEN FRONT GUIDE ASSEMBLY IS IN THE STOWED POSITION THE CAB MOUNTED CONTROL SWITCH IS TO BE IN THE DOWN OR FLOAT POSITION.

Optional hydraulically driven components may include:

- 11 OV generator

Refer to the table of contents at the front of this manual for location of optional equipment information.

AIR SYSTEM OVERVIEW

The truck's compressed air system consists of a utility mount air compressor, an external air cooler, air filter, water separator, air oiler(s) and an air distribution system. Typical air system operating pressure is 11 O psi, unless noted otherwise. Refer to the compressor Owner's Manual for information on equipment operation and maintenance.

The compressor control panel, which includes a run/stop switch, hour meter and system status, is normally located on the centerline side of the air compressor. Refer to the compressor Owner's Manual for information on the operation and maintenance of the equipment.

The air system provides compressed air for:

- Bead tank pressurization and bead transport
- Bead loading venturi (creates a vacuum in tank for transfer of beads)
- Blow-air for cleaning the road surface
- Actuation of pneumatic cylinders
- Material tank pressurization

AwARNING A

COMPRESSED AIR FROM THIS SYSTEM IS NOT TO BE USED FOR BREATHING.

Compressed air is supplied to various systems through two main distribution lines. Air in one of the lines is passed through a heat exchanger to reduce the air temperature and allow the water separator to work more effectively. The cool, dry air is supplied to the bead tank(s), air actuated valves on the gun carriages and air for power tools.

The remaining, non-cooled air is supplied to the bead tank venturi, material tanks and the blow air for cleaning the road surface ahead of the gun cart. For additional air system information, please

refer to the air schematics in your Owner's Manual.

AwARNING A

SERIOUS INJURY OR DEATH MAY OCCUR IF THIS EQUIPMENT IS OPERATED WITHOUT PROPER PERSONAL PROTECTION. ALWAYS WEAR APPROPRIATE PERSONNEL PROTECTION WHEN OPERATING THIS EQUIPMENT.

BEAD SYSTEM

Striping truck bead systems consist of one or more ASME oressure tanks. a bead load 8Yi Le111, bead Lla115puri iii 1e;, a1id bec1d application hardware. The size and number of bead tanks vary depending on the model of your truck.

Figure 7 shows the typical bead tank valve a rangement. Your truck may be slightly different. The following paragraphs contain a brief overview of the bead system components.

Air Filter/Dryer - Bead tank supply air must be reasonably clean and dry for trouble free operation. All bead tanks are equipped with a particulate filter (5 micron) that will remove most of the water from the c mpressed air. The unit may be equipped with a manual or an automatic drain. Drain the bowl and inspect the automatic drain on a periodic basis to keep it operating properly. Refer to the manufacturer's information in the Owner's Manual for more complete operation instructions.

A CAUTION A

NEVER REMOVE FILTER BOWL WHEN THE AIR SYSTEM IS UNDER PRESSURE.

Air Dryer/Extractor (optional equipment)- Your truck may also be equipped with a second stage extractor/dryer for moisture free operation in humid areas. The dryer is equipped with a weep drain to allow water and oil to drain from the unit. Check drain frequently for proper operation. Refer to the manufacturer's information in the Owner's Manual for more complete operation instructions.

Venturi - High velocity compressed air creates a vacuum (negative pressure) as it passes through the venturi. The vacuum is used to transfer beads from the tote or drum into the bead tank.

Load Hose Coupling - The load hose coupling is used to secure the load hose to the bead tank fill port while loading beads. The camlocks must be completely rotated against the coupling body to ensure it is properly secured.

Be d Muffler - The muffler, a long yllndncal tube attached to the striper deck, 1s used to reduce the noise associated with the discharge of air from the venturi. Beads can be carried over venturi exhaust. The hi h velocity air and beads can damage wires or hoses beneath the equipment bed. Discharge from the muffler is to be directed toward the ground, away from any hoses or electrical wires under the striper bed. Inspect the bead muffler discharge hose on a periodic basis. Reroute hose or replace as necessary.

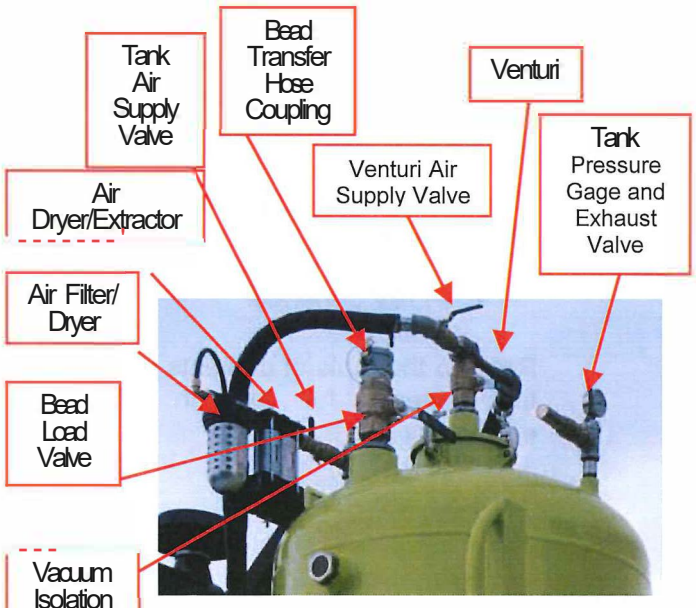

Figure 7 Bead tank

AwARNING A

ALWAYS USE THE TANK EXHAUST VALVE TO RELIEVE TANK PRESSURE. NEVER EXHAUST TANK PRESSURE THROUGH THE LOAD HOSE.

AwARNING A

RELEASE ALL PRESSURE IN TANK BEFORE ATTEMPTING TO LOAD BEADS OR WORK ON THE BEAD TANK.

Bead Application Hardware MRL Plural Component Trucks can be equipped with different types of bead application equipment. Detailed information, including maintenance, parts lists and troubleshooting for MRL manufactured bead guns is contained in one of the supplements supplied with this manual. Refer to the Owner's Manual for information on bead guns from other manufacturers.

BEAD LOADING PROCEDURE
(refer to figure 7 on the previous page)

A ATTENTION A

AIR LEAKS IN THE BEAD SYSTEM WILL AFFECT BEAD LOADING EFFICIENCY. PERIODICALLY INSPECT SYSTEM FOR LEAKS AND REPAIR AS NECESSARY.

1. Air compressor must be running to load beads. Verify air compressor switch is set to "Run" position.
2. Close the valves at the bottom of the bead tank and at the bead manifolds.
3. Close tank air supply valve; relieve tank pressure by opening exhaust valve.
4. Close exhaust valve after tank is vented.
5. Attach bead load hose to bead transfer hose coupling. Place the other end of bead load hose in the glass beads.
6. Open the vacuum isolation valve located below the venturi pump.
7. Open the venturi air supply valve to allow compressed air to flow through the venturi and create a vacuum in the tank.
8. Open bead load valve.
9. Use the bead load hose to "vacuum" the beads until the bead tank is full.
10. Close the air supply to the venturi.
11. Close the valve below the hose coupler; disconnect the load hose and replace load port cap.
12. Close the vacuum isolation valve below the venturi.
13. Open the air tank supply valve. Pressurize tank to approximately 40 psi for bead application. The tank pressure may have to be adjusted for proper bead application rate. Bead tank pressure regulator is located in the console.
14. Open the valves at the bottom of the bead tank and at the bead manifolds.

A CAUTION A

CLEAN SPILLED BEADS FROM WORK AREA, BEADS CAN BE VERY SLIPPERY.

CONSOLE OVERVIEW

The epoxy truck console provides the operator with system status and controls. The actual features of the console may vary depending on the truck's configuration and selection of options.

Some of the systems that are controlled from the console include:

1. **Work lights** - Switch for the 12 V work lights. Each grouping of lights has it's own switch.

2. **Engine RPM Switch** - Sets auxiliary engine at high RPM.

3. **Voltmeter** - Displays the system voltage, normally between 12 to 13 VDC.

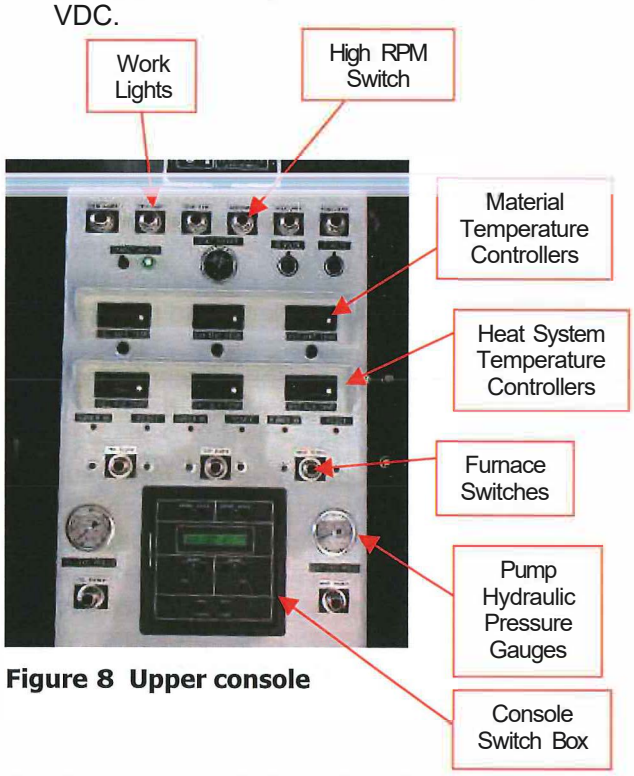

Figure 8 Upper console

4. **Generator Switch** (optional) - Turns on generator.

5. **Material Temperature Controllers** Provides digital readout of material temperatures and set points.

6. **Heat System Temperature Controllers** - Provides digital readout of the heat system temperature and set-points.

7. **Console Switch Box** - Controls functions for skip length, cycle length and skip bead application. It also provides footage displays and calibration parameters.

8. **Hydraulic Control Switches** Provides power to operate solenoid valves located on the hydraulic pressure block inside the console. The hydraulic solenoid is energized when one of the CIRC/PAINT switches is in CIRC, or when in PAINT, SOLID, SKIP or START.

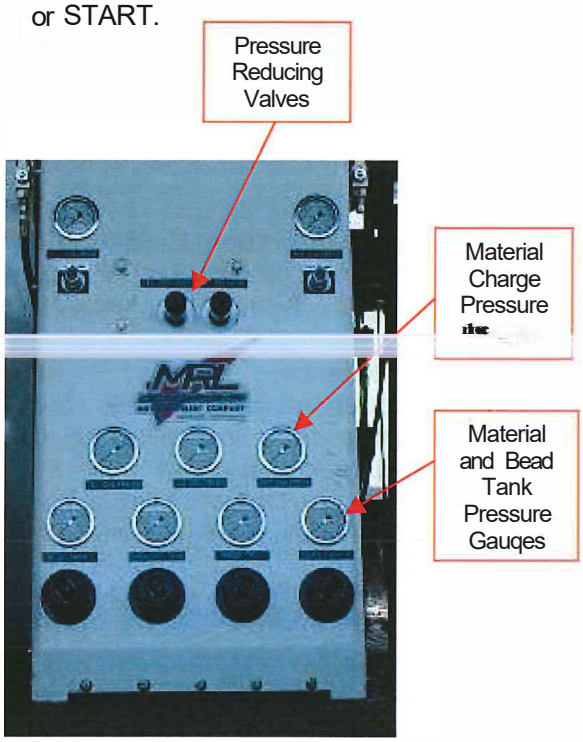

Figure 9 Lower console controls

9. **Pressure Reducing Valves (PRV)** Controls hydraulic pressure applied to material pump hydraulic cylinder.

10. **Hydraulic Pressure Gauges** Indicates pressure applied to the material pump hydraulic cylinder.

11. **Material Charge Pressure Gauges** Indicates material pressure at pump inlets.

12. **Material and Bead Tank Pressure** Indicates material and bead supply pressures and allows air pressure adjustment. Refer to tank-mounted gauge for actual pressure in tank.

CAMERA SYSTEM
(Optional equipment)

The camera guidance system consists of two color cameras mounted on electrically actuated extension tubes, a crosshair generator and a LCD monitor for viewing. The following paragraphs contain a general overview of these systems. Refer to the Owner's Manual for electrical schematics or other vendor-supplied information.

Cameras - Two color cameras are mounted on a self-leveling base inside protective enclosures on the centerline and edgeline side of your equipment. Each camera enclosure is attached to the extension carriage by a mount that allows horizontal and vertical camera adjustment. Turning the threaded adjusting rods can make adjustments to camera orientation.

Camera carriage - An electrically actuated tube within a tube assembly allows the cameras to be extended out from their stowed position. Switches, to extend and retract the camera enclosures, are located in the camera control console in the chassis cab. Location of camera actuator switch may not be located as shown in figure 10.

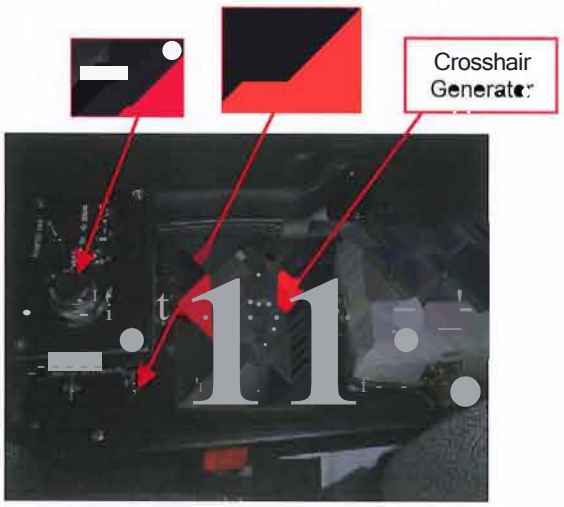

Figure 10 Cab Controls

A/B Switch - The A/B switch, located in the chassis cab, is used to select which camera (edgeline or centerline) is displayed on the monitor.

Crosshair generator - The crosshair generator is used to provide a crosshair on the monitor to aid in driving a straight line while striping. Controls for the crosshair generator are located in the camera control console in the chassis cab. The four lockable knobs control the horizontal and vertical position of the crosshairs. The three micro switches can be used to alter how the crosshairs appear on the monitor.

Failure in the crosshair generator could be misinterpreted as a monitor problem. The signal from the camera is routed through the crosshair generator to the monitor. If monitor problems occur, bypass the crosshair generator to isolate the signal failure or noise.

Monitor and mount - The LCD monitor is mounted to the chassis windshield with a suction cup. Position of the monitor should not block the driver's view through the windshield.

Keep inside of windshield and surface of suction cup clean. The suction cup vacuum pump stays in when air has been vacated. Check the pump hourly to ensure no loss of vacuum.

A ATTENTION A

CHECK THE SUCTION CUP VACUUM PUMP FREQUENTLY. MONITOR AND/OR INSTRUMENT PANEL CAN BE DAMAGED IF THE MOUNT RELEASES FROM THE WINDSHIELD.

Remove the monitor mount by pinching the tabs on the top and bottom of the suction cup. Try not to touch the monitor screen; oily fingerprints are hard to remove from the LCD display. The monitor should be stored in the monitor case when not in use. Refer to the Owner's Manual for manufacturer's camera information.

Camera System Maintenance

- ► Keep camera-housing lenses clean and clear of road grime.
- ► Keep camera gimbal adjustment rods clean, apply anti-seize frequently.
- ► Periodically check coax cables and connectors for damage or loose connections.
- ► Keep camera extension tubes clean and lubricated for ease of movement. Use grease sparingly and apply grease only while actuating the extension tubes.

BASIC MECHANICAL EQUIPMENT

Cart tubes - The cart tubes provide lateral extension and support of the gun carriages. Cart tube extension/retraction is provided by the orbitals (steering wheel(s) at the operator station) and a hydraulic cylinder. Keep the cart tubes free of road grit, grease tubes weekly. Cart tube seals must be kept clean and in good working condition. Replace seals when required.

Scissors - Raising and lowering the gun carriage assembly is done by a mechanism and a hydraulic cylinder. Switches to raise and lower the gun carriage are located in the switch box at the rear operator's stations.

Always release pressure from the scissors cylinder and allow the assembly to rest on the hanger when in the stowed position.

Pivot points of the scissors assembly are to be greased on a weekly basis. Inspect pivot point bushings for excessive wear or damage weekly. Replace bushings as required.

Guidance Wheel (optional equipment) - If equipped, the guidance wheel assembly is mounted at the front of the truck. It is designed to quickly switch from the centerline side to the edgeline side for operation. The guidance wheel position switch is momentary UP to raise, mid-point **HOLD** and **DOWN** to float on the roadway with the switch in the **DOWN/FLOAT** position.

A CAUTION A

DO NOT RAISE THE GUIDANCE WHEEL WHEN STOWED, DAMAGE MAY RESULT. LEAVE THE SWITCH IN THE "DOWN/FLOAT" POSTION WHEN STOWED.

DAILY PRE-START CHECK LIST

AwARNING A

SERIOUS INJURY OR DEATH MAY OCCUR IF THIS EQUIPMENT IS IMPROPERLY OPERATED. THIS EQUIPMENT IS TO BE OPERATED BY TRAINED PERSONNEL ONLY. DO NOT OPERATE WITHOUT PROPER TRAINING. READ THIS MANUAL BEFORE OPERATING.

AwARNING A

SERIOUS INJURY OR DEATH MAY OCCUR IF THIS EQUIPMENT IS OPERATED WITHOUT PROPER PERSONAL PROTECTION. ALWAYS WEAR APPROPRIATE PERSONAL PROTECTION WHEN OPERATING THIS EQUIPMENT.

After reading the manual, please familiarize yourself with all operational controls and details of the equipment before operating.

- Insure that you know how to stop the machine in case of an emergency.
- Insure that you know the function of each control before operating.
- Walk around the equipment and familiarize yourself.
- Use the manual as a reference.
- Seek assistance with any questions that you may have before starting.
- After reading and comprehending this manual make a dry run and get comfortable with the equipment before you put it to work.
- Start with the easy pre-start checklist to ensure that everything is in a ready to go condition.

A IMPORTANT A

Use the Pre-Start Check List that has been provided to assist with the daily start-up procedure. A blank form is included for your use (see the Supplement section of this manual). It is recommended you make copies and keep them on a clipboard with the equipment. This will ensure that any deficiency is noted and corrected before operation. The Pre-Start Check List should be completed while performing your DOT required pre-trip inspection.

DAILY PRE-START CHECK LIST

1	Check all chassis fluid levels; refer to chassis manufacturer's routine maintenance recommendations.	☐	Do not overfill!
2	Check fuel levels; fill as required.	☐	Do not overfill!
3	Check air compressor and compressor engine fluid levels. Refer to manufacturer's maintenance schedule.	☐	Do not overfill!
4	Check hydraulic system oil level. Fill with clean, high quality grade AW46 hydraulic oil.	☐	Do not overfill!
5	Check all work lights and safety lights for proper operation.	☐	
6	Check all hoses for leaks, breaks, cuts, damage, or loose fittings. Repair and/or tighten loose fittinqs as required.	☐	
7	Material pumps - Inspect material pumps and hydraulic motors. Tighten pump packings as required. Keep material pump rods lightly lubricated with Graco TSL or equivalent lubricant	☐	
8	[illegible]	☐	
9	Air oiler - check level of oil, fill as necessary.	☐	
10	Water separators - inspect for proper operation, clean on a monthly basis.	☐	
11	Furnaces - Inspect daily; clean or repair as necessary	☐	
12	Verify spray guns are operational with clean tips, check lockdown mechanism for proper operation.	☐	
13	Clean high-pressure material filters on a daily basis. More frequent cleaninq may be required dependinq on material quality.	☐	
14	Check charge on accumulators; charge with dry nitrogen as required.	☐	
15	Verify bead guns are calibrated and operational.	☐	
16	Insure that all guards and cabinet doors are in place before starting.	☐	
17	Clean up any spilled fluids and dispose waste properly.	☐	
18	Wear all appropriate personal protective equipment such as safety glasses, face shields, leather gloves, steel toed leather shoes, etc. while operatinq this equipment.	☐	

START-UP PROCEDURE

AwARNING A

SERIOUS INJURY OR DEATH MAY OCCUR IF THIS EQUIPMENT IS OPERATED WITHOUT PROPER PERSONAL PROTECTION. ALWAYS WEAR APPROPRIATE PERSONAL PROTECTION WHEN OPERATING THIS EQUIPMENT.

A ATTENTION A

READ ALL MANUFACTURE'S RECOMENDATIONS FOR PROPER MATERIAL APPLICATION TEMPERATURE AND MATERIAL HANDLING.

1. Complete Daily Pre-Start Check List. Correct all deficiencies prior to start-up.

2. Inspect both switch boxes and ensure switches are in the following positions:
   - ► Two **"START/STOP"** switches are in the **STOP** position.
   - ► All **"PAINT/CIRC"** switches are in the **CIRC** position.
   - ► All **"SOLID/OFF/SKIP"** switches are in the **OFF** position.

3. Ensure the switches and valves located in console are in the following positions:
   - ► Yellow and white pump switches are in the **OFF** position.
   - ► Yellow and white hydraulic Pressure Reducing Valves (PRVs) are dialed down (fully counter-clockwise).

4. Start compressor engine. Ensure that oil pressure gauge rises to operating range. Close air supply drain valve.

5. Allow compressor engine to warm up for a couple minutes, then open air supply valves.

6. Turn-on "Master" switch in chassis cab.

7. Ensure that the hydraulic selector valve is in the **START** position. Start auxiliary engine (push by-pass button until oil pressure gauge climbs). Allow engine to warm up for a couple minutes.

8. Place hydraulic selector valve to **OPERATE** position. Observe that pump pressure gauge (located above the selector valve) rises from standby pressure of 500 psi to operating pressure.

9. Turn furnace switches on. Furnaces will ignite and their circulation pumps will start. Set glycol system controllers at 5° F to 15° F warmer than the desired material temperature. Refer to material temperature vs. viscosity information supplied by the manufacturer.

10. Check nitrogen charge in material accumulators. The charge should be:

    - ► Resin - 1100 to 1200 psi.
    - ► Catalyst - 900 to 1000 psi.

    If the accumulator requires charging, refer to the accumulator charging section of operator's manual for assistance.

11. Complete material and bead loading. Verify ball valves on the discharge side of the load pumps are closed. Refer to page 25 for detailed material loading procedures.

12. Pressurize material tanks at 40 to 60 psi. and bead tanks to 40 psi. Bead tank pressure may have to be adjusted during striping to achieve proper bead application rate.

13. Open all material line valves between material tanks and high-pressure pumps.

14. Once glycol temperature is at the desired temperature, material circulation and heat-up can begin.

15. Verify all material guns' safety mechanisms are locked down.

16. Turn on high-pressure pump at the console.

17. Use the pressure-reducing valve to dial up pump hydraulic pressure to 200 to 800 lbs. Continue circulation until the material reaches the desired temperature.

START-UP PROCEDURE
(continued)

A ATTENTION A

IF ONLY USING ONE GUN, MAKE SURE THE OTHER GUN IS IN THE PAINT POSITION IN THE TIMER SWITCH BOX.

18. Once desired material temperature is reached, set the auxiliary engine to high RPM with the switch in the console.

19. Slowly dial up the hydraulic pressure until you reach the desired material pressure as indicated on the duplex gage.

cycle in the timer control box.

21. Unlock the safety mechanism on the gun(s) that will be used.

A CAUTION A

NEVER PLACE ANY PART OF YOUR BODY NEAR THE TIP OR UNDER THE SPRAY GUN WHEN THE SYSTEM IS UNDER PRESSURE.

22. Set the circ/paint switch for the gun(s) to paint.

23. Set blow air (if needed) and bead switches to auto.

24. Turn gun control switch to the desired pattern (solid or skip).

25. Position the truck and set the gun carriage on the ground.

26. Once the truck is at the desired speed for the proper mil application, turn the start/stop switch to start.

27. Adjust the line width by raising or lowering spray guns with the gun actuator switches in the operator's switch box.

28. Continuously monitor and adjust temperatures/pressures to achieve desired results.

SHUTDOWN PROCEDURE

AwARNING A

ALWAYS WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHILE LOADING MATERIAL. REFER TO MANUFACTURER'S MATERIAL SAFETY DATA SHEETS (MSDS) FOR PROPER MATERIAL HANDLING PRECAUTIONS.

1. At switch box turn START/STOP switch to STOP.

L. At console, turn PUMP switch to OFF.

3. At switch box, turn PAINT/CIRC switch to CIRC. Pump will cycle until it bottoms at the lower proximity sensor, the pump switch light will go out. This feature prevents contamination and corrosion of exposed pump shafts.

4. Ensure that material pressures drop to Opsi.

5. Dial down the pressure reducing valve, ensure that hydraulic pressure drops to Opsi.

6. Auxiliary engine HIGH RPM switch off. Allow engine to run at low RPM for 2 to 3 minutes.

7. Lock down the spray guns and switch the gun to paint mode.

A CAUTION A

NEVER PLACE ANY PART OF YOUR BODY NEAR THE TIP OR UNDER THE SPRAY GUN WHEN THE SYSTEM IS UNDER PRESSURE.

8. Have an assistant spray the tip and needle with solvent while you turn the gun off and on with the momentary (push button) switch in the switch box.

SHUTDOWN PROCEDURE
(continued)

9. Turn off furnaces with switches in console. Furnaces have an automatic two-minute purge cycle after the switch is turned off.

10. Secure carriages on their hangers and verify hose bundles have stowed properly.

11. Turn off the auxiliary engine after a few minutes of running at low RPM.

12. Turn the selector switch for the air compressor to start; allow the compressor to unload.

13. Turn off the compressor engine and slowly open the drain valve to drain water from the air system.

14. Bl ed air pressure from the 'ma.terial and bead tanks by shutting· the supply valves and slowly opening the_ dump valV:es.

15. Record footages and clear footage counter.

16. Turn off Master Switch.

17. Remove spray tips and soak them in solvent.

MATERIAL LOADING

AwARNING A

ALWAYS WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHILE LOADING MATERIAL. REFER TO MANUFACTURER'S MATERIAL SAFETY DATA SHEETS (MSDS) FOR PROPER MATERIAL HANDLING PRECAUTIONS.

1. "Master" switch must be on and the hydraulic power plant must be running with hydraulic by-pass in the "run" position.

2. Close air supply valves to material tank.

3. Open tank exhaust valve, check tank pressure gauge to verify pressure is discharged.

4. Remove hammer cap lid on tank, level of tank must be visually monitored while loading material.
5. Remove the load hose cap and place the end of the load in the barrel.

6. Open the valve on the outlet side of the pump.

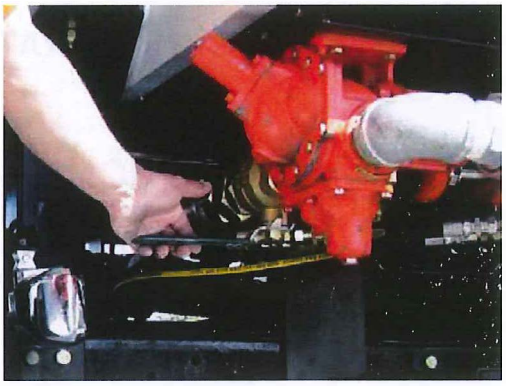

Figure 11 Load pump and discharge valve

7. Turn the appropriate load pump on with the switch in the load pump control panel.

8. Turn the load pump flow control valve clockwise to increase pump speed.

A ATTENTION A

COLD AMBIENT TEMPERATURES MAY CAUSE DIFFICUTY IN PUMPING MATERIAL.
CHECK FOR AIR LEAKS IN LOAD HOSE; REPAIR AS NECESSARY TO HELP MAINTAIN LOAD PUMP PRIME.

9. When loading is complete, elevate the load hose to assist in draining the hose.

10. Turn the pump off and turn the flow control valve fully counter clockwise.

11. Close the valve on the outlet side of the pump.

12. Clean the load hose with solvent; install the cap on the end of the hose.

MATERIAL LOADING
(continued)

13. Replace the material tank hammer cap.

14. Close tank vent valve.

15. Follow steps 2 thru 14 to load other material tanks. Clean and stow the load hoses.

16. The tanks are now ready to be pressurized. Tank pressure should be set at 40 to 60 psi.

HAND GUN OPERATION

A CAUTION A

GUN ARE LOCKED DOWN Bet-OKE PROCEEDING WITH HAND GUN OPERATION.

1. Attach the handgun air supply into one of the quick disconnects located at the rear of the truck.

2. Open valves that control flow to the handgun. Handgun valves are located near the high-pressure filters.

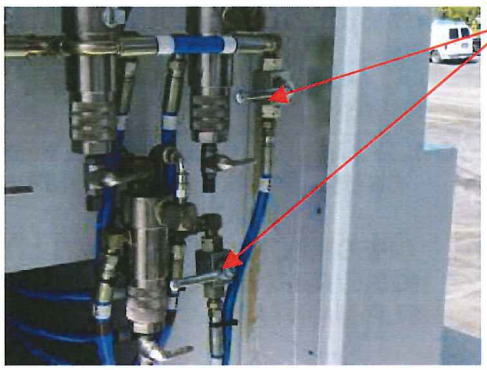

Figure 12 Handgun valves in rear pump tower cabinet

3. Open the two three-way valves at the pneumatic circulation control valves to allow material to circulate through the handgun. **Note:** The handgun shares the pneumatic circulation control valve with the ground gun.

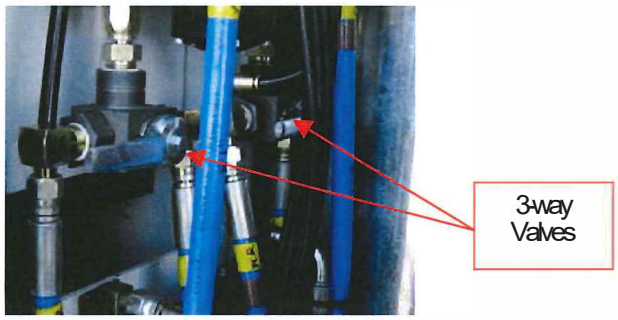

Figure 13 Three-way circulation control valves.

4. At the operator's switch box, set the **"PAINT/CIRC"** switch for the ground gun to **CIRC.**

5. At the rear pump tower cabinet, turn on the handgun switch and turn off bead and blow air switches.

A ATTENTION A

THE FLOW TO THE YELLOW HANDGUN HOSES IS CONTROLLED WITH THE #1 (LEFT) GUN AND THE FLOW TO THE WHITE HAND GUN HOSES IS CONTROLLED WITH THE #3 WHITE (CENTERLINE) GUN.

6. The system is now ready to circulate material through the handgun. Circulating through the handgun is the same circulating through the ground gun.

7. Turn the pump on and slowly increase pump hydraulic pressure with the pressure-reducing valve.

8. Once you have reached spraying pressures, turn the **"PAINT/CIRC"** switch to **PAINT.**

9. The system is now ready to apply material. Unlock the handgun and begin spraying material.

A CAUTION A

NEVER PLACE ANY PART OF YOUR BODY NEAR THE TIP OR UNDER THE SPRAY GUN WHEN THE SYSTEM IS UNDER PRESSURE.

MAINTENANCE

AwARNING A

UNLESS SPECIFICALLY REQUIRED, DO NOT RUN ENGINE WHILE SERVICING OR ADJUSTING THE EQUIPMENT.

Repairs and maintenance that require engine power should be performed by trained personnel.

To prevent carbon monoxide poisoning, be sure proper ventilation is available when engine must be operated in an enclosed area.

Read and observe safety warnings in front of manual.

Regular maintenance is the best prevention for costly downtime or expensive, premature repair.

The following pages contain suggested maintenance information and schedules which the operator should follow on regular basis.

Remain alert for unusual noises; they could be signaling a problem.

Visually inspect the machine for any abnormal wear or damage. A good time to detect potential problems is while performing scheduled maintenance.

Keep the equipment clean, remove heavy deposits of dirt; they can cause engine and hydraulic overheating. Clear away heavy build-up of grease, oil, and dirt, especially in the area of oil reservoir and engine combustion air; minute dust particles are abrasive to close-tolerance engine and hydraulic assemblies.

Some repairs require the assistance of a trained service mechanic and should not be attempted by unskilled personnel. Consult MRL Equipment Company, Inc. when assistance is needed.

Electrical System Maintenance

The electrical system is a 12-volt, negative ground. A maintenance-free battery is recommended. Follow battery manufacturer's maintenance, safety, storing and charging specifications.

AwARNING A

AVOID SKIN CONTACT WITH BATTERY ACID. DO NOT ALLOW OPEN FLAME NEAR THE BATTERY. ACID CAN CASE SERIOUS INJURY TO SKIN AND EYES. ALWAYS WEAR EYE PROTECTION WHEN CHECKING THE BATTERY.

Hydrogen gas forms inside the battery. This gas is both toxic and flammable and may cause an explosion if exposed to flame. Always remove the negative ground first and replace it last.

Do not overfill battery.

Electrolyte may overflow and damage paint, wiring or structure. When cleaning the battery, use soap and water. Be careful not to get soap and water into the battery. Use soda mixed in water to clean corroded terminals.

Common circuit failures are usually caused by loose, corroded or dirty terminals, defective wire insulation or broken wires. Switches, solenoids, alternator, air compressor, temperature controls and other components may also fail, causing a shorted or open circuit.

Before attempting any failure diagnosis of the electrical system, use a test light or voltmeter to check the battery voltage. If the battery voltage is satisfactory, ensure that all terminals and ground connections are clean and tight. A general understanding of electrical servicing and use of basic test equipment is necessary for troubleshooting and repair.

Check terminals, components, and ground connections in the main electrical box and

console on a regular basis; it will prevent many failures of electrical system.

Hydraulic System Maintenance

A WARNING A

HYDRAULIC OIL ESCAPING FROM LOOSE FITTINGS OR RUPTURED HOSES MAY BE INJECTED INTO SKIN OR THROUGH THIN CLOTHING. DO NOTUSEYOURHANDTOLOCATE LEAKS. ALWAYS WEAR PROPER PERSONAL PROTECTIVE CLOTHING WHILE SERVICING, INSPECTING OR ADJUSTING HYDRAULIC SYSTEM COMPONENTS.

AwARNING A

NEVER ADJUST HYDRAULIC SYSTEM PRESSURE ABOVE THE MANUFACTURER'S SPECIFICED SETTING WITHOUT CONSULTING THE MANUFACTURER DIRECTLY FOR TECHNICAL ASSISTANCE.

Never use automatic transmission fluid or motor oil in the system. Use only AW46 or equivalent hydraulic oil in the system.

Check oil level at the beginning of and periodically during the day's operation, and add as necessary. If continual additions are necessary inspect system for leaks and repair or replace leaking components.

Fill reservoir so level is 1/2 of sight glass when cart tubes are retracted. Insure all pump suction valves are open before starting engine. Inspect system for leakage.

AwARNING A

IMPROPER FLUID LEVEL OR INCORRECT OIL SPECIFICATION MAY RESULT IN CATASTROPHIC FAILURE OF HYDRAULIC PUMP AND SYSTEM COMPONENTS.

AwARNING A

USE ONLY REPLACEMENT PARTS AND HOSES OBTAINED FROM THE MANUFACTURER WHICH MEET OR EXCEEDS SYSTEM PRESSURE AND FLOW REQUIREMENTS. IMPROPERLY SIZED PARTS MAY RESULT IN SEVERE PERSONNEL INJURY OR COMPONENT FAILURE.

Pneumatic System Maintenance

AwARNING A

COMPRESSED AIR FROM THIS SYSTEM IS NOT TO BE USED FOR BREATHING.

Maintain all air solenoids, hoses, and fittings in proper working order. Inspect and replace hoses or fittings only after the compressor has been turned off and air pressure in the system has been purged.

AwARNING A

ALL PRESSURE SWITCHES AND RELIEF VALVES INSTALLED IN THIS SYSTEM ARE DESIGNED TO PROTECT PERSONNEL AND EQUIPMENT. DO NOT DISABLE, REMOVE OR BYPASS ANY SAFETY EQUIPMENT INSTALLED BY THE MANUFACTURER.

Air compressor maintenance requirements and procedures are in the air compressor manual included in the Owner's Manual.

Fuel System Maintenance

AwARNING A

OBSERVE FUEL HANDLING PRECAUTIONS:

- **DO NOT SMOKE WHILE REFUELING.**
- **DO NOT FILL TANK WITH ENGINE RUNNING OR WHILE ENGINE IS HOT.**
- **TURNOFFFURNACEBURNERS BEFORE REFUELING.**
- **KEEP FUEL AWAY FROM OPEN FLAMES OR SPARKS.**
- **READ AND OBSERVE SAFETY PRECAUTIONS AT THE FRONT OF THIS MANUAL**

When replacing the fuel filter, check the fuel line hoses for any cracks or leaks. Replace damaged fuel lines as needed.

Engine Oil and Filter Maintenance

Check engine oil daily. Truck must be setting level when checking oil. Refer to engine manual and maintenance schedule for oil recommendation and capacities.

Change the engine oil and filter per the engine manufacturer's recommendations. If the truck is being operated in extremely dirty conditions, then it is recommended to change oil more frequently.

Engine Air Filter Maintenance

Perform engine air filter maintenance per the respective Engine Owner's Manual.

Routine Maintenance Schedule

The following page contains a routine maintenance schedule to assist you in keeping your equipment maintained. Maintenance service intervals are based on hours of compressor or auxiliary engine operation.

ROUTINE MAINTENANCE SCHEDULE

SERVICE DESCRIPTION	FREQUENCY				
	3 hrs	8 hrs	Weekly	Monthly	Yearly
Check hydraulic oil level and temperature.	X[1]				
Check hydraulic filter pressure drop indicators.	X				
Check auxiliary diesel unit oil pressure, engine temperature and voltmeter.	X				
Check compressor engine oil pressure, engine temperature and voltmeter.	X				
Headlights, taillights and clearance lights.		X			
Tire inflation and wheel fasteners.		X			
Beacon and strobes.		X			
Inspect all hydraulic hoses and fittings for leaks or chafing.		X			
Drain water from air system and check in-line air filter auto drains.		X			
Check air compressor receiver oil level.		X			
Check auxiliary diesel unit engine oil and coolant levels.		X			
Check compressor engine oil and coolant levels.		X			
Check air system lubricator level.		X			
Grease carriages and extension tubes.			X		
Clean soot from furnace heat exchangers.				X	
Clean soot from furnace flame sensors.				X	
Tighten electrical terminals in main electrical box and console.				X	
Clean chassis, compressor and auxiliary diesel unit battery terminals.					X
Change air compressor oil and filter.	[2] **Refer to air compressor manual.**				
Check air compressor air filter.					
Change auxiliary diesel unit engine oil and filters.	[2] **Refer to auxiliary diesel engine manual.**				

[1] Change hydraulic oil filters and sample oil condition after the first 200 hours of operation. Change filters and sample oil condition every 600 hours or yearly after break-in.

[2] Refer to the appropriate section of the Truck Owner's Manual.

TROUBLESHOOTING INDEX

TROUBLESHOOTING

Air Compressor

Symptom	Problem	Remedy
Loss of air pressure	► Air leak	► Check air dump valve under edgeline operators station, air reservoir drain, pop-off valve, and air hose integrity
	► Compressor electrical	► Check main electrical box circuits
		► Check solenoid in compressor compartment is energized (magnetized when energized)
		► Check voltage on both sides of compressor "ON/OFF" switch in console
	► Compressor hydraulic	► Screw relief valve fully in and out, then reset compressor rpm
		► Replace relief valve
No ignition or turns over slow.	► Low battery voltage	► Master switch may have been left on without the engine running. ► Charge battery.
	► Dirty or corroded battery terminals	► Clean battery terminals and posts

TROUBLESHOOTING

Hydraulic Power Plant

Symptom	Problem	Remedy
No ignition or turns over slow.	▶ Low battery voltage	▶ Ensure engine is running when heat system furnaces are on. Hydraulic power plant and battery supply power for furnaces. Master system electrical (compressor engine) supplies power for furnace controllers only.
		▶ Charge or replace battery; check the charge system.
	▶ Hydraulic pump selector valve in "OPERATE" position.	▶ Put selector valve to "START" position when starting the engine.
High ::Pi'i inoµer Hive.	▶ Blown fuse in the Main Electrical box	▶ Replace fuse.
	▶ Self-resetting breaker or 12volt constant-duty solenoid failure. Located in hydraulic power plant compartment	▶ Isolate failed component with a voltmeter or test-light. ▶ Replace failed component.
	▶ Throttle solenoid failure.	▶ Replace solenoid. **Note:** Ensure that linkage allows the solenoid to fully retract when activated.

Material Pumps

Symptom	Problem	Remedy
Hydraulic pump pressure at console will not rise above 500psi.	▶ Hydraulic selector valve in wrong position.	▶ Dial down PRV. ▶ Switch hydraulic selector valve to operate (1850 to 2000 psi).
Hydraulic pump gauge at console rises when PRV is turned up.	▶ Proximity sensors stalled.	▶ Dial down PRV. ▶ Manually trigger proximity sensor(s) with a metal object. Should hear directional valve click.
Hydraulic gauge at console stays at 0psi when PRV is turned up.	▶ Console pump switch	▶ Dial down PRV. ▶ Tum pump switch on.
	▶ PAINT/CIRC switch(s) in PAINT.	▶ Dial down PRV. ▶ Switch appropriate gun(s) to CIRC.
	▶ PRV failure	▶ Tum hydraulic power plant off. ▶ Replace PRV.
	▶ No power at pump switch. Blown fuse in Main Electrical Box.	▶ Dial down PRV. ▶ Replace "WN Material Pump" fuse.

TROUBLESHOOTING

Hydraulic gauge at console stays at Opsi when PRV is turned up.	▶ Push/pull switch failure.	▶ Replace switch.
	▶ Failed solenoid at console hydraulic block.	▶ Dial down PRY. ▶ Check for voltage at solenoid when pump switch is on in CIRC. ▶ Replace solenoid if required
Pumps stop at top or bottom of stroke.	▶ Pump fasteners loose.	▶ Tighten hydraulic pump shaft on material pump t-bar
	▶ Directional valve failure.	▶ Try operating directional valve by using the manual override buttons on the end of the solenoids. ▶ Replace directional valve. If solenoids are good they can be saved for spare parts.
Pumps stop at top or bottom stroke	▶ Proximity sensor not triggered.	▶ Ensure sensors are operational. Lamp in sensor base will light when metal object triggers sensor. ▶ Check clearance of sensor from disk (1/4" max). ▶ Ensure that set-screw hole on disk isn't lined up with sensor. If disk is tight on shaft, tighten shaft and fasteners.
	▶ Pump circuit electrical failure.	▶ Ensure all pump circuit fuses in Main Electrical box are good. ▶ Turn off Master circuit electrical and ensure all terminals are tight in the Main Electrical box (including the Slave Box, fuse block, relay blocks, terminal strip and power/ground distribution block). ▶ Ensure console terminal strip and pump switch terminals are tight. ▶ Check for corrosion and loose wires at pump directional valve solenoids.

TROUBLESHOOTING

Material Pumps (continued)

Symptom	Problem	Remedy
Pumps stop at top or bottom stroke (continued)	► Pump circuit electrical failure. (continued)	► Check terminal box and wiring at grommets on the front of the pump tower. ► Move pump to center so that disk isn't triggering proximity sensors. ► Shut of engines; chassis, compressor and hydraulic power plant. Leave Master circuit power on, tum pump switch back on and switchbox to CIRC. ► Ensure directional valve solenoirls ;ire clickin, when you altemate1y tngger the proximity sensors with a metal object. ► Ensure relays in the Main Electrical box are switching when you alternately trigger the proximity sensors. ► Isolate failed relay or directional valve solenoid; replace failed component.
Pump hydraulic pressure bleeds off when pumps are static at application pressure.	► PRV failure.	► Hydraulic power plant off. ► Replace PRV.
	► Other hydraulic component failure.	► Consult MRL tech. service.
Material pumps continue to cycle when switched to PAINT.	► Incorrect switchbox settings	► Both CIRC/PAINT switches for each color need to be in PAINT.
Both material pressures bleed off when switched to PAINT.	► Low or no air pressure.	► Start compressor. ► Open supply valves, close dump valves. ► Close material tank dump valves. ► Close bead load valves. ► Check air supply valve on solenoid manifold above CIRC/ PAINT valves.

TROUBLESHOOTING

Problem		
Both material pressures bleed off when switched to PAINT	▶ CIRC/PAINT valves not operating.	▶ Ensure valves are switching to PAINT by manually triggering solenoid valves. (Trace air hoses to locate solenoid) ▶ Troubleshoot solenoid electrical. ▶ Replace solenoid.
Only one material pressure bleeds off when switched to PAINT.	▶ Material leak.	▶ Repair leak.
	▶ High-pressure relief valve failure. (If valve is warm, near material temperature, failure is indicated.)	▶ Replace relief valve.
	▶ CIRC/PAINT valve packing failure. (Front cabinet, right side.)	▶ Repair or replace failed valve.
Pressures split while circulating, one material rises while the other drops or stays at 0psi.	▶ Material leak.	▶ Repair leak.
	▶ Flow restriction at high-pressure filter screens.	▶ Clean high-pressure filter screens.
	▶ High-pressure relief valve failure. (If valve is warm, near material temperature, failure is indicated.)	▶ Replace relief valve.
	▶ Handgun 3-way valve improperly positioned. (Front cabinet, right side)	▶ Ensure valves at CIRC/PAINT valves are in the right position.
	▶ Restrictor orifice plugged. (Front cabinet, left side.)	▶ Cycle appropriate orifice valve 180°.
	▶ Restrictor orifice flip-valve leaking.	▶ Teflon packings need to be replaced, rebuild valve. ▶ Ensure valve handle is positioned properly. (Valve handle could have been installed wrong if recently serviced.)
Pressures split during down-stroke of pumps.	▶ Material supply **Note:** Insufficient material supply or cold material is indicated by pump "surge" during down-stroke of the pumps.	▶ Ensure there is sufficient material in tanks. ▶ Ensure that all 2" valves between material tanks and heat exchangers are open. ▶ Ensure that all I" valves at pump inlets are open. ▶ Ensure there is sufficient air pressure in material tanks. ▶ Ensure Y-strainer screens aren't restricted.

TROUBLESHOOTING

Material Pumps (continued)

Symptom	Problem	Remedy
Pressures split during down-stroke of pumps (continued)	➢ Cold material	► Ensure heat system is working properly. ► Allow more time for preheat.
	► Proportioning pump failure. Lower check ball leaking.	► May be able to clear debris from lower ball and seat without rebuilding pump. Contact MRL. ► Rebuild pump.
Pressures split during up-stroke of pumps	► Proportioning pump failure. Upper check ball or piston packings leaking.	► Rebuild pump.
Pressures split while spraying.	► Material leak	► Repair leak.
	► Flow restriction at high-pressure filter screens.	► Clean high-pressure filter screens.
	► High-pressure relief valve failure. If valve is warm (near material temperature) failure is indicated.	► Replace relief valve.
	► Plugged or restricted mix-chamber orifice at gun.	► Clear orifice or rebuild gun.
Upper packing leakage filling cups.	► Upper packing wear	► Tighten upper packings. ► Tighten with pumps warm. ► Tighten only enough to stop leakage. ➢ Clean and lubricate cups.

Material Accumulators

Symptom	Problem	Remedy
Accumulator(s) loose nitrogen charge.	► Leak in nitrogen plumbing.	► Leak-check nitrogen plumbing, tighten or replace needle valve or fittings.
	► Accumulator piston seal leaking. There may be material on the nitrogen side of the piston.	► Rebuild or replace accumulator(s).
Accumulator gauge is much lower than Duplex gauge at application pressure.	► Low nitrogen charge, piston has topped out in accumulator.	► Troubleshoot low nitrogen charge.

Hydraulic System

Symptom	Problem	Remedy
Hydraulic accumulator(s) loose nitrogen charge.	► Leak in nitrogen plumbing.	► Leak-check nitrogen plumbing, tighten or replace needle valve or fittings.
	► Accumulator bladder failure.	► Rebuild or replace accumulator(s).

TROUBLESHOOTING

Hydraulic System (continued)

Symptom	Problem	Remedy
Hydraulic cooler fans inoperative.	▸ Fan electrical supply (Inside hydraulic power plant enclosure.)	▸ Ensure voltage across 40amp self-resetting breaker, 12volt constant-duty solenoid and solenoid exciter supply from ignition or oil pressure sensor. Replace faulty component(s).

Heat System

Symptom	Problem	Remedy
Slow blower motor speed, weak or popping flame, excessive smoke, multiple furnaces going to reset.	▸ Low voltage.	▸ Hydraulic power plant supplies furnace motor, electrical, power plant must be running. ▸ Troubleshoot hydraulic power plant charge system.
	▸ Contaminated fuel supply.	▸ Fuel is from the chassis fuel supply. ▸ Add fuel additive for moisture. ▸ Install fuel filter/water separator.
	▸ Air Supply	▸ Adjust furnace air intake.
Backfire at ignition.	▸ Air supply	▸ Increase air supply for high altitude.
Loss of power to all three furnaces.	▸ Main power supply from hydraulic power plant battery interrupted. Located in chassis battery box.	▸ Furnaces may work fine after the breaker resets. ▸ Replace 40amp self-resetting breaker. ▸ Run two furnaces only until breaker can be replaced.
Furnace blower comes on but furnace will not ignite.	▸ 12-volt constant-duty solenoid in Main Electrical Box.	▸ Ensure voltage is present at exciter terminals. ▸ Replace solenoid.
	▸ Temperature controller switch leg interrupted.	▸ Inspect and repair two spade-connectors at furnace "brain" box. ▸ Ensure temperature controller switch is operating properly by toggling set temperature.
Single furnace shuts down soon after flame ignition.	▸ Flame sensor covered with soot.	▸ Clean photocell.
	▸ Flame sensor broken/cracked.	▸ Replace photocell.

TROUBLESHOOTING

Control console does not have power	► Master switch is off.	► Tum Master switch on
	► Emergency shutdown switch(s)	► Release emergency shutdown switches at console and cab.
	► Weak or dead battery	► Charge the battery
	► Master fuse in main electrical box	► Replace bad fuse.
	► Main solenoid failed, exciter terminal voltage and ground are good, no voltage on load side of 12volt constant duty solenoid.	► Replace failed solenoid.
	► Tripped l00A circuit breaker in auxiliary diesel engine enclosure	► Reset breaker
Air compressor, work lights, timer etc. do not have power	► Fuse in main electrical box	► Replace appropriate fuse
	► Loose or corroded connection	► Inspect terminals in main electrical, console and hydraulic directional valve blocks.
Voltage is getting low during the operation	► Battery does not hold a charge.	► Clean the battery terminals
		► Check the batteries for dry or failed cells, service as necessary.
	► Alternator output is not sufficient.	► Check alternator belt tension
		► Check alternator electrical terminals and electrical circuit.
Solenoid not energizing.; valve operates when manual override is triggered	► Blown fuse	► Replace appropriate fuse
	► Bad wire connection.	► Check terminals in main electrical box, console and solenoid
	► Defective solenoid	► Replace solenoid

Master Circuit Electrical

::-Sympfofu	Prolilem	Remedy
No power at operator's console	► Master switch off.	► Tum Master switch on.
	► Compressor battery	► Ensure that battery is charged and compressor electrical system is working properly.
	► Master circuit fuse in Main Electrical box is blown.	► Replace fuse. (Always the bottom fuse in the fuse block.)

TROUBLESHOOTING

Master Circuit Electrical (continued)

Symptom	Problem	Remedy
No power at operator's console	▶ 100amp circuit breaker tripped.	▶ Reset circuit breaker. (Located in compressor enclosure.)
	▶ Master circuit 12volt constant-duty solenoid.	▶ Ensure voltage present at exciter terminals
		▶ Check voltage on load side of solenoid; replace if bad.
Low voltage at console voltmeter.	▶ Gauge error	▶ Verify proper charge at compressor voltmeter.
Low voltage at voltmeter.	▶ Charge system	▶ Ensure battery terminals are clean, battery charged, alternator voltage output is good and alternator belts are tight.
Camera actuators inoperative.	▶ Fuse in chassis fuse block (newer models). Breaker at Main Electrical box (older models).	▶ Avoid holding switch when cameras are at full travel.

Timer System

Symptom	Problem	Remedy
Switchboxes inoperative. Console displays - "MEMORIZE", blank or garbled.	▶ Timer system needs to be reset.	▶ Turn Master switch off for 10 seconds.
Switchboxes inoperative. Console displays - "TURN OFF START SWITCH".	▶ One of the START switches was on at start-up.	▶ Turn off START switches.
One of the switchboxes is inoperative.	▶ Data cable or plug	▶ Check plug connections for moisture and corrosion.
		▶ Plug switchbox into another location using different cable to check operation
		➢ Replace plug or cable.
Single switchbox function not working. Tested with both switchboxes.	▶ Switchbox failure.	▶ Plug a working switchbox into the problem box's data cable, if it works, get box repaired.
	▶ Slave box failure. (Located in Main Electrical box).	▶ Ensure voltage is present at the proper Slave box tenninal.
		▶ Test non-functioning circuit by grounding the proper Slave box terminal.
		▶ Get Slave box repaired.

TROUBLESHOOTING

Timer System (continued)

Symptom	Problem	Remedy
Applied skip cycle (skip start to start) is not the same as console timer system setting.	▶ Timer system calibration	▶ Ensure calibration setting hasn't been accidentally changed. (Cal. # should be written down for reference.)
		▶ Ensure that the sensor and mag-wrap on the chassis driveline are clean, secure and adjusted properly
		▶ Calibrate the timer system.
Applied skip length is not the same as the console timer setting. 3kIp le11gdlS add LjCk; a1e consistent.	▶ If the calibration menu of the timer system includes GUN FACTOR option, this Will have to be calibrated.	▶ Calibrate GUN FACTOR using Skipline manual.
	▶ If GUN FACTOR calibration is not an option. Applied skip length will not match skip length setting.	▶ Add tenths to skip length setting until desired application length is acquired. (Normally 3-4 tenths for a 10' skip.)
Applied skip lengths are inconsistent.	▶ Gun or air solenoid sticking.	▶ Ensure gun is operating properly.
		▶ Ensure solenoid in cart-box is operating properly.
	▶ Hall Effects sensor signal is inconsistent.	▶ Check Slave box terminals in Main Electrical box.
		▶ Check sensor and mag-wrap on chassis driveline.
Speedometer on console switchbox display at 0.0	▶ No signal from Hall Effects sensor at chassis driveline.	▶ Adjust sensor clearance to ½" or less from mag-wrap.
		▶ Check continuity of three Hall Effects wires from the sensor to the Main Electrical box.
Speedometer on console switchbox display at 0.0	▶ At Slave box tenninal "G"; there should be 0volts when the sensor is over a magnet, 12volts when the sensor isn't over a magnet.	▶ Replace Hall Effects sensor

TROUBLESHOOTING

Timer System (continued)

Symptom	Problem	Remedy
Gallon counter(s) incorrect.	▶ Timer system calibration # incorrect.	▶ Measure pump stroke and use calibration chart (See Owners Manual) to calculate the setting. ▶ Fine tune by measuring tank levels and adjusting the calibration # by percentage of difference.
Carriage will not raise.	▶ Blown fuse and/or loose terminals in Main Electrical box.	▶ Replace fuse and check terminals on fuse block and Slave box.
	▶ Single switchbox function failure.	▶ Test and remedy as described previously
	▶ Directional valve or solenoid failure.	▶ Ensure solenoid is magnetizing when energized.
		▶ Check operation by manually triggering the valve.
		▶ Replace solenoid; repair or replace valve.
One or more of the AIR dusters doesn't shut off with the switch.	▶ Diaphragm valve(s) sticking	▶ Clean and lubricate seat and diaphragm. (Located under the deck between operator stations.

Gun Actuators

Symptom	Problem	Remedy
Gun actuator inoperative	▶ Blown fuse in Main Electrical box.	▶ Replace fuse.
		▶ Check for damaged wires near the actuator.
		▶ Check voltage at plug. UP/DOWN switch changes polarity at plug.
	▶ Failed up or down relay in Main Electrical box.	▶ Ensure that relays are operating when up/down switch is operated
	▶ Corroded or damaged actuator assembly.	▶ Lubricate ¼" stabilizer rod. Repair or replace damaged components.

TROUBLESHOOTING

Gun Actuators (continued)

Symptom	Problem	Remedy
Gun actuator inoperative (continued)	► Actuator is moving in the mount assembly.	► Tighten actuator in mount with two set-screws on set-collars. There should be a metal strip behind set-screws to protect the actuator limit switch. Do not over-tighten; actuator could be damaged.
	► Actuator mount set-screws have been over-tightened and have damaged the actuator limit switch.	► The actuator can be salvaged. • Cut the limit switch wires at the top of the ;i;-tmtrw rnnnPl'.t thP two Wifes with a wife-nut or crimp connector. • This will eliminate the auto-stop function of the limit switch. If the UP/DOWN switch is held when the actuator gets to its stops, the fuse in the Main Electrical box will blow.

Material Application

Symptom	Problem	Remedy
Pump Strokes - Even spaced areas of no cure, slow cure and/or discoloration.	► Material accumulators	► Check accumulator nitrogen charge. ► Ensure Accumulator charge gauge raises along with Duplex. ► Repair nitrogen plumbing leaks, rebuild or replace accumulator.
	► Pump linkages and/or fasteners loose.	► Ensure all linkages and fasteners are tight.
	► Hydraulic pump stroke improperly adjusted.	► Adjust proximity sensor clearance and position to ensure that pump is shifting at least 1/8" before full stroke.
	► Y-strainer screens and/or high-pressure filter screens restricted.	► Clean filter screens.

TROUBLESHOOTING

Material Application

Symptom	Problem	Remedy
Pump Strokes - Even spaced areas of no cure, slow cure and/or discoloration. (continued)	▶ Material temperature	▶ Ensure heat system is working properly. ▶ Ensure material tank glycol jackets are heating and air has been purged at petcocks.
Overspray - Splatter.	▶ Low material temperature.	▶ Increase material temperatures.
	▶ Truck speed	▶ Maintain consistent truck speed.
	▶ Spray tip fan angle	▶ Use narrower angle tip so that gun can be raised.
	▶ Gun angle	▶ Angle gun slightly to spray rearward. A gun angled forward will cause material to puddle and splatter.
Overspray - Mist, halo effect beside lines.	▶ High material temperature.	▶ Reduce material temperature.
	▶ Spray tip fan angle	▶ Use wider-angle tip so that gun can be lowered to reduce overspray in windy conditions.
Heavy edges, railroad tracking.	▶ Low material temperature.	▶ Increase material temperatures.
	▶ Spray tip worn or obstructed.	▶ Clean or replace spray tip.
	▶ Spray tip orifice size	▶ Use appropriate tip for mix-chamber being used.
Cure time inconsistent side to side.	▶ Low material temperature.	▶ Increase material temperatures.
	▶ High-pressure material restriction.	▶ Ensure high-pressure filter screens are clean. ▶ Ensure mix-chamber orifices are clear.
	▶ Purgemaster needle inhibiting material flow.	▶ Ensure needle assembly is tight. ▶ Ensure two-piece piston assembly is operating properly and o-rings are good. ▶ Ensure air system is working properly with no leaks, gun o-rings are good and air passages are clear.

TROUBLESHOOTING

Bead Application

Symptom	Problem	Remedy
Bead surging	► Damp beads	► Clean out damp beads, replace with dry beads.
	► Improper tank pressure.	► Adjust bead tank pressure at console
	► Vent on bead manifold is plu!l!led.	► Clean bead manifold vent, replace filter if plu!l!led.