

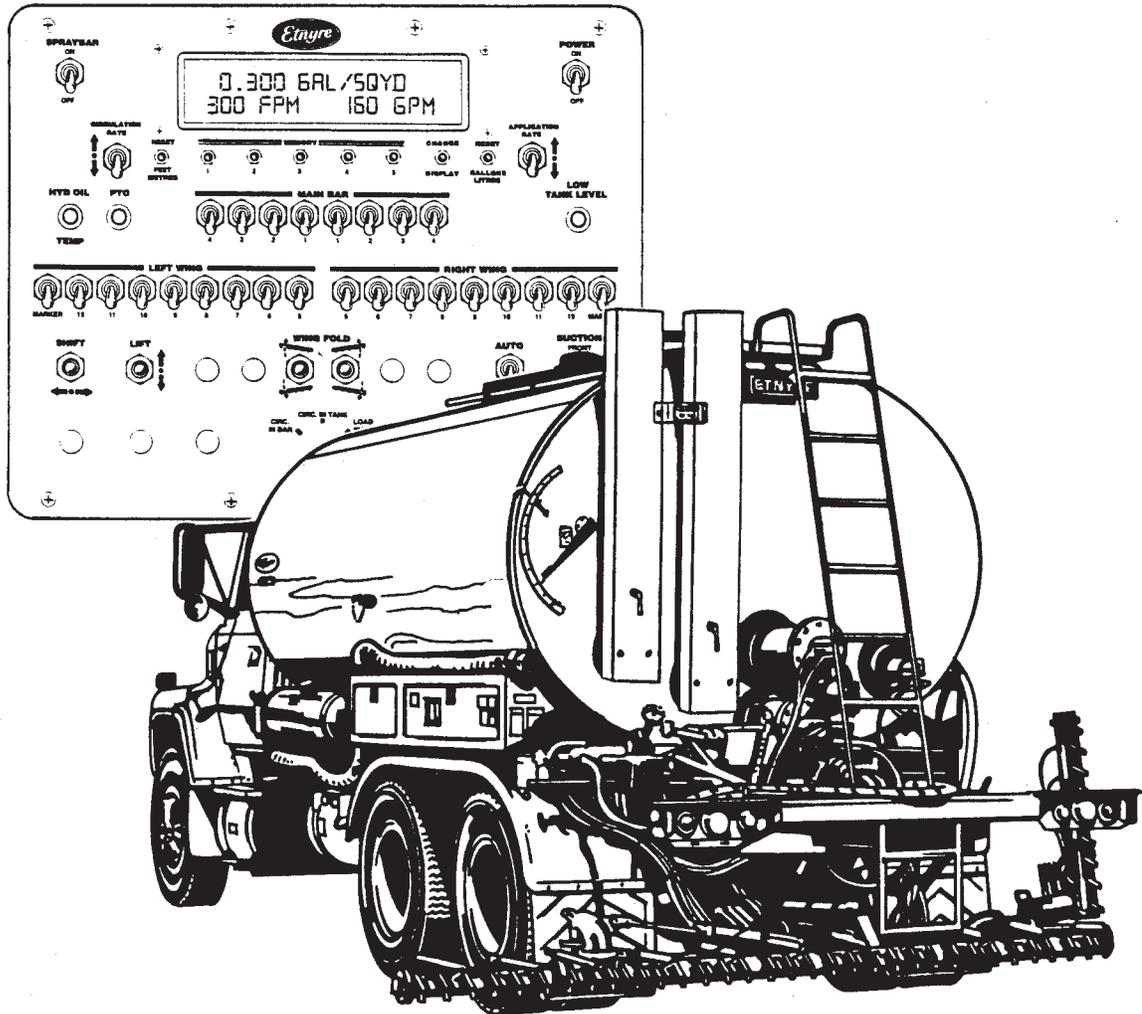
# M-102-95R

Supersedes M-102-95



## BLACK-TOPPER® SERIES 2000

### OPERATION, MAINTENANCE and SAFETY MANUAL



E. D. ETNYRE & CO., Oregon, Illinois 61061

# GENERAL SAFETY INSTRUCTIONS

The operation of a bituminous distributor normally requires the handling of liquid products at elevated temperatures. Additionally, these liquids may be of a volatile nature. A heating system is supplied to raise or maintain the product temperature, and these systems use highly combustible fuels. And, as with any type of construction equipment, there are certain hazards associated with improper or careless operation.

Safety warnings have been provided to call attention to any potentially hazardous situation that may cause property damage, personal injury or death to the operator or bystanders. These safety warnings are identified by the following warning symbol.

- The **DANGER** symbol alerts you to immediate hazards which **WILL** result in severe personal injury or death.
- The **WARNING** symbol alerts you to hazards which may cause severe personal injury or death.

All of these warnings are listed below, and they also appear throughout the manual.

You will also find **CAUTIONS** and **NOTES** throughout the manual.

- A **CAUTION** alerts you to procedures that may result in damage to the equipment if not followed properly.
- A **NOTE** provides general information that the operator should be aware of when performing an operation.

## **DANGER**

To avoid an extreme fire hazard or explosion, **NEVER** use gasoline as fuel in low pressure or generating burners.

## **WARNING**

A fully charged dry chemical type fire extinguisher must be within easy reach whenever the burners are operating or there is an open flame near the distributor. Minimum dry chemical capacity of the fire extinguisher should be 10 pounds.

To prevent an explosion or fire hazard: Position unit broadside to wind to prevent volatile fumes from drifting toward burners.

To prevent an explosion or fire hazard: Flues must be covered by a minimum 6 inches of material (bitumen) when burners are in operation.

To prevent an explosion or fire hazard: Ensure that burners are extinguished before removing any material from tank in any manner. Liquid petroleum (L.P.) burners can support a flame for several minutes after the fuel supply is turned off.

To prevent an explosion or fire hazard: Do not operate burners if tank is damaged or leaking.

To prevent an explosion or fire hazard: Do not operate burners when vehicle is unattended, when vehicle is in motion, or with vehicle in a confined area.

## **WARNING**

To prevent an explosion or fire hazard: When burners go out, shut off fuel supply to both burners and allow flues to ventilate for at least 3 minutes before re-lighting burners.

To prevent an explosion or fire hazard: Do not heat material beyond the manufacturer's recommended temperature.

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent possible hand or facial burns: Always light inside burner first. Do not reach across a lit burner to light (or re-light) inside burner. Shut off outside burner before lighting inside burner.

To prevent possible burns: Always use a torch to light burners. Never attempt to light burners with a match or pocket lighter.

To prevent an explosion or fire hazard: Check the tank vent to insure that it is free from obstruction before lighting the burners.

To prevent an explosion or fire hazard: Do not operate the burners with the manhole open or open the manhole while the burners are in operation.

To prevent possible burns to operators or bystanders, or possible equipment damage, do not start any operation if the control settings for the asphalt pump are unknown.

# GENERAL SAFETY INSTRUCTIONS

## WARNING

To prevent possible burns from leaking material: Be sure all pipe, cap and hose connections are secure before opening valves.

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

To prevent an explosion or fire hazard: Keep area free of all sources of combustion when spraying .

To prevent foaming or violent eruption: Do not load tank with material temperature over 200° F if water or condensation is present in tank, or if emulsion was used in the previous load. Clean and thoroughly drain tank first. If water or emulsion may be present in spray bar or circulating system, allow a small amount of hot material to circulate in bar BEFORE filling tank. Do not heat material over 200° if moisture or emulsion is present in tank.

To prevent an explosion or fire hazard: Eliminate sparks from engine exhausts.

## WARNING

To prevent possible burns from hot asphalt spray when handspraying: Hold handspray gun in proper position and watch for other people.

To prevent burns: Always wear insulated gloves when handling spray bar sections or hoses.

To prevent severe injury from becoming entangled in machinery: Stand clear of rotating drives.

To prevent possible injury: Always open manhole cover slowly. Pressure build-up in tank may cause cover to burst open.

To prevent possible fire hazards, burns or falls: Keep unit clean for safe operation.

To prevent personal injury, be sure no one is standing near rear of truck when the circulate in tank, circulate in bar, load, or suckback functions are switched with the Rotary Actuator knob (if equipped).

To prevent possible burns from material overflow: Allow sufficient space in tank for expansion of material when heating.

## WARNING

Before removing fill line cap, make certain asphalt pump is turning and suction valve is closed.

# INTRODUCTION

Your Etnyre Distributor is designed to give you many years of accurate, dependable, and economic service. The following instructions will enable you to receive the maximum performance from your distributor.

The distributor controls are designed for simple operation. They require a minimum of training for proficient usage. The exclusive Etnyre circulating system is designed and built for handling all grades of bituminous materials efficiently.

This manual is provided as a tool to aid personnel in the operation of the Etnyre Black-Topper in a safe and efficient manner. As with any type of construction equipment, there are certain hazards associated with improper or careless operation. The ability to read and understand the instructions in this manual should be a required qualification to become an operator. There are also functions that require a certain amount of physical strength to accomplish. Persons lacking the required strength may not only place themselves in jeopardy, but also others in the vicinity.



## **CAUTION**

Unusually strong electromagnetic interference could cause the electronic controls on this equipment to temporarily mis-function. Test the effect of two way radios and similar equipment while operating in a safe area.

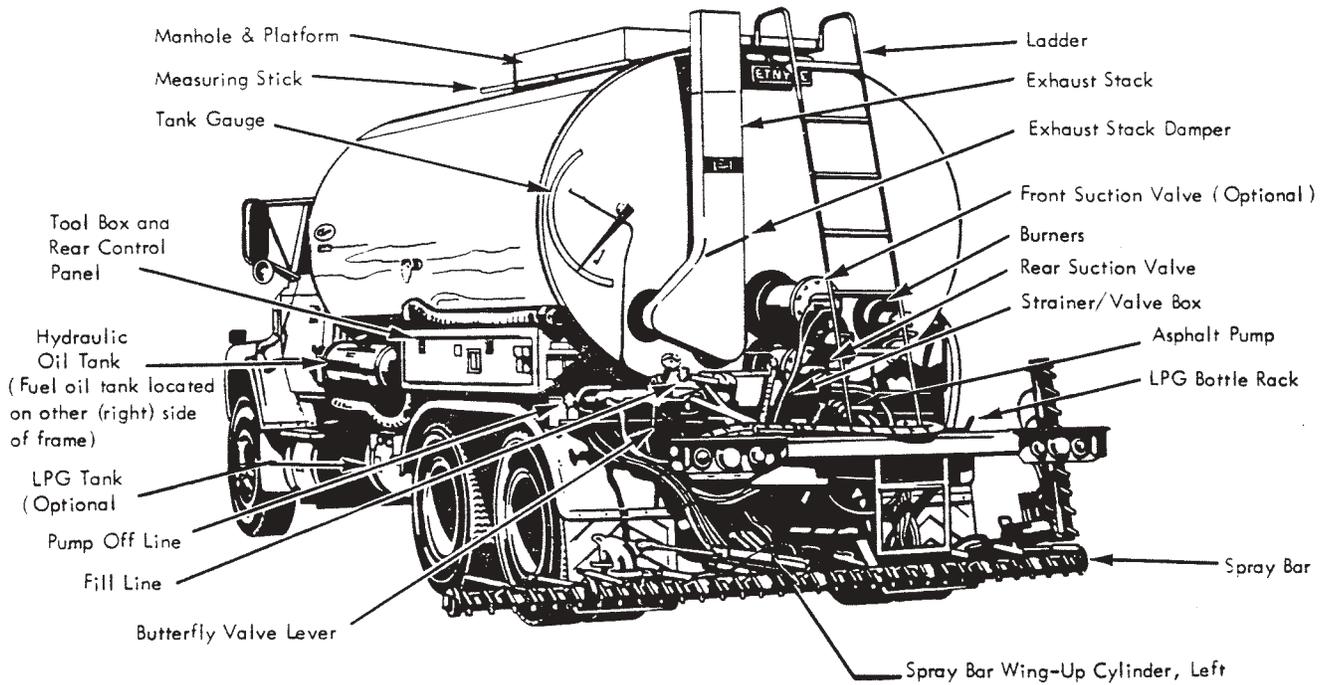
## **REPORTING SAFETY DEFECTS**

If you believe that your vehicle has a defect which could cause a crash, or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying E. D. Etnyre & Co.

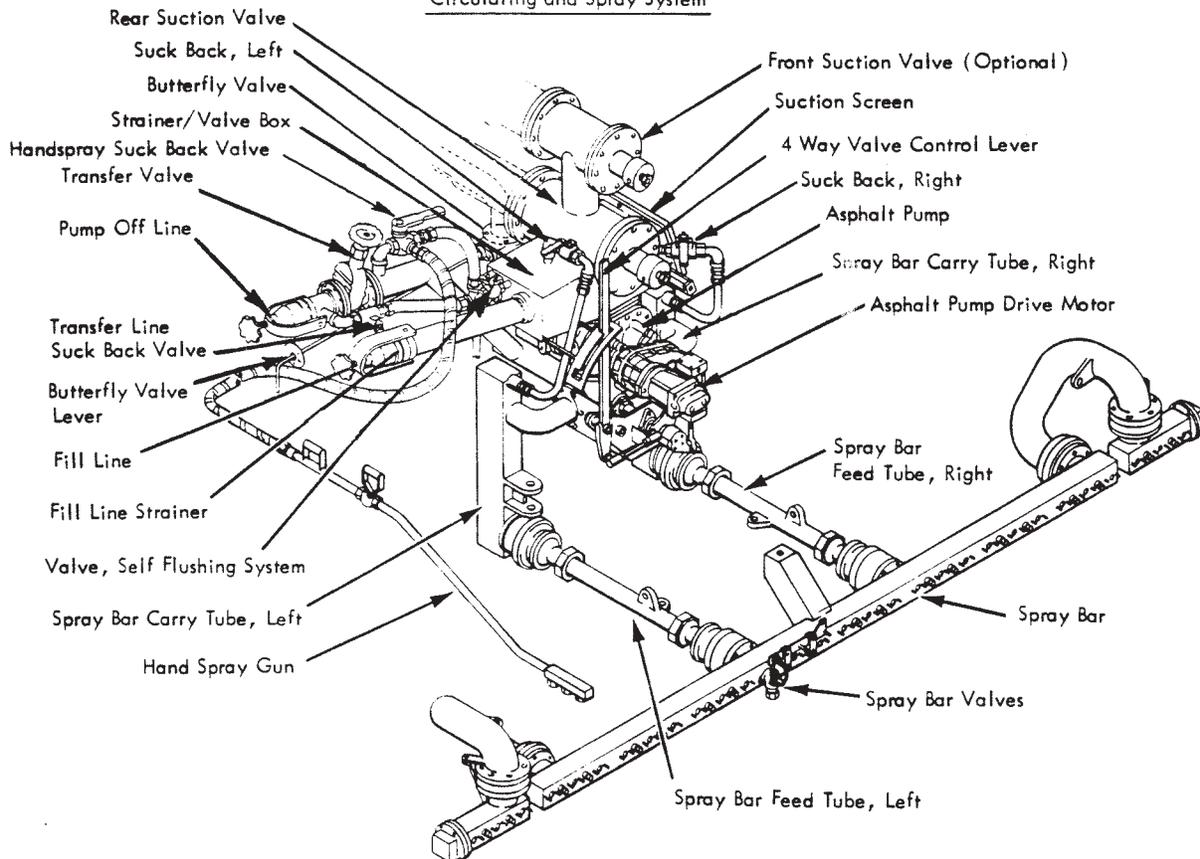
If NHTSA receives similar complaints, it may open an investigation; and, if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or E.D. Etnyre & Co.

To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in the Washington, D.C. area), or write to: NHTSA, U.S. Department of Transportation, Washington, D.C., 20696. You can also obtain other information about motor vehicle safety from the hotline.

# COMPONENT LOCATION AND IDENTIFICATION

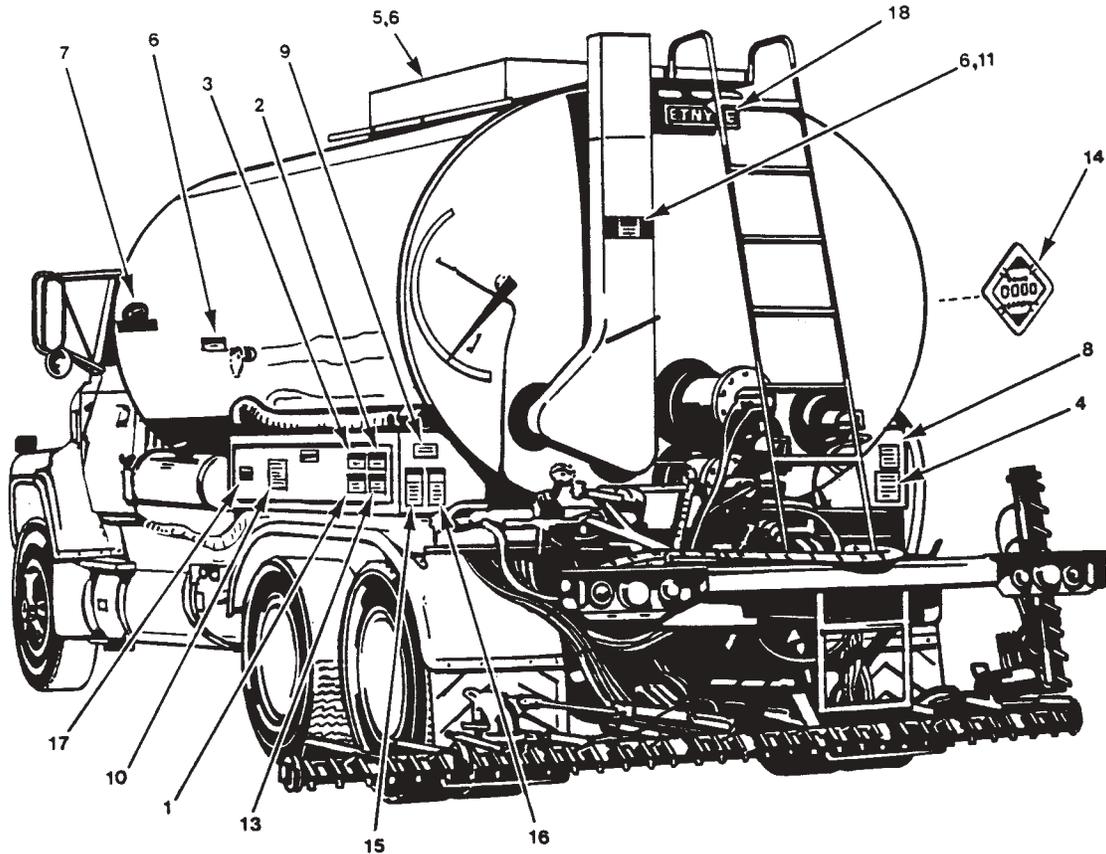


## Circulating and Spray System



# COMPONENT LOCATION AND IDENTIFICATION

WARNING AND INSTRUCTION PLATES



**⚠** For operator safety and possible liability protection, all Safety and Instruction Plates should remain in place and be legible.

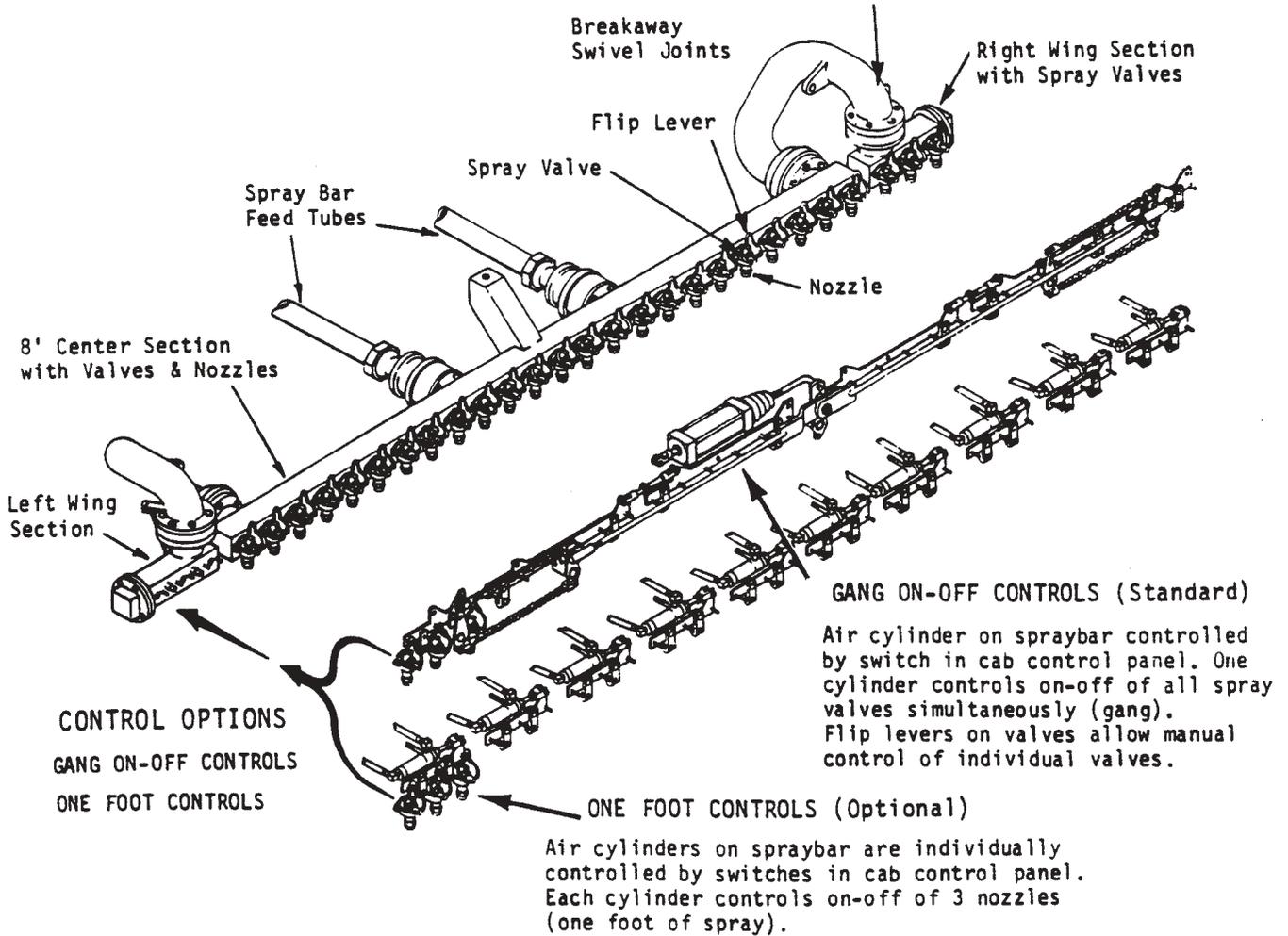
**⚠** Should a plate be removed, lost, or become illegible, reorder and replace immediately.

**⚠** If plates become difficult to read because of material coating the surface, clean with solvent.

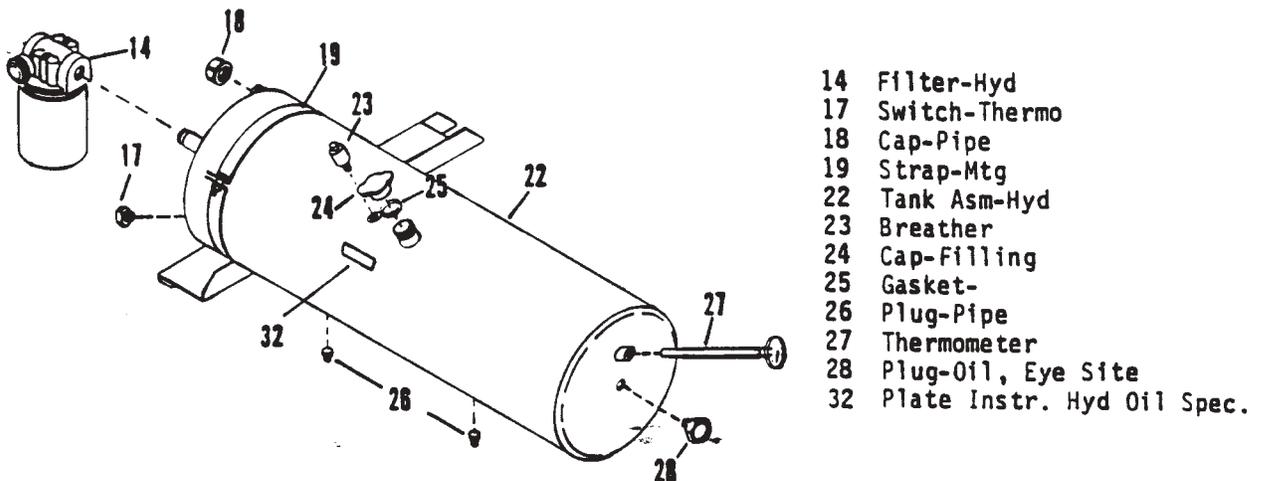
REF.	PART NO.	QTY.	DESCRIPTION	REF.	PART NO.	QTY.	DESCRIPTION
1	3561029	1	Plate-Caution, Shields In Place	13	3390620	2	Plate-Warning, Manuals
2	3561028	1	Plate-Caution, Remain Clear	14	6320056	AR	Placard System (Optional)
3	3561027	2	Plate-Caution, Before Starting	15	3390636	1	Plate-Warning, Flues Covered
4	3390537	1	Plate-Warning, Burner, General	16	3390637	1	Plate-Warning, Asphalt Grades
5	3390535	2	Plate-Warning, Manhole	17	3360414	1	Plate-Name, Distributor S/N, Brass
6	3561030	3	Plate-Caution, Hot Surface	18	3390149	1	Plate-Name, Etnyre
7	3390654	2	Decal-BlackTopper Series 2000				
8	3390540	*	Plate-Directions, LPG Burner				AR = As Required
	3390629	*	Plate-Directions, High Pressure Burners				* Use Appropriate Plate For Specific Burner Type
9	3390534	1	Plate-Warning, Fill Cap				
10	3390533	1	Plate-Warning, Safety, General				
11	3390562	1	Bracket-Mtg, Cauton Plate, Hot Surf				
12	6100139	AR	Rivet-Pop, 0.12, Not Shown				

# COMPONENT LOCATION AND IDENTIFICATION

## SPRAY BAR COMPONENT IDENTIFICATION

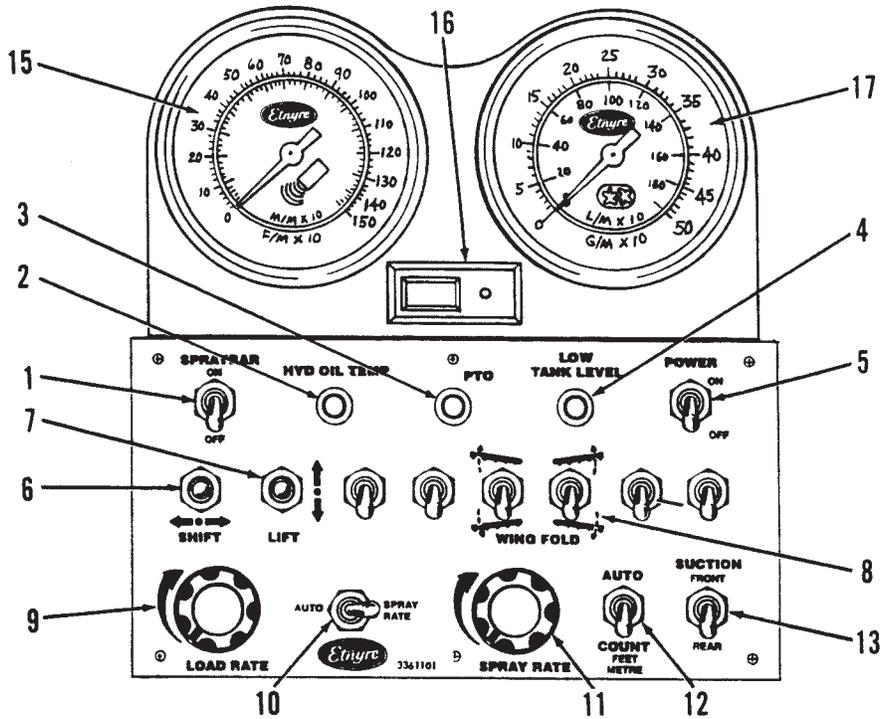


## HYDRAULIC TANK AND COMPONENTS



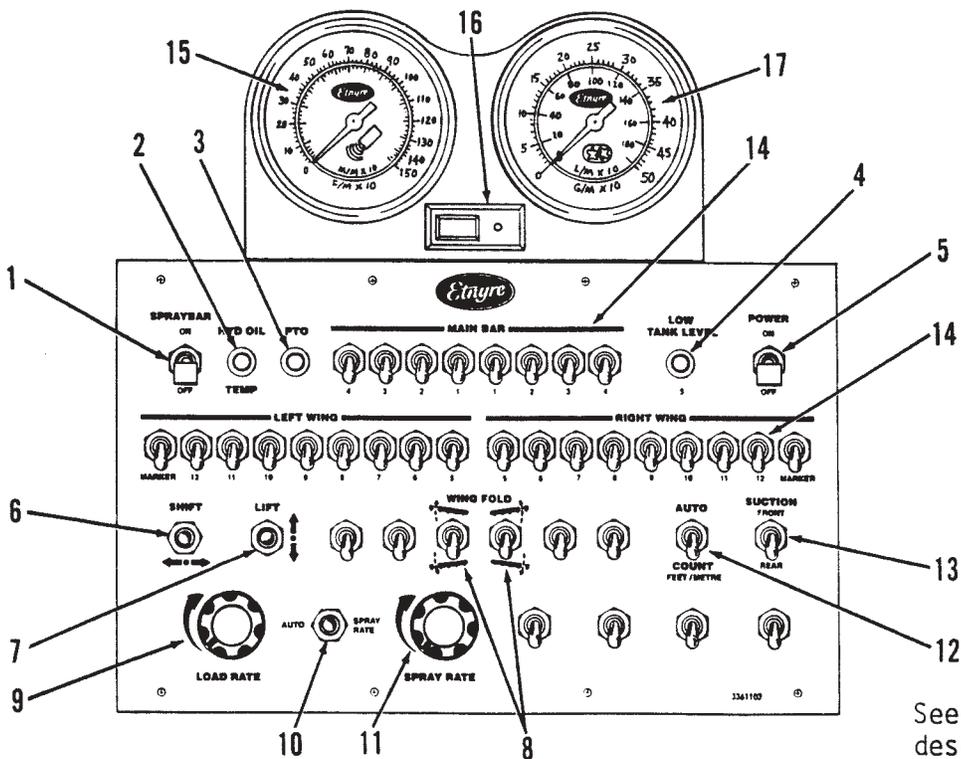
# COMPONENT LOCATION AND IDENTIFICATION

## BASIC CONTROL PANEL



See page 8 for descriptions

## BASIC CONTROL PANEL WITH ONE-FOOT BAR CONTROLS



See page 8 for descriptions

# COMPONENT LOCATION AND IDENTIFICATION

## BASIC CONTROL PANEL AND OPTIONAL ONE-FOOT BAR CONTROLS

### **WARNING**

To prevent possible burns to operators or bystanders, or possible equipment damage, do not start any operation if the control settings for the asphalt pump are unknown.

**NOTE:** *The LOAD RATE and SPRAY RATE knobs on the basic cab control panel, and the PUMP CONTROL knob on the rear control panel are 10-turn controls; they can be rotated ten (10) full revolutions between their minimum and maximum settings. If you are not sure of the pump control setting, turn the control fully counter-clockwise to the minimum setting before starting the operation, then increase the pump speed gradually to the desired rate.*

1. **SPRAY BAR ON/OFF Switch:** Actuates solenoid valve to control product flow to spray bar.
2. **HYD OIL TEMP Indicator Light:** Indicates hydraulic oil temperature is excessive. Light comes on if hydraulic oil temperature exceeds 180 degrees F.  
*CAUTION: Stop unit immediately and determine cause of high temperature. Damage to equipment may result.*
3. **PTO Indicator Light:** Indicates PTO engagement when lit.
4. **LOW TANK LEVEL Indicator Light:** Indicates low asphalt level in tank.
5. **POWER Switch:** Controls master power to both front and rear control panels.
6. **SHIFT Switch:** Controls left and right movement of spray bar.
7. **LIFT Switch:** Controls raise/lower function of spray bar.
8. **WING FOLD Switch:** Controls raise and lower (fold) functions of spray bar wings. Panel shown is for a unit with three hinges on each side of bar. Units with fewer hinges will have a corresponding number of switches.
9. **LOAD RATE Knob:** Controls speed of asphalt pump for all functions requiring circulation or transfer of material except spraying. When spraying (SPRAY BAR switch ON), the asphalt pump is controlled by the setting of the SPRAY RATE knob.

10. **AUTO/SPRAY RATE Switch:** The SPRAY RATE position is used for setting the desired application rate with the SPRAY RATE knob.

The AUTO position is used during spraying operations. When this switch is in the AUTO position and the SPRAY BAR switch is OFF (no spray), the asphalt pump circulating rate is controlled by the setting of the LOAD RATE knob. When spraying is initiated (SPRAY BAR switch ON), the asphalt pump speed is automatically switched to correspond with the application rate setting of the SPRAY RATE knob.

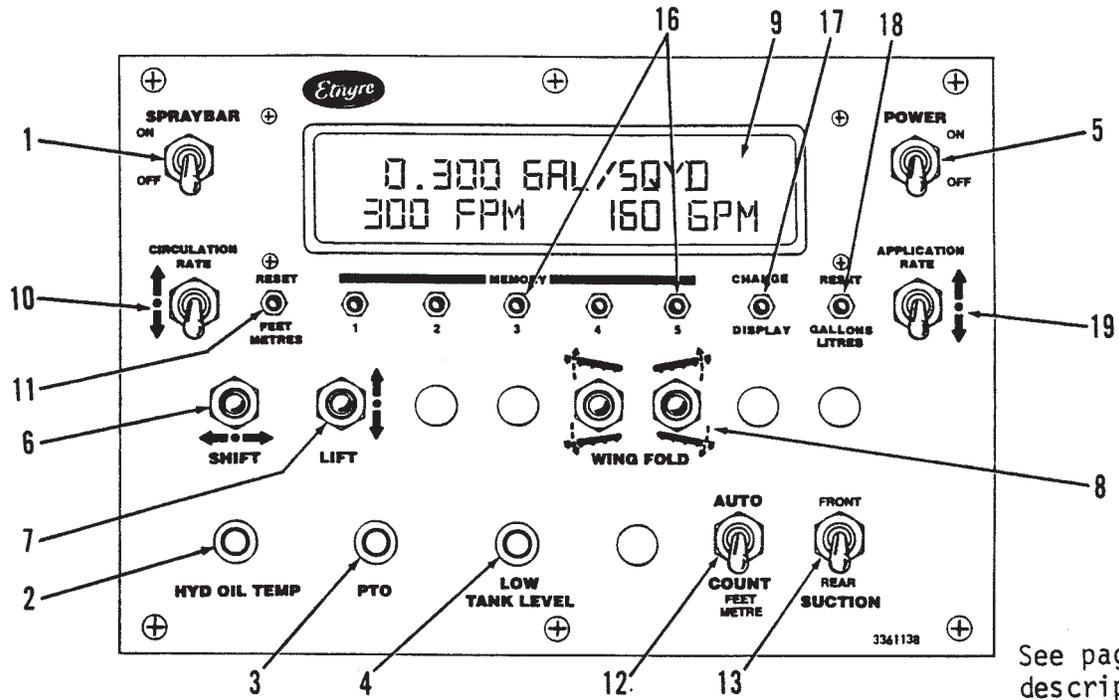
11. **SPRAY RATE Knob:** Used to set the application rate for spraying. When the AUTO/SPRAY RATE switch is in SPRAY RATE position this knob is used to adjust the desired pump flow rate.

During spraying operations (AUTO/SPRAY RATE switch in AUTO position and SPRAY BAR switch ON), the asphalt pump is controlled by the setting of this knob. When the SPRAY BAR switch is OFF, the asphalt pump is controlled by the setting of the LOAD RATE knob.

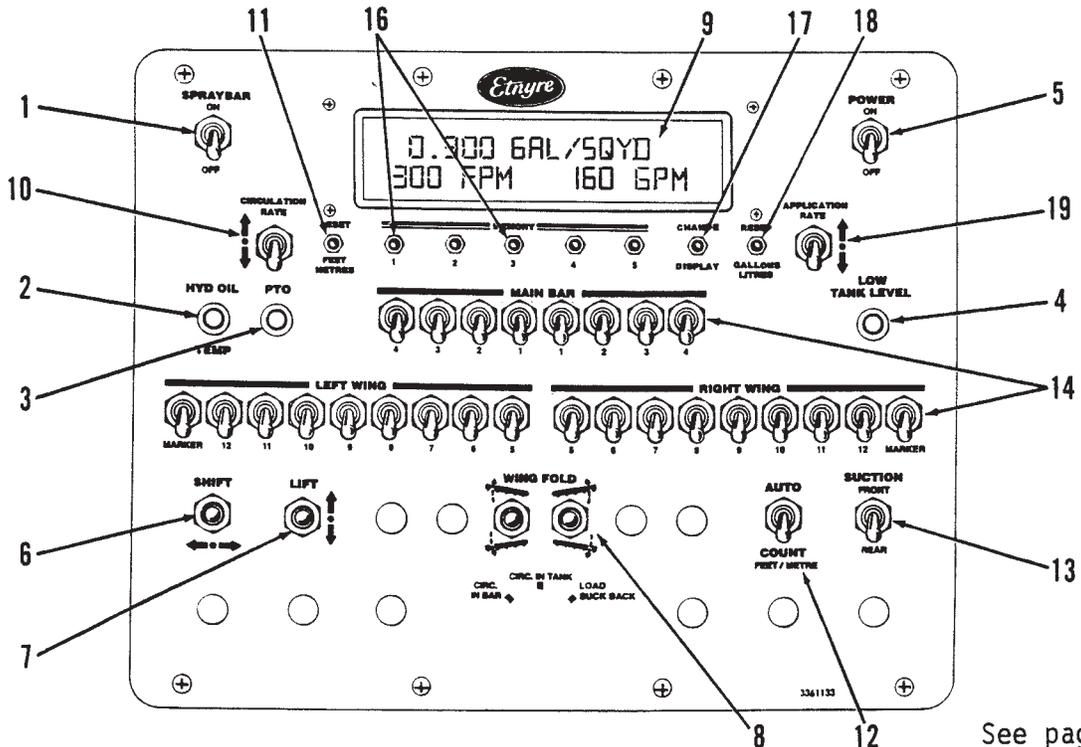
12. **AUTO/COUNT Switch:** Position of this switch determines how travel distance is recorded on the gauge. In the AUTO position, distance traveled is recorded only when spraying. In the COUNT position, distance travelled is recorded continuously when truck is moving.
13. **SUCTION Switch:** Switches between front and rear tank-to-pump suction valves. Front suction valve is optional equipment.
14. **Bar Switches (MAIN BAR, LEFT WING, RIGHT WING):** These switches actuate spray bar solenoid valves for control of product flow through spray bar. Each switch controls one foot (1') of spray bar. Switch in up position turns flow ON. Select bar length before setting circulation rate. With this style control panel, if a switch is turned on or off while spraying the asphalt pump does not automatically compensate for the change in bar length. The application rate must be changed manually with the SPRAY RATE knob.
15. Feet Per Minute Gauge.
16. Distance traveled Counter.
17. Gallons Per Minute Gauge.
18. Optional Equipment.

# COMPONENT LOCATION AND IDENTIFICATION

## BASIC DC-2 CONTROL PANEL



## DC-2 PANEL WITH ONE-FOOT BAR CONTROLS AND ROTARY ACTUATOR SWITCH



## DC-2 PANEL AND ONE-FOOT BAR CONTROLS

# COMPONENT LOCATION AND IDENTIFICATION

1. **SPRAY BAR ON/OFF Switch:** Actuates solenoid valve to control product flow to spray bar.
2. **HYD OIL TEMP Indicator Light:** Indicates hydraulic oil temperature is excessive. Light comes on if hydraulic oil temperature reaches 180 degrees F.

*CAUTION: Stop unit immediately and determine cause of high temperature. Damage to equipment may result.*

3. **PTO Indicator Light:** Indicates PTO engagement when lit.
4. **LOW TANK LEVEL Indicator Light:** Indicates low asphalt level in tank.
5. **POWER Switch:** Controls master power to both front and rear control panels.
6. **SHIFT Switch:** Controls left and right movement of spray bar.
7. **LIFT Switch:** Controls raise/lower function of spray bar.
8. **WING FOLD Switch:** Controls raise and lower (fold) functions of spray bar wings. Panel shown is for a unit with one hinge on each side of bar. Units with more hinges will have a corresponding number of switches.
9. **DIGITAL DISPLAY:** Provides digital readout for GAL/SQYD (gallons per square yard; FPM (feet per minute); and GPM (gallons per minute) as shown. Can also be changed to read gallons sprayed and feet travelled by pressing the CHANGE DISPLAY button (see below).

The digital display can be preset at the factory to display in metric units if desired.

10. **CIRCULATION RATE Switch:** Controls speed of asphalt pump for all functions requiring circulation or transfer of material except spraying. When spraying (SPRAY BAR switch ON), the asphalt pump is controlled by the setting of the APPLICATION RATE switch. Hold switch up to increase rate, down to decrease. Holding switch continually causes rate to count faster.
11. **RESET (FEET/METERS) Button:** Reset button for "feet travelled" display. Can be reset after each shot, or at end of day. Also see descriptions for DIGITAL DISPLAY and CHANGE DISPLAY Button.
12. **AUTO/COUNT Switch:** Position of this switch determines how distance travelled (FPM) is recorded. In the AUTO position, distance traveled

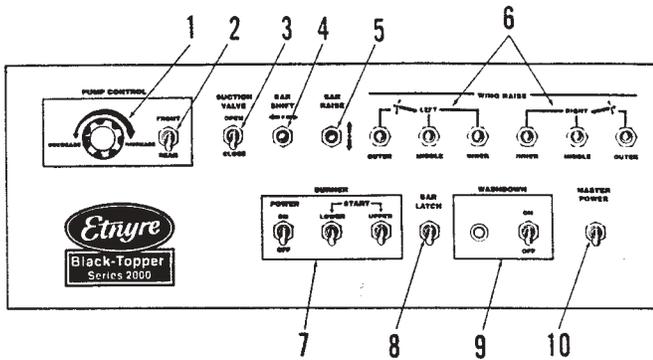
is recorded only when spraying (SPRAY BAR switch ON). In the COUNT position, distance travelled is recorded continuously when truck is moving.

13. **SUCTION Switch:** Switches between front and rear tank-to-pump suction valves. Front suction valve is optional equipment.
14. **Bar Switches (MAIN BAR, LEFT WING, RIGHT WING):** These switches actuate spray bar solenoid valves for control of product flow through spray bar. Each switch controls one foot (1') of spray bar. Switch in up position turns flow ON. Select bar length before setting circulation rate. With DC-2 control panel, if one of these switches is turned on or off while spraying the asphalt pump automatically compensates for the change in bar length.
15. **ROTARY ACTUATOR (CIRC IN BAR/CIRC IN TANK/LOAD/SUCK BACK) Knob:** Provides cab control of various circulating operations making it unnecessary to change valves manually.
16. **MEMORY Buttons:** Used to program and store up to five (5) application rates for frequent use. Hold memory button in while adjusting application rate with APPLICATION RATE switch. Release button when desired rate is displayed.
17. **CHANGE DISPLAY Button:** Changes display from GAL/SQYD, FPM and GPM (shown) to read "Gallons Sprayed" and "Feet Travelled." The button must be pressed again to return display back to GAL/SQYD, FPM and GPM, even if the power switch has been turned off. You get to the temperature screen by pushing the "change display" button and stepping through the GPM/FPM screen and the feet and gallons traveled screen.

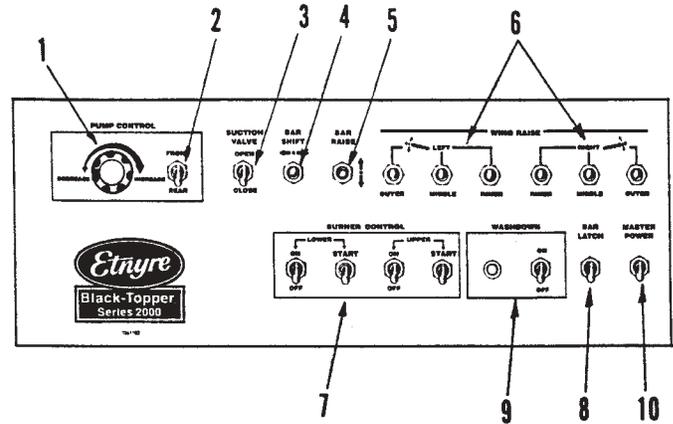
**The Start Up Factor screen:** You get to the start up factor screen by pushing the "change display" button and stepping through the GPM/FPM screen, the feet and gallons traveled screen, and the temperature screen. The next screen is the start up factor screen. Change the start up factor by pushing the application rate switch up to increase or down to decrease. A higher number will make for a "harder", more aggressive start when the spraybar is first turned on. A lower number will make for a "softer", more gentle start. You may need to change the start up factor by 25% to 30% to see much change in the spray. That means if you want a harder start, set the start up factor to 125%. If you want a softer start, set the factor to 75% as a first try. You may then adjust again up or down as you like.

# COMPONENT LOCATION AND IDENTIFICATION

## REAR CONTROL PANEL



Rear Control Panel  
Hydraulic Driven Burners



Rear Control Panel  
Electric Driven Burners

18. RESET (GALLONS/LITERS) Button: Reset button for “gallons sprayed” display. Can be reset after each shot, or at end of day. Also see descriptions for DIGITAL DISPLAY and CHANGE DISPLAY Button.
19. APPLICATION RATE Switch: Used to set the application rate for spraying. During spraying operations (SPRAY BAR switch ON), the asphalt pump is controlled by the rate set with this switch (GAL/SQYD). When the SPRAY BAR switch is OFF, the asphalt pump is controlled by the GPM rate set with the CIRCULATION RATE switch.

### **⚠ WARNING**

To prevent possible burns to operators or bystanders, or possible equipment damage, do not start any operation if the control settings for the asphalt pump are unknown.

**NOTE:** The LOAD RATE and SPRAY RATE knobs on the basic cab control panel, and the PUMP CONTROL knob on the rear control panel are 10-turn\* controls; they can be rotated ten (10) full revolutions between their minimum and maximum settings. If you are not sure of the pump control setting, turn the control fully counter-clockwise to the minimum setting before starting the operation, then increase the pump speed gradually to the desired rate. \* NOTE: On later models, the LOAD RATE and PUMP CONTROL knobs are 1 turn controls.

### REAR CONTROL PANEL

1. PUMP CONTROL DECREASE/INCREASE knob. Controls speed of asphalt pump whenever the pump control switch is in the REAR position.
2. PUMP CONTROL Switch: Selects pump control – cab panel or rear panel.
3. SUCTION VALVE switch: Switches between front and rear tank-to-pump suction valves. Front suction valve is optional equipment.
4. BAR SHIFT Switch: Controls left and right movement of spray bar.
5. BAR RAISE Switch: Controls raise/lower function of spray bar.
6. WING RAISE Switches: Controls raise and lower (fold) functions of spray bar wings. Panel shown is for a unit with three hinges on each side of bar. Units with fewer hinges will have a corresponding number of switches.
7. BURNER POWER and START switches for high pressure fuel oil burners.
8. BAR LATCH Switch: Activates power bar latches for travel (if so equipped).
9. WASHDOWN Switch: Switch activates pump for power washdown. Light indicates when pump is ON.
10. MASTER POWER Switch: Controls power to rear control panel.

# PREPARING FOR OPERATION

## INSPECTION

The following procedures apply to new or rebuilt units.

**NOTE:** Refer to the chassis owner's manual for chassis and engine maintenance information.

1. Inspect unit for damage that may have occurred during transport.
2. Check and tighten all fasteners, body tie-down bolts, pipe and circulating line connections, etc., that may have loosened in transit.
3. Check the fluid level in the hydraulic reservoir. The fluid must always be visible in the sight glass, and preferably within 3-4 inches of the top of the reservoir.
4. Install drive line on crank-drive units. (Drive line is removed for shipping).

## ESTABLISHING FLOW RATE/GROUND SPEED RATIO

### Introduction

The hydrostatic drive consists of a variable output pump driven by the truck PTO or crank drive, which in turn drives

the distributor asphalt pump via a hydrostatic motor. Once the correct ratio between ground speed and pump flow rate is established for a given transmission setting, the truck speed maybe varied without affecting the application rate.

### Using the Etnyre Computer

1. To determine the proper speed and pump discharge use the Etnyre computer. On the top scale find the spray bar length to be used.
2. At the end of the computer, grasp the black portion and move the center slide until the desired application rate is directly below the spray bar length (i. e., 12 feet over .30).
3. In a straight line below the application rate you will find the distributor speed (in feet per minute), and directly below the feet per minute the pump discharge (in gallons per minute).

Example: Width of Spray 12 feet  
 Application Rate .30  
 Distributor Speed 300 FPM  
 Pump Discharge 120 GPM

4. Select a transmission gear that will provide 300 FPM at 1200 - 1600 RPM on the truck engine.

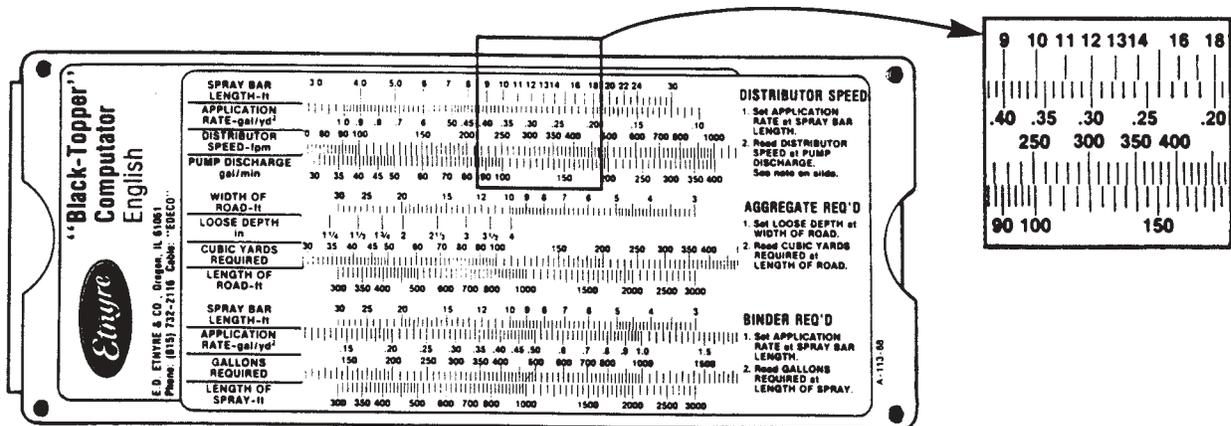


Figure 1. Etnyre Computer

# PREPARING FOR OPERATION

## RECORDING SETTINGS WITH HYDROSTATIC DRIVE

1. Refer to Figure 2. below. Enter distribution rate in space at lower left of chart.
2. Enter corresponding distributor speed in space at lower center of chart.
3. Enter bar length in left column of chart.
4. Enter pump flow rate in second column of chart.
5. Make a dry run at indicated distributor speed. Make note of the truck RPM, transmission gear and rear axle setting that provides the best operation at the required speed.

**NOTE:** Space is also provided for units with two-speed PTO or auxiliary transmissions.

6. Maintain distributor speed and set hydraulic control in accordance with instructions. Enter data in the appropriate column of chart.

Bar Length	Pump Discharge	Truck Eng. RPM	Tran. Gear	PTO. Gear	Rear Axle Gear	Aux. Tran. Gear
16 FT	160 GPM	1310	1	—	HIGH	—
24 FT	240 GPM	1310	1	—	HIGH	—
SAMPLE						

Dist. Rate 0.3 gal/yd<sup>2</sup> Dist. Sp. 300 FPM

Bar Length	Pump Discharge	Truck Eng. RPM	Tran. Gear	PTO. Gear	Rear Axle Gear	Aux. Tran. Gear

Dist. Rate \_\_\_\_\_ Dist. Sp. \_\_\_\_\_

**Figure 2. Etnyre Shot Guide**

7. Whenever a repeat of the distribution rate is called for with a previously recorded bar length, reset the pump flow rate to the corresponding

engine RPM with unit stationary. All other settings must also correspond.

8. Use a different chart for each distribution rate. In time all necessary settings will be recorded. Additional charts are available in the "Etnyre Shot Guide." Copies may be obtained from E.D. Etnyre & Co.

## ENGAGING PUMP ON PTO EQUIPPED MODELS

### ⚠ WARNING

To prevent becoming entangled in machinery, stand clear of rotating drives.

### ⚠ CAUTION

To prevent damage to the asphalt pump, do not run pump for more than 10 minutes without bitumen to supply lubrication.

Start truck engine with transmission in neutral and engage PTO.

On trucks with manual transmission, depress the clutch and pull outward or upward on the PTO control knob. If the PTO fails to engage, gently allow the clutch pedal upward until engagement occurs. Or, depress electric air shift PTO switch if available. Increase engine RPM to fast idle.

On trucks with automatic transmission, push down on the foot brake pedal, move the gear selector to any forward gear and pull upward or outward on the PTO control knob. Or, depress electric air shift PTO switch if available. When PTO engages move gear selector to neutral.

**NOTE:** If the PTO fails to engage, continue pulling on the knob while releasing the brake pedal sufficiently to allow the truck to inch forward until the PTO engages, then move the gear selector back to neutral.

1. Ensure that truck parking brake is engaged before exiting cab.
2. Set pump GPM rate with PUMP CONTROL knob at rear control panel. With the PUMP CONTROL switch in the REAR position, pump speeds are controlled with the rear PUMP CONTROL knob without changing application rate settings.

**NOTE:** Insufficient pump speed may require an increase in truck engine RPM.

# PREPARING FOR OPERATION

## PREHEATING

### **⚠ WARNING**

To prevent an explosion or fire hazard: Do not heat material beyond the manufacturer's recommended temperature.

### **⚠ CAUTION**

To prevent possible damage to equipment from material setting up in hose or distributor, ensure that bitumen in supply tank is heated sufficiently.

If pump, spray bar and/or circulating system were not drained and flushed after previous use it may be necessary to preheat the circulating system to ensure that the first material to enter the pump will not stop the pump.

**NOTE:** A portable burner is available to preheat the circulating system.

If distributor is to be filled with hot bitumen, proceed cautiously. If there is any moisture in the tank, or if emulsion was used in the previous load, foaming or eruption may occur.

**NOTE:** Dow-Corning DC-200 may be used to prevent foaming.

## Mixing Dow-Corning DC-200 Anti-Foam Agent

### Distributors, Transports, Maintenance Units

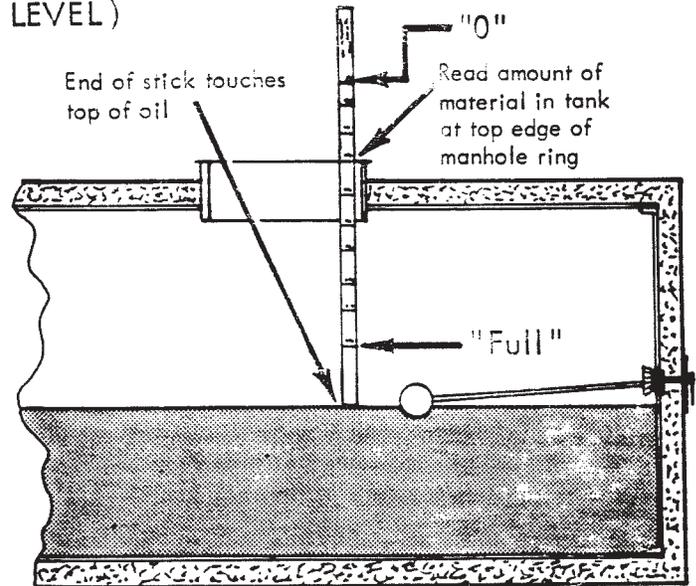
Mix content of can (16 oz.) with (1) gallon of diesel fuel or kerosene. Add one (1) oz. of this diluted mixture to each one thousand (1000) gallons of asphalt. The correct amount may be poured through the manhole. This will assist in reducing foaming, particularly if moisture is present or if emulsified asphalt was used in a previous load.

If no foaming occurs at the start of the filling operation but you suspect there may be moisture in the circulating system or spray bar, the filling operation should be stopped when the tank is no more than 25 percent full. The product should then be circulated through the spray bar at 80 to 110 GPM before continuing the filling operation.

If foaming occurs, continue circulating until foaming stops, then suck the product in the spray bar back into the tank before filling the tank the rest of the way.

## ETNYRE MEASURING STICK

How To Measure Quantity of Material In Tank (ACCURATE ONLY WHEN TANK IS LEVEL)



## S2000 Distributor, DC-2 Computer Control

### Set up Screens

There are ten set up screens that need to be set to match the options of the particular S2000 Blacktopper in which the DC-2 computer control is installed.

To enter the set up screens, hold the "reset gallons" button down, while turning on the master power switch. The screens shown below will appear. To step through the screens, push the "reset gallons" button. To change the set up, follow the instructions that appear on the screen: push the "application rate" switch up or down, as instructed. When done, save the settings as instructed on the screen.

first screen:

Circulate Rate Adj.  
XXX Gal/Min.

This screen shows the current setting for the circulation rate. If the control is set for metric measure, Lit/Min will appear instead of Gal/Min.

second screen:

Flow Cal. Factor  
1000

This screen shows a pump speed calibration factor. The factory setting should be 1000. The pump calibration can be adjusted by 0.1% increments, by changing this factor; ie. 1001 or 999. Increasing the flow factor will increase the reading for a given flow. Use the "application rate" switch to change.

third screen:

Speed Cal. Factor  
100

This screen shows a radar ground speed calibration factor. The factory setting should be 100. The ground speed calibration can be adjusted in 1.0% increments, by changing this factor; ie. 101 or 99. Increasing the speed factor will increase the reading for a given speed. Use the "application rate" switch to change.

fourth screen:

English Units  
Decrease to Change

This screen allows for the change between English and metric units of measure. Push the "application rate" switch down, (decrease) to change to metric. If the control is set to metric, push up, (increase) to change to English.

fifth screen:

Series 40 Pump  
Decrease to Change

This screen allows for the change between 40 series pumps and 90 series pumps. Push the "application rate" switch down, (decrease) to change to 90 series. If the control is set to 90 series, push up, (increase) to change to 40 series.

sixth screen:

1 ft. controls  
Decrease to Change

This screen allows for the change between one foot spray bar controls and gang bar controls. Push the "application rate" switch down, (decrease) to change to gang bar control. If the control is set to gang bar control, push up, (increase) to change to one foot controls.

seventh screen:

Pulses/Gallon Adjust  
131

This screen allows for changing the pulse pick up gear on the asphalt pump shaft. The factory setting should be 131. This is the number of teeth on the gear divided by 0.61, (the gal/rev of the P15 pump). The standard gear has 80 teeth.  $80/0.61=131$ . Use the "application rate" switch to change.

eighth screen:

Threshold Adjust  
16

This screen allows for the adjustment of the target current "threshold", for the start of spraying. This number can be adjusted up or down. A higher number will provide a more aggressive start when the master spray switch is turned on. A lower number will provide a more gentle start. The number on a specific Distributor should be set to match the current, in milliamps that is required to start the asphalt pump turning. See engineering instruction #9100411 for detailed instructions on setting the threshold. The number can be adjusted up or down with the "application rate" switch.

ninth screen:

3.1 to 1 Ratio  
Decrease to Change

This screen allows for changing the ratio of the gear box between the hydraulic drive motor and the asphalt pump. The standard gear ratio is used. The proper gear box ratio can be selected with the "application rate" switch.

tenth screen:

EXIT=PUSH APP INCR  
SAVE=PUSH APP DECR

This screen allows for returning to the operating mode, or saving the settings and returning to the operating mode. Push down and hold the "application rate" switch to save the settings. When the screen changes, release the switch. Push up to exit without saving.

# BASIC CONTROL PANELS

## COMPONENT IDENTIFICATION

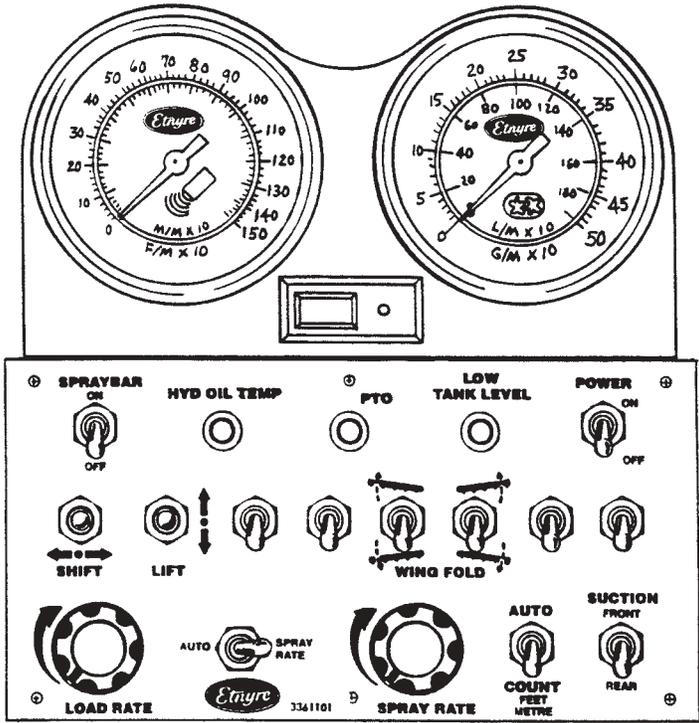


Figure 3. Basic Control Panel

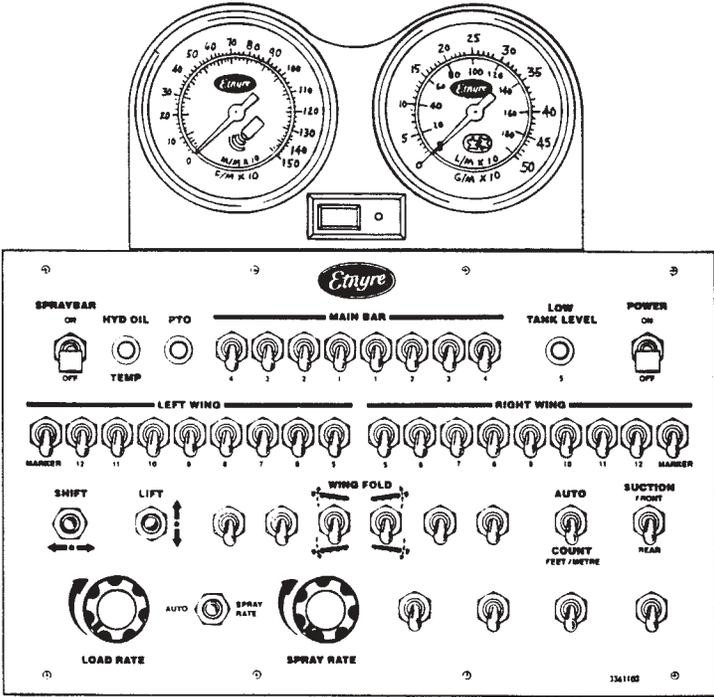


Figure 4. Basic Control Panel With One-Foot Bar Controls

# BASIC CONTROL PANELS

## FILLING INSTRUCTIONS

### FILLING DISTRIBUTOR THROUGH FILL LINE

#### **⚠ WARNING**

To prevent possible burns from foaming or violent eruption, do not load tank with material temperature over 200° F if water or condensation is present in tank, or if emulsion was used in the previous load. Clean and thoroughly drain tank first. If water or emulsion may be present in spray bar or circulating system, allow a small amount of hot material to circulate in bar BEFORE filling tank. When approximately 1/3 full, drive unit to mix material in tank. This will help absorb moisture. Do not heat material over 200° if moisture or emulsion is present in tank.

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

If you suspect there may be moisture or emulsion in the tank, Dow-Corning DC-200 may be used to reduce foaming if product being fed through manhole is in excess of 200° F. One ounce of DC-200 concentrate should be adequate for 1000 gallons of asphalt. Additional DC-200 may be obtained from E.D. Etnyre & Co.

#### Mixing Dow-Corning DC-200 Anti-Foam Agent

Distributors, Transports, Maintenance Units

Mix content of can (16 oz.) with (1) gallon of diesel fuel or kerosene. Add one (1) oz. of this diluted mixture to each

#### **WARNING**

To prevent possible personal injury, Do Not Load the vehicle beyond the GVWAR or GVWR. The maximum load volume must be calculated based on the material density.

#### GENERAL

The S-2000 distributor tank has a built-in air space, or expansion space, above the "Tank Full" level. This air space is designed to minimize the chance that the tank will overflow if the material in the tank expands due to heating or foaming. The air space should not be used to carry product. The "Tank Full" level is based on the vehicle GVWAR, GVWR and a material density of 7.7 lb/gal. A lower "Tank Full" level must be calculated if a material with a density greater than 7.7 lb/gal. is loaded.

one thousand (1000) gallons of asphalt. The correct amount may be poured through the manhole. This will assist in reducing foaming, particularly if moisture is present or if emulsified asphalt was used in a previous load.

If no foaming occurs at the start of the filling operation but you suspect there may be moisture in the circulating system or spray bar, the filling operation should be stopped when the tank is no more than 25 percent full. The product should then be circulated through the spray bar at 80 to 110 GPM before continuing the filling operation.

If foaming occurs, continue circulating until foaming stops, then suck the product in the spray bar back into the tank before filling the tank the rest of the way.

#### Connections and Preliminary Checks

1. Ensure that both the fill line and suction strainers are clean and properly installed.

#### **⚠ WARNING**

To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

2. Ensure that all connections between distributor and supply source are tight. Air leaks will reduce vacuum and slow down filling operation.

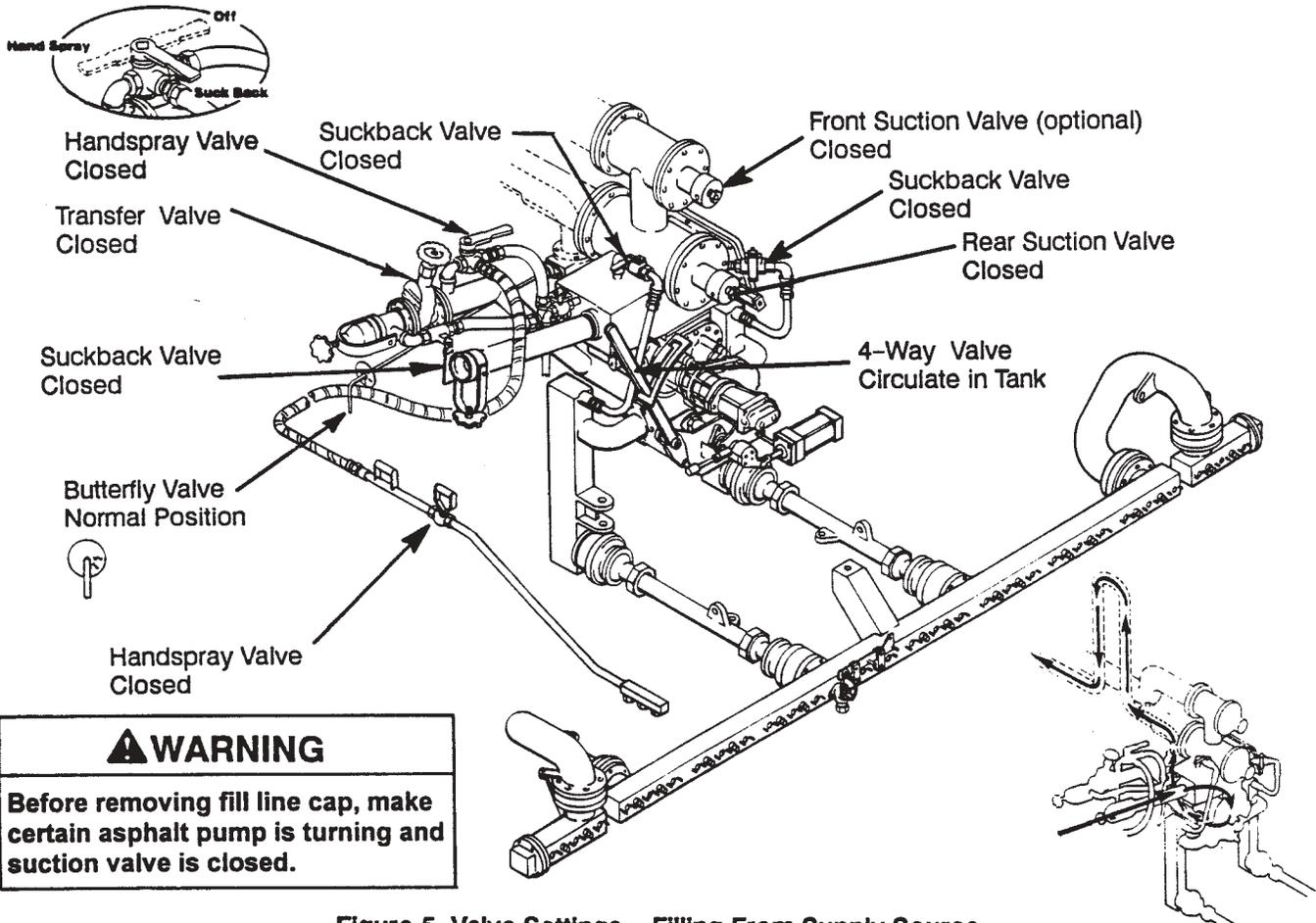
**NOTE:** *When connecting to tank car, connect 3-way valve to tank car coupling and then connect inlet hose to 3-way valve. You can then shut off tank car supply from underneath and allow pump suction to clean bitumen from hose by drawing air through vent in 3-way valve.*

#### **⚠ WARNING**

Before removing fill line cap, make certain asphalt pump is turning and suction valve is closed.

# BASIC CONTROL PANELS

## FILLING INSTRUCTIONS



**Figure 5. Valve Settings - Filling From Supply Source**

### FILLING DISTRIBUTOR THROUGH FILL LINE (CONTINUED)

#### Filling From Cab

1. Set all valve positions first (see Figure 5).
2. Be sure POWER switch is in OFF position.
3. Rotate LOAD RATE knob fully counter-clockwise.
4. Place AUTO/SPRAY RATE switch in AUTO position.
5. Turn SPRAY BAR switch OFF.
6. Place AUTO/COUNT switch in AUTO position.
7. SUCTION switch (optional) can be in either position.
8. At rear control panel, do the following:
  - a. Place PUMP CONTROL switch in FRONT position.

- b. Place SUCTION VALVE switch in CLOSED position.
  - c. Turn MASTER POWER switch ON.
9. At cab control panel turn POWER switch ON.
  10. Adjust the LOAD RATE knob for the desired rate.

### ⚠ WARNING

**To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.**

11. When loading is complete operate the pump at the maximum speed where it will run quietly. Higher speeds will not load thick material fast. Normally 150 GPM is the best loading speed. Light materials, or heavy materials at spraying temperature, may be loaded at faster pump speeds (maximum 240 GPM).

# BASIC CONTROL PANELS

## FILLING INSTRUCTIONS

### FILLING DISTRIBUTOR THROUGH FILL LINE (CONTINUED)

#### **⚠ WARNING**

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

12. Open the valve at the supply source and monitor the tank gauge. When the gauge shows half-full, position someone at the manhole to advise the person at the supply source when to close the valve. For safety reasons there should always be two people acting together during the filling operation.
13. After closing off the supply tank valve, open the bleeder valve (at the supply) to assist in sucking residual product out of the fill line before disconnecting the hose from either the supply source or the distributor fill line.

#### **⚠ WARNING**

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

**NOTE:** *If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.*

14. Disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the fill line.
15. Allow the pump to continue turning while the hose is disconnected from the fill line and the fill line cap is replaced and secured.

### Filling From Rear Control Panel

1. Set all valve positions first (see Figure 5).
2. Turn POWER switch ON at cab panel.
3. Turn PUMP CONTROL knob fully counter-clockwise.
4. At rear panel place PUMP CONTROL switch in REAR position.
5. Place SUCTION VALVE switch in CLOSE position.

6. Turn BAR LATCH switch, BURNER POWER switch and WASHDOWN switch OFF (down).
7. Turn MASTER POWER switch ON.
8. Adjust PUMP CONTROL knob for desired rate.

#### **⚠ WARNING**

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

9. When loading is complete operate the pump at the maximum speed where it will run quietly. Higher speeds will not load thick material fast. Normally 150 GPM is the best loading speed. Light materials, or heavy materials at spraying temperature, may be loaded at faster pump speeds (maximum 240 GPM).

#### **⚠ WARNING**

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

10. Open the valve at the supply source and monitor the tank gauge. When the gauge shows half-full, position someone at the manhole to advise the person at the supply source when to close the valve. For safety reasons there should always be two people acting together during the filling operation.
11. After closing off the supply tank valve, open the bleeder valve (at the supply) to assist in sucking residual product out of the fill line before disconnecting the hose from either the supply source or the distributor fill line.

#### **⚠ WARNING**

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

**NOTE:** *If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.*

12. Disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the fill line.

# BASIC CONTROL PANELS

## FILLING INSTRUCTIONS

13. Allow the pump to continue turning while the hose is disconnected from the fill line and the fill line cap is replaced and secured.

### FILLING DISTRIBUTOR THROUGH MANHOLE

**NOTE:** *Ensure suction valve is closed for this operation.*

Set valves and switches same as "Filling Distributor Through Fill Line." It is not necessary to run pump when filling through manhole.

#### **▲ WARNING**

To prevent possible injury, always open manhole cover slowly. Pressure build-up in tank may cause cover to burst open.

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent possible burns from foaming or violent eruption, do not load tank with material temperature over 200° F if water or condensation is present in tank, or if emulsion was used in the previous load. Do not heat material over 200° if moisture or emulsion is present in tank.

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

#### **▲ CAUTION**

*To prevent possible damage to equipment, always use manhole strainer when filling through manhole.*

If you suspect there may be moisture or emulsion in the tank, Dow-Corning DC-200 may be used to prevent foaming if product being fed through manhole is in excess of 200° F. One ounce of DC-200 concentrate should be adequate for 1000 gallons of asphalt. See mixing instructions on previous page. Additional DC-200 may be obtained from E.D. Etnyre & Co.

#### **Mixing Dow-Corning DC-200 Anti-Foam Agent Distributors, Transports, Maintenance Units**

Mix content of can (16 oz.) with (1) gallon of diesel fuel or kerosene. Add one (1) oz. of this diluted mixture to each one thousand (1000) gallons of asphalt. The correct amount may be poured through the manhole. This will assist in reducing foaming, particularly if moisture is present or if emulsified asphalt was used in a previous load.

If no foaming occurs at the start of the filling operation but you suspect there may be moisture in the circulating system or spray bar, the filling operation should be stopped when the tank is no more than 25 percent full. The product should then be circulated through the spray bar at 80 to 110 GPM before continuing the filling operation.

If foaming occurs, continue circulating until foaming stops, then suck the product in the spray bar back into the tank before filling the tank the rest of the way.

# BASIC CONTROL PANELS

## CIRCULATING PRODUCT IN TANK

### ⚠ WARNING

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

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

To prevent becoming entangled in machinery, stand clear of rotating drives.

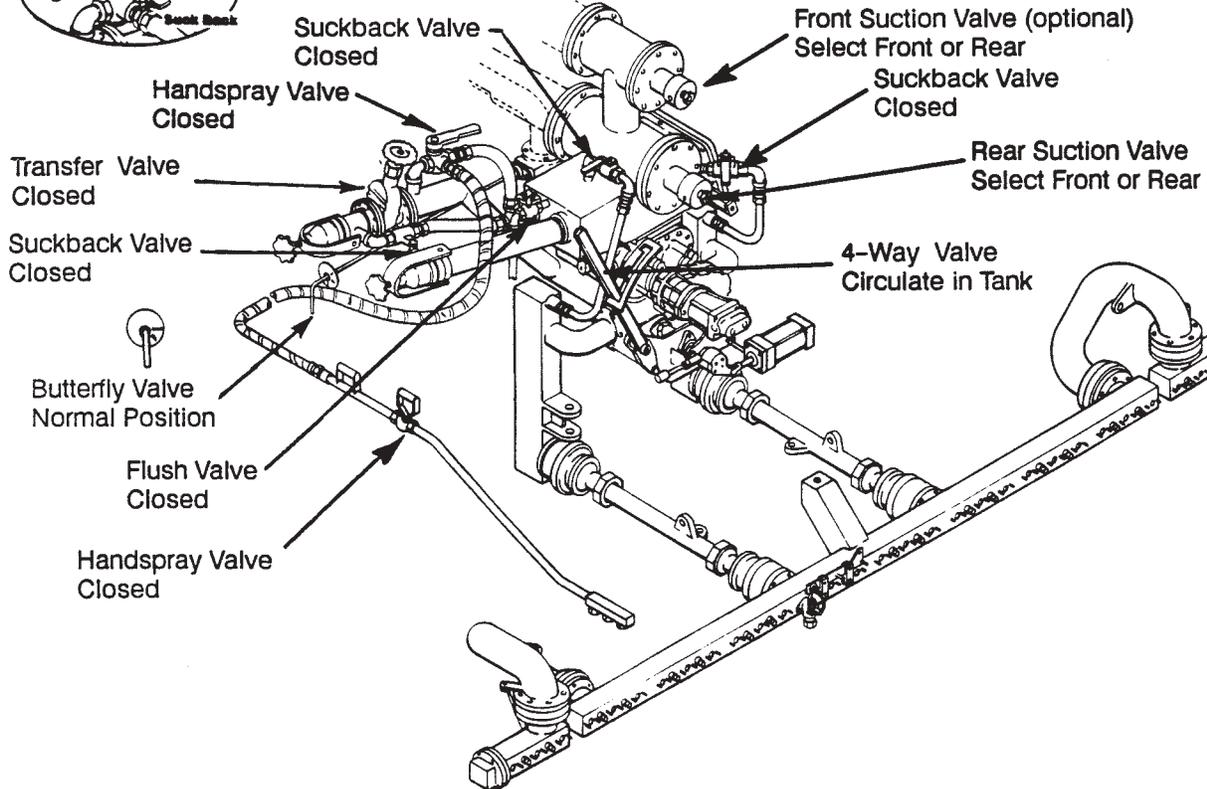
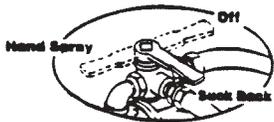
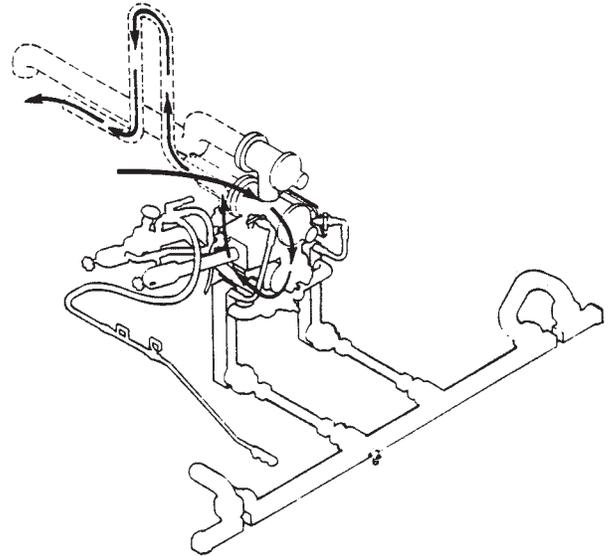


Figure 6. Valve Settings - Circulate Product in Tank

# BASIC CONTROL PANELS

## CIRCULATING PRODUCT IN TANK

### Circulating in Tank From Cab

1. Set all valve positions first (see Figure 6).
2. Ensure POWER switch is OFF.
3. Turn SPRAY BAR switch OFF.
4. Place AUTO/SPRAY RATE switch in AUTO position.
5. Turn LOAD RATE knob fully counter-clockwise.
6. Place AUTO/COUNT switch in AUTO position.
7. SUCTION switch (optional) can be in either position.
8. At rear control panel, do the following:
  - a. Place PUMP CONTROL switch in FRONT position.
  - b. Place SUCTION VALVE switch in OPEN position.
  - c. Turn MASTER POWER switch ON.
9. At cab panel turn POWER switch ON.
10. Adjust LOAD RATE knob to obtain 100–150 GPM.

### Circulating in Tank From Rear Control Panel

1. Turn POWER switch ON at cab control panel.
2. At rear panel place PUMP CONTROL switch in REAR position.
3. Turn PUMP CONTROL knob fully counter-clockwise.
4. Turn BAR LATCH switch, BURNER POWER switch and WASHDOWN switch OFF (down).
5. Turn MASTER POWER switch ON.
6. Place SUCTION VALVE switch in OPEN position.
7. Adjust PUMP CONTROL knob for desired GPM.

If the pump fails to quickly regain its speed, close suction valve and put a small amount of diesel fuel into the fill line to free up the pump or use hand torch to warm the pump.

### WARNING

To prevent possible burns, use extreme caution when using a torch to heat the pump. Asphalt accumulated on and around the pump may ignite when heating the pump with a torch.

Even if the product in the tank is at (or near) spraying temperature, the cold pump may chill the product sufficiently to lock up the pump. If this occurs, heat may be applied to the pump with a hand-held torch.

If the product is too cold to be circulated, some heating with the flue burners will be needed to increase the temperature enough to start circulating. Refer to operating instructions for your particular burner type.

### WARNING

Allowing the flue burners to operate for a long period of time without circulating can damage the product and create explosive fumes. If product cannot be circulated after fifteen minutes of heating without circulation, the burners should be extinguished for 20–30 minutes before re-lighting the burners.

Moving the distributor back and forth while the burners are off will allow the hot product to mix with the cooler product. This should decrease the time required to bring the product temperature up enough to start circulating. Once circulation has been established, the heating can continue without interruption. Circulate at 100–160 GPM.

### WARNING

To prevent an explosion or fire hazard, never move the vehicle when the burners are operating.

# BASIC CONTROL PANELS

## CIRCULATING PRODUCT IN BAR

### ⚠ WARNING

To prevent an explosion or fire hazard: Ensure that burners are extinguished before removing any material from tank in any manner. Liquid petroleum (L.P.) burners can support a flame for several minutes after the fuel supply is turned off.

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent an explosion or fire hazard: Keep area free of sparks or open flames when spraying with volatile materials.

To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

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

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

To prevent becoming entangled in machinery, stand clear of rotating drives.

To circulate product in bar, perform Circulate in Tank procedure first. Then move 4-Way Valve Control Lever to the CIRCULATE IN BAR position. This procedure can be performed from either the cab or rear control panel.

**NOTE:** When moving lever from Circulate in Tank to Circulate in Bar move lever slowly. In case of moisture or plugged spray bar, lever can be quickly returned to Circulate in Tank. Slug in bar can then be heated with hand torch to release.

### ⚠ CAUTION

To prevent excessive pressure in spray bar, asphalt pump speed should not exceed 160 GPM while circulating.

Circulate product long enough to ensure removal of all air from bar, and to heat spray valves sufficiently.

**NOTE:** Material will circulate in bar ends with extensions folded or in spraying position.

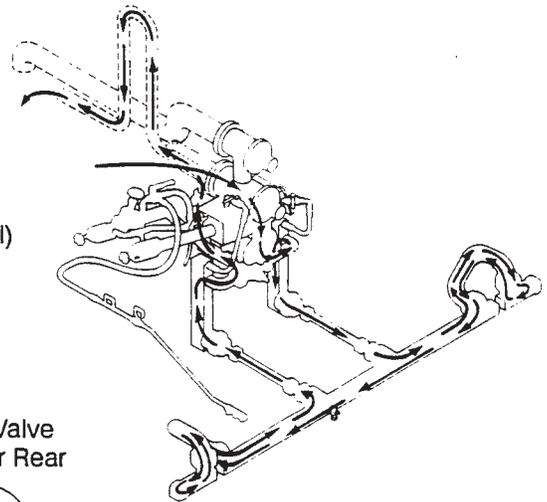
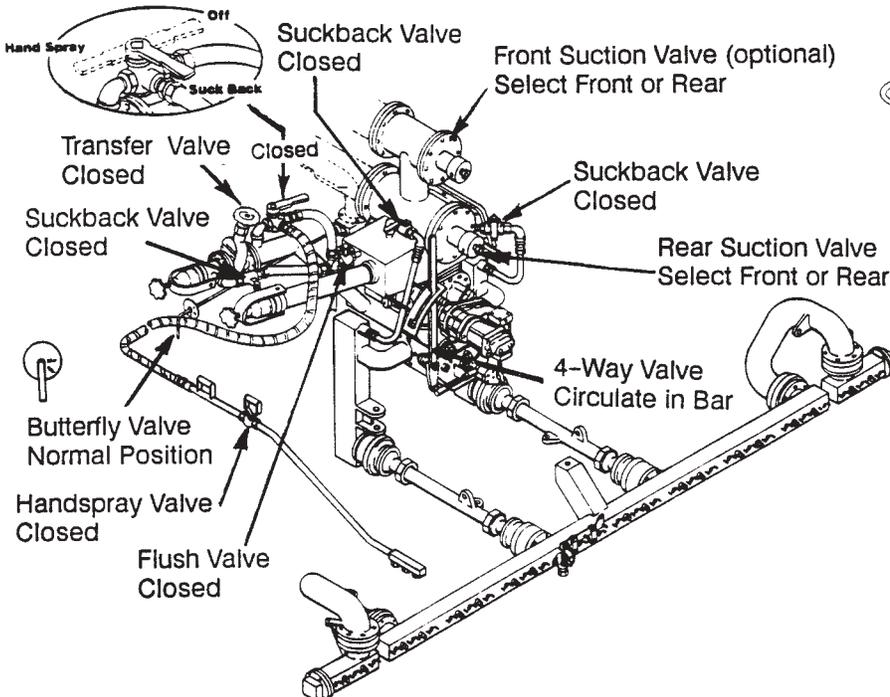


Figure 7. Valve Settings – Circulate Product in Bar

# BASIC CONTROL PANELS

## SPRAYING OPERATIONS

### ⚠ WARNING

**To prevent an explosion or fire hazard: Ensure that burners are extinguished before removing any material from tank in any manner. Liquid petroleum (L.P.) burners can support a flame for several minutes after the fuel supply is turned off.**

**To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.**

**To prevent an explosion or fire hazard: Keep area free of sparks or open flames when spraying with volatile materials.**

**To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.**

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

**To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.**

**To prevent becoming entangled in machinery, stand clear of rotating drives.**

**To prevent being struck by control lever on rear quadrant, stand clear when ON/OFF function is being performed with air control.**

Correct spray cannot be obtained unless bitumen is heated to proper spraying temperature. Cold bitumen will not provide sharp spray edges, and will cause streaking. Refer to "Heating Bitumen in Distributors" for your particular burner type.

Refer to "Circulating Product for Spraying" for setting proper asphalt pump speeds. Pump speeds higher than recommended will cause excessive fogging of spray. If higher pump speeds are desired, use larger spray nozzles. Low pump speeds will cause sprayfan to sag and cause heavy edges.

### Adjusting Spray Bar Nozzle Angle

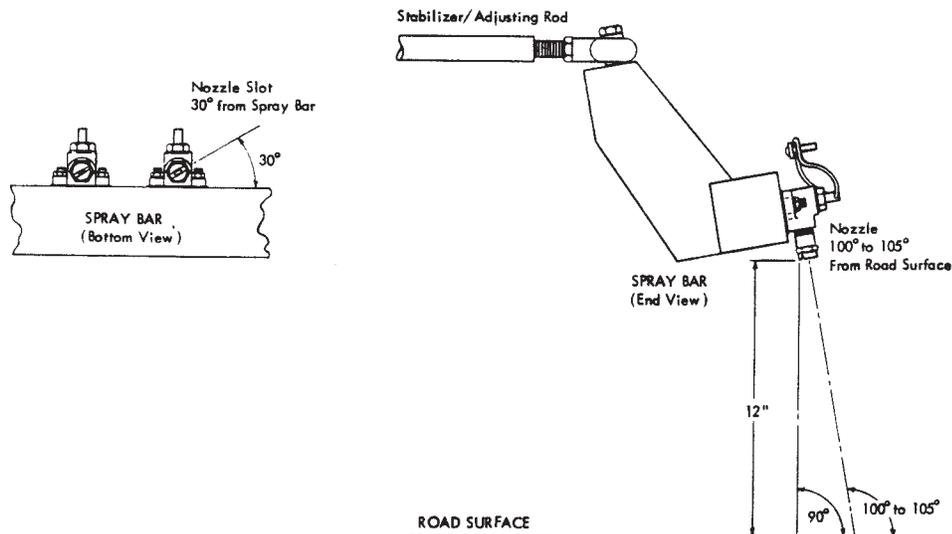
Adjust nozzles to obtain an angle of approximately 30 degrees with bar centerline. Every nozzle should be at the same angle.

**NOTE:** A nozzle adjustment wrench is supplied with each new unit.

### Adjusting Spray Bar Height

Lower spray bar and adjust so that nozzles are approximately 12 inches above the road when tank is empty. At this height spray fans will overlap to provide triple coverage.

**NOTE:** Under heavy wind conditions it may be necessary to lower spray bar further.



**Figure 8. Spray bar Adjustments**

# BASIC CONTROL PANELS

## SPRAYING OPERATIONS

### Establishing Flow Rate/Ground Speed Ratio

1. Use the Etnyre Computator to determine the following:
  - a. Correct ground speed in feet per minute (FPM).
  - b. Pump flow rate in gallons per minute (GPM) for the desired spray bar length in feet (FT).
  - c. Application rate in gallons per square yard (GAL/SQ YD).
2. Place the 4-Way Valve Control Lever in the "Circulate in Tank" position.
3. At rear control panel, set PUMP CONTROL switch to the FRONT.
4. Place AUTO/COUNT switch in the AUTO position. This will accumulate feet travelled while spraying.
5. Place AUTO/SPRAY RATE switch in SPRAY RATE position.
6. If equipped with optional one-foot bar controls, select number of bar feet desired and place corresponding switches in the ON position (up).

**NOTE:** Bar length should not be changed during spray; pump speed will remain constant thus changing application rate if bar length changes.

7. Engage truck PTO (optional)
8. Select truck transmission setting and, if necessary, auxiliary and rear axle setting, to give adequate ground speed and power for desired application rate.

**NOTE:** More than one attempt may be necessary before the proper gear setting is determined that will prevent jerky forward motion and still provide adequate power and speed for the terrain.

9. Now, while driving the distributor forward at the speed (FPM) previously determined from the computator, adjust the SPRAY RATE knob until the asphalt pump flow rate is equal to the GPM determined from the computator. Or, while driving the distributor forward at the speed (FPM) previously determined from the computator, note truck tachometer reading and gear selection. Stop unit and run truck engine to previously noted RPM. Adjust SPRAY RATE knob until asphalt pump flow rate is equal to GPM determined from computator.
10. The SPRAY RATE knob should be left in this position. Moving the knob will affect your spray setting.
11. Place the AUTO/SPRAY RATE switch in the AUTO position.

**NOTE:** The following adjustments should be made with truck at operating RPM.

12. Adjust the LOAD RATE knob to an adequate circulation rate; approximately 10 GPM per foot of bar length selected, but not to exceed 160 GPM.

**NOTE:** If unit is to be used for tach coating (0.05 to 0.20 gal/sq yd), adjust LOAD RATE knob to approximately 4 GPM per foot of bar length selected.

13. Now that a dry run has been completed, record the truck gear setting, spray bar length, application rate and engine tachometer RPM so the application rate can be duplicated in the future by merely using the truck engine tachometer to establish the proper pump flow rate. An ETNYRE SHOT GUIDE has been provided for this purpose. Also, refer to the next section, "Recording Settings With Hydrostatic Drive" for additional Shot Guide instructions.

# BASIC CONTROL PANELS

## SPRAYING OPERATIONS

### To Spray

1. Lower spray bar to spraying position.
2. Adjust spray bar to predetermined length.

**NOTE:** On units with 1-foot bar controls, select desired spray bar configuration by placing the appropriate switches in the ON position (up). Spray bar valves corresponding to the selected bar switches will open when SPRAY BAR switch is turned on.

3. Engage truck PTO (optional).

**NOTE:** Prior to placing 4-Way Valve in "Circulate in Bar" position, decrease pump flowrate to a maximum of 160 GPM. This is done to prevent excessive pressure in the spray bar when not spraying.

4. Place 4-Way Valve in "Circulate in Bar" position. Allow material to circulate in bar for several minutes to warm up bar and nozzles.
5. Engage truck transmission in gears previously determined for proper application speed.

6. Start the distributor moving in the pre-selected gear.
7. At the start line move the SPRAY BAR switch to the ON position. While the unit is spraying, the truck speed does not have to remain constant to maintain accuracy.

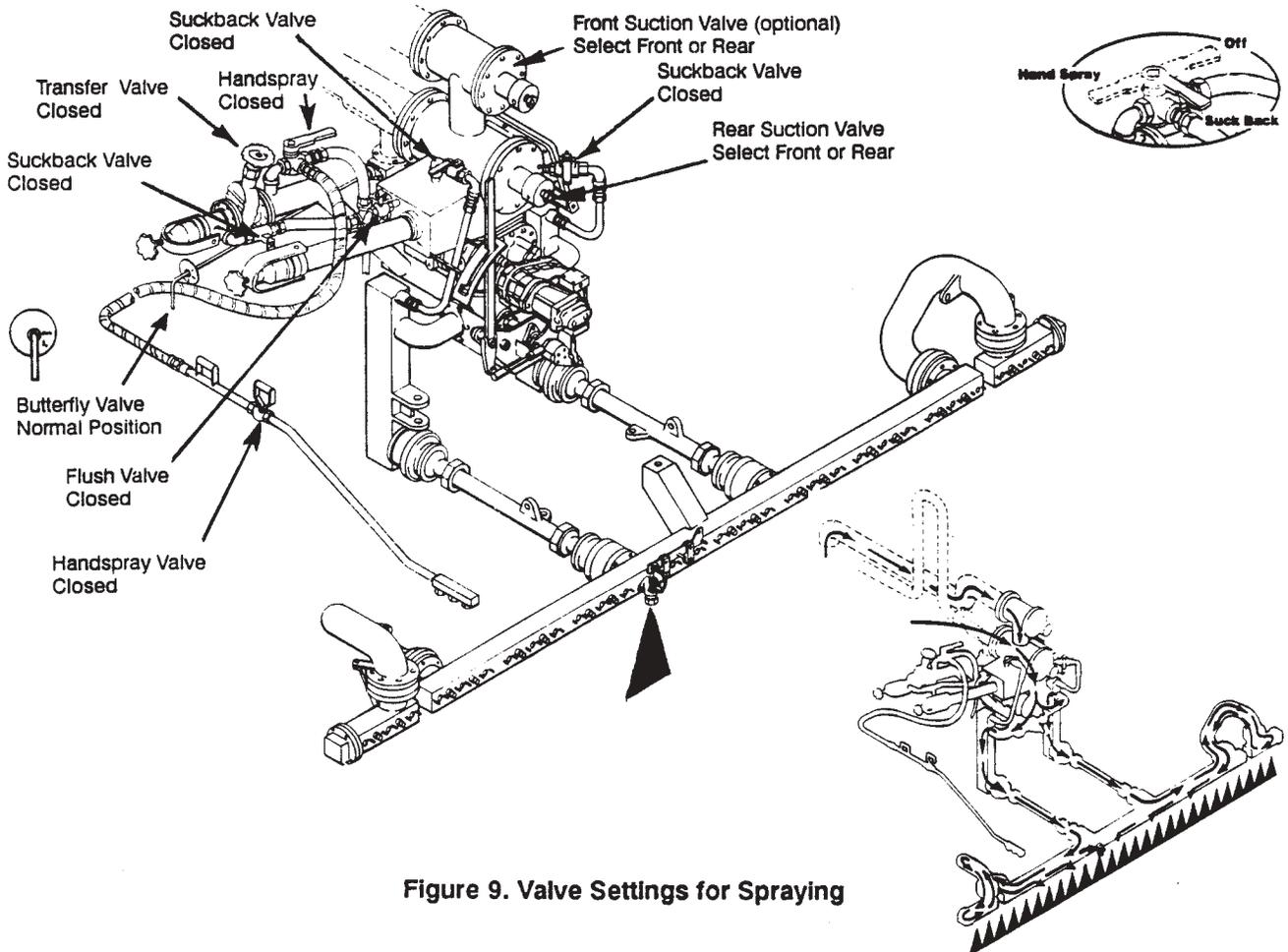
### ⚠ CAUTION

*Do not run pump above rated capacity of 400 GPM. Damage to equipment may result.*

**NOTE:** At higher speeds flow rates may increase beyond the nozzle flow rating. When this occurs, fogging may result. At lower speeds flow rate may decrease below recommended nozzle flow rating. When this occurs, fan droops causing heavy edges and/or streaking.

8. When end of shot is reached, turn SPRAY BAR switch OFF.

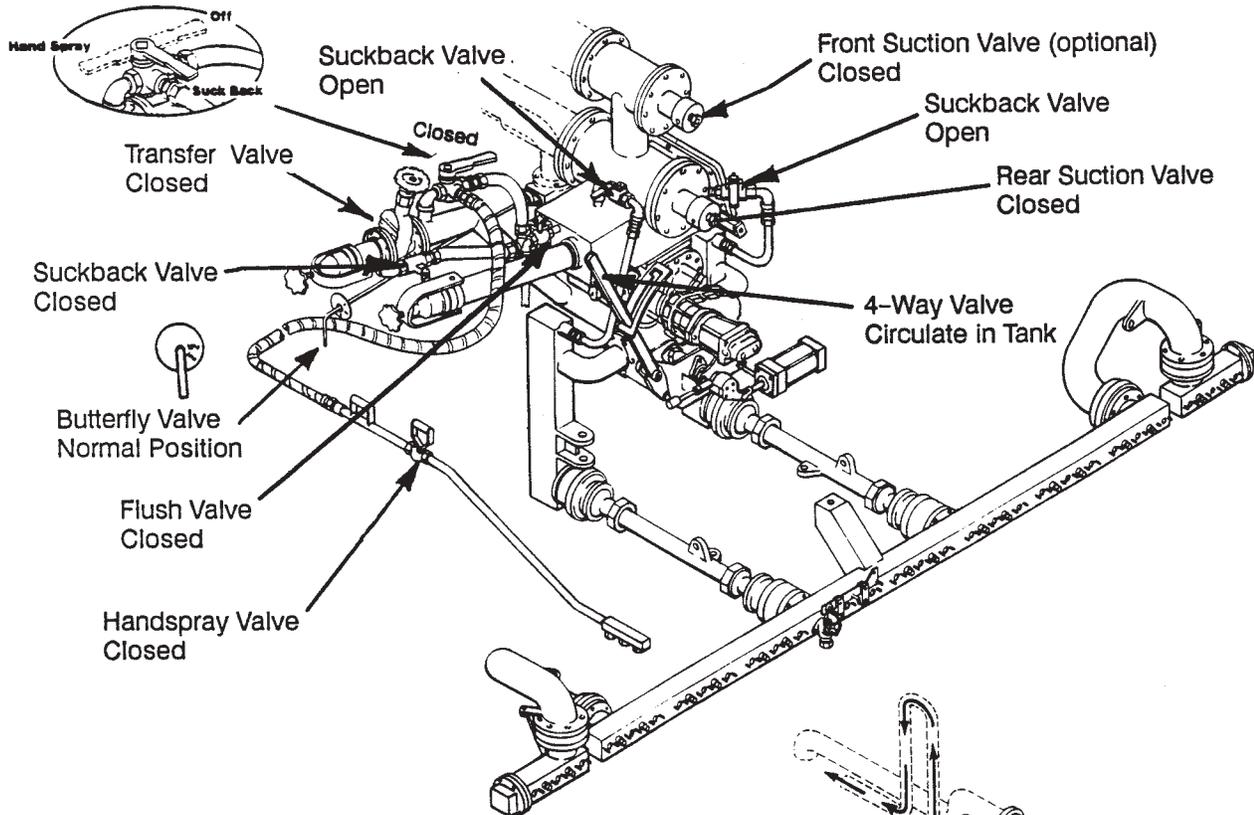
**NOTE:** 4-Way valve is automatically returned to Circulate in Bar position when spray bar switch is turned OFF.



**Figure 9. Valve Settings for Spraying**

# BASIC CONTROL PANELS

## SUCKBACK OPERATIONS FOR SPRAY BAR



**Figure 10. Valve Settings for Suckback**

### Suckback From Cab

1. Set 4-Way Valve to "Circulate in Tank" using manual lever at rear of truck.
2. Open suckback valves.
3. Raise spray bar and fold wings up.
4. Close SUCTION VALVE with switch at rear control panel.
5. Run pump at 200 GPM using LOAD RATE knob in cab or set PUMP CONTROL to REAR and adjust pump speed with rear pump control knob.

**NOTE:** GPM reading is only displayed on cab panel.

### ⚠ WARNING

**To prevent possible burns, do not stand in front of spray bar when opening spray bar valves.**

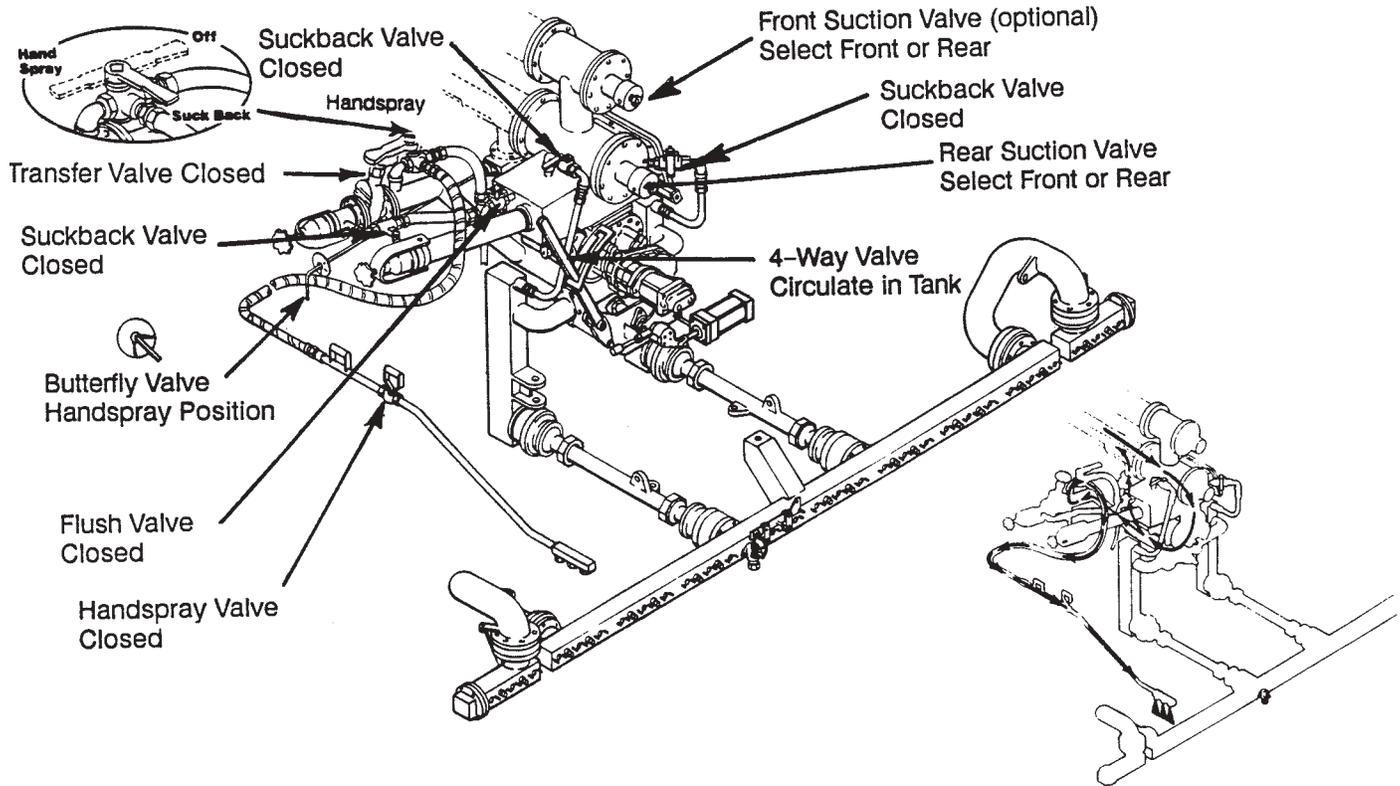
6. After drawing material back for approximately 2 minutes, open end valves on spray bar momentarily allowing air to enter system.
7. Close suckback valves.

8. Reduce pump speed to 100 GPM.
9. Open self-flush valve located on fill line cap. This will allow diesel fuel to enter system and wash out pump.
10. After 2 minutes shut self-flush valve.
11. Reduce pump GPM rate.
12. Turn POWER switches OFF.

**NOTE:** For better cleaning of pump it may be helpful to pour some diesel fuel down the fill line after all functions are completed. The diesel fuel will remain in pump over night to keep pump free for morning operation.

# BASIC CONTROL PANELS

## HANDSPRAYING OPERATIONS



**Figure 11. Valve Settings for Handspray**

### Handspray From Cab

#### ⚠ WARNING

To prevent possible burns from hot asphalt spray when handspraying: Hold handspray gun in proper position and watch for other people.

To prevent burns: Always wear insulated gloves when handling spray bar sections or hoses.

1. Set operating valves and levers as shown in Figure 11.
2. Turn SPRAY BAR switch OFF.
3. Turn LOAD RATE knob fully counter-clockwise.
4. Place AUTO/SPRAY RATE switch in AUTO position.
5. Turn POWER switch ON.
6. Move 4-Way Valve to Circulate in Tank position.

7. At rear panel place SUCTION VALVE switch in OPEN position.
8. Adjust asphalt pump speed to 80 GPM using LOAD RATE knob in cab, or set PUMP CONTROL switch to REAR and adjust pump speed with PUMP CONTROL knob.

**NOTE:** GPM reading is only displayed on cab panel.

9. Turn handspray valve on spray gun 90 degrees to spray.
10. Adjust handspray pressure with BUTTERFLY VALVE. Turn counter-clockwise (towards transfer) to increase pressure.

**NOTE:** Do not turn handle of BUTTERFLY VALVE completely to transfer. This will cause oil to dead head into handspray hose when hand wand is turned off.

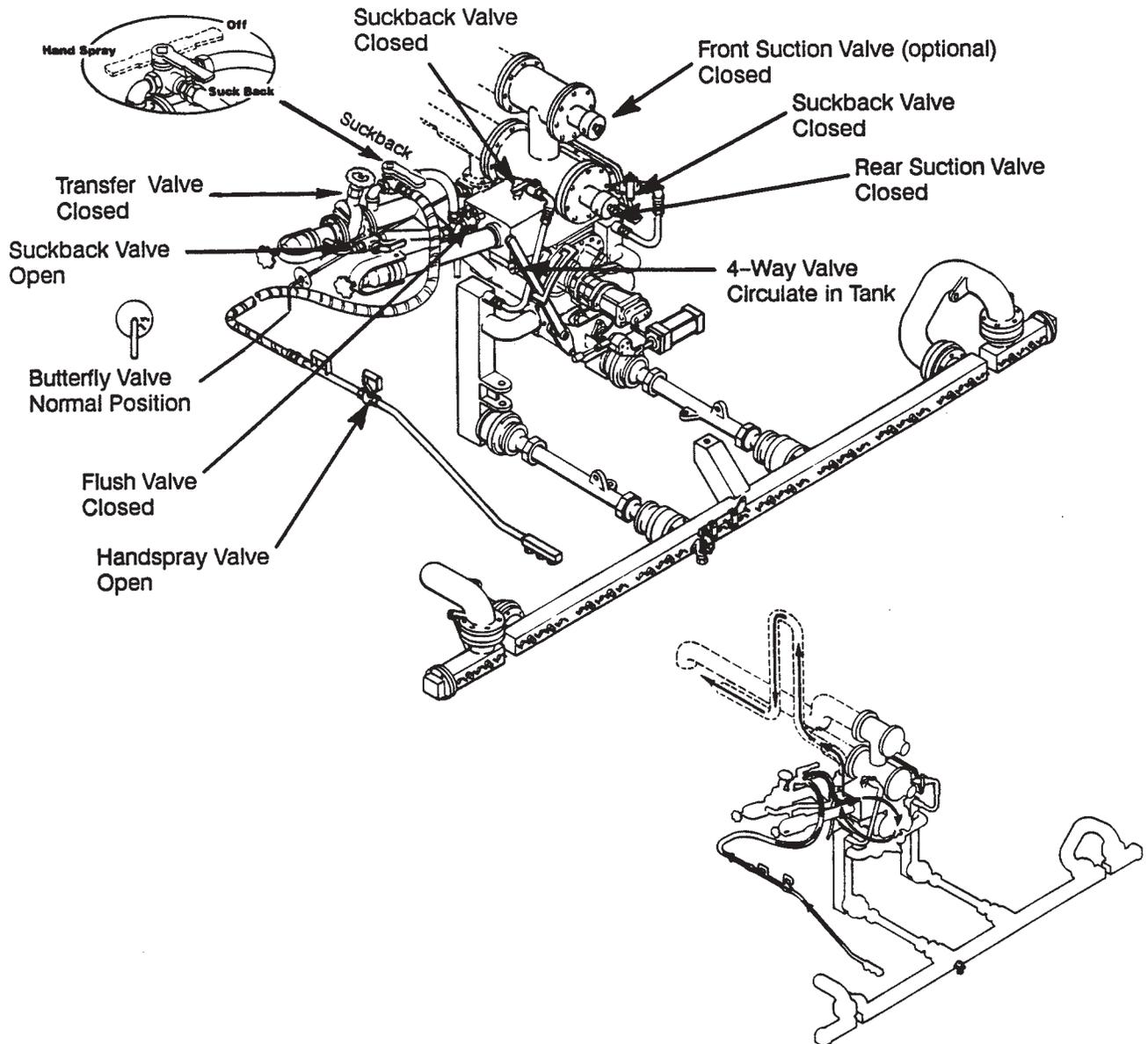
11. If butterfly valve is approaching the completely closed position and pressure at hand wand is insufficient, reset butterfly valve to handspray position and increase asphalt pump rate.
12. When finished handspraying, proceed to Suck-back for Handspray.

**NOTE:** If finished handspraying for the day, crack open handspray valve with nozzle submerged in flushing oil.

# BASIC CONTROL PANELS

## SUCKBACK FOR HANDSPRAY OPERATIONS

1. When finished handspraying, proceed as follows:
2. Close SUCTION VALVE with switch at rear control panel.
3. Suck back material from handspray hose by turning butterfly valve to NORMAL.
4. Open handspray suckback valve.
5. Close 3-inch TRANSFER valve on transfer line.
6. Increase pump speed to 200 GPM.
7. After approximately 1 minute crack handspray valve open on handspray wand.



**Figure 12. Suckback for Handspray**

# BASIC CONTROL PANELS

## PUMP-OFF OPERATIONS

**NOTE:** When pumping off, ensure that all valves in pump-off line between distributor and storage tank are open before opening suction valve on distributor.

1. Set operating valves and levers as shown in Figure 13.
2. Connect pump-off hose to transfer line.
3. Open 3-inch TRANSFER gate valve.
4. Open SUCTION valve.
5. Increase pump speed to approximately 150 GPM using LOAD RATE knob in cab or set pump CONTROL switch at rear panel to REAR and adjust pump speed with PUMP CONTROL knob.

**NOTE:** GPM reading is only displayed on cab panel.

6. Turn butterfly valve to TRANSFER position.
7. When pump-off is complete turn butterfly valve to NORMAL position.
8. Decrease pump speed.
9. Close suction valve.

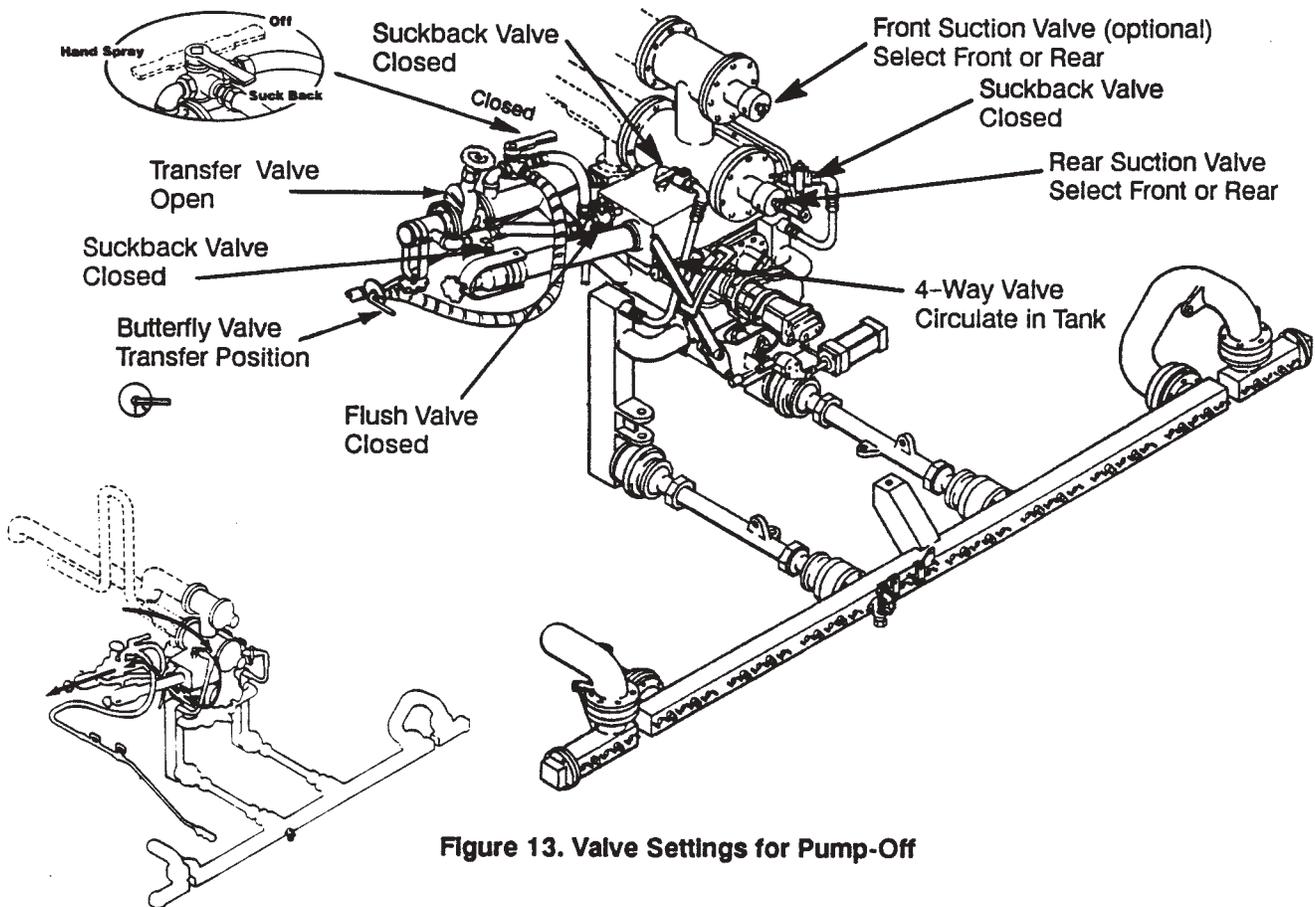
10. Close valve at storage tank.
11. Close 3-inch TRANSFER valve in transfer line.
12. Open suckback valve in transfer line and open bleeder valve at supply source.
13. Increase pump speed to approximately 150 GPM.

### ▲ WARNING

**To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.**

**NOTE:** If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.

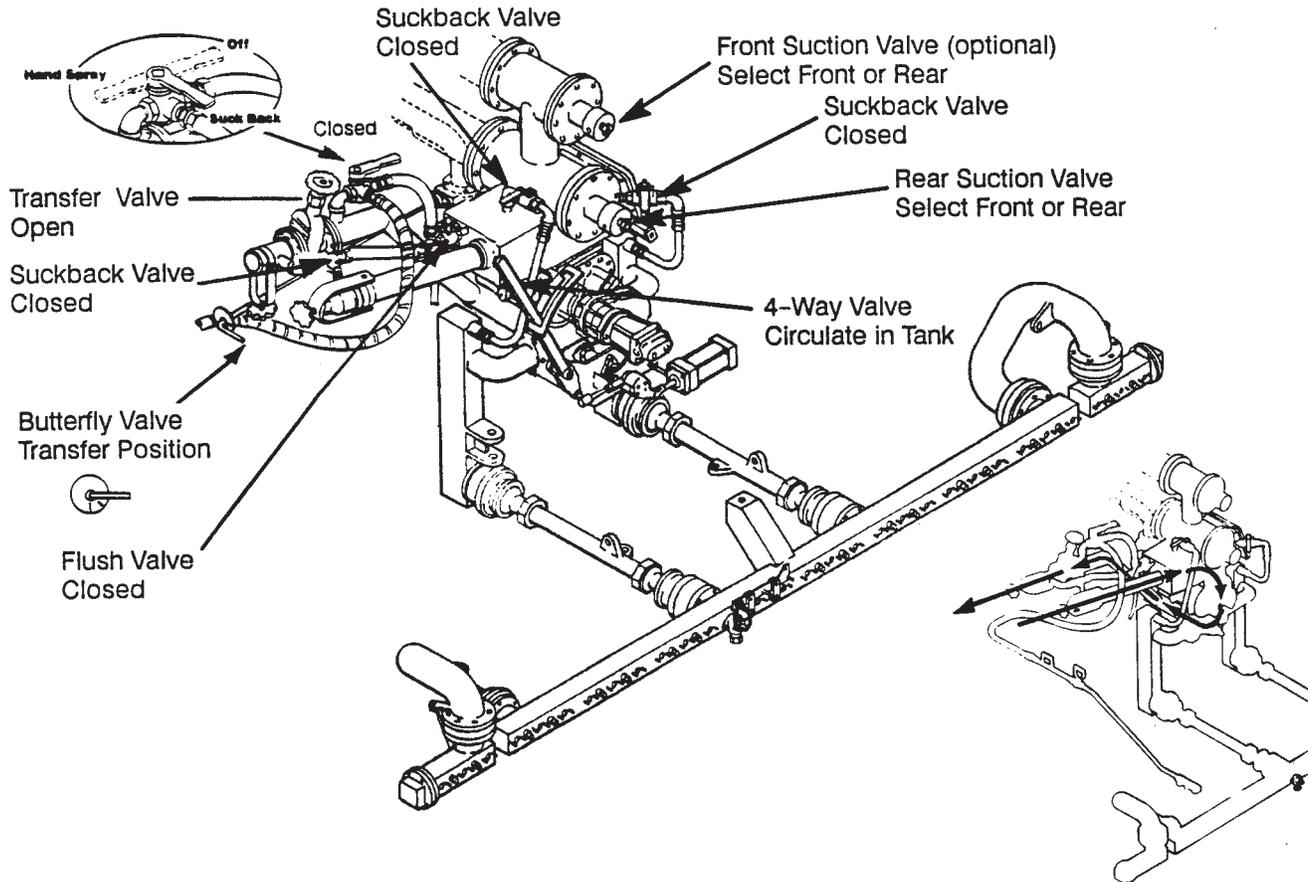
14. Increase the pump speed to 200 GPM, disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the transfer line.
15. Allow the pump to continue turning while the hose is disconnected from the transfer line and the transfer line cap is replaced and secured.



**Figure 13. Valve Settings for Pump-Off**

# BASIC CONTROL PANELS

## TRANSFER OPERATIONS



**Figure 14. Valve Settings for Transferring**

1. Connect hose from supply source to filling connection. Be sure hose connections are tight.
2. Connect hose from storage to transfer connection. Be sure connections are tight.
3. Set operating valves and levers as shown in Figure 14.
4. Place 4-Way Valve in Circulate in Tank position.
5. Close SUCTION valve.
6. Open TRANSFER valve.
7. Increase pump speed to approximately 150 GPM using LOAD RATE knob in cab or set PUMP CONTROL switch at rear panel to REAR and adjust pump speed with PUMP CONTROL knob.
8. Turn butterfly valve to TRANSFER position.
9. After material is transferred, close valve at supply source and open supply line bleeder valve.
10. Disconnect supply line and install cap on distributor fill line.
11. Close valve at storage tank.
12. Close TRANSFER valve.
13. Open suckback valve on transfer line.
14. Turn butterfly valve to NORMAL position.
15. Open bleeder valve at storage tank.

**NOTE:** GPM reading is only displayed on cab panel.

8. Turn butterfly valve to TRANSFER position.
9. After material is transferred, close valve at supply source and open supply line bleeder valve.
10. Disconnect supply line and install cap on distributor fill line.

### ⚠ WARNING

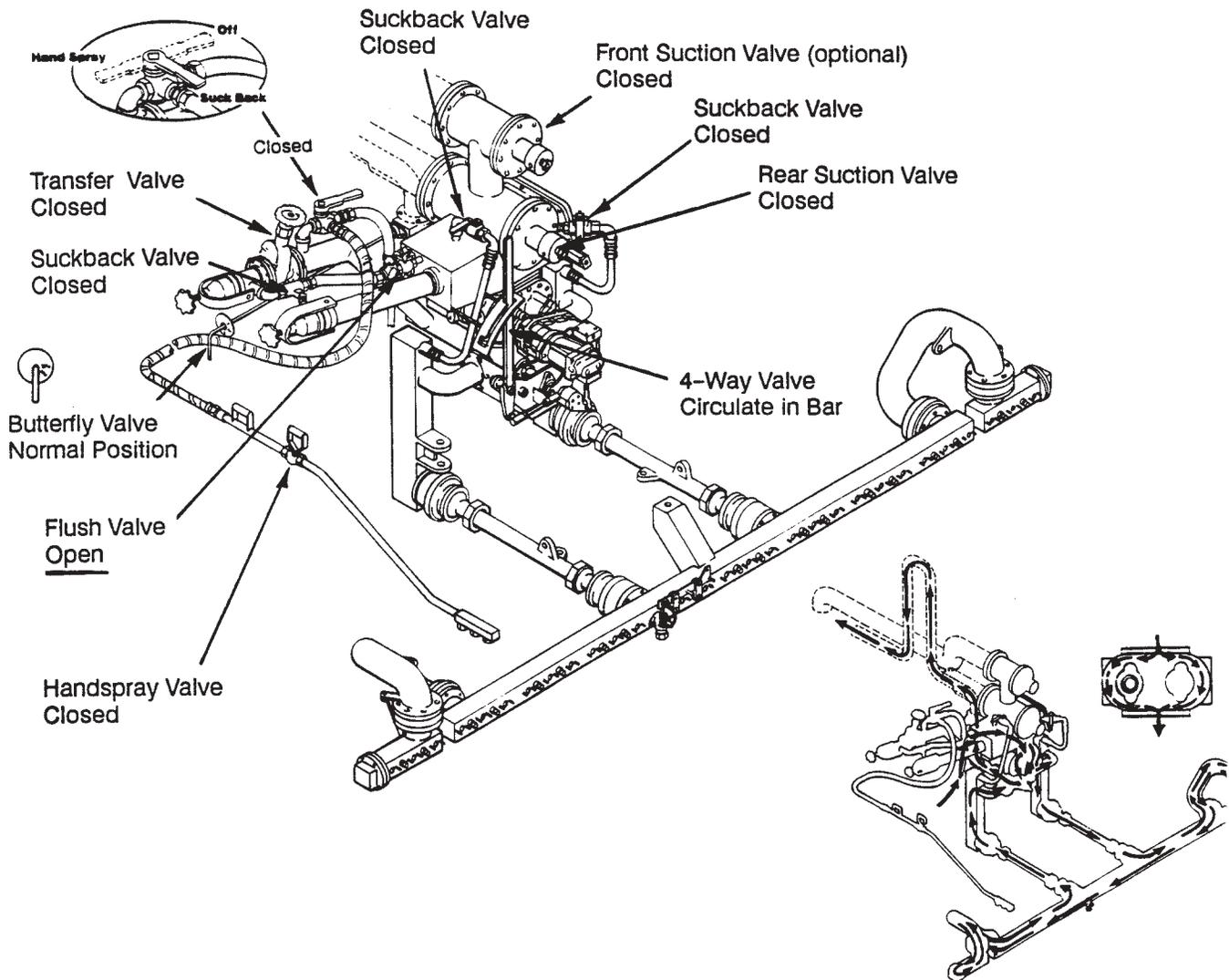
**To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.**

**NOTE:** *If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.*

16. Increase the pump speed to 200 GPM, disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the transfer line.
17. Allow the pump to continue turning while the hose is disconnected from the transfer line and the transfer line cap is replaced and secured.

# BASIC CONTROL PANELS

## FLUSHING OPERATIONS



**Figure 15. Valve Settings for Flushing**

1. Set valves and operating levers as shown in Figure 15.
2. Open self-flushing valve and run pump at 100 GPM.
3. After 1-2 minutes close self-flushing valve.
4. Move 4-Way Valve to Circulate in Tank position.

Normally the suck back procedure will remove sufficient material from the circulating system to negate the need for

draining the circulating system and spray bar before proceeding with the wash-out operation.

The flushing operation requires only 3 quarts of flushing solvent. This small amount is not sufficient to fill the lines to the tank, thus preventing solvent from being forced into the tank.

A common practice following completion of the flushing procedure and subsequent shutdown is to pour 1-2 quarts of solvent into the fill line which softens or dissolves the residual asphalt in the pump. Allow solvent to remain in the system overnight.

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

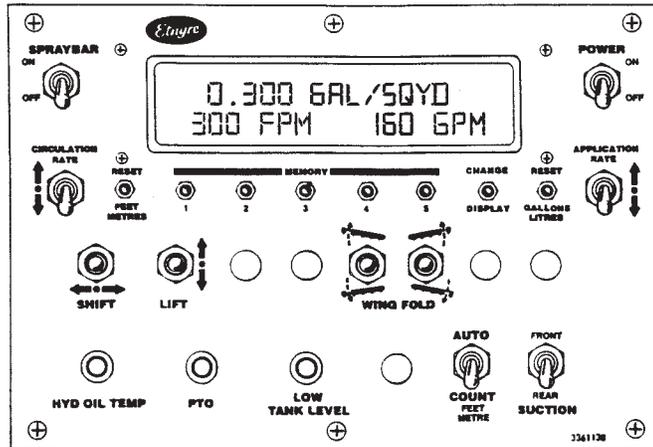


Figure 16. Basic DC-2 Control Panel

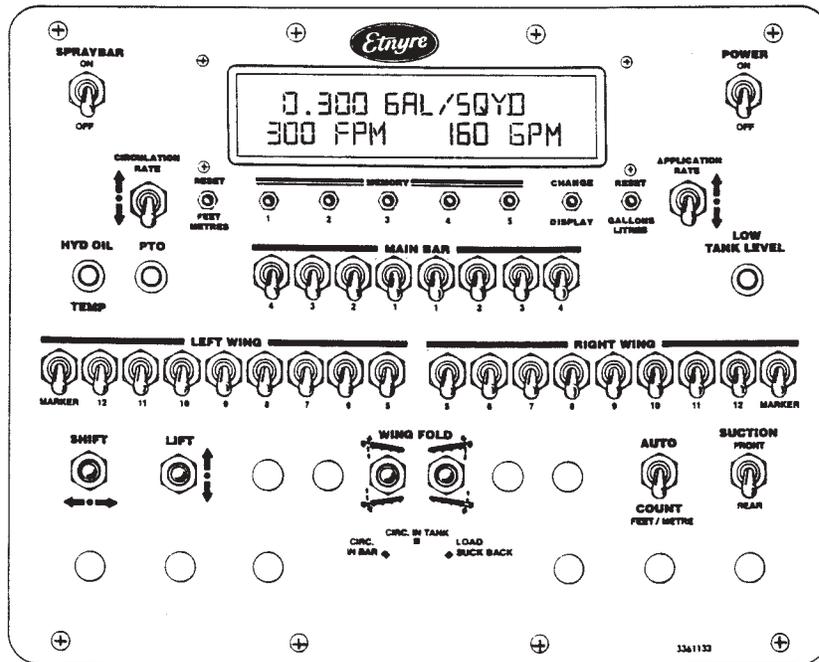


Figure 17. DC-2 Panel With One-Foot Bar Controls

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## FILLING INSTRUCTIONS

### FILLING DISTRIBUTOR THROUGH FILL LINE

#### **⚠ WARNING**

To prevent possible burns from foaming or violent eruption, do not load tank with material temperature over 200° F if water or condensation is present in tank, or if emulsion was used in the previous load. Clean and thoroughly drain tank first. If water or emulsion may be present in spray bar or circulating system, allow a small amount of hot material to circulate in bar BEFORE filling tank. When approximately 1/3 full, drive unit to mix material in tank. This will help absorb moisture. Do not heat material over 200° if moisture or emulsion is present in tank.

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

If you suspect there may be moisture or emulsion in the tank, Dow-Corning DC-200 may be used to reduce foaming if product being fed through manhole is in excess of 200° F. One ounce of DC-200 concentrate should be adequate for 1000 gallons of asphalt. Additional DC-200 may be obtained from E.D. Etnyre & Co.

#### **Mixing Dow-Corning DC-200 Anti-Foam Agent**

##### Distributors, Transports, Maintenance Units

Mix content of can (16 oz.) with (1) gallon of diesel fuel or kerosene. Add one (1) oz. of this diluted mixture to each

one thousand (1000) gallons of asphalt. The correct amount may be poured through the manhole. This will assist in reducing foaming, particularly if moisture is present or if emulsified asphalt was used in a previous load.

If no foaming occurs at the start of the filling operation but you suspect there may be moisture in the circulating system or spray bar, the filling operation should be stopped when the tank is no more than 25 percent full. The product should then be circulated through the spray bar at 80 to 110 GPM before continuing the filling operation.

If foaming occurs, continue circulating until foaming stops, then suck the product in the spray bar back into the tank before filling the tank the rest of the way.

#### **Connections and Preliminary Checks**

1. Ensure that both the fill line and suction strainers are clean and properly installed.

#### **⚠ WARNING**

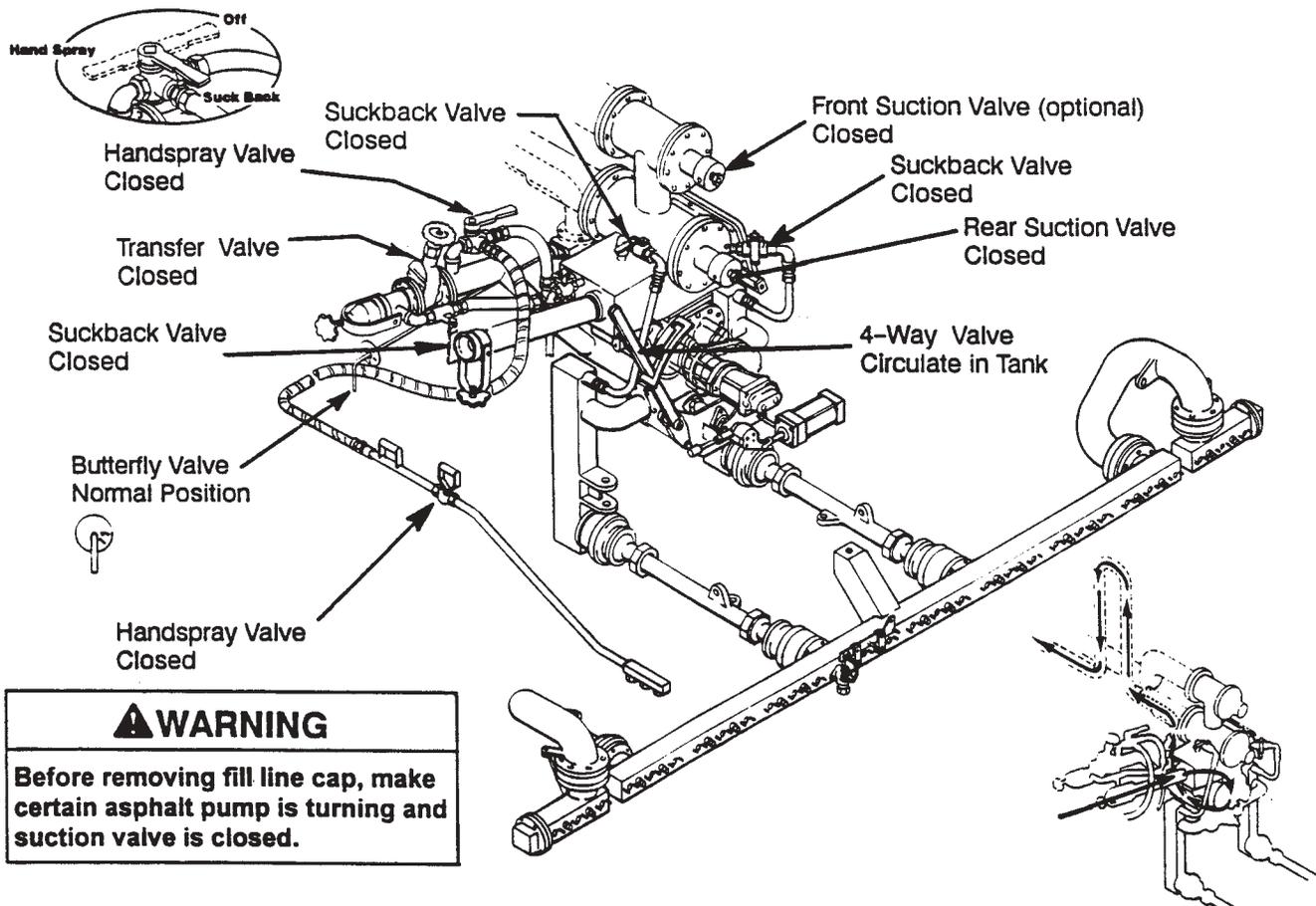
To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

2. Ensure that all connections between distributor and supply source are tight. Air leaks will reduce vacuum and slow down filling operation.

**NOTE:** *When connecting to tank car, connect 3-way valve to tank car coupling and then connect inlet hose to 3-way valve. You can then shut off tank car supply from underneath and allow pump suction to clean bitumen from hose by drawing air through vent in 3-way valve.*

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## FILLING INSTRUCTIONS



**Figure 18. Valve Settings - Filling From Supply Source**

### FILLING DISTRIBUTOR THROUGH FILL LINE (CONTINUED)

#### Filling From Cab

1. Set all valve positions first (see Figure 18).
2. Be sure POWER switch is OFF.
3. Turn SPRAY BAR switch OFF.
4. Place AUTO/COUNT switch in AUTO position.
5. SUCTION switch (optional) can be in either position.
6. At rear control panel, do the following:
  - a. Place PUMP CONTROL switch in FRONT position.
  - b. Place SUCTION VALVE switch in CLOSED position.
  - c. Turn MASTER POWER switch ON.

7. At cab panel turn POWER switch ON.
8. Be sure digital display is set to "GAL/SW YD; FPM; GPM." If not, press CHANGE DISPLAY button..
9. Toggle CIRCULATION RATE switch up or down to obtain desired rate..

**⚠ WARNING**

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

10. When loading is complete, operate the pump at the maximum speed where it will run quietly. Higher speeds will not load thick material fast. Normally 150 GPM is the best loading speed. Light materials, or heavy materials at spraying temperature, may be loaded at faster pump speeds (maximum 240 GPM).

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## FILLING INSTRUCTIONS

### FILLING DISTRIBUTOR THROUGH FILL LINE (CONTINUED)

#### WARNING

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

11. Open the valve at the supply source and monitor the tank gauge. When the gauge shows half-full, position someone at the manhole to advise the person at the supply source when to close the valve. For safety reasons there should always be two people acting together during the filling operation.
12. After closing off the supply tank valve, open the bleeder valve (at the supply) to assist in sucking residual product out of the fill line before disconnecting the hose from either the supply source or the distributor fill line.

#### WARNING

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

**NOTE:** *If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.*

13. Disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the fill line.
14. Allow the pump to continue turning while the hose is disconnected from the fill line and the fill line cap is replaced and secured.

### Filling From Rear Control Panel

1. Turn POWER switch ON at cab panel.
2. Turn PUMP CONTROL knob fully counter-clockwise.
3. Place pump CONTROL switch in REAR position.
4. Place SUCTION VALVE switch in CLOSE position.
5. Turn BAR LATCH switch, BURNER POWER switch and WASHDOWN switch OFF (down).

6. Turn MASTER POWER switch ON.
7. Adjust PUMP CONTROL knob for desired rate.

#### WARNING

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

8. When loading is complete, operate the pump at the maximum speed where it will run quietly. Higher speeds will not load thick material fast. Normally 150 GPM is the best loading speed. Light materials, or heavy materials at spraying temperature, may be loaded at faster pump speeds (maximum 240 GPM).

#### WARNING

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

9. Open the valve at the supply source and monitor the tank gauge. When the gauge shows half-full, position someone at the manhole to advise the person at the supply source when to close the valve. For safety reasons there should always be two people acting together during the filling operation.
10. After closing off the supply tank valve, open the bleeder valve (at the supply) to assist in sucking residual product out of the fill line before disconnecting the hose from either the supply source or the distributor fill line.

#### WARNING

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

**NOTE:** *If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.*

11. Disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the fill line.

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## FILLING INSTRUCTIONS

12. Allow the pump to continue turning while the hose is disconnected from the fill line and the fill line cap is replaced and secured.

### FILLING DISTRIBUTOR THROUGH MANHOLE

**NOTE:** *Ensure suction valve is closed for this operation.*

Set valves and switches same as "Filling Distributor Through Fill Line." It is not necessary to run pump when filling through manhole.

#### **⚠ WARNING**

To prevent possible injury, always open manhole cover slowly. Pressure build-up in tank may cause cover to burst open.

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent possible burns from foaming or violent eruption, do not load tank with material temperature over 200° F if water or condensation is present in tank, or if emulsion was used in the previous load. Do not heat material over 200° if moisture or emulsion is present in tank.

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

#### **⚠ CAUTION**

*To prevent possible damage to equipment, always use manhole strainer when filling through manhole.*

If you suspect there may be moisture or emulsion in the tank, Dow-Corning DC-200 may be used to prevent foaming if product being fed through manhole is in excess of 200° F.. One ounce of DC-200 concentrate should be adequate for 1000 gallons of asphalt. See mixing instructions on previous page. Additional DC-200 may be obtained from E.D. Etnyre & Co.

#### **Mixing Dow-Corning DC-200 Anti-Foam Agent Distributors, Transports, Maintenance Units**

Mix content of can (16 oz.) with (1) gallon of diesel fuel or kerosene. Add one (1) oz. of this diluted mixture to each one thousand (1000) gallons of asphalt. The correct amount may be poured through the manhole. This will assist in reducing foaming, particularly if moisture is present or if emulsified asphalt was used in a previous load.

If no foaming occurs at the start of the filling operation but you suspect there may be moisture in the circulating system or spray bar, the filling operation should be stopped when the tank is no more than 25 percent full. The product should then be circulated through the spray bar at 80 to 110 GPM before continuing the filling operation.

If foaming occurs, continue circulating until foaming stops, then suck the product in the spray bar back into the tank before filling the tank the rest of the way.

#### **⚠ WARNING**

**Before removing fill line cap, make certain asphalt pump is turning and suction valve is closed.**

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## CIRCULATING PRODUCT IN TANK

### ⚠ WARNING

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

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

To prevent becoming entangled in machinery, stand clear of rotating drives.

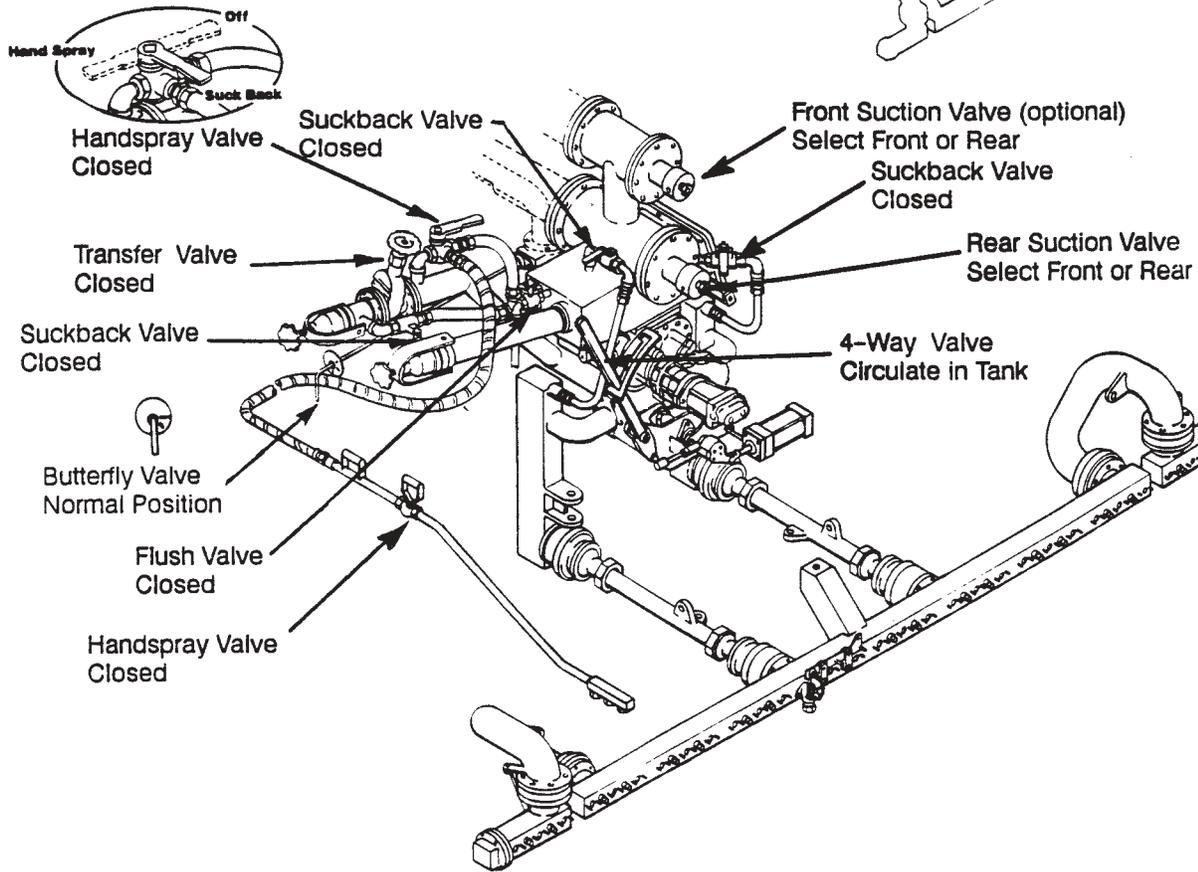
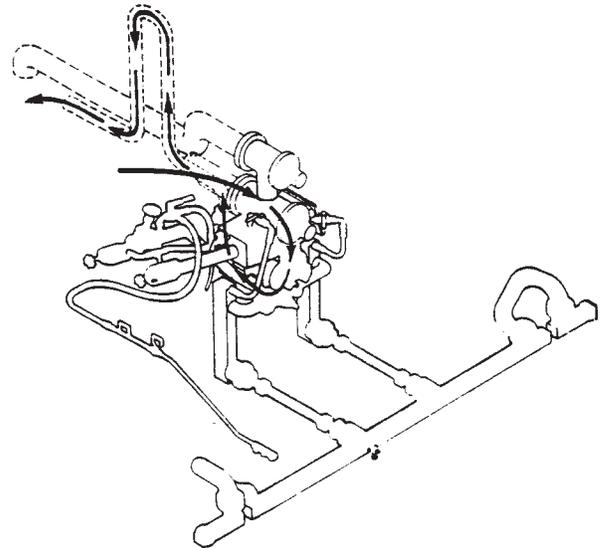


Figure 19. Valve Settings - Circulate Product in Tank

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## CIRCULATING PRODUCT IN TANK

### Circulating In Tank From Cab

1. Set all valve positions first (see Figure 19).
2. Turn POWER switch OFF.
3. Turn SPRAY BAR switch OFF.
4. SUCTION switch (optional) can be in either position..
5. At rear control panel, do the following:
  - a. Place PUMP CONTROL switch in FRONT position.
  - b. Place SUCTION VALVE switch in OPEN position.
  - c. Turn MASTER POWER switch ON.
6. At cab panel place AUTO/COUNT switch in AUTO position.
7. Set digital readout to display "GAL/SQ YD; FPM: GPM" (press CHANGE DISPLAY button if necessary).
8. Use CIRCULATION RATE switch to obtain 100–150 GPM.

### Circulating In Tank From Rear Control Panel

1. Turn POWER switch ON at cab control panel.
2. At rear panel place PUMP CONTROL switch in REAR position.
3. Turn PUMP CONTROL knob fully counter-clockwise.
4. Turn BAR LATCH switch, BURNER POWER switch and WASHDOWN switch OFF (down).
5. Turn MASTER POWER switch ON.
6. Place SUCTION VALVE switch in OPEN position.
7. Adjust PUMP CONTROL knob for desired GPM.

**NOTE:** GPM is only shown on cab panel. If display does not show GAL SQ/YD; FPM; GPM, press CHANGE DISPLAY button until this screen appears.

If the pump fails to quickly regain its speed, close suction valve and put a small amount of diesel fuel into the fill line to free up the pump or use hand torch to warm the pump.

Even if the product in the tank is at (or near) spraying temperature, the cold pump may chill the product sufficiently to lock up the pump. If this occurs, heat may be applied to the pump with a hand-held torch.

### WARNING

To prevent possible burns, use extreme caution when using a torch to heat the pump. Asphalt accumulated on and around the pump may ignite when heating the pump with a torch.

If the product is too cold to be circulated, some heating with the flue burners will be needed to increase the temperature enough to start circulating. Refer to operating instructions for your particular burner type.

### WARNING

Allowing the flue burners to operate for a long period of time without circulating can damage the product and create explosive fumes. If product cannot be circulated after fifteen minutes of heating without circulation, the burners should be extinguished for 20–30 minutes before re-lighting the burners.

Moving the distributor back and forth while the burners are off will allow the hot product to mix with the cooler product. This should decrease the time required to bring the product temperature up enough to start circulating. Once circulation has been established, the heating can continue without interruption. Circulate at 100–160 GPM.

### WARNING

To prevent an explosion or fire hazard, never move the vehicle when the burners are operating.

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## CIRCULATING PRODUCT IN BAR

### ⚠ WARNING

To prevent an explosion or fire hazard: Ensure that burners are extinguished before removing any material from tank in any manner. Liquid petroleum (L.P.) burners can support a flame for several minutes after the fuel supply is turned off.

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent an explosion or fire hazard: Keep area free of sparks or open flames when spraying with volatile materials.

To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

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

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

To prevent becoming entangled in machinery, stand clear of rotating drives.

To circulate product in bar, perform Circulate in Tank procedure first. Then move 4-Way Valve Control Lever to the CIRCULATE IN BAR position. This procedure can be performed from either the cab or rear control panel.

**NOTE:** When moving lever from Circulate in Tank to Circulate in Bar move lever slowly. In case of moisture or plugged spray bar, lever can be quickly returned to Circulate in Tank. Slug in bar can then be heated with hand torch to release.

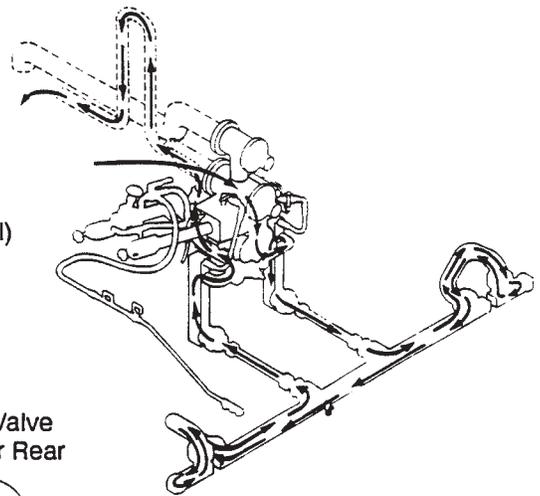
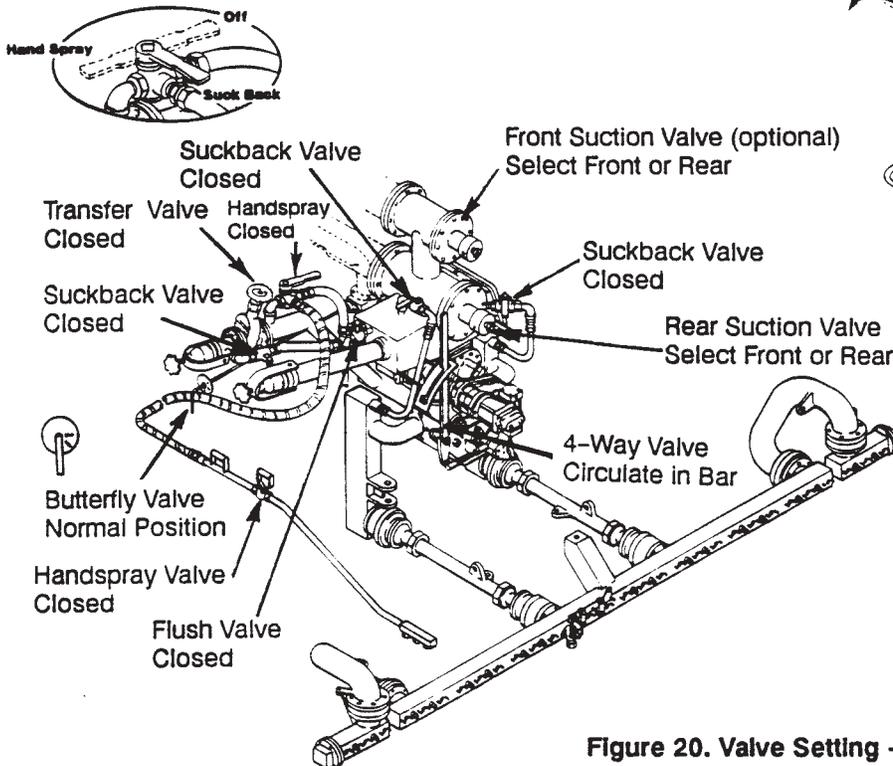
### CIRCULATING PRODUCT IN BAR

### ⚠ CAUTION

To prevent excessive pressure in spray bar, asphalt pump speed should not exceed 160 GPM while circulating.

Circulate product long enough to ensure removal of all air from bar, and to heat spray valves sufficiently.

**NOTE:** Material will circulate in bar ends with extensions folded or in spraying position.



**Figure 20. Valve Setting – Circulate Product in Bar**

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## SPRAYING OPERATIONS

### ⚠ WARNING

To prevent an explosion or fire hazard: Ensure that burners are extinguished before removing any material from tank in any manner. Liquid petroleum (L.P) burners can support a flame for several minutes after the fuel supply is turned off.

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent an explosion or fire hazard: Keep area free of sparks or open flames when spraying with volatile materials.

To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

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

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

To prevent becoming entangled in machinery, stand clear of rotating drives.

To prevent being struck by control lever on rear quadrant, stand clear when ON/OFF function is being performed with air control.

### GENERAL

Correct spray cannot be obtained unless bitumen is heated to proper spraying temperature. Cold bitumen will not provide sharp spray edges, and will cause streaking. Refer to "Heating Bitumen in Distributors" for your particular burner type.

Refer to "Circulating Product for Spraying" for setting proper asphalt pump speeds. Pump speeds higher than recommended will cause excessive fogging of spray. If higher pump speeds are desired, use larger spray nozzles. Low pump speeds will cause sprayfan to sag and cause heavy edges.

### Adjusting Spray Bar Nozzle Angle

Adjust nozzles to obtain an angle of approximately 30 degrees with bar centerline. Every nozzle should be at the same angle.

**NOTE:** A nozzle adjustment wrench is supplied with each new unit.

### Adjusting Spray Bar Height

Lower spray bar and adjust so that nozzles are approximately 12 inches above the road when tank is empty. At this height spray fans will overlap to provide triple coverage.

**NOTE:** Under heavy wind conditions it may be necessary to lower spray bar further.

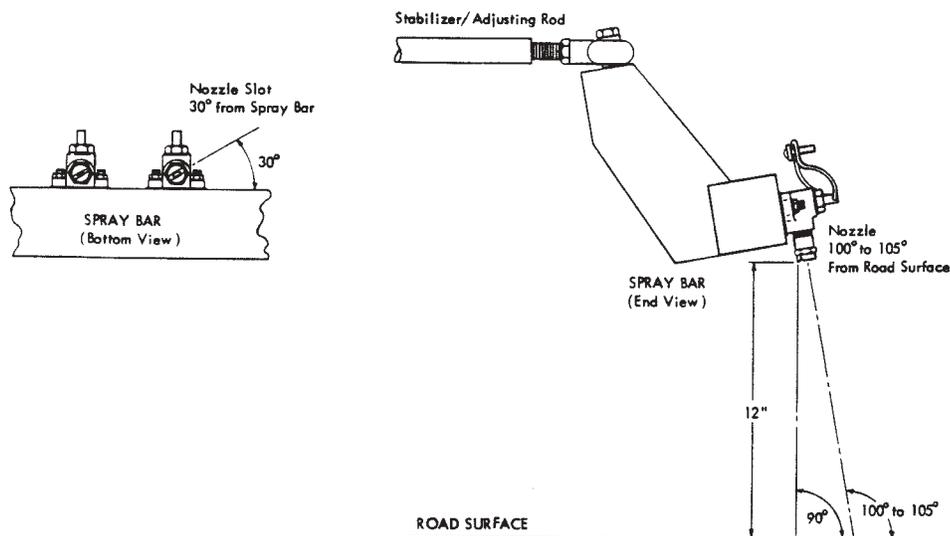
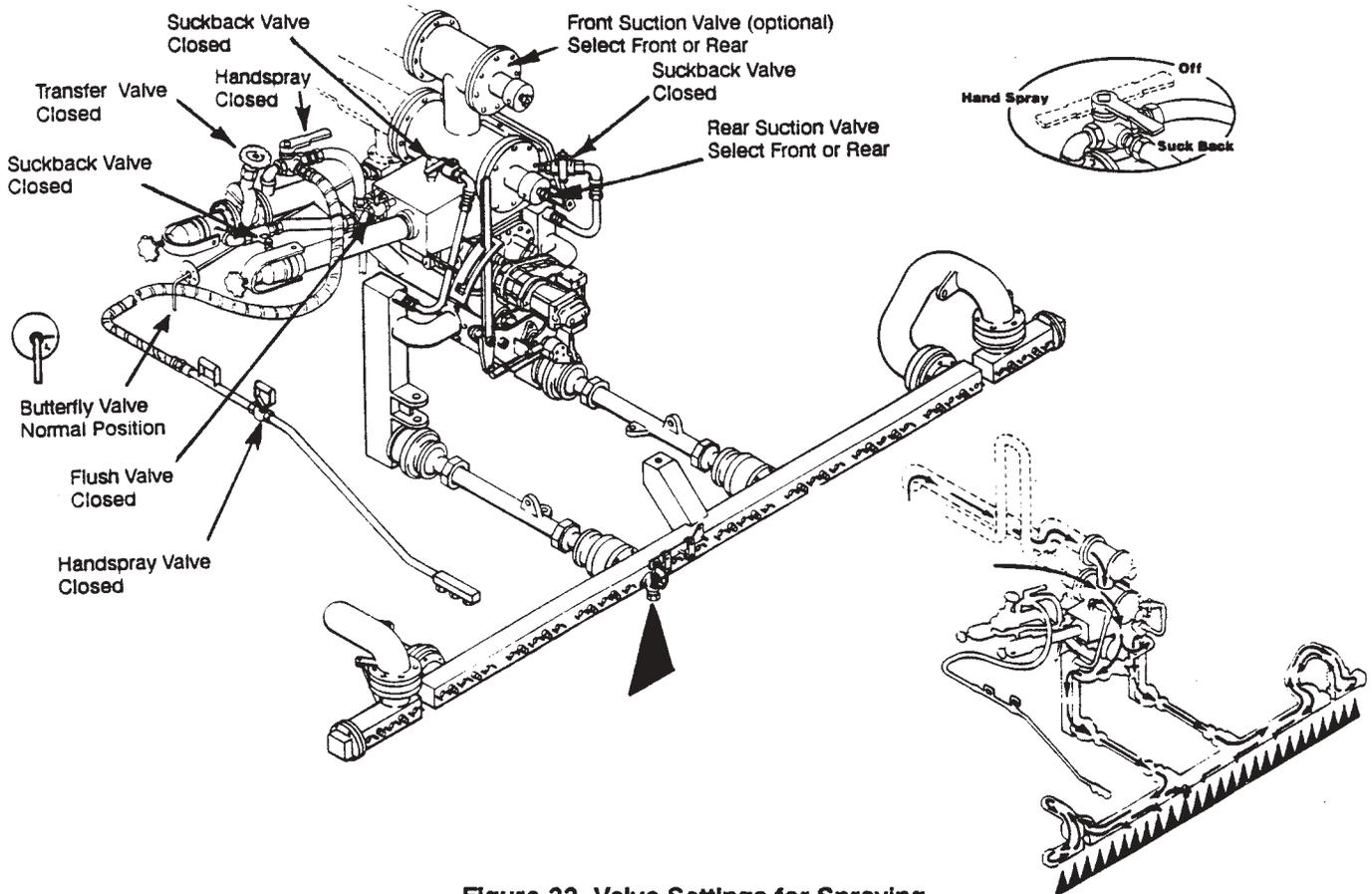


Figure 21. Spray bar Adjustments

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## SPRAYING OPERATIONS



**Figure 22. Valve Settings for Spraying**

1. At rear control panel, do the following:
  - a. Place PUMP CONTROL switch in FRONT position.
  - b. Place SUCTION VALVE switch in OPEN position.
  - c. Turn MASTER POWER switch ON.
2. If equipped with gang spray bar:
  - a. Change display to BAR FT with CHANGE DISPLAY button.
  - b. Toggle APPLICATION RATE switch to obtain desired bar width.
  - c. Adjust spray bar to match width of spray selected in cab.
  - d. Press CHANGE DISPLAY to show application rate screen.
3. If equipped with optional one-foot bar controls, select number of bar feet desired and place corresponding switches in the ON position (up).
4. Turn power ON.

**NOTE:** Individual bar control switches may be turned on or off during spray. DC-2 computer will adjust pump accordingly to maintain proper application rate.

5. Choose desired application rate with MEMORY button or toggle APPLICATION RATE switch up or down until desired application rate (GAL/SQ YD) appears on digital display.

**NOTE:** The application rate may be changed while spraying simply by using the APPLICATION RATE toggle switch. Return to the initial rate by using the toggle switch or by pressing the MEMORY button.

6. When desired application rate is set in computer, lower the spray bar.
7. Set 4-Way Valve to "Circulate in Bar" position.
8. Use CIRCULATION RATE toggle switch to adjust circulation rate for 10 GPM per foot of spray bar selected. Do not exceed 160 GPM.

**NOTE:** If unit is to be used for tach coating (0.05 to 0.20 gal/sq yd), adjust CIRCULATION RATE to approximately 4 GPM per foot of bar length selected.

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## SPRAYING OPERATIONS

9. Start the distributor moving in the pre-selected gear.
10. At the start line move the SPRAY BAR switch to the ON position. While the unit is spraying, the truck speed does not have to remain constant to maintain accuracy.

### CAUTION

*Do not run pump above rated capacity of 400 GPM. Damage to equipment may result.*

**NOTE:** *At higher speeds flow rates may increase beyond the nozzle flow rating. When this occurs, fogging may result. At lower speeds flow rate may decrease below recommended nozzle flow rating. When this occurs, fan droops causing heavy edges and/or streaking.*

11. When end of shot is reached, turn SPRAY BAR switch OFF.

**NOTE:** *4-Way valve is automatically returned to Circulate in Bar position when spray bar switch is turned OFF.*

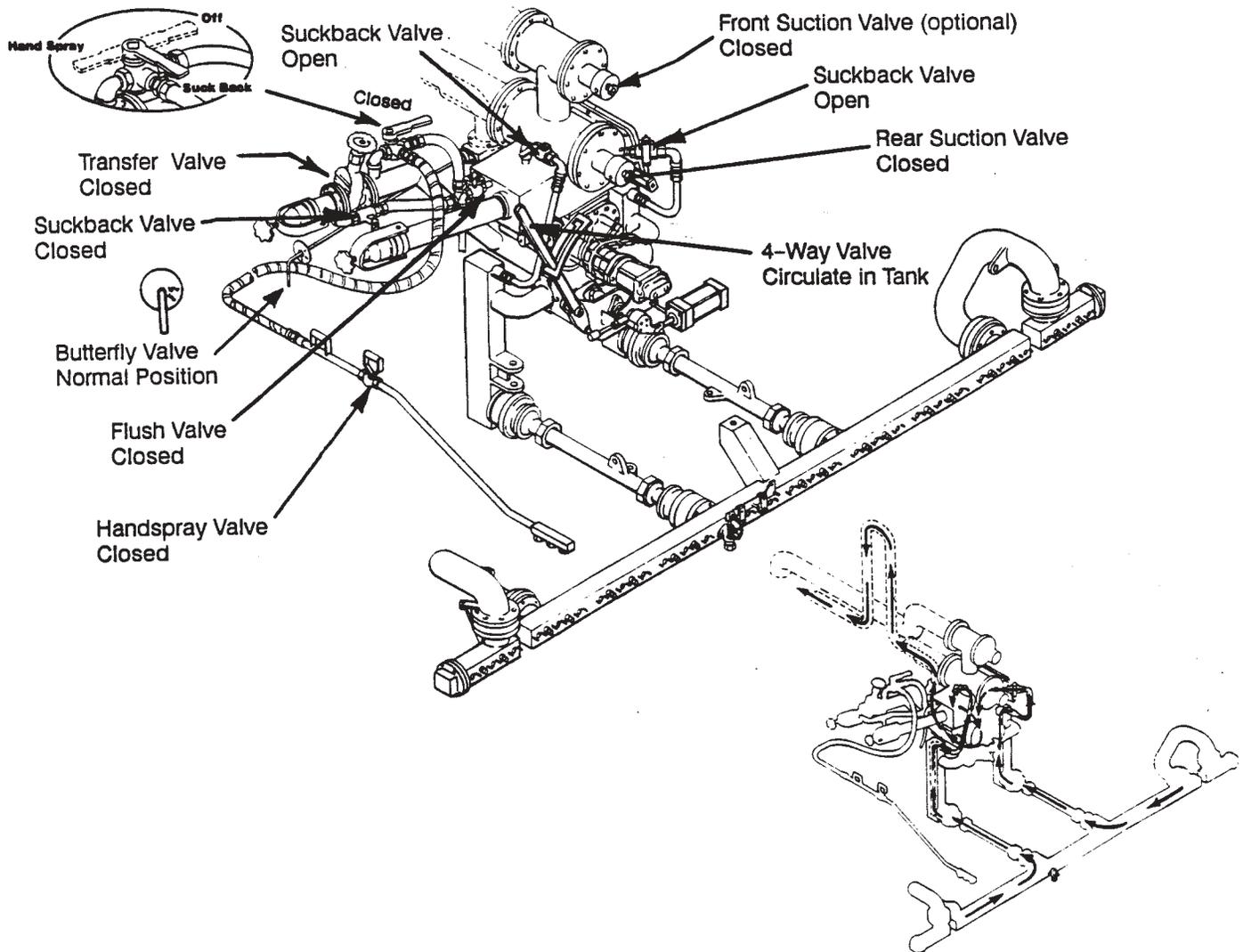
### Setting Digital Memory Presets

**NOTE:** *Setting the memory presets is not required to spray. The memory buttons are provided as a convenience to allow the operator to save five (5) different present application rates. These settings will be saved in memory even with the master power shut off.*

1. Set digital display to GAL/SQ YD (use CHANGE DISPLAY button if necessary).
2. To set GAL/SQ YD memory, push in and hold desired MEMORY button. While holding memory button, toggle APPLICATION RATE switch up or down to desired GAL/SQ YD. When reached, release button.

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## SUCKBACK FOR SPRAY BAR



**Figure 23. Valve Settings for Suckback**

### Suckback With DC-2 Control Panels

1. Set valves as shown in Figure 23.
2. Raise spray bar and fold wings up.
3. Close SUCTION VALVE with switch at rear control panel.
4. Run pump at 200 GPM using CIRCULATION RATE switch in cab or set PUMP CONTROL to REAR and adjust pump speed with rear pump control knob.
5. After drawing material back for approximately 2 minutes, open end valves on spray bar momentarily allowing air to enter system.
6. Close suck back valves.
7. Reduce pump speed to 100 GPM.
8. Open self-flush valve located on fill line cap. This will allow diesel fuel to enter system and wash out pump.
9. After 2 minutes shut self-flush valve and stop pump.
10. Reduce pump GPM.
11. Turn POWER SWITCHES OFF.

**NOTE:** For better cleaning of pump it may be helpful to pour some diesel fuel down the fill line after all functions are completed. The diesel fuel will remain in pump over night to keep pump free for morning operation.

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## HANDSPRAYING OPERATIONS

### ⚠ WARNING

To prevent possible burns from hot asphalt spray when handspraying: Hold handspray gun in proper position and watch for other people.

To prevent burns: Always wear insulated gloves when handling spray bar sections or hoses.

### Handspray With DC-2 Control Panel

1. Set operating valves and levers as shown in Figure 24.
2. Turn SPRAY BAR switch OFF.
3. Turn POWER switch ON.
4. Adjust asphalt pump speed to 80 GPM using CIRCULATION RATE switch at cab panel, or set

PUMP CONTROL switch to REAR and adjust pump speed with rear PUMP CONTROL knob.

5. Turn handspray valve on spray gun 90 degrees to spray.
6. Adjust handspray pressure with BUTTERFLY VALVE. Turn counter-clockwise (towards transfer) to increase pressure.

**NOTE:** Do not turn handle of BUTTERFLY VALVE completely to transfer. This will cause oil to dead head into handspray hose when hand wand is turned off.

7. If butterfly valve is approaching the completely closed position and pressure at hand wand is insufficient, reset butterfly valve to handspray position and increase asphalt pump rate.
8. When finished handspraying, proceed to suckback for handspray procedure.

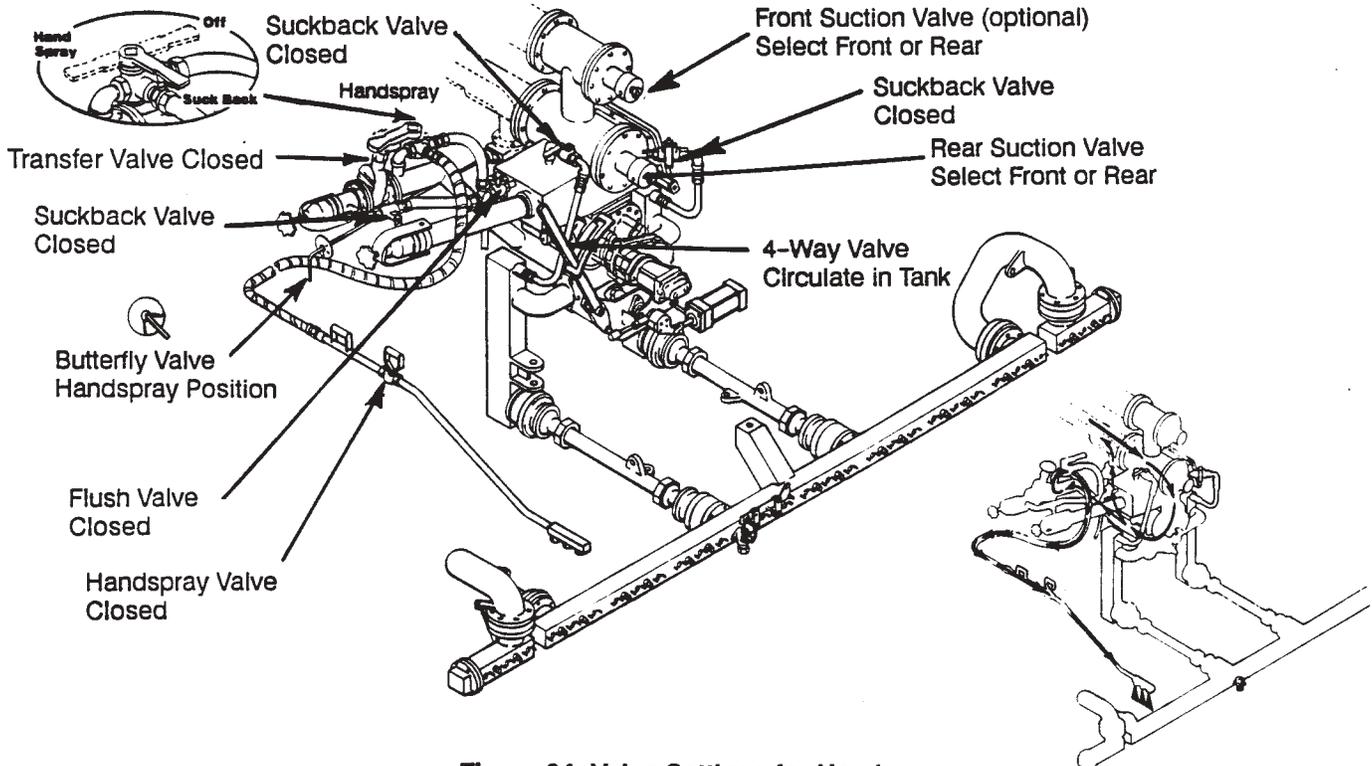


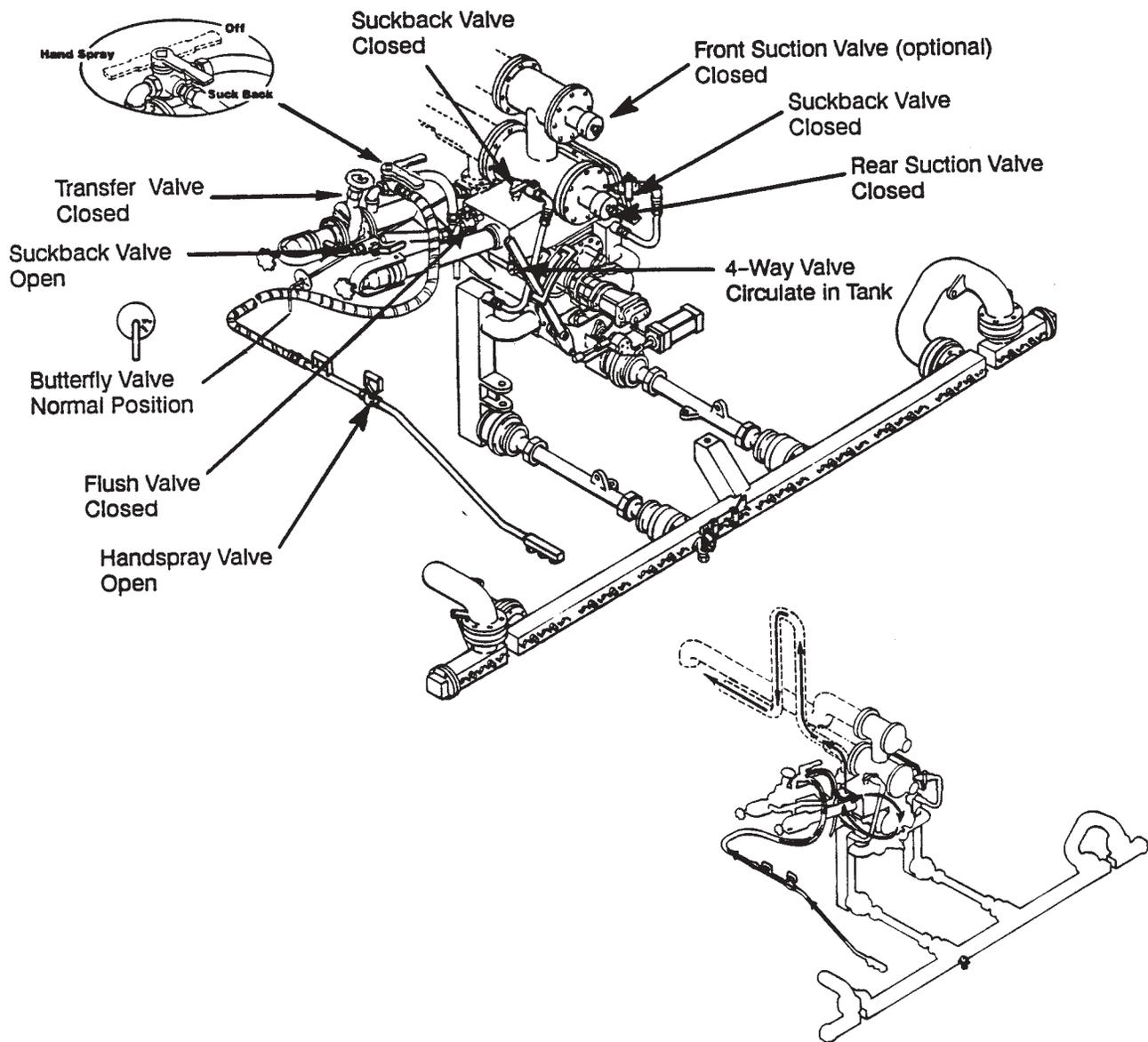
Figure 24. Valve Settings for Handspray

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## SUCKBACK FOR HANDSPRAY

1. Set operating valves and levers as shown in Figure 25.
2. Close SUCTION VALVE with switch at rear control panel.
3. Suck back material from handspray hose by turning butterfly valve to NORMAL.
4. Open handspray suckback valve.
5. Increase pump speed to 200 GPM.
6. After approximately 1 minute crack handspray valve open on handspray wand.

**NOTE:** *If finished handspraying for the day, crack open handspray valve with nozzle submerged in flushing oil.*



**Figure 25. Suckback for Handspray**

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## PUMP-OFF OPERATIONS

**NOTE:** When pumping off, ensure that all valves in pump-off line between distributor and storage tank are open before opening suction valve on distributor.

1. Set operating valves and levers as shown in Figure 26.
2. Connect pump-off hose to transfer line.
3. Open 3-inch TRANSFER gate valve.
4. Open SUCTION valve.
5. Increase pump speed to approximately 150 GPM using CIRCULATION RATE switch in cab or set PUMP CONTROL switch to REAR and adjust speed with PUMP CONTROL knob.
6. Turn butterfly valve to TRANSFER position.
7. When pump-off is complete turn butterfly valve to NORMAL position.
8. Decrease pump speed.
9. Close suction valve.
10. Close valve at storage tank.

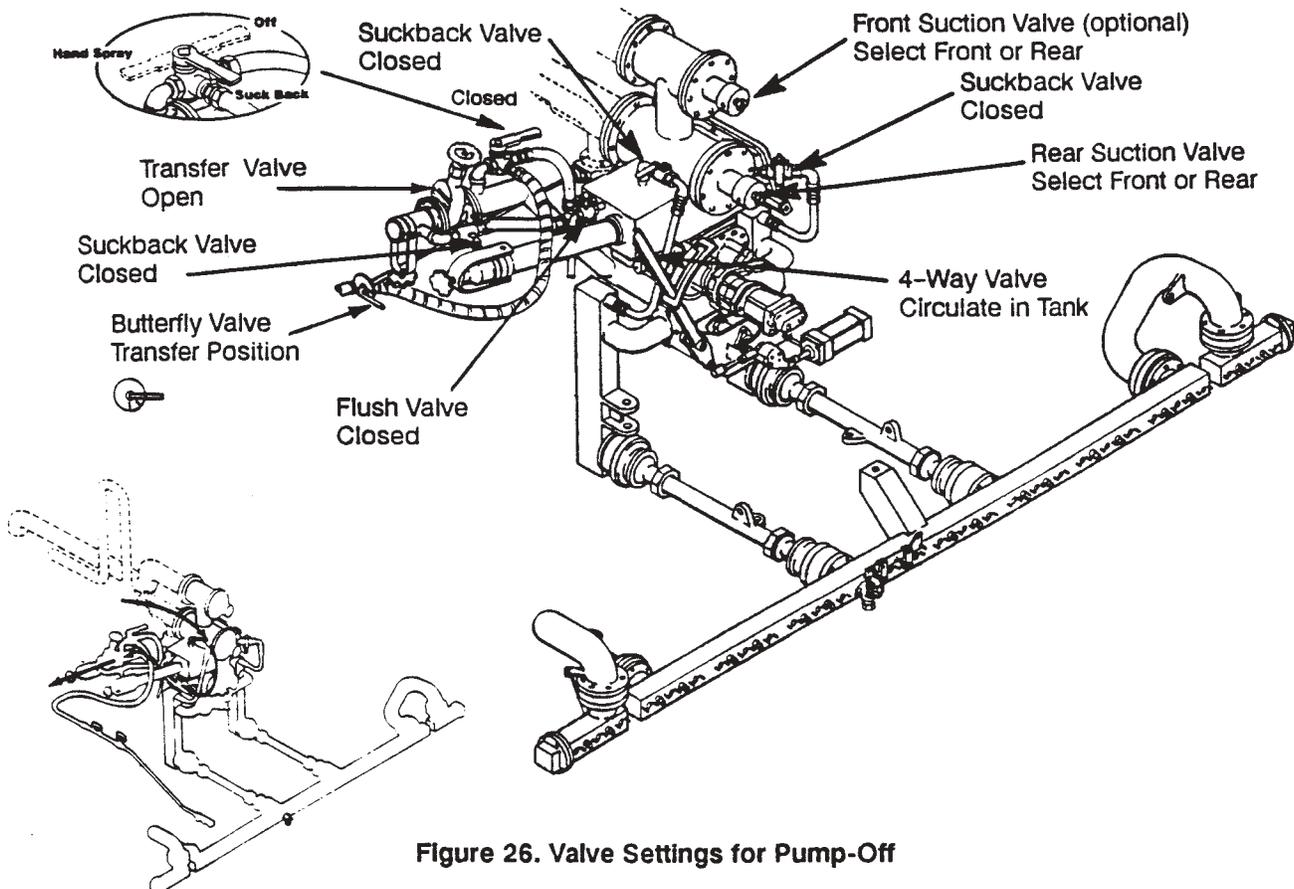
11. Close 3-inch TRANSFER valve in transfer line.
12. Open suckback valve in transfer line and open bleeder valve at supply source.
13. Increase pump speed to approximately 150 GPM.

### ⚠ WARNING

**To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.**

**NOTE:** If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.

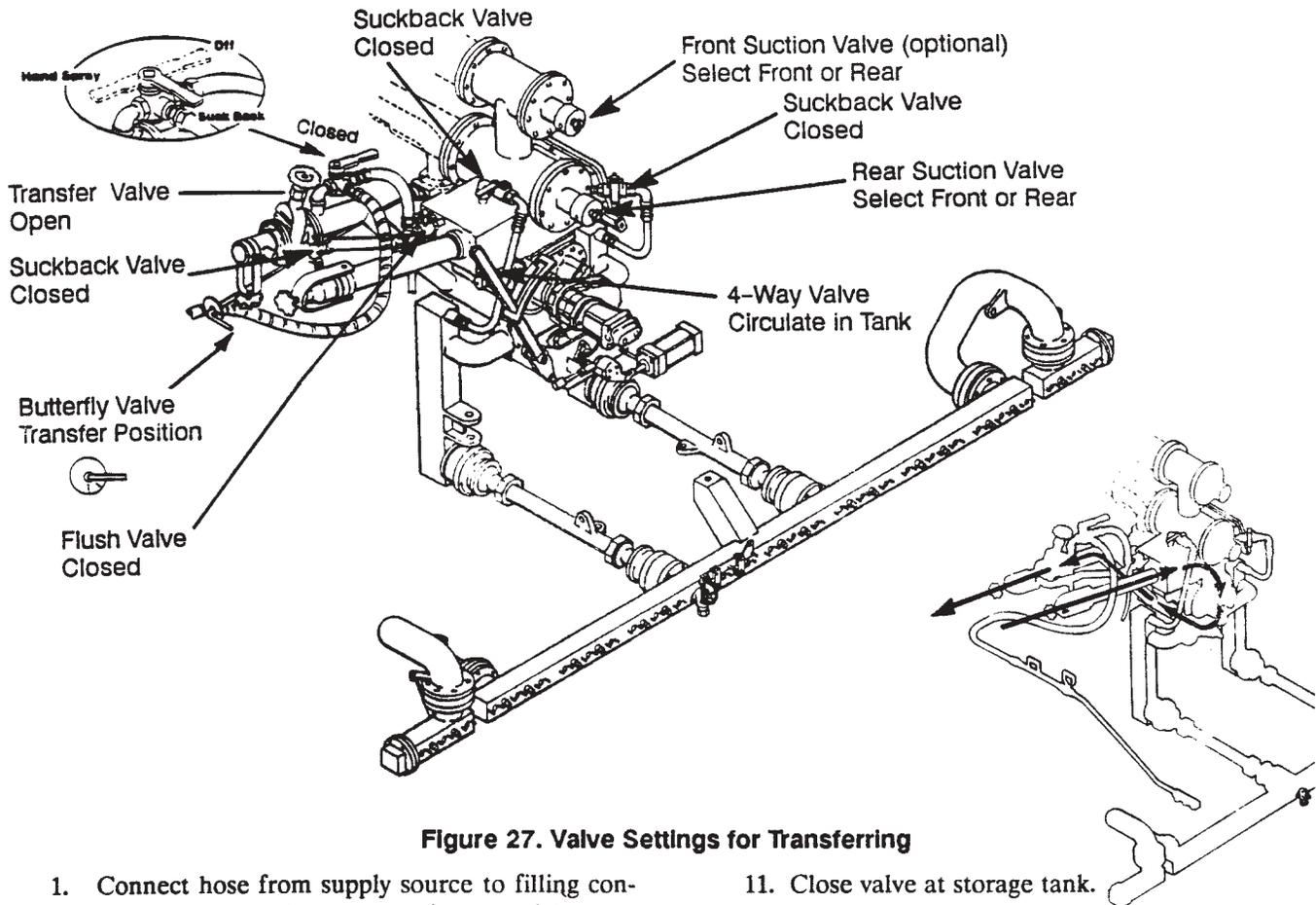
14. Increase the pump speed to 200 GPM, disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the transfer line.
15. Allow the pump to continue turning while the hose is disconnected from the transfer line and the transfer line cap is replaced and secured.



**Figure 26. Valve Settings for Pump-Off**

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## TRANSFER OPERATIONS



**Figure 27. Valve Settings for Transferring**

1. Connect hose from supply source to filling connection. Be sure hose connections are tight.
2. Connect hose from storage to transfer connection. Be sure connections are tight.
3. Set operating valves and levers as shown in Figure 27.
4. Place 4-Way Valve in Circulate in Tank position.
5. Close SUCTION valve.
6. Open TRANSFER valve.
7. Increase pump speed to approximately 150 GPM using CIRCULATION RATE switch in cab or set PUMP CONTROL switch at rear panel to REAR and adjust pump speed with PUMP CONTROL KNOB.
8. Turn butterfly valve to TRANSFER position.
9. After material is transferred, close valve at supply source and open supply line bleeder valve.
10. Disconnect supply line and install cap on distributor fill line.
11. Close valve at storage tank.
12. Close TRANSFER valve.
13. Open suckback valve on transfer line.
14. Turn butterfly valve to NORMAL position.
15. Open bleeder valve at storage tank.
16. Increase the pump speed to 200 GPM, disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the transfer line.
17. Allow the pump to continue turning while the hose is disconnected from the transfer line and the transfer line cap is replaced and secured.

### ⚠ WARNING

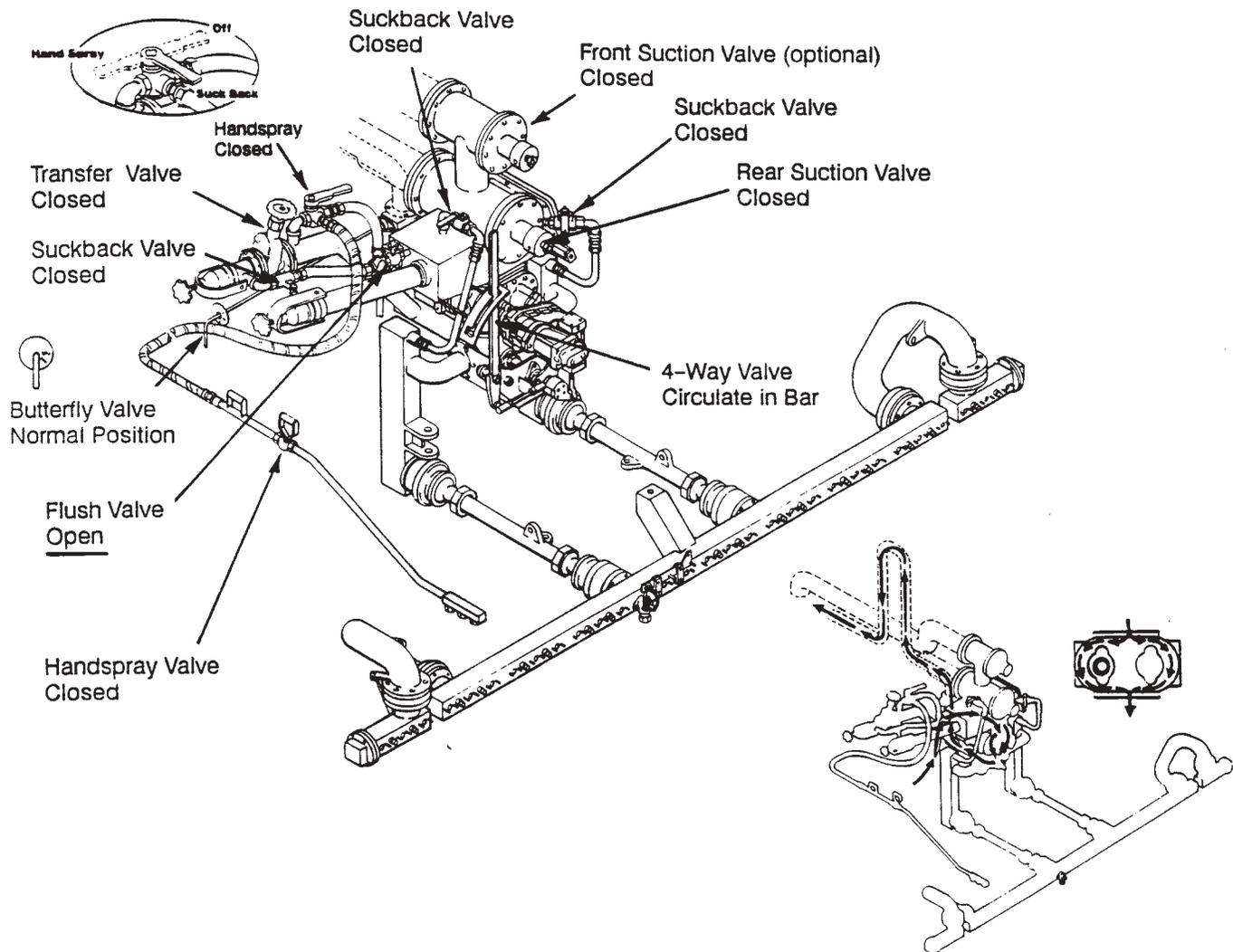
**To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.**

**NOTE:** *If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.*

# DC-2 PANELS WITHOUT ROTARY ACTUATOR

## FLUSHING OPERATIONS

### FLUSHING BAR AND CIRCULATING SYSTEM



**Figure 28. Valve Settings for Flushing**

1. Set valves and operating levers as shown in Figure 28.
2. Open self-flushing valve and run pump at 100 GPM.
3. After 1-2 minutes close self-flushing valve.
4. Move 4-Way Valve to Circulate in Tank position.

Normally the suck back procedure will remove sufficient material from the circulating system to negate the need for

draining the circulating system and spray bar before proceeding with the wash-out operation.

The flushing operation requires only 3 quarts of flushing solvent. This small amount is not sufficient to fill the lines to the tank, thus preventing solvent from being forced into the tank.

A common practice following completion of the flushing procedure and subsequent shutdown is to pour 1-2 quarts of solvent into the fill line which softens or dissolves the residual asphalt in the pump. Allow solvent to remain in the system overnight.

# DC-2 PANELS WITH ROTARY ACTUATOR

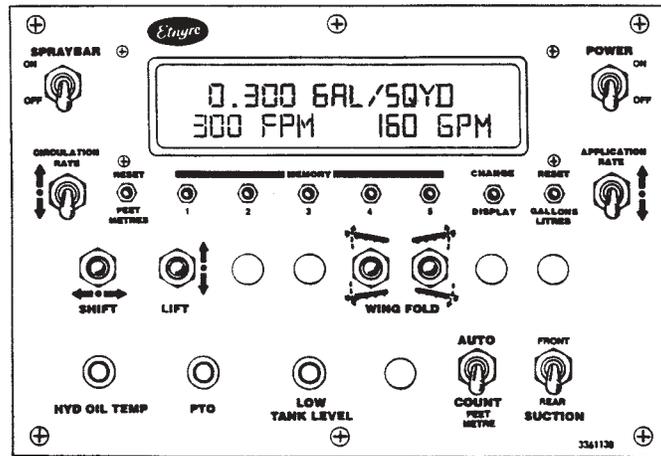


Figure 29. Basic DC-2 Control Panel

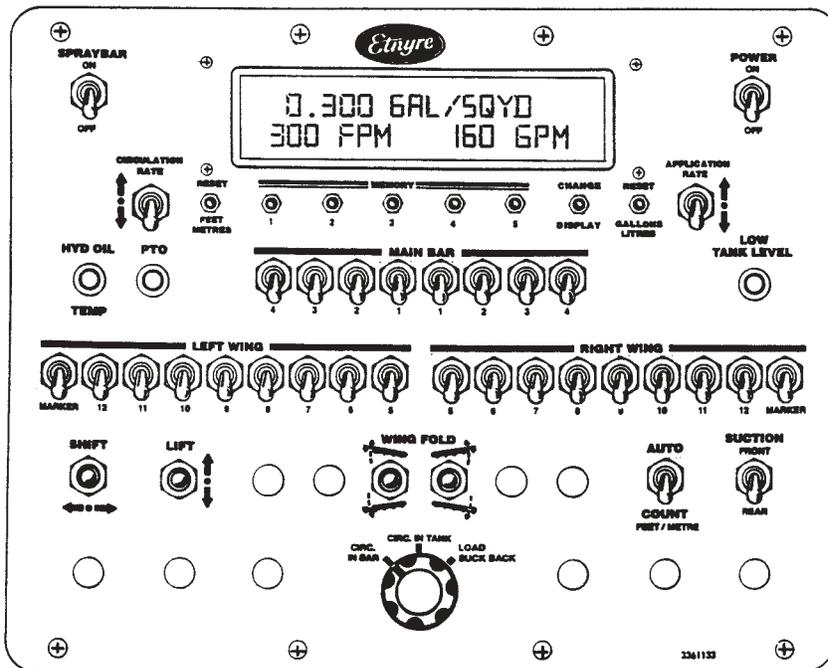


Figure 30. DC-2 Panel With One-Foot Bar Controls and Rotary Actuator

# DC-2 PANELS WITH ROTARY ACTUATOR

## FILLING INSTRUCTIONS

### FILLING DISTRIBUTOR THROUGH FILL LINE

#### **WARNING**

To prevent possible burns from foaming or violent eruption, do not load tank with material temperature over 200° F if water or condensation is present in tank, or if emulsion was used in the previous load. Clean and thoroughly drain tank first. If water or emulsion may be present in spray bar or circulating system, allow a small amount of hot material to circulate in bar BEFORE filling tank. When approximately 1/3 full, drive unit to mix material in tank. This will help absorb moisture. Do not heat material over 200° if moisture or emulsion is present in tank.

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

If you suspect there may be moisture or emulsion in the tank, Dow-Corning DC-200 may be used to reduce foaming if product being fed through manhole is in excess of 200° F.. One ounce of DC-200 concentrate should be adequate for 1000 gallons of asphalt. Additional DC-200 may be obtained from E.D. Etnyre & Co.

#### Mixing Dow-Corning DC-200 Anti-Foam Agent Distributors, Transports, Maintenance Units

Mix content of can (16 oz.) with (1) gallon of diesel fuel or kerosene. Add one (1) oz. of this diluted mixture to each

one thousand (1000) gallons of asphalt. The correct amount may be poured through the manhole. This will assist in reducing foaming, particularly if moisture is present or if emulsified asphalt was used in a previous load.

If no foaming occurs at the start of the filling operation but you suspect there may be moisture in the circulating system or spray bar, the filling operation should be stopped when the tank is no more than 25 percent full. The product should then be circulated through the spray bar at 80 to 110 GPM before continuing the filling operation.

If foaming occurs, continue circulating until foaming stops, then suck the product in the spray bar back into the tank before filling the tank the rest of the way.

#### Connections and Preliminary Checks

1. Ensure that both the fill line and suction strainers are clean and properly installed.

#### **WARNING**

To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

2. Ensure that all connections between distributor and supply source are tight. Air leaks will reduce vacuum and slow down filling operation.

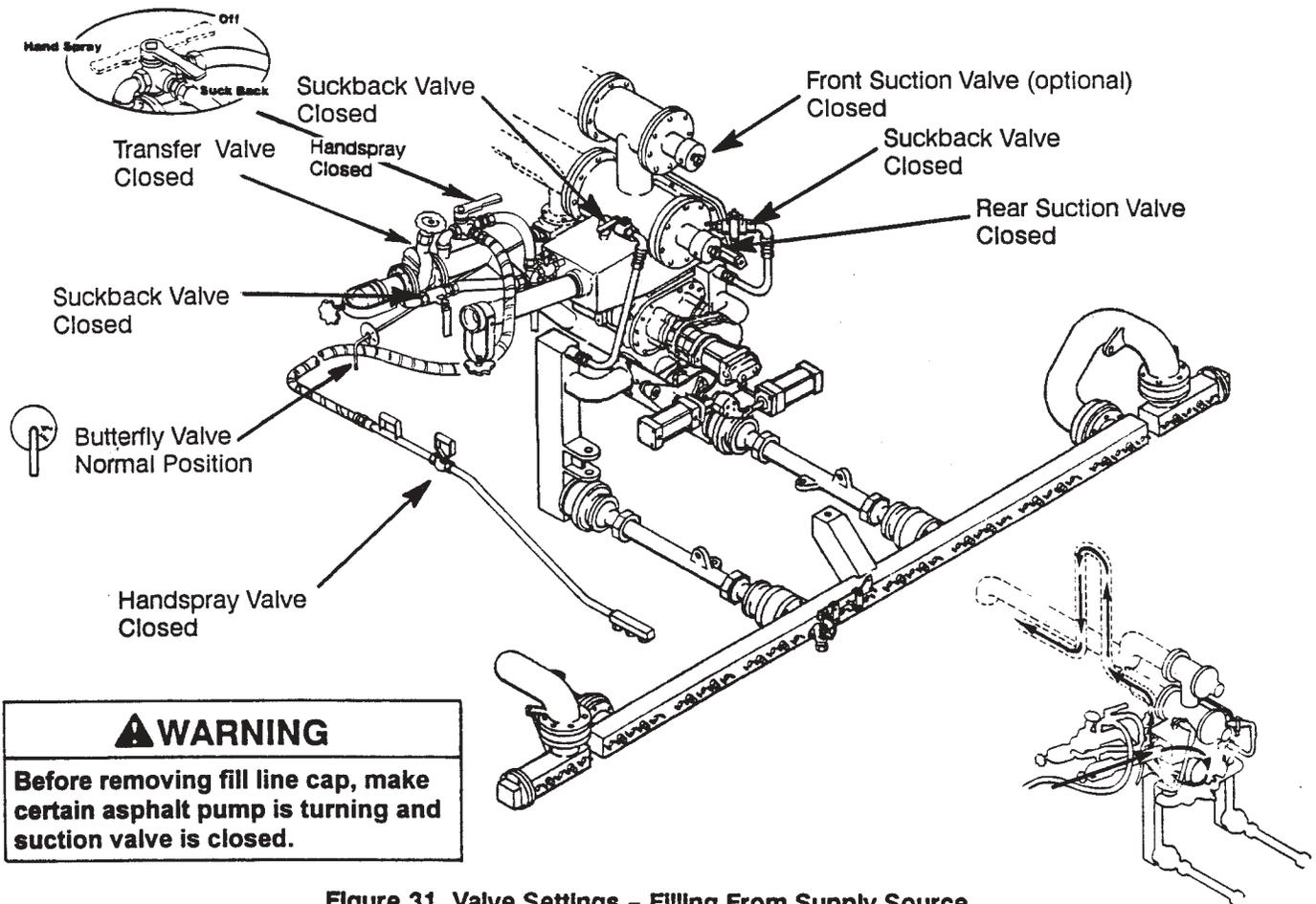
**NOTE:** When connecting to tank car, connect 3-way valve to tank car coupling and then connect inlet hose to 3-way valve. You can then shut off tank car supply from underneath and allow pump suction to clean bitumen from hose by drawing air through vent in 3-way valve.

#### **WARNING**

Before removing fill line cap, make certain asphalt pump is turning and suction valve is closed.

# DC-2 PANELS WITH ROTARY ACTUATOR

## FILLING INSTRUCTIONS



**⚠ WARNING**

**Before removing fill line cap, make certain asphalt pump is turning and suction valve is closed.**

**Figure 31. Valve Settings - Filling From Supply Source**

### FILLING DISTRIBUTOR THROUGH FILL LINE (CONTINUED)

#### Filling From Cab

1. Set all valve positions first (see Figure 31).
2. Turn SPRAY BAR switch OFF.
3. Place AUTO/COUNT switch in AUTO position.
4. SUCTION switch (optional) can be in either position.
5. Turn ROTARY ACTUATOR knob to LOAD/SUCKBACK position.
6. At rear control panel, do the following:
  - a. Place PUMP CONTROL switch in FRONT position.
  - b. Place SUCTION VALVE switch in CLOSED position.
  - c. Turn MASTER POWER switch ON.

7. At cab panel turn POWER switch ON.
8. Be sure digital display is set to "GAL/SW YD; FPM; GPM." If not, press CHANGE DISPLAY button..
9. Toggle CIRCULATION RATE switch up or down to obtain desired rate..

**⚠ WARNING**

**To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.**

10. When loading is complete, operate the pump at the maximum speed where it will run quietly. Higher speeds will not load thick material fast. Normally 150 GPM is the best loading speed. Light materials, or heavy materials at spraying temperature, may be loaded at faster pump speeds (maximum 240 GPM).

# DC-2 PANELS WITH ROTARY ACTUATOR

## FILLING INSTRUCTIONS

### FILLING DISTRIBUTOR THROUGH FILL LINE (CONTINUED)

#### WARNING

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

11. Open the valve at the supply source and monitor the tank gauge. When the gauge shows half-full, position someone at the manhole to advise the person at the supply source when to close the valve. For safety reasons there should always be two people acting together during the filling operation.
12. After closing off the supply tank valve, open the bleeder valve (at the supply) to assist in sucking residual product out of the fill line before disconnecting the hose from either the supply source or the distributor fill line.

#### WARNING

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

**NOTE:** *If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.*

13. Disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the fill line.
14. Allow the pump to continue turning while the hose is disconnected from the fill line and the fill line cap is replaced and secured.

### Filling From Rear Control Panel

1. Turn POWER switch ON at cab panel.
2. Turn PUMP CONTROL knob fully counter-clockwise.
3. Place pump CONTROL switch in REAR position.
4. Place SUCTION VALVE switch in CLOSED position.
5. Turn BAR LATCH switch, BURNER POWER switch and WASHDOWN switch OFF (down).

6. Turn MASTER POWER switch ON.
7. Adjust PUMP CONTROL knob for desired rate.

#### WARNING

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

8. When loading is complete, operate the pump at the maximum speed where it will run quietly. Higher speeds will not load thick material fast. Normally 150 GPM is the best loading speed. Light materials, or heavy materials at spraying temperature, may be loaded at faster pump speeds (maximum 240 GPM).

#### WARNING

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

9. Open the valve at the supply source and monitor the tank gauge. When the gauge shows half-full, position someone at the manhole to advise the person at the supply source when to close the valve. For safety reasons there should always be two people acting together during the filling operation.
10. After closing off the supply tank valve, open the bleeder valve (at the supply) to assist in sucking residual product out of the fill line before disconnecting the hose from either the supply source or the distributor fill line.

#### WARNING

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

**NOTE:** *If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.*

11. Disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the fill line.

# DC-2 PANELS WITH ROTARY ACTUATOR

## FILLING INSTRUCTIONS

12. Allow the pump to continue turning while the hose is disconnected from the fill line and the fill line cap is replaced and secured.

### FILLING DISTRIBUTOR THROUGH MANHOLE

**NOTE:** *Ensure suction valve is closed for this operation.*

Set valves and switches same as "Filling Distributor Through Fill Line." It is not necessary to run pump when filling through manhole.

### **⚠ WARNING**

To prevent possible injury, always open manhole cover slowly. Pressure build-up in tank may cause cover to burst open.

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent possible burns from foaming or violent eruption, do not load tank with material temperature over 200° F if water or condensation is present in tank, or if emulsion was used in the previous load. Do not heat material over 200° if moisture or emulsion is present in tank.

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

### **⚠ CAUTION**

*To prevent possible damage to equipment, always use manhole strainer when filling through manhole.*

If you suspect there may be moisture or emulsion in the tank, Dow-Corning DC-200 may be used to prevent foaming if product being fed through manhole is in excess of 200° F. One ounce of DC-200 concentrate should be adequate for 1000 gallons of asphalt. See mixing instructions on previous page. Additional DC-200 may be obtained from E.D. Etnyre & Co.

### **Mixing Dow-Corning DC-200 Anti-Foam Agent Distributors, Transports, Maintenance Units**

Mix content of can (16 oz.) with (1) gallon of diesel fuel or kerosene. Add one (1) oz. of this diluted mixture to each one thousand (1000) gallons of asphalt. The correct amount may be poured through the manhole. This will assist in reducing foaming, particularly if moisture is present or if emulsified asphalt was used in a previous load.

If no foaming occurs at the start of the filling operation but you suspect there may be moisture in the circulating system or spray bar, the filling operation should be stopped when the tank is no more than 25 percent full. The product should then be circulated through the spray bar at 80 to 110 GPM before continuing the filling operation.

If foaming occurs, continue circulating until foaming stops, then suck the product in the spray bar back into the tank before filling the tank the rest of the way.

# DC-2 PANELS WITH ROTARY ACTUATOR

## CIRCULATING PRODUCT IN TANK

### **⚠ WARNING**

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

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

To prevent becoming entangled in machinery, stand clear of rotating drives.

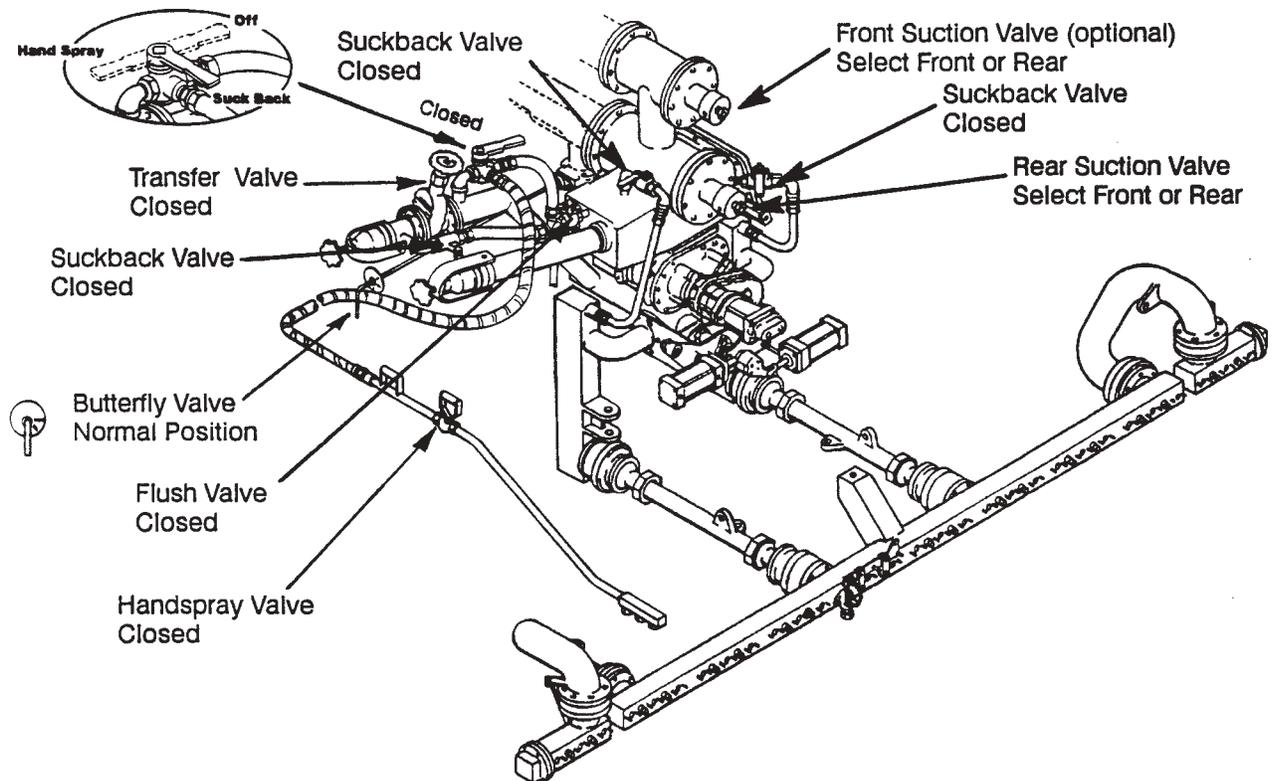
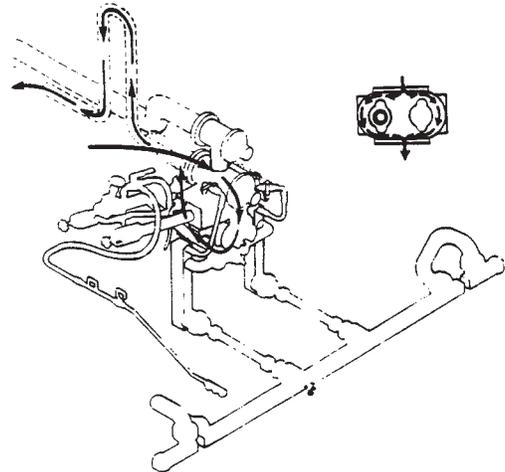


Figure 32. Valve Settings – Circulate Product in Tank

# DC-2 PANELS WITH ROTARY ACTUATOR

## CIRCULATING PRODUCT IN TANK

### Circulating In Tank From Cab

1. Set all valve positions first (see Figure 32).
2. Turn POWER switch OFF.
3. Turn SPRAY BAR switch OFF.
4. SUCTION switch (optional) can be in either position..
5. Turn ROTARY ACTUATOR knob to CIRC IN TANK position.
6. At rear control panel, do the following:
  - a. Place PUMP CONTROL switch in FRONT position.
  - b. Place SUCTION VALVE switch in OPEN position.
  - c. Turn MASTER POWER switch ON.
7. At cab panel place AUTO/COUNT switch in AUTO position.
8. Set digital readout to display "GAL/SQ YD; FPM; GPM" (press CHANGE DISPLAY button if necessary).
9. Use CIRCULATION RATE switch to obtain 100–150 GPM.

### Circulating In Tank From Rear Control Panel

1. Turn POWER switch ON at cab control panel.
2. Turn ROTARY ACTUATOR knob to CIRC IN TANK position.
3. At rear panel place PUMP CONTROL switch in REAR position.
4. Turn PUMP CONTROL knob fully counter-clockwise.
5. Turn BAR LATCH switch, BURNER POWER switch and WASHDOWN switch OFF (down).
6. Turn MASTER POWER switch ON.
7. Place SUCTION VALVE switch in OPEN position.
8. Adjust PUMP CONTROL knob for desired GPM.

**NOTE:** GPM is only shown on cab panel. If display does not show GAL SQ/YD; FPM; GPM, press CHANGE DISPLAY button.

If the pump fails to quickly regain its speed, close suction valve and put a small amount of diesel fuel into the fill line to free up the pump or use hand torch to warm the pump.

Even if the product in the tank is at (or near) spraying temperature, the cold pump may chill the product sufficiently to lock up the pump. If this occurs, heat may be applied to the pump with a hand-held torch.

### WARNING

To prevent possible burns, use extreme caution when using a torch to heat the pump. Asphalt accumulated on and around the pump may ignite when heating the pump with a torch.

If the product is too cold to be circulated, some heating with the flue burners will be needed to increase the temperature enough to start circulating. Refer to operating instructions for your particular burner type.

### WARNING

Allowing the flue burners to operate for a long period of time without circulating can damage the product and create explosive fumes. If product cannot be circulated after fifteen minutes of heating without circulation, the burners should be extinguished for 20–30 minutes before re-lighting the burners.

Moving the distributor back and forth while the burners are off will allow the hot product to mix with the cooler product. This should decrease the time required to bring the product temperature up enough to start circulating. Once circulation has been established, the heating can continue without interruption. Circulate at 100–160 GPM.

### WARNING

To prevent an explosion or fire hazard, never move the vehicle when the burners are operating.

# DC-2 PANELS WITH ROTARY ACTUATOR

## CIRCULATING PRODUCT IN BAR

### ⚠ WARNING

To prevent an explosion or fire hazard: Ensure that burners are extinguished before removing any material from tank in any manner. Liquid petroleum (L.P.) burners can support a flame for several minutes after the fuel supply is turned off.

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent an explosion or fire hazard: Keep area free of sparks or open flames when spraying with volatile materials.

To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

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

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

To prevent becoming entangled in machinery, stand clear of rotating drives.

To circulate product in bar, perform Circulate in Tank procedure first. Then move ROTARY ACTUATOR knob to the CIRC IN BAR position. This procedure can be performed from either the cab or rear control panel.

### CIRCULATING PRODUCT IN BAR

### ⚠ CAUTION

To prevent excessive pressure in spray bar, asphalt pump speed should not exceed 160 GPM while circulating.

Circulate product long enough to ensure removal of all air from bar, and to heat spray valves sufficiently.

**NOTE:** Material will circulate in bar ends with extensions folded or in spraying position.

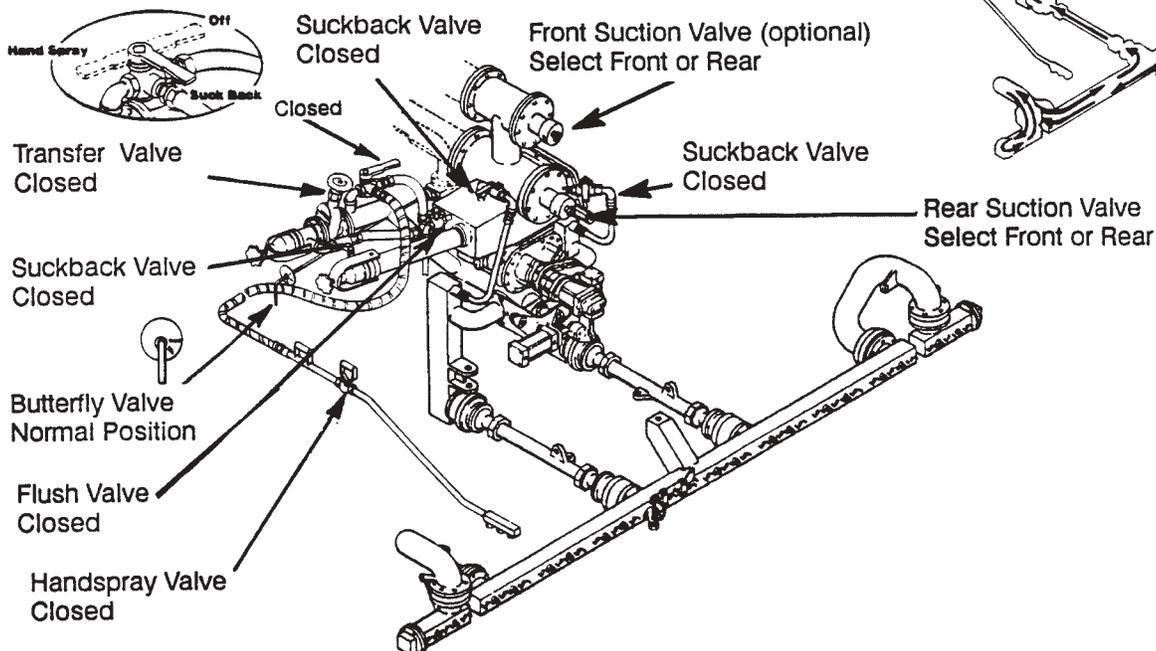


Figure 33. Valve Setting - Circulate Product in Bar

# DC-2 PANELS WITH ROTARY ACTUATOR

## SPRAYING OPERATIONS

### ⚠ WARNING

To prevent an explosion or fire hazard: Ensure that burners are extinguished before removing any material from tank in any manner. Liquid petroleum (L.P.) burners can support a flame for several minutes after the fuel supply is turned off.

To prevent an explosion or fire hazard: Keep burning cigarettes or other sources of combustion away from manholes and overflow vents.

To prevent an explosion or fire hazard: Keep area free of sparks or open flames when spraying with volatile materials.

To prevent possible burns from leaking material, be sure all pipe, cap and hose connections are secure before opening valves.

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

To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.

To prevent becoming entangled in machinery, stand clear of rotating drives.

To prevent being struck by control lever on rear quadrant, stand clear when ON/OFF function is being performed with air control.

### GENERAL

Correct spray cannot be obtained unless bitumen is heated to proper spraying temperature. Cold bitumen will not provide sharp spray edges, and will cause streaking. Refer to "Heating Bitumen in Distributors" for your particular burner type.

Refer to "Circulating Product for Spraying" for setting proper asphalt pump speeds. Pump speeds higher than recommended will cause excessive fogging of spray. If higher pump speeds are desired, use larger spray nozzles. Low pump speeds will cause sprayfan to sag and cause heavy edges.

### Adjusting Spray Bar Nozzle Angle

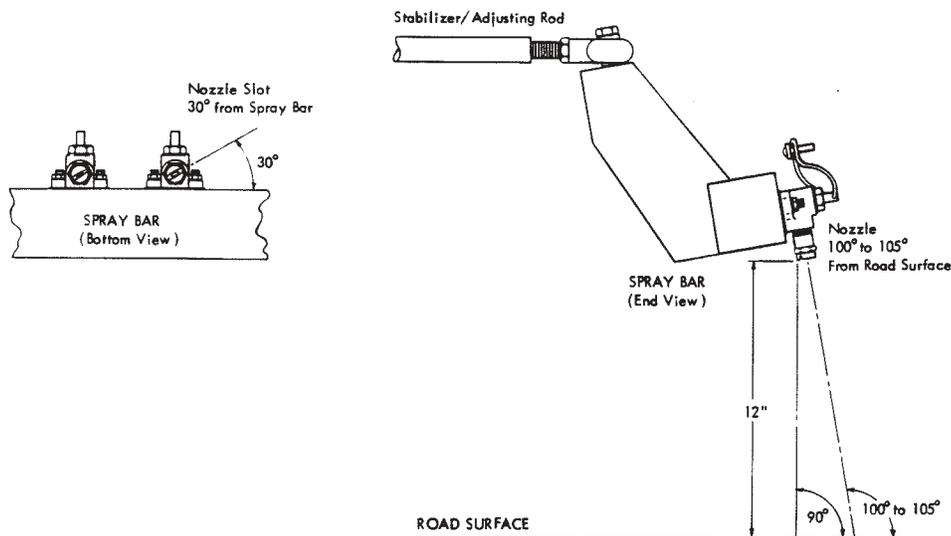
Adjust nozzles to obtain an angle of approximately 30 degrees with bar centerline. Every nozzle should be at the same angle.

**NOTE:** A nozzle adjustment wrench is supplied with each new unit.

### Adjusting Spray Bar Height

Lower spray bar and adjust so that nozzles are approximately 12 inches above the road when tank is empty. At this height spray fans will overlap to provide triple coverage.

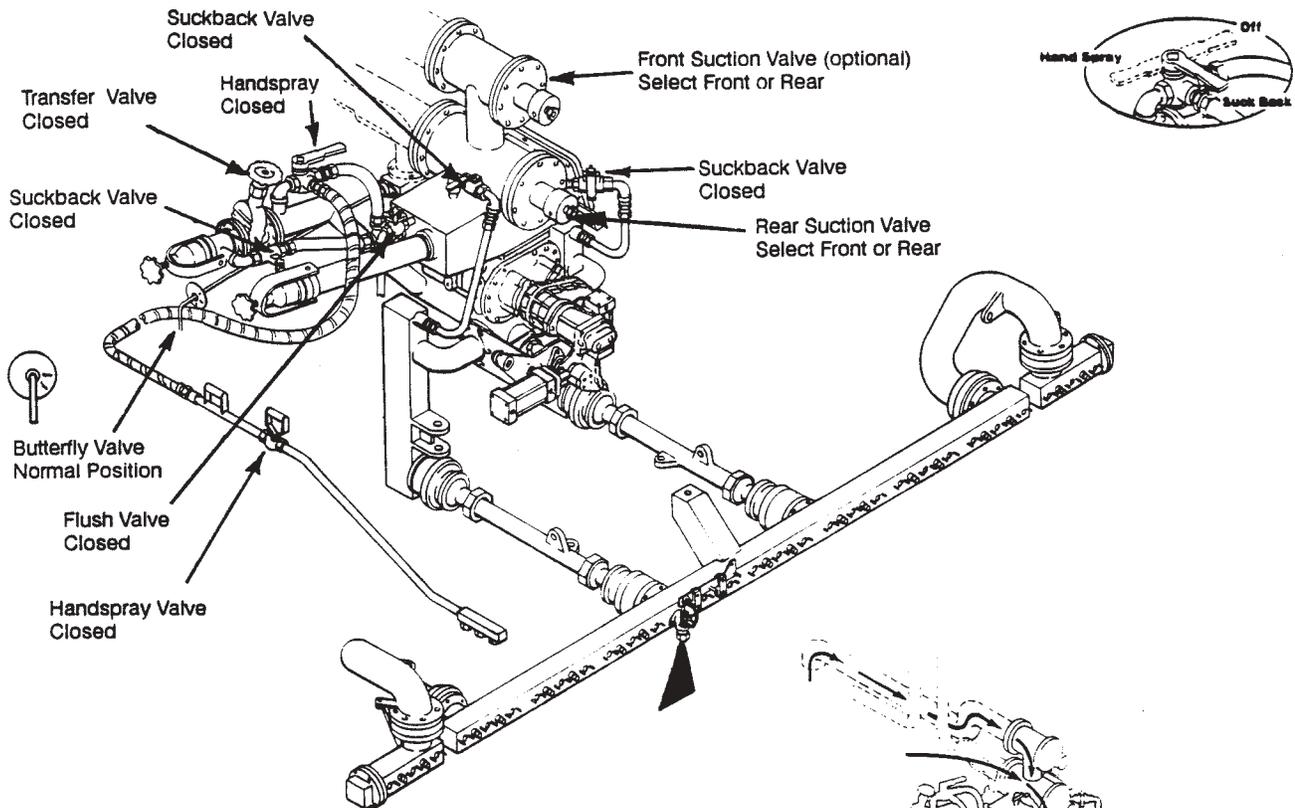
**NOTE:** Under heavy wind conditions it may be necessary to lower spray bar further.



**Figure 34. Spray bar Adjustments**

# DC-2 PANELS WITH ROTARY ACTUATOR

## SPRAYING OPERATIONS



**Figure 35. Valve Settings for Spraying**

1. At rear control panel, do the following:
  - a. Place PUMP CONTROL switch in FRONT position.
  - b. Place SUCTION VALVE switch in OPEN position.
  - c. Turn MASTER POWER switch ON.
2. If equipped with gang spray bar:
  - a. Change display to BAR FT with CHANGE DISPLAY button.
  - b. Toggle APPLICATION RATE switch to obtain desired bar width.
  - c. Adjust spray bar to match width of spray selected in cab.
  - d. Press CHANGE DISPLAY to show application rate screen.
3. Select number of bar feet desired and place corresponding switches in the ON position (up).
4. Turn power ON.

**NOTE:** Individual bar control switches may be turned on or off during spray. DC-2 computer will adjust pump accordingly to maintain proper application rate.

5. Choose desired application rate with MEMORY button or toggle APPLICATION RATE switch up or down until desired application rate (GAL/SQ YD) appears on digital display.

**NOTE:** The application rate may be changed while spraying simply by using the APPLICATION RATE toggle switch. Return to the initial rate by using the toggle switch or by pressing the MEMORY button.

6. When desired application rate is set in computer, lower the spray bar.

# DC-2 PANELS WITH ROTARY ACTUATOR

## SPRAYING OPERATIONS

7. Set ROTARY ACTUATOR to "CIRC IN BAR" position.
8. Use CIRCULATION RATE toggle switch to adjust circulation rate for 10 GPM per foot of spray bar selected. Do not exceed 160 GPM.

**NOTE:** *If unit is to be used for tach coating (0.05 to 0.20 gal/sq yd), adjust CIRCULATION RATE to approximately 4 GPM per foot of bar length selected.*

9. Start the distributor moving in the pre-selected gear.
10. At the start line move the SPRAY BAR switch to the ON position. While the unit is spraying, the truck speed does not have to remain constant to maintain accuracy.

### CAUTION

*Do not run pump above rated capacity of 400 GPM. Damage to equipment may result.*

**NOTE:** *At higher speeds flow rates may increase beyond the nozzle flow rating. When this occurs, fogging may result. At lower speeds flow rate may decrease below recommended nozzle flow rating. When this occurs, fan droops causing heavy edges and/or streaking.*

11. When end of shot is reached, turn SPRAY BAR switch OFF.

**NOTE:** *4-Way valve is automatically returned to Circulate in Bar position when spray bar switch is turned OFF.*

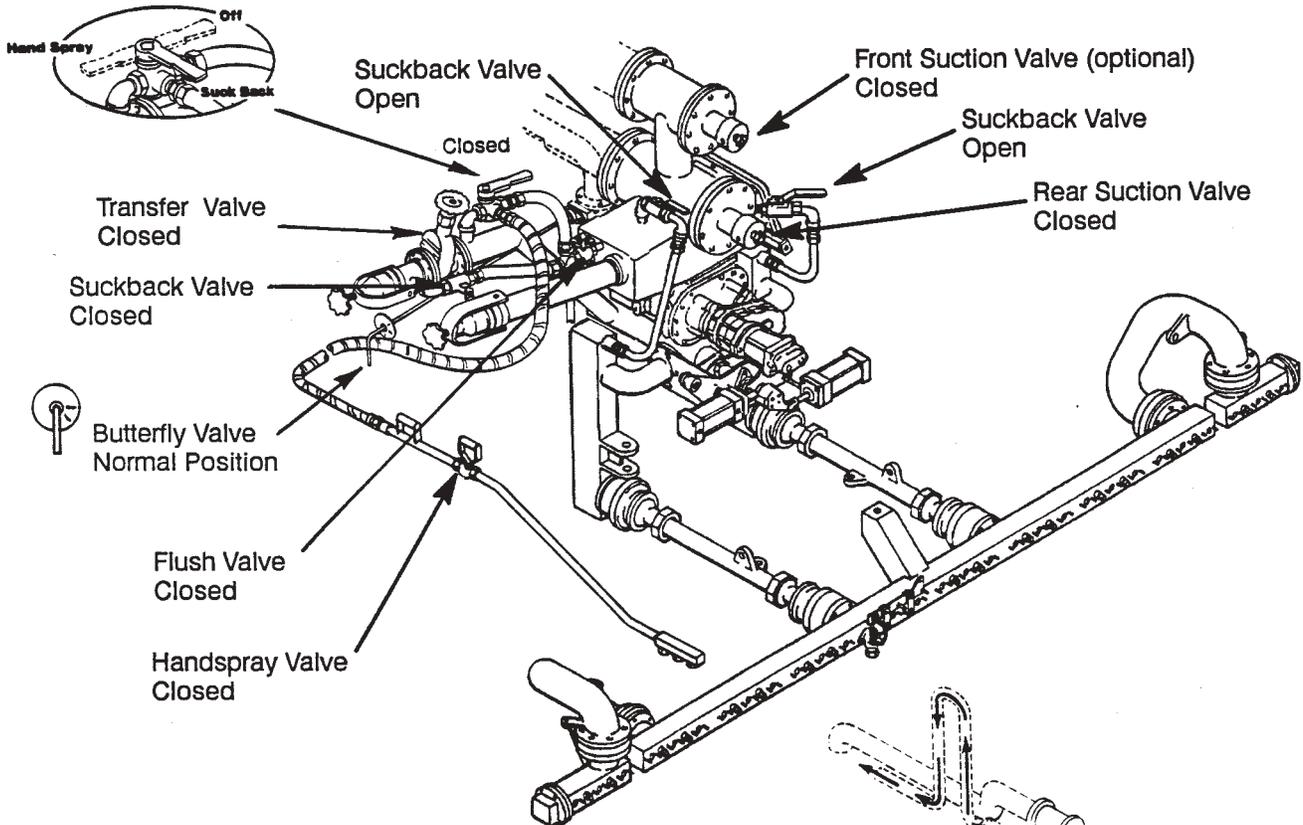
### Setting Digital Memory Presets

**NOTE:** *Setting the memory presets is not required to spray. The memory buttons are provided as a convenience to allow the operator to save five (5) different present application rates. These settings will be saved in memory even with the master power shut off.*

1. Set digital display to GAL/SQ YD (use CHANGE DISPLAY button if necessary).
2. To set GAL/SQ YD memory, push in and hold desired MEMORY button. While holding memory button, toggle APPLICATION RATE switch up or down to desired GAL/SQ YD. When reached, release button.

# DC-2 PANELS WITH ROTARY ACTUATOR

## SUCKBACK FOR SPRAY BAR



**Figure 36. Valve Settings for Suckback**

### Suckback With DC-2 Control Panels

1. Set valves as shown in Figure 36.
2. Raise spray bar and fold wings up.
3. Turn ROTARY ACTUATOR knob to LOAD/SUCKBACK position.
4. Run pump at 200 GPM using CIRCULATION RATE switch in cab or set PUMP CONTROL to REAR and adjust pump speed with rear pump control knob.
5. After drawing material back for approximately 2 minutes, open end valves on spray bar momentarily allowing air to enter system.
6. Close suck back valves.
7. Reduce pump speed to 100 GPM.
8. Open self-flush valve located on fill line cap. This will allow diesel fuel to enter system and wash out pump.
9. After 2 minutes shut self-flush valve and stop pump.
10. Reduce pump GPM.
11. Turn POWER SWITCHES OFF.

**NOTE:** For better cleaning of pump it may be helpful to pour some diesel fuel down the fill line after all functions are completed. The diesel fuel will remain in pump over night to keep pump free for morning operation.

# DC-2 PANELS WITH ROTARY ACTUATOR

## HANDSPRAYING OPERATIONS

### **⚠ WARNING**

To prevent possible burns from hot asphalt spray when handspraying: Hold handspray gun in proper position and watch for other people.

To prevent burns: Always wear insulated gloves when handling spray bar sections or hoses.

### Handspray With DC-2 Control Panel

1. Set operating valves and levers as shown in Figure 37.
2. Turn ROTARY ACTUATOR to CIRC IN TANK position.
3. Turn SPRAY BAR switch OFF.
4. Turn POWER switch ON.

5. Adjust asphalt pump speed to 80 GPM using CIRCULATION RATE switch at cab panel, or set PUMP CONTROL switch to REAR and adjust pump speed with rear PUMP CONTROL knob.
6. Turn handspray valve on spray gun 90 degrees to spray.
7. Adjust handspray pressure with BUTTERFLY VALVE. Turn counter-clockwise (towards transfer) to increase pressure.

**NOTE:** Do not turn handle of BUTTERFLY VALVE completely to transfer. This will cause oil to dead head into handspray hose when hand wand is turned off.

8. If butterfly valve is approaching the completely closed position and pressure at hand wand is insufficient, reset butterfly valve to handspray position and increase asphalt pump rate.
9. When finished handspraying, proceed to suckback for handspray procedure.

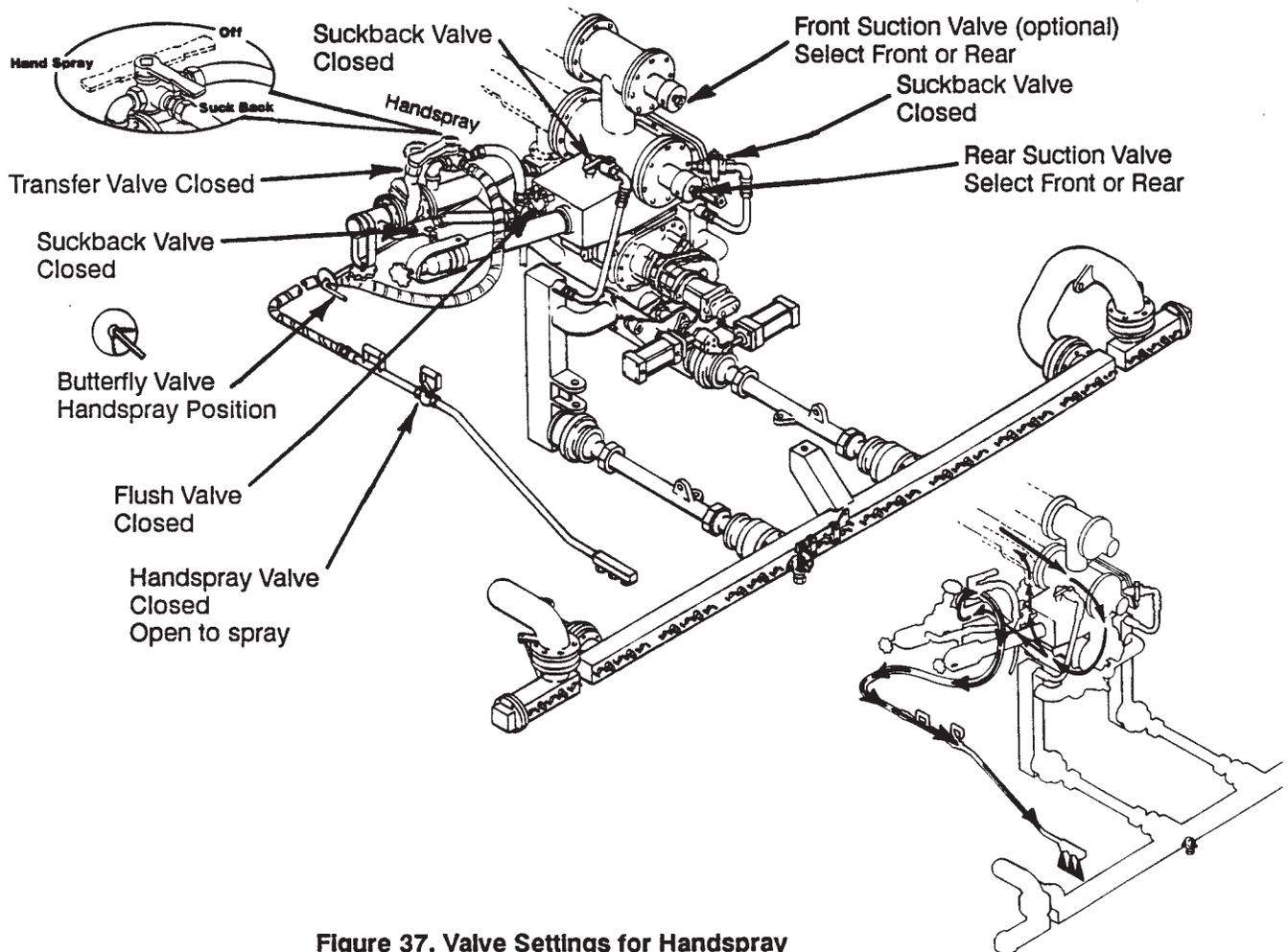
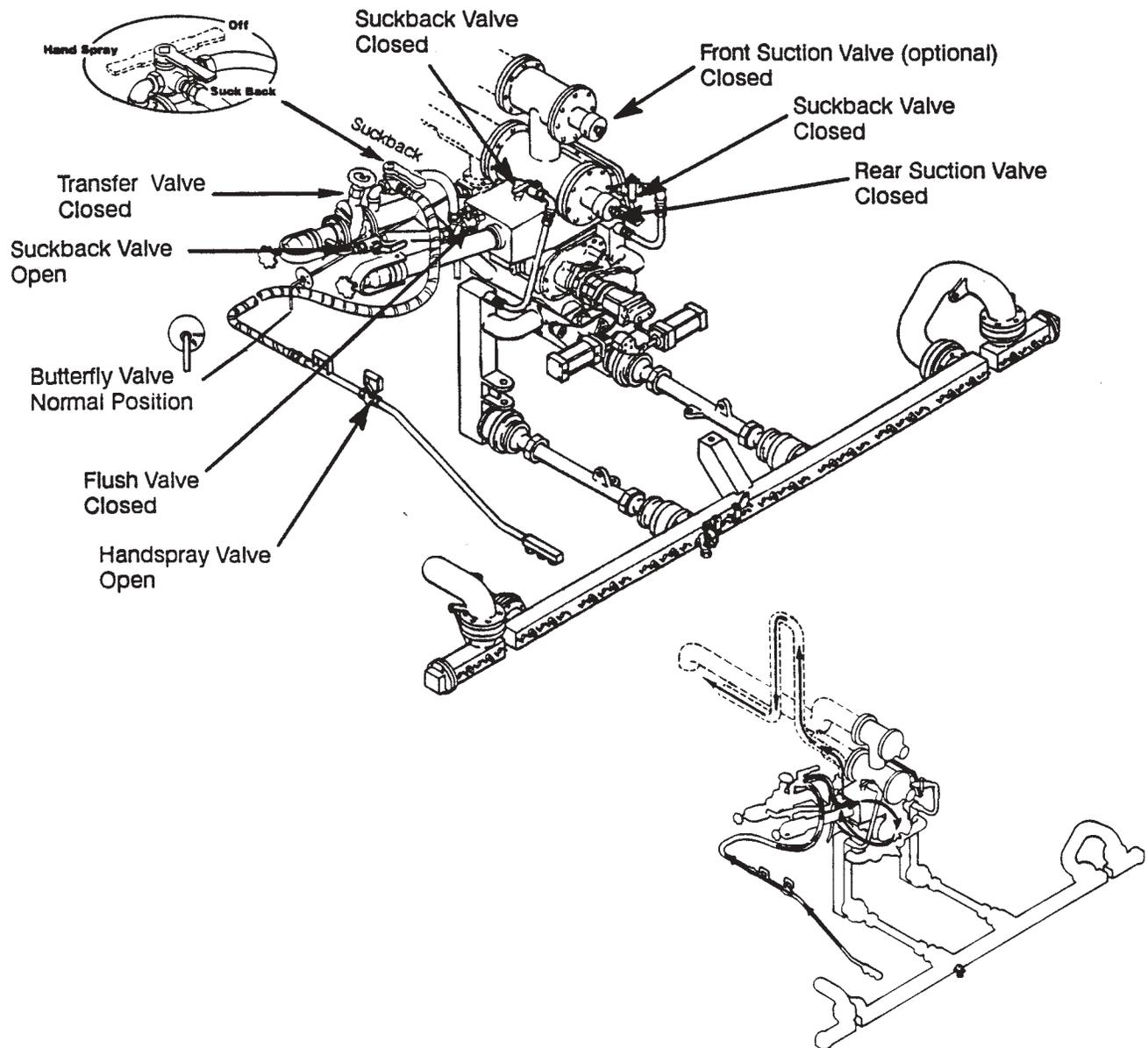


Figure 37. Valve Settings for Handspray

# DC-2 PANELS WITH ROTARY ACTUATOR

## SUCKBACK FOR HANDSPRAY

1. Set operating valves and levers as shown in Figure 38.
  2. Turn ROTARY ACTUATOR to LOAD/SUCK-BACK position.
  3. Suck back material from handspray hose by turning butterfly valve to NORMAL.
  4. Open handspray suckback valve.
  5. Close 3-inch gate valve on transfer line.
  6. Increase pump speed to 200 GPM.
  7. After approximately 1 minute crack handspray valve open on handspray wand.
- NOTE:** *If finished handspraying for the day, crack open handspray valve with nozzle submerged in flushing oil.*



**Figure 38. Suckback for Handspray**

# DC-2 PANELS WITH ROTARY ACTUATOR

## PUMP-OFF OPERATIONS

**NOTE:** When pumping off, ensure that all valves in pump-off line between distributor and storage tank are open before opening suction valve on distributor.

1. Set operating valves and levers as shown in Figure 39.
2. Connect pump-off hose to transfer line.
3. Open 3-inch TRANSFER gate valve.
4. Turn ROTARY ACTUATOR knob to CIRC IN TANK position.
5. Increase pump speed to approximately 150 GPM using CIRCULATION RATE switch in cab or set PUMP CONTROL switch to REAR and adjust speed with PUMP CONTROL knob.
6. Turn butterfly valve to TRANSFER position.
7. When pump-off is complete turn butterfly valve to NORMAL position.
8. Decrease pump speed.
9. Place ROTARY ACTUATOR knob in LOAD/SUCKBACK position.

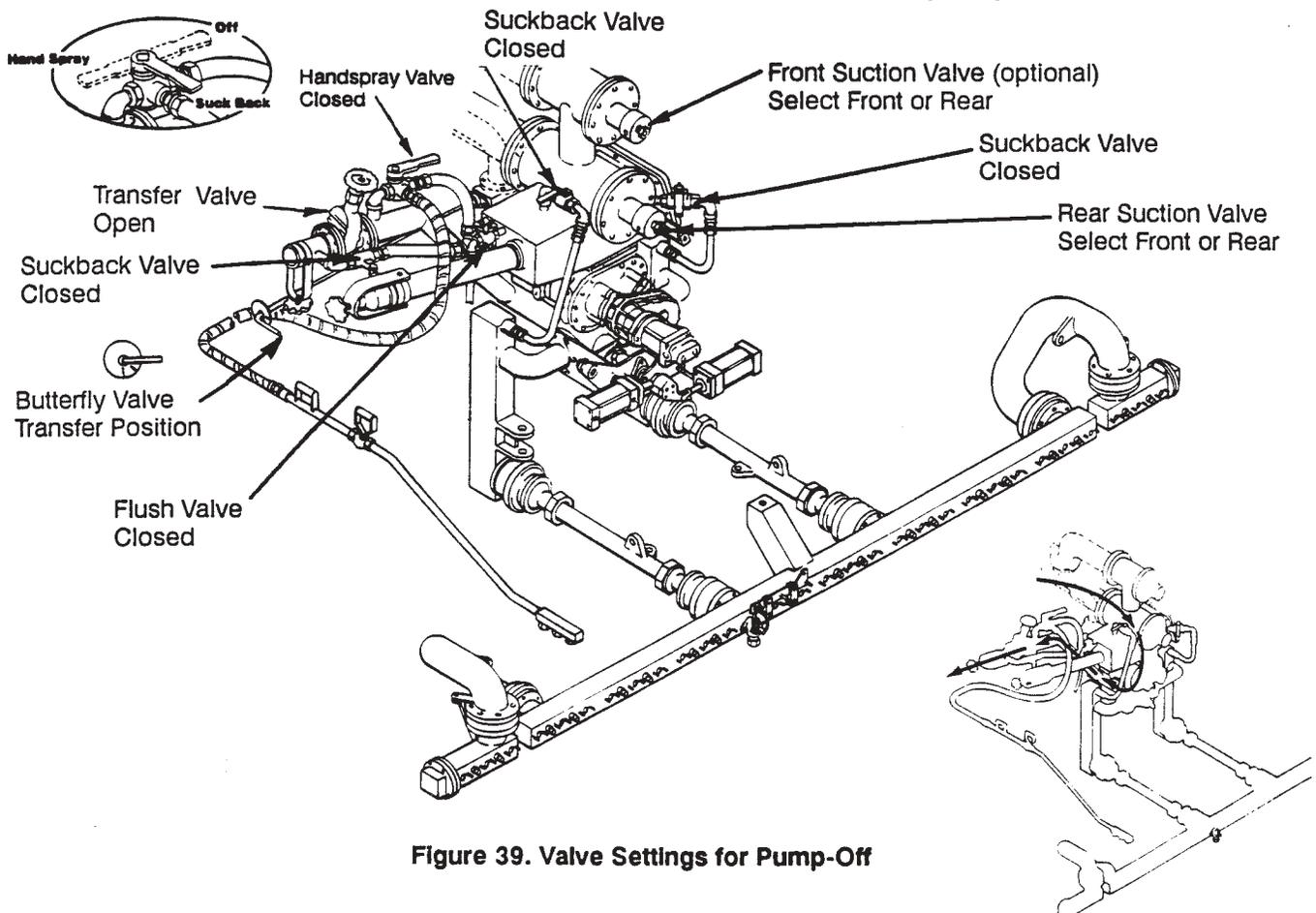
10. Close suction valve.
11. Close valve at storage tank.
12. Close 3-inch TRANSFER valve in transfer line.
13. Open suckback valve in transfer line and open bleeder valve at supply source.
14. Increase pump speed to approximately 150 GPM.

### ⚠ WARNING

**To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.**

**NOTE:** If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.

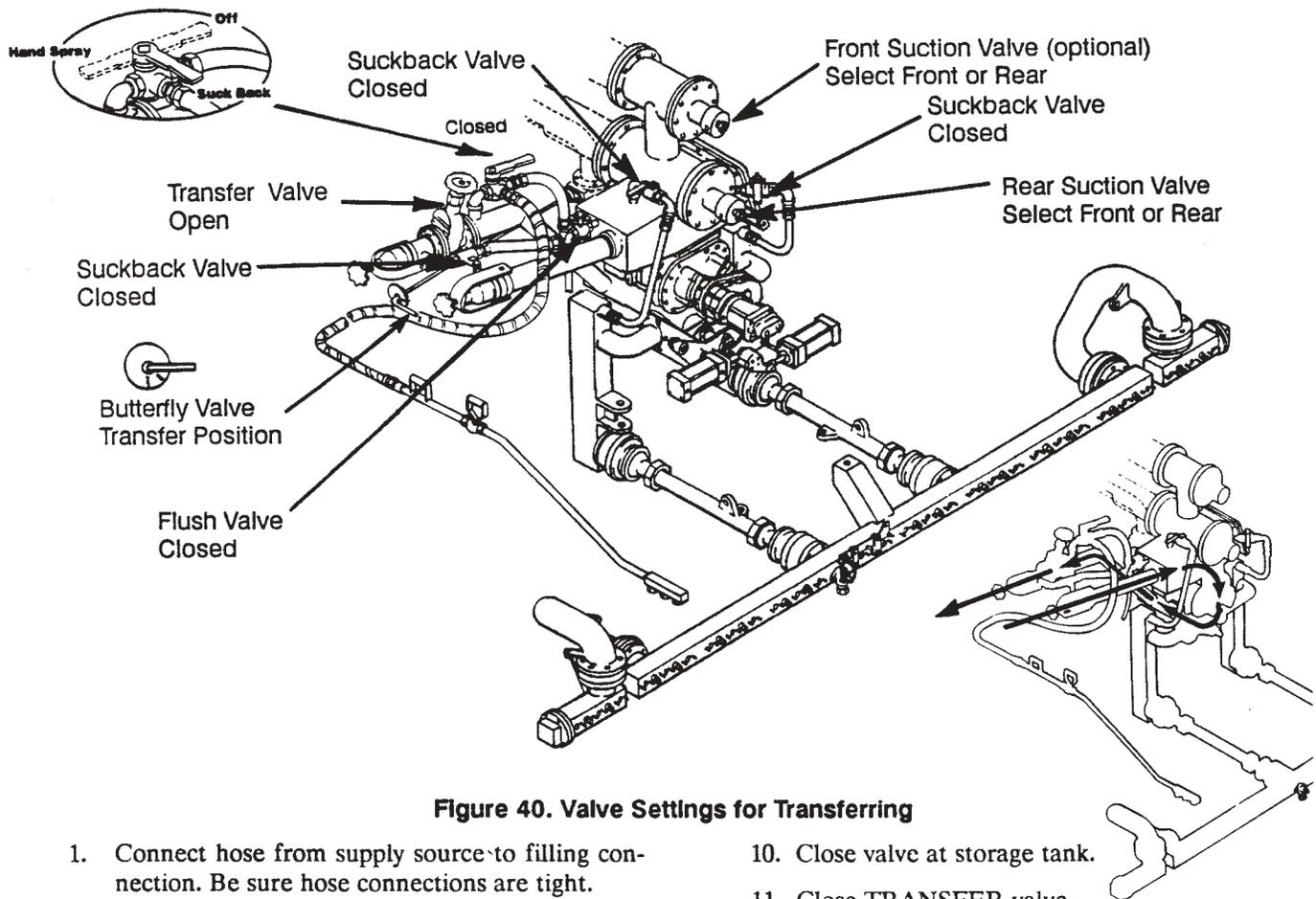
15. Increase the pump speed to 200 GPM, disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the transfer line.
16. Allow the pump to continue turning while the hose is disconnected from the transfer line and the transfer line cap is replaced and secured.



**Figure 39. Valve Settings for Pump-Off**

# DC-2 PANELS WITH ROTARY ACTUATOR

## TRANSFER OPERATIONS



**Figure 40. Valve Settings for Transferring**

1. Connect hose from supply source to filling connection. Be sure hose connections are tight.
2. Connect hose from storage to transfer connection. Be sure connections are tight.
3. Set operating valves and levers as shown in Figure 40.  
Close SUCTION VALVE with switch at rear.
4. Turn ROTARY ACTUATOR knob to CIRC IN TANK position.
5. Open TRANSFER valve.
6. Increase pump speed to approximately 150 GPM using CIRCULATION RATE switch in cab or set PUMP CONTROL switch at rear panel to REAR and adjust pump speed with PUMP CONTROL KNOB.
7. Turn butterfly valve to TRANSFER position.
8. After material is transferred, close valve at supply source and open supply line bleeder valve.
9. Disconnect supply line and install cap on distributor fill line.
10. Close valve at storage tank.
11. Close TRANSFER valve.
12. Open suckback valve on transfer line.
13. Turn butterfly valve to NORMAL position.
14. Open bleeder valve at storage tank.
15. Increase the pump speed to 200 GPM, disconnect the hose at the supply end and elevate the hose to allow maximum drainage to the transfer line.
16. Allow the pump to continue turning while the hose is disconnected from the transfer line and the transfer line cap is replaced and secured.

### ⚠ WARNING

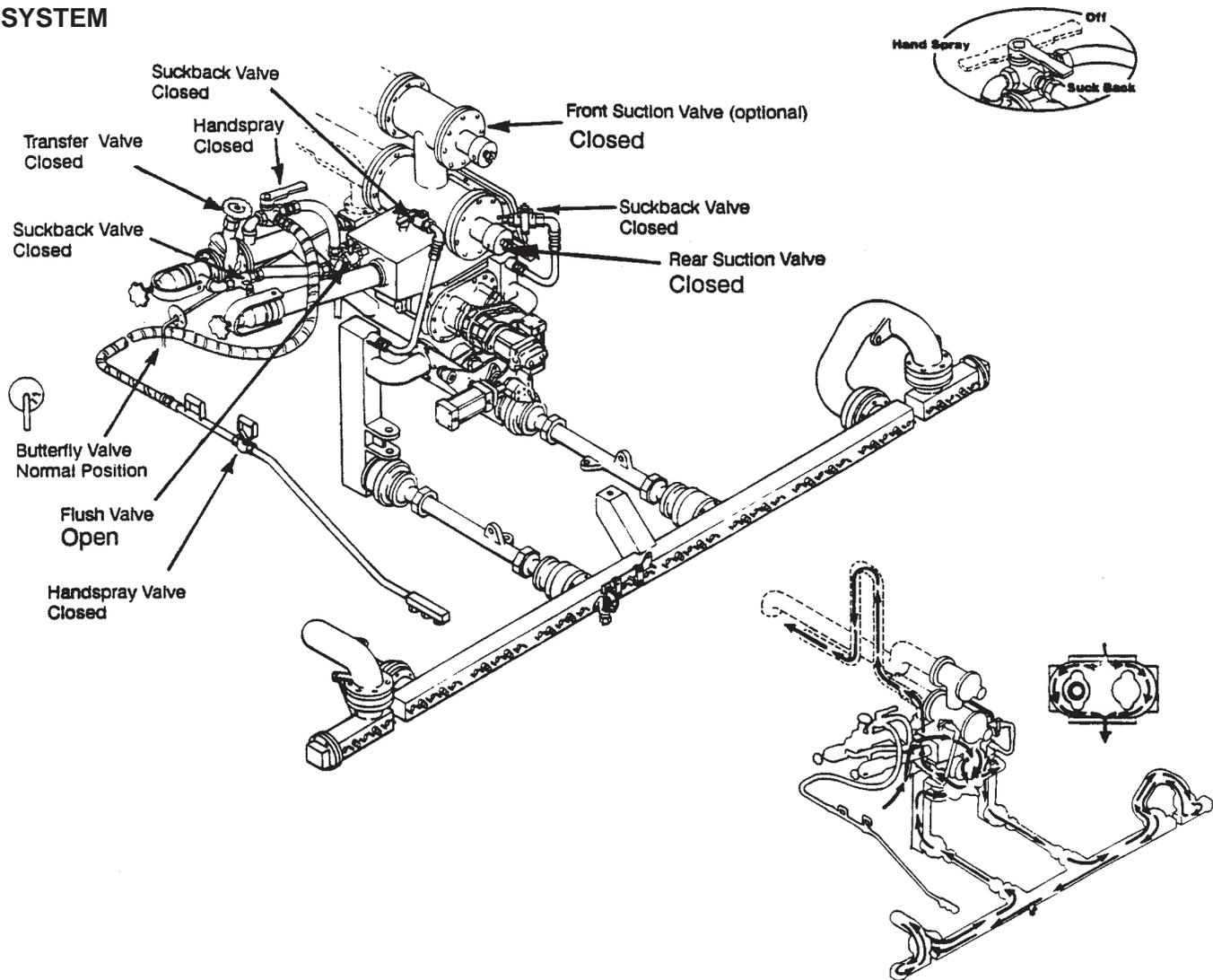
**To prevent burns, always wear insulated gloves when handling spray bar sections or hoses.**

**NOTE:** *If there is no bleeder valve at the supply source, carefully break the connection between the valve and the fill hose to allow air into the hose.*

# DC-2 PANELS WITH ROTARY ACTUATOR

## FLUSHING OPERATIONS

### FLUSHING BAR AND CIRCULATING SYSTEM



**Figure 41. Valve Settings for Flushing**

1. Set valves and operating levers as shown in Figure 41.
2. Turn ROTARY ACTUATOR knob to LOAD/SUCKBACK position.
3. Open self-flushing valve and run pump at 100 GPM.
4. After 1-2 minutes close self-flushing valve.

Normally the suck back procedure will remove sufficient material from the circulating system to negate the need for

draining the circulating system and spray bar before proceeding with the wash-out operation.

The flushing operation requires only 3 quarts of flushing solvent. This small amount is not sufficient to fill the lines to the tank, thus preventing solvent from being forced into the tank.

A common practice following completion of the flushing procedure and subsequent shutdown is to pour 1-2 quarts of solvent into the fill line which softens or dissolves the residual asphalt in the pump. Allow solvent to remain in the system overnight.

# HEATING BITUMEN IN DISTRIBUTOR

## LIQUID PROPANE GAS (LPG) BURNERS

### **⚠ DANGER ⚠**

To avoid an extreme fire hazard or explosion, NEVER use gasoline as fuel in high pressure burners.

### **⚠ WARNING**

Residual fuel in LPG burners will support a flame for several minutes after the fuel flow has been shut off. After using LPG burners, confirm that all flame has been extinguished before attempting any operation that could release flammable vapors.

Failure to ensure that the flame is completely extinguished could result in an explosion or fire that can cause injury or death.

### **⚠ WARNING**

To prevent an explosion or fire hazard: Position unit broadside to wind whenever possible to prevent volatile fumes from drifting toward burners.

To prevent an explosion or fire hazard: Flues MUST be covered by a minimum 6 inches of material when burners are in operation.

To prevent an explosion or fire hazard: Do not remove material from tank in any manner when burners are in operation.

To prevent an explosion or fire hazard: Do not drive unit when burners are operating.

### **⚠ WARNING**

To prevent an explosion or fire hazard: Do not operate burners if tank is damaged or leaking.

To prevent an explosion or fire hazard: When burners go out, allow flues to ventilate for several minutes before re-lighting burners.

### **⚠ WARNING**

A fully charged dry chemical type fire extinguisher must be within easy reach whenever the burners are operating or there is an open flame near the distributor. Minimum dry chemical capacity of the fire extinguisher should be 10 pounds.

To prevent an explosion or fire hazard: Do not heat material beyond the manufacturer's recommended temperature.

To prevent foaming or violent eruption, do not heat material over 200° if moisture or emulsion is present in tank.

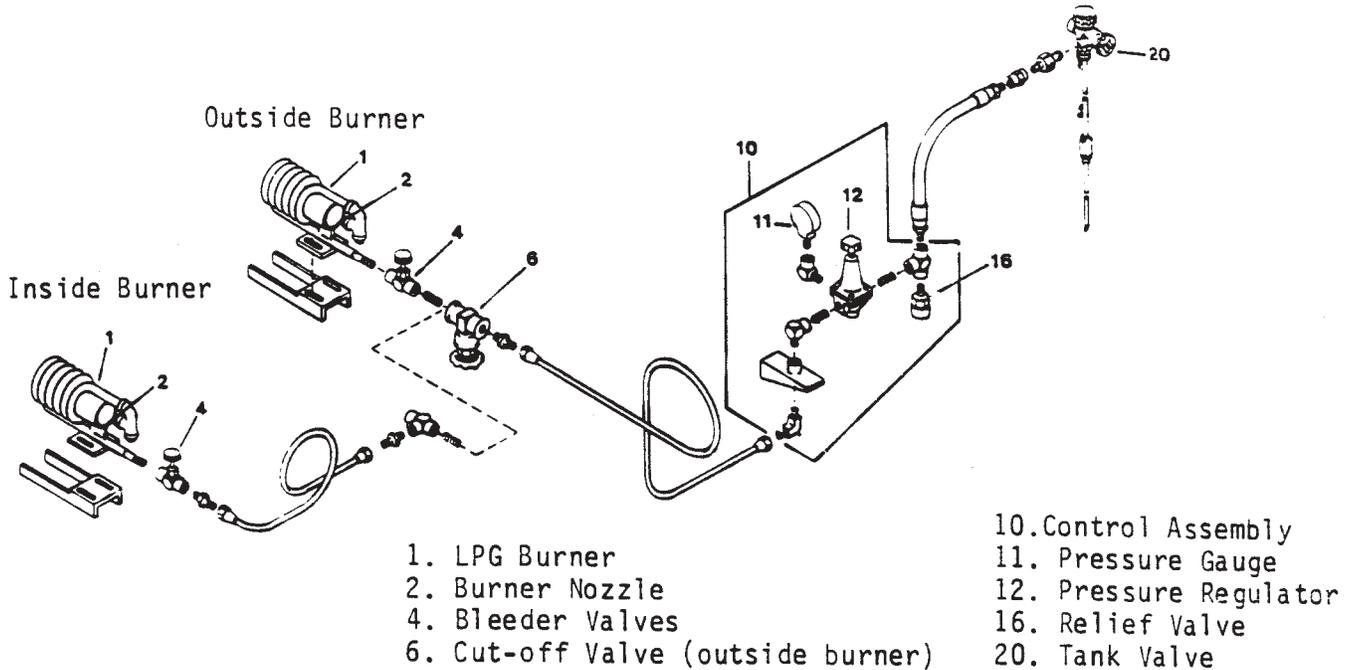
To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

To prevent possible hand or facial burns, always light inside burner first. Do not reach across a lit burner to light (or re-light) inside burner. Shut off outside burner before lighting inside burner.

To prevent possible burns, always use a torch to light burners. Never attempt to light burners with a match or pocket lighter.

# HEATING BITUMEN IN DISTRIBUTOR

## LIQUID PROPANE GAS (LPG) BURNERS



**Figure 42. LPG Burners**

### IMPORTANT

Circulating bitumen in the tank while heating is recommended for faster heating and reduced carbon on flues. Only when the asphalt pump is "frozen" is it acceptable to operate burners without circulating material. However, if the asphalt pump is frozen, carefully apply heat to the pump and start circulating material as soon as possible.

### LPG SUPPLY TANK REQUIREMENTS

Use only liquid withdrawal type supply tanks for your LPG burners!

Two types of LPG supply tanks are available: tanks for liquid-type burners and tanks for vapor-type burners. The LPG burners on your Etnyre equipment require a supply tank equipped for liquid-type burners. Liquid type burners will operate from a vapor withdrawal tank, however, the amount of heat delivered will be dramatically reduced, and the life of the burner will be greatly decreased.

This section will cover three types of LPG burners: manual control burners, burners with outfire control, and burners with automatic ignition and temperature limiting control.

### MANUAL CONTROL BURNERS

#### Burner Control Valves

There are four valves associated with operation of the manual control burners: one at the supply tank and three in the burner piping.

The two smaller valves (one at each burner) are bleeder type valves with a small hole drilled through the valve case that bypasses the main cut off. It is NOT possible to completely cut off all fuel flow to the burners with these valves.

The large valve located in the fuel line to the outside (or upper) burner is a positive cutoff valve that allows all fuel to be cut off to the bleeder valve on the outside burner. The only way to completely stop fuel flow to the inside burner is to close the main supply valve at the fuel supply tank.

#### Burner Operation

1. Ensure that all burner control valves are fully closed before starting.
2. Open the damper on the heat exhaust stack.
3. Open the valve at the supply tank and quickly check for leaks. If no leaks are found light the inside burner. As soon as the flame is established open the bleeder valve fully. No preheating is necessary.

# HEATING BITUMEN IN DISTRIBUTOR

## LIQUID PROPANE GAS (LPG) BURNERS

### MANUAL CONTROL BURNERS (CONTINUED)

#### WARNING

To prevent possible burns, always use a torch to light burners. Never attempt to light burners with a match or pocket lighter.

A fully charged dry chemical type fire extinguisher must be within easy reach whenever the burners are operating or there is an open flame near the distributor. Minimum dry chemical capacity of the fire extinguisher should be 10 pounds.

#### IMPORTANT

It is recommended that two persons be involved in lighting the first burner. When the main fuel valve is opened at the bottle or tank, there is an immediate trickle of gas passing through the inside burner bleeder valve. The longer the gas is allowed to collect in the flue, the more likely there will be a flash-back when the burner is ignited. Having one person light the burner while the other opens the main supply valve will reduce the likelihood of a flash-back.

4. Check the fuel pressure at the pressure regulator. Too much fuel pressure for a small tank will waste fuel. Too little fuel pressure on a large tank will increase heating time. Some experimentation with pressures will allow you to determine the most efficient fuel pressure to use. The following is a good rule of thumb:

1000 – 1250 gallon tank:	15 PSI
1500 – 1750 gallon tank:	20 PSI
2000 – 2250 gallon tank:	25 PSI
2250 – 2500 gallon tank:	30 PSI
2750 – gallon and larger	40 PSI

5. If necessary, adjust the flame with the bleeder valve at the burner.

When the LPG burners are operating, the outside of the fuel line up to the first coil of the burner should frost over. If no frost forms it is an indication that the burners are operating on vapor instead of liquid. This condition must be corrected immediately to prevent damage to the burners.

If after the lines frost over, the flame starts to die down and the frost melts off the fuel line, it is likely there is moisture in the fuel supply tank. When the moisture passes through the frost covered lines it forms ice crystals that stop the fuel flow. This can be overcome by adding 1 pint of 99.85% pure Genuine Anhydrous Methanol when the tank is filled with fuel. See your local LPG supplier for details. Keeping the tank valve closed when the tank is empty will keep moisture from entering the tank.

**NOTE:** *If there is at least 6 inches of product covering the entire length of the upper flue the second burner can be ignited.*

#### WARNING

To prevent possible burns, always use a torch to light burners. Never attempt to light burners with a match or pocket lighter.

6. To ignite the second burner ensure the bleeder valve on the burner is closed. Position a torch at the burner nozzle and open the positive shut off valve in the line to the burner. As soon as the low fire is established the bleeder valve can be opened fully.
7. Monitor the product temperature. When the desired temperature is reached, CLOSE THE MAIN FUEL SUPPLY VALVE AT THE BOTTLE OR TANK FIRST. Allow the burners to operate at full capacity until the fuel in the line from the bottle burns out, then close both bleeder valves and the positive shut off valve at the burners.
8. Close the exhaust stack damper to prevent heat loss.

### BURNERS WITH OUTFIRE CONTROL

#### Equipment Description

The burner mounting and the burner control valves are identical to the manual operated burner system. However, burners with outfire control are equipped with an outfire control box. The outfire controls consist of two thermocouple switches, a push button start switch, an electric fuel solenoid valve, a pressure regulator and a pressure gauge.

A heat sensing probe is positioned in each burner. These probes are connected to the thermocouple switches by a capillary tube. If either burner loses flame, the probe senses the reduced temperature, the thermocouple switch deactivates the fuel solenoid, and all fuel to both burners is cutoff.

# HEATING BITUMEN IN DISTRIBUTOR

## LIQUID PROPANE GAS (LPG) BURNERS

The only difference in operation between manual burners and burners with optional outfire control is the start-up and shut-down procedures. Unlike the manual burners, when the burners are equipped with outfire control no fuel flows to the burners when the main fuel supply valve is opened.

### Operation

**NOTE:** *It is recommended that two persons be involved in lighting the burners. One person should hold the torch while the other person opens the valves and holds the pushbutton in.*

1. Open the damper on the heat exhaust stack.
2. Ensure that all three burner control valves are closed.
3. Open the main fuel supply valve at the tank.

### IMPORTANT

Both burners must be lit on low flame even if only one burner will be used for heating.

### ⚠ WARNING

A fully charged dry chemical type fire extinguisher must be within easy reach whenever the burners are operating or there is an open flame near the distributor. Minimum dry chemical capacity of the fire extinguisher should be 10 pounds.

4. Place the ignition torch at the inside burner nozzle and depress the push button in the outfire control box. Continue to hold the pushbutton in until both burners are lit.
5. As soon as the low fire is established at the inside burner, open the positive shut off valve to the outside burner and light the outside burner on low fire.
6. If both burners are to be used for heating you can now open both bleeder valves fully. If only the inside burner is to be used for heating, open the bleeder valve on the inside burner and allow the outside burner to remain burning on low flame so the thermocouple will be heated. Remember, if either flame goes out the outfire control will cut off fuel to both burners.

7. After 30 to 40 seconds, release the push button and observe the pressure gauge. If the pressure starts to drop rapidly, depress the push button and hold it for another 30 seconds. It may require a slight increase in fuel to the outside burner to heat the thermocouple. Once both thermocouples are heated the push button can be released.

When the LPG burners are operating, the outside of the fuel line up to the first coil of the burner should frost over. If no frost forms it is an indication that the burners are operating on vapor instead of liquid. This condition must be corrected immediately to prevent damage to the burners.

If after the lines frost over, the flame starts to die down and the frost melts off the fuel line, it is likely there is moisture in the fuel supply tank. When the moisture passes through the frost covered lines it forms ice crystals that stop the fuel flow. This can be overcome by adding 1 pint of 99.85% pure Genuine Anhydrous Methanol when the tank is filled with fuel. Keeping the tank valve closed when the tank is empty will keep moisture from entering the tank.

8. When the desired product temperature is reached:
  - a. Close the main fuel supply valve at the bottle.
  - b. Depress the push button in the outfire box and hold it until all the fuel is burned and there is no flame at either burner.
  - c. Close both bleeder valves and the positive cut off valve at the burners.
  - d. Close the exhaust stack dampers to prevent heat loss.

### BURNERS WITH AUTOMATIC IGNITION AND TEMPERATURE LIMITING CONTROL

#### Equipment Description

The temperature limiting control box contains the temperature limiting control components as well as the automatic ignition circuitry.

The automatic ignition circuit consists of two 12-volt coils, two spark plugs, a pair of thermocouple temperature probes (one at each pilot burner), and a momentary push button switch. The 12-volt coils send high voltage to the spark plugs that cause a spark to arc intermittently at each pilot burner whenever there is fuel pressure in the line from the main supply bottle. The temperature probes provide a signal that indicates when there is a flame at the pilot burners. The momentary push button switch on the control box is used to fire the main burners once the pilot burners have ignited and the thermocouples have heated sufficiently.

# HEATING BITUMEN IN DISTRIBUTOR

## LIQUID PROPANE GAS (LPG) BURNERS

### BURNERS WITH AUTOMATIC IGNITION AND TEMPERATURE LIMITING CONTROL (CONTINUED)

The temperature limiting control circuit consists of a temperature probe in the distributor tank that senses product temperature, a thermostatic switch in the control box and a temperature adjustment dial on the face of the control box. When the product in the distributor is heated to the temperature selected with the temperature adjustment dial the thermostatic switch shuts down the burners.

#### Burner Operation

1. Open the damper on the heat exhaust stack.
2. Open the main fuel supply valve at the supply tank. The spark plugs will begin arcing and ignite the pilot burners.

**NOTE:** *With this type of control the inside (lower) burner may be operated without opening the positive shut off valve to the outside (upper) burner. If both burners are to be used, the positive shutoff valve to the outside burner should be opened.*

3. Set thermostat to desired temperature.
4. Allow the pilot burners to heat the thermocouple probes for a minute or two. When the pilot burners have heated the thermocouples sufficiently the spark or flasher will stop. Press the momentary push button switch to fire the main burners. The bleeder valves may then be fully opened.

5. On new or rebuilt units, monitor the product thermometers to make certain the burners shut down when the desired temperature is reached (as set on the temperature adjustment dial). If the burners do not shut down at the correct temperature, refer to "Calibrating the Thermostat" below.
6. To shut the system down:
  - a. Close the main fuel supply valve at the supply tank.
  - b. Increase the thermostat setting 50° to 75° higher and push the start button. This will bring on the main burners and quickly burn off all the fuel in the line between the bottle and the control box. The pilot burners may continue to burn for a short while after the main burners cut off. Do not draw material from the tank as long as there is flame present.
  - c. Close exhaust stack dampers.

#### Calibrating the Thermostat

If the desired temperature is reached and the burners have not shut down, remove the thermostat dial. Using a small screwdriver slowly turn the screw in the center of the thermostat shaft counterclockwise until the main burners shut down.

If the main burners shut down before the desired temperature is reached, remove the dial and rotate the screw clockwise half a turn and push the start button. Monitor the thermometer and make further adjustments if needed to calibrate the thermostat.

# HEATING BITUMEN IN DISTRIBUTOR

## HIGH PRESSURE FUEL OIL BURNERS

### DANGER

To avoid an extreme fire hazard or explosion, NEVER use gasoline as fuel in high pressure burners.

### WARNING

To prevent an explosion or fire hazard: Position unit broadside to wind whenever possible to prevent volatile fumes from drifting toward burners.

To prevent an explosion or fire hazard: Flues MUST be covered by a minimum 6 inches of material when burners are in operation.

To prevent an explosion or fire hazard: Do not remove material from tank in any manner when burners are in operation.

To prevent an explosion or fire hazard: Do not operate burners if tank is damaged or leaking.

To prevent an explosion or fire hazard: Do not operate burners when vehicle is unattended, when vehicle is in motion, or with vehicle in a confined area.

To prevent an explosion or fire hazard: When burners go out, allow flues to ventilate for several minutes before re-lighting burners.

To prevent an explosion or fire hazard: Do not heat material beyond the manufacturer's recommended temperature.

To prevent foaming or violent eruption, do not heat material over 200° if moisture or emulsion is present in tank.

To prevent possible burns from material overflow, allow sufficient space in tank for expansion of material when heating.

To prevent possible hand or facial burns, always light inside burner first. Do not reach across a lit burner to light (or re-light) inside burner. Shut off outside burner before lighting inside burner.

### WARNING

To prevent possible burns, always use a torch to light burners. Never attempt to light burners with a match or pocket lighter.

A fully charged dry chemical type fire extinguisher must be within easy reach whenever the burners are operating or there is an open flame near the distributor. Minimum dry chemical capacity of the fire extinguisher should be 10 pounds.

### IMPORTANT

Circulating bitumen in the tank while heating is recommended for faster heating and reduced carbon on flues. Only when the asphalt pump is "frozen" is it acceptable to operate burners without circulating material. However, if the asphalt pump is frozen, carefully apply heat to the pump housing and start circulating material as soon as possible.

1. Set truck parking brake.
2. Open damper on heat exhaust stack. (Handle in vertical position.)
3. Place truck transmission in neutral.
4. Engage PTO (if so equipped).
5. Set engine throttle at 1500 RPM.
6. Pull out palm button on lower burner hydraulic control valve located in tool box (see Figure 43.).

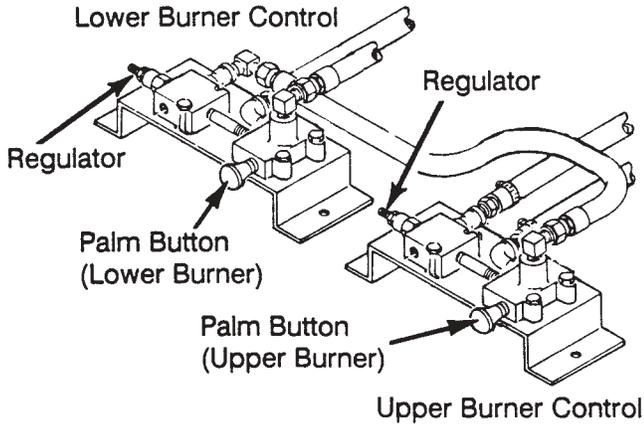
**NOTE:** *If there is a least 6" of product covering the entire length of the upper flue the second burner can be ignited.*

7. If upper burner operation is desired pull out palm button on upper burner hydraulic control valve located in tool box (see Figure 43.).
8. Pull out Master Power palm button switch located on burner control panel at rear of unit (see Figure 44.).
9. Allow hydraulic oil temperature to reach minimum 100°F.
10. To light lower burner, push lower burner START button on burner control panel.
11. If upper burner operation is desired, push upper burner START button on burner control panel.

# HEATING BITUMEN IN DISTRIBUTOR

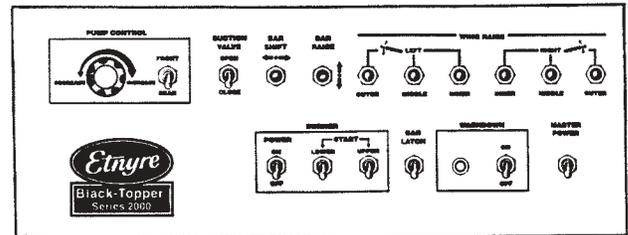
## HIGH PRESSURE FUEL OIL BURNERS

### Hydraulic Driven Burners



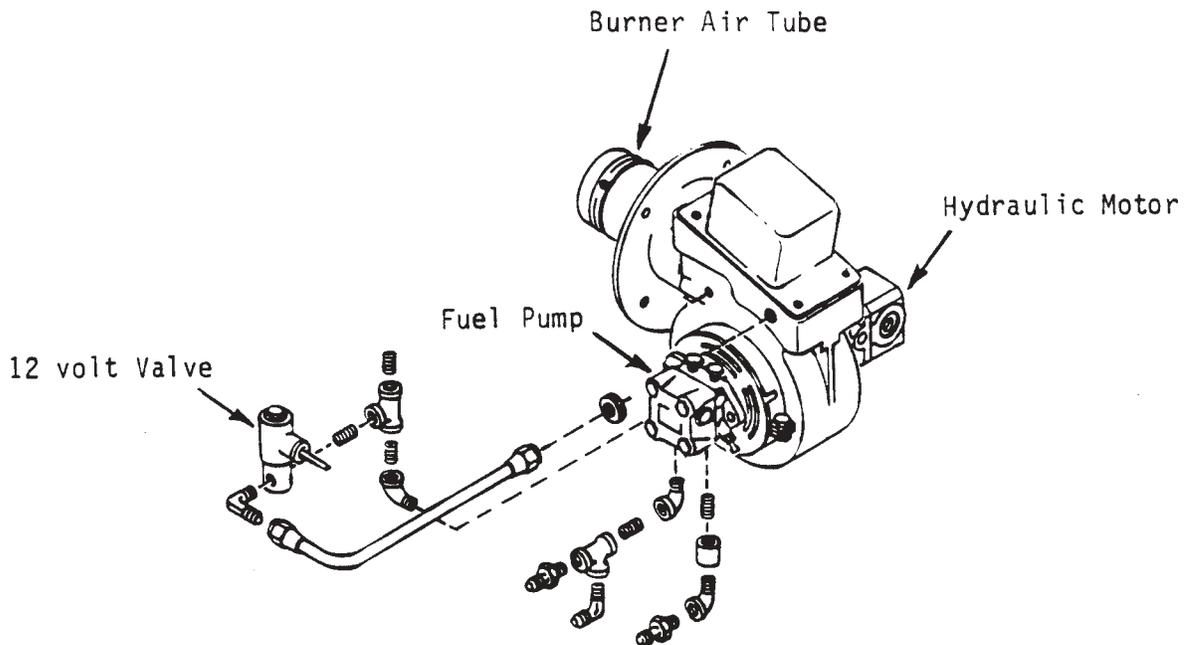
**Figure 43. Burner Hydraulic Control Valves**

NOTE: For Electric Driven Burner operation, see next page.



**Figure 44. Rear Control Panel Hydraulic Driven Burners**

12. To shut down burner(s) push in Master Power palm button switch.
13. Push in hydraulic control valve palm button(s).
14. When burners are not in use, close the exhaust stack damper to prevent heat loss.



**Figure 45. Burner Assembly Hydraulic Driven Burners**

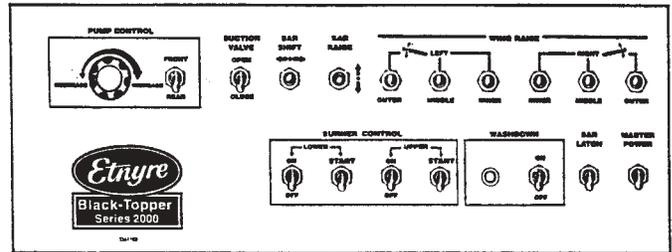
# HEATING BITUMEN IN DISTRIBUTOR

## HIGH PRESSURE FUEL OIL BURNERS

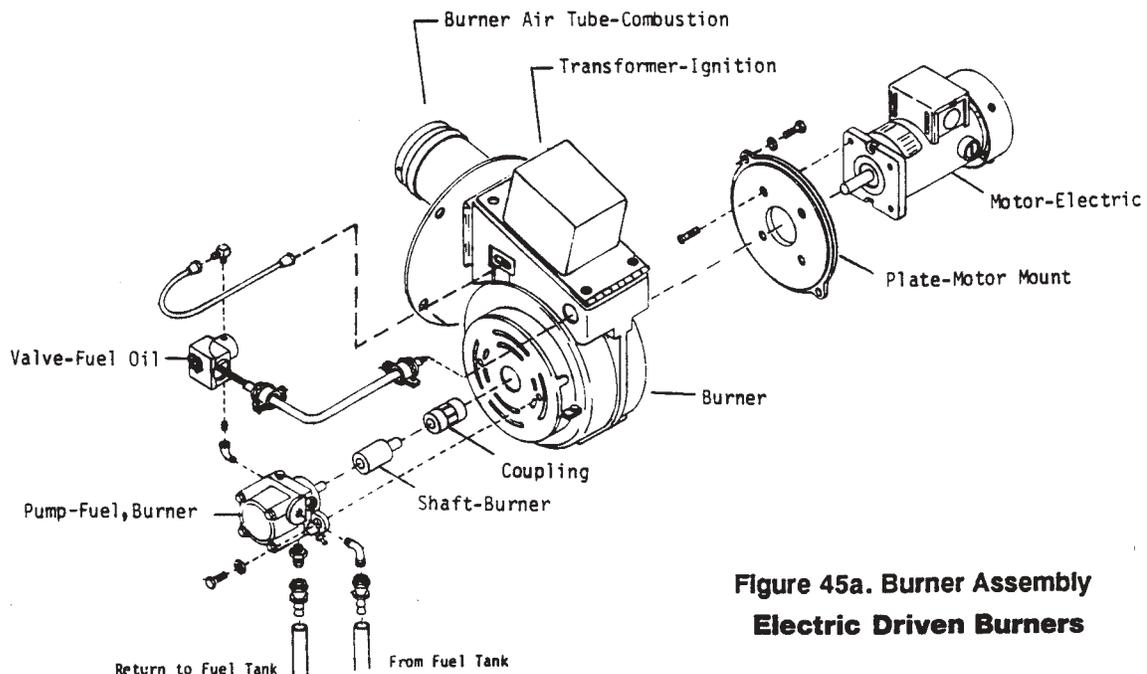
### Electric Driven Burners

#### DIRECTIONS FOR HIGH PRESSURE BURNERS Electric Driven Burners

1. Open covers or dampers on exhaust stacks.
2. Turn on burner power switch.
3. To light, turn on lower burner start switch and hold until burner has lit.
4. If upper burner operation is desired, repeat steps #2 & #3 for upper burner.
5. Do not heat material higher than the spraying temperature recommended by the asphalt supplier.
6. To shut down, turn off burner power switches.



**Figure 44a. Rear Control Panel  
Electric Driven Burners**



**Figure 45a. Burner Assembly  
Electric Driven Burners**

# TROUBLESHOOTING

Trouble	Cause	Remedy
Spray Fogs	Pump speed too fast for size of nozzle.	Lower pump speed or change nozzles. See "Establishing Flow Rate/Ground Speed Ratio."
Spray Streaks	Pump speed too slow.  Nozzles not at proper angle. Spray bar at improper height above ground. Material temperature too low.	Increase pump speed. See "Establishing Flow Rate/Ground Speed Ratio."  Adjust angle of nozzles. Adjust spray bar height. Heat material to correct temperature.
Spray Lacks Pressure.	Pump speed too slow. One or more control valves in incorrect position, not fully opened or closed, or leaking. Suction strainer plugged.	Adjust pump speed. Check position of all control valves. Be sure all valves are fully opened or closed. Repair leaking valves as necessary. Clean suction strainer.
All Nozzles Do Not Cut Off Spray.	Spray bar linkages not adjusted correctly.	Adjust linkage.
Pump Will Not Turn, Or Turns Slowly.	Material in tank or pump below pumping temperature. Air leak in suction line from reservoir to filter to inlet of charge pump. Hydraulic system pressure low. Low oil in hydraulic reservoir. Spray bar valves set improperly. Defective pump or motor.	Heat material to proper pump temperature. Locate and repair leak.  Raise pressure. Add hydraulic oil to correct level. Correct spray bar valve settings. Check for excessive case drain in pump and/or motor. Repair or replace defective components.
Hydraulic Oil Overheats.	Material in tank or pump below pumping temperature. Air leak in suction line from reservoir to filter to inlet of charge pump. Low oil in hydraulic reservoir. Spray bar valves set improperly.	Heat material to proper pump temperature. Locate and repair leak.  Add hydraulic oil to correct level. Correct spray bar valve settings.
Spray Bar Supply Tube Ball Joints Leak.	Ball joint O-ring is loose. Ball joint gaskets not fully seated.	Replace ball joint O-ring.  Circulate hot material through spray bar and supply tubes while shifting spray bar from side to side. This should seat gaskets and stop leaks. <i>CAUTION: To prevent damage to equipment, do not allow flame to be applied directly to gasket material.</i>
Application Rate Varies.	Quantity of material in tank not being measured accurately.  Suction strainer plugged. Engine governor or hydrostatic controls not firmly positioned. Faulty tachometer or bitumeter.	Use Etnyre measuring stick for accurate readings. Be sure tank is level when measuring.  Clean suction strainer regularly. Ensure that all controls are firmly locked in place. Have tachometer and/or bitumeter checked and calibrated.

# MAINTENANCE

## Electrode Assembly Adjustments

1. Adjust electrode assembly per Figure 46.

**NOTE:** Before installing electrode assembly, check that blower wheel turns freely and that all setscrews are tightened securely.

2. Install electrode assembly into air tube unit. Use escutcheon plate for mounting (see Figure 47.).

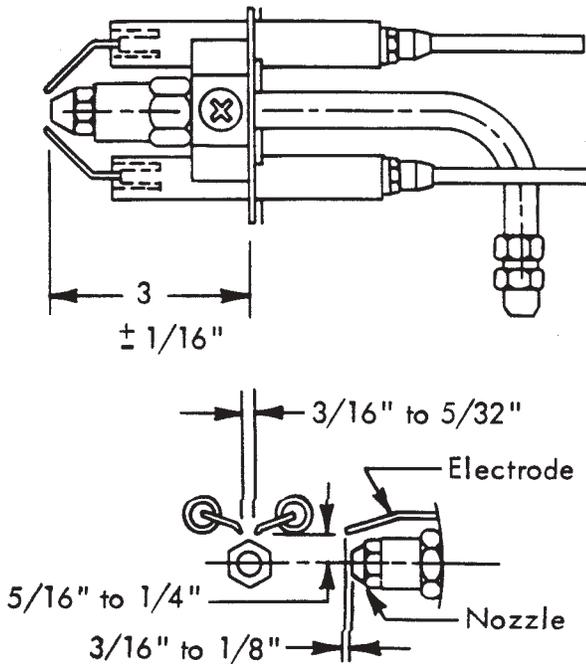


Figure 46. Burner Electrode Adjustments

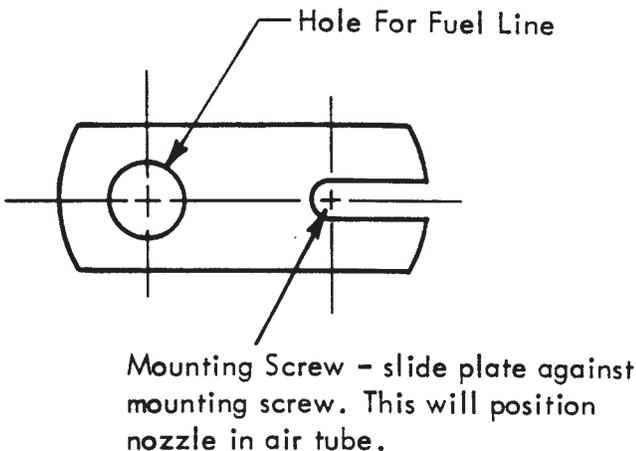


Figure 47. Electrode Assembly Installation

## Burner Air Band Settings

1. Close bulk air band (outside diameter band).

2. Set end air band between 3.5-4.0 on scale.
3. Open covers or dampers on exhaust stacks.
4. Check initial settings of burner regulators. Approximately 1/4-inch of adjustment screw thread should be exposed. See Figure 48.

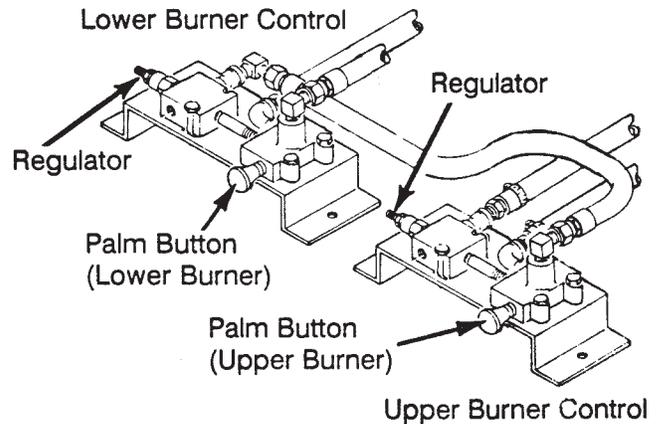


Figure 48. Burner Flow Control Regulator - Initial Adjustment

## Adjust Hydraulic System Relief Valve Setting

1. Ensure that truck parking brake is set.
2. Place truck transmission in neutral.
3. Start engine and engage PTO (optional).
4. Adjust engine throttle to 1500 RPM.
5. Activate spray bar shift and allow spray bar to bottom out. Hold spray bar shift in this position and adjust relief valve to 1500-1975 PSI.

## Set Burner Blower Wheel Speeds

### **⚠ WARNING**

To prevent an explosion or fire hazard: Keep area free of sparks or open flames when testing burners.

1. On both burners, swing ignition transformer out of position so that blower wheel is visible.
2. Set engine throttle to 1500 rpm.
3. At system control box in cab, switch power on.
4. On burner control panel at rear of unit, pull Master Power palm button switch out.

# MAINTENANCE

5. On hydraulic control assembly, pull out palm button for lower burner and immediately check for the following:
  - a. Is blower wheel turning? If not check as follows:
    1. Check for hydraulic leakage and correct as necessary.
    2. Carefully place a screwdriver on outside diameter of blower wheel and attempt to start blower wheel manually.

## CAUTION

*Blower wheel may accelerate rapidly.*

3. Check for hydraulic flow from dump valve to burner hydraulic control assembly, to burner motor, and check return flow back to hydraulic tank.
  - b. Is there any fuel coming out where fuel line is disconnected from burner nozzle?
    1. Check electrical operation of solenoid valve. Solenoid valve should be normally closed, and open when energized.
    2. Check for sticking solenoid valve.
6. Refer to Fuel Oil Pressure Gauge. Fuel oil pressure should build within 1-1/2 minutes. If fuel oil pressure does not start to build within 1-1/2 minutes, shutdown system and check all fuel system fittings for tightness or leakage.
7. On hydraulic control assembly pull out palm button for upper burner and immediately repeat steps 5. to 6. above. When satisfied that fuel oil pressure is correct and that blower wheel is operating properly, proceed as follows:
8. Run both burners hydraulically until hydraulic oil temperature in reservoir reaches 145-150° F. When hydraulic oil has reached this temperature, turn burners on and off approximately 10 times (both hydraulically and electrically) and check stability of system.

**NOTE:** *An RPM indicator will be required to check burner speeds.*
9. With upper burner running hydraulically, set lower burner speed to 3450-3475 RPM. Then set upper burner speed to 3450-3475 RPM.

10. Shut down system and reconnect fuel line to burner assembly.

## Check Ignition Transformer Spark

1. Shut off hydraulic pressure to burners.
2. Pull out Master palm button on burner control box.
3. Hold an insulated screwdriver approximately 1 to 1-1/2 inches above the two wire springs on the transformer and hold the Ignition switch down. It should be possible to jump a spark across the 1 to 1-1/2 inch gap between the springs and the screwdriver. If unable to generate a spark, check the voltage at terminal spades of the 12-volt ignition control box. Voltage must be 110 volts AC minimum. If voltage is incorrect or not present, check ground wiring.
4. Reposition ignition transformer and secure to burner housing.

## Fire Burners

1. Ensure that fuel oil pressure is 125 PSIG.

## WARNING

**To prevent an explosion or fire hazard: Flues must be covered by a minimum 6 inches of material when burners are in operation. When testing burners, do not run burners for more than 15 seconds if tank is empty.**

2. Hold ignition switch down until ignition occurs, and keep switch down for an additional 2 to 4 seconds before releasing.
3. Run burner for 15 seconds maximum, then shut down.

## Adjusting Spray Bar Nozzle Angle

Adjust nozzles to obtain an angle of approximately 30° with bar centerline (see Figure 49). Every nozzle should be at the same angle.

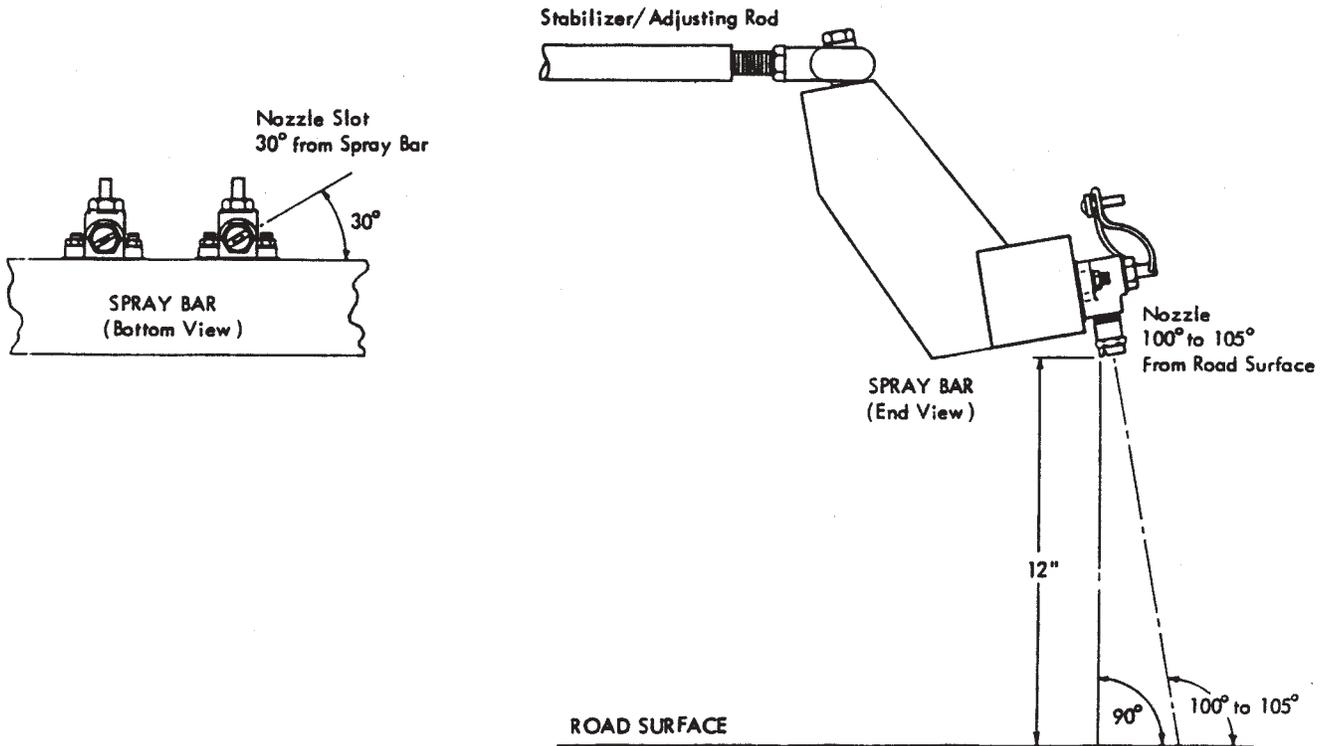
**NOTE:** *A nozzle adjustment wrench is supplied in the tool box of each new unit.*

## Adjusting Spray Bar Height

Lower spray bar and adjust so that nozzles are approximately 12 inches above road when tank is empty. At this height spray fans will overlap to provide triple lap coverage. See Figure 49.

**NOTE:** *Under heavy wind conditions it may be necessary to lower spray bar further.*

# MAINTENANCE



**Figure 49. Adjusting Spray Bar Nozzles**

# SERVICING THE ETNYRE P-15 PUMP

## VACUUM CHECK

1. Flush pump with 3 quarts of diesel fuel through fill line.
2. Set controls for filling operation.
3. Install vacuum gauge in fill line cap.
4. Operate pump at 140 GPM on pump tachometer. A vacuum reading of less than 5 Hg. (inches of mercury) after 2 minutes of operation indicates a vacuum leak or a worn pump.

## PUMP DISASSEMBLY AND INSPECTION

1. Remove double universal joint between motor and asphalt pump.
2. Remove sheet metal housing for easy access to pump.

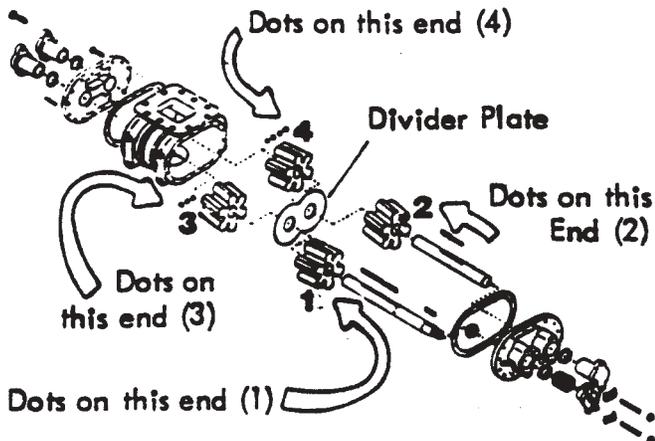


Figure 50. Etnyre P-15 Pump

3. Remove 20 capscrews from perimeter of pump end plate (see Figure 50.).
4. Install two capscrews in the threaded holes near the outer edge of the end plate at approximately the 5 o'clock and 11 o'clock positions. Tighten the capscrews evenly to force the endplate away from the pump body.

5. Remove the endplate, impeller shafts and impellers (gears) as an assembly.
6. Clean the interior of the pump case. Slide your fingers across the interior surfaces of the case. If a narrow raised area can be felt midway between the front and rear of the case, the entire pump should be replaced.
7. If there is no raised area, measure the bore of the case at its widest point horizontally (side-to-side). This measurement must not exceed 9.910 inches.
8. Next, measure the case bore vertically at a point 2.8 inches from each side. The vertical measurement must not exceed 5.660 inches. If any bore measurements exceed these limits, the entire pump must be replaced.
9. If inspection indicates the pump case is acceptable, measure the outside diameter of the impeller gears. Measure the impeller gears from tooth point to tooth point on teeth directly opposite each other. The minimum outside diameter of the gears should be 5.635 inches. The minimum length of the gears should be 3.628 inches.
10. If any impeller gear is undersize, the entire four-gear set must be replaced.
11. End plate gasket thickness should be 0.014–0.016 inches.
12. Divider plate thickness should be 0.127–0.128 inches.

## IMPELLER INSTALLATION AND PUMP ASSEMBLY

Each impeller gear set uses a series of dots on the gear faces to indicate position of the gears within the pump. Refer to Figure 50. for proper positioning of the gears. The dots must face away from the divider plate (towards the ends of the pump). Install the impellers in numerical order.

# HYDROSTATIC PUMPS AND MOTORS

## SUNDSTRAND

### START-UP AND MAINTENANCE

#### Fluids

Hydraulic fluids used with Sauer-Sundstrand products should be carefully selected with assistance from a reputable supplier.

#### Start-Up Procedure

The following start-up procedure should always be followed when starting-up a new Series 90 installation, or when restarting an installation in which either the pump or motor has been removed from the system.

1. Prior to installing the pump and/or motor, inspect the units for damage incurred during shipping and handling. Ensure all system components (hoses, valves, fittings, etc.) are clean prior to filling with fluid.
2. Fill the reservoir with recommended hydraulic fluid which should be passed through a 10-micron (nominal, no bypass) filter prior to entering the reservoir. The use of contaminated fluid will cause damage to the components.
3. The inlet line from the reservoir to the pump must be filled prior to start-up. Check inlet line for properly tightened fittings, and ensure it is free of restrictions and air leaks.

#### CAUTION

*Be sure to fill the pump and/or motor housing with clean hydraulic fluid prior to start-up. Failure to heed this caution will result in damage to the hydraulic pump and/or motor.*

4. Fill the pump and/or motor housing by pouring filtered oil into the upper case drain port.
5. Install a 0 to 500 psi (35 BAR) pressure gauge in the charge pressure gauge port to monitor charge pressure during start-up.
6. Disconnect control linkage from pump to ensure pump remains in neutral position.

#### CAUTION

*Do not start prime mover unless pump is in neutral position. Damage to equipment may result.*

7. "Jog" or slowly rotate the prime mover (engine) until the charge pressure starts to rise. Start the prime mover and run at the lowest possible RPM until charge pressure has been established. Excess air may be bled from the high pressure lines through the high pressure gauge ports.
8. Once charge pressure has been established, increase speed to normal operating RPM. Charge pressure should be 320 PSI (23 BAR) minimum. If charge pressure is incorrect, shut down system and determine cause for improper pressure.

#### WARNING

**Inadequate charge pressure will affect the operator's ability to control pump output.**

9. Shut down engine and connect pump control linkage. Start engine and check to be sure pump remains in neutral position. With engine at normal operating speed, slowly check forward and reverse functions of pump and/or motor.
10. Charge pressure should remain at 320 to 340 PSI (23 to 24 BAR) minimum during forward and reverse operation. Continue to cycle slowly between forward and reverse for at least five (5) minutes.
11. Shut down engine, remove gauges and plug ports. Check reservoir and add fluid as necessary.

### Maintenance

To insure optimum service life from Series 90 products, regular maintenance of the fluid and filter must be performed.

Check the reservoir daily for the following:

1. Proper fluid level.
2. The presence of water (indicated by cloudy or milky appearance or free water in the bottom of the reservoir).
3. Rancid fluid odor (indicating excessive heat).

It is recommended that the fluid and filter be changed per the following schedule:

1. System with a sealed reservoir: Every 2000 hours.
2. System with a breathing type reservoir: Every 500 hours.

# HYDROSTATIC PUMPS AND MOTORS

## SUNDSTRAND

It may be necessary to change the fluid more frequently than the above intervals if the fluid becomes contaminated with foreign matter (dirt, water, grease, etc.) or if the fluid has been subjected to temperatures higher than the maximum recommended. Never reuse hydraulic fluid.

The filter should be changed whenever the fluid is changed, or whenever the filter indicator shows that it is necessary to change the filter.

### TROUBLESHOOTING

#### Gauge Installation

Various pressure and vacuum gauge readings can be helpful in troubleshooting problems with the Series 90 hydraulic components.

It will be necessary to install a high pressure gauge into the system pressure gauge ports to check the high pressure setting of the multi-function valves.

Measuring the charge pump inlet vacuum will help locate restrictions in the inlet lines, filter, etc.

Case pressure readings can help locate restrictions in the return lines, oil cooler, and return filter.

**NOTE:** *Snubbers are recommended to protect pressure gauges. Frequent gauge calibration is necessary to insure accuracy.*

GAUGE INSTALLATION		
A	System Pressure Port "A"	Gauge: 10,000 PSI (690 BAR) Fitting: 9/16 - 18 O-Ring
B	System Pressure Port "B"	Gauge: 10,000 PSI (690 BAR) Fitting: 9/16 - 18 O-Ring
C	Charge Pressure	Gauge: 500 PSI (35 BAR) Fitting : 9/16 - 18 O-Ring or Tee into Charge Pressure Filter Outlet Line
D	Case Pressure	Gauge: 500 PSI (35 BAR) Fitting: See Chart Below
E	Charge Pump Inlet Vacuum	Gauge: Vacuum Fitting : 9/16 - 18 O-Ring or Tee into Charge Pressure Filter Outlet Line
F	Servo Pressure	Gauge: 500 PSI (35 BAR) Fitting : 9/16 - 18 O-Ring or 7/16 - 20 O-Ring
G	Servo Pressure	Gauge: 500 PSI (35 BAR) Fitting : 9/16 - 18 O-Ring or 7/16 - 20 O-Ring

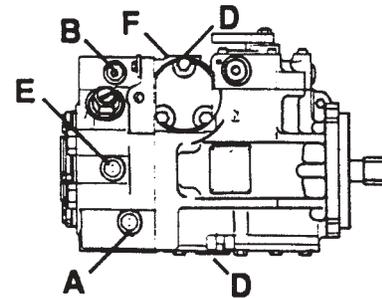


Figure 51. Gauge Connections – Variable Pump with Radial Port End Cap

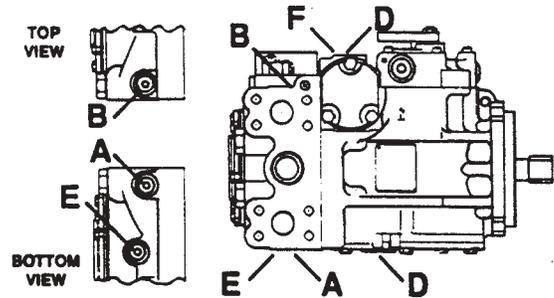


Figure 52. Gauge Connections – Variable Pump with Twin Port End Cap

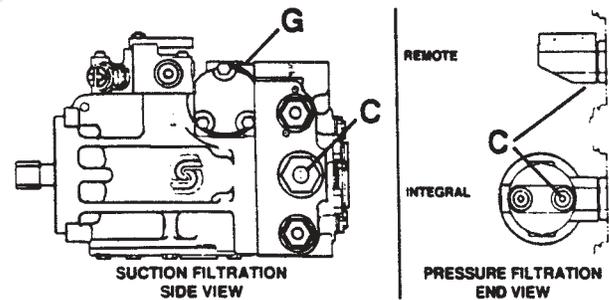


Figure 53. Gauge Connections – Variable Pump

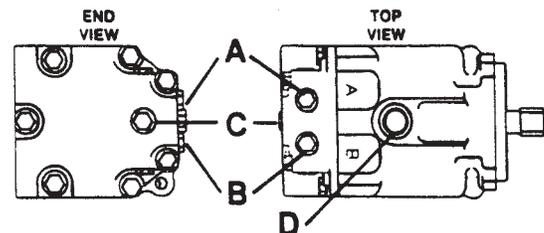


Figure 54. Gauge Connections – Fixed Motor

# HYDROSTATIC PUMPS AND MOTORS

## SUNDSTRAND

Case Drain Port Sizes		
Frame Size	Pump	Motor
030	7/8 - 14 O-Ring Fitting	—
042	7/8 - 14 O-Ring Fitting	—
055	1-1/16 - 12 O-Ring Fitting	7/8 - 14 O-Ring Fitting
075	1-1/16 - 12 O-Ring Fitting	1-1/16 - 12 O-Ring Fitting
100	1-1/16 - 12 O-Ring Fitting	1-1/16 - 12 O-Ring Fitting
130	1-5/16 - 12 O-Ring Fitting	1-5/16 - 12 O-Ring Fitting

### INSPECTIONS AND ADJUSTMENTS

#### Manual Displacement Control (MDC)

There are no adjustable elements in the manual displacement control. All functions are preset at the factory.

#### Hydraulic Displacement Control (HDC) Neutral Adjustment

The neutral adjustment is the only adjustment that can be made on the hydraulic displacement control; all other functions are preset at the factory. The neutral adjustment of this control must be made on a test stand or on the vehicle with the engine operating.

### WARNING

To prevent severe injury from becoming entangled in machinery, stand clear of rotating drives.

1. Install two (2) 500 PSI (35 BAR) gauges in the servo gauge ports (one on each side). Start the engine and operate at normal speed.

2. For earlier production controls, loosen the lock nut on the neutral shaft with a 17 mm hex wrench. For later production controls, loosen the lock nut on the neutral adjusting screw with a 10 mm hex wrench.
3. Use a 5 mm internal hex wrench to turn the neutral shaft on earlier production controls, or a 3 mm internal hex wrench to turn the neutral adjusting screw on later production controls.
4. Rotate the neutral adjusting shaft or the neutral adjusting screw clockwise until the pressure increases in one of two pressure gauges. Note the location "A" (angular position) of the internal hex wrench.
5. Without removing the internal hex wrench, rotate the neutral shaft or adjusting screw counter-clockwise until the pressure increases in the other gauge. Note the location "B" (angular position) of the internal hex wrench.
6. Rotate the neutral shaft or adjusting screw clockwise half the distance between locations "A" and "B". The control should now be in neutral. In this position both gauges should read the same pressure (case pressure).
7. While holding the neutral shaft or adjusting screw stationary with the internal hex wrench, tighten the neutral shaft lock nut (earlier production controls) to 16 ft. lbs. (22 Nm), or the neutral adjusting screw lock nut (later production controls) to 60 in. lbs. (7 Nm). Do not over-torque the locknut.
8. With the neutral position set, stop the engine, remove the gauges and install the gauge port plugs.

#### Electric Displacement Control (EDC) Neutral Adjustment

The adjustment procedures for the Electric Displacement Control are the same as the procedures for adjusting the hydraulic displacement control listed above.

# HYDRAULIC FLUID QUALITY REQUIREMENTS

## GENERAL INFORMATION

The ability of a hydrostatic transmission to maintain desired performance for the expected life depends on the quality of fluid being circulated in the units. Fluid quality can be measured in three general categories: lubricity, contaminants, and temperature. Obtaining satisfactory values in these three areas depends on the fluid and the circuit in which it is used.

Sauer-Sundstrand field experience indicates that most transmission failures result from a breakdown of fluid quality. Primary causes are solid particle contamination and overheating. Water or air in the fluids are also significant contributors. These problems are usually the result of insufficient system design or poor maintenance. Sometimes fluid selection can lessen the impact of unusual environmental factors.

This Bulletin outlines Sauer-Sundstrand's requirements for fluid which is used in piston hydraulic units. Contact Sauer-Sundstrand if questions of suitability exist.

## HYDRAULIC FLUID REQUIREMENTS

The catalog ratings and performance data for Sauer-Sundstrand products are based on operating with good quality petroleum-based fluids. Premium hydraulic fluids containing high quality rust, oxidation and foam inhibitors are required. These include premium turbine oils, API CD engine oils per SAE J183, M2C33F or G automatic transmission fluid (Type F), power shift transmission fluids meeting Allison C-3 or Caterpillar TO-2, and certain specialty agricultural tractors fluids. Fire-resistant fluids are also suitable at modified conditions as described in this bulletin.

Although fluids containing anti-wear additives are not necessary for the satisfactory performance of Sauer-Sundstrand piston units, they are often required for associated equipment. When used, the fluids must possess good thermal and hydrolytic stability to prevent wear, erosion and corrosion of the internal components.

Where water contamination is likely due to condensation, operation in a damp environment or frequent splashing, a fluid with outstanding hydrolytic stability is recommended. Consult Sauer-Sundstrand for recommendations for these fluids. Avoiding the use of Dexron II transmission fluids which do not meet Allison C-3 specification is recommended.

## VISCOSITY AND TEMPERATURE REQUIREMENTS

The fluid must have sufficient viscosity to maintain an oil film at the bearing surfaces. This depends on fluid selection and on operating temperature. Recommended viscosity for best life and efficiency, and minimum for intermittent and continuous operation is listed below.

### FLUID VISCOSITY LIMITS For Petroleum Based Fluids

	Series 30	Other Piston Units
Maximum Continuous SUS (cSt)	500 (110)	500 (110)
Optimum Viscosity SUS (cSt)	70 (13)	70 (13)
Minimum Continuous SUS (cSt)	47 (6.4)	55 (9.0)
Minimum Intermittent SUS (cSt)	42 (5.0)	47 (6.4)

Viscosity index improved (multi-viscosity) fluids may noticeably shear down in service when used in hydrostatic transmissions. This will lower the operating viscosity below the originally specified value. The lowest expected viscosity must be used when selecting fluids. Consult your fluid supplier for details on viscosity sheardown.

Fluid temperature affects the viscosity of the fluid and resulting lubricity and film thickness. High temperatures can also limit seal life, as most non-metallic materials are adversely affected by use at elevated temperature. Also, fluids may break down or oxidize at high temperatures, reducing their lubricity and resulting life of the unit. Cavitation is more likely at high temperature. Recommended limits for operating temperatures are tabulated below.

### FLUID TEMPERATURE LIMITS For Petroleum Based Fluids

	Series 30	Other Piston Units
Continuous Limit	220°F	180°F
Intermittent Limit	240°F	220°F

These temperature limits apply at the hottest point in transmission, which is normally the case drain.

Heat exchangers should be sized to keep the fluid within these limits. This is normally done by selecting the worst continuous operating condition, and sizing for all the transmission loss being cooled in the hottest ambient environment, at the continuous temperature rating. For many machines, this occurs at the highest transmission output speed obtainable. Testing to verify that these temperature limits are maintained is recommended.

# HYDRAULIC FLUID QUALITY REQUIREMENTS

## VISCOSITY AND TEMPERATURE REQUIREMENTS (CONTINUED)

Heat problems sometimes occur because of problems with one of the circuit components. Circuit designs should avoid depending on high pressure relief valves as part of the control system as frequent operation of these relief valves will generate intolerable heat. Circuit components with high internal leakage also contribute to heat problems. Also, circuits containing flow control valves such as flow dividers are susceptible to heat generation as they function by restricting oil flow with a pressure drop.

Cold oil will generally not affect durability of Sauer-Sundstrand transmission components, but it may affect the ability to flow oil and transmit power. In general, cold starts may be made at a temperature 30°F warmer than the pour point of the fluid. Some period of time may be required to initiate motor shaft movement, but the fluid will warm rapidly after this occurs. Operation of units at high speed without oil flowing in the circuit may damage the units and should be avoided.

## FIRE-RESISTANT FLUIDS

Fire-resistant fluids require special considerations in application of Sauer-Sundstrand units. Materials used in elastomeric seals, metal and plastic parts may be attacked by these fluids, which may require modification or render the unit unsuitable. System designers must verify that these conditions are satisfactory for each individual application. Consult ANSI B93.5, your fluid supplier and Sauer-Sundstrand for information on use of fire-resistant fluids.

Because of high specific gravity, these fluids are more susceptible to pump inlet condition problems and generally require reduced vacuum. Also, because of poor air release properties, larger reservoirs are recommended to increase dwell time and reduce aeration of fluids.

Filters can be affected by water-based fluids to reduce the pore size and restrict flow. It is advisable to provide increased filter flow capacity and verify that the pressure drop will stay within required limits.

Fluids with water content may require grounding the hydraulic units in order to prevent galvanic action.

Fluid and system maintenance is more critical when using fire-resistant fluids than with petroleum-based fluid. These fluids can change in composition and viscosity over time and affect the ability of hydraulic units and associated equipment to function properly. Frequent monitoring of

the fluid properties is required as well as timely maintenance procedures.

It is necessary to modify operating parameters of transmissions when used with non-petroleum based fluids. Modified parameters are suggested below. Assuming proper maintenance, and that conditions of material compatibility, inlet condition, and filter suitability are satisfied, these are estimated to produce the life normally expected with petroleum-based fluids.

As operating conditions and fluid properties may vary, testing is required to verify actual unit life of hydraulic units operating with fire-resistant fluids. Contact Sauer-Sundstrand if there are questions regarding use of fire-resistant fluids.

## MODIFIED OPERATING PARAMETERS For Fire-Resistant Fluids

Fluid Type	Speed <sup>1</sup> (% Catalog)	Pressure <sup>1</sup> (% Catalog)	Maximum Temperature °F
Phosphate Ester or Ester W/Oil	100%	100%	180°
Polyolester	85%	85%	150°
Invert Emulsion (60 oil/40 water)	65%	70%	140°
Water Glycol (60/40)	65%	60%	140°
HWCF (95 water/5 oil)	65%	40%	122°

Consult Sauer-Sundstrand Bulletin BLN-9884 "Pressure and Speed Limits" for information on ratings and unit life. Contact Sauer-Sundstrand prior to using a V11 40 bent axis variable motor in a system using fire-resistant fluids.

## Phosphate Ester or Ester with Oil

Phosphate ester or ester with oil requires Viton or EPR seals in dynamic locations. Consult the fluid manufacturer to obtain a recommendation for the particular fluid used. These fluids attack some plastics, zinc, and cadmium. The high specific gravity of these fluids requires an inlet vacuum of 2 in. Hg maximum. Use an elevated reservoir and increased inlet line size for these fluids. Some of these fluids have caused high wear of aluminum parts in transmissions.

## Polyolester Fluids

Polyolester Fluids have been used successfully with standard units. Some fluids are prone to an increase in acid number and this condition must be monitored closely. This class of fluid sometimes produces unusually rapid wear of metal on bearing surfaces, especially in the presence of high temperature and pressure or speed. Certain controls may require hardened parts to achieve acceptable life.

# HYDRAULIC FLUID QUALITY REQUIREMENTS

## FIRE-RESISTANT FLUIDS (CONTINUED)

### Invert Emulsion

Invert Emulsion fluids can break down with repeated freezing and thawing. Also, heating above 150°F can cause emulsion breakdown. High specific gravity requires an inlet vacuum of 3 in. Hg maximum. Use an elevated reservoir and increased inlet line size. Monitoring the fluid water content is necessary; frequent additions may be necessary in order to overcome evaporation losses. These fluids also show poor vapor phase corrosion inhibition.

### Water Glycol

Water glycol attacks zinc and cadmium, and produces solvent action on some paints. Wear of aluminum in transmission parts sometimes occurs in the presence of these fluids. Their high specific gravity requires an increase in absolute inlet pressure. Keep inlet vacuum below 2 in. Hg. Use an elevated reservoir and increased inlet line size. Stability regarding pH and water content can be a problem.

### HWCF (95-5)

HWCF (95.5) has been used successfully at the reduced operating parameters indicated above. There can be bacterial control problems and corrosion problems. Fluid pH stability can be a problem and can cause wear and chemical reaction with aluminum. Also, there may be a solvent action on some paints. A positive head reservoir is required to maintain a positive inlet pressure when operating, and to keep air out of internal passageways when shut down.

## CONTAMINATION LEVELS

Clean fluid implies the absence of impurities such as solid particles, water and air. Contamination control includes proper design, installation, and maintenance of hydraulic components.

Reservoirs must be designed to limit entry of contamination during servicing and operation. A sealed reservoir with a low pressure relief valve will reduce the introduction of contaminants while maintaining inlet and case drain pressure below the maximum recommended.

Hoses, pipes, and fluid couplings must be designed to prevent the entry of air and must be of adequate size. Excessive turbulence will cause air and fluid vapor bubbles to be released, causing cavitation and erosion and associated life reduction.

The purpose of the filter in a system is to clean the oil at initial start-up and to maintain acceptable levels of particle contaminants as they are ingested or generated during operation of the system. Filtration is a matter of controlling the particle sizes and their respective quantities to appropriate levels so as to avoid degradation of the system components and thereby assure the desired life.

Fluid contaminant profile requirements for Sauer-Sundstrand hydraulic units have been determined empirically based on measuring fluid quality in successful applications, and in laboratory tests designed to evaluate hydraulic unit contaminant sensitivity. General contaminant levels have been developed based on this experience and are shown on Figure 55.

Acceptable contamination levels at machine start-up for the system loop should be equal or better than Curve D, Figure 55. The machine may be exercised to 500 PSI but should not be worked (pressure over 500 PSI) until the oil cleanliness level meets or exceeds Curve C. The machine may be shipped at this level.

The machine should clean up during a relatively short period of normal operation to meet the oil cleanliness level of Curve A or Curve B. A system that meets Curve A will provide the user with a longer trouble-free operating life than one that meets Curve B. The Curve A cleanliness level should be met in systems exceeding the continuous pressure limit for 1000 hours/year machine use, listed in Table 1 of Bulletin BLN-9884, "Pressure and Speed Limits".

Some control valves may require better contamination limits than specified in Figure 55. Controls with small area screens or low force level values may be susceptible to malfunction from contamination. Consult Sauer-Sundstrand for assistance if this condition exists.

# HYDRAULIC FLUID QUALITY REQUIREMENTS

## CONTAMINATION LEVELS (CONTINUED)

The contaminant sensitivity of components generally increases with higher pressure, temperature or speed. A better fluid contaminant profile may be required for systems which operate near the extremes of their ratings. Short life or infrequent operation requirements may increase allowable contaminants.

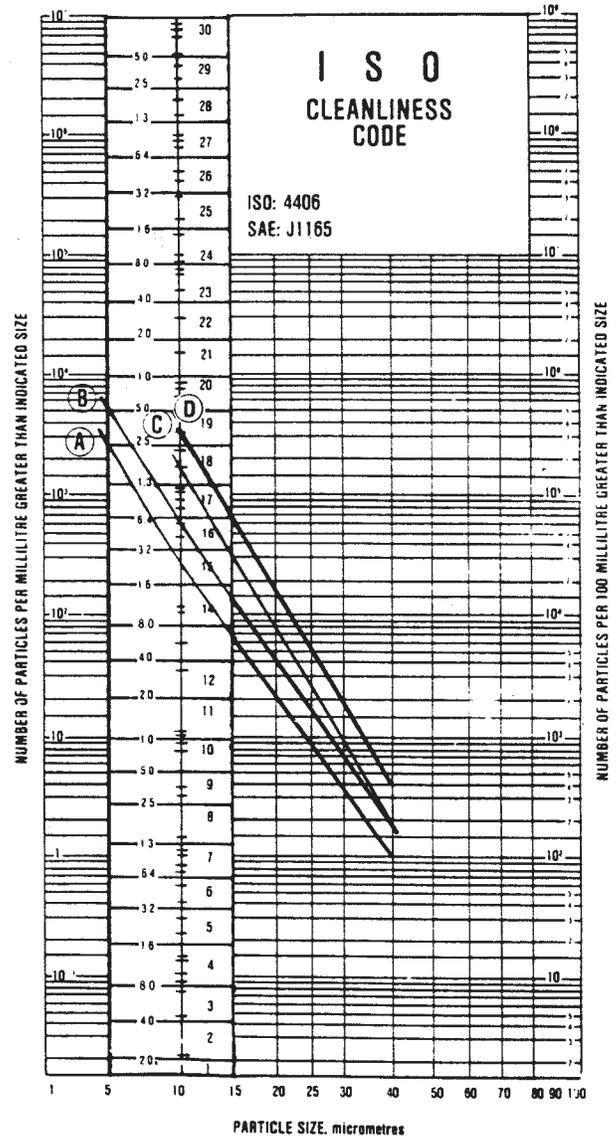
The selection of a filter depends on a number of factors including the contaminant ingress rate, the generation of contaminants in the system, the required fluid cleanliness, and the desired maintenance interval. Filters are selected to meet the above requirements using rating parameters of efficiency and capacity.

Filter efficiency may be measured with a Beta ratio. (2) For simple closed circuit transmissions with controlled reservoir ingress, a filter with a Beta 10 ratio of 1.5 to 2 has been found to be satisfactory. For some open circuit systems, and closed circuits with cylinders being supplied from the same reservoir, a considerably higher filter efficiency is recommended. This also applies to systems with gears or clutches using a common reservoir. For these systems, Beta 10 ratios of 10 to 20 are typically required.

The filter capacity required depends on the amount of contaminants ingressed and retained in the filter and the desired maintenance interval. As a rough guide, a capacity in grams equal to twice the charge flow in GPM has been found to be satisfactory for many closed circuit systems.

Since each system is unique, the filtration requirement for that system will be unique and must be determined by test in each case. It is essential that monitoring or prototypes and evaluation of components and performance throughout the test program be the final criteria for judging the adequacy of the filtration system.

(2) Filter Beta ratio is a measure of filter efficiency defined by ISO 4572. It is determined by dividing contaminant particle density upstream of the filter by downstream density. The Beta rating applies at specific particle size, measured in microns.



**Curve A**  
Desired limit  
for longer life  
(3500 PSI  
continuous system  
pressure — reference)

**Curve B**  
Continuous  
operating  
limit  
(2000 PSI  
continuous system  
pressure — reference)

**Curve C**  
Limit at machine ship  
and new fluid added  
to transmission

**Curve D**  
Limit at machine  
start-up

Figure 55. Fluid Contamination Levels

# GENERAL FUEL DATA AND HEATING TERMINOLOGY

## FUEL DATA

FUEL	WEIGHT PER GALLON	BTU CONTENT
Propane	4.20 lbs	91,500 per gallon
#2 Fuel Oil	7.49 lbs.	144,300 per gallon
Kerosene	6.97 lbs.	134,500 per gallon

## APPROXIMATE BURNER FUEL CONSUMPTION

**Propane** 1,000,000 BTU @ 40 PSI  
(91,500 BTU per gallon)  
One 100-pound bottle contains 23 gallons

For each burner

- @ 15 PSI – 5 GPH
- @ 20 PSI – 6 GPH
- @ 25 PSI – 7 GPH
- @ 30 PSI – 8.2 GPH
- @ 35 PSI – 9.5 GPH
- @ 40 PSI – 11 GPH

### Low Pressure Fuel Oil

935,000 BTU @ 20 PSI  
6.5 GPH per burner  
(144,000 BTU per gallon)

### Kerosene Generating

575,000 BTU @ 40 PSI  
4.25 GPH per burner  
(135,000 BTU per gallon)

## HEATING TERMINOLOGY

### Flash Point (Open Cup)

The temperature at which a flammable liquid in an open container emits vapor that will flash when exposed to a direct flame. This temperature is lower than required for the liquid mass to ignite.

### Closed Flash Point

The temperature at which a flammable liquid in a closed container emits a vapor that will flash when exposed to a direct flame. This temperature is lower than required for the liquid mass to ignite. The closed flash point is generally 30° (F) lower than the open cup flash point.

### Fire Point

The temperature at which a flammable liquid emits a vapor at a rate that will continue to burn after it has flashed.

### Ignition Temperature (Kindling Temperature)

The lowest temperature at which a combustible material will continue to burn once ignited.

### Convection

Heat transfer by a flow of a liquid or gas over a solid material. Example: Flues in asphalt tank are heated from hot gases passing through them, or, heat transfer coils in a tank are heated from steam or hot oil passing through them.

### Conduction

Heat transfer through a solid mass by direct molecular contact. Example: Heat applied only to one end of a metal rod will be transferred throughout the entire body by molecular transfer.

# LUBRICATION CHART

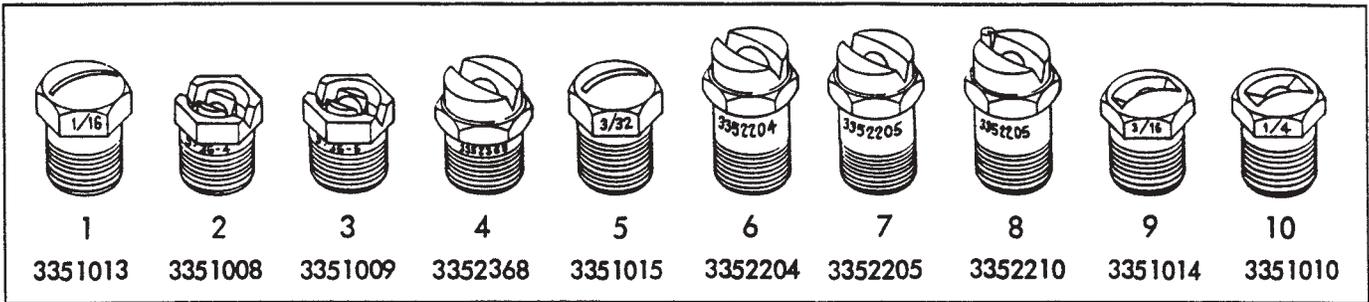
INTERVAL	POINT	IDENTIFICATION	LUBRICANT	QUANTITY
30 DAYS	1	Manhole Cover	EO*	Sparingly
	2	Spray Bar Controls	EO*	Sparingly
	3	Bar Bearings Swivel	MPG	Sparingly
	4	Bar Carrying Mechanism	EO* & MPG	Sparingly
DAILY	5	Control Linkage	EO*	Sparingly
	6	Hydraulic Reservoir	HTF	3/4 Full**
	7	Hydraulic Oil Filter		Replace if vacuum gauge shows in red area
WEEKLY	8	Gear Reduction Box		

MPG: Multipurpose Type Grease  
 EO\*: Engine Crankcase Oil/Applied w/Oil Can  
 #90 Oil Gear Lube  
 HFT: Hydraulic Transmission Fluid - Type A

**NOTE:** Fill line oiler, located on outlet side of air reservoir, with light oil as needed. Also wipe cylinder rods clean and lightly oil. Drain water from air reservoir daily.

\*\*Fill completely for winter storage. This will prevent condensation in reservoir. Drain down to thermometer hole prior to use.

# ETNYRE SPRAYBAR NOZZLES



REF	PART NUMBER	DESCRIPTION	APPLICATION Per Square Yard	APPLICATION (Metric) Liters Per Square Meter	FLOW Gallon Per Minute Per Foot
1.	3351013**	1/16" Coin Slot	.05 - .20	.23 - .90	3 to 4.5
2.	3351008	S36-4 V Slot	.10 - .35	.45 - 1.6	4 to 7.5
3.	3351009	S36-5 V Slot	.18 - .45	.82 - 2.0	7 to 10
4.	3352368	Multi-Material V Slot	.15 - .40	.68 - 1.8	6 to 9
5.	3351015	3/32" Coin Slot	.15 - .40	.68 - 1.8	6 to 9
6.	3352204 *	Multi-Material V Slot	.35 - .95	1.6 - 4.3	12 to 21
7.	3352205*	Multi-Material V Slot	.20 - .55	.90 - 2.5	7.5 to 12
8.	3352210	End Nozzle (3352205)	.20 - .55	.90 - 2.5	7.5 to 12
9.	3351014	3/16" Coin Slot	.35 - .95	1.6 - 4.3	12 to 21
10.	3351010	1/4" Coin Slot	.40 - 1.10	1.8 - 5.0	15 to 24

\* Recommended nozzles for seal and chip with emulsified asphalts.

\*\* For application prior to laying a hot mix mat.

### DECIMAL EQUIVALENT CHART

Decimal	Fraction	Decimal	Fraction	Decimal	Fraction
.06	1/16	.31	5/16	.69	11/16
.09	3/32	.38	3/8	.75	3/4
.12	1/8	.44	7/16	.81	13/16
.16	5/32	.50	1/2	.88	7/8
.19	3/16	.56	9/16	.94	15/16
.25	1/4	.62	5/8	1.00	1

### HYDRAULIC FITTING CODE

#### LETTER DESIGNATION

MP - Male Pipe Thread	FL - "O" Ring Flange
FP - Female Pipe Thread	MS - Male SAE, 45
MB - Male "O" Ring Boss	FS - Female SAE, 45
MJ - Male JIC, 37	C - Compression Fitting (Ferrule Type)
FJ - Female JIC, 37	X - Swivel

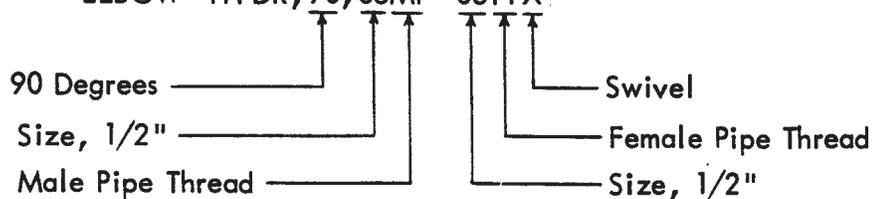
#### SIZE

Size is represented in sixteenths of an inch. One inch equals 16, one half inch equals 08.

02 - 1/8	10 - 5/8	18 - 1 1/8
04 - 1/4	12 - 3/4	20 - 1 1/4
06 - 3/8	14 - 7/8	24 - 1 1/2
08 - 1/2	16 - 1	28 - 1 3/4

EXAMPLE: The description for a "1/2" 90 degree Hydraulic Elbow, Male NPT to Female NPT Swivel, would be as follows:

ELBOW - HYDR, 90, 08MP - 08FPX



# WARRANTY

## WARRANTY for Asphalt Distributors

E. D. ETNYRE & CO. warrants to the original Purchaser, it's new product to be free from defects in material and workmanship for a peroid of one (1) year on the distributor components and on the tank portion of the distributor after the date of delivery to original Purchaser. The obligation of the Company is limited to repairing or replacing any defective part returned to the Company and will not be responsible for consequential damages or any further loss by reason of such defect.

**THE COMPANY EXCLUDES ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, WHICH EXTEND BEYOND THE DESCRIPTION OF THE GOODS CONTAINED IN THIS CONTRACT.**

This warranty does not obligate the Company to bear the cost of machine transportation in connection with the replacement or repair of defective parts, nor does it guarantee repair or replacement of any parts on which unauthorized repairs or alterations have been made or for components not manufactured by the Company except to the extent of the warranty given by the original Manufacturer.

This warranty does not apply to:

- (1) Normal start-up services, normal maintenance services or adjustments usually performed by the selling dealer, factory service representative or customer personnel.
- (2) Any product manufactured by E. D. Etnyre & Co. purchased for or subjected to rental use.
- (3) Any product or part thereof which shows improper operation, improper maintenance, abuse, neglect, damage or modification after shipment from factory.
- (4) Any product or part thereof damaged or lost in shipment. Inspection for damage should be made before acceptance or signing any delivery documents releasing responsibility of the delivering carrier.

This warranty and foregoing obligations are in lieu of all other obligations and liabilities including negligence and all warranties of merchantability or otherwise, express or implied in fact or by law.



## CALIFORNIA

### Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Please note this warning and remember -

Always start and operate the engine in a well-ventilated area;

If in an enclosed area, vent the exhaust to the outside;

Do not modify or tamper with the exhaust system.

## WARNING

### Fluoroelastomer Handling

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

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

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

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

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