

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

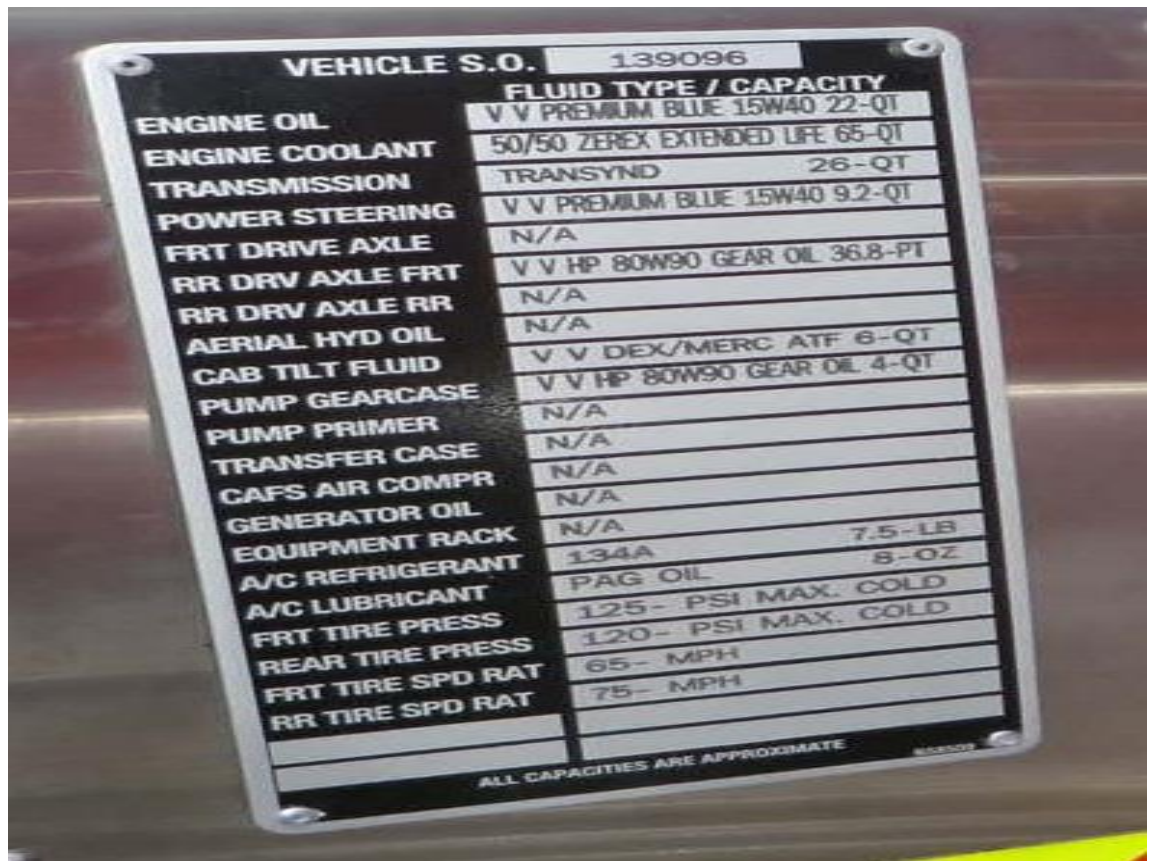
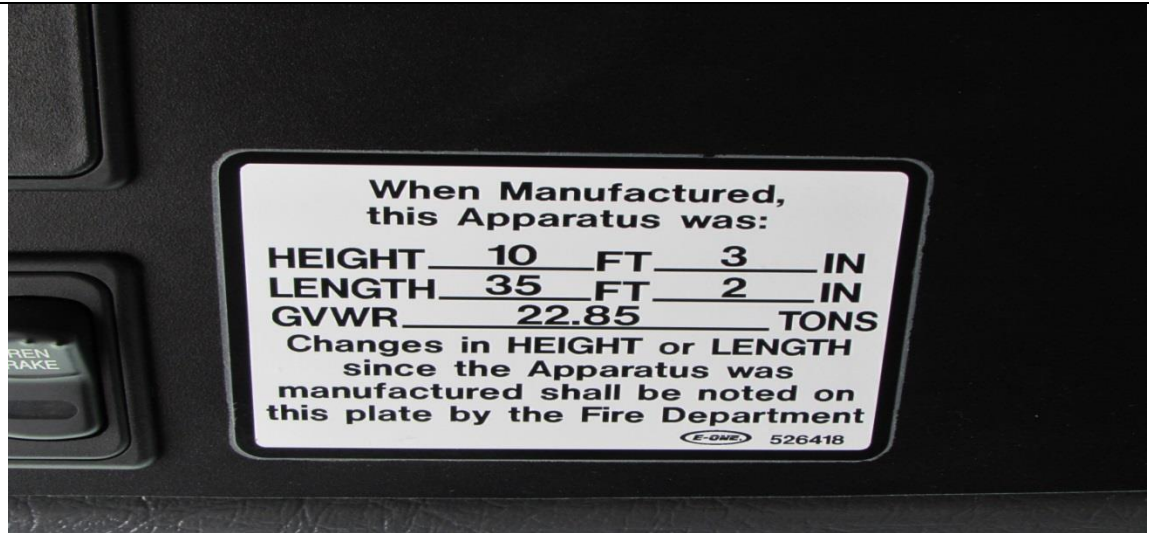


Vehicle Specs:

Manufacturer	E-One Typhoon Cab
Engine	450Hp Cummings Diesel
Transmission	Allison EVS 3000 6 speed Transmission
Fuel	65 Gallon Diesel tank
Emissions	Diesel Particulate Filter (DPF)
Primary Brake System	Front Disk with Rear Drum Air Brake System Anti-Lock Braking (ABS) with Electronic Stability Control
Secondary Brake System	Jacobs (Jake) Engine Compression Break
Pump System	Darley EMax 1500 GPM single stage pump
Water Tank	750 Gallon Water Tank
Foam System	125 GPM In-line Foam Inductor delivered to the front #1 Bumper line
Foam Tank	30 Gallon on Board Foam Tank
Pre-connects	2-150 foot 1 3/4" Bumper lines 2-200 foot 1 3/4" Mid-ship pre-connected lines 1-200 foot 2 1/2" Pre- connected Blitz Line loaded
Supply Line	1200 feet of 5" Hose 350 Feet of 2 1/2" Hose
Generator	Honda® 5000 SX (gasoline) for portable power

Sunrise Fire Rescue
 Division of Operations
 Presents
 Engine 341 and 343

Truck Information

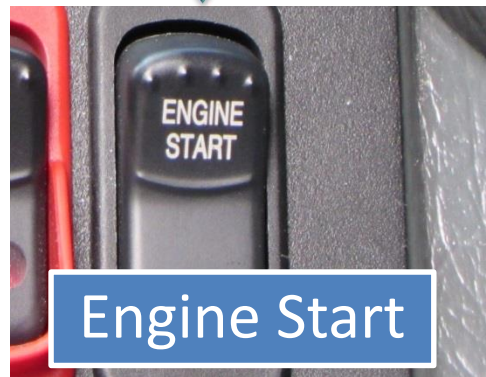


Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

STARTING THE VEHICLE



Battery switch



Engine Start

- **Battery switch: OFF in the DOWN POSITION**
- **Engine Start: engaged in the UP position.**
- **Do not run this switch longer then 15 seconds according to the manufacturer.**
- **To shut the engine off place Engine Start in the DOWN position.**

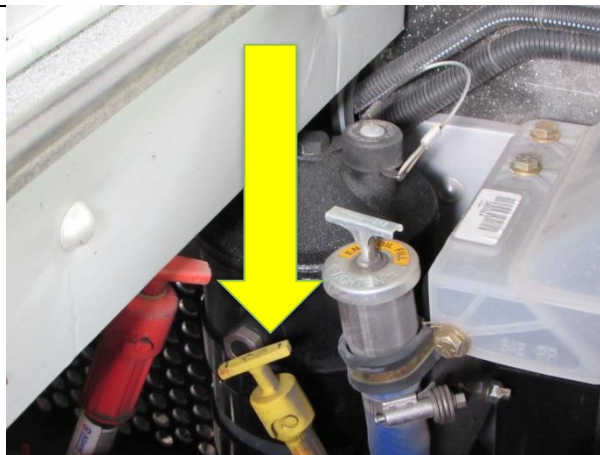
Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

CHECKING FLUID LEVELS

Access Panel



Located between the Driver and officer on the center console is an access panel to check the fluids for the Engine. All fluids should be checked daily in accordance with Sunrise Fire Rescue Policy.



ENGINE OIL LEVEL

To check engine oil, locate yellow dipstick pull.
Carefully pull dipstick from dipstick tube.
Wipe oil from dipstick and reinsert into dipstick tube.
Carefully pull dipstick from dipstick tube again, this time examining the oil level on dipstick.
Ensure oil level is at full mark.
Low levels should be taken to the garage to be refilled..

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343



TRANSMISSION FLUID LEVEL - Transmission Fluid is checked with engine running.

To check transmission fluid level, locate the dark orange dipstick pull.

Carefully pull dipstick from dipstick tube.

Wipe fluid from dipstick and reinsert into dipstick tube.

Carefully pull dipstick from dipstick tube again, this time examining the fluid level on dipstick. Ensure fluid level is at full mark.

Low levels should be taken to the garage to be refilled

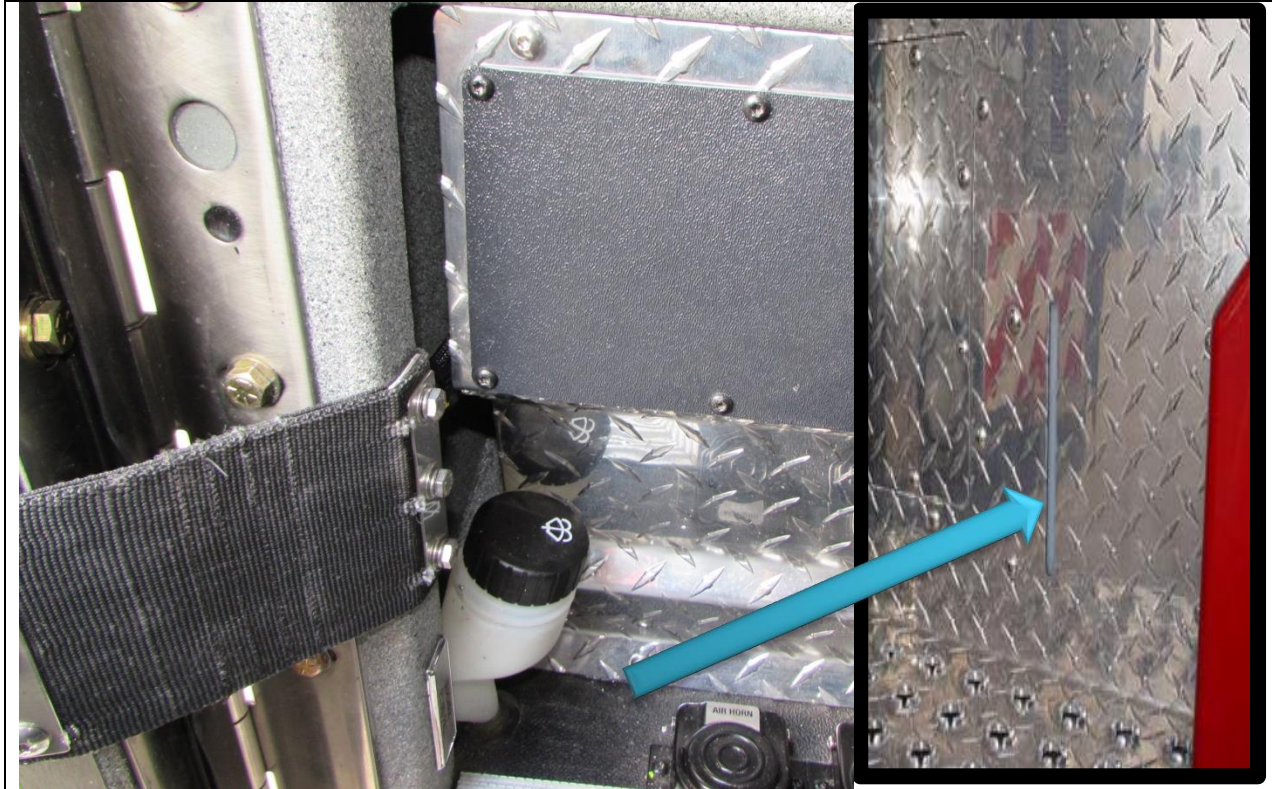


POWER STEERING FLUID LEVEL

The fluid level should be checked using the site level gauge

Low levels should be taken to the garage to be refilled

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Division of Operations
Presents
Engine 341 and 343

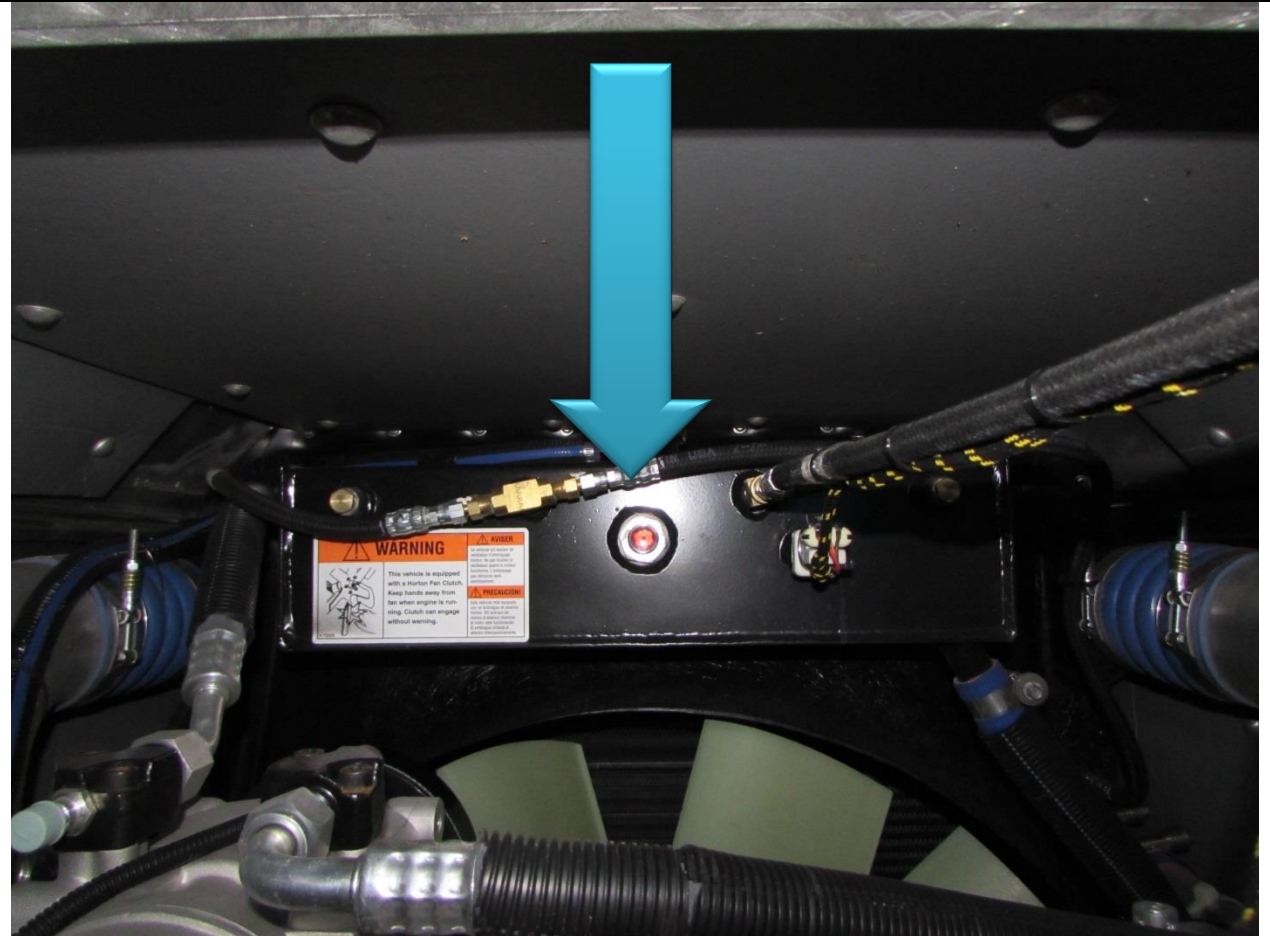


WINDSHIELD WIPER CLEANING FLUID LEVEL

Located on the riser of the drivers step is a fluid level indicator for the washer fluid(shown with the arrow in the picture) If fluid is needed, the fill tube is located near the floor board to the left side of where the driver sits,

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Division of Operations
Presents
Engine 341 and 343

ENGINE COOLANT LEVEL



Check coolant level when the engine is cold. Coolant level must be checked using the sight glass on the top of the radiator tank, NOT the expansion tank. This is located under the hatch in the center console looking forward. If there is insufficient coolant, fill the radiator with coolant until it can be seen in the sight glass. DO NOT ADD ANY COOLANT TO THE EXPANSION TANK.

WARNING!

NEVER REMOVE THE RADIATOR OR COOLANT RESERVOIR CAP WHEN THE ENGINE IS HOT. WAIT UNTIL THE ENGINE AND RADIATOR COOL DOWN. SERIOUS BURNS COULD BE CAUSED BY HIGH PRESSURE FLUID ESCAPING FROM THE RADIATOR.

NOTE: NEVER FILL COOLANT RECOVERY BOTTLE. DOING SO WILL CAUSE COOLANT TO OVERFLOW ONCE ENGINE REACHES NORMAL OPERATION TEMPERATURE

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

TRANSMISSION



The vehicle is equipped with an Allison 6 speed automatic transmission. The transmission selector consists of an electronic control head mounted on the engine cowling by the driver's right arm. The control head consists of a display window and a series of touch pad buttons. The **R** button activates the reverse gear. The **N** button places the transmission in neutral. The **D** button places the transmission in the normal drive range. In this range, the transmission will automatically shift up and down through gears 1-5. The **MODE** button is utilized whenever the vehicle operator wishes to access the 6th gear. This gear functions like an overdrive. **The mode button must not be used for pumping applications.** The mode feature can be activated at any time. The mode feature is deactivated whenever the **MODE** button is depressed for a second time, or after the vehicle is shut off. There are two additional touch pad buttons on the control head. The up and down buttons allow the operator to manually shift/downshift between gears. The display window on the control head displays the gear range (**R, N, 4, 5**) on the left side and, on the right side of the window, the actual gear that the transmission is in at the moment it is being viewed. By depressing the both arrow buttons at the same time while the engine is running and in the Neutral position, will allow the operator to run a fluid level check which will be displayed in the display window.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

DIESEL PARTICULATE FILTER REGENERATION

BACKGROUND

- Diesel particulate filters (DPF) are being used on Cummins automotive engines to meet new emissions regulations.
- A DPF is a large filter which traps soot. The soot needs to be oxidized periodically.

UNDERSTANDING THE NEED FOR REGENERATION

- Emergency Vehicles seldom remain in a high vehicle speed condition long enough for a complete mobile regeneration (30 minutes or longer).
- Extended periods of engine idle – not enough heat in exhaust system

NOTE: IF REGENERATION IS NOT PERFORMED IT COULD RESULT IN AN EXPENSIVE DPF REPLACEMENT.

HOW DOES THE DPF REGENERATION WORK

There are two methods of DPF regeneration:

- Passive regeneration: The passive regeneration process operates in the background, no operator interaction is required. When the exhaust flow temperature is high enough, the DPF will clean itself automatically
- Active regeneration: The active regeneration cycle heats up the DPF by adding extra hydrocarbons into the system. The exhaust temperature may reach 600°C (1112°F). Illumination of the high exhaust system temperature (HEST) lamp during regeneration is normal and does not indicate a problem.

Most Emergency Vehicles require active regeneration to remove the soot. This can be accomplished either during a stationary (parked) regeneration or during a mobile regeneration (driving the vehicle at highway speed)

HOW OFTEN IS DPF REGENERATION NECESSARY

Emergency Vehicles which encounter long periods of idle, even high idle rarely encounter highway speeds for long intervals (30 to 45 minutes) and may require DPF regeneration from daily to 2 or 3 times per week. High heat in the exhaust flow is needed for proper operation of the DPF. Operating the engine in low exhaust heat flow conditions, will require the regeneration process more often.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

WHY DOES THE NEED FOR REGENERATION VARY

- Due to the varied operation requirements, the need for regeneration will vary from vehicle to vehicle as well as day from day with the same vehicle.
- High exhaust flow heat is needed for the DPF to work properly. The engine working under a load is the best method for longer intervals between regenerations.
- Long periods of idle, even fast idle, driving the vehicle at low speeds or seldom reaching highways speeds for intervals longer than thirty minutes, will require the need for more frequent regeneration.
- Because of the varied operation of the vehicle on a day to day basis, it is impossible to determine intervals that regeneration will be required.

HOW LONG DOES REGENERATION TAKE

- Stationary (parked) regeneration: 30-60 minutes.
- Mobile (driving) regeneration: 30 minutes average.

Factors which determine the time to complete a regeneration include level of soot, engine load, vehicle speed, and ambient temperature.

FOR ACTIVE MOBILE REGENERATION TO TAKE PLACE

***THE REGEN LAMP MUST BE ILLUMINATED (SOLID OR FLASHING)
BEFORE AN ACTIVE REGENERATION CAN BE PERFORMED.***

1. To initiate the regeneration cycle, the vehicle must be moving at least 40 MPH.
2. To complete a regeneration, the vehicle must remain above 5 MPH.
3. Regeneration will be completed, when REGEN Lamp goes out.

NOTE:THE HEST MAY ILLUMINATE. THIS IS NORMAL AND DOES NOT INDICATE A PROBLEM.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

FOR ACTIVE STATIONARY REGENERATION TO TAKE PLACE

- Park vehicle in an appropriate location, set parking brake and place transmission in Neutral.
- Set up a safe exhaust area. Confirm that nothing is on or near the exhaust system surfaces.
- Disconnect PTO powered devices before starting the regeneration, i.e. make sure switches are in the off position.
- Push and hold for 4 seconds the REGEN switch. Note: Engine speed will increase and there may be a noticeable change to the sound of the turbocharger during the regeneration process. If the engine speed does not increase immediately, recheck the above steps or contact Service Technical Support.
- Once the regeneration process is completed, the engine will automatically return to normal idle speed.
- Monitor the vehicle and surrounding area during the regeneration process. If any unsafe conditions occur, shut off the engine immediately.
- The HEST lamp may illuminate during regeneration which is normal and does not indicate a problem.
- To stop a stationary regeneration process, depress the throttle pedal.
- Be careful, exhaust gas and exhaust surface temperatures will remain elevated for 3 to 5 minutes, after the regeneration process is completed.
- At anytime during the stationary regeneration process, the regeneration can be stopped by depressing the throttle pedal.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343



Regen: Press switch upward to start “parked” regeneration. Press switch downward to inhibit regeneration. See Diesel Particulate Filter Regeneration

HOW WILL I KNOW WHEN AN ACTIVE REGENERATION WILL NEED TO BE DONE?

There are three (3) designated warnings before possible engine or DPF damage will occur.

- The first indication a regeneration process is needed will be a solid illuminated REGEN lamp.
- If no action is taken, the second indication will be a flashing illuminated REGEN lamp.
- If no action is taken, the third indication will be a flashing illuminated REGEN lamp and an illuminated Check Engine lamp.

Once the first stage is reached (REGEN lamp solid), it is expected you will have 4 to 6 hours before the second stage (REGEN lamp flashing). It is expected you will have 2 to 4 hours before reaching the third stage (REGEN lamp solid and Check Engine lamp solid). At this stage, you will have 1 to 2 hours before the Stop Engine lamp is illuminated. Summary, from the first stage (REGEN lamp solid) to the last stage (Stop Engine lamp solid) is anticipated to be 8 plus hours.

Sunrise Fire Rescue Division of Operations Presents Engine 341 and 343

WHAT HAPPENS WHEN I'M IN PUMPING MODE?

The DPF is designed to work in a mode with no operator interface. This mode is referred to as passive regeneration. When operating in pumping mode, due to the engine load (exhaust flow temperature), passive regeneration may take place. The passive regeneration does not affect engine operation, i.e. power, speed, pressures, etc. The only indication you may have will be the HEST lamp may illuminate. Remember, this is normal and does not indicate a problem.

ANTI-LOCK BRAKING SYSTEM (ABS)

This unit is equipped with an anti-lock braking system. This system prevents the vehicle from skidding out of control during panic braking. IFSTA's *1999 Pumping Apparatus DRIVER/OPERATOR Handbook* pg. 64 describes how ABS brake systems operate:

“These systems are effective in that they **minimize** the chance of the vehicle being put into a skid when the brakes are applied forcefully. ABS works using digital technology in an onboard computer that monitors each wheel and controls air pressure to the brakes, maintaining optimal braking ability. A sensing device located in the axle monitors the speed of each wheel. The wheel speed is converted into a digital signal that is sent to the on board computer. When the driver/operator begins to brake and the wheel begins to lock up, the sensing device sends a signal to the computer that the wheel is not turning. The computer analyzes the signal against the signals from the other wheels to determine if this particular wheel should still be turning. If it is determined that it should be turning, a signal is sent to the air modulation valve at that wheel and allowing the wheel to turn. Once the wheel turns, the computer allows the brake to be applied again and repeats the diagnosis. When being applied the driver may feel a pulsation in the brake pedal until the vehicle is brought to a complete stop or the brake pedal is fully released. The computer makes these decisions many times a second until the vehicle is brought to a halt.”

OPERATION

The brake pedal must be activated with solid continuous pressure. **Do not pump the brakes while attempting to stop the vehicle.** Should the ABS system detect impending lockup, it will activate and the driver may feel a pulsation of the brake pedal. This is normal.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

INSTRUMENT CLUSTER AND OVERHEAD CONTROLS



The Gauge Mode Switch cycles through the different functions of odometer display screen sequentially to display the next parameter.

Tachometer
Hour meter
RPM
HOURS
Miles
Odometer

Trip A/B (to reset the odometer for trip mode hold the “Gauge Switch” for several seconds.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

OVERHEAD PANEL LEFT



Jacobs (Jake) Brake Controls: These switches operate the Jake Brake system. Flip left toggle switch up to activate system. Right switch selects how aggressive the Jake Brake will function. Down is lowest braking action, center is medium and up is highest. Driving conditions and driver preferences will dictate which setting works best for your application.

NEVER USE THE JAKE BRAKE IN BAD WEATHER CONDITIONS WHEN ROADS MAY BE SLICK. SUDDEN JAKE BRAKE ENGAEMENT COULD CAUSE VEHICLE TO LOSE CONTROL!!!



DEF Fluid Gauge Shows the level of the DEF fluid in the reservoir. The Reservoir is located in the rear passenger compartment on the driver's side of the vehicle below the step.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343



The Federal Signal Corporation® Traffic Master™ is the directional traffic light bar located on the rear of the apparatus. The electronic control head for the Traffic Master™ is located to the right of the driver on the overhead panel. This device allows the driver/operator to choose a light pattern to direct traffic to the LEFT, RIGHT, and SPLIT out both sides from the center, and FLASH which places the Traffic Master™ into an alternating wigwag pattern for additional rear warning. There is also FAST/LOW feature

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

V-MUX Vista



This unit controls the emergency lighting and scene for the vehicle as well as safety information warning the driver operator of crew members not having their seatbelts in place or compartment doors ajar. This device will also display images from the backup and officer side camera. To activate the emergency lighting push the E-Master switch. The vehicle's high idle can also turned on or off by pressing the high idle button

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343



Jump Start Studs: Located below the drivers step inside the door.



Parking Brake: Pull to apply and Push to release Please note the airbrakes will not release if the air pressure is below 70 PSI in the system

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Division of Operations
Presents
Engine 341 and 343



Air Pump Shift:

- 1. Truck must be in neutral with the parking break applied.**
- 2. Move pump shift to "NEUTRAL" and briefly pause**
- 3. Move pump Shift to the "PUMP" position**
- 4. Place transmission into drive.**

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

FIRE RESEARCH CORPORATION® IN-CONTROL 400™

The Fire Research **INControl** pressure governor and all-in-one instrument panel uses state of the art programmable microprocessor technology. Measuring only 10.5 by 5.5 inches the **INControl** offers pump discharge and pump intake displays, pump pressure or RPM control, and remote engine displays. It will maintain a steady pump discharge pressure by controlling engine speed or hold a selected engine RPM. It offers complete engine control and remote display in a single compact unit.

The **INControl** operates in one of two modes, pressure or RPM. In pressure mode the **INControl** maintains a constant pump discharge pressure. The discharge pressure is monitored and compared to the selected pressure setting, the engine RPM is varied to keep the discharge pressure at the selected setting. In RPM mode the **INControl** maintains a constant engine RPM. The pump discharge pressure is monitored and can vary but as a safety feature it will be limited to an increase of 30 PSI. If the discharge pressure increases 30 PSI the governor will automatically lower the engine RPM to prevent a high-pressure surge.



RPM (throttle) mode - The driver operator can switch to the RPM mode when pressure surges cause the pump to keep returning to an idle. When using the Throttle (RPM) mode, the operator can either watch the RPM display on the engine status monitor to the right of the rotating throttle or watch the pump discharge pressure on the left side of the governor while rotating the throttle control knob.

PSI (pressure) Mode – The pressure mode will adjust engine speed to maintain a selected pressure. Regardless of whether incoming pressure changes, or discharges are opened and shut,

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

the pressure governor will maintain the selected PSI. When using the pressure mode the operator should watch the pump discharge pressure.

Mode Selection – After engaging the pump the FRC® In- Control 400™ head will display the word MODE. To activate the unit, the operator pushes the pressure switch of desired mode once.
Cavitation Protection Feature – The pressure governor includes a cavitation protection feature, which protects the pump, plumbing, and firefighters from sudden water surges, ingestion of large amounts of air, or loss of supply pressure. **The mode selector must be in the PSI mode for this feature to be active and the pump pressure must be above 40 PSI.** If the water supply is reduced or interrupted, the governor will first attempt to increase pressure by increasing the engine speed. If the pump discharge pressure remains less than 25 PSI for more than 5 seconds, the engine speed will automatically return to an idle.

If it is apparent that air or a temporary reduction of suction pressure has been or will be introduced into the pump, it may be desirable to temporarily switch from the PSI mode to the RPM mode to reduce the likelihood of sudden RPM changes and the automatic shutdown of lines due to the anti-cavitation feature.

System Shutdown- Pushing the red idle button in for more than one second will cause the engine governor to return to an idle speed. The red idle button can and should be used to return the engine speed to idle when operating in low or no water flow conditions. **It should not be used when flowing large amounts of water as this may cause a water hammer.** When flowing large amounts of water use the rotating throttle to gradually reduce engine speed to an idle.

Once the red idle button has been activated, the governor leaves the mode sequence. The MODE button must be depressed again and a mode type selected in order to restore control of the pump.

The INControl also features remote engine monitoring for the following:

- Engine oil pressure
- Engine water temperature
- Transmission temperature
- Battery voltage

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

Pump Control Valves



These Engines are equipped with two types of discharge operating valves:

Gear type which opens by rotating COUNTERCLOCKWISE. The position of the valve can be seen by the gauge in the middle.

Electronic Valve: Operated by pressing the OPEN and CLOSE buttons. The valve position is indicated by the LED lights above the operating buttons. The 4" discharge is the only discharge equipped with this type of valve.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343



NOTE: In the event of the Electronic valve for the 4" discharge is not operating properly. A Manual valve control is located to the left of the 4" discharge. This valve is operated by inserting a socket wrench onto the operating nut and rotating the nut **CLOCKWISE** to **CLOSE**.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343



Pump intakes are located on the driver side and officer sides of the engine. Each side is equipped with a 5" Stortz connection and a 2 ½" intake. All intakes operate separate of each other and each intake has a separate bleeder valve to purge the air out of the system once the hydrant is charged. The Stortz connection intake is controlled by a hand wheel above the connection labeled MIV (Master Intake Valve) and the bleeder is located to the right of the hand wheel. Both are opened by turning COUNTER CLOCKWISE. The axillary 2 ½" intake is controlled by a lever to the right of the intake. This lever is operated by lifting up to open. The air bleeder is located below the intake to the left. It is opened by lifting up on the lever.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

Pump Primer



Operation:

The *AirPrime* is operated by increasing the engine speed to a maximum of 1000 RPM and depressing the push to prime button on the panel. Hold the button down until the discharge pressure begins to rise. The primer will stop running when the button is released. The push button will operate regardless of whether the fire pump is engaged or not.

1. Depressing the “Push to Prime” button directs air to the primer inlet.
2. An internal valve to the water pump is “opened “ with air pressure from the chassis air system.
3. Vacuum for drafting is created by airflow through multi-stage internal ‘venturi nozzles’.
4. Panel control valve has no water, plumbing, or electric lines.
5. Never run a dry pump at speeds above 1200 RPM and/or for more than 45 seconds in accordance with fire pump manufacturer’s operating instructions.

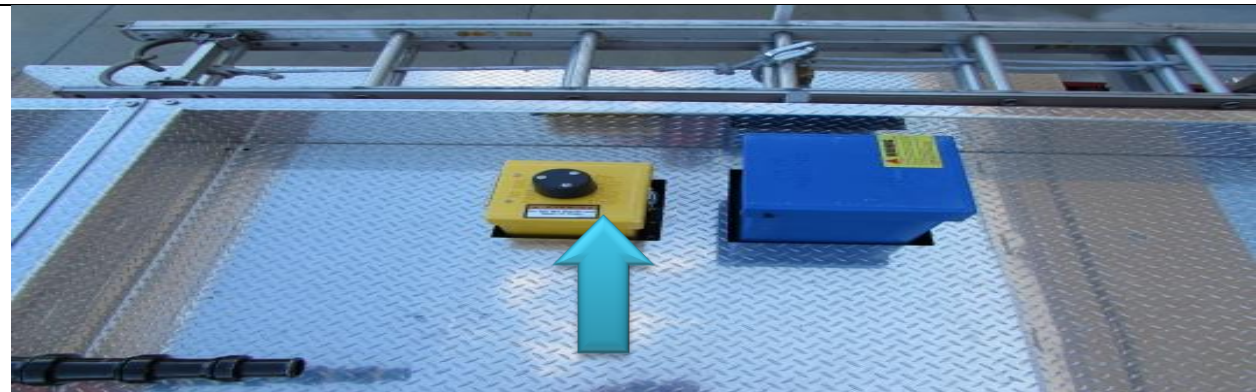
Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343

FOAM



Engine 341 and 343 equipped with an AKRON® 125 GPM bypass eductor foam system. This will allow the 30 gallons of on board foam to be proportioned and dispensed through the FRONT 1-3/4" BUMPER CROSS LAY ONLY. To produce foam, the operator merely opens the tank to pump, open the eductor valve (pull), open the foam tank suction (rotate COUNTER CLOCKWISE), and lastly sets the foam metering dial to the proper percentage and charges the front discharge line to 200 psi.

Foam Fill



The fill for the 30 gallon on board Class B foam tank is located on top of the truck under the yellow hatch.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343



Additionally, these engines have been equipped with an AKRON® off truck access kit. This kit allows foam to be drawn into the on board foam system from a source other than the on board tank (5 gallon jug). To use this function follow the steps described below.

- Connect the 6 foot off truck suction hose to the off truck screw on connection on the pump panel.
- Open tank to pump
- Open the eductor as described on the previous page
- Leave the on-board foam tank closed
- Open the auxiliary foam inlet valve
- Set the foam proportioner
- Set #1 FRONT BUMPER LINE @ 200 psi

NOTE: Whenever either foam supply source is utilized, the foam system must be flushed with fresh water for 3 minutes at 100 psi. To accomplish this, the foam tank valve is closed, the flush valve opened, and the educator valve opened.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343



Engine 341 and 343 are equipped with a motorized rolling style hose bed cover. The switch to this cover is located at the left rear corner of the engine (Drivers Side). Follow all safety warnings when operating.

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343



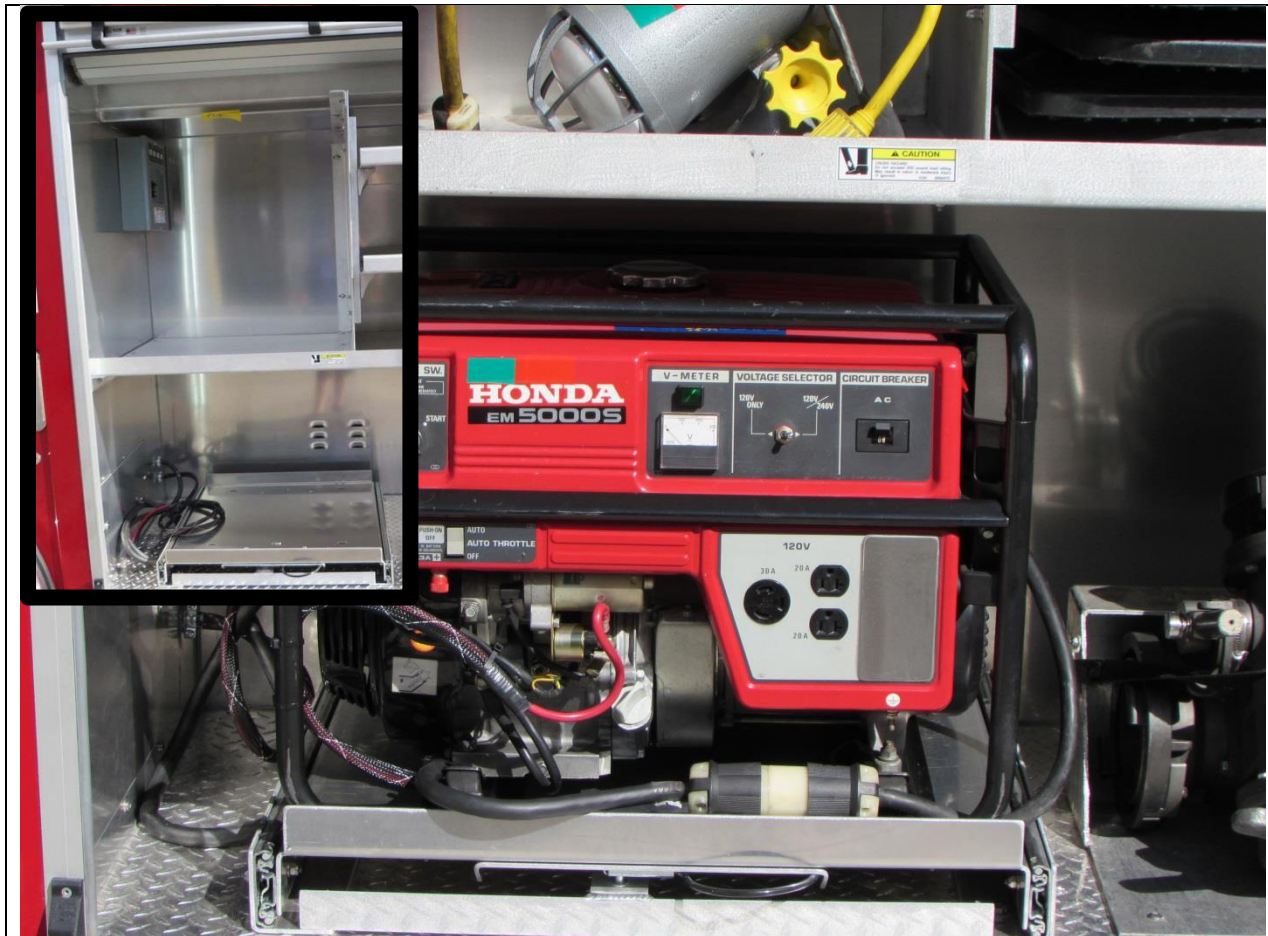
Ladder Rack Controls

These Engines are equipped with hydraulic ladder racks that store the ground ladders above the outside compartments of the engine on the right side (Officer Side). To activate the ladder racks a control switch is located on the right side of the engine indicated by the arrow in the picture.

Steps to operate the ladder rack

1. Batteries must be on in the engine.
2. Turn the power switch to the on position.
3. Operate the ladder rack either UP or DOWN (Ensure you have a clear working area prior to operating the ladder rack to prevent injury. Return the ladder rack to the stored position when not in use).

Sunrise Fire Rescue
Division of Operations
Presents
Engine 341 and 343



A Honda a 5000 SX Honda four-cycle gasoline fueled air-cooled generator is located in the right side rear compartment. This generator powers the cord reel and the outlets located around the engine. The generator draws its fuel supply from an integrated 4.5-gallon fuel tank (gasoline) and has a 1.2-quart oil reservoir for 10W-30 or 10W-40 oil. The generator weighs 175 lbs. without fluids. In the same compartment on the upper left side is the circuit breaker panel for the generator.