

Vehicle Modular Decontamination System (VMDS)

“Version B” Prototype System
(for Installation on M1083 5-ton Truck and M1095 5-ton Trailer)

OPERATOR'S MANUAL ELIN A004



25 September 2019



Modular, Vehicle Independent & Transportable
Decontamination System

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REVISION TRANSMITTAL PAGE

| DATE | REV NO. | DESCRIPTION OF CHANGE | APPROVED BY |
|------------|---------|--|-------------|
| 04/03/2019 | 2.f | Incorporation of modifications | |
| 05/07/2019 | 2.g | Incorporation of modifications and lessons learned at Dugway testing | |
| 05/06/2019 | 2.h | Incorporation of modifications | |
| 08/02/2019 | 2.k | Operation Procedures Slurry Operations | |
| 09/18/2019 | 2.l | Incorporation of Government Comments | |

DISTRIBUTION

This manual should always be kept with the VMDS Power Unit and used primarily as an additional on-site reference guide to operators and maintenance personnel who have already received all required classroom, hands-on, and field training applicable to safely operate and/or maintain this equipment. The preferred storage location of this manual is inside the accessory box.

This manual is for reference use only and is not to be used solely to operate the VMDS system without necessary training. Unit commanders require that all training be documented on the Soldiers' driver's training records.

The **MASTER COPY** of this complete manual is permanently maintained and on record at Intelagard, Inc. the Original Equipment Manufacturer. Please direct comments or suggested changes to:

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This Operator's Manual pertains to the "Version B" VMDS system, incorporating design changes that were requested by the end users and the JPM-Protection from October 2018 through August 2019. The Serial Numbers of the Version B systems start with VM000004.

WARNING SUMMARY (GENERAL)**WARNING! DEATH OR SEVERE INJURY MAY RESULT IF PERSONNEL FAIL TO OBSERVE WARNINGS**

- Remove all jewelry before starting work. Metal objects such as rings or tools can cause grave injuries and equipment damage.
- Do not allow tools to contact live circuits. A direct short can cause instant heating of tools resulting in equipment damage and personnel burns. Failure to comply may result in personal injury.
- TOXIC CHEMICALS, DIESEL FUEL, VOLTAGE (12V DC) are used in the operation of the equipment. CARBON-MONOXIDE is present in the exhaust gases of the engine.
- ALWAYS wear military standard personal protective equipment (PPE) when handling, mixing and using decontamination solutions.
- Wear hearing protection when near (within 30 feet of) the running power unit.
- An operator must be in attendance at all times during operation of the power unit.
- Make certain that the fuel supply and fuel return lines are properly connected before operating the power unit
- Authorized fuel will be obtained only from authorized fuel services or fuel trucks. Siphoning fuel from vehicles is prohibited.
- When operating tank drain valves and couplings wear gloves to help prevent injury to fingers and hands.
- Keep decontaminant containers closed and stored in a cool dry place. Mix only in accordance with directions for use.
- Keep clear of the exhaust stack during operation of the power unit.



WARNING SUMMARY (SPECIFIC)

Although every effort has been taken to ensure that the VMDS is safe to operate, the operator **MUST** be aware that this system uses pressurized water to apply decontamination solutions onto a target. Precautions **MUST** be taken to ensure operator safety.

Operators must read this manual and be familiar with the safety considerations outlined herein. Refer to the **Warning Summary** in this manual for an explanation of potential risks.

Throughout this manual **Important Procedures**, **Cautions** and **Warnings** will be clearly identified with the symbol below. Ensure the cautions, warnings and procedures specified herein are closely followed.



*This symbol is used throughout this manual to clearly indicate an **important procedural step or warning statement**. When accompanied with the word "**WARNING**" this symbol indicates that personal injury or possibly death could result from not obeying the guidance given.*

ADDITIONAL WARNINGS ARE LOCATED TROUGHOUT THIS MANUAL

WARNING SUMMARY - Continued

WARNING! Personnel using the VMDS must be educated in the basic principles of decontamination to mitigate the risks of performing these inherently dangerous operations. Personal Protective Equipment (PPE) is always required.



WARNING! This system uses pressurized air (~100 psi) as an energy source to both create and propel decontamination solutions onto a target. Before operation, always verify that all hoses and accessories are properly connected. Always inspect the unit to ensure that the integrity of air lines and liquid hoses are not compromised and are serviceable IAW the PMCS guidance set forth in this manual. After operation, always turn off the liquid supply line valves and bleed the discharge hose(s) to relieve the system of pressure. Failure to do so can result in injury and/or system damage.



WARNING! The VMDS deploys various chemical and/or biological decontamination solutions. Operator must be fully trained in this type of operation. Military standard personal protective equipment (PPE) is required prior, during and after decontamination operations.



WARNING! ALWAYS wear eye and hearing protection while operating the VMDS.



WARNING! When working with any decontaminant, take appropriate measures to avoid getting the substance into eyes and mouth or on skin. In the event of eye, mouth or skin contact, refer to product Safety Data Sheet (SDS) for emergencies or first aid.



WARNING! Liquids deployed by this system may be slippery. Every effort should be made to control accidental slippage and to avoid walking on areas where liquid has been spilled and/or applied.



WARNING! NEVER operate the VMDS if it has an identified air leak or worn or damaged airline or discharge hose. Once pressurized, a loose/leaking/damaged connection and/or hose may disconnect or rupture, potentially causing serious injury.



WARNING! ALWAYS treat the VMDS as though the discharge line(s) are pressurized. Once the system is pressurized, it will remain so until the air supply is turned off and the system is completely depressurized via checking the air pressure gauge or the lack of a hissing sound.



WARNING! When using the VMDS, **ALWAYS** ensure that all connections, hoses and nozzles are tightly attached, and point all discharge devices in a safe direction.



WARNING! The VMDS engine runs on diesel fuel. Observe all applicable precautions when handling, storing or dispensing fuels.



WARNING! The VMDS power unit uses a 12V DC battery to supply electrical energy to the starter. To mitigate risks associated with the battery/charging system, do not remove or install any cables while the system is running or energized. Never allow any object to touch metal components in the battery box or other electrical components.



WARNING! Disconnect all battery cables before servicing the VMDS engine.



WARNING! Some parts of this system, especially the exhaust system, may be hot to the touch during and after operation. **NEVER attempt to service internal components while the VMDS is running!** Once the system is shut down, allow adequate time for components to cool before attempting to service any internal components.



WARNING! ALWAYS ensure the spray/hose operator has a firm grip and stance before opening the discharge hose(s). The VMDS propels solutions with significant force! Once the system is pressurized, never let go of the hose. A loose discharge hose will whip around violently and can cause serious injury and/or equipment damage. Always close the Pump Control valve on Power Unit Control Panel and relieve pressure from discharge line before releasing the hose.

GENERAL OVERVIEW

The Vehicle Modular Decontamination System (VMDS) is a modular, diesel-driven system specifically designed for rapid, mobile decontamination missions for terrain and military equipment. This system is designed to be operated while mounted in the back of a vehicle or on a trailer, while stationary or mobile.

The VMDS Power Unit uses a Diesel engine-powered air compressor to provide energy to create and propel decontamination solutions through a 1 ½-inch (3.81 cm) pump. It deploys these solutions through vehicle- or trailer-mounted spray bars, a remote-control stanchion-mounted monitor (water cannon) and non-collapsible hoses with D-bale handset(s). The VMDS is capable of drafting from external water sources such as bulk tanks or natural water sources. In addition to the Power Unit, the VMDS incorporates two solution-mixing tanks with fill capacities of 750 gallons each tank. Tanks are constructed with internal baffles to minimize liquid movement and weight shift during transport.

The VMDS can deploy decontamination solutions in three forms: liquid, foam, and slurry.

Liquid – Non-expanded (1:1 expansion ratio) – no addition of air into the stream.

Compressed Air Foam (CAF) - Expanded (up to ~20:1 air to liquid ratio) which is generated by on board air injection into the liquid solution. This expansion rate can be realized when using surfactant-based decontaminant solutions. CAF is activated using the air control valve on the front panel of the Power Unit.

Slurry – Non-expanded, highly concentrated solution that is applied in a thick, cake-batter like consistency.

ADDITIONAL SYSTEM PERFORMANCE CHARACTERISTICS:

- Expansion: 1:1 (liquid application) to ~20:1(CAF application)
- Output Stream: 90-95 gpm
- Output Throw Distance: Up to ~90 ft (Dependent upon user settings, decontaminant or foaming product, nozzle, wind and other factors)
- Zero-Prime Drafting: Up to ~20 ft. vertical lift
- Hydrant Fill Capability: Yes (Directly into tank, not via DRAFT mode)

VMDS QUICK START PROCEDURE

WARNING! DO NOT attempt to use this Quick Start to place the system into operation without **FIRST** reviewing all warnings, cautions and maintenance related material in this manual. This Quick Start is intended for experienced system operators who fully understand safe operation of this system and all maintenance considerations. **IMPORTANT! Before initiating startup of the VMDS, ensure that all discharge ports are CLOSED. OPEN and EMPTY all discharge hoses and devices, then return to normal CLOSED and OFF positions. IMPORTANT: Ensure the PUMP CONTROL (7,9,11) and AIR CONTROL (6) VALVES are in OFF positions.**



Figure 1. Operator Controls on the Front Face of the Power Unit

1. Press the **GREEN** (#1) start button **ONE TIME**. Status display in window shows software loading.
2. Press the **GREEN** (#1) start engine button a second time; the **RED** LED glow plug light (#2) will light up for approximately 6 seconds. Then engine will start. For a brief second, the **RED OIL PRESSURE** light will flash - this is normal.
3. After the engine starts there will be a 10 second delay before the compressor will engage. Once you hear the engine RPMs drop, this means the compressor is now engaged and the unit is fully operational.
***NOTE** – If the engine stalls for any reason, press the **RED** stop button (#3) twice. Wait at least a minute before attempting to restart. The engine will not restart properly if it is under compressed air load. Wait for the hissing noise to subside.*
4. Add decontaminant to HOPPER/BLENDER in tank (not shown).
5. Place SELECTOR VALVE 1 (#5) in DRAFT position **by pushing to turn and select**.
6. Place AIR CONTROL VALVE (#6) in OFF/WET position.

7. ***SLOWLY*** turn the PUMP CONTROL VALVE (#7) to full OPEN position.
8. Fill mixing tank with water from holding tank (not shown) unless drafting from another source.
9. ***SLOWLY*** turn PUMP CONTROL VALVE (#7) to full CLOSED position.
10. Set SELECTOR VALVE 1 (#5) to AGITATOR position to mix contents of tank by **pushing to turn and select setting**.
11. ***SLOWLY*** turn PUMP CONTROL VALVE (#7) to full OPEN position.
12. Mix tank contents continuously until mission operations begin.
13. Set SELECTOR VALVE(s) (#5, #10) to setting that matches desired operation by **pushing to turn**. Ensure proper hose connections. See Section 10 of this manual. **ALWAYS ensure PUMP CONTROL VALVE is CLOSED before changing SELECTOR VALVE settings.**

1.0 VMDS MAJOR SYSTEM COMPONENTS AND DESCRIPTION

1.1 VMDS PART AND SERIAL NUMBERS

VMDS Power Unit PN: 46182401-V681

VMDS 750 gal. Tank Module PN: 31341106-V896

Serial Number Locations

Upon receipt of your system, note the serial numbers and take the time to write enter them below.

VMDS Power Unit Serial No: _____

Located at the top left corner of the Control Panel.



Figure 2. Serial Number for Power Unit (upper left corner of control panel)

Note: There is a data plate in the battery box just above the battery with the serial numbers of the critical components. These serial numbers are annotated on the DA Form 2062 (hand receipt).

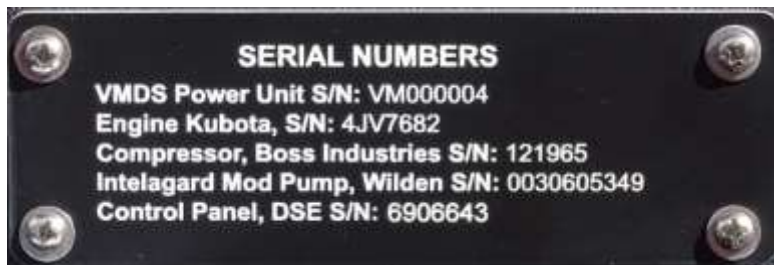


Figure 3. Serial Number Data Plate (under lid of battery box of Power Unit)

VMDS Tank Serial No: _____

Located on the front passenger's side of the tank (near the stanchion location) and the rear driver's side of the tank (above the drain valve on the rear wall).

VMDS Monitor Serial No: _____

Located on the black and white data plate on the monitor and engraved on the mounting flange.

VMDS Spray Monitor Stanchion Serial No: _____

Located on the upper portion and the base plate of the stanchion.

VMDS Front Spray Bar (FSB) Serial No: _____

Located on the upper portion of the bracket/mount. Also engraved on the outriggers and the mounting brackets.

VMDS Rear Spray Bar (RSB) Serial No: _____

Located on the upper portion of the bracket/mount. Also engraved on the mounting brackets.

1.2 VMDS KEY COMPONENTS:

1.2.1 Power Unit: Weight (with liquids): approx.~1,000 lbs.



Figure 4. Front of the Power Unit

Frame Dimensions: Approximate dimensions: ~ 48" (L) x ~27.5" (W) x ~38.25" (H)

1.2.1.1 Kubota Model D902-E4B - Liquid Cooled Diesel Engine: 24.8 Hp @ 3,600 rpm MAX
3,600 rpm



Figure 5. Engine

1.2.1.2 Rotary Screw Compressor -Type SC18
Output ~95 CFM @ ~100 psi



Figure 6. Compressor



Figure 7. Engine and Compressor Base Placement

1.2.1.3 Pneumatic Pump:

- Flow: ~90-95 gal (max) per minute (When working in conjunction with the compressed air foam (CAF) components, pump flow is reduced by as much as 35%)
- Pressure: ~100 psi
- Stainless-steel body, aluminum pumping cylinder (center)



Figure 8. Pneumatic Pump

1.2.1.4 Programmable Logic Control

- Pre-programmed
- Preset engine and compressor controls
- One button push, to start and stop the Power Unit



Figure 9. Programmable Logic Control

1.2.1.5 Fuel and Water Separator with Pump/Primer

- Parker/Racor R20P

Figure 10. Fuel/Water Separator



1.2.1.6 Power Unit Platform

The Power Unit is affixed to an 80-inch wide X 60-inch long platform used to anchor the Power Unit to the bed of the truck. Only lift the Power Unit/Platform with extended forks from the driver's side of the vehicle or the tailgate end of the platform. The platform must be strapped down to the bed of the truck for transit.



WARNING: WHEN USING A FORKLIFT TO LIFT THE POWER UNIT PLATFORM, EXTENDED FORKS (AT LEAST 72 INCHES LONG) MUST BE USED. INSERT FORKS UNDER THE POWER UNIT PLATFORM FOR PROPER WEIGHT DISTRIBUTION! FAILURE TO USE THE CORRECT FORKS MAY RESULT IN INJURY AND SYSTEM DAMAGE.

1.2.2 750 Gallon Tank: Weight empty ~ 1000 lbs; Weight full (with water) ~ 7500 lbs

Overall Dimensions (with skid): 92 in. L x 80 in. W x 43.5 in. H (without storage basket). Actual dimensions of the tank: (outside-to-outside) 68 in. L x 78 in. W x 36 in. H. The hoses are stored in the baskets on top of the tanks to allow them to dry properly. Hoses are described in detail in Section 10 of this manual.



Figure 11. 750-Gallon Tank with Guides for the Tie-Down Straps, and Basket (Inspection/Cleanout Ports are not shown)

There are 6 plastic guides welded on top of the tank to indicate proper positioning of tie-down ratchet straps. Each ratchet strap is rated at 10,000 lbs., burst strength (working load limit, WLL ~ 3333 lbs.) and three (3) straps are required to hold the tank down to the bed of the truck or trailer. The tank must be mounted with the front (notched) portion of the lip butted up against the front wall of the truck bed to reduce shift. The tanks are equipped with four (4) Inspection/Cleanout Ports that are attached to the tank with lanyards (Figure 13).



Figure 12. Close-up of the Plastic Guides for the Tie-Down Straps (three on each side).
Inspection/Cleanout Ports are not shown.

1.2.2.1 Inspection/Cleanout Ports

There are four (4) Inspection/Cleanout Ports incorporated into the tanks to be used as aids in their cleaning and content inspection. These ports have lanyard-attached camlock caps.



Figure 13. Inspection/Cleanout Ports

1.2.2.1 Hopper/Blender

The stainless-steel Hopper/Blender is 16 inches in diameter and the funnel section is 22 inches deep. It has a plastic lid attached with a lanyard and a perforated stainless-steel screen. The Hopper/Blender is fed by a 1.5-inch EZLink cam-lock fitting on the White Banded Hopper Hose, as its primary connection; alternately, it can be fed with red banded discharge hoses or any other 1-inch diameter hose in the VMDS hose kit. The Hopper/Blender is used to aid in mixing powdered, liquid, and granular decontaminant materials into the tank. The screen is an aid in

breaking up clumps of solid decontaminant materials. Avoid sticking fingers or gloved hands into the holes in the screen as it may cut fingers or gloves.

1.2.2.2 Tank Level Inspection Port/Dipstick

The Tank Level Inspection Port is a capped, 2 in. diameter port located next to the Hopper/Blender. The plastic cap is secured with a metal “dog tag chain” lanyard. This port contains a measuring tape marked on the back side of the tape with increments of 100 gallons and enables visual measurement of the amount of liquid in the tank. 1 inch represents approximately 20 gallons of liquid. To measure, gently pull upwards on tape until a ‘catch’ is felt; then read the measurement. To secure, gently push tape back down the tube and re-cap the port; the tape may be left out to watch the tank level rise or fall.



Figure 14. Tank Level Inspection Port/Dipstick

1.2.2.3 Agitator

The Agitator Input is a 1 in. diameter, right-angled fitting located next to the Hopper/Blender. The Agitator hoses (yellow bands) attach here. The Agitator mixes tank contents and keeps concentrated decontaminant solutions mixed while the system is running. It is important to keep the tanks agitated, especially when they contain concentrated bleach solutions or slurries. The agitator is turned off when discharging the tank and is not operable when loading the tank using the VMDS DRAFTING function.

1.2.2.4 Storage Basket and Cargo Net

The Storage Basket is a 60 in. x 34 in. basket installed on the top of each tank and includes a cargo net used to secure and store hoses. Open air storage is recommended over a closed box or trunk as it allows hoses to drain and dry out, minimizing deterioration and mold growth. The net has multiple straps and quick release buckles to hold the hoses in place. The Cargo Net is not shown here.



Figure 15. Basket (Cargo Net is not shown)

1.2.3 Hose Kit

The VMDS includes a hose kit to attach the Power Unit to the Tanks and the various discharge functions. There are 15 hoses in the hose kit (see Table below).

1.2.3.1 Description of the Hose Kit

The hoses that deliver pressurized water are made of red “booster hose” material (same material as on the M12A1 discharge hoses) that is durable and will withstand caustic bleach solutions. The larger diameter (1.5-inch) hoses have EZLink® Camlock connectors for fast and easy, one-handed installation and de-installation. The smaller diameter (1-inch) hoses use Instalock® camlock connectors. The suction and drafting hoses are made of blue-colored, reinforced PVC to retain rigidity under suction. The suction and drafting hoses are always connected with 1.5-inch Instalock® camlock style connectors. The drafting hoses have male fittings where all the other hoses are equipped with female fittings.

1.2.3.2 Components of the Hose Kit

The hose kit consists of fifteen (15) hoses (described in Section 10 of this manual), a filter basket and four (4) adaptors stored in the Accessory Box with the De-Icer kit:

- One (1) 1-inch male-male adapter - to connect/extend the hoses for longer reach and placement of the VMDS farther away from the decontamination line (DED or DAD);
- One (1) 1-inch male-male adapter – to connect/extend the hoses for longer reach and placement of the VMDS farther away from the decontamination line (DED or DAD);
- One (1) 1.5-inch fire hydrant (Fire Fighting Threads, FHN) to 1.5-inch male camlock adapter – for filling tanks from a standard fire hydrant; and
- One (1) 1-inch Standard Nipple Thread (NPT) to 1-inch male camlock adapter – for connecting the M12A1 shower bars to the Power Unit using one of the 1-inch hoses supplied with the system.

1.2.4 Monitor, Stanchion and Wired Remote-Control Box

The Monitor is a water cannon intended to be used for large area/long distance decontamination and can be configured to operate either manually or with the wired remote-control box. It is made of stainless steel and fed by the 1½' hose (purple band) and is comprised of the monitor head, a “haloed” stanchion to protect the monitor head, and a wired remote-control box. The remote-control box can be used external from the cab of the truck or the wire can be run through the rear half of the passenger-side window.

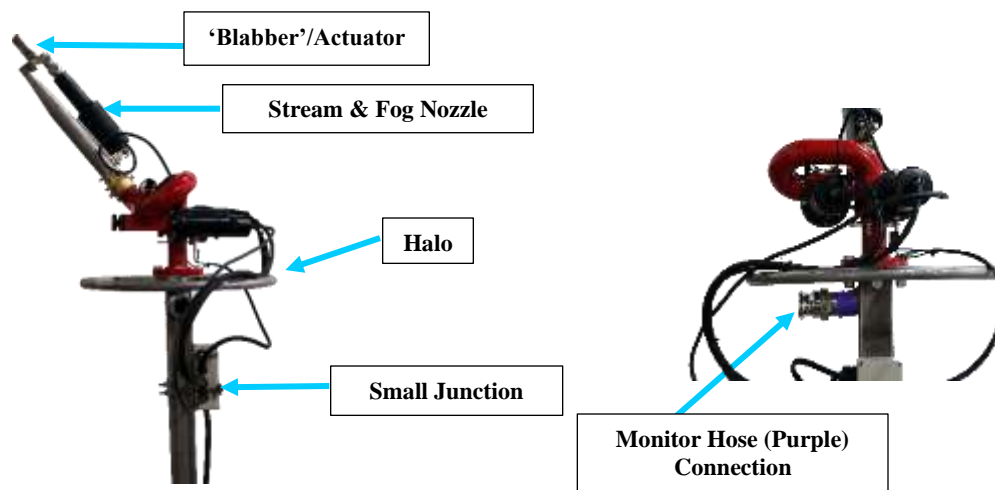


Figure 24. Monitor and Stanchion Configuration

The Version B VMDS Monitor is equipped with a stainless-steel Stream & Fog nozzle with an actuator on its tip (the ‘blabber’) which is controlled by the lower left-hand switch of the remote-control box. The actuator reduces the stream from the nozzle to a fan spray pattern and reduces impact pressure.

The Monitor is fed by 17-foot long 1.5-inch hose (Purple Banded EZLink hose. Selector Valve #2 on the Power Unit has two functions related to the Monitor: Monitor and Remote Monitor. Monitor setting allows liquid to flow constantly once the Pump Control Valve is opened. The Remote Monitor setting signals the wired remote controller to turn water flow on and off at the controller. The switch on the remote controller is a “dead man’s switch”, meaning that the water flow will stop when the switch is released. This switch **must be pressed for water to flow when the Selector Valve #2 is in the Remote Monitor position and is bypassed (water flows constantly) when the Selector Valve #2 is in the Monitor position.** The nozzle control switch (‘Fog/Stream’) controls the “blabber” actuator on the Stream & Fog nozzle; the ‘stream’ is a straight flow of liquid, whereas the ‘fog’ is of lower pressure, and fan shaped. There are 2 manual-control hand wheel knobs on the Monitor that can be used to move it if there is no power being supplied to it.



Figure 25. Monitor Control Hand Wheel Knobs

1.2.4.1 Monitor with Remote Control

The Monitor is equipped with a wired remote controller that can be operated from the cab of the truck or from the ground. The cable for the remote control should be routed through the partially open truck window.



Figure 26. Remote Control Joystick Face Plate

1.2.4.2 Stanchion

The telescoping Version B Monitor Stanchion measures 68-inches to the top of the flange when retracted and can be raised an additional 2 feet higher overall but under 12.5-feet tall. It requires 2 people to raise and lower it; one to remove and replace the locking pin and the other to raise or lower the upper portion/haloed monitor. Be careful as there is a pinch hazard between the upper and lower sections of the stanchion, clearly marked with **“red” caution marking tape**.



Figure 27. Extendable Stanchion for the Monitor



WARNING! ALWAYS avoid placement of hands, fingers or clothing in or near the meeting point of the upper and lower sections of the stanchion.

1.2.5 Front Spray Bar (FSB)

The Front Spray Bar is made of stainless steel and consists of three main parts. The middle section is 98 inches long and comes equipped with the mounting brackets as well as two capped ends that are used to attach the right- and left- “wings.” The mounting brackets are set up to mount the FSB to armored M1083 trucks. The mounting bracket must be inverted in order to mount the bracket and FSB to the unarmored versions of the M1083 trucks. The FSB comes with two 1 in. diameter pins to hold the brackets onto the clevis fittings on the front of the truck. The FSB is fed by a 1 in. diameter hose with Green Bands. The FSB can be used without the extension wings and in this configuration, will cover approximately 16 feet (wide). Ensure that the caps with gaskets are in place and locked down. Failure to do so will result in liquid spray up the side(s) of the truck. The right- and left-wings extend the FSB’s overall length by 4-feet (each), 8-feet overall; the spray pattern is approximately 32 feet wide when the wings are extended. The wings can swivel backwards if the vehicle strikes an object on either side, avoiding damage to the FSB or the vehicle. The center nozzles on the middle spray bar and the inner nozzles on the wings point approximately 45 degrees forward from vertical. The outer nozzles on the wings point outward and downward. To add the wings to the FSB, detach the cam-lock caps on ends of the middle section of the FSB and attach the wings using the Instalock cam-lock fittings. Make certain that there is a rubber gasket in the fitting or it won’t operate properly. The wings are marked “R” (red bands) and “L” (green bands) and mounted so the inner nozzles point forward at an angle of approximately 45 degrees.



Figure 28. Front Spray Bar with Wings extended on an Armored M1083A1P2



Figure 29. Front Spray Bar with Wings extended on an M1083 (without armor)

1.2.6 Rear Spray Bar (RSB)

The Rear Spray Bar (RSB) can be mounted on the rear of the truck or the trailer using the same mounting bracket. The RSB is made of stainless steel and the nozzles point downward (near vertical) and the outer nozzles point outward from the sides. The RSB is approximately 8-feet long overall and will spray a pattern approximately 16-feet wide. When mounted on the trailer, the RSB is fed by two 1 in. diameter hoses with Orange Bands that are connected with a 1-inch to 1-inch male-male adapter that is stored in the De-Icer Kit/Accessory Box. Both hoses must be connected to reach the rear bumper of the trailer. A single RSB hose will reach the rear bumper of the truck. There is a bolt on the bottom of each of the two RSB brackets where the operator can adjust the angle of the RSB to ensure the nozzles are pointing downward as much as possible. The brackets are equipped with 1 in. diameter pins to fasten the RSB brackets to the rear clevis fixtures on the truck or the trailer.



Figure 30. Rear Spray Bar on rear of M1083

1.2.7 De-Icer Kit/Accessory Box

A Pelican® Model 1660 case is included with the system for storing and securing nozzles, small parts and the tank De-Icer Kit. The De-Icer consists of an Inverter and NATO slave power cord (permanently attached), an extension cord, and 4 De-Icers. The red De-Icers are used to thaw or prevent freezing of water in the system tank(s). Use 1-2 De-Icers per tank. The inverter is powered from the vehicle's 24-28 VDC NATO slave connector but can be powered by exterior power sources as well.



Figure 31. De-Icer Kit in the Accessory Box

1.2.8 Fuel Container and Gauge

The VMDS Power Unit uses a 5 gallon “jerry” fuel can with a VMDS fuel line/cap that includes a fuel level indicator; “F” denotes full, “E” denotes empty. The jerry/fuel can is seated in a holder and must be secured by the strap before system operation and/or transport. There is a check valve at the bottom of the siphon tube on the fuel cap system to reduce loss of fuel prime to the engine making startups after storage or transportation easier.



WARNING! Avoid allowing fuel level to fall below $\frac{1}{4}$ tank. The Power Unit will shut down without fuel, and fuel system damage may occur. Running the fuel rail or filters dry will eventually damage the fuel pump and fuel injectors.



WARNING! Always secure jerry/fuel can with straps before system operation and/or transport.



Figure 32. Plastic 5-Gallon “Jerry Cans” and attachment to the Power Unit Platform
(Jerry cans are not supplied with the VMDS system)

2.0 LOCATION AND DESCRIPTION OF OPERATOR CONTROLS AND INDICATORS

The VMDS is an uncomplicated system with intuitive operator controls and indicators, all of which are clearly labeled with their function and, if applicable, adjustments. This section provides the operator with the location of all controls and indicators as well as description their function(s).

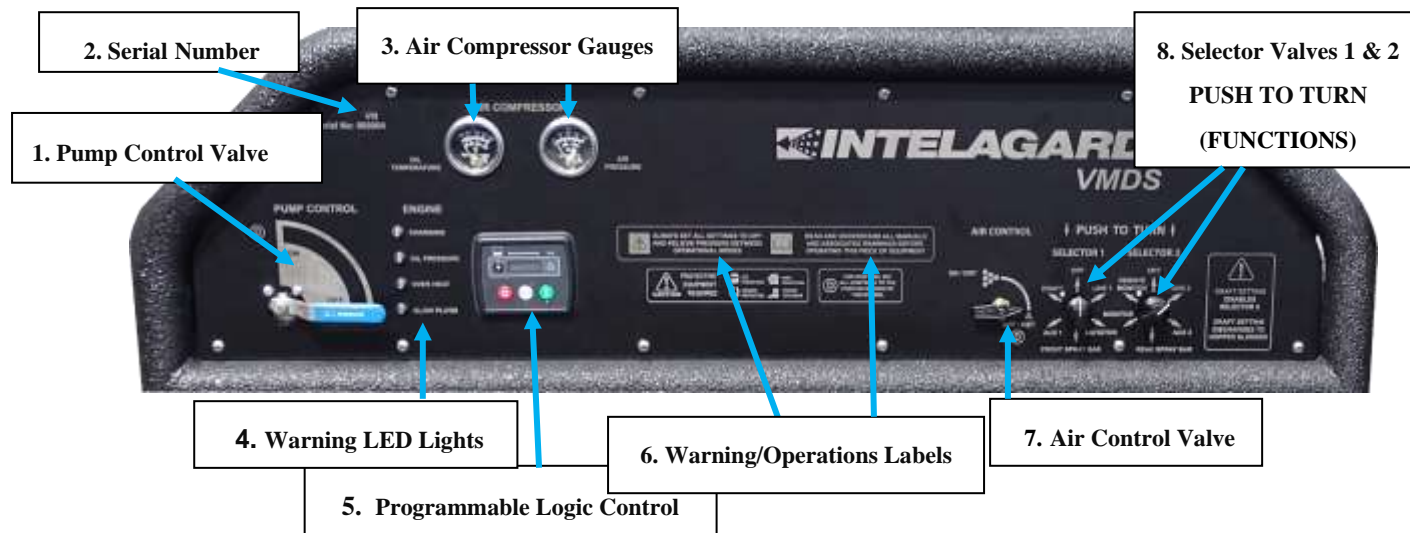


Figure 33. Front Control Panel of Power Unit

| REF # | Control/Indicator | Function |
|-------|--|--|
| 1 | Pump Control Valve | The Pump Control turns the main system pump on and off. This control has 2 distinct positions and should only be placed in the full ON or full OFF positions, not in between. The “D” next to the ON valve position indicates that this control should be placed in the ON position when drafting water from an off-board source. |
| 2 | Serial Number | This is the serial number of the VMDS system. |
| 3 | Air Compressor Gauges <ul style="list-style-type: none"> Oil Temperature (max 318° F) Air Pressure (max 115 psi) | These gauges indicate compressor oil pressure and air temperature. Operators should observe them and ensure that the needles remain below the maximum temperature and pressure ranges. If either needle reads above the maximum setting, the PLC should automatically shut down the Power Unit. If you observe the gauges reading above the maximum values and the engine is still running, shut the Power Unit down and refer to Section 13.0 of this manual. |
| 4 | Warning LED Lights | Indicators of engine status and potential problems. See Sections 2.2 and 13.0 manual. |
| 5 | Programmable Logic Control (PLC) | This is the display that monitors the power unit’s operating functions as described in Section 2.2 of this manual. |
| 6 | Warning/Operations Labels | Adhere to all warning and operations labels, both located on the Instrument Panel and within this manual. |
| 7 | Air Control Valve | Proportions the air-to-solution ratios specific to foaming solutions. During operation of the VMDS using anything BUT foaming solutions, this valve should be set in the WET/OFF position. The “D” next to the ON/WET valve position indicates that this control should be placed in the ON/WET position when drafting water from an off-board source. |
| 8 | Selector Valves 1 & 2 | These two valves control the operations of the VMDS. <i>Push to turn and select function.</i> See Section 2.1 of this manual. |

(Continuing 2.0 – Location and Description of Operator Controls and Indicators)

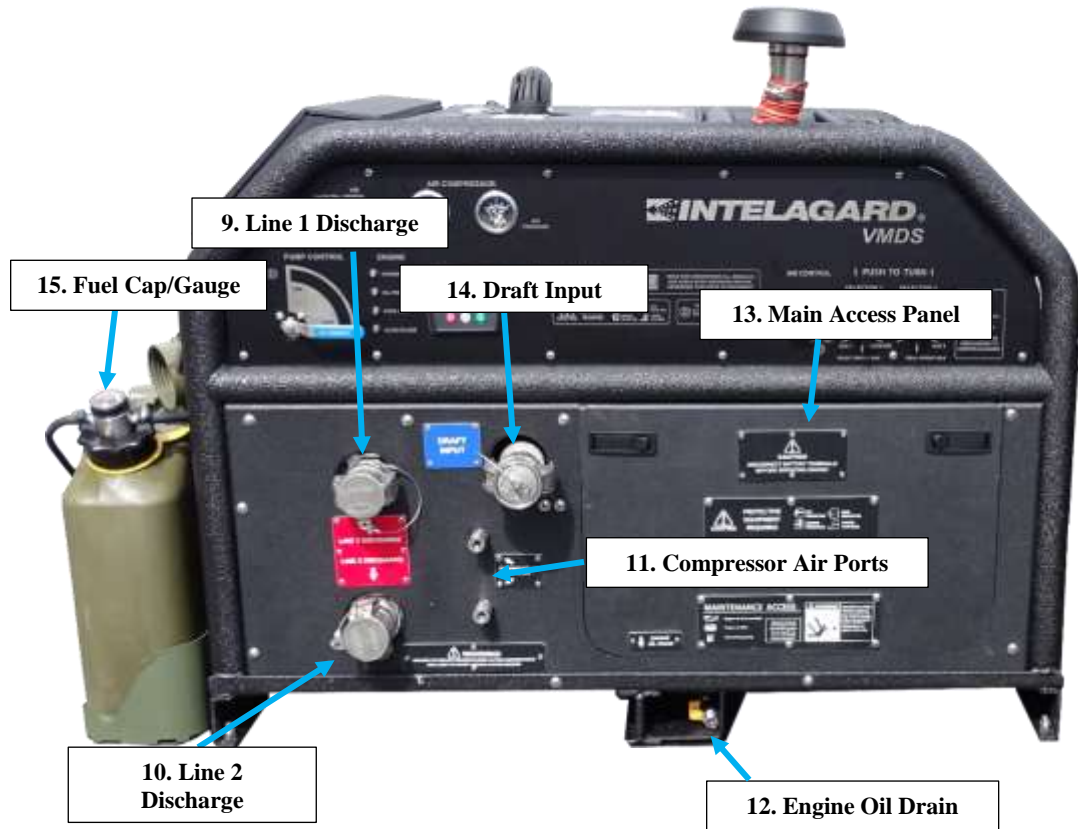


Figure 34. Front Controls and Outputs on Power Unit

| REF # | Control/Indicator | Function |
|-------|----------------------|---|
| 9 | Line 1 Discharge | Used for fluid discharge with 1.5 in. hose. |
| 10 | Line 2 Discharge | Used for fluid discharge with 1.5 in. hose. |
| 11 | Compressed Air Ports | The VMDS compressor supplies 90-100 psi of air to operate pneumatic equipment. Air lines can be connected to these auxiliary ports to supply power to external pneumatic equipment. (i.e., the Intelagard Macaw Backpack). Air lines for these ports are supplied separately. |
| 12 | Engine Oil Drain | Discharge for engine oil. |
| 13 | Main Access Panel | Used for PMCS access. <i>Removal of this door automatically disables power unit.</i> |
| 14 | Draft Input | The Draft port is used to connect to a bulk liquid source (or drop into a natural source) for filling the VMDS tank(s). The vertical (single Blue Band) and horizontal drafting (dual Blue Bands) hose which connects to this Camlock port are standard. |
| 15 | Fuel Cap/Gauge | The fuel gauge is incorporated into the “jerry can” cap. Use Diesel Fuel ONLY! |

NOTE: Engine will stop if Main Access Panel is removed. This is a critical safety feature of the VMDS system. Do not attempt to bypass this safeguard.

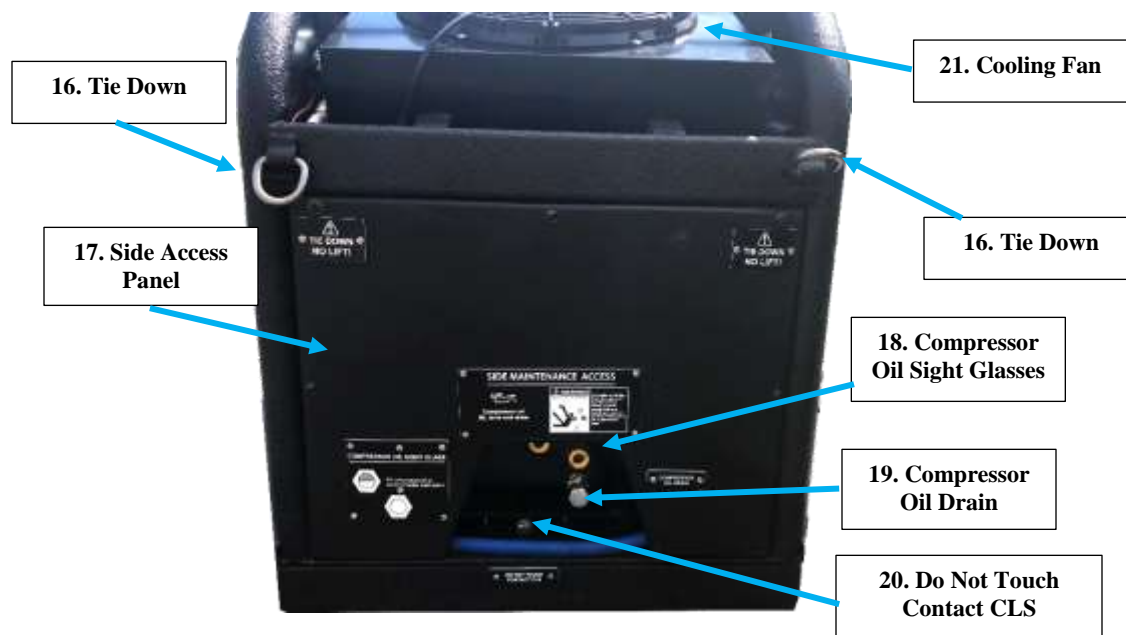
(Continuing 2.0 – Location and Description of Operator Controls and Indicators)

Figure 35. Right End of Power Unit

| REF # | Control/Indicator | Function |
|-------|------------------------------|--|
| 16 | Tie Down (2 of 4) | There are 4 tie downs located on the top of the power unit. These are intended for use to restrain the power module to the bed of the transporting vehicle. Tie down straps are provided with the VMDS. The tie-downs are not used when securing the Power Unit to the vehicle with the Power Unit Platform. See Section 5.2 of this manual. |
| 17 | Side Access Panel | For removal during routine maintenance and troubleshooting of the compressor. |
| 18 | Compressor Oil Sight Glasses | There are 2 compressor oil sight glasses used to check compressor oil level. The lower glass should always be flooded whether the system is running or not. When the system is not running, the upper sight glass should have a visible line of compressor oil across it. When the system is running, the upper glass cannot be checked since the oil is being pulled into the compressor. |
| 19 | Compressor Oil Drain | Drain for compressor oil. |
| 20 | Do Not Touch/Contact CLS | Do not touch. Contact CLS – this is the belt adjustment nut for tightening the belt tension. |
| 21 | Cooling Fan | When the VMDS is running, the fan runs to cool the internal components of the system as needed. Keep fingers and other objects out of fan! |

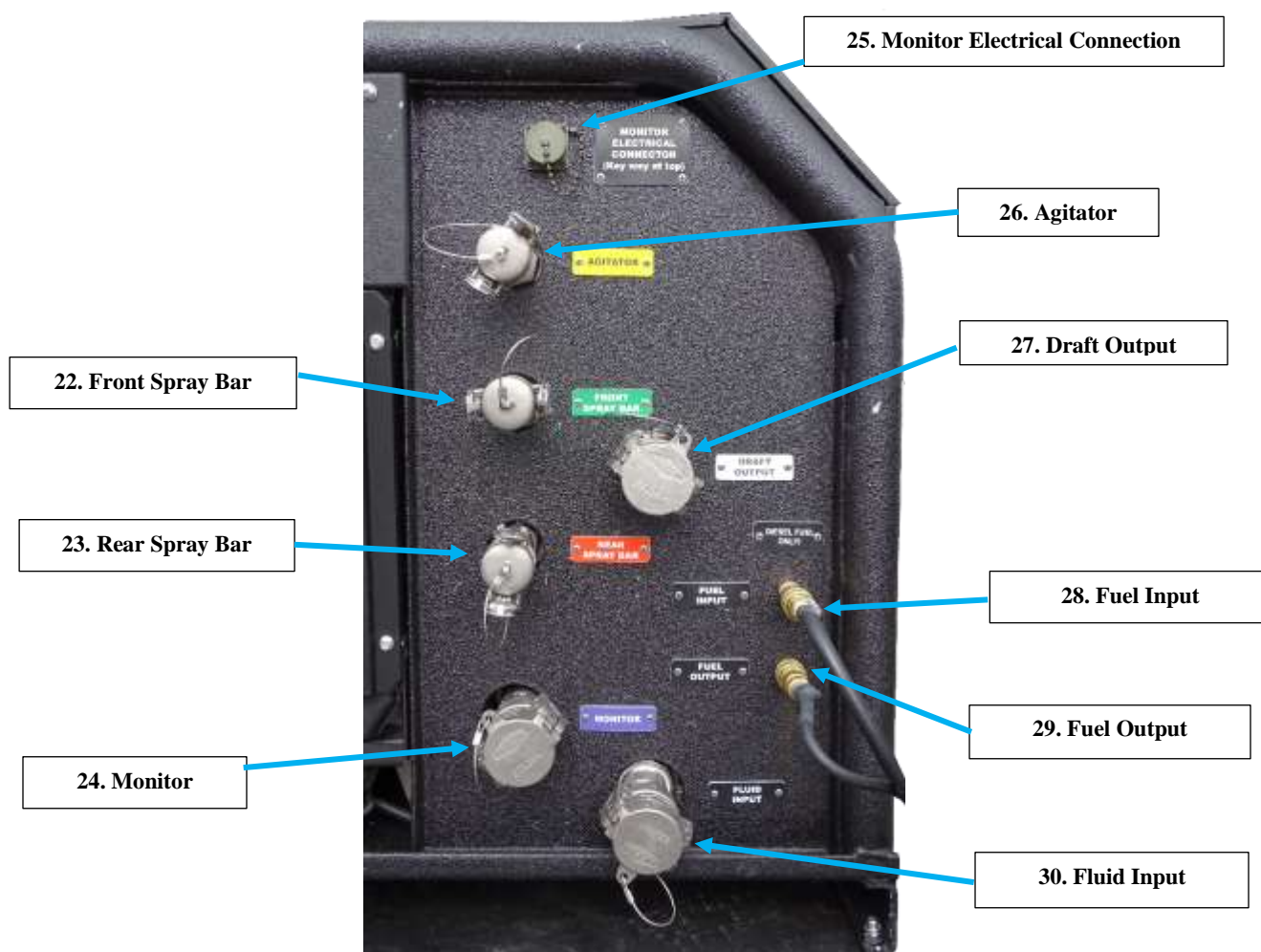
(Continuing 2.0 – Location and Description of Operator Controls and Indicators)

Figure 36. Rear Outputs and Connections, Power Unit

| REF # | Control/Indicator | Function |
|-------|-------------------------------|---|
| 22 | Front Spray Bar | Port for connection of 1 in. hose to Front Spray Bar. |
| 23 | Rear Spray Bar | Port for connection of 1 in. hose to Rear Spray Bar. |
| 24 | Monitor | Port for connection of 1.5 in. hose to Monitor |
| 25 | Monitor Electrical Connection | Connector for wired remote for Monitor |
| 26 | Agitator | Port for connection of 1 in. hose to Agitator |
| 27 | Draft Output | Port for connection of 1.5 in. hose for Draft |
| 28 | Fuel Input | Port for fuel intake. USE DIESEL FUEL ONLY! |
| 29 | Fuel Output | Port for fuel output. USE DIESEL FUEL ONLY! |
| 30 | Fluid Input | Port for 1.5 in. hose for Fluid Input from tank(s) |

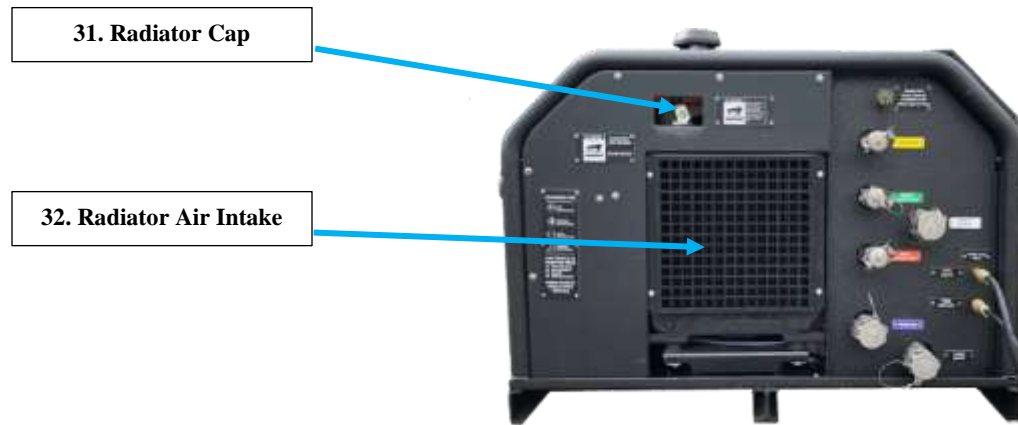
(Continuing 2.0 – Location and Description of Operator Controls and Indicators)

Figure 37. Rear of Power Unit

| REF # | Control/Indicator | Function |
|-------|---------------------|---|
| 31 | Radiator Cap | Add coolant here if necessary. Check coolant reservoir inside power unit for levels before adding additional coolant. Cap may be very hot to the touch. Wait for it to cool before opening! |
| 32 | Radiator Air Intake | Air intake for radiator. Stand clear and do not block. |



Figure 38. Left End of Power Unit

| REF # | Control/Indicator | Function |
|-------|-------------------|--|
| 33 | Tie Down (2 of 4) | There are 4 tie downs located on the top of the power unit. These are intended for use to restrain the power module to the bed of the transporting vehicle. Tie down straps are provided with the VMDS. The tie-downs are not used when securing the Power Unit to the vehicle with the Power Unit Platform. See Section 5.2 of this manual. |
| 34 | Battery Box | Location for the system's 12 volt battery, fuse box, emergency kill switches (2) and automatic battery charger (not shown). |
| 35 | Pump Access Panel | Access for system pump. <i>Any attempt to open or tamper with pump will void system warranties.</i> Install and secure the Pump Access Panel before operating the system. |

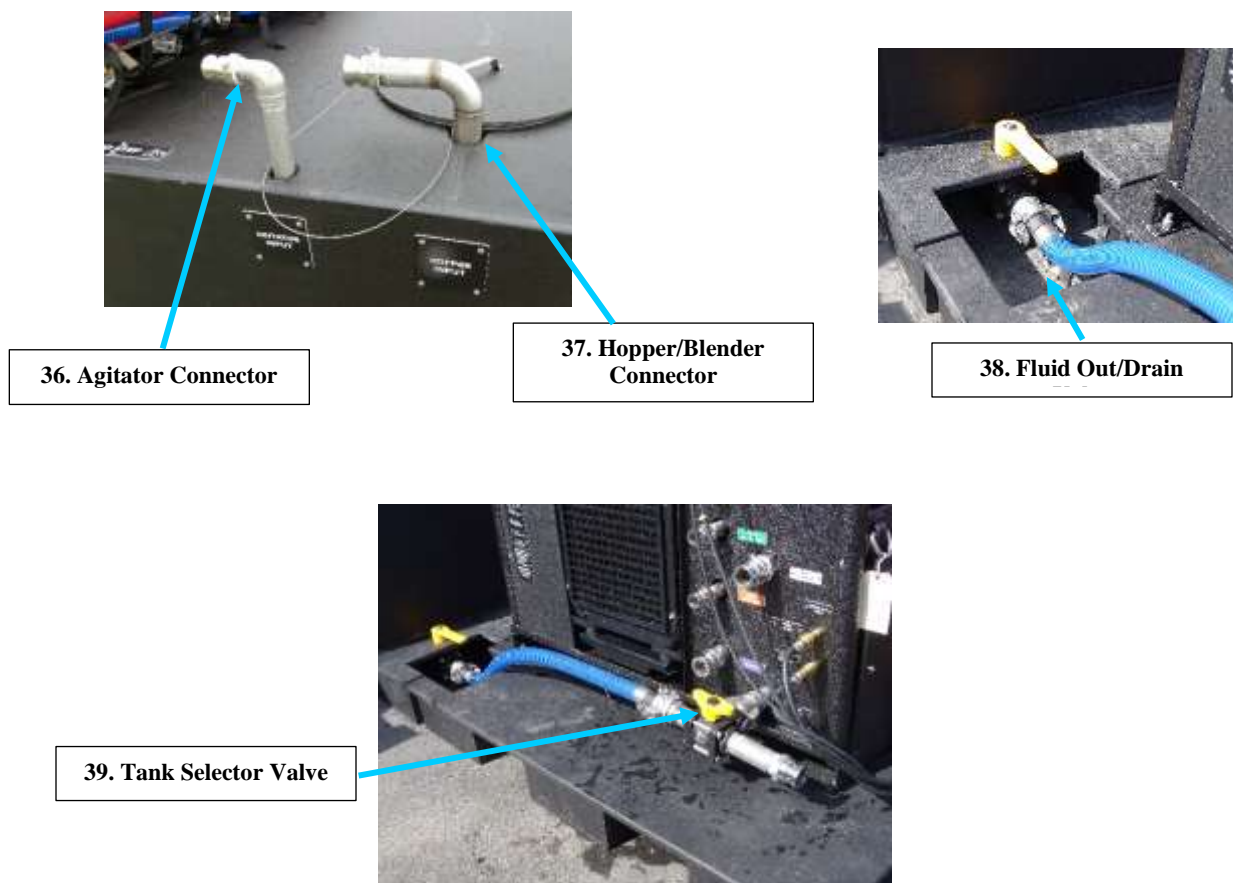
(Continuing 2.0 – Location and Description of Operator Controls and Indicators)

Figure 39. Tank Connection Points

| REF # | Control/Indicator | Function |
|-------|--------------------------|--|
| 36 | Agitator Connector | Connector for 1 in. AGITATOR hose. Used to mix decontaminant material with water in tank. Agitator must always run while decontaminant is in tank to prevent clumping. |
| 37 | Hopper/Blender Connector | Connector for 1.5 in. HOPPER hose. Used to fill tank with water in DRAFT mode when connected to water source. |
| 38 | Fluid Out/Drain Valve | Connector for SUCTION MAIN hose; connects to power unit to supply fluid from tank. This port also serves as the drain for the tank. |
| 39 | Tank Selector Valve | Designates which tank (truck or trailer) the VMDS is pulling water from. |

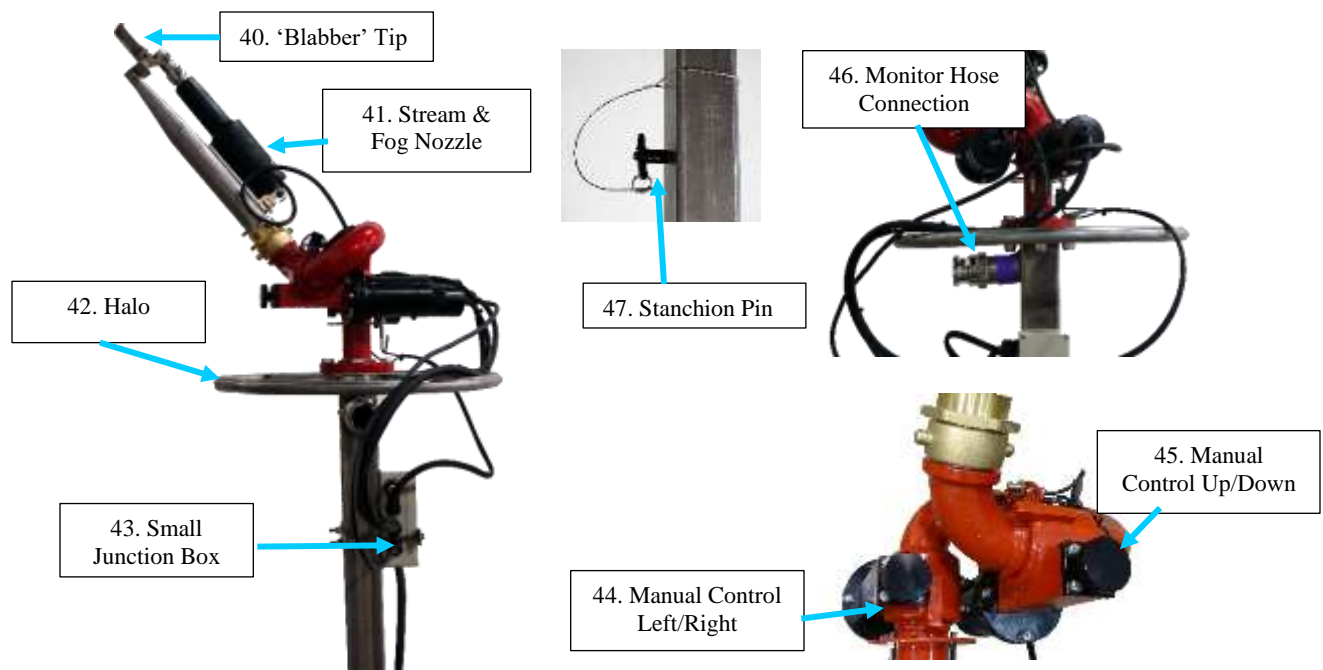


Figure 40. Monitor Configuration Items and Controls

| REF # | Control/Indicator | Function |
|-------|----------------------------------|--|
| 40 | 'Blabber' Tip | Actuator which controls the fan pattern of liquid dispersed by the monitor. |
| 41 | Stream & Fog Nozzle | Delivery nozzle for the monitor. |
| 42 | Halo | Acts as a protector of the monitor in the event the stanchion should become unbalanced and fall. |
| 43 | Small Junction Box | Electrical connections for monitor controller. |
| 44 | Manual Control Left/Right | Manual control of right and left movement of the nozzle. |
| 45 | Manual Control Up/Down | Manual control of up and down movement of the nozzle. |
| 46 | Monitor Hose (Purple) Connection | Connection point for purple banded monitor hose. |
| 47 | Stanchion Pin | Controls placement of the telescoping stanchion. Remove when raising or lowering and replace the Stanchion Pin when it is in the desired position. |



Figure 41. Monitor Remote Joystick and Controls

| REF # | Control/Indicator | Function |
|-------|--------------------|--|
| 48 | Water Valve On/Off | Controls water flow when in 'Remote' mode. |
| 49 | Stream/Fog Switch | Controls fan stream on nozzle. |
| 50 | Power On/Off | Power switch for monitor. |
| 51 | Joystick | Controls movement of monitor up, down, right and left. |
| 52 | Power LED | Indicates power to monitor. |

2.1 SELECTOR VALVES – OPERATIONAL SETTINGS

The Selector Valves govern individual system functions. To operate each selector knob, **PUSH** the selector knob **IN**, **SELECT** the operation and **RELEASE** the selector knob. **ALWAYS** return both selector settings to **OFF** when **NOT** operating or before starting the unit.



Figure 42. Push and Turn Selector Valve Positions

SELECTOR 1

- 1 OFF – Stops all pump functions to Selector 1 operations.
- 2 LINE 1 – Sends fluid from tank to the **LINE 1** discharge port for hose spraying operation.
- 3 AGITATOR – Controls continuous agitation of tank contents to keep chemicals from settling.
- 4 FRONT SPRAY BAR – Supplies fluid to the **FRONT SPRAY BAR**.
- 5 AUX 1 – Future expanded operations (not currently used).

- 6 DRAFT – Used to pull from a water source to fill tank(s). ***NOTE – When in **DRAFT**, no other functions are operable. The only active discharge port is the **DRAFT OUTPUT** on the back of the Power Unit. Use this function to fill tanks with water or to transfer water from tank to tank. You can use this port to mix slurries or bleach solutions, but you cannot agitate the tank while you mix when using this port and function. The preferred technique is to mix decontaminants by drawing from one of the tanks into the other and discharging into the other tank via the Monitor port on the back or one of the front Discharge ports.

SELECTOR 2

- 1 OFF – Stops all pump functions to Selector 2 operations.
- 2 LINE 2 – Sends fluid from tank to the **LINE 2** discharge port for hose spraying operation.
- 3 AUX 2 – Future expanded operations (not currently used).
- 4 REAR SPRAY BAR – Supplies fluid to the REAR spray bar.
- 5 MONITOR – Supplies fluid to the monitor for **MANUAL** operations ONLY.
- 6 REMOTE MONITOR – Supplies fluid for **REMOTE** controller monitor operations ONLY.

2.2 PROGRAMMABLE LOGIC CONTROL

This section provides the location and description of the Engine Control Display functions.

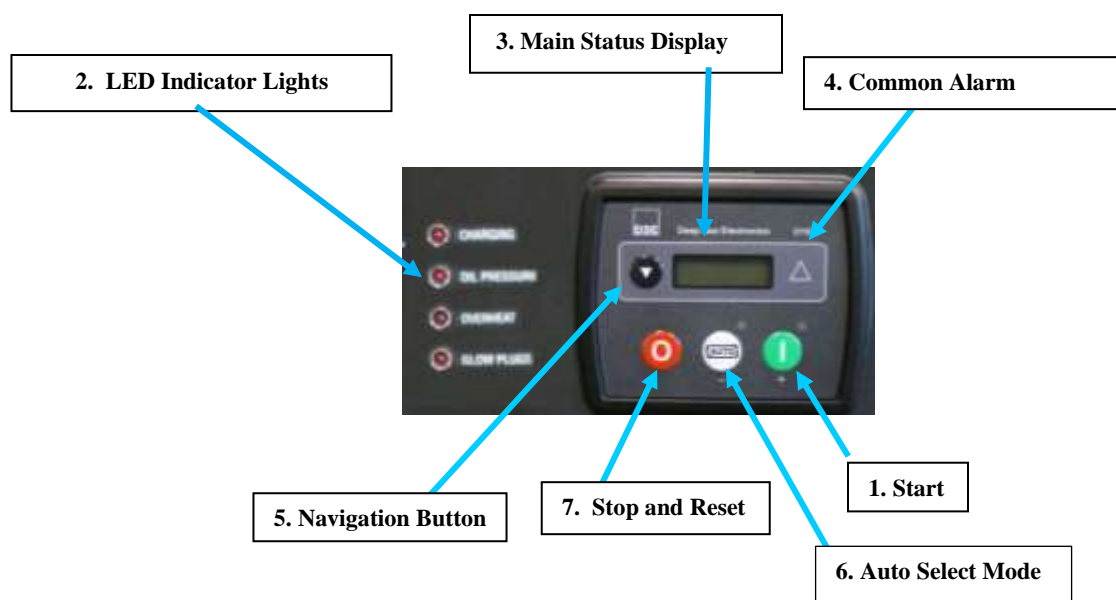


Figure 43. Programmable Logic Control (PLC)

| REF # | Control / Indicator | Function |
|-------|------------------------|---|
| 1 | Start | Start button. Engages the engine control display on first press, starts the engine on second press. |
| 2 | LED Indicator Lights | <p>Charging: This is a warning indicator. When illuminated, indicates problem with charging system</p> <p>Oil Pressure: This is a warning indicator. When illuminated the oil pressure is <u>not</u> within normal parameters.</p> <p>Overheat: This is a warning indicator. When illuminated, indicates engine temperature is <u>not</u> within normal parameters. [Shut the system down and check the coolant system.]</p> <p>Glow Plugs: When the GREEN start engine button is pushed for the second time, the glow plugs RED LED light will light up for approximately 6 seconds. Then engine will start.</p> |
| 3 | Main Status Display | The window for viewing and monitoring engine speed, voltage and run hours. Also displays the warning and shutdown status of the engine. These monitors are PRE-PROGRAMMED |
| 4 | Common Alarm Indicator | Designates problems with engine functions. If a problem occurs during operation of power unit, the indicator will light up and indicate problem. Refer to Troubleshooting section of this manual or contact maintenance support. |
| 5 | Navigation Button | PRE-PROGRAMMED – Preset to VMDS specifications and are not adjustable. Scrolls to display OEM settings. |
| 6 | Select Auto Mode | This mode is not used by VMDS. |
| 7 | Stop and Reset | Stops and resets power unit. |

3.0 TANKS



WARNING! Although the tanks are sturdy and supported with internal baffles, do not stand on them as they may become very slippery and can create a slip and fall hazard.

The VMDS Version B has two 750-gallon tanks with incorporated skids. The 750-gallon tanks must always be mounted on either a 5-ton truck or 5-ton trailer. For truck mounted tanks, the hose attachments must be pointed toward the rear of the truck. The tanks must always be mounted as far forward in the truck bed (touching the front wall) as possible. There are cutouts in the forward ends of the tank platform that incorporate room for the stanchion.



Figure 44. Skid Cutouts on front edge of Tank

For trailer mounted tanks, the hose attachments may be oriented toward the rear or front of the trailer. The tank should be mounted over the axles and slightly forward of the center of gravity on the trailer.

The tanks are built with a 4-way, modular platform skid design which allows 360-degree forklifting capability. EMPTY tanks can also be lifted from underneath with extended fork forklifts or slings and an overhead crane or wrecker and can be loaded from either the rear or the sides of transport vehicles. Both tanks have an approximate 13-inch notched bottom lip (skid cutouts to the front to accommodate the monitor) on the front ends which butts the tank against the front wall of the truck bed, preventing slippage and damage to the tank itself. Each tank is equipped with a Hopper/Blender assembly, Hopper/Blender fill connection, Agitator fill connection and assembly, tank level indicator port and a ball valve fluid output/drain with a 1 ½ in. camlock.

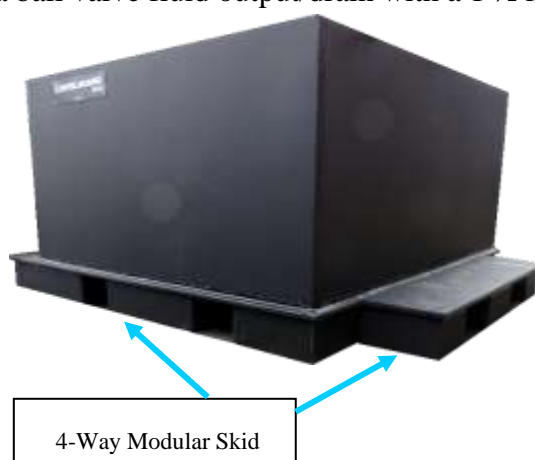


Figure 45. 750-Gallon Tank and its integral 4-Way Modular Skid

3.1 TANK SELECTOR VALVE ASSEMBLY

The Tank Selector Valve assembly designates which tank the VMDS draws water or decontaminant from and attaches to the Power Unit via the Fluid Input port (see below). If desired, the operator can have decontaminant mixed in one tank and rinse water in the other tank. Fluid cannot be drawn from both tanks at the same time. The Tank Selector Valve is stored in the De-Icer kit box.



Tank Selector Valve
Trailer Position



Tank Selector Valve
Truck Position

Figure 46. Tank Selector Valve

3.2 AGITATOR

The AGITATOR mixes tank contents and keeps concentrated decontaminant solutions mixed while the system is running. It is important to keep the tanks agitated, especially when they contain concentrated bleach solutions or slurries. The AGITATOR is turned off when discharging the tank via Discharge #1.

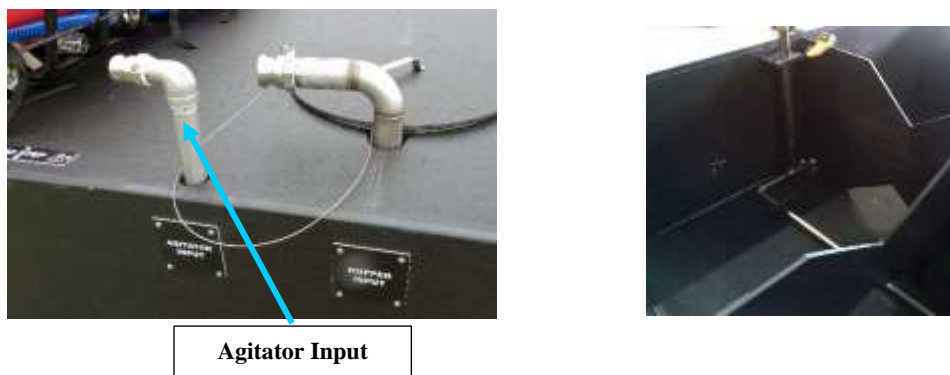


Figure 47. Agitator Input and Baffles

3.3 HOPPER/BLENDER

The Hopper/Blender is located next to the Agitator and has two ½ inch stainless steel bars in the funnel section. The bars are in place to prevent objects (i.e., cans and bags) from accidentally falling into the tank. The bars support the removable screen that is used to break up “clumps” of HTH or STB from falling into the hopper and clogging the 1 ½ inch diameter funnel hole. The removable screen has 1-inch diameter holes and a stainless-steel handle on the top of the screen to assist with breaking up clumps of powdered or granular decontaminant.



Figure 48. Hopper-Blender Input and Screen

If there are “clumps” of decontaminant on the bars or screen, use a disposable dipstick (supplied by the unit) made of wood or plastic to break apart to a size which will allow the clumps to feed through the screen. DO NOT use a hammer, metal objects, or use excessive force that will create damage to the hopper. If “clumps” are not easily breakable, do not use and simply remove them.

3.4 DE-ICER KIT

NOTE – Although the De-icer Kits are supplied to keep water in the VMDS tanks from freezing in cold weather, the recommended method of freeze prevention is to drain the tanks (and Power Unit) and to winterize the system, as both tanks can usually be re-filled via drafting in less than 40 minutes (1500 gallons @ 50 gallons/min drafting = 30 mins).

The VMDS De-icer features a 24 VDC inverter, powered by a NATO slave connector on the truck source that feeds a GFCI-protected 3000 Watt, 120 VAC output. ***It is imperative that the vehicle is stationary while conducting this operation, as a grounding cable must be secured from the Inverter to the vehicle chassis to reduce electric shock risk.*** The heaters can be also powered by shore power, but it is highly recommended that a GFCI-protected circuit is used since the electric de-icing system functions while immersed in water.

NOTE - The vehicle's engine must be running during operation of the heaters or the De-Icer Kit will drain the vehicle batteries very quickly (within minutes).

Each VMDS system includes one three-ended extension cords to lead from the inverter to the two (interchangeable) heaters in each tank. One heater is used as a “floater” and the other as a “sinker.” Unscrew the red float-ring on the de-icer to convert a floater into a sinker. The 500-watt de-icer is normally sufficient to keep the water from freezing. If ambient air temperature is near freezing but above 25 degrees F, one heater (either float or sink) should be sufficient. If ambient air temperature is below 25 degrees F, a second heater may be required.



WARNING! ALWAYS use the GFCI to protect the De-icer circuit. It is imperative to use a grounding cable attached to the vehicle chassis to reduce the risk of electric shock. The De-icer is an electrical device being operated in or near water.



WARNING! A grounding cable **MUST** be attached from the inverter to the vehicle chassis when operating the De-Icer Kit. Failure to do so drastically increases the risk of electric shock and may result in injury or death!

Again, the recommended and easiest method of keeping the tanks from icing over is to simply drain the tanks and winterize the Power Unit. The geometry of the plumbing within the tanks themselves will ensure that most of the water will flow to the lowest part of the plumbing where there is a ball valve at the drain cock. The procedure to winterize the system is located in **Section 12** of this manual.

De-Icer Kit components

- 1 - NATO Slave Connector
- 1 – Inverter, Heavy Duty

- 1 - GFCI outlet
- 1 - Weather resistant box
- 2 – Heavy Duty Extension Cord, multi-end (female)
- 4 – 500W de-icer heaters (2 for the truck tank and 2 for the trailer tank)
- 1 – Grounding cable

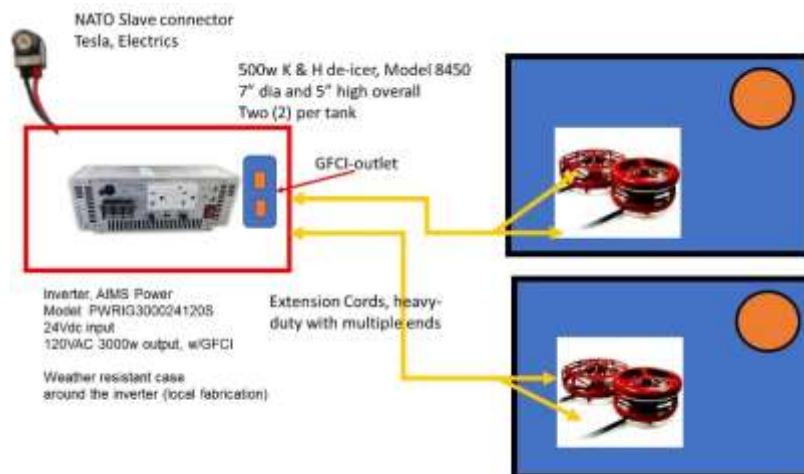


Figure 49. De-Icer Kit Components

The De-icer shown below is in float-mode within the tank itself (unscrew the float ring and the de-icer will sink to the bottom of the tank to thaw from the bottom).



Figure 50. De-Icer as a “Floater”

4.0 DESCRIPTION OF NOZZLES – FUNCTIONS & USE

| Quantity | Control | Function |
|----------|------------------------------------|---|
| 1 | 1.5 in. Bale Handset | Used for spraying and controlling the flow of solution. Base handset for interchangeable nozzles provided with system. Used by operator to turn hose discharge flow on/off. When in full-back position (toward operator) the bale is turned on and solution will flow. Move to the forward (away from operator) position to turn off. |
| 1 | Adjustable Fogging Nozzle | Used in lieu of the smoothbore nozzle when spraying a variety of patterns and flow. The primary set is made of orange plastic for water and the stainless-steel version is for spraying decontaminant solutions. |
| 2 | Stainless Steel Smoothbore Nozzles | ½” and 3/8” smoothbore nozzles made of stainless-steel specifically for spraying decontaminant solutions |
| 1 | 1.5 in. Cone Nozzle | Provides a broader concentrated spray. There is a red plastic cone nozzle and two stainless steel nozzles with varying bores. The narrower bore will typically shoot a longer, narrower stream. |
| 1 | 2-in-1 Flip-Tip Smoothbore Nozzle | Provides 2 spray patterns (3/8 in. and 1/4 in.) Red plastic. Allows for adjustment of spray patterns and through-put pressure for associated applications. DO NOT USE THE BASE THREADED OPENING FOR SPRAYING. THIS WILL DAMAGE THE THREADS. |
| 1 | Monitor Stream & Fog Nozzle | Installed on the monitor, stainless steel nozzle with an actuator that adjusts the liquid stream coming out of the nozzle. It is controlled at the remote-control box (lower left-hand switch). The actuator reduces the stream from the nozzle to a fan spray pattern and reduces impact pressure. |
| NOTE** | | <u>A NOZZLE MUST BE ATTACHED TO THE HANDSET AT ALL TIMES FOR PROPER OPERATION.</u> |



1 1/2” NST D-Bale Handset
w/ Fogging Nozzle attached



Stainless-steel Smoothbore
Nozzles 5/16” and ½”



3/8 in. - 1/4 in. Flip Tip
Smoothbore Nozzle



1/2 in. Smoothbore
Nozzle



Stainless-steel
Fogging Nozzle



Monitor Stream & Fog
Nozzle

5.0 VMDS COMPONENT INSTALLATION



WARNING! NEVER lift, load or unload the VMDS with liquid in the tanks. Completely empty fluid tank(s) before lifting system. Tank damage could occur, and the weight of the liquid could destabilize the forklift resulting in severe injury or damage to the tanks and forklift operator. Properly drain all liquid from the tanks prior to commencing loading/unloading operations.



WARNING! When lifting, loading and unloading the tanks or power unit NEVER stand under or place any body part underneath! Using the proper forklift is the *ONLY* recommended manner of loading and unloading VMDS power unit.



WARNING! Never place any body part under the power unit or tanks when lifting, loading or unloading! Never lift, load or unload power unit or tanks overhead! Doing so may result in injury or death!

5.1 TANK INSTALLATION

When transported in the bed of a vehicle or on a trailer, all VMDS modules **MUST** be properly secured to the vehicle for platform stability and to ensure the unit is not damaged during transport. **It is the Operator's responsibility to securely restrain the VMDS to the transport platform. Tanks, the power unit and their skids should be restrained on forward, aft, sides and vertical axes.** Use the 2-soldier, triple check system to ensure the tanks and power unit are securely strapped down. Failure to do so, especially when the tanks are filled and begin to move, could injure, crush or cause severe injury or death or catastrophic damage to other equipment. Three (3) 10,000 lb. tie-down straps (shown below) are supplied with the VMDS Power Unit and three (3) 10,000 lb. tie-down straps are supplied for each 750-Gallon Tanks (9 total for the VMDS system "kit") for this purpose.



WARNING! Always securely restrain all VMDS components to the transport platform before transport of any kind. Failure to do so may result in injury or death and damage to the system! Follow manufacturer's instructions.

NOTE: Secure the tank to the bed of the truck or trailer in the following manner. **NO OTHER METHOD OF SECURING THE TANK TO THE TRUCK/TRAILER IS AUTHORIZED:** Three (3) 10,000 lb cargo tie-down ratchet straps are used on the tank and passed over the tank at the guides, welded to the top of the tank. The guides correspond to D-rings on the truck/trailer bed. The tank's notched front lip must be butted up against the front wall of the truck/trailer bed; the lip prevents the tank from shifting forward in a sudden braking event. Attach the free hook end of the strap on the driver's side and run the straps over the guides and under the storage basket to secure. Attach the ratchet end of the strap on the passenger side of the vehicle or trailer. Check straps for tightness as part of daily PMCS. Refer to the diagram below for the only authorized tie down procedure.

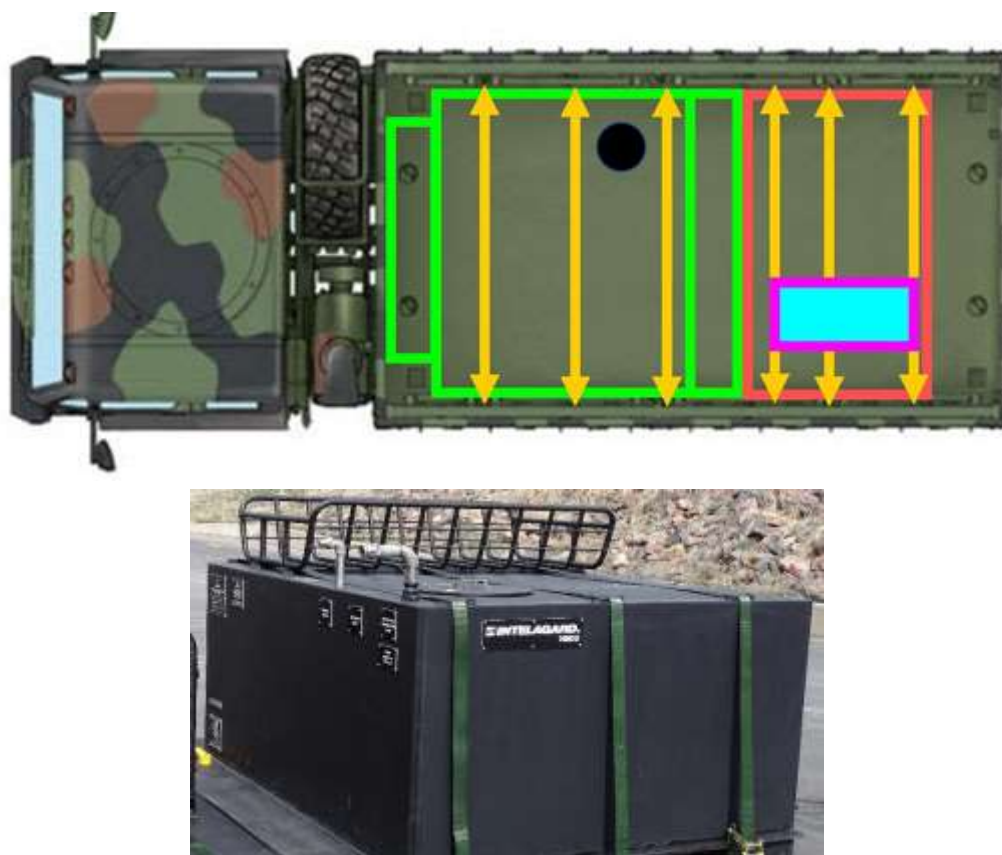


Figure 51. Strap positions (gold arrows) for tanks and power unit platform

5.2 POWER UNIT INSTALLATION

The Power Unit is bolted to its skid platform and the platform is tied down to the truck using cargo straps attached to D-rings on the truck, with the straps lying on the top surface of the platform and under the Power Unit itself. Insert blocks between the sides of the platform and the walls of the truck to prevent the platform from shifting side to side. The Power Unit has (4) “D” rings (2 on each side of the Power Unit) that are to be used as alternate tie downs if the platform is not used. The Power Unit can be strapped down to the truck's tie down D-rings to secure it if not using the Power Unit platform.

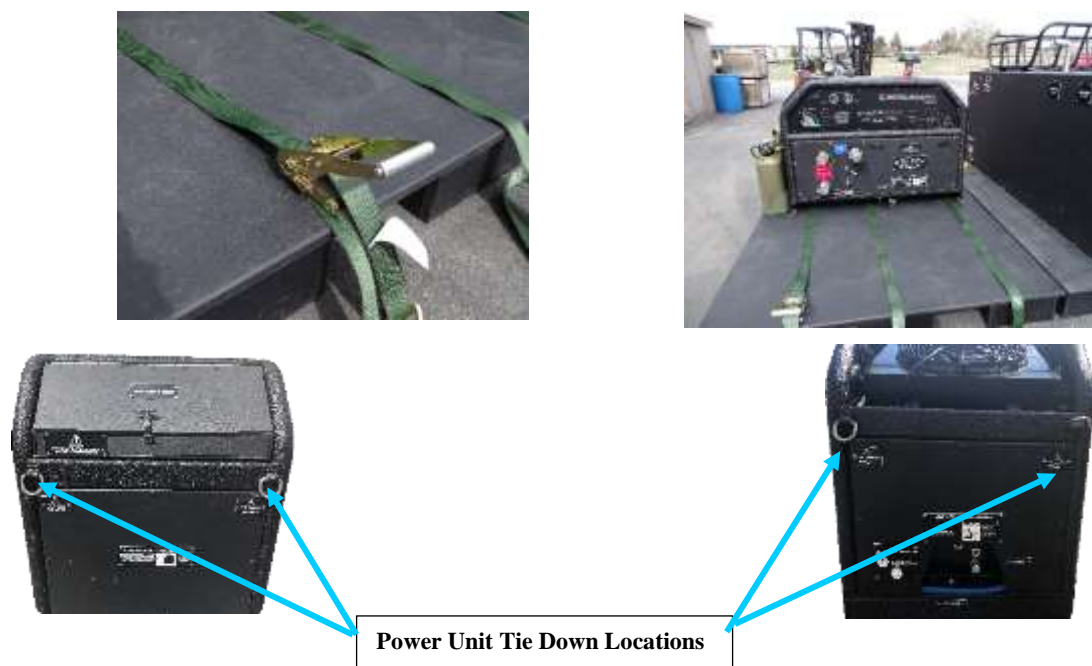


Figure 52. Strap Locations on the Power Unit Platform (use three straps)

5.3 SPRAY BARS – ATTACHMENT & OPERATION PROCEDURES

The spray bars themselves are designed with four (4) ½-inch, 80-degree fan spray tips producing ~ 60 psi each at the tip. The 8-foot spray bars also designed to be universally fit-enabled by an adjustable slide bracket mechanism which allows up to 2” of lateral adjustability (shown below). This mechanism also allows for interchangeability between the Front Spray Bar (FSB) mounts on the M1083 5-ton FMTV variants. The FSBs also have “wings” or outriggers to extend the spraying pattern wider (up to 32 feet wide) and a total of 8 fan spray tips/nozzles.

The Rear Spray Bars (RSBs) are also a universal fit and can be mounted on the rear of the M1083 FMTV style trucks and the M1095 series trailers. The spray bars are held in place with the clevis pins on the shackle mounts.



WARNING! NEVER stand on the spray bar. Doing so may cause injury and/or system damage.

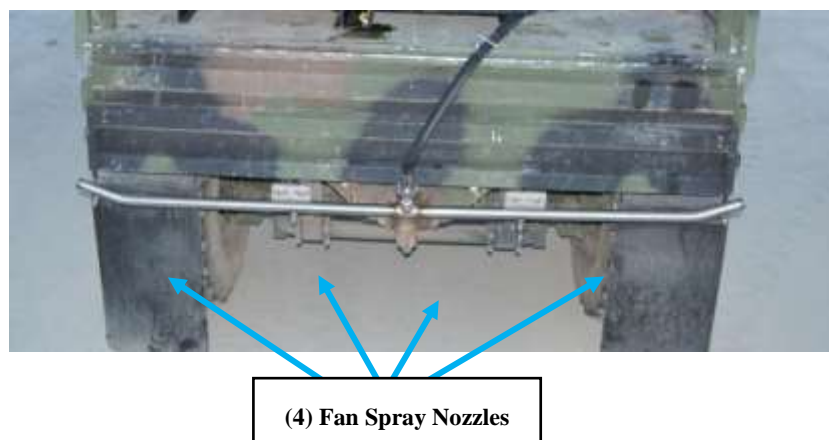


Figure 53. Rear Spray Bar attached to rear of the trailer

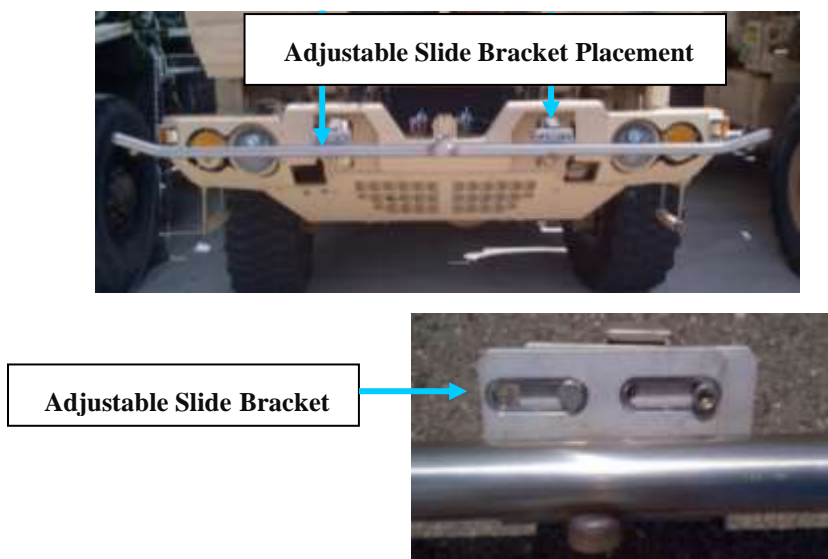


Figure 54. Adjustable Slide Bracket for Spray Bars (Front and Rear)

There are 2 different universal spray bar mounts. The one pictured below with the **SHORT** extension will **ALWAYS** be mounted on the **FRONT** of the truck **ONLY**. The other pictured below with the **LONG** extension will be either mounted on the **REAR** of the truck or trailer. The slide will be **retracted** and tightened down for placement on the rear of the truck. The slide will be **extended** and locked down for placement on the trailer. The slide is designed to keep the spray bar from rolling down and must be butted against the trailer by the locked down slide to keep it from doing so. Ensure the slide bolt is tight. Check periodically and re-tighten if rolling starts to occur. Non-armored vehicles may require the installer to disassemble and invert the truck side of the adjustable slide bracket.

The Front Spray Bar (FSB) is equipped with two capped ends that enable the attachment of extensions, “outriggers” or “wings” to provide a significantly wider spray pattern. The wings are marked Right “R” (red markings) and Left “L” (green markings). The orientation of the nozzles

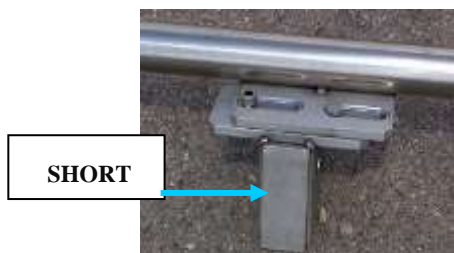
on the wings are important for correct function of the spray bars; the slots should be in line with the long axis of the bars. Attach the wings using the Instalock cam-lock fittings and ensure there is a rubber gasket in each of them for correct sealing and seating. Each wing will swivel rearward if it strikes a fixed item while the vehicle is moving. The gasket may need to be replaced often due to wear on the part. Contact CLS.



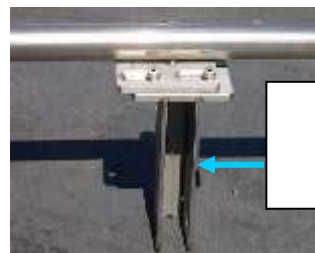
Figure 55 Inverted Front Spray Bar Mounts on Non-Armored Truck



Figure 56. Adjustable Slide for Rear Spray Bar and Trailer Mounting ONLY



Front Spray Bar - TRUCK



Rear Spray Bar - TRUCK and TRAILER

5.4 MONITOR/STANCHION INSTALLATION

1. Remove the selected davit pocket cover removing the pin and then pull the cover down through the davit pocket. It is attached with a wire lanyard to the truck to prevent loss.
2. Insert the monitor/stanchion into the davit pocket.
3. Re-insert pin to secure.

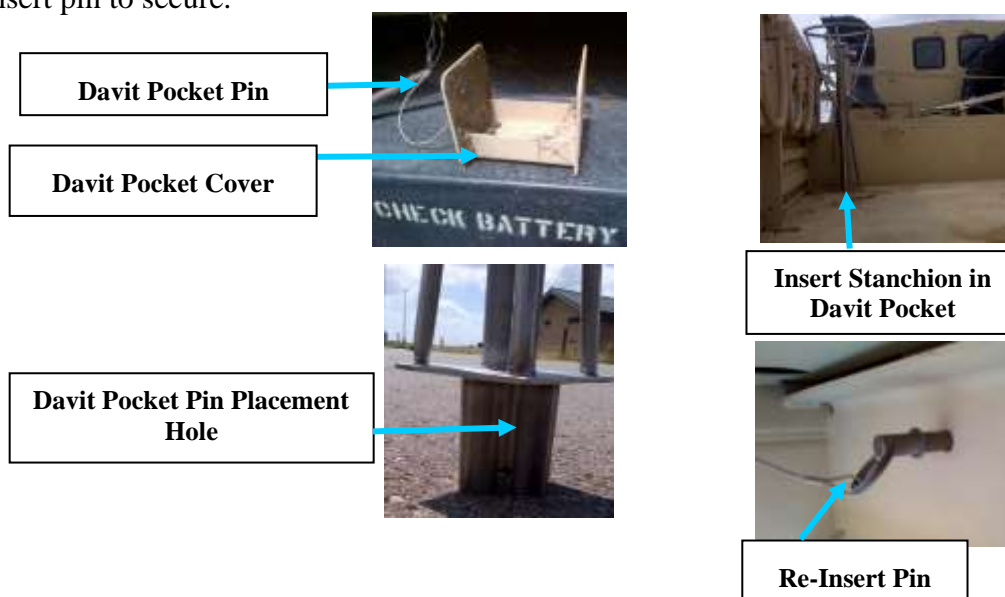


Figure 57. Attachment points for the Monitor Stanchion on M1083 Truck

The stanchion can be mounted into in any one of the four davit pockets on the M1083 truck bed. The stanchion can be placed in the davit in any position desired. Ensure the pin for the davit pocket is used for the stanchion. Position the monitor's tank input to point towards the VMDS Power Unit to avoid kinks in the hose. The "halo" on the top of the stanchion serves as protection and lifting handle for the monitor.

The monitor can be operated either manually or by the remote-control box. The remote-control box is strictly wired and not operated by Radio Frequency (RF, "wireless"). The remote-control can be operated while dismounted or from inside truck's cab. The Monitor Electrical Connector on the back of the Power Unit supplies power (12 VDC) to the remote-control monitor and its controller and establishes the connection to turn the water flow on and off when system is in REMOTE MONITOR mode.

5.5. INSTALLATION OF REMOTE-CONTROL BOX (CAB OR DISMOUNTED OPERATIONS)

Ensure power unit if turned OFF and selector valves are in the OFF position.

1. Establish hose connections for REMOTE MONITOR operations.
2. Connect the remote-control box connector to the MONITOR ELECTRICAL CONNECTOR located on the back of the power unit.

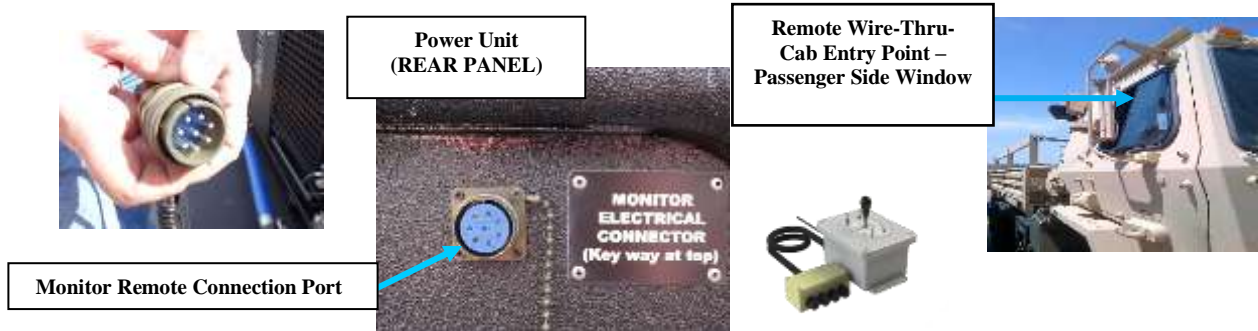


Figure 58. Remote Control Monitor Electrical Connection

Although not recommended, it is possible to **manually** operate the monitor:

1. Connect the monitor's remote-control box; and power it up.
2. Place selector knob to MONITOR instead of REMOTE MONITOR.

Note: The operator can manually turn the handwheels on the monitor to change its position (up, down, left or right).



WARNING! For use with VMDS ONLY. Monitor connection is 12 Volts DC, 10 AMP. NEVER attach the Monitor to a 24 Volt DC connection, such as a military vehicle slave connector. This will result in significant system damage and will void all warranties.

6.0 PRE-OPERATIONAL MAINTENANCE CHECKS (PMCS)



CAUTION! *Failure to add appropriate fluids prior to starting the VMDS WILL result in system damage and WILL void all warranties.*

6.1 PMCS OF THE ENGINE

Contact CLS or if not available, the manufacturer with any questions and/or problems.

There are two dipsticks on the engine, they both serve the same purpose. The easier one to check is between the alternator and the muffler and accessed via the top door panel. The other engine oil dipstick is on the opposite side of the engine, facing the compressor. It can be accessed via the front engine access panel on the Power Unit.

Check engine/compressor drive belt for fraying, cuts or other physical defects.

Verify the engine oil drain valve is closed fully.

Check engine oil level using one of the two engine oil dipsticks. To check oil, remove the dipstick, wipe clean, inspect (oil level should be between the two holes in the dipstick). Re-insert it when finished.

Check for leaks inside the engine and compressor compartment.

Open the top engine access panel by opening latches, then lifting the panel up. Perform the following checks:

Check the engine oil level and quality by removing the engine oil dipstick (located on the compressor side of the engine). If the oil level is below the minimum mark on the dipstick, oil will need to be added. Re-check oil level frequently during the oil adding process ensuring the oil level does not exceed the full mark on the dip stick. **DO NOT OVER FILL.** Mid-point on the dipstick marking area is ideal. If the oil level exceeds the full mark, oil needs to be drained from the system until the checked level falls below the full mark. Poor quality oil needs to be changed. For oil changes contact CLS.

Oil in the engine is based on the operational temperature range requirements:

| | |
|-----------------------------------|----------------------------|
| Above 25 deg C (77 deg F): | SAE30, SAE10W-30 or 15W-40 |
| -10 to 25 deg C (14 to 77 deg F): | SAE10W-30 or 15W-40 |
| Below -10 deg C (14 deg F): | SAE10W-30 |

Check the tension on the drive belt. It should not be over or under tight. Push on the belt itself. There should be approximately a ½ twist in play. If too tight or too loose, contact CLS.

Check the tension on the alternator belt. It should not be over or under tight. Push on the belt itself. There should be about a ½ twist in play. If too tight or too loose, contact CLS.

Check the coolant overflow bottle to ensure coolant is present. If low or not present, fill the overflow bottle to the halfway point only. Open the radiator cap on the radiator. Look inside to observe radiator coolant level. If low, fill to almost the top and replace cap. Check for leaks. If coolant loss continues or you notice a leak, contact CLS. **NOTE:** Coolant loss will cause the engine to overheat and shut down via built in safety features. The Red LED on the power unit operator panel will illuminate if the engine becomes overheated as described in Section 13.0.

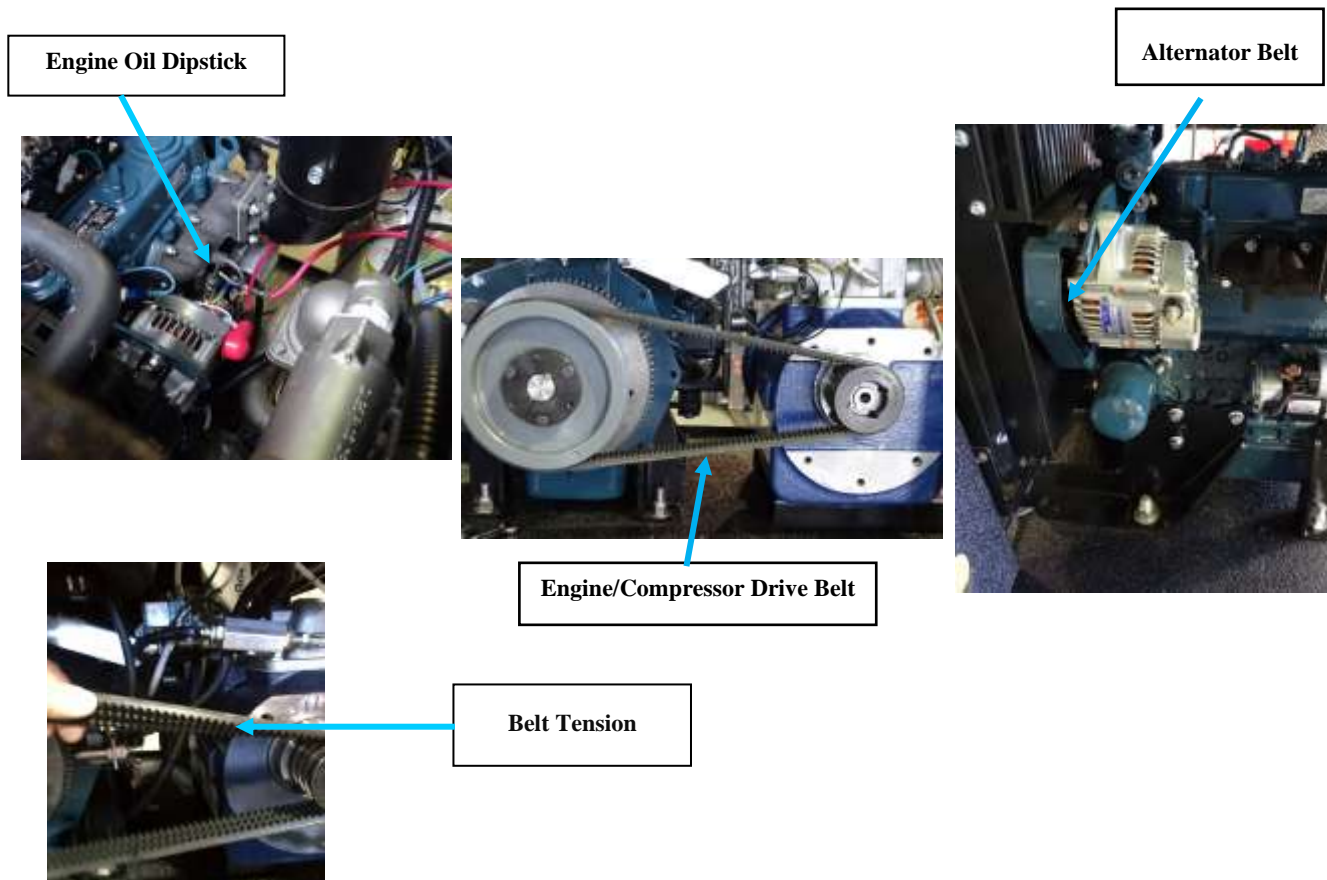


Figure 59. Checking the Belt Tension

The engine operates with an electric fuel pump that is mounted on the end panel. When draining or changing the filter body ensure that you use the integrated fuel primer pump to re-fill (prime) the fuel/water filter. To do so, unscrew the knob until the knob is free from the housing and pump 14 times or until full. Close the knob securely and the fuel/water separator will have enough fuel to be able to start the engine.



Figure 60. Fuel/Water Separator Placement

When inspecting the plastic bowl on the fuel separator, look for any type of color difference which would indicate that there is water condensation or water in the jerry/fuel can. If this is the case, unscrew the drain cock and eliminate the water until the color is uniform. Close the drain cock securely but do not over tighten. Dispose of the drained water and contaminated fuel appropriately. **DO NOT ALLOW** water to enter the engine. Check the fuel/water separator before use of the Power Unit. If excess water is seen in the plastic bowl separator, remove the fuel from the fuel container and re-fill with fresh, uncontaminated fuel. If problem persists, contact CLS.

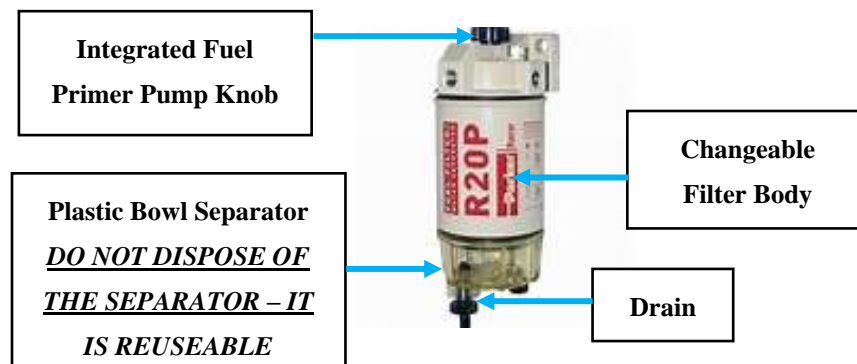


Figure 61. Fuel/Water Separator

Open the top engine access panel. Perform the following checks:

1. Check the antifreeze reservoir. The antifreeze level must be between the low and full marks on the reservoir. Add antifreeze to the reservoir if necessary.
2. Remove compressor air filter cap and filter. Now the engine air filter is accessible.
3. Check the engine air filter by removing the air filter cleaner body cover. Check for dust in the body and on the air filter. Wipe clean and shake off the air filter if dusty, then clean and replace. You can also blow off the air filter with compressed air. Avoid getting dust into the air inlet duct work. **Note:** Air filter cover is marked TOP to ensure that the cover is returned to the air filter body correctly.
4. Check the engine oil (dipstick).
5. Check for leaks inside the engine compartment.
6. Check engine alternator fan belt for fraying, cuts or other physical defects.
7. Contact CLS if any problems are encountered.



Figure 62. Oil/Air Separator Filter on top of the Compressor



Figure 64. Engine Air Filter Cover



Figure 63. Compressor Air Filter cover removed)

When finished with these checks, replace the top engine access panel and secure the latches.
If the engine is hard to start or starts briefly and stalls due to lack of fuel flow, contact CLS.

ENGINE SERVICE INTERVALS

| Interval | Item |
|--|--|
| Every 50 hours | Check of fuel pipes and clamp bands |
| See NOTE | Change of engine oil (depending on the oil pan) |
| Every 100 hours | Cleaning of air cleaner element |
| | Cleaning of fuel filter |
| | Check of fan belt tightness |
| | Draining water separator |
| Every 200 hours | Replacement of oil filter cartridge (depending on the oil pan) |
| | Check of intake air line |
| Every 200 hours of operation or six months | Check of radiator hoses and clamp bands |
| Every 400 hours | Replacement of fuel filter element |
| | Cleaning of water separator in fuel tank |
| Every 500 hours | Cleaning of water jacket (radiator interior) |
| | Replacement of fan belt |
| Every year or every 6 cleanings of air cleaner element | Replacement of air cleaner element |
| Every 800 hours | Check of valve clearance |
| Every 1500 hours | Check of fuel injection nozzle injection pressure |
| Every 3000 hours | Check of injection pump |
| Every two years | Replacement of radiator hoses and clamp bands |
| | Replacement of fuel pipes and clamps |
| | Change of radiator coolant (L.L.C.) |
| | Replacement of intake air line |

OIL CHANGE INTERVAL:

Oil Change (Initial): 50 hours

Oil Change (Subsequent): 100 hours

Oil Filter Cartridge Change: 200 hours

In dusty environments, oil, oil filters and air filters may need to be checked and changed more frequently.

6.2 PMCS OF THE COMPRESSOR



CAUTION! *Turn Main Air Control to the 'OFF' position before servicing compressor!*

Perform the following checks on the compressor:

1. Check compressor air filter for dust. Clean if needed - filter needs to be dry. If air filter is clean, replace the filter cover; if not, replace the air filter before reinstalling filter cover.
2. Check compressor oil level.
3. Check the air pressure setting on the air compressor gauge (control panel). Regulated pressure should be at 100 psi and the Limit Switch at 115 psi. See Figure 67. Contact CLS if the adjustment is out of specification.
4. Check compressor drive belt for fraying, cuts or other physical defects. It should twist no more than ½ twist. Contact CLS if adjustment of the belt is required.
5. Check for leaks in the compressor compartment.
6. Check that all the hoses and connectors are in place.
7. Contact CLS if any problems are encountered.

Compressor Oil Sight Glasses are located on the right side of the power unit. The oil level must always be visible in the lower glass. When the system is not running, the proper oil level in the upper sight glass creates a line across the upper portion of the glass. If compressor oil is low, remove the side access panel of the power module and then remove the oil plug. Add the oil. Once the oil is added, reinstall the oil plug, check for leaks, and replace the side access panel.

Compressor Oil Fill



Compressor Oil Sight Glasses

Figure 65. Compressor Oil Fill and Sight Glasses



WARNING! *DO NOT attempt to run the system if the compressor oil level is not visible in the top sight glass. Compressor oil level must not be checked when the system is running as oil is being pulled from the reservoir.*

Remove air intake filter cover by unsnapping the clips. Remove cover to expose filters. **NOTE** – There is an inner and outer filter. Both filters simply pull out of the housing. Dust can be blown off with compressed air. Replace if necessary. **NOTE:** ALL air filters must be replaced after a real-world decontamination mission, as the filters may have trapped CBRN contamination in them.

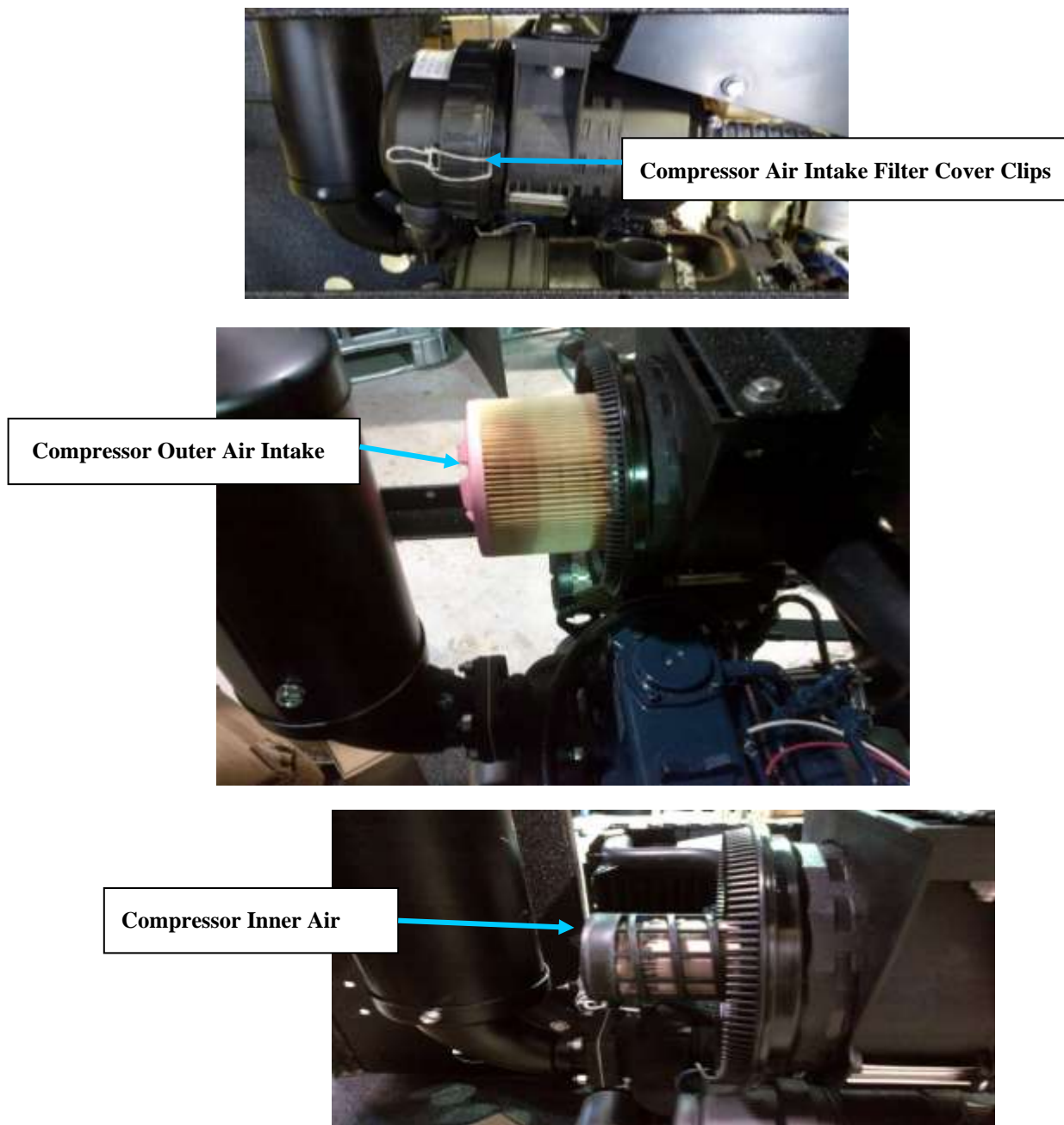


Figure 66. Air Compressor Air Intakes and Filters

Compressor Air Pressure Gauge Setting – Check the compressor air pressure gauge to ensure it is in the correct position, with the Limit Switch set at 115 psi. This gauge setting is a factory preset. Contact CLS if the pressure gauge is not set correctly. The gauge needle should read between 100

– 110 psi when operating. If it rises above 115 psi the system will automatically shut down to protect the operator and equipment. Contact CLS if the Limit Switch appears to be out of adjustment.



Figure 67. Compressor Air Pressure Gauge with Gauge Needle and Limit Switch



CAUTION! The Limit Switch setting of 115 psi is a factory preset. Contact CLS if it is not at this setting.

Compressor Oil Filter – Change the filter initially at 50 hours of run time then 500 hours or annually, whichever is sooner. Change the filter more frequently in dusty environments or if mixing dusty decontaminant powders such as STB or HTH, immediately after the mission.

Compressor Oil/Air Filter – Change initially at 50 hours of run time and then 500 hours or annually, whichever comes first. If the unit is being used in rough and dusty terrain, the air filters may need to be changed sooner. Change the filter more frequently in dusty environments or if mixing dusty decontaminant powders such as STB or HTH, immediately after the mission.

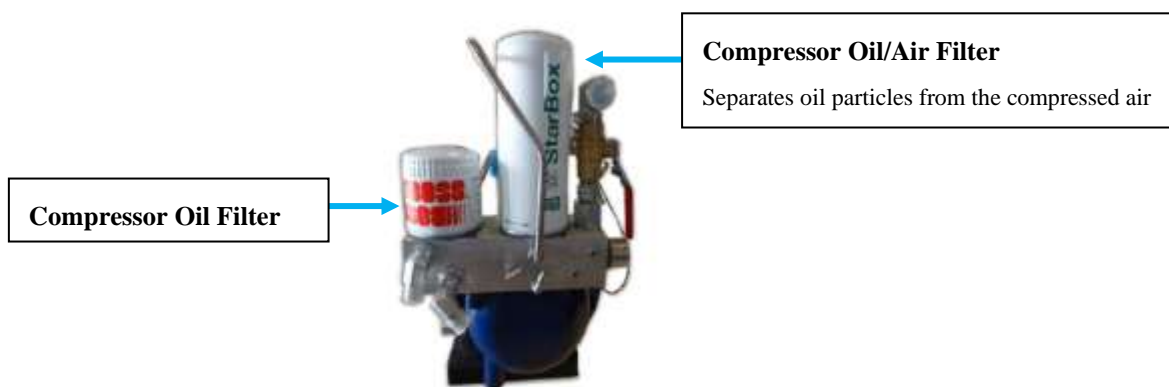


Figure 68. Compressor Oil Filter and Oil/Air Filter

6.3 PMCS OF BATTERY

1. Open the battery box and inspect/check battery terminals for corrosion and clean if required.
2. Look at the expiration date of the battery.
 - a. Replace if weak or at expiration date.



Figure 69. Battery Terminals

6.4 PMCS OF FUEL & FUEL SUPPLY FITTINGS

1. **USE ONLY DIESEL FUEL (No gasoline)** – using the wrong fuel type WILL result in system damage! ONLY use non-metal containers. The system will run on JP-4, JP-5 and JP-8 grade Diesel fuels.
2. Inspect the fuel connections (supply and return) for any evidence of leaks.
3. Ensure all air discharge ports are properly capped and all valves are in closed/off position.

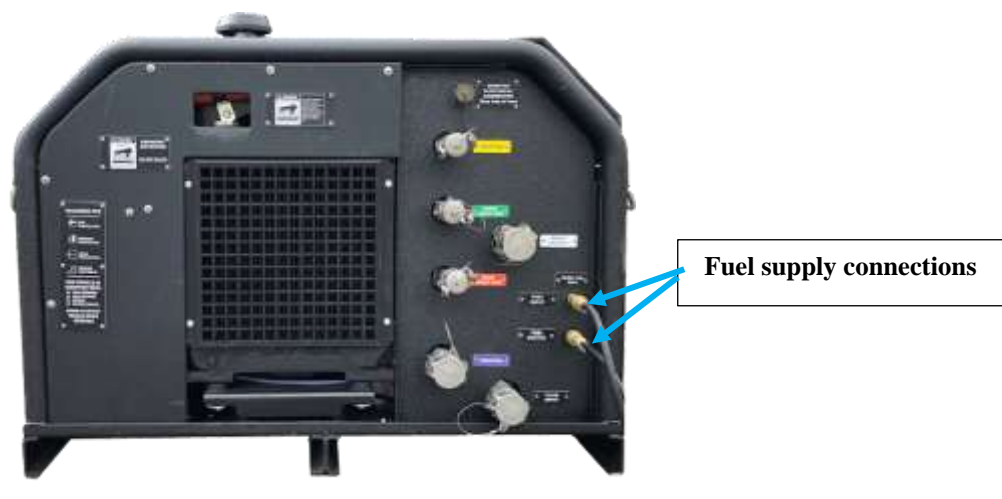


Figure 70. Fuel Line Connections

6.5 PMCS OF TANKS

1. Verify the Fluid In/Drain valve is completely closed (no evidence of liquid leakage).
2. Verify the Hopper Blender cover is securely attached.

3. Check Fluid Input port for leaks.
4. Check Draft Input port for leaks.
5. Check the ratchet tie down straps daily to ensure they are tight to the vehicle or trailer.

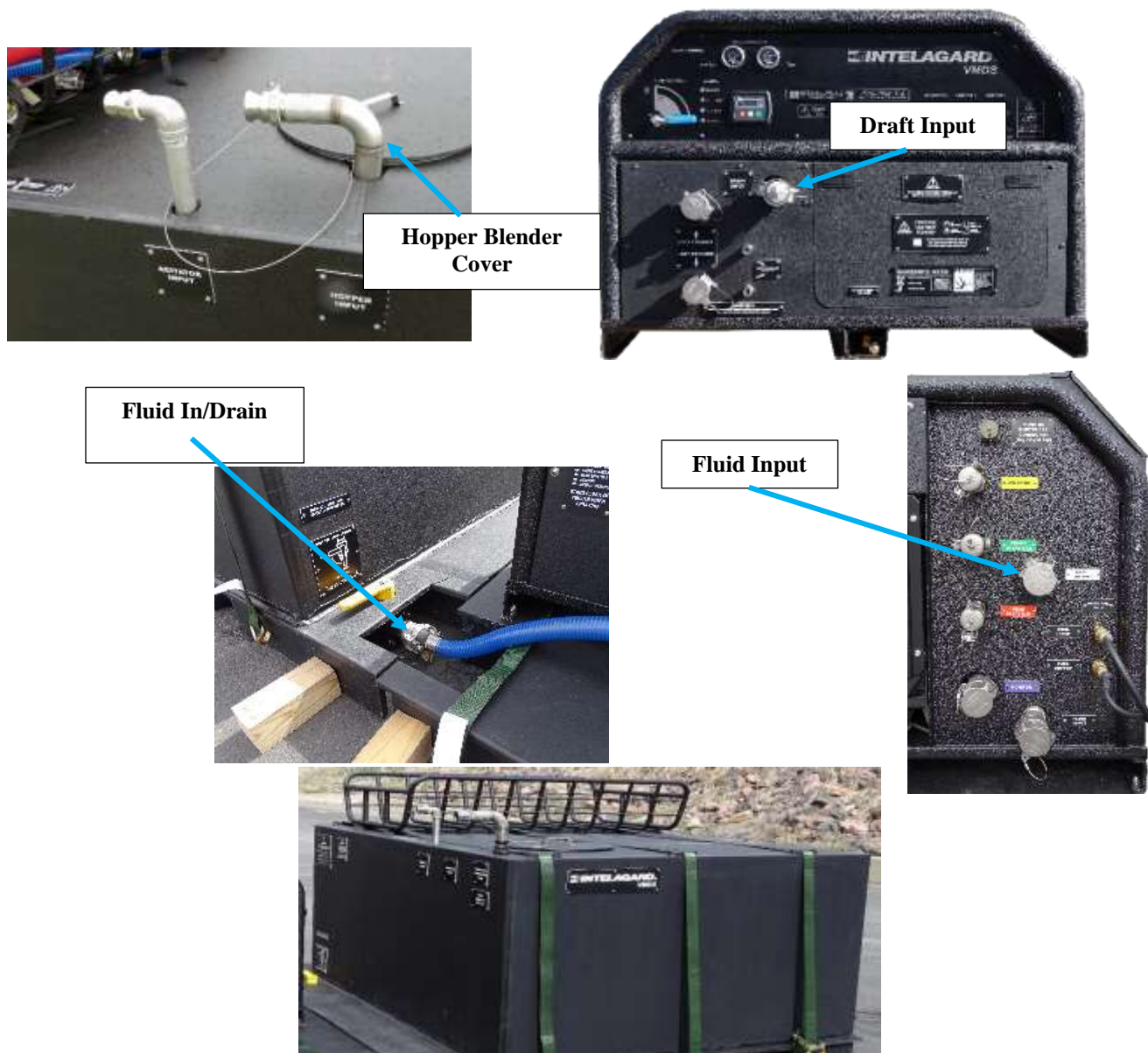


Figure 71. Dust Caps and Connections PMCS

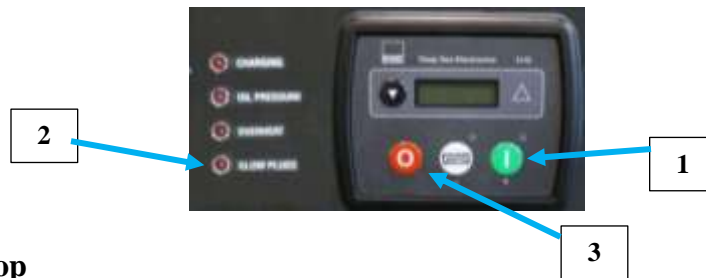
7.0 VMDS OPERATION

NOTE: Ensure that SELECTOR VALVES, PUMP CONTROL VALVE and AIR CONTROL VALVE are all in the OFF position before starting Power Unit.

7.1 POWER UNIT STARTING PROCEDURE

1. Press the **GREEN** start button **ONE TIME**. Status display in window shows software loading.
2. Press the **GREEN** start engine button a **second time**; the **RED** LED glow plug light will light up for approximately 6 seconds. Then engine will start. For a brief second, the **RED OIL PRESSURE** light will flash - this is normal.
3. After the engine starts there will be a 10 second delay before the compressor will engage. Once you hear the engine RPMs drop, this means the compressor is now engaged and the unit is fully operational.

***NOTE** – If the engine stalls for any reason, press the **RED** stop button (3) twice. Wait at least a minute before attempting to restart. The engine will not restart properly if it is under a compressed air load.*



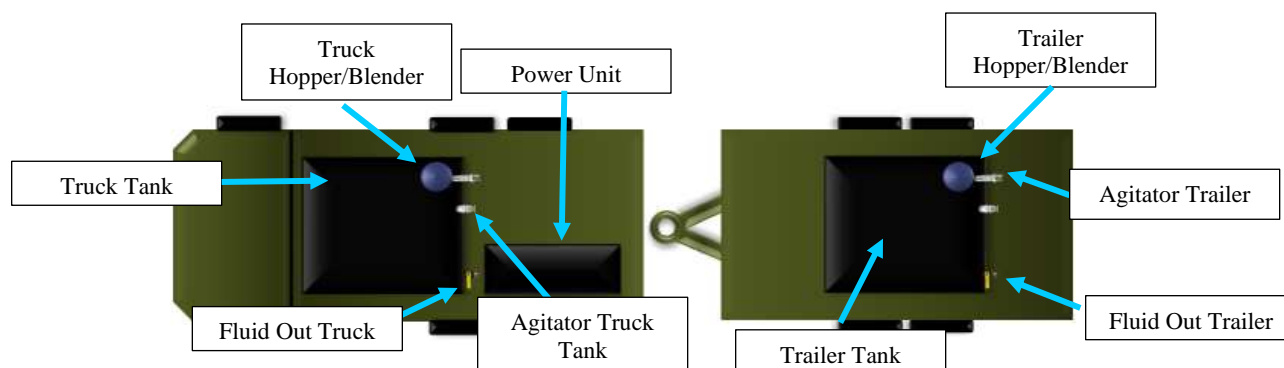
Stop/Emergency Stop

Push the **RED** Stop button 1 time and the power unit will shut down.

7.2 VMDS OPERATION PROCEDURES

The VMDS has several methods of operation which include two (2) discharge hoses with D-Baled handles and nozzle(s), front and rear spray bars and a monitor. There are specific hose connection configurations (see Section 10.2 of this manual) for each specific operational mode. The graphic below shows the location of truck and trailer components. Refer to Section 2.0 (Location and Description of Operator Controls and Indicators) of this manual for additional system locators.

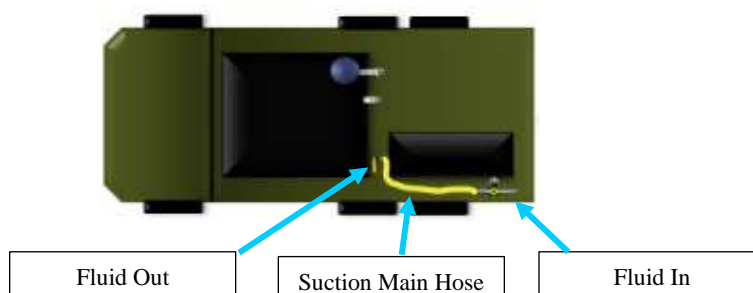
Truck and trailer tanks cannot be used simultaneously. Operator may, however, begin agitation of decontaminant in one tank while conducting mission operations with the other tank. When in DRAFT mode, no other operations are possible.



Fill the fluid tank(s). The fluid tank(s) may be filled by a hose through the hopper blender or straight into the tank. **Do not attempt to attach the Power Unit directly to a fire hydrant!** During filling operations, monitor the water level at all times by looking in the hopper-blender hole or at the fluid tank level indicator (measuring tape). Use clean water when possible. *If you are drafting from a natural water source, such as a stream, pond or lake you MUST use the strainer and a bucket to ensure that particles and/or debris are not drafted into the system. These materials can clog lines and damage the pump.*

7.2.1 Suction Main Hose (SM)

This is the main fluid hose that draws liquid into the power unit from the tank. It is a clear, blue rigid PVC 40-inch, 1.5-inch diameter hose that connects to the power unit and tank with female to female connections. It has Black Bands. This hose remains in this configuration for all modes of operation of the VMDS.





WARNING: Ensure nozzle(s) are pointed in a safe direction before operation! Failure to do so may result in significant injury.

7.2.2 Filling the Holding Tank

There are 2 methods by which to fill the fluid tank of the VMDS.

7.2.2.1 Draft Fill:

- Turn Air Control (17) to OFF position; Turn Pump Control (7) to OFF position;
- Attach Filter Basket to one end of a Blue Band hose;
- Connect the Blue Band hose to the Draft Input (1) port on the front of the Power Unit, ensuring that the filter basket is attached to the end submerged in the water source or blivit;
- Connect the White Band hose to the Draft Output (2) port on the back of the Power Unit with the other end attached to the Hopper/Blender Input (3) on holding tank;
- Start Power Unit (4);

- Set Selector 1 (5) to DRAFT, Selector 2 (6) to OFF;
- **SLOWLY** turn on Pump Control (7) to full ON position;
- Fill tank
- Once tank is filled, **SLOWLY** turn Pump Control (7) to full OFF position;
- Set Selector 1 (5) to OFF
- Turn Power Unit (4) off.

7.2.2.2 Hydrant Fill:



WARNING: NEVER connect a fire hydrant directly to the VMDS Power Unit. Introducing pressurized water directly through the Power Unit will cause significant system damage!



WARNING: Ensure nozzle(s) are pointed in a safe direction before operation! Failure to do so may result in significant injury.

- Connect the White Band hose to the Hopper/Blender (3) on the holding tank and the other end to the fire hydrant. NOTE: An adaptor may be required to connect to the fire hydrant.
- **SLOWLY** turn hydrant on and fill tank;
- Once tank is full, **SLOWLY** turn hydrant off.

7.2.3 Drafting Operation

- Turn Air Control (17) to OFF position; Turn Pump Control (7) to OFF position;
- Connect the Filter Basket to one end of the Blue Band hose;



Filter Basket



Filter Basket Attached to
Hose

- Connect the Blue Band hose to the Draft Input (1) port on the front of the Power Unit, ensuring that the filter basket is attached to the end submerged in the water source or blivit;
- Connect the White Band hose to the Draft Output (2) port on the back of the Power Unit with the other end attached to the Hopper/Blender (3) on the recipient tank;

- Connect the Yellow Band hose to the Agitator (9) port on the back of the Power Unit and to the Agitator (10) on the recipient tank;
- Start Power Unit (4);
- Set Selector 1 (5) to DRAFT, Selector 2 (6) to OFF;
- **SLOWLY** turn on Pump Control (7) to full on position; Turn Air Control (17) to full on position; do not use the air injection for mixing slurry.
- To mix decontaminant in recipient tank, set Selector 1 (5) from DRAFT position to AGITATOR position (NOTE: If it is necessary to stop mixing, place Selector 1 (5) to OFF position.);
- Add decontaminant to Hopper/Blender opening (13) on the recipient tank;
- Ensure that decontaminant in tank is mixing properly;
- Keep Agitator engaged the entire time there is decontaminant in the tank.
- Upon completion of mission, clean tanks using procedure required for the decontaminant used;
- **SLOWLY** turn Pump Control (7) to full OFF position; Turn Air Control (17) to full OFF position;
- Set Selector 1 (5) to OFF position;
- Turn Power Unit off (4).



WARNING: Ensure nozzle(s) are pointed in a safe direction before operation! Failure to do so may result in significant injury.

7.2.4 Tank-to-Tank Operation

One of the dual tanks on the VMDS can be used as a holding tank to supply the recipient/holding tank with water when desired. In this case it is the trailer tank.

- Turn Air Control (17) to OFF position; Turn Pump Control (7) to OFF position;
- Fill tank to be used as holding (trailer) tank with water;
- Fill the recipient (truck) by using the White Band hose to connect the Hopper/Blender (3) on the recipient tank to the Discharge Line #2 (8) on the Power Unit;
- Attach the Tank Selector Valve to the Fluid Input (11) port on the Power Unit;
- Use the short Black Band hose to connect the Fluid In/Drain (12) valve of recipient (truck) tank to the short connector on the Tank Selector Valve;
- Use the long double Black Band hose to connect the Fluid In/Drain (12) valve of the holding (trailer) tank to the long connector on the Tank Selector Valve;
- Turn the Tank Selector Valve to the holding tank (trailer) position (see figure below);



a. Tank Selector Valve
(Pull From Trailer)



b. Tank Selector Valve
(Pull From Truck Tank)

- Use the Yellow Band hose to connect the Agitator (10) on the recipient (truck) tank to the Agitator (9) port on the Power Unit;
- Connect the White Band hose to the Line 2 Discharge (8) and to the Hopper/Blender (3) on the recipient (truck) tank;
- Start Power Unit (4);
- Set Selector 1 (5) to AGITATOR, Selector 2 (6) to LINE 2 or MONITOR as appropriate;
- **SLOWLY** turn on Pump Control (7) to full ON position; Turn Air Control (17) to full on position;
- Add decontaminant to Hopper/Blender opening (13) on the recipient (truck) tank;
- Ensure that decontaminant in tank is mixing properly;
- Keep Agitator engaged the entire time there is decontaminant in the tank.
- Upon completion of mission, clean tanks using procedure required for decontaminant used;
- **SLOWLY** turn Pump Control (7) to full OFF position; Turn Air Control (17) to full off position;
- Set Selector 1 (5) and Selector 2 to OFF position;
- Turn Power Unit off (4).

7.2.5 Front Spray Bar Operation

- Turn Air Control (17) to OFF position; Turn Pump Control (7) to OFF position;
- Connect Front Spray Bar to front bumper of truck.
- Run FRONT SPRAY BAR (FSB) hose (green band) over the top of truck cab and connect it to the front spray bar, using magnets on top of the cab near the windshield to secure the hose.
- Connect FSB to FRONT SPRAY BAR output (14) (green) on back of power unit.
- **SLOWLY** turn PUMP CONTROL VALVE (7) to full OFF position.
- Turn SELECTOR VALVE 1 (5) to FRONT SPRAY BAR mode.
- **SLOWLY** turn PUMP CONTROL VALVE (7) to full ON position; Turn Air Control (17) to full ON position.



WARNING: Ensure nozzle(s) are pointed in a safe direction before operation! Failure to do so may result in significant injury.

7.2.6 Rear Spray Bar Operation

- Turn Air Control (17) to OFF position; Turn Pump Control (7) to OFF position;
- Connect Rear Spray Bar to rear bumper of truck *or* rear bumper of trailer if using the trailer.
- Connect the two (2) 15 ft. REAR SPRAY BAR (RSB) hoses (orange band) via the 1-inch male-to-male fittings.
- Connect the RSB hose(s) to the REAR SPRAY BAR output (15) (orange) on the back of the power unit, and to the Rear Spray Bar, using the magnets on the truck and trailer bumpers to secure hose and prevent sagging between platforms.
- **SLOWLY** turn PUMP CONTROL VALVE (7) to full OFF position.
- Turn SELECTOR VALVE 2 (6) to REAR SPRAY BAR mode.
- **SLOWLY** turn PUMP CONTROL VALVE (7) to full ON position; Turn Air Control (17) to full ON position;

NOTE: *Both front and rear spray bars can be activated and used simultaneously.*



WARNING: Ensure nozzle(s) are pointed in a safe direction before operation! Failure to do so may result in significant injury.

7.2.7 Monitor Operation

- Install Monitor as instructed in Section 5.4 of this manual.
- Turn Air Control (17) to OFF position; Turn Pump Control (7) to OFF position;
- Connect MONITOR (MON) hose to MONITOR output (16) (blue) on the back of the power unit, and to the Monitor Hose Connector on Monitor Stanchion (not shown).
- **SLOWLY** turn the PUMP CONTROL VALVE (7) to full OFF position.
- Turn SELECTOR VALVE 2 (6) to MONITOR mode.
- **SLOWLY** turn the PUMP CONTROL VALVE (7) to full ON position; Turn Air Control (17) to full ON position.



WARNING: Ensure nozzle(s) are pointed in a safe direction before operation! Failure to do so may result in significant injury.

7.2.8 Wired Remote Monitor Operation

- Install Monitor as instructed in Section 5.4 of this manual.
- Turn Air Control (17) to OFF position; **SLOWLY** turn Pump Control (7) to OFF position;
- Connect MONITOR (MON) hose to MONITOR output (16) (blue) on the back of the power unit, and to the Monitor Hose Connector on Monitor Stanchion;
- Turn SELECTOR VALVE 2 (6) to REMOTE MONITOR mode;
- **SLOWLY** turn the PUMP CONTROL VALVE (7) to full ON position; Turn Air Control (17) to full ON position.



WARNING: Ensure nozzle(s) are pointed in a safe direction before operation! Failure to do so may result in significant injury.

7.2.9 Line 1 Discharge Operation

Start Up

- Turn Air Control (17) to OFF position; Turn Pump Control (7) to OFF position;
- Turn SELECTOR VALVE 1 (5) to LINE 1.
- Ensure Hand Bale on the end of the Discharge Hose (red band) is in CLOSED position.
- **SLOWLY** turn PUMP CONTROL (7) to full ON position. Turn Air Control (17) to full ON position;
- Line 1 will be fully charged and ready for operation.

Shut Down

- **SLOWLY** turn PUMP CONTROL VALVE (7) to full OFF position; Turn Air Control (17) to full OFF position;
- Ensure Hand Bale at the end of the Discharge Hose (red band) is in OPEN position to drain all fluids from hose.
- Turn SELECTOR VALVE 1 (5) to OFF position.



WARNING: Ensure nozzle(s) are pointed in a safe direction before operation! Failure to do so may result in significant injury.

7.2.10 Line 2 Discharge Operation

Start Up

- Turn Air Control (17) to OFF position; Turn Pump Control (7) to OFF position;
- Turn SELECTOR VALVE 2 (6) to LINE 2
- Ensure Hand Bale on the end of the Discharge Hose (red band) is in CLOSED position.
- **SLOWLY** turn PUMP CONTROL VALVE (7) to full ON position. Turn Air Control (17) to full ON position;
- Line 2 will be fully charged and ready for operation.

Shut Down

- **SLOWLY** turn PUMP CONTROL VALVE (7) to full OFF position; Turn Air Control (17) to full OFF position;
- Ensure Hand Bale at the end of the Discharge Hose (red band) is in OPEN position to drain all fluids from hose.
- Turn SELECTOR VALVE 2 (6) to OFF position.



WARNING: Ensure nozzle(s) are pointed in a safe direction before operation! Failure to do so may result in significant injury.

7.3 TANK CLEANING PROCEDURE

- Use proper PPE when cleaning tanks;
- Drain tank of all fluid, opening drain and routing liquid away from tank with a hose;
- Pre-rinse tank inside and out with water;
- Wash tank with a liquid detergent (i.e. 'Dawn' dish soap) and water solution, using discharge hose and gun (through inspection/clean out ports, if necessary);
- Flush tank with clean water.

Dispose of the wastewater liquid IAW unit approved disposal procedures for the chemicals used. Repeat procedure until tank is thoroughly cleaned. Any residual chemicals may harden and become a clog.

Special techniques to clear clogs or to remove decontaminant residues from the tanks include:

- Use a ¼" to ½" shaper tip nozzle to shoot water into clogs/residue;
- Use a pressure washer in high pressure mode to assist in cleaning off large of decontaminant;
- Agitate the tank (using the Agitator function) with clear water when flushing and add air to the Agitator when flushing to clear clogs;
- Back flush the main tank drain valve using a 1 ½" hose and any of the 1 ½" discharge functions (i.e. the Monitor function);
- Shovel out any large chunks of decontaminant and dispose of per unit environmental procedures.

8.0 BATTERY OPERATION & MAINTENANCE

1. Open the battery box and inspect/check battery terminals for corrosion and clean if required.
2. Look at the expiration date of the battery. Contact CLS if the battery is weak or past its expiration date.



Figure 71. Battery Terminals

9.0 FUEL SUPPLY AND RETURN PORTS



Figure 72. Fuel Supply Connections

ONLY USE DIESEL OR MILITARY GRADE JP4/5/8 FUEL! – using the wrong fuel type **WILL** result in system damage! **ONLY** use non-metal “jerry can” or other, non-metal fuel container.



WARNING! *Using the wrong fuel type WILL result in system damage and will void warranty!*

1. Inspect the fuel connections (supply and return) for any evidence of leaks.
2. Ensure all air discharge ports are properly capped and all valves are in the closed/off position.

10.0 HOSES

10.1 VMDS HOSE DESCRIPTIONS / COLOR CODING

| Number | Name | Diameter | Fittings | Length | Magnets | Diameter & Material | Fittings | Label |
|--------|----------------------------|----------|----------|---------|-----------|----------------------------------|----------------------|---------------------------------|
| 1 | Agitator | 1" | F-F | 8' | | 1" Red Booster Hose Material | 1" Instalock F-F | YELLOW |
| 2 | Agitator Trailer | 1" | F-F | 35' | 2 Magnets | 1" Red Booster Hose Material | 1" Instalock F-F | YELLOW X2 |
| 3, 4 | Discharge #1 and #2 | 1 1/2" | F-F | 2 X 50' | | 1 1/2" Red Booster Hose Material | 1 1/2" EZLink F-F | RED |
| 5,6 | Discharge, Short #3 and #4 | 1 1/2" | F-F | 2 X 12' | | 1 1/2" Red Booster Hose Material | 1 1/2" EZLink F-F | RED X2 |
| 7 | Draft (Vertical) | 1 " | M-M | 20' | | Blue Water PVC, 1" dia | 1 1/2" Cam-Lock M-M | BLUE |
| 8 | Draft (Horizontal) | 1 1/2" | M-M | 60' | | Blue Water PVC, 1 1/2" dia | 1 1/2" Cam-Lock M-M | BLUE X2 |
| 9 | Hopper/Blender | 1 1/2" | F-F | 35' | | 1 1/2" Red Booster Hose Material | 1 1/2" EZLink F-F | WHITE |
| 10 | Hopper/Monitor | 1 1/2" | F-F | 17' | | 1 1/2" Red Booster Hose Material | 1 1/2" EZLink F-F | PURPLE |
| 11 | Spray Bar, Front (FSB) | 1 " | F-F | 25' | 2 Magnets | 1" Red Booster Hose Material | 1" Instalock F-F | GREEN |
| 12,13 | Spray Bar, Rear (RSB) | 1" | F-F | 2 X 15' | 2 Magnets | 1" Red Booster Hose Material | 1" Instalock F-F | ORANGE |
| 14 | Suction Main Tank | 1 1/2" | F-F | 40" | | Blue Water PVC, 1 1/2" dia | 1 1/2" Instalock F-F | BLACK BLACK X2 |
| 15 | Suction Trailer Tank | 1 1/2" | F-F | 25' | | Blue Water PVC, 1 1/2" dia | 1 1/2" Instalock F-F | |

1.2.3.2.1 Agitator (Yellow Band) and Agitator -Trailer (Double Yellow Band) Hoses

The Agitator hose (left, below) is 8-feet long/1-inch in diameter and is used to feed the Agitator on the main (truck) tank and is marked with a yellow band.. The Agitator-Trailer hose (right, below) is 35-feet long and used to reach the trailer tank and is marked with a double yellow band. The Instalock connectors on these hoses require two hands to attach and detach.



Figure 16. Agitator and Agitator-Trailer Hose connectors

1.2.3.2.2 Discharge 1&2 (Red Bands) and Short Discharge 3&4 (Double Yellow Bands) Hoses

The Discharge hose (left, below) and Short Discharge hose (right, below) are used with D-Bale handles (guns) and other nozzles stored in the Accessory Box . These two main discharge hoses are marked with a single Red Band and are 50 feet long and 1.5-inch in diameter. Using a male-male adapter, they can be connected together to create a longer reach. The two short discharge hoses are marked with Double Red Bands and are used to connect the D-Bale handles, guns and nozzles or the Hopper-Blender to the main (truck) tank. This hose can also be used to discharge from the back of the Power Unit to a dump tank on the ground. The short discharge hoses are 12 feet long and 1.5-inch diameter.



Figure 17. Discharge Hoses: Discharge 1&2 (red band) and Short Discharge 3&4 (double red bands)

1.2.3.2.3 Vertical Drafting (Blue Band) and Horizontal Drafting (Double Blue Band) Hoses

The Vertical Draft (Blue Band) hose is used to draft water vertically (from a stream, pond, ocean or a tank on the ground) into the truck and/or trailer tank. It is marked with a single blue band and is 20 feet long and 1-inch in diameter, fitted with 1.5-inch male fittings. This hose attaches to the Power Unit on the DRAFT input port on the front of the Power Unit. The Horizontal Draft (Double

Blue Band) hose is 60-feet long and is meant to draft water from a water source on the same level as the recipient tank. ALWAYS use the filter basket when drafting to reduce the risk of foreign objects getting lodged in the Power Unit or the tank(s).



Figure 18. Vertical Drafting Hose (blue band) and Horizontal Drafting Hose (double blue band)

1.2.3.2.4 Hopper Blender Hose (White Band)

The Hopper-Blender hose is used to connect the Power Unit to the tank that is mounted in the trailer or a tank on the ground. This hose attaches via the hopper-blender on the tank or can be used to fill the tank from the bottom at the Tank Main Drain. The Hopper-Blender hose is 35-feet long and made of 1.5-inch red booster hose material. It has EZLink connectors for quick, one-handed connection and removal and is marked with a White Band. This hose can be used as an intermediate length discharge hose.



Figure 19. Hopper-Blender Hose (White Band)

1.2.3.2.5 Monitor Hose (Purple Band)

The Monitor Hose is used to connect the Power Unit to the Remote Monitor (water cannon) that is mounted in the forward corner of the truck. It attaches to the Monitor Discharge port on the rear of the Power Unit. It can also be attached to the Draft Discharge or either Discharge 1 or 2 ports to fill the tank(s). The Monitor hose is 17-feet long and made of 1.5-inch red booster hose material. It has the EZLink connectors for quick, one-handed connection and removal. It is marked with a Purple band and can be used as an intermediate length discharge hose or the mixing hose when attached to the Hopper-Blender on the truck tank.



Figure 20. Monitor Hose (Purple Band)

1.2.3.2.6 Front Spray Bar Hose (Green Band)

The Front Spray Bar Hose (Green Band) is 1-inch in diameter and is made of the Red Booster Hose material (same as the M12A1) and 25-feet long. The hose is equipped with Instalock fittings and used to connect the Front Spray Bar port on the Power Unit to the Front Spray Bar. The hose is routed over the cab of the truck and can be held in place with magnets that are stored in the accessory box of the De-Icer Kit. This hose can also be attached to the Agitator on the main (truck) tank.



Figure 21. Front Spray Bar Hose (Green Band)

1.2.3.3.7 Rear Spray Bar Hoses (Orange Bands)

There are two (2) Rear Spray Bar Hoses (Orange Bands). They are 15-feet long, 1-inch in diameter and are made of the Red Booster Hose material (same as the M12A1). These hoses are equipped with Instalock fittings and used to connect the Rear Spray Bar port on the Power Unit to the Rear Spray Bar. The hose is routed over the tailgate of the truck and can be held in place with magnets that are stored in the accessory box of the De-Icer Kit. In order to reach the rear of the trailer, use both Orange Band hoses connected with the male-male 1-inch adapter. This hose can also be attached to the Agitator on the trailer tank.



Figure 22, Rear Spray Bar Hose (Orange Band)

1.2.3.2.8 Suction Main Tank (Black Band) and Suction Trailer Tank (Double Black Band)

The Suction Main (SM) Hose is 40-inches long and connects the main tank to the Tank Selector Valve. This hose is made of reinforced 1.5-inch PVC and is clear with a blue spiral reinforcement. The Suction Main Hose has a single black band.

The Suction Trailer Hose is 25-feet long and is constructed the same material as the Suction Main hose. This hose has two black bands and connects the trailer tank to the Tank Selector Valve by transitioning over the front transom of the trailer and over the tailgate of the truck. This hose can also be used to extend the length of the Horizontal Drafting Hose for transferring water.



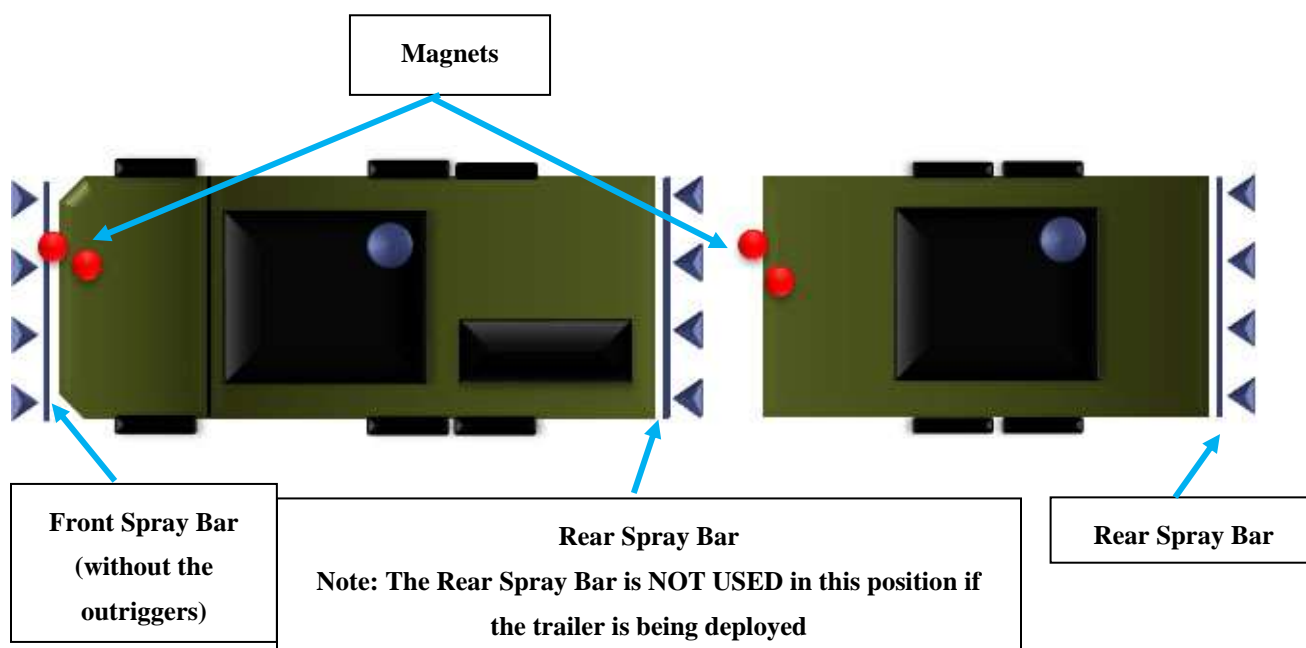
Figure 23. Suction Main Hose (Black Band) and Suction Trailer Tank Hose (Double Black Bands)

10.2 POWER UNIT HOSE CONNECTION COLOR CODE

| Function | Label Color | Associated Hose Color | Associated Hose Material |
|---|---------------|-----------------------|--|
| Front of Power Unit | | | |
| Discharge #1 & #2 | RED | Red | 50' X 1 ½" Booster #1 and #2 |
| Discharge #3 & #4 (shorter hoses for in the truck bed) | RED | Red | 12' X 1 ½" Booster #3 and #4 |
| Draft Input | BLUE | Blue | 20' X 1 ½" Blue PVC or 60' X 1-1/2" Blue rigid/PVC |
| Rear of Power Unit | | | |
| Agitator | YELLOW | Red | 6' X 1" Booster |
| Front Spray Bar | GREEN | Red | 25' X 1" Booster |
| Rear Spray Bar | ORANGE | Red | 2 each 15' X 1" Booster |
| Monitor | PURPLE | Red | 17' X 1 ½" Booster |
| Draft Output (Hopper/Blender) | WHITE | Red | 35' X 1 ½" Booster |
| Fluid Input (Suction) | BLACK | Blue | 40" 1 ½" Blue PVC or 25' 1 ½" Blue PVC |

11.0 CAB AND TAILGATE MAGNETS

The truck cab magnets can be used to keep the hoses secure over the cab of the truck and off of the windshield. The tailgate magnets keep the hoses from sagging and give additional support. They are rated at 50 lbs apiece. Connection clamps, zip-ties, or 550 parachute cord can be used to attach the hose to the magnet. You can also use plastic coiled hose protectors to aid in protecting the hoses where they bend over the truck cab or the tailgate. See CLS for the coiled protector materials. Magnets and coiled protectors are expendable items that may be consumed in use.



12.0 WINTERIZATION AND FREEZE PREVENTION PROCEDURES

12.1 (STEP #1) INITIAL BLOW-DOWN OPERATION

NOTE: If the following procedures are not properly completed, risk of cracking the power unit's pump may occur if the residual water freezes within the pump housing. Use gloves, hearing and eye protection to protect against injury.

This procedure will use the internally generated air pressure to blow out any residual liquid laying in the lowest internal points within the diaphragm pump. This initial procedure will ensure as much of the contained liquid is pushed out of the pump.

Winterization/Blow-Down:

1. Turn BOTH SELECTORS to **OFF**
2. Start the power unit and let run until unit is idled down and ready for operation.
3. Turn PUMP CONTROL to **OFF**
4. Turn AIR CONTROL to **DRY/OPEN**
5. Keep SELECTOR 1 to **OFF**
6. Remove all the dust caps.
7. Turn SELECTOR 2 to **LINE 2**. Run for 10-15 seconds.
8. Turn SELECTOR 2 to **MONITOR**. Run for 10-15 seconds.
9. Return BOTH SELECTORS to **OFF**
10. Shut down power unit
11. Replace all the dust caps.

12.2 (STEP #2) RECREATIONAL VEHICLE (RV) ANTI-FREEZE PROCEDURE



WARNING! NEVER use anti-freeze with STB (Super Tropical Bleach). A heat-releasing reaction occurs!

This procedure serves as a secondary precaution to ensure pump cracking does not occur. The intake of RV anti-freeze will mix with any residual liquid within the pump after the blow-down procedure is completed to further prevent the pump from cracking under freezing conditions.

Using the DRAFT hose, connect the male end to the **DRAFT** port located on the front of the power unit. Pour 1 quart of RV anti-freeze into a bucket. Place the opposite end of the hose into the anti-freeze bucket.

1. Start the power unit and let run until unit is ready for operation. (Ensure BOTH SELECTORS are still in the **OFF** position)
2. Remove the dust cap on the **DRAFT INPUT** port. Attach the DRAFT hose (Blue band)
3. Turn PUMP CONTROL to **ON**

4. Turn AIR CONTROL to **WET/OFF**
5. Turn SELECTOR 2 to **OFF**
6. Turn SELECTOR 1 to **DRAFT**
7. Allow Anti-freeze to be drafted in until gone and it is blown through and visually validated exiting the DRAFT OUT port located on the back of the power unit.



WARNING: Be cautious of the hose suction for it may cause injury if body parts come in direct contact with the suction force itself.

8. Return BOTH SELECTORS to **OFF** and shut down the power unit.
9. Remove hose and replace the dust cap.

NOTE: IF UNSURE of the quality of the winterization procedure completed (Step #1 or #2), REPEAT the above outlined procedures. A cracked pump will deadline the power unit.

Power unit pump is now winterized and ready for safe storage in cold weather.

13.0 TROUBLESHOOTING

This section includes two tables, ‘Problems’ and ‘Corrective Actions’. Operators experiencing problems with their system should refer to the first table and see if the problem(s) they are experiencing are listed. If they are, note the ‘Reference Number(s)’ in the left column.

Use the reference number(s) to refer to the second table, ‘Corrective Actions’. Perform the recommended actions one at a time to see if the problem(s) are corrected.

If the problems experienced are not listed in the ‘Problems’ table, or if additional information is required, contact CLS. Be prepared to provide the system serial number.

INTERNAL SAFETY SYSTEMS – This power unit is designed with various safety controls built within. If any of the **RED** LED lights illuminate, the unit is designed to automatically shut down on its own. This also signals that the power unit started to run outside one or several of the programmed operating ranges. If the following unit-level troubleshooting methods do not resolve the issue, STOP and always contact maintenance support. Continued use of the power unit could cause severe damage to the power unit components. The programmable logic control navigation button allows for scrolling to obtain specific engine operational data which monitors the safety cut-off features. These parameters must be set and adjusted only by qualified service technicians.

13.1 PROBLEMS

| PROBLEM | CORRECTIVE ACTION REFERENCE NUMBER(S) |
|---|---------------------------------------|
| When the green Start button is pressed, the engine does NOT turn on | 1,2,14,15,16,18 |
| Air to system shuts off. | 24 |
| While the system is running the “Charging” indicator light comes on and stays on | 4, 5, 14 |
| While the system is running the “Oil Pressure” indicator light comes on and stays on | 5, 14 |
| The system shuts itself down during operations – the “Oil Pressure” indicator light is on | 5, 14 |
| While the system is running the “Alternator” indicator light comes on and stays on | 4 |

(Continuing 13.1 Trouble Shooting - Problems)

| PROBLEM | CORRECTIVE ACTION REFERENCE NUMBER(S) |
|---|--|
| The system shuts itself down during operations – the “Over Heat” light is on | 5, 16, 18 |
| The air compressor “Temperature” gauge needle goes above 318 degrees and stalls unit | 18, 19 |
| The air compressor “Pressure” gauge needle is over 115 psi the system shuts down | 11 |
| The system shuts down/cuts off during operation | 2, 14, 15, 16, 17, 19 |
| System runs rough, does not idle smoothly | 2, 3, 4, 15, 16, 17, 18, 19 |
| When conducting spray operations, the discharge line surges | 3, 23 |
| Pump cycles unevenly, or skip-cycles | 20 |
| Pump cycles rapidly – faster than usual | 3, 8, 9, 20 |
| When attempting to draft the pump will not prime | 7, 8 |
| Fluid leaks detected – fluid appears to be coming from the VMDS power module | 9, 11, 12 |
| Fluid leaks detected – fluid appears to be leaking from the tank(s) | 7, 10 |
| During operation a ‘pulsating hissing noise’ is heard from the pump area of the VMDS power module | 11 |
| A small trickle of water is seen coming from the pump compartment | 12 |
| Line ‘bucks’ when discharging foam | 3, 22 |
| Water is discharged from discharge air line(s) | 24 |

13.2 PROGRAMMABLE LOGIC CONTROLLER ERROR CODES

Indicator Display for trouble shooting on the Programmable Logic Controller (PLC) module:



Compressor High Temperature Switch



Air PSI Gauge Engine Kill



Compressor Temperature Gauge Engine Kill



Oil Sending Unit & Oil Indicator LED



Engine High Temperature



Engine Under speed



Engine Overspeed



Emergency Stop



Battery Under Voltage / Over Voltage

Note: Code “C” also indicates that the front engine access panel is open. Secure the panel and reset the PLC to continue operations.

13.3 TROUBLE SHOOTING – CORRECTIVE ACTIONS

NOTE: Always disconnect battery cables before servicing engine. Always turn PUMP CONTROL VALVE, AIR CONTROL VALVE and SELECTOR VALVES 1 & 2 are set to the OFF position before servicing compressor. Contact CLS for additional information and assistance if necessary.

| REF # | POSSIBLE CAUSES | CORRECTIVE ACTION(S) |
|-------|---|---|
| 1 | Battery not connected, terminals loose or dirty, battery dead | Clean and/or tighten battery terminals. Test battery. Charge battery. Replace battery if required. |
| 2 | Hourglass appears in bottom bowl of separator; System out of fuel; fuel contaminated; fuel pickup blocked; fuel lines not properly connected; Water/fuel separator needs drained; clogged fuel filter; fuel pump failure | Check fuel gauge – ensure can is not empty – refill/replace with clean fuel if required. Check fuel pick-up for obstructions – if air can't flow through the lines neither can fuel. Check fuel line connections on the back of the VMDS. If contaminated fuel is suspected change fuel supply, empty water fuel separator. |
| 3 | Water tank empty or near empty | Add water to the water tank. Unit can continue to operate while water is added through top-fill port. |
| 4 | Loose alternator belt or wiring | Check alternator belt and visible wires going to alternator. Contact CLS. |
| 5 | Possible indicator failure; Malfunction | While the system is OFF(!) check indicator display or LED connections – ensure connections are not broken. Ensure moisture is not in connectors. Reconnect if required. Use air to blow out connectors. |
| 6 | NOTE: The repairs in this Troubleshooting Section are unit level repairs ONLY. | If necessary, contact CLS. |
| 7 | Improper drafting hose/valve configuration. Draft hose cut/sliced/compromised; Drafting hose cam-lever coupler sealing washer missing, damaged; floating dock-strainer not fully submerged in liquid source; foot valve ball stuck, not allowing fluid intake | Verify all connections are properly made; All valves/dials are in the proper position. Inspect the drafting hose for cuts or tears; Ensure the sealing washer on the system connector is present, clean and undamaged; Inspect the draft hose filter – ensure the ball moves freely when you tip the valve; Ensure the filter is fully submerged in the liquid source |

(Continuing 13.3 Trouble Shooting - Corrective Actions)

| REF # | POSSIBLE CAUSES | CORRECTIVE ACTION(S) |
|-------|--|--|
| 8 | Loose hose connectors; Damaged hose(s) | Shut down the VMDS power unit. Completely dry the internals of the system and wipe up any fluid puddles. When these actions are complete restart the system and cycle through fluid drafting and fluid discharge modes. After each is performed shut down the system and check for leaks. If leaks are confirmed inspect the suspected source. Contact CLS for replacement parts if necessary; if due to a loose connection tighten as required. |
| 9 | Spillage; Damaged Fluid Storage Tank | Park on a level surface and completely fill the tank(s) with water. Wipe up any fluid on the tank/areas suspected of leaking – if possible, use compressed air to blow the area dry. Wait several hours and re-inspect the suspected source of the leak. If the fluid storage tank is damaged/compromised contact CLS. |
| 10 | Humid/Cold environment, moisture in the air | The compressor draws moisture from the outside air. When the air is compressed in humid/cold environments, condensation occurs. This condensate may ice at the pump muffler, causing a partial restriction and hissing noise. Continue to use the system, if the problem persists in different conditions, contact CLS for service. |
| 11 | Compressor regulator needs adjustment | Contact CLS |
| 12 | Obstruction in the tank | Flush the tank. Occasionally concentrate hardens and crusts. These solids can build up in the circuit and plug the lines and strainers. Run the system with the tank full of water to flush the entire circuit. |
| 13 | Bad ground/loose wire/connection in charging system; alternator failing/failed | Shut the system down and let it cool. Check wires to/from the alternator for loose connections; air dry connections if excess moisture is present; remove and test alternator |

(Continuing 13.3 Trouble Shooting – Corrective Actions)

| REF # | POSSIBLE CAUSES | CORRECTIVE ACTION(S) |
|-------|---|---|
| 14 | Low engine oil; Loose wire/bad ground; Oil filter clogged | Shut the system down; allow the system to cool – DO NOT check oil level until oil has had time to drain back into the pan. Verify the oil drain valve is in the closed position. Note the last time the oil and oil filter were changed – change if required. While system is shutdown check wiring to and from the indicator light – verify no loose connections, blow out any excess moisture. |
| 15 | Low coolant; Ambient temperature too high; air flow restricted; Air filter clogged; Cooling fan failure | Shut the system down and allow it to cool. DO NOT attempt to check/add coolant until the system has cooled down and coolant has drained back to reservoirs. Once cool, open the radiator cap to verify coolant level – add fluid to the cooling tank as required. Inspect coolant reservoir and make sure coolant is at the proper level. While system is shut-down, check the air filter – clean or replace if required. Ensure the system has sufficient air flow to and around the unit. Once system is re-started observe cooling fan to ensure it is engaging (coming on) to cool the system. If not, you could have a belt problem. |
| 16 | Insufficient fuel flow | Fuel flow can be restricted/interrupted in numerous ways. Check the fuel supply, replace if required; verify the pickup is not clogged; check fuel line connections from supply to VMDS; Note the last time the fuel filter was changed – replace if required; Check fuel/water separator – drain if required. |
| 17 | Belt slippage | Belt slippage can cause overheating, unusual noises, surging/slowness of component. Inspect belts for cracks, fraying or other obvious defects. Contact CLS. |
| 18 | Compressor oil level too low | Shut the system down and allow the system to cool. DO NOT attempt to check or add compressor oil until the system has had time to drain oil back into the reservoirs. Once cool, check compressor oil level – add as necessary. |
| 19 | Possible pump malfunction | Contact CLS for additional advice/trouble shooting. |

(Continuing 13.3 Trouble Shooting – Corrective Actions)

| REF # | POSSIBLE CAUSES | CORRECTIVE ACTION(S) |
|--------------|--|--|
| 20 | Improper settings; wrong nozzle | When spraying liquid only, ensure the Air Control valve is turned to the 'Full Wet' setting. |
| 22 | Dispensing straight water and air | If dispensing straight water and air, line surges are normal as pockets of water and air form in the discharge line. |
| 23 | Failure of hose or fitting | Shut down system and locate leak point. Contact CLS for assistance. |
| 24 | Compressor air and water separator is full | Unlock top of compressor air and water separator, twist and remove. Clean separator compartment. |

APPENDIX A – SUPERTROPICAL BLEACH (STB) SLURRY MIXING PROCEDURE

Modular Decontamination System (VMDS) STB Slurry Mixing Instructions Supplemental Information was adapted from TM 3-4230-237-10, dated 13 March 2012, Work Package 0008 (Located on JACKS).

MAKING STB DECONTAMINATING AGENT SLURRY



WARNING: Do not use antifreeze with STB. A heat-releasing reaction occurs!



WARNING: Do not let dry STB contact grease, fuel or oil. A spontaneous, heat-releasing chemical reaction may occur!

STB Slurry is a legacy decontaminant applied onto surfaces such as roads, airfields, parking aprons, pier side, and taxiways. It is used primarily for terrain decontamination because it is plentiful worldwide and forms a “crust” over the surface where it is applied, aiding in contact time and speeds the decontamination process and weathering effects on terrain. STB Slurry is difficult to mix and keep in suspension for long periods of time, so it is strongly recommended to use (dispense) the batch of STB Slurry within 4 hours of mixing the batch.

PREPARATION OF THE POWER UNIT FOR MIXING SLURRY:

You will need to temporarily replace the air check valve on top of the pump module inside the VMDS Power Unit prior to mixing STB Slurry. STB Slurry operations may create excessive gas pressure inside the pump module that may cause a failure of the check valve on the compressed air foam (CAF) air injection nozzle in the top manifold of the pump. As air injection/CAF is not needed for making STB Slurry, temporarily replace the check valve on the top manifold with a ¼ inch NPT galvanized iron for the STB Slurry mixing mission.



Temporarily replace the check valve on top of the pump module with the ¼" NPT plug to prevent overpressure air in the pneumatic systems when making STB Slurry. No need to detach the air hose from the check valve; just turn off the air control valve on the front control panel
Ensure to use Teflon sealing paste (e.g., Blue Monster) to seal around the plug

Use Teflon sealing paste (e.g., Blue Monster) or Teflon tape to aid in sealing the plug and making removal easier at the end of the mission. It is not necessary to remove the check valve, let it hang free with the air tubing still attached. Just turn off the air control valve on the front control panel as you will not need to add air to make STB Slurry (foaming is not desirable for STB Slurry).



Replace the plug with the check valve after the mission and after flushing out the entire Power Unit with clear water.

CONFIGURATION OF THE TANKS AND HOSES

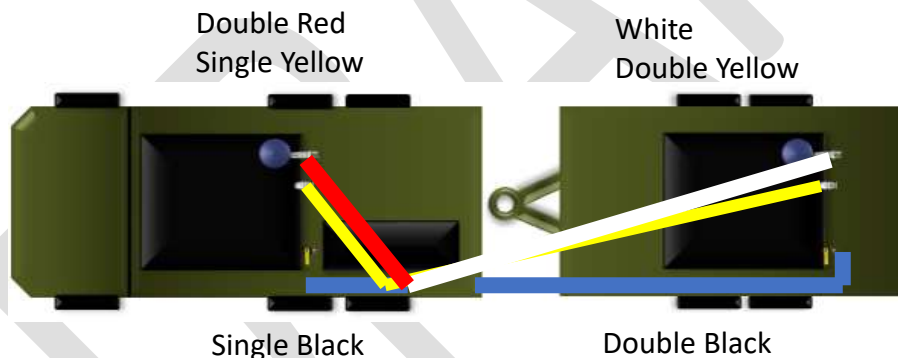
There are two configurations that the operators may use for mixing STB slurry: 1-Two Tanks (Truck and Trailer) or 2-Single Tank (Truck only)

1- Truck and Trailer

The Two-Tank configuration uses both of the 750-Gallon tanks for the STB Slurry mixing operation. The Main (Truck) Tank is used to mix the slurry and the trailer tanks is a source of water for mixing and rinsing the tank. The availability of rinse water is necessary to help clear any clogged lines and to rapidly flush out the system after discharging the slurry.

Using the Tank Selector Valve attached to the rear of the Power Unit, attach the Suction Main (Single Black band) hose to the left side of the Tank Selector Valve and the Trailer Suction hose (Double Black band) to the right. Turn the valve to draw water from the trailer tank as the water source and then turn it back to draw slurry and to mix slurry in the Truck Tank. You can use one of the short discharge hoses (Double Red) to connect the monitor output and the Agitator hose (Single Yellow) connected to the Agitator output to mix the STB slurry, recirculate and agitate the main truck tank. The White band trailer monitor hose and the double yellow band trailer agitator hose can be used to recirculate water or slurry back to the trailer tank. The trailer suction hose (double Black bands) is used to draw water or slurry from the trailer tank.

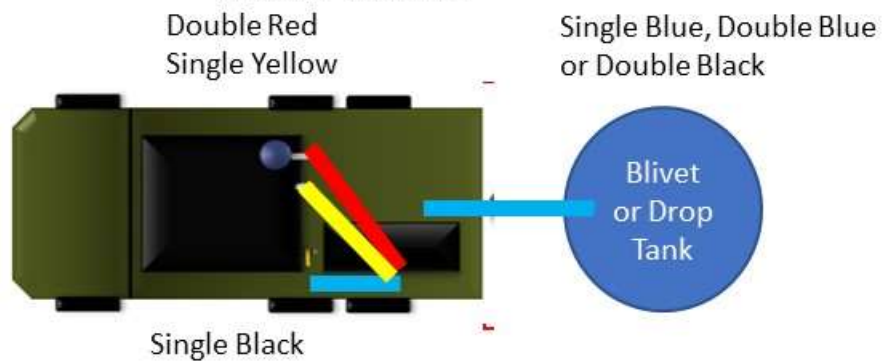
Mixing STB Slurry with Two Tanks



2- Truck only

When using the truck by itself for mixing slurry, the unit will need to supply water for mixing from an external tank such as a blivet, drop tank, tank and pump unit or out of a natural source. Make the mixing connections the same way as above for the truck tank but you will be drafting water vertically or horizontally to fill water into the mixing tank. Keep in mind that you cannot perform any other functions (i.e., agitation, or the mixing with the monitor or discharge outlets) when drafting in through the drafting port and out through the draft outlet port. Use the Vertical Draft hose (Single Blue band) to raise water from below the level of the truck tires to draw water up to the Power Unit and into the Main (Truck) tank. Use the Horizontal Drafting hose (Double Blue bands) to draw water horizontally from a drop tank or blivet on the ground. You can do the same with the Trailer Suction Tank (Double Black bands) to extend the horizontal distance but it might not work for increasing the vertical distance.

Mixing STB Slurry with a Truck Tank only using Blivet or Drop Tank as an external water source



VMDS STB Slurry Mixing Proportions

Approximately 40% STB (W/W) to 60% Water (W/W)

| Standard M12A1-sized Batch | LBS | 50# Drums | Gallons | Relative Percent (W/W) | YIELD |
|----------------------------|---------|-----------|---------|------------------------|-----------------------------|
| STB | 1300 | 26 | | 41% | about 317 gallons of slurry |
| Water | 1878 | | 225 | 59% | |
| Antiset | 12.5 | | | | |
| Antifoam | 144 oz. | | | | |

| Batch for VMDS 750-gallon tank | | | | | Approximately 70% larger batch than that of the M12A1 |
|---------------------------------------|---------|-----------|---------|------------------------|---|
| Double Batch (for VMDS tanks) | LBS | 50# Drums | Gallons | Relative Percent (W/W) | YIELD |
| STB | 2200 | 44 | | 41% | about 630 to 650 gallons of slurry |
| Water | 3130 | | 375 | 59% | |
| Antiset | 25 | | | | |
| Antifoam | 240 oz. | | | | |

Approximately 8.5 to 9 gallons of water per drum of STB to mix slurry

Adding and Blending M2 Antiset and Silicone Antifoam Agent.

1. Fill the VMDS holding (source) tank with 750 gallons of water. The mixing tank should be empty to start.
2. Connect the Hopper/Blender to the mixing tank with the white band hose and the Agitator to the mixing tank using the yellow band hose. A shorter 1 ½ inch hose (double red bands) can be used if the mixing tank is located on the same truck as the Power Unit. The Hopper/Blender hose should be connected to the Monitor outlet (use Selector Valve #2 - preferred). The alternate method is to draft water from an external tank using the drafting function and the draft output port on the back of the Power Unit (white marking port on the back side). Keep in mind you will not be able to agitate if you are using the drafting function. The Agitator is connected to the Agitator outlet with the yellow banded hose and uses Selector Valve #1 in "Agitator" mode. The Hopper/Blender should have the screen on top of the bars to be used in a manner like a "sifter" to help break up any clumps or "dough balls" of dampened STB. A wooden broom stick or other wooden stick is useful for breaking up clumps as well.



3. Connect both tanks to the Tank Selector Valve and initially draw from the source tank (Trailer Tank in most cases) and discharges via the Monitor and Agitator outlets to the mixing tank on board the truck.
4. Connect a short (12-foot, double red band) discharge hose and bale with a plain shaper tip nozzle (plastic or stainless) to aid in mixing in the hopper and to flush out any clumps in the hopper. This hose is connected to the Line #2 Discharge on the front of the Power Unit. You may use this hose to clear any clogs or chunks in the hopper-blender. Close the Pump Control valve and shift the function on Selector Valve #2 to the Monitor function after using the discharge line to flush the hopper.



The agitator function does not allow for the front spray bar outlet to be used. If the STB batch is mixed and ready to dispense through both spray bars, then connect the front spray bar hose to the front spray bar outlet and the rear spray bar hose to the rear spray bar outlet. You will then need to immediately proceed to dispense the STB slurry out both spray bars without further agitation. Leave the yellow hose in place on the truck and attached to the agitator on the tank to facilitate changing over to agitation and flushing the tank after you've discharged the slurry batch.



5. Start the Power Unit, begin agitation (set the Selector Valve #1 to Agitate) and draw water from the source into the mixing tank as described in the proportion table below.
6. Dump the antiset into the mixing tank hopper-blender. Agitate the solution in the tank for at least 3 minutes.
7. Mix the antifoam solution into a 5-gallon bucket and then dump it into the mixing tank. It is important that the antiset and antifoam materials are completely dissolved in water before dumping them into the mixing tank.
8. To prepare STB decontaminating agent for loading, open the drums of STB decontaminating agent (item 7, app D) that you intend to use for the batch. There is a plastic bag inside the drum; open it as well. It is sometimes useful to dump the bag into an empty drum to make dumping and mixing easier for the operator. Try to keep the STB powder dry while doing this operation as the STB will clump and form “dough balls” if it gets dampened.
9. Draw water into truck/mixing tank from the trailer/holding tank (see Section 7.2.4 of this manual).
10. Begin mixing with the Hopper/Blender (use the Monitor function on Selector Valve #2) and begin to dump one drum of STB into the hopper. This process will be slow going at first and you may need to rinse or flush the hopper periodically with a hose and bale connected to the Discharge #2 port. STB is a very fine powder that resembles flour and will clump when wetted. The action of the hopper/blender converts the clumps and powder into slurry at the ejector (located at the bottom of the hopper/blender). When one drum is completely mixed, start on the next drum. Keep a steady pace of filling the hopper-blender with STB to reduce air from getting into the mixture and causing foam to occur in the tank. Do not flush the hopper/blender if you don't have to.
11. The resulting STB slurry should be the consistency of pancake batter. If too foamy; add more antifoam.
12. Disperse the STB slurry out of the front spray bar (FSB), using the Rear Spray Bar (RSB) function on Selector #2. (Selector #1 is already set to Agitator so cannot be set to FSB.) You will need to do it this way if you need to continue agitation while dispensing slurry. If you are intending to use both spray bars, then connect the spray bars and hoses in the primary manner and rapidly dispense the slurry and then immediately begin flushing and agitating the tank to reduce any remaining STB from falling out of the suspension and forming a crust on the insides of the tank.
13. You can disperse the STB slurry out of the Monitor and a hose connected to the Monitor output, using the “Remote Monitor” function on Selector #2.

14. You can also disperse STB Slurry with a red band hose with a D-Bale gun and a 3/8" or 1/2" shaper tip nozzle connected to Discharge Line 2. Do not use a fog nozzle with STB slurry as the fogger nozzle will clog almost immediately.
15. Add the planned amount of STB decontaminating agent (item 7, app D) in one continuous operation through the hopper-blender. When loading agent, see that hopper does not run out of STB decontaminating agent. If the supply of agent is exhausted before loading is completed, the slurry in the tank may foam. Stop or reduce foaming by adding additional silicone antifoam agent.

CAUTION

Cycle the water containing M2 antiset and the antifoam for at least three (3) minutes before mixing STB. The M2 antiset and antifoam must be completely dissolved.

NOTE

If the M2 antiset is caked, it must be crushed as fine as possible before adding it to the water in the tank unit assembly.

NOTE

Before starting the loading and blending operations, break up the large lumps of STB to prevent clogging of the lines and to ensure the best possible water-slurry mixture.

CAUTION

After the slurry is blended, it must be agitated constantly until used. It is useful to agitate with both the agitator and the hopper-blender. Use "Agitator" function on Selector #1 and "Monitor" on Selector #2 and route the monitor hose (purple band) or a short discharge hose (double red band) to the hopper-blender. The alternate is to use the #2 discharge port to the hopper-blender with a double red band hose. Decide which method you will use in advance, so you avoid changing over hoses and connections. After blending is complete, replace tank lid. Agitate the slurry mixture avoid adding air with the Agitator and to reduce foaming.

AGITATING SLURRY IN TANK UNIT

- a. Make sure the Agitator hose (yellow band) is connected to the Agitator output on the back of the Power Unit and that the Agitator function is operating (Agitator function on Selector #1). You can look into the tank if the hopper/blender is removed to observe the agitation (adding air to add more turbulence helps in this observation but adding air will cause foaming to occur). You can also inspect the tank in the other compartments using the inspection/cleanout ports.
- b. If too foamy; add more antifoam.
- c. Continue to agitate while dispensing the slurry. Once the slurry is dispensed (should take 15-30 minutes to dispense the standard batch), rinse and flush the tank immediately or immediately make another batch.

CAUTION

You can still operate the hopper/blender, but it may introduce more air in the slurry mixture and cause foaming after mixing.

CAUTION

The agitator and the hopper-blender hoses will contain slurry. Rinse and clean out these hoses and any fittings thoroughly before storing them in the tank basket.

NOTE: Only one discharge hose is to be used for spraying slurry at a time; use Discharge #2 only so agitation of the slurry in the tank may continue. IN MOST OPERATIONS USING SLURRY, IT MAY BE DESIRED TO SPRAY SLURRY WITH THE FRONT SPRAY BAR. TO DO THIS OPERATION, YOU WILL NEED TO CONTINUE AGITATION WHILE SPRAYING. YOU WILL USE THE AGITATOR FUNCTION ON SELECTOR VALVE #1 AND THE “REAR SPRAY BAR” FUNCTION ON SELECTOR VALVE #2 BUT CONNECT THE FRONT SPRAY BAR HOSE (GREEN BAND) TO THE REAR SPRAY BAR OUTLET (ORANGE) ON THE BACK OF THE POWER UNIT.

When mixing and dispensing slurry, you must agitate the tank to keep the slurry in suspension. Selector #1 will be occupied with that function. You will then need to use Selector #2 and the Rear Spray Bar outlet (on the back of the VMDS Power Unit) to connect the front spray bar and its hose to discharge slurry through the front spray bar. You can also spray slurry using Discharge #2 (on the front of the Power Unit) with the 1 ½ inch discharge hose (red bands) and bale (gun) assembly.

NOTE: YOU WILL ONLY BE ABLE TO DISPENSE SLURRY THROUGH *EITHER* THE FRONT OR REAR SPRAY BAR BUT NOT BOTH AT THE SAME TIME. DO NOT USE A FOG NOZZLE AS IT WILL CLOG WITH SLURRY; USE A SHAPER TIP NOZZLE (RED PLASTIC OR STAINLESS STEEL).

If dispersing slurry with a gun, use Discharge #2 and a D-Bale gun with the shaper tip nozzle or the Monitor outlet (on the back of the Power Unit) using the Remote Monitor function on the #2 Selector Valve.

After the spraying mission is complete, flush, drain, clean, and store the apparatus according to procedure outlined in Section 7.3 of the VMDS Operator's Manual.

A-1: HMDS STB Mixing Requirements, V1, 08 May 8, 2019

Required Personnel:

of mixers: 3, two to mix the STB, one to prep (cut the bag and place the powder in the drums)

Required Material:

Decon Agent STB, NSN 6850-00-297-6653,
Antifoam Compound, NSN 6850-00-950-6489
Antisetting compound, NSN 6850-00-656-0926

Appendix A TM 3-4230-237-10

0008

OPERATOR MAINTENANCE OPERATION UNDER USUAL CONDITIONS SPRAYING DECONTAMINANT SOLUTION

INITIAL SETUP:

Materials/Parts

Antifoam Compound, Silicone (WP 0029, Table 1, Item 2)
Antisetting Compound, Decontaminating Slurry (WP 0029, Table 1, Item 3)
Decontaminating Agent STB (WP 0029, Table 1, Item 8)
Detergent, General Purpose (WP 0029, Table 1, Item 9)
Disinfectant, Calcium Hypochlorite (WP 0029, Table 1, Item 10)
Foam Liquid, Fire Extinguishing (WP 0029, Table 1, Item 12)

Materials/Parts (cont.)

Sodium Carbonate (WP 0029, Table 1, Item 21)
Sodium Hydroxide, Technical (WP 0029, Table 1, Item 22)

References

FM 3-11.5
TM 10-8415-220-10
WP 0006
WP 0007
WP 0011

MAKING SUPER TROPICAL BLEACH (STB) DECONTAMINATING AGENT SLURRY

WARNING



- Wear protective clothing and a mask when engaged in decontaminating operations. Super Tropical Bleach (STB) decontaminating agent and slurry are harmful to the skin, eyes, lungs, and clothing. If STB decontaminating agent or slurry gets into the eyes, flush them immediately with clear water. If STB decontaminating agent or slurry is taken internally, drink raw egg white, milk, rice gruel, or milk of magnesia. Do not induce vomiting. Seek medical assistance immediately. If STB decontaminating agent or slurry contacts the skin, wash off immediately with clear water.
- Do not use antifreeze with STB. Heat releasing reaction occurs.
- STB slurry temperature increases as STB powder is added. When using higher starting water temperatures, use caution when handling bare metal parts such as gun assemblies. Failure to comply may result in burns to skin.

General

When preparing slurry, add the M2 (antisetting compound decontaminating slurry) to the water first. Mix water with M2 antiset for three minutes. Next add the silicone antifoam agent. Mix silicone antifoam agent for at least three minutes before adding the STB decontaminating agent. Prepare the slurry as near to using time as possible. Never prepare slurry more than four hours in advance of use. STB will dissolve more rapidly in hot water; however, STB may foam excessively at water temperatures greater than 110 °F. Limit starting water temperature to 110 °F or less when possible. If water temperature must exceed 110 °F (such as if the source water exceeds 110 °F), it is recommended to limit STB slurry batch size to a half batch (158 gallons) to mitigate the effects of excessive foaming.

0008-1

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MAKING SUPER TROPICAL BLEACH (STB) DECONTAMINATING AGENT SLURRY - Continued**M2 Antiset**

Figure 1. Making STB Decontaminating Agent Slurry.

The M2 antiset retards setting of the slurry. If M2 antiset is not added, especially in cold weather, the slurry will set rapidly and will form a hard mortar-like mass that will clog the tank and lines. Add M2 antiset in the proportion of 1 lb to each 100 lb. (0.45 kg to each 45 kg) of STB agent for small quantities of slurry or one 12-1/2 lb (5.7 kg) package of M2 antiset per 1,300 lb (589.6 kg) of STB decontaminating agent (225 gallons/851.7 liters of water). Remove the hopper tank lid and load the M2 antiset into the tank through the hopper-blender.

Silicone Antifoam Agent

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Figure 2. Making STB Decontaminating Agent Slurry.

Add approximately 144 oz (4082.4 g) of silicone antifoam agent to the mixture to prevent foaming of the slurry for a filling of the tank (225 gallons/851.7 liters). Adding silicone antifoam agent to the mixture does not affect the decontaminating properties of the STB decontaminating agent.

0008-2

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MAKING SUPER TROPICAL BLEACH (STB) DECONTAMINATING AGENT SLURRY – Continued**STB Decontaminating Agent****WARNING**

Use caution when opening drums of Super Tropical Bleach (STB). Avoid contact with skin or eyes. Avoid contamination with acids and oxidizable materials such as fuels, oils, paint products, disinfectants, and ammonia. Such contamination can cause release of hazardous gases. Keep container closed and stored in a cool dry place. Mix only in accordance with directions for use. In case of contact with skin or eyes, immediately flush continuously with water; for eyes get medical attention.

NOTE

If less than 317 gallons (1,200 liters) of slurry are required, decrease all ingredients proportionately. That is, if one-half (158 gallons/598 liters) of slurry mix is to be prepared, use approximately 115 gallons (435.3 liters) of water, 650 lb (295 kg) of STB decontaminating agent, 6-1/2 lb (2.95 kg) of antiset compound, and 72 oz (2129.4 g) of silicone antifoam agent.

**STB DECONTAMINATING AGENT**

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Figure 3. Making STB Decontaminating Agent Slurry.

The most effective mixture of water and STB decontaminating agent is prepared by mixing 40 parts (by weight) of STB decontaminating agent with 60 parts (by weight) of water (8.3 lb per gallon/3.76 kg per 3.78 liter).

The decontaminating apparatus accommodates a mixture of 1,300 lbs (589.7 kg) of STB with 225 gallons (851.7 liters) of water. This mixture provides approximately 317 gallons (1,200 liters) of slurry which weighs about 10 lbs per gallon (4.53 kg per 3.78 liters).

0008-3

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MAKING SUPER TROPICAL BLEACH (STB) DECONTAMINATING AGENT SLURRY – Continued**Coverage of Slurry**

1. Table 1 gives normal coverage of slurry for different types of surfaces.

Table 1. Coverage of Slurry (THIS DATA APPLIES TO M12A1 ONLY).

| Type of Surface | Coverage | |
|---|-----------------------|---------------------------|
| | (Per gallon) | (Per filling) |
| Concrete road (smooth) | 4.4 sq yd (3.67 sq m) | 1,350 sq yd (292.64 sq m) |
| Macadam or gravel road (loosely surfaced) | 2.2 sq yd (1.83 sq m) | 675 sq yd (564.38 sq m) |
| Short grass (3 to 5 inches) | 1.5 sq yd (1.25 sq m) | 464 sq yd (387.96 sq m) |
| Long grass and low brush | 1 sq yd (0.836 sq m) | 310 sq yd (259.2 sq m) |

2. Refer to FM 3-11.5, NBC Decontamination, for additional information on decontaminants and decontaminating methods.

Adding and Blending M2 Antiset and Silicone Antifoam Agent

1. Follow operation number 3 on the STARTING PROCEDURE instruction plate.

| OPERATION NO. | | OPERATION | PREVIOUS OPERATION REQUIRED | SUCKER HOSE TO SOURCE | TANK DISCHARGE CONNECTION | DISCHARGE CONNECTION LOWER | VALVE #1 MANIFOLD LOWER | VALVE #2 LOWER | VALVE #3 UPPER | VALVE #4 UPPER | PRIME | DETERGENT | VALVE POSITION | | REMARKS | |
|---------------|--|--------------|-----------------------------|-----------------------|---------------------------|----------------------------|-------------------------|----------------|----------------|----------------|-------|-----------|----------------|------------|---------|--|
| | | | | | | | | | | | | | O - OPEN | X - CLOSED | | |
| 3 | | BLEND SLURRY | 2 | 7 | ON CAP | O | X | X | X | | | | | | | *TO TANK BLENDER ADD ANTISEPTIC THEN ADD STB |

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Figure 4. Adding and Blending M2 Antiset and Silicone Antifoam Agent.

- Fill the tank with the desired amount of water. Check tank liquid level indicator (Figure 5, Item 1).
- Connect the suction hose (Figure 5, Item 5) to the tank drain valve (Figure 5, Item 6) and the connection on the pump unit (Figure 5, Item 4) as illustrated.
- Connect agitator-blender hose (Figure 5, Item 3) to pump unit (Figure 5, Item 4) top discharge connection and to tank unit blender pipe (Figure 5, Item 2).
- Be sure that bolts holding hopper-blender are in place and tightened.

MAKING SUPER TROPICAL BLEACH (STB) DECONTAMINATING AGENT SLURRY – Continued

Adding and Blending M2 Antiset and Silicone Antifoam Agent - Continued

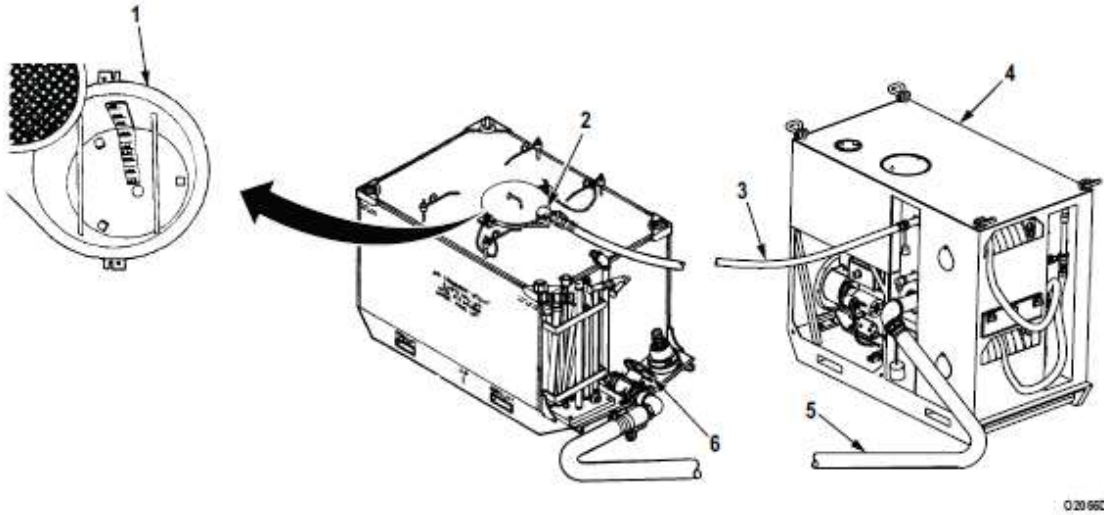
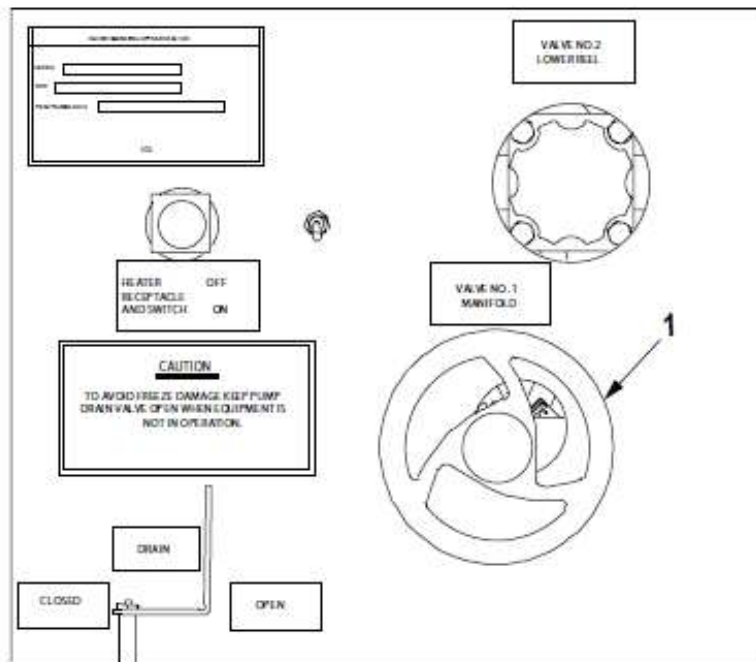


Figure 5. Adding and Blending M2 Antiset and Silicone Antifoam Agent.

6. Prime and start the pump unit (TM 3-4230-237-10 WP 0006). Open VALVE NO. 1 (Figure 6, Item 1) for this operation. Remove the hopper tank lid.



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Figure 6. Adding and Blending M2 Antiset and Silicone Antifoam Agent.

MAKING SUPER TROPICAL BLEACH (STB) DECONTAMINATING AGENT SLURRY - Continued**Adding and Blending M2 Antiset and Silicone Antifoam Agent - Continued****CAUTION**

Cycle water containing M2 antiset for at least three minutes. The M2 antiset must be completely dissolved.

NOTE

If the M2 antiset is caked, it must be crushed as finely as possible before adding it to the water in the tank unit assembly.

7. Add the M2 antiset and silicone antifoam agent. Operate for three minutes to fully blend these additives.
8. To prepare STB decontaminating agent for loading, open the 26 cans of STB decontaminating agent.

CAUTION

Particles of plastic, from the plastic bags that hold the STB inside the metal containers, can break off and end up in the slurry mixture. This can hinder or disrupt performance of the M12A1. Visually inspect the STB and remove loose particles of plastic prior to pouring it into the water tank.

NOTE

Before starting the loading and blending operations, break up the large lumps of STB to prevent clogging of the lines and to ensure the best possible water-slurry mixture. To prevent damage to the equipment, do not strike the metal drums containing the STB decontaminating agent against the tank or any other part of the tank unit.

9. Add the 1,300 lb (589.7 kg) of STB decontaminating agent in one continuous operation. Loading of STB powder should be conducted as quickly as possible. Foaming of the STB slurry in the tank increases the longer the hopper is allowed to remain empty during STB blending operations. Stop foaming by adding additional silicone antifoam agent.

CAUTION

After the slurry is blended, it must be agitated constantly until used.

10. Once the last drum is added, continue blending for one minute. After blending is complete, replace tank lid. Agitate the slurry mixture.
11. Continue with *Agitating Slurry in Tank Unit* as described in TM 3-4230-237-10.

APPENDIX B - TANK CLEANING PROCEDURE

1. Be sure to use proper PPE when cleaning out the tanks, especially if you have been using actual chlorinated or peroxide/peracetic acid-based decontaminants and against actual CWAs/BWAs.
2. Drain tank of all fluid, opening drain and routing liquid away from tank with a hose;
3. Pre-rinse tank inside and out with water;
4. Wash tank with a liquid detergent (i.e., “Dawn” dishwashing liquid is readily available and effective) and water solution, using discharge hose and gun through the clean out ports if necessary;
5. Flush tank with clear water.

Dispose of the wastewater liquid IAW unit-approved disposal procedures for the chemicals used. Repeat procedure until tank is thoroughly cleaned. The tanks are fitted with inspection/cleanout ports to assist in cleaning out the tanks. Any residual decontaminant chemicals may harden and become a clog.

Special techniques to clear clogs or to remove decontaminant residues and scale from the tanks include:

1. Shoot a D-bale (gun) with a ¼ in to ½ inch shaper tip nozzle (don’t use the fog nozzles with slurries; the fog nozzles will clog very fast with slurry).
2. A commercial pressure washer or an operable M26 in high pressure mode can assist in cleaning off large amounts of stuck-on decontaminant.
3. Agitate the tank with clear water and add air to the Agitator when flushing. This will help to clear any potential clogs. A coat hanger or wire probe can be used to push out clogs in the agitator ports.
4. Back flush the tank main drain valve using a 1 ½ inch hose and any of the 1 ½ inch discharge functions. The “Monitor” function and output works very well for this operation.
5. Shovel or scoop out any large, agglomerated chunks of decontaminant and dispose of per unit-approved environmental procedures.
6. Rinse the tank until the drain flows freely and is clear of chunks of STB, scale or slurry.