



MSC/MST-OPS-1

SPECIALTY HAULAGE SOLUTIONS FOR CONSTRUCTION AND MINING

OPERATORS MANUAL



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Definitions and Abbreviations

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MANUAL USAGE

This technical manual only contains information required to safely install or service an MSC/MST. See the appropriate Maintenance and Operators Safety Manual for specific vehicle system information and maintenance procedures. If your system is not covered in this manual or you are experiencing difficulties, please contact MEGA Corp. Product Support Group at:

US toll free: 1-800-345-8889

Direct: 1-505-345-2661 or visit our website at www.megacorpinc.com for more detailed contact information.

The exact location of the hazards and description of the hazards are reviewed in this section. All personnel working on or operating the machine must become familiarized with all the safety messages.

WARNING

Due to the nature of these processes, ensure that all safety information, warnings and instructions are read and understood before any operation or any maintenance procedures are performed. Some procedures take place with heavy components and at moderate heights, ensure proper safety procedures are maintained when performing these actions. Failure to use and maintain proper safety equipment and procedures will cause injury, death or damage to equipment.

WARNING, CAUTION AND NOTES

The following definitions are found throughout the manual and apply as follows:

WARNING

Operating procedures and techniques, which could result in personal injury and/or loss of life if not carefully followed.

CAUTION

Operating procedures and techniques, which could result in damage to equipment if not carefully followed.

NOTE

Operating procedures and techniques that are considered essential to emphasize.

USE OF SHALL, WILL, SHOULD AND MAY

Shall and **Will** – Used when application of a procedure is mandatory.

Should – Used when application of a procedure is recommended.

May - Used to indicate an acceptable or suggested means of accomplishment.

SECTION 1

Definitions and Abbreviations

SAFETY MESSAGES

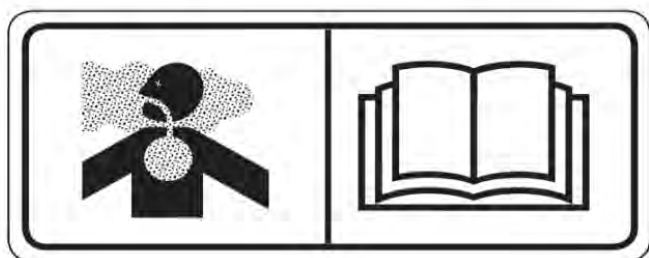
There are several specific safety messages on this machine. The exact location of the hazards and description of the hazards are reviewed in this section. All personnel working on or operating the machine must become familiarized with all the safety messages.

Make sure that all of the safety messages are legible. Clean the safety messages or replace the safety messages in you cannot read the words. Replace the illustrations if the illustrations are not legible. When you clean the safety messages, use a cloth, water and soap. Do not use solvent, gasoline or other harsh chemicals to clean the safety messages. Solvents, gasoline or harsh chemicals could loosen the adhesive that secures the safety messages. Loose adhesive will allow the safety messages to detach.

Replace any safety message that is damaged or missing. If a safety message is attached to a part that is replaced, install a new safety message on the replacement part.

TOXIC GAS HAZARD (1)

This safety label is located on the side of the tank and at all water fill entrances.

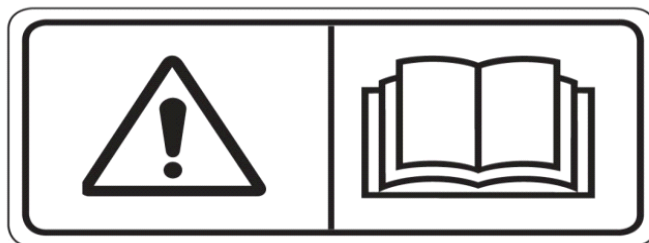


⚠ WARNING

Cutting or welding operation on the inside of the tank can cause the accumulation of toxic gases. Read and understand instructions and warnings in the Maintenance Manual. Failure to provide proper ventilation or breathing apparatus while conducting these operations may result in serious injury or death.

DO NOT OPERATE (2)

This safety label is located on the outside of the front and rear control boxes (if equipped).

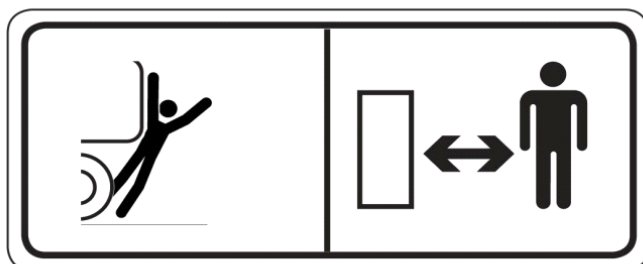


⚠ WARNING

Do not open this control box unless you read and understand the instructions and warnings in the Operator and Maintenance Manual. Failure to follow instructions or heed the warnings could result in serious injury or death.

BACKING RUNOVER HAZARD (3)

This safety label is located on the rear of the tank and inside the cab.



⚠ WARNING

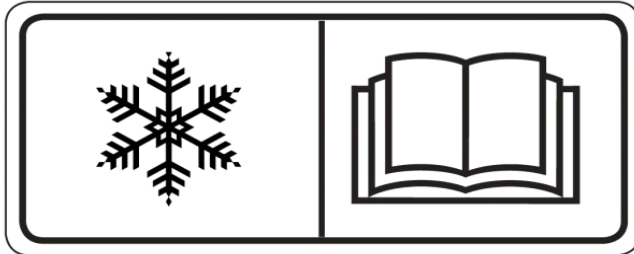
The vehicle is equipped with a back-up alarm. Alarm must sound when operating this vehicle in reverse. Failure to maintain a clear view in the direction of travel could result in serious injury or death.

SECTION 1

Definitions and Abbreviations

FREEZING (4)

This safety label is located on the side of the tank, at the sump drain, and on the pump.

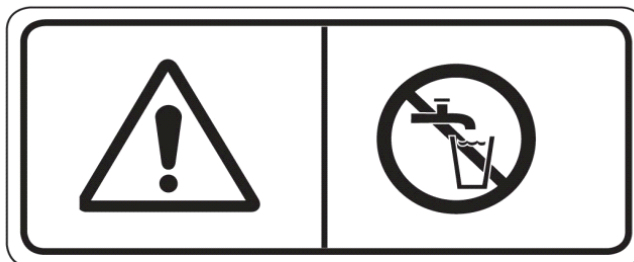


⚠ WARNING

Drain tank, fill pipe and valve in freezing weather. Refer to the Operator and Maintenance Manual for the procedure to follow.

NON-POTABLE (5)

This safety label is located on the side of the tank and sump drain.



⚠ WARNING

Water held within tank is not potable. Do not use tank for transport of water intended for human or animal consumption or serious injury or death may result.

DO NOT HOIST WHILE IN MOTION (6)

This safety label is located inside the cab.

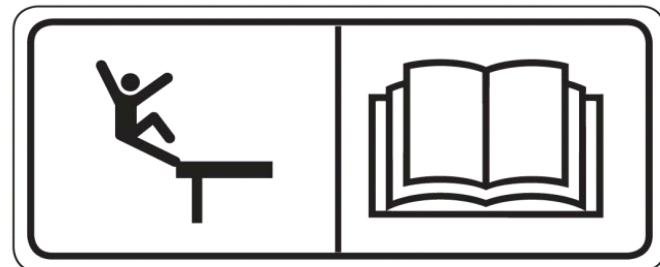


⚠ WARNING

Do not engage hoist cylinders while vehicle is in motion. Before engaging hoist STOP the vehicle. Do not engage hoisting cylinders unless you read and understand the instructions and warnings in the Operator or Maintenance Manual. Failure to follow instructions or heed the warnings will result in injury or death.

FALL HAZARD (7)

This safety label is located at the top of the front and rear of the tank.



⚠ WARNING

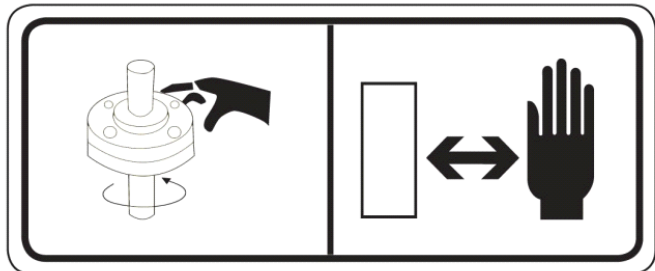
Do not walk on the top of tank without fall arrest PPE. Serious injury or death could occur from a fall.

SECTION 1

Definitions and Abbreviations

ROTATING SHAFT (8)

This safety label is located on the pump.

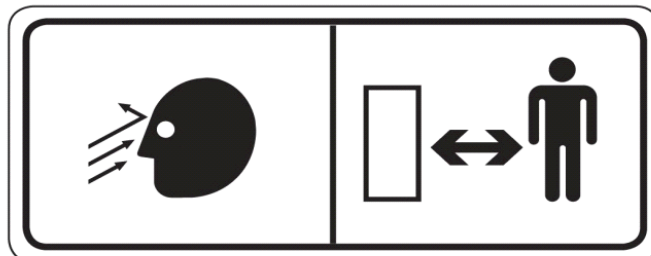


⚠ WARNING

Do not place your hand or tools within pump bell while pump is rotating and/or pressure held within the motor supply hose. Refer to the Operator and Maintenance Manual for the procedures to operate and maintain the pump. Failure to follow proper procedures could result in serious injury.

HIGH PRESSURE WATER CANNON (10)

This safety label is located on top of the cab control box.

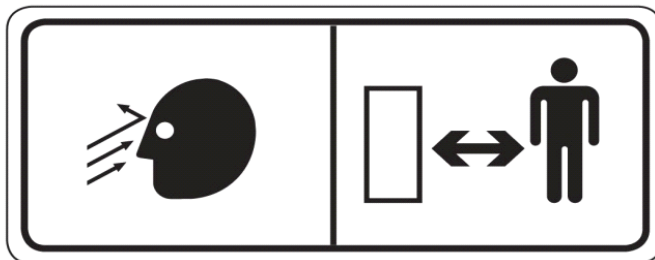


⚠ WARNING

Do not operate the water cannon until all personnel are a safe distance away from the vehicle.

HIGH PRESSURE SPRAY HEADS (9)

This safety label is located on the spray bar.

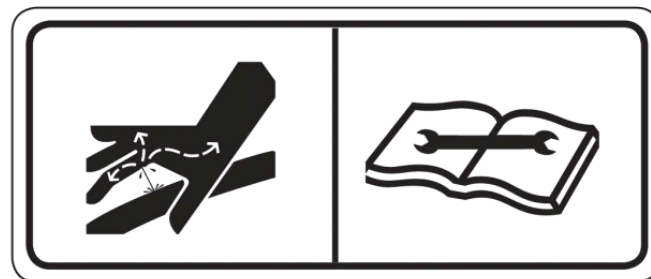


⚠ WARNING

Do not operate spray heads until all personnel are a safe distance away from the vehicle.

HIGH PRESSURE MOTOR (11)

This safety label is located on the hydraulic motor.



⚠ WARNING

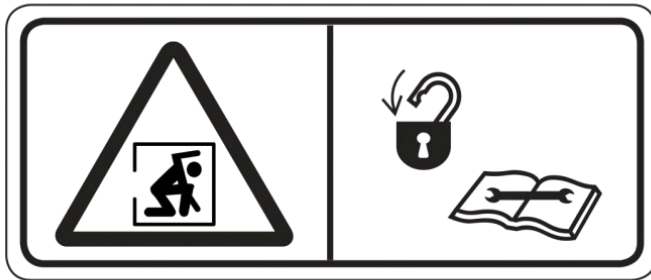
Hydraulic motor and supply lines contain oil under high pressure. Improper removal and repair procedures could cause severe injury. To remove or repair, instructions in the Maintenance Manual must be followed.

SECTION 1

Definitions and Abbreviations

CONFINED SPACE (12)

This safety label is located near the water tank access and fill ports.








WARNING







Do not enter confined spaces without following established site specific procedures. Failure to follow proper safety procedures will result in serious injury or death.








ABBREVIATIONS

- BFV - Butterfly Valve
- cc - Cubic Centimeters
- CCW - Counter Clockwise
- CW - Clockwise
- fl. oz. - Fluid Ounce
- FT - Feet
- FPM - Feet Per Minute
- GPM - Gallons Per Minute
- IN/SQ FT - inches per Square Feet
- KM-H - Kilometers Per Hour
- Kg - kilograms
- Kpa - Kilopascals
- l - liters
- lpm - Liters per minute
- LT - Left as viewed from the operators position facing forward
- m - meters
- MPH - Miles Per Hour
- MSC/MST - Mega Scraper Conversion
- Nm - Newton meters of torque
- psi - pounds per square inch
- RPM - Revolutions Per Minute
- RT - Right as viewed from the operators position facing forward
- SQ FT - Square Feet
- VDC - Volts, Direct Current

SYMBOLOLOGY

Symbol	Name
	POWER
	PUMP
	INTMNT /AUTO2
	LIGHTS
F1	F1
F2	F2
	PAUSE

Symbol	Name
	WATER LEVEL
	AUTO
	AUX 1
	AUX 2
	HOSE
	LT VSS

Symbol	Name
	DRAIN
	DUMP BAR
	RT VSS
	LT REAR
	LT CTR
	RT CTR
	RT REAR

IN-CAB SUPPLEMENTS

CHECKLISTS

A pocket size Operator's Checklist of all MTT/MWT procedures is contained in the Appendix for use in the vehicle cab, and an Inspections Checklist is located at the end of this section.

NOTE

Place copies of both the Appendix Operator's Checklist and the Section 4 Inspections Checklist within the cab for daily use.

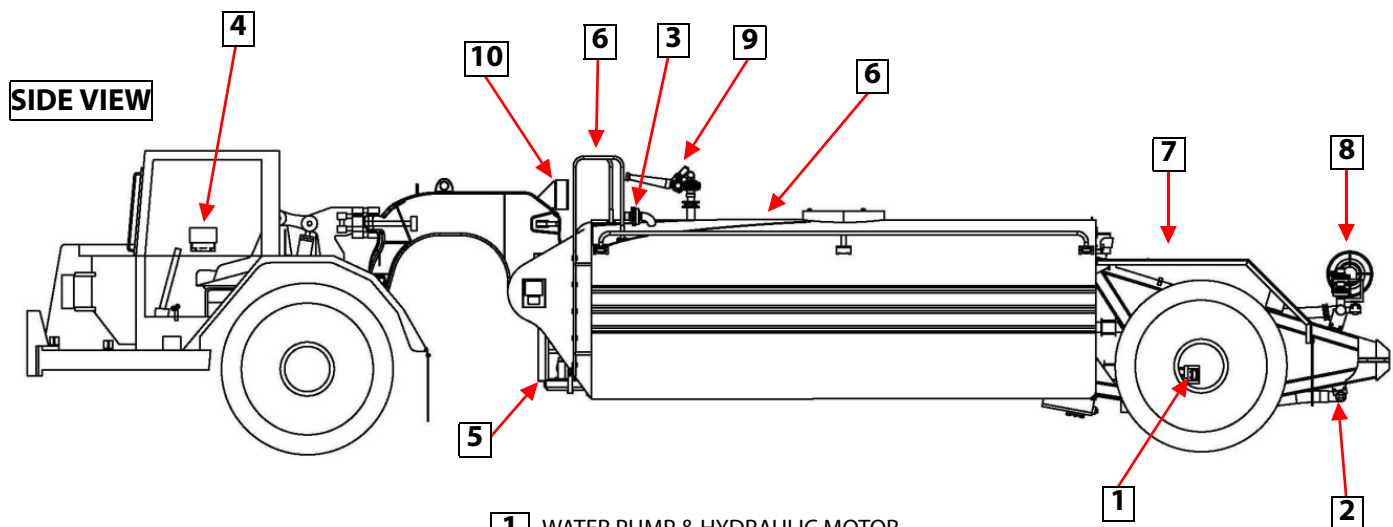
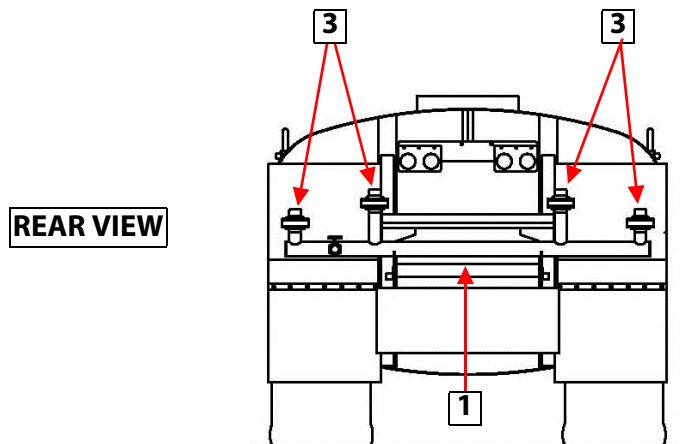
INSTRUCTIONAL DECALS

Instructional decals are included at the beginning of the Appendix. These decals may be cut out and placed in the cab wherever is most convenient for the operator.

SECTION 1

Definitions and Abbreviations

MSC/MST GENERAL OVERVIEW (TYPICAL)



- 1** WATER PUMP & HYDRAULIC MOTOR
- 2** DUMP BAR
- 3** SPRAY HEADS
- 4** CAB CONTROLS
- 5** SUCTION LOAD STATION
- 6** HAND RAIL & WALKWAY
- 7** FOAM CONCENTRATE TANK
- 8** HOSE REEL
- 9** WATER CANNON
- 10** SOLENOID CONTROL BOX

SECTION 2

System Description

Contents

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WATER TANK (MSC/MST)

The MEGA steel water tank consists of a water tunnel, primary floor, vertical baffles, bulkheads, outer skins, internal piping and external piping. The tank design is patented and known as the MEGA Anti-surge Stabilization Tube (MAST).

The MAST is the backbone of the structure and provides mounting for transverse baffles. The baffles add to tank strength and dampen water surges. The forward and rear baffles are reinforced with vertical beams to provide mounting for the gooseneck and rear trailing axle respectively. External and internal piping is also used to carry water from the water pump to spray heads, water cannon, spray bar, hose reel, dump bar and tank drain.

NOTE

Early MSC/MST's may have a Berkley water pump (B4J) installed. Contact MEGA Corp for more information.

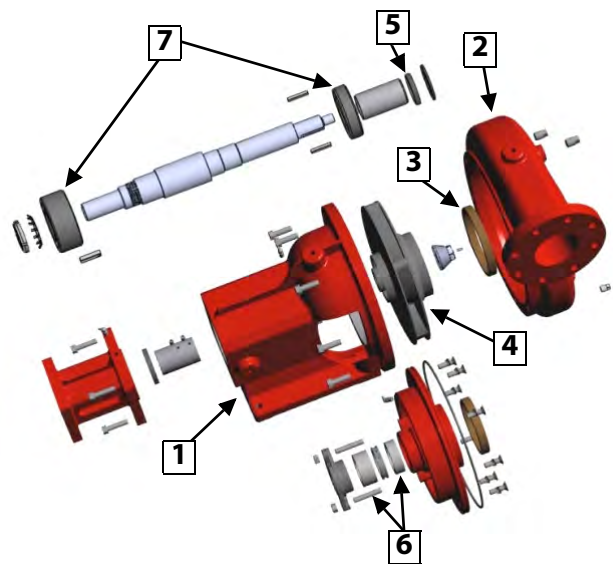
WATER PUMP

MSC/MST units are configured with different types of water pumps and are based on the size of the water tank. Typically the 5,000 - 7,000 gallon tanks are configured with a smaller pump (4 inch inlet & 3 inch outlet) while the 8,000 - 12,000 gallon tanks are configured with the larger water pump (6 inch inlet & 4 inch outlet). The water pumps are very similar in design and for the purposes of this manual the M-4 (6 inch inlet & 4 inch outlet) is used to present component information.

M-4 WATER PUMP



M-4 Water Pump major components and their functions are:



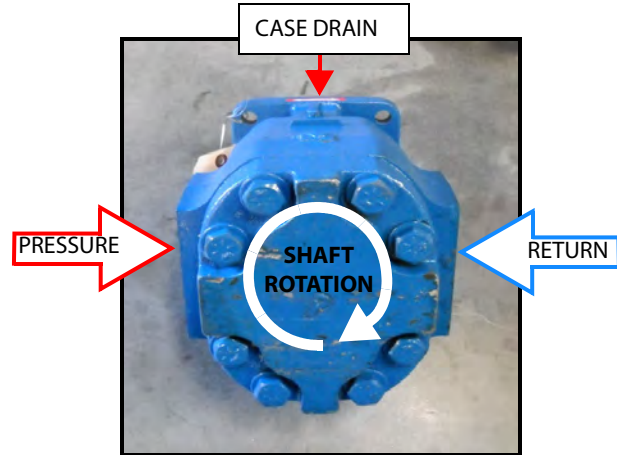
1. **Bracket** – Main frame of the pump that allows a pump to be bolted to the tanker and provides the means to direct mount the hydraulic drive motor.
2. **Volute Case** – A “snail shell” shaped case that encloses the impeller. It is narrow at the center and enlarges from there to the discharge area.

SECTION 2

System Description

3. **Wear Ring** – Acts as a bearing surface between the impeller and volute case. Constructed of bronze material.
4. **Impeller** – Rotating wheel attached to the shaft that accelerates the speed of the water producing water flow and pressure.
5. **Shaft Seal** – Confines grease to the inner and outer bearing area while keeping foreign material from entering the bearing area and seals water inside the volute case.
6. **Rope Seal** – Provides a seal around the rotating pump shaft at the volute case. Constructed of a graphite rope material that is designed to drip water and allow shaft lubrication.
7. **Upper/Lower Bearings** - Provide roller surface for the pump shaft.

The hydraulic drive motor may be installed in 4 different orientations depending on the water pump location or application.



HYDRAULIC DRIVE MOTOR

M-4 PUMP DRIVE MOTOR AND CROSSOVER ASSEMBLY

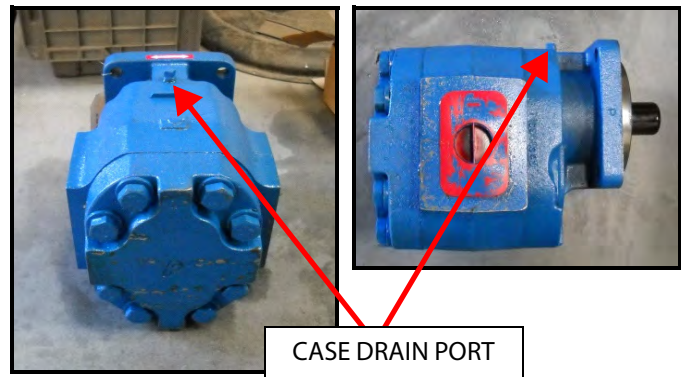
The M-4 pump rotates clockwise as viewed from the drive end of the assembly.



Clockwise rotation as viewed from the drive end of the water pump assembly.

HYDRAULIC DRIVE MOTOR PORT IDENTIFICATION

The hydraulic drive motor requires hydraulic flow from a valve to the motor pressure port, return oil flow to the hydraulic reservoir and a free to tank case drain.

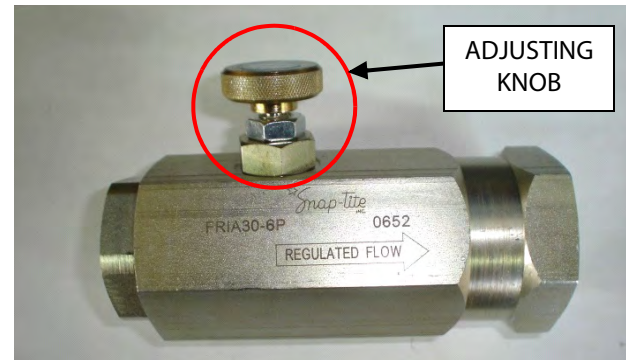
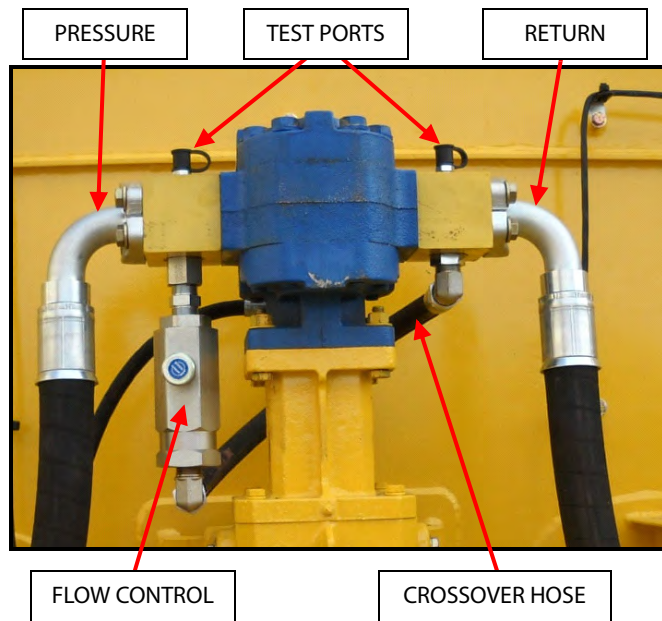


SECTION 2

System Description

HYDRAULIC DRIVE MOTOR SPEED CONTROL (CROSSOVER ASSEMBLY)

The hydraulic drive motor speed control (Crossover Assembly) consists of a flow control valve, 2 hydraulic manifolds, crossover hose and test ports.



Typical 135 lpm (35 gpm) Adjustable Hydraulic Flow Control

HYDRAULIC DRIVE MOTOR ACTIVATION

The hydraulic drive motor on MSC/MSTs are typically driven by the chassis implement hydraulic system. The activation can be controlled by the following;

Pilot Operated Diversion Valve - A remote mounted diversion valve that receives an electric signal from the cab control pump switch to activate a pilot control to move a spool within the diversion valve redirecting the hydraulic oil to flow to the water pump drive motor. Typically this type of valve is installed between the hoist pump and the hoist valve.

Existing Mechanically Operated Implement Valve - Typically used on early model trucks with a pneumatic system. This system is operated by the existing cab control lever. When the lever is moved to move a spool valve which divert hydraulic oil to the water pump drive motor.

HYDRAULIC FLOW CONTROL VALVE

The hydraulic flow control is directional. The arrow on the body indicates the direction of oil flow to meter the bypassing oil. The adjusting knob on the valve will allow adjustment of the oil flow to bypass the drive motor, up to 135 LPM (35 GPM) or up to 700 RPMs (RPM increase/decrease will vary depending on the size of hydraulic drive motor the unit is equipped with). If the flow control is reversed, the flow control adjusting knob will not function and the full flow capacity of the valve will bypass. This can result in water pump rpm being below specifications with no adjustment capability of the adjusting knob. By turning the adjusting knob clockwise the hydraulic oil that is bypassing will be reduced, increasing the speed of the water pump. Turning the knob counter-clockwise will increase the volume oil being bypassed reducing the water pump speed. The flow control valve is typically mounted on the PRESSURE manifold of the hydraulic drive motor.

SECTION 2

System Description

CAB CONTROLS (ANALOG)

MSC/MST units can be configured with a manual pneumatic, electro-pneumatic or electro-hydraulic control system.

MANUAL PNEUMATIC



Multi-function control box mounted in the cab to control all water tank functions. Spray system head and auxiliary functions are controlled by using manual pneumatic levers, accessory switches and embedded joystick. The cab control requires 24 VDC power to operate.

ELECTRO-PNEUMATIC



Multi-function control box that is mounted in the vehicle cab to control all water tank functions. Controls are available for the water cannon, intermittent spray, water pump, work lights, foam suppression, adjustable nozzle, system, spray heads, spray bar, gravity dump bar, and tank drain valve. The control box also provides indications of tanker water level and a system fuse holder. The cab controls requires 24 VDC vehicle power to operate.

The control functions operate as follows:

Control	Function
Joystick	Sends command signals to the logic box (electric water cannon) or hydraulic control valve assembly (hydraulic water cannon) to move the water cannon left, right, up and down.
TIMER ON	Sets ON time (variable adjustment 5-100 sec) of selected spray heads and dump bar when the timer switch is in the intermittent position
TIMER OFF	Sets OFF time (variable adjustment 5-100 sec) between timer cycles of selected spray heads and dump bar when the timer switch is in the intermittent position.
PUMP	Routes vehicle hydraulic system pressure and flow to the water pump hydraulic drive motor.
MONITOR	Opens the water cannon BFV.
LIGHTS	Provides power to work lights.
FOAM	Open or closes the foam concentrate tank in-line control valve.
INTERMITTENT/CONSTANT	Activates or deactivates system timer function.
AUX	Reserved for specialized functions.
ADJUSTABLE NOZZLE	Adjusts water cannon nozzle from FOG/FAN to STREAM.
AUX	Reserved for specialized functions.
WATER LEVEL	Indicates tank water level.
SYSTEM	Provides power for all cab control functions.
LT BUMPER	Opens or closes left front bumper spray head.
LT VSS	Opens or closes left vertical side spray head.

SECTION 2

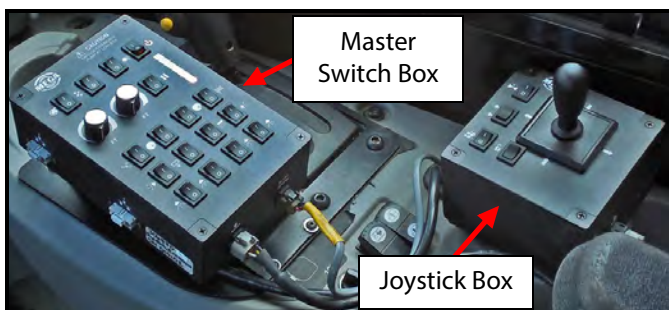
System Description

Control	Function
LT REAR	Opens or closes left rear spray head.
LT CENTER	Opens or closes left center rear spray head.
RT CENTER	Opens or closes right center rear spray head.
RT REAR	Opens or closes right center rear spray head.
RT VSS	Opens or closes right vertical side spray head.
RT BUMPER	Opens or closes right front bumper spray head.
DUMP BAR	Opens or closes dump bar BFV.
DRAIN	Opens or closes tank drain BFV.

ABBREVIATIONS AND DEFINITIONS

- AUX1** – Auxiliary or additional optional function
- BFV** – Butterfly Valve
- DMPBAR** – Dump bar for heavy spray of water close to ground. Can be either a gravity or pressure dump bar (pressure dump bar requires water pump activation to operate).
- DRAIN** – Drain (gravity or pressure) for evacuation of water from tank, mounted typically at the rear of the tank.
- KPH** – Kilometers per hour
- LT VSS** – Left Vertical Side Spray
- LTC** – Left Center Spray Head
- LTR** – Left Rear Outer Spray Head
- MPH** – Mile per hour
- RAMP** – Ramping Control feature. Rate of increase or decrease in speed of water flow during PUMP engagement or disengagement
- RT VSS** – Right Vertical Side Spray
- RTC** – Right Center Spray Head
- RTR** – Right Rear Outer Spray Head

CAB CONTROL SYSTEM (DIGITAL, GEN 1.5) ELECTRO-HYDRAULIC SYSTEM (CAT 621H/K only)
















This system is designated as a Digital Spray Control System (DiSCS). The most recent version is Generation 1.5. The system is comprised of control boxes, controllers, sensors, and cabling. It is a multi-function control system with a separate joystick box that is mounted in the vehicle cab. These two boxes control all water tank functions. The master switch box operates the water pump, spray heads, intermittent spray, work lights, hose reel, dump bar, suction loading, and tank drain valve. The master switch box also provides indications of tanker water level and water pump protection features. The remote mounted joystick box operates the water cannon, adjustable nozzle and foam suppression. The cab controls require 24 VDC vehicle power to operate.

The master switch box control functions operate as follows:





Symbol	Name	Function
	POWER	Provides power for all cab control functions.
	PUMP	Routes vehicle hydraulic system pressure and flow to the water pump hydraulic drive motor.
	INTMNT	Controls activation of either the time-based intermittent mode or the distance-based AUTO mode. See the extended description of "INTMNT" for details.
	LIGHTS	Provides power to work lights.
	F1	Function is dependent on the intermittent or AUTO mode settings. See extended description.
	F2	Function is dependent on the intermittent or AUTO mode settings. See extended description.
	PAUSE	Pauses all system functions.

SECTION 2

System Description

Symbol	Name	Function
	WATER LEVEL	Indicates tank water level. From top to bottom, respectively, the symbols indicate a water level of FULL, 3/4, 1/2, 1/4, and EMPTY.
	AUTO	Controls activation of GPS AUTO mode. See extended description for more details.
	AUX 1	Reserved for user-added option.
	AUX 2	Controls activation of suction load station ONLY.
	HOSE	Controls activation of hose reel function ONLY.
	LT VSS	Opens or closes left vertical side spray head.
	DRAIN	Opens or closes tank drain BFV.
	DUMP BAR	Opens or closes dump bar BFV.
	RT VSS	Opens or closes right vertical side spray head.
	LT REAR	Opens or closes left rear spray head.
	LT CTR	Opens or closes left center rear spray head.
	RT CTR	Opens or closes right center rear spray head.
	RT REAR	Opens or closes right rear spray head.

The joystick box functions operate as follows:

	Control	Function
(N/A)	Joystick (LEFT-RIGHT-UP-DOWN)	Sends command signals to the hydraulic control valve assembly to move the water cannon.
	FOAM	Open or closes the foam concentrate tank in-line control valve.
	FOAM LOCK	Unlocks FOAM switch for activation of foam suppression.
	NOZZLE	Adjusts water cannon nozzle from FOG to STREAM.
	BFV	Opens or closes the water cannon butterfly valve.

BASIC SYSTEM THEORY OF OPERATION

Spray system power is provided by chassis 24 volt DC power. Power is routed to the cab control boxes by turning on the switched power via the ignition key switch.

When the chassis ignition switch is turned on, the master switch box will undergo a functional self-test. During this process, ALL LEDs will first turn ON, then OFF. While this is occurring, the water level indicator lights will initially register a FULL tank, and will then decrease down to EMPTY. The EMPTY light will blink, and then the water level indicator will count up to register the current water level of the tank.

Cab control power is then activated by turning the cab control POWER switch ON. The spray system will function normally when cab control power is applied (cab control POWER switch ON) and sufficient water is present (water level EMPTY light not flashing). Activation of a specific function is accomplished by depressing the appropriate function switch on the master switch box or joystick box.

Depressing a switch sends a signal to the logic control panel in the solenoid box to activate the associated function. The appropriate controller in the solenoid box receives the signal and provides output voltage to the given coil.

SECTION 2

System Description

Once voltage is sensed at the coil, the controller sends a signal back to the cab control box to illuminate the LED on the selected function switch.

NOTE

If a switch is depressed and the corresponding LED does not illuminate, check to ensure that the POWER switch is ON and the water level EMPTY light is not flashing. If the switch LED still does not illuminate, a malfunction may exist. Contact Mega Product Support immediately at US toll free: 1-800-345-8889, or Direct: 1-505-345-2661.

NOTE

If the selected switch LED illuminates, but the component on the water tank is not functioning, then the associated function component (water-way valve, spray head, or water cannon) may have malfunctioned. Contact Mega Product Support immediately at US toll free: 1-800-345-8889, or Direct: 1-505-345-2661.

WATER PUMP PROTECTION FEATURES


Soft Start and Stop – The water pump is protected from sudden starts and stops whenever the pump is turned ON or OFF. This protection is implemented in the spray control system by commanding the appropriate proportional hydraulic control valve to open or close slowly. This prevents hard starts or stops that would reduce water pump service life.


Low Water Protection – The water pump is automatically turned off when a low water condition is detected. This prevents the water pump from overheating due to running dry.

No-Flow Conditions – Whenever ALL water discharge valves are closed, the water pump is automatically turned off after approximately 100 seconds. This feature prevents the water from heating up as a result of the water pump impeller spinning in a sump with no flow. Otherwise, the heating of the static water will also heat the water pump, causing deterioration of grease and premature bearing failure.

MASTER SWITCH BOX EXTENDED FUNCTION DESCRIPTIONS



 **POWER** – Turns POWER ON and OFF to cab controls and the controllers in the solenoid box.


 **PUMP** – Sends request for pump engagement/disengagement. The appropriate controller will activate the hydraulic circuit to slowly ramp-up or ramp-down the water pump.

The water pump switch will flash whenever the switch is on and the following conditions apply:

- Low water condition is sensed (EMPTY LED is flashing).
- No flow condition is sensed (for about 100 seconds no waterway valves are open)

CAUTION

Engaging/disengaging the water pump above LOW IDLE will result in water pump component damage and reduced service life.

 **PAUSE** – Turning this switch ON will pause all spray system functions. Once this switch is turned OFF, spray system functions will resume operation. If the distance-based AUTO mode is active, spray head functions will resume beginning with a dry patch.

SECTION 2

System Description

- INTMNT** – When the AUTO switch is OFF, turning the INTMNT switch ON activates the Intermittent Mode, in which spray head and dump bar functions are controlled manually by adjustment of the F1 and F2 dials.

When the AUTO switch is ON, turning the INTMNT switch ON activates the *distance-based* checkerboarding version of GPS Auto Mode. More details on this mode can be found under “Ground Speed Sensing (AUTO MODE) Control” on page 2-10.

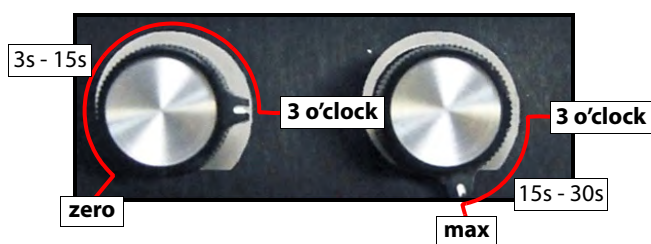
Intermittent Mode

In intermittent mode, spray system functions are controlled by the F1 and F2 dials. Intermittent mode will only operate if at least 1 discharge function (spray head or dump bar) switch is activated. Water discharge can be stopped at any time when in intermittent mode by turning discharge function switches OFF.

The F1 and F2 adjustable dials set the timing as follows:

- **F1** – Adjusts spray head ON time in seconds.
- **F2** – Adjusts spray head OFF time in seconds.

The relationship between dial rotation and ON/OFF time is as follows:



- zero to 3 o'clock position: 3 sec to 15 sec
- 3 o'clock to max position: 15 sec to 30 sec

The intermittent mode will turn selected spray heads or dump bar on and off. When a selected function switch (spray head or dump bar) is operating during an ON cycle, the selected function switch LED will be illuminated as well as the Intermittent switch LED. When INTMNT cycles to an OFF cycle, the INTMNT switch and function switch LEDs will extinguish. As the ON cycle is about ready to engage, the INTMNT switch LED will flash 3 times to indicate the selected spray functions are about to be turned ON.

Water Level Indicator – Indicates tank water level.



When the red **EMPTY** LED light flashes, the tank is at minimum water level, and the water pump low water protection feature will be activated, as previously described on page 7. Water pump operation can only be restored if the tank is above the minimum water level.

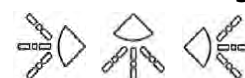
NOTE

In order to re-activate the water pump after low-water shut-off, first fill the water tank with sufficient water capacity to permit pump operation. Then cycle the PUMP switch OFF/ON.

NOTE

Certain terrains and water level fluctuations may allow low water protection to capture a low water level condition, causing the pump to slow to a stop. If conditions allow water pump activation after water level/terrain fluctuations have ceased, then the water pump may be re-activated by cycling the PUMP switch OFF/ON.

Pressure Discharge Function Descriptions:



Spray Heads – Spray head switches control the opening and closing of the associated spray head valve. The opening and closing of the associated valves is automatically controlled according to the F1 and F2 dial settings when INTMNT or AUTO mode is active.



Dump Bar (Pressure) – Controls opening or closing of the dump bar BFV when selected, or automatically controlled when INTMNT or GPS function is selected.

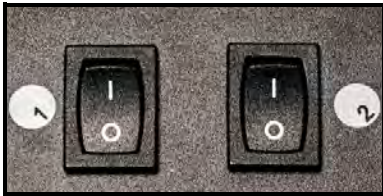


Suction Load (AUX 2) – See “AUX 2” description.

SECTION 2

System Description

AUX FUNCTIONS



AUX 1 – Controls customer-requested optional features. This function is unique to a specific tank serial number.

AUX 2 (Suction Load Station) – If equipped, sends a request to the hydraulic water pump drive circuit to allow suction load pump drive motor operation during a low water level condition while also disabling the pump time-out feature. When turned ON, this also disables use of any other spray system function.

Hose – Allows continuous water pump operation for hose reel use while disabling the use of any other spray system function.

NOTE

Ensure all discharge function switches are OFF when using HOSE function. Activating the HOSE switch requests all discharge function to turn OFF (spray heads, water cannon, drain, dump bar, and foam).

Non-Pressure Discharge Function Descriptions:

Dump Bar (Gravity) – Controls opening and closing of the dump bar BFV when selected, or automatically controlled when INTMNT mode or AUTO mode is active.

JOYSTICK BOX FUNCTION DESCRIPTIONS

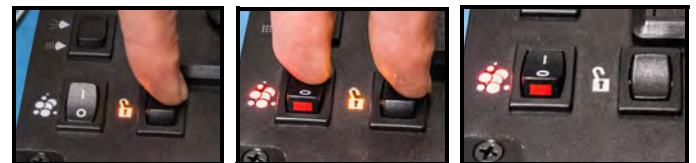


The joystick box houses logic controls for the joystick and the FOAM, NOZZLE, and BFV switches. These switches and the joystick control requests for water cannon operation.

Foam – Sends request for FOAM agent valve to open or close.

NOTE

The FOAM switch is protected by the FOAM LOCK momentary switch. In order to activate FOAM, first press and hold the FOAM LOCK switch. While still holding the FOAM LOCK switch, turn the FOAM switch ON. Hold both switches in the ON position for 1 second and then release.



Step 1

Step 2

Step 3

Nozzle – Sends request for adjustable nozzle on water cannon to move from FAN/FOG to STREAM spray patterns.

BFV – Sends request to open or close the water cannon butterfly valve. This butterfly valve controls water flow to the water cannon. Activating the BFV switch requests the water PUMP to stay ON with NO other pressure discharge functions activated providing that at least the minimum water level is present in the tank.

Joystick – Sends requests for rotation and elevation motion for water cannon operation.

SECTION 2


System Description

GROUND SPEED SENSING (AUTO MODE) CONTROL

The MEGA ground speed sensing control system is an independent and self-contained GPS unit that provides speed information to the existing DiSCS. The DiSCS logic control uses the ground speed signal to automatically cycle and pulse spray heads to obtain a desired lay-down of water regardless of ground speed. This automatic control reduces water usage and prevents over-watering of haul roads and intersections.

Near or below 4.8 KPH/3 MPH, AUTO mode will switch to INTERMITTENT mode and discharge functions may operate continuously or may ramp down the water pump to OFF. When vehicle speed rises above 4.8 KPH/3 MPH, AUTO mode will resume control of the system. The system warns the operator of all malfunctioning system functions and provides full manual control of all spray system functions in the event of an AUTO mode failure. All automatic system protection features of low water level conditions, no-flow conditions and water pump soft start/stop feature still operate normally in the AUTO mode.

AUTO MODE EXTENDED FUNCTION DESCRIPTIONS

 **AUTO** – This function has priority over intermittent mode. AUTO uses the speed signal from the GPS module to operate the spray system based on **F1** and **F2** adjustments. Pulsed spray (rather than continuous spray) will begin when the AUTO function requests reduced volume.

PWM Mode

If the AUTO switch is ON and the INTMNT switch is OFF, then the AUTO mode is a time-based banding mode, and is adjusted as follows:

F1 – The time for spray head ON cycle. Dial turned counterclockwise **reduces** spray head ON time. Dial turned clockwise **increases** ON time.

F2 – This setting dictates the vehicle speed above which all selected discharge functions (spray heads and pressure dump bar) are set for maximum flow. Below this vehicle speed, “reduced volume mode” comes into effect (see description below), and spray heads may pulse on and off rather than spraying continuously.

NOTE

The scale for this F2 function is 0 KPH/0 MPH (Full LEFT) to 48 KPH/30 MPH (Full RIGHT).

NOTE

If the vehicle speed is GREATER than the F2 dial setting, the F1 dial has little or no effect on water discharge. Typically in this case, all requested pressure discharge functions are ON and there is no timing cycle; pressure discharge functions operate continuously.

Reduced Volume Mode – Reduction in discharge volume by reducing the number of spray heads requested to activate.

- If 4 rear spray heads are requested, reduced volume allows only the 2 outer spray heads to turn ON, and the 2 center spray heads are OFF.
- If 3 rear spray heads are requested, 1 spray head will be OFF (typically the center head adjacent to the outer head requested).
- If 2 spray heads are requested, 1 spray head will be OFF (typically the center spray head, unless no center spray heads are requested, in which case NO spray heads will be OFF).

Pulsing – Reference to Pulse Width Modulation or ON/OFF cycle.

SECTION 2

System Description

Distance-Based (Pattern-Based)

If *both* the AUTO and INTMNT switches are ON, then the GPS mode is *distance-based*, or “pattern-based”. Spray head functions operate to create wet and dry patches, the lengths of which are controlled by the **F1** and **F2** dials, as follows:

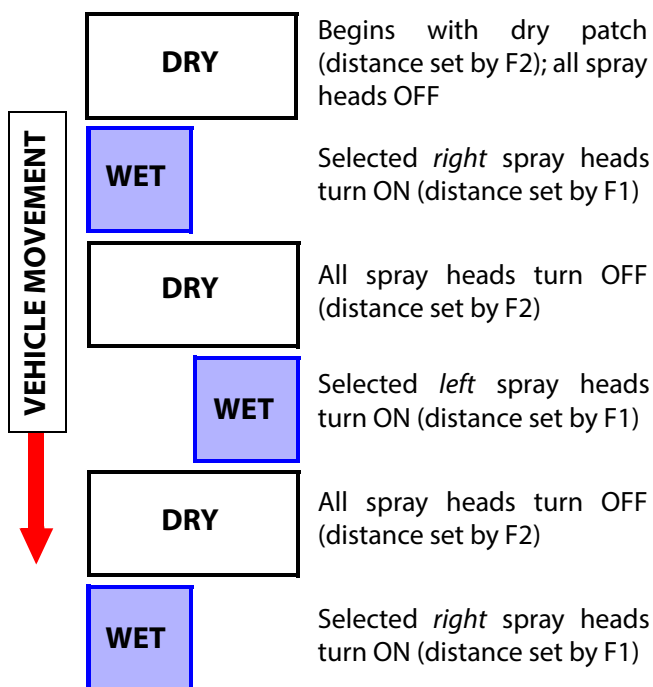
F1 – Adjusts the length of the **wet** patches on a linear scale from 10 m (FULL CCW) to 100 m (FULL CW).

F2 – Adjusts the length of the **dry** patches on a linear scale from 0 m (FULL CCW) to 100 m (FULL CW).

NOTE

In **version 4.2**, the minimum length of the dry patch is 0 m, whereas in **version 4.0**, the minimum dry patch length is 10 m. Verify your system’s current firmware version before operating in this mode.

The wet and dry patches will form a checkerboard pattern. The activated left and right spray heads will alternate spraying water to produce wet and dry sections in the following sequence:

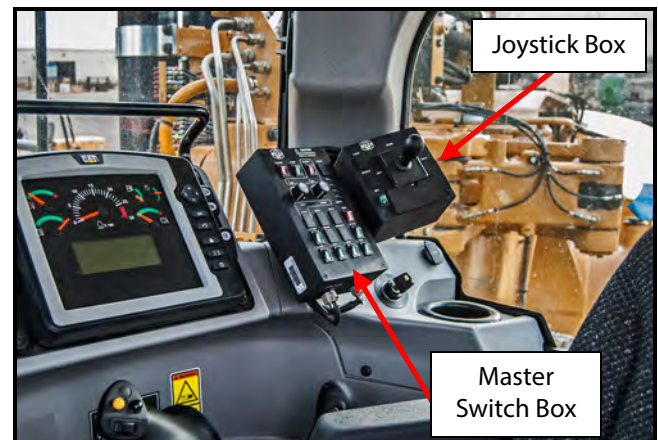


If the system is PAUSED, spray head functions will resume beginning with a dry patch once unpaused.

CAB CONTROL SYSTEM (DIGITAL, GEN 1.0)

MSC/MST units with fully hydraulic systems **MUST** be configured with the Mega Digital Spray Control System (DiSCS).

ELECTRO-HYDRAULIC SYSTEM (CAT 621H/K only)



This system is designated as a Digital Spray Control System (DiSCS). The system is comprised of control boxes, logic controllers, sensors, and cabling. It is a multi-function control system with a separate joystick box that is mounted in the vehicle cab. These two boxes control all water tank functions. The master switch box operates the water pump, spray heads, intermittent spray, work lights, hose reel, dump bar, suction loading, and tank drain valve. The master switch box also provides indications of tanker water level and water pump protection features. The remote mounted joystick box operates the water cannon, adjustable nozzle and foam suppression. The cab controls require 12/24 VDC vehicle power to operate.

ABBREVIATIONS AND DEFINITIONS

AUX1 – Auxiliary or additional optional function

BFV – Butterfly Valve

DMPBAR – Dump bar for heavy spray of water close to ground. Can be either a gravity or pressure dump bar (pressure dump bar requires water pump activation to operate).

DRAIN – Drain (gravity or pressure) for evacuation of water from tank, mounted typically at the rear of the tank.

KPH – Kilometers per hour

LT VSS – Left Vertical Side Spray

LTC – Left Center Spray Head

SECTION 2

System Description

LTR – Left Rear Outer Spray Head

MPH – Mile per hour

RAMP – Ramping Control feature. Rate of increase or decrease in speed of water flow during PUMP engagement or disengagement

RT VSS – Right Vertical Side Spray

RTC – Right Center Spray Head

RTR – Right Rear Outer Spray Head

The master switch box control functions operate as follows:

Control	Function
POWER	Provides power for all cab control functions.
PUMP	Routes vehicle hydraulic system pressure and flow to the water pump hydraulic drive motor.
INTMNT	Intermittent setting. Activates or deactivates system timer function.
LIGHTS	Provides power to work lights.
t ON (Intermittent timer—manual mode)	Sets ON time of selected spray heads when the timer switch is in the intermittent (INTMNT) position. Scale: adjustable from 5 seconds to 30 seconds.
RATE (GPS Auto Mode)	Increases or decreases amount of water dispersed during a cycle when AUTO switch is on (see extended description).
t OFF (Intermittent timer—manual mode)	Sets OFF time between timer cycles of selected spray heads when the timer switch is in the intermittent (INTMNT) position. Scale: adjustable from 5 seconds to 30 seconds.
SPEED (GPS Auto Mode)	Sets desired ground speed for maximum flow (OPEN continuously) of selected spray heads (see extended description).
WATER LEVEL	Indicates tank water level.
AUTO	Controls activation of GPS Auto mode.
AUX 1	Reserved for user-added option.
AUX 2	Reserved for specialized function.

Control	Function
HOSE	Controls activation of hose reel function ONLY.
LT VSS	Opens or closes left vertical side spray head.
DRAIN	Opens or closes tank drain BFV.
DUMP BAR	Opens or closes dump bar BFV.
RT VSS	Opens or closes right vertical side spray head.
LT REAR	Opens or closes left rear spray head.
LT CENTER	Opens or closes left center rear spray head.
RT CENTER	Opens or closes right center rear spray head.
RT REAR	Opens or closes right rear spray head.

The joystick box functions operate as follows:

Control	Function
Joystick (LEFT-RIGHT-UP-DOWN)	Sends command signals to the hydraulic control valve assembly to move the water cannon.
FOAM	Open or closes the foam concentrate tank in-line control valve.
NOZZLE	Adjusts water cannon nozzle from FOG to STREAM.
BFV	Opens or closes the water cannon butterfly valve.

BASIC SYSTEM THEORY OF OPERATION

Spray system power is provided by chassis 12/24 volt DC power. Power is routed to cab controllers and logic control panels by turning on the switched power via the ignition key switch.

When the chassis ignition switch is turned ON, the master switch box will undergo a functional self-test. During this process, ALL LEDs will first turn ON, then off. While this is occurring, the water level indicator lights will initially register a FULL tank, and will then decrease down to EMPTY. The EMPTY light will blink, and then the water level indicator will count up to register the current water level of the tank.

SECTION 2

System Description

Cab control power is then activated by turning the cab control POWER switch ON while logic controllers are switched on when the chassis ignition switch is turned ON.

The spray system will function normally when cab control power is applied (cab control POWER switch ON) and sufficient water level (water level EMPTY light not flashing) is present. Activation of a specific function is accomplished by depressing the selected function switch on the master switch box or joystick box.

Depressing the switch sends a signal to the logic control panel in the solenoid box to activate a given function. The logic control then receives the signal and provides an output command to the given coil or function.

Once the logic control panel output is processed, the logic control sends a feedback signal back to the cab control box to illuminate the LED on the selected function switch. If the switch LED does not illuminate, a malfunction may exist in the logic control, wiring harness or cab control box.

NOTE

If a function switch is depressed with no corresponding switch LED, check to ensure system power switch is ON and the water level empty LED is not flashing. If the switch LED is not illuminated, a malfunction may exist.

NOTE

If the selected function switch LED illuminates and the component on the water tanker is not functioning, the component (water-way valve, spray head or water cannon) may have malfunctioned.

As functions are turned on and off, the water pump switch will remain illuminated unless all spray system functions (water-way valves, spray heads or water cannon) are turned off. The logic control will automatically turn the water pump off if all valves are closed to prevent over-temp of the water pump volute case. As the water level of the tank drops and the EMPTY LED begins to flash, the logic controls will deactivate the water pump to prevent cavitation or dry running of the water pump.

WATER PUMP PROTECTION FEATURES

Soft Start and Stop – The water pump is protected from sudden starts and stops whenever the pump is turned ON or OFF via the switch or any auto/logic control feature. This is accomplished by the logic control system slowly commanding the appropriate proportional hydraulic control valve to open or close slowly to prevent hard starts or stops that can reduce water pump service life.

Low Water Protection – The water pump is automatically turned off by the logic control system when a low water condition is detected. The logic control system monitors tank water level and commands the water pump to turn off when a predetermined low water condition is noted. This prevents the water pump from running in a dry sump that will over-heat shaft seals due to lack of water. Continued use will damage the shaft seals.

No-Flow Conditions – The water pump is automatically turned off after about 100 seconds, whenever all water discharge valves are closed. The logic control system monitors all discharge valves and begins a TIME OUT cycle to turn off the water pump after about 100 seconds. Any time a discharge valve is opened during the timing cycle, the clock is reset. This feature prevents the water from heating up due to the water pump impeller spinning in a sump with no flow. The heating of the static water will also heat the water pump causing deterioration of grease and premature bearing failure.

SECTION 2

System Description

MASTER SWITCH BOX EXTENDED FUNCTION DESCRIPTIONS



POWER – Turns POWER ON and OFF to cab controls and digital controllers.

PUMP – Sends request for pump engagement/disengagement to the digital control processor. The digital controllers will activate the hydraulic circuit to slowly ramp-up or ramp-down the water pump.

The water pump switch will flash whenever the switch is on and the following conditions apply:

- Low water condition is sensed (EMPTY LED is flashing).
- No flow condition is sensed (for about 100 seconds, no waterway valves are open)

CAUTION

Engaging/disengaging the water pump above LOW IDLE will result in water pump component damage and reduced service life.

INTMNT (Intermittent Function)

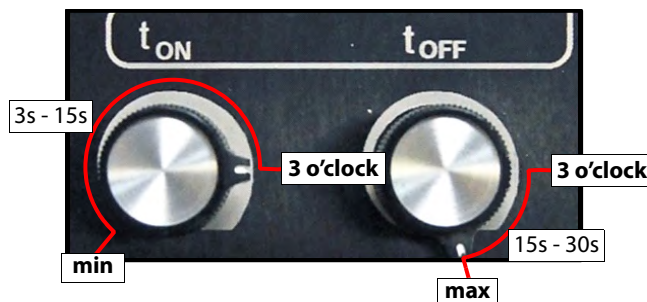
Intermittent spray function sends request for adjustable timing of spray head and dump bar as commanded by the tON and tOFF dials.

Intermittent will only operate if at least 1 discharge function (spray head or dump bar) switch is activated. Water discharge can be stopped at any time when in INTMNT mode by turning discharge function switches OFF. The timer will continue to cycle even if no water is being sprayed

The tON and tOFF adjusting knobs command timing as follows:

- **t ON** – Adjusts spray head ON time.
- **t OFF** – Adjusts spray head OFF time.

The relationship between dial rotation and ON/OFF time is as follows:



- min to 3 o'clock position: 3 sec to 15 sec
- 3 o'clock to max position: 15 sec to 30 sec

NOTE

The above time ON/OFF scale applies to firmware versions 3.7.0 and above. For firmware versions 3.6.x and below, the range is 5 seconds to 30 seconds, scaled linearly across the rotation of the dial.

The intermittent function will turn selected spray head or dump bar on and off. Duration of tON and tOFF cycle times are selected by setting the appropriate dials on the master switch box. When the INTMNT switch is ON and functions are selected, the operator will observe different switch LEDs conditions to indicate operation within the tON and tOFF cycles. When a selected function switch (spray head or dump bar) is operating during an ON cycle, the selected function switch LED will be illuminated as well as the INTMNT switch LED. When the INTMNT cycles automatically to an OFF cycle, INTMNT switch and function switch LEDs will extinguish. As the ON cycle is about ready to engage, the INTMNT switch LED will flash 3 times at the end of the OFF cycle to indicate the selected spray functions are about to be turned ON. These light conditions will change back and forth until intermittent or function switches are turned off.

SECTION 2

System Description

Water Level Indicator – Indicates tank water level as sensed by the water level pressure sensor in the rear of the water tank. When the red **EMPTY** LED light flashes, the tank is at minimum water level. This low level signal is also sent to the logic control to automatically ramp-down the water pump to prevent component damage. Water pump operation can only be restored if sufficient water is in tank to extinguish the **EMPTY** light.



NOTE

In order to re-activate the water pump after low-water shut-off, first fill the water tank with sufficient water capacity to permit pump operation. Then turn the PUMP and POWER switches OFF. Cycle the chassis ignition key OFF/ON. Wait for the Master Switch Box to complete its lights check. Then, if the water level gauge reads above EMPTY, turn the POWER and the PUMP switches on.

NOTE

Certain terrains and water level fluctuations may allow low water protection to capture a low water level condition, causing the pump ramp-down. If conditions allow water pump activation after water level/terrain fluctuations have ceased, then the water pump may be re-activated by following the steps in the previous note.

Pressure Discharge Function Descriptions:

Spray Heads – Control opening or closing of the associated valve when selected, or automatically controlled when INTMNT function is selected.

Dump Bar (Pressure) – Controls opening or closing of the BFV when selected, or automatically controlled when INTMNT function is selected.

Suction Load - Allows continuous hydraulic water pump drive circuit flow during a low water level condition. Also disables use of any other master switch box waterway valve

AUX FUNCTIONS



AUX 1 – Sends request for operation of auxiliary functions or additional non-standard options of spray system. This function is unique to a specific tank serial number.

AUX 2 (Suction Load Station) – If equipped, sends a request to the hydraulic water pump drive circuit to allow suction load pump drive motor operation during a low water level condition while also disabling the timed-out function. When turned ON, the AUX2 switch LED will flash rapidly and all pressure discharge functions are disabled.

HOSE – Allows continuous water pump operation for hose reel use while also disabling the use of any other master switch box waterway valves.

NOTE

Ensure all discharge function switches are OFF when using HOSE function. Activating the HOSE switch requests all discharge function to turn OFF (All Spray heads, Water Cannon BFV, Drain, Dump Bar and FOAM).

Non-Pressure Discharge Function Descriptions:

Dump Bar (Gravity) – Controls opening and closing of the BFV when selected, or automatically controlled when the INTMNT function is selected.

JOYSTICK BOX EXTENDED FUNCTION DESCRIPTIONS

The joystick box houses logic controls for the joystick and the FOAM, NOZZLE, and BFV switches. These switches and the joystick control requests for water cannon operation.

FOAM – Sends request for FOAM agent valve to open or close.

NOZZLE – Sends request for adjustable nozzle on water cannon to move from FAN/FOG to STREAM spray patterns.

SECTION 2

System Description



Joystick Box Functions

BFV – Sends request to open or close butterfly valve. The butterfly valve controls water flow to the Water Cannon. Activating the BFV switch requests the water PUMP to stay ON with NO other pressure discharge functions activated providing, sufficient water is in tank to allow command to be sent.

JOYSTICK – Sends requests for rotation and elevation motion for water cannon operation.

GROUND SPEED SENSING (GPS) CONTROL

The MEGA ground speed sensing control system is an independent and self-contained GPS unit and antenna that provides speed information to the existing Mega Digitally Integrated Spray Control System (DiSCS). The DiSCS's logic control uses the ground speed signal to automatically cycle and pulse spray heads to obtain a desired lay-down of water regardless of ground speed. The system contains controls to adjust maximum water discharge speed as well as actual rate of flow. This automatic control reduces water usage and prevents over-watering of haul roads and intersections.

The system will automatically close all discharge functions (spray heads) below 5 KPH/3 MPH to prevent puddling of water at intersections. The system also opens selected discharge functions when accelerating above 5KPH/3 MPH.

The system warns the operator of all malfunctioning system functions and provides full manual control of all spray system functions in the event of an AUTO mode failure. All automatic system protection features of low water level conditions, no-flow conditions and water pump soft start/stop feature still operate normally in the AUTO mode.

GPS EXTENDED FUNCTION DESCRIPTIONS



AUTO – This function has priority over intermittent mode. The intermittent light will illuminate steadily when operating conditions are met and AUTO is ON. AUTO enables vehicle speed signal from the GPS module to activate the speed sensing mode, and operates the spray system based on **RATE** and **SPEED** adjustments. Pulse will begin when the AUTO function requests reduced volume.

NOTE

Near or below 4.8 KPH/3 MPH, AUTO will switch to INTERMITTENT mode and discharge functions may operate continuously or ramp down the water pump to OFF. When vehicle speed rises above 4.8 KPH/3 MPH, AUTO will resume control of the system.

RATE – Is the distance traveled/time for spray head ON cycle.

- Knob turned counterclockwise **reduces** ON distance/ ON time
- Knob turned clockwise **increases** ON distance/ ON time

SECTION 2

System Description

SPEED – Above what vehicle speed the command is sent for maximum flow of all selected discharge functions (spray heads). Below this vehicle speed, timed cycles and/or reduced water volume flow occur.

NOTE

The scale for the SPEED function is 0 KPH/0 MPH (Full LEFT) to 48 KPH/30 MPH (Full RIGHT).

When vehicle speed goes below the set SPEED, application rate of water discharged will be either pulse the requested discharge functions and/or reducing the number of discharge functions based on the RATE selected.

NOTE

IF vehicle speed is GREATER than set SPEED the RATE has little or no effect on water discharge. Typically all requested pressure discharge functions are ON and no timing cycle.

Reduced Volume Mode – Reduction in discharge volume by reducing the number of spray heads requested to activate.

- If 4 rear spray heads are requested, reduced volume allows only the 2 outer spray heads to turn ON and the 2 center spray heads are OFF.
- If 3 rear spray heads are requested 1 spray head will be OFF, typically the center head adjacent to the outer head requested.
- If 2 spray heads are requested 1 spray head will be OFF typically the center spray head unless no center spray heads are requested, then NO spray heads will be OFF.

Pulsing – Reference to Pulse Width Modulation or ON/OFF cycle.

WATER CANNON SYSTEM

The system is comprised of a water cannon (hydraulic or electric), hydraulic control valve assembly or logic box, butterfly valve assembly, nozzle and controls.

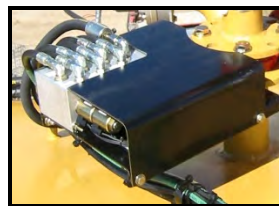
WATER CANNON (Hydraulic)



A metal waterway that directs a stream of water in both elevation (up-down) and rotation (right-left). Hydraulic motors move the waterway based upon hydraulic flow from the hydraulic control valve assembly as commanded by the cab control joystick. The water

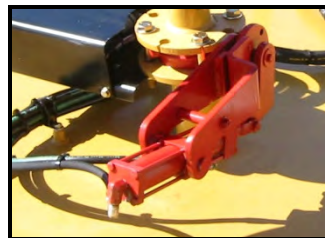
cannon is threaded to a flanged pipe that mounts directly above the BFV. The water cannon also provides mounting for a variety of different nozzles.

HYDRAULIC CONTROL VALVE ASSEMBLY



The assembly contains three hydraulic solenoid valves that direct hydraulic pressure to the hydraulic motors on the water cannon and BFV cylinder as commanded by the cab control box. A pressure relief valve is incorporated in the manifold block to protect the water cannon system against any over pressurization conditions. The assembly is mounted to the tank lower flange and receives hydraulic pressure from the vehicle hydraulic pump.

HYDRAULIC BFV ASSEMBLY ASSEMBLY



A hydraulically operated valve that opens or closes to control water flow to the water cannon. The hydraulic cylinder receives hydraulic pressure from the hydraulic control valve or solenoid control box assembly as commanded by the cab control water cannon switch. The assembly is clamped between upper and lower pipe flanges.

SECTION 2

System Description

WATER CANNON (ELECTRIC)



A metal waterway that directs a stream of water in both elevation (up-down) and rotation (right-left). 24 VDC electric motors move the waterway based upon filtered electronic signals from the logic box as commanded by the cab control joystick. The water cannon is threaded to a flanged pipe that mounts directly above the BFV. The water cannon also provides mounting for a variety of different nozzles.

ELECTRO-PNEUMATIC BFV ASSEMBLY



An electro-pneumatic valve that controls the flow of water to the water cannon. A 24 volt DC solenoid receives commands from a cab control MONITOR / BFV switch through the logic box to route pressurized air to an air chamber which opens or closes a 3" valve. The assembly is clamped between upper and lower pipe flanges.

WATER CANNON NOZZLES AND STREAM SHAPERS

Smooth Bore Nozzle



A cone shaped 1.5" diameter nozzle that directs water flow. The nozzle has a built in stream shaper that smooths water flow to increase water stream distance.

Smooth Bore (Stackable)



A segmented cone shaped nozzle that directs water flow. The nozzle opening is adjusted by removing segments to acquire the most efficient nozzle opening for a given water pump operating pressure. Nozzle segment diameters are 1", 1½", 1¾" and 2". The nozzle requires and in-line stream shaper to increase water stream distance.

In-Line Stream Shaper



A performance enhancer that is mounted between the water cannon outlet and the selected straight bore nozzle. The stream shaper pathway is a honeycomb style channel designed to efficiently shape a water stream to maximum water stream distance.

Manual Adjustable Nozzle



Fog/Stream: A modified straight bore nozzle that allows the operator to manually adjust selected water stream patterns from fog to stream. Some nozzles are configured for fire suppression foam education.

Fan/Stream: A modified straight bore nozzle that allows the operator to manually adjust selected water stream patterns from flat fan to stream. The flat fan pattern orientation is adjustable from horizontal to vertical by reorienting the nozzle on the water cannon.

Remote Adjustable Nozzle (Electric/Hydraulic)



A modified straight bore nozzle that allows the operator to remotely adjust selected water stream patterns from fog to stream from the cab control. The nozzle inner or outer barrel is moved by an electric or hydraulic actuator to obtain the fog or stream pattern. Some nozzles are configured for fire suppression foam education.

SECTION 2

System Description

Fan/Stream



A modified straight bore nozzle that allows the operator to remotely adjust selected water stream patterns from flat fan to stream from the cab control. The nozzle inner or outer barrel is moved by an electric actuator to obtain the fan or stream pattern. The flat fan pattern orientation is adjustable from horizontal to vertical by reorienting the nozzle on the water cannon.

SPRAY SYSTEM

The spray head system consists of 4, 6 or 8 hydraulic or pneumatic actuated spray heads, cab controls, solenoid control box assembly, and hydraulic or pneumatic hosing.

PNEUMATIC SPRAY HEAD



A two piece aluminum valve body and adjustable ring mounted to a water supply header pipe. The upper portion of the valve body is an air chamber with a diaphragm and guide disk assembly attached to the bottom. The air chamber receives pressurized air from the solenoid control box as commanded by the cab control switch. When the upper portion of the valve body is pressurized the guide disk will seal the opening on the lower portion of the valve and stop water flow.

When the cab control system is OFF and the water pump is OFF the air chamber incorporates a spring that will apply pressure to the guide disk assembly and seal the opening on the lower portion of the valve and stop flow. When air pressure is removed from the upper portion of the valve body when the water pump is ON and the cab control switch ON, pressurized water from the header pipe will unseat the guide disk and water will flow from the lower portion of valve.

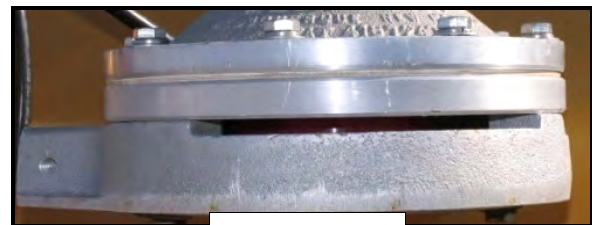
HYDRAULIC SPRAY HEAD



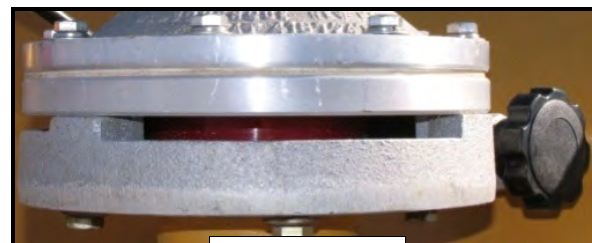
A two piece aluminum valve body, hydraulic cylinder and adjustable ring mounted to a water supply header pipe. The upper portion of the valve body contains a hydraulic cylinder that receives hydraulic pressure from the system solenoid control box as commanded by the cab control switch. When the hydraulic cylinder on the upper portion of the valve body is pressurized the cylinder extends to contact the guide disk and seal the opening on the lower portion of the valve and stop water flow. When the cab control system is OFF and the water pump is OFF the upper valve body incorporates a spring to apply pressure to the guide disk to seal the opening on the lower portion of the valve and stop flow. When the spray head switch is turned on hydraulic pressure retracts the hydraulic cylinder and pressurized water from the header pipe will unseat the guide disk and water will flow from the lower portion of valve.

Spray Head Adjustable Rings

The adjustable ring is used to control fan width and water flow. The ring may be loosened and rotated to expose more or less of the lower valve opening to control water fan width from 15° to 90°. The ring also may be used rotated to a 1/4" or 3/8" slot (as shown below) to increase or decrease overall water flow. The greater the opening, the greater the water flow.



1/4" Opening



3/8" Opening

SECTION 2

System Description

SOLENOID CONTROL BOX



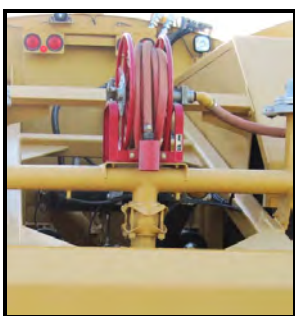
The control box assembly is mounted to the forward bulkhead or the rear of the gooseneck of the MSC/MST. The assembly contains pneumatic or hydraulic solenoid valves that direct pneumatic or hydraulic pressure to the spray head as commanded by the cab control box. The solenoids receive pneumatic pressure from the vehicle or hydraulic pressure from water pump oil circuit and 24 VDC power from the cab control box.

DUMP BAR



A spray bar that contains several rows of 3/8" drain holes to dispense water. A hydraulically operated BFV controls the water supply to the dump bar. The BFV is controlled electrically from the cab control box and is actuated by a hydraulic cylinder. The actuators receive hydraulic pressure from the solenoid control box assembly. Dump bars can be either gravity or pressure fed.

HOSE REEL



A reel assembly that is located on the bottom aft end of the water tank fitted with a 1" or 1.5" diameter reinforced rubber hose and a fire fighting style nozzle. The hose reel assembly receives pressurized water from the pressurized manifold on the back of the tank to operate.

TANK DRAIN



A hydraulic BFV attached to the water tank pressure pipe is used to drain water from the water tank. The BFV is controlled electrically from the cab control box and is actuated by a hydraulic actuator. The actuators receive hydraulic pressure from the solenoid control box assembly. Tank drains can be either gravity or pressure fed.

FIRE SUPPRESSION SYSTEM

A system that consists of a 120 or 60 gallon stainless steel holding tank, an electric or pneumatic actuated shut-off valve, in-cab control switch, hosing and a foam eduction nozzle mounted to the water cannon.

FOAM CONCENTRATE TANK



A stainless steel tank mounted in the forward upper portion of the water tank. The holding tank contains a supply tube that extends to the bottom of the tank and connected to a flexible hose at the top of the tank and then routed to the foam agent shut-off valve. The tank also contains a pressure/vacuum cap which keeps foreign matter out of the tank while providing for pressure relief and air displacement during temperature changes.

The tank also contains a pressure/vacuum cap which keeps foreign matter out of the tank while providing for pressure relief and air displacement during temperature changes.

ELECTRIC/PNEUMATIC SHUT-OFF VALVE

The in-line shut-off valve is mounted on the foam tank upper lip and is controlled by the in-cab control FOAM switch. The shut-off valve is actuated by either an electric or pneumatic actuator that is controlled by the in-cab control switch. Once the shut-off valve is opened, foam concentrate will flow from the holding tank to the water cannon nozzle if the water cannon and water pump switches are ON.

SECTION 2

System Description

FOAM EDUCATION NOZZLE



A manual or remote adjustable (fog/stream) nozzle is attached to the water cannon waterway. The nozzle inner housing uses high pressure water to create a venture effect that will create a suction force,

pulling foam concentrate from the holding tank. Once foam concentrate is flowing, the nozzle proportions foam concentrate, water and air to produce finished foam. The nozzle can be adjusted to allow control of foam solution at a rate of 1%, 3% or 6%. Rate adjustment is obtained by replacing a removable disk.

SUCTION LOADING (IF EQUIPPED)



A second water pump mounted typically to the water pump sump at the rear of the tank. The suction loading station is equipped with a manual diversion valve that will switch the hydraulic oil flow from the main discharge pump drive motor to the suction loading pump drive motor. When oil is diverted to the suction loading drive motor, it can pull water from a holding pond and fill the tank. The suction loading option includes lengths of 4" suction hose equipped with quick couplers and a check valve inlet foot with a debris screen. The suction hoses are typically stored in tubes either built into the tank or a hanging tube arrangement.

BRAKING SYSTEM

MSC/MST PRIME MOVERS

See the prime mover Operator and Service Manual for brake system information.

MSC/MST 611/615

See the CAT 611/615 Operator and Service Manual for brake system information.

MSC/MST 613

See the CAT 613 Operator and Service Manual for braking system information

MSC/MST 621H/K

See the CAT 621H/K Operator and Service Manual for braking system information.

For further information contact MEGA Corp. Product Support Group at:

US toll free: 1-800-345-8889

Direct: 1-505-345-2661 or visit our website at www.megacorpinc.com for more detailed contact information.

MSC/MST 621G & 631G

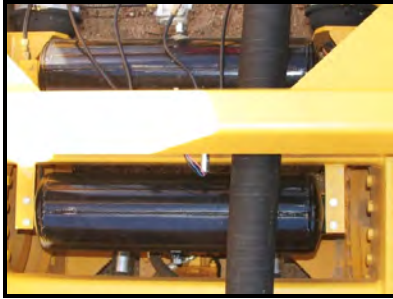
The MSC/MST rear brake system is integrated with the existing tractor parking, service and emergency brakes. All three systems are activated with the existing brake controls located in the tractor cab. See the CAT 621G and 631G operator and service manual for additional tractor brake information.

The MSC/MST rear brake system consists of a wheel group, two additionally air tanks, pneumatic manifold assembly, pneumatic brake relay valve, brake pods, solenoid valve, pressure switch, pressure sending unit and hosing.

SECTION 2

System Description

AIR TANKS

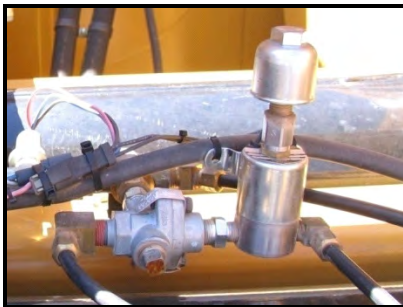


The MSC/MST is equipped with two 8 inch x 32 inch air cylinder mounted to the MSC/MST rear trailing axle that store 110-130 psi air. The cylinders receive pressurized air from the tractor primary air tank mounted under the tractor cab.

TANK PRESSURE SENDING UNIT

A 24 VDC pressure sending unit is mounted to the rear MSC/MST air tank and is wired into existing tractor brake pressure indicating and warning systems. The sending unit provides air pressure sensing for the tractor air pressure gauge mounted in the dash. The sending unit also provides a signal to the brake low pressure warning system that sounds an audible warning tone when brake supply pressure drops below allowable limits.

PNEUMATIC MANIFOLD ASSEMBLY



A pneumatic manifold mounted in the rear trailing axle used to route air pressure for service, parking and emergency brake operation. The manifold also

provides mounting for a check valve, parking brake/emergency solenoid valve and parking brake pressure switch.

CHECK VALVES

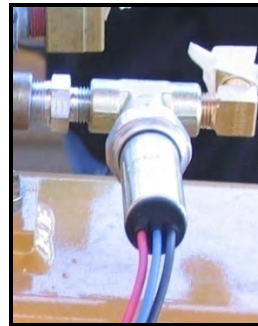
A spring operated valve allowing air flow in a predetermined direction. A one-way check valve is located at the MSC/MST rear air tank tractor air supply in. A double-check valve is located on the pneumatic manifold.

PARKING /EMERGENCY BRAKE SOLENOID



A 24 VDC electrical solenoid that opens or closes to control the parking or emergency brake function. The solenoid valve responds to electrical signals as commanded by the parking or emergency brake in the tractor cab. The solenoid valve will open to bleed off parking/emergency brake release pressure from the brake pods. This release of air pressure will cause the parking/emergency brakes to be applied.

PARKING BRAKE PRESSURE SWITCH



A 24 VDC pressure switch used to illuminate the parking brake warning light in the tractor cab. The sensor will turn on the parking brake warning light when parking brake release pressure drops below allowable limits.

SERVICE BRAKE RELAY VALVE



A pneumatic relay that controls and routes air tank activation pressure to both brake pods. The relay controls air pressure applied to the brake pods as commanded by a pneumatic signal generated by activating the service brake pedal located in the tractor cab.

SECTION 2

System Description

BRAKE PODS



A pneumatic cylinder designed to extend or retract and apply service, parking or emergency brakes. The pods are mounted to the MSC/MST rear trailing axle and are connected to the wheel group brake activation lever. The pod contains a coil spring and responds to pressure received from the brake relay valve as commanded by service brake pedal. The pod will also apply parking or emergency brakes when one side of the cylinder is depressurized when commanded by the activation of the parking or emergency brakes. Lose of pneumatic pressure allows the brake pod coil spring to extend the rod end.

THEORY OF OPERATION

Parking Brake

The parking brake is applied by activating the parking brake switch in the tractor cab. Once the switch is moved to the park position an electrical signal is sent to the parking brake solenoid valve mounted on the rear trailing axle pneumatic manifold. The sent signal will open the solenoid valve allowing pneumatic pressure to decrease from one side of the brake pod. The brake pod coil spring can now overcome air pressure and extend the brake pod rod end attached to the wheel group brake lever and apply the brakes. Once parking brake pneumatic pressure drops below allowable limits, the parking brake pressure switch mounted on the pneumatic manifold will close and illuminate the parking brake warning light in the cab of the tractor.

The parking brake is released by activating the parking brake switch. Once the switch is moved an electric signal is sent to close the parking brake solenoid valve. The valve closing will allow

pneumatic pressure from the pneumatic manifold to be routed to the brake pod. This pressure increase will eventually overcome the brake pod coil spring and retract the brake pod cylinder rod end attached to the brake pod releasing the brakes. As pressure increases above allowable limits, the parking brake pressure switch will turn off the parking brake warning light in the tractor cab once pressure is above allowable limits.

Service Brake

The service brake is applied by pressing down on the service brake pedal in the tractor cab. Pressing down on the pedal will send a pneumatic pressure signal to the service brake relay valve mounted on the rear trailing axle. The sent signal will release pneumatic pressure from the brake pod chamber allowing the pod coil spring to extend the rod end and apply service brakes.

The service brake is released by releasing the brake pedal. Once the pedal released a pneumatic signal is received by the brake relay to increase air pressure to the brake pod. As pneumatic pressure increases the force of the brake pod coil spring is overcome and the service brake is released.

Emergency Brake

The emergency brake theory of operation is the same as the parking brake except for the means of activation. Activation is accomplished by using the emergency brake foot switch located on the floor of the tractor cab just left of the service brake pedal.

SECTION 2

System Description

SECTION 3 Limitations

Contents

Water Pump.....3-1

WATER PUMP

The following cautions are operational limitations of Mega water pumps. Failure to heed these cautions may result in reduced pump life and severe water pump damage.

CAUTION

Do not operate the water pump in a dry sump. Operating the water pump with a dry sump will result in water pump component damage and reduced service life.

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

CAUTION

Limit water pump operation to 2.5 minutes when in a no-flow condition (not flowing water through spray heads, dump bar, water cannon, drain valve or hose reel). Water pump operation in a no flow condition will cause overheating of the water pump and damage to the shaft bearings and seals.

CAUTION

Avoid any sudden stoppage of water pump e.g.; disengaging water pump above LOW IDLE. Stopping water pump suddenly above LOW IDLE will result in shaft, impeller and drive motor damage.

CAUTION

Water pump RPM must not exceed the specifications listed below with engine at HIGH IDLE. Failure to ensure water pump speed is at or below specifications will result in reduced spray system component service life.

PUMP MODEL	RPM
M-3 PUMP	2350 ± 50
M-4 PUMP	1,900 ± 50
M-4B PUMP	2,000 ± 50

If water pump RPM is too out of the desired range, adjust the water pump hydraulic drive motor flow control valve to obtain specified RPM.

NOTE

The suction loading pump has a maximum vertical lift capability of 8-10 feet. Attempting to pump water into the tank from a reservoir that is more than 8-10 feet below the pump station will result in reduced suction loading performance.

SECTION 3

Limitations

SECTION 4

Normal Operations

Contents

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DESCRIPTION

This section provides the vehicle operator with step by step operating procedures for the installed MSC/MST system. The information is separated into before operations, operations, and after operations. A pocket size checklist of all listed procedures is also provided in the Appendix for use in the vehicle cab.

A pocket size Operator’s Checklist of all MSC/MST procedures is contained in the Appendix for use in the vehicle cab, and an Inspections Checklist is located at the end of this section.

NOTE

Place copies of both the Appendix Operator’s Checklist and the Section 4 Inspections Checklist within the cab for daily use.

BEFORE OPERATIONS

These procedures are used to perform a walk-around inspection of the MEGA water tanker system before use or the beginning of a shift. This inspection is in addition to and does not replace the vehicle manufacturer’s inspection requirements.

1. Chocks – As Required
2. Vehicle Parking Brake – ON
3. Cab Control Switches – SET OFF
4. Bumper Spray Heads – SECURED & SET
5. Vehicle Hydraulic Tank – SERVICED
6. Gooseneck Lines & Hoses – CHECKED & SECURED
7. Solenoid Control Box – CHECKED AND SECURED
8. Water Cannon – CHECKED & SECURED
 - a. Nozzle – Check for security and kinking of foam concentrate supply line.
9. **(If Equipped)** Foam Concentrate Level – at least 1” from the top of the foam tank.

WARNING

Ensure PPE fall arrest harness is worn, adjusted properly and attached to an anchor point. Failure to use PPE properly may result in personnel injury or death.

10. Tank Drain Petcocks – CLOSED
11. Spray Heads – SECURED & SET
12. Water Pump Assembly – CHECKED
 - a. Water Pump – Check to ensure volute case drain valve is closed.
 - b. Water pump and drive motor for evidence of overheating.
13. Hose Reel – CHECKED

OPERATIONS

Use these procedures to safely operate the standard and optional systems installed on the MEGA water tanker.

CAUTION

Limit water pump operation to 2.5 minutes when in a no-flow condition (not flowing water through spray heads, dump bar, water cannon, drain valve or hose reel). Water pump operation in a no flow condition will cause overheating of the water pump and damage to the shaft bearings and seals.

SPRAY HEAD SYSTEM

NOTE

Operating more than 4 spray heads simultaneously will greatly reduce the width and flow of active spray heads.

1. Cab Control SYSTEM/POWER Switch – ON
2. INTERMITTENT TIMER – SET
 - a. TIMER ON/OFF Dials – SET
 - b. INTERMITTENT Switch – SET
3. PUMP Switch – ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

SECTION 4

Normal Operations

- Individual Spray Heads – SELECTED

Once operations are complete:

- PUMP Switch – OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

- Cab Control SYSTEM/POWER Switch – OFF

GPS AUTO MODE

- Cab Control POWER Switch – ON
- PUMP Switch ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

- AUTO – SET AS REQUIRED
 - (**GEN 1.0**) RATE and SPEED Dials – SET
 - (**GEN 1.5**) F1 and F2 Dials – SET
 - AUTO Switch – ON

- Individual Spray Head Switches – ON

Once operations are complete:

- Individual Spray Head Switches – OFF
- PUMP Switch – OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

- Cab Control POWER Switch - OFF

DUMP BAR

- Cab Control SYSTEM/POWER Switch – ON
- INTERMITTENT – SET AS REQUIRED
 - TIMER ON/OFF Dials – SET
 - INTERMITTENT Switch – SET

- PUMP Switch – ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

- DUMP Bar Switch – ON

Once operations are complete:

- PUMP Switch – OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

- Cab Control SYSTEM/POWER Switch – OFF

WATER CANNON

- Cab Control SYSTEM/POWER Switch – ON
- PUMP Switch – ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

- Water Cannon – Pointed in a safe direction.
- MONITOR/BFV Switch – ON
- Water Cannon Joystick – As Required.
- MONITOR/BFV Switch – OFF

Once operations are complete:

- Water Cannon Nozzle - STOW

CAUTION

Manual and remote adjustable nozzles must be stowed pointing vertically to reduce wear on water cannon joints. Leaving the nozzle in any other position will cause increased wear on water cannon joints and result in premature joint failure.

SECTION 4

Normal Operations

8. PUMP Switch – OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

9. Cab Control SYSTEM/POWER Switch – OFF

FIRE SUPPRESSION SYSTEM

1. Cab Control SYSTEM/POWER Switch – ON

2. PUMP Switch – ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

3. Water Cannon – Pointed in a safe direction.
 4. FOAM Switch – ON
 5. MONITOR/BFV Switch – ON
 6. Water Cannon Joystick – As Required.

Once operations are complete:

7. FOAM Switch – OFF
 8. Water Cannon – Flow water through the water cannon nozzle with the FOAM switch off to flush foam from the nozzle.
 9. MONITOR/BFV Switch – OFF
 10. Water Cannon Nozzle – STOW

CAUTION

Manual and remote adjustable nozzles must be stowed pointing vertically to reduce wear on water cannon joints. Leaving the nozzle in any other position will cause increased wear on water cannon joints and result in premature joint failure.

11. PUMP Switch – OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

12. Cab Control SYSTEM/POWER Switch – OFF

13. Vehicle – Wash or fresh water rinse areas exposed to the foam spray.

TANK DRAIN

1. Cab Control SYSTEM/POWER Switch – ON

2. PUMP Switch – ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

3. DRAIN Switch – ON
 4. Water Level – Drain to desired level.

CAUTION

Do not operate the water pump in a dry sump. Dry running operation will cause water pump failure.

Once operations are complete:

5. DRAIN Switch – OFF
 6. PUMP Switch – OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

7. Cab Control SYSTEM/POWER Switch – OFF

HOSE REEL

1. Hose Nozzle – CLOSED
 2. Hose – Deploy desired length.
 3. Gate Valve – OPEN
 4. Cab Control SYSTEM/POWER Switch – ON

SECTION 4

Normal Operations

5. PUMP Switch – ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

6. Vehicle RPM – SET
7. Hose Nozzle – OPEN as desired.

Once operations are complete:

8. Hose Nozzle – CLOSE
9. Vehicle RPM – LOW IDLE
10. PUMP Switch – OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

11. (If Equipped) Cab Control SYSTEM/POWER Switch- OFF
12. Gate Valve – CLOSED
13. Hose – Reel in and stow hose nozzle.

SUCTION LOAD STATION

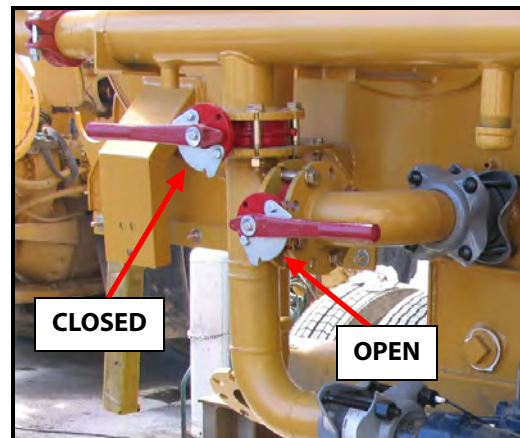
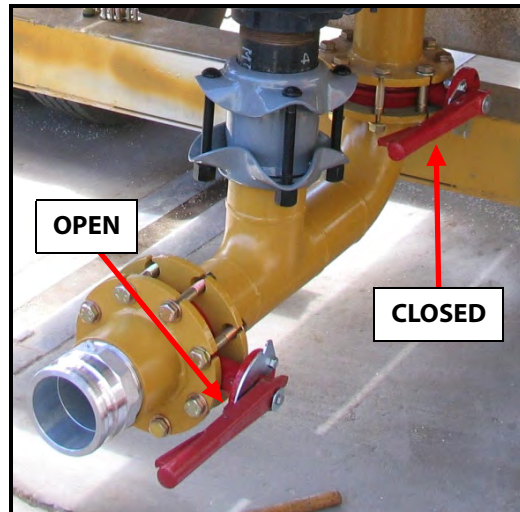
1. Place vehicle near water holding pond.
2. Secure vehicle and make unit safe for exiting cab.
3. Foot Valve – Serviceable
4. Suction Hoses – Inspect suction hoses for serviceability. Ensure suction hoses are connected properly to each other and the suction load inlet to prevent air leaks while in use.
5. Suction Hoses – Immerse in water supply.

NOTE

The suction loading pump has a maximum vertical lift capability of 8-10 feet. Attempting to pump water into the tank from a reservoir that is more than 8-10 feet below the pump station will result in reduced suction loading performance.

6. Position all butterfly valves as indicated in the following pictures and in the order as follows:

- a. SUMP VALVE - **CLOSE**
- b. SUCTION VALVE - **OPEN**
- c. SPRAY BAR VALVE - **CLOSE**
- d. TANK FILL VALVE - **OPEN**



NOTE

Opening and closing valves in this sequence allows the water in the suction loading sump built inside of the tank to flood the water pump and suction hose. This will allow water pump to lift water from pond.

7. Ensure water pump and suction hoses are full of water before operating pump.

CAUTION

Operating the water pump in a dry sump will result in shaft seal damage.

8. Ensure foot valve remains submerged in water.

SECTION 4

Normal Operations

9. Start chassis engine.
10. At LOW IDLE turn SYSTEM/POWER switch ON.
11. (DiSCS Only) AUX2 - ON
12. Turn PUMP Switch – ON
13. Increase engine RPM to HIGH IDLE.
14. Reduce engine RPM to LOW IDLE.
15. PUMP Switch – OFF
16. AUX2 - OFF
17. SYSTEM/POWER Switch OFF.
18. Turn engine OFF.
19. Disconnect, drain and stow suction hoses.
20. Gooseneck Hoses & Lines – CHECKED & SECURED
21. Solenoid Control Box – CHECKED
22. Water Cannon – CHECKED & SECURED
23. Vehicle Hydraulic Tank - CHECKED AS REQUIRED
24. Tank Drain Petcocks – As Required.
25. Tank Lines and Hoses – SECURED
26. Spray Heads – SECURED & SET
27. Water Pump – CHECKED
 - a. Water Pump – Check for damage and volute case drain valve set as required.
28. Hose Reel – CHECKED

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

16. AUX2 - OFF
17. SYSTEM/POWER Switch OFF.
18. Turn engine OFF.
19. Disconnect, drain and stow suction hoses.

AFTER OPERATIONS

These procedures are used to perform a walk-around inspection after using the MEGA water tanker systems. This inspection is in addition to and does not replace the vehicle manufacturer's inspection requirements.

1. Vehicle parking brake – ON
2. Cab Control Switches – SET OFF
3. Chocks – As Required
4. Bumper Spray Heads – SECURED & SET

COLD WEATHER OPERATION AND STORAGE

CAUTION

Ice will cause serious damage to water pump, spray heads, butterfly valves, water-to-oil cooler, and the water cannon if water is allowed to freeze in the volute case, water piping, or on top of a closed butterfly valve. Ensure **all water is drained** from system when the temperatures are expected to fall **below 4.4°C (40°F)** for any period of time. Failure to ensure all systems are drained and free from standing water will result in shaft, operator, diaphragm, drive motor, water pump, or butterfly valve damage when operation is attempted with ice in the housings.

To ensure all water is drained from tank check the following:

1. Park unit on a slight nose up angle to allow water to flow to the rear of the tank.
2. Drain the tank using an appropriate method until the Water Level Gauge reads EMPTY.
3. Open all drain petcocks (water pump, spray bars, etc.).
4. Remove water pump sump cover.

SECTION 4

Normal Operations

5. Start engine.
6. Cab Control SYSTEM/POWER Switch – ON
7. MONITOR/BFV Switch – ON
8. DUMP BAR Switch – ON
9. DRAIN Switch – ON
10. Water Cannon Nozzle – Pointed fully DOWN
11. Turn engine off.
12. Cab Control SYSTEM/POWER Switch – OFF
13. Hose Reel – DRAIN
 - a. Hose – UNWIND
 - b. Nozzle – Fully OPEN
 - c. Gate Valve – OPEN
 - d. Allow water to drain.
 - e. Hose – REWIND
 - f. Gate Valve – CLOSED
 - g. NOZZLE – CLOSED
14. Check to ensure all water has drained from tank.

TO REACTIVATE UNIT:

1. Lubricate water pump bearings as instructed in -2 technical manual.
2. Inspect tank interior to ensure it is clean, if the tank is coated, ensure coating integrity, clean or repair as required.
3. Install sump cover with new gasket.
4. Close all drain valves and petcocks.
5. Start engine.
6. Control SYSTEM/POWER Switch – ON
7. Individual Spray Head Switches – OFF
8. DUMP BAR Switch – OFF
9. DRAIN Switch – OFF

SECTION 4 Normal Operations

Place copies of this Inspections Checklist and the Appendix Operator's Checklist within the cab for daily use.

INSPECTIONS CHECKLIST

MACHINE # _____ **DATE:** _____

NAME: _____ **HOUR METER:** _____

Pre-Operations Inspection	OK	NOT	Comments and Corrective Action
SERVICE REQUIRED	<input type="checkbox"/>	<input type="checkbox"/>	
Foam Concentrate Level	<input type="checkbox"/>	<input type="checkbox"/>	
Water Cannon – Damage & Security	<input type="checkbox"/>	<input type="checkbox"/>	
Solenoid Control Box – Security	<input type="checkbox"/>	<input type="checkbox"/>	
MTT Front Mounts – Security	<input type="checkbox"/>	<input type="checkbox"/>	
Hydraulic Tank Fluid Levels	<input type="checkbox"/>	<input type="checkbox"/>	
Hydraulic Hoses and Cabling – Leaks and Security	<input type="checkbox"/>	<input type="checkbox"/>	
Chassis Pivot Bore Pins – Security	<input type="checkbox"/>	<input type="checkbox"/>	
Tank Drain Petcocks CLOSED	<input type="checkbox"/>	<input type="checkbox"/>	
Spray Heads – Damage, Security, Adjustments	<input type="checkbox"/>	<input type="checkbox"/>	
Water Pump Assembly – Damage and Security	<input type="checkbox"/>	<input type="checkbox"/>	
Hose Reel – Damage and Security	<input type="checkbox"/>	<input type="checkbox"/>	
After Operations Inspection	OK	NOT	Comments and Corrective Action
Water Cannon – Damage & Security	<input type="checkbox"/>	<input type="checkbox"/>	
Hydraulic Tank Fluid Levels	<input type="checkbox"/>	<input type="checkbox"/>	
Hydraulic Hoses and Cabling – Leaks and Security	<input type="checkbox"/>	<input type="checkbox"/>	
Tank Drain Petcocks CLOSED	<input type="checkbox"/>	<input type="checkbox"/>	
Spray Heads – Damage and Security	<input type="checkbox"/>	<input type="checkbox"/>	
Water Pump Assembly – Damage and Security	<input type="checkbox"/>	<input type="checkbox"/>	
Hose Reel – Damage and Security	<input type="checkbox"/>	<input type="checkbox"/>	

SECTION 4

Normal Operations

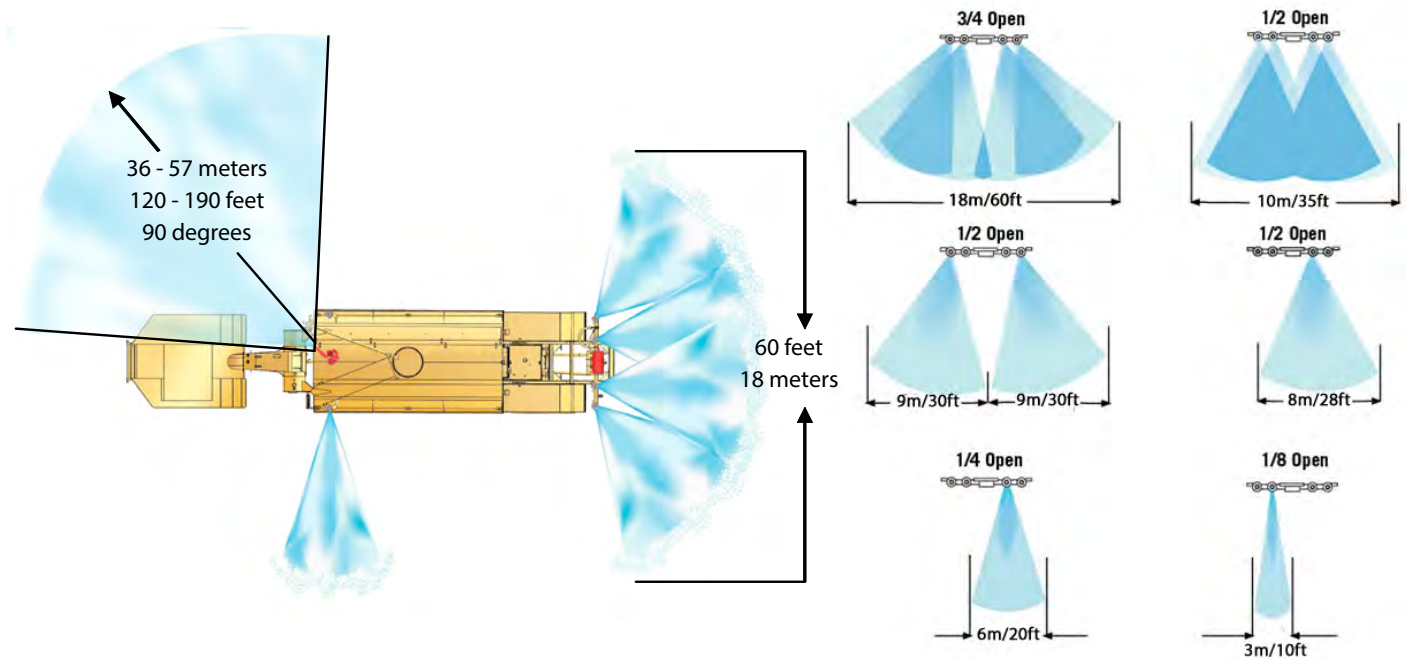
SECTION 5 Performance

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Typical Spray Distance	5-1	Fire Suppression System	5-6
Typical Spray Duration and Flow	5-2		

SPRAY PATTERN AND REACH (TYPICAL)

The figures below illustrate the typical width and reach of spray heads and water cannon. Typical spray head deflector fan adjustments are also depicted.



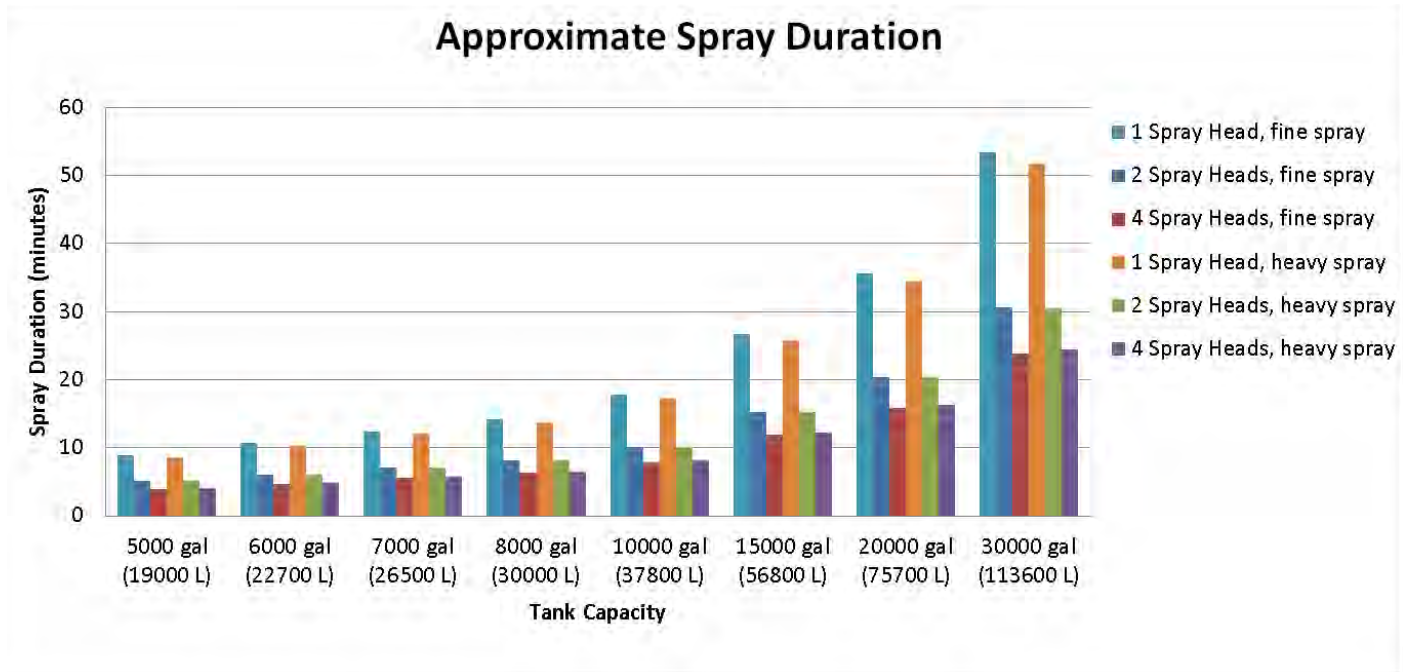
TYPICAL SPRAY DISTANCE

The table below contains a standard vehicle spray duration based on spray head deflector opening, vehicle speed and 18,927 liter (5,000 gallon) capacity.

Number of Spray Heads and Opening Width	LPM/GPM	Ground Speed (KPH/MPH)	Max. Distance (Km./Miles)
2 Spray Heads@ 1/4"	3611/954	16/10	2.4/1.5
2 Spray Heads@ 1/4"	3611/954	24/15	3.3/2.1
2 Spray Heads@ 3/8"	4705/1243	16/10	1.7/1.1
2 Spray Heads@ 3/8"	4705/1243	24/15	2.5/1.6
4 Spray heads @ 1/4"	5693/1504	16/10	1.4/0.9
4 Spray heads @ 1/4"	5693/1504	24/15	2.0/1.3
4 Spray heads @ 3/8"	5950/1572	16/10	1.2/0.8
4 Spray heads @ 3/8"	5950/1572	24/15	2.0/1.3

SECTION 5 Performance

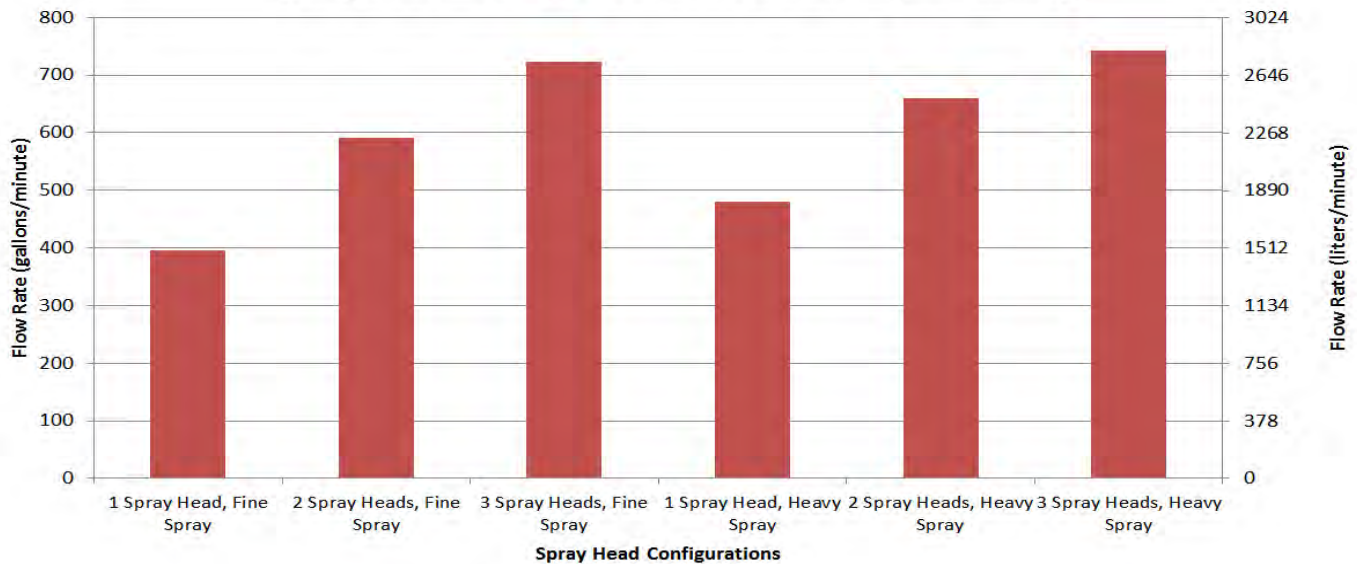
TYPICAL SPRAY DURATION AND FLOW DURATION



Estimated spray duration for various capacity tanks with four different spray head configurations. Spray duration in minutes is shown on the vertical axis. The 'fine' setting is 1/4 inches in height, and the 'heavy' setting is 3/8 inches in height. These flow rates were recorded on an MSC8 with an M-4 Pump.

FLOW RATES

Spray Head Configuration Flow Rates (M-3 Pump)



Total flow rates of different spray head configurations. The approximate total flow rates in gallons/minute (left vertical axis) and liters/minute (right vertical axis) of four possible spray head configurations. The 'fine' setting is 1/4 inches in height, and the 'heavy' setting is 3/8 inches in height. These flow rates were recorded on a MACHINE HERE with an PUMP TYPE HERE.

SECTION 5 Performance

PRECISION WATERING

The following tables provide precision watering calculations for the installed spray system. Each table is categorized by size of spray head deflector opening at a full fan width for 2 or 4 spray heads.

1/4 OPENING & FULL FAN (18,927 lit/5,000 gal TANK)

SPEED		2 SPRAY HEADS (FLOW 3611 lpm/954 gpm)				4 SPRAY HEADS (FLOW 5693 lpm/1504 gpm)				
		SPRAY DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	MAX DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	
		(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	
U S	2	176	1600	96000	0.052	0.084	880	52800	0.095	0.152
	5	440	4000	240000	0.021	0.033	2200	132000	0.038	0.061
	10	880	8000	480000	0.010	0.017	4400	264000	0.019	0.030
	15	1320	12000	720000	0.007	0.011	6600	396000	0.013	0.020
M E T R I C	KPM	MPM	(METER)	(M SQ)	(L/M SQ)	(MM)	(METERS)	(M SQ)	(M/M SQ)	(MM)
	3	53	675	12147	2.181	2.67	371	6679	3.968	4.65
	8	134	1706	30712	0.863	1.07	938	16885	1.569	1.84
	16	268	3412	61423	0.431	0.53	1876	33771	0.785	0.94
	24	402	5119	92135	0.288	0.35	2814	50656	0.523	0.61

3/8 OPENING & FULL FAN (18,927 lit/5,000 gal TANK)

SPEED		2 SPRAY HEADS (FLOW 4705 lpm/1243 gpm)				4 SPRAY HEADS (FLOW 5950 lpm/1572 gpm)				
		SPRAY DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	MAX DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	
		(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	
U S	2	176	1354	81231	0.062	0.099	880	57200	0.087	0.140
	5	440	3385	203077	0.025	0.039	2200	143000	0.035	0.056
	10	880	6769	406154	0.012	0.020	4400	286000	0.017	0.028
	15	1320	10154	609231	0.008	0.013	6600	429000	0.012	0.019
M E T R I C	KPM	MPM	(METER)	(M SQ)	(L/M SQ)	(MM)	(METERS)	(M SQ)	(M/M SQ)	(MM)
	3	53	571	10276	2.579	3.68	371	6679	3.968	5.59
	8	134	1443	25980	1.020	1.47	938	16885	1.569	2.23
	16	268	2887	51960	0.510	0.74	1876	33771	0.785	1.11
	24	402	4330	77940	0.340	0.48	2814	50656	0.523	0.74

SECTION 5 Performance

1/4 OPENING & FULL FAN (30,283 lit/8,000 gal TANK)

SPEED		2 SPRAY HEADS (FLOW 3611 lpm/954 gpm)				4 SPRAY HEADS (FLOW 5693 lpm/1504 gpm)				
		SPRAY DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	MAX DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	
		(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	
MPH	FPM									
U S	2	176	1476	122499	0.065	0.105	936	70213	0.114	0.183
	5	440	3690	306247	0.026	0.042	2340	175532	0.046	0.073
	10	880	7379	612495	0.013	0.021	4681	351064	0.023	0.037
	15	1320	11069	918742	0.009	0.014	7021	526596	0.015	0.024
M E T R I C	KPM	MPM	(METER)	(M SQ)	(L/M SQ)	(MM)	(METERS)	(M SQ)	(M/M SQ)	(MM)
	3	53	444	11112	2.725	2.67	282	6484	4.670	4.65
	8	134	1124	28094	1.078	1.07	713	16394	1.847	1.84
	16	268	2248	56188	0.539	0.53	1426	32788	0.924	0.94
	24	402	3371	84283	0.359	0.35	2138	49183	0.616	0.61

3/8 OPENING & FULL FAN (30,283 lit/8,000 gal TANK)

SPEED		2 SPRAY HEADS (FLOW 4705 lpm/1243 gpm)				4 SPRAY HEADS (FLOW 5950 lpm/1572 gpm)				
		SPRAY DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	MAX DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	
		(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	
MPH	FPM									
U S	2	176	1133	88354	0.091	0.145	896	58219	0.137	0.220
	5	440	2832	220885	0.036	0.058	2239	145547	0.055	0.088
	10	880	5664	441770	0.018	0.029	4478	291094	0.027	0.044
	15	1320	8496	662655	0.012	0.019	6718	436641	0.018	0.029
M E T R I C	KPM	MPM	(METER)	(M SQ)	(L/M SQ)	(MM)	(METERS)	(M SQ)	(M/M SQ)	(MM)
	3	53	341	8187	3.699	3.68	270	5395	5.613	5.59
	8	134	862	20699	1.463	1.47	682	13640	2.220	2.23
	16	268	1725	41399	0.731	0.74	1364	27280	1.110	1.11
	24	402	2587	62098	0.488	0.48	2046	40920	0.740	0.74

SECTION 5 Performance

1/4 OPENING & FULL FAN (37,854 lit/10,000 gal TANK)

SPEED		2 SPRAY HEADS (FLOW 3611 lpm/954 gpm)				4 SPRAY HEADS (FLOW 5693 lpm/1504 gpm)				
		SPRAY DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	MAX DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	
		(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	
MPH	FPM									
U S	2	176	1845	153124	0.065	0.105	1170	87766	0.114	0.183
	5	440	4612	382809	0.026	0.042	2926	219415	0.046	0.073
	10	880	9224	765618	0.013	0.021	5851	438830	0.023	0.037
	15	1320	13836	1148428	0.009	0.014	8777	658245	0.015	0.024
M E T R I C	KPM	MPM	(METER)	(M SQ)	(L/M SQ)	(MM)	(METERS)	(M SQ)	(M/M SQ)	(MM)
	3	53	556	13890	2.725	2.67	352	8105	4.670	4.65
	8	134	1405	35118	1.078	1.07	891	20493	1.847	1.84
	16	268	2809	70236	0.539	0.53	1782	40986	0.924	0.94
	24	402	4214	105354	0.359	0.35	2673	61479	0.616	0.61

3/8 OPENING & FULL FAN (37,854 lit/10,000 gal TANK)

SPEED		2 SPRAY HEADS (FLOW 4705 lpm/1243 gpm)				4 SPRAY HEADS (FLOW 5950 lpm/1572 gpm)				
		SPRAY DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	MAX DISTANCE	TOTAL COVERAGE	DISPERSAL	WATER LAYER	
		(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	(FT)	(SQ FT)	(GAL/SQ FT)	(IN/SQ FT)	
MPH	FPM									
U S	2	176	1416	110442	0.091	0.145	1120	72774	0.137	0.220
	5	440	3540	276106	0.036	0.058	2799	181934	0.055	0.088
	10	880	7080	552212	0.018	0.029	5598	363868	0.027	0.044
	15	1320	10619	828319	0.012	0.019	8397	545802	0.018	0.029
M E T R I C	KPM	MPM	(METER)	(M SQ)	(L/M SQ)	(MM)	(METERS)	(M SQ)	(M/M SQ)	(MM)
	3	53	426	10234	3.699	3.68	337	6744	5.613	5.59
	8	134	1078	25874	1.463	1.47	853	17050	2.220	2.23
	16	268	2156	51749	0.731	0.74	1705	34100	1.110	1.11
	24	402	3234	77623	0.488	0.48	2558	51151	0.740	0.74

SECTION 5

Performance

FIRE SUPPRESSION SYSTEM

The table below shows consumption rates and duration of foam suppression concentrate and water based upon a standard flow rate 1893 lpm/500 gpm and 3% foam proportioning.

Foam Concentrate liters/gallons	Water liters/gallons	Duration
57/15	1893/500	1 minute
114/30	3786/1000	2 minutes
228/60	7571/2000	4 minutes
341/90	11,357/3000	6 minutes
455/120	15,142/4000	8 minutes

SECTION 6 Employment

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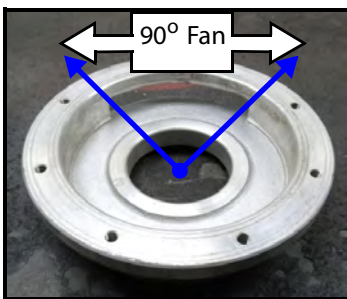
Description	6-1	GPS Ground Speed Sensing	6-6
Spray Heads	6-1	Tank Drain.....	6-6
Dust Suppression	6-4	Dump Bar.....	6-7
Intermittent Spray.....	6-4	Water Cannon	6-7
Troubleshooting	6-5	Fire Suppression System	6-8

DESCRIPTION

This section provides descriptions, guidance, and techniques used when employing the MEGA spray system features. These best practices will provide operators with several different choices that will result in maximum system performance in most applications with ever changing conditions.

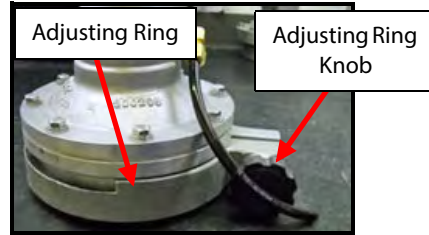
SPRAY HEADS

Spray head adjustment and fine tuning techniques are key factors in optimizing water distribution and preventing over-watering of roadways. The MEGA spray heads are mounted to base plate assemblies connected to the water discharge piping. MEGA spray heads can be rotated on the base plate to direct the discharge fan in the necessary directions for optimum spray pattern. The spray heads incorporate an adjustable ring to control the spray intensity and fan width. The opening in the base of the MEGA spray head will allow for approximately a 90° maximum fan width as illustrated below.



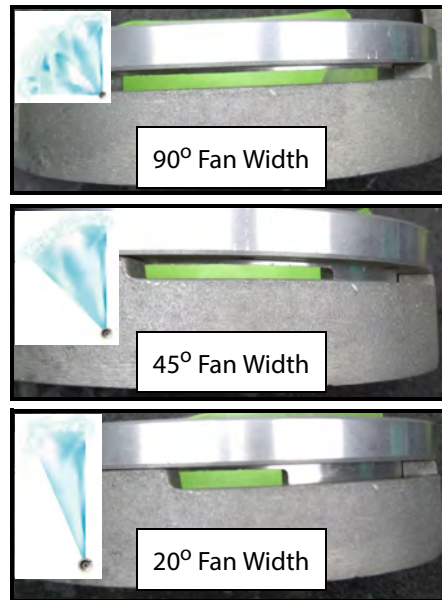
FAN WIDTH AND SPRAY INTENSITY ADJUSTMENT

The spray head adjusting ring is used to control the fan width and spray intensity to match most applications. These settings can be changed by first loosening the adjusting ring knob and then rotating the adjusting ring to the desired position.



The following images are examples of the adjustment ring at the “fine spray” setting with varying fan widths.

Fine Spray (1/4" Slot Height)



The “fine spray” setting is typically used for reduced water volumes and a larger pattern, and is best suited for lower vehicle speeds and low water pump rpm.

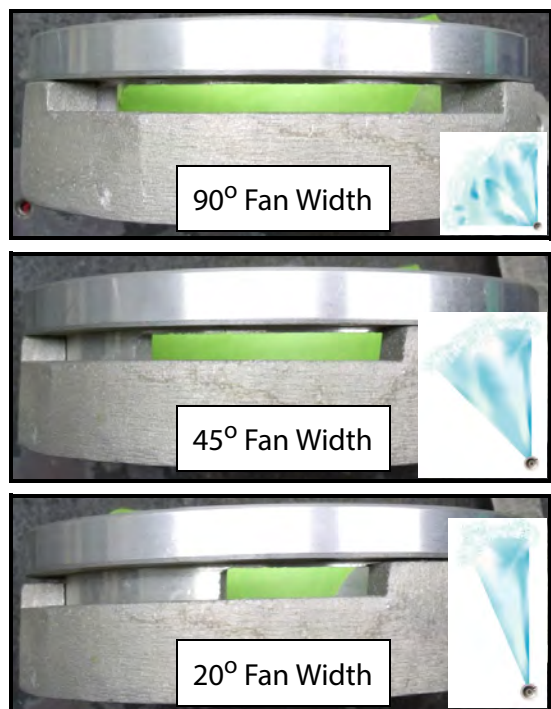
NOTE

- Adjusting the ring for narrower fan widths will increase the length of the spray pattern; this may also increase the closure delay of the spray head.
- The “fine spray” setting produces smaller water droplets ideal for low wind and high humidity conditions.

SECTION 6 Employment

The following images are examples of the adjustment ring at the “heavy spray” setting with varying fan widths

Heavy Spray (3/8" Slot Height)



The “heavy spray” setting is typically used for heavy watering and discharging large quantities of water a short distance from spray head, and is best suited for higher vehicle speeds and high engine rpm.

NOTE

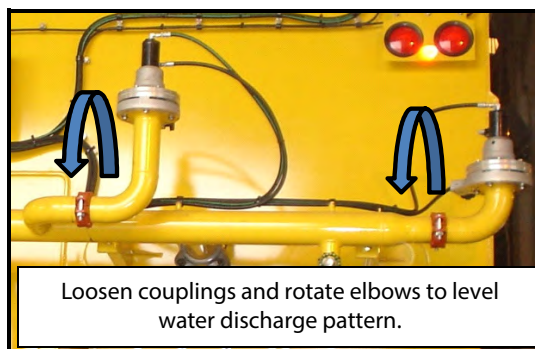
- When the spray head is set for “heavy spray”, water pressure is decreased and the reach of the discharge is reduced.
- The heavy spray setting produces larger water droplets ideal for high wind and low humidity conditions.
- When more than 2 spray heads are operated at the same time, the performance of the spray system is reduced.

SPRAY HEAD VERTICAL TILT ADJUSTMENT

Swivel joints are an optional feature for spray head mounting. The joint allows the spray head to be tilted up or down to suit a given application. In their default positions, the spray heads discharge water at an angle of 10° above level. This results in more uniform droplet formation and subsequent water

coverage. However, in drier climates or high wind conditions where evaporation is a significant source of water loss, it may be desirable to adjust the tilt of the spray heads towards the ground, thus reducing the amount of water lost to the effects of wind and low humidity.

To adjust the vertical tilt of spray heads, loosen the elbow couplings and adjust the swivel elbows (as shown below) down to the desired angle.



NOTE

Angling the spray heads down is typically used for high wind conditions and narrow watering strips.

SPRAY HEAD FAN PATTERN

Proper employment of the spray system includes spray head adjustments to best suit the desired application. ‘Best practices’ are adjustments to the procedures that address the situation more accurately. Every application has specific conditions that must be addressed, such as safety, wind and weather conditions, terrain, traffic, traction, and proximity to sensitive equipment and personnel.

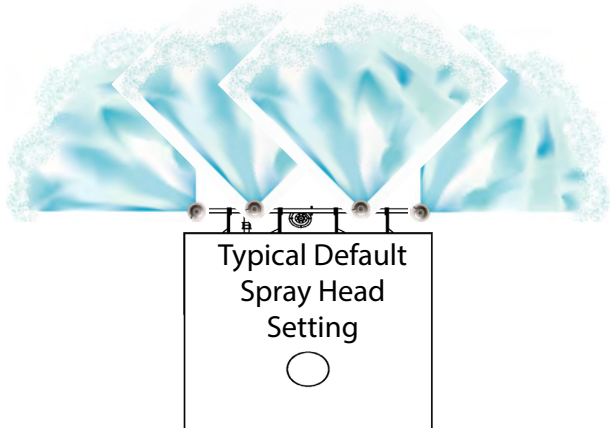
Steps for accurate spray system employment are as follows:

1. Select spray head fan height to meet road and watering pattern requirements.
2. Set spray head adjusting ring to the maximum fan width.
3. Evaluate road conditions for width, grade, vehicle traffic and optimum travel speed.
4. Locate an isolated section of road to test spray pattern.
5. Follow Operator’s Manual steps for water pump activation and spray head operation.

SECTION 6

Employment

6. Operate water truck and turn all spray heads ON. Ensure uniform water distribution and coverage.



7. Apply a test pattern by operating 1 spray head at a time on road surface traveling at a safe and average speed until all spray heads have been cycled. Note engine rpm while discharging water.

NOTE

- Water discharge pressure and volume are dependent on engine rpm. The higher the engine rpm, the higher the water pressure. Adjustments to vehicle speed, engine rpm, and spray head angle may be required.
- Adjusting the vehicle gear shift selector may be required in order to obtain the engine rpm necessary for the desired water pump performance level.

8. Observe applied watering pattern. Adjust spray head discharge angle, and fan opening height and width to suit 'best practices' for the haul road application.

NOTE

During initial spray pattern testing, observe spray head closure delay. Delayed spray head closure is caused by the mechanical limitations of the hydraulic spray system. These noted delays will be helpful in predicting the actual closure rate of the spray heads when adjusting the spray pattern for oncoming traffic, obstacles and setting up strip watering or scotching patterns either manually or if equipped with the intermittent spray timer.

VERTICAL SIDE SPRAY HEADS



Vertical side spray heads are typically located on the front or rear of the top skin of the water tank. The discharge opening is vertical to the tank and sprays to the side. Vertical side spray heads can be employed for applying water to high walls, reaching over berms, or watering opposing traffic lanes. Vertical side spray heads can be controlled using the intermittent function.

WARNING

Vertical side spray is not recommended for use when high winds are present. Due to the spray head locations on the top of the water tank, the wind will unevenly distribute the water and may carry the water where it obstructs the view from the operator's position, potentially impairing visibility and thereby creating dangerous operating conditions.



FRONT BUMPER SPRAY HEADS

Front bumper spray heads are used and adjusted like any other spray head for haul road and berm operations. Spray heads mounted to a swiveling coupling allow the fan pattern to be pointed down towards the road and perform as a street sweeper. This same configuration is very effective when water patterns are needed to penetrate the ground surface for compaction operations.

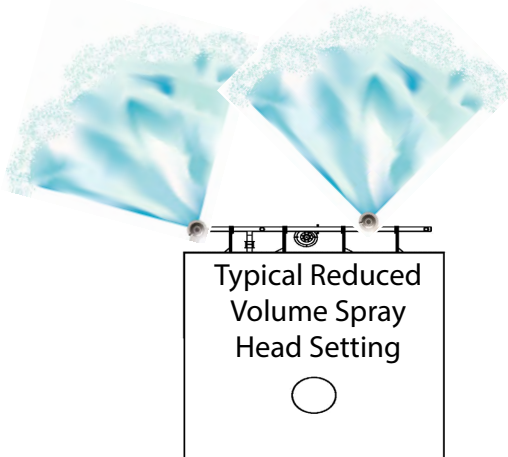
SECTION 6 Employment

DUST SUPPRESSION

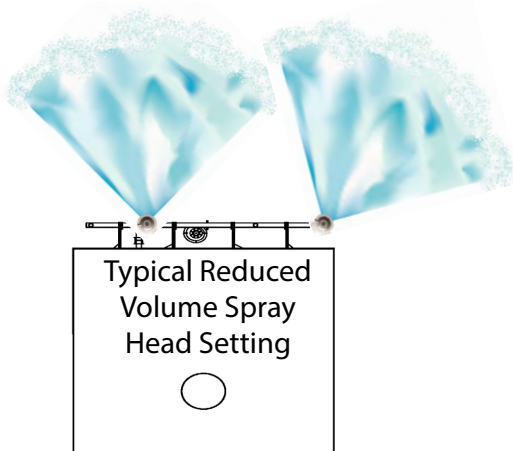
For dust suppression it is recommended that a light coating of water be applied to the road surface. This can be achieved by monitoring and adjusting the engine rpm and vehicle speed with properly adjusted spray heads that allow an even coating of water to fall onto the road surface. Typically 1 or 2 spray heads are employed for this application.

Examples for light water distribution:

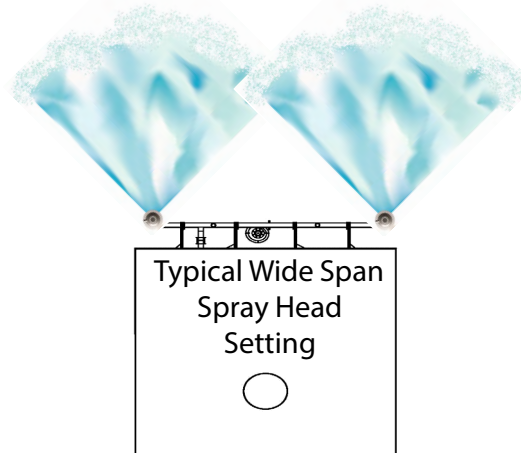
Adjusting Ring Opening - FULL WIDTH, FINE SPRAY
Right Rear Spray Head - ON
Right Center Spray Head - OFF
Left Center Spray Head - ON
Left Rear Spray Head - OFF



Adjusting Ring Opening – FULL WIDTH, FINE SPRAY
Right Rear Spray Head – OFF
Right Center Spray Head – ON
Left Center Spray Head – OFF
Left Rear Spray Head – ON



Adjusting Ring Opening - FULL WIDTH, FINE SPRAY
Right Rear Spray Head - ON
Right Center Spray Head - OFF
Left Center Spray Head - OFF
Left Rear Spray Head - ON



INTERMITTENT SPRAY

Intermittent spray is a time based function. Individual controls knobs set the ON and OFF time of the spray heads based on the desired length of time needed to apply wet/dry strips on the road. The standard MEGA spray system with intermittent spray has a timer range of 5 to 100 seconds. The DiSCS spray system intermittent spray has a timer range of 3 to 30 seconds.

Intermittent spray control is best suited for light watering and pit ramps, where it is desired to have definite wet and dry sections of road, and where additional driver attention to road conditions is required. This wet and dry strip watering provides for better traction, allowing haul trucks and other vehicles to drag water down the haul road while also increasing water truck duration between tank refills.

NOTE

Due to the mechanical limitations of the spray system, the timer control range refers to the requests to open and close the spray head; delays in closure may be experienced.

1. Ensure tank is full of water.
2. Adjust spray head openings to desired settings.

SECTION 6

Employment

3. Turn SYSTEM/POWER switch ON.
4. Set intermittent timer knobs to desired time of spray pattern.
5. Turn INTERMITTENT switch ON.
6. Turn PUMP switch ON.

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced Service life.

7. Select spray heads required for desired road condition.
8. Operate water tanker on desired route and observe spray pattern.
9. Adjust timing as desired to create the necessary wet/dry strips.

NOTE

While in intermittent mode all discharge functions can be turned OFF by turning off the corresponding function switch. If the function is turned ON while the timer is in the OFF cycle, the function will stay OFF until the next ON cycle. The illustrations below are examples of strip watering:



TROUBLESHOOTING

If the following conditions occur, adjust as follows and re-test spray patterns until the optimal pattern is achieved.

Discharge spray extends to and beyond berms or into oncoming traffic.

1. Adjust spray head width toward center of truck by loosening the 4 retaining bolts on the bottom of the spray heads and rotating the spray head on the base plate to the desired position.
2. Re-tighten spray head retaining bolts.

Insufficient water on roadway.

1. Increase engine rpm by shifting to a lower gear.
2. Increase the number of spray heads activated.
3. Reduce vehicle speed.
4. Increase the spray intensity by rotating the adjusting ring to the "heavy spray" setting (3/4" slot height).

Excess water on roadway.

1. Decrease engine rpm by selecting a higher gear.
2. Increase vehicle travel speed.
3. Reduce the number of spray heads activated.
4. Reduce the spray intensity by rotating the adjusting ring to the "fine spray" setting (1/4" slot height).

SECTION 6 Employment

GPS GROUND SPEED SENSING

The resident software provides a consistent layer of water on haul roads regardless of ground speed. The software minimizes water usage and prevents puddling at stops and haul ramps. Nominal settings produce about 3 liters per cubic meter regardless of ground speed. This maximizes water usage and extends the duration of a given load of water. Adjustments are provided to increase or decrease the layer of water dispersed, as well as setting maximum water flow at a desired ground speed. All automatic system protection features are active regardless of auto or manual modes. Below are several examples of initial system setup and adjustments:

EXAMPLE 1 (Medium Speed & High Winds)

Setup:

1. **RATE** - Set at midpoint (50%)
2. **SPEED** - Set at mid-point (approximately 24 KPH/15 MPH)
3. **AUTO** – ON
4. **Spray heads** - Select all 4 spray heads
5. **Vehicle speed** – Less than 21 KPH/14 MPH

Observed Operation:

1. 2 Outer spray heads on with a timed cycle, **shortened** ON cycle durations
2. 2 Center spray heads OFF (reduced volume)

EXAMPLE 2 (High Speed & Low Winds)

Setup:

1. **RATE** - Set at midpoint (50%)
2. **SPEED** - Set at mid-point (approximately 24 KPH/15 MPH)
3. **AUTO** – ON
4. **Spray heads** - Select all 4 spray heads
5. **Vehicle speed** – Greater than 27 KPH/16 MPH

Observed Operation:

1. All 4 requested spray heads ON, NO timed cycle

EXAMPLE 3 (Medium Speed & Low Winds)

Setup:

1. **RATE** - Set LESS than midpoint ($\leq 50\%$)
2. **SPEED** - Set at mid-point (approximately 24 KPH/15 MPH)
3. **AUTO** – ON
4. **Spray heads** - Select all 4 spray heads
5. **Vehicle speed** – Less than 21 KPH/14 MPH

Observed Operation:

1. 2 Outer spray heads on with a timed cycle, **shortened** ON cycle durations
2. 2 Center spray heads OFF (reduced volume)

EXAMPLE 4 (High Speed & High Winds)

Setup:

1. **RATE** - Set at GREATER than midpoint ($\geq 50\%$)
2. **SPEED** - Set at mid-point (approximately 24 KPH/15 MPH)
3. **AUTO** – ON
4. **Spray heads** - Select all 4 spray heads
5. **Vehicle speed** – Less than 21 KPH/14 MPH

Observed Operation:

1. 2 Outer spray heads on with a timed cycle, **increased** ON cycle durations
2. 2 Center spray heads OFF (reduced volume)

TANK DRAIN



Remote or manually operated drain valves are typically used to drain water from the tank after daily operations or when the water tank is prepared for maintenance. Gravity or pressure tank drains are also employed very successfully in water haulage or supply operations. Pressurized drains systems work very well when performing bulk water haulage from a main supply site to remote fill sites or established holding ponds. This pressurized system is also very effective in providing water for drilling and fire suppression operations.

SECTION 6

Employment

DUMP BAR



The dump bar application is for laying a heavy defined pattern of water directly onto the roadway. This application can be used for increasing the moisture content of road beds for compaction, confined areas for which the use of the spray heads is not desired, narrow haul roads where discharge beyond the side of the tanker is not required, confined application in high wind conditions, and preparation of roadways for grader applications. The dump bar function is capable of being operated in the intermittent mode.

The pressure dump bar is designed to force water into the upper layer of the road. The pressure feature is also useful for high wind conditions at high ground speeds.

CAUTION

If the dump bar is activated (pressure or gravity) and the water tanker has stopped, damage to the road surface can occur. Ensure that the dump bar is OFF when coming to a stop to prevent road surface damage. Physical and mechanical delays will occur when turning the dump bar OFF.

NOTE

The gravity dump bar can also be used as a tank drain.

WATER CANNON



The water cannon system is a very versatile for many different mining and construction applications. The straight bore nozzles work very well in producing a straight stream of water able to reach out at long distances. The water cannon will obtain maximum reach when the nozzle is at about 32 degrees of elevation with the chassis RPM at high idle. Reach can further be increased with the addition of in-line stream shaper when extreme reach is required for "high wall" or "stockpile" operations.

The water cannon system is also very useful for "wash down" operations. The system is best suited for wash down when configured with a remote adjustable "stream to fan/fog" nozzle. The operator can adjust the fan or stream pattern as needed while directing the stream or fan towards the components for wash down. The operator may also control water flow and pressure by simply increasing or decreasing the chassis RPM to obtain desired water flow and pressure.

CAUTION

Do not point straight streams directly at cab windows, exhausts or sensitive components. Damage can be caused when water cannon is flowing at maximum flow and pressure.

SECTION 6

Employment

FIRE SUPPRESSION SYSTEM



The fire suppression operations are never typical and the environment is ever changing. Operators must always be aware of the type of fire they are suppressing, wind conditions, the potential hazards surrounding the fire, the potential heat generated by the fire and the duration of the fire suppression system.

General guideline for fire suppression operations are:

1. Have a basic understanding of the different classes of fires (A, B, C, and D) and how to extinguish them.
2. Be familiar with site specific standard operating procedures for fire suppression.
3. Understand basic fire suppression techniques for applying foam blankets (rain-down, and bounce-up).
4. Ensure fire suppression holding tank is full, system components are serviceable and the entire system is operational before employing the system for an actual fire.
5. Obtain Situational Awareness of the site:
 - a. On scene commander and establish communication.
 - b. People and equipment involved in the fire.
 - c. Duration of the fire suppression system.
 - d. Wind direction at the site.
 - e. Hazards and restrictions at the site.
 - f. Emergency Support people and equipment.

6. Head to the site and perform operational check of the fire suppression system.
7. Activate the water pump.
8. Approach the site from a safe direction based on observed winds and know hazards.
9. Activate the fire suppression system as contained in Section 2 "Normal Operations".
10. Lay down an initial foam protective blanket as required.
11. Maintain a foam protective blanket as required or as duration allows.
12. Always be aware of hazards, wind conditions and remaining fire suppression duration.
13. Once fire suppression is completed, secure system as contained in Section 2 "Normal Operations".
14. Ensure water truck is completely washed down after fire suppression operations.

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Appendix

IN-CAB INSTRUCTIONAL DECALS

FOAM LOCK (DiSCS Gen 1.5 Only)

Cut out the decal below and place in the cab wherever is most convenient for the operator.

In order to activate FOAM:

1. Press and hold the FOAM LOCK switch.
2. While still holding the FOAM LOCK switch, press the FOAM switch ON.
3. Hold both switches in the ON position for 1 second and then release.



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Place copies of this Operator's Checklist and the Inspections Checklist at the end of Section 4 in the cab.

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MSC/MST OPERATOR'S CHECKLIST

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BEFORE OPERATIONS

These procedures are used to perform a walk-around inspection of the MEGA water tanker system before use or beginning of a shift. This inspection is in addition to and does not replace the vehicle manufacturer's inspection requirements.

1. Chocks – As Required
2. Vehicle Parking Brake – ON
3. Cab Control Switches – SET OFF
4. Bumper Sprayheads – SECURED & SET
5. Vehicle Hydraulic Tank – SERVICED
6. Gooseneck Lines & Hoses – CHECKED & SECURED
7. Solenoid Control Box – CHECKED AND SECURED
8. Water Cannon – CHECKED & SECURED
 - a. Nozzle – Check for security and kinking of foam concentrate supply line.

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9. (If Equipped) Foam Concentrate Level – CHECKED. At least 1” from the top of the foam tank.

 **WARNING**

Ensure PPE fall arrest harness is worn, adjusted properly and attached to an anchor point. Failure to use PPE properly may result in personnel injury or death.

10. Tank Drain Petcocks – CLOSED
11. Spray Heads – SECURED & SET
12. Water Pump Assembly – CHECKED
 - a. Water Pump – Check to ensure volute case drain valve is closed.
 - b. Water pump and drive motor for evidence of overheating.
13. Hose Reel – CHECKED

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MSC/MST-OPS(CL)-1**28 Sept 2015****OPERATIONS**

Use these procedures to safely operate the standard and optional systems installed on the MEGA water tanker.

CAUTION

Limit water pump operation to 2.5 minutes when in a no-flow condition (no flow from spray heads, dump bar, water cannon, drain valve or hose reel). Water pump operation in a no flow condition will cause overheating of the water pump and damage to the shaft bearings.

SPRAY HEAD SYSTEM**NOTE**

Operating more than 4 spray heads simultaneously will greatly reduce the width and flow of active spray heads.

1. Cab Control SYSTEM/POWER Switch – ON
2. INTERMITTENT – SET AS REQUIRED
 - a. TIMER ON/OFF Dials – SET
 - b. INTERMITTENT Switch – SET

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3. PUMP Switch – ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

4. Individual Spray Head Switches – ON

Once operations are complete:

5. Individual Spray Head Switches – OFF

6. PUMP Switch – OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

7. Cab Control SYSTEM/POWER Switch – OFF

GPS AUTO MODE

1. Cab Control POWER Switch – ON

2. RATE and SPEED Dials - SET

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3. AUTO – ON AS REQUIRED
4. Desired Spray Head Switches – ON
5. PUMP Switch ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

Once operations are complete:

6. PUMP Switch OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

7. AUTO – OFF
8. Individual Spray Head Switches – OFF
9. Cab Control POWER Switch - OFF

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DUMP BAR

1. Cab Control SYSTEM/POWER Switch – ON
2. INTERMITTENT – SET AS REQUIRED
 - a. Timer ON/OFF Dials – SET
 - b. INTERMITTENT Switch – SET
3. PUMP Switch ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

4. DUMP BAR Switch – ON

Once operations are complete:

5. DUMP BAR Switch – OFF
6. PUMP Switch OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

7. Cab Control SYSTEM/POWER Switch – OFF

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WATER CANNON

1. Cab Control SYSTEM/POWER Switch – ON
2. PUMP Switch ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

3. Water Cannon – Pointed in a safe direction.
4. MONITOR/BFV Switch – ON
5. Water Cannon Joystick – As Required.
6. MONITOR/BFV Switch – OFF

Once operations are complete:

7. Water Cannon Nozzle - STOW

CAUTION

Manual and remote adjustable nozzles must be stowed pointing vertically to reduce wear on water cannon joints. Leaving the nozzle in any other position will cause increased wear on water cannon joints and result in premature joint failure.

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8. PUMP Switch OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

9. Cab Control SYSTEM/POWER Switch – OFF

FIRE SUPPRESSION SYSTEM

1. Cab Control SYSTEM/POWER Switch – ON

2. PUMP Switch ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

3. Water Cannon – Pointed in a safe direction.

4. FOAM Switch – ON

5. MONITOR/BFV Switch – ON

6. Water Cannon Joystick – As Required.

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Once operations are complete:

7. FOAM Switch – OFF
8. Water Cannon – Flow water through the water cannon nozzle with the FOAM switch off to flush foam from the nozzle.
9. MONITOR/BFV Switch – OFF
10. Water Cannon Nozzle - STOW

CAUTION

Manual and remote adjustable nozzles must be stowed pointing vertically to reduce wear on water cannon joints. Leaving the nozzle in any other position will cause increased wear on water cannon joints and result in premature joint failure.

11. PUMP Switch OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

12. Cab Control SYSTEM/POWER Switch – OFF

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13. Vehicle – Wash or fresh water rinse areas exposed to the foam spray.

TANK DRAIN

1. Cab Control SYSTEM/POWER Switch – ON
2. PUMP Switch ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

3. DRAIN Switch – ON
4. Water Level – Drain to desired level.

CAUTION

Do not operate the water pump in a dry sump. Dry running operation will cause water pump failure.

Once operations are complete:

5. DRAIN Switch – OFF

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6. PUMP Switch OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

7. Cab Control SYSTEM/POWER Switch – OFF

HOSE REEL

1. Hose Nozzle – CLOSED
2. Hose – Deploy desired length.
3. Gate Valve – OPEN
4. Cab Control SYSTEM/POWER Switch – ON
5. PUMP Switch ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

6. Vehicle RPM – SET
7. Hose Nozzle – OPEN as desired.

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Once operations are complete:

8. Hose Nozzle – CLOSED
9. Vehicle RPM – LOW IDLE
10. PUMP Switch OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

11. Cab Control SYSTEM/POWER Switch – OFF
12. Gate Valve – CLOSED
13. Hose – Reel in and stow hose nozzle.

SUCTION LOAD STATION

1. Place vehicle near water holding pond.
2. Secure vehicle and make unit safe for exiting cab.
3. Foot Valve – Serviceable

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4. Suction Hoses – Inspect suction hoses for serviceability. Ensure suction hoses are connected properly to each other and the suction load inlet to prevent air leaks while in use.
5. Suction Hoses – Immerse in pond or water supply.
6. Position all butterfly valves as indicated in the following pictures and in the order as follows:
 - a. SUMP VALVE - **CLOSED**
 - b. SUCTION VALVE - **OPEN**
 - c. SPRAY BAR VALVE - **CLOSED**
 - d. TANK FILL VALVE - **OPEN**
7. Ensure water pump and suction hoses are full of water before operating pump.

CAUTION

Operating the water pump in a dry sump will result in shaft seal damage.

8. Ensure foot valve remains submerged in water.
9. Start chassis engine.
10. At LOW IDLE turn SYSTEM/POWER switch ON.

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11. (DiSCS Only) AUX2 - ON

12. PUMP Switch ON

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

13. Increase engine RPM to HIGH IDLE.

When unit is full of water

14. Reduce engine RPM to LOW IDLE.

15. PUMP Switch OFF

CAUTION

Engaging/disengaging the water pump above LOW IDLE may result in water pump component damage and reduced service life.

16. AUX2 - OFF

17. SYSTEM/POWER Switch OFF.

18. Turn engine OFF.

19. Disconnect, drain and stow suction hoses.

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AFTER OPERATIONS

These procedures are used to perform a walk-around inspection after using the MEGA water tanker systems. This inspection is in addition to and does not replace the vehicle manufacturer's inspection requirements.

1. Vehicle parking brake – ON
2. Cab Control Switches – SET OFF
3. Chocks – As Required.
4. Water Cannon – CHECKED AND SECURED
5. Vehicle Hydraulic Tank – CHECKED
6. Tank Lines and Hoses – SECURED
7. Tank Drain Petcocks – As Required.
8. Spray Heads – SECURED AND SET
9. Water Pump Assembly – Check for damage and volute case drain valve set as required.
10. Hose Reel – CHECKED
11. Solenoid Control Box – CHECKED

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COLD WEATHER OPERATION AND STORAGE

CAUTION

Ice will cause serious damage to water pump, spray heads, butterfly valves, water-to-oil cooler, and the water cannon if water is allowed to freeze in the volute case, water piping, or on top of a closed butterfly valve. Ensure **all water is drained** from system when the temperatures are expected to fall **below 4.4°C (40°F)** for any period of time. Failure to ensure all systems are drained and free from standing water will result in shaft, operator, diaphragm, drive motor, water pump, or butterfly valve damage when operation is attempted with ice in the housings.

To ensure all water is drained from tank check the following;

1. Park unit on a slight nose up angle to allow water to flow to the rear of the tank.
2. Drain the tank using an appropriate method until the Water Level Gauge reads EMPTY.
3. Open all drain petcocks (water pump, spray bars, etc.).
4. Remove water pump sump cover.

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5. Start engine.
6. Cab Control SYSTEM/POWER Switch – ON
7. MONITOR/BFV Switch – ON
8. DUMP BAR Switch – ON
9. DRAIN Switch – ON
10. Water Cannon Nozzle – Pointed fully DOWN
11. Turn engine off.
12. Cab Control SYSTEM/POWER Switch – OFF
13. Hose Reel – DRAIN
 - a. Hose – UNWIND
 - b. Nozzle – Fully OPEN
 - c. Gate Valve – OPEN
 - d. Allow water to drain.
 - e. Hose – REWIND
 - f. Gate Valve – CLOSED
 - g. NOZZLE – CLOSED
14. Check to ensure all water has drained from tank.

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TO REACTIVATE UNIT:

1. Lubricate water pump bearings as instructed in the Maintenance (-2) technical manual.
2. Inspect tank interior to ensure it is clean, if the tank is coated, ensure coating integrity, clean or repair as required.
3. Install sump cover with new gasket.
4. Close all drain valves and petcocks.
5. Start engine.
6. Control SYSTEM/POWER Switch – ON
7. Individual Spray Head Switches – OFF
8. DUMP BAR Switch – OFF
9. DRAIN Switch – OFF
10. MONITOR/BFV Switch – OFF
11. Turn engine off.
12. Cab Control SYSTEM/POWER Switch – OFF

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