Operators' Manual

For Spray King®
Water Tank
for
Cat® 773/775/777
Off-Highway Truck

Tank Models
SK-12RF
SK-15RF
SK-20RF

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SAFETY FIRST: BEFORE STARTING

Read and become familiar with the basic safety and operations manual for your Cat® truck as well as with the information in this guide for operation of the water tank. Your safety, your coworkers' safety, and the quality of the productivity of the equipment you're operating depend on a thorough walkaround inspection before operations begin to ensure your machine is in safe working order. Make sure you are trained in the safe operation of your Cat machine and the Spray King water tank before starting.

This manual contains information necessary to safely operate the HOLT Spray King® water truck, including basic maintenance procedures. For any questions, please call HOLT Manufacturing, 844.465.8634.

Follow HOLT Manufacturing instructions to operate and maintain your Spray King® water tank. Unless otherwise instructed by this guide or by HOLT or your Cat dealer, use only HOLT supplied parts during installation for your safety and to maintain your warranty.

Use appropriate personal protective equipment and clothing, safety helmets, safety harnesses, and procedures.

Before performing any work, proper machine power lockout procedures should be followed, and wheels should be chocked.

NO tubing on top of the tank may be used as anchor points or tie off points as part of a fall arrest system.

Contact Us

For questions regarding your tank operation, troubleshooting, or maintenance, please contact HOLT Manufacturing, at 844.465.8634.

For parts, call 844.465.8634 or email SprayKing@holtmfg.com.

DEFINITIONS

Definitions of symbols and words used in this manual and in the operation of the HOLT Spray King water truck. Follow safety precautions before proceeding.

WARNING: Follow safety precautions before proceeding.

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

WARNING: Rotating Shaft. Do not place your hand or tools within pump bell while pump is rotating and/or pressure held within the motor supply hose.

WARNING: Slip and Fall Hazard. Don't walk on the top of tank without fall arrest PPE. Serious injury or death could result from a fall.

WARNING: Trip Hazard. Take care using steps and walking on top of tank.

WARNING: Confined Space. Permit-required confined spaces contain hazards that could cause death or serious injury to workers.

WARNING: Freeze Hazard. Drain tank, fill pipe, pump, monitor, and valves in freezing weather.

WARNING: Crush/Pinch Risk. Do not place your hand or tools near the butterfly valve (if equipped) when the truck is in operation.

WARNING: Low Clearance/Risk of Injury. Use caution when walking around the back of the truck and tank.

WARNING: Check for pedestrians before spraying. Before engaging spray heads or monitor, make sure there are no pedestrians present.

WARNING: Tank must be dry/empty before lifting; use lift points.

WARNING: Make sure tank is secured using tie down points before transporting.

WARNING: NO tubing on top of the tank may be used as anchor points or tie off points as part of a fall arrest system.

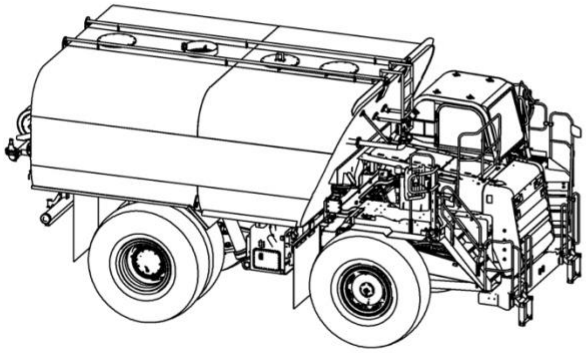
STANDARD FEATURES & CAPABILITIES

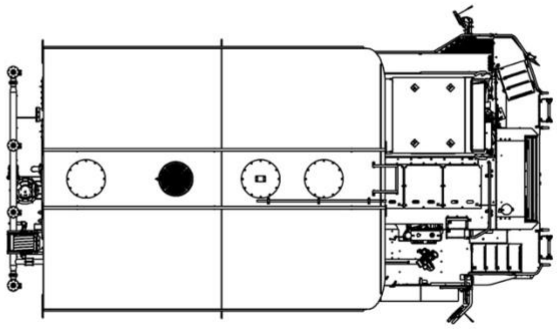
Second Generation (2025-)

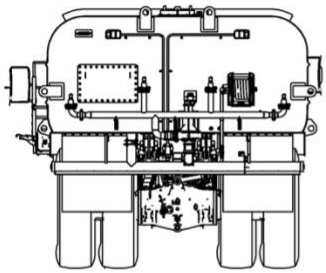
Cat 773

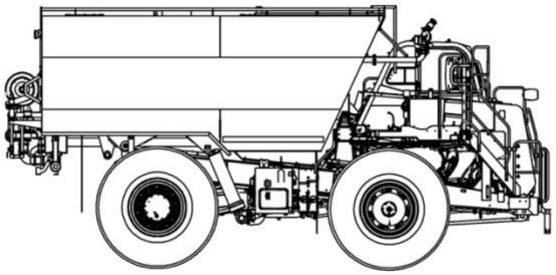
The Cat 773 Spray King features a 12,000 gallon water tank with optional 150 gallon fire foam tank; adjustable front-mounted monitor controlled with joy stick; gravity bar; retractable hose with spray nozzle; four rear-mounted spray heads.

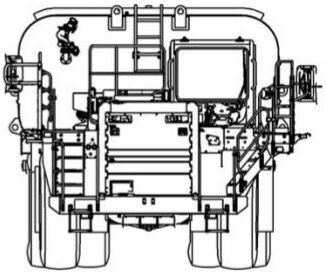
Cat 775 First Generation (to 2024)







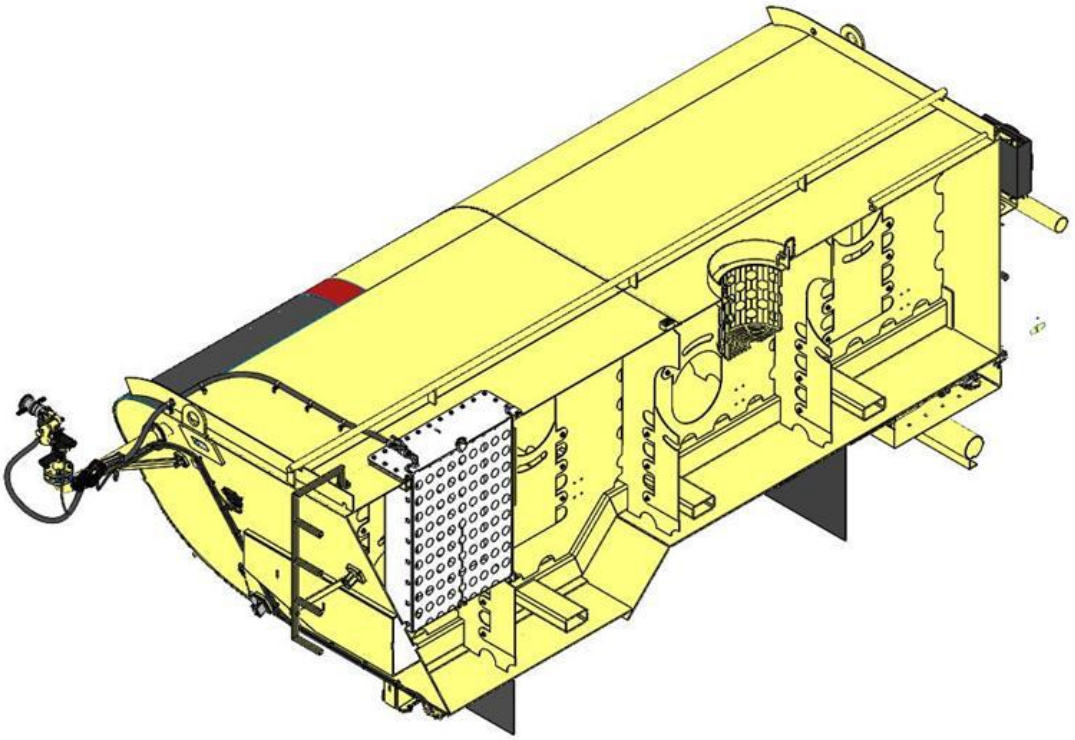


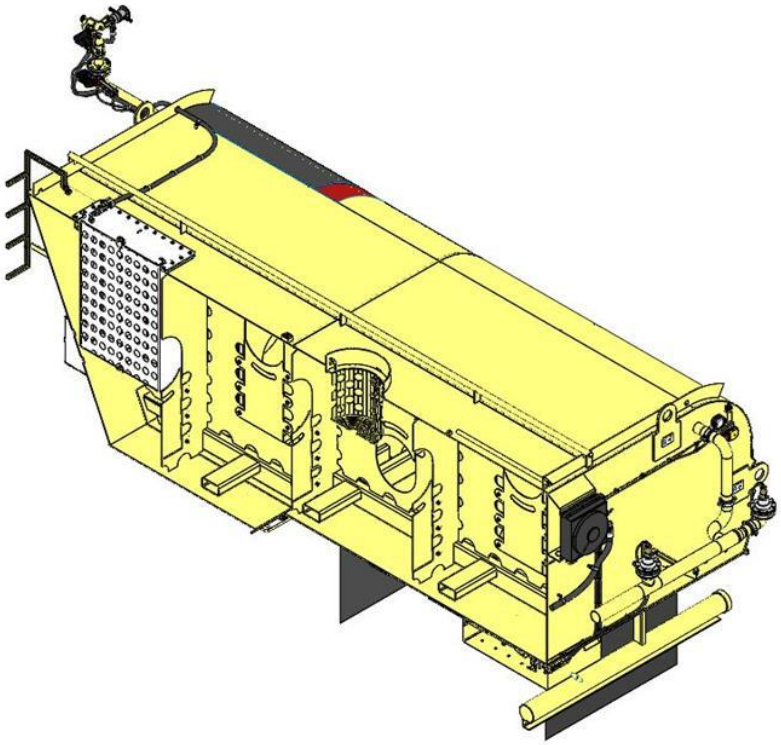


Features: Rooftop fill port with side camlock fill port; four rear-mounted spray heads; monitor controlled with joy stick; rear mounted Berkeley water pump; rear mounted gravity bar; retractable hose and reel with spray nozzle.

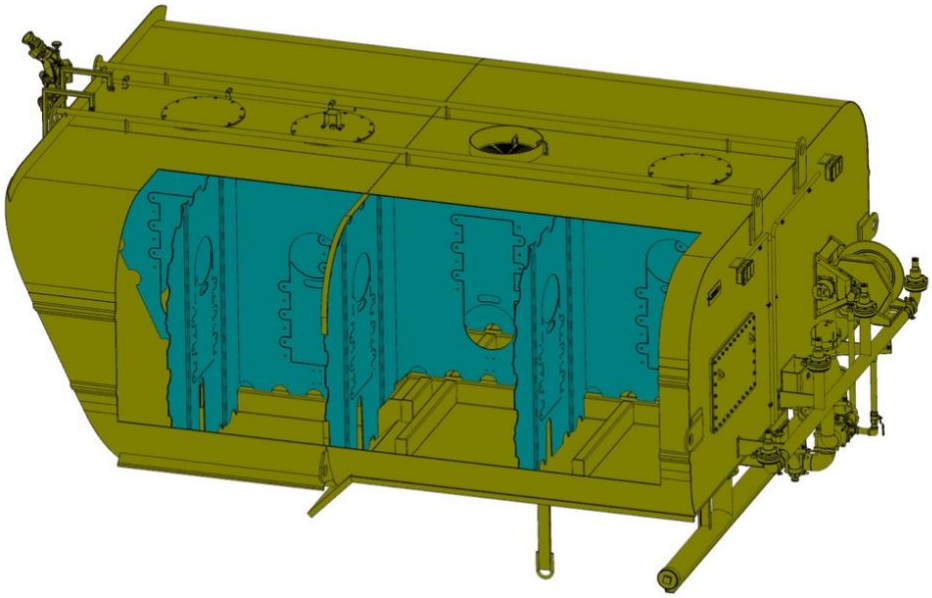
Internal Tank Configuration

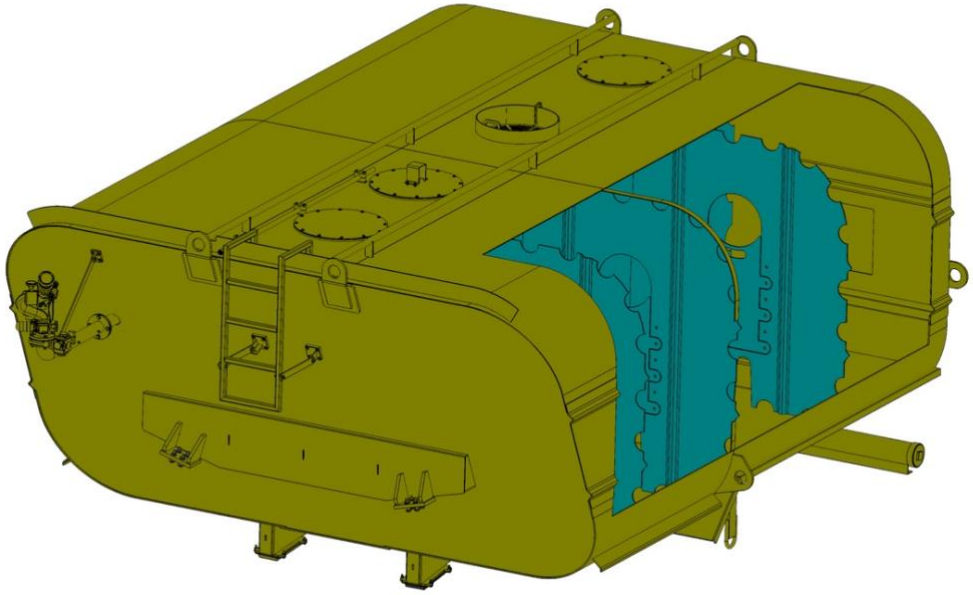
Second Generation 773 (access hatch on top of tank)





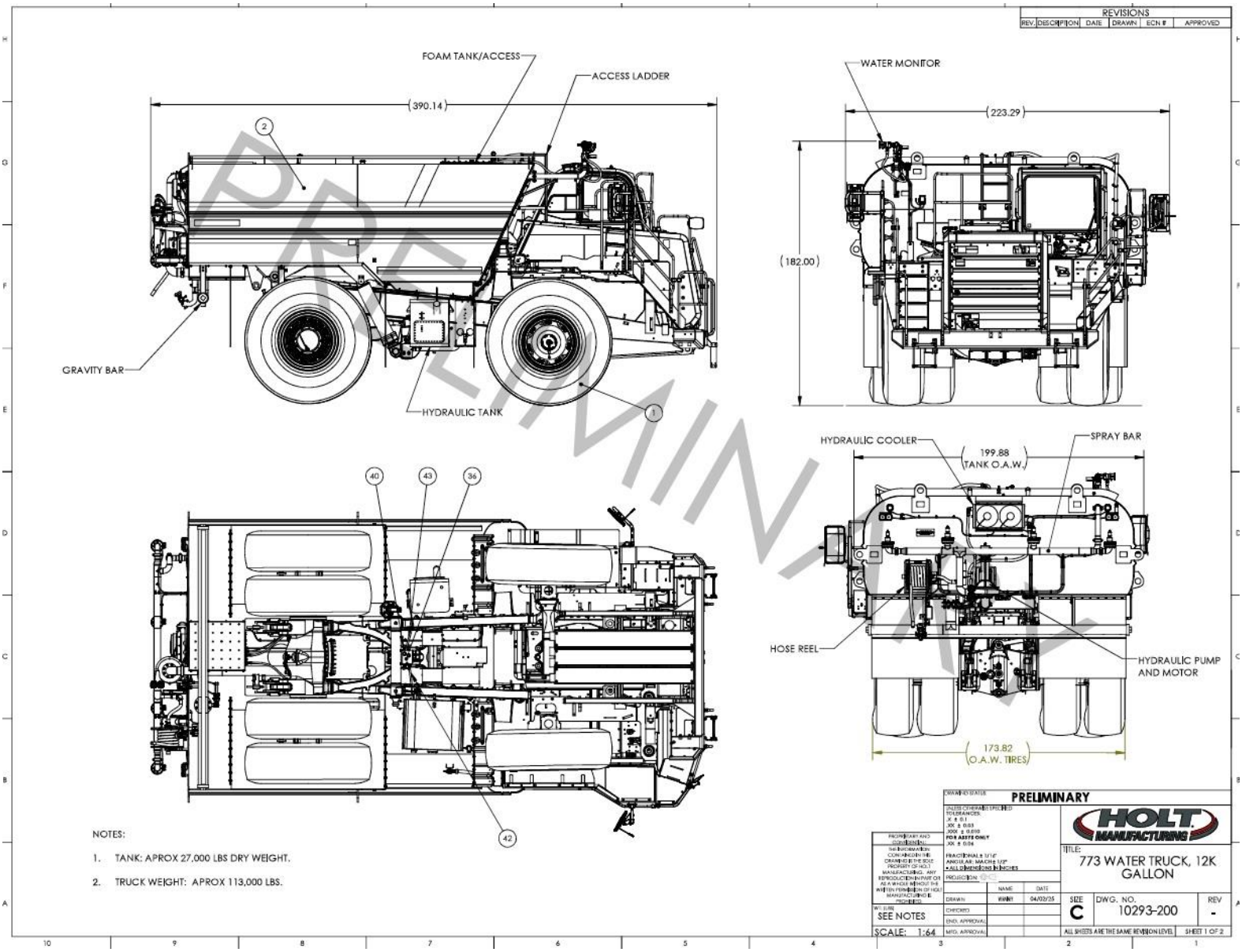
First Generation tanks (to 2024 - access hatch at back of tank)





SPECIFICATIONS

SK12RF - 12,000 gallon tank for Cat 773



WARRANTY

HOLT MANUFACTURING® LIMITED WARRANTY

The Manufacturer warrants that products produced shall be free from defects in material and workmanship that develop under normal use for a period of one year from the date of delivery to buyer on all products. The preceding shall be the exclusive remedy of the buyer and the exclusive liability of the Manufacturer. Our warranty excludes normal replaceable wear items (e.g. gaskets, wear parts, seals, O-rings, belts, drive chains, clutches, batteries, tires, etc.). Any equipment, part or product which is furnished by the Manufacturer but manufactured by another, bears only the warranty given by such other manufacturer. This Limited Warranty is non-transferable.

Warranty is voided by product abuse, alterations, use of equipment in applications for which it was not intended, use of non-manufacturer parts or failure to follow documented service instructions. Equipment which is substantially damaged by collision, accident, flood, fire, vandalism or other similar occurrences are not covered by this Limited Warranty. Any delays in Manufacturer's performance under the Warranty resulting from strikes, acts of God, or other occurrences beyond the reasonable control of Manufacturer that cause any type of loss to buyer are not covered and will not result in any additional compensation to buyer. Buyer will pay Manufacturer its cost to diagnose and investigate claims unless the repairs are covered under this Limited Warranty. **The foregoing warranty is exclusive of all other warranties whether written or oral, expressed or implied. No warranty of merchantability or fitness for a particular purpose shall apply.** The agents, dealers and employees of Manufacturer are not authorized to make modifications to this warranty, or additional warranties binding on the Manufacturer. Therefore, additional statements, whether oral or written, do not constitute warranty and should not be relied upon.

The Manufacturer's sole responsibility for any breach of the foregoing warranty provisions, with respect to any product or part not conforming to the Warranty or the description herein contained, is at the Manufacturer's option: (a) to repair, replace, or refund such product or parts upon the prepaid return thereof to location designated specifically by the Manufacturer (product returns not shipped prepaid will be refused); in the event buyer requests an expedited repair charges may include overtime if applicable, (b) as an alternative to the foregoing modes of settlement the Manufacturer's dealer may repair defective units with reimbursement for expenses if expressly allowed for in writing by Manufacturer. A written description of problem or cause must accompany all warranty claims. All repairs must be performed by Manufacturer and at a location designated by Manufacturer. Manufacturer shall pay usual and customary ground shipping charges for parts needed for warrantable repairs made at a Manufacturer's location. This Warranty does not apply to routine maintenance.

Except as set forth here in above and without limitation of the above, there are no warranties or other affirmation which extend beyond the description of the products on the fact here of, or as to operational efficiency, product reliability, or maintainability or compatibility with products furnished by others. **In no event, whether as a result of breach of contract or warranty or alleged negligence, shall the Manufacturer, be liable for special, indirect, incidental, punitive or consequential damages including but not limited to: loss of profits or revenue, personal injury, property damage, strict liability, loss of use of the product or any associated product, cost of capital, cost of substitute products, facilities or services or claims of customers.** The Manufacturer does not assume responsibility for any accident due to equipment modification, unless approved prior in writing by a Holt Manufacturing engineer.

No claim will be allowed for products lost or damaged in transit. Such claims should be filed with the carrier within fifteen days.

THE PARTIES HERETO SHALL SUBMIT TO BINDING ARBITRATION ANY DISPUTED QUESTIONS OR CONTROVERSY ARISING FROM OR RELATED TO THIS LIITED WARRANTY, OR RELATED TO THE TRANSACTION CONTEMPLATED BY THIS LIMITED WARRANTY. ANY SUCH ARBITRATION SHALL BE CONDUCTED IN BEXAR COUNTY, TEXAS UNDER THE COMMERCIAL ARBITRATION RULES OF THE AMERICAN ARBITRATION ASSOCIATION. THE ISSUE OF WAIVER PURSUANT TO THIS PARAGRAPH IS AN ARBITRABLE ISSUE. THE AWARD OF THE ARBITRATORS SHALL BE FINAL AND NON-APPEALABLE.

THE PROVISIONS OF THIS LIMITED WARRANTY SHALL BE INTERPRETED AND GOVERNED IN ACCORDANCE WITH THE LAWS OF THE STATE OF TEXAS.

PRE-OPERATION INSPECTION

Walk Around Inspection

Make a detailed walk around inspection the start to every workday.

At ground level, look for:

- Damage
- Excessive wear
- Loose or missing bolts
- Debris or trash buildup
- Damaged or missing safety signs

On a second trip around, additionally:

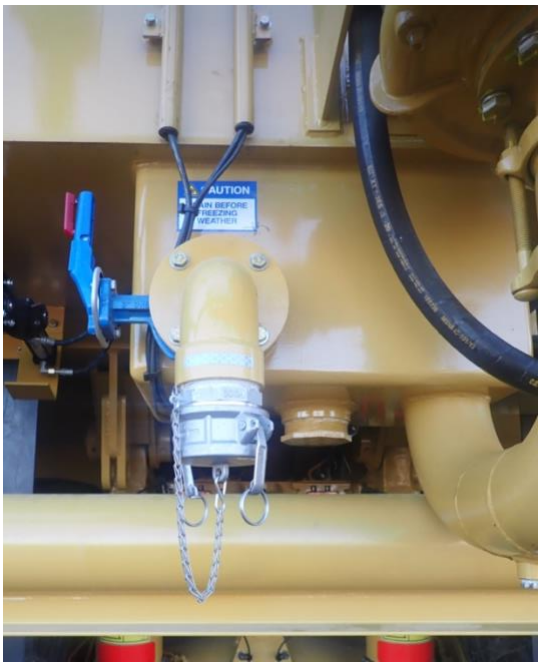
- Examine all tank mounts (pictured below) for tightness
- Examine all seals, covers and hoses for leaks
- Check fluid levels
- Check tires and tire inflation
- Check that windows are clear and that all steps and handrails are clean and clear
- Store and secure all loose tools and objects in the cab

OPERATING THE TANK

Filling the Tank

Cat 773: The tank is filled through the manhole port on the top of the tank, **pictured left.**

Cat 775, **pictured below**: Use the manhole port on top of the tank, or, to fill with a hose from an existing water source or fire hydrant, fill the tank through camlock fill port at the rear.



Important Note: For first generation IFM screens only - During water fill, the screen in the cab will indicate the water level in the tank. When the level gets to about 90%, the tank is close to full. If water reaches the roof of the tank and goes over the top of the sensor, the fill level indicator will drop to about 70% temporarily but will return to full when the water level drops again.

WARNING: NO tubing on top of the tank may be used as anchor points or tie off points as part of a fall arrest system.

WARNING: Low clearance around the rear of the tank. Take precautions to avoid injury.

Spray Heads

All rigid frame truck models have four sprayers across the rear of the tank.

Examine all sprays heads for excessive wear, dirt, and debris. Make sure that the exhausts filter (brass fitting) is clean and clear.

Spray heads are mounted on the rear of the tank. The heads rotate on the base plate to direct the discharge fan for optimum spray patterns. There is an adjustable ring to control intensity and spray width, as well as a vertical adjustment.

Adjusting Spray Heads

To adjust spray heads, loosen the black adjusting ring knob and raise and lower the adjusting ring (on the bottom of the valve) to the desired position. For a fine spray, or reduced water volumes and a large pattern recommended for low vehicle speed, set the slot to ¼ inch. For heavier soaking with larger volumes of water, set the slot wider. Tighten the black adjusting knob when finished.

The opening at the base of the spray head will allow 90-degree maximum fan width. To adjust for a narrower spray, while the black adjusting knob is loose, rotate the base to narrow the width. Tighten the black adjusting knob when finished.

Wide setting


Narrow setting

Spray Head Vertical Tilt Adjustment

Spray heads also may be tilted up or down if needed. To adjust, loosen the elbow couplings and adjust the swivel elbows down to the angle desired. Tighten bolts with a torque wrench to 38 foot-pounds.

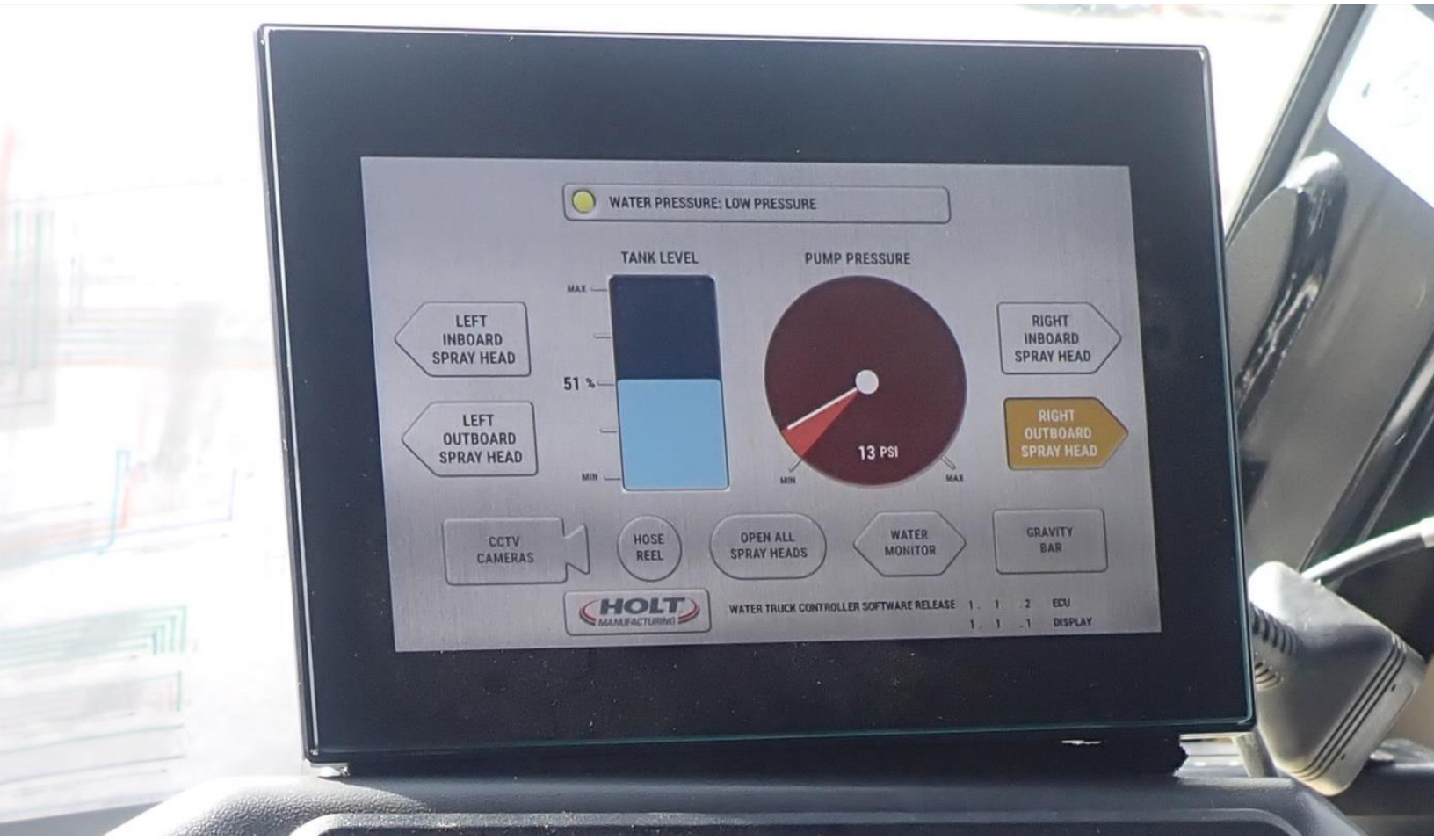
Spray Operations

Before engaging spray valves, make sure:

- To check surroundings and ensure any bystanders are kept away from the area of operation
- To be sure the valves are adjusted and tightened in place for the desired spray pattern
- To select the desired spray valves

SECOND GENERATION SCREEN (2023 -)

Use touch screen in cab to control spray heads and monitor.



Engaging/Disengaging Spray Heads

At the top of screen is system monitoring. Fault codes and warnings will appear here with a red warning of a circuit failure, and amber warning for low water levels. There is also a display gauge for water pressure in manifold. To activate spray devices simply touch the portion of screen labeled for that device. It will change the display from white to gold. This indicates the function being commanded. Touching it again will stop the command.

Note: At a 4% water level, the low water warning notice will appear and after one minute hydraulics will shut off.

FIRST GENERATION SCREEN

In-cab Control Screen

1. Left Spray Head Controls outboard (O/B) and inboard (I/B)
2. Water Level indicator
3. Open and Close All Valve Controls
4. Right Spray Head Controls outboard (O/B) and inboard (I/B)
5. Fire Hose Control
6. Water Pump On/Off switch (labeled Hose Reel)
7. Manual Left and Right Valve Spray Head controls
8. Camera Option (Do not use unless equipped)

Note: Activation of options can be done by pressing buttons on side of each option or by touching the screen. If you accidentally touch the camera shutter symbol, a black screen may appear if you don't have optional cameras. Touch the camera shutter symbol again and the black screen will disappear.

After starting the vehicle there are two ways to engage the rear spray heads.

1. Press LEFT O/B to activate the left outboard sprayer, and LEFT IB to activate the left inboard sprayer.
2. Press RIGHT O/B to activate the right outboard sprayer, and RIGHT I/B to activate the right inboard sprayer.

   Press the individual buttons again to stop the heads individually. When the sprayers are active, they will light up yellow on the screen. Pressing LEFT O/B and LEFT I/B and/or RIGHT O/B and RIGHT I/B activates the pump, which turns the Hose Reel indicator and the on/off symbol green.

3. Alternatively: Use the Hose Reel button to activate the pump, then touch the OPEN ALL VALVES green bar at the top of the screen. You may also activate individual spray heads this way by pressing LEFT O/B and LEFT I/B and/or RIGHT O/B and RIGHT I/B. This opens all rear spray heads.
4. To close all valves, touch the CLOSE ALL VALVES green bar.

Note: At a 4% water level, the low water warning notice will appear and after one minute hydraulics will shut off

Disengaging Spray Heads

To disengage the spray heads, press the LEFT O/B and LEFT I/B and/or RIGHT O/B and RIGHT I/B buttons again, or press CLOSE ALL VALVES. Turn off the pump by pressing HOSE REEL.

Driving While Spraying

Select a controlled gear, in most trucks L1, L2, or L3, to apply water. For optimal spray distance, run the vehicle slowly at a controlled speed applying full RPMs. Conduct a test run to determine optimal speed and RPMs for the application.

Disengage the spray heads at any time while driving.

Reengage the heads at low RPMs or idle.

At a 4% water level, the low water warning notice will appear and after one minute hydraulics will shut off.

Driving in Reverse While Spraying

WARNING: DO NOT DRIVE IN REVERSE WHILE SPRAYING. In order to shift truck into REVERSE, Spray King hydraulic systems MUST be turned off.

Hose Reel

HOLT Spray King is equipped with COXREELS® outlet hose reels.

Before operating, check for correct operation by pulling out some of the hose. A slight friction of drag should be noticed. This is to prevent backlash when pulling out the hose.

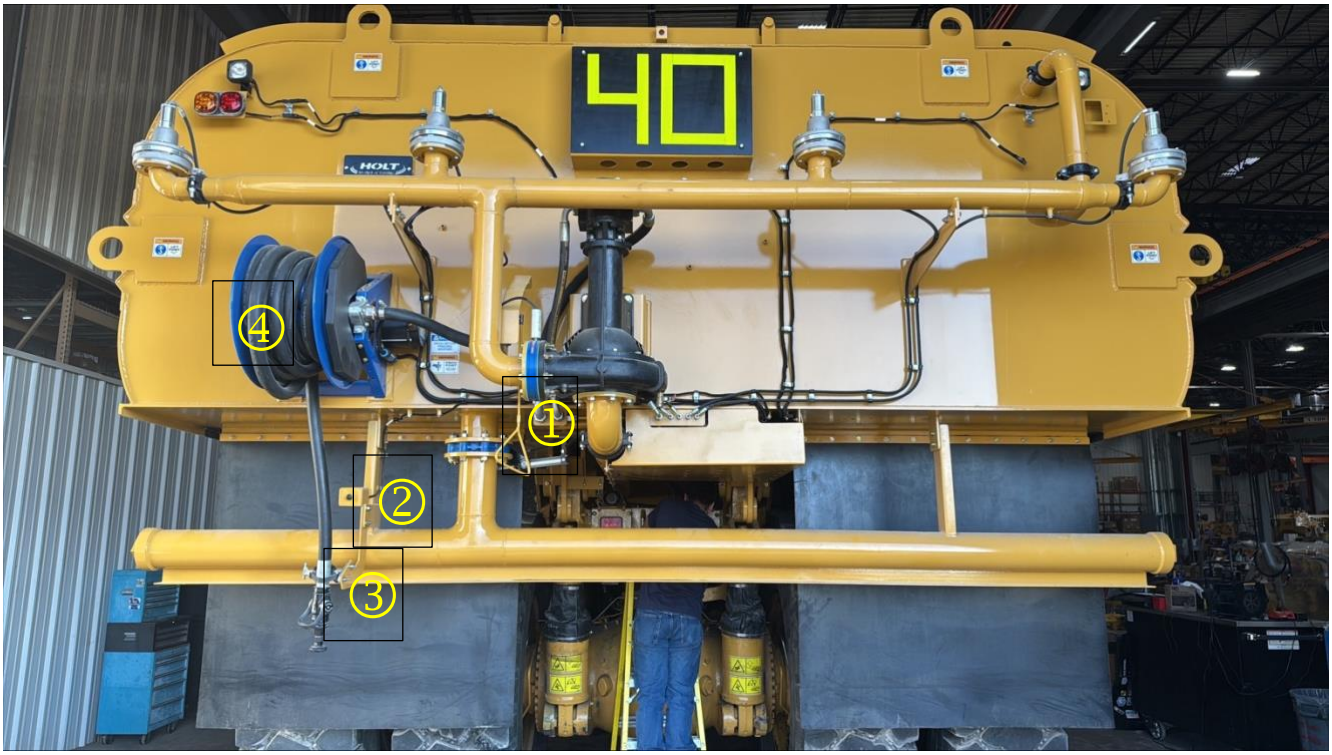
Adjust drag brake by turning clockwise to add tension and counterclockwise to decrease tension. The adjustment for the hose reel brake is located on the right side of reel on center pivot shaft.

THIRD GENERATION (2025 -)

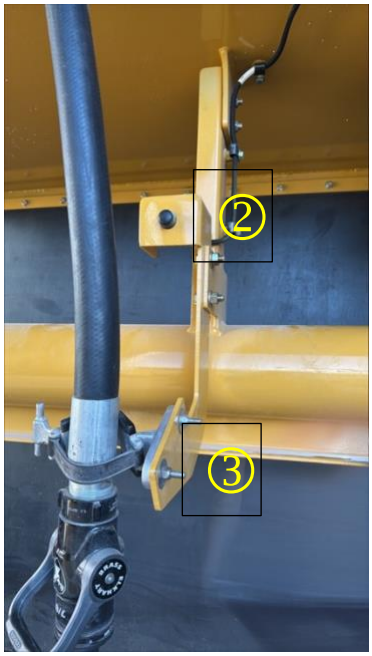
Hose reel is on the left side of the rear of the tank.

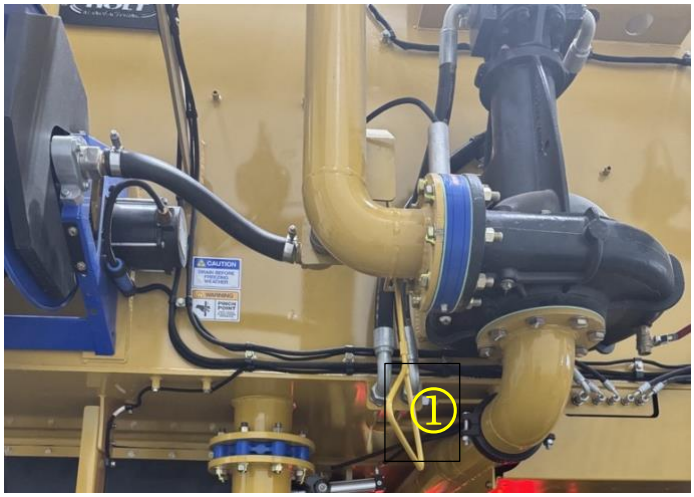
1. Activate the hose reel in cab by pressing **Hose Reel** on screen.
2. Pressurize the hose reel by pushing up on the valve cable to open the hose reel valve. Ater flow can now be controlled by the shut off valve on the hose nozzle end.
3. Remove the hose reel nozzle from its storage position, and pull hose needed from the reel.
4. Open the nozzle and spray.
5. To stop, close the hose nozzle. Close the hose reel valve by pulling down the valve cable. Disengage the hose reel in the cab.
6. Press black button to retract the hose reel and stow nozzle securely in the nozzle bracket.

See detail below.



1 Pull cable to open hose reel valve
2 Hose reel retract button
3 Nozzle storage bracket
4 Hose reel



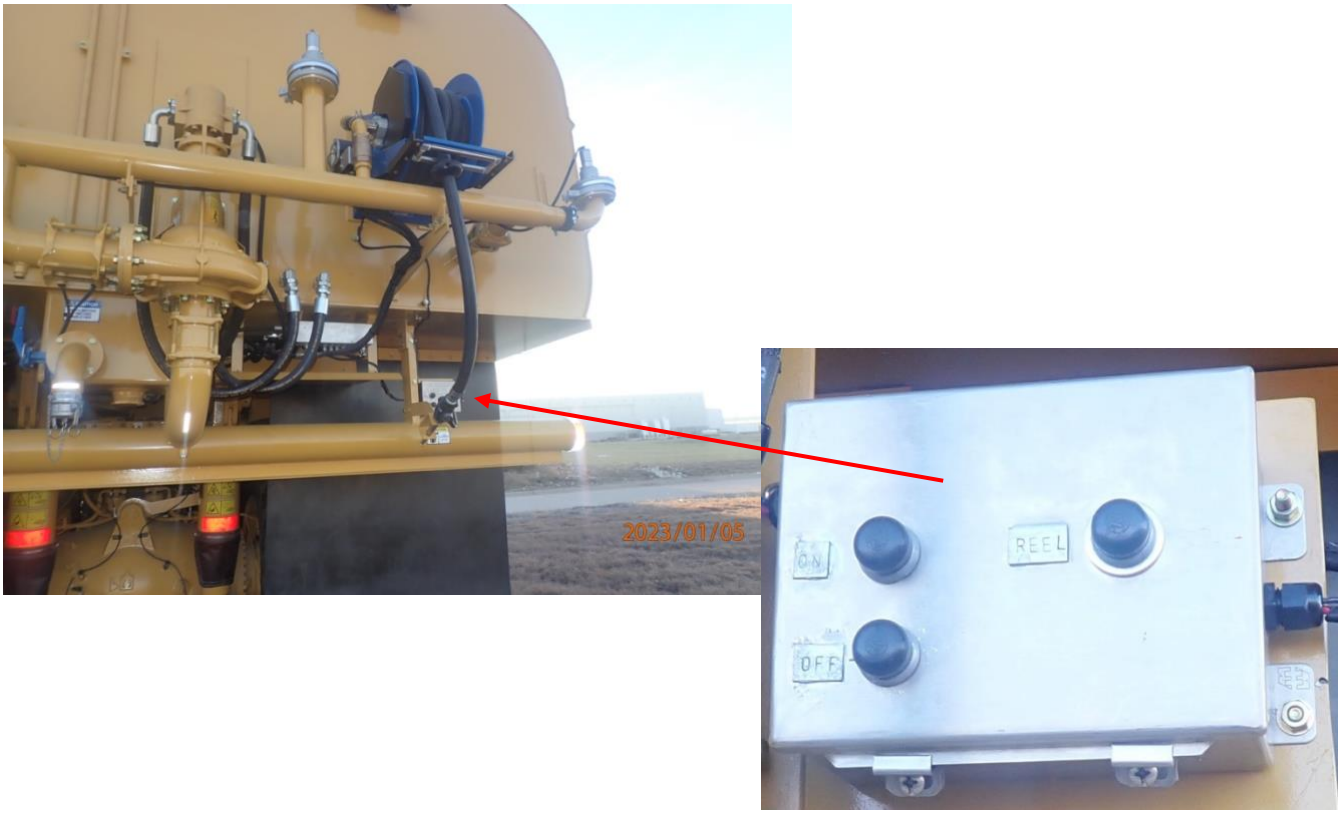


FIRST GENERATION

Using the Hose Reel

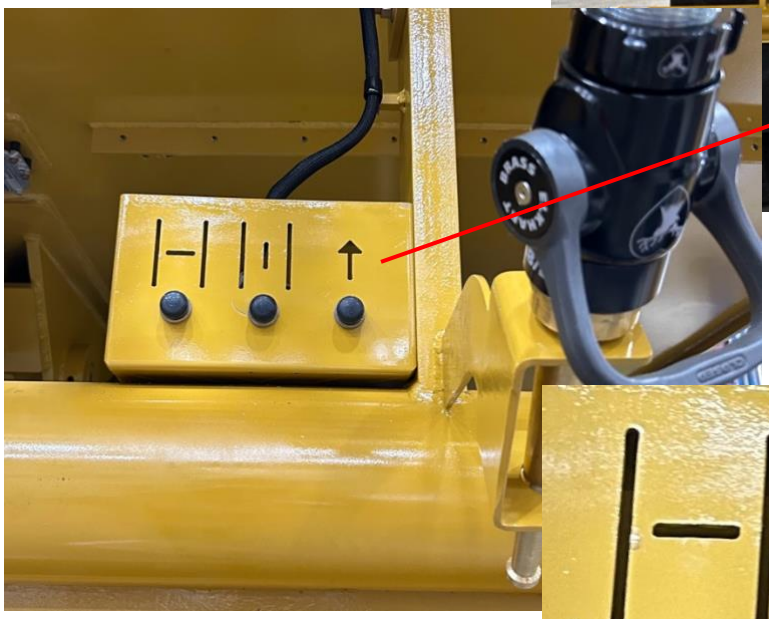
Older versions of the Spray King have the hose reel on the right side of the tank.

1. Activate the hose reel in cab by pressing **Hose Reel** on screen.
2. Pressurize hose reel: at the rear control box, press the **ON** button one time. This will command the hydraulics to open the water valve and allow manifold water pressure into the hose reel. Water flow can now be controlled by the shut off valve on the hose nozzle end.
3. ALWAYS close the valve by pressing the **OFF** button on the lower left one time when hose reel is not in use.
4. Retract the hose by pressing and holding the right button labeled **REEL**.
5. Stow nozzle end in holder.



SECOND GENERATION

Retract hose by using electric retract by pressing and holding up arrow button on the far right of the rear panel when finished with use and secure spray nozzle end in holder.



Using the Hose Reel

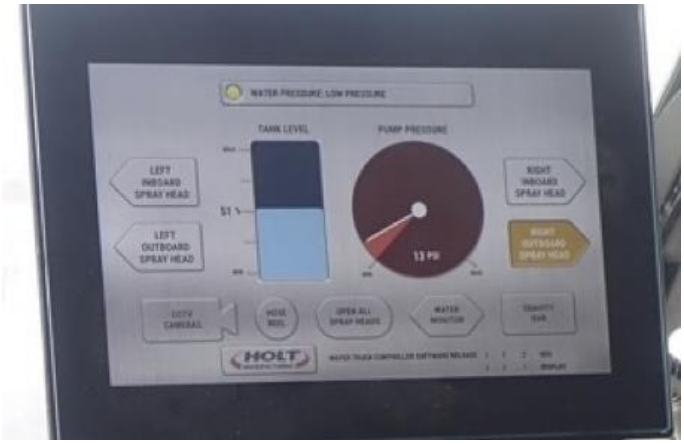
1. Activate the hose reel in cab by pressing **Hose Reel** on screen.
2. Pressurize hose reel: at the rear control box, press the center button. Water flow can now be controlled by the shut off valve on the hose nozzle end.
3. ALWAYS close the valve by pressing the button on the left one time when hose reel is not in use.
4. Retract the hose by pressing and holding the right button.
5. Stow nozzle end in holder.

Using the Gravity Bar

The gravity bar lays a heavy but narrow pattern of water directly onto the ground surface, used for confined areas or during high wind when spraying isn't the most efficient delivery method. Water is not under pressure but drains from the tank with gravity only.

First generation screen

Second generation screen



When using the gravity bar, it is not necessary to operate at higher RPM as the water is released only with gravity and not under pressure.

Activate the pump by touching the HOSE REEL circle, bottom center. Then touch on GRAVITY BAR. To disengage, touch the HOSE REEL circle again.

Monitor Operation

The HOLT Spray King is equipped with a Nitro HD® monitor and joystick controller. The joystick provides basic directional movement of the monitor and actuation of the nozzle.

The controller for the Nitro HD is mounted on the front of the tank.

Before operating, inspect the Nitro system for signs of excessive wear or abnormal damage, water or hydraulic hose leaks.

Look for signs of loose mounting or wiring connections.

Flow water to check the nozzle pattern; if pattern is disrupted, clear any debris. Check any joints for leaks.

Store nozzle facing downward to drain and to lower the profile and height of the truck. Monitor could be damaged by low hanging tree limbs or other obstructions.

Rotation Limits

For safety, the fire hose is set to of 180 degrees horizontal rotation and 90 degrees vertical rotation.

Warning: High pressure water - Do not operate monitor until all personnel are a safe distance away from the vehicle. Equipment damage can be caused by water flowing at maximum pressure. Don't point monitor directly at equipment or any sensitive components.

Engaging the Monitor

Touch the HOSE REEL circle, then touch the WATER MONITOR bar. The WATER MONITOR bar will illuminate, and the spray symbol on the truck diagram will indicate engagement.

Second generation screen

First generation screen

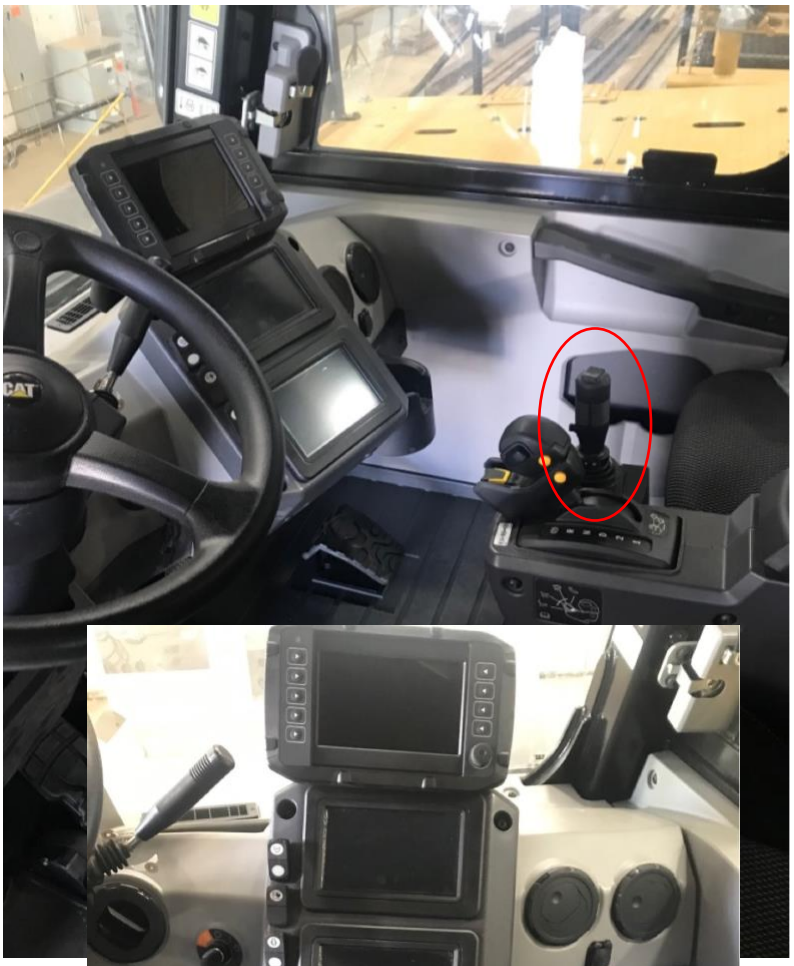
Monitor operation in the Cat 773

- UP movement: pull back on the joystick handle
- DOWN movement: push forward on the joystick handle
- RIGHT movement: pull the joystick handle to the right
- LEFT movement: pull the joystick handle to the left

Note: The rocker switch and push buttons have no function in the Cat 773.

Monitor operation in the Cat 775

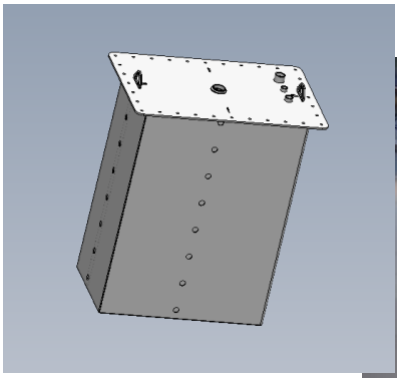
Use the joystick to control the direction of the water spray.

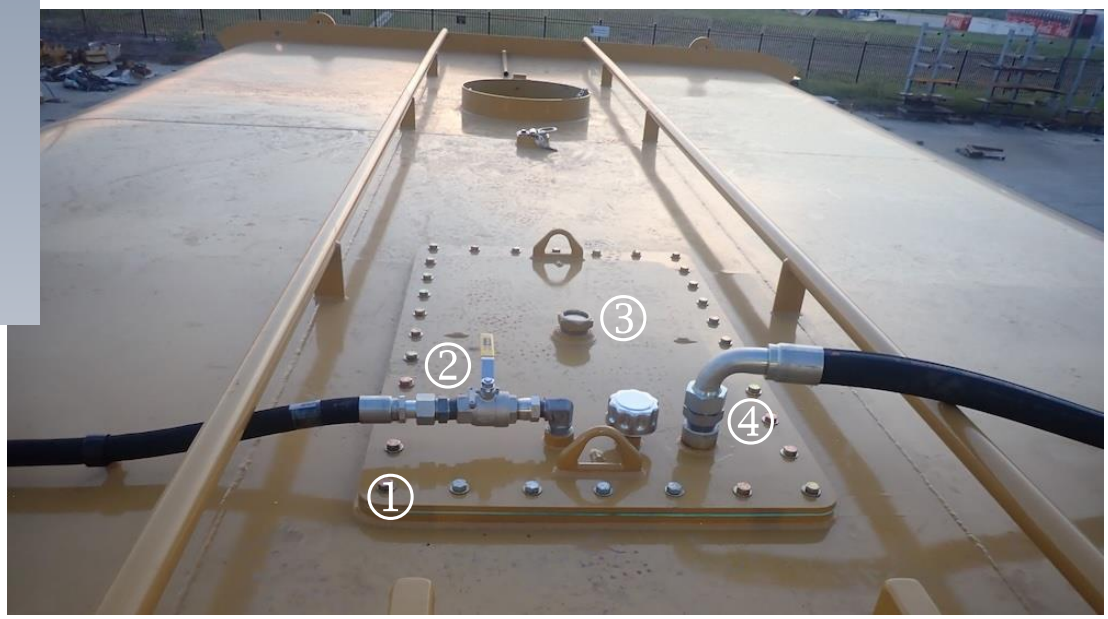


- UP movement: pull back on the joystick handle
- DOWN movement: push forward on the joystick handle
- RIGHT movement: pull the joystick handle to the right
- LEFT movement: pull the joystick handle to the left
- TO STREAM nozzle movement: press and hold the right rocker switch (top of joystick)
- TO FOG nozzle movement: press and hold the left rocker switch (top of joystick)
- The trigger on the joystick handle is an option and has no function for Spray King.

Using Fire-Fighting Foam (Option)

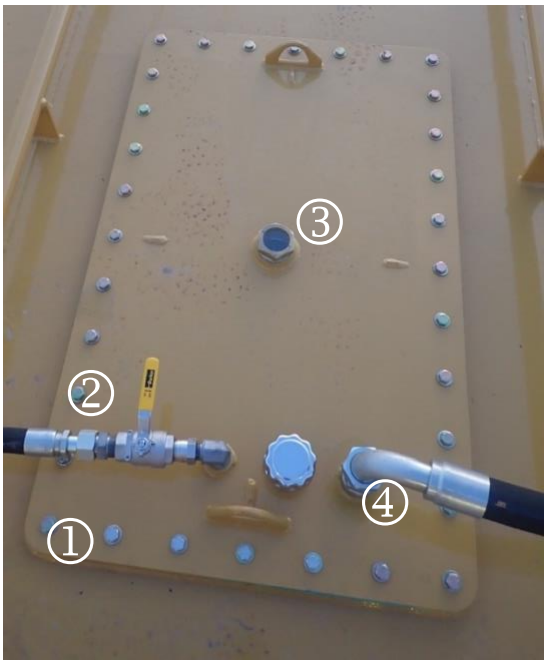
The Spray King is equipped with an optional 150 gallon fire-fighting foam tank, accessible on the top of the tank near the front.





1 Foam tank access hatch
2 Ball valve to monitor
3 View port
4 Liquid foam fill line

See detail at right.



Adjusting the Monitor When Spraying Foam

If desired, the monitor must be manually adjusted before spraying foam for a longer stream (turn the handles to the left) or a wider fan of spray (turning the handles to the right).

Monitor spray nozzle handles

Warning: High pressure water - Do not operate monitor until all personnel are a safe distance away from the vehicle. Make sure monitor is disengaged before attempting to adjust the nozzle manually.

Steps to use to Spray Foam

1. Set brake and turn machine off.
2. Open ball valve on top of tank at foam tank.
3. Manually adjust monitor for stream or wide spray.
4. Restart truck.
5. On HMI screen, engage water flow to monitor.
6. Use joystick to spray foam. There may be a momentary delay until foam begins spraying.
7. Disengage water flow on screen.
8. Set brake and turn machine off.
9. Close ball valve.

Maintaining the Foam System

Run clean water through monitor after each foam application.

Routinely clean out the foam tank by lifting it from the hatch and cleaning with water; check tank and lines for cracks, damage, and debris.

Follow manufacturer’s instructions for regular inspection and replacement of foam concentrate as required.

Other Parts: Pump

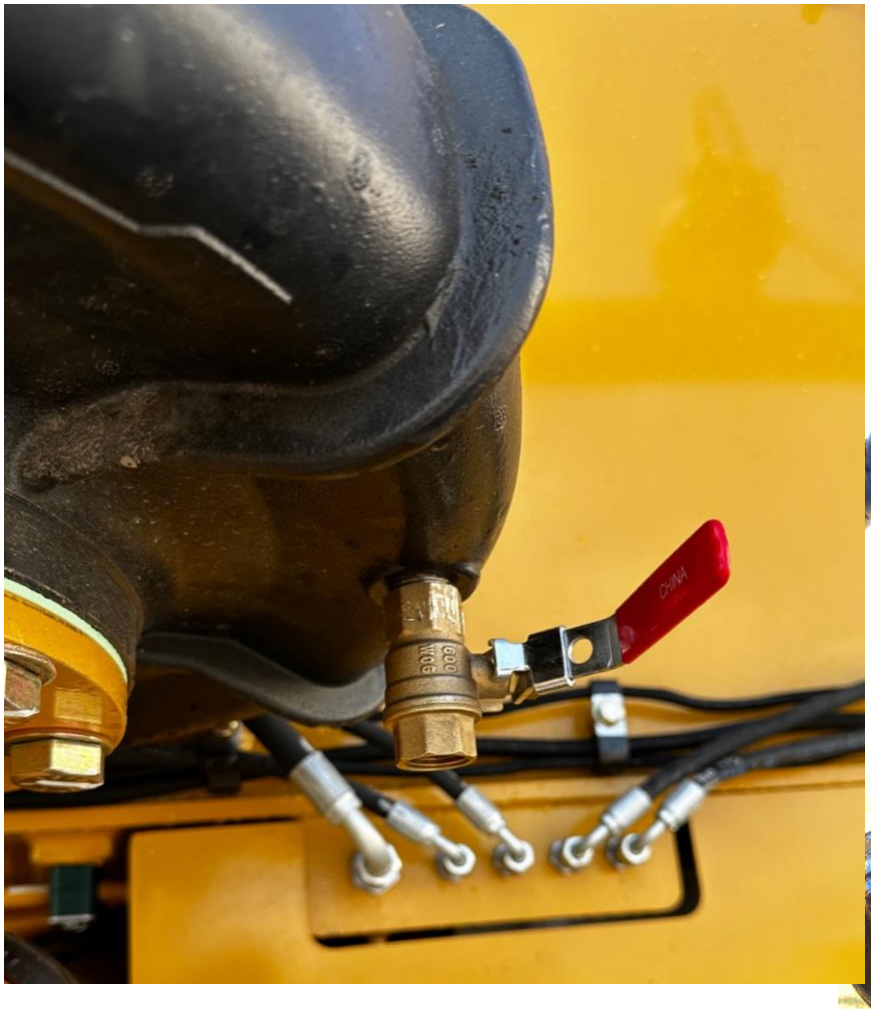
Warning: Rotating parts. Can catch hands, feet, or clothing. Stay clear of equipment and keep shields in place while pump is running. Stop motor or engine before servicing pump.

HOLT Spray King includes a Berkeley® pump.

- Periodically inspect pump and system components for signs of wear, damaged or leaking hoses, excessive vibration, or unusual sounds.
- Check operating temperature: normal is 150 degrees F. If the surface temperature of the pump bracket or driver is excessive, discontinue use and call for service.
- To prevent freezing, draining the tank will drain the pump, see below. An additional drain valve is at the base of the pump. Do not allow pump, piping, or any other system component containing water to freeze. Freezing may damage system, leading to injury or flooding. Allowing pump or system components to freeze will void warranty.
- Pump water only.
- Never run pump dry.

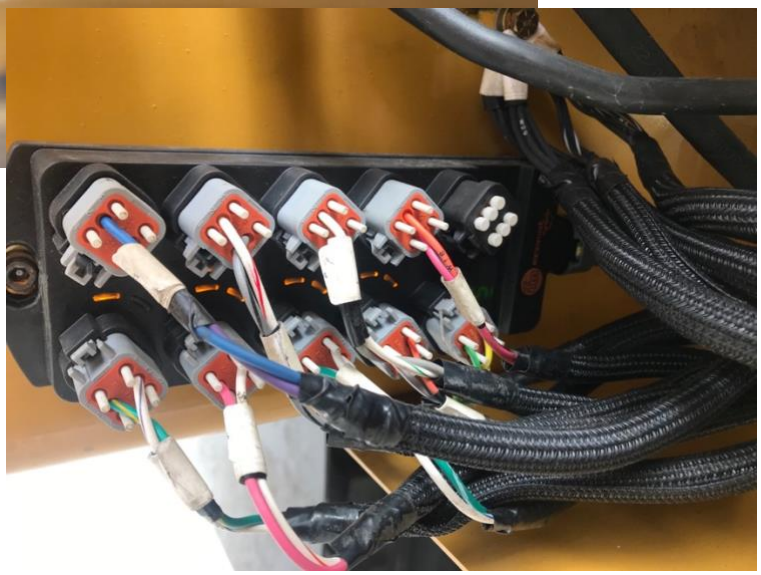
WARNING: Drain pump and lines when experiencing freezing weather.

(If equipped) Open the ball valve to drain the pump; otherwise, remove the plug on the bottom of the pump to drain any residual water.



IFM Hydraulic Controller (Installed 2022 -)

With the key on, the IFM hydraulic controller box, located under the center rear of the tank, will cycle through test mode before showing a green light in ready mode.



Butterfly Valves

WARNING: Crush/Pinch Risk. Do not place your hand or tools near the butterfly valve (if equipped) when the truck is in operation.

The butterfly valves control water flow to the monitor. There is one at the rear of the tank for the gravity bar, and one located under the monitor. Examine for wear and leaks.

MAINTENANCE

Pump Maintenance, Start Up and Winterization

For less down time and to extend the life of the pump, keep the pump well maintained.

A routine maintenance and inspection schedule should be set up on a weekly, quarterly, and annual basis with records kept of these actions.

Weekly Checks: Lubrication

LIQUID END of pump requires no lubrication. Wear rings, packing rings, and models using a mechanical shaft seal, are lubricated by the liquid being pumped. Do not run dry! BEARING FRAME - add approximately 2 ounces of a lithium-based NGLI No. 2 extra pressure ball bearing grease to each bearing during quarterly inspection. Excess grease will cause bearings to run hot.

The following are factory approved brands of grease for use with Berkeley Pumps: Alvania EP2, Shell Oil; Mobilith AW2, Mobil Oil, Ronex MP, Exxon, Litholine EP2, Atlantic Richfield; and Amolith EP2, Amoco.

NOTE: Grease fitting in packing area is for priming only. See PRIMING in start-up section for instruction.

Weekly Observational Maintenance

Observe the following:

- VIBRATION: All rotating machines can be expected to produce some vibration, however, excessive vibration can reduce the life of the unit. If the vibration seems excessive, discontinue operation, determine cause of the excessive vibration, and correct.
- NOISE: When the unit is operating under load, listen closely for unusual sounds that might indicate that the unit is in distress. Determine the cause and correct.
- OPERATING TEMPERATURE: During operation, heat is dissipated from the pump and the driver. After a short period of time, the surface of the pump bracket will be quite warm (as high as 150°F), which is normal. If the surface temperature of the pump bracket or driver is excessive, discontinue operation, determine cause of the excessive temperature rise, and correct. Bearings will run hotter for a brief run-in period after packing which is normal. However, worn bearings will cause excessive temperatures and need to be replaced. The pump unit is cooled by the water. For quarterly and annual maintenance, refer to check list on the following page.

WARNING: To avoid damage, drain pump during freezing weather.

Winterizing

If pump is to be out of service for an extended period, such as the winter months, the following storage procedures should be followed.

- Remove exterior dirt and grime or any substance that may trap moisture. Exposed metal is subject to oxidation, prime and repaint if necessary. If this is not possible, coat with grease or heavy oil.
- Flush suction and discharge lines. Check for leaks and replace any worn gaskets.
- Remove lowest plug-in pump and drain pump casing and suction and discharge lines.
- Lubricate bearings.
- If possible, keep unit clean and dry during storage period to guard against corrosion.
- Seal all open ports to keep out foreign objects such as insects, rodents, dust and dirt.
- Rotate driver shaft periodically to prevent freeze-up of internal components.
- Shelter unit from elements if possible.
- Work oil into impeller wear ring by dripping oil into the gap while rotating by hand.

Spring Start-Up

- Inject sufficient grease into the bearings to displace old grease.
- Visual inspection.
- Rotate by hand, if any binding occurs, disassemble, and inspect.

Quarterly and annual inspections are on the next page.

Maintenance
Routine Inspection
Record

I. QUARTERLY INSPECTION

- ☐ Inspect all system piping connections for leakage or possible misalignment.
- ☐ Check pump foundation for soundness and see that all hold-down bolts are secure.
- ☐ Complete any lubrication requirements as dictated by pump and driver owner's manual.
- ☐ Inspect packing or mechanical seal for possible replacement. Examine shaft sleeve, if present, for wear and replace if necessary.
- ☐ Inspect pumping plant panel for signs of wear (ie: replace pitted contactors, etc., as needed).
- ☐ Check pump and motor bearings from signs of wear. Repack or replace as necessary.
- ☐ Check alignment of couplings and/or pulleys and belt tension if applicable.
- ☐ _____

II. QUARTERLY INSPECTION

- ☐ Inspect all system piping connections for leakage or possible misalignment.
- ☐ Check pump foundation for soundness and see that all hold-down bolts are secure.
- ☐ Complete any lubrication requirements as dictated by pump and driver owner's manual.
- ☐ Inspect packing or mechanical seal for possible replacement. Examine shaft sleeve, if present, for wear and replace if necessary.
- ☐ Inspect pumping plant panel for signs of wear (ie: replace pitted contactors, etc., as needed).
- ☐ Check pump and motor bearings from signs of wear. Repack or replace as necessary.
- ☐ Check alignment of couplings and/or pulleys and belt tension if applicable.
- ☐ _____

NOTES:

III. QUARTERLY INSPECTION

- ☐ Inspect all system piping connections for leakage or possible misalignment.
- ☐ Check pump foundation for soundness and see that all hold-down bolts are secure.
- ☐ Complete any lubrication requirements as dictated by pump and driver owner's manual.
- ☐ Inspect packing or mechanical seal for possible replacement. Examine shaft sleeve, if present, for wear and replace if necessary.
- ☐ Inspect pumping plant panel for signs of wear (ie: replace pitted contactors, etc., as needed).
- ☐ Check pump and motor bearings from signs of wear. Repack or replace as necessary.
- ☐ Check alignment of couplings and/or pulleys and belt tension if applicable.
- ☐ _____

IV. QUARTERLY INSPECTION

- ☐ Inspect all system piping connections for leakage or possible misalignment.
- ☐ Check pump foundation for soundness and see that all hold-down bolts are secure.
- ☐ Complete any lubrication requirements as dictated by pump and driver owner's manual.
- ☐ Inspect packing or mechanical seal for possible replacement. Examine shaft sleeve, if present, for wear and replace if necessary.
- ☐ Inspect pumping plant panel for signs of wear (ie: replace pitted contactors, etc., as needed).
- ☐ Check pump and motor bearings from signs of wear. Repack or replace as necessary.
- ☐ Check alignment of couplings and/or pulleys and belt tension if applicable.
- ☐ _____

ANNUAL INSPECTION

- ☐ Inspect pump and entire pumping system for signs of wear.
- ☐ Inspect system valves, screens, etc.
- ☐ If electric motor is used, check windings for degredation, rewind if necessary.
- ☐ Check pump impeller eye for clearance.
- ☐ Inspect impeller, volute case, and seal chamber for signs of excessive wear or corrosion.

Maintenance: Monitor

The complete system should be inspected before each use or once a month on a scheduled basis. Visually inspect the nozzle carefully for damage:

- Check the system for signs of excessive wear or abnormal damage
- Examine monitor, nozzle, joystick, and wire harnesses for loose mounting or wiring connections.

Flow water as a test to check the nozzle pattern. If the pattern is disrupted, clear the nozzle of debris. If the obstruction remains, remove the nozzle and check for debris lodged between the nozzle stem and monitor or in the nozzle stream shapers.

Warning: Do not use high pressure spray to clean the Nitro HD. This can damage seals and lead to serious damage of electrical components.

During nozzle flow test, inspect the monitor swivel joints for leaks, and inspect all exposed wiring for signs of damage.

Grease fittings are provided for the up-down and left-right gear cases. Routine greasing should be done. Mobil™ Mobilux™ EP 2 grease is recommended to lubricate the monitor gearing.

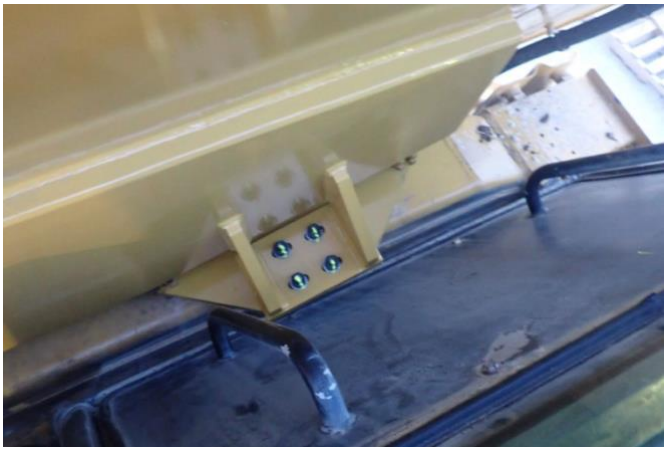
Raising Tank For Necessary Maintenance

It may be necessary to access the area under the tank for service or maintenance. In this case, follow these instructions.

SECOND GENERATION 773 (from 2025)

In order to raise the tank for maintenance, use two people to perform the following tasks:

1. Unbolt the tank mounts at the front of the tank.



2. Remove the Cat locks underneath tank, close ball valves, closing hydraulic flow from the Spray King back to the hoist cylinders.

3. Unplug four of the water monitor connectors on the rear of the tank.

4. Turn on the key switch behind the driver's seat.

5. On the Cat 773 or older 775 models, once the switch is on, control the hoist with the lever next to the shifter. A second person should stand behind the tank to watch the safety pin alignment.

The tank will tilt no more than 44 degrees.

6. As the tank tilts, the safety pins on the tank at the rear frame will align. Once aligned, release spring loaded locks and insert the pins to lock the tank in place.

7. Perform the same steps to lower the tank.

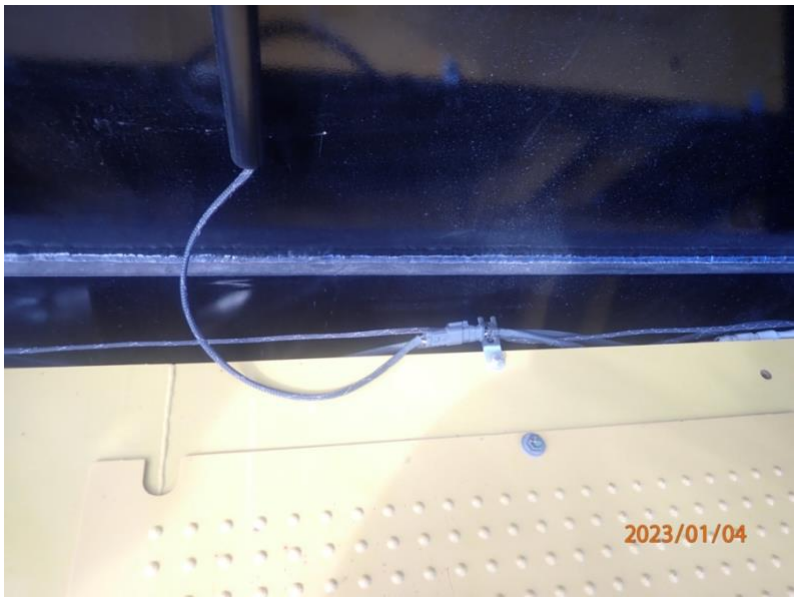
Note: As these cylinders are not routinely used, air can get into the cylinder, preventing the tank from moving downward again. When using the cylinders for the first time, you may need to physically pull down on the tank, or mechanically force the tank to start moving downward.

FIRST GENERATION (models to 2024)

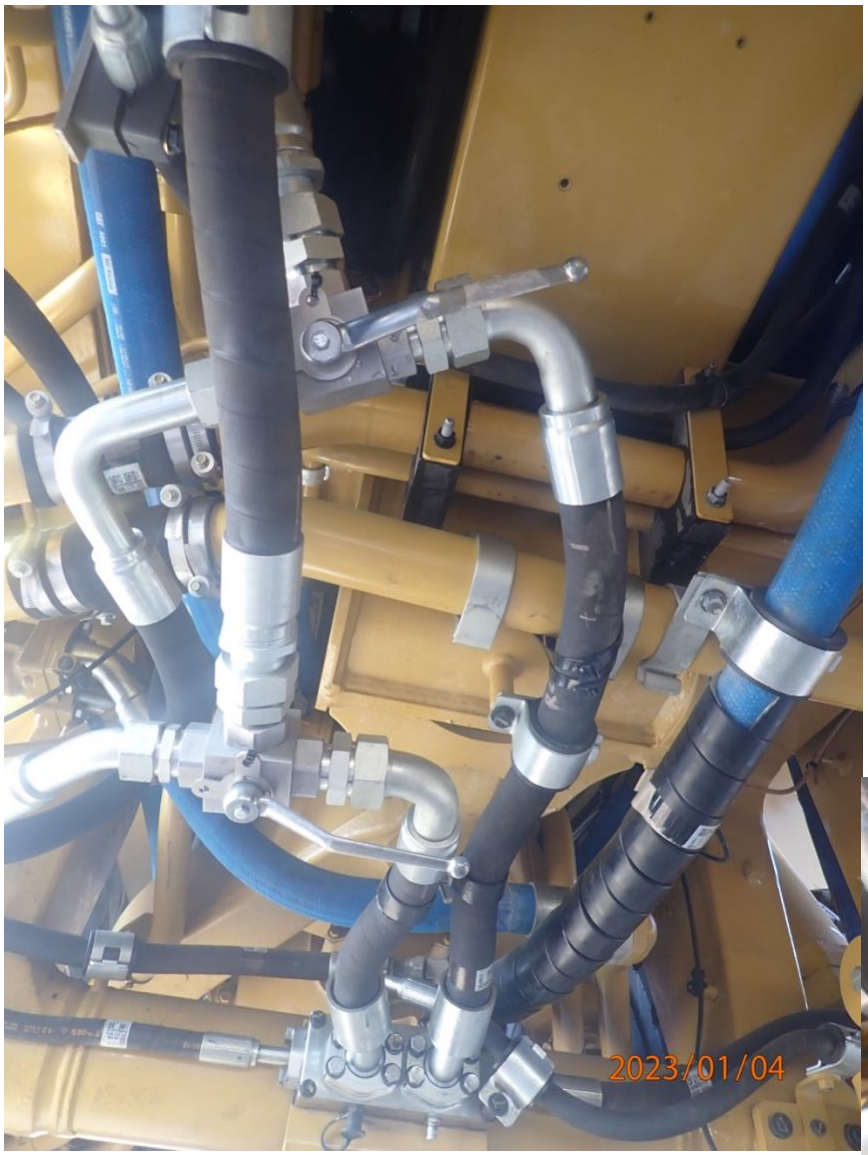
1. Unplug cannon control at control box on front of tank (black wires in photo at left).

2. Unplug power connector to control box.

3. Unplug water level sensor.



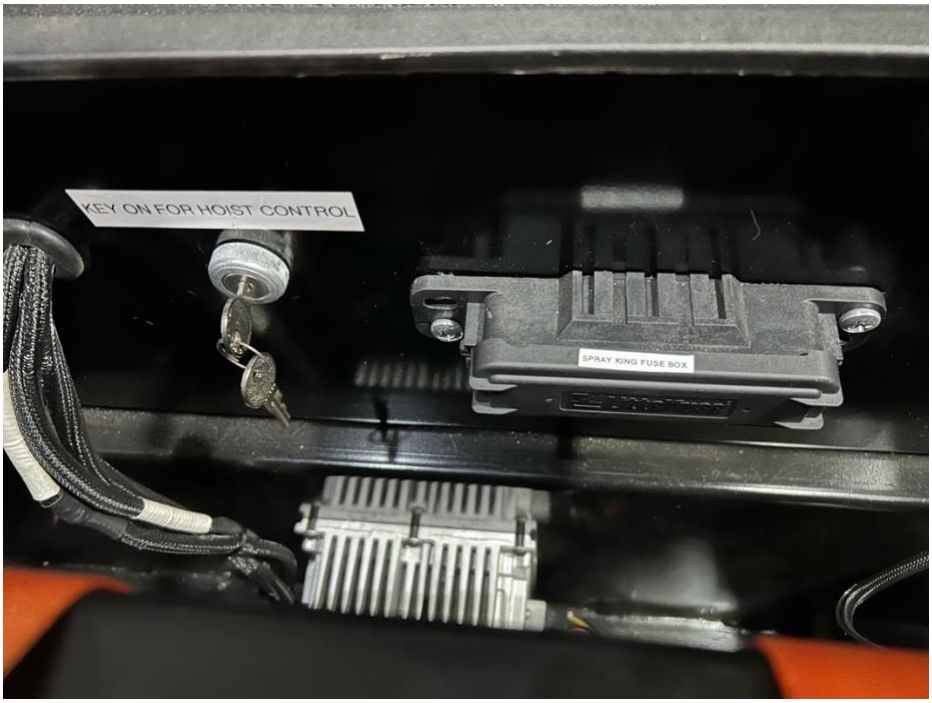
4. Remove 8 bolts from front mounts – shown here is one mount on one side. Remove mounts from both sides.



5. Under center of machine there are two manual directional ball valves. Remove safety tie strap and open both valves. This will allow hydraulic oil to be diverted from water tank back to cylinders.

6. FIRST GENERATION: Inside cab, behind driver seat, under fuse box, there is a safety lock toggle switch. Raise safety lock and toggle up the switch. This will transfer hydraulic engagement from the screen back to the hoist switch on the shift selector.

SECOND GENERATION: Inside cab, behind driver seat, above and to the left of the fuse box, there is a safety lock key control. Turn the key on transfer hydraulic engagement from the screen back to the hoist switch on the shift selector.



7. Remove safety lock pins on back of machine.
Tank can now be raised using the hoist up lever. Tank should only be raised while using a ground guide person to visually watch when tank approaches stop plates mounted on support pivot plates. Once tank is at 40-degrees lock pins need to be installed to prevent tank from coming down.

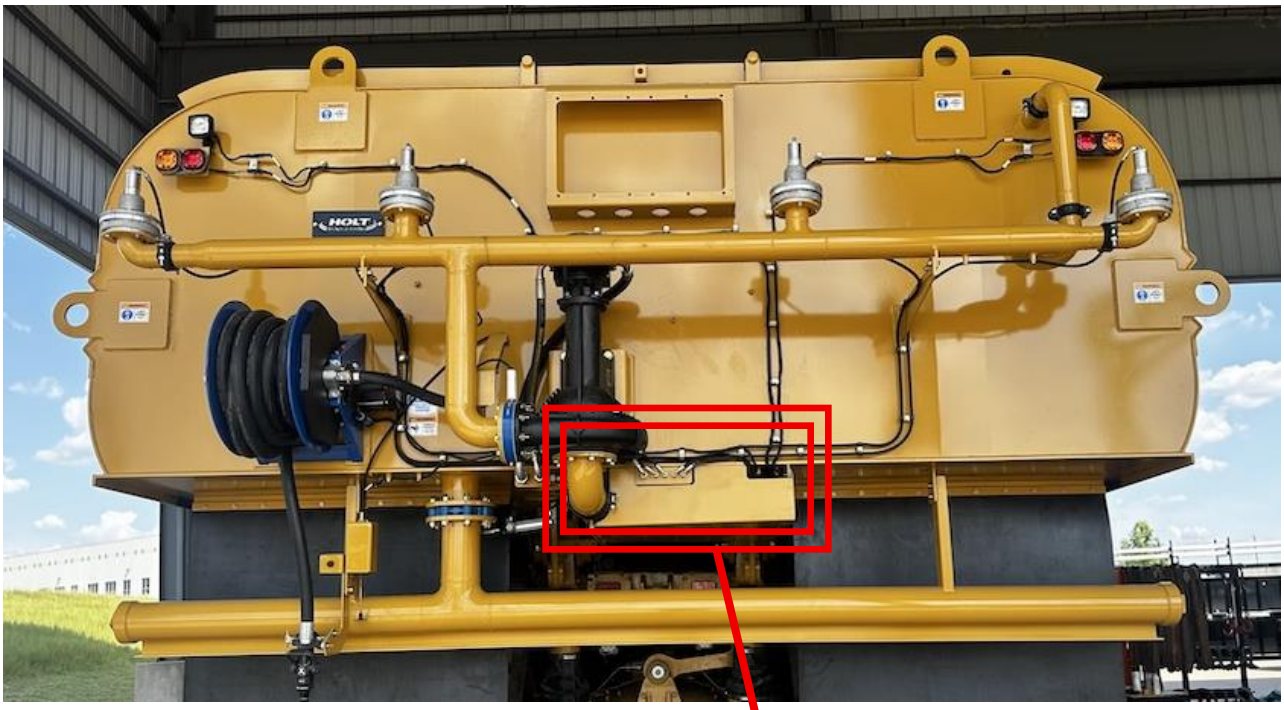
Stop plate: **the tank cannot be fully raised**; when the stop plate reaches the point where a lock pin can be inserted, stop raising the tank and insert the pins.

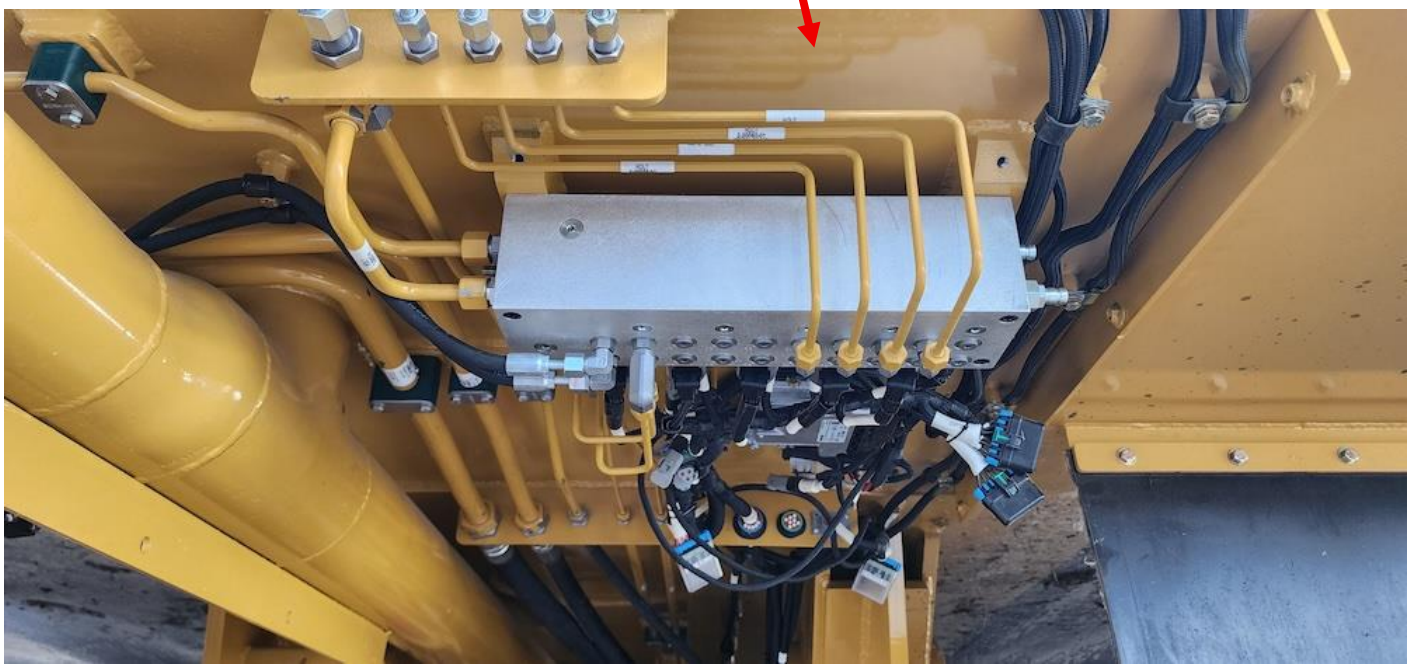
Appendix

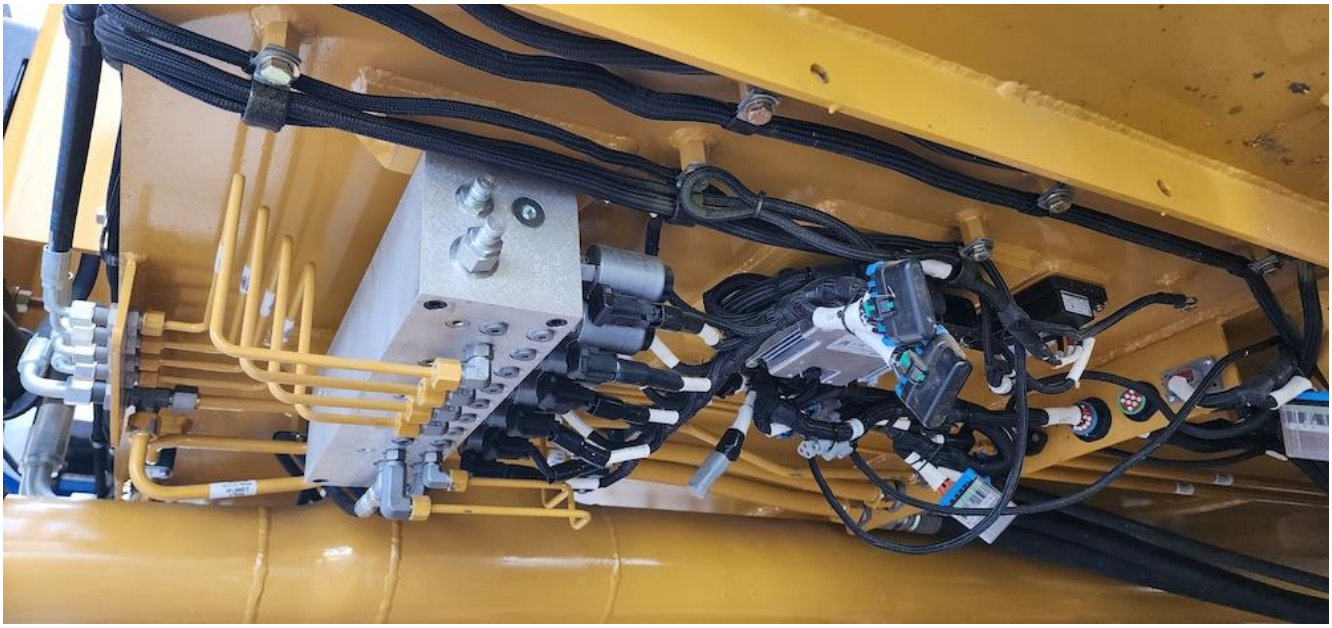
I. Hydraulic Manifold 2nd Generation (2025-) Images
II. Deep Sea Screen Features and Pin Outs
III. IMF Controller Wiring Diagram

I. Detail of Hydraulic Manifold 2nd Generation (2025-)

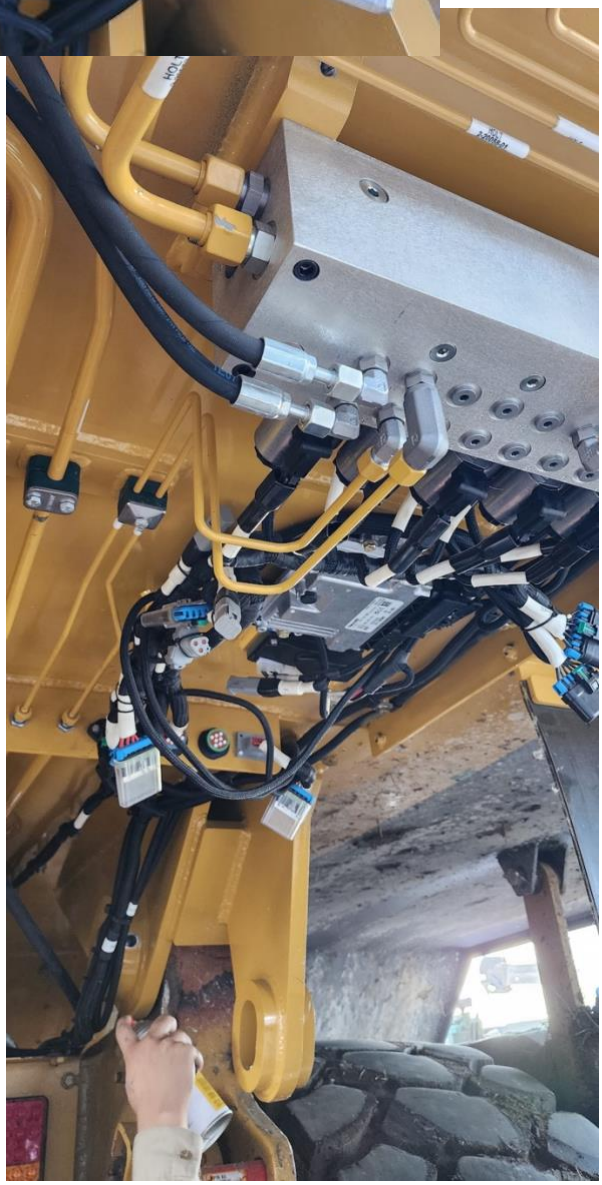
Images show rock guard removed, with location indicated below.







There are three inline fuses in the harness under the rock guard cover.



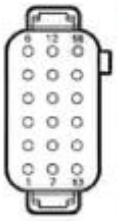
II. Deep Sea Screen Features and Pin Outs

DSEControl®

DSE

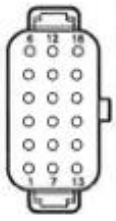
DSEM870

PROGRAMMABLE DISPLAY FOR USE IN VEHICLES AND OFF-HIGHWAY MACHINERY



Connector A

PIN	DESCRIPTION
1	DGU Supply GND
2	CAN1 GND
3	CAN2 GND
4	No connection
5	Camera 1 GND
6	Camera 3 GND
7	DCU Supply +VE
8	CAN1 H
9	CAN 2 H
10	No connection
11	Camera 1 signal
12	Camera 2 signal
13	Ignition +VE (15)
14	CAN1 L
15	CAN2 L
16	No connection
17	No connection
18	No connection



Connector C

PIN	DESCRIPTION	REF
1	Output supply +VE	
2	OUT H, L	
3	OUT H, L	
4	OUT H, L	
5	OUT H, L	
6	VREF -	
7	Output supply GND	
8	No connection	
9	No connection	
10	No connection	
11	No connection	
12	Output supply GND	
13	Aux 12 +VE Output	
14	AIN, DIN H, L, FREQ	
15	AIN, DIN H, L, FREQ	
16	AIN, DIN H, L, FREQ	
17	AIN, DIN H, L, FREQ	
18	VREF GND	

Ethernet

M12 'D' coded - 4 pin female

Pin - 01	TX+
Pin - 02	RX+
Pin - 03	TX-
Pin - 04	RX-

USB Host

M12 'S' coded - 5 pin female

Pin - 01	+ 5 V (X)
Pin - 02	Data +
Pin - 03	Data +
Pin - 04	ID
Pin - 05	GND

Abbreviations

OUT PWM, H, L — Output can be configured as a PWM, PWM, digital high-side or digital low-side

OUT H — Output is digital High

OUT H, L — Output can be configured as a digital high-side or digital low side

AIN — Input can be configured to accept signals from passive digital, negative digital, 0 V to 10 V, 4 mA to 20 mA, ratiometric or resistive

DIN, H, L, FREQ — Input can be configured to accept signals from passive digital, negative digital or frequency

A GND — Ground connection for the analogue input channels

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050-199/03/21 (3)

DSEControl®

DSE

DSE M870

Camera		Connector A
Analogue video input (supported video standards: PAL & NTSC)	2	5, 6, 11, 12
CAN interfaces		**Connector A**
Number of CAN ports	2	Pin 2, 3, 8, 9, 14, 15
Supported protocols	J1939	
	CAN open	
	Raw CAN	
Supported programmable baud rates	50 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 Mbit/s, 1 Mbit/s	
Ethernet interface		**M12, 4 pole**
Number of Ethernet ports	1	D-coded 4 pole socket
Supported data rates	10/100 Mbit/s	
Supported protocols	Modbus TCP	
	CODESYS 3.5	
USB interface		**M12, 5 pole**
Number of USB host ports	1	B-coded, 5 pole socket
Supported USB version	2	
Speeds supported	Full speed (12 Mbit/s)	
Device class supported	08 (Mass Storage)	
Supported filing system	FAT32	
Processor		
Technexion Freescale iMX6-SOLO Microcontroller	ARM A9	
	800 MHz	
Memory		
Flash	2 GB	
RAM	512 MB	
Software		**Version**
CODESYS 3.5 (M870-01 / M870-02 / M870-03)		SP12 Patch 0
Qt (M870-04)		V 5.15

LED Status			
Colour	**Description**	**Operation**	**State**
None	Device not powered	N/A	Off
Green	Unit powered up, application program loaded but not running	Static	Application stopped
	Unit powered up, application program loaded and running	1 Hz flash	Application running
	Unit powered up, but no application program loaded	5 Hz flash	No application
Amber	Bootloader functioning normally, firmware present	Static	Bootloader mode
	Firmware is at start-up	Static	Firmware start-up
	Unit stopped due to a serious fault	Static	Application exception
	Bootloader is decrypting the downloaded image	1 Hz flash	Decrypting image
	Bootloader is reading an image from the USB	5 Hz flash	Reading image from USB
Red	Fatal system/hardware fault - LEd may be driven directly by microcontroller error pin or firmware is in a fault condition	Static	Fatal error
	Unit running with a fault, see CODESYS error flags or web tool.	1 Hz flash	Faulty application running

055-169/03/21 (B)

DSEControl®

DSE

Technical Data

DSE**M870**

Supply		**Connector A**
Operating voltage	8 V DC to 32 V DC	Pin 7
Unit power supply maximum current consumption, full backlight (no external loads)	< 1000 mA at 12 V and 24 V	
Unit power supply maximum current consumption, full backlight and heater (no external loads)	< 1500 mA at 12 V and 24 V	
Unit power supply current consumption after controlled shutdown has occurred due to the ignition being turned off	< 5 mA at 24 V	
Fusing		**Connector A**
Unit power supply external protection fuse rating	3 A	Pin 7
High current outputs supply input external fuse protection rating (i.e. sum of output currents from all outputs provided for by an individual supply to < external fuse rating in total)	10 A	Pin 1
Housing		
PC PBT alloy plastic resin		
Dimensions		
140 mm x 230 mm x 60 mm (W x H x D) / 10.8" x 8.3" x 3.15" (W x H x D)		
Weight		
< 1 kg		
Temperature		
Operating temperature	-30 °C to +85 °C / -22 °F to +185 °F	
Storage temperature	-40 °C to +85 °C / -40 °F to +185 °F	
Protection Rating		
	IP67 (with mating connectors)	
Display		
Resolution, pixel	800 px x 480 px	
Colour	24 bit	
Format	7" diagonal	
Touchscreen	Capacitive touch (M870-02 / M870-04 variants)	
Mounting	Optically bonded	
Illumination	LED (lifetime > 50,000 hrs)	
Connectors		
Connector A	18 pin TE connectivity DT16-18SA-K004	
Connector C	18 pin TE connectivity DT16-18SC-K004	
Ethernet	M12, D-coded 4 pole socket	
USB	M12, B-coded 5 pole socket	
Digital Inputs		**Connector C**
Digital inputs configured high or low		Pin 14, 15, 16, 17
High level voltage threshold	> 8 V	
Low level voltage threshold	< 2 V	
Analogue Voltage Inputs		**Connector C**
0 V to 5 V programmable voltage range	0 V to 5 V	Pin 14, 15, 16, 17
0 V to 10 V programmable voltage range	0 V to 10 V	
0 V to 32 V programmable voltage range	0 V to 32 V	
Voltage measurement resolution	12 bits	
Voltage measurement accuracy	± 1% FSD	
Voltage measurement input resistance	≥ 30 kΩ	
Voltage measurement sampling rate	500 Hz	
FSD = Full Scale Deflection		

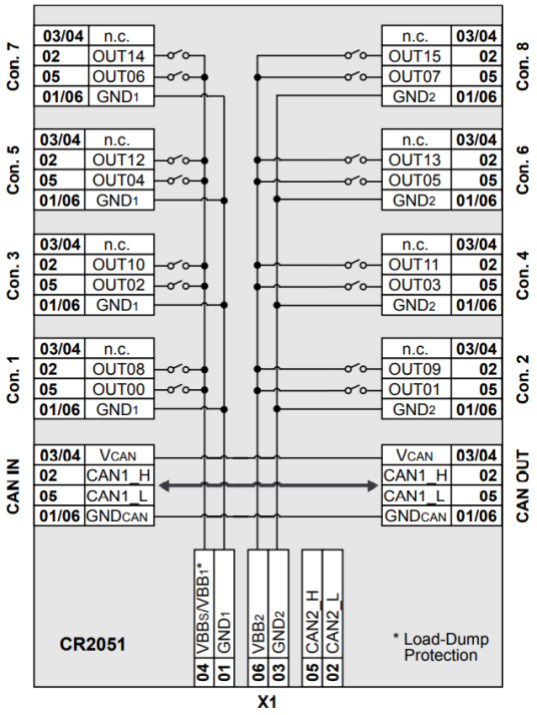
III: IFM Controller Wiring Diagram

CR2051 – GUIDE TO HOLT/GGI SOFTWARE

1.1 Pin Configuration

The 16 outputs of the CR2051 are distributed between the 6-pin Deutsch connectors There are two outputs on each connector. There are ground terminals allocated in the connector but not specifically used as we use the chassis ground directly in the wire design.

Given below is the pinout for the controller.



1.2 Troubleshooting Wiring

A few scenarios that could happen in case of bad contacts from wiring:

- **CR2051 does not power on**: Check that terminals 1,4,6,3 on connector X1 are all connected to ignition power and ground appropriately. Pins 1 and 4 are the main power supply, and pins 3 and 6 provide power for specific outputs to function properly.
- **Controller does not respond to the state of the Deep Sea/ DSE M870**: Ensure that the CAN bus wires make good contact individually on both sides. Further, make sure that the CAN HI and CAN LO have a resistance of 60 Ω with all parts of the harness connected, and 120 Ω with the parts being disconnected. The resistances are near the device and thus the intermediate harness will be an open connection between CAN HI and CAN LO bus lines.
- **CR2051 LEDs light up but do not activate some or all the valves**: Make sure that there is solid connection between the valve and the designated output, and that there is a good ground on the valve's second terminal.

Additionally, verify that both the power and ground lines on X1 connector have good connections. It is possible that the CR2051 is powered by just one line, in which case the device will fail to supply power to half the outputs.

- **CR2051 seems to power on but the built-in display does not work:** Check the power lines and make sure all the ignition power and grounds are connected. Additionally check if the LEDs on the CR2051 (located just above the 4-digit display) are in any error state.

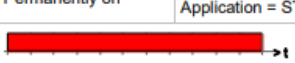
LED Description:

There are a total of 6 LEDs located just above the 4-digit display. From left to right these are:
LED [Power](green), LED [Mode](green), Application LEDs(green), LED [Lock] (green), LED [Diagnostics] (red)
Only LED [Power] and LED [Diagnostics] are used to convey the system status and errors:

The green LED [PWR] signals the system status.

LED colour	Display	Description
Off	Permanently off	No operating voltage
		
Green	briefly on	initialisation or reset checks
	 (time frame = 200 ms)	
Green	Flashing with 5 Hz	no runtime system loaded
	 (time frame = 200 ms)	
Green	Flashing with 2 Hz	Application = RUN
	 (time frame = 200 ms)	
Green	Permanently on	Application = STOP
		

The red LED [DIA] signals the diagnostic status.

LED colour	Display	Description
Off	Permanently off	No operating voltage
		
Red	briefly on	initialisation or reset checks
	 (time frame = 200 ms)	
Red	Flashing with 10 Hz	Application = STOP with error application program is stopped Cause: exceeded timeout of the application or visualisation: ► Delete the application! ► PowerOn reset ► Reload the application into the device
	 (time frame = 200 ms)	
Red	Flashing with 5 Hz	Application = stopped because of undervoltage
	 (time frame = 200 ms)	
Red	Permanently on	System error (FATAL ERROR): Application = STOP
		

1.3. Device Description and Configuration

The CR2051 has 16 outputs in total, labeled OUT00 to OUT15. Each output is mapped to specific purpose, either single acting or complementary double acting solenoid. 6 of the outputs are single acting, and 8 outputs are committed towards 4 double acting solenoids in total.

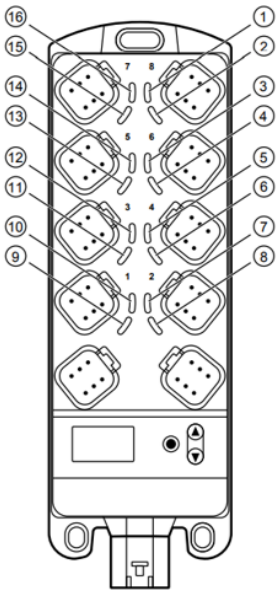
Given here is an illustration of the LEDs on the device, and the mapped output for each.

The LEDs are operational for all 16 outputs regardless of the type of solenoid being used.

If the LED is lit, the corresponding output is at 12/24V state.

In the Holt specific software, the PWM output's LED is lit up when the master solenoid is switched on, or the PWM duty cycle is at the configured high state.

1: LED OUT15
2: LED OUT07
3: LED OUT13
4: LED OUT05
5: LED OUT11
6: LED OUT03
7: LED OUT09
8: LED OUT01
9: LED OUT08
10: LED OUT00
11: LED OUT10
12: LED OUT02
13: LED OUT12
14: LED OUT04
15: LED OUT14
16: LED OUT06



1.4. Mapped Outputs to Holt-Specific Purpose

OUTPUT	PURPOSE
OUT00	GravBar1
OUT01	GravBar2
OUT02	FireHose1
OUT03	FireHose2
OUT04	L1
OUT05	R1
OUT06	L2
OUT07	R2
OUT08	LRojo1
OUT09	LRojo2
OUT10	RRojo1
OUT11	RRojo2
OUT12	L3
OUT13	R3
OUT14	Not Used
OUT15	PWM MasterSolenoid

2.1. Display Output

The default display on the CR2051 signifies the most up to date output status requested on the CAN bus.It is a hexadecimal number that corresponds to the 16 outputs on the device. Each character in the string describes the state of 4 outputs in order.

The most significant bit (left side) points to OUT15 and the least significant bit (right side) points to OUT00. On startup, the status will show 0000, or all off.

Few examples from the 256 possibilities of the statuses:

Status	OUT															
	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
FFFF	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0000																
0100								✓								
A001	✓		✓													✓
05C0						✓		✓	✓	✓						

✓- The output is high, or at 12/24V. This does not reflect valve state.

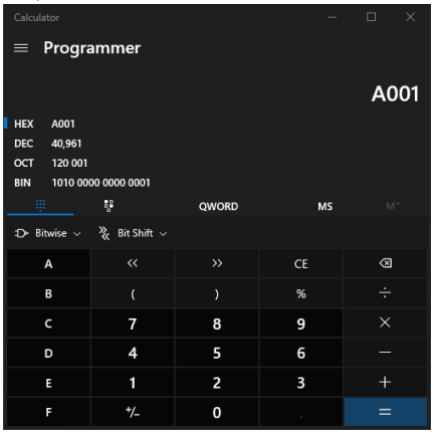
The same can also be verified with the amber LEDs beside each output, as shown in the diagram before.

2.2. Convenient way to decode the 4-digit display

Since the 4-digit display represents the output state in hexadecimal, an online converter, or a calculator with such features can be used to decode the string to get the current state easily.

For example, using the calculator built into Windows 10 and for the string A001:

1. Open the calculator application and switch to Programmer mode from the navigation drawer.
2. Click on “HEX” from the four options.
3. Type the string. In this case it is “A001”.
4. Check the equivalent number in binary which will be under “BIN” and will update as you type the hexadecimal number.
5. The binary number represents 1 for +24/12V and 0 for off state. Read this number from right to left to match the outputs from OUT00 to OUT15. If there are less than 16 digits in the binary number, the other outputs are 0.



ABOUT HOLT MANUFACTURING

The Holt name has been associated with a heritage of innovation for more than 100 years. HOLT Manufacturing owners Peter J. Holt and Corinna Holt Richter are direct descendants of Benjamin Holt, who revolutionized farming in the late 1800s with the Holt Combined Harvester and then in 1904 developed the first successful track-type tractor, which he named the "Caterpillar."

Within HOLT Manufacturing and the family of Holt companies, innovation has meant everything from the original Caterpillar track-type tractor to today's Spray King® Water Tanks, engine and generator packaging, root plows, custom attachments, and special application machines. HOLT Manufacturing's values date all the way back to the incredible work ethic of Benjamin Holt. Centered around a belief in unmatchable customer service, Holt instilled many of the values that still live within HOLT Manufacturing to this day. Holt developed "link belt" combined harvesters in the late 1880's. By the turn of the century, Holt Manufacturing was the largest combine manufacturer in America and was exporting to countries around the world.

Finding that heavy farm equipment bogged down in the loose soil of the San Joaquin River Delta in California, Holt put his inventive mind to work again. In 1904, Holt Manufacturing introduced the first successful track-type tractor, which they named the "Caterpillar." Its continued success was assured once Holt found a way to power it with a gasoline engine in 1908. In 1925, Holt Manufacturing Company merged with one of its longtime competitors to form Caterpillar Tractor Company. Today, Caterpillar, Inc., is the world's largest manufacturer of construction equipment.

In 1933, Ben's second son William K. "Bill" Holt established the William K. Holt Machinery Co. in San Antonio, Texas, as a Caterpillar equipment dealership. Seeing the need for specialized land-clearing equipment, Bill Holt encouraged the development of the Holt root plow during the 1940's. In quick succession he developed other brush management implements and today HOLT land-clearing equipment is sold all over the world, a tribute to the second generation of Holt ingenuity.

Over the years, this custom design and manufacturing has included specialized tools, modifications to existing products, and development of unique products for unique customer applications. Today, the original William K. Holt Machinery company is known as HOLT CAT, the largest Caterpillar equipment dealership in the United States. HOLT CAT sells, rents and services Caterpillar machines, engines and generator sets in a 118-county territory in Texas. Five other companies, including HOLT Manufacturing, make up the Holt Companies, a name synonymous with quality, integrity, and commitment to customer service.

The HOLT Manufacturing company name lives on through Benjamin Holt's direct descendants and a team who believe in his original values and vision. The innovation that started with linked belts and self-laying tracks also continues through modern technology and advances.