CLEAN FUEL TECHNOLOGIES™

OPERATOR MANUAL
All Fuel Systems

Published April 1, 2025, CCFT All Series

CLEAN FUEL TECHNOLOGIES

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I. Legal Disclaimer

All information and illustrations in this manual are the property of Cummins Clean Fuel Technologies. Any photographs or graphics presented in this manual are for representational purposes only. All content is based on the latest information available at the time of publishing. As part of our continuous product improvement policy, we may modify information, illustrations, and/or specifications to explain and/or exemplify a product, service, or maintenance improvement. We reserve the right to make any change at any time without notice.

II. Preface

This manual covers all Cummins Clean Fuel Technologies Fuel Systems with and without Fuel Management Modules. Service information is available by calling Cummins Clean Fuel Technologies at 1-844-CNG-TANK. DO NOT attempt to fill, defuel, vent, or perform basic maintenance on the system until you have read and fully understand the information presented in this manual.

If you have questions about any part of this manual, contact Cummins Clean Fuel Technologies 1-844-CNG-TANK.

This manual must always be kept in the vehicle, so it is accessible to the operator at all times. This manual includes information that is important for the safety of the operator and First Responders (i.e. police, fire fighters) in the event of an emergency.

The following abbreviations are used throughout this manual:

1. CNG, which means Compressed Natural Gas.
2. FMM, which means Fuel Management Module

III. Warning Statements

Warning statement definitions used in this manual.

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The word “DANGER” applies to the most extreme situations.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation or unsafe practice which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates practices not related to personal injury. The safety alert symbol shall not be used with this signal word.

CCFT Characteristic Notifications Symbols

Symbols are defined as components or procedure that has direct effects on safety of personnel, equipment, and regulatory compliance.

Safety Characteristic

Regulatory Characteristic

Safety and Regulatory Characteristic

Cummins Clean Fuel Technologies Acronyms

°C Celsius
°F Fahrenheit
AHJ Authority Having Jurisdiction
AMP Amperage
ANSI American National Standards Institute
BOC Back of Cab
CCFT Cummins Clean Fuel Technologies
CGA Compressed Gas Association
CNG Compress Natural Gas
CSA Compliance Safety Accountability
DGE Diesel Gallon Equivalent
DOT Department of Transportation
ECU Electronic Control Unit
EMS Emergency Medical Service
ESD Emergency Shutdown Device
FLIM Fuel Level Indicator Module
FMM Fuel Management Module
FMVSS Federal Motor Vehicle Safety Standards
FOB Front Of Body
ft/lbs. Foot-Pound
GVWR Gross Vehicle Weight Rating
HD Heavy Duty
in/lbs. Inch-Pound
JIC Joint Industry Council
JSA Job Safety Assessment
kg kilogram
lb. Pound
LOTO Lockout Tagout
NFPA National Fire Protection Agency
NGV Natural Gas Vehicle
NGV1 CNG Fueling Receptacle (Small)
NHTSA National Highway Traffic Safety Administration
Nm Newton Meter
NPT National Pipe Threads
NPTF National Pipe Thread Fuel
OSHA Occupational Safety and Health Administration
PPE Personnel Protective Equipment
PRD Pressure Relief Device
PRV Pressure Relief Valve
psi pressure per square Inch
psig pounds per square in gauge
RM Roof Mount
SAE Society of Automotive Engineers
SM Side Mount
TG Tailgate
um one millionth of a meter.
UL Underwriters Laboratories
UV Ultraviolet
“ inch

Cummins Clean Fuel Technologies Fuel Systems Defined

Back Of Cab (BOC) CNG fuel system refers to a CNG fuel storage and delivery system mounted behind the cab of a vehicle, housing the CNG cylinders and related integrated components.

Side Mount (SM) CNG fuel system refers to a CNG fuel storage and delivery system mounted on the sides of a vehicle's frame, housing the CNG cylinders and related integrated components.

Fuel Management Module (FMM) is a critical component in CNG fuel systems, integrating features like manual shutoff valve, fueling receptacles, pressure gauges, regulator, fuel filtration, and electronics that controls the flow of fuel to the engine.

Tailgate (TG) CNG fuel system refers to a CNG fuel storage system where the CNG cylinders are integrated into the tailgate assembly of a vehicle, typically a refuse truck, offering a low-profile design and improved weight distribution. Works with Fuel Management Module (FMM).

Roof Mount (RM) CNG fuel system refers to a CNG fuel storage system where the CNG cylinders are mounted on the roof of the vehicle, typically for applications like refuse trucks and buses, to maximize cargo space. Works with Fuel Management Module (FMM).

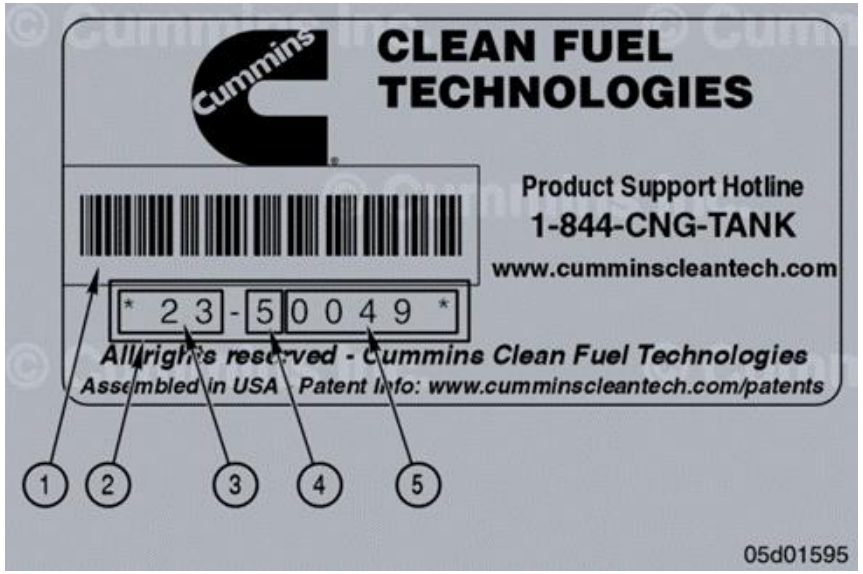
Front Of Body (FOB) CNG fuel system refers to a CNG fuel storage system where the CNG fuel cylinders are mounted on the front portion of the vehicle's body like refuse trucks. Works with Fuel Management Module (FMM).

Split System (SS) is a CNG fuel system designed for vehicles, where the fuel cylinders are split into multiple modules or units for increased range. A CNG split system consist of a Primary Module containing the Fuel Management Module (FMM) components that controls the flow of fuel to the engine. Secondary Module is an auxiliary module for storing CNG for use through the Primary Module containing the Fuel Management Module (FMM).

Data Plate

1. Bar code
2. Serial number (YY-FXXXX)
3. YY-Year manufactured 23 = 2023
4. Type of system
    - 1-Pony Tank
    - 2-Not used
    - 3-Stand alone Fuel Management Module (FMM)
    - 4-Roof Mount
    - 5-Back of Cab
    - 6-Side Mount
    - 7-Tailgate
    - 8-Front of Body
    - 9-Not used
    - 0-Not used
5. Number of units produced in chronological order

The data plate is located on the valve side of the fuel delivery system or in the FMM fuel panel door.



Safety

DANGER

The CNG fuel system has several significant differences from the typical diesel fuel systems used in heavy trucks. The fuel lines are under high pressure and leaking fuel can ignite. It is important to observe all safety statements in this manual to ensure safe operation of a CNG vehicle. Never disregard a safety directive.

WARNING

Maintenance, defuelling and depressurizing should be performed by a qualified technician only.

L'entretien, la vidange et la dépressurisation doivent être effectués uniquement par une personne qualifiée.

DANGER

It is the responsibility of the operator to read and understand all Warnings, Cautions, and guidelines in this manual BEFORE operating the vehicle or performing maintenance. Contact Cummins Clean Fuel Technologies if you do not clearly understand any part of the material presented here. Do not attempt to conduct any procedure you do not completely understand. Do not perform any procedure for which you do not have the specified Cummins Clean Fuel Technologies parts or required tools. Failure to do so can result in serious personal injury, or death.

WARNING

Compressed natural gas is flammable and highly explosive. Serious personal injury can result if leaking natural gas ignites. If a leak is suspected, have the vehicle immediately inspected and repaired before returning it to operation.

Fuel System Covers, Panels, and Access Doors

Regulations requires that all covers, panels, and access doors **MUST** be installed correctly and free from damage before operating vehicle. *Refer to regulation noted on the right-hand side of the page.

DANGER

All vehicle fuel receptacle access doors, panels, covers must be closed and free from damage. All fuel system covers, or panels must be on the fuel system, attached correctly and free from damage. All cylinder shutoff valve access doors, panels or covers must be on and attached correctly.

If fuel receptacle doors or fuel system covers or cylinder shutoff valve covers are missing, or damaged. The fuel system must be taken out of service.

Defuel fuel system to remove the pressure until repairs are completed.

R ***CFR 49 Subtitle B Chapter V 571.304 Standard No. 304; Compressed Natural Gas Fuel Container Integrity 4.7.2025.**

S8.3.4 Shielding. (a) Use shielding to prevent the flame from directly contacting the CNG fuel container valves, fittings, or pressure relief devices.

R ***NFPA 52 2019 Annex C Pressure Relief Devices (PRDs)**

(2) Manifolds for vent lines of multiple PRDs can be designed with a flow capacity less than the sum of the flow capacities of all of the PRDs. The following are some of the conditions in such a design:
(a) Containers can have PRDs at each end for protection against partial fire exposures. Either PRD will generally have sufficient flow capacity to vent the containers safely.
(b) Containers protected with high flow PRDs can be expected to vent to a safe pressure level before the fire spreads to containers located elsewhere in the vehicle.
(c) The individual PRD might have greater capacity than is required to perform safely in the container fire test. The container manufacturer will have data from the required container fire test that can support a manifold design with flow capacity less than the total PRD flow capacities.

⚠ WARNING

One should never detect (smell) gas or hear gas escaping at any other time besides refueling. If the smell of natural gas or a hissing sound is detected at any time besides refueling, the CNG system should be shut down. Refer to the Fuel System Shut Down Procedure.

⚠ WARNING

Only trained and qualified personnel should service this natural gas vehicle. Components in the fuel system are under extreme pressure. Severe injury or death can result from improper service or failure to follow safety precautions.

Safety Tips

1. A portable fire extinguisher having a UL rating not less than 20 B:C should be accessible and visible. Fire extinguishers must always be kept fully charged and up to date.
2. Always wear protective footwear and eyewear when conducting fueling operations.
3. Inspect for leaks using a methane detector or an approved liquid leak detector. Do not use any other method or products to find leaks.
4. Do not attempt to tighten or loosen fittings when the fuel system is under pressure.
5. Always use tools that are in proper working order and properly calibrated.
6. Appropriate work attire must always be worn when servicing or maintaining fuel system. Never wear loose clothes, rings or loose neck chains.
7. All maintenance and service procedures must be conducted in an environment that is free of dust.
8. Perform service only in CNG-approved facilities.
9. For any maintenance that may create a spark or flame, follow the Welding and Hot Work Procedures.

CNG Vehicle Safety Precautions

⚠ WARNING

Following proper safety and handling practices is necessary when operating a compressed natural gas fuel system. Adhere to the following safety precautions when operating compressed natural gas fuel systems. Failure to do so can result in serious personal injury or death.

⚠ WARNING

If the vehicle requires service work that would generate flames, sparks, or excess heat, defuel the CNG system completely with an inert gas. Failure to do so can result in a fire or explosion.

Safety Tips

1. Always have at least one fire extinguisher with a UL rating of 20 B:C or more installed on the vehicle in a place that is easily accessible. The extinguisher must be labeled or marked with that rating. Fire extinguishers must always be kept fully charged and in good mechanical condition. Fire extinguisher mounting brackets must allow visual determination of being fully charged.
2. If a gas leak is detected, do NOT try to start vehicle. Refer to the If You Suspect a Fuel Leak procedure.
3. Never perform service on the system when it is pressurized.
4. Do not allow the system pressure to exceed working pressure.
5. Do not smoke or produce open flame within 50 feet a CNG dispensing/filling station.

CNG Diamond Decal

In accordance with federal law, any CNG fuel system vehicle must always be labeled to signify it as a CNG vehicle. The vehicle must be marked with a weather resistant diamond-shaped label located on an exterior vertical or near-vertical surface on the lower right rear of the vehicle. In addition to placement of the ‘CNG" diamond label on the right rear of the vehicle, the "CNG" diamond label shall also be affixed to both sides of the ***power unit** figure1.

If a DOT number is required to be displayed in the accordance with 49CFR 390.21, then the labels shall be affixed near the DOT numbers on each side of the ***power unit** figure1**.**

The CNG Diamond Decal for vehicles with a GVWR of 19,500 lb. (8869 kg) or greater shall be a minimum of 5.7 in. long x 4.2 in. high (145 mm long x 107 mm high) figure 1.

The marking in the label shall consist of a border and the letters "CNG" 1 in. (25 mm) minimum height centered in the diamond] of silver or white reflective luminous material on a blue background figure 1.

Auxiliary fueling connection receptacle shall include the following:

a. Identification as a CNG fueled vehicle
b. Service pressure

figure 1

***Power Unit -** A power unit can be a single-unit truck, also called a straight truck, or a "bob-tail" tractor. In a combination vehicle such as a tractor-trailer, the power is the tractor.

Roof Mount Fuel System

R The top of the fuel supply container and any related piping, fitting, valve, housing, guardrail, or shield shall not be more than 13.5 ft (4.1m) above the road surface.

R The vehicle shall include a permanent label in the driver's compartment, clearly visible to a seated operator, which includes the maximum total height of the unladen vehicle figure 1.

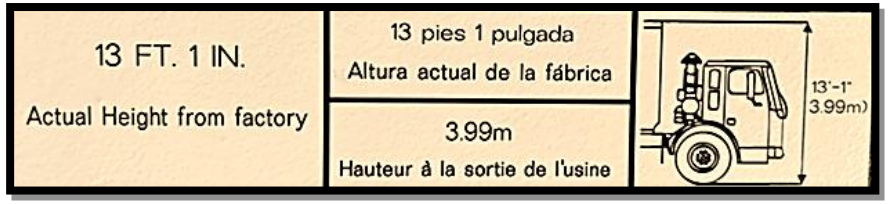


figure 1

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Codes and Compliances

For more information on CNG fuel system requirement in general, refer to following CNG codes and regulations the year the fuel system built:

- CGA C-6.4 CNG System Inspection Standard (also covers installation)
- FMVSS 304 (DOT) Cylinder Standards
- NFPA 52 Vehicular Gaseous Fuel Systems Code.
- ANSI/NGV 2 CNG Vehicle Container requirements
- ANSI/IAS PRD 1 Pressure Relief Devices
- ANSI/IAS NGV 3.1 Valves, Fittings and Brackets
- Canada: CAN/CGA B109, CSA Group
- CSA/ANSI NGV 6.1:21
- North America: ANSI/AGA NGV 3.1/CGA 12.3 and
- NGV 12.3-M95
- Compressed Natural Gas and Liquefied Natural Gas, Railroad Commission of Texas

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Suspect a Fuel Leak

⚠ WARNING

Compressed natural gas is flammable and explosive. Serious personal injury can occur if leaking gas is ignited. If you suspect a leak, do not operate the vehicle. The vehicle must be inspected by a qualified technician before being returned to operation.

If You Smell a "Rotten Egg" Odor

An odorant which smells like rotten eggs is added to compressed natural gas to aid in detection of a leak. If you notice this kind of lingering odor coming from your vehicle, you may have a leak in the CNG fuel system.

NOTE: It is normal to detect this slight odor when the fueling nozzle is being connected or disconnected during the refueling process. The odor should quickly dissipate when fueling has been completed.

Other Signs of a Fuel Leak

If you notice any of the following, you may have a leak in the CNG fuel system:

- Frosting at suspected leak point
- Bubbling in wet area
- Blowing or hissing sound
- Flames, if a leak has ignited

If the Vehicle is Involved in an Accident

If the vehicle is involved in any accident or is leaking fuel, perform the following procedure.

⚠ WARNING

If the vehicle is involved in any accident the fuel system MUST be inspected by a certified fuel system inspector before being returned to service.

If the Vehicle is Involved in an Accident

1. Turn the ignition switch OFF, turn the main battery OFF, and set the parking brake.
2. Eliminate all ignition sources such as fire, sparks, electronics, lights, or electrostatic charges. Never smoke near the disabled vehicle and do not light road flares. Inform First Responders the vehicle is a CNG vehicle and point out tank location.
3. If it is safe to do so, open the FMM access door and turn the FMM Manual Shut-Off Valve 1/4-turn clockwise to OFF position.
4. Open the service access panel. Turn all Fuel Cylinder Manual Shut-Off Valves clockwise 1/4-turn to the OFF position.
5. Conduct a visual check of the damaged area of the fuel system for signs of leaks.
6. Keep pedestrians and traffic away from the area. If towing service is called, inform the operator of the presence of CNG and give guidance on proper safety procedures. Refer to the CNG Vehicle Safety Precautions procedure.
7. Have a qualified Cummins Service Technician inspect the fuel system and make any necessary repairs. Qualified service support can be found at www.cumminscleantech.com

If the Vehicle is on Fire

1. Turn the ignition switch OFF.
2. Exit the vehicle in the safest manner possible.
3. Call 911.
4. If safe to do so, extinguish the fire using an appropriately-rated fire extinguisher.
5. Establish a safety zone of not less than 100 meters.
6. Report the following to the First Responder (i.e. police, fire fighters) when they arrive on site.
    a. Vehicle is a CNG vehicle
    b. Amount of fuel in the tank (psi reading if known)
    c. Number of tanks
    d. Location of the vent system

Note: Have the vehicle inspected by a qualified technician to ensure integrity of the CNG fuel system. Qualified service support can be found at www.cumminscleantech.com

In Case of Emergency

Natural Gas Vehicles (NGVs) are subject to the requirements of the National Fire Protection Association (NFPA). NFPA 52, the Vehicular Gaseous Fuel Systems Code, details the safety requirements for NGVs and their fueling facilities.

Fuel System Shut Down Procedure

In the event of an emergency or the vehicle requires service, shut down the CNG fuel system using the procedure below.

Location of Manual Shutoff Valves

- Back of Cab figure 1
- Side Mount figure 2
- Fuel Management Module (FMM) figure 3

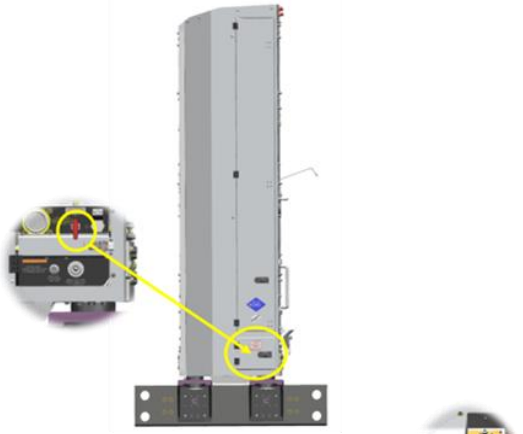


figure 1

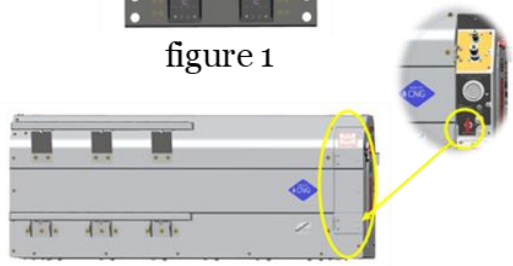


figure 2

figure 3

Turn OFF the Fuel Management Module (FMM) Manual Shut-Off Valve

The FMM Manual Shut-Off Valve isolates the fuel storage system from the engine. The FMM Manual Shut-Off Valve is RED and clearly labeled for easy identification.

To turn OFF the FMM Manual Shut-Off Valve:

1. Turn the ignition OFF and set the parking brake. Do not set the parking brake if the vehicle is being towed.

2. Open the fuel access door and locate the red Manual Shut-Off Valve.

3. Turn the valve clockwise 1/4 turn to the OFF-position figure 1 and 2.

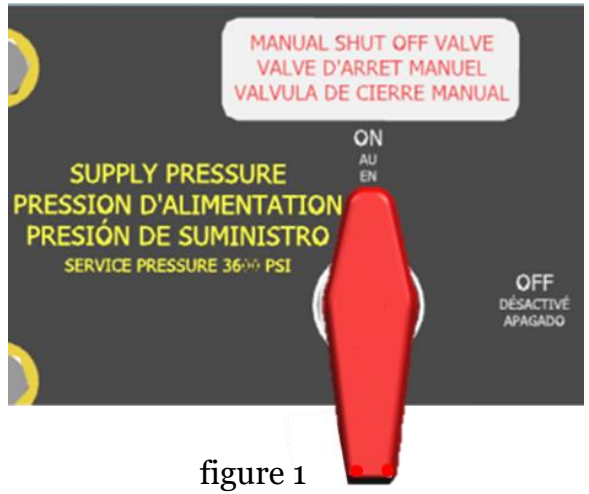
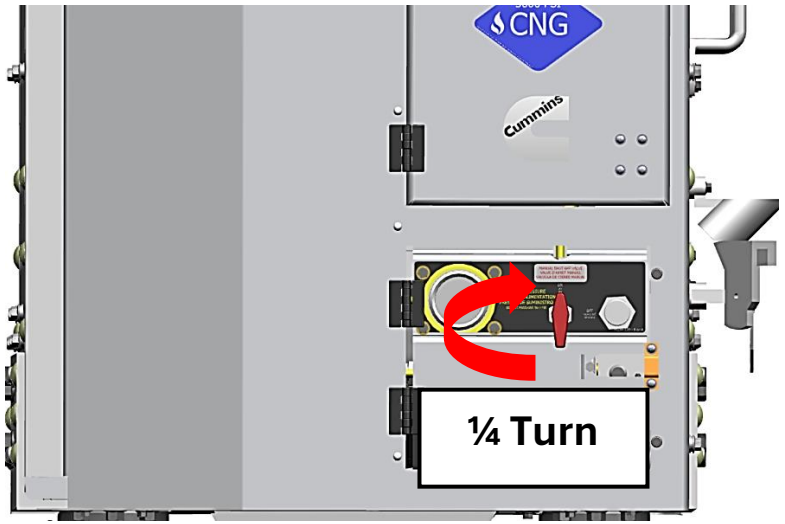


figure 1

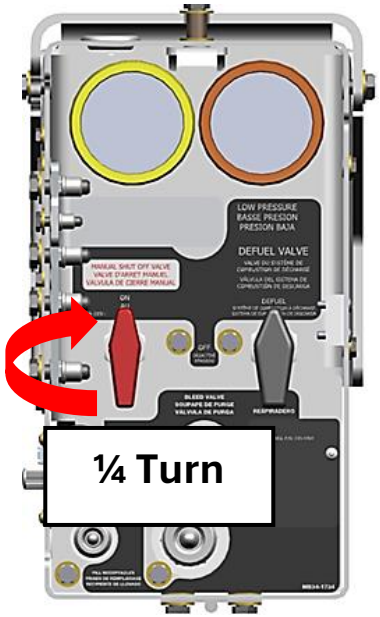
figure 2

Side Mount
Manual Shutoff Valve

Back Of Cab
Manual Shutoff Valve



FMM
Manual Shutoff Valve



Cylinder Shutoff Valve Location – Side Mount

Side Mount cylinder shutoff valve(s) can be found on the driver side and passenger side of the fuel system.

To access the cylinder shutoff valve(s), open the access cover(s) by turning the knob figure 1a and 2a and rotating the access cover(s) upwards away from the knob, then downwards

Driver side cylinder shutoff valve figure 1b

Passenger side cylinder shutoff valve figure 2b

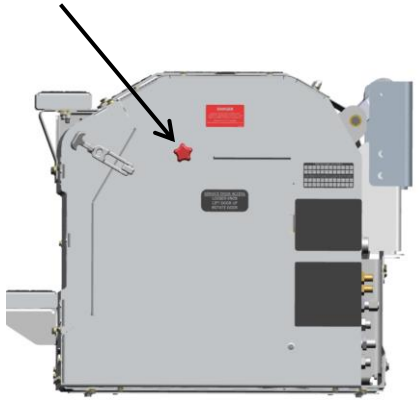


figure 1a

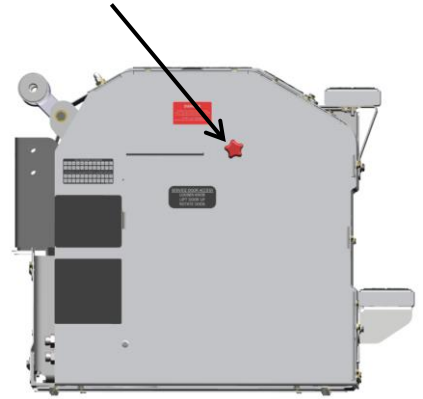


figure 2a

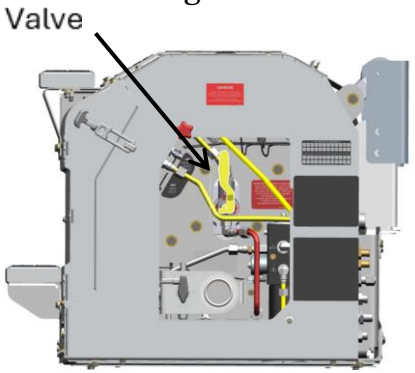


figure 1b

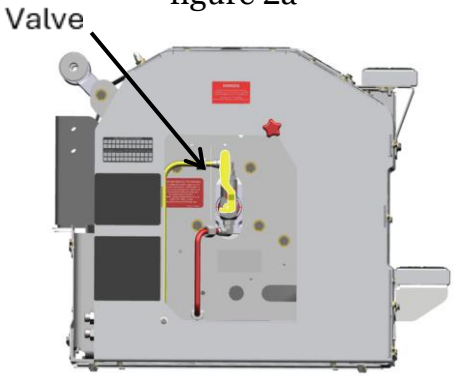


figure 2b

Cylinder Shutoff Valve Location – Back of Cab and Front of Body

Back of Cab and Front of Body cylinder shutoff valve(s) can be found on the driver side of the fuel system.

To access the cylinder shutoff valve(s), open the access cover by operating the access cover latch.

Fuel cylinder cabinet configuration can have cylinders with valve on each cylinder(s) or be equipped with a Multi BOSS(s) on some cylinder(s) and controlled by cylinder shutoff valve(s) on the other cylinder(s).

Fuel cylinder cabinet configuration with cylinder shutoff valves on each cylinder(s) figure 1.

Fuel cylinder cabinet configuration with Multi BOSS(s) and cylinder shutoff valve(s) figure 2.

⚠ WARNING

Accessing some of the valves may require fall protection.

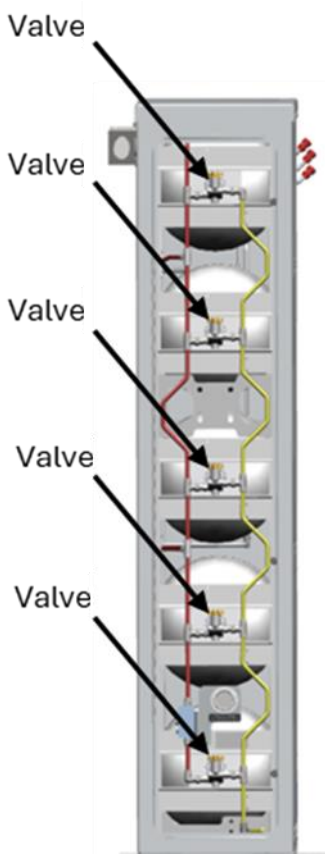


figure 1

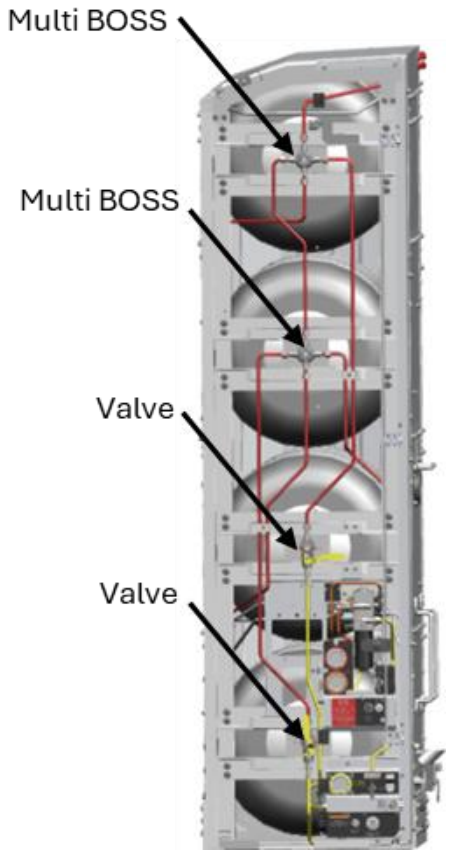


figure 2

Cylinder Shutoff Valve Operation

Note: Cummins Clean Fuel Technologies Back of Cab and Front of Body cylinder(s) are plumbed together. To operate safely and correctly ALL cylinder shutoff valve(s) must be either ALL CLOSED or OPEN at the same time figure 1 and 2.

a) Cylinder Shutoff Valve(s) must be ALL OPEN during vehicle operation.
b) Cylinder Shutoff Valve(s) must be ALL OPEN during defueling operation.
c) Cylinder Shutoff Valve(s) must be ALL Closed during depressurization operation.

Note: If vehicle is equipped with another manufactured fuel cylinder cabinet refer to their manual.

⚠ WARNING

Accessing some of the valves may require fall protection.

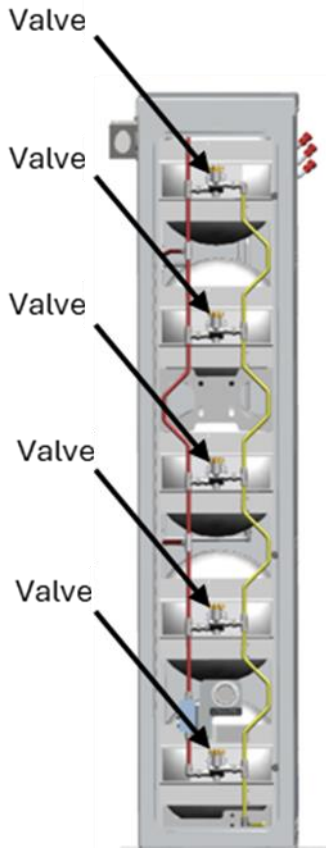


figure 1

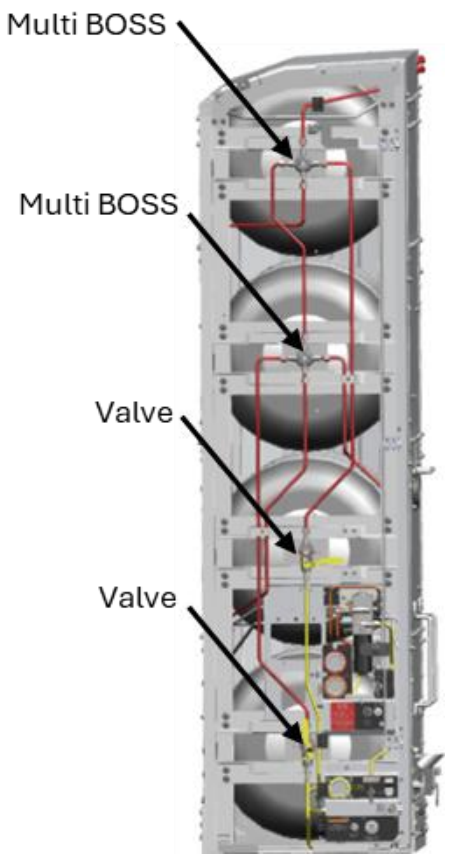


figure 2

Cylinder Shutoff Valve Location – Roof Mount

Roof Mount cylinder shutoff valve(s) can be found on the back of the fuel cylinder cabinet.

To access the cylinder shutoff valve(s), open the access cover by loosening the Butterfly Bolt(s) or remove the Lynch Pin(s) and remove access cover figure 1.

Note: Cummins Clean Fuel Technologies Roof Mount cylinder(s) are plumbed together. To operate safely and correctly ALL cylinder shutoff valve(s) must be either ALL CLOSED or OPEN at the same time figure 2.

a) Cylinder Shutoff Valve(s) must be ALL OPEN during vehicle operation.
b) Cylinder Shutoff Valve(s) must be ALL OPEN during defueling operation.
c) Cylinder Shutoff Valve(s) must be ALL Closed during depressurization operation.

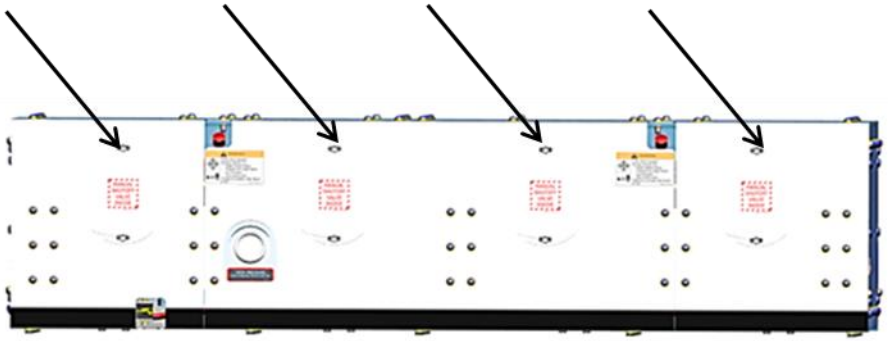


figure 1

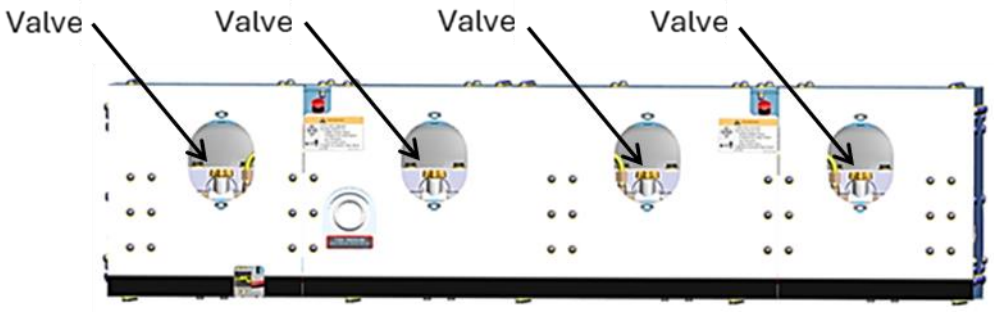


figure 2

Note: If vehicle is equipped with another manufactured fuel cylinder cabinet refer to their manual.

⚠ WARNING

Accessing some of the valves may require fall protection.

Cylinder Shutoff Valve Location – Tailgate

Tailgate cylinder shutoff valve(s) can be found on the back of the fuel cylinder cabinet.

To access the cylinder shutoff valve(s), open the access cover by loosening the butterfly bolt(s) or remove the Lynch Pin(s) and remove access cover.

Note: Cummins Clean Fuel Technologies Roof Mount cylinder(s) are plumbed together. To operate safely and correctly ALL cylinder shutoff valve(s) must be either ALL CLOSED or OPEN at the same time figure 1a and 1b.

a) Cylinder Shutoff Valve(s) must be ALL OPEN during vehicle operation.
b) Cylinder Shutoff Valve(s) must be ALL OPEN during defueling operation.
c) Cylinder Shutoff Valve(s) must be ALL Closed during depressurization operation.

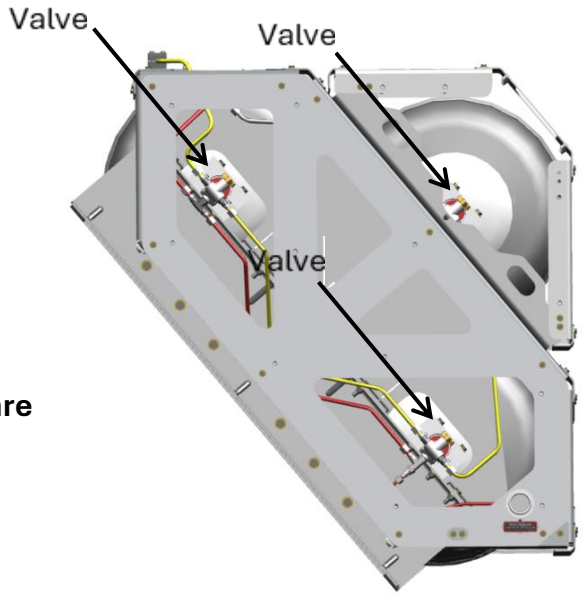


figure 1a

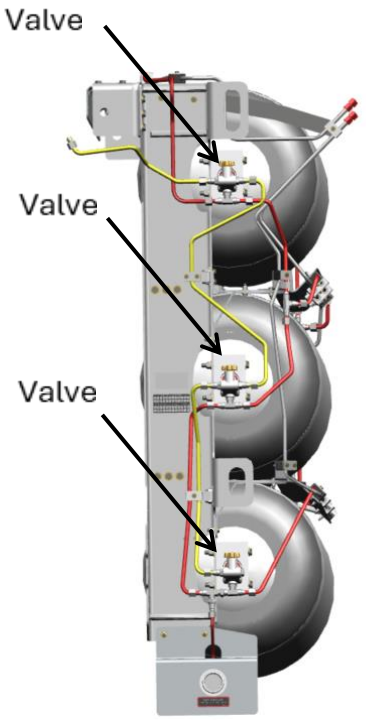


figure 1b

Note: If vehicle is equipped with another manufactured fuel cylinder cabinet refer to their manual.

WARNING

Accessing some of the valves may require fall protection.

Turn OFF the ¼ Turn Cylinder Shutoff Valve(s)

The cylinder shutoff valve on each tank isolates the fuel inside that tank.

NOTE: The cylinder shutoff valve is designed so that it does not turn off pressure in the Pressure Relief Devices (PRDs) lines. This is a safety design so the CNG fuel system PRDs can still activate when the valves are shut off.

To turn OFF the ¼ turn cylinder shutoff valve:

1. Open or remove the cylinder shutoff valve access cover on the fuel cylinder cabinet.
2. Locate the cylinder shutoff valve in the fuel cylinder cabinet.
3. Turning off (CLOSING) Ball Valve style valve, turn the valve handle clockwise until handle stops turning. Turning on (OPENING) Ball Valve style valve, turn the valve handle counterclockwise until handle stops turning. (Figure 1 and 2)

NOTE: Use this method to turn OFF EACH cylinder shutoff valve.

Handle inline with valve body OPEN

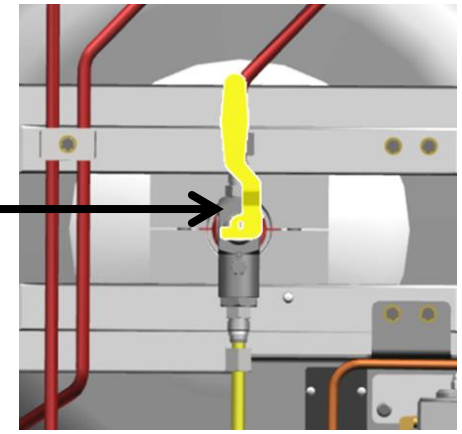


figure 1

Handle across with valve body CLOSED

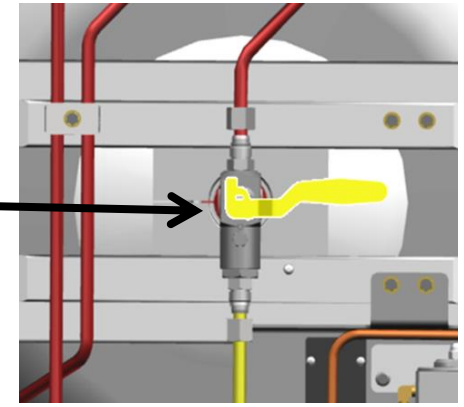


figure 2

Turn OFF the Stem Valve Cylinder Shutoff Valve(s)

The cylinder shutoff valve(s) on each tank isolates the fuel inside that tank.

NOTE: The cylinder shutoff valve is designed so that it does not turn off pressure in the Pressure Relief Devices (PRDs) lines. This is a safety design so the CNG fuel system PRDs can still activate when the cylinder shutoff valve are shut off.

To turn OFF the Stem Valve cylinder shutoff valve:

1. Open or remove the cylinder shutoff valve access cover on the fuel cylinder cabinet.
2. Locate the cylinder shutoff valve in the fuel cylinder cabinet.
3. Turning off (CLOSING) a Stem Valve style valve, turn the valve handle clockwise until handle stops turning CLOSING the valve. (Figure 1) . Turning on (OPENING) a Stem Valve style valve, turn the valve handle counterclockwise to OPEN (Figure 2)

NOTE: Use this method to turn OFF EACH cylinder shutoff valve.

Turn clockwise to CLOSE

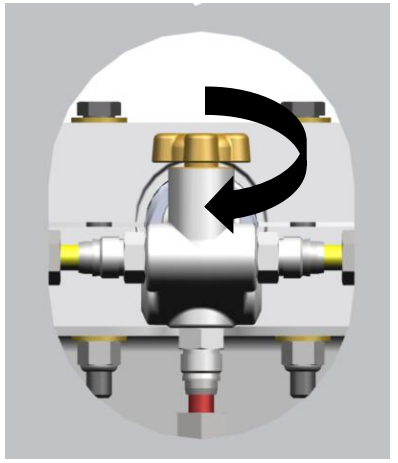


figure 1

Turn counterclockwise to OPEN

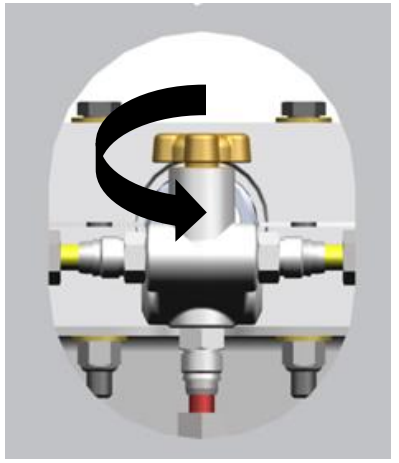


figure 2

Fuel Delivery System Shutoff Valve

The fuel delivery system shutoff valve controls fuel flow from the cylinder(s) to the regulator. The fuel system shutoff valve is used when multiboss fittings are used in place of cylinder shutoff valves.

To turn OFF Fuel Delivery System Shutoff Valve:

1. Open the fuel access door and locate the red Fuel Delivery System Shutoff Valve.

2. Turn the valve clockwise 1/4 turn to the OFF-position figure 1 and 2.

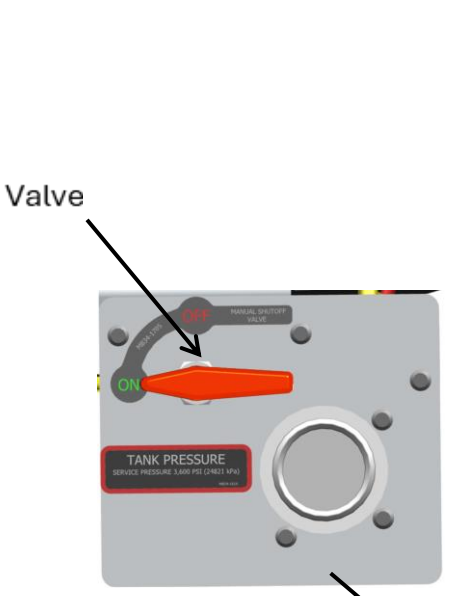


figure 1

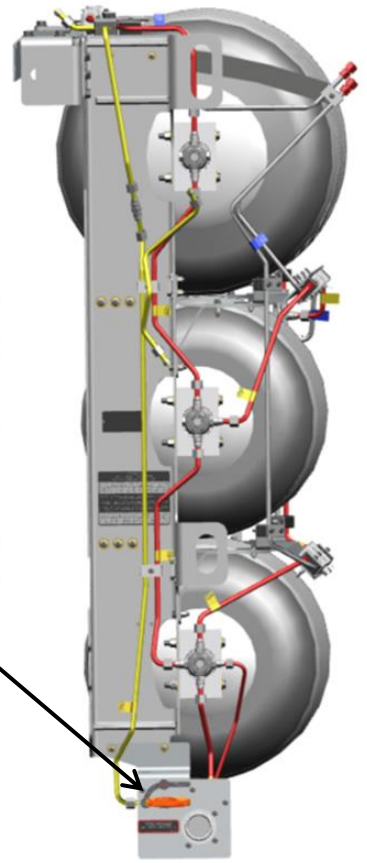


figure 2

First Responder Alerts and Procedures

These procedures are intended for EMERGENCY PERSONNEL ONLY (i.e. police, fire fighters). Emergency First Responders are specially trained to handle emergencies involving alternative fuel vehicles. These instructions are not intended for untrained, unqualified individuals. DO NOT attempt to perform these procedures on your own. Call 911 and follow any preliminary emergency steps listed at the beginning of this section.

First Responder Emergency Procedure

It is recommended that the following procedure be followed in the order given. **IF SAFE TO DO SO!**

1. SET THE PARKING BRAKE
2. TURN OFF THE ENGINE
3. TURN OFF THE ELECTRICAL SYSTEM
4. TURN OFF THE CNG FUEL

Fire Response Guidelines

⚠ WARNING

Observe the following warnings when responding to a fire involving a CNG vehicle. Failure to do so can result in serious personal injury or death.

⚠ WARNING

If the fuel cylinders or fuel cylinder housing ARE NOT involved in the fire, use normal response tactics to extinguish the fire.

⚠ WARNING

If fire is impinging on the cylinder housing or the cylinders are on fire, move to a safe distance and let the vehicle burn to protect the public and yourself from the possibility of an explosion hazard.

⚠ WARNING

DO NOT apply water to the cylinder housing or cylinder. Applying water can prevent the PRDs from activating, resulting in a catastrophic cylinder failure causing an explosion.

Pressure Relief Device (PRD)

Pressure Relief Devices (PRDs) are thermally (heat) activated at **230°F**, releasing pressurized gas through the vent ports. Once a PRD activates, it will remain open to vent the entire contents of the CNG fuel system figure 1.

Note: If vehicle is equipped with another manufactures fuel cylinder cabinet refer to their manual.

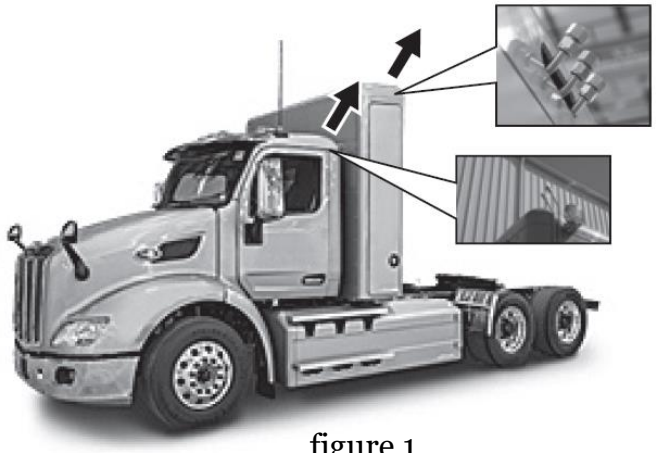


figure 1

R A label indicates the PRD(s) vent location(s) with the following language.

figure 2

ATTENTION CNG Vent Location

R Vent Caps MUST be attached to the vent ports to prevent water, dirt, insects and any foreign objects from collecting in the vent lines of pressure relief device figure 2.

DO NOT operate vehicle with missing Vent Caps

Pressure Relief Devices (PRDs) Vent Directions on Cummins Clean Fuel Technologies Fuel Systems

DANGER

If fire exists and the PRDs do not activate, the cylinder pressure can increase to above the rated pressure (5,000 psi) causing a probable hazardous situation. Clear the area as far as possible and let the vehicle burn.

WARNING

When Pressure Relief Devices (PRDs) activate, the result could jet fire. Pressure within the system will determine the duration and distance of the jet fire figure 1. The fuel can re-ignite several times. Clear the area as far as possible and let the gas burn off.

NOTICE

The amount of fuel will determine how long it takes for the fuel to be vented. It could take several minutes to vent out all the gas through the vent system from PRD activation.

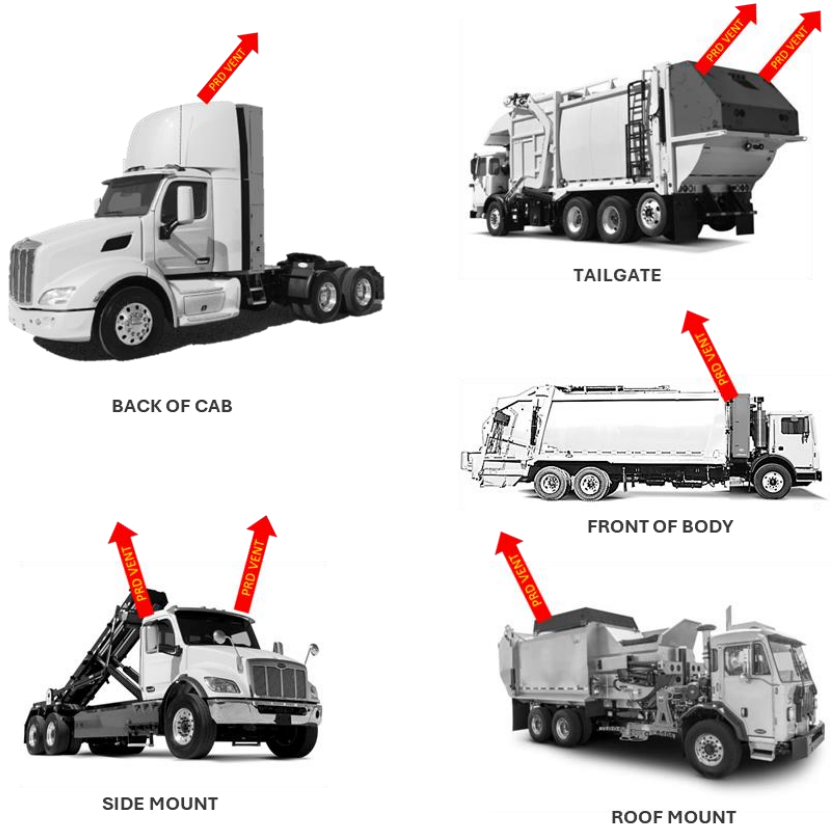


figure 1

⚠ DANGER

DO NOT position ladder trucks and personnel in the path of the PRD VENTS during a CNG truck fire figure 1 and 2.

NOTICE

After the fire is out, allow time for the system to cool before approaching the vehicle.

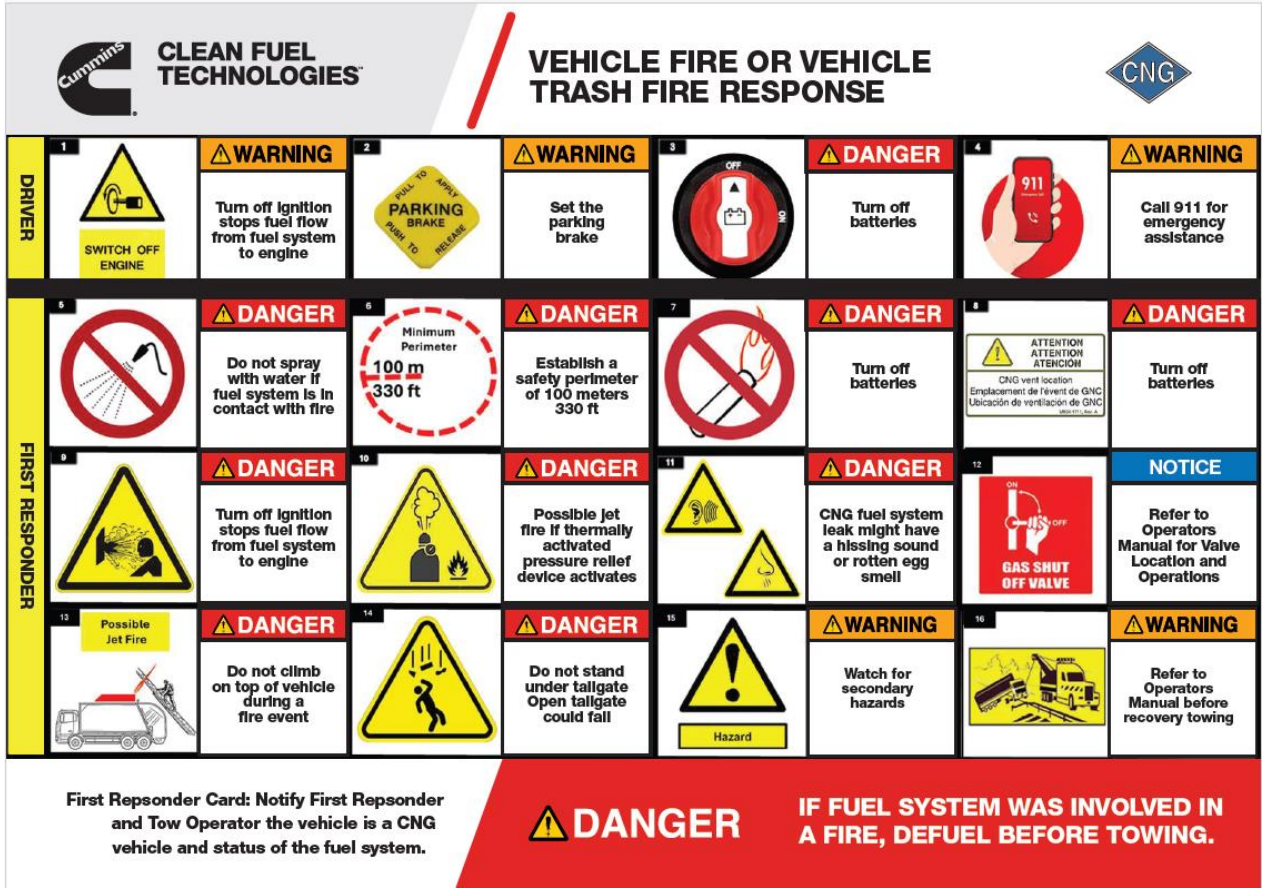
NOTICE

Once PRDs have activated and gas has stopped venting, it is safe to put water on the system.

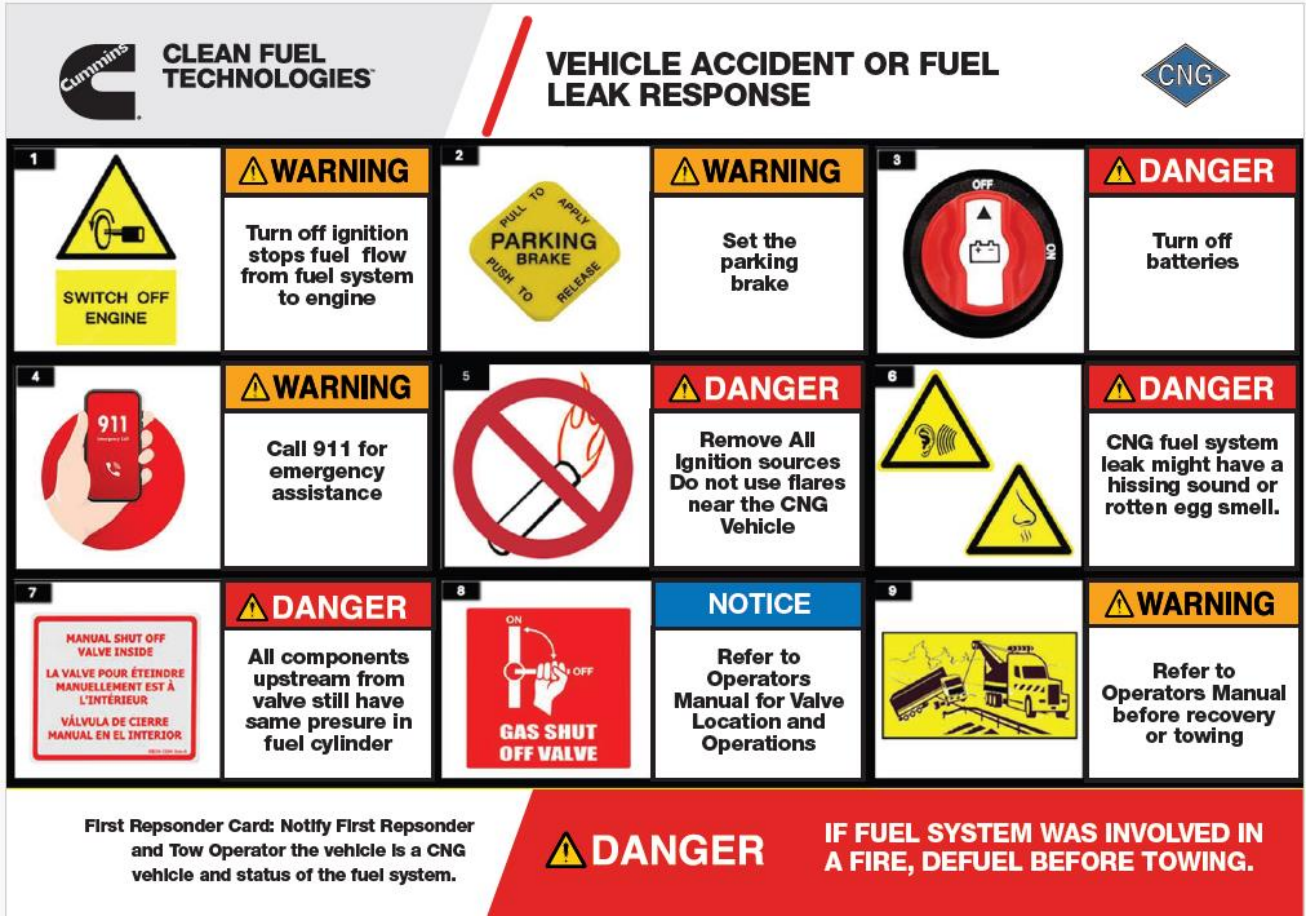
figure 1

figure 2

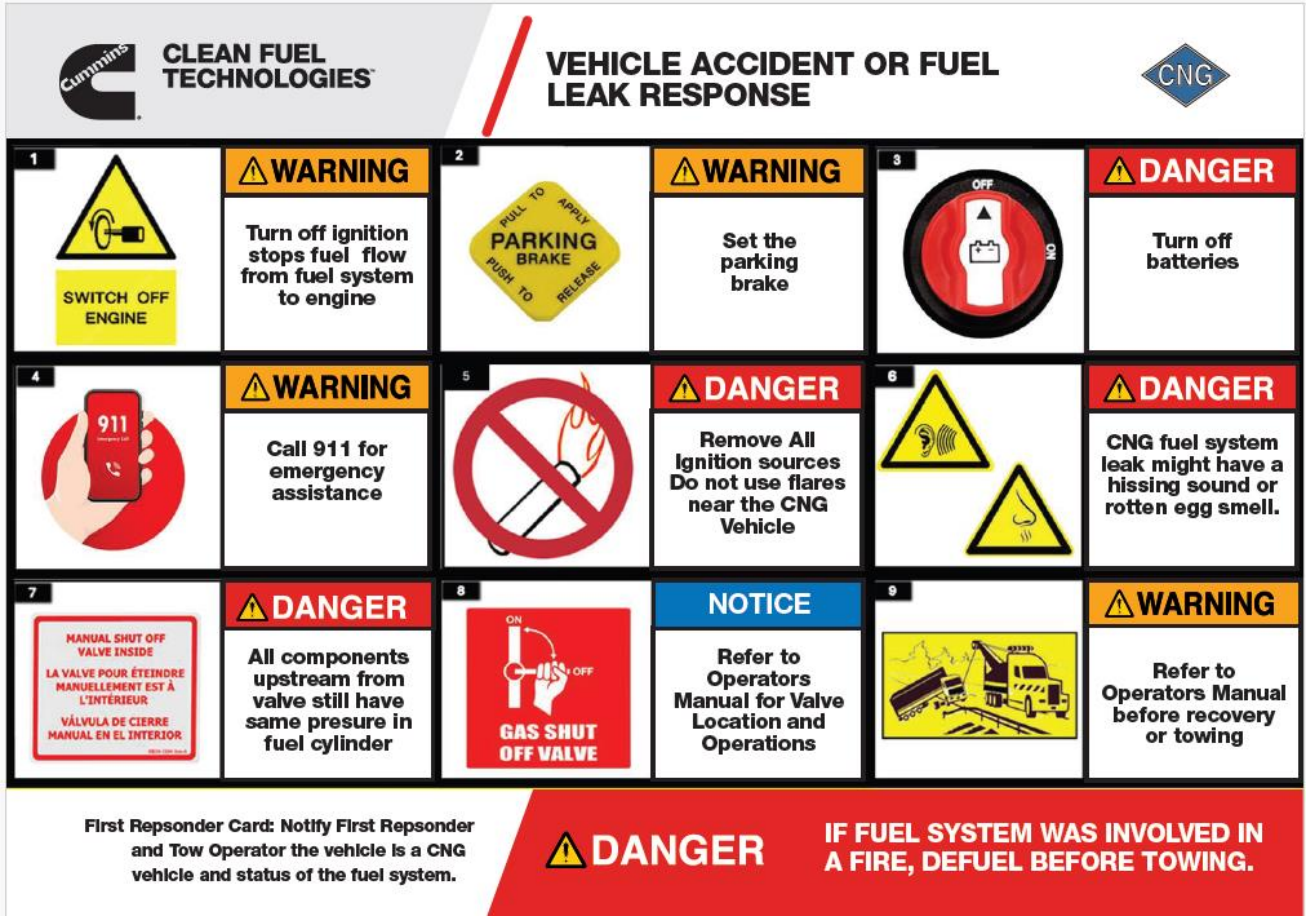
Response Guidelines - Fire



Response Guidelines - Accident



Response Guidelines – Recovery and Towing



Introduction

System Overview

The engine in this vehicle is fueled by a compressed natural gas (CNG) system designed by Cummins Clean Fuel Technologies. The system uses the same type of gas used in household appliances such as ovens and dryers.

The main difference is that natural gas vehicle fuel is stored under high pressure (3,600 psi [24,800 kPa]).

Compressed Natural Gas

CNG is a naturally occurring hydrocarbon gas mixture which consists primarily of methane.
It is:

- Colorless
- Odorless
- Non-corrosive
- Non-toxic

This gas is lighter than air, which means if gas were to leak, it would float upwards and quickly dissipate into the atmosphere. CNG will burn only when in an air-to- gas mixture of approximately 5-15% so its range of flammability is limited compared to other fuels. The gas also has an ignition temperature of 1076°F which is significantly higher than diesel. As a fuel, CNG is less expensive and burns cleaner than diesel fuel, producing low emissions. These characteristics make CNG an efficient, safe choice for fueling vehicles.

⚠ WARNING

Compressed natural gas is flammable and highly explosive. Serious personal injury or death can result if leaking natural gas ignites. If a leak is suspected, have the vehicle immediately inspected and repaired before returning it to operation.

CNG is odorless and invisible in its natural state. To aid detection, a chemical odorant called mercaptan is added to it which gives it a distinctive, pungent smell, similar to "rotten eggs". If you notice this kind of lingering odor coming from your vehicle, you may have a leak in the CNG fuel system.

⚠ WARNING

One should never detect (smell) gas or hear gas escaping at any other time besides refueling. If the smell of natural gas or a hissing sound is detected at any time besides refueling, the CNG system should be shut down. Refer to the Fuel System Shut Down Procedure.

⚠ WARNING

Only trained and qualified personnel should service this natural gas vehicle. Components in the fuel system are under extreme pressure. Severe injury or death can result from improper service or failure to follow safety precautions.

Fuel Standards

This vehicle is designed to run on CNG that meets North American standards, NFPA-52 and SAE J1616 for fuel composition.

Specifications

Cummins Clean Fuel Technologies CNG fuel systems are available to meet all chassis configurations to include side mount, back-of-cab, front of body, roof mount, or refuse tail mount configurations. Systems may have one or more fuel storage cylinders in varying capacities. All systems use common components with slight variations, depending on the configuration.

Color Coded Tubing

It is important for both technicians and drivers to easily identify high pressure tubes. Understanding the pressure in the tube allow technicians and drives to control the pressure with the correct procedure figure 1.

Regulated Pressure (fuel to engine) identified by Orange coated tube.

Supply Pressure (fuel between the cylinder shutoff valve and the first stage regulator) identified by Yellow coated tube. Supply Pressure can be controlled by the cylinder shutoff valve.

PRD Pressure (fuel between the cylinder and the PRD(s)) identified by Red coated tube. RED to indicate a live channel that is always under pressure no matter cylinder shutoff valve position.

Vent (vent tube between the PRD(s) and the vent cap) tubes are not coated. Vent tube will only be under pressure if a PRD(s) activates.

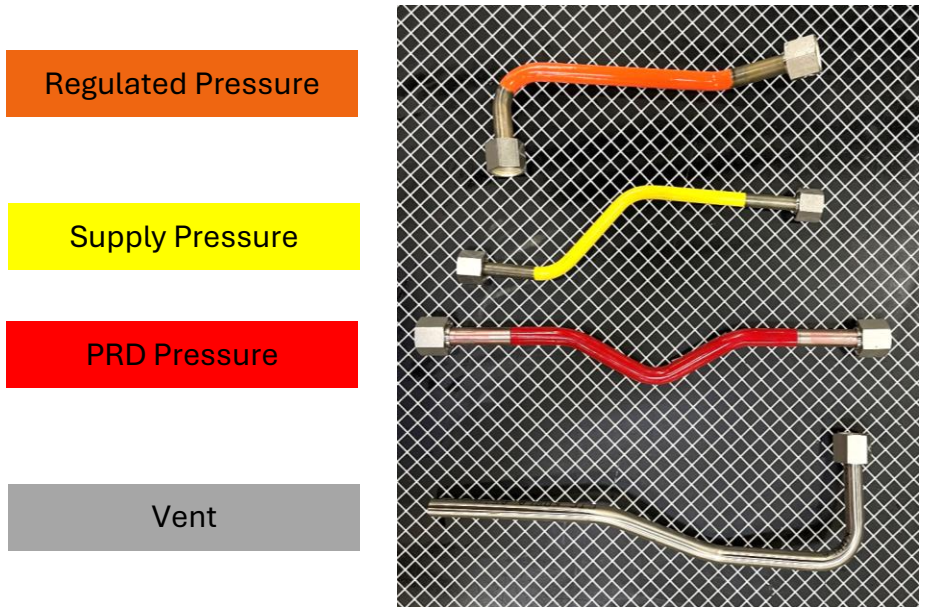


figure 1

Fuel System Components

Fuel Management Module (FMM)
The FMM houses the fuel filling receptacles, high-pressure and low-pressure gauges, electronic controls, regulator, high pressure fuel filter, and fuel manifold. Stand alone or integrated.

Cylinder Shutoff Valve
The cylinder shutoff valve(s) are attached to each cylinder controls the flow of gas in and out of the cylindering other systems are configured with cylinder shutoff(s) valve and

Multi BOSS
Multiboss fitting works as a manifold that allows fuel to flow in and out of the fuel cylinder. Only RED tube(s) will be attached to the Multiboss fitting and a RED tube(s) will go to a Cylinder Shutoff Valve or Fuel Delivery System Shutoff Valve to control fuel flow to the regulator.

Manual Shutoff Valve
Controls the flow of gas to the engine. It is referred to as a "1/4-turn" valve because it only requires a 1/4 turn to open or close the valve. Turn the valve 1/4-turn clockwise to close the valve and counterclockwise to open it.

Fill Receptacles
Fill receptacles are used to fill the CNG storage cylinders with fuel. There are two sizes: standard NGV1 (slow) or HD bus transit (fast) fill. The receptacles are supported with built-in check valve to prevent fuel from escaping when the fuel fill nozzle is connected and disconnected.

Door Sensor
The door sensor that is located on the FMM functions as a safety interlock to prevent the vehicle from starting if the FMM access door is open.

Fuel Cylinder(s)
The fuel cylinder(s) stores CNG fuel at a service pressure of 3,600 psi. The fuel cylinders used on this vehicle are type 3 and type- 4 composite containers, manufactured to meet FMVSS 304, NGV2, and CSA B51 Part 2 specifications. In accordance with applicable regulations, the cylinders must display permanent labels which provide information necessary for inspection.

Check Valve
The 1-way check valve, located in the manifold, is used to prevent fuel from backing up during the fuel filling process. Some fuel systems require an Inline Check Valve.

High Pressure Filter
The high-pressure coalescing filter is used to remove contaminants and oil from the fuel prior to it entering the low-pressure portion of the fuel system.

Low Pressure Filter
The low-pressure filter is located on the frame near the engine. The low-pressure filter is used to remove contaminants and oil from the fuel prior to it entering the engine. See to the engine manufacturer's recommended instructions for maintenance and replacement.

Pressure Regulator
The pressure regulator reduces the pressure of fuel in the system from high pressure (3,600 psi) to low pressure (80 to 90 psi) for the engine to use. Coolant from the engine circulates through the regulator to keep it from freezing.

Solenoid Valve
The solenoid valve allows pressure to flow from the regulator inlet port to the outlet port when the ignition is on.

Bleed Valve
The bleed valve vents residual pressure in the FMM portion of the system to allow for maintenance procedures. The bleed valve is the only fitting that it is safe to open while under pressure.

Defuel Valve
The defuel valve controls fuel flow when removing fuel from the cylinder during defueling operations. It is a 3-way type valve marked OFF-DEFUEL-VENT. The valve must be in the OFF position when operating the vehicle.

Pressure Relief Devices
The Pressure Relief Devices (PRD) are thermally-activated valves that open at a temperature of approximately 230°F. In the event of a fire, they are designed to release the fuel stored in the cylinders a safe distance from the vehicle to prevent over-pressurizing the fuel cylinders. When activated, the PRD cannot be closed and will vent all gas.

Vent System
The vent system is only under pressure when a PRD(s) activates. Vent system consists of the uncoated tubing and vent caps figure 1.

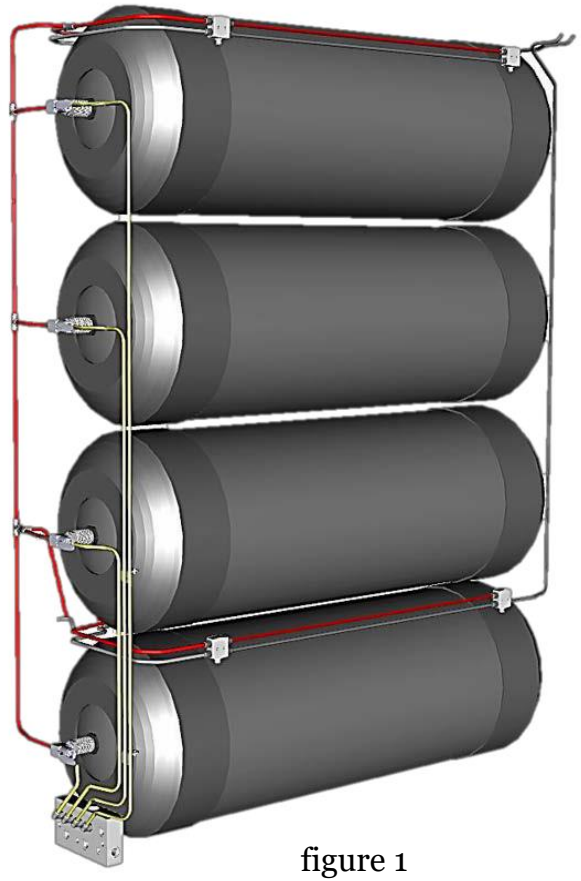


figure 1

Supply Pressure Gauge has a range of 0 to 6000 psi. The supply pressure gauge will read pressure in supplies tubes figure 1.

Supply Pressure

Yellow

figure 1

Regulated Pressure Gauge reads the fuel pressure between the regulator and engine The gauge has a range 0 to 200 psi. With key on, the pressure reading normal operating pressure will be approximately 80 - 90 psi figure 2.

Regulated Pressure

Orange

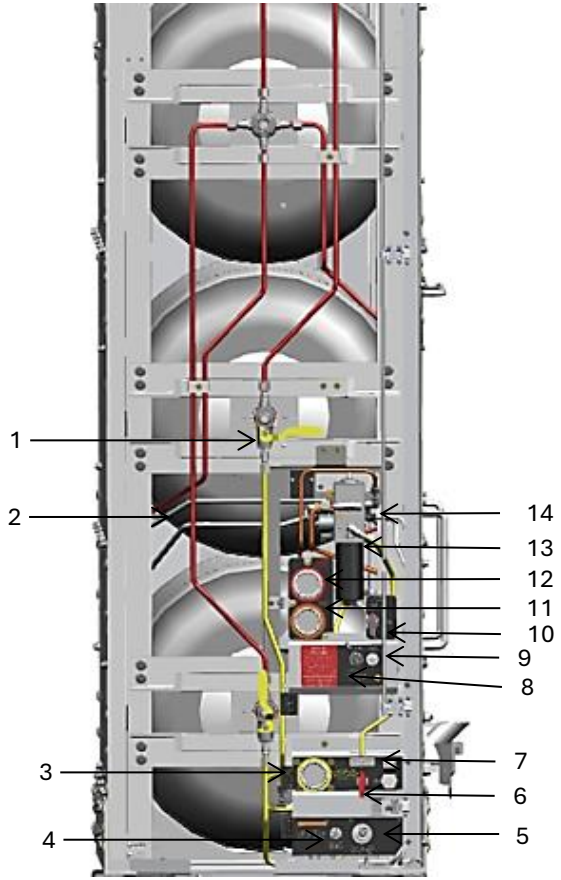
figure 2

Pressure Relief Device (PRD) Gauge will read the cylinder pressure and PRD tubes regardless of the valve position figure 3.

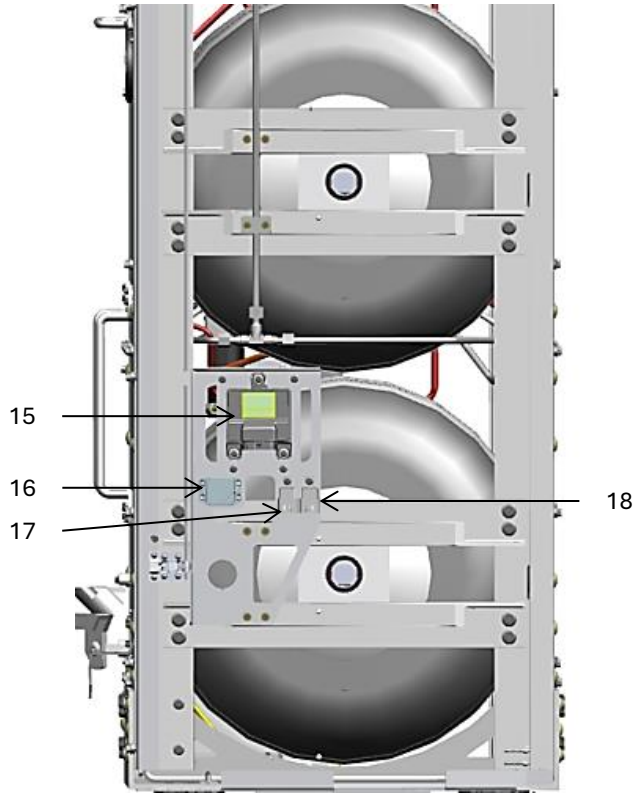
PRD Pressure

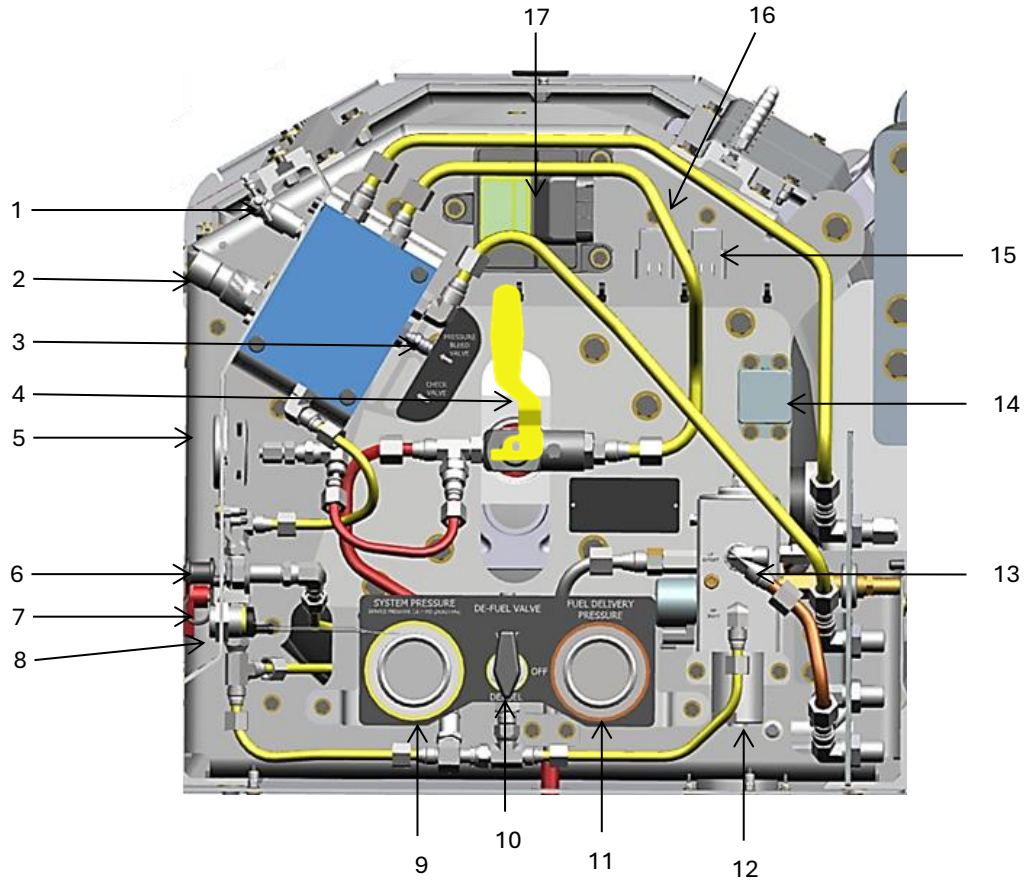
Red

figure 3



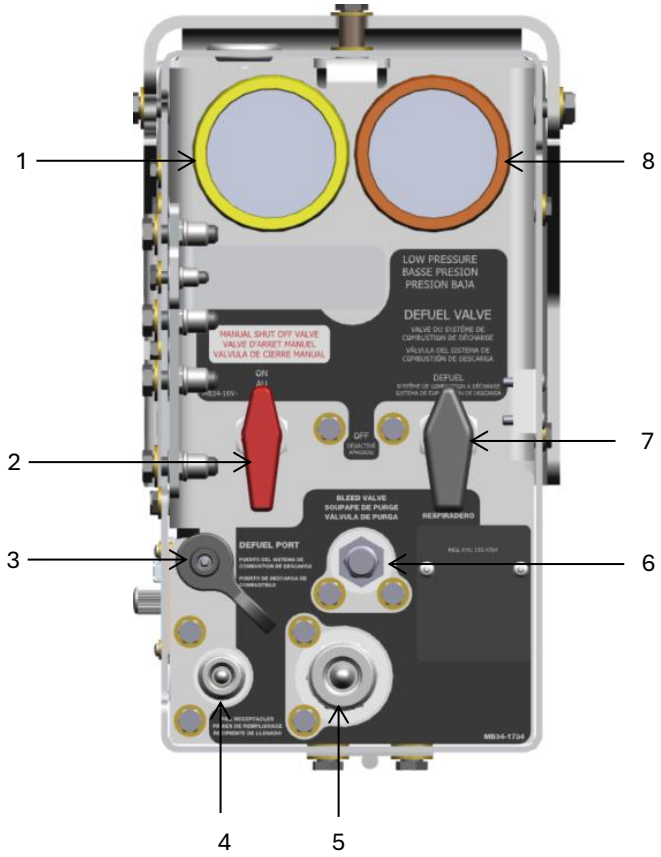
1. Cylinder Shut-Off Valve
2. Coolant Plumbing
3. Supply Pressure Gauge
4. Slow Fill/NGV 1 Receptacle
5. Fast Fill/HD Bus Receptacle
6. Manual Shut-Off Valve
7. Door Safety Interlock
8. Defuel Coupler
9. Bleed Valve
10. Defuel Valve
11. Regulated Pressure Gauge
12. PRD Pressure Gauge
13. High Pressure Filter
14. Regulator
15. Electronic Control Unit
16. FLIM
17. Starter Relay
18. Fuel Relay





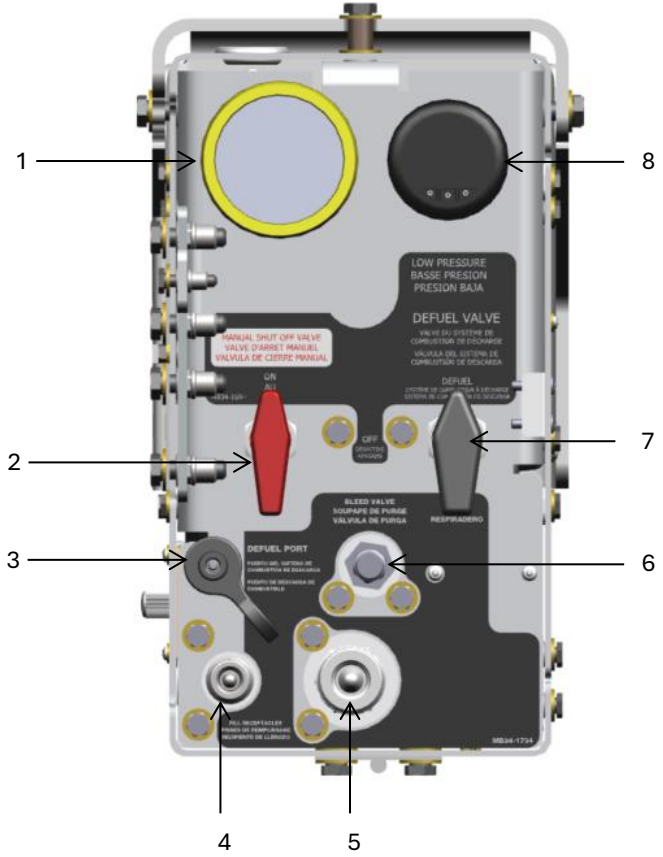
1. Slow Fill/NGV 1 Receptacle
2. Fast Fill/HD Bus Receptacle
3. Bleed Valve
4. Cylinder Shut-Off Valve
5. PRD Pressure Gauge
6. Defuel Coupler
7. Manual Shut-Off Valve
8. Door Safety Interlock
9. Supply Pressure Gauge
10. Defuel Valve
11. Regulated Pressure Gauge
12. High Pressure Filter
13. Regulator
14. FLIM
15. Starter Relay
16. Fuel Relay
17. Electronic Control Unit

FMM with Analog Regulated Pressure Gauge



1. Supply Pressure Gauge
2. Manual Shut-Off Valve
3. Defuel Coupler
4. Slow Fill/NGV 1 Receptacle
5. Fast Fill/HD Bus Receptacle
6. Bleed Valve
7. Defuel Valve
8. Regulated Pressure Gauge

FMM with Digital Regulated Pressure Gauge



Digital Gauge

The Digital Gauge displays fuel system information using a 3-button interface. Pressing either one of the outside buttons, to select desired fuel reading display figure 1.

Press one of the outside buttons to select the desired menu page.

figure 1

Fuel Reading Displays:

Fuel Level – Usable fuel remaining in percentage until empty figure 2. **Note:** 250 psi is empty (zero percent fuel level).
Fuel Pressure - Current supply (Yellow) pressure in fuel system at current temperature figure 3.
Miles to Empty – Estimated miles remaining until empty figure 4 (*Refer to next page*)

Fuel Level

figure 2

Fuel Pressure

figure 3

Miles to Empty

figure 4

Miles to Empty Defined

Miles to Empty calculates the approximate distance you can drive with the amount of fuel remaining in the fuel system. This calculation is based off the Average Fuel Economy since Last Trip Reset broadcast by the engine multiplied by the remaining useable fuel in the fuel system.

The Average Fuel Economy is calculated by the engine and only includes drive times. It does not include idle or PTO times. The engine broadcasts this value over the engine data bus, and the fuel delivery system reads this value.

The useable fuel remaining is calculated by the fuel delivery system based on fuel system capacity, fuel pressure, and fuel temperature in the fuel delivery system. The amount of fuel in the fuel delivery system at a given pressure varies significantly with temperature. This means the miles to empty for a given pressure will vary with every temperature reading.

Note: to reset Miles to Empty a technician must reset use Cummins Insite.

figure 1

GreenLync Digital Gauge

Digital Gauge Contrast and Backlight can be selected and adjusted by pressing and holding the center button figure 1.

Contrast display will be the first display, push the center button again and the Backlight display will be displayed.

Contrast can be adjusted by pressing the outside button to brighten or dim.

Backlight can be adjusted manually by selecting “Set Manually” and pressing the outside button to brighten or dim.

Press and hold center button to select the desired menu page.

figure 1

Contrast

figure 2

Backlight

figure 3

GreenLync Digital Gauge

Low Fuel Indicator Light

When the fuel system reaches 10% fuel level or lower the Low Fuel Indicator Light at the 12 o'clock position will turn RED figure 1 and 2.

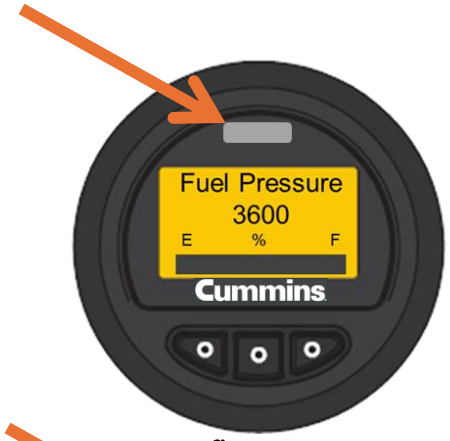


figure 1

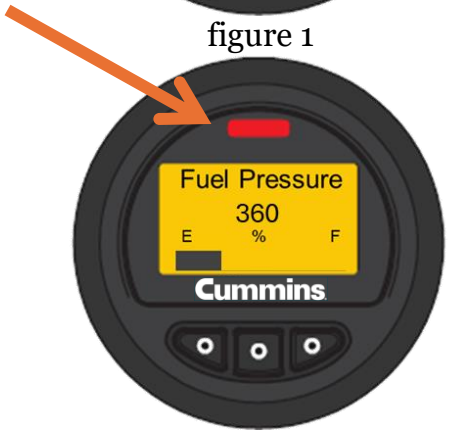


figure 2

Pre – Trip Inspection

1. Verify the MANUAL SHUTOFF VALVE on the Fuel Management Module (FMM) is in the ON position.
    a. Ensure the fuel cylinder manual shut-off valve(s) is open/ON.
2. Check the high-pressure gauge (Yellow) on the FMM to ensure it is operating and reading in a range consistent with the fuel gauge on the dashboard. The fuel system maximum pressure is 3,600 psi.
3. Verify the vent port(s) and vent cap(s) are clear of debris or damage.
4. Verify label that indicates the PRD(s) vent location(s) with the following language. ATTENTION CNG Vent Location is present and legible.
5. Verify all required CNG Diamond labels are present and legible.
6. Inspect all fill receptacle(s) and cap(s). The fill receptacle cap should be in place. The fill receptacle O-ring present and free from damage. All starter safety interlock device should operate correctly.
7. Check the entire fuel system for any signs of damage or wear. Include checks for:
    a) Gas leaks – Smell for gas, look for frost or ice, and listen for hissing noises at joints and components.
    b) Inspect for external damage to housings and covers. Verify all covers are present and secured correctly.
8. Drain the low-pressure filters per the engine manufacturers recommendation.
9. Install bumper fill cap and close fuel door.
10. Check gas detection system is operational, if equipped.
11. Turn the ignition key to ON and check that the low-pressure gauge (Orange) reading is approximately 80 - 90 psi.
12. Verify the dashboard fuel gauge is functioning properly.

⚠ WARNING

DO NOT operate vehicle with a fuel system that has leaks or visible damage. Report all leaks and damage to supervisor and/or maintenance.

DO NOT operate vehicle with missing or damaged vent cap(s) Report all leaks and damage to supervisor and/or maintenance.

Do NOT operate vehicle with damage or missing covers. Report all leaks and damage to supervisor and/or maintenance.

Post – Trip Inspection

1. Follow company's parking procedures.
2. Check gas detection system is operational, if equipped.
3. Verify the vent port(s) and vent cap(s) are clear of debris or damage.
4. Verify label that indicates the PRD(s) vent location(s) with the following language. ATTENTION CNG Vent Location is present and legible.
5. Verify all required CNG Diamond labels are present and legible.
6. Inspect all fill receptacle(s) and cap(s). The fill receptacle cap should be in place. The fill receptacle O-ring present and free from damage. All starter safety interlock device should operate correctly.
7. Check the entire fuel system for any signs of damage or wear. Include checks for:
    a) Gas leaks – Smell for gas, look for frost or ice, and listen for hissing noises at joints and components.
    b) Inspect for external damage to housings and covers. Verify all covers are present and secured correctly.

⚠ WARNING

Report vehicle with a fuel system that has leaks or visible damage. Report all leaks and damage to supervisor and/or maintenance.

Report vehicle with missing or damaged vent cap(s). Report damage to supervisor and/or maintenance.

Report vehicle with damage or missing covers. Report damage to supervisor and/or maintenance.

General Inspection

A qualified technician conducts a general inspection of the fuel system during preventative maintenance (PM) events, such as oil changes, filter changes, scheduled maintenance, etc.

1. Inspect for damage to fuel system covers and mounting brackets to include dents, cuts, gouges, scrapes from impact damage on covers.
2. Broken, deformed or lose brackets and brackets fasteners. Damage to isolator bushing.
3. Check gas detection system is operational, if equipped.
4. Verify the vent port(s) and vent cap(s) are clear of debris or damage.
5. Verify label that indicates the PRD(s) vent location(s) with the following language. ATTENTION CNG Vent Location is present and legible.
6. Verify all required CNG Diamond labels are present and legible.
7. Inspect for signs of gas leaks. Leaks can be detected by a rotten egg smell, visible damage to CNG fuel system, and a hissing sound, and frosting and icing.
8. Inspect all fill receptacle(s) and cap(s). The fill receptacle cap should be in place. The fill receptacle O-ring present and free from damage. All starter safety interlock device should operate correctly.
9. Fuel system tubes, hoses, and piping free from damage and secured to prevent damage from vibrations.
10. Inspect starter safety interlock functions and operations.
11. Chassis tubing, hose coolant plumbing, and wiring should be in place as designed. Chassis clamps, where applicable, should be in place and free from damage to prevent damage form vibration.
12. Inspect all valves for damage and smooth correct operating and correct labeling.
13. Pressure Relief Device (PRD) and vent tubes, caps, and labels are free from damage. Must be secure in a manner to prevent damage from vibration.
14. Clear ant debris around the CNG cylinders. Remove all debris and check for any damage to the cylinders.
15. Inspect the cylinder neck extenders, clamping blocks and floating blocks for loose bolts or signs of wear or damage.
16. Inspect for any unauthorized modification.

⚠ WARNING

If any missing, modification, or damage components are found a detailed inspection must be completed.

Detailed Inspection

The Department of Transportation requires this statement on the label of all CNG cylinders used on motor vehicles:
"THIS CONTAINER SHOULD be visually inspected for damage and deterioration after a motor vehicle accident or fire, and either (a) at least every 12 months when installed on a vehicle with a GVWR greater than 4,536 kg (10,000 lbs.), or (b) at least every 36 months or 36,000 miles, whichever comes first, when installed on a vehicle with a GVWR less than or equal to 4,536 kg (10,000 lbs.).
Qualified person for inspection
Evidence that the cylinders have been inspected can be found in one of the following forms:

1. A readily visible inspection label on the cylinder.
2. An inspection form/report provided by inspector (perhaps kept in glove box with insurance and registration papers).
3. Other: sticker on windshield, doorpost, fueling receptacle area.

Periodic In-Service Inspection Requirements
Cylinders must be reinspected if over pressured, dropped, impacted, reinstalled on a different vehicle, exposed to excessive heat or fire, harsh chemicals, or if vehicle was in an accident of 5 mph or more.

A qualified technician conducts detailed inspection processing a current credential from an approved accredited body.

NOTE: If no label missing or not legible or are unable to determine cylinder SSN or manufacturer must condemn the cylinder and remove it from service. Some cylinder will have a SSN engraved on the cylinder neck extender. If you need a replacement sticker, contact **Cummins Clean Fuel Technologies @ 1-844-CNG-TANK**.

NOTICE

States and local Authority Having Jurisdiction (AHJ) including the local Fire Marshal may have their own requirements. Check for local requirements; states and municipalities may have requirements that vary from these codes.

Starting Vehicle

1. Follow the vehicle manufacturer's recommended instructions for vehicle start-up.
2. Pre-Trip Inspection complete.
3. Ensure Cylinder Shutoff Valve(s) are OPEN.
4. Ensure Manual Shutoff Valve is OPEN.
5. Check Supply Pressure Gauge (Yellow) for pressure (fuel) Note: regulator needs 250 psi to operate correctly.
6. Close fuel door.
7. Bumper fill cap installed, if equipped.
8. Turn the ignition switch to ON and allow a few seconds delay for the vehicle to boot up.
9. Turn the ignition switch to start and start vehicle.
10. Allow the vehicle to warm to operating temperature.

Note: For vehicles being started in the cold, allow the engine to idle until engine reaches operating temperature. This provides enough time for the engine coolant to warm up and help keeps the regulator from "icing". Let the vehicle idle for a longer period if it is extremely cold.

DANGER

If hissing sound is heard when the key is turned to ON, and the hissing sounds stops when the key is turned OFF. DO NOT operate vehicle and Report it to supervisor and/or maintenance. This is a sign of a bad regulator, and the hissing sound is flammable gas venting out the vent system to protect the engine components .

Fueling Safety

⚠ WARNING

To reduce the risk of impact and/or fire, which if not controlled, could result in death or serious injury:

1. *Allow the fuel tank and all mounting hardware to acclimate to ambient temperature prior to initial fueling.*
2. *Do NOT proceed to fill the cylinder(s) if a leak of CNG is detected or suspected. This includes, but is not limited to, the emission of a natural gas odor, unexpected loss of pressure in the fuel system, rattling, or other indications of loose connections, or unusual hissing or snapping.*

NOTICE

When fueling at public or private fueling areas, check for evidence of oil or other contaminants on the nozzle or on the ground below the nozzle. Oily or dusty conditions may be an indication of poor fuel quality, DO NOT USE. These conditions should be reported to the station maintenance personnel.

⚠ WARNING

While a slight odor might be present when fueling or connecting or disconnecting nozzle, it should dissipate quickly after fueling. If you smell CNG at any other time or notice a hissing sound, especially from the nozzle and receptacle connection, stop fueling immediately. If the vehicle is on a fast fill or time fill system, disconnect the fuel nozzle. Report the presence of the rotten egg smell to the station maintenance personnel.

Fueling the CNG System

⚠ WARNING

Do not fill the CNG system fuel cylinder with any other type of fuel other than CNG (Compressed Natural Gas). No other type of fuel may be used in the cylinder.

Fueling Safety

⚠ WARNING

Observe the following to reduce the risk of impact and fire. Failure to do so can result in death or serious injury and property damage:

1. ***Verify the station filling pressure is compatible with system pressure rating is compatible with the fuel tank pressure rating.***
2. ***Never fill the CNG system to a pressure that exceeds 4,500 psi at any temperature.***

NOTICE

The following are general fueling guidelines. Always check with your fuel station for specific pump operating instructions and procedures.

NOTICE

If a fill receptacle is damaged, only qualified technicians are permitted to perform mechanical repairs to the receptacles.

NOTICE

The nozzles at fill stations are designed so they will not come off the receptacles when under pressure.

NOTICE

The fuel system is equipped with safety interlocks on the FMM door. The door MUST be closed in order for the engine to crank.

NOTICE

Compressed Natural Gas (CNG) can expand and contract significantly depending on temperature. The amount of CNG that can be stored in a vehicle's tank varies based on the following variables following page:

Temperature Compensated Cylinder Pressure

The typical industry standard for CNG fueling system pressure is 3,600 psi. These fill pressures are based on a 70ºF ambient temperature.

The cylinders are designed to hold up to 125% of their operating pressure. So a 3,600 tank can be filled to 4,500 psi. This makes it possible to fill a tank to a higher pressure on hot days when the gas is expanding, as well as compensate for the heat of compression.

A good rule of thumb is that for every 1ºF plus or minus 70ºF, the pressure will change by 16 psi. All pressure are settled pressure on pressure chart figure1.

Refer to the Temperature Compensated Cylinder Pressure Chart figure 1.

Temperature Compensated Cylinder Pressure	
3,600 psi service pressure calculated from the standard gas composition used to create the gasoline gallon equivalent	
Gas Temperature, Degrees F	Pressure in Full 3,600 psi CNG Container, psig
123.6	4,500
120.0	4,455
110.0	4,272
100.0	4,105
90.0	3,936
80.0	3,768
70.0	3,600
60.0	3,432
50.0	3,263
40.0	3,094
30.0	2,926
20.0	2,757
10.0	2,589
0.0	2,421
-10.0	2,253
-20.0	2,086
-30.0	1,919
-40.0	1,753

figure 1

Fueling Vehicle

1. Open the fuel access door. Remove the cap from the appropriate fueling receptacle. (figure 1)
2. Wipe the receptacle with a dry, lint-free cloth.
3. Check that the fill nozzle is free from damage and the O-ring is present figure 1. If the nozzle is in acceptable condition, connect the nozzle to the fuel receptacle.
   NOTE: The NGV-1 and HD nozzles are different sizes. If the nozzle does not fit the receptacle, make sure you have selected the correct receptacle for your intended fueling.
4. Turn the nozzle valve to the Fill position, if required. You will hear fuel start to flow.
5. Fueling will continue until the cylinder(s) have been filled. The fuel station pump will then shut off automatically.
6. Turn the nozzle valve to the Vent position to release it from the receptacle and remove the fueling nozzle.
7. Once the fueling process is complete, replace the cap on the receptacle and close the FMM door.

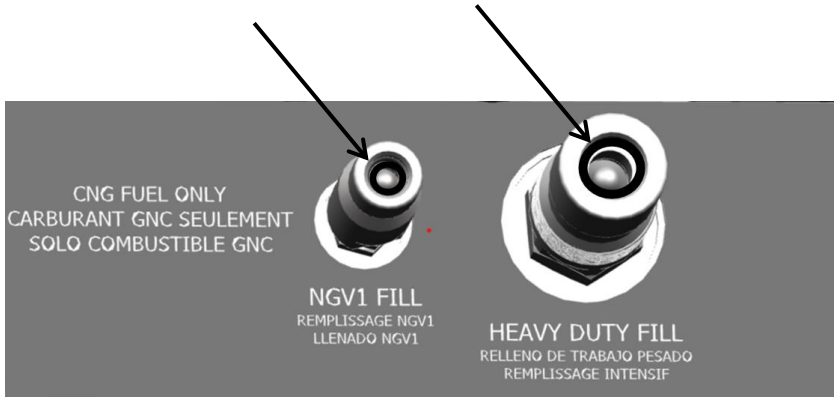


figure 1

Symptoms	Conditions	Action	Maintenance Needed	Specification
Gas Leak	▪ Natural gas smell (rotten egg smell) in or near vehicle ▪ Natural Gas Detection System activates	▪ If vehicle in not running, DO NOT START or OPERATE ▪ If vehicle is running, follow OEM procedure for vehicle shutdown ▪ If vehicle is operating move to well-ventilated area, away from other operations follow OEM procedure for vehicle shutdown ▪ Notify supervisor or first responders of gas leak ▪ Inspect the fuel system for leaks within the level trained. ▪ If leak is found close cylinder shutoff valve (if trained)	**Do Not Operate** Turn in for maintenance	Natural gas is a flammable gas, primarily composed of methane (CH4), and it can ignite when mixed with air within a specific concentration range (roughly 5% to 15%) at temperature of 1,100 degrees Fahrenheit (580 degrees Celsius). Even the smallest leak can cause the gas to ignite.
No Crank	▪ Vehicle batteries are charged. ▪ Key ON ▪ Turn-key to crank	▪ Check that all the fuel doors are closed. ▪ Check all the auxiliary fuel receptacle caps are installed.	Turn in for maintenance	Fuel system will prevent cranking if the fuel system determines it is not safe for the vehicle to start or to drive away. Conditions the fuel system will prevent cranking are: ▪ Any fill receptacle door is “OPEN”, or damaged or bumper fill rubber cap is not installed ▪ The engine has died without the ignition key being turned off ▪ The engine is broadcasting an emergency shutdown fault
Crank No Start	▪ Manual Shut Off Valve “ON” ▪ Cylinder Shutoff Valve “OPEN” ▪ Fuel Delivery System Shutoff Valve "OPEN”	▪ Verify the Regulated Pressure Gauge (orange) is showing fuel pressure(80 – 90 psi) with key “ON”. ▪ Cycle key OFF and ON and verify an audible click from Fuel System Regulator Solenoid Coil, pressure on the Regulated Pressure gauge (Orange) should be between (80 – 90 psi)	Turn in for maintenance	Fuel systems only job is to provide the fuel within the operating range if the engine. The fuel pressure supplied to the engine should be within 80 - 90 psi. This can be verified by looking at the regulated pressure gauge (Orange)
Fuel Venting Out With Key ON	▪ Key ON ▪ Fuel venting out of vent cap	▪ Turn-key off ▪ Clear area of all ignition sources	**Do Not Operate** Turn in for maintenance	The Fuel Delivery System (FDS) regulator has a Pressure Relief Valve (PRV) . The (PRV) is in place to protect the engine from high pressure gas if the regulator fails. The (PRV) is spring loaded and should close once the regulated pressure drops below the set pressure or key is turn off. In rare circumstances the regulated pressure may briefly creep high enough to activate the (PRV) at key on, but should close in a short amount of time, and the regulated pressure should go to the normal operating pressure once the engine is running.
Coolant Leak	▪ Vehicle operating ▪ Running at idle ▪ Vehicle shutdown	▪ If operating or running, follow OEM procedure for vehicle shut down. ▪ If vehicle is not running do not start ▪ Fuel System leak’s location can be in the coolant hoses from the engine to the FDS, or inside the FDS housing.	**Do Not Operate** Turn in for maintenance	The Fuel Delivery System (FDS) regulator utilizes engine coolant to prevent freeze up of the regulator during operation of the vehicle. The coolant has a channel that goes around the natural gas channels, but they are not connected. There is no way that the natural gas can mix with the coolant as their pathways are completely separated. Any coolant leak in the FDS system will be an external leak and should be visible in either the coolant hoses to and from the engine, or the hoses or tubes inside the FDS.

Depressurize Fuel System

Depressurizing the fuel delivery system removes pressure from the supply pressure (yellow) tubes before the regulator and the regulated (orange) tubes and low-pressure hose after the regulator. Depressurizing the fuel delivery system allows technicians to conduct repairs safely on the supply tubes and pressure regulated tubes.

Depressurizing instructions describe how to configure the Cummins Clean Fuel Technology fuel system for depressurizing. These instructions must be used in conjunction with company Depressurizing Policies and Procedures.

The instructions do not cover the location where fuel is released to the atmosphere. See individual company policies and procedure for releasing fuel to the atmosphere.

The only safety covered is configuring the fuel system for depressurizing. See individual company policies and procedure prior to releasing fuel to the atmosphere.

Refer to Depressurizing Procedure (042-001)

Service Procedure Information

For more information refer to Cummins Clean Fuel Technologies service procedures can be found in "Cummins Engine Service Manual, Section 42 Fuel Deliver System," which can be accessed via the Cummins QuickServe Online portal.

Service manuals are available for the engine platforms listed below:

- **B6.7N** CM2380 B150B
- **ISB6.7 G** CM2180 B118
- **ISL G** CM2180
- **ISX12 G** CM2180 EJ
- **ISX12N** CM2380 X120B
- **L9N** CM2380 L124B & L130B
- **L9N** CM2380 L142B & L147B
- **X15N** CM2380 X150B

Depressurize Fuel System

DANGER

Servicing or removing components attached to the pressure relief device tubes with natural gas in the fuel system can result in death, serious injury and property damage. Always defuel the fuel system before servicing or removing any component attached to the pressure relief device tubes.

DANGER

Servicing or removing components attached to pressurized supply or regulated tubes in the fuel system can result in death, serious injury and property damage. Always depressurize the fuel system before servicing or removing any component attached to the supply or regulated tubes.

WARNING

To reduce the risk of explosion and fire, or asphyxiation from compressed natural gas (CNG), always vent in an area that allows for gas to dissipate quickly and observe the following guidelines. Failure to do so can result in death or serious injury.

WARNING

Do not vent CNG in enclosed spaces. Breathing CNG can cause asphyxiation; a high-pressure stream of CNG can penetrate skin, and a nearby source of ignition could spark an explosion.

WARNING

Gas venting should only take place outdoors or following an alternative method which is in compliance with NFPA 52. This is to avoid the possibilities of asphyxiation or accumulation of an explosive gas mixture.

CAUTION

Release the fuel slowly to reduce static electricity/ electrostatic discharge and to avoid freezing.

NOTICE

To reduce the possibility of personal injury or equipment damage, this procedure must only be performed by suitably qualified service technicians.

Depressurize Fuel System

1. Verify cylinder shutoff valves are in the CLOSED position. If the valves are not in the CLOSED position, close the valve.
   - **Quarter Turn:** Verify quarter turn valve is CLOSED, turn the handle on the ball valve ¼ turn until the handle is not in line with the valve for CLOSED.
   - **Stem Valve:** If equipped with a stem valve, verify the valve is in the CLOSED position by rotating clockwise.
   - **Fuel Delivery System Shutoff Valve:** Verify the fuel delivery system shutoff valve is in the OFF position. If the valve is in the ON position, rotate the handle ¼ turn clockwise to OFF.

2. Verify the Manual Shutoff Valve is OPEN/ON.

DANGER

If the Manual Shutoff Valve is CLOSED/OFF there will still be pressure on one side of the valve. Manual Shutoff Valve must be OPEN/ON to allow pressure on both sides to vent out to properly depressurize the fuel system.

Relieve Pressure

1. With the cylinder valves closed, start the engine. Allow to run at low idle to depressurize the supply and regulated fuel system tubes (yellow and orange).
2. Crank the engine for 10 seconds.
3. If the vehicle starts, allow the engine to run until out of fuel. Do not idle above 900 rpm.
4. NOTE: If the engine does not start, relive pressure with the manual bleed valve.
5. The bleed valve is a manual bleed, vent, or drain valve for depressurizing the system.
6. The knurled cap is permanently assembled to the valve body for safety.
7. Rotate the bleed valve cap counterclockwise to open.
8. Verify the regulator and supply gauges are at 0 kPa [0 psi].

NOTICE

The Pressure Relief Device (Red) gauge will read pressure contained in the fuel cylinder due to cylinder valve design.

Close the bleed valve. Rotate the cap clockwise ¼ turn from finger-tight. Use a wrench.

Defueling and Fuel Transfer Guidelines

Defueling is the process of removing all fuel from the fuel system, including fuel cylinders, making the fuel system safe or to perform maintenance. This procedure describes how to configure the Cummins Clean Fuel Technologies™ fuel system for defueling. Defueling is required when servicing or replacing cylinders, pressure relief devices, and any red, high-pressure fuel tubes to pressure relief devices or cylinders. Use this procedure in conjunction with company defueling policies and procedures.

This procedure covers defueling setup. See company defueling policies and procedures for safety procedures and releasing fuel into the atmosphere.

Refer to Defuel Procedure (042-039)

The transfer defueling hose must be electrically conductive with a minimum working pressure of 34.5 Mpa [5000 psi], 65°C [-40 to 185°F], Cummins® Natural Gas Class 6 ANSI/CAS NGV 4.2 Class A and D.

⚠ WARNING

Inspect the defueling hose before use. Do not use if damage is found.

Service Procedure Information

For more information refer to Cummins Clean Fuel Technologies service procedures can be found in "Cummins Engine Service Manual, Section 42 Fuel Deliver System," which can be accessed via the Cummins QuickServe Online portal.

Service manuals are available for the engine platforms listed below:

- **B6.7N** CM2380 B150B
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- **L9N** CM2380 L142B & L147B
- **X15N** CM2380 X150B

Defueling and Fuel Transfer Guidelines

DANGER

Servicing or removing components attached to the pressure relief device tubes with natural gas in the fuel system can result in death, serious injury and property damage. Always defuel the fuel system before servicing or removing any component attached to the pressure relief device tubes.

DANGER

Servicing or removing components attached to pressurized supply or regulated tubes in the fuel system can result in death, serious injury and property damage. Always depressurize the fuel system before servicing or removing any component attached to the supply or regulated tubes.

WARNING

To reduce the risk of explosion and fire, or asphyxiation from compressed natural gas (CNG), always vent in an area that allows for gas to dissipate quickly and observe the following guidelines. Failure to do so can result in death or serious injury.

WARNING

Do not vent CNG in enclosed spaces. Breathing CNG can cause asphyxiation; a high-pressure stream of CNG can penetrate skin, and a nearby source of ignition could spark an explosion.

WARNING

Gas venting should only take place outdoors or following an alternative method which is in compliance with NFPA 52. This is to avoid the possibilities of asphyxiation or accumulation of an explosive gas mixture.

CAUTION

Static electricity buildup can cause fire or explosion. Ground the fuel system when transferring fuel or defueling the fuel system.

NOTICE

Only a trained individual should conduct defueling operations

Defueling and Fuel Transfer Guidelines

Defueling

1. Verify cylinder shutoff valves are in the OPEN position. If the valves are not in the OPEN position, open the valve.
   - **Quarter Turn:** Verify quarter turn valve is CLOSED, turn the handle on the ball valve ¼ turn until the handle is in line with the valve for OPEN.
   - **Stem Valve:** If equipped with a stem valve, verify the valve is in the OPEN position by rotating counterclockwise.
   - **Fuel Delivery System Shutoff Valve:** Verify the fuel delivery system shutoff valve is in the ON position. If the valve is in the OFF position, rotate the handle ¼ turn counterclockwise to ON.

2. Verify the Manual Shutoff Valve is OPEN/ON.

⚠ DANGER

If the Manual Shutoff Valve is CLOSED/OFF there will still be pressure on one side of the valve. Manual Shutoff Valve must be OPEN/ON to allow pressure on both sides to vent out to properly defuel the fuel system.

- **Three-Way-Defuel Valve:** Relieve pressure between the valve and defuel coupler. Turn the defuel valve to the VENT position. Pressure is relieved with a short hissing sound. Turn the defuel valve OFF figure 1.

figure 1

- **Two-Way Defuel Valve: Turn the two-way valve to defuel then r**efer to Depressurize Procedure to relive pressure on the defuel coupler figure 2.


figure 1

3. Connect the Cummins Clean Fuel Technologies™ transfer defueling hose, Part Number MT22-1005, to the defuel coupler on the supplying fuel system. Verify the hose is locked in place. Pull on the hose.
4. Connect transfer defueling hose to defuel equipment.

- **Defuel Stack:** See equipment manufacturer service information for defuel stack operating instructions.

- **Compressed Natural Gas Fuel Station:** See equipment manufacturer service information for defuel operating instructions.

5. Connect the defueling hose from the defuel stack or Compressed Natural Gas Fuel Station. Verify the hose is locked in place. Pull on the hose.

6. Connect the ground cable on an uncoated surface of the defuel stack to a suitable ground.

7. Follow defueling operating instructions for defueling equipment. Inspect defueling equipment before use. Do **not** operate defueling equipment if damage is found.

NOTICE

NOTE: Venting fuel is noisy. A visible plume of fuel is possible. Verify the fuel system has 0 psi. Check the supply or pressure relief device/tank pressure gauges. When the system is completely defueled, turn the defuel valve OFF. Remove the transfer defueling hose. Verify the regulated pressure gauge reads 0 psi. If there is pressure, depressurize the system. Refer to Procedure 042-001 in Section 42. Remove the transfer defueling hose from the defuel coupler on the fuel delivery system.

Fuel Transfer

1. Transferring fuel is when fuel is moved from one fuel system to another fuel system. There are two fuel systems required for this procedure
   - Supply (sending) fuel system
   - Receiving (empty) fuel system
2. Setup supply (sending) fuel system for defueling.
3. Connect the fuel nozzle to the receiving (empty) fuel system.
4. Start to defuel the supply (sending) fuel system. Turn the defuel valve OFF when required fuel is reached in receiving (empty) fuel system.

Transfer hose MUST be electrically conductive, so the fuel systems are bonded.

⚠ WARNING

Three-Way Valve: depressurize transfer hose, by turning the three-way valve on the supply (sending) fuel system to vent and vent off pressure in transfer hose.
Two-Way Valve: depressurize transfer hose, by following depressurizing procedures for the supply (sending) fuel system.

Scheduled Maintenance

Perform the maintenance tasks provided in this section as scheduled to prolong component life and ensure maximum performance of the CNG fuel system.

Maintenance Schedule

Maintenance Schedule	Frequency
Check Vent Lines Daily	Daily
Drain Low Pressure Filter Daily	Daily
Replace Low Pressure Filter	Refer to the engine manufacturer for maintenance and replacement guidelines.
Drain High Pressure Filter Weekly	Weekly
Replace High Pressure Filter Element	At regular oil change per engine type in vehicle
Leak Test with Methane Detector	CFR Title 49 Subtitle B Chapter V Part 571
Component Inspection	CFR Title 49 Subtitle B Chapter V Part 571
Cylinders	CFR Title 49 Subtitle B Chapter V Part 571

NOTICE

The high-capacity, high-pressure fuel filter interval is directly affected by the fuel quality and can be negatively impacted by problems with the fueling station. The filter is designed to be changed at the same interval as the engine oil filter, but poor fuel quality could reduce this interval significantly. The best way to determine a proper interval (when always fueling at the same station) is to drain the filter on a weekly basis. If the oil level is too high in the filter bowl, it could cause the filter to bypass and contaminate the secondary filters as well. Constantly having high amounts of oil/water drain from the secondary filter(s) could be a sign that the primary filter should be changed.

Area intentionally left blank

High Pressure Filter Drain Procedure

High Pressure Coalescing Fuel Filter Refer to Procedure (042-026) in Section 42

Depressurize the fuel system. Refer to Procedure 042-001 in Section 42

1. Remove the excess fuel in the filter per the depressurizing procedure.
2. Ensure the FMM Manual Shut-Off Valve is in the OFF position.
3. Locate and access the high-pressure coalescing filter inside the service access door/panel. The filter location will vary, depending on the system configuration.
4. Locate the drain plug at the bottom of the filter. Hold a cloth under the port to catch any draining liquid. Remove the plug and allow the liquid inside the filter to drain.
5. Re-install the drain plug and torque to 20 ft-lbs.
6. Confirm the bleed valve is closed.
7. Slowly open the FMM Manual Shut-Off Valve.
8. Check the high-pressure gauge to ensure the fuel pressure has been returned in the system.

High Pressure Filter Change Procedure

1. Remove the excess fuel in the filter per the depressurization procedure.
2. Ensure the FMM Manual Shut-Off Valve is in the OFF position.
3. Locate and access the high-pressure coalescing filter inside the service access door/panel. The filter location will vary, depending on the system configuration.
4. Unscrew and remove the filter bowl from the filter housing. Note the filter is equipped with wrench flats to assist removal.
5. Empty and clean the filter bowl.
6. Remove the filter element by grasping and pulling it downward out of the filter housing. Place the new filter element into position and press it into place.
7. Install a new O-ring (supplied with the filter element) into the groove on the filter housing.
8. Re-install the filter bowl in the filter housing and torque to 40 ft-lbs.
9. Verify that the bleed valve is closed.
10. Slowly open the FMM Manual Shut-Off Valve.
11. Check the high-pressure gauge to ensure fuel pressure has returned in the system.

Welding and Hot Work Procedures

DANGER

Never weld on any fuel system components. Welding can ignite the fuel, resulting in an explosion or fire causing serious personal injury or death.

NOTICE

If a CNG fuel system component is damaged, do not attempt to repair it. Contact Cummins Clean Fuel Technologies for a replacement part.

NOTICE

If slag or a spark comes in contact with the fuel cylinder, you must take the vehicle out of service and have it inspected by a certified inspector.

If any welding or 'hot work' (i.e., any work that involves burning or use of tools that produce a spark, flame, or source of ignition) is required on a CNG fuel vehicle excluding the CNG Fuel System, you must perform the following procedures:

Fuel Cylinder(s) Within 6 feet from Hot Work:

1. Defuel fuel system Refer to Procedure 042-039 in Section 42.
2. Depressurize the fuel system. Refer to Procedure 042-001 in Section 42.
3. Use a welding blanket to protect the fuel system from slag and sparks produced from welding and hot work operations.

Fuel Cylinder(s) further 6 feet from Hot Work:

1. Conduct work in a well-ventilated area.
2. Shut off every cylinder in the fuel system by turning the 1/4-turn valve clockwise to OFF.
3. Ensure the FMM Manual Shut-Off Valve is in the ON position.
4. Start the vehicle and let it run until the engine stops. Refer to Depressurizing Procedure (042-001)
5. Turn the ignition key OFF and remove the key.
6. Check the gauges on the FMM to ensure all pressure is at ZERO.
7. Slowly relieve excess pressure by turning the bleed valve cap counter-clockwise until a hissing sound is heard. Close the bleed valve when the hissing stops.
8. Use a welding blanket to protect the fuel system from slag and sparks produced from welding and hot work operations.

Lifting Vehicle

Always raise the vehicle using the lifting points recommended by the vehicle manufacturer. Refer to the vehicle manufacturer's instructions for correct lifting instructions.

⚠ WARNING

Never use any part of the fuel system as a lifting point to raise the vehicle. Do not allow fuel system components to come into contact with any part of the lifting device. The fuel system can become damaged, resulting in a leak. Serious personal injury can occur if the gas is ignited.

Towing Vehicle

Before towing the vehicle, close the Manual Shut-Off Valves on the FMM and all fuel cylinders using the Fuel System Shut Down Procedure.

Once the fuel system is shut down, follow the vehicle manufacturer's instructions for towing the vehicle.

⚠ WARNING

Do not attach towing equipment to or allow towing equipment to come into contact with any part of the fuel system. The fuel system can become damaged, resulting in a leak. Serious personal injury can occur if the gas is ignited.

⚠ DANGER

Defuel fuel system if vehicle was involved in a fire to prevent possible cylinder rupture during towing operations.

Definitions

General. The definition contained in this document apply to the terms used in CCFT Manuals, Procedures, Instructions and CCFT fuel System related documents. Where terms are not defined in this document or within other CCFT document, they should be defined using their ordinarily accepted means, within the context in which they are used.

Approved – Acceptable to the authority having jurisdiction.

Authority Having Jurisdiction (AHJ) – An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

Automatic Dispenser - A CNG dispenser which is operated by a member of the general public, and which requires transaction authorization.

Capacity – The water volume of a container in liters (gallons)

Cascade Storage System - Storage in multiple cylinders.

Certificate Holder - An individual:

(A) who has passed the required all criteria for certification and meets all equipment criteria.

(B) who holds a current examination criterion and in good standing with certification issuer.

Certified - An individual who is authorized by Authority Having Jurisdiction (AHJ) to perform the CNG activities covered by the certification issued.

CNG - See “Compressed natural gas” in this section.

CNG Cylinder - A cylinder or other container designed for use or used as part of a CNG system.

CNG System - A system of safety devices, cylinders, piping, fittings, valves, compressors, regulators, dryers, gauges, relief devices, vents, installation fixtures, and other CNG equipment intended for use or used in any building or public place by the general public, or used in conjunction with a motor vehicle or mobile fuel system fueled by CNG, and any system or facilities designed to be used or used in the compression, sale, storage, transportation for delivery, or distribution of CNG in portable CNG cylinders, but does not include natural gas facilities, equipment, or pipelines located upstream of the outlet of the natural gas meter.

Code – A standard that is an extensive compilation of provisions covering board subject matter or that is suitable for adoption into law independently of other codes and standards.

Combustible Material - A material that, in the form in which it is used and under the conditions anticipated, will ignite, burn, support combustion or release flammable vapors when subjected to fire or heat. Wood, paper, rubber, and plastics are examples of combustible materials.

Compressed Natural Gas (CNG)- Natural gas primarily consisting of methane (CH4) in gaseous state that is compressed and used, stored, sold, transported, or distributed for use by or through a CNG system.

Container - A pressure vessel cylinder or cylinders permanently manifolded together used to store CNG.

Composite Container – A container consisting of an inner metal or plastic gas -containing component, reinforced with a filament and resin outer layer.

Cylinder – A container constructed, inspected, and maintained in accordance with DOT and Transport Canada regulations or ANSI NGV 2, Compressed Natural Gas Vehicle (NGV) fuel Container.

Cylinder Valve - A manually operated valve connected directly to a CNG cylinder.

Dispensing Station – A natural gas installation that dispenses CNG for a storage container or a distribution pipeline into vehicular fuel supply containers, portable cylinders, or transportation vehicles by means of a compressor, or pressure booster.

DOT Number – A number assigned by the U.S. Department of Transportation (DOT) to a motor carrier that is required to be marked on all power units of the motor carrier.

Emergency Shutdown Device (ESD) – A device that closes all operations within the fueling facility from either local or remote locations.

Enclosure – A structure that protects equipment from the environment.

Engine Compartment – A space on the vehicle where the engine is hosed.

Fuel Line – The tube or hose on a vehicle, including the related fittings, through which natural gas passes during normal vehicle fueling or operation.

Fuel Supply Cylinder - A cylinder mounted upon a vehicle for storage of CNG as fuel supply to an internal combustion engine.

Fueling Nozzle – A mating device at the refueling station, including shutoff valves, which connects the fueling dispenser hose to the vehicle fuel filling system receptacle for the transfer of gas.

Fueling Receptacle – The mating part of the fueling connector mounted to the vehicle.

Gas Detection System – One or more sensors capable of detecting natural gas at specified concentrations and activating alarms and safety systems.

Ignition Source – Any item or substance capable of an energy release type and magnitude sufficient to ignite any flammable mixture of gases or vapor that could occur at the site or onboard the vehicle.

Installation – the process of attaching CNG fuel system to the vehicle chassis following both fuel system manufactures, and chassis manufactures requirements.

Labeled – Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction (AHJ) and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or material, and by who's labeling the manufacture indicates compliance with appropriate standards or performance in a specified manner.

Licensed - Authorized by the Authority Having Jurisdiction (AHJ) to perform CNG activities through the issuance of a valid license.

Licensee - A person which has applied for and been granted a CNG license by the Authority Having Jurisdiction (AHJ).

Lower Explosive Limit (LEL) - is defined as the lowest concentration (by percentage) of a gas or vapor in the air that is capable of producing a flash.

Mass Transit Vehicle - Any vehicle which is owned or operated by a political subdivision of a state, city, or county and primarily used in the conveyance of the general public.

Maximum Allowable Working Pressure (MAWP) – The maximum pressure to which a component is designed to be subjected when handling fluid or gas over the range of designed temperature.

Maximum Filling Volume – The maximum volume to which a vessel could be filled with a liquid.

Motor Fuel System - A CNG system to supply natural gas as a fuel for an engine used to propel the vehicle.

Motor Vehicle - A self-propelled vehicle licensed for highway use or used on a public highway.

Must - means a legal obligation, Indicates a mandatory requirement.

Natural Gas – Mixture of hydrocarbon gases and vapors consisting principally of methane in gaseous form.

Overpressure – A pressure within a containment structure that exceeds the maximum allowable working pressure of the containment structure, or 1.25 times the service pressure of the CNG vehicle component upstream of the first stage if pressure regulator.

Person - An individual, partnership, firm, joint venture, association, corporation, or any other business entity, a state agency or institution, county, municipality, school district, or other governmental subdivision, or licensee.

Point of Transfer - The point where the fueling connection is made.

Operating Pressure – The varying pressure in a fuel system component during normal use.

Pressure Regulator – A device either adjustable or nonadjustable, for controlling and maintaining within acceptable limits, a uniform outlet pressure.

Pressure Relief Device PRD - A non-reclosing device designed to provide a means of venting excess pressure to prevent rupture of a normally charged cylinder.

Pressure Relief Valve (PRV) a reclosing device that opens to relive pressure at the set pressure.

PRD Pressure – fuel pressure contained in fuel system cylinder(s) and PRD tubes (Red Tubes) and fuel system Pressure Relief Device

Pull-Away - The accidental separation of a hose from a cylinder, container, transfer equipment, or dispensing equipment, which could occur on a cylinder, container, transfer equipment, or dispensing equipment whether or not they are protected by a pull-away or breakaway device.

Qualified Person – A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by virtue of education, training, experience, or other special attributes, possesses expertise regarding a particular subject matter work, or project.

Regulated Pressure – fuel pressure output from the fuel system regulator providing fuel to the engine fuel system regulator tube (Orange Tube).

Service Pressure – The settled pressure of the CNG fuel container in a uniform gas temperature of 21 °C (70 °F) and full gas content. It is the pressure for which the container has been constructed under normal conditions.

Set Pressure – The "start–to–discharge" pressure for which a relief valve is set and marked.

School Bus - A vehicle that is sold or used for purposes that include carrying students to and from school or related events.

Shall – means a legal obligation**,** Indicates a mandatory requirement.

Should - something that is recommended but not mandatory.

Supply Pressure – fuel pressure contained in the fuel system cylinder(s) and all components and supply tubes (Yellow tubes) from cylinder(s) to the input side of the regulator.

Trainee - An individual who has not yet taken and passed an employee-level rules examination.

Transfer System - All piping, fittings, valves, pumps, compressors, meters, hoses, and equipment used in transferring CNG between containers.

Transport - Any vehicle or combination of vehicles and CNG cylinders designed or adapted for use or used principally as a means of moving or delivering CNG from one place to another, including but not limited to any truck, trailer, semitrailer, cargo tank, or other vehicle used in the distribution of CNG.

Ultimate Consumer - The person controlling CNG immediately prior to its ignition.

Upper Explosive Limit (UEL) - The highest concentration of a gas or vapor (percentage by volume in air) above which a flame will not spread in the presence.

Vent Tube – The passage or passages beyond the operating parts of a pressure relief device through which fluid passes to reach the atmosphere.

Working Pressure – The maximum pressure that a vehicle component ca be expected to experience in actual service.

Warranty Procedures

To file a warranty, claim email
warranty@cumminscleanfueltech.com

Warranty information:
https://www.cumminscleantech.com/customer-support/technical-support/warranty-information

Warranty Statement

Any alteration of CCFT CNG fuel system or components will void the warranty. Contact CCFT before performing any modifications to the vehicle's fuel system which may affect coverage.

Parts Information

Cummins Clean Fuel Technologies
1051 Republic Drive, Suite 200
Roanoke, TX 76262
www.CumminsCleanTech.com
Orders@CumminsCleanTech.com
https://parts.cumminscleantech.com/

Service Information

Cummins Clean Fuel Technologies
1051 Republic Dr Ste 200, Roanoke, TX 76262
Phone: (817) 767-6020
service@cumminscleantech.com

Revision	Description	Author	Approved By	Published
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