CLEAN FUEL TECHNOLOGIES™

MECHANICAL INSTALLATION SPECIFICATIONS

SIDE MOUNT

TAILGATE

FMM

BACK OF CAB

ROOF MOUNT

Table of Contents

Legal Disclaimer

Preface

This manual covers CNG Fuel System Installation Specifications Guidelines for all Cummins Clean Fuel Technologies fuel systems. This manual contains installation requirements information for Cummins Clean Fuel Technologies fuel systems and the installation of fuel system to chassis. If not a Cummins Clean Fuel Technologies fuel system. Refer to the original equipment manufacturer (OEM) fuel system manual. Component's location may vary slightly, however the operating and function of the components are the same.

Cummins Clean Fuel Technologies Service Procedures are in Cummins Engine Service Manuals, Section 42 Fuel Deliver System covers all CCFT Fuel Systems on Cummins QuickServe Online. Below are the engine platform manuals.

Cummins Clean Fuel Technologies Installation Procedures can be found on Cummins Clean Fuel Technologies website. https://www.cumminscleantech.com/customer-support/technical-support/installation-documents

Cummins Clean Fuel Technologies Troubleshooting Procedures can be found on Cummins Clean Fuel Technologies website https://www.cumminscleantech.com/customer-support/technical-support/service/troubleshooting

Vehicle Codes, Regulations, and Standards

All components must meet requirements for the year the fuel system was built and installed found in:

- 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

Introduction

This document outlines the installation specifications and procedures for Cummins Clean Fuel Technologies (CCFT) systems. All installations must comply with the latest standards and regulations outlined in **NFPA 52 (2019 edition)**. It is critical to ensure that all components attached to the fuel system meet CCFT standards and comply with applicable regulations.

Important Notes for Installers:

1. **No Modifications Authorized**: Any unauthorized modifications to the fuel system or its components are strictly prohibited. If assistance is required, contact CCFT Engineering for guidance.
2. **Quality Check Requirements**: Upon completion of the installation, all Quality Check sheets must be fully completed and submitted to **Warranty@cumminscleantech.com** for review and documentation.
3. **Compliance with Standards**: All components, including wiring, hoses, and mounts, must be installed in accordance with CCFT guidelines to ensure safety and functionality.

Failure to adhere to these guidelines may result in safety hazards, warranty voidance, or non-compliance with regulatory requirements. Please review this document thoroughly before proceeding with any installation work.

Qualified Personnel

Cummins Clean Fuel Technologies fuel systems MUST be installed, maintained and inspected exclusively by qualified person. All personnel engaged in activities in discharging CNG fuel containers or the inspection, maintenance, repair replacement, removal, or testing of CNG fuel system or its components shall be a qualified person.

NFPA 52 2019, Defines **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.

Safety Warnings

Single Word	Color	Potential Injury or Damage	Likelihood of Occurrence
DANGER	Red Background White Letters	Severe	**WILL** occur if warning is ignored
WARNING	Orange Background Black Letters	Severe	**COULD** occur if warning is ignored
CAUTION	Yellow Background Black Letters	Minor	**MAY** occur if warning is ignored but result will be minor
NOTICE	Blue Background White Letters	None	N/A label is for important instructions **Unrelated** to hazards

DANGER DO NOT attempt to service or remove components attached to the (RED) tubes without following defueling procedures. Failure to do so will result in death, or severe injury and property damage.

DANGER DO NOT attempt to service or remove components attached to the (YELLOW) tubes and (ORANGE) tubes without following depressurizing procedures. Failure to do so will result in death, or severe injury and property damage.

WARNING Batteries can emit explosive gases. To reduce the possibility of personal injury, always ventilate the compartment before servicing the batteries. To reduce the possibility of arcing, remove the negative (-) battery cable first and attach the negative (-) battery cable last.

WARNING Follow company's Lockout Tagout (LOTO) policy to control all hazardous energy sources. Failure to do so could result in death, or severe injury and property damage.

WARNING Failure to follow company's Hot Work policy or NFPA 51B Standard for Fire Prevention During Welding, Cutting, and Other Hot Work. Could result in death, or severe injury and property damage.

WARNING Failure to follow company's Fall Protection policy or OSHA 1926.501 Duty to have fall protection. 1926.502 Fall protection systems criteria and practices. 1926.503 Training requirements. Could result in death, or severe injury and property damage.

WARNING Failure to follow company's PPE policy or OSHA 1910.132 Personal Protective Equipment. Failure to do so could cause injury.

WARNING Always check the temperature of the coolant before working on coolant hoses. Failure to do so could result in injury.

WARNING Never tighten or loosen fitting when under pressure. Could cause injury or damage to the fitting.

WARNING Natural gas is explosive and flammable. Always be sure to maintain adequate ventilation in the work area. Keep all cigarettes, flames, pilot lights, arcing equipment, and switches out of the work area and areas with shared ventilation to reduce the possibility of severe personal injury or death when working on a natural gas system.

Regulatory Symbols

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

CCFT 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

ECE Economic Commission for Europe

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

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

LNG Liquefied Natural Gas

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

SAE Society of Automotive Engineers

SM Side Mount

um one millionth of a meter.

UL Underwriters Laboratories

UV Ultraviolet

“ inch

Installation Requirements

Final-Stage or Intermediate Vehicle Integrator/Manufacturer (FSVIM)

Note: information is the same in NFPA 52 2013 and NFPA 52 2019, however the information in NFPA 52 2019 is in deferent locations.

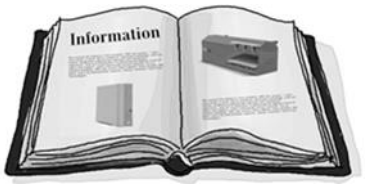
The FSVIM shall have the responsibility for integration of the engine, fuel system, and gaseous detection system, where required, onto the vehicle chassis and for the operation of the vehicle.

The FSVIM shall obtain, when available, documented approval of the chassis original equipment and component manufactures of the onboard fuel and detection system components, proper installation, and application from each of the following.

- Vehicle
- Chassis
- Engine
- Gas Detection
- Fuel System

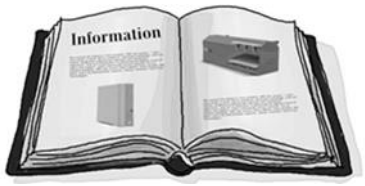
Modifications of a vehicle gaseous fuel system shall conform with, when available, the engineering recommendation of the original specification of the original chassis vehicle manufacturer.

System components shall comply with the applicable provision of Chapter 5 and this section NFPA 52, 2013 or 2019.



Alterations Prohibited

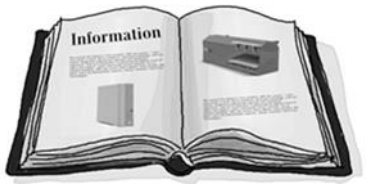
Any alteration, including welding, brazing, or other application of intense heat, to the CNG fuel container or to the components while attached to the CNG fuel container (e.g., valve, bracket, tubing, piping) shall be prohibited.



CNG Components Requirements

Fuel - carrying components, with exception of, container valve, tubing, and fittings, shall be labeled or stamped with the following:

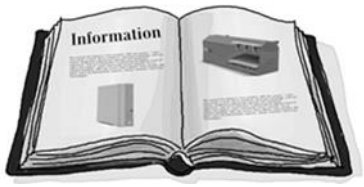
1. Manufacturers name or symbol
2. Model designation
3. Design service pressure
4. Direction of fuel flow where necessary for correct installation
5. Capacity or electrical rating, as applicable



Components Minimum Temperature Range

Components in the **engine** compartment shall be designed or selected for a minimum temperature range of -40 °F to 248 °F (-40°C to 120 **°C**).

All **other components** shall be designed or selected for service for a minimum temperature range of -40 °F to 185 °F (-40°C to 85 **°C**).



Installation of Electrical Wiring

Wiring shall be secured and protected from abrasion and corrosion to the same standard as the original wiring on the vehicle.

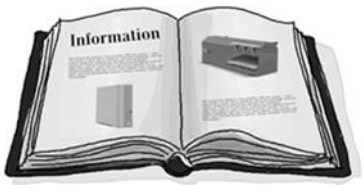
All wiring shall be sized according to the Society of Automotive Engineers (SAE) and fuse protected with a 10-amp fuse.

If rubber boot is still on the chassis wiring harness remove it to prevent moisture damage to the connector pins. Route wiring harness in a manner to prevent moisture running down harness and collecting in wiring harness connectors or entering cab.

Route and secure chassis wiring harness in a manner to prevent strain on the harness wires and connectors.

Chassis wiring harness passing through a panel should be protected by grommets or similar devices that shall snugly fit the piping or tubing and the hole in the panel or structural member.

Do not route chassis wiring harness on or near sharp edges or near moving parts. Use edge protector when necessary.



Keep chassis wiring harness away from heat sources. Where necessary use heat protective covering. Do not attach chassis wiring harness to Main Battery Cable, Regulated Fuel Hose, or CNG tubes, or Coolant hoses. Wiring shall be secured and protected from abrasion and corrosion to the same standard as the original wiring on the vehicle. Minimum wiring harness must be secured at least every 21 to 27 inches with cable ties or P clamps.	

CCFT Chassis Wiring Harness Part Number

All CCFT wiring harness has a part number. Part numbers are located on the end by the harness main connector.
Wiring harness wire diagrams can be found on the CCFT web page Customer Support/Technical Support/Wiring Diagrams

https://www.cumminscleantech.com/customer-support/technical-support/wiring-diagrams

Refer to OEM Chassis Harness Installation

Fuel System Attaching Requirements

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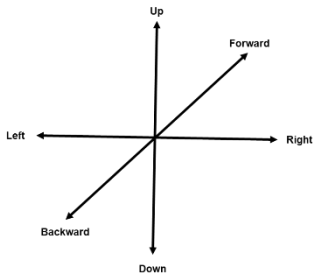
Each fuel supply container rack shall be secured to the vehicle body, bed, or frame to prevent damage from road hazards, slippage, loosening, or rotation using a method capable of withstanding a static force in the six principal directions of eight times the weight of a fully pressurized container.



Ground Clearance

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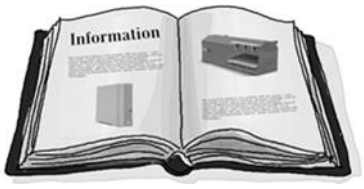
The fuel system, including containers, shall be installed with as much road clearance as practical.

This minimum clearance shall be measured from the road to the container, its housing, or its fittings, whichever is lowest, and shall not, with the vehicle loaded to it gross weight rating, allow any component to touch the road surface in the event of a flat tire or the removal of any tire.

Off road vocational vehicle should have a minimum clearance to safely operate on off road terrain.



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Roof Mount Fuel System

Where the fuel supply container is roof mounted or installed above the operator or passenger compartment of a vehicle, the following requirements shall apply:

1. The fuel supply container and its piping, fittings and valves shall be protected from damage by the following:
2. A guard rail or similar device that is designed to absorb the impact of a collision with a stationary object when the vehicle is moving either forward or backward at 5 mph/hr. (8km/hr.)
3. A shield designed to absorb impacts that can occur during loading, unloading, or use of the vehicle.
4. 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.
5. The cylinder shall be protected from accidental contact with overhead electrical wiring by metallic or nonmetallic covers.
6. The guard 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.

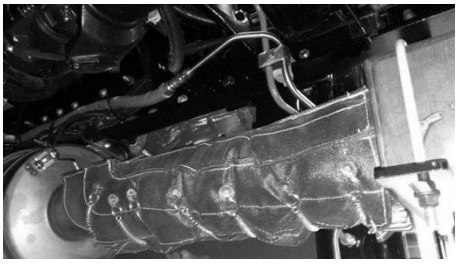
Vehicles with roof mounted CNG fuel containers shall include a permanent label in the driver's compartment, clearly visible to a seated operator, which includes the maximum total height of the unladen vehicle.

Heat Shielding

Fuel supply containers located less than 8 in, (200mm) from the exhaust system shall be shielded against direct heat.

Fuel supply containers shall be shielded against direct heat from any vehicle or cargo related source that would result in normal operating container or PRD surface temperatures exceeding 185°F (85°C)

?Non-pressurized PRD vent lines?



CNG Labeling and Auxiliary Fueling Connection

The labels for Class 6 Vehicles and greater shall be a minimum of 5.7 in. x 4.2 in. high (145mm x 107mm)

The marking the label shall consist of a boarder and the letters “CNG” [1.2 in. (30 mm) minimum height centered in the diamond] of silver or white reflective luminous material on a blue background.

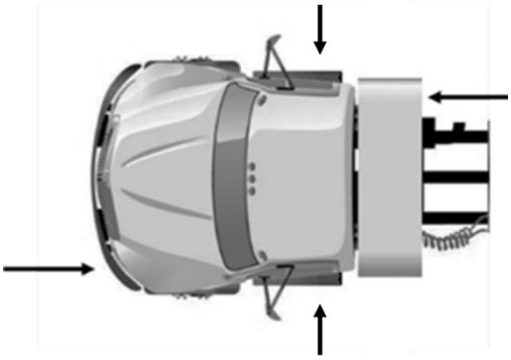
CNG Diamond Label should be placed 1 on vertical surface or near-vertical sure on the lower right rear of the vehicle other than in the bumper of the vehicle, 1 on the driver side of the power unit, and 1 on the passenger side of the power unit and 1 on the lower left front near the front bumper fill if equipped.

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 side of the power unit.

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.
NFPA 52 2019 defines 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.

Label(s) located at each auxiliary fueling connection receptacle shall include the following:

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



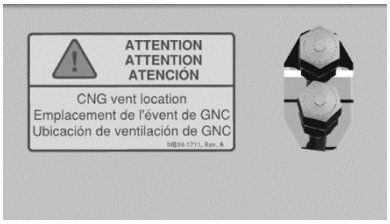
Labeling PRD(s) Vent Location

A label shall indicate the PRD(s) vent location(s) with the following language.

ATTENTION CNG Vent Location

Each safety sign shall be 3 in tall by 5 in wide and shall use 18-point sans serif font for the message text.

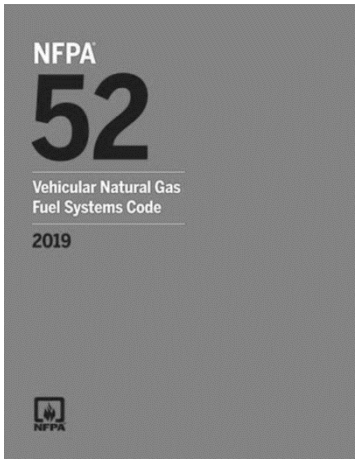
One safety sign shall be located near each vent location.



Labeling CNG Vehicle

A vehicle equipped with a CNG fuel system shall bear the following permanent labels:

1. A label(s) readily visible and located in the engine compartment shall include the following:
   a) Identification as a CNG fueled vehicle.
   b) System designed and installed in conformance with NFPA 52-XXXX (insert the edition year of the code).
   c) Service Pressure
   d) Installer/converters name or company and contact information) i.e., address, telephone number, and email).
2. A label(s) located at the primary fueling connection receptacle shall include the following:
   a) Identification as a CNG fueled vehicle.
   b) System service pressure
   c) Fuel container life expiration (insert date) for limited life fuel containers. This label item is not required for containers with unlimited life.
   d) Fuel containers are to be inspected by (insert date) and each (insert number) months thereafter.



Hose and Hose Connection (Vent and Regulated Hose)

Hose and metallic hose shall be constructed of or lined with materials that are resistant to corrosion and exposure to natural gas.

Hose, metallic hose, flexible metal hose, tubing and their connections shall be designed or selected for the most severe pressure and temperatures under normal operating conditions, with a burst pressure of at least **4 times** the service pressure.

Prior to use, hose assemblies shall be tested by the OEM or its designated representative at a pressure a least **TWICE** the service pressure.

Vent Hose shall have a burst pressure of at least 1.5 times the pressure in the vent that will result from activation of the PRD.

Hose and metallic hose shall be distinctly marked by the OEM or component manufacturer, either by the manufacturers permanently attached tag or by distinct markings indicating the manufacturers name and trademark, applicable service identifier, and design pressure.

Vent Hose shall be electrically conductive.

Hose shall be secured at intervals in such a manner as to minimize the possibility of damage the possibility of damage, corrosion, breakage, or dislocation due to gas flow forces during venting, expansion, contraction, vibration, strain, or wear and to preclude and loosening wile in operation. At least a minimum of 21 to 27 inches.

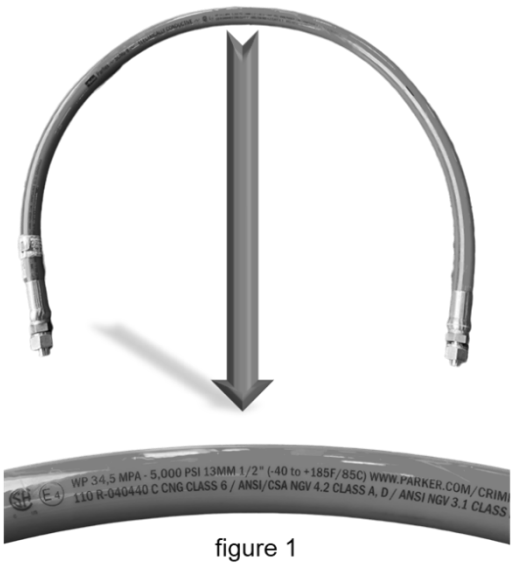


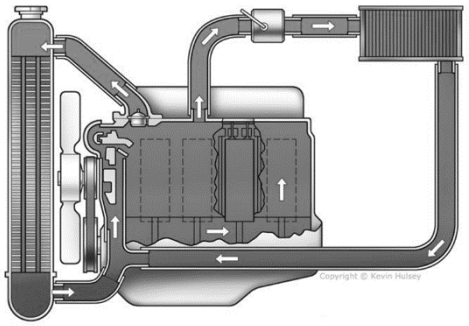
figure 1

Coolant Flow

Some chassis will have the coolant hoses routed back to the area where the fuel system will be installed.
Hoses will be connected with a union fitting to control coolant flow until fuel system is installed.

If coolant hoses are not installed on chassis the tech must install and connect hose to the engine.

Ensure one hose is connected to the high side (hot) of the engine and the other hose is connected to the low side (cool) of the engine. This will allow coolant to circulate through the regulator.



Tube Labeling

Supply Pressure tubing should be labeled with CNG High Pressure Shrink Tubing (Yellow), recommended every 21 – 27 inches figure 1.

Regulated Pressure tubing should be labeled CNG Low Pressure 150 PSI (Orange), recommended every 21 – 27 inches figure 2.

PRD Vent tubing should be labeled PRD VENT (Blue), recommended every 21 – 27 inches figure 3.

Figure 1

Figure 2

Figure 3

Area Intentionally left blank.

Tubing and Fittings

Natural Gas Piping shall be fabricated and tested in accordance with ANSI NGV 3.1/CSA 12.3 *Fuel System Components for Compressed Natural Gas-Powered Vehicle.*

The following components shall **NOT** be used for CNG service:

1. Fitting, street els and other piping components of cast irons other than those complying with ASTM A47, *Standard and Specification for Malleable Iron Casting (Grade 35018), ASTM A395Standard Specification for ferritic Ductile Iron Pressure Retaining Casting for use at Elevated Temperatures, and ASTM A536 Standard Specification for Ductile Iron Casting (Grade 60-40-18).*
2. Plastic pie, tubing, and fitting for high-pressure service.
3. Galvanized pipe and fittings
4. Aluminum pipe, tubing and fittings.
5. Pipe nipples for the initial connection to a container.
6. Copper alloy with copper content exceeding 70 percent.

Piping and fitting shall be clear and free from cutting or threading burrs and scales.

The ends of all piping shall be reamed and deburred.

Piping and tubing passing through a panel or structural member shall be protected by grommets or similar devices that shall snugly fit the piping or tubing and the hole in the panel or structural member.

Fuel lines shall have clearance from the engine exhaust system to protect the fuel lines from excessive by durable and effective means.

Fuel lines shall be mounted, braced and supported to minimize vibration. Minimum must be secured at least every 21 to 27 inches with tube clamps or P clamps.

Fuel lines shall be protected against damage, corrosion, or breakage due to strain or wear.

A bend in piping or tubing shall be prohibited where such a bend weakens the piping or tubing.

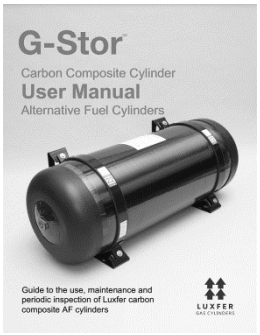
Joints or connections on piping shall be installed in an accessible location.

Initial Filling

Refer to G-Stor™ Pro Carbon Composite Cylinder User Manual Alternative Fuel Cylinders Guide to the use, maintenance and periodic inspection of Luxfer carbon composite AF cylinders.

https://www.luxfercylinders.com/support-item/g-stor-carbon-composite-cylinder-user-manual-alter/

Section 5.0 Fueling (filling) and defueling (evacuating) cylinders

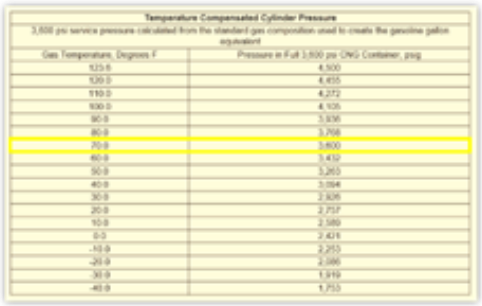


Leak Testing

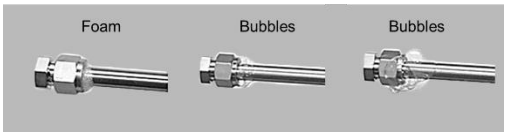
Leak testing must be completed under working pressure of 3600 psi upon installation. Regulated tubing and hose must be leak tested at 80 psi.

Leak test using approved solution resulting in bubbling or foaming at the leak point.

Give the solution 3 minutes under working pressure (3600 psi). Small leaks may appear as foam and no bubbles.



Temperature compensated equivalent to 3600 psi at 70°F.

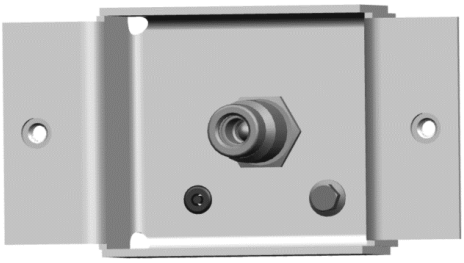


Bumper Fill (Remote Fill) Receptacle

The Bumper Fill connection receptacle shall be mounted to withstand the breakaway force not greater than 150 lb. (68 kg) when applied in any direction that the vehicle would move.

The receptacle shall be installed in accordance with the manufacturer's instructions.

The clearance around the receptacle shall be free of interference that prevents the connection of the fueling nozzle.



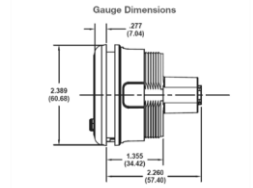
Digital Fuel Gauge

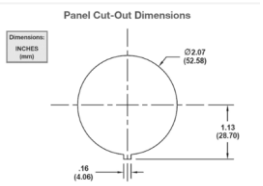
- 106 X 56-pixel graphic LC display
- 3-button user interface, Fuel Level, Fuel Pressure, and Miles to Empty
- Dead-fronted LED warning indicator (red, amber or green)
- Sealed to IP67 specifications, front and rear.
- 9 to 32-volt operation
- J1939 (CAN) data bus input
- Switch-to-ground, 500-mA output.
- Optional analog input
- Backlit LC display and switches
- Variable backlight control (Blue Wire)
- Data stored in non-volatile memory.
- RoHS compliant (No hazardous substance)

Digital Fuel Gauge Dash Mounting

Install in OEM provide panel hole or cut 2 1/8-inch hole in the panel at a location that will be visible to the operator.
Verify digital gauge orientation is correct and secure gauge to panel with bezel.

Hand tight bezel on gauge to hold gauge orientation, during normal vehicle operation.





Digital Fuel Gauge Wiring

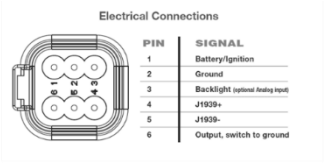
Six PIN connector on back of digital fuel gauge.
Yellow J1939 + Fuel System Chassis Wiring Harness

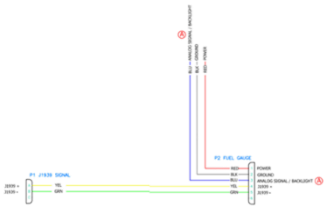
Green J1939 – Fuel System Chassis Wiring Harness

Black Chassis Ground

Red Chassis Key ON Power

Blue Analog Signal/Backlight *Not always used.*





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Min and Max Pressure

CCFT Fuel System Minimum and Maximum Pressures

All Minimum and Maximum Pressures are at 70 degree Fahrenheit. A full container, defined as one in which the gas pressure is 3,600 psi at 70° F, will have a pressure of only 1,753 psi at -40° F and a pressure of 4,272 psi at 110° F. **Refer to Temperature Compensated Cylinder Pressure Chart**

Fuel System Minimum and Maximum Pressures			
Minimum Tank to Regulator	250 psi	(1724 kPa)	(17 bar)
Maximum Service Pressure	3600 psi	(24821 kPa)	(248 bar)
Maximum Fueling Pressure	4500 psi	(31026 kPa)	(310 bar)
Maximum Tank Pressure	4500 psi	(31026 kPa)	(310 bar)
Minimum Burst Pressure	8100 psi	(55848 kPa)	(558 bar)

Tubing	All tubing must be Seamless Stainless Steel, Type 316 with .065 Wall Thickness with a minimum working pressure of 5000 psi.
RED	Red Tubing indicates Tank/PRD Pressure, current pressure in the fuel tank 0 to 3600 psi. Fuel System MUST be defueled to release the pressure.
YELLOW	Yellow Tubing indicates Supply Pressure, working pressure withing the fuel management components 0 to 3600 psi. Fuel System MUST be depressurized to release the pressure.
ORANGE	Orange Tubing indicates Regulated Pressure from the regulator to the engine 80 to 125 psi. Fuel System MUST be depressurized to release the pressure.
STAINLESS	All bare Stainless Steel Tubing indicates Vent Line, 0 psi during normal operations. Could be subject to pressures up to 3600 psi due to PRD activation or regulator failure.
Fittings	All high-pressure fitting must meet a minimum construction of Type 316 Stainless Steel with a minimum burst pressure of 5,000 psi. All high-pressure fittings MUST be leaked checked at full service pressure of 3600 psi.
Regulator	Regulator reduces the CNG pressure from 3,600 PSI to minimum 80 to 125 PSI for introduction into the engine. To perform correctly regulator needs to receive 250 psi.

CLEAN FUEL TECHNOLOGIES

1051 Republic Drive, Suite 200 | Roanoke, TX 76262 | Direct: 817-767-6020 | Toll Free: 844-CNG-TANK

Fuel System Installation Final QC Inspection

Instructions: Within 15 days email completed Fuel System Installation Final QC Inspection Form to warranty@cumminscleantech.com

Customer Name: _____ Date:_____

Make and Model: _____ Vin: _____

Installer Company Name: _____ Techs Name: _____

Installer Location: _____

CCFT Fuel System Serial Numbers (All Systems, Including ***FMM, LH Sidemount, RH Sidemount, Back of Cab,Tailgate System, Roof Mount System***)

_____ _____ _____

- ☐ Incoming inspection was completed, and any damages, issues, or concerns were documented, including pictures, and sent to Cummins Clean Fuel Technologies.
- ☐ Verify all mounting hardware used are either Grade 8 SAE or Class 10.9 Metric, are properly torqued, and have at least two full threads protruding past nut. Verify adequate clearance to all chassis components keeping in mind the truck and system will be moving and flexing during operation.
- ☐ Verify all external tubing carrying fuel under normal operating conditions, including all service tubing, must have at least 8" clearance from exhaust or adequately heat shielded. Service tubing and high pressure hoses will require heat sleeves within 8" of exhaust.
- ☐ Verify all tubing is routed appropriately and secured at least every 21"-27". Note that no tubing should be secured directly to battery cables.
- ☐ Verify all wiring harnesses are correctly installed and secure.
- ☐ Verify full system leak test has been completed at full system service pressure after installation is completed.
- ☐ Verify both digital fuel gauge and chassis OEM fuel gauges are working correctly. Fuel Pressure, Fuel Level, and Miles to Empty must all be functioning. Note if Miles to Empty is displaying 0 with pressure in the system, the fuel system is most likely not communicating with engine over J1939.

- ☐ Verify Start Interrupt is working correctly and does not allow the engine to crank with any of the fuel doors open or rubber kill caps not installed. Also verify Fuel Door Open message appears in dash when any of the fuel doors are open or kill caps are not installed.
- ☐ Verify coolant Regulator gets hot when the engine is running and up to temperature. Road test vehicle and verify there are no engine faults or messages dealing with the fuel system during road test.
- ☐ Verify no coolant leaks after road test while coolant is warm, and when engine is run at high idle.
- ☐ Verify all high-pressure flex hoses are maximum 48" long and have heat sleeve installed over them.
- ☐ Verify that no CNG system components are secured to battery cables. Verify low pressure outlet setting of regulator is 80 psi at 3600 psi system pressure with the engine idling and coolant warm.
- ☐ Verify all engine fault codes have been cleared, bodybuilder label attached to door-jam, and fuse box marked for which fuse is used.
- ☐ Verify installer has filled out label requiring installer name, full system water volume, and next inspection date label has been punched out.
- ☐ Verify required intermediate or final vehicle manufacture label has been applied to door jamb.

Notes and Comments:

_____

_____

_____

QC Inspector's Name: _____

QC Inspector's Signature: _____

Back Of Cab Installation

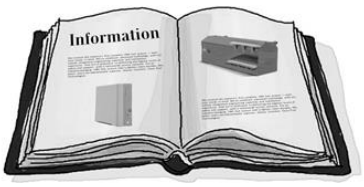
BACK OF CAB SYSTEM

General Information

Back of Cab Fuel Systems with Integrated Fuel Management Module FMM

Required Connections:
Frame Bracket
Electrical
Engine Coolant
Aux Fill
Regulated Pressure (Fuel to Engine)
Aux Tank

Frame layout Appendix A



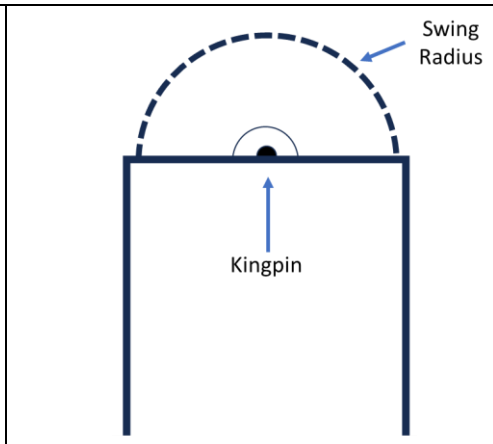
Fuel Capacity (DGE)	65N DGE	80N DGE	95N DGE	135N DGE	175N DGE
Cylinder Size	16" diameter	16" diameter	22" diameter	27" diameter	27" diameter
Water Volume in Liters	823	1062	1262	1737	2316
Dimensions (in inches)	74.56H x 19.63D x 90.37W	92.56H x 19.63D x 90.37W	74.06H x 26.09D x 96.44W	87H x 29.09D x 91.09W	115H x 29.89D x 91.09W
System Weight In Pounds (Empty/Full)	1400/1800	1900/2400	1850/2450	2038/2875	2472/3557

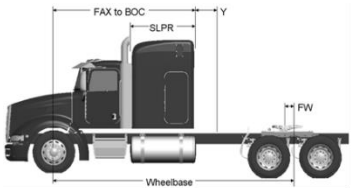
Swing Clearance

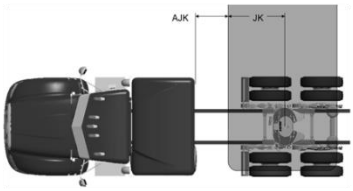
Verify cab clearance before laying out frame for Back of Cab.

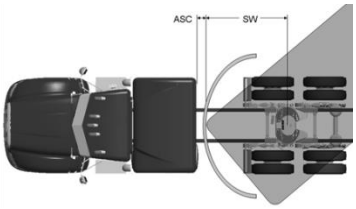
Distant from the fifth wheel most forward position, (-) minus the distant from trailer king pin to the corners of the trailer.

10" Recommended for high roof sleeper w/o BOS exhaust or CNG BOC cabinet.
7" for low roof sleeper or daycab.
4" Recommended minimum jackknife clearance.









To calculate swing clearance, Input and Select values in Calculator Spreadsheet above.
The calculator includes jackknife clearance and trailer gap.

Trailer Gap = Distance from back wall of cab/sleeper to front of trailer (back of CNG box)
Decreased trailer gap improves aerodynamics resulting in a potential increase in fuel economy. A gap of 42" or less is desirable.

ASC = Available Swing Clearance = CA - SLPR - FW - Y - SW - DC (recommended)

CA = Cab to Axle (from spec)

SLPR = Sleeper Size + Sleeper Interconnect Boot (See Lookup Values tab on Databook Swing Clearance - Jackknife Spreadsheet)

FW = Fifth wheel slide length +/- fifth wheel setting

Y = Any above the rail BOC/BOS mounted option (See Lookup Values tab on Databook Swing Clearance - Jackknife Spreadsheet)

SW = Trailer Swing calculation -Kingpin setting, trailer width, corner radius

DC = Recommended minimum dip clearance is 10” for high roof sleeper or CNG BOC/BOS Cabinet w/o BOS exhaust and 7” for low roof sleeper or non-sleeper.

Cab Clearance

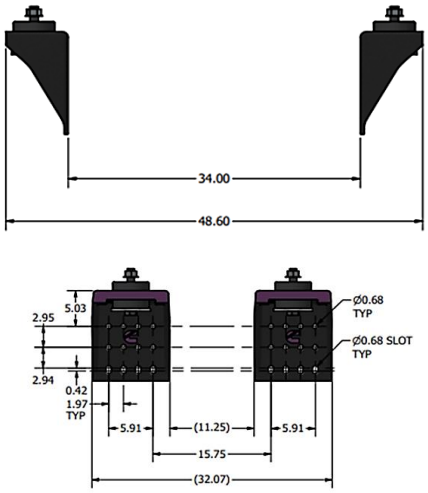
Day Cab – Minimum 6 inches with cab air bag fully extended.

Sleeper Cab – Minimum 8 inches with cab air bag fully extended.

Maximum Cab Clearance will be taken into consideration depending on swing clearance.

Frame Layout and Prep

Frame layout Appendix A

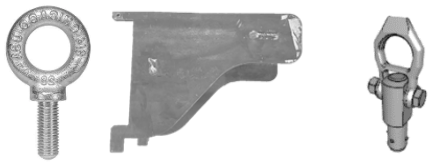


Lifting Equipment

Lifting Eye

CCFT Lifting Bracket

Push Pin Quick Release



Lifting Eye

Screw in the two Lifting Eyes completely.

Type: Lifting Eyebolt with shoulder
Thread: ½”-13
Shank Length: Min: 1½” Max: 3”
Vertical Lifting Capacity: ≥ 2600 lbs.
Must be lifted with a spreader bar. Cannot use a sling to the center.

Use a spreader bar with a minimum length of 78-inch weight rating of 3,000 lbs.

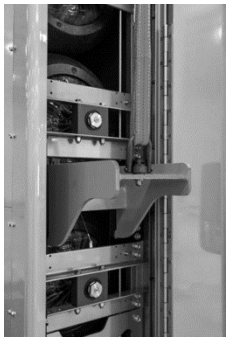
CCFT Lifting Bracket

Insert lifting mounts bottom studs first, roll mount upwards to insert the studs till stops encounter lifting plate.

Insert quick disconnect pin. The weight of the unit will hold the mounts in place.

Attached a lifting strap to the hooks on the lifting bracket. Weight rating 3000 lbs. with a 1 ½ TON hook.

Use a spreader bar with a minimum length of 78-inch (6-foot 6-inch) weight rating of 1.25 TON.



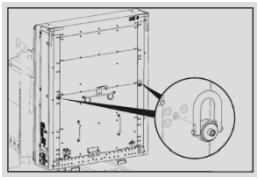
Push PIN

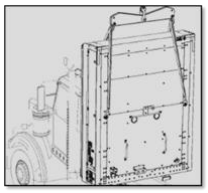
Install the four push pins into the holes in the fuel system. 2 in the front and 2 in the back.

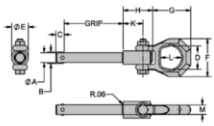
Two sizes of Push Pin ¾ inch and 1 inch used to lift CCFT Back of Cab Fuel System

Use cushion to protect the paint when lifting the fuel system.
Attached four lifting straps to all four hooks. Weight rating 3000 lbs. with a 1 ½ TON hook.

Use a spreader bar with a minimum length of 78-inch weight rating of 1.25 TON



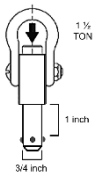




Part Specifications

Part Number	A DIA NOMINAL	A DIA ACTUAL	GRIP LENGTH +.024/-.000	B	C ±.04	D	E DIA	F	G	H	K	L	M
CL-16-LFPM-1.00-S	1	.9970/.9985	1.00	1.22	.82	1.42	1.38	2.21	2.29	2.20	1.44	1.29	.43

Push Pin Quick Release 2-inch Loop
1 1/2 TON weight rating 3/4 PIN.



Removing From Shipping Frame

After Installing lifting mounts, attach sling to hook eyes. Sling rating must be 3000 lbs.

Put tension on the sling to control the Fuel System for bolt removal.

Remove the 5/8-inch bolts. Lift Fuel System till it is free of shipping frame.

DO NOT use bolts from shipping frame to attach Fuel System to truck frame.

Placing Back of Cab on Chassis

Lower the fuel system unit onto the frame of the truck.

Use the weight of the fuel system to push the fuel system brackets down the side of the frame.

Align the mounting bolt holes using an alignment bar.

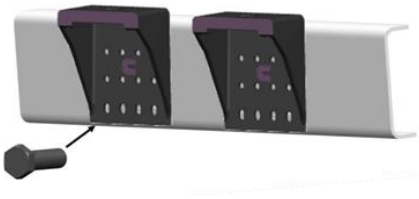
Attaching Back of Cab

Fasten mounting bracket to frame with 8 Black Oxide 5/8 bolts and Hex Flange nuts.

Black Oxide 5/8-inch bolt with a length long enough to have 2 full threads past the nut after torquing.

Torque Value 200 to 230 ft-lb

175 DGE 8 bolts per bracket
135 DGE 8 bolts per 2 brackets and 7 per 2 brackets
90 DGE 6 bolts per bracket



Regulated Pressure (Fuel to Engine) Connection

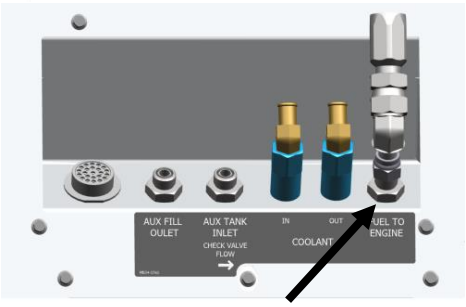
Attach the regulated low-pressure hose to the CCFT fuel system and to the CNG fuel filter within the engine compartment.

Torque Value: 108 N•m [80 ft-lb]

All hoses must be enclosed in split loom or other protective sleeve. Do not route hoses on or near sharp edges or near moving parts. Use edge protector when necessary. Keep hoses away from heat sources. Where necessary use heat protective covering for the hose.

Hose must be mounted, braced, and supported to minimize vibration, and shall be protected against damage, corrosion, or breakage due to strain or wear. Hose shall be supported at least every 21 to 27 inches.

Do not attach hoses to main battery cables.



Chassis Wiring Harness Connection

Connect the chassis wiring harness to the bulkhead connector on the fuel system.

If rubber boot is still on the chassis wiring harness remove it to prevent moisture damage to the connector pins. Route wiring harness in a manner to prevent moisture running down harness and collecting in wiring harness connectors or entering cab.

Route and secure chassis wiring harness in a manner to prevent strain on the harness wires and connectors.

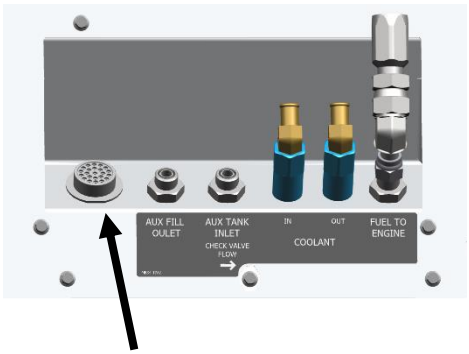
Chassis wiring harness passing through a panel should be protected by grommets or similar devices that shall snugly fit the piping or tubing and the hole in the panel or structural member.

Do not route chassis wiring harness on or near sharp edges or near moving parts. Use edge protector when necessary.

Keep chassis wiring harness away from heat sources. Where necessary use heat protective covering.

Do not attach chassis wiring harness to Main Battery Cable, Regulated Fuel Hose, or CNG tubes, or Coolant hoses.

Wiring shall be secured and protected from abrasion and corrosion to the same standard as the original wiring on the vehicle. Minimum wiring harness must be secured at least every 21 to 27 inches with cable ties or P clamps.



Coolant Hoses and Connections

Do not install in-line valve on coolant hose connection.

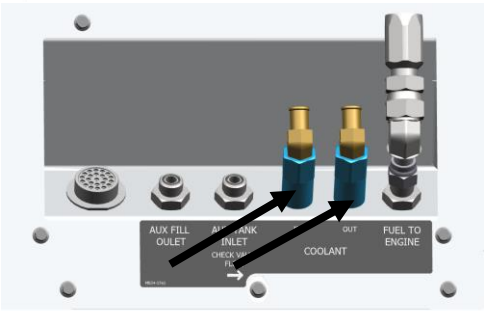
Physical Characteristics: Must meet SAE J20R3 HT Class A, Temperature: -65°F to 350°F.

All hoses must be enclosed in split loom or other protective sleeve. Do not route hoses on or near sharp edges or near moving parts. Use edge protector when necessary. Keep hoses away from heat sources. Where necessary use heat protective covering for the hose.

Do not attach hoses to main battery cables.

Hoses shall be secured and protected from abrasion to the same standard as the original wiring on the vehicle. Minimum hoses must be secured at least every 21 to 27 inches with cable ties or P clamps.

Use a Heavy-Duty Worm Drive Clamp - **Lined**



Aux Fill Outlet Connection (if equipped)

The Aux Fill connection may act as the fueling port when connected to another fuel system that is acting as the primary fuel system. If not used, this connection will be capped.

O-Ring Face Seal Fitting

Inspect the O-rings. Verify O-rings are free from dirt and damage.

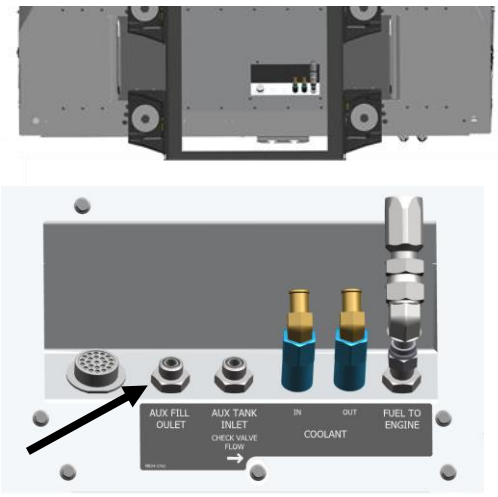
Lubricate the O-rings. Use a silicone-based O-ring. lubricant.

Install the tubing. Tighten tube nuts finger tight.

Torque Value:
3/8 Tube Nut 41 N•m [30 ft-lb]

Torque Value:
1/2 Tube Nut 54 N•m [40 ft-lb]

Tubes must be secured a minimum of 21 to 27 inches, using P clamps.



Aux Tank Inlet Connection (if equipped)

The Aux Fill connection may act as the fueling port when connected to another fuel system that is acting as the primary fuel system. If not used, this connection will be capped.

O-Ring Face Seal Fitting

Inspect the O-rings. Verify O-rings are free from dirt and damage.

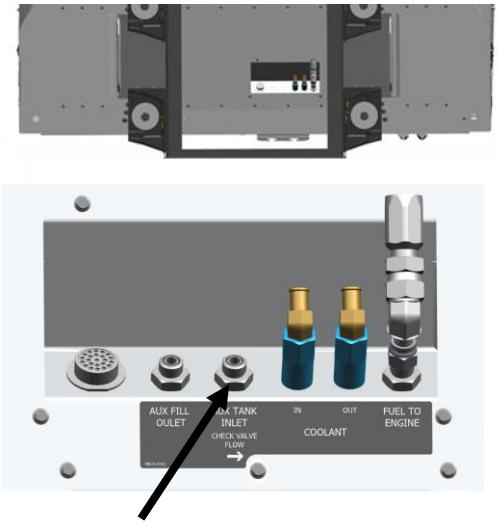
Lubricate the O-rings. Use a silicone-based O-ring. lubricant.

Install the tubing. Tighten tube nuts finger tight.

Torque Value:
3/8 Tube Nut 41 N•m [30 ft-lb]

Torque Value:
1/2 Tube Nut 54 N•m [40 ft-lb]

Tubes must be secured a minimum of 21 to 27 inches, using P clamps.



Side Mount Installation

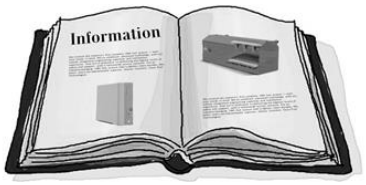
SIDE MOUNT

General Information

Side Mount Fuel Systems with Integrated Fuel Management Module FMM

Required Connections:
Frame Bracket
Electrical
Engine Coolant
Aux Fill
Regulated Pressure (Fuel to Engine)
Aux Tank
Vent Line

Frame layout Appendix B



Fuel Capacity (DGE)	30 DGE	32 DGE	40 DGE	50 DGE	55 DGE	60 DGE
Cylinder Size	26" diameter	22" diameter	26" diameter	26" diameter	22" diameter	26" diameter
Water Volume in Liters	398	425	531	664	730	797
Dimensions (in inches)	29W x 31H x 70.5L	25W x 29H x 97L	29W x 31H x 70.5L	29W x 31H x 90.5L	25W x 31H x 100L	29W x 31H x 119L
System Weight In Pounds (Empty/Full)	585/765	700/900	700/950	725/1025	900/1250	875/1275

Ground Clearance

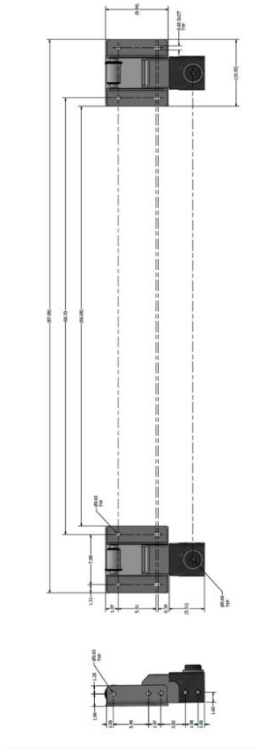
The fuel system, including containers, shall be installed with as much road clearance as practical.

This minimum clearance shall be measured from the road to the container, its housing, or its fittings, whichever is lowest, and shall not, with the vehicle loaded to it gross weight rating, allow any component to touch the road surface in the event of a flat tire or the removal of any tire.

Off road vocational vehicle should have a minimum clearance to safely operate on off road terrain.

Frame Layout and Prep

Frame layout Appendix B



Frame Bracket and V-Notch

Side Mount Fuel System can be installed using a U bracket or L bracket. Both brackets are slightly bents outwards to allow room the hang the side mount and tighten when the bracket bolts are torqued.

Use Black Oxide 5/8-inch bolt with a length long enough to have 2 full threads past the nut after torquing.

Torque Value 200 to 230 ft-lb

Stiffing plates are available if need per frame requirements.

U bracket and L bracket both have a V-Notch that the swing arm PIN sets in for easy installation.

Side Mount Lifting

Forklift: Position forks even with the back cabinet of the fuel system. This will prevent forks from hitting equipment on the truck. Lift and tilt forward so the swing arm bushing pins rotate towards frame. Then lower fuel system into the V-notch bracket on the frame.

Cart with hydraulic Lift: The use of a 2x4 block under the outboard bottom edge of the fuel system to tilt the system inward towards the frame. This will allow the swing arm bushing pins to rotate forward, so the swing arm bushing pins rotate towards frame. then lower fuel system into the V-notch bracket on the frame.

Side Mount Hanging

Position the fuel system swing arm bushing pins above the V-Notches on the frame U bracket or L bracket for both the front and back of the fuel system.

Always check clearance between the fuel system and cab, and equipment behind the fuel system.

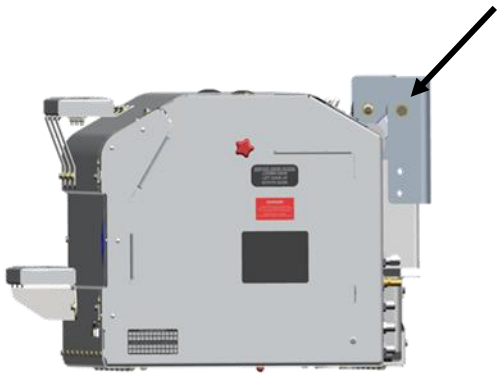
Bushing Pin Bolt

Lower the fuel system down until the bushing pins comes in rest in the V notches on the bracket.

With the weight of the fuel system supported by a forklift or cart with hydraulic lift system make small adjustment to install the top 9/16 X 6.5 bolt on both the front and rear brackets.

Install the top 9/16 X 6.5-inch bolt on both the front and rear brackets.

Install washer and nut loosely to prevent the bolt from sliding out.



Connecting to Frame Bracket

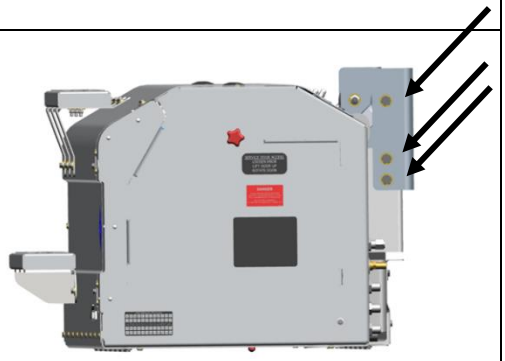
Lower the fuel system to align the bottom cap screw holes to the swing arm bracket.

Install the cap screws on the front and back of the fuel system hand tight.

Lower the fuel system completely.

Tighten all cap screws.

Torque Value: 150 N•m [110 ft-lb]



Coolant Hose Connections

Do not install in-line valve on coolant hose connection.

Physical Characteristics: Must meet SAE J20R3 HT Class A, Temperature: -65°F to 350°F.

All hoses must be enclosed in split loom or other protective sleeve. Do not route hoses on or near sharp edges or near moving parts. Use edge protector when necessary. Keep hoses away from heat sources. Where necessary use heat protective covering for the hose.

Do not attach hoses to main battery cables.

Hoses shall be secured and protected from abrasion to the same standard as the original wiring on the vehicle. Minimum hoses must be secured at least every 21 to 27 inches with cable ties or P clamps.

Use a Heavy-Duty Worm Drive Clamp - **Lined**

Electrical Connection

Connect the chassis wiring harness to the bulkhead connector on the fuel system.

If rubber boot is still on the chassis wiring harness remove it to prevent moisture damage to the connector pins. Route wiring harness in a manner to prevent moisture running down harness and collecting in wiring harness connectors or entering cab.

Connect the chassis wiring harness to the bulkhead connector on the fuel system.

If rubber boot is still on the chassis wiring harness remove it to prevent moisture damage to the connector pins. Route wiring harness in a manner to prevent moisture running down harness and collecting in wiring harness connectors or entering cab.

Route and secure chassis wiring harness in a manner to prevent strain on the harness wires and connectors.

Chassis wiring harness passing through a panel should be protected by grommets or similar devices that shall snugly fit the piping or tubing and the hole in the panel or structural member.

Do not route chassis wiring harness on or near sharp edges or near moving parts. Use edge protector when necessary.

Keep chassis wiring harness away from heat sources. Where necessary use heat protective covering.

Do not attach chassis wiring harness to Main Battery Cable, Regulated Fuel Hose, or CNG tubes, or Coolant hoses.

Chassis wiring harness must be secured at least every 21 to 27 inches with cable ties or P clamps.
Do not route chassis wiring harness on or near sharp edges or near moving parts. Use edge protector when necessary.

Keep chassis wiring harness away from heat sources. Where necessary use heat protective covering.

Do not attach chassis wiring harness to Main Battery Cable, Regulated Fuel Hose, or CNG tubes, or Coolant hoses.

Wiring shall be secured and protected from abrasion and corrosion to the same standard as the original wiring on the vehicle. Minimum wiring harness must be secured at least every 21 to 27 inches with cable ties or P clamps.

Aux Fill Connection (if equipped)

O-Ring Face Seal Fitting

Inspect the O-rings. Verify O-rings are free from dirt and damage.

Lubricate the O-rings. Use a silicone-based O-ring. lubricant.

Install the tubing. Tighten tube nuts finger tight.

Torque Value:
3/8 Tube Nut 41 N•m [30 ft-lb]

Torque Value:
1/2 Tube Nut 54 N•m [40 ft-lb]

Tubes must be secured a minimum of 21 to 27 inches, using P clamps.

Regulated Pressure (Fuel to Engine) Connection

Attach the regulated hose to the CCFT fuel system and to the CNG fuel filter within the engine compartment.

Torque Value: 108 N•m [80 ft-lb]

All hoses must be enclosed in split loom or other protective sleeve. Do not route hoses on or near sharp edges or near moving parts. Use edge protector when necessary. Keep hoses away from heat sources. Where necessary use heat protective covering for the hose.

Hose must be mounted, braced, and supported to minimize vibration, and shall be protected against damage, corrosion, or breakage due to strain or wear. Hose shall be supported at least every 21 to 27 inches.

Do not attach hoses to main battery cables.

Aux Tank Connection (if equipped)

O-Ring Face Seal Fitting

Inspect the O-rings. Verify O-rings are free from dirt and damage.

Lubricate the O-rings. Use a silicone-based O-ring. lubricant.

Install the tubing. Tighten tube nuts finger tight.

Torque Value:
3/8 Tube Nut 41 N•m [30 ft-lb]

Torque Value:
1/2 Tube Nut 54 N•m [40 ft-lb]

Tubes must be secured a minimum of 21 to 27 inches, using P clamps.

PRD Vent Line Connections

PRD vent lines use stainless steel tubing and electrically conductive flex hoses to complete connections.

RED PRD Vent Line Caps provided in installation kit 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.

Compression Fitting

Initial torque is 1 ¼ turns after finger tight for new fittings.

Re-installation requires tighten the nut slightly after resistance.

Gap inspection gauges may also be used to ensure proper tightening. DO NOT use the inspection gauge with reassembled fittings.

O-Ring Face Seal Fitting

Inspect the O-rings. Verify O-rings are free from dirt and damage.

Lubricate the O-rings. Use a silicone-based O-ring. lubricant.

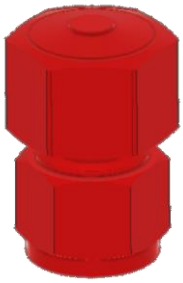
Install the tubing. Tighten tube nuts finger tight.

Torque Value:
3/8 Tube Nut 41 N•m [30 ft-lb]

Torque Value:
1/2 Tube Nut 54 N•m [40 ft-lb]

Tubes must be secured a minimum of 21 to 27 inches, using P clamps.

PRD VENT CAP



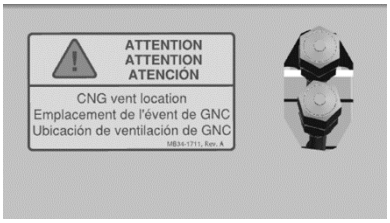
Labeling PRD(s) Vent Location

A label shall indicate the PRD(s) vent location(s) with the following language.

ATTENTION CNG Vent Location

Each safety sign shall be 3 in tall by 5 in wide and shall use 18-point sans serif font for the message text.

One safety sign shall be located near each vent location.



FUEL MANAGEMENT MODULE (FMM)

CCFT FMM GreenLync

REAR PANEL

1 ea. Compression fitting for Supply tube connection.

1 ea. JIC fitting for Regulated fuel to engine.

2 ea. Coolant connections ½" beaded hose barb.

2 ea. Posts for Remote Fill

1 ea. Vent for Pressure Relief Valve

CCFT FMM GreenLync has an electrical box attached to the bottom of the FMM housing the ECU, FLIM, Starter and Fuel Relay.

CCFT FMM Basic

REAR PANEL

1 ea. Compression fitting for Supply tube connection.

1 ea. JIC fitting for Regulated fuel to engine.

2 ea. Coolant connections ½" beaded hose barb.

2 ea. Posts for Remote Fill

1 ea. Vent for Pressure Relief Valve

CCFT FMM Basic does not have an electrical box attached to the bottom of the FMM. Heil uses their own electronics.

Remove FMM from Frame Bracket

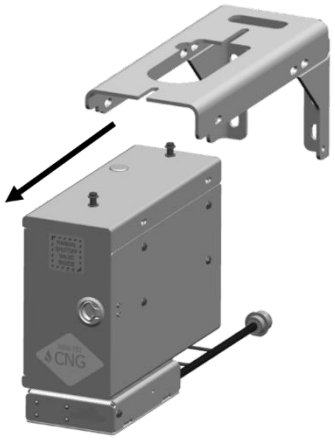
Remove the 4 bolts holding the FMM Box to the Frame Bracket, 2 on each side of the Frame Bracket.

Slide the FMM forward until the 2 top bolts clear the slots on the Frame Bracket and lower the FMM.

FMM Box Weight: 58 lbs. (34 kg)

Frame Bracket Weight: 17 lbs. (7.7 kg)

WARNING Follow your company's Safe Lifting requirements when removing or installing FMM.



Frame Bracket

Fasten mounting bracket to frame with 4 Black Oxide 5/8 bolts and Hex Flange nuts.

Black Oxide 5/8-inch bolt with a length long enough to have 2 full threads past the nut after torquing.

Torque Value: 271 to 289 N•m [200 to 220 ft-lb]

Frame layout Appendix C

Attach FMM to Frame Bracket

Slide the FMM back on the Frame Bracket slots.

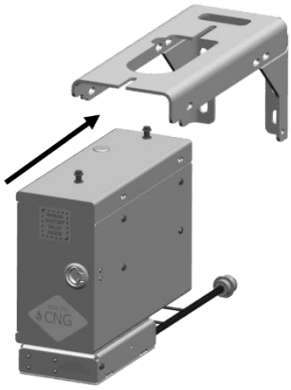
Install the 4 bolts holding the FMM Box to the Frame Bracket, 2 on each side of the Frame Bracket.

Torque Value: 34 N•m [25 ft-lb]

FMM Box Weight: 58 lbs. (34 kg)

Frame Bracket Weight: 17 lbs. (7.7 kg)

WARNING Follow your company's Safe Lifting requirements when removing or installing FMM.



Coolant Hose Connection

Do not install in-line valve on coolant hose connection.

Physical Characteristics: Must meet SAE J20R3 HT Class A, Temperature: -65°F to 350°F.

All hoses must be enclosed in split loom or other protective sleeve. Do not route hoses on or near sharp edges or near moving parts. Use edge protector when necessary. Keep hoses away from heat sources. Where necessary use heat protective covering for the hose.

Do not attach hoses to main battery cables.

Hoses shall be secured and protected from abrasion to the same standard as the original wiring on the vehicle. Minimum hoses must be secured at least every 21 to 27 inches with cable ties or P clamps.

Use a Heavy-Duty Worm Drive Clamp - **Lined**

High Pressure In (Tank Supply) Connection

HP In (Tank Supply) port connects fuel supply system to the Fuel Management Module for fuel delivery to the engine.

Compression Fitting

Initial torque is 1 ¼ turns after finger tight for new fittings.

Re-installation requires tighten the nut slightly after resistance.

Gap inspection gauges may also be used to ensure proper tightening. DO NOT use the inspection gauge with reassembled fittings.

O-Ring Face Seal Fitting

Inspect the O-rings. Verify O-rings are free from dirt and damage.

Lubricate the O-rings. Use a silicone-based O-ring. lubricant.

Install the tubing. Tighten tube nuts finger tight.

Torque Value:
3/8 Tube Nut 41 N•m [30 ft-lb]

Torque Value:
1/2 Tube Nut 54 N•m [40 ft-lb]

Tubes must be secured a minimum of 21 to 27 inches, using P clamps.

Regulated Pressure (Fuel to Engine) Connection

Connects the regulated pressure hose from the CCFT fuel system to the CNG fuel filter within the engine compartment.

Torque Value: 108 N•m [80 ft-lb]

All hoses must be enclosed in split loom or other protective sleeve. Do not route hoses on or near sharp edges or near moving parts. Use edge protector when necessary. Keep hoses away from heat sources. Where necessary use heat protective covering for the hose.

Hose must be mounted, braced, and supported to minimize vibration, and shall be protected against damage, corrosion, or breakage due to strain or wear. Hose shall be supported at least every 21 to 27 inches.

Do not attach hoses to main battery cables.

Remote Fill Connections (If equipped)

These ports are used when the option of additional fueling receptacles is needed. (if equipped).

Compression Fitting

Initial torque is 1 ¼ turns after finger tight for new fittings.

Re-installation requires tighten the nut slightly after resistance.

Gap inspection gauges may also be used to ensure proper tightening. DO NOT use the inspection gauge with reassembled fittings.

O-Ring Face Seal Fitting

Inspect the O-rings. Verify O-rings are free from dirt and damage.

Lubricate the O-rings. Use a silicone-based O-ring. lubricant.

Install the tubing. Tighten tube nuts finger tight.

Torque Value:
3/8 Tube Nut 41 N•m [30 ft-lb]

Torque Value:
1/2 Tube Nut 54 N•m [40 ft-lb]

Tubes must be secured a minimum of 21 to 27 inches, using P clamps.

Chassis Wiring Harness

Connect the chassis wiring harness to the bulkhead connector on the fuel system.

If rubber boot is still on the chassis wiring harness remove it to prevent moisture damage to the connector pins. Route wiring harness in a manner to prevent moisture running down harness and collecting in wiring harness connectors or entering cab.

Connect the chassis wiring harness to the bulkhead connector on the fuel system.

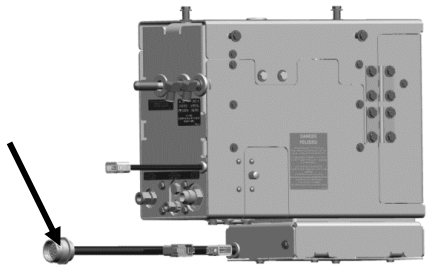
If rubber boot is still on the chassis wiring harness remove it to prevent moisture damage to the connector pins. Route wiring harness in a manner to prevent moisture running down harness and collecting in wiring harness connectors or entering cab.

Route and secure chassis wiring harness in a manner to prevent strain on the harness wires and connectors.

Chassis wiring harness passing through a panel should be protected by grommets or similar devices that shall snugly fit the piping or tubing and the hole in the panel or structural member.

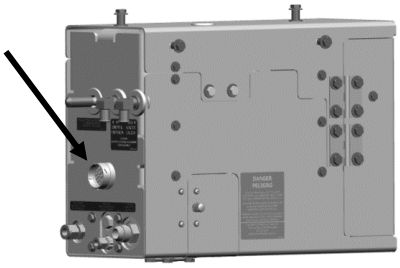
Do not route chassis wiring harness on or near sharp edges or near moving parts. Use edge protector when necessary.

Keep chassis wiring harness away from heat sources. Where necessary use heat protective covering.



Do not attach chassis wiring harness to Main Battery Cable, Regulated Fuel Hose, or CNG tubes, or Coolant hoses.

Chassis wiring harness must be secured at least every 21 to 27 inches with cable ties or P clamps.
Keep chassis wiring harness away from heat sources. Where necessary use heat protective covering.



Do not attach chassis wiring harness to Main Battery Cable, Regulated Fuel Hose, or CNG tubes, or Coolant hoses.

Wiring shall be secured and protected from abrasion and corrosion to the same standard as the original wiring on the vehicle. Minimum wiring harness must be secured at least every 21 to 27 inches with cable ties or P clamps.

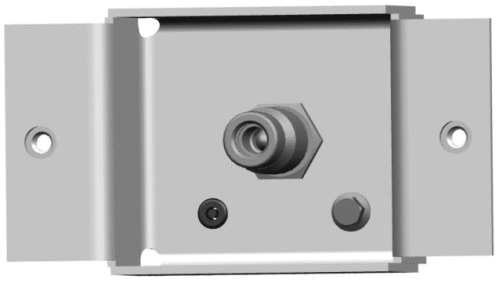
Auxiliary Fuel Receptacle (Bumper Fill)

Bumper Fill (Remote Fill) Receptacle

The Bumper Fill connection receptacle shall be mounted to withstand the breakaway force not greater than 150 lb. (68 kg) when applied in any direction that the vehicle would move.

The receptacle shall be installed in accordance with the manufacturer's instructions.

The clearance around the receptacle shall be free of interference that prevents the connection of the fueling nozzle.



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Roof Mount Installation

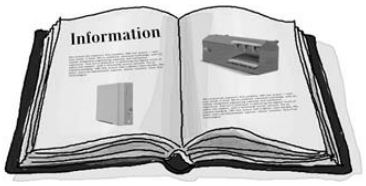
ROOF MOUNT

General Information

Roof Mount Fuel Systems without Integrated Fuel Management Module FMM

Required Connections:
Mounting Bracket
High Pressure In/Out

Frame layout Appendix D



Fuel Capacity (DGE)	60 DGE	60 DGE	75 DGE	80 DGE	95 DGE	95 DGE
Cylinder Size	4 x 13"Diameter	4 x 16"Diameter	4 x 16"Diameter	2 x 22 Diameter 1 x 16"Diameter	2 x 22 Diameter 2 x 16 Diameter	4 x 16"Diameter
Water Volume in Liters	797	797	996	1062	1262	1262
Dimensions (In inches)	14.75H 80.25W 129.75L	16.9H 72.8W 101.75L	16.9H 72.8W 118.4L	24H 84.1W 105.5L	24H 84.1W 105.5L	17.5H 72.1W 138.6L
System Weight In Pounds (Empty/Full)	632/1015	656/1039	744/1203	612/1103	776/1363	888/1485

Standard Body Roof Mount Installation

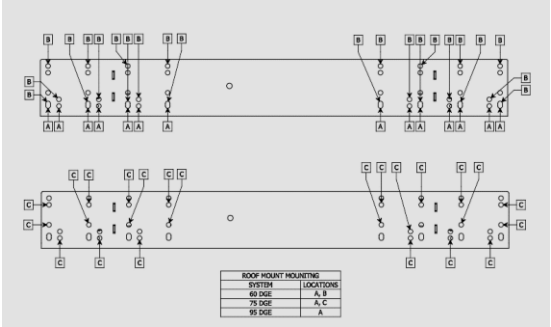
Bolt Quantity: 16 Total
Front = 8 | **Back** = 8

Bolt Size: 5/8” – 11 sized bolts with a length long enough to have 2 full threads past the nut after torquing.

Bolt Grade: Minimum SAE Grade 8 or Metric Class 10.9

Torque Value: 200 to 230 ft-lbs.

Note: Refer to Roof Mount Mounting chart for acceptable bolt pattern placement. Roof mount side covers (Front & Back) will need to be removed for fuel system installation.



Rear

Front

Scorpion Body Roof Mount Installation

Bolt Quantity: 4 Total
1 bolt in each mounting point.

Bolt Size: 1-1/8" – 7 sized bolts with a length long enough to have 2 full threads past the nut after torquing.

Bolt Grade: Minimum SAE Grade 8 or Metric Class 10.9

Torque Value: 1280 to 1300 ft-lbs.

Note:

AR / ZR (4 Flat horizontal corners) Body Roof Mount Installation

Bolt Quantity: 12 Total
Minimum of 3 bolts in each mounting point.

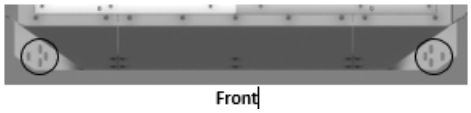
Bolt Size: 5/8” – 11 sized bolts with a length long enough to have 2 full threads past the nut after torquing.

Bolt Grade: Minimum SAE Grade 8 or Metric Class 10.9

Torque Value: 200 to 230 ft-lbs.

Note:

Rear



Front

Mammoth Body Roof Mount Installation

Bolt Quantity: 14 Total
Minimum of 3 bolts in each mounting foot.

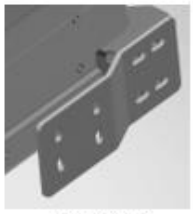
Bolt Size: 5/8” – 11 sized bolts with a length long enough to have 2 full threads past the nut after torquing.

Bolt Grade: Minimum SAE Grade 8 or Metric Class 10.9

Torque Value: 200 to 230 ft-lbs.

Note:

LH FRONT



RH FRONT

LH REAR

RH REAR

Tailgate Mount Installation

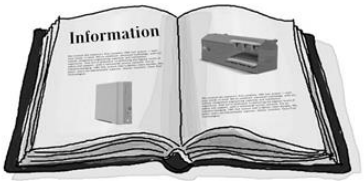
TAILGATE

General Information

Tailgate Mount Fuel Systems without Integrated Fuel Management Module FMM

Required Connections:
Mounting Bracket
High Pressure In/Out

Frame layout Appendix E



Fuel Capacity (DGE)	80 DGE	98 DGE	120 DGE
Cylinder Size	2 x 26"Diameter	2 x 26"Diameter 1 x 16"Diameter	3 x 26"Diameter
Water Volume in Liters	1062	1301	1594
Dimensions (In inches)	62H 93.5W 58.6L	62H 93.5W 58.6L	62H 93.6W 58.6L
System Weight In Pounds (Empty/Full)	1,275/1,800	1,550/2,175	1,600/2,325

E-Z PACK Tailgate Mount Installation

Bolt Quantity: 4 Total
1 bolt in each mounting point.

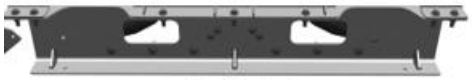
Bolt Size: 5/8" – 11 sized bolts with a length long enough to have 2 full threads past the nut after torquing.

Bolt Grade: Minimum SAE Grade 8 or Metric Class 10.9

Torque Value: 200 to 230 ft-lbs.

Note:

Valve End



Floating End

McNeilus Tailgate Mount Installation

Bolt Quantity: 4 Total
Upper: 1 bolt in each mounting point.

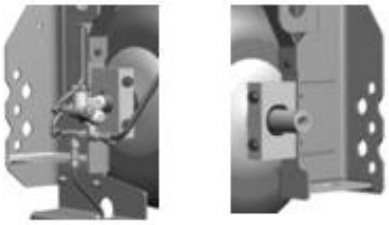
Bolt Size: 5/8" – 11 sized bolts with a length long enough to have 2 full threads past the nut after torquing.

Bolt Grade: Minimum SAE Grade 8 or Metric Class 10.9

Torque Value: 200 to 230 ft-lbs.

Note:

Upper End



Lower End

CNG Decal Location Conventional

CNG Diamond Driver and Passenger Side

Final-Stage or Intermediate Vehicle Integrator/Manufacturer (FSVIM) is responsible for attaching the CNG Diamond Decal on the power unit (highlighted in Yellow) as part of the CCFT fuel system installation.

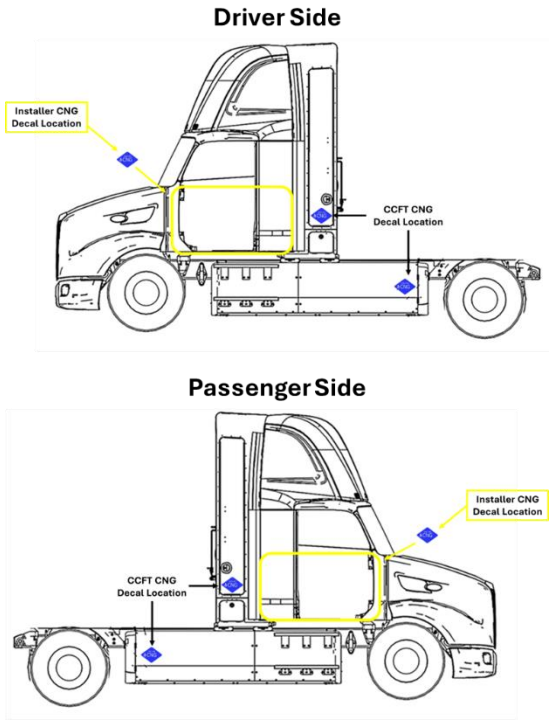
The labels for Class 6 Vehicles and greater shall be a minimum of 5.7 in. x 4.2 in. high (145mm x 107mm).

The marking the label shall consist of a boarder and the letters "CNG" [1.2 in. (30 mm) minimum height centered in the diamond] of silver or white reflective luminous material on a blue background.

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 side of the **power unit.**

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.

NFPA 52 2019 defines **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.



Auxiliary Fueling Connections CNG Diamond Location

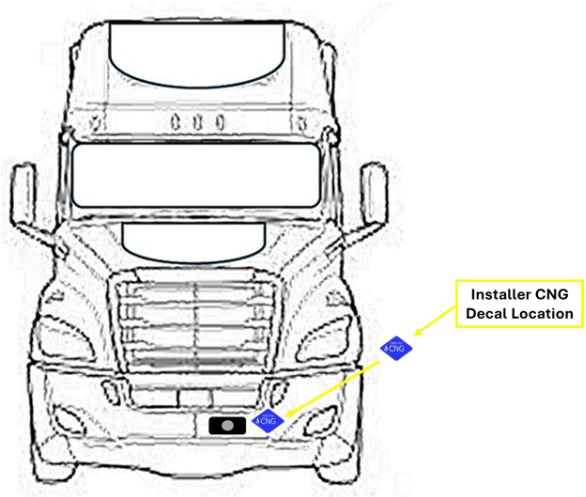
Final-Stage or Intermediate Vehicle Integrator/Manufacturer (FSVIM) is responsible for attaching the CNG Diamond Decal on the power unit (highlighted in Yellow) as part of the CCFT fuel system installation.

The labels for Class 6 Vehicles and greater shall be a minimum of 5.7 in. x 4.2 in. high (145mm x 107mm)

The marking the label shall consist of a boarder and the letters "CNG" [1.2 in. (30 mm) minimum height centered in the diamond] of silver or white reflective luminous material on a blue background.

Label(s) located at each auxiliary fueling connection receptacle shall include the following:

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



Rear CNG Diamond Location

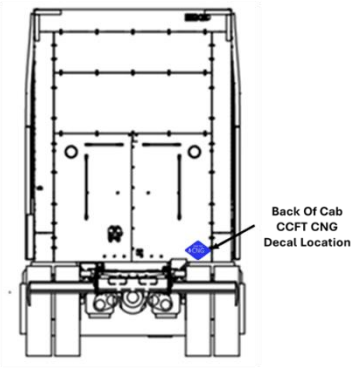
Final-Stage or Intermediate Vehicle Integrator/Manufacturer (FSVIM) is responsible for attaching the CNG Diamond Decal on the power unit (highlighted in Yellow) as part of the CCFT fuel system installation.

Each CNG or LNG each vehicle shall be identified with a permanent, diamond-shaped label located on the exterior vertical surface or near-vertical surface on the lower right rear of the vehicle other than on the bumper of the vehicle (or on the trunk lid of a vehicle so equipped, but not on the bumper or tailgate of any vehicle), inboard from any other markings.

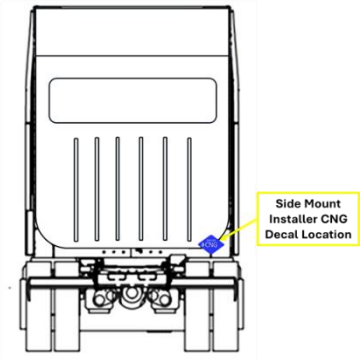
The labels for Class 6 Vehicles and greater shall be a minimum of 5.7 in. x 4.2 in. high (145mm x 107mm)

The marking the label shall consist of a boarder and the letters “CNG” [1.2 in. (30 mm) minimum height centered in the diamond] of silver or white reflective luminous material on a blue background.

Vehicle with Back Of Cab



Vehicle with Side Mount(s)



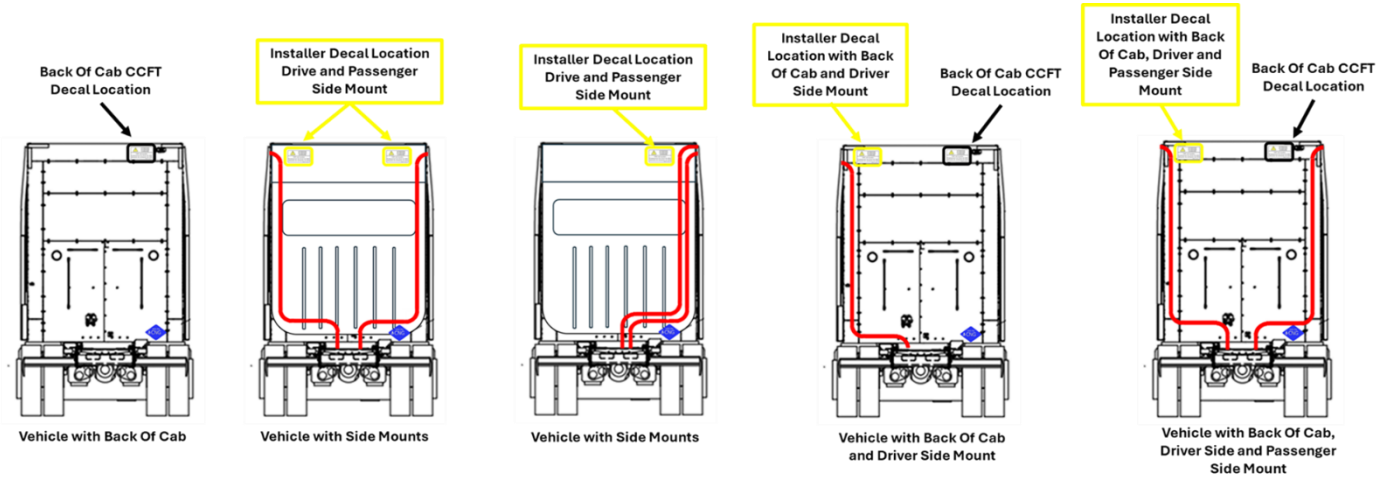
CNG Vent Location Decal Conventional

ATTENTION CNG Vent Location Decal

A label shall indicate the PRD(s) vent location(s) with the following language. ATTENTION CNG Vent Location

Each safety sign shall be 3 in tall by 5 in wide and shall use 18-point sans serif font for the message text.

One safety sign shall be located near each vent location.



CNG Decal Location Vocational

CNG Diamond Driver and Passenger Side and ATTENTION CNG Vent Location Decal

Final-Stage or Intermediate Vehicle Integrator/Manufacturer (FSVIM) is responsible for attaching the CNG Diamond Decal on the power unit (highlighted in Yellow) as part of the CCFT fuel system installation.

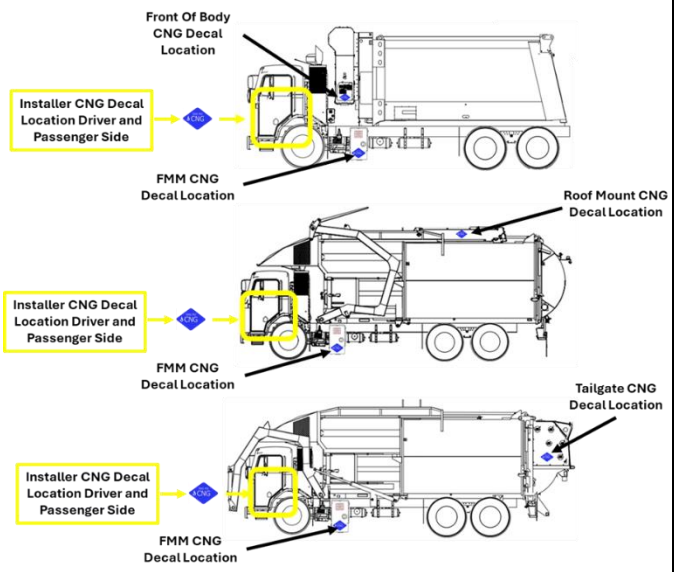
The labels for Class 6 Vehicles and greater shall be a minimum of 5.7 in. x 4.2 in. high (145mm x 107mm).

The marking the label shall consist of a boarder and the letters “CNG” [1.2 in. (30 mm) minimum height centered in the diamond] of silver or white reflective luminous material on a blue background.

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 side of the **power unit.**

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.

NFPA 52 2019 defines **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.



Auxiliary Fueling Connections CNG Diamond Location

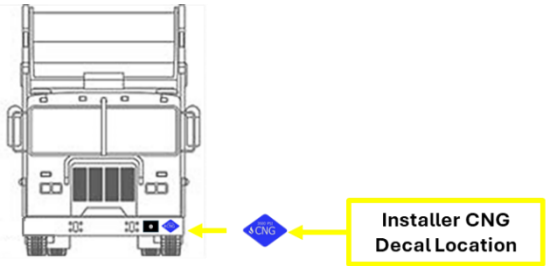
Final-Stage or Intermediate Vehicle Integrator/Manufacturer (FSVIM) is responsible for attaching the CNG Diamond Decal on the power unit (highlighted in Yellow) as part of the CCFT fuel system installation.

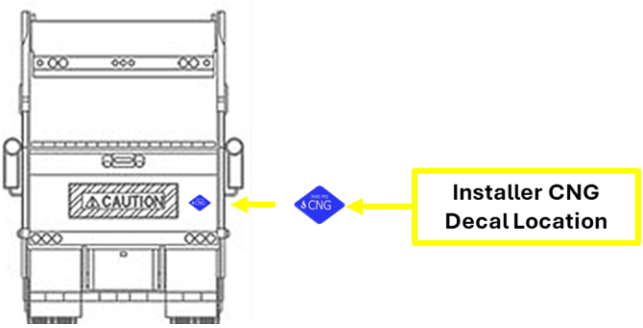
The labels for Class 6 Vehicles and greater shall be a minimum of 5.7 in. x 4.2 in. high (145mm x 107mm)

The marking the label shall consist of a boarder and the letters “CNG” [1.2 in. (30 mm) minimum height centered in the diamond] of silver or white reflective luminous material on a blue background.

Label(s) located at each auxiliary fueling connection receptacle shall include the following:

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



Rear CNG Diamond Location	
Final-Stage or Intermediate Vehicle Integrator/Manufacturer (FSVIM) is responsible for attaching the CNG Diamond Decal on the power unit (highlighted in Yellow) as part of the CCFT fuel system installation. Each CNG or LNG each vehicle shall be identified with a permanent, diamond-shaped label located on the exterior vertical surface or near-vertical surface on the lower right rear of the vehicle other than on the bumper of the vehicle (or on the trunk lid of a vehicle so equipped, but not on the bumper or tailgate of any vehicle), inboard from any other markings. The labels for Class 6 Vehicles and greater shall be a minimum of 5.7 in. x 4.2 in. high (145mm x 107mm) The marking the label shall consist of a boarder and the letters “CNG” [1.2 in. (30 mm) minimum height centered in the diamond] of silver or white reflective luminous material on a blue background.	

Area Intentionally left blank.

CNG Diamond Driver and Passenger Side and ATTENTION CNG Vent Location Decal

Final-Stage or Intermediate Vehicle Integrator/Manufacturer (FSVIM) is responsible for attaching the CNG Diamond Decal on the power unit (highlighted in Yellow) as part of the CCFT fuel system installation.

The labels for Class 6 Vehicles and greater shall be a minimum of 5.7 in. x 4.2 in. high (145mm x 107mm).

The marking the label shall consist of a boarder and the letters “CNG” [1.2 in. (30 mm) minimum height centered in the diamond] of silver or white reflective luminous material on a blue background.

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 side of the **power unit.**

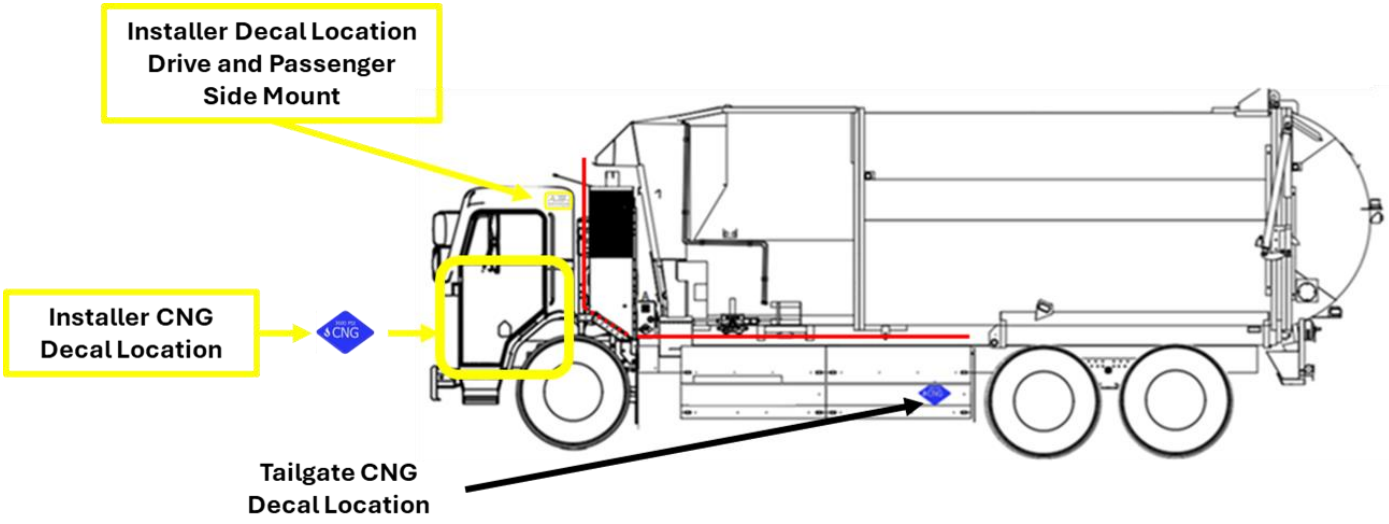
If a DOT number is required to be displayed in the accordance with 49CFR 390.21, then the labels shall be affixed near the DOT numbers on each side of the power unit.

NFPA 52 2019 defines **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.

A label shall indicate the PRD(s) vent location(s) with the following language. ATTENTION CNG Vent Location

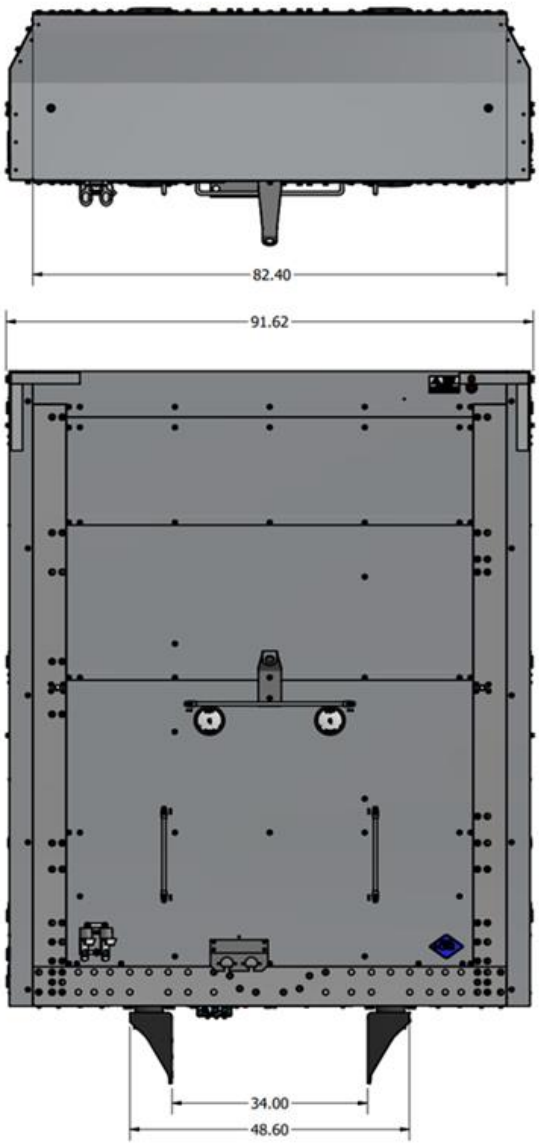
Each safety sign shall be 3 in tall by 5 in wide and shall use 18-point sans serif font for the message text.

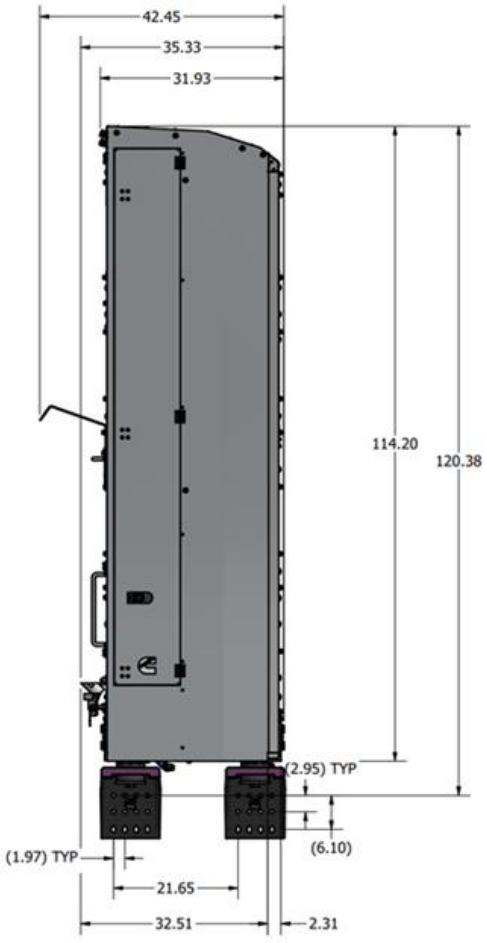
One safety sign shall be located near each vent location.



Appendix A

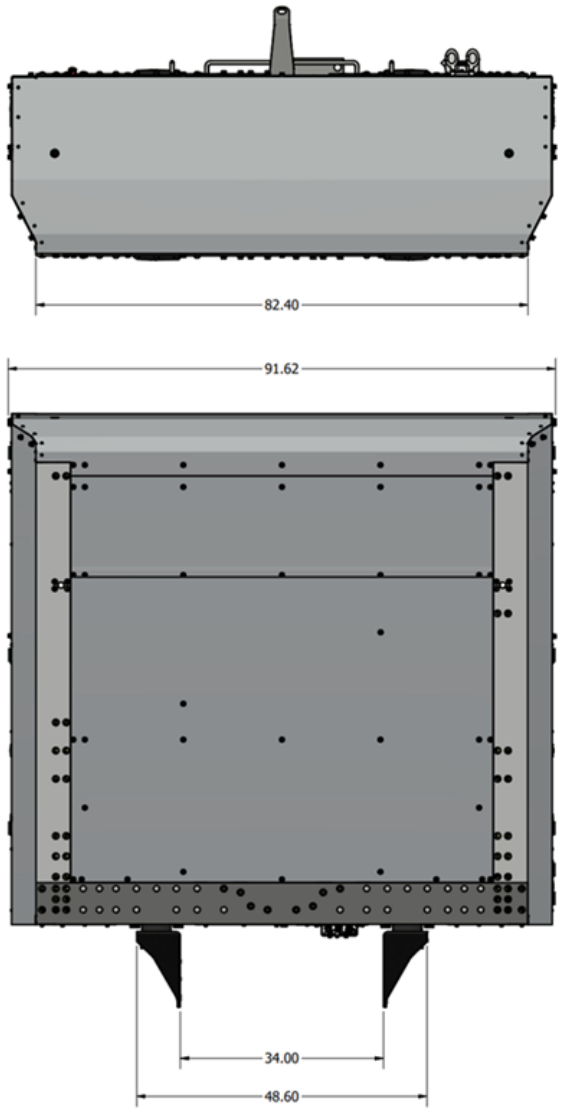
175 Back of Cab Overall Size Dimension

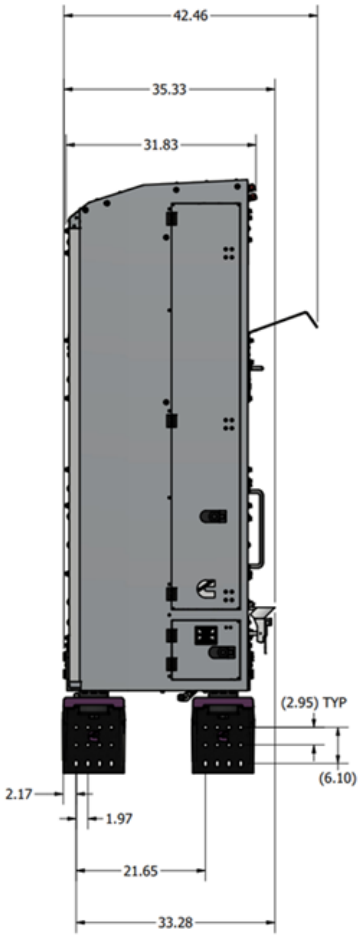




Appendix A

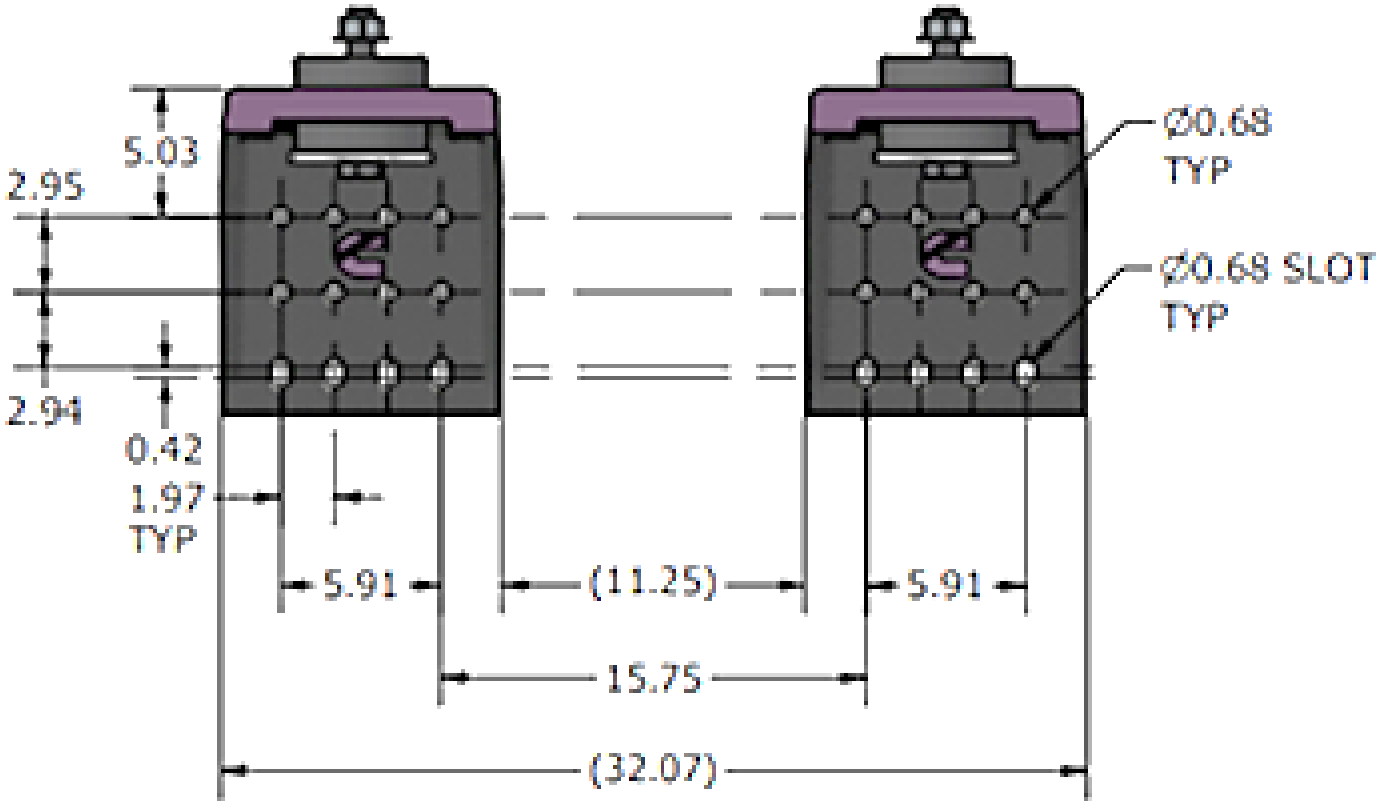
135 Back of Cab Overall Size Dimension





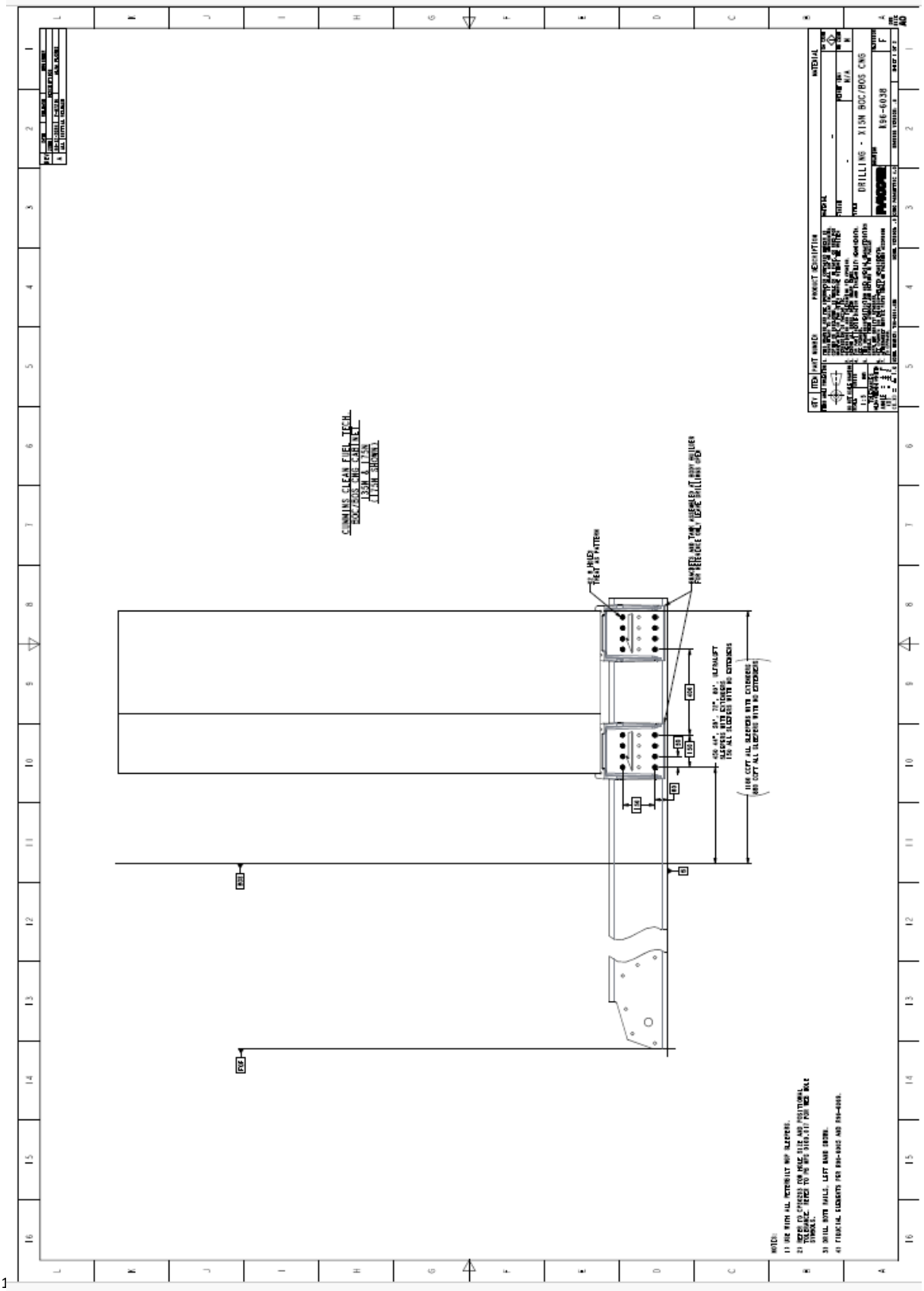
Appendix A

175 /135 Back of Cab Frame Bracket

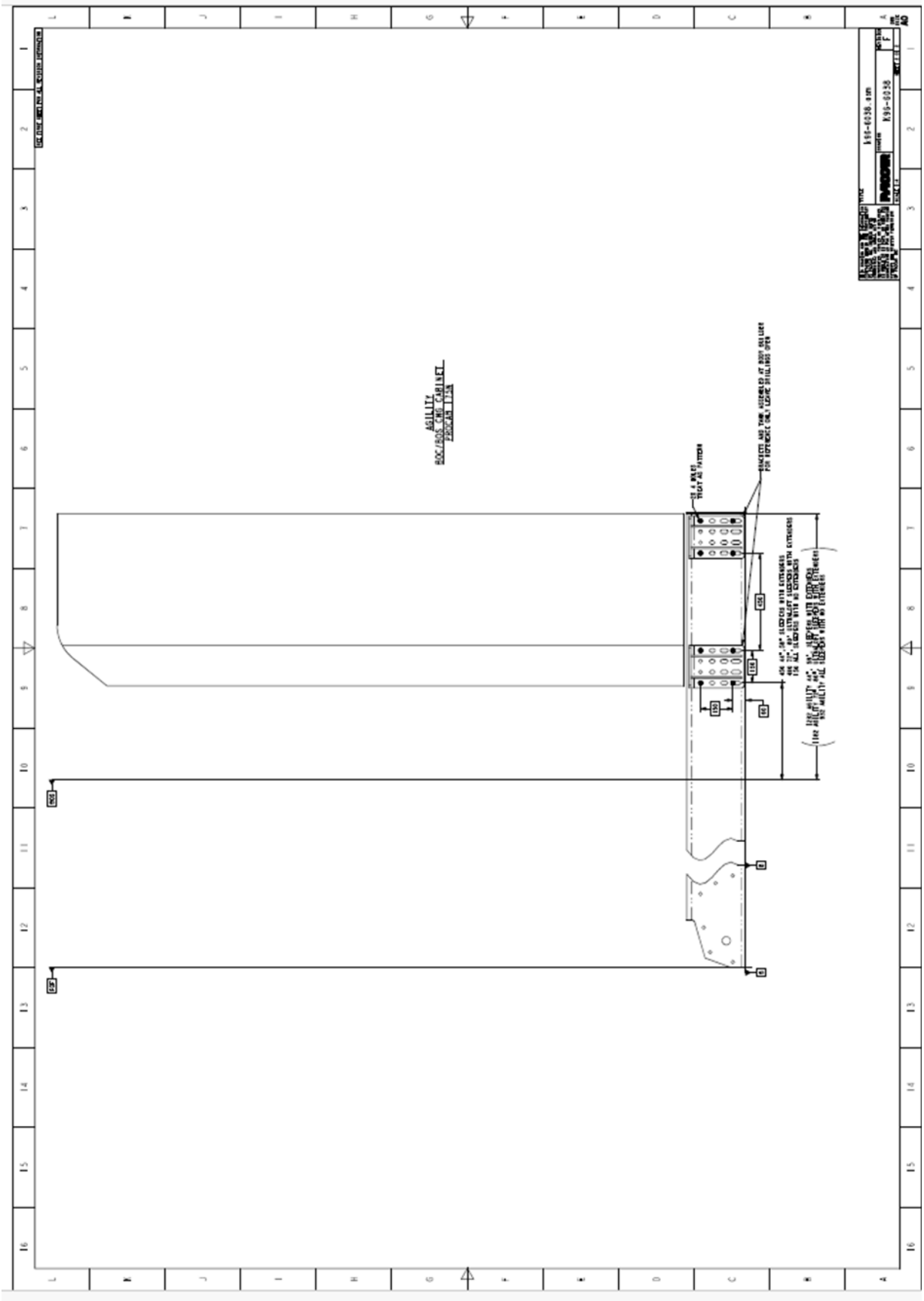


Appendix A

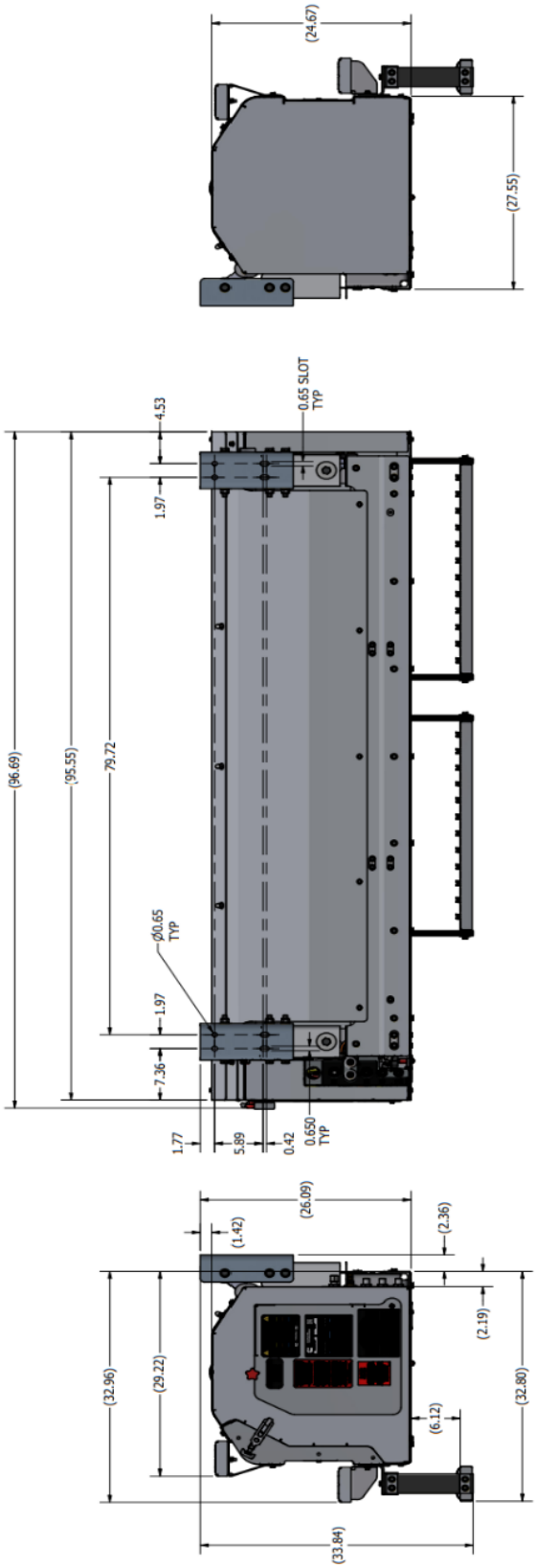
Back of Cab 175N – 135N



Back Of Cab 175N – 135N

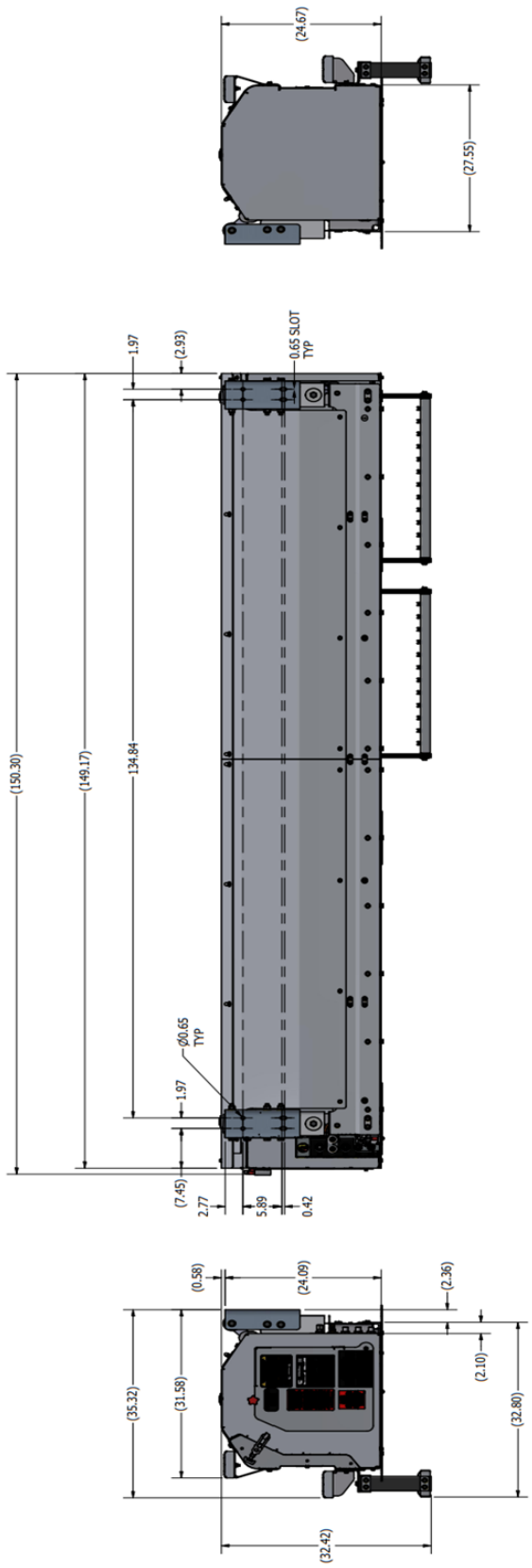


Overall Size Dimension-32DGE



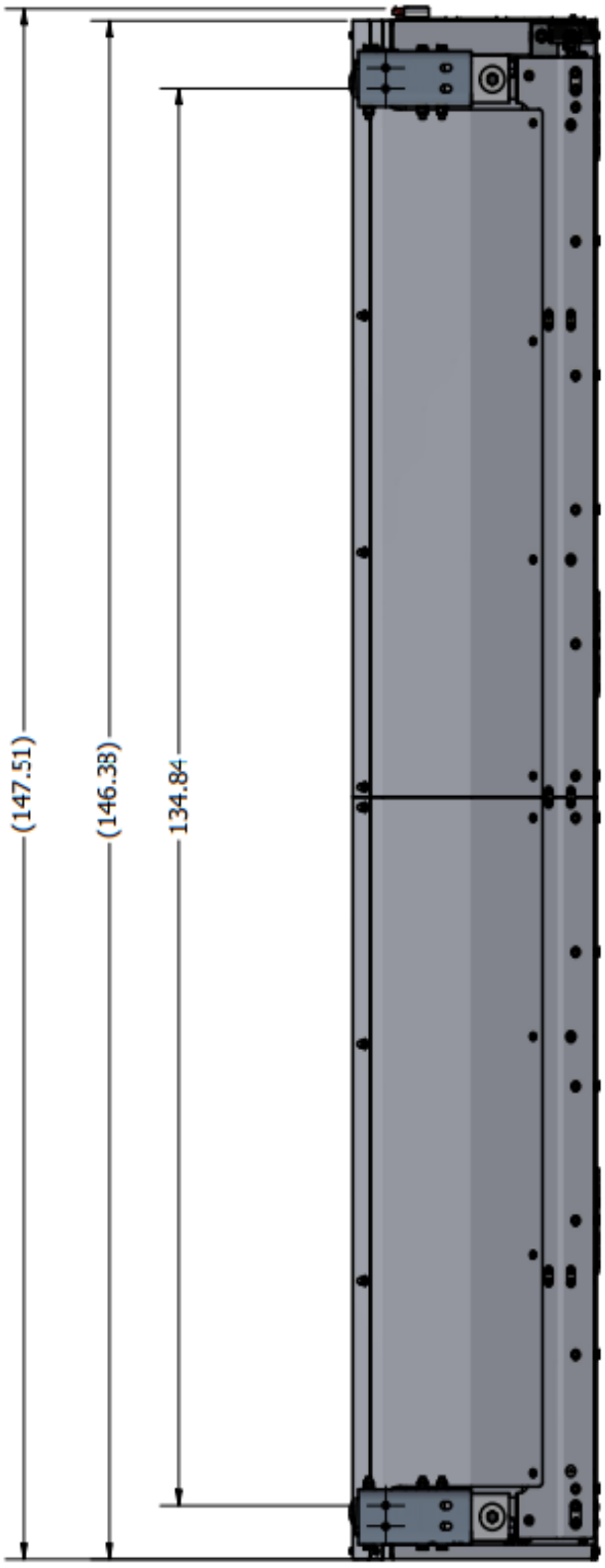
Appendix B

Overall Size Dimension-55DGE



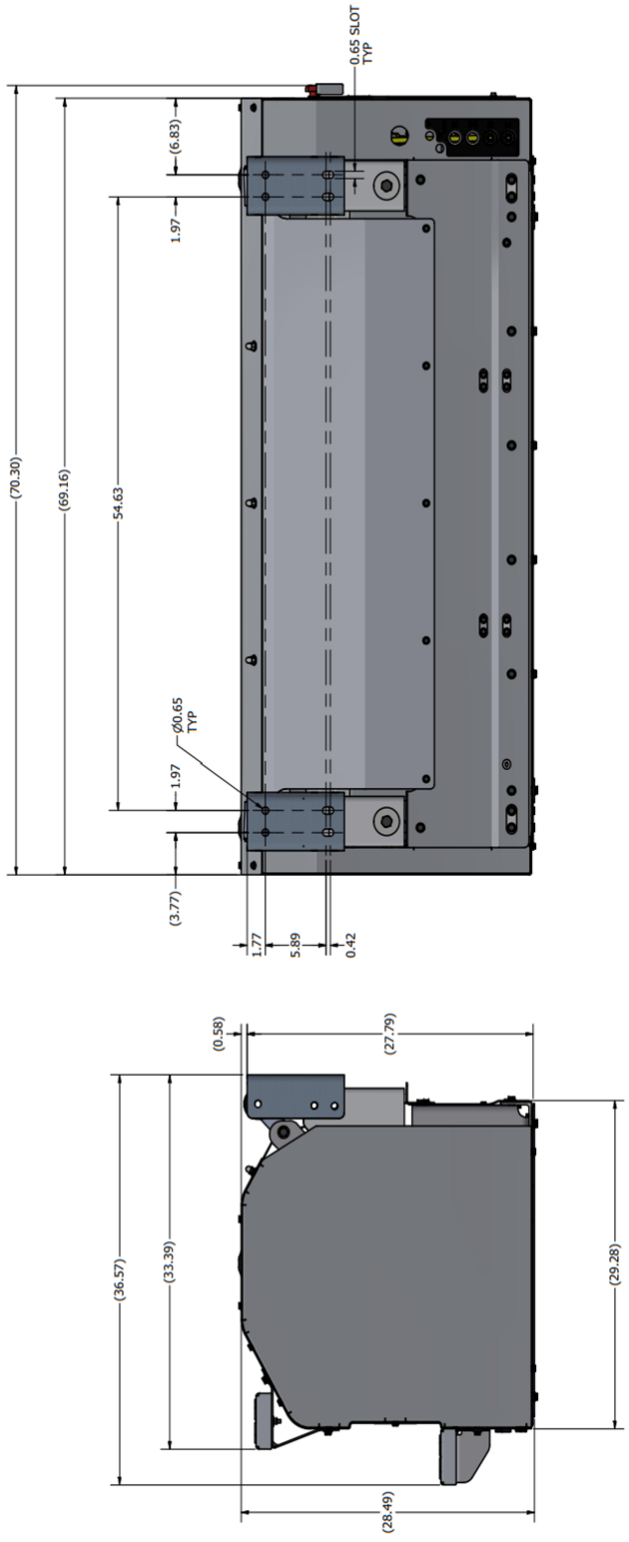
Appendix B

Overall Size Dimension-55DGE-LU01



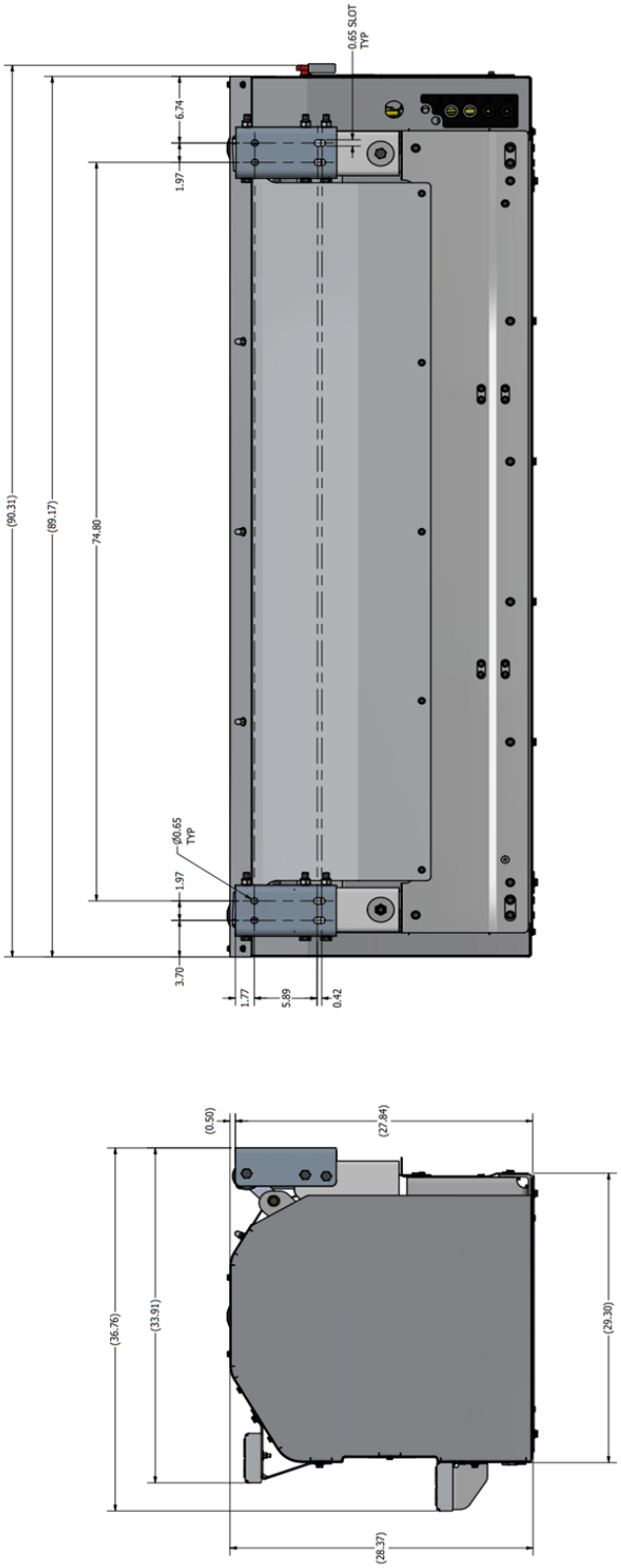
Appendix B

Overall Size Dimension-30DGE



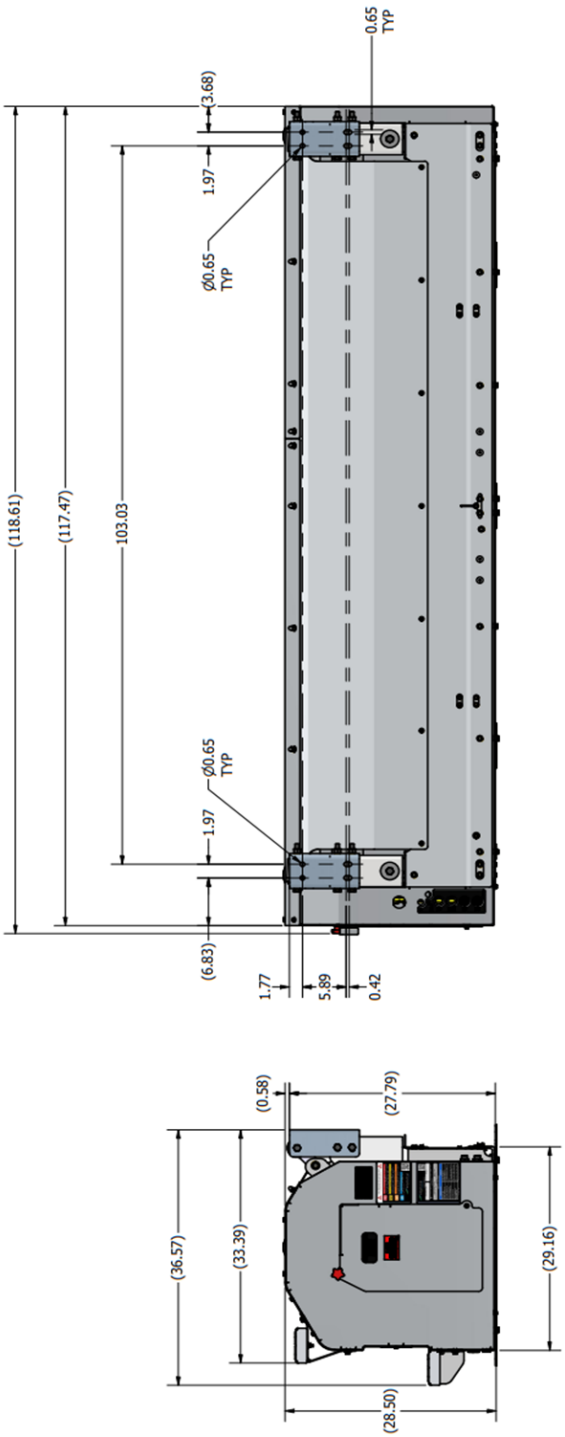
Appendix B

Overall Size Dimension-40DGE



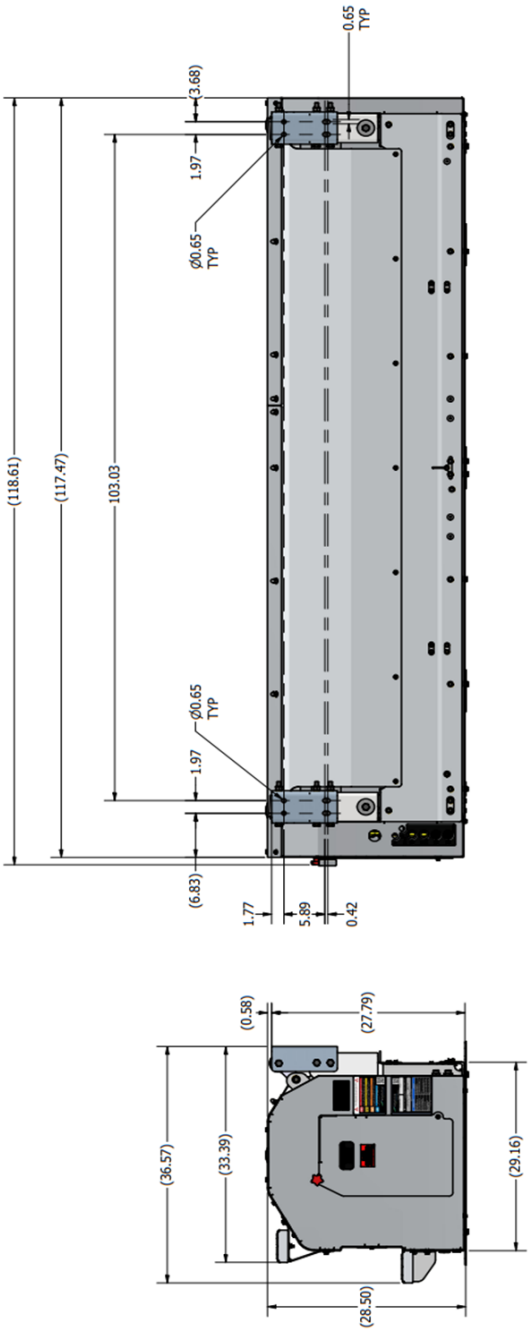
Appendix B

Overall Size Dimension-50DGE



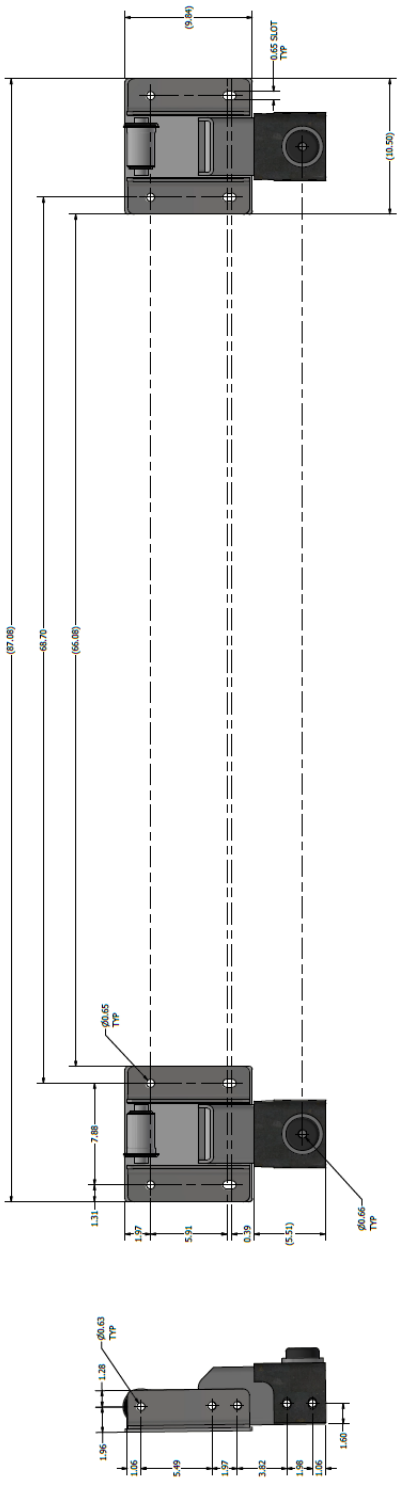
Appendix B

Overall Size Dimension-60DGE



Appendix B

Chassis Mounting L Bracket



Appendix C

Stand Alone FMM