

Installation Manual

Generator Set

HGLAA Spec A



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Chapter 1 - Introduction

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1.1 Owner - Overview

General Information

Cummins Inc. manuals are created to support Cummins® products.

The content of this manual is based on the information in effect at the time of publication.

- Cummins Inc. reserves the right to make any changes at any time without obligation.
- If differences are found between your product and the information in this manual, contact a Cummins® Authorized Repair Location.

For information on components or fault codes not supplied by Cummins Inc., contact the original equipment manufacturer (OEM) or supplier.

This set of literature is intended to provide guidance and recommendations for the safe operation and maintenance of the applicable Cummins® product.

This product has been designed to provide safe and efficient service when properly installed, maintained, and operated.

Overview

Owner/Operator information contains the following.

- Operating instructions
- Daily maintenance schedules
- Routine maintenance schedules
- Overhaul schedules, when applicable
- Common repair instructions
- Basic troubleshooting

1.2 Illustrations - Overview

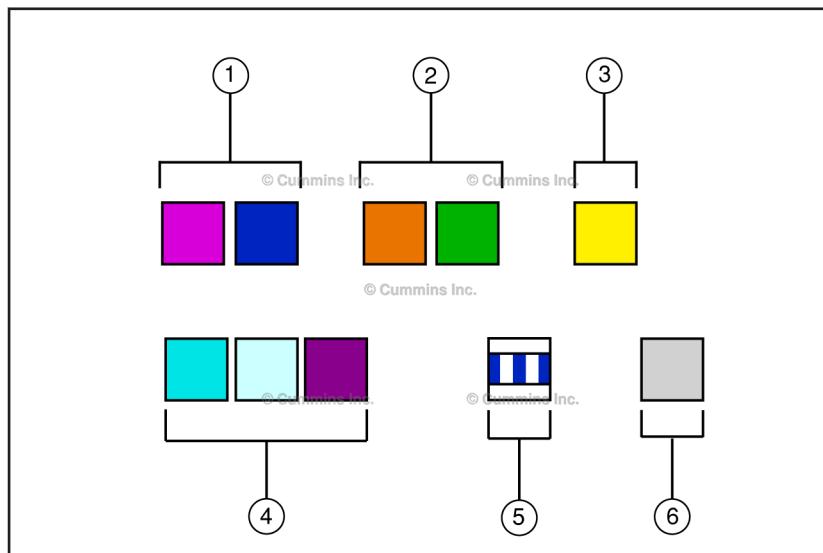
General Information

Various imagery styles are utilized throughout the service information.

- Online images are delivered in color, rendered styles.
- Printed images are delivered in black and white line art styles.

When viewing images online within instructional context, the colors represent the following actions.

- Blue or Magenta - Target, or primary component being handled.
- Orange or Green - Additional components being removed or installed to access the target component.
- Yellow - Areas highlighted for inspection, special attention, or adjustment.
- Cyan, Light Blue, or Purple - Special tools or other equipment.
- Blue/White Dash - Indicating surfaces to apply a chemical or material.
- Light Grey - Remaining, background components.



Chapter 2 - Safety

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2.1 Generator Set RV - Overview

General Information

This procedure contains general safety precautions that must be followed to provide personal safety. Read and understand the safety information and precautions before operating or performing any repair.

Overview

Work Environment

Follow these recommended practices when servicing products.

- Always follow on-site safety requirements and regulations.
- Always follow local training, certification, authorization, and specific customer requirements.
 - Do not work on products unless proper training has been completed to allow safe repair completion.
 - Do not operate equipment before product familiarization using the equipment operator manual.
- Always be aware of hazardous conditions that may exist in the work environment.
 - Work in a well-ventilated area away from ignition sources.
 - If adverse weather conditions are present, take appropriate safety precautions when performing work.
- Training
 - Confirm if you have received task and safety training for the job being performed.
- Working Alone
 - Avoid working alone.
 - Avoid working where you are not able to be seen or heard by another person.
 - If you must work alone, notify others of your location and schedule check-in times.
- Safety Barricades and Warnings
 - Mark overhead work areas with barricade tape or signs.
 - Mark open floor hazards with barricade tape, signs, or cones.
- Confined Space
 - Confirm if a confined space entry permit is required.
 - If required, confirm the permit is posted, signed, and dated correctly.
- Hot Work
 - Confirm a functional fire extinguisher is readily available.
 - Fire extinguishing rating must meet required safety regulations based on type of work being performed.
 - Maintain separation between ignition sources and fuel sources.
- Wheel Chocks
 - Place wheel chocks at either the front or back tire of the unit prior to starting the task.
- Spotter
 - Use a spotter when moving a customer's unit.
 - Confirm the driver can see and hear the spotter when moving.
- Housekeeping (The 5 S's - Scrap or Segregate, Set to Order, Spotless, Standardize, and Sustain)
 - Remove parts, extension cords, air hoses, and liquids from the work area that may cause trip, slip, or fall hazards.

Perform the following prior to beginning work on any products.

- Shutdown the equipment unless otherwise directed by troubleshooting procedures.
- Always allow the product to cool.
- Lock-Out-Tag-Out Equipment.
- Always make sure the product is properly supported by blocks or stands.
 - Do not work on a product supported only by lifting jacks or hoists.
- Become familiar with the tools required for performing the task at hand and how to use those tools correctly.
- Use only genuine Cummins or Cummins Recon replacement parts as instructed.

Best Safety Practices

Follow these recommended practices when servicing or operating equipment.

- Always wear protective glasses and protective shoes.
- Remove rings, watches, long jewelry, or metallic items.
- Do not wear loose fitting or torn clothing, jewelry, long hair, etc.
- Do not perform any repairs, or operate equipment, when fatigued or impaired due to drugs or alcohol.
- Always use tools that are in good condition.
- Do not work on equipment with the batteries connected or that is running unless otherwise directed by troubleshooting procedures.
- If any work must be performed while the batteries are connected or the unit is running, use extreme caution especially around hot components, moving parts, etc.
- Exercise caution when working on products that have just been turned off.
 - Hot parts may cause burns or ignite or melt common materials.
- Do not bleed the fuel system of a hot engine.
 - Contact with hot manifolds or other components may cause a fire.
- Only use proper engine barring techniques.
- Do not lift components that weigh 23 kg [50 lb] or more.
 - Use mechanical help or seek assistance.
- Exercise caution when working around rotating parts.
 - Rotating parts can cause cuts, mutilation, or strangulation.
- Exercise caution when working on electrical components.
 - High voltages can cause serious injury or death.
- Relieve system pressure as instructed before removing or disconnecting lines, fittings, or related items.
- Always test for pressure leaks as instructed.
- Always torque fittings and connections to the required specifications.
 - Over or under tightening can damage threads and create leaks.
- Always use the same fastener part number, or equivalent, when replacing fasteners.

Standard Job Safety Work Practices

- Job Safety Analysis.
 - Assess the job to identify safety hazards that may occur during the repair event.
- Ascending or Descending
 - Maintain 3 points of contact when using steps, ladders, or entering and exiting a unit.

- Communication
 - When working with others, make sure you understand what each other is doing to safely complete the task.
- Eyes On Hands and Work.
 - Confirm if you will be able to maintain an unobstructed view of your hands at all times while performing the task.
- Eyes On Path
 - Watch for hazards in your path to avoid trip or slip hazards. Examples are pits, platform edges, etc.
- Line Of Fire
 - Position yourself so that you avoid striking against, or being struck by, anything that can swing, fall, or roll.
- Pinch Point
 - Prevent exposure of all parts of your body to a nip hazard or pinch point.
- Rushing
 - Take adequate time to safely perform the job. Do not rush or take short cuts.
- Follow Procedures
 - Utilize QuickServe® Online or other standard procedures when available.
 - Make sure the procedures are correct and safe.

Job Safety Assessment

Completing a Job Safety Assessment prior to performing work helps identify job safety hazards and prevent incidents.

Use the guidelines below to assess if a situation is safe or at risk prior to performing designated work.

- If determined to be at risk, take appropriate precautions to prepare for, or eliminate, the hazard.
- If the risks are uncontrollable, consult a knowledgeable resource to find a safe practice solution.
 - A knowledgeable resource may include, but is not limited to, one of the following:
 - Site supervisor
 - Customer
 - Work supervisor
- Always check with the site where work is being performed to determine if safety assessment documentation is required.

Emergency Action Plan

Personnel engaged in installation, commissioning, operating and maintenance of Cummins Inc. products must also comply with all statutory requirements and regulations regarding health and safety.

- Establish and have in place an emergency action plan that complies to all local safety regulations.
 - Fire extinguishing media that meets required safety regulations based on type of work being performed.
 - First aid kits available.
 - Eye flushing safety device.
 - Chemical spill kit for prompt response and clean-up of a spill, discharge, or leak of hazardous materials or wastes.

Common Hazards

Follow these recommended practices when interacting with equipment as the following hazards may exist.

- High Temperature Area
 - Be alert for high temperature areas which may cause severe burns.
 - High temperature areas may be encountered in the following situations.
 - On products that have just been turned off.
 - On or around exhaust related components (turbocharger, aftertreatment systems, etc).
 - In exhaust gas flow paths.
 - Contacting hot fluid lines, tubes, or compartments.
- Recommended Practices
 - Allow components to cool before servicing.
 - Verify the temperature of the component.
 - Utilize an infrared gun, temperature sensor, temperature gauge, or other reliable method to determine component temperature.
 - Protect Eyes.
 - Protect Skin.
 - Wear insulated gloves.
 - Make sure surrounding items do not come in contact with hot components or exhaust.
 - Contact may ignite or melt those materials.
- Heavy Objects
 - Be alert when working with heavy objects.
 - Do not lift components that weigh 23 kg [50 lb] or more.
 - Use mechanical help or seek assistance.
 - Use mechanical help to move items when ever possible.
 - Make sure the load is securely fastened to the equipment.
 - Make sure lifting devices, like chains, hooks, slings, etc., are in good condition and are rated for the correct capacity before use.
 - Make sure lifting devices are positioned correctly before use.
 - Use a spreader bar when necessary.
 - If the item can be lifted manually, squat to lift and lower the item.
 - Do NOT bend at the waist.
 - Maintain balance when lifting items by keeping feet apart or staggered if possible.
 - If the item must be carried, make sure the path is clear when carrying the item to, and placing the item in, the desired location.
- Pressurized Areas
 - Be alert for pressurized areas. Pressurized areas may be encountered in the following situations.
 - Air, Oil, Fuel, and Cooling systems.
 - When disconnecting or removing lines, fittings, or related items.
 - When disconnecting a device from a pressurized system.
 - When removing or loosening caps on tanks or pressurized systems.
 - Injuries that may result when interacting with pressurized areas are listed below.
 - High pressure spray can penetrate the skin. Serious injury or death may result.
 - Hot fluid spray can cause burns. See "High Temperature Area."

- Recommended Practices
 - Protect Skin.
 - Wear impervious gloves.
 - If skin penetration from high pressure spray occurs, it is a medical emergency, seek medical attention immediately.
 - Check for pressure leaks as instructed.
 - Never check for pressure leaks with your hand.
 - Allow product to cool before accessing pressurized areas.
 - Relieve system pressure as instructed.
 - Slowly loosen fill caps to relieve pressure before servicing.

Common Substances

Follow these recommended practices when interacting with the following substances, for information regarding proper handling of various substances refer to the manufacturer's safety data sheet.

- Storage
 - Do not store any of the following common substances in the generator set compartment.
 - Oily rags and other material can restrict cooling and cause fire.
 - Keep the generator set, drip pan, and compartment clean.
- Coolant
 - Coolant is also referred to as antifreeze.
 - Protect Eyes.
 - In case of contact with eyes, flush with water for a minimum of 15 minutes.
 - Seek medical attention immediately.
 - Protect Skin.
 - In case of contact with skin, wash with soap and water.
 - Remove contaminated clothing.
 - If injection occurs, it is a medical emergency, seek medical attention immediately.
 - Do not ingest.
 - If ingested, drink excess water for dilution and seek medical attention.
 - Do not pour used antifreeze into containers that have been used to store other chemicals or products, such as oil or gasoline, unless they have been thoroughly cleaned.
 - If material is spilled, avoid contact and dispersal with runoff, soil, waterways, drains, and sewers.
 - Provide adequate ventilation to the area.
 - Absorb with sand, clay, or commercial absorbent.
 - Transfer to containers and neutralize the material.
 - Flush spill area with soap and excess water.
 - Report spills effecting water source contamination to local authorities immediately.
 - Proper disposal is required.
 - Dispose of in accordance with local and environmental regulations.

- Liquid Nitrogen
 - Work in a well-ventilated area.
 - Protect Eyes.
 - In case of contact with eyes, flush with water for a minimum of 15 minutes.
 - Seek medical attention immediately.
 - Protect Skin.
 - In case of contact with skin, seek medical attention immediately.
 - Wear protective clothing and gloves that insulate.
 - Handle items with tongs or wire hooks.
 - Avoid prolonged breathing of liquid nitrogen vapors.
 - Utilize breathing assistance or oxygen if necessary.
- Lubricating Oil
 - Protect Eyes.
 - In case of contact with eyes, flush with water for a minimum of 15 minutes.
 - Protect Skin.
 - In case of contact with skin, wash with soap and water.
 - Do not ingest.
 - If ingested, seek medical attention.
 - Proper disposal is required.
 - Dispose of in accordance with local and environmental regulations.
- Refrigerant
 - Protect Eyes.
 - In case of contact with eyes, flush with water for a minimum of 15 minutes.
 - In case of frostbite, use lukewarmwater, not hot.
 - Seek medical attention if irritation continues.
 - Proper disposal is required.
 - Dispose of in accordance with local and environmental regulations.
 - Only disconnect liquid refrigerant lines in a well-ventilated area.
 - Liquid refrigerant systems must be properly emptied and filled using equipment that prevents the release of refrigerant gas into the atmosphere.
 - Federal law requires capturing and recycling refrigerant in the United States of America.
- Solvents
 - Follow the manufacturer's instructions for safe handling practices.
 - Follow the manufacturer's recommendations for use.
 - Some solvents are flammable and toxic.
 - Protect Eyes.
 - In case of contact with eyes, follow manufacturer's recommendations.
 - Protect Skin.
 - In case of contact with skin, follow manufacturer's recommendations.
 - Dispose of in accordance with manufacturer's recommendations.

- Starting Aids (Starting Fluid)
 - Do NOT use starting fluid if the intake air heater option is used.
 - Do NOT use volatile cold starting aids in underground mine or tunnel operations.
 - The local United States Bureau of Mines inspector can provide more information and instructions.
 - Avoid sparks, arcing switches and equipment, cigarettes, pilot lights, flames, and other sources of ignition.
 - Work in a well-ventilated area.
 - Avoid inhalation.

Electrical Components

Follow these recommended practices when interacting with electrical components.

- Lead Acid Batteries
 - Protect Eyes.
 - Wear safety glasses or goggles.
 - In case of battery acid contact with eyes, flush with water for a minimum of 15 minutes.
 - Seek medical attention immediately.
 - Protect Skin.
 - Wear rubber gloves and a chemical apron.
 - In case of battery acid contact with skin or clothing, rinse with water for several minutes.
 - Avoid spreading the acid.
 - Seek medical attention immediately.
 - Do NOT open the battery caps with your face over or near the battery.
 - Remove rings, watches, long jewelry, or metallic items when working with or near batteries.
 - Ventilate the battery compartment before servicing the battery.
 - Work in a well-ventilated area.
 - Avoid sparks, arcing switches and equipment, cigarettes, pilot lights, flames, and other sources of ignition.
 - Use insulated or non-conducting tools.
 - Neutralize static buildup by contacting the nearest ground surface before working on a battery.
 - Do not lift batteries by the posts.
 - Do not touch both battery terminals with your bare hands at the same time.
 - Disconnect the negative (-) battery cable first.
 - Attach the negative (-) battery cable last.

Fuels

Follow these recommended practices when interacting with equipment that uses different types of fuels.

- General recommended safety practices for all fuels.
 - Protect Eyes.
 - Protect Skin.
 - ALWAYS test for fuel leak as instructed.
 - Do NOT dilute.
 - Avoid sparks, arcing switches and equipment, cigarettes, pilot lights, flames, and other sources of ignition.
 - Provide extra ventilation to the work area.
 - Do not troubleshoot or repair fuel leaks while the engine is running.
 - If material is spilled, avoid contact and dispersal with runoff, soil, waterways, drains, and sewers.
 - Absorb with sand, clay, or commercial absorbent.
 - Transfer to containers and neutralize the material.
 - Flush spill area with soap and excess water.
 - Report spills effecting water source contamination to local authorities immediately.
 - Proper disposal is required.
 - Dispose of in accordance with local and environmental regulations.
 - Always torque fittings and connections to the required specifications.
 - Over or under tightening can damage threads and create leaks.
 - Storage
 - Do not store any fuels in the generator set compartment.
 - Oily rags and other material can restrict cooling and cause fire.
 - Keep the generator set, drip pan, and compartment clean.
- Gasoline additional recommended safety practices.
 - ALWAYS be alert for the smell of gasoline.
 - Vapors accumulate near the floor.
 - Check the work floor, sumps, and low-lying areas for ignition sources before servicing equipment.
- Biodiesel additional recommended safety practices.
 - Vapors accumulate near the floor.
 - Check the work floor, sumps, and low-lying areas for ignition sources before servicing equipment.

- Compressed Natural Gas additional recommended safety practices.
 - Always be alert for the smell of gas.
 - Compressed natural gas is typically treated with an odor producing chemical for leak detection.
 - Non-refined sources of natural gas (landfill gas, biogas, coal bed gas, wellhead gas, etc.) can not always be detected by smell.
 - Always test for fuel leaks as instructed. Odorant can fade.
 - Upon entering a room or approaching a vehicle where the smell of gas is present, immediately shutoff all engines and ignition sources.
 - Natural gas ignites when there is a 5% - 15% mixture in the air.
 - Asphyxiation can occur when concentration reaches 21% or more.
 - Do not start equipment or nearby equipment until a suspected gas leak is corrected and the area is ventilated.
 - Work in areas that do not share common ventilation with areas containing ignition sources.
 - Store and service natural gas fueled equipment in large, well-ventilated areas, or outside.
 - Natural gas accumulates near the ceiling.
 - Check the ceiling of the work area for ignition sources before servicing equipment.
 - Only disconnect gas lines in a well-ventilated area.
 - Natural gas ignition systems produce high voltage during operation.
 - Do not touch ignition wiring or components while the engine is operating.
 - If necessary, use only insulated tools.
 - Natural gas exhaust systems operate at higher temperatures than similar diesel exhaust systems.
 - Do not touch exhaust components.
 - Do not route lines or hoses which deteriorate from heat exposure near exhaust components or in the flow path of the exhaust.
 - Upon entering a room or approaching a vehicle where the smell of gas is present, immediately shutoff all engines and ignition sources.

- Liquefied Natural Gas additional recommended safety practices.
 - Always be alert for the smell of gas.
 - Non-refined sources of natural gas (landfill gas, biogas, coal bed gas, wellhead gas, etc.) can not always be detected by smell.
 - Liquefied natural gas may not have an odor.
 - Always test for fuel leaks as instructed. Odorant can fade.
 - Natural gas ignites when there is a 5% - 15% mixture in the air.
 - Asphyxiation can occur when concentration reaches 21% or more.
 - Do not start equipment or nearby equipment until a suspected gas leak is corrected and the area is ventilated.
 - Work in areas that do not share common ventilation with areas containing ignition sources.
 - Store and service natural gas fueled equipment in large, well-ventilated areas, or outside.
 - Natural gas accumulates near the ceiling.
 - Check the ceiling of the work area for ignition sources before servicing equipment.
 - Only disconnect gas lines in a well-ventilated area.
 - Natural gas ignition systems produce high voltage during operation.
 - Do not touch ignition wiring or components while the engine is operating.
 - If necessary, use only insulated tools.
 - Natural gas exhaust systems operate at higher temperatures than similar diesel exhaust systems.
 - Do not touch exhaust components.
 - Do not route lines or hoses which deteriorate from heat exposure near exhaust components or in the flow path of the exhaust.
 - Liquefied natural gas is stored in vehicle tanks at extremely cold temperatures.
 - If there is a liquefied natural gas spill, evacuate the area immediately and do not attempt to make contact with the liquid.
 - Vapors accumulate near the floor.
 - Check the work floor, sumps, and low-lying areas for ignition sources before servicing equipment.

- Liquefied Petroleum Gas
 - Always be alert for the smell of gas.
 - Liquefied petroleum gas is typically treated with an odor producing chemical for leak detection.
 - Always test for fuel leaks as instructed. Odorant can fade.
 - Upon entering a room or approaching a vehicle where the smell of gas is present, immediately shutoff all engines and ignition sources.
 - Work in areas that do not share common ventilation with areas containing ignition sources.
 - Store and service natural gas fueled equipment in large, well-ventilated areas, or outside.
 - Liquefied petroleum gas accumulates near the floor.
 - Check the work floor, sumps, and low-lying areas for ignition sources before servicing equipment.
 - Liquefied petroleum gas ignition systems produce high voltage during operation.
 - Do not touch ignition wiring or components while the engine is operating.
 - If necessary, use only insulated tools.
 - Liquefied petroleum gas exhaust systems operate at higher temperatures than similar diesel exhaust systems.
 - Do not touch exhaust components.
 - Do not route lines or hoses which deteriorate from heat exposure near exhaust components or in the flow path of the exhaust.
 - Liquefied natural gas is stored in vehicle tanks at extremely cold temperatures.
 - If there is a liquefied natural gas spill, evacuate the area immediately and do not attempt to make contact with the liquid.

Personal Protective Equipment (PPE)

- To reduce the possibility of personal injury, personal protective equipment (PPE) should be utilized.
 - Always meet on-site safety regulations for required PPE.
 - Proper maintenance of safety equipment must be practiced.
 - Integrity of safety equipment must be checked to make sure equipment functionality is maintained.
- Eye Protection
 - Eye protection must always be worn. Types of eye protection to consider are listed below.
 - Safety glasses. Exposure to flying particles or debris, chemicals or caustic liquids, gases or vapors.
 - Polarized safety glasses. Working in outdoor or bright lighting environments.
 - Over-the-glass safety glasses. Add protection to prescription glasses.
 - Safety goggles: Handling caustic liquids or chemicals.
 - Shade or arc rated eyewear. Exposure to welding. Use appropriate filter ratings.

- Foot Protection
 - Protective shoes must always be worn. Wear appropriate foot protection based on the task being completed. Types of protective footwear to consider are listed below.
 - Steel toed shoes. Exposure to falling or rolling objects. Working with or around parts, tools, and equipment.
 - Chemical resistant. Exposure to chemicals and other fluids.
 - Overshoes and overboots. Add protection to everyday work shoes.
 - Foot, toe, and metatarsal guards. Add protection to everyday work shoes.
 - Electrical hazard safety toe shoes. Exposure to electrical hazards.
 - Leather footwear or shoe protectors. Exposure to welding or arc flash.
 - Cold protection. Exposure to cold weather.
- Head and Face Protection
 - Wear appropriate face protection based on the task being completed. Types of head and face protection to consider are listed below.
 - Hard hats. Exposure varies. Consider welding, heat, or arc-rated.
 - Visors. Exposure varies. Consider welding, heat, or arc-rated.
 - Face liners. Exposure to cold weather.
 - Face shields: Exposure to liquid splash. Handling caustic liquids or chemicals.
- Hand Protection
 - Wear appropriate type and fit of gloves based on the task being completed. Types of protective gloves to consider are listed below.
 - Heat resistant or insulated. Exposure to hot items.
 - Flame resistant. Exposure to welding or arc flash.
 - Impact resistant. Performing repetitive impact and vibration work. Using pneumatic tools.
 - Impervious. Exposure to high pressure fluids.
 - Chemical resistant. Exposure to chemicals, fluids, or batteries.
 - Cut resistant. Handling sharp objects or tools.
 - Cold weather. Exposure to cold weather.
- Hearing Protection
 - When working around operating equipment, appropriately rated hearing protection should be worn. Types of hearing protection to consider are listed below.
 - Single use ear plugs.
 - Pre-formed ear plugs.
 - Ear muffs.
- Protective Clothing
 - Wear appropriate protective clothing based on the task being completed. Types of protective clothing to consider are listed below.
 - Flame resistant. Exposure to electrical hazards. Exposure to oil and gas or generator set applications. Performing welding.
 - Chemical resistant. Exposure to chemicals.
 - High visibility. Exposure to reduced visibility working environments. Working on mining, oil and gas, or sites with large equipment.

- Respiratory Protection
 - Wear appropriate respiratory protection based on the task being completed. Types of respiratory protection to consider are listed below.
 - Disposable respirators. Exposure to dust and particles, welding fumes, nuisance odors, nuisance level acid gas.
 - Reusable respirators. Exposure to cleaning, machining, welding, sanding, grinding, etc.
- Fall Protection
 - Utilize fall protection if a task is being completed more than 1.2 m [4 ft] above a solid surface. Types of fall protection to consider are listed below.
 - Fall harness and lanyard combinations.
 - Safety nets.
 - Guardrails.

Tools and Equipment

- Tool Selection
 - Select the correct tool or equipment to perform the task.
- Tool Condition
 - Confirm the tool or equipment is free of defects before use.
 - Always use tools that are in good condition.
- Tool Use
 - Use the tool or equipment as directed.
 - Follow the manufacturer's instructions.

Ergonomics

- Back-Bending and Twisting
 - Avoid bending forward more than 45° at your waist.
 - Avoid working with your back twisted with loads over 23 kg [50 lb].
 - Wear approved back support belt when appropriate.
- Lifting and Lowering
 - Squat to pick up parts.
 - Keep loads close to the body when lifting or carrying.
 - Use a team lift or a lifting device if the object is more than 23 kg [50 lb].
 - Wear approved back support belt when appropriate.
- Knee
 - Avoid bending your knee more than 90°.
 - Avoid kneeling for more than 4 hours per day.
 - Wear approved knee protective devices when appropriate.
- Pulling or Pushing
 - Pull with your arms.
 - Push with your legs.
 - Avoid exerting more force than necessary.
 - Avoid moving heavy load(s) too quickly.

2.2 Safety Messages - Overview

General Information

Safety messages are utilized throughout Cummins® Service Information to alert users of hazards that can be encountered when performing work as instructed on Cummins® products.

Safety messages define the following characteristics:

- Severity- seriousness of the hazard in terms of how much harm or damage it can cause
- Hazard- any potential source or agent that can cause harm or damage to life or health
- Risk- negative consequences caused by exposure or interaction with the hazard
- Avoidance- procedures taken to best avoid the risk that the hazard poses

The severity of a safety message is defined by one of the following color-coded signal words:

- Danger – Red background. Indicates a hazardous situation which will result in death or serious injury.
- Warning – Orange background. Indicates a hazardous situation which could result in death or serious injury.
- Caution – Yellow background. Indicates a hazardous situation which could result in minor or moderate injury.

2.3 Batteries - Overview

General Information

The purpose of this document is to make all repair locations aware of safe lead acid battery service instructions.

There are many types of batteries with varying technology.

Common battery types include the following.

- Standard lead acid (also called flooded or wet cell)
 - Starting
 - Deep cycle
 - Serviceable or maintenance free
- Maintenance free absorbent glass mat
- Maintenance free gel cell

Battery supplier service literature will provide specific removal and installation, maintenance, inspection, and testing requirements. See Original Equipment Manufacturer (OEM) service information.

2.4 Battery Cables and Connections - Remove and Install

Tools Summary		
Part Name	Part Number	Quantity
Battery Brush		1

Tools Summary		
Part Name	Part Number	Quantity
Wire Brush		1
Clean Rag		1
Battery Terminal Sealant		1

General Information

There are different types of battery connections.

These instructions are representing basic safety practices when performing battery servicing.

Refer to OEM Service Manual for specific battery instructions

Remove

Make sure the battery compartment is ventilated.

Remove the cables in the following order.

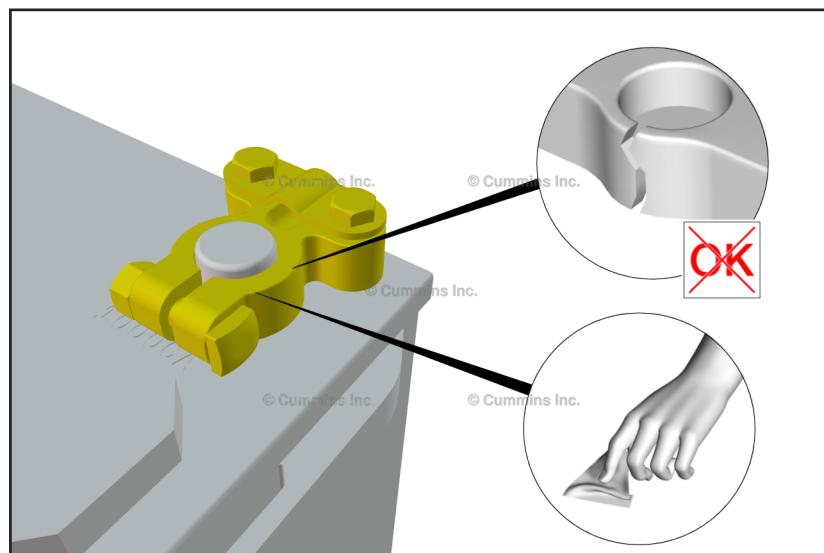
1. Negative Cable
2. Positive Cable

Remove OEM components, as necessary.

Clean

	WARNING	Battery Exposure Battery may explode. Battery acid may cause burns or injury. Avoid contact. Wear appropriate personal protective equipment.
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Clean the battery cables and connections if corroded.



Use the following tool as applicable.

Tool Name	Tool Type	Part Number	Quantity
Battery Brush	Generic		1
Wire Brush	Generic		1
Clean Rag	Generic		1

Clean cable connections until surfaces are clear of debris.

Clean battery terminals until surfaces are clear of debris.

Clean battery tops until surfaces are clear of debris.

Check

Check the following.

- Battery cables and connections
- Terminals
- Connectors
- Cables

Replace if any of the following are found.

- Broken
- Cracked
- Deformed Terminals
- Loose Terminals

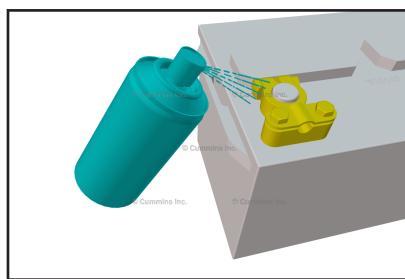
Install

Install the cables in the following order:

1. Positive Cable
2. Negative Cable

Tighten the battery connections.

Prevent corrosion by applying sealant to the terminals.



Tool Name	Tool Type	Part Number	Quantity
Battery Terminal Sealant	Generic		1

Tighten the battery connections.

- Refer to OEM manual for tightening steps.

2.5 Equipment - Safe Service

General Information

Lock out / Tag out must only be performed by persons authorized to perform Lock out / Tag out on the specific equipment.

Lock-Out-Tag-Out

Comply with location specific lock out / tag out procedures including, but not limited to the following.

- Permits for work
- Emergency stop process
- Immobilization of vehicles or equipment
- Lock out / tag out signage and required data
- Informing appropriate site personnel
- Application back-up dependencies
 - Example: Critical life support generator sets

Shut off all sources of energy and check that all moving parts have stopped moving.

Use appropriate personal protective equipment.

Electrical equipment must be treated as energized until proven de-energized with a live-dead-live test

Activate emergency stop.

Isolate the equipment from all energy sources, but not limited to the following.

- Generator set
- Control panels
- Associated equipment
- Batteries
- AC power to all associated heaters

Lock out and apply tag to all points of isolation.

Lock out tags must include the following information at a minimum.

- Identity of the equipment being isolated
- Reason for isolation
- Date of the isolation
- Person that applied the lock out
- Method to contact the person

Verify the Lock out / Tag out by attempting to restart the equipment using manual controls.

Maintain the lock out by performing the following.

- Keep keys secure

Keep unqualified personnel away from the point of work

Re-Energize

Make sure that the work is complete.

Check the following.

- All connections have been restored

- All guards and covers are in place

Make sure that the area is clear of personnel and tools.

Close any test points or stop cocks that were opened during verification.

Cancel any work permits.

Notify the appropriate personnel that the lock out will be removed.

Remove the locks and tags.

Make sure the equipment is ready.

Chapter 3 - Basic Service Practices

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3.1 Generator Set - Overview

General Information

This document provides general cleaning practices for a generator set.

Detailed information for individual components can be found in the clean action for each component.

The intent of cleaning is to remove debris; this does not mean they have to appear as new.

Debris buildup can affect the performance and heat dissipation of pumps and other electric motors.

The general working area must be cleaned prior to opening closed systems.

Accumulation of oils and coolants can result in unsafe working conditions.

Overview

The following conditions must be met before cleaning is started.

- Sources of power must be isolated
- The generator set is not running.
- The generator set has cooled to ambient temperature
- Make sure drainage flows away from the generator set
- Ambient conditions are above freezing temperature

Low pressure wash should be used to remove dust and light debris.

Low pressure wash is defined as follows.

- Use water
- Flow rate between 0.07 and 0.15 lit/sec [1 and 2 gal/min]
- Diameter of the water outlet less than 15.9 mm [5/8 inch]
- Water temperature between 10 °C and 30 °C [50 °F and 86 °F]
- Spray from a distance greater than 10 cm [4 in]
- Spray the target component with a sweeping motion

Do NOT low pressure wash the following components.

- Air filters
- Air inlets
- Fans
- Belts
- Bearings
- Batteries
- Any exposed electrical terminals

High pressure wash should be used to remove large debris or other buildup not removed by a low-pressure wash.

High pressure wash is defined as follows.

- Use water
- Water pressure greater than 10340 kPa [1500 psi]
- Spray from a distance greater than 15 cm [6 in]
- Spray the target component with a sweeping motion

Do NOT high pressure wash the following components.

- Air filters
- Air inlets
- Fans
- Belts and Hoses
- Bearings
- Batteries
- Electrical Components
 - Wiring harnesses
 - Electronic Control Module
 - Electronic Control Module Connectors
 - Capacitive Coil Driver Module
 - Ignition Coils and Leads
 - Sensors
 - Any electronic actuators
- Electrical boxes

	WARNING	<p>Steam Cleaning Risk of burns and flying debris. Wear appropriate personal protective equipment.</p>
---	----------------	---

Steam cleaning can be used to remove debris or buildup not removed by a low-pressure wash.

Steam cleaning is defined as follows.

- Use water
- Temperature between 99 °C and 110 °C [210 °F and 230 °F]
- Spray the target component with a sweeping motion

Do not steam clean the following components:

- Air filters
- Air inlets
- Fans
- Belts and Hoses
- Bearings
- Batteries
- Electrical Components
 - Wiring harnesses
 - Electronic Control Module
 - Electronic Control Module Connectors
 - Capacitive Coil Driver Module
 - Ignition Coils and Leads
 - Sensors
 - Any electronic actuators
- Electrical boxes

	CAUTION	Solvent Exposure Skin and eye irritation may occur. Follow manufacturer's instructions for use. Wear appropriate personal protective equipment.
---	----------------	--

Solvent and acid cleaning should be used to remove oils or other buildup not removed by a low-pressure wash.

Solvent cleaning should only be used on focused areas.

There are several solvent and acid-type cleaners available.

Follow the manufacturer's recommendations for cleaning solvents.

Do NOT use solvents on the following components.

- Rubber couplings
- Rubber vibration isolators

Chapter 4 - Service Support

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4.1 Service Assistance - Overview

Overview

To contact or locate the nearest Cummins® Authorized Repair Location, please visit locator.cummins.com.

- For 24 hour assistance, please visit www.cummins.com/support

When contacting Cummins Inc., have the following information readily available:

- Model
- Specification
- Serial Number

Cummins Inc. provides a 24-hour, toll free telephone number to aid in technical and emergency service when a Cummins® Authorized Repair Location can not be reached or is unable to resolve an issue with a Cummins® product.

U.S. and Canada

- 1-800-CUMMINS™ (1-800-286-6467)

Mexico

- 01-800-CUMMINS (2866467)
- Email: contacto.mexico@cummins.com

Australia/New Zealand

- For Australia: 1-300-CUMMINS (1300 286 6467)
- For New Zealand: 0-800-CUMMINS (0800 286 6467)
- Email: 1300cummins@cummins.com

Brazil

- 0800 CUMMINS (0800 286 6467)
- Email: falecom@cummins.com

Europe

- From the UK, Ireland, Germany, France, and the Netherlands - Freephone: 00 8000 2866467 or +44 1327 886464
- Email: cceurope@cummins.com

China

- (+86) 400 810 5252
- Email: cac@cummins.com

India

- 800 210 2525
- Email: powermaster-India@cummins.com

Russia

- Primary: +7 495 926 8624
- Alternate: +7 962 943 1211

For All Other Areas:

- +44 (0) 1327 886464

4.2 Manufacturing Locations - Overview

Overview

U.S. and Canada

- Cummins Inc.
- 1400 73rd Ave. NE
- Minneapolis, MN 55432 USA
- 1-800-CUMMINS™ (1-800-286-6467)
- Phone +1 763-574-5000
- Fax +1 763-574-5298

EMEA, CIS

- Cummins Inc.
- Royal Oak Way South
- Daventry
- Northamptonshire
- NN11 8NU
- United Kingdom
- Phone +44 1327 88-6453
- Fax +44 1327 88-6125

Brazil

- Cummins Inc.
- Rua Jati, 310, Cumbica
- Guarulhos, SP 07180-900
- CNPJ: 43.2201.151/0001-10
- Brazil
- Phone 0800 286 6467

China

- Cummins Inc.
- No.118 South Quanli Road
- Wuhan Economic & Technological Development Zone
- Hubei, P.R.China 430058
- Phone + 86 (27) 8421 4008
- Fax + 86 (27) 8421 4804

India

- Cummins Inc.
- Plot No B-2, SEZ Industrial Area
- Village-Nandal & Surwadi, Taluka- Phaltan
- Dist- Satara, Maharashtra 415523
- India
- Phone +91 021 66305514

LATIN AMERICA

- Cummins Inc.
- 3350 Southwest 148th Ave.
- Suite 205
- Miramar, FL 33027
- USA
- Phone +1 954 431 551
- Fax +1 954 433 5797

Mexico

- Cummins Inc.
- Eje 122 No. 200 Zona Industrial
- San Luis Potosi, S.L.P. 78395
- Mexico
- Phone +52 444 870 6700
- Fax +52 444 824 0082

ASIA PACIFIC

- Cummins Power Generation (S) Pte Ltd.
- 85 Tuas South Avenue 1
- Singapore 637419
- Fax +65 6265 6909

Chapter 5 - Product and System Identification

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5.1 Generator Set - Overview

General Information

Model names provide identification information for Cummins® products.

Information that may be found in model names are listed below.

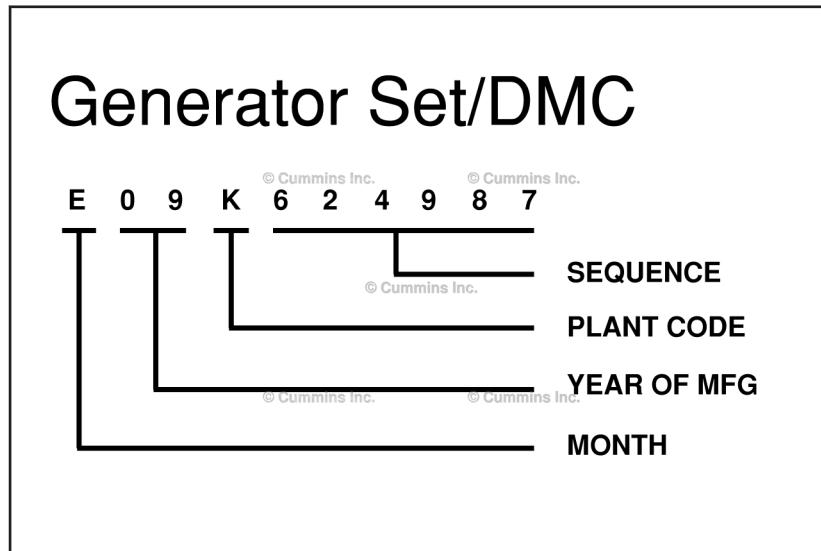
- Marketing Model Names and numbers
- Specification numbers
- Electrical characteristics
 - Control system

When contacting Cummins® dealers or distributors for service assistance, always be ready to provide the complete product model, service model name or serial number information for the product as listed on the nameplate.

Overview

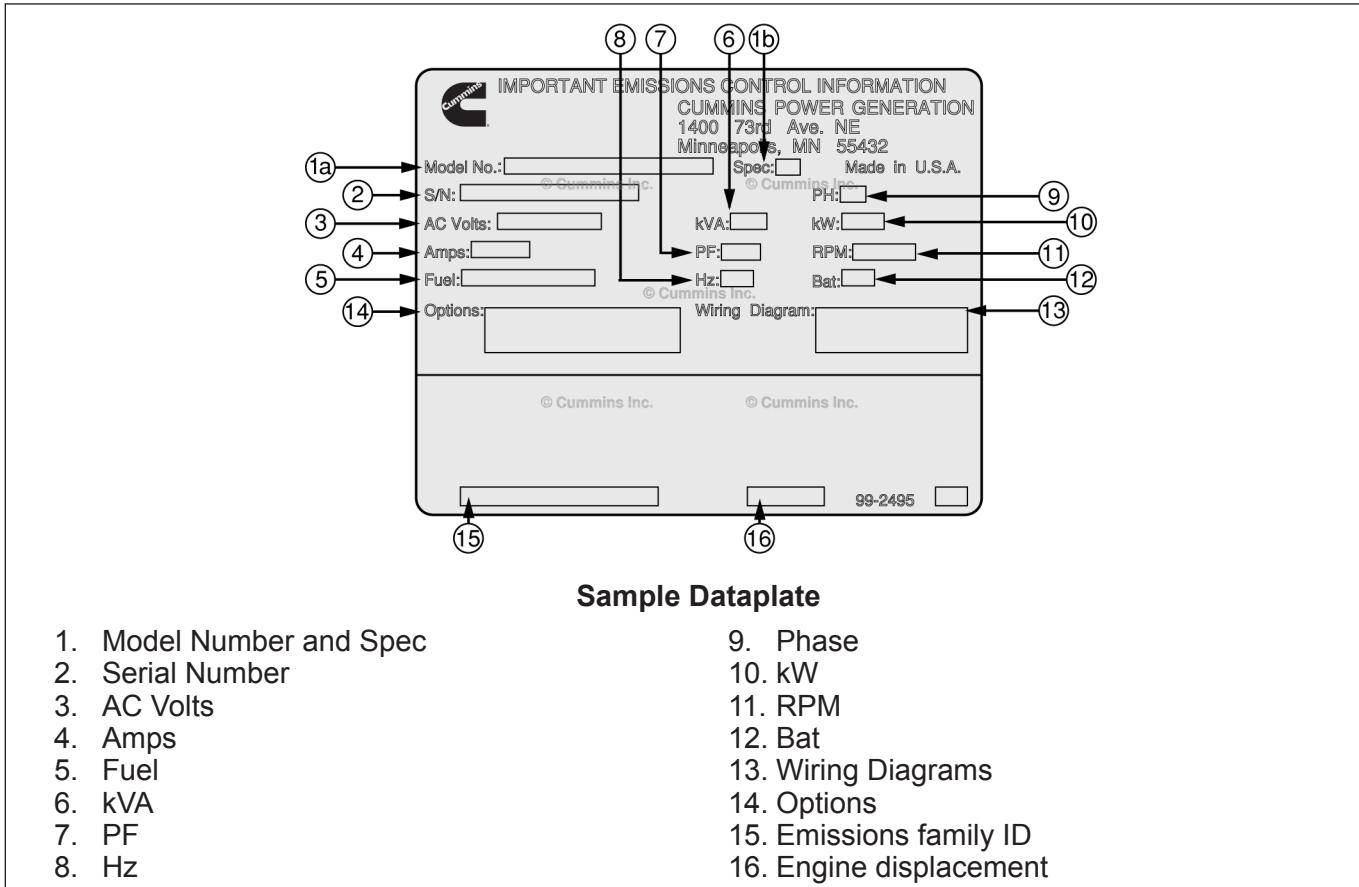
Generator set model names consist of the following.

1. Month
2. Year of manufacture
3. Plant code
 - 0 = Fridley USA
 - A = Australia
 - B = Italy Rental
 - C = Italy (DIEM)
 - D = Daventry UK
 - E = Loncin
 - F = Domestic US
 - G = Girtz & Brazil G-Drive
 - H = Wuhan China
 - I = India
 - J = Cal Pac (Eco systems)
 - K = Kent UK
 - M = SLP Mexico
 - Q = CPT China
 - S = Singapore
 - T = Brazil
 - V = Venture
 - W = Wuxi China
 - WH = China Domestic Products
 - Y = Nigeria
 - Z = GE Zenith Controls
4. Sequence - 6 characters
 - Product since 2012 have 6 numeric characters previous to this it was three letters followed by three numbers



5.2 Dataplates - Overview

Diagrams



General Information

Each generator set is provided with a dataplate that contains the generator set model and serial number.

This information is needed when contacting Cummins for parts, service, and product information.

The last character of the Model Number is the "Spec Letter" and is important for obtaining the correct information.

Overview

The fields on the dataplate refer to the following information.

- Model Number and Spec Letter
- S/N
 - Serial Number
- AC Volts
 - Generator set output voltage rating
- Amps
 - Generator set output amps at rated kW and maximum volts

- Fuel
 - Generator set fuel type
 - Diesel, Gasoline, LPG Vapor, LPG Liquid, or Natural Gas
- kVA
 - kW / Power Factor
- PF
 - Power Factor
- Hz
 - Generator set output frequency
- Phase
 - Number of generator set output phases
 - Can be one or three phase output
- kW
 - Generator set output power rating
- RPM
 - Generator set operating speed at rated output
- Bat
 - Generator set DC battery voltage requirement
- Wiring diagram
 - Diagram as specified by the generator set parts list
- Options
 - Feature options included on the generator set

Chapter 6 - Product and System Overviews

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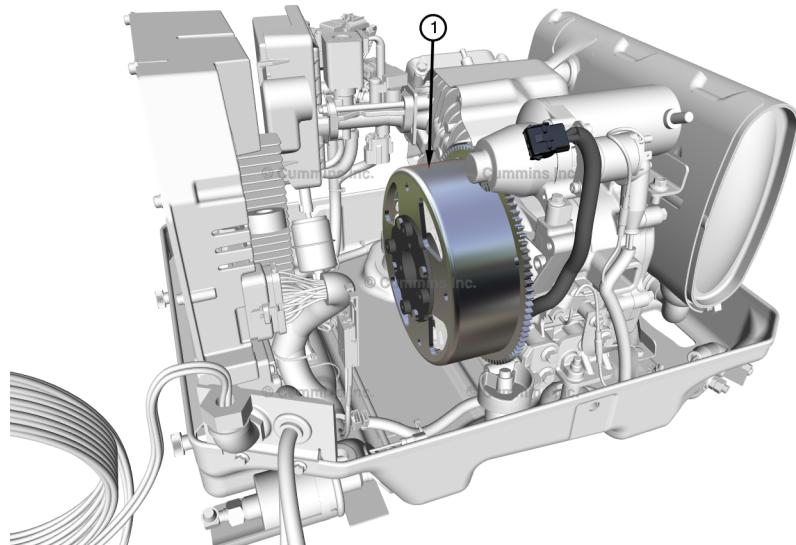
6.1 Generator Set - Overview

Diagrams



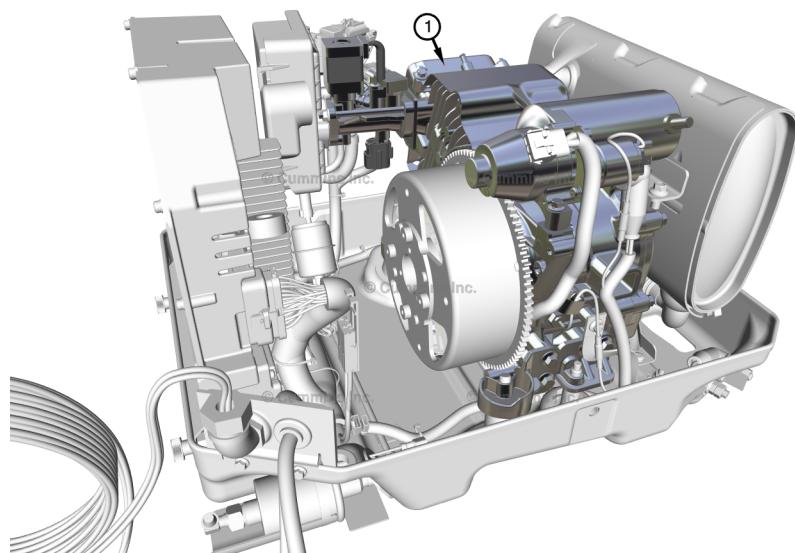
Front View

- 1. Enclosure cover
- 2. Enclosure door
- 3. Mounting system



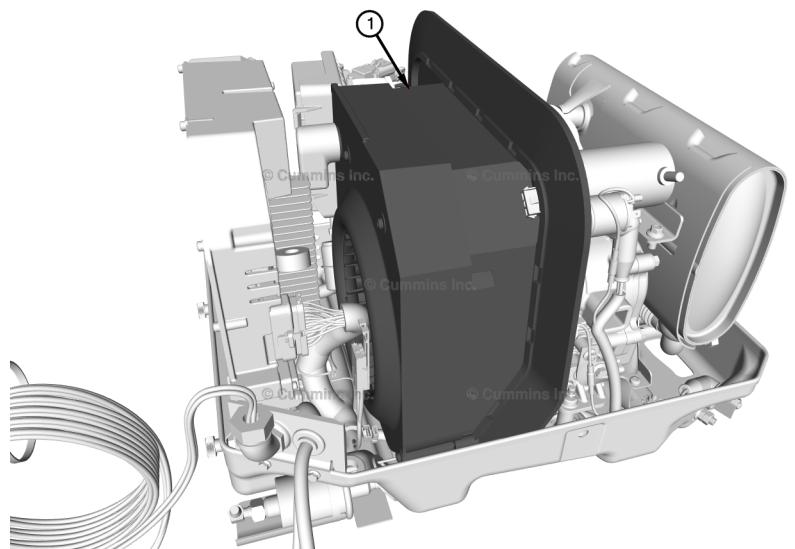
Rear View

- 1. Alternator



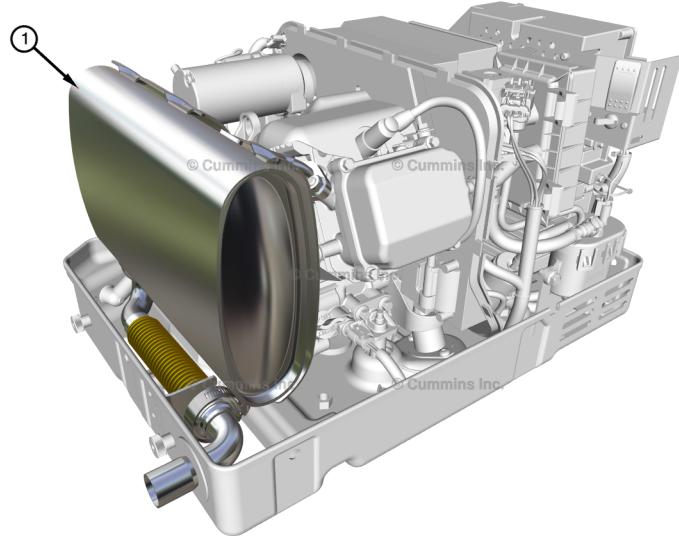
Rear View

1. Engine



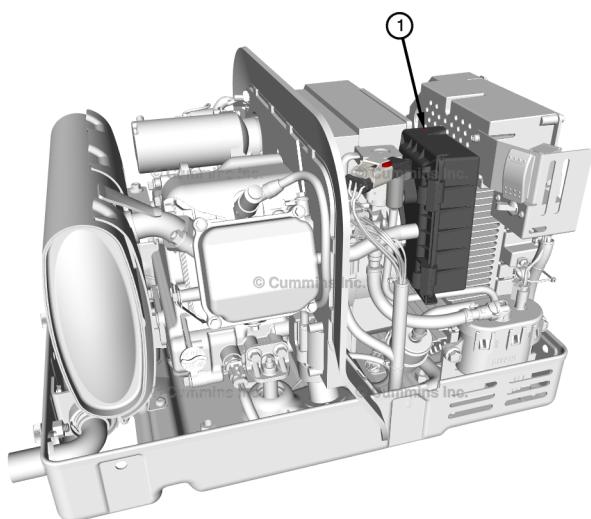
Rear View

1. Cooling system



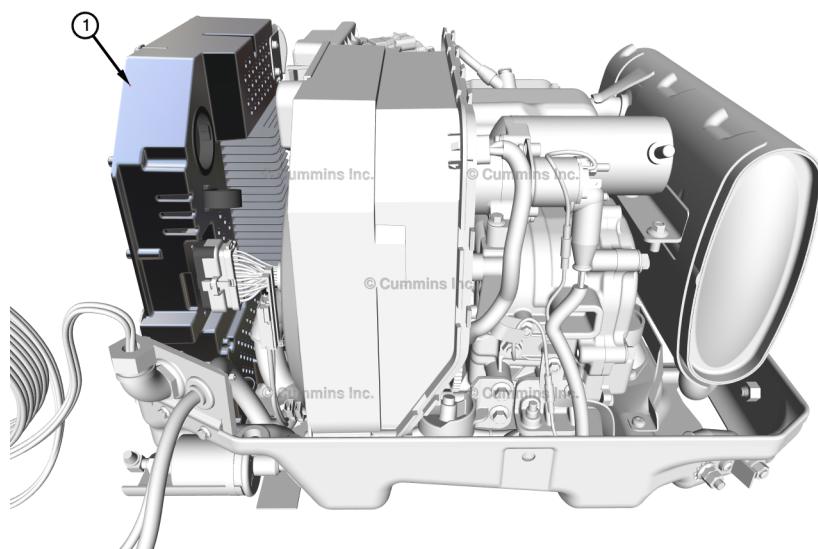
Front View

1. Exhaust system



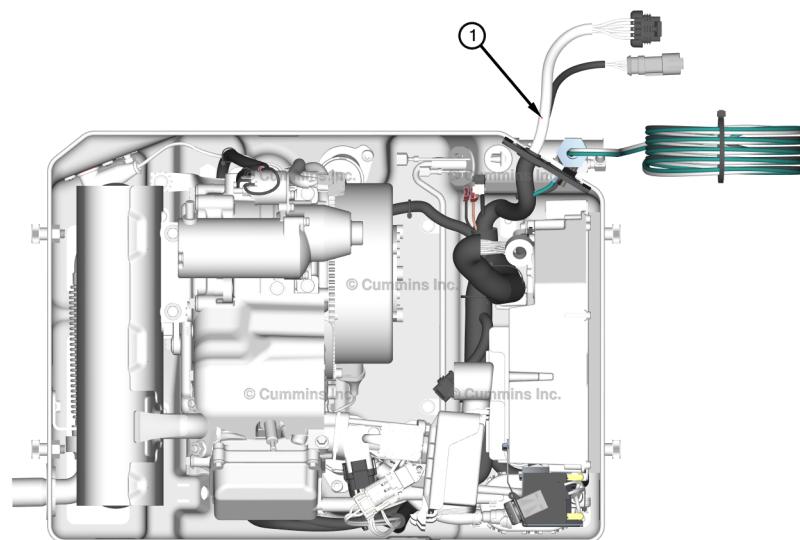
Front View

1. Air filter



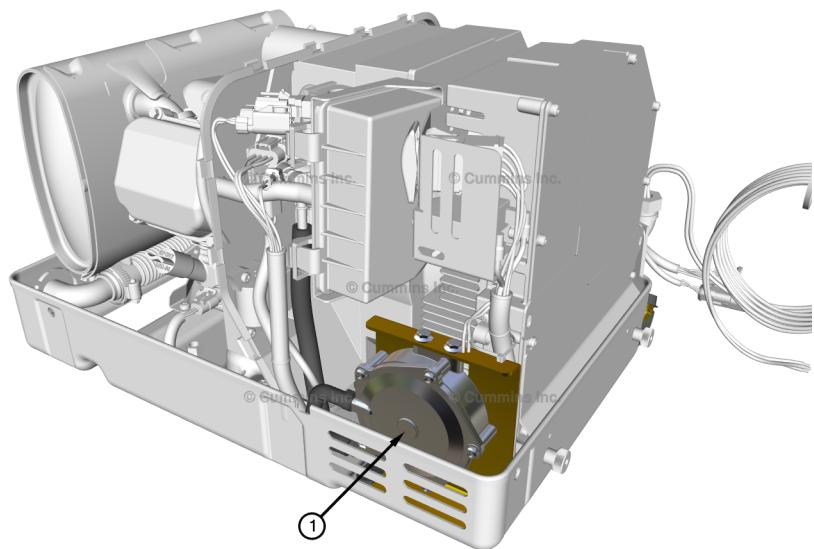
Rear View

1. Inverter/Controller



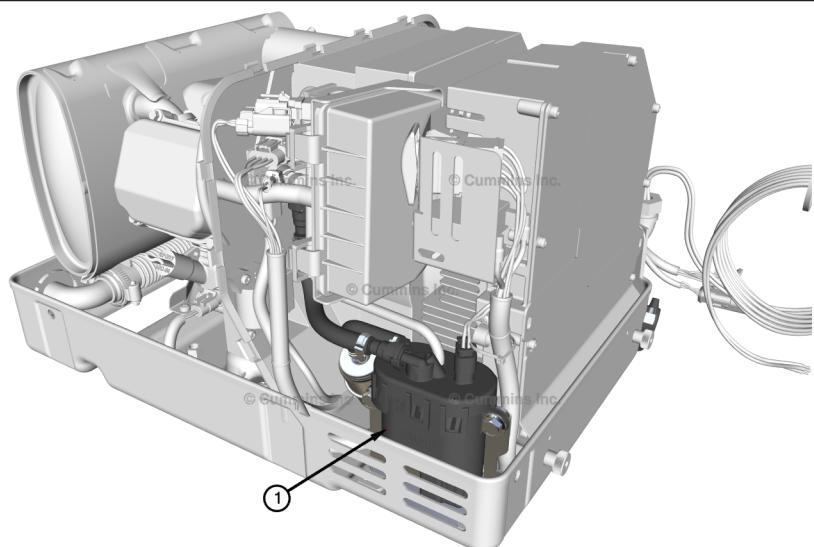
Top View

1. Harness



Front View

1. Liquid Propane Fuel System



Front View

1. Gasoline Fuel System

Overview

The generator set converts mechanical energy to electrical energy.

Chapter 7 - Preparation

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7.10 Carbon Canister-Evaporative Emissions System (EVAP)	65

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7.1 Location - Application Preparation

General Information

The location, mounting, and ventilation of a generator set must be such that mounting is secure, engine exhaust and fuel vapors are prevented from entering the vehicle, rain and road debris are prevented from entering the generator set, and ready access is afforded for operating the generator set and performing periodic maintenance.

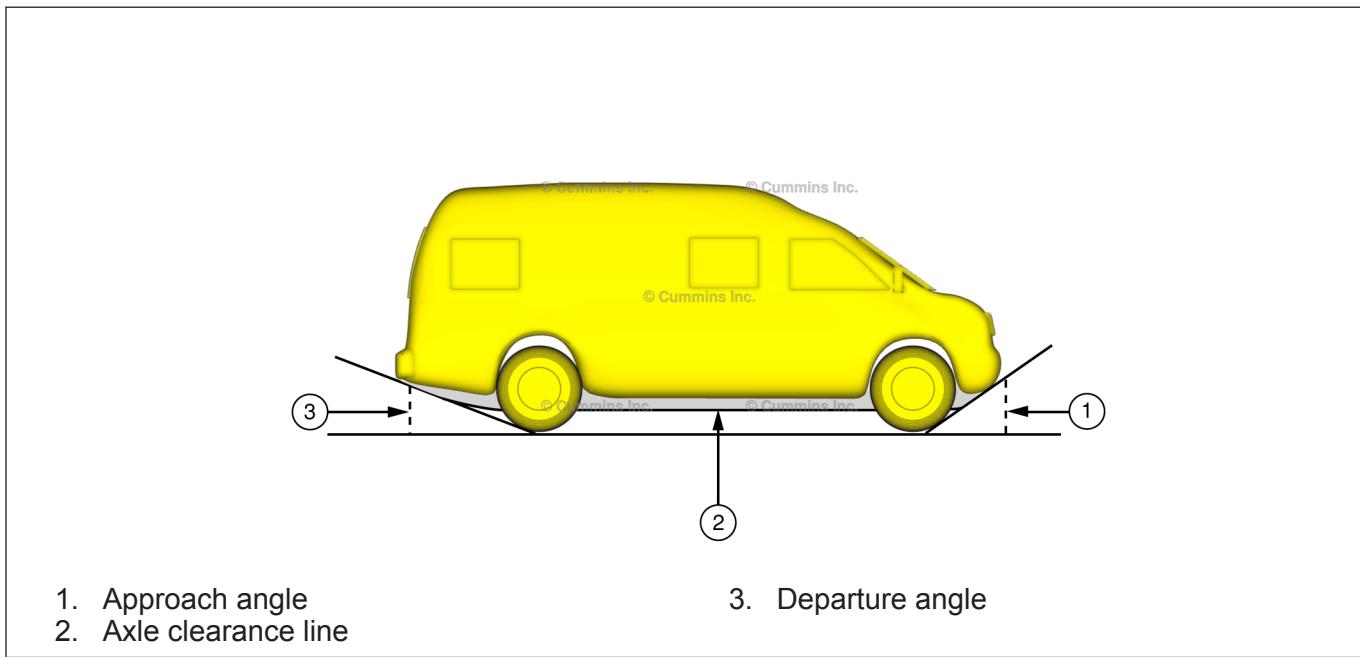
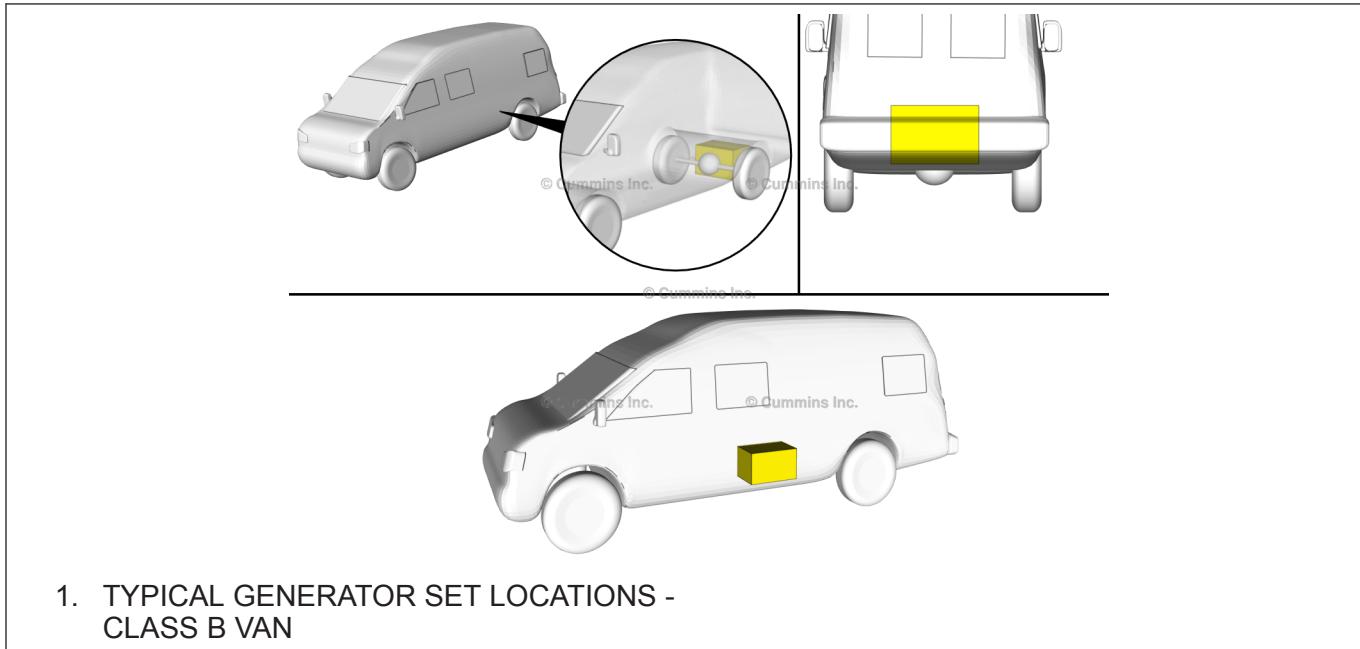
Guidelines

The location must provide:

- Ready access for starting and stopping the generator set and performing all periodic maintenance.
- Separation from sources of flammable vapors, such as batteries and fuel tanks, which the generator set could ignite.
- Access for connecting and disconnecting fuel lines, battery cables, remote control wiring, and AC wiring.
- Access from below for draining engine oil.
- Unobstructed space around the generator set for proper cooling air flow.
 - [Application Preparation Ventilation \(Page60\)](#)
- The generator set must not share a compartment or ventilation with batteries or fuel tanks. An operating generator set can ignite flammable vapors.
- Make sure the space below the generator set cooling outlet is unobstructed for at least 305 mm [12 in] and open on at least 3 sides.
 - If less than 305 mm [12 in] is provided, the application must pass a generator set cooling performance test
 - [Performance Test Cooling System \(Page96\)](#)
- Locate or shield the generator set cooling air openings from direct rain, road splash and debris thrown up by the road wheels.
- Space to mount the generator set with at least 12.7 mm (1/2 in) clearance at the top.
 - Minimum clearances apply to any thermal or acoustic insulation with which a compartment may be lined.
- Space to mount the generator set with at least 25.4 mm (1 in) clearance at the side of the generator set.
 - Minimum clearances apply to any thermal or acoustic insulation with which a compartment may be lined.
- Locating a generator set more than 1.5 m (5 ft) above the floor and at the very back of the vehicle can result in 'g' forces imparted to the generator set that causes physical damage to it as it travels down the road.
 - Generator sets located in these areas do not have warranty coverage for damage resulting from high 'g' loads.
- Locating the generator set near the front of the coach or vehicle (directly behind or under the driver or passenger seat) creates a situation where heat from the running propulsion engine can be drawn into the generator set while stationary or moving.
 - An alternate location should be selected for the generator set.
- Following these guidelines does not guarantee generator set performance.
 - A generator set cooling performance test is required to verify generator set performance.
 - [Performance Test Cooling System \(Page96\)](#)

7.2 Location - Class B Van Locations - Application Preparation

Diagrams



Guidelines

Application Preparation Location (Page 57)

The generator set is typically mounted behind the rear axle.

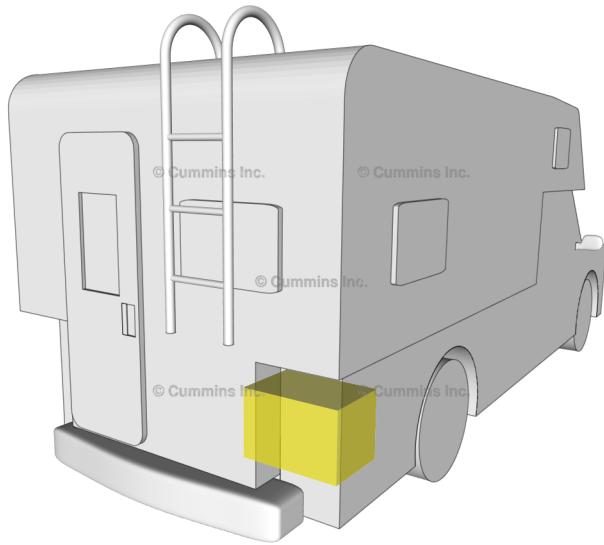
Mounting kits are available for below floor mounting.

- Follow the kit instructions.

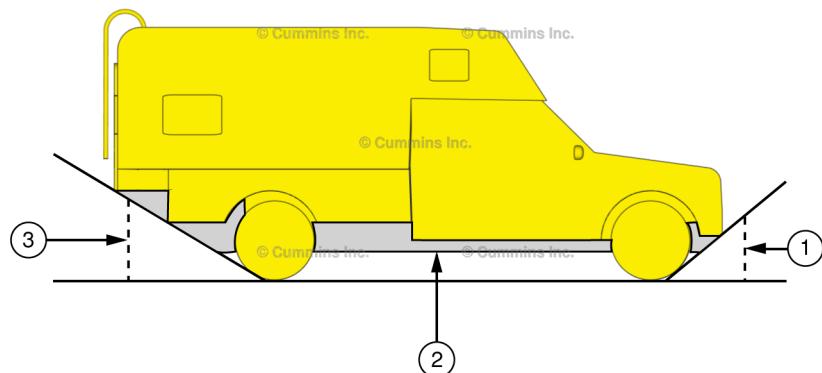
Do not mount the generator set within the approach or departure angles of the vehicle or below the axle line.

7.3 Location - Pickup Truck Camper Locations - Application Preparation

Diagrams



1. TYPICAL GENERATOR SET LOCATIONS -
PICKUP TRUCK CAMPER



1. Approach angle
2. Axe clearance line

3. Departure angle

Guidelines

[Application Preparation Location \(Page57\)](#)

The generator set is typically mounted inside of a compartment at the rear or the camper.

Do not mount the generator set within the approach or departure angles of the vehicle or below the axle line.

7.4 Ventilation - Application Preparation

Guidelines

Generator set cooling air inlet must not be obstructed.

- A free-air inlet size of at least 416 cm² (64 in²) is recommended.
 - Grilles, louvers, and other kinds of decorative treatments on air openings restrict air flow.
 - Contact the manufacturer of the decorative assembly or material to obtain the minimum free-air inlet size.
- The compartment air inlet must align directly with the generator set air inlet.
- The air inlet duct accessory is recommended for compartment mounted generator sets to prevent hot air recirculation.

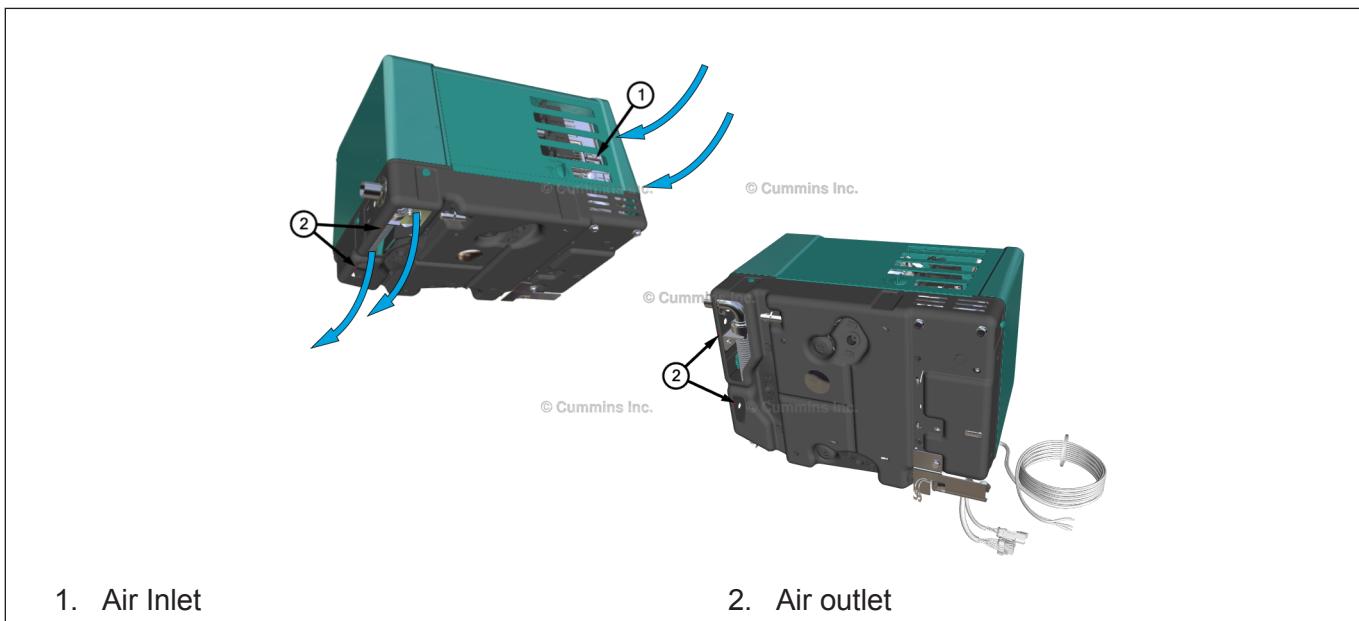
Generator set cooling air outlet must not be obstructed.

- When preparing a generator set installation, following mounting guidelines is critical for optimal hot air ventilation performance.
 - [Application Preparation Location \(Page57\)](#)
 - [Application Preparation Mounting - Floor \(Page61\)](#)
 - [Application Preparation Mounting - Hangdown \(Page63\)](#)
- Park the vehicle away from walls, snow banks, high grass, and brush so generator set hot air exhaust is able to disperse away from the generator set.
- Do not operate power ventilators or fans in a manner that would cause hot air exhaust to recirculate into the cooling air intake.

Following cooling air ventilation guidelines is critical to optimal generator set performance.

- An installation with deviations from ventilation requirements must pass a generator set cooling performance test.
- [Performance Test Cooling System \(Page96\)](#)

Diagrams



1. Air Inlet

2. Air outlet

7.5 Mounting - Floor - Application Preparation

Tools Summary		
Part Name	Part Number	Quantity
Generator set floor mounting template	A063B826	1

Guidelines

The floor of the application must provide the following.

- Adequate space for oil drain.
- Adequate space for cooling air to enter and exit the generator set.
 - Following cooling air ventilation guidelines is critical to optimal generator set performance. (Page60)
- Adequate space for LP regulator pressure reference vent.
- Holes to utilize the basepan mounting adaptations.

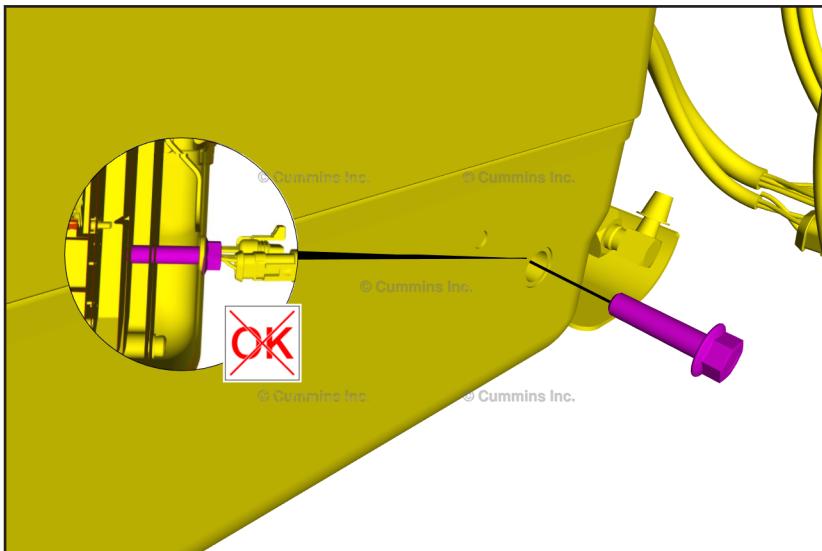


Use the following tool to locate the necessary features.

Tool Name	Tool Type	Part Number	Quantity
Generator set floor mounting template	Cummins	A063B826	1

Use quantity 4, grade 5, corrosion resistant, 3/8-16 NC, length of the bolts should be the thickness of the bracket plus 13 mm [1/2 in] to secure the generator set to the vehicle.

Using bolts that extend more than 14 mm [9/16 in] into the generator set can cause damage to internal components.



The use of washers or spacers is acceptable to prevent the bolts from penetrating more than 14 mm [9/16 in].

Removable thread locking adhesive is recommended on the mounting bolts

Shoulder bolts provided are for lifting only, these bolts are not appropriate for mounting of the generator set.

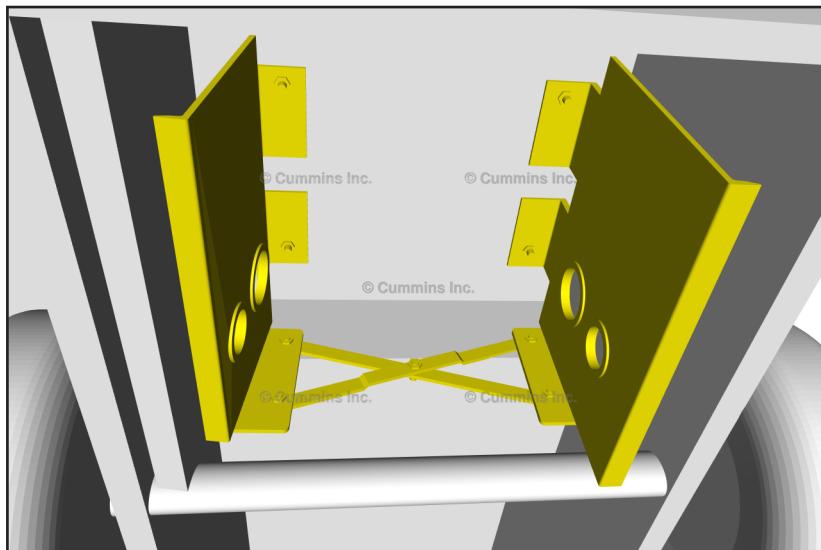
7.6 Mounting - Hangdown - Application Preparation

Tools Summary		
Part Name	Part Number	Quantity
Generator set hangdown kit mounting template	A043F758	1

Guidelines

The hangdown kit of the application must provide the following.

- Adequate space for oil drain.
- Adequate space for cooling air to enter and exit the generator set.
 - [Following cooling air ventilation guidelines is critical to optimal generator set performance. \(Page60\)](#)
- Adequate space for LP regulator pressure reference vent.
- Vehicle studs to utilize the hangdown kit mounting provisions.



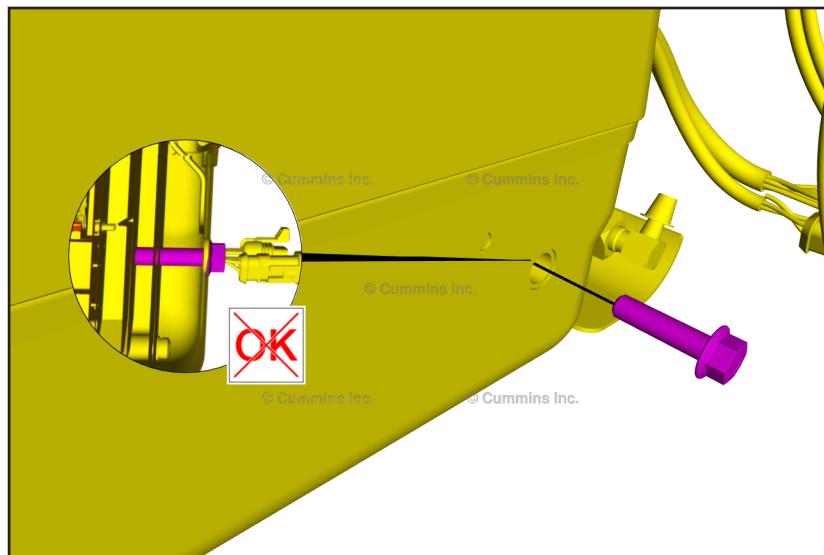
Refer to the RV Accessory Catalog for a list of Cummins supplied hangdown kits.

Use the following tool to locate the necessary features.

Tool Name	Tool Type	Part Number	Quantity
Generator set hangdown kit mounting template	Cummins	A043F758	1

Use quantity 4, grade 5, corrosion resistant, 3/8-16 NC, length of the bolts should be the thickness of the bracket plus 13 mm [1/2 in] to secure the generator set to the bracket.

Using bolts that extend more than 14 mm [9/16 in] into the generator set can cause damage to internal components.



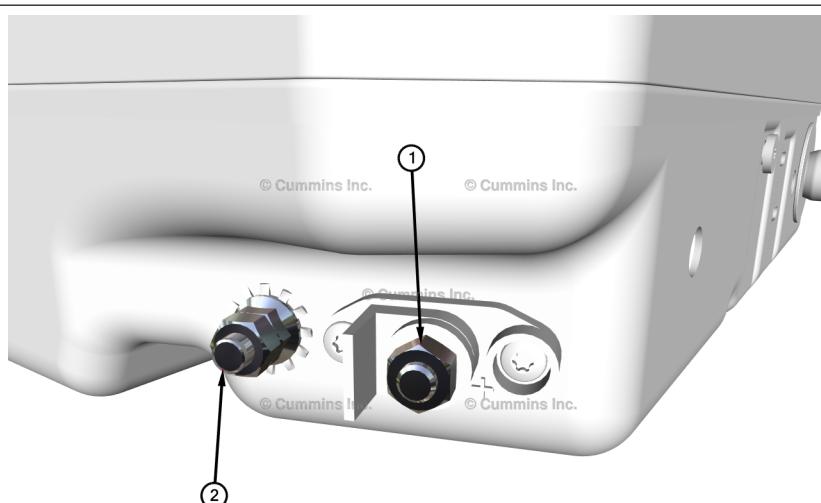
The use of washers or spacers is acceptable to prevent the bolts from penetrating more than 14 mm [9/16 in].

Removable thread locking adhesive is recommended on the mounting bolts

Shoulder bolts provided are for lifting only, these bolts are not appropriate for mounting of the generator set.

7.7 Equipment Electrical Ground - Application Preparation

Diagrams



1. Positive battery terminal

2. Negative battery terminal and equipment grounding location

Guidelines

When required, connect the generator set grounding screw to the vehicle frame with 8 AWG or larger stranded cable with a ring terminal.

The grounding post size is 5/16-16

Equipment Grounding Screw	
Metric	U.S.
11 N·m	97 in-lb

7.8 Fire and Exhaust Barriers - Application Preparation

Guidelines

Fire and Exhaust Barriers

- Barriers to provide vapor and fire resistance must be installed between the generator set and the interior of the vehicle if the generator set is mounted below the floor.
- If the generator set is mounted in a compartment on the floor of the vehicle, the entire compartment must be lined with vapor and fire resistive materials.
- Use approved materials (26 gauge galvanized steel or equivalent).
 - See NFPA 1192 for details.
 - Refer to local codes and standards for additional information.
- All seams and openings in the barriers for wiring, mounting screws, etc. must be sealed.

7.9 Insulating Materials - Application Preparation

Guidelines

Acoustic/thermal insulation and adhesive must be classified as "Self-Extinguishing" at not less than 90 °C [200 °F].

Do not line the bottom of a compartment with insulation since it absorbs fuel and oil.

7.10 Carbon Canister-Evaporative Emissions System (EVAP) - Application Preparation

General Information

EPA and ARB enacted legislation requires that a vehicle with a gasoline powered generator set must have an evaporative emissions system.

This legislation applies in all 50 states.

If the vehicle has a gasoline propulsion engine an EVAP system is not required, as the vehicle's evaporative emissions system satisfies the regulation.

The generator EVAP system is required on vehicles that do not have a propulsion engine connected to the fuel tank (trailers primarily).

Guidelines

This generator set is evaporative emissions ready.

Cummins does not offer an evaporative emissions canister for this product.

To obtain the required certification the entire fuel system; tank, canister, and generator set must be tested together.

Contact the fuel tank OEM for the evaporative emissions compliance statement.

Chapter 8 - Customer Connection Guidelines

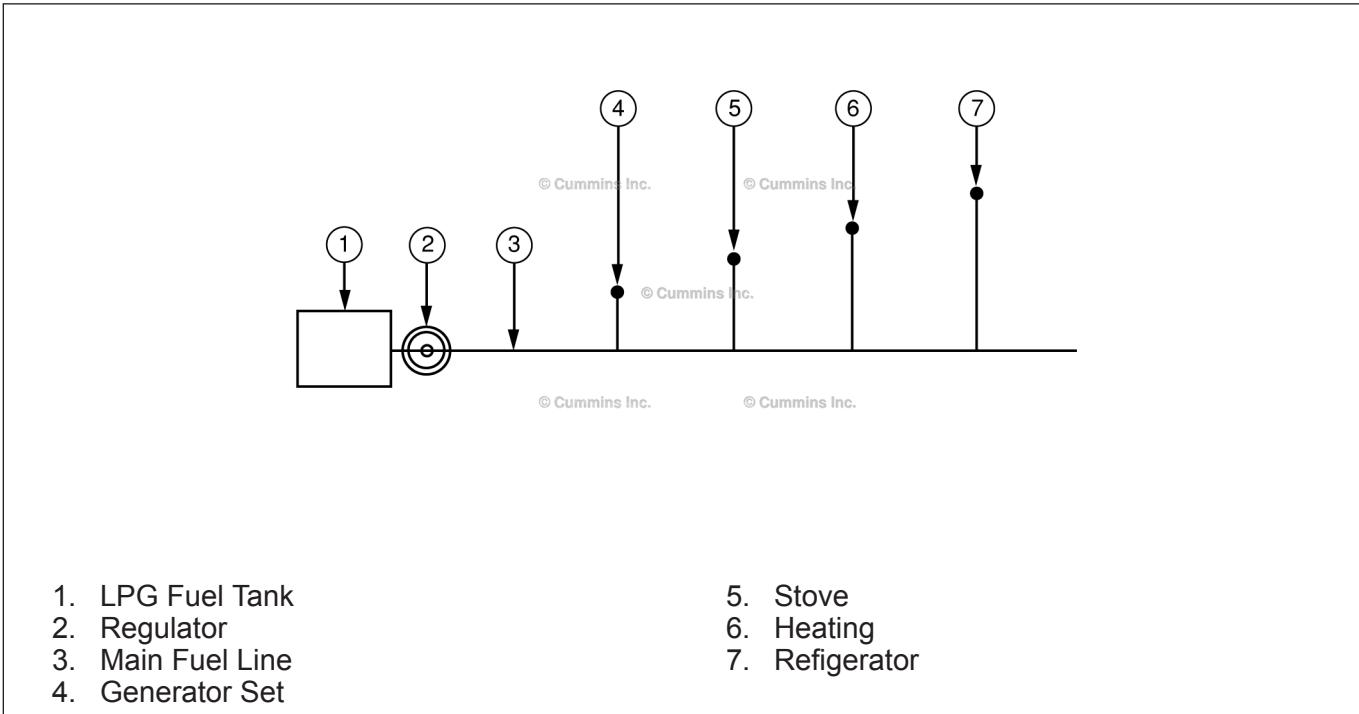
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8.1 External Fuel Tube - Liquid Propane - Mechanical Connection Guidelines

Diagrams



Guidelines

NFPA 1192, the Standard on Recreation Vehicles for Liquefied Petroleum Gases should be used as a guide for the installation of the LPG fuel system in regard to the following sections:

- Propane Container
- Propane Supply Connection/Connector
- Regulated High Pressure Piping
- Propane Systems
- Propane Piping Systems
- Propane Piping Design
- Propane Pipe Sizing
 - The generator set is included in pipe sizing calculations and testing.
- Special Requirement for High Pressure Testing
- Testing Low-Pressure Piping Systems for Propane Leakage After Appliances are Connected
 - Generator is considered connected as an appliance for testing.
- Testing Regulated High-Pressure Piping System for Gas Leakage

For a long fuel line run, use seamless steel tubing with flared ends.

- Make flexible hose connections at the fuel tank and at the generator set.
- Use 3/8 inch I.D. fuel line for runs up to 0.9 m (3 ft) and 1/2 inch I.D. up to 4.6 m (15 ft).

Customer connection provided is 5/8-18 UNF-2A with a 45 degree flare

Route LPG fuel lines away from electrical wiring and hot engine exhaust components.

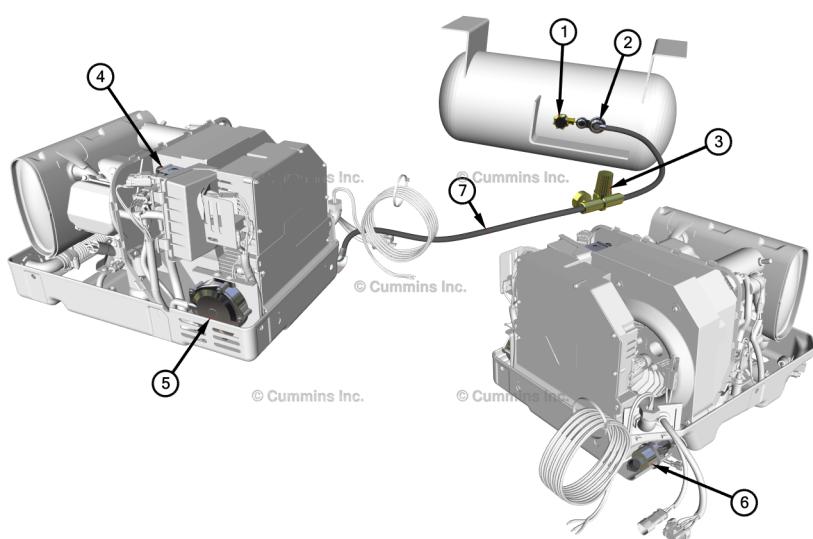
- Fuel lines should be accessible for inspection and replacement, protected from damage, and secured to prevent kinking, contact with sharp edges, and chafing due to vibration.

Do not connect the generator set fuel supply line to any appliance fuel supply line.

Upon completion of the installation, fill the LPG tank and test every joint and fitting in the LPG supply system using an approved method, such as soap bubbles.

8.2 Fuel Connections - Liquid Propane - Mechanical Connection Guidelines

Diagrams



1. Vapor Shutoff Valve	5. Demand Regulator
2. Two Stage Regulator	6. Fuel Shutoff Solenoid
3. Regulator Outlet	7. Fuel line
4. Mixer	

Guidelines

NFPA 58, the Standard for the Storage and Handling of Liquefied Petroleum Gases (NFPA 58) should be used as a guide for the installation of the LPG fuel system.

Connect the LPG fuel system.

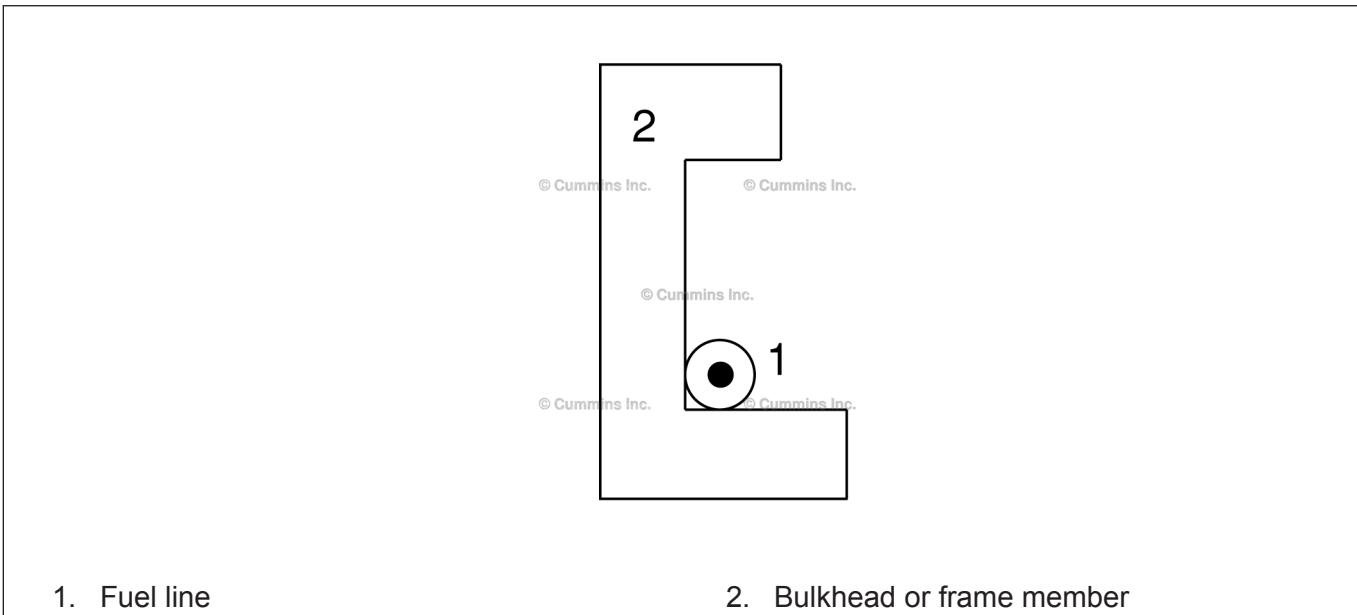
- Follow Liquid Propane fuel tube mechanical connection guidelines. (Page 69)
 - Failure to follow mechanical connection guidelines can cause a flame out.
- Adjust the gas supply pressure (at the gas inlet of the pressure regulator) to at least 229 mm (9 in) Water Column (WC).
 - The pressure must not exceed 330 mm (13 in) Water Column (WC).
- Route the LPG vent hose so that it vents to the outside or provide required openings.

To prevent the possibility of flameout, the fuel supply system must be designed to deliver sufficient fuel for normal operation of the generator set and other appliances at the expected temperature conditions.

It may be necessary to use a separate fuel tank for the generator set if sufficient fuel cannot be supplied with a single tank system.

8.3 External Fuel Hose - Gasoline - Mechanical Connection Guidelines

Diagrams



1. Fuel line

2. Bulkhead or frame member

Guidelines

Fuel line is 1/4" I.D.

Low permeation fuel hose is required to meet CARB and EPA standards for gasoline evaporative emissions.

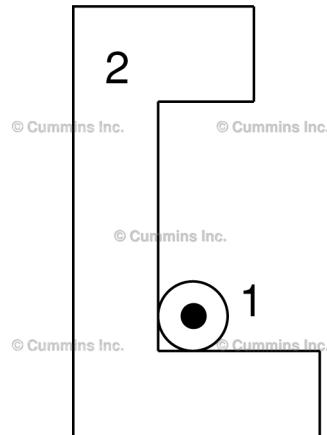
For a list of CARB approved fuel hoses visit <http://arb.ca.gov>

Fuel hose routing

- Route the fuel line along bulkheads and frame members such that it is protected.
 - The entire length of the fuel line must be visible for inspection and accessible for replacement.
 - It is preferred that fuel line routing be parallel to the motorized chassis fuel line.
- Support and protect fuel lines to restrain movement and prevent chaffing or contact with sharp edges, electrical wiring, and hot exhaust parts.
- The fuel line should be at or above the top of the fuel tank to reduce siphoning if a line breaks or a hose comes off.

8.4 External Fuel Tube - Gasoline - Mechanical Connection Guidelines

Diagrams



1. Fuel line

2. Bulkhead or frame member

Guidelines

Fuel line requirements

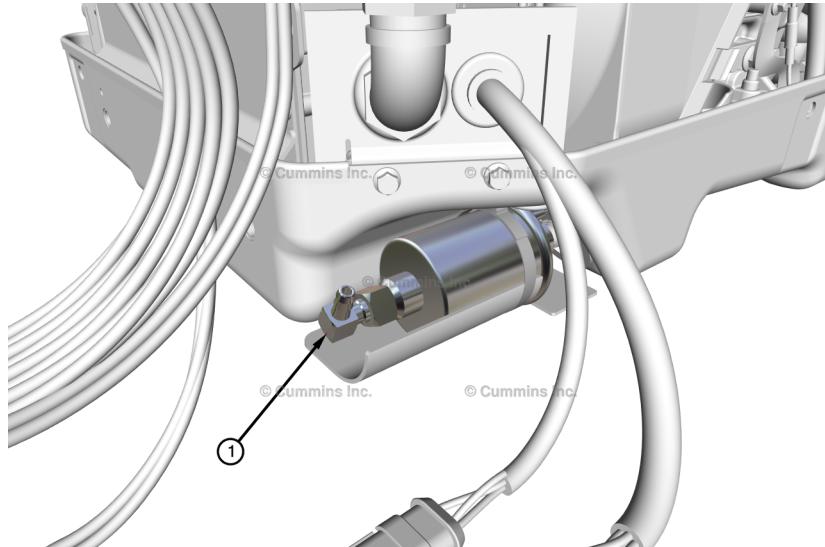
- **Tubing**
 - Use 1/4 inch I.D. (± 0.003 inch) welded and drawn Type 304L stainless or AISI 1008-1010 low carbon zinc plated steel tubing of 0.028 inch minimum wall thickness.
 - Tubing must meet requirements for 150 psi operating pressure (Ref. ASTM A 539-99) and have corrosion resistance equal to or better than hot-dipped zinc galvanized.
- **Hose beads**
 - Use suitable tooling to form tubing ends into SAE J1231 Type 1 or Type 3 double-flare hose beads.
 - Recommended for all tubing and fittings.

Fuel line routing

- Route the fuel line along bulkheads and frame members such that it is protected.
 - The entire length of the fuel line must be visible for inspection and accessible for replacement.
 - It is preferred that fuel line routing be parallel to the motorized chassis fuel line.
- Support and protect fuel lines to restrain movement and prevent chaffing or contact with sharp edges, electrical wiring, and hot exhaust parts.
- The fuel line should be at or above the top of the fuel tank to reduce siphoning if a line breaks or a hose comes off.

8.5 Fuel Connections - Gasoline - Mechanical Connection Guidelines

Diagrams



1. Fuel hose barb fitting

Guidelines

The maximum fuel pump lift is 914 mm (36 in).

Generator set fuel pick up should be above the vehicle propulsion engine pick-up inside the supply tank, this prevents the generator set from consuming too much fuel and leaves sufficient fuel for vehicle propulsion.

Do not interconnect generator set and vehicle propulsion engine fuel supply or return lines .

The fuel line feeding the generator set must be 1/4 inch I.D. between the generator set and the main tank draw tube.

- If the line is smaller than 1/4 inch I.D., fuel starvation and poor running or stalling can occur, especially in hot weather.

Fuel connection requirements

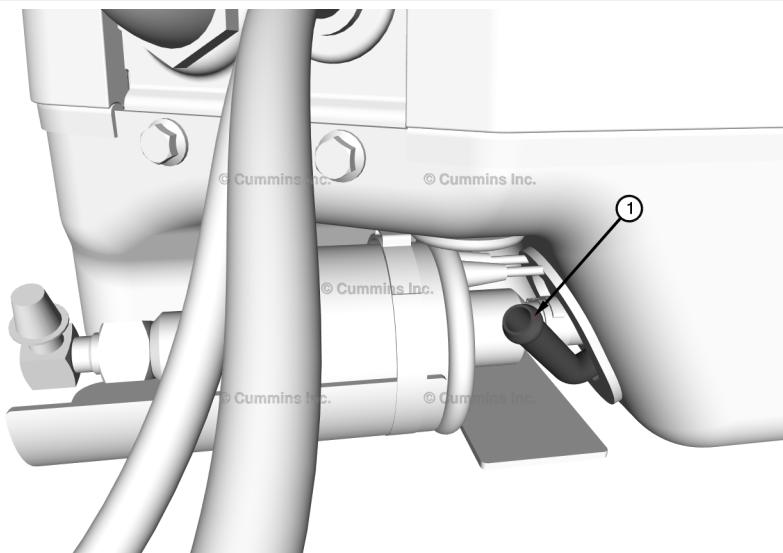
- SAE J1231 - Formed Tube Ends for Hose Connections and Hose Fittings
- SAE J1508 - Hose Clamp Specifications
- SAE J2260 - Nonmetallic Fuel System Tubing with One or More Layers
- SAE J2044 - Quick Connector Specification for Liquid Fuel and Vapor Emissions Systems

8.6 Fuel Connections - Evaporative Emissions System (EVAP) - Mechanical Connection Guidelines

General Information

Evaporative (EVAP) requires an additional fuel vapor line from the carbon canister to the generator set.

Diagrams



1. Hose barb for canister purge line

Guidelines

The generator set is supplied with a 7.9 mm [5/16 in] hose barb for connecting to the canister purge line.

Use 5/16 inch I.D. hose for canister purge line from the carbon canister to the generator set.

Use an SAE J2044 quick connect fuel fitting on the canister hose barb or use a soap-free lubricant such as WD40 to slip the hoses on the canister hose barbs.

Secure the hoses with Oetiker® ear-type clamps or equivalent.

8.7 Exhaust System - Mechanical Connection Guidelines

Guidelines

	WARNING	High Temperature Risk of burns or melting of items may result. Avoid contact. Wear appropriate personal protective equipment.
---	----------------	--

The tailpipe of the generator set will be hot during operation and can cause severe burns.

- To reduce the risk of contact, consideration must be used where the tailpipe will be located and routed.

This product incorporates a catalyst exhaust system which leads to higher exhaust gas temperatures.

The installer must review and follow all guidelines for the installation.

The generator set is equipped with a U.S. Forest Service approved spark-arrest muffler.

Liability for damage, injury, and warranty expense due to the modification of the exhaust system or the use of unapproved parts is the responsibility of the person performing the modification or installing the unapproved exhaust system parts.

The generator set exhaust system must be gas tight and designed to prevent entry of exhaust gasses into the vehicle interior.

Use approved materials only.

8.8 Tailpipe - Mechanical Connection Guidelines

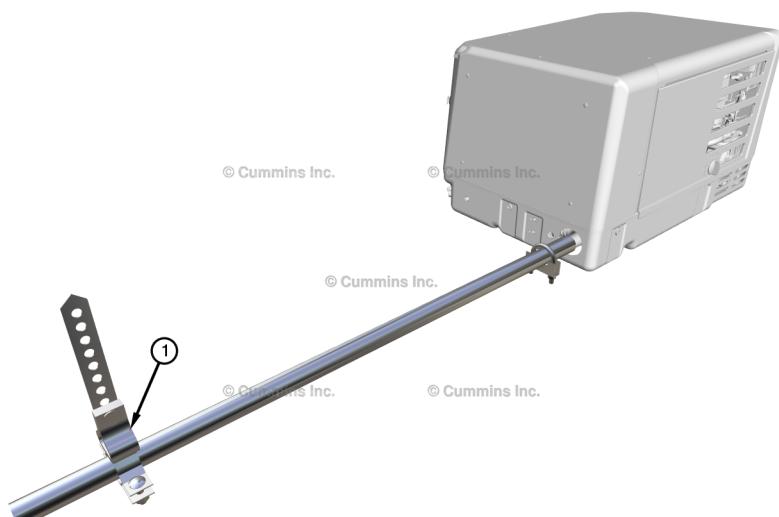
Diagrams



Tailpipe adapter (Bottom view)

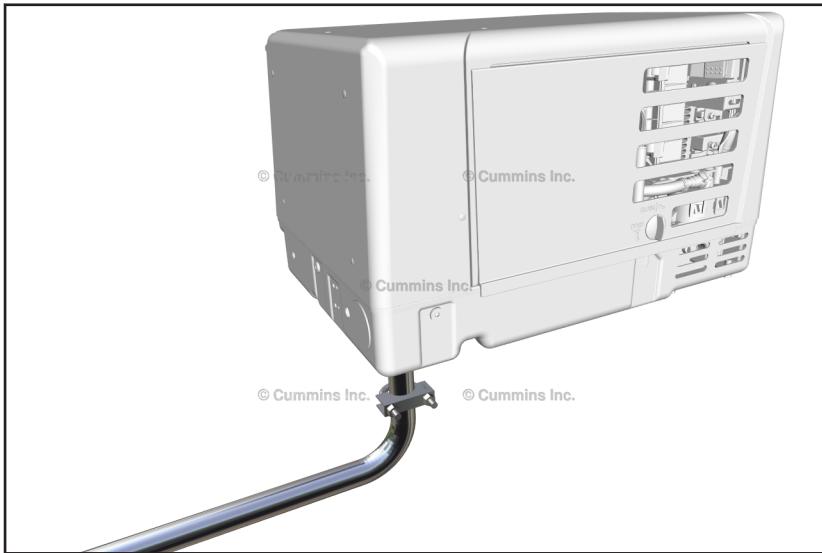
1. Tailpipe adapter clamp

2. Tailpipe adapter

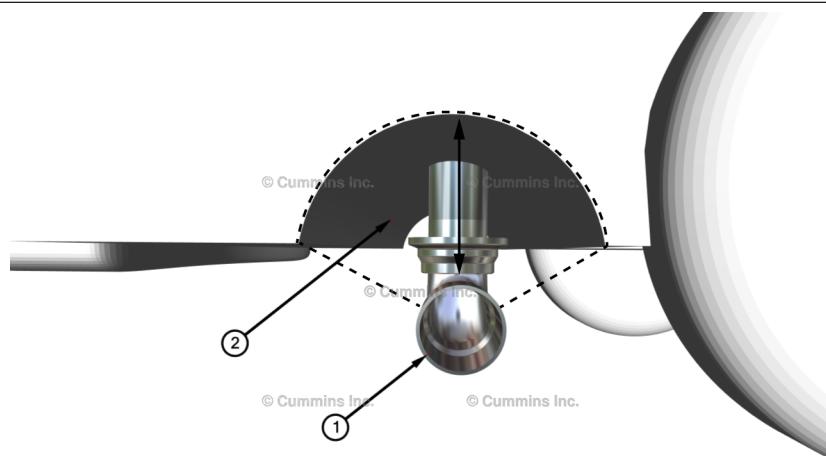


Tailpipe side outlet

1. Tailpipe hanger



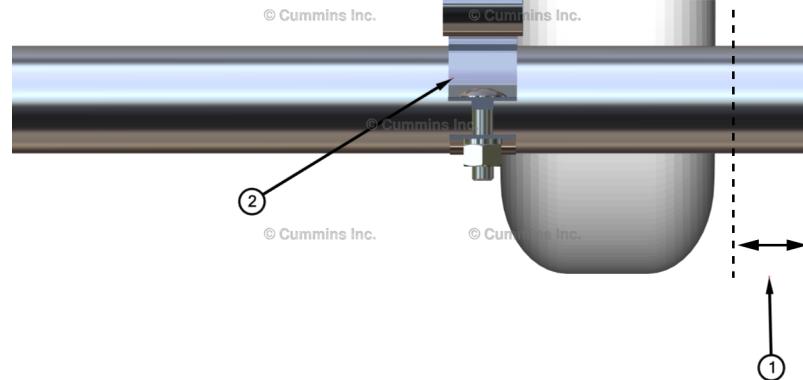
Tailpipe bottom outlet



Distance from tailpipe to combustibles

1. Tailpipe

2. Clearance from vehicle



1. Tailpipe extending beyond skirt of vehicle
2. Tailpipe hanger must be as close to the end of the pipe as possible.

Guidelines

The muffler is mounted inside the generator set, and has a tailpipe adapter.

The adapter can be used to connect the tailpipe through the bottom or the side of the generator set.

The tailpipe must be connected to the tailpipe adapter. (Page93)

The exhaust tailpipe extension must meet the following requirements.

- Use 18-gauge 1-1/8 inch I.D. aluminized steel tubing or material of equivalent heat and corrosion resistance for the tailpipe.
- Support a tailpipe longer than 457 mm (1-1/2 ft) near its end and at intervals of 900 mm (3 ft) or less.
 - Use automotive-type tailpipe hangers.
 - Do not attach the hangers to combustible material such as wood.
- Use U-bolt muffler clamps to connect sections of tailpipe.
 - Overlapping pipe should be slotted.
- Do not route the tailpipe closer than 114 mm (4.5 in) to any unshielded fuel distribution system components including the fuel lines or fuel tanks.
- Do not route the tailpipe closer than 76 mm (3 in) to combustible material (wood, felt, cotton, organic fibers, etc.) unless it is insulated or shielded.
 - The temperature rise (above ambient) on adjacent combustible material must not exceed 65 °C (117 °F).
- Do not route the exhaust tailpipe underneath the oil drain.
- Do not route the exhaust tailpipe such that it will restrict the air inlet/outlet.
- To keep the tailpipe from being damaged, do not route it such that it protrudes into the approach or departure angles of the vehicle or below the axle clearance line.
- Do not interconnect generator set and vehicle engine exhaust systems.
- Do not terminate the tailpipe underneath the vehicle.
 - Extend the tailpipe a minimum of 25 mm (1 in) beyond the perimeter of the vehicle.
 - Support the end of the tailpipe such that it cannot be pushed in and up under the skirt of the vehicle.

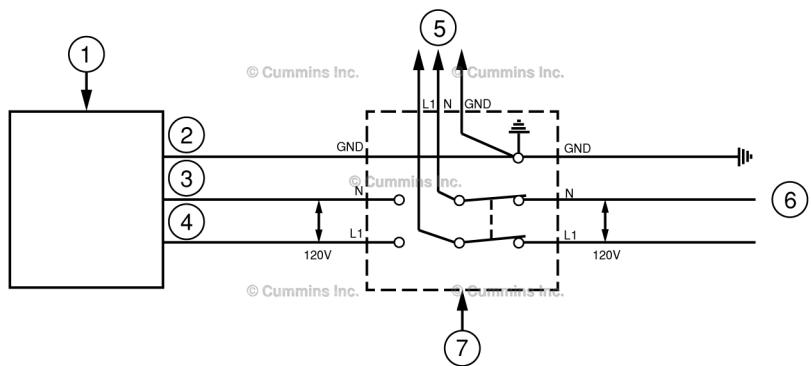
- Do not terminate the tailpipe such that it is closer than 153 mm (6 in) to any opening, such as a door, window, vent, or unsealed compartment into the vehicle interior.
- Make sure a tailpipe deflector will not cause excessive back pressure.
 - Maximum back pressure should not exceed 204 mm water column (8.0 in water column)

8.9 AC Power Connection - Electrical Connection Guidelines

General Information

AC Power Output Connections

Diagrams



1. Generator Set
2. Green Lead
3. White Lead
4. Black Lead

5. To Vehicle AC Distribution Panel
6. Utility Power
7. Transfer Switch

Guidelines

Generator set leads are 12 AWG and 2.5 m (100 in) in length.

Generator set has a 1/2" liquid tight flexible metal conduit connector.

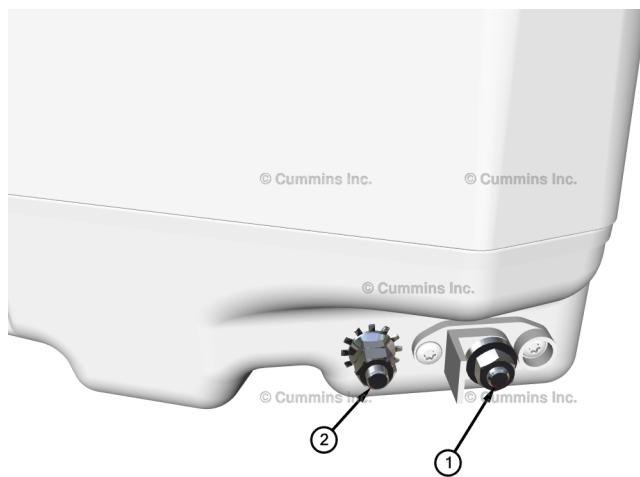
Generator set has a 30 A circuit breaker.

AC Power Output Connections

- General requirements
 - The leads can be terminated at the main AC distribution panel where individual breakers can be provided for vehicle/trailer AC loads.
 - If longer AC cable is required or code stipulates, a junction box can be mounted near the generator set.
 - Use a weather tight junction box if it is exposed to the elements.
 - A weather tight junction box that is IP54 or greater, NEMA Type 3 or better.
 - When extending this cable, use the proper size wire for amperage and insulation temperature rated wire to the main AC distribution panel.
- Wiring Methods
 - Follow the National Electrical Code.
 - Have a qualified electrician supervise and inspect the installation of all AC wiring.
 - Install vibration-proof switches and controls that will not open and close circuits when the vehicle is in motion.
 - Route AC wiring, remote control wiring, and fuel lines separately.
 - Seal all conduit openings into the vehicle interior to keep out exhaust gas.
 - Apply silicone rubber or an equivalent type of sealant inside and outside each conduit connector.
 - FMT (Flexible MeTallic) conduit is not vapor tight and will allow exhaust gas to enter along the wires if not sealed.
 - Bond the generator set and all connected AC and DC equipment and controls to a common grounding point in accordance with applicable codes.
 - [Guidelines Equipment Electrical Ground \(Page64\)](#)
- Connecting to Shore Power
 - Use an approved switching device to prevent interconnections.

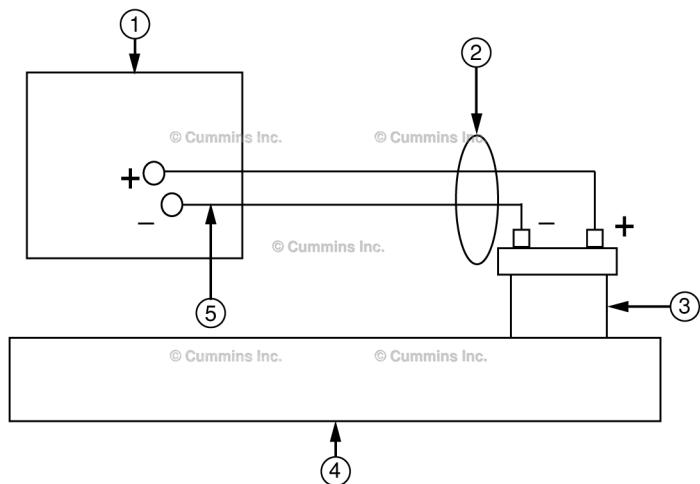
8.10 Battery Connections - Electrical Connection Guidelines

Diagrams



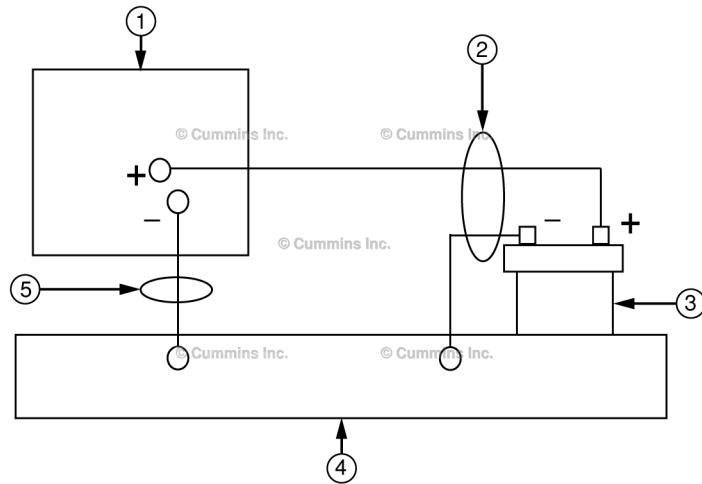
Battery cable connection terminals

1. Positive battery cable terminal 2. Negative battery cable terminal



Full length cable from negative battery terminal

1. Generator Set 4. Vehicle Frame
2. Cable 5. Cable
3. Battery



Vehicle frame as path from negative battery terminal

1. Generator Set	4. Vehicle Frame
2. Cable	5. Cable
3. Battery	

Guidelines

For cable length up to 30.5 m (100 ft) use 2 AWG wire.

Use red wire for the connection to the positive terminals and black wire for connection to the negative terminals.

Circuit resistance must not exceed 0.02 Ohms.

Battery cables should be terminated with ring terminals.

Battery stud sizes are 5/16-16

Positive battery cable nuts

Metric	U.S.
11 N·m	97 in-lb

Negative battery cable nut

Metric	U.S.
11 N·m	97 in-lb

Do not over tighten the battery studs.

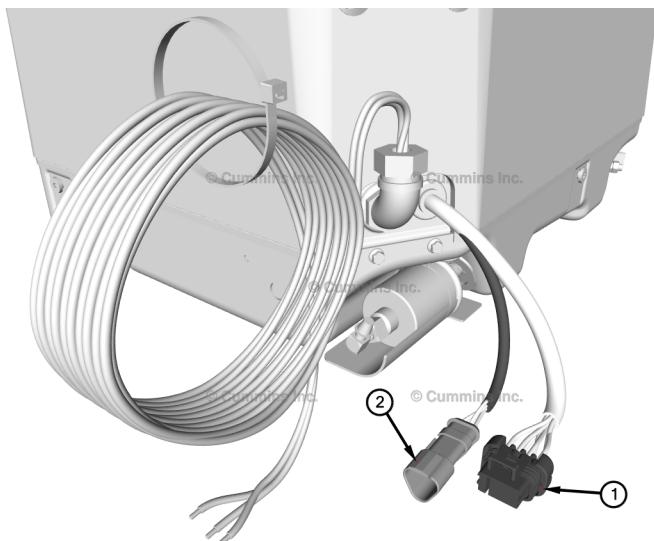
- Component damage will occur

8.11 Remote Control Panel - Electrical Connection Guidelines

General Information

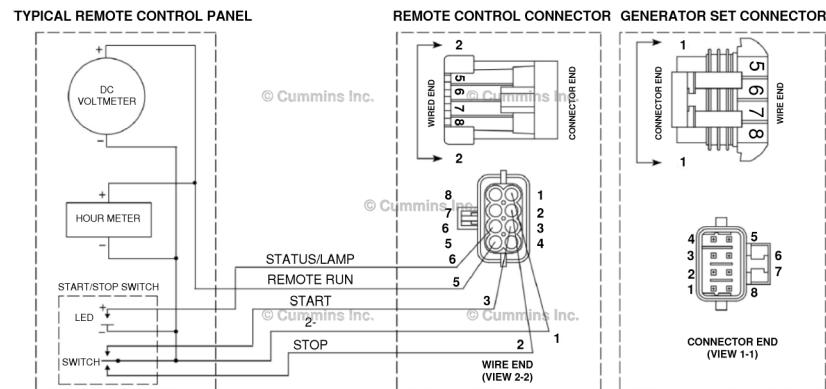
When installing a new generator set of a different model, the remote control panel software may need to be updated in order to properly display notifications and fault codes.

Diagrams



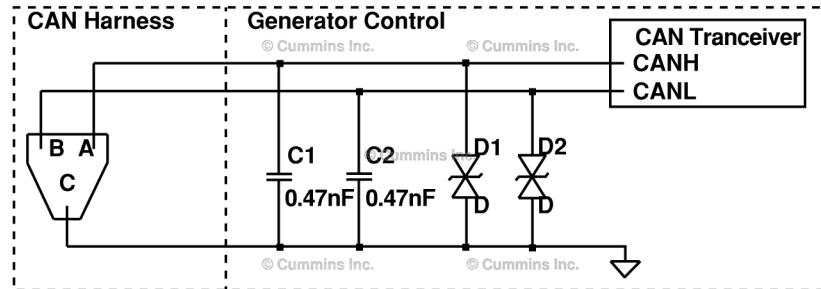
1. Remote control connector plug

2. CAN J1939 connection plug



Remote Control Harness Plug Diagram

1. Battery ground	6. Status light.
2. Stop/Prime	7. Not used
3. Start	8. Not used
4. Not used	
5. Hour meter on 12V DC 200mA when running	



1. A - CANH	3. C - Shield (grounded at generator set)
2. B - CANL	

Guidelines

The generator set has an 8-pin connector for remote control connections.

Wiring harnesses in several lengths are available separately for connections between the generator set and remote control panel.

To make connections to a remote control connector.

- Refer to the Remote Control Harness Plug Diagram to fabricate the remote control panel and/or wiring harness when not using the accessories available from Cummins.
 - Mark the remote control end of each lead to identify the connector pin number at the generator set.
 - Use insulated 18 AWG copper conductors for distances up to 9 m (30 ft) and heavier gauge conductors for greater distances.
 - Protect the wiring with full-length flexible sheathing.
- Route control leads separately from AC power leads to reduce the possibility of erratic operation due to false induced signals.
- Seal the opening where the leads enter the vehicle interior with silicone rubber or equivalent sealant to keep out exhaust gas.

The generator set has a DT04-3P stub connector for connection to J1939 CAN network.

Refer to CEB00793 for additional information regarding J1939 features.

Chapter 9 - Installation

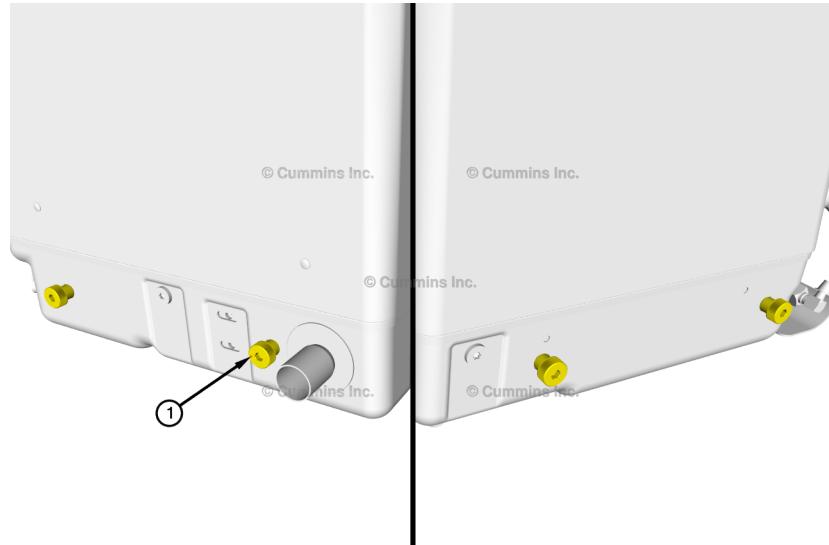
Contents

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9.4 Tailpipe	93
9.5 Remote Control Panel	95
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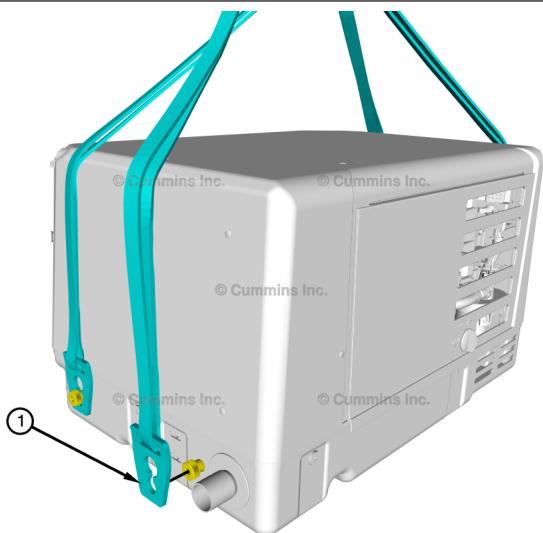
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9.1 Generator Set - Lifting

Diagrams



1. Lifting bolts



1. Connecting the harness



1. Lifting the genset

General Information

The harness can be sourced from Sharroo Lifting Products

Sharroo Lifting Products

- 301 W County Rd E2 West, New Brighton, MN 55112
- +1 (651) 489-1341
- Product Number 2400-00340

Preparatory Steps

Follow all recommendations of the harness manufacturer. See Original Equipment Manufacturer (OEM) service information.

How To

Lifting procedure

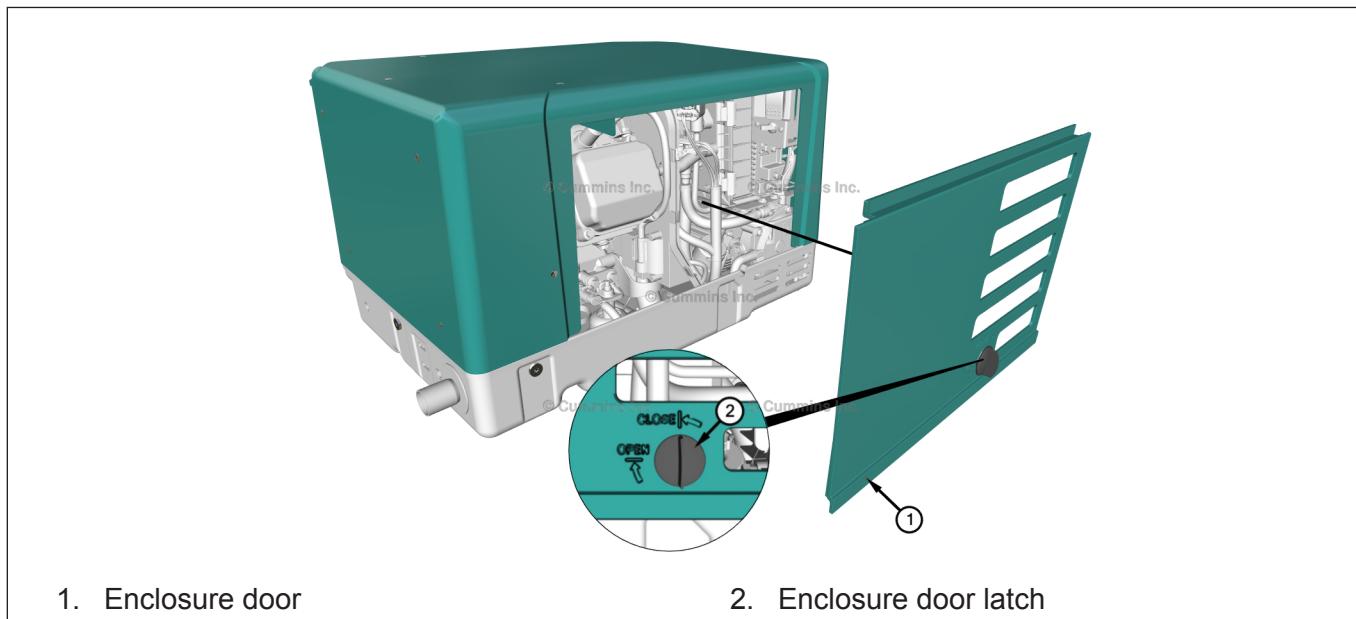
1. Insert 2 shoulder bolts on each side of the base pan
 - Shoulder bolts are supplied with the generator set
2. Use a 4-legged sling and insert a bracket at each shoulder bolt
3. Make sure each bracket is seated firmly before lifting
4. Slowly lift the unit off the ground and make sure all the bracket and shoulder bolts are seated properly on each side
5. Move the unit slowly to the location.
6. Set the generator set on surface which is able to safely support the full weight.
7. Slide out each bracket from the shoulder bolts.
8. Discard lifting bolts.
 - Shoulder bolts are not suitable for generator set mounting

Lifting Bolts	
Metric	U.S.
9 N·m	80 in-lb

9.2 Enclosure Door - Remove and Install

Tools Summary		
Part Name	Part Number	Quantity
Solvent		1
Clean Rag		1

Exploded View



1. Enclosure door

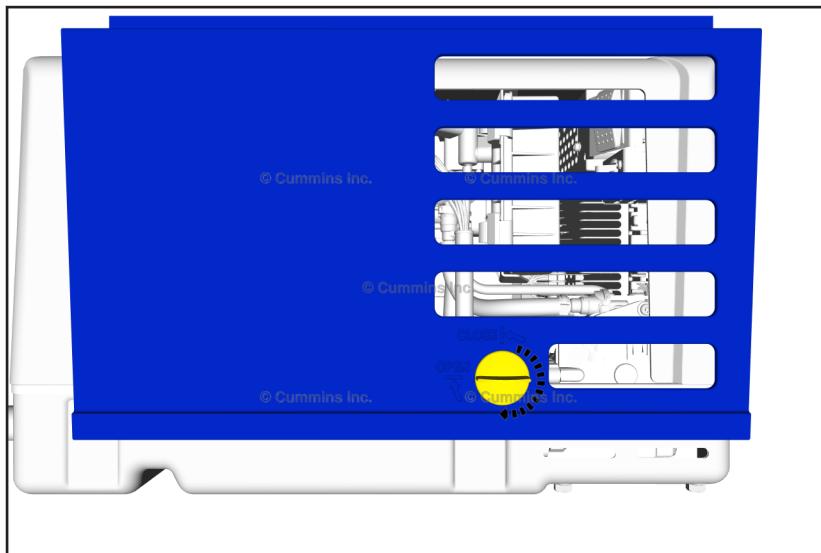
2. Enclosure door latch

General Information

All components handled in this procedure weigh less than 23 kg [50 lb].

Remove

Turn the latch clockwise to open.



Remove the enclosure door.

Clean

	CAUTION	Solvent Exposure Skin and eye irritation may occur. Follow manufacturer's instructions for use. Wear appropriate personal protective equipment.
--	----------------	--

Clean the components removed using the following.

Tool Name	Tool Type	Part Number	Quantity
Solvent	Generic		1
Clean Rag	Generic		1

Check

Check the enclosure door.

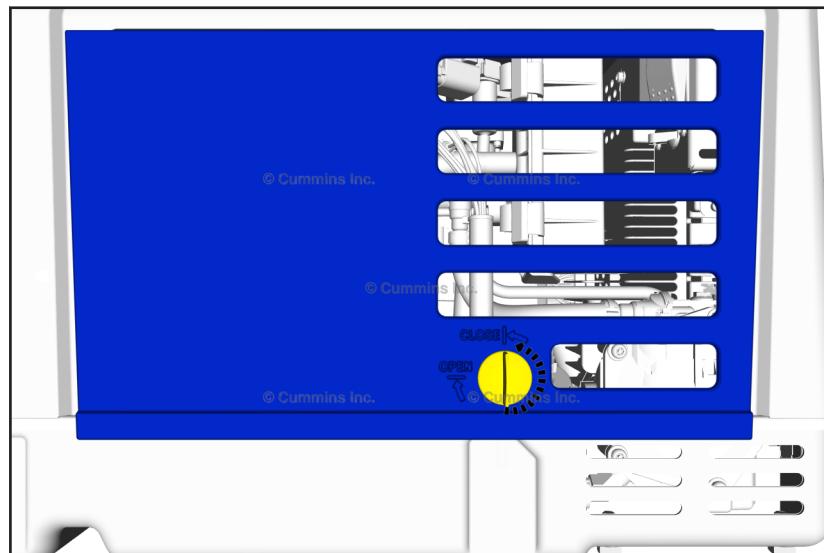
Repair or replace if any of the following are found.

- Bent
- Broken, cracked
- Cosmetically unacceptable
- Misassembled
- Mismachined
- Wrong Parts

Install

Install the enclosure door.

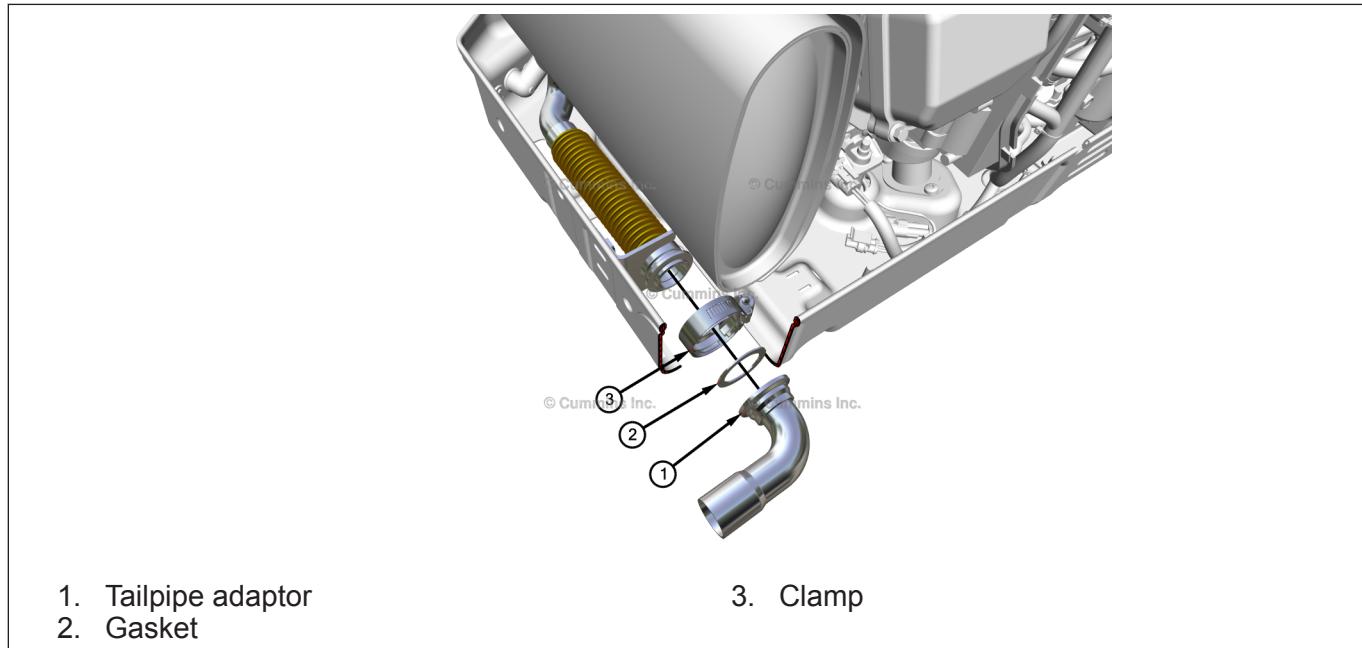
Turn the latch counterclockwise to close.



9.3 Tailpipe Adaptor - Remove and Install

Tools Summary		
Part Name	Part Number	Quantity
Clean Rag		1

Exploded View



1. Tailpipe adaptor
2. Gasket

3. Clamp

General Information

All components handled in this procedure weigh less than 23 kg [50 lb].

Preparatory Steps

- Refer to: Lock-Out-Tag-Out Equipment
- Remove Enclosure Door, as necessary (Page89)
- Remove Tailpipe, as necessary (Page93)

Remove

The tailpipe adaptor can be accessed through the generator set hot air exhaust outlet.

Remove the following.

- Clamp
- Gasket - Discard
- Tailpipe adaptor

Clean

Clean the components removed using the following.

Tool Name	Tool Type	Part Number	Quantity
Clean Rag	Generic		1

Check

Check the tailpipe adaptor.

Repair or replace if any of the following are found.

- Bent
- Broken, cracked
- Leaks - exhaust
- Misassembled
- Mismachined

Install

Install the following.

- Gasket - New
- Clamp
- Tailpipe adaptor

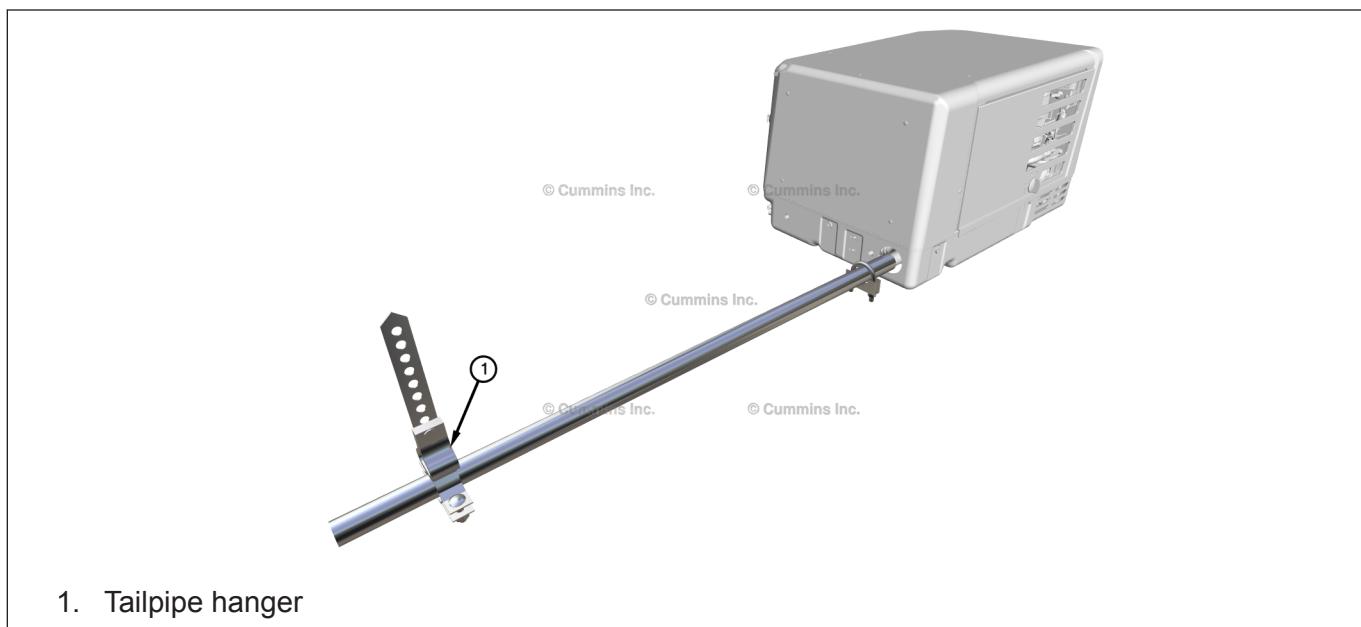
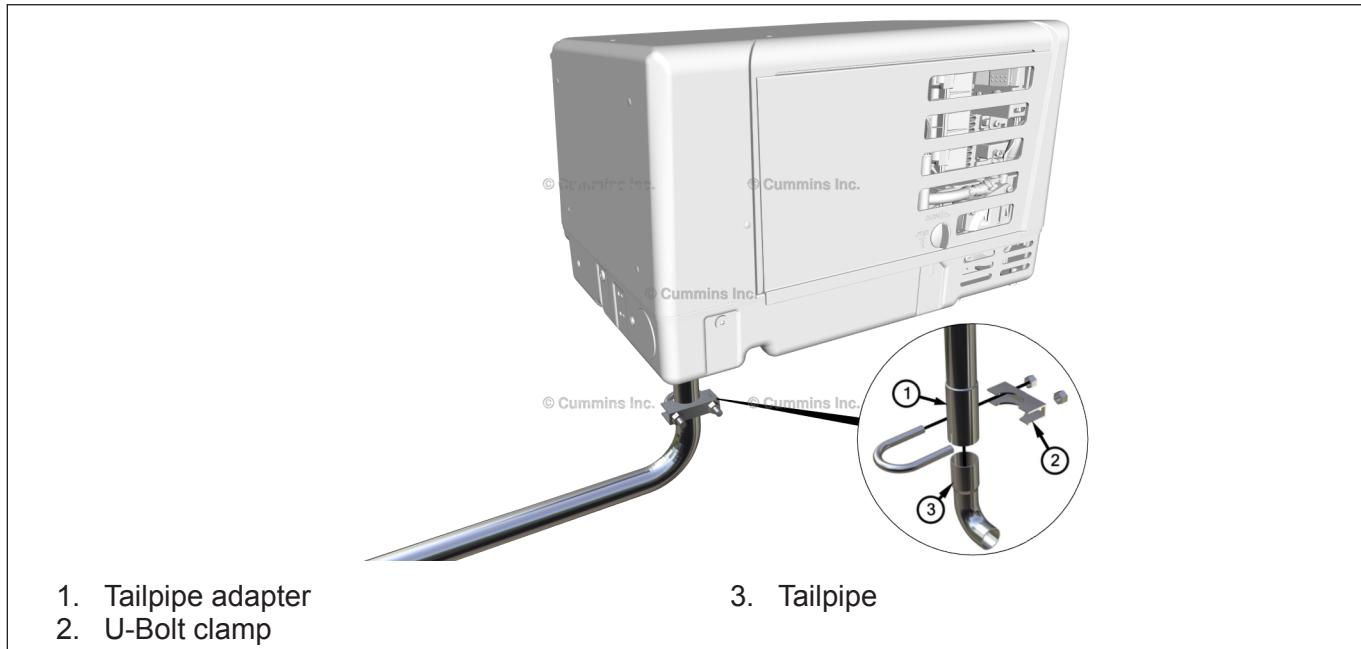
Finishing Steps

- Install Tailpipe, as necessary (Page93)
- Install Enclosure Door, as necessary (Page89)
- Refer to: Re-Energize Equipment

9.4 Tailpipe - Remove and Install

Tools Summary		
Part Name	Part Number	Quantity
Clean Rag		1

Exploded View



General Information

All components handled in this procedure weigh less than 23 kg [50 lb].

Preparatory Steps

- Refer to: Lock-Out-Tag-Out Equipment

Remove

Remove the following.

- U-bolt clamps
- Tailpipe hangers
- Tailpipe

Clean

Clean the components removed using the following.

Tool Name	Tool Type	Part Number	Quantity
Clean Rag	Generic		1

Check

Check the tailpipe.

Repair or replace if any of the following are found.

- Bent
- Broken, cracked
- Leaks - exhaust
- Misassembled
- Mismatched

Check the tailpipe hangers.

Repair or replace if any of the following are found.

- Broken, cracked
- Misassembled
- Mismachined

Inspect the U-bolt clamps.

Repair or replace if any of the following are found.

- Broken, cracked
- Leaks - exhaust
- Misassembled

Install

Install the following.

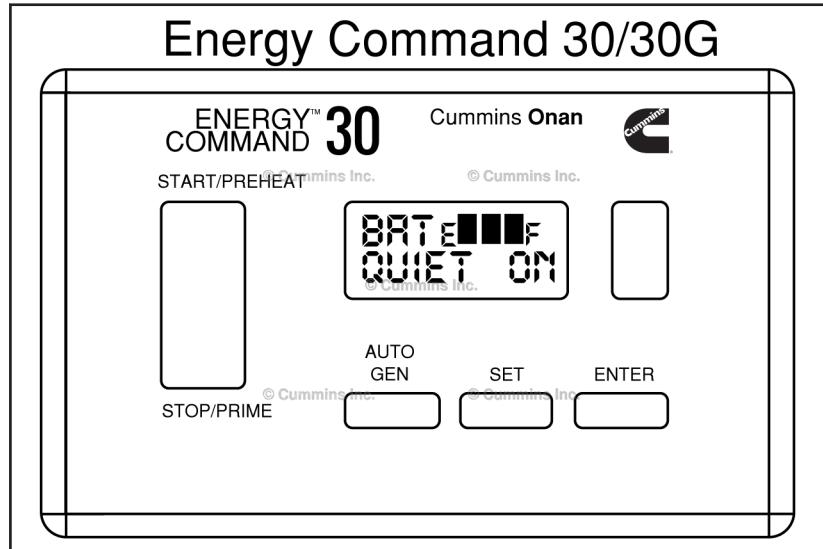
- Tailpipe
- Tailpipe hangers
- U-bolt clamps

Finishing Steps

Refer to: Re-Energize Equipment

9.5 Remote Control Panel - Overview

Diagrams



Optional Remote Control Panel

General Information

When installing a new generator set of a different model, the remote control panel software may need to be updated in order to properly display notifications and fault codes.

Overview

The EC 30 is an Automatic Generator Starting (AGS) optional system that provides both automatic and manual control of RV generator sets.

The EC 30 can be used to provide the following.

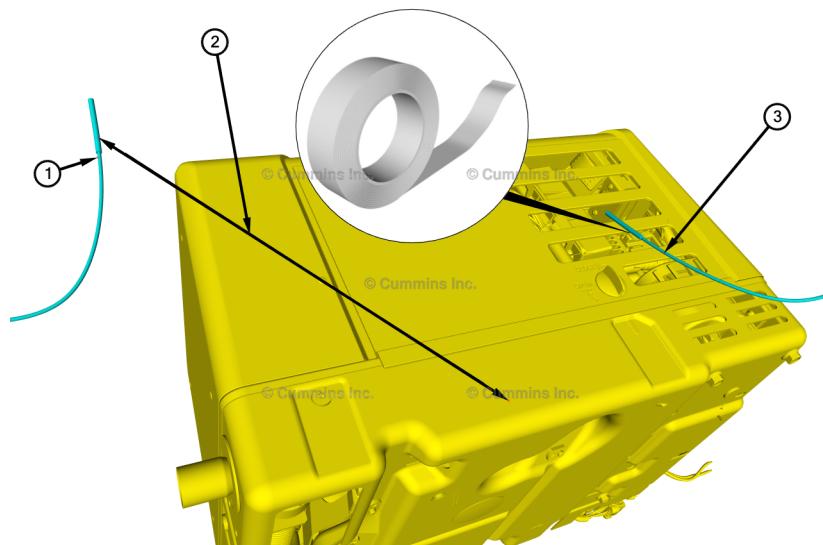
- Battery state-of-charge
- Quiet time
- Hours of service
- Fault Codes
- Automatically start the generator set if the battery becomes discharged, or when there is a run request
- Automatically stop the generator set when it does not need to be used

For more information on the EC 30, please reference Owner's Manual 0900-0541 on QuickServe Online <https://quickserv.cummins.com>

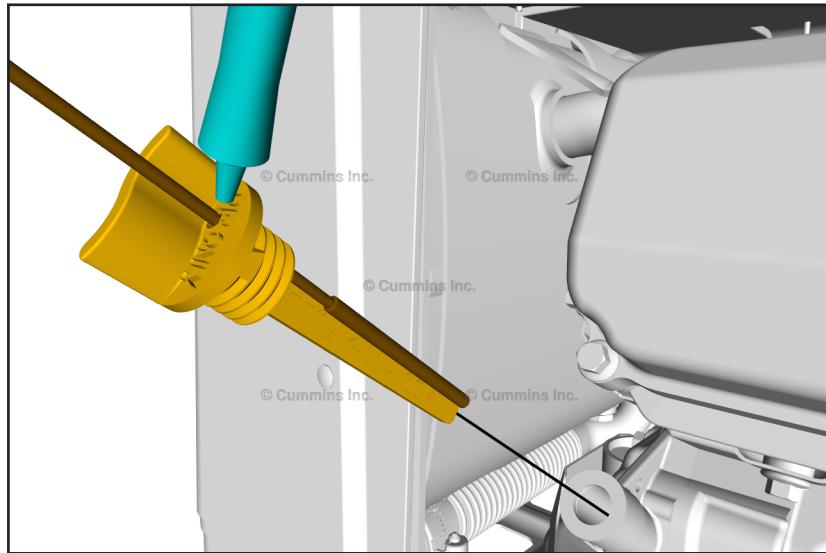
9.6 Cooling System - Performance Test

Tools Summary		
Part Name	Part Number	Quantity
Load bank		1
PVC Piping		1
Thermocouple Type K		3
Clock		1

Diagrams



1. Thermocouple to measure ambient air temperature
2. Distance from generator set is 1.2 m (4 ft)
3. Thermocouple to measure the intake air temperature



General Information

A representative installation of the generator set must be tested to determine that the generator set will not overheat due to recirculation of hot air back into the generator set.

Preparatory Steps

Complete a representative installation. See Original Equipment Manufacturer (OEM) service information.

Test

Tool to load the generator set to full load.

Tool Name	Tool Type	Part Number	Quantity
Load bank	Generic		1

Tools for measuring temperature.



Tool Name	Tool Type	Part Number	Quantity
PVC Piping	Generic		1
Thermocouple Type K	Generic		3

Tool to measure duration of test

Tool Name	Tool Type	Part Number	Quantity
Clock	Generic		1

Ambient air temperature

Ambient air temperature		
	Metric	U.S.
MAX	38 °C	100 °F
MIN	16 °C	60 °F
Out Of Range		
Perform the test when the ambient temperature is in range		

Test Method

- Disconnect the AC leads from the vehicle loads.
- Connect the load bank to the AC leads.
- Conduct the test at a location where the ambient air temperature will remain within the specified range.
- Measure temperatures with thermocouples.
 - Measure generator set inlet air temperature with one thermocouple tied in the middle of the inlet air grille.
 - Measure the ambient air temperature with a shielded thermocouple within 1.2 m (4 ft) of the generator set and approximately the same height.
 - Make sure the thermocouple will not be affected by warm air discharged from the generator set or by sunlight.
 - Use PVC piping as a thermocouple shield.
 - Measure the oil temperature
 - Oil temperature can be read from CAN J1939
 - Oil temperature can be measured using a thermocouple
 - Purchase an additional dipstick A063D836
 - Drill a small hole though the top of the dipstick
 - Insert a thermocouple wire though the hole down to the tip of the dipstick
 - Use fast setting epoxy to secure the thermocouple wire to the dipstick
 - Seal the hole though the cap with epoxy to prevent oil splashing
 - Ensure epoxy is properly set before proceeding
- Close all compartment doors.
- Run the generator set at full load for at least an hour.
- Record temperatures at 15 minute intervals until they stabilize.
 - Temperature is considered stable when there is no change in 3 consecutive readings.
 - The following table illustrates how the data can be arranged for recording and analysis.
- Stop the generator set and disconnect the load bank.
- Reconnect the AC leads to the vehicle.

Thermocouple Location	© Cummins Inc.		© Cummins Inc. °C or °F		© Cummins Inc.	
	Time of reading					
Ambient Air		© Cummins Inc.				
Inlet Air		© Cummins Inc.				
Oil		© Cummins Inc.				

Test Results

- Ideally, the air inlet temperature should be as close to ambient as possible in all modes of operation: driving, parked, propulsion engine running and propulsion engine off.
- Other environmental effects (wind, parking location, location of obstructions near the generator set) can create undesirable performance due to temperature.
 - This should be taken into consideration when installing the generator set with intent for common usage patterns.
- Inlet air temperature rise over ambient is found by subtracting the measured inlet air temperature from the ambient air temperature.
- Oil temperature must be below 155 °C (311 °F) under all conditions
 - 40 °C (104 °F) - Ambient temperature + Oil temperature < 155 °C (311 °F)
 - A typical oil temperature value is 122 °C (251 °F) at 20 °C (68 °F) ambient conditions

Installation should perform well in most conditions.

Intake air temperature rise over ambient good		
	Metric	U.S.
MAX	5 °C	9 °F
MIN	0 °C	0 °F
Out Of Range		
High:Check if the temperature is within range of the measurement "Intake air temperature rise over ambient adequate"		
Low:Not applicable		

Installation may not operate as intended in extremely warm conditions or at high loads. Modifications to the installation could improve performance in hot conditions.

Intake air temperature rise over ambient adequate		
	Metric	U.S.
MAX	10 °C	18 °F
MIN	5 °C	9 °F
Out Of Range		
High: Check if the temperature is within range of the measurement "Intake air temperature rise over ambient poor"		
Low: Check if the temperature is within range of the measurement "Intake air temperature rise over ambient good"		

Installation will likely experience heat related issues including accelerated wear and possible fueling issues. Repair or modify this installation for better performance

Intake air temperature rise over ambient poor		
	Metric	U.S.
MAX	15 °C	27 °F
MIN	10 °C	18 °F
Out Of Range		
High: These conditions will cause the generator set to have poor performance and accelerated wear, the installation must be repaired or modified.		
Low: Check if the temperature is within range of the measurement "Intake air temperature rise over ambient adequate"		

Chapter 10 - Specifications

Contents

10.1 Generator Set	103
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10.1 Generator Set - Specifications

Specifications

All models

- Refer to: Operating range
- Generator set weight
 - 49.8 kg (110 lb)
- Generator set size
 - Length
 - 560 mm (22 in)
 - Width
 - 430 mm (16.9 in)
 - Height
 - 340 mm (13.4 in)
- Generator set sound
 - No load at 3.05 m (10 ft)
 - 64 dB(A)
 - Half load at 3.05 m (10 ft)
 - 65 dB(A)
- Generator set starting battery
 - 650 CCA minimum
 - 12 Volts
- Certifications
 - ANSI / RVIA EGS-1, 2018
 - CSA C22.2 No. 100-14
 - USDA FFS No. 5100-1A / SAE J350
 - Meets National Park Service sound level requirements (60 dB(A) at 15.24 m (50 ft)) for use in national parks.

Gasoline models

- Electrical specifications
 - Output frequency
 - 60 Hz
 - Rated output power
 - 2800 Watts
 - Output voltage
 - 120 V
 - Output current
 - 23.3 A
 - Phases
 - 1
 - Circuit breaker rating
 - 30 A

- Engine specifications
 - Fuel
 - Not more than 10% ethanol blend
 - Not more than 5% methanol and must contain solvents and corrosion inhibitors
 - Average fuel consumption
 - No load: 0.14 Gal/h (0.53 L/h)
 - Half load: 0.21 Gal/h (0.79 L/h)
 - Full load: 0.46 Gal/h (1.74 L/h)
 - The maximum fuel pump lift is 914 mm (36 in).
 - Refer to: Lubricating Oil Capacity
 - Design
 - 4 cycle, single cylinder, Overhead valves
 - Aluminum alloy crankcase cover, cylinder head, and crankcase, with iron cylinder liner
 - Pressurized air cooling
 - Computer controlled ignition system
 - 3-wire, negative ground, 12 V starting system
 - Splash lubrication system
 - Displacement
 - 252 cubic cm (15.4 cubic in)
 - Compression Ratio
 - 8.8:1
 - RPM
 - 2445-2900 RPM
 - Power
 - 7.1 bhp (max) at 3600 RPM

Liquid Propane models

- Electrical specifications
 - Output frequency
 - 60 Hz
 - Rated output power
 - 2500 Watts
 - Output voltage
 - 120 V
 - Output current
 - 20.8 A
 - Phases
 - 1
 - Circuit breaker rating
 - 30 A

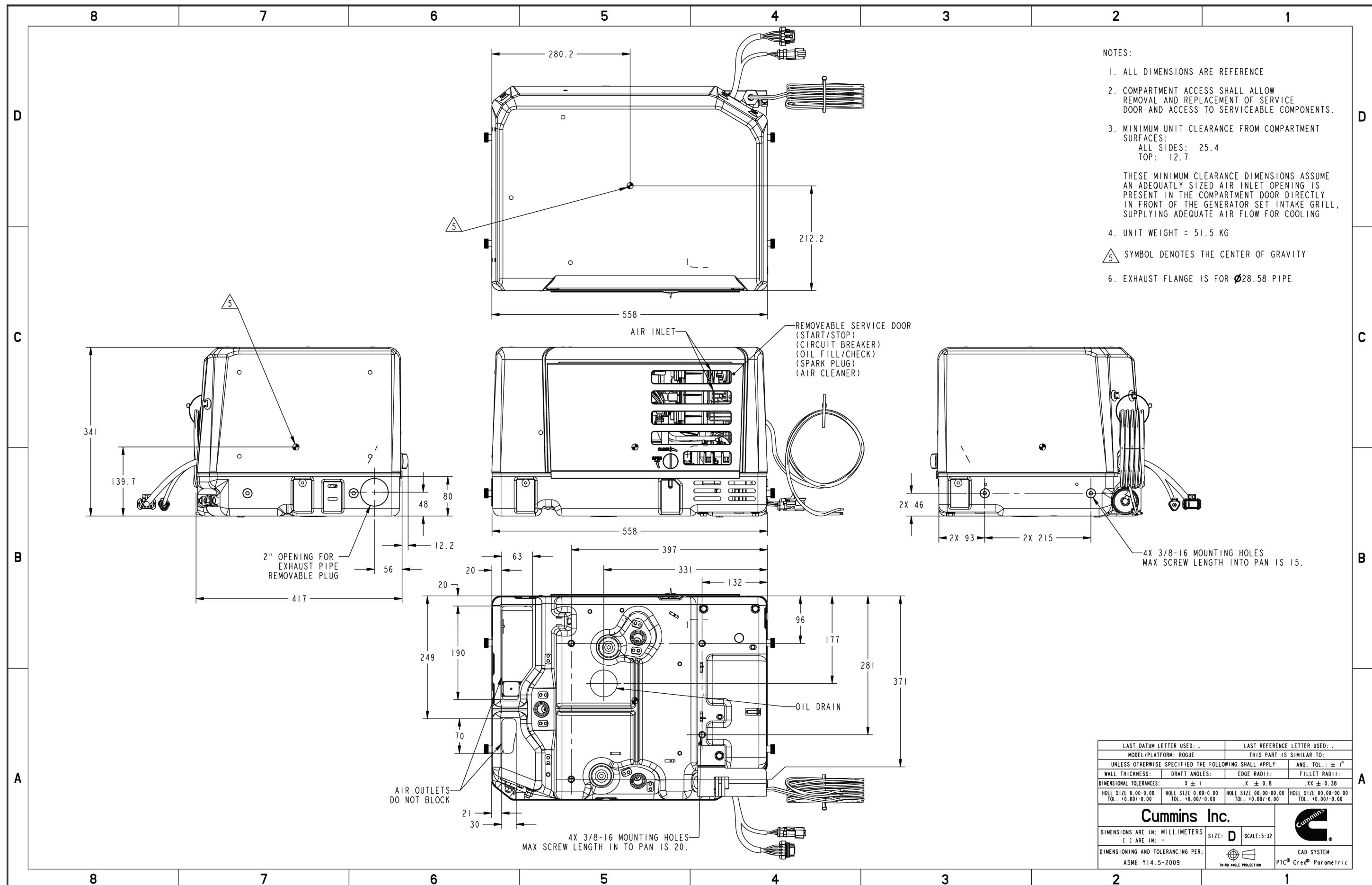
- Engine specifications
 - Fuel
 - Supply pressure: 9-13 inWC (2.25-3.25 kPa) 0.33-0.5 psi
 - HD-5 grade
 - No more than 2.5% butane when operating in low ambient temperatures
 - Average fuel consumption
 - No load: 0.18 Gal/h (0.77 lb/h) 0.35 kg/h
 - Half load: 0.31 Gal/h (1.27 lb/h) 0.59 kg/h
 - Full load: 0.56 Gal/h (2.31 lb/h) 1.05 kg/h
 - Refer to: Lubricating Oil Capacity
 - Design
 - 4 cycle, single cylinder, Overhead valves
 - Aluminum alloy crankcase cover, cylinder head, and crankcase, with iron cylinder liner
 - Pressurized air cooling
 - Computer controlled ignition system
 - 3-wire, negative ground, 12 V starting system
 - Splash lubrication system
 - Displacement
 - 252 cubic cm (15.4 cubic in)
 - Compression Ratio
 - 8.8:1
 - RPM
 - 2445-2900 RPM
 - Power
 - 7.1 bhp (max) at 3600 RPM

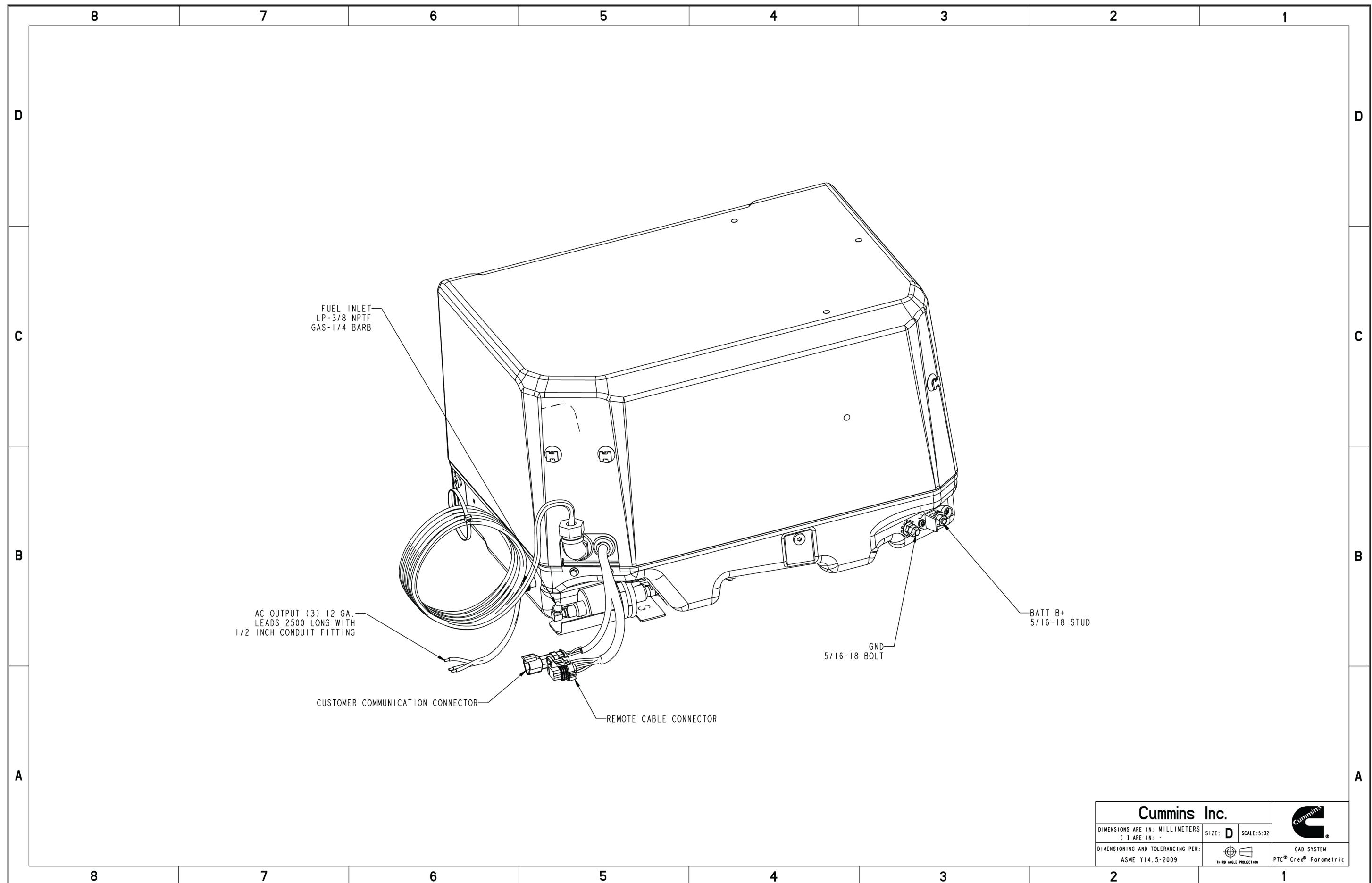
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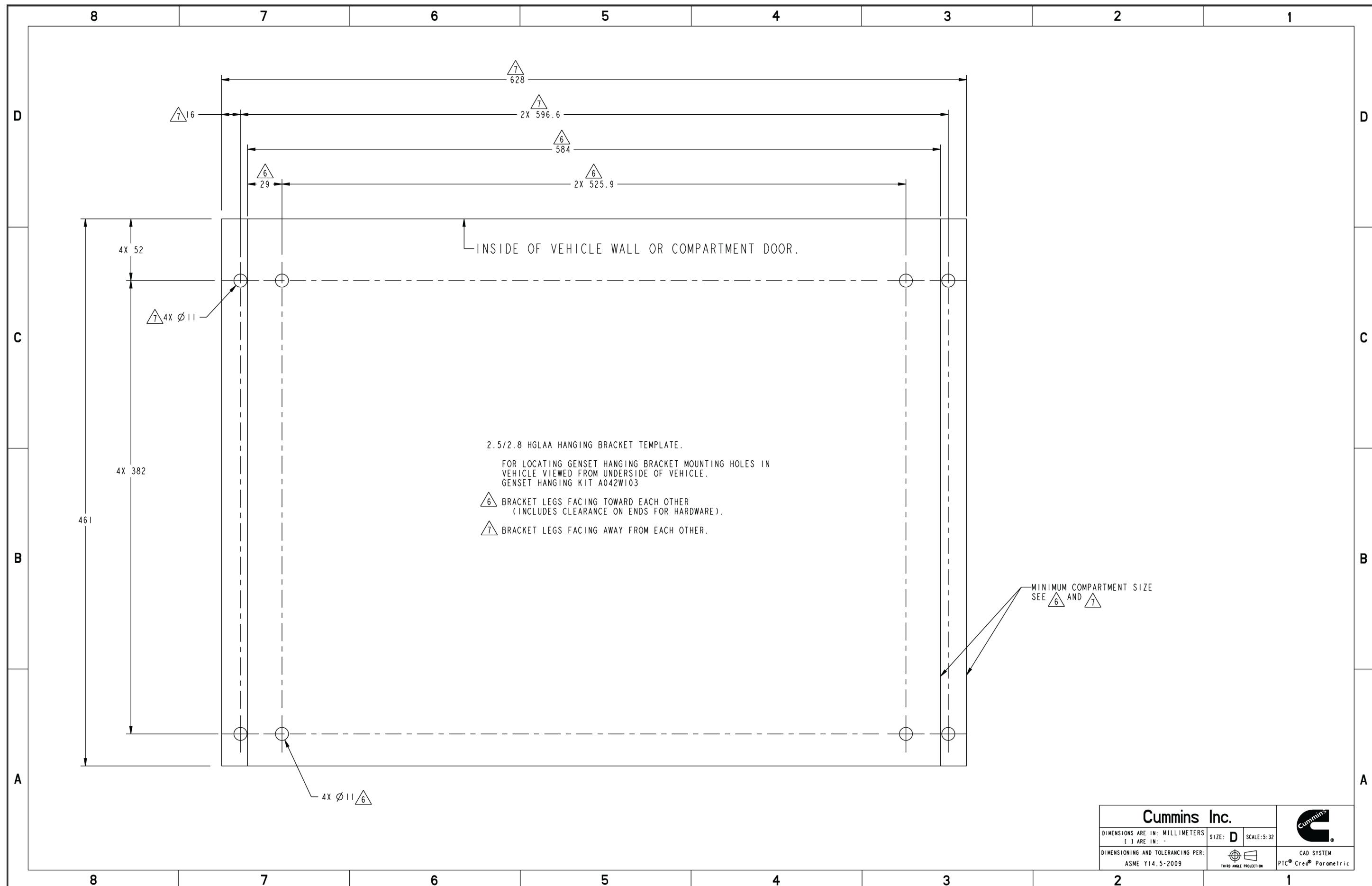
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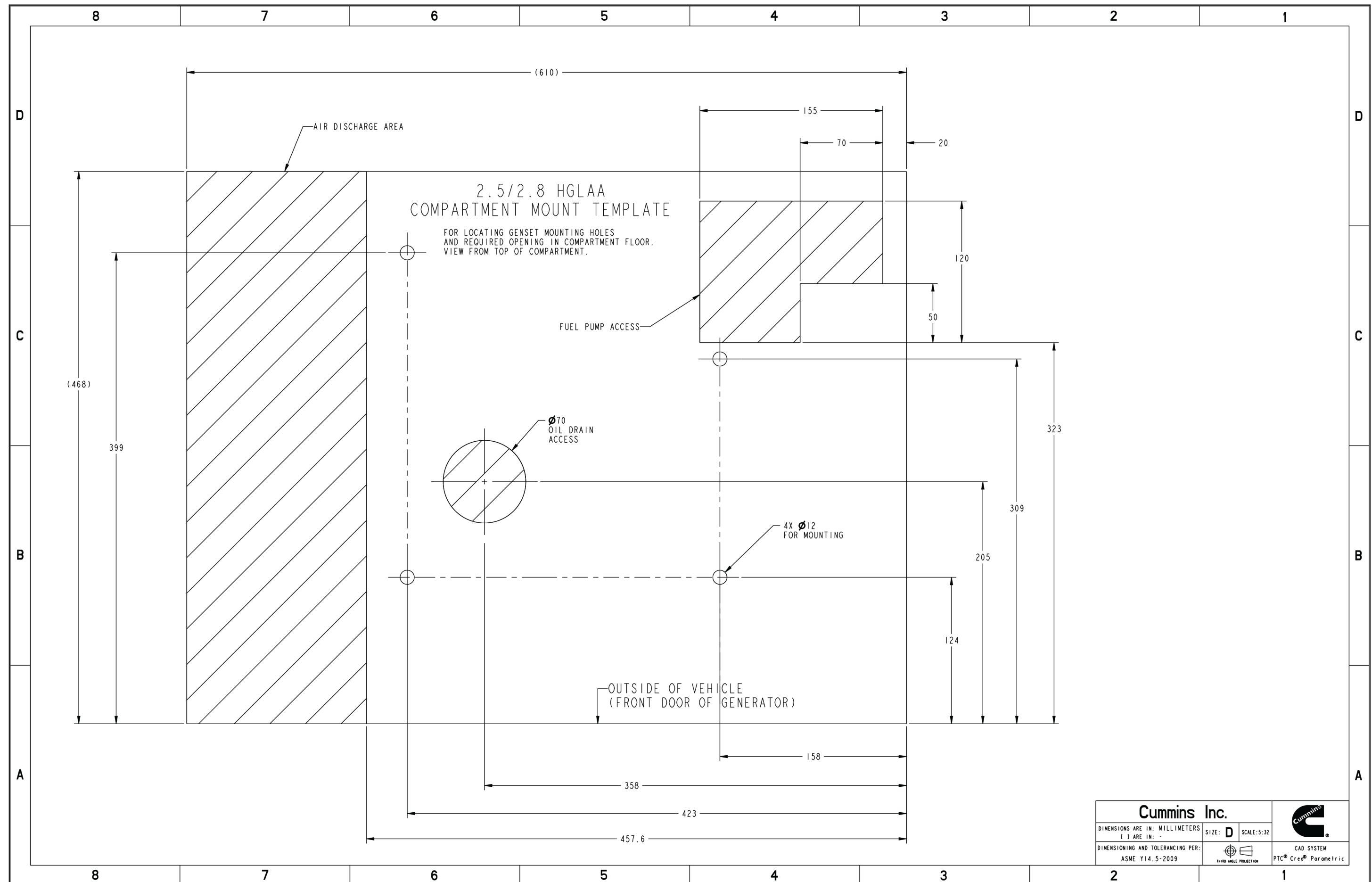
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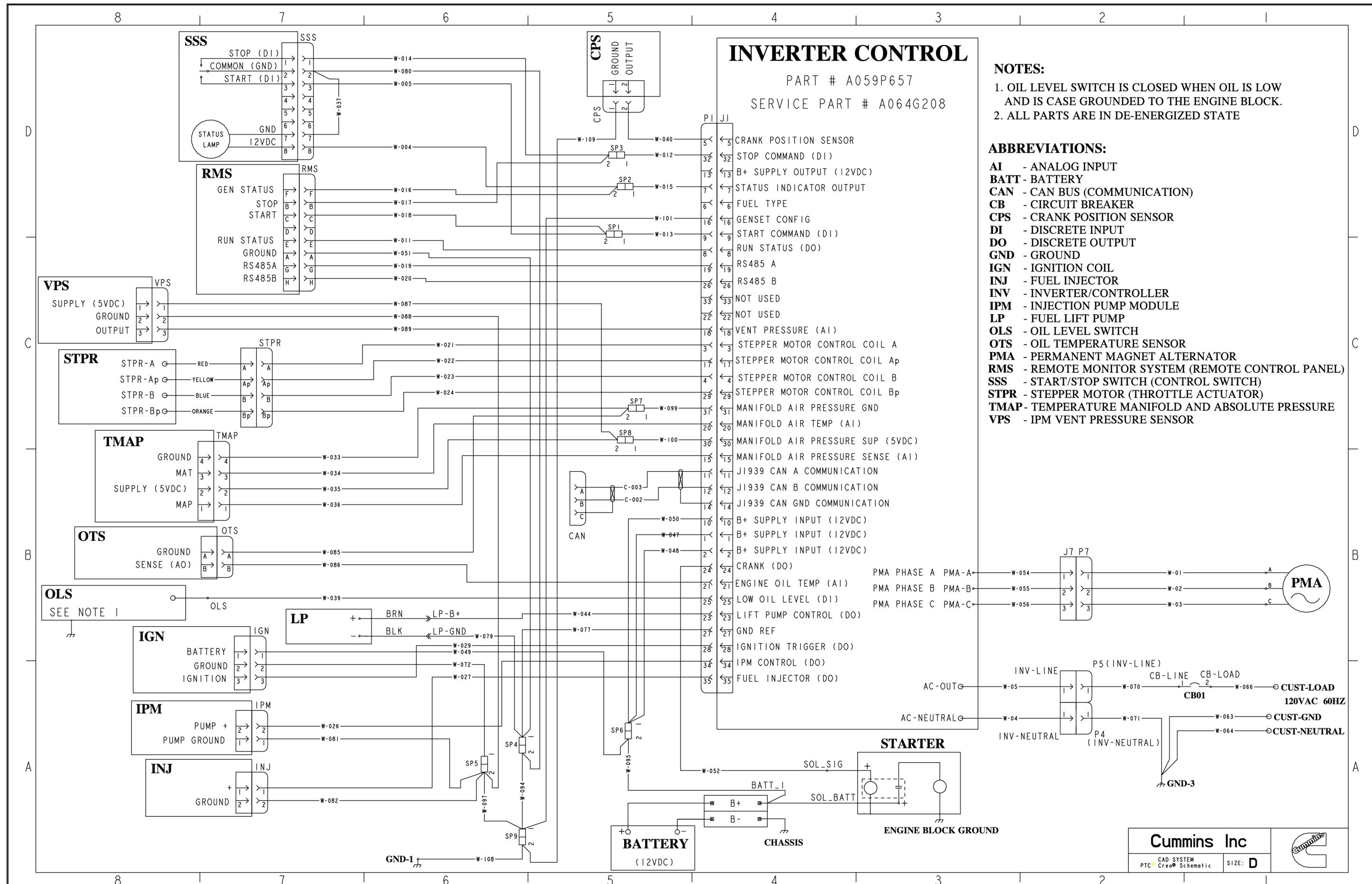
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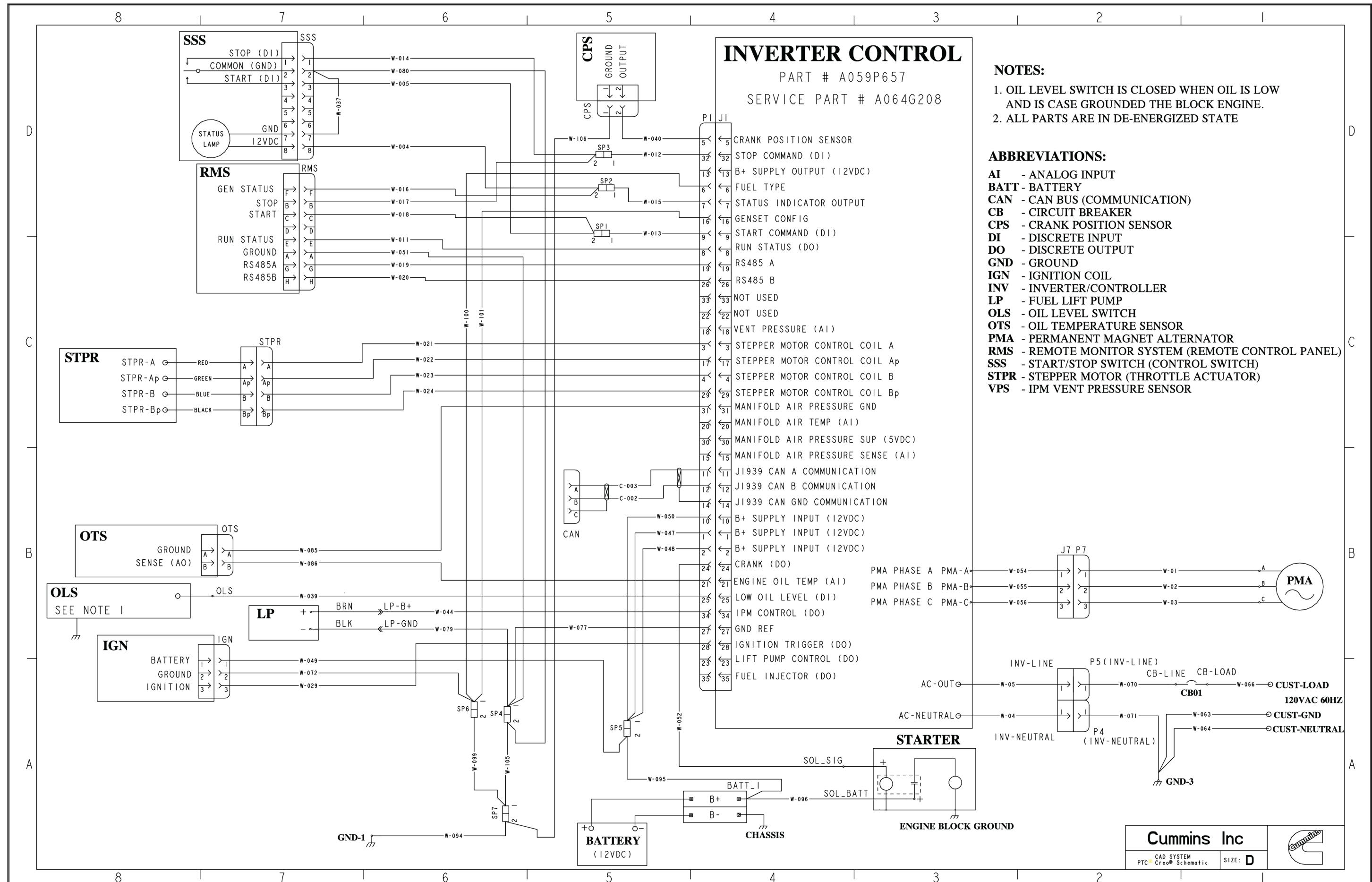


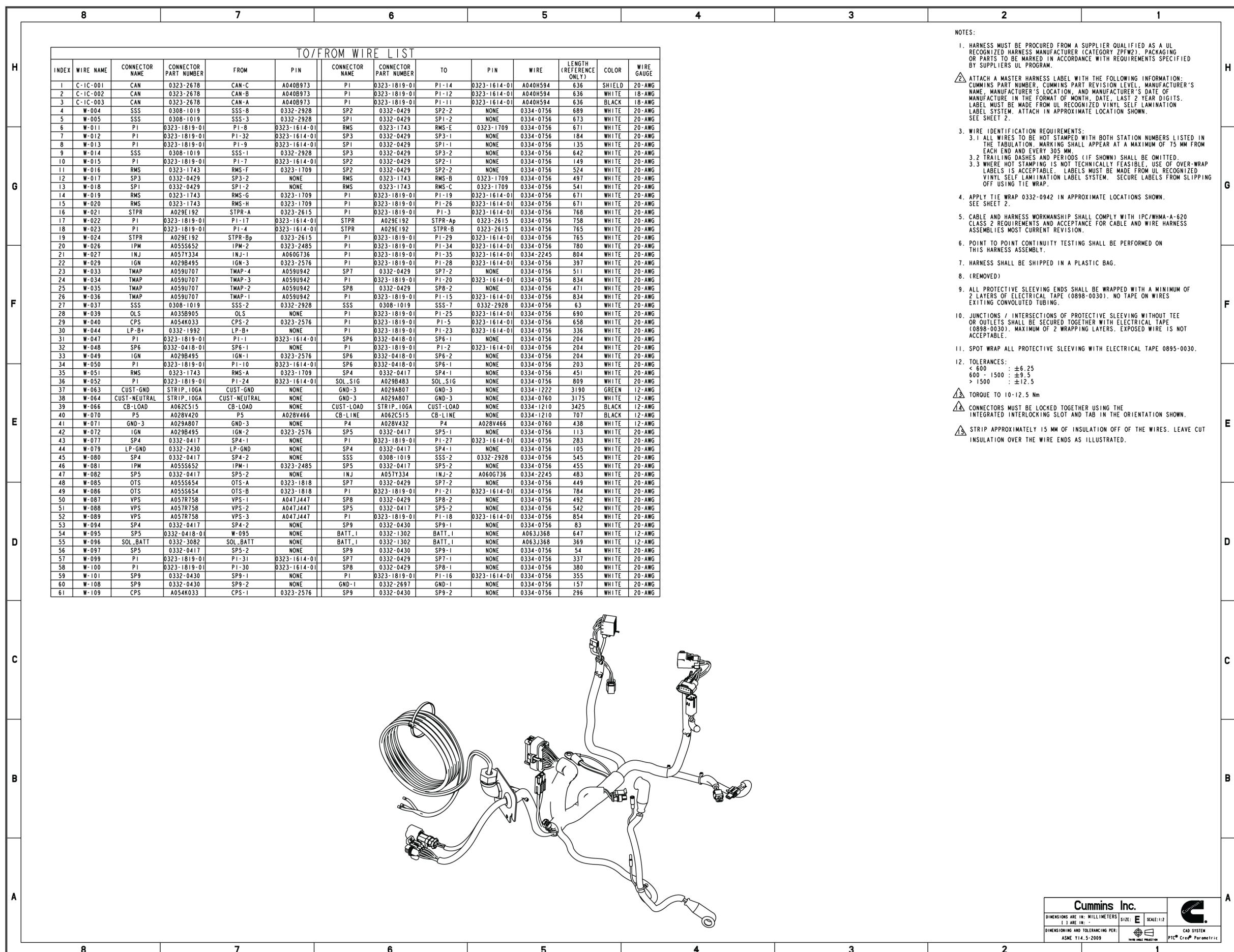


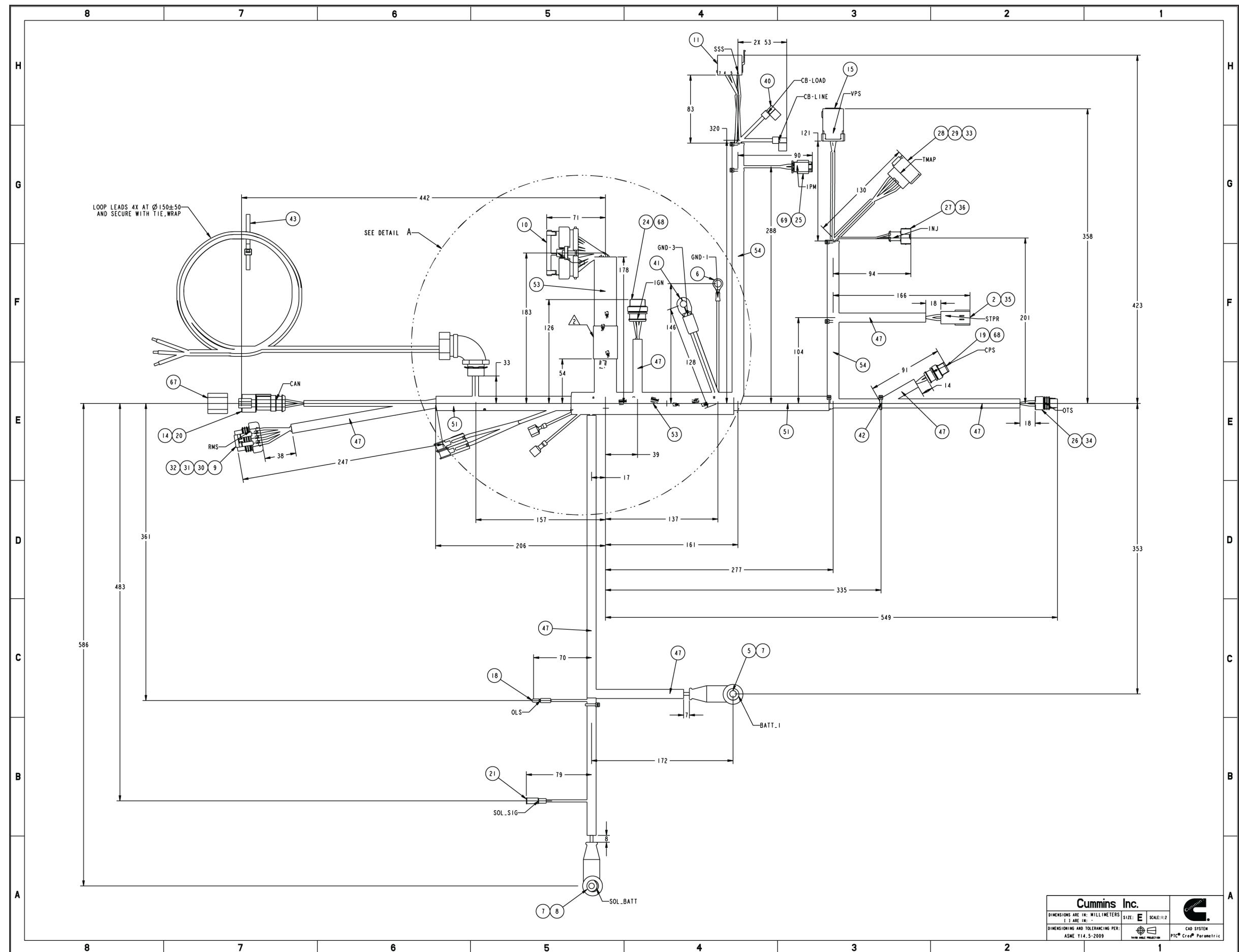


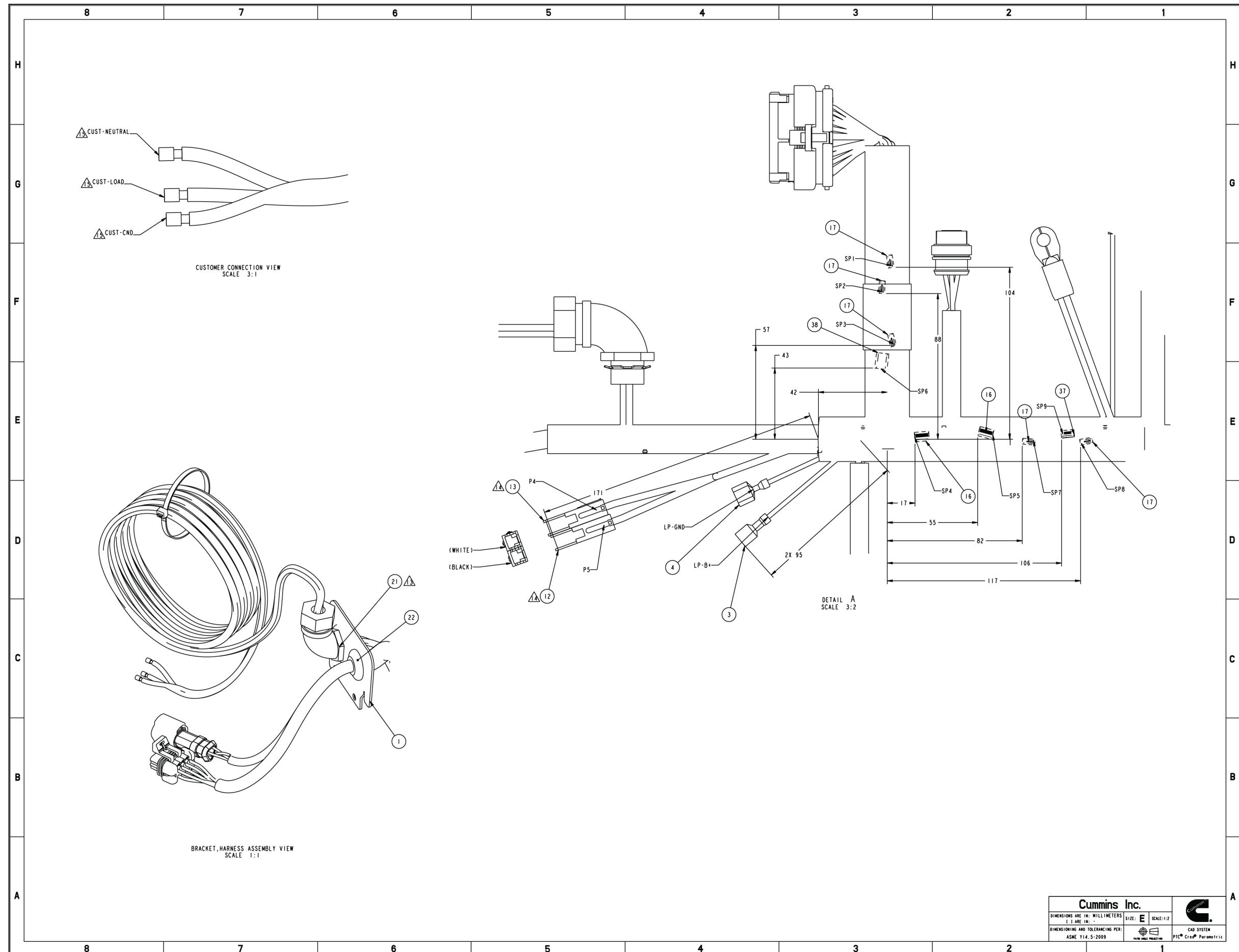


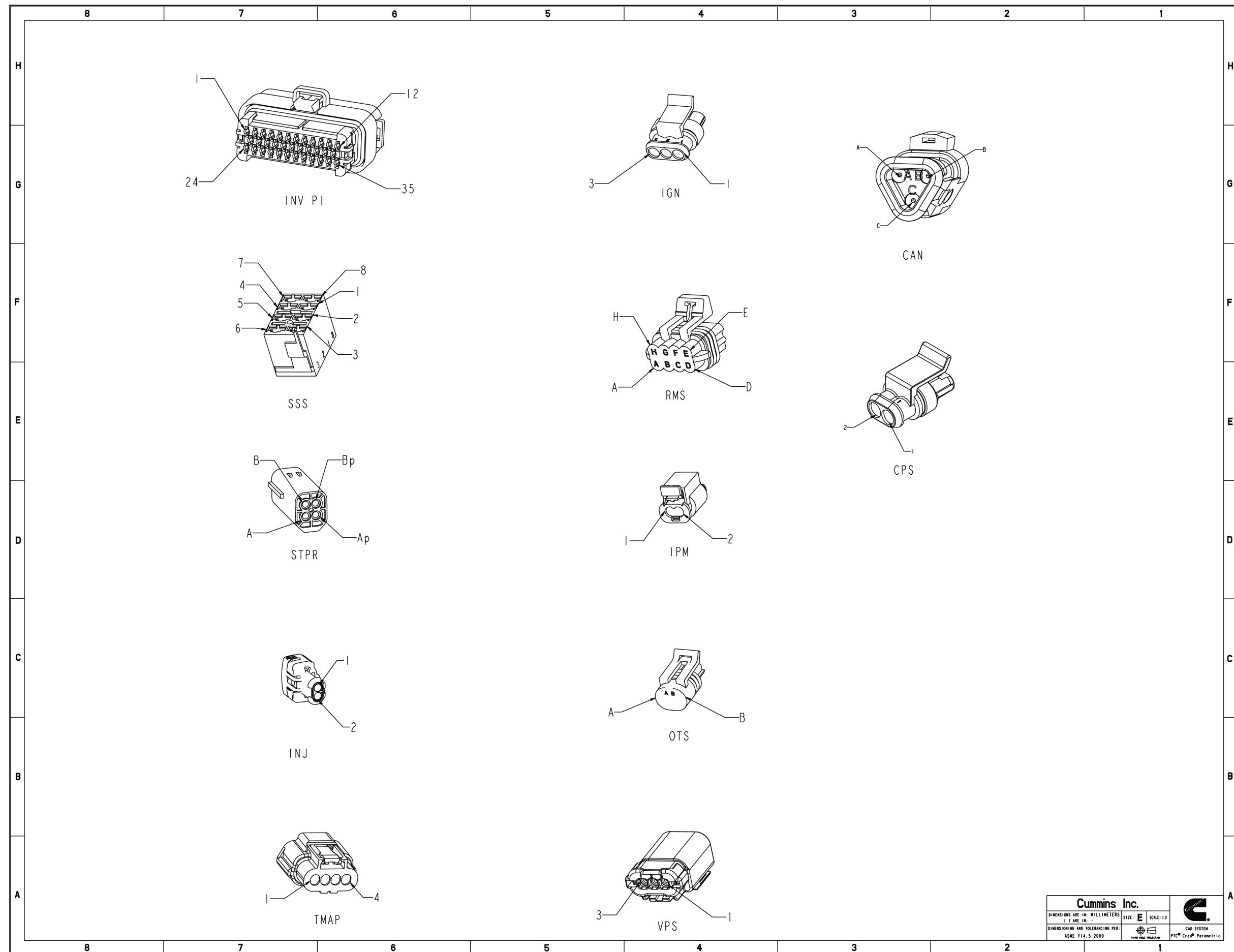


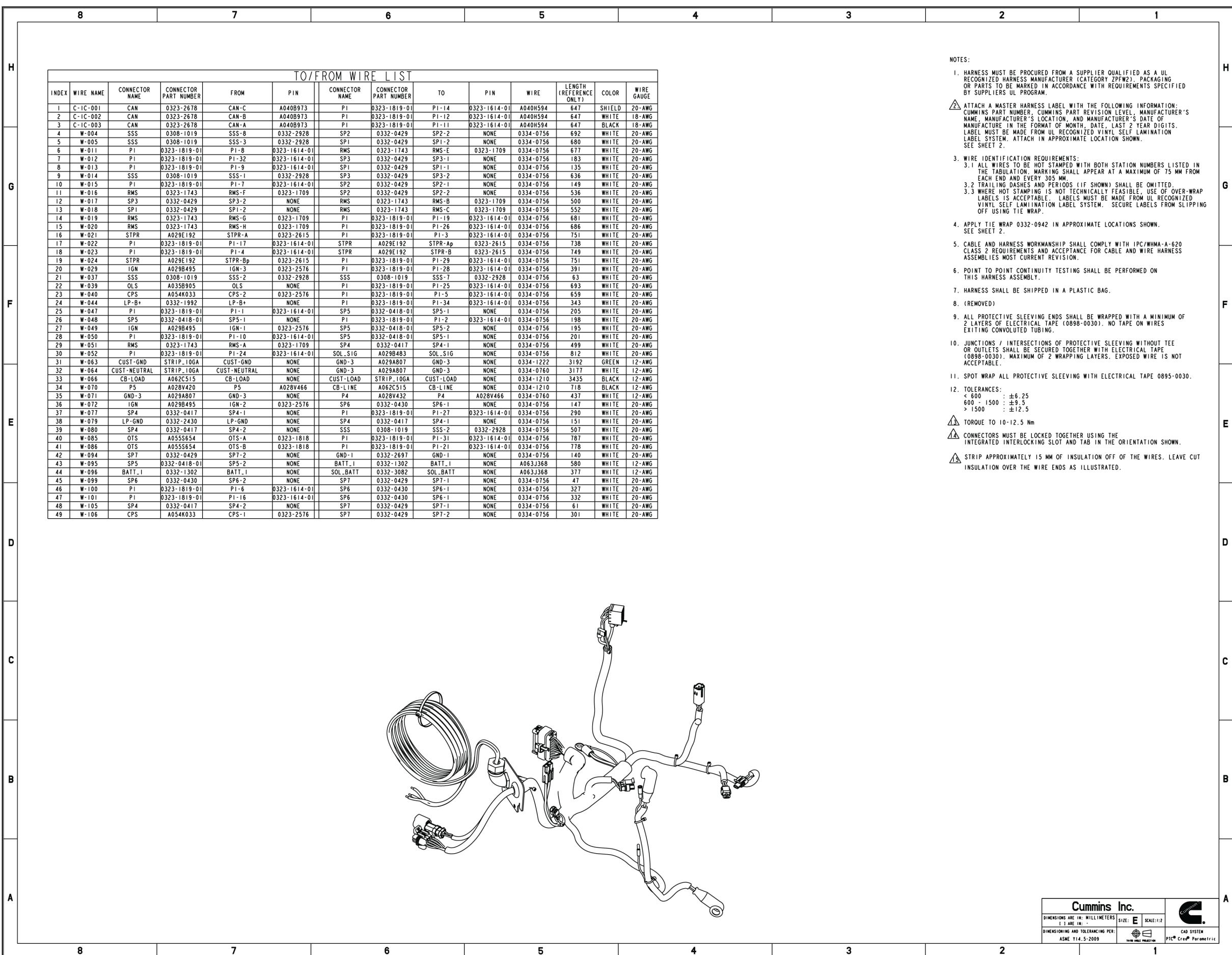


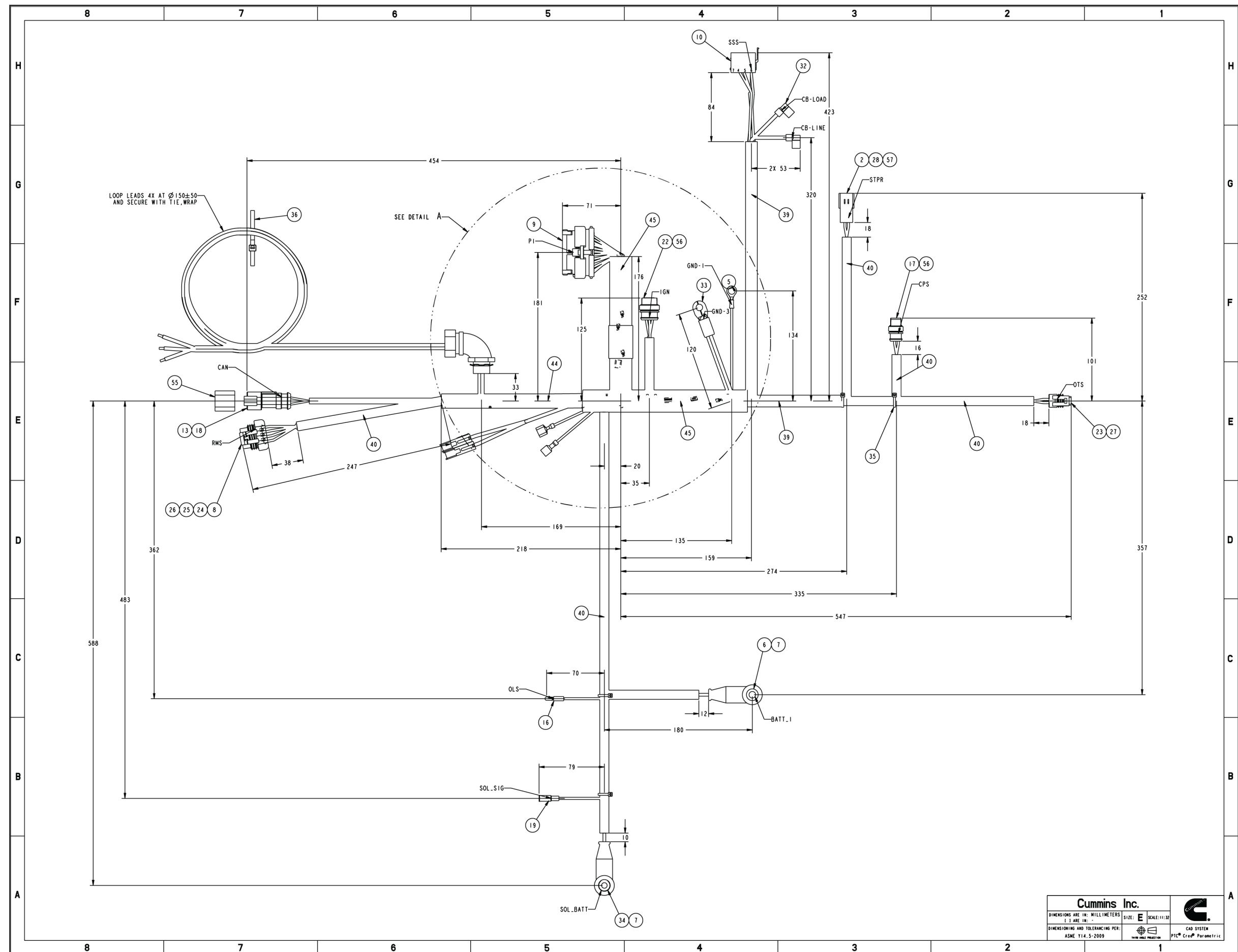


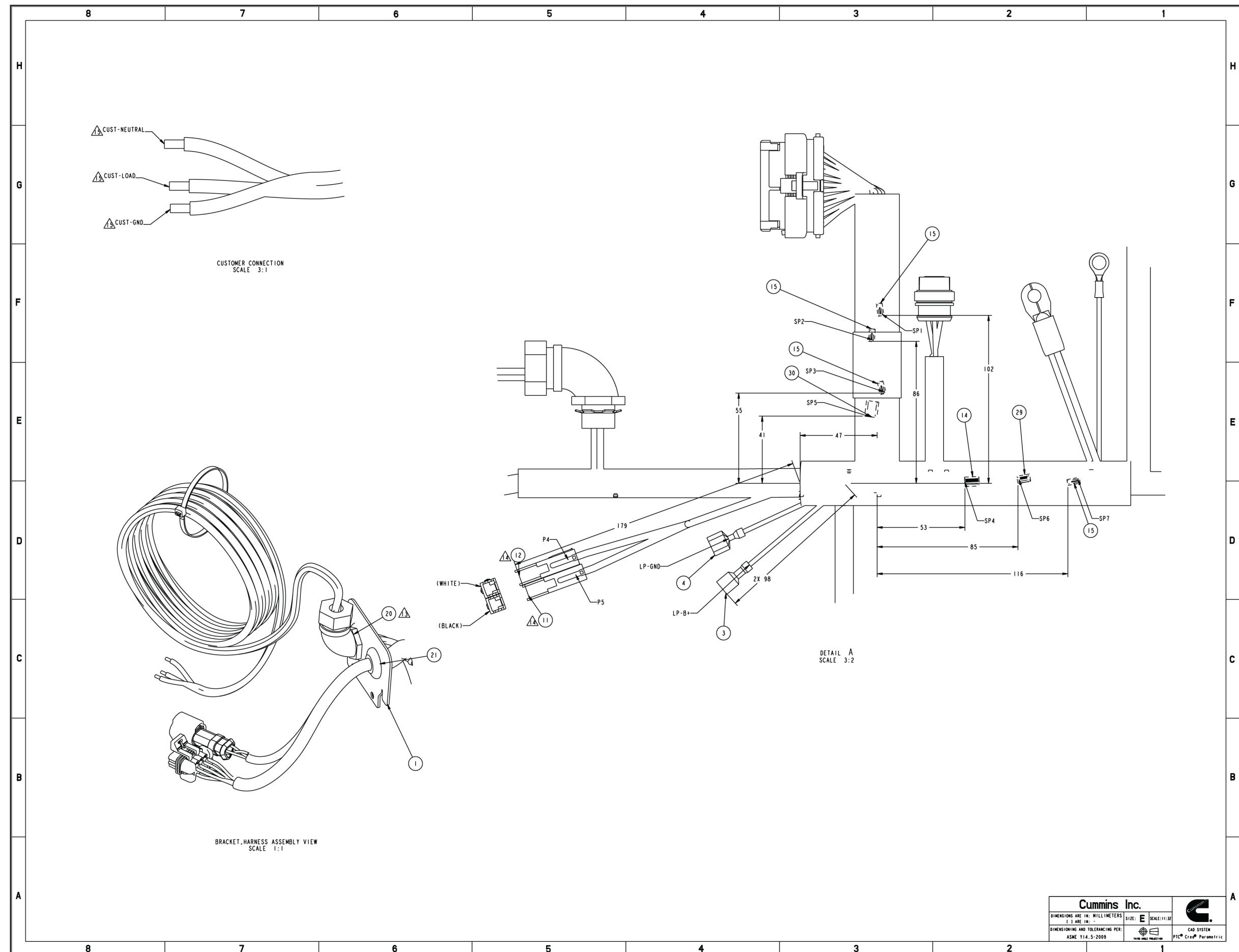


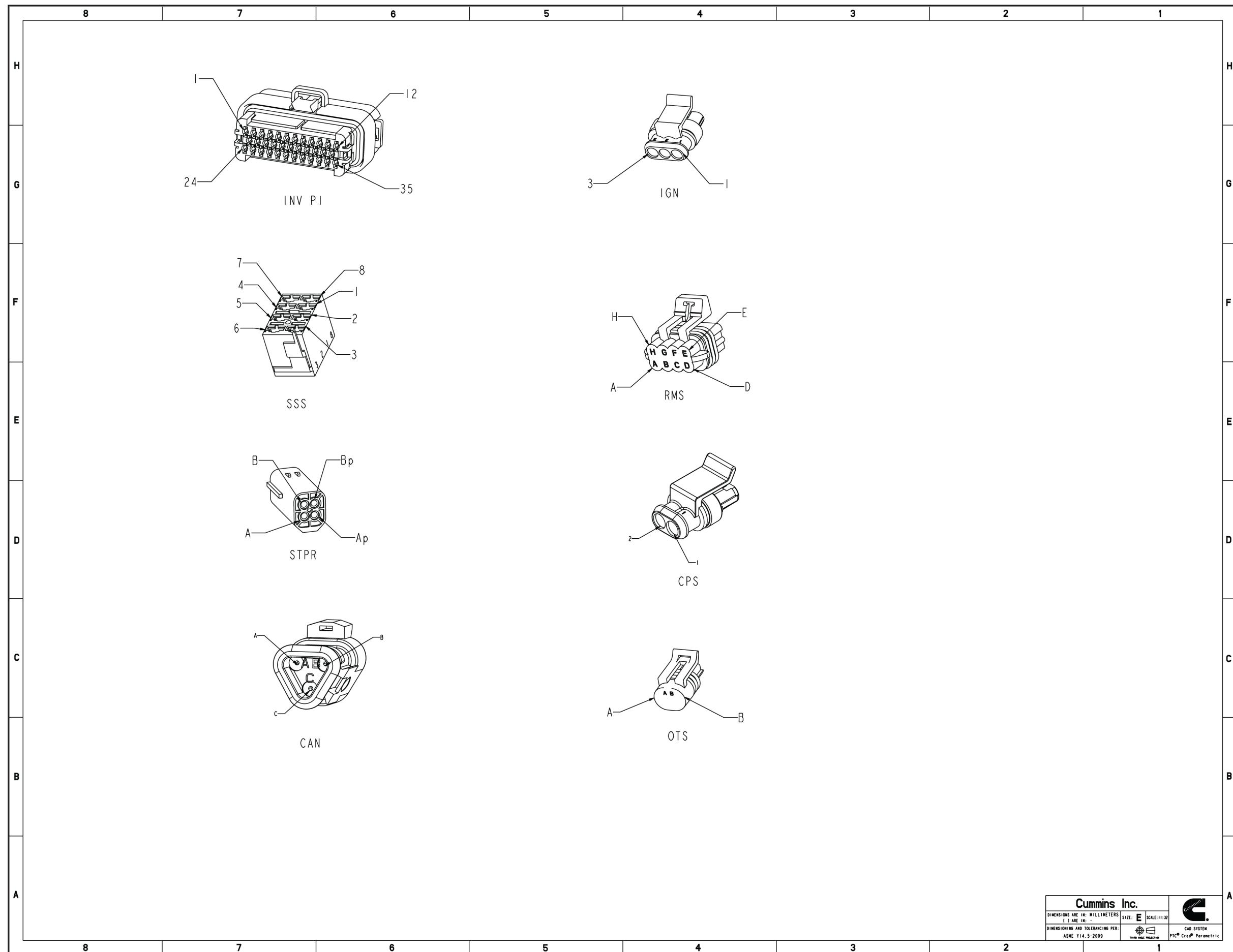












Torques

Battery Connections - Electrical Connection Guidelines - Page 80

Positive battery cable nuts	
Metric	U.S.
11 N·m	97 in-lb

Negative battery cable nut	
Metric	U.S.
11 N·m	97 in-lb

Equipment Electrical Ground - Application Preparation - Page 64

Equipment Grounding Screw	
Metric	U.S.
11 N·m	97 in-lb

Generator Set - Lifting - Page 87

Lifting Bolts	
Metric	U.S.
9 N·m	80 in-lb

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Cummins Inc.
Box 3005
Columbus, Indiana, U.S.A., 47202

www.cummins.com

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