Installation Manual

Generator Set

QSK95 Engine with PowerCommand® 3.3 Control and S9 Alternator

C3000 D6 (Spec A-B)
C3000 D6e (Spec A-B)
C3250 D6 (Spec A-B)
C3250 D6e (Spec A-B)
C3500 D5 (Spec A-B)
C3500 D5e (Spec A-B)
C3500 D6 (Spec A-B)
C3500 D6e (Spec A-B)
C3750 D5 (Spec A-B)
C3750 D5e (Spec A-B)

English
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1 IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS. This manual contains important instructions that should be followed during installation and maintenance of the generator set and batteries.

Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

1.1 Warning, Caution, and Note Styles Used in This Manual

The following safety styles and symbols found throughout this manual indicate potentially hazardous conditions to the operator, service personnel, or equipment.

⚠ DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

Indicates information considered important, but not hazard-related (e.g., messages relating to property damage).

1.2 General Information

This manual should form part of the documentation package supplied by Cummins with specific generator sets. In the event that this manual has been supplied in isolation, contact your authorized distributor.

NOTICE

It is in the operator's interest to read and understand all warnings and cautions contained within the documentation relevant to the generator set, its operation and daily maintenance.

1.2.1 Safety Symbols

Safety information signs are displayed where equipment has been installed. Become familiar with all signage and the sign meaning before operating the equipment. Sample safety symbols are shown below; observe and comply with the warning labels particular to your product installation.

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Safety Symbol			
Message	Warning	Prohibition	Mandatory Action

1.2.2 Warning Labels

Warning signs are provided on the equipment at the point of risk. Become familiar with the product labeling and the label meaning before operating the equipment. To avoid injury, always take the necessary precautions. Sample signs are shown below; observe and comply with the warning labels particular to the product.

TABLE 1. WARNING LABELS

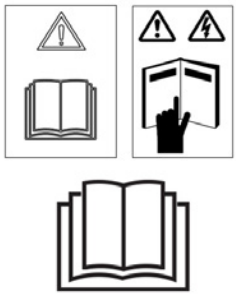
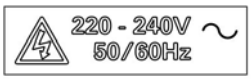
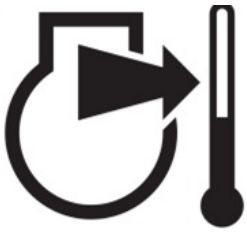
Image	Title/Meaning/ Reference	Function/Description
	Refer to instruction manual/booklet	Signifies that the instruction manual/booklet must be read.
	Read operator's manual	Indicates that the operator's manual or card should be read before continuing the operation.
	Caution	Indicates that caution is necessary when operating the device or control close to where the symbol is placed. Indicates that the current situation needs operator awareness or operator action in order to avoid undesirable consequences. On the health app quality label: indicates that the health app requires approval from a health professional for use.

Image	Title/Meaning/ Reference	Function/Description
	Caution, risk of electric shock	Identifies equipment, for example, the welding power source, that has risk of electric shock.
	Warning (various voltages)	Indicates *****V is the highest voltage likely to be encountered.
	Dangerous voltage	Indicates voltage range and frequency for alternating current.
	Warning (press liquid) Effect or action in both directions towards a reference point	Indicates the direction of a certain effect or action in both directions towards a real or imaginary reference point or mark, which is realized by means of the control marked with this symbol.
	Caution, hot surface	Indicates that the marked item can be hot and should not be touched without taking care.
 	Protective earth; protective ground	To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth (ground) electrode.

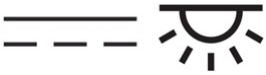
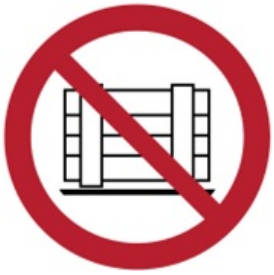
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Image	Title/Meaning/ Reference	Function/Description
	Volume, empty	Indicates that the container is empty. Identifies the empty reading or indicator position on the display or container.
	Volume, half full	Indicates that the container is half-full. Identifies the half-full reading or position indicator on the display or container.
	Volume, full	Indicates that the container is full. Indicates the full reading or position indicator on the display or container.
	Engine coolant	Identifies the fill point for engine coolant. Identifies the container for engine coolant.
	Engine lubricating oil	Identifies the fill point for engine oil. Identifies the container for engine oil.
	Engine coolant output; exit	Identifies an exit for engine coolant.
	Engine exhaust gas temperature	Identifies the display that provides information about the temperature of the exhaust gas from the engine. Indicates the engine exhaust gas temperature.

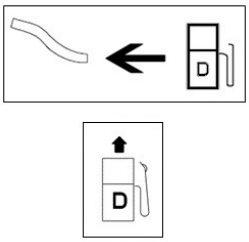
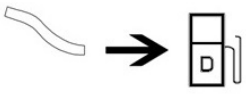
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Image	Title/Meaning/ Reference	Function/Description
	Lubrication	Identifies a lubricating point for oil.
	Water; fluid	Indicates water or water-base fluid.
	Draining; emptying	Indicates the emptying of any vessel, or container of liquid or produce (for example, draining of oil tanks, draining ink reservoirs, emptying grain hoppers).
	Filling	Indicates the filling of a vessel or container by any type of liquid or produce (for example, filling of oil tanks, filling ink reservoirs, filling grain hoppers).
	Keep locked	Signifies that a cabinet or facility must be kept locked.
	Wear ear protection	Signifies that ear protection must be worn.

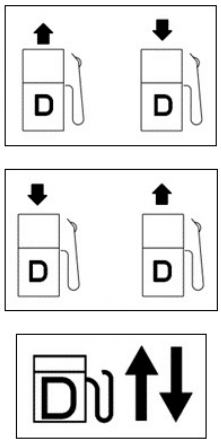
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Image	Title/Meaning/ Reference	Function/Description
	Light Descriptor – Alternating current Interior compartment illumination; interior (dome) light	Alternating light Indicates on the rating plate that the equipment is suitable for alternating current only; identifies relevant terminals. Identifies the control that operates the interior compartment illumination. Indicates the operational status of the dome light.
	Light Descriptor – Direct current Interior compartment illumination; interior (dome) light	Direct current light Indicates on the rating plate that the equipment is suitable for direct current only; identifies relevant terminals. Identifies the control that operates the interior compartment illumination. Indicates the operational status of the dome light.
	Do not obstruct	Prohibits the obstruction of a designated clear area.
	Warning; Substance or mixture that can cause an environmental hazard	Warns of a substance or mixture that can cause an environmental hazard.
	Trash bin	Indicates a receptacle for the acceptance of trash being thrown away.
	General symbol for recovery / recyclable	Indicates that the marked item or its material is part of a recovery or recycling process.
	Reference position	Reference position.

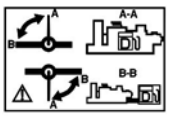
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Image	Title/Meaning/ Reference	Function/Description
	Do not alter the state of the switch	Prohibits any change of the current energetic or mechanical state of a machine or equipment.
	Engine, run	Identifies the control position that indicates the engine, once started, will continue to operate. Indicates that the engine is operating.
	Disconnect mains plug from electrical outlet	Signifies that the mains plug must be disconnected from electrical outlet for the purposes of maintenance of electrical equipment, in the case of malfunction or when left unattended.
	Information (fuel out)	Diesel fuel outlet connection.
	Information (fuel in)	Diesel fuel inlet connection.

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Image	Title/Meaning/ Reference	Function/Description
	Information (fuel in fuel out)	Indication for fuel in and out.
	Tank, filled	Indicates that the tank is filled.
	Fill up to level	Indicates that the tank or reservoir should be filled to the indicated level.
	Fuel type	Identifies which fuel type (e.g. LPG, CMG, DIESEL, HYDROGEN) is currently being used. May be used on a control to switch between dual fuel types or a display to show current fuel type.
	Diesel fuel	Identifies the fill point for diesel fuel. Identifies the container for diesel fuel. Indicates the operational status of the diesel fuel system. Use only at fuel fill point to indicate fuel type.

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Image	Title/Meaning/ Reference	Function/Description
	Fuel pressure	Identifies the display that provides information about the pressure of the fuel system.
	Diesel fuel drain	Identifies the control that drains diesel fuel from the diesel fuel tank. Indicates that diesel fuel is draining from the diesel fuel tank.
	Unleaded fuel	Indicates low unleaded fuel. Identifies the unleaded fuel gauge. Identifies the unleaded fuel filler cap or fill point.
	3-way fuel valve to connect external tank	Indicates which way the 3-way valve operates corresponding to the fuel inlet from the external or internal fuel tank.
	No thoroughfare	Prohibits the use of a thoroughfare by pedestrians.

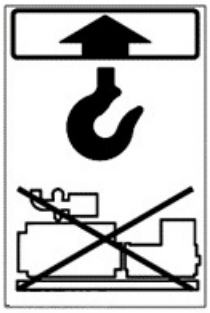
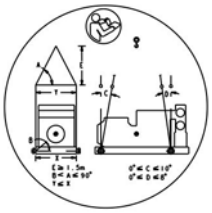
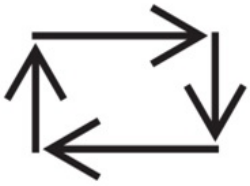
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Image	Title/Meaning/ Reference	Function/Description
	Do not walk or stand here	Prohibits walking or standing on a designated area.
	No access for forklift trucks and other industrial vehicles	Prohibits the use of forklift trucks and other industrial vehicles.
	No activated mobile phone	Prohibits activated mobile phones.
	Warning; Non-ionizing radiation	Warns of non-ionizing radiation.
	Caution, non-ionizing electromagnetic radiation; caution, microwave radiation	Indicates that precaution should be taken to avoid an unexpected effect of non-ionizing radiation, for example, microwave energy.

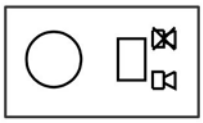
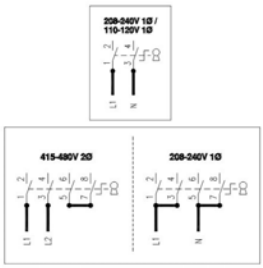
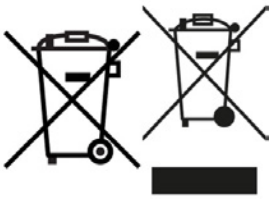
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Image	Title/Meaning/ Reference	Function/Description
	Engine coolant temperature	Indicates that the engine coolant may be overheating or fails outside of specified parameters. Identifies the engine coolant temperature gauge.
	Hot pressurized coolant warning	Indicates hot pressurized coolant that can cause severe injury / burns. Do not open when hot.
	Hot surface warning	Warns of a hot surface that can cause burns. Allow surface to cool before servicing.
	Caution – rotating parts	Rotating parts can cause severe injury. Do not operate without guards in place.
	Warning – Hazardous voltage	Will cause severe injury or death; risk of electrical shock Do not operate generator set without this cover in place. Disconnect all electrical supply sources before servicing. Service by trained personnel only.
	Warning – Lifting points	Using lifting points can cause severe injury and / or property damage. Use generator set skid to lift.
	Lift point	Identifies the locations on the equipment where a lifting device can be attached.

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Image	Title/Meaning/ Reference	Function/Description
	Label warning (do not lift)	Apply next to engine, alternator and any other lifting eyes which are not to be used to lift complete generating set.
	No lifting point; central support	Identifies the locations on the equipment where a lifting jack or support device can be used.
	Lifting instructions	Lifting arrangement for generator set.
	Apply torque to specification	Torque to 3.5 Newton Meters maximum.
	Automatic cycle; semi-automatic cycle	Indicates an automatic sequence of machine functions repeated continuously without manual intervention.
	Center of gravity	Indicates the center of gravity of the transport package which will be handled as a single unit.

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Image	Title/Meaning/ Reference	Function/Description
	Annunciator on/off overlay	Annunciator on/off overlay.
	Generator set wiring connections schematic	Generator set wiring connections schematic used on items requiring a power source.
	Wear eye protection Protect your eyes Explosive gasses can cause blindness or injury	Signifies that eye protection must be used.
	No smoking Avoid • Spark • Flames • Smoking	Indicates that smoking is prohibited.
	Sulfuric acid can cause blindness or severe burns	
	Wash your eyes with water immediately Get medical attention immediately	
	WEEE; waste electrical and electronic equipment	Indicates that separate collection for waste electric and electronic equipment (WEEE) is required. If a product has been placed on the market after 13 August 2005, the symbol may have the bar underneath the crossed-out wheeled bin symbol.

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1.2.3 General Safety Precautions

⚠ WARNING

Hot Pressurized Liquid

Contact with hot liquid can cause severe burns.

Do not open the pressure cap while the engine is running. Let the engine cool down before removing the cap. Turn the cap slowly and do not open it fully until the pressure has been relieved.

⚠ WARNING

Moving Parts

Moving parts can cause severe personal injury.

Use extreme caution around moving parts. All guards must be properly fastened to prevent unintended contact.

⚠ WARNING

Toxic Hazard

Used engine oils have been identified by some state and federal agencies to cause cancer or reproductive toxicity.

Do not ingest, breathe the fumes, or contact used oil when checking or changing engine oil. Wear protective gloves and face guard.

⚠ WARNING

Electrical Generating Equipment

Incorrect operation can cause severe personal injury or death.

Do not operate equipment when fatigued, or after consuming any alcohol or drug.

⚠ WARNING

Toxic Gases

Substances in exhaust gases have been identified by some state and federal agencies to cause cancer or reproductive toxicity.

Do not breathe in or come into contact with exhaust gases.

⚠ WARNING

Combustible Liquid

Ignition of combustible liquids is a fire or explosion hazard which can cause severe burns or death.

Do not store fuel, cleaners, oil, etc., near the generator set.

⚠ WARNING

High Noise Level

Generator sets in operation emit noise, which can cause hearing damage.

Wear appropriate ear protection at all times.

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⚠ WARNING

Hot Surfaces

Contact with hot surfaces can cause severe burns.

The unit is to be installed so that the risk of hot surface contact by people is minimized. Wear appropriate PPE when working on hot equipment and avoid contact with hot surfaces.

⚠ WARNING

Electrical Generating Equipment

Incorrect operation and maintenance can result in severe personal injury or death.

Make sure that only suitably trained and experienced service personnel perform electrical and/or mechanical service.

⚠ WARNING

Toxic Hazard

Ethylene glycol, used as an engine coolant, is toxic to humans and animals.

Wear appropriate PPE. Clean up coolant spills and dispose of used coolant in accordance with local environmental regulations.

⚠ WARNING

Combustible Liquid

Ignition of combustible liquids is a fire or explosion hazard which can cause severe burns or death.

Do not use combustible liquids like ether.

⚠ WARNING

Automated Machinery

Accidental or remote starting of the generator set can cause severe personal injury or death.

Isolate all auxiliary supplies and use an insulated wrench to disconnect the starting battery cables (negative [–] first).

⚠ WARNING

Fire Hazard

Materials drawn into the generator set are a fire hazard. Fire can cause severe burns or death.

Make sure the generator set is mounted in a manner to prevent combustible materials from accumulating under the unit.

⚠ WARNING

Fire Hazard

Accumulated grease and oil are a fire hazard. Fire can cause severe burns or death.

Keep the generator set and the surrounding area clean and free from obstructions. Repair oil leaks promptly.

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⚠ WARNING

Fall Hazard

Falls can result in severe personal injury or death.

Make sure that suitable equipment for performing tasks at height are used in accordance with local guidelines and legislation.

⚠ WARNING

Fire Hazard

Materials drawn into the generator set are a fire hazard. Fire can cause severe burns or death.

Keep the generator set and the surrounding area clean and free from obstructions.

⚠ WARNING

Pressurized System

Pressurized systems can rupture/leak which can result in severe personal injury or death.

Use appropriate lock out/tag out safety procedures to isolate from all energy sources before performing any service tasks. Use PPE.

⚠ WARNING

Confined Areas

Confined spaces or areas with restricted access or potential to entrap can cause severe personal injury or death.

Use appropriate lock out/tag out safety procedures to isolate from all energy sources. Use PPE. Follow site specific lone worker protocols/permits to work.

⚠ CAUTION

Manual Handling Heavy Objects

Handling heavy objects can cause severe personal injury.

Use appropriate lifting equipment and perform tasks with two people where doing so would make completion of the task safe.

⚠ CAUTION

Power Tools and Hand Tools

Tools can cause cuts, abrasions, bruising, puncture injuries.

Only trained and experienced personnel should use power tools and hand tools. Use PPE.

⚠ CAUTION

Sharp Edges and Sharp Points

Projecting corners/parts may cause cuts, abrasions and other personal injury.

Use PPE. Be aware of sharp edges and corners/sharp points. Cover/protect them.

NOTICE

Keep multi-type ABC fire extinguishers close by. Class A fires involve ordinary combustible materials such as wood and cloth. Class B fires involve combustible and flammable liquid fuels and gaseous fuels. Class C fires involve live electrical equipment. (Refer to NFPA No. 10 in the applicable region.)

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NOTICE

Before performing maintenance and service procedures on enclosed generator sets, make sure the service access doors are secured open.

NOTICE

Stepping on the generator set can cause parts to bend or break, leading to electrical shorts, or to fuel leaks, coolant leaks, or exhaust leaks. Do not step on the generator set when entering or leaving the generator set room.

1.3 Generator Set Safety Code

Before operating the generator set, read the manuals and become familiar with them and the equipment. Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

⚠ WARNING

Electrical Generating Equipment

Incorrect operation and maintenance can result in severe personal injury or death.

Read and follow all Safety Precautions, Warnings, and Cautions throughout this manual and the documentation supplied with the generator set.

1.3.1 Moving Parts Can Cause Severe Personal Injury or Death

- Keep hands, clothing, and jewelry away from moving parts. Do not wear loose clothing or jewelry in the vicinity of moving parts or while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts.
- Before starting work on the generator set, disconnect the battery charger from its AC source, then disconnect the starting batteries using an insulated wrench, negative (–) cable first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps; keep guards in position over fans, drive belts, etc.
- If any adjustments must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

1.3.2 Positioning of Generator Set - Open Sets

The area for positioning the set should be adequate and level, and the area immediately around the set must be free of any flammable material.

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1.4 Electrical Shocks and Arc Flashes Can Cause Severe Personal Injury or Death

⚠ WARNING

Electric Shock Hazard

Voltages and currents present an electrical shock hazard that can cause severe burns or death.

Contact with exposed energized circuits with potentials of 50 Volts AC or 75 Volts DC or higher can cause electrical shock and electrical arc flash. Refer to standard NFPA 70E or equivalent safety standards in corresponding regions for details of the dangers involved and for the safety requirements.

Guidelines to follow when working on de-energized electrical systems:

- Use proper PPE. Do not wear jewelry and make sure that any conductive items are removed from pockets as these items can fall into equipment and the resulting short circuit can cause shock or burning. Refer to standard NFPA 70E for PPE standards.
- De-energize and lockout/tagout electrical systems prior to working on them. Lockout/Tagout is intended to prevent injury due to unexpected start-up of equipment or the release of stored energy. Please refer to *Locking the Generator Set Out of Service* section for more information.
- De-energize and lockout/tagout all circuits and devices before removing any protective shields or making any measurements on electrical equipment.
- Follow all applicable regional electrical and safety codes.

Guidelines to follow when working on energized electrical systems:

NOTICE

It is the policy of Cummins Inc. to perform all electrical work in a de-energized state. However, employees or suppliers may be permitted to occasionally perform work on energized electrical equipment only when qualified and authorized to do so and when troubleshooting, or if de-energizing the equipment would create a greater risk or make the task impossible and all other alternatives have been exhausted.

NOTICE

Exposed energized electrical work is only allowed as per the relevant procedures and must be undertaken by a Cummins authorized person with any appropriate energized work permit for the work to be performed while using proper PPE, tools and equipment.

In summary:

- Do not tamper with or bypass interlocks unless you are authorized to do so.
- Understand and assess the risks - use proper PPE. Do not wear jewelry and make sure that any conductive items are removed from pockets as these items can fall into equipment and the resulting short circuit can cause shock or burning. Refer to standard NFPA 70E for PPE standards.
- Make sure that an accompanying person who can undertake a rescue is nearby.

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1.4.1 Locking the Generator Set Out of Service

Before any work is carried out for maintenance, etc., the generator set must be immobilized. Even if the generator set is put out of service by pressing the **Off** switch on the operator panel, the generator set cannot be considered safe to work on until the engine is properly immobilized, as detailed in the following procedures.

NOTICE
Refer also to the engine specific Operator Manual. This manual contains specific equipment instructions that may differ from the standard generator set.

1.4.1.1 Immobilizing for Safe Working

To immobilize the generator set:

1. Press the **Off** mode switch on the operator panel to shut down the generator set.
2. Press the **Emergency Stop** button. This prevents the generator set starting, regardless of the Start signal source and provides an additional safety step for immobilizing the generator set.

NOTICE
When the Emergency Stop button is pressed, the operator panel indicates a Shutdown condition. The red Shutdown status LED illuminates and a message is displayed.

NOTICE
Do not cover Emergency stop button in any situation for easy accessibility

NOTICE
This condition is stored in the Fault History.

3. Isolate and lock off the starting battery/batteries.
4. As an additional precaution, thoroughly ventilate the plant room before disconnecting any leads.
5. Isolate and lock off the supply to the heater, where fitted.
6. Isolate and lock off the supply to the battery charger, where fitted.
7. Isolate the fuel supply to the engine.
8. Using an insulated wrench, disconnect the negative (–) cable first on the starting batteries and control system batteries (if separate).
9. Fit warning notices at each of the above points to indicate Maintenance in Progress — Plant Immobilized for Safe Working.

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1.4.2 AC Supply and Isolation

NOTICE

Local electrical codes and regulations (for example, *BS EN 12601:2010 Reciprocating internal combustion engine driven generating sets)* may require the installation of a disconnect means for the generator set, either on the generator set or where the generator set conductors enter a facility.

NOTICE

The AC supply must have the correct over current and earth fault protection according to local electrical codes and regulations. This equipment must be earthed (grounded).

It is the sole responsibility of the customer to provide AC power conductors for connection to load devices and the means to isolate the AC input to the terminal box; these must comply with local electrical codes and regulations. Refer to the wiring diagram supplied with the generator set.

The disconnecting device is not provided as part of the generator set, and Cummins accepts no responsibility for providing the means of isolation.

1.4.2.1 AmpSentry

Generator sets with PC 3.3 control utilize AmpSentry™ protective relay which includes integral AC protective functions for the alternator and conductors, if conductors are rated for operation at a minimum of 100% of the generator nameplate rating.

1.4.3 AC Disconnect Sources

⚠ WARNING

Hazardous Voltage

Contact with high voltages can cause severe electrical shock, burns, or death.

The equipment may have more than one source of electrical energy. Disconnecting one source without disconnecting the others presents a shock hazard. Before starting work, disconnect the equipment, and verify that all sources of electrical energy have been removed.

1.4.4 Medium Voltage Equipment (601 V to 15 kV - U.S. and Canada)

- Medium voltage acts differently than low voltage. Special equipment and training is required to work on or around medium voltage equipment. Operation and maintenance must be done only by persons trained and experienced to work on such devices. Improper use or procedures will result in severe personal injury or death.
- Do not work on energized equipment. Unauthorized personnel must not be permitted near energized equipment. Due to the nature of medium voltage electrical equipment, induced voltage remains even after the equipment is disconnected from the power source. Plan the time for maintenance with authorized personnel so that the equipment can be de-energized and safely grounded.

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1.5 Exhaust Gases Are Deadly

- Provide an adequate exhaust system to properly expel discharged gases away from enclosed or sheltered areas, and areas where individuals are likely to congregate. Visually and audibly inspect the exhaust system daily for leaks per the maintenance schedule. Make sure that exhaust manifolds are secured and not warped. Do not use exhaust gases to heat a compartment.
- Make sure the unit is well ventilated.

1.5.1 Exhaust Precautions

⚠ WARNING

Hot Exhaust Gases

Contact with hot exhaust gases can cause severe burns.

Wear personal protective equipment when working on equipment.

⚠ WARNING

Hot Surfaces

Contact with hot surfaces can cause severe burns.

The unit is to be installed so that the risk of hot surface contact by people is minimized. Wear appropriate PPE when working on hot equipment and avoid contact with hot surfaces.

⚠ WARNING

Toxic Gases

Inhalation of exhaust gases can cause asphyxiation and death.

Pipe exhaust gas outside and away from windows, doors, or other inlets to buildings. Do not allow exhaust gas to accumulate in habitable areas.

⚠ WARNING

Fire Hazard

Contaminated insulation is a fire hazard. Fire can cause severe burns or death.

Remove any contaminated insulation and dispose of it in accordance with local regulations.

The exhaust outlet may be sited at the top or bottom of the generator set. Make sure that the exhaust outlet is not obstructed. Personnel using this equipment must be made aware of the exhaust position. Position the exhaust away from flammable materials - in the case of exhaust outlets at the bottom, make sure that vegetation is removed from the vicinity of the exhaust.

The exhaust pipes may have some insulating covers fitted. If these covers become contaminated they must be replaced before the generator set is run.

To minimize the risk of fire, make sure the following steps are observed:

- Make sure that the engine is allowed to cool thoroughly before performing maintenance or operation tasks.
- Clean the exhaust pipe thoroughly.

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1.6 Earth Ground Connection

The neutral of the generator set may be required to be bonded to earth ground at the generator set location, or at a remote location, depending on system design requirements. Consult the engineering drawings for the facility or a qualified electrical design engineer for proper installation.

NOTICE
The end user is responsible to make sure that the ground connection point surface area is clean and free of rust before making a connection.

NOTICE
The end user is responsible for making sure that an earthing arrangement that is compliant with local conditions is established and tested before the equipment is used.

1.7 Decommissioning and Disassembly

NOTICE
Decommissioning and disassembly of the generator set at the end of its working life must comply with local guidelines and legislation for disposal/recycling of components and contaminated fluids. This procedure must only be carried out by suitably trained and experienced service personnel. For more information contact your authorized distributor.

1.8 WEEE Directive 2012/19/EU + Battery Directive 2006/66/EC

Electrical and electronic equipment (EEE) and batteries contain materials, components and substances that may be hazardous and present a risk to human health and the environment when waste electrical and electronic equipment (WEEE) and batteries are not handled correctly.

Electrical and electronic equipment and batteries are marked with the crossed-out wheelie bin symbol indicating that electrical and electronic equipment and batteries should not be disposed of in the regular household waste stream but need to be collected separately. In case batteries contain more than 0,0005% mercury (Hg), 0,002% cadmium (Cd) or 0,004% lead (Pb) (by weight), the corresponding chemical symbol is displayed on the battery.

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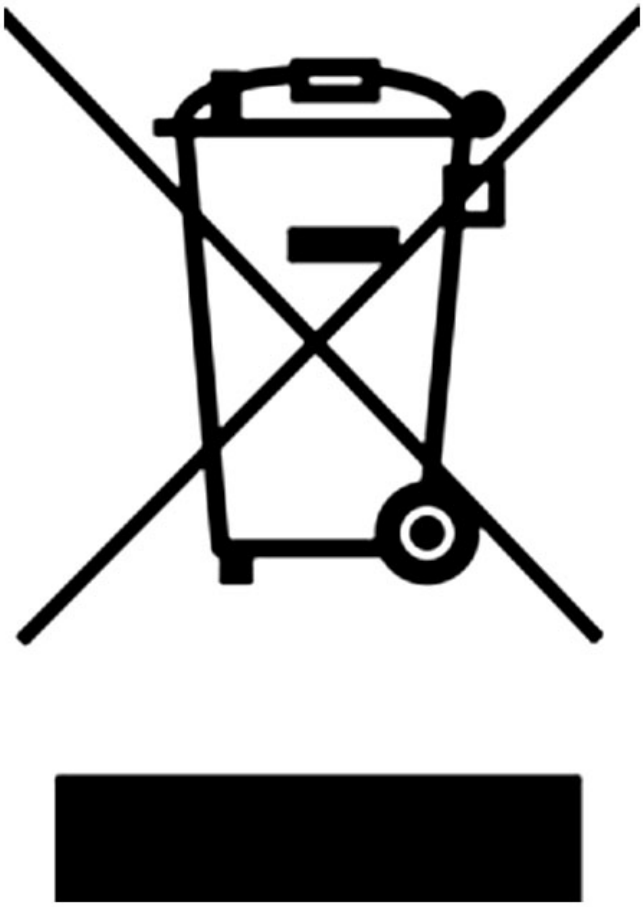
WEEE*	Batteries
	
*The bar below the bin is recommended to include to prove that a product was made after the 13 August 2005. Alternatively, a date can be included.	

FIGURE 1. PRODUCT BATTERY INFORMATION

As a consumer, you have an important role in recycling this equipment and contributing to the protection of the environment. Please follow local recycling regulations to reduce adverse environmental impact in connection with disposal of WEEE and batteries and to increase opportunities for reuse, recycling, and recovery of WEEE and batteries. To facilitate this, free collection points are available in your area. Users are responsible for removing personal data from electronic devices prior to disposal. If possible please remove old batteries or accumulators from the electronic device before you return it for recycling.

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2 Introduction

⚠ WARNING

Hazardous Voltage

Contact with high voltages can cause severe electrical shock, burns, or death.

Make sure that only a trained and experienced electrician makes generator set electrical output connections, in accordance with the installation instructions and all applicable codes.

⚠ WARNING

Electrical Generating Equipment

Faulty electrical generating equipment can cause severe personal injury or death.

Generator sets must be installed, certified, and operated by trained and experienced persons in accordance with the installation instructions and all applicable codes.

2.1 About This Manual

The purpose of this manual is to provide the users with sound, general information. It is for guidance and assistance with recommendations for correct and safe procedures, which may from time to time be updated. It is the user's responsibility to ensure they are aware of any updates to this guidance before commencing operational activities. Cummins shall not be liable for any operational consequences arising as a result of not following the guidance outlined in this manual, nor for any discretionary actions taken by the user in response to recommendations outlined in this manual.

The information contained within the manual is based on information available at the time of going to print. In line with Cummins policy of continuous development and improvement, information may change at any time without notice. The users should therefore make sure that before commencing any work, they have the latest information available. The latest version of this manual is available on QuickServe Online (**https://quickserve.cummins.com**).

Users are respectfully advised that, in the interests of good practice and safety, it is their responsibility to employ competent persons to carry out any installation work. Consult your authorized distributor for further installation information. It is essential that the utmost care is taken with the application, installation, and operation of any engine due to their potentially hazardous nature. Careful reference should also be made to other Cummins literature. A generator set must be operated and maintained properly for safe and reliable operation.

For further assistance, contact your authorized distributor.

2.1.1 Additional Installation Manual Information

The purpose of this manual is to provide the Installation Engineer with sound, general information for the installation of the generator set. Refer to the Generator Set Operator Manual for additional information which must also be read before operating the set.

This manual provides installation instructions for the generator set models listed on the front cover. This includes the following information:

- Mounting Recommendations - for fastening the generator set to a base and space requirements for normal operation and service.
- Mechanical and Electrical Connections - covers most aspects of the generator set installation.
- Prestart - checklist of items or procedures needed to prepare the generator set for operation.

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- Installation Checklist - reference checks upon completion of the installation.

This manual does not provide application information for selecting a generator set or designing the complete installation. If it is necessary to design the various integrated systems (fuel, exhaust, cooling, etc.), additional information is required. Review standard installation practices. For engineering data specific to the generator set, refer to the Specification and Data Sheets. For application information, refer to Application Manual T-030, "Liquid Cooled Generator Sets." To find this manual online:

1. Go to **powersuite.cummins.com**
2. Click on **Login** on the Home page.
3. Click on **T-030**, Liquid Cooled Generator Set Application Manual under Application Manuals.

2.2 Schedule of Abbreviations

This list is not exhaustive. For example, it does not identify units of measure or acronyms that appear only in parameters, event/fault names, or part/accessory names.

ABBR.	DESCRIPTION	ABBR.	DESCRIPTION
AC	Alternating Current	LTS	Long Term Storage
AMF	Automatic Mains Failure	LVRT	Low Voltage Ride Through
AMP	AMP, Inc., part of Tyco Electronics	MCB	Main Generator set Circuit Breaker
ANSI	American National Standards Institute	MFM	Multifunction Monitor
ASOV	Automatic Shut Off Valve	Mil Std	Military Standard
ASTM	American Society for Testing and Materials (ASTM International)	MLD	Masterless Load Demand
ATS	Automatic Transfer Switch	MRS	Manual Remote Start
AVR	Automatic Voltage Regulator	NC	Normally Closed
AWG	American Wire Gauge	NC	Not Connected
CAN	Controlled Area Network	NFPA	National Fire Protection Agency
CB	Circuit Breaker	NO	Normally Open
CE	Conformité Européenne	NWF	Network Failure
CFM	Cubic Feet per Minute	OEM	Original Equipment Manufacturer
CGT	Cummins Generator Technologies	OOR	Out of Range
CMM	Cubic Meters per Minute	OORH / ORH	Out of Range High
CT	Current Transformer	OORL / ORL	Out of Range Low
D-AVR	Digital Automatic Voltage Regulator	PB	Push Button
DC	Direct Current	PCC	PowerCommand® Control
DEF	Diesel Exhaust Fluid	PGI	Power Generation Interface
DPF	Diesel Particulate Filter	PGN	Parameter Group Number

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ABBR.	DESCRIPTION	ABBR.	DESCRIPTION
ECM	Engine Control Module	PI	Proportional/Integral
ECS	Engine Control System	PID	Proportional / Integral / Derivative
EMI	Electromagnetic interference	PLC	Programmable Logic Controller
EN	European Standard	PMG	Permanent Magnet Generator
EPS	Engine Protection System	PPE	Personal Protective Equipment
E-Stop	Emergency Stop	PT	Potential Transformer
FAE	Full Authority Electronic	PTC	Power Transfer Control
FMI	Failure Mode Identifier	PWM	Pulse-width Modulation
FRT	Fault Ride Through	RFI	Radio Frequency Interference
FSO	Fuel Shutoff	RH	Relative Humidity
Genset	Generator Set	RMS	Root Mean Square
GCB	Generator set Circuit Breaker	RTU	Remote Terminal Unit
GCP	Generator Control Panel	SAE	Society of Automotive Engineers
GND	Ground	SCR	Selective Catalytic Reduction
LCT	Low Coolant Temperature	SPN	Suspect Parameter Number
HMI	Human-machine Interface	SWL	Safe Working Load
IC	Integrated Circuit	SW_B+	Switched B+
ISO	International Organization for Standardization	UL	Underwriters Laboratories
LBNG	Lean-burn Natural Gas	UPS	Uninterruptible Power Supply
LCD	Liquid Crystal Display	VPS	Valve Proving System
LED	Light-emitting Diode		

2.3 Related Literature

Before any attempt is made to operate the generator set, the operator should take time to read all of the manuals supplied with the generator set, and to familiarize themselves with the warnings and operating procedures.

⚠ CAUTION

A generator set must be operated and maintained properly if you are to expect safe and reliable operation. The Operator manual includes a maintenance schedule and a troubleshooting guide.

The Health and Safety manual must be read in conjunction with this manual for the safe operation of the generator set:

- Health and Safety Manual (0908-0110)

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The relevant manuals appropriate to your generator set are also available, the documents below are in English:

- Operator Manual for C3000 series (A043F055)
- Operator Manual for C3000 series with S9 (A072S094)
- Installation Manual for C3000 series (A043F056)
- Installation Manual for C3000 series with S9 (A072S093)
- Service Manual for C3000 series with P80 (A043F057)
- Service Manual for C3000 series with DIG142 (A048U572)
- Service Manual for C3000 series with S9 (A072S095)
- Controller Service Manual for PowerCommand 3.3 (0900-0670)
- Engine Operation & Maintenance Manual for QSK95 (4358520)
- Engine Service Manual for QSK95 (4358519)
- Alternator Service Manual for P80 (A040J851)
- Alternator Service Manual for DIG142 (A046V044)
- Alternator Service manual for S9 (A062L877)
- *Specification* and *Data Sheet* (For engineering data specific to the generator set)
- Application Manual T-030, *Liquid Cooled Generator Sets* (For application information)
- Parts Manual for C3000 series with P80 or DIG142 (A043F058)
- Universal Annunciator Owner Manual (0900-0301)
- Recommended Spares List (RSL) for C3000 D6 with P80 alternator (A049P902)
- Recommended Spares List (RSL) for C3000 D6e with P80 alternator (A049P904)
- Recommended Spares List (RSL) for C3250 D6 with P80 alternator (A049P905)
- Recommended Spares List (RSL) for C3250 D6e with P80 alternator (A049P906)
- Recommended Spares List (RSL) for C3500 D5 with P80 alternator (A049P908)
- Recommended Spares List (RSL) for C3500 D5e with P80 alternator (A049P909)
- Recommended Spares List (RSL) for C3500 D6 with P80 alternator (A051G104)
- Recommended Spares List (RSL) for C3500 D6e with P80 alternator (A051G105)
- Recommended Spares List (RSL) for C3750 D5 with P80 alternator (A051G106)
- Recommended Spares List (RSL) for C3750 D5e with P80 alternator (A051G107)
- Recommended Spares List (RSL) for C3000 D6 with DIG142 alternator (A051V940)
- Recommended Spares List (RSL) for C3000 D6e with DIG142 alternator (A051V941)
- Recommended Spares List (RSL) for C3250 D6 with DIG142 alternator (A051V942)
- Recommended Spares List (RSL) for C3250 D6e with DIG142 alternator (A051V943)
- Recommended Spares List (RSL) for C3500 D5 with DIG142 alternator (A051V944)
- Recommended Spares List (RSL) for C3500 D5e with DIG142 alternator (A051V945)
- Recommended Spares List (RSL) for C3500 D6 with DIG142 alternator (A051V946)
- Recommended Spares List (RSL) for C3500 D6e with DIG142 alternator (A051V947)
- Recommended Spares List (RSL) for C3750 D5 with DIG142 alternator (A051V948)

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- Recommended Spares List (RSL) for C3750 D5e with DIG142 alternator (A051V950)
- Standard Repair Times - HH Family (A049P911)
- Service Tool Manual (A043D529)
- Fuels for Cummins Engines Service Bulletin (3379001)
- Warranty Administration Manual (4021290)
- Global Commercial Warranty Statement (A028U870)

2.3.1 Further Information - Literature

Contact your authorized distributor for more information regarding related literature for this product.

2.4 After Sales Services

Cummins offers a full range of maintenance and warranty services.

2.4.1 Maintenance

⚠ WARNING

Electrical Generating Equipment

Incorrect operation and maintenance can result in severe personal injury or death.

Make sure that only suitably trained and experienced service personnel perform electrical and/or mechanical service.

For expert generator set service at regular intervals, contact your local distributor. Each local distributor offers a complete maintenance contract package covering all items subject to routine maintenance, including a detailed report on the condition of the generator set. In addition, this can be linked to a 24-hour call-out arrangement, providing year-round assistance if necessary. Specialist engineers are available to maintain optimum performance levels from generator sets. Maintenance tasks should only be undertaken by trained and experienced technicians provided by your authorized distributor.

2.4.2 Warranty

For details of the warranty coverage for your generator set, refer to the Global Commercial Warranty Statement listed in the Related Literature section.

In the event of a breakdown, prompt assistance can normally be given by factory trained service technicians with resources to undertake all minor and many major repairs to equipment on site.

Extended warranty coverage is also available.

For further warranty details, contact your authorized service provider.

NOTICE

Damage caused by failure to follow the manufacturer's recommendations will not be covered by warranty. Contact your authorized service provider.

2.4.2.1 Warranty Limitations

For details of the warranty limitations for your generator set, refer to the warranty statement applicable to the generator set.

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3 System Overview

This section provides an overview of the generator set.

3.1 Generator Set Identification

Each generator set is provided with a nameplate similar to that shown below. The nameplate provides information unique to the generator set.

3.1.1 Nameplate

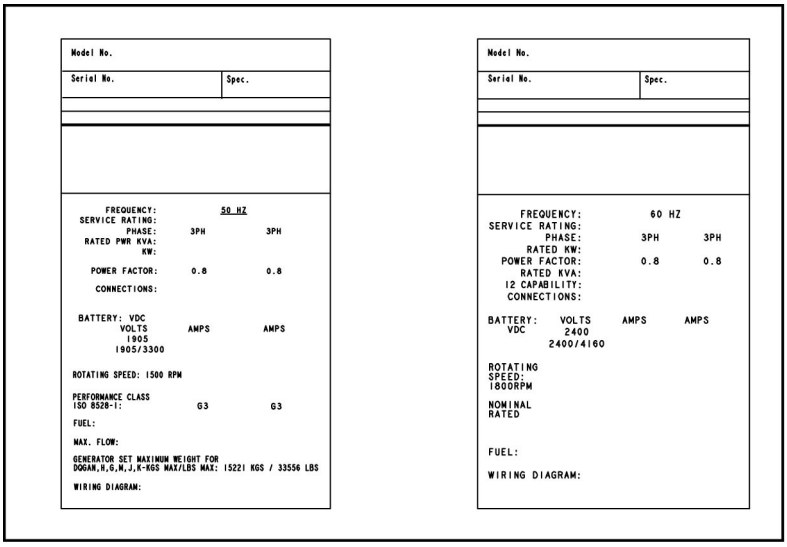


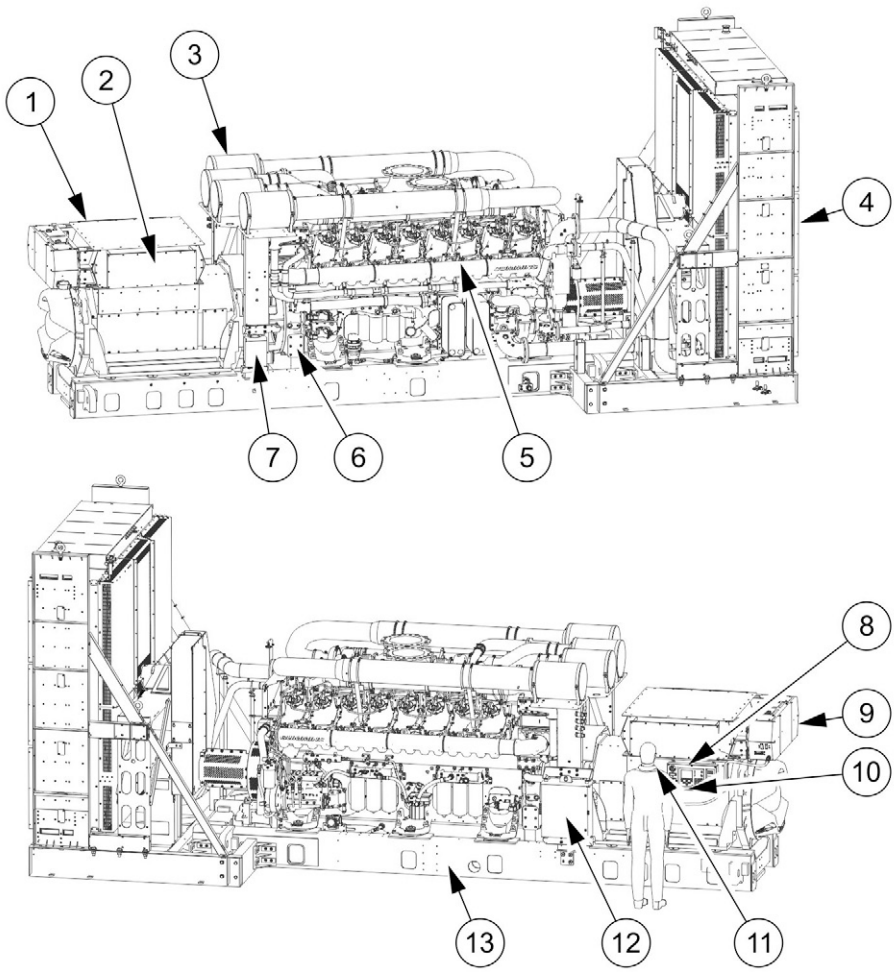
FIGURE 2. TYPICAL GENERATOR SET NAMEPLATE

3.2 Generator Set Components

The main components of a typical generator set with a QSK95 engine are shown below, and referred to within this section.

There are various options listed although they may not be available for all models.

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No.	Description	No.	Description
1	Alternator	9	Control Box
2	Terminal Box	10	HMI
3	Air Filter (X4)	11	Nameplate (not shown)
4	Radiator	12	DC Distribution Panel
5	Engine	13	Skid
6	Coolant Heater (location only, device not shown)		(Not indicated)
7	AC Distribution Panel		Alarm Module
8	Control Panel		Battery (X3) or (X4)

FIGURE 3. TYPICAL GENERATOR SET

3.3 Generator Set Rating

For details of the generator set rating, refer to the generator set nameplate. For operation at temperatures or altitudes above those stated on the nameplate, a derate may be necessary.

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3.4 Derating Factors

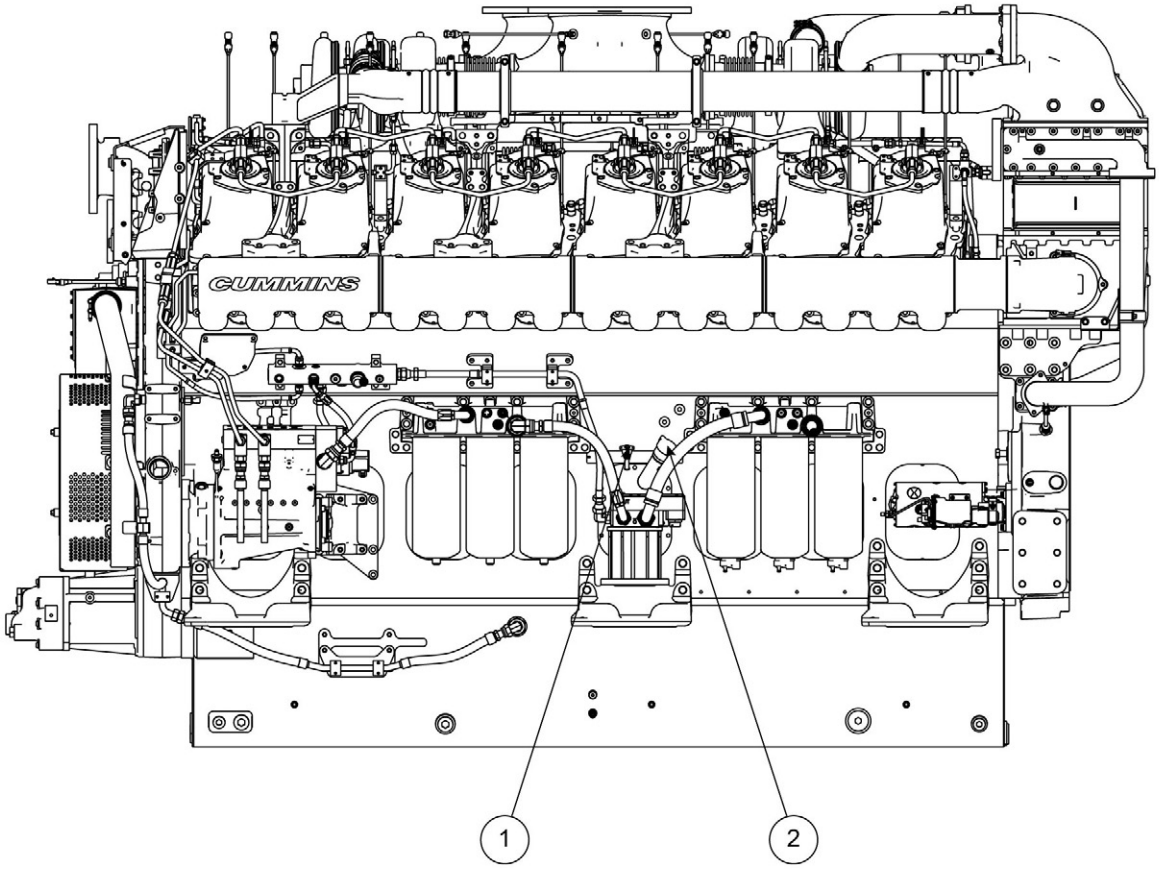
The following is an example of environmental conditions that must be met to ensure proper generator set operation. Operation outside of these conditions may require derates to be applied. Derate information for each generator set can be found in the GenSize and generator set data sheet areas of https://powersuite.cummins.com.

TABLE 2. C3000 D6E - EXAMPLE DERATING FACTORS

Application	Derating Factor
Data Center Continuous	Generator set power available up to 2529 m (8297 ft) at 40 °C (104 °F), and up to 2132 m (6995 ft) at 50 °C (122 °F). Above these conditions derate by an additional 3.7% per 305 m (1000 ft) and 4% per 10 °C (18 °F).
Continuous	Generator set power available up to 1628 m (5341 ft) at 40 °C (104 °F), and up to 885 m (2094 ft) at 50 °C (122 °F). Above these conditions derate by an additional 3.4% per 305 m (1000 ft) and 6.0% per 10 °C (18 °F).
Prime	Generator set power available up to 2051 m (6729 ft) at 40 °C (104 °F), and up to 1644 m (5394 ft) at 50 °C (122 °F). Above these conditions derate by an additional 3.4% per 305 m (1000 ft) and 8.0% per 10 °C (18 °F).
Standby	Generator set power available up to 1917 m (6289 ft) at 40 °C (104 °F), and up to 1410 m 4626 ft) at 50 °C (122 °F). Above these conditions derate by an additional 3.6% per 305 m (1000 ft) and 4.0% per 10 °C (18 °F).

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3.5 Engine



No.	Description	No.	Description
1	Dipstick	2	Oil Fill

FIGURE 4. TYPICAL ENGINE COMPONENTS (QSK95)

3.6 Sensors

Various generator set parameters are measured by sensors, and the resulting signals are processed by the control board.

Engine-mounted sensors monitor a number of different systems, such as:

- Lube Oil Pressure
- Cooling System Temperature

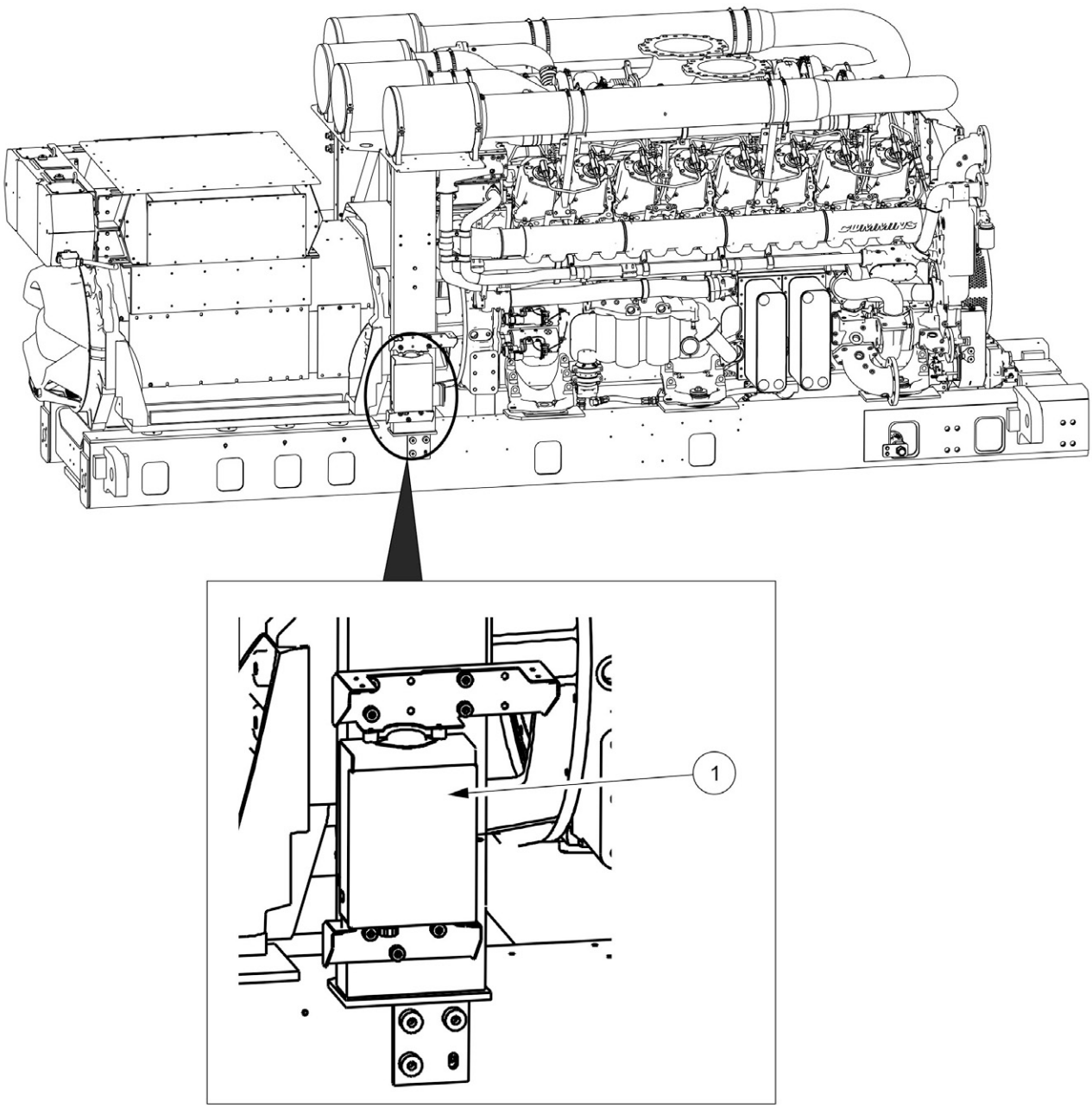
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3.7 System Options

3.7.1 AC Distribution Panel

NOTICE
Make sure that all circuit breakers are in the OFF position before applying power to the AC distribution panel. Other options may require additional installation before connecting to power.

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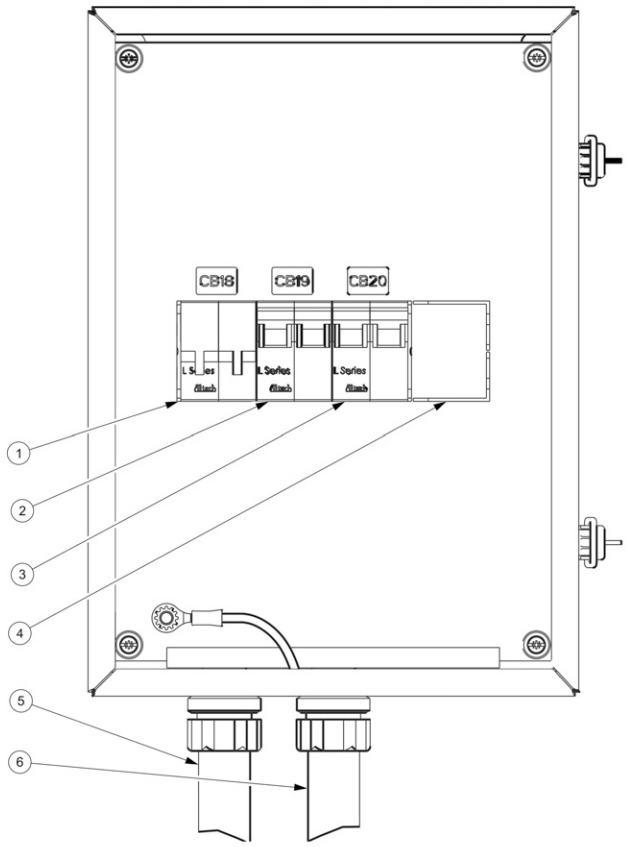


No.	Description	No.	Description
1	Distribution Panel (120/240 VAC)		

FIGURE 5. AC PANEL LOCATION

The AC distribution panel provides a centralized power source for generator set single phase (120/240 VAC) accessories. The configuration of these panels depends on the factory supplied options shipped with the generator set.

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Panel door removed for clarity.

No.	Description	No.	Description
1	40 A Main Circuit Breaker (CB18)	4	Knockout for 15A Customer Supplied Circuit Breaker
2	20 A Alternator Heater Circuit Breaker (CB19)	5	Control Box Heater AC Supply (if equipped)
3	5A Control Box Heater Circuit Breaker (CB20)	6	Alternator Heater AC Supply (if equipped)

FIGURE 6. AC DISTRIBUTION PANEL FEATURES

3.7.2 Annunciators

The annunciator's lamps and alarm indicate the operating status and fault conditions of an emergency power system.

3.7.3 Heaters

3.7.3.1 Heater Supply and Isolation

An external power supply is required for the operation of the generator set heaters.

NOTICE
If not already provided, it is the sole responsibility of the customer to provide the power supply and the means to isolate the AC input to the terminal box. Cummins accepts no responsibility for providing the means of isolation.

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3.7.3.2 Alternator Heaters

Alternator heaters are used to help keep the alternator free of condensation when the generator set is not running. For more information on alternator heater components and specifications, refer to **Section 10.5 on page 237**.

3.7.4 Skid Mounted Radiator Installation

Radiators shipped separately must be installed at the site. Refer to **on page 105** .

3.7.5 Relays

3.7.5.1 Customer Relays

These relays are used for customer-specific applications. For more information, see **Section 9.3 on page 224**.

3.7.5.2 Ground Fault Relays

A Ground Fault Relay (GFR) continuously monitors the neutral-to-ground connection and activates a fault alarm when the connection is broken. During generator set operation, the relay continuously monitors the line-to-neutral and activates a fault alarm when a ground fault is sensed.

A control reset will clear the fault at the control panel and will also reset the ground fault relay.

Ground fault relays can be used in the following applications:

- Local CT for 4-pole transfer switch
- Remote CT for 3-pole transfer switch

3.7.5.3 Paralleling Circuit Breaker Control Relays

Paralleling circuit breaker control relays can be installed on generator sets used in paralleling applications. For more information on relay components and wiring, see **Section 9.3 on page 224**.

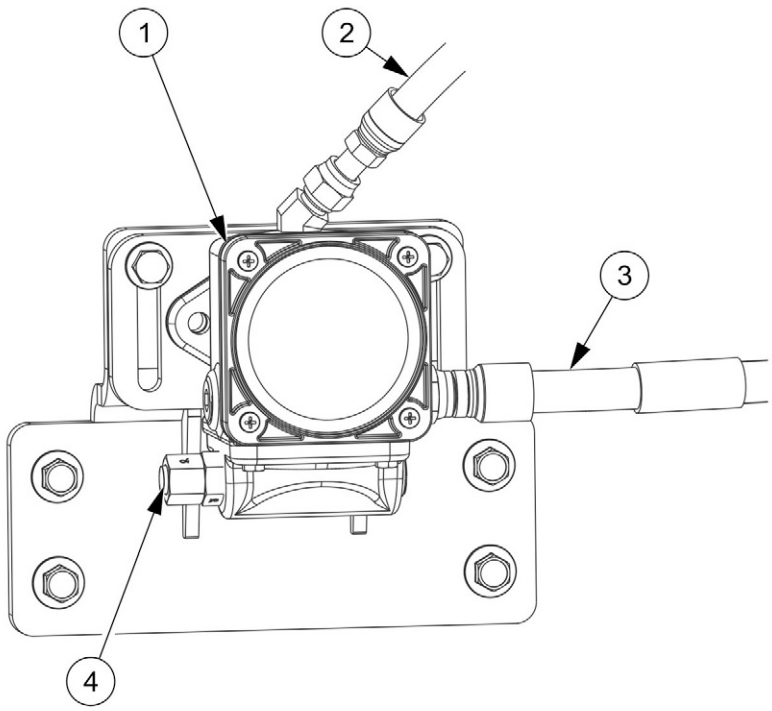
3.7.6 Oil Maintainer System

The oil maintainer system includes a oil level regulator and connection points. An auxiliary oil tank and tank mounting hardware is provided by the end user.

The oil maintainer system ensures a proper level of engine lubricating oil.

NOTICE
The regulator should not be used as an oil level sight glass. The oil regulator does not accurately reflect the level of oil in the engine oil pan.

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No.	Description	No.	Description
1	Oil regulator	3	Supply line to the engine oil pan
2	Vent line to the engine	4	Bulk supply line connection from auxiliary oil tank

FIGURE 7. OIL MAINTAINER

3.7.7 Coolant Heater

Coolant heaters preheat the engine coolant to maintain a minimum engine temperature when the generator set is not running. This assists engine starts in cold ambient conditions. For more information on coolant heater components and specifications. See [**Section 10.6 on page 237**.

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4 Installation Overview

These installation recommendations apply to typical installations with standard model generator sets. Whenever possible, these recommendations also cover factory designed options or modifications. However, because of the many variables in any installation, it is not possible to provide specific recommendations for every situation. If there are any questions not answered by this manual, contact your nearest authorized distributor for assistance.

4.1 Application and Installation

A power system must be carefully planned and correctly installed for proper operation. This involves two essential elements.

- **Application** (as it applies to generator set installations) refers to the design of the complete power system that usually includes power distribution equipment, transfer switches, ventilation equipment, mounting pads, cooling, exhaust, and fuel systems. Each component must be correctly designed so the complete system will function as intended. Application and design is an engineering function generally done by specifying engineers or other trained specialists. Specifying engineers or other trained specialists are responsible for the design of the complete power system and for selecting the materials and products required.
    - Generator sets are designed and manufactured for specific environments.
        - Open generator sets are designed for use inside a building or plant where they will not be subjected to extreme environments.
        - Enclosed generator sets are designed for use outside, with features designed to enable operation in a wide range of climates.
- **Installation** refers to the actual set-up and assembly of the power system. The installers set up and connect the various components of the system as specified in the system design plan. The complexity of the system normally requires the special skills of qualified electricians, plumbers, sheet-metal workers, etc. to complete the various segments of the installation. This is necessary so that all components are assembled using standard methods and practices.

4.2 Safety Considerations

The generator set has been carefully designed to provide safe and efficient service when properly installed, maintained, and operated. However, the overall safety and reliability of the complete system is dependent on many factors outside the control of the generator set manufacturer. To avoid possible safety hazards, make all mechanical and electrical connections to the generator set exactly as specified in this manual. All systems external to the generator (fuel, exhaust, electrical, etc.) must comply with all applicable codes. Make certain all required inspections and tests have been completed and all code requirements have been satisfied before certifying the installation is complete and ready for service.

⚠ WARNING

Fall Hazard

Falls can result in severe personal injury or death.

Make sure that suitable equipment for performing tasks at height are used in accordance with local guidelines and legislation.

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4.3 Standby Heating Devices

Cummins requires installing standby generator sets (life safety systems) with engine jacket water coolant heaters in order to ensure a 10 second start. Jacket water coolant heaters are also recommended in prime and continuous applications where time and load acceptance is to be minimized.

The jacket water coolant heater provided by Cummins rated to provide the above requirements in ambient temperatures as low as 4 °C (40 °F). Although most Cummins generator sets will start in temperatures down to –32 °C (–25 °F) when equipped with engine jacket water coolant heaters, it might take more than 10 seconds to warm the engine before a load can be applied when ambient temperatures are below 4 °C (40 °F).

On generator sets equipped with a graphic display, the **Low Coolant Temperature** message, in conjunction with illumination of the Warning LED, is provided to meet the current requirements. The engine cold sensing logic initiates a warning when the engine jacket water coolant temperature falls below 21 °C (70 °F). In applications where the ambient temperature falls below 4 °C (40 °F), or there exists a high amount of cold airflow, the jacket water coolant heater may not provide the necessary heating. Under these conditions, although the generator set may start, it may not be able to accept load within 10 seconds. When this condition occurs, check the coolant heaters for proper operation. If the coolant heaters are operating properly, other precautions may be necessary to warm the engine before applying a load.

4.4 Product Modifications

Agency certified products purchased from Cummins comply only with those specific requirements and as noted on company product specification sheets. Subsequent modifications must meet commonly accepted engineering practices and/or local and national codes and standards. Product modifications must be submitted to the local authority having jurisdiction for approval.

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5 Specifications

5.1 Generator Set Specifications

TABLE 3. C3000 D6 AND C3000 D6E SPECIFICATIONS

MODELS	C3000 D6	C3000 D6e
Engine		
Cummins Diesel Series	QSK95-G2	QSK95-G9
Generator kVA/kW Rating	See generator set nameplate for rating information.	
Engine Fuel Connection		
Inlet/Outlet Thread Size	Refer to generator set outline drawing supplied	
Maximum Weight	36390 kg (80226 lb)	36390 kg (80226 lb)
Fuel		
Max. Fuel Inlet Restriction (Prime)	16.9 kPa (5 inHg)	16.9 kPa (5 inHg)
Max. Fuel Inlet Restriction (Standby)	30.5 kPa (9 inHg)	30.5 kPa (9 inHg)
Max. Fuel Return Restriction	34 kPa (10 inHg)	34 kPa (10 inHg)
Fuel Pump Flow Rate	1602 L/hr (423 gal/hr)	1602 L/hr (423 gal/hr)
Exhaust	**1800 RPM**	**1800 RPM**
Outlet Size	DIN 350 mm, ASME B16.5 14 in	DIN 350 mm, ASME B16.5 14 in
Max. Allowable Back Pressure	7 kPa (28 inH_2O)	7 kPa (28 inH_2O)
Exhaust Flow at Rated Load	628 m^3/min (22170 cfm) at SBY	645 m^3/min (22780 cfm) at SBY
Exhaust Temperature	815 °F (435 °C)	830 °F (443 °C)
Electrical System		
Starting Voltage	24 Volts DC	
Battery Group Number	8D	
CCA (minimum)	1400 A at -18 °C to 1730 A at 0 °C (0 °F to 32 °F)	
Cold Soak @ 0 °F (-18 °C)		
Total Battery Quantity (Recommended)		
Engine Starter- Air Motor Configuration:	2 batteries	
Engine Starter- Standard 3- Starter configuration:	6 batteries	
Engine Starter- Redundant Start Configuration:	8 batteries	
Lubricating System		
Oil Capacity with Filters	647.3 L (684 qt)	647.3 L (684 qt)

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TABLE 4. C3250 D6 AND C3250 D6E SPECIFICATIONS

MODELS	C3250 D6	C3250 D6e
Engine		
Cummins Diesel Series	QSK95-G2	QSK95-G9
Generator kVA/kW Rating	See generator set nameplate for rating information.	
Engine Fuel Connection		
Inlet/Outlet Thread Size	Refer to generator set outline drawing supplied	
Maximum Weight	36390 kg (80226 lb)	36390 kg (80226 lb)
Fuel		
Max. Fuel Inlet Restriction (Prime)	16.9 kPa (5 inHg)	16.9 kPa (5 inHg)
Max. Fuel Inlet Restriction (Standby)	30.5 kPa (9 inHg)	30.5 kPa (9 inHg)
Max. Fuel Return Restriction	34 kPa (10 inHg)	34 kPa (10 inHg)
Fuel Pump Flow Rate	1602 L/hr (423 gal/hr)	1602 L/hr (423 gal/hr)
Exhaust	**1800 RPM**	**1800 RPM**
Outlet Size	DIN 350 mm, ASME B16.5 14 in	DIN 350 mm, ASME B16.5 14 in
Max. Allowable Back Pressure	7 kPa (28 inH_2O)	7 kPa (28 inH_2O)
Exhaust Flow at Rated Load	666 m^3/min (23530 cfm) at SBY	677 m^3/min (23910 cfm) at SBY
Exhaust Temperature	863 °F (462 °C)	872 °F (467 °C)
Electrical System		
Starting Voltage	24 Volts DC	
Battery Group Number	8D	
CCA (minimum)	1400 A at -18 °C to 1730 A at 0 °C (0 °F to 32 °F)	
Cold Soak @ 0 °F (-18 °C)		
Total Battery Quantity (Recommended)		
Engine Starter- Air Motor Configuration:	2 batteries	
Engine Starter- Standard 3- Starter Configuration:	6 batteries	
Engine Starter- Redundant Start Configuration:	8 batteries	
Lubricating System		
Oil Capacity with Filters	647.3 L (684 qt)	647.3 L (684 qt)

TABLE 5. C3500 D6 AND C3500 D6E SPECIFICATIONS

MODELS	C3500 D6	C3500 D6e
Engine		
Cummins Diesel Series	QSK95-G2	QSK95-G9
Generator kVA/kW Rating	See generator set nameplate for rating information.	
Engine Fuel Connection		
Inlet/Outlet Thread Size	Refer to generator set outline drawing supplied	

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MODELS	C3500 D6	C3500 D6e
Maximum Weight	36390 kg (80226 lb)	36390 kg (80226 lb)
Fuel		
Max. Fuel Inlet Restriction (Prime)	16.9 kPa (5 inHg)	16.9 kPa (5 inHg)
Max. Fuel Inlet Restriction (Standby)	30.5 kPa (9 inHg)	30.5 kPa (9 inHg)
Max. Fuel Return Restriction	34 kPa (10 inHg)	34 kPa (10 inHg)
Fuel Pump Flow Rate	1602 L/hr (423 gal/hr)	1602 L/hr (423 gal/hr)
Exhaust	**1800 RPM**	**1800 RPM**
Outlet Size	DIN 350 mm, ASME B16.5 14 in	DIN 350 mm, ASME B16.5 14 in
Max. Allowable Back Pressure	7 kPa (28 inH_2O)	7 kPa (28 inH_2O)
Exhaust Flow at Rated Load	705 m^3/min (23530 cfm) at SBY	677 m^3/min (23910 cfm) at SBY
Exhaust Temperature	910 °F (488 °C)	914 °F (490 °C)
Electrical System		
Starting Voltage	24 Volts DC	
Battery Group Number	8D	
CCA (minimum)	1425 A at -18 °C to 1730 A at 0 °C (0 °F to 32 °F)	
Cold Soak @ 0 °F (-18 °C)		
Total Battery Quantity (Recommended)		
Engine Starter- Air Motor Configuration:	2 batteries	
Engine Starter- Standard 3- Starter Configuration:	6 batteries	
Engine Starter- Redundant Start Configuration:	8 batteries	
Lubricating System		
Oil Capacity with Filters	647.3 L (684 qt)	647.3 L (684 qt)

TABLE 6. C3500 D5 AND C3500 D5E SPECIFICATIONS

MODELS	C3500 D5	C3500 D5e
Engine		
Cummins Diesel Series	QSK95-G4	QSK95-G10
Generator kVA/kW Rating	See generator set nameplate for rating information.	
Engine Fuel Connection		
Inlet/Outlet Thread Size	Refer to generator set outline drawing supplied	
Maximum Weight	36390 kg (80226 lb)	36390 kg (80226 lb)
Fuel		
Max. Fuel Inlet Restriction (Prime)	16.9 kPa (5 inHg)	16.9 kPa (5 inHg)
Max. Fuel Inlet Restriction (Standby)	30.5 kPa (9 inHg)	30.5 kPa (9 inHg)
Max. Fuel Return Restriction	34 kPa (10 inHg)	34 kPa (10 inHg)
Fuel Pump Flow Rate	1392 L/hr (368 gal/hr)	1428 L/hr (377 gal/hr)

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MODELS	C3500 D5	C3500 D5e
Exhaust	**1500 RPM**	**1500 RPM**
Outlet Size	DIN 350 mm, ASME B16.5 14 in	DIN 350 mm, ASME B16.5 14 in
Max. Allowable Back Pressure	7 kPa (28 inH_2O)	7 kPa (28 inH_2O)
Exhaust Flow at Rated Load	526 m^3/min (18580 cfm) at SBY	562 m^3/min (19860 cfm) at SBY
Exhaust Temperature	749 °F (398 °C)	771 °F (411 °C)
Electrical System		
Starting Voltage	24 Volts DC	
Battery Group Number	8D	
CCA (minimum)	1425 A at -18 °C to 1730 A at 0 °C (0 °F to 32 °F)	
Cold Soak @ 0 °F (-18 °C)		
Total Battery Quantity (Recommended)		
Engine Starter- Air Motor Configuration:	2 batteries	
Engine Starter- Standard 3- Starter Configuration:	6 batteries	
Engine Starter- Redundant Start Configuration:	8 batteries	
Lubricating System		
Oil Capacity with Filters	647.3 L (684 qt)	647.3 L (684 qt)

TABLE 7. C3750 D5 AND C3750 D5E SPECIFICATIONS

MODELS	C3750 D5	C3750 D5e
Engine		
Cummins Diesel Series	QSK95-G4	QSK95-G10
Generator kVA/kW Rating	See generator set nameplate for rating information.	
Engine Fuel Connection		
Inlet/Outlet Thread Size	Refer to generator set outline drawing supplied	
Maximum Weight	36390 kg (80226 lb)	36390 kg (80226 lb)
Fuel		
Max. Fuel Inlet Restriction (Prime)	16.9 kPa (5 inHg)	16.9 kPa (5 inHg)
Max. Fuel Inlet Restriction (Standby)	30.5 kPa (9 inHg)	30.5 kPa (9 inHg)
Max. Fuel Return Restriction	34 kPa (10 inHg)	34 kPa (10 inHg)
Fuel Pump Flow Rate	1392 L/hr (368 gal/hr)	1428 L/hr (377 gal/hr)
Exhaust		
	1500 RPM	**1500 RPM**
Outlet Size	DIN 350 mm, ASME B16.5 14 in	DIN 350 mm, ASME B16.5 14 in
Max. Allowable Back Pressure	7 kPa (28 inH_2O)	7 kPa (28 inH_2O)
Exhaust Flow at Rated Load	550 m^3/min (19420 cfm) at SBY	588 m^3/min (20780 cfm) at SBY
Exhaust Temperature	762 °F (406 °C)	795 °F (424 °C)

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MODELS	C3750 D5	C3750 D5e
Electrical System		
Starting Voltage	24 Volts DC	
Battery Group Number	8D	
CCA (minimum)	1425 A at -18 °C to 1730 A at 0 °C (0 °F to 32 °F)	
Cold Soak @ 0 °F (-18 °C)		
Total Battery Quantity (Recommended)		
Engine Starter- Air Motor Configuration:	2 batteries	
Engine Starter- Standard 3- Starter Configuration:	6 batteries	
Engine Starter- Redundant Start Configuration:	8 batteries	
Lubricating System		
Oil Capacity with Filters	647.3 L (684 qt)	647.3 L (684 qt)

TABLE 8. COOLING SYSTEM CAPACITY WITH STANDARD RADIATOR

Radiator Part Number	Radiator Size	Generator Hz	Radiator Capacity – Liters (US Gal)
A048D623	94 ft^2	60	1208 (319)
A048D645	94 ft^2	50	1208 (319)
A048D652	84 ft^2	50	1166 (308)
A052D767	84 ft^2	60	1166 (308)
A052D765	84 ft^2	50	1166 (308)
A049E410	84 ft^2	60	1166 (308)
A065K735	94 ft^2	60	1208 (319)
A065K736	84 ft^2	60	1166 (308)
A065K741	84 ft^2	50	1166 (308)
A065K742	84 ft^2	60	1166 (308)
A065K746	84 ft^2	50	1166 (308)
A063X313	61 ft^2	60	1238 (327)
A063X314	61 ft^2	50	1238 (327)
A053J805	84 ft^2	50	1166 (308)
A054B569	84 ft^2	50	1166 (308)
A072Y755	84 ft^2	50	1166 (308)
A065H332	61 ft^2	50	1238 (327)
A078R238	84 ft^2	60	1166 (308)
A078R241	84 ft^2	60	1166 (308)

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Radiator Part Number	Radiator Size	Generator Hz	Radiator Capacity – Liters (US Gal)
A078T815	84 ft^2	60	1166 (308)
A078T816	84 ft^2	60	1166 (308)
A078T818	84 ft^2	60	1166 (308)
A078T819	84 ft^2	60	1166 (308)
A078L535	84 ft^2	50	1010 (267)
A078L534	84 ft^2	50	1010 (267)
A076E016	61 ft^2	50	931 (246)
A076E017	94 ft^2	60	1138 (301)
A078M281	84 ft^2	60	1117 (295)
A078M282	84 ft^2	60	1117 (295)
A076E020	61 ft^2	60	965 (255)

5.2 Engine Fuel Consumption

TABLE 9. FUEL CONSUMPTION - L/HR (GAL/HR) AT 1500 RPM (50 HZ) (SPEC A)

Model	C3500 D5	C3500 D5e	C3500 D5e	C3750 D5	C3750 D5e
Engine	**QSK95 G4**	**QSK95 G5**	**QSK95 G10**	**QSK95 G4**	**QSK95 G10**
Engine Performance Data at 50Hz (Standby/Full Load)	662 (175)	700 (185)	685 (181)	704 (186)	731 (193)
Engine Performance Data at 50Hz (Maximum)	1392.9 (368)	1445.9 (382)	1392.9 (368)	1392.9 (368)	1392.9 (368)
Refer to Data Sheets for other applications. In line with the CPG policy of continuous improvement, these figures are subject to change.					

TABLE 10. FUEL CONSUMPTION - L/HR (GAL/HR) AT 1800 RPM (60 HZ) (SPEC A)

Model	C3000 D6	C3000 D6e	C3250 D6	C3250 D6e	C3500 D6	C3500 D6e
Engine	**QSK95 G2**	**QSK95 G9**	**QSK95 G2**	**QSK95 G9**	**QSK95 G2**	**QSK95 G9**
Engine Performance Data at 60Hz (Standby/Full Load)	753 (199)	768 (203)	821 (217)	836 (221)	878 (232)	893 (236)
Engine Performance Data at 60Hz (Maximum)	1601.1 (423)	1601.1 (423)	1601.1 (423)	1601.1 (423)	1601.1 (423)	1601.1 (423)
Refer to Data Sheets for other applications. In line with the CPG policy of continuous improvement, these figures are subject to change.						

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TABLE 11. FUEL CONSUMPTION - L/HR (GAL/HR) AT 1500 RPM (50 HZ) (SPEC B)

Model	C3500 D5	C3500 D5e	C3500 D5e	C3750 D5	C3750 D5e
Engine	**QSK95 G4**	**QSK95 G5**	**QSK95 G10**	**QSK95 G4**	**QSK95 G10**
Engine Performance Data at 50Hz (Standby/Full Load)	667 (176)	722 (191)	688 (182)	722 (191)	741 (196)
Engine Performance Data at 50Hz (Maximum)	1387 (366)	1402 (370)	1413 (373)	1387 (366)	1413 (373)
Refer to Data Sheets for other applications. In line with the CPG policy of continuous improvement, these figures are subject to change.					

TABLE 12. FUEL CONSUMPTION - L/HR (GAL/HR) AT 1800 RPM (60 HZ) (SPEC B)

Model	C3000 D6	C3000 D6e	C3250 D6	C3250 D6e	C3500 D6	C3500 D6e
Engine	**QSK95 G2**	**QSK95 G9**	**QSK95 G2**	**QSK95 G9**	**QSK95 G2**	**QSK95 G9**
Engine Performance Data at 60Hz (Standby/Full Load)	768 (203)	776 (205)	826 (218)	839 (222)	899 (238)	908 (240)
Engine Performance Data at 60Hz (Maximum)	1584 (418)	1594 (421)	1584 (418)	1594 (421)	1584 (418)	1594 (421)
Refer to Data Sheets for other applications. In line with the CPG policy of continuous improvement, these figures are subject to change.						

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6 Installing the Generator Set

Generator set installations must be engineered so that the generator set will function properly under the expected load conditions. Use these instructions as a general guide only. Follow the instructions of the consulting engineer when locating or installing any components. The complete installation must comply with all local and state building codes, fire regulations, and other applicable regulations.

Requirements to be considered prior to installation are:

- Level mounting surface
- Adequate cooling air
- Adequate fresh induction air
- Discharge of generator set air
- Non-combustible mounting surface
- Discharge of exhaust gases
- Electrical connections
- Accessibility for operation and servicing
- Noise levels
- Vibration isolation
- Environmental conditions:
  - High and low temperatures, humidity
  - Rain and snowfall
  - Flood risk
  - Period of exposure to detrimental weather conditions
  - Wind

NOTICE

Depending on the location and intended use, ensure that international, national or local laws and regulations regarding Air Quality Emissions have been observed and complied with. Be sure to consult local pollution control or air quality authorities before completing construction plans.

6.1 Location

⚠ WARNING

Electrical Generating Equipment

Incorrect operation and maintenance can result in severe personal injury or death.

Make sure that only suitably trained and experienced service personnel perform electrical and/or mechanical service.

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⚠ WARNING

Incorrect installation

Incorrect installation of the generator set, service or parts replacement, can result in severe personal injury, death, and/or equipment damage.

Service personnel must be trained and experienced to perform electrical and mechanical component installation.

NOTICE

Depending on your location and intended use, additional laws and regulations may require for you to obtain an air quality emissions permit before beginning installation of your generator set. Be sure to consult local pollution control or air quality authorities before completing your construction plans.

Generator set location is decided mainly by related systems such as ventilation, wiring, fuel, and exhaust. The set should be located as near as possible to the main power service entrance. Exhaust gases must not be able to enter or accumulate around inhabited areas.

Provide a location away from extreme ambient temperatures and protect the generator set from adverse weather conditions.

Use the following information to locate the generator set for optimal operating conditions:

Surface: Concrete or compacted gravel with the generator set resting on solid, poured concrete blocks, or timber blocks spaced at reasonable intervals around the perimeter of the generator set.

Leveling: Level the generator set from side-to-side within 3.5°, and end-to-end within 2.5°.

Placement:

- Generator sets should be a minimum of 5 m (16.4 ft) apart to allow for adequate access.
- Make sure that the air inlets are not obstructed by surrounding trees, buildings, or other obstructions.
- Make sure noise distribution (to prevent echoing) is kept to a minimum.
- Consider exhaust for immediate neighbors.
- The prevailing wind direction should be considered so that the engine combustion air inlet is upwind and the exhaust discharge is downwind.
- The immediate area around the proposed location of the mounting surface should be evaluated for proper drainage so that moisture run-off is sufficient to prevent ponding around the unit(s).

6.2 Moving the Generator Set

⚠ WARNING

Heavy Load

Incorrect lifting or repositioning can cause severe personal injury or death.

Make sure that only suitably trained and experienced personnel transport and handle generator sets and associated components.

⚠ WARNING

Heavy Load

Incorrect lifting or repositioning can cause severe personal injury or death.

Do not lift the generator set by attaching to the engine or alternator lifting points. Do not stand under or near the generator set when lifting.

⚠ WARNING

Mechanical Hazard

Failed components may be ejected or operate incorrectly which can cause severe personal injury or death.

Do not climb the generator set; this may damage critical parts.

NOTICE

Make sure that any shipping brackets supplied with the generator set are fitted, before moving the generator set. Failure to install the shipping brackets before moving may result in damage to the generator set.

NOTICE

Access or service doors must be closed and locked before repositioning, and they must remain locked during transportation and siting.

It is essential that there are sufficient trained and experienced personnel in attendance to make sure the lifting and transportation of the generator set is undertaken in a safe and appropriate manner, and in accordance to local guidelines and legislation.

Before lifting the generator set, lifting points, angle of slings, mass, access to intended site, and the distance of movement should all be taken into account when organizing a suitable crane/hoist. Consult the generator set information supplied with the generator set for details of dimensions and mass.

- Make sure the fuel tank is empty.
- Make sure that the crane operating area is able to support the mass of the crane and the generator set.
- Make sure the equipment used for lifting is adequate to support the weight of the generator set.
- Attach the lifting device to the lifting points only using suitable shackles, chains, and spreader bars.
- Slowly tighten the slings. Inspect the lifting attachments before commencing a full lift to make sure they are attached correctly.
- Hoist the generator set slowly using the indicated lifting points only.
- Guide the generator set with ropes at a safe distance to prevent uncontrolled rotation when positioning the generator set.
- Move the generator set to the desired location and place in position, bringing the set down slowly.
- Loosen the slings; unhook and remove the shackles.

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6.2.1 Rigging Instructions

⚠ WARNING

Heavy Load

Incorrect lifting or repositioning can cause severe personal injury or death.

Do not lift the generator set by attaching to the engine or alternator lifting points. Do not stand under or near the generator set when lifting.

⚠ WARNING

Heavy Load

Incorrect lifting or repositioning can cause severe personal injury or death.

Make sure that only suitably trained and experienced personnel transport and handle generator sets and associated components.

1. Consult the generator set outline drawing for weight and center-of-gravity information.
2. Attach cables from the lifting lugs to a spreader bar. Never make the spreader bar cable attachment points wider than the attachment points on the skid or the bars. Make sure cables do not touch any other part of the generator set other than the skid.

NOTICE

Spreader bar cable attach points width "Y" must never be wider than skid cable attach points "X." Distance "X" is the narrowest width.

NOTICE

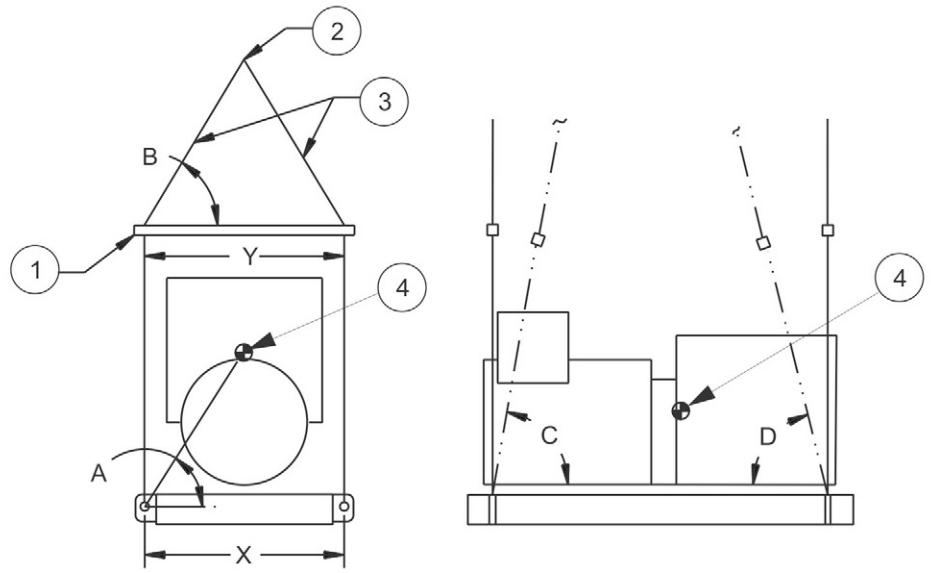
Angle B must be slightly greater than angle A. Angle B should be as close to 90° as possible to provide a stable lift.

3. With pedestal box (not shown), the spreader bars (front and back) should be used to clear the pedestal box and the attachment cables must be as vertical as possible.

NOTICE

Do not lift the generator set with the radiator installed. Damage can occur.

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Item	Description	Item	Description
A	Angle A	1	Spreader Bar
B	Angle B	2	Lifting Point
C	Angle C (80° Minimum)	3	Lifting Cables
D	Angle D (76° Minimum)	4	Center of Gravity
X	The Narrowest Width (On the Skid)		
Y	This Distance Must be Less than Distance "X"		

FIGURE 8. RIGGING

6.3 Mounting

Generator sets are mounted on a steel skid that provides proper support, which is sited on mechanical spring isolators to provide adequate vibration isolation per application.

NOTICE
The use of unapproved isolators may result in harmful resonances and may void the generator set warranty.

Mount the generator set on a substantial and level base such as a concrete pad. A non-combustible material must be used for the pad.

The fixing centers for the mounting bolts can be found on the generator set Outline Drawing.

6.3.1 Seismic Installation Notes

1. The design of post-installed anchors in concrete used for the component anchorage is pre-qualified for seismic applications in accordance with "ACI 355.2" and documented in a report by a reputable testing agency. (ex. the evaluation service report issued by the International Code Council)

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2. Anchors must be installed to an embedment depth as recommended in the pre-qualification test report as defined in Note 1. For "IBC 2000" and "IBC 2003" applications, the minimum embedment must be 8X for the anchor diameter.
3. Anchors must be installed in minimum 4000 PSI compressive strength normal weight concrete. Concrete aggregate must comply with "ASTM C33". Installation in structural lightweight concrete is not permitted unless otherwise approved by the structural engineer of record.
4. Anchors must be installed to the torque specification as recommended by the anchor manufacturer to obtain maximum loading.
5. Anchors must be installed in locations specified in this section.
6. Wide washers must be installed at each anchor location between the anchor head and equipment for tension load distribution. Wide washers must be Series "W" of American National Standard Type "A" plain washers (ANSI B18.22.1-1965, R1975) with the nominal washer size selected to match the specified nominal anchor diameter.
7. Concrete floor slab and concrete housekeeping pads must be designed and rebar reinforced for seismic applications in accordance with "ACI 318". The design loads shall be taken as those specified in this section.
8. All housekeeping pad thicknesses must be designed in accordance with the pre-qualification test report as defined in Note 1 or a minimum of 1.5X the anchor embedment depth, whichever is largest.
9. All housekeeping pads must be dowelled or cast into the building structural floor slab and designed for seismic application per "ACI 318" and as approved by the structural engineer of record.
10. Wall mounted equipment must be installed to a rebar reinforced structural concrete wall that is seismically designed and approved by the engineer of record to resist the added seismic loads from components being anchored to the wall.
11. Floor mounted equipment (with or without a housekeeping pad) must be installed to a rebar reinforced structural concrete floor that is seismically designed and approved by the engineer of record to resist the added seismic loads from components being anchored to the floor.
12. When installing to a floor or wall, rebar interference must be considered.
13. Attaching seismic certified equipment to any floor or wall other than those constructed of structural concrete and designed to accept the seismic loads from said equipment is not permitted by this specification and beyond the scope of this certification.
14. Attaching seismic certified equipment to any floor constructed of light weight concrete over steel decking is not permitted by this specification and beyond the scope of this certification.
15. Attaching the seismic certified equipment to any concrete block walls or cinder block walls is not permitted by this specification and beyond the scope of this certification.
16. Installation upon a rooftop steel dunnage shall be coordinated with the structural engineer of record.
17. Installation upon any rooftop curb shall be coordinated with the curb manufacturer and the structural engineer of record. Any curb or concrete pad that supports the generator set unit is beyond the scope of this certification.
18. Connections to the equipment, including but not limited to conduit, wiring from cable trays, other electrical services, ducting, piping such as exhaust, steam, water, coolant, refrigerant, fuel, or other connections, are the responsibility of the installing contractor and beyond the scope of this document. Typical requirements for these connections are stated in the equipment installation manual. Special considerations for seismic applications are as follows; connections to non-isolated components or equipment may be installed as typical for that particular application. Connections to isolated components (ex. breaker box bolted directly to an isolated generator set) or isolated equipment (ex. an enclosed generator set mounted on external isolators) must be flexibly attached. The flexible attachment must provide for enough relative displacement to remain connected to the equipment and functional during and after a seismic event.

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6.4 Access to Generator Set

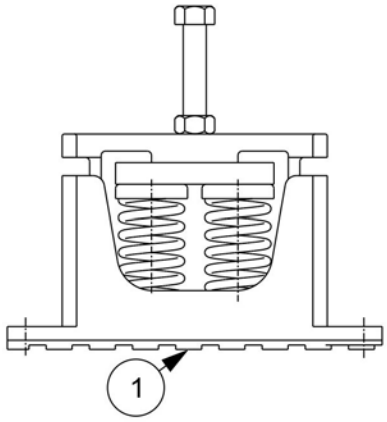
Generally, at least 1 meter (3.3 ft) of clearance should be provided on all sides of the generator set for maintenance and service access. (Increase clearance by width of door if optional housing is used.) A raised foundation or slab of 152 mm (6 inches) or more above floor level will make servicing easier. Lighting should be adequate for operation, maintenance and service operations and should be connected on the load side of the transfer switch so that it is available at all times.

6.5 Vibration Isolator Installation and Adjustment Procedure

This procedure covers the procedure to install vibration isolators (Part Number - A053M152).

6.5.1 Installation Instructions

1. Place the isolators on the ground or suitable sub-base.
   - The ground or sub-base must be a solid surface strong enough to support the generator set weight.
   - The ground or sub-base must be level. The maximum allowable height difference between the isolators base plates is 0.25 inch (6.35 mm).
   - Shim or grout the isolator base plates to achieve a level generator set mounting plane.
   - Refer to T-030 Generator Set Application Manual for floor and mounting requirements.

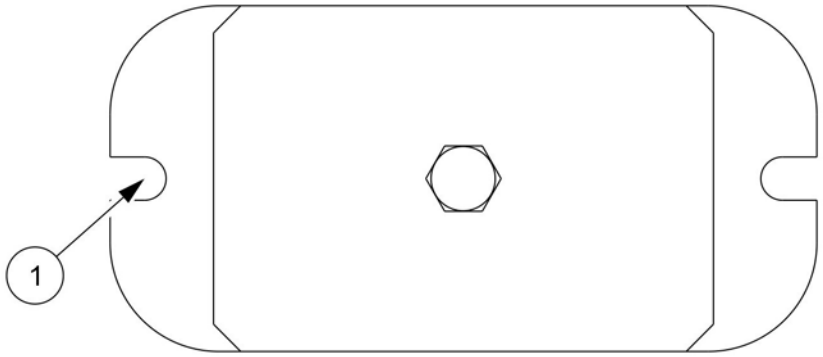


No.	Description	No.	Description
1	Base plate		

FIGURE 9. BASE PLATE

2. Make sure that all the isolator adjustment bolt holes align to the isolator mounting locations in the generator set skid.
3. Attach the isolator to the ground or the sub-base using the two holes in the isolator base plate.

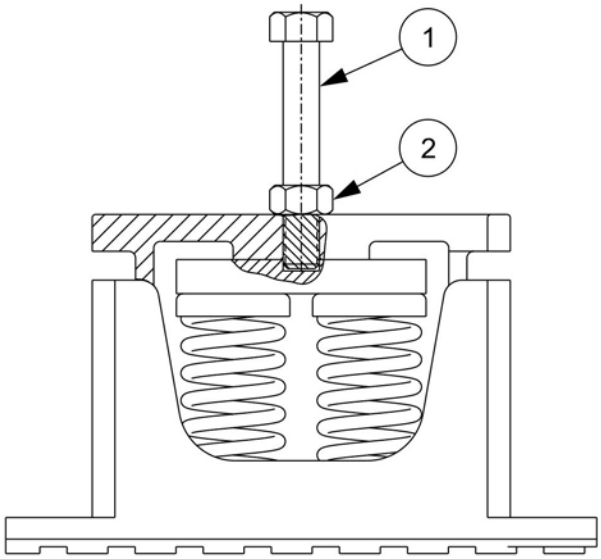
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No.	Description	No.	Description
1	Mounting holes		

FIGURE 10. MOUNTING HOLES

4. Remove the isolator adjustment bolt, jam nut and flat washer. Do not discard.

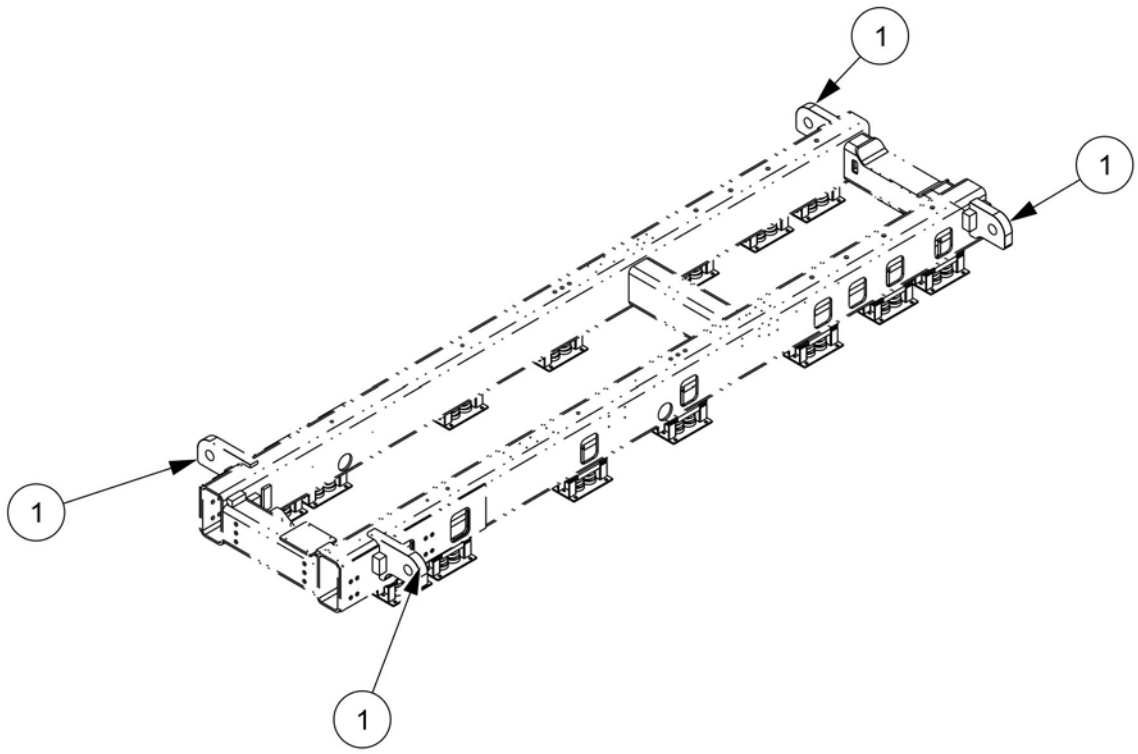


No.	Description	No.	Description
1	Adjustment bolt	2	Jam nut

FIGURE 11. ADJUSTMENT BOLT AND JAM NUT

5. Use all four lifting eyes to lift the generator set. The generator set may be lifted with an overhead crane or with jacks under the lifting eyes.

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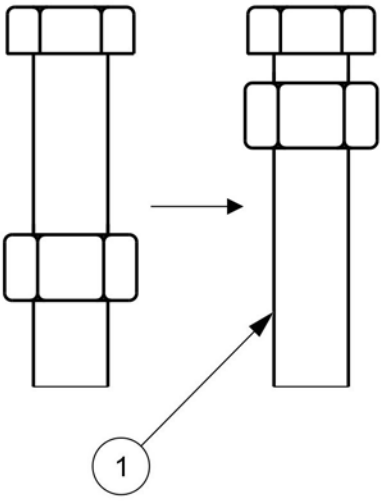


No.	Description	No.	Description
1	Lifting eyes		

FIGURE 12. LIFTING EYES

6. Make sure that all isolators are aligned to the isolator mounting locations in the generator set skid.
7. Spin the jam nut to move it towards the head on the isolator adjustment bolt.
8. Apply anti-seize lubricant to the threads of the isolator adjustment bolt.

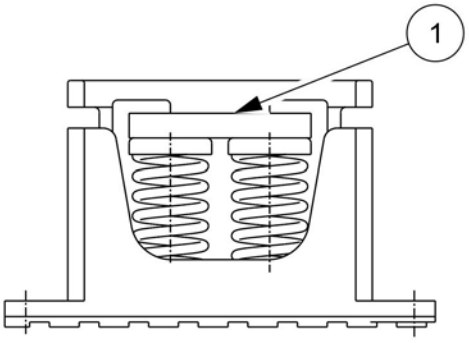
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No.	Description	No.	Description
1	Anti-seize lubricant		

FIGURE 13. ADJUSTMENT BOLT

9. Install each isolator adjustment bolt to the point that it makes contact with the spring plate. Do not tighten further until instructed.
10. Place blocking equivalent to the isolator free height, 149.2 mm (5 7/8 inches), and capable of supporting the generator set load alongside the isolator.

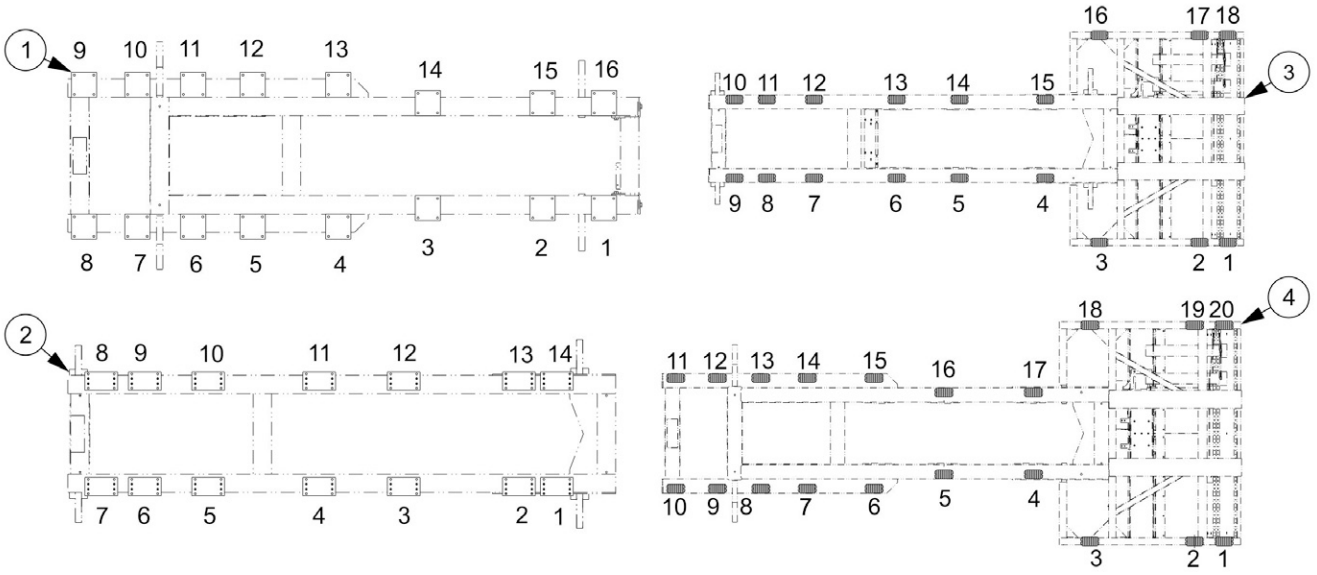


No.	Description	No.	Description
1	Spring plate		

FIGURE 14. COMPRESSION PLATE

11. After all the isolator adjustment bolts are started, lower the generator set onto the vibration isolators.
12. When the generator set is fully supported by the isolators, remove the lifting equipment.
13. Complete installation of the generator set. The generator set must be full of coolant and oil before the isolators are adjusted.
14. Adjust the isolators by turning the head of the adjustment bolts for isolator number 1 a full revolution clockwise. See **Figure 15** for isolator 1 location.

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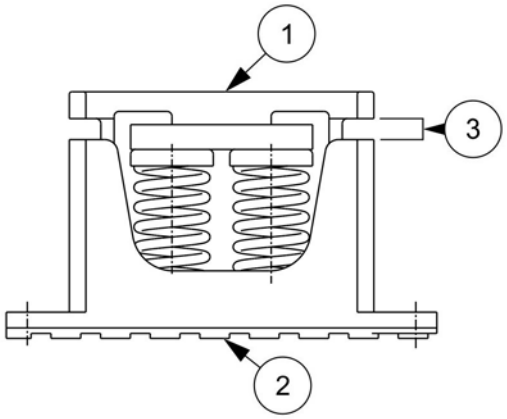
No.	Description	No.	Description
1	Generator set with DIG alternator	3	Generator set with P80 or S9 alternator and radiator
2	Generator set with P80 or S9 alternator	4	Generator set with DIG alternator and radiator

FIGURE 15. ISOLATOR LOCATIONS

15. Repeat step 14 until there is a gap of at least 0.25 inch (6.33 mm between the isolator top plate and the isolator base plate on all isolators. Adjust each isolator adjustment bolt only one full revolution at a time.

NOTICE
If the gap between the isolator top plate and the isolator base plate is 0.25 inch on one isolator before the other isolators, continue adjusting that isolator along with the other isolators until all the gap is at least 0.25 inch on all isolators.

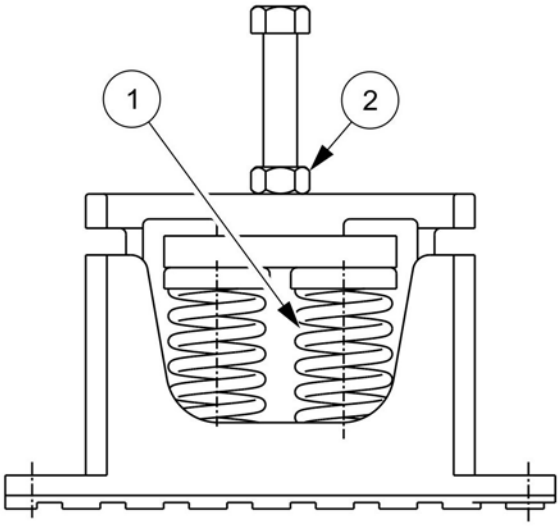
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No.	Description	No.	Description
1	Top plate	3	0.25 to 0.5 inch (6.3 to 12.7 mm)
2	Base plate		

FIGURE 16. TOP PLATE AND BASE PLATE GAP

16. Periodically check the gap between the isolator spring coils. The gap cannot be less than 0.04 inch (1 mm). Adjust isolators as necessary.
17. Torque the jam nut against the generator set skid to 27 Nm (20 ft-lb) lock the isolator adjustment bolt in place.
18. Remove the blocking.



No.	Description	No.	Description
1	Spring gap	2	Jam nut

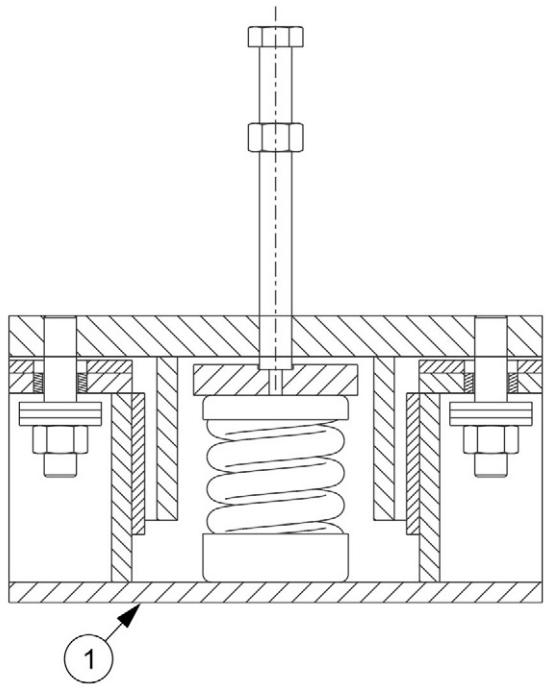
FIGURE 17. JAM NUT AND SPRING GAP

6.6 Vibration Isolator Installation and Adjustment Procedure

This procedure covers the procedure to install vibration isolators (Part Number - A053L607).

6.6.1 Installation Instructions

1. Place the isolators on the ground or suitable sub-base.
   - The ground or sub-base must be a solid surface strong enough to support the generator set weight.
   - The ground or sub-base must be level. The maximum allowable height difference between the isolators base plates is 0.25 inch (6.35 mm).
   - Shim or grout the isolator base plates to achieve a level generator set mounting plane.
   - Refer to T-030 Generator Set Application Manual for floor and mounting requirements.

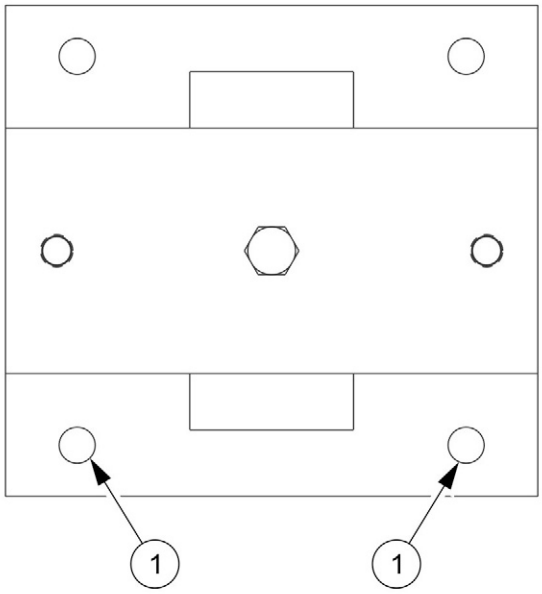


No.	Description	No.	Description
1	Base plate		

FIGURE 18. BASE PLATE

2. Make sure that all the isolator adjustment bolt holes align to the isolator mounting locations in the generator set skid.
3. Attach the isolator to the ground or the sub-base using the four holes in the isolator base plate.

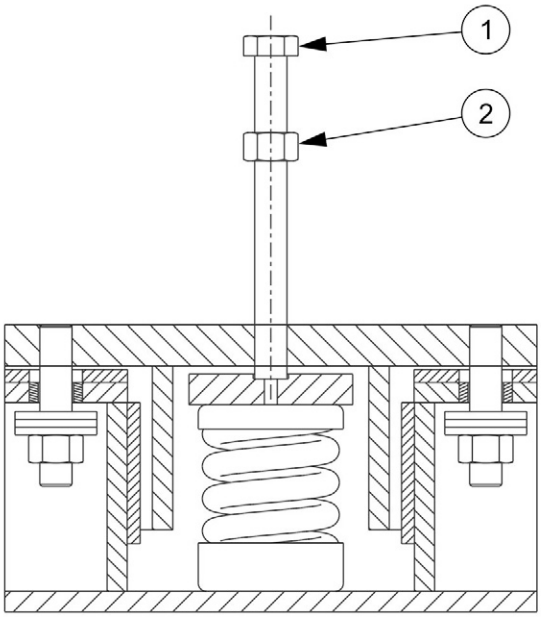
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No.	Description	No.	Description
1	Mounting holes		

FIGURE 19. MOUNTING HOLES

4. Remove the isolator adjustment bolt, jam nut and flat washer. Do not discard.

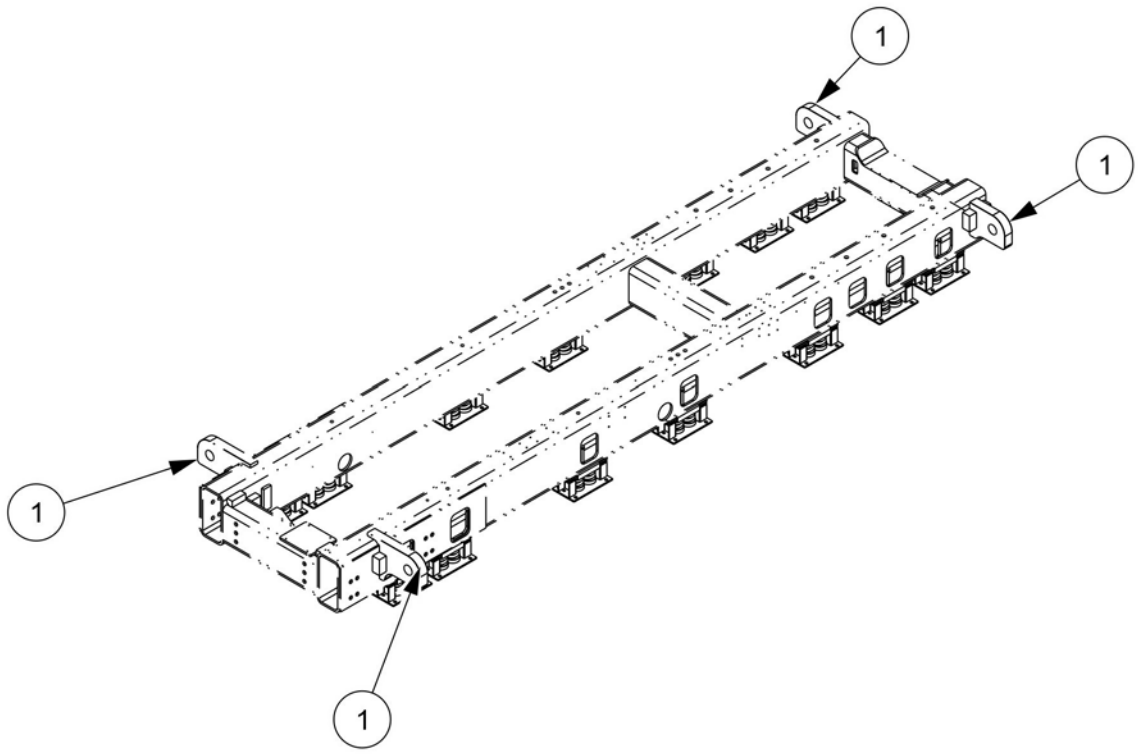


No.	Description	No.	Description
1	Adjustment bolt	2	Jam nut

FIGURE 20. ADJUSTMENT BOLT AND JAM NUT

5. Use all four lifting eyes to lift the generator set. The generator set may be lifted with an overhead crane or with jacks under the lifting eyes.

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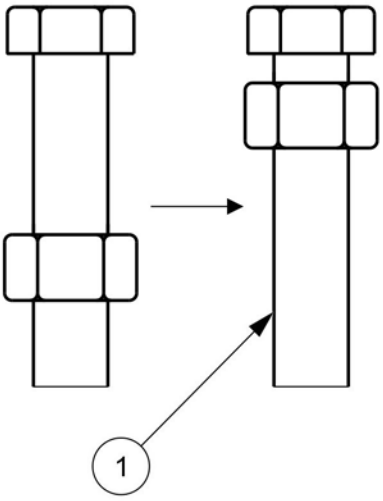


No.	Description	No.	Description
1	Lifting eyes		

FIGURE 21. LIFTING EYES

6. Make sure that all isolators are aligned to the isolator mounting locations in the generator set skid.
7. Spin the jam nut to move it towards the head on the isolator adjustment bolt.
8. Apply anti-seize lubricant to the threads of the isolator adjustment bolt.

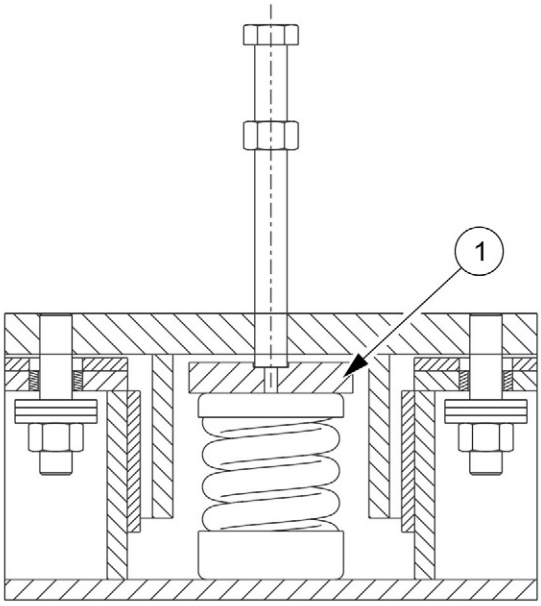
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No.	Description	No.	Description
1	Anti-seize lubricant		

FIGURE 22. ADJUSTMENT BOLT

9. Install each isolator adjustment bolt to the point that it makes contact with the compression plate. Do not tighten further until instructed.



No.	Description	No.	Description
1	Compression plate		

FIGURE 23. COMPRESSION PLATE

10. After all the isolator adjustment bolts are started, lower the generator set onto the vibration isolators.

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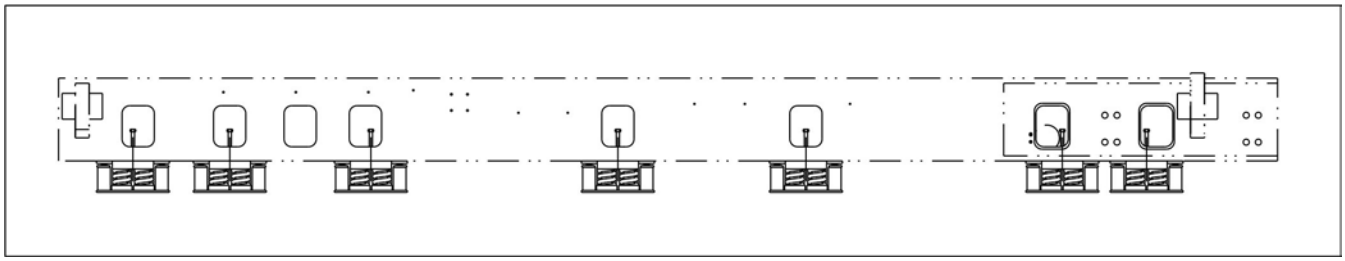
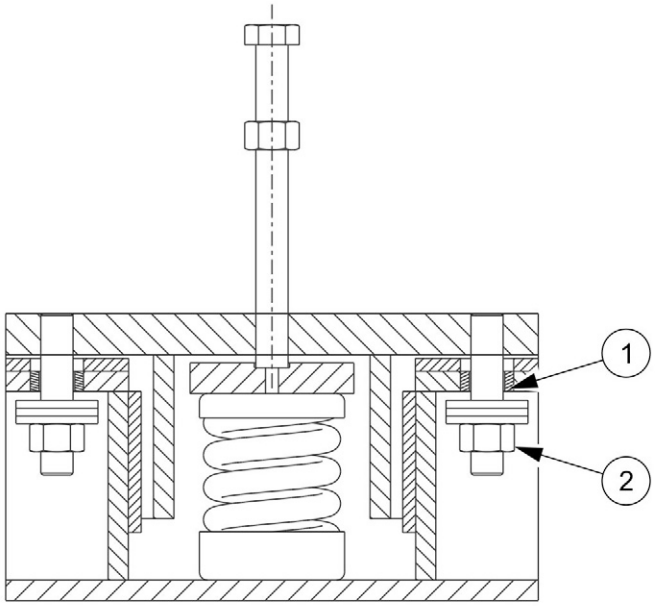


FIGURE 24. GENERATOR SET SKID ON THE VIBRATION ISOLATORS

11. When the generator set is fully supported by the isolators, remove the lifting equipment.
12. Complete installation of the generator set. The generator set must be full of coolant and oil before the isolators are adjusted.
13. Loosen the limit stop nuts so that there is a gap between the nut and the rubber grommet.

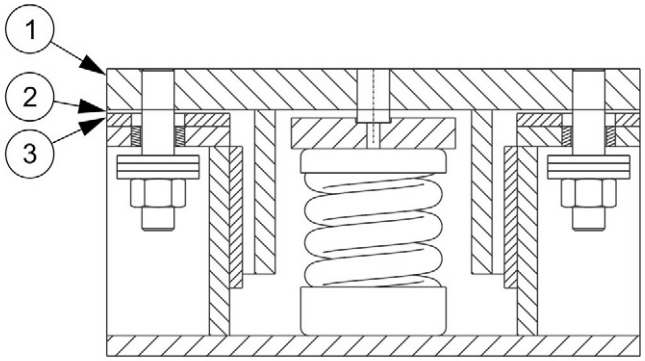


No.	Description	No.	Description
1	Rubber grommet	2	Limit stop nut

FIGURE 25. LIMIT STOP NUTS

14. Adjust all the isolators by turning the head of the adjustment bolts for isolator number 1 a full revolution clockwise until there is a slight gap between the top plate and the elastomeric pad (**Figure 26 on page 69**). See **Figure 27** for isolator 1 location.

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No.	Description	No.	Description
1	Top plate	3	Elastomeric pad
2	Slight air gap		

FIGURE 26. TOP PLATE AND ELASTOMERIC PAD

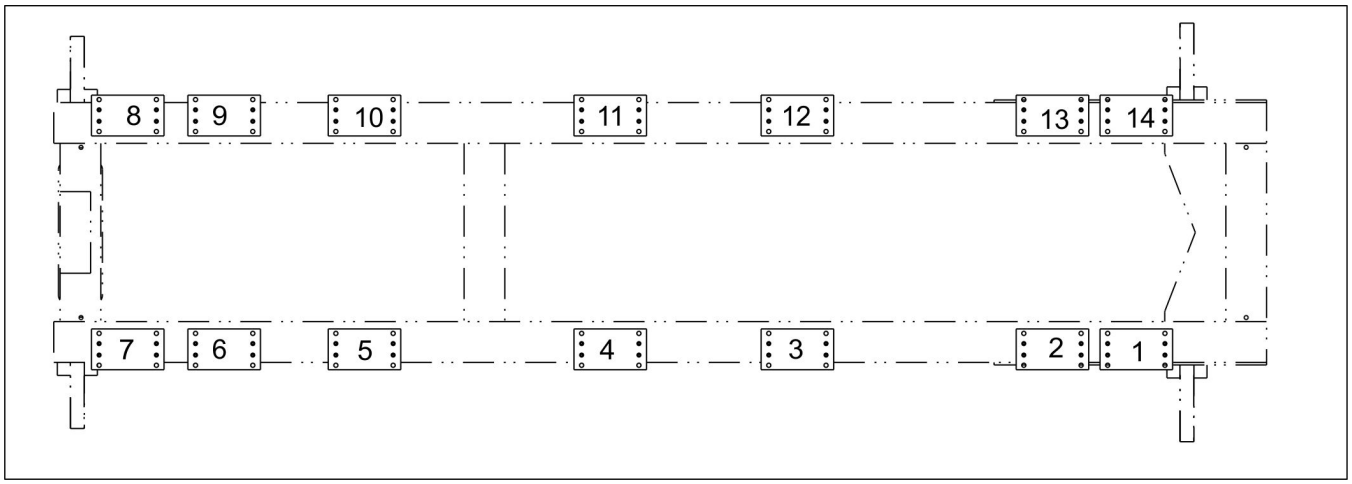
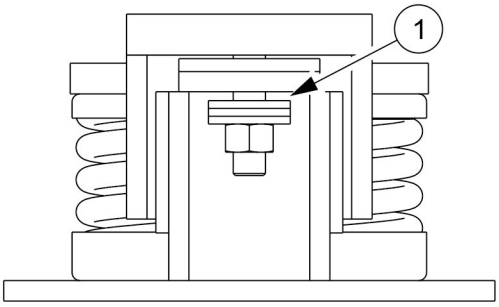


FIGURE 27. ISOLATOR LOCATIONS

15. Check the limit stop locknuts to make sure the gap between the limit stop locknuts and the rubber grommets are maintained.
16. Repeat steps 14 and 15 for isolators 2 through 14 (**Figure 27**).
17. Repeat steps 14, 15, and 16 until the steel shipping shims can be removed on all isolators. Adjust each isolator adjustment bolt only one full revolution at a time.
18. Periodically check the gap between the isolator spring coils. The gap cannot be less than 0.04 inch (1 mm). Adjust isolators as necessary.
19. Adjust the isolator limit stop nuts on all isolators so that there is a 3/8 inch (10 mm) gap between the limit stop nut and the rubber grommet.

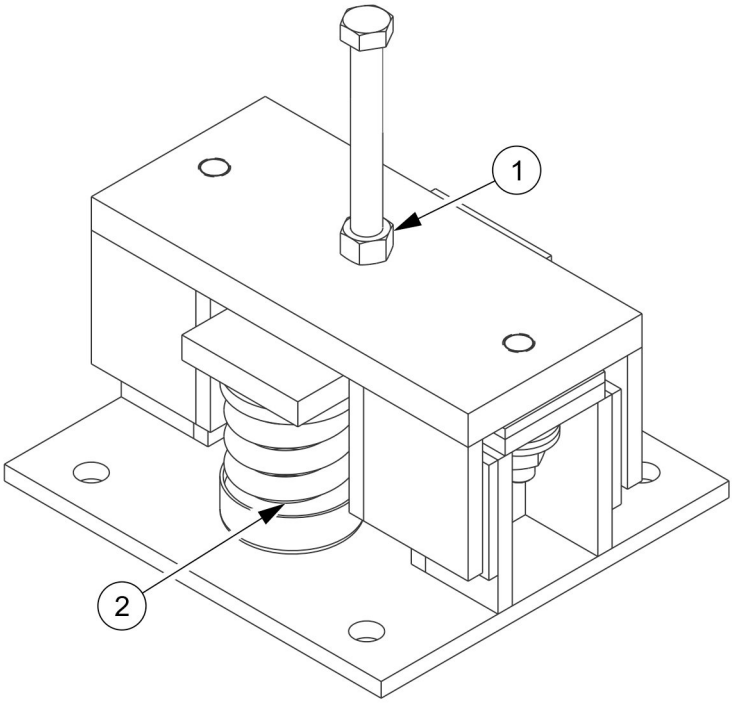
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No.	Description	No.	Description
1	Limit stop nut gap		

FIGURE 28. LIMIT STOP NUT GAP

20. Torque the jam nut against the generator set skid to 254 Nm (187 ft-lb) lock the isolator adjustment bolt in place.



No.	Description	No.	Description
1	Jam nut	2	Spring gap

FIGURE 29. JAM NUT AND SPRING GAP

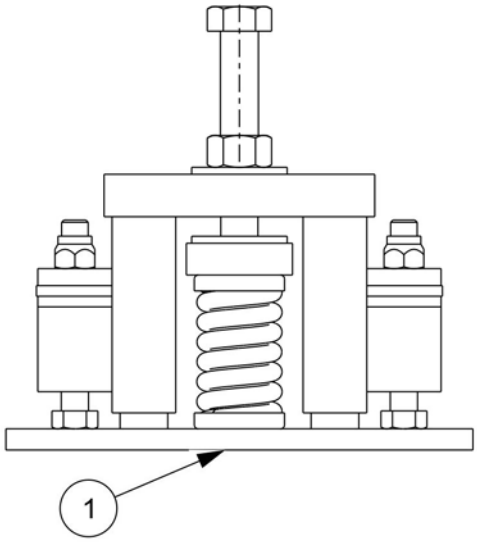
6.7 Vibration Isolator Installation and Adjustment Procedure

This procedure covers the procedure to install vibration isolators (Part Number - A050T776).

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6.7.1 Installation Instructions

1. Place the isolators on the ground or suitable sub-base:
   - The ground or sub-base must be a solid surface strong enough to support the generator set weight.
   - The ground or sub-base must be level. The maximum allowable height difference between the isolators base plates is 1/8 inch (3.18 mm).
   - Shim or ground the isolator base plates to achieve a level generator set mounting plane.
   - Refer to T-030 Generator Set Application Manual for floor and mounting requirements.

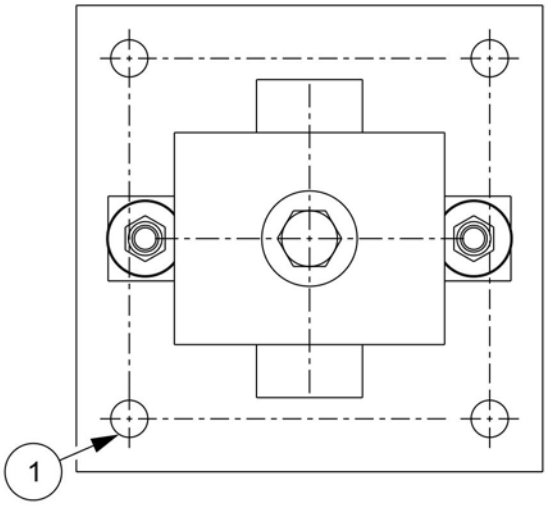


No.	Description	No.	Description
1	Base plate		

FIGURE 30. BASE PLATE

2. Make sure that all the isolator adjustment bolt holes align to the isolator mounting locations in the generator set skid.
3. Attach the isolator to the ground or the sub-base using the four holes in the isolator base plate.

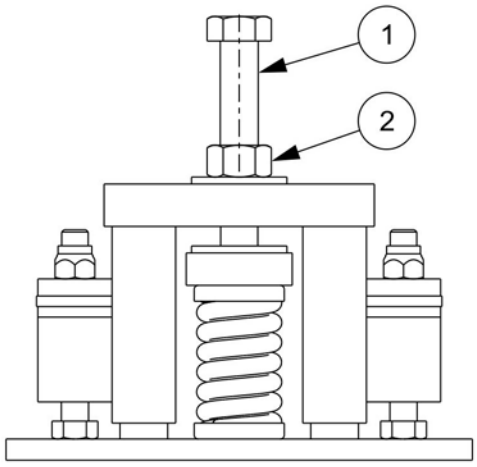
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No.	Description	No.	Description
1	Mounting holes		

FIGURE 31. MOUNTING HOLES

4. Remove the isolator adjustment bolt, jam nut and flat washer. Do not discard.

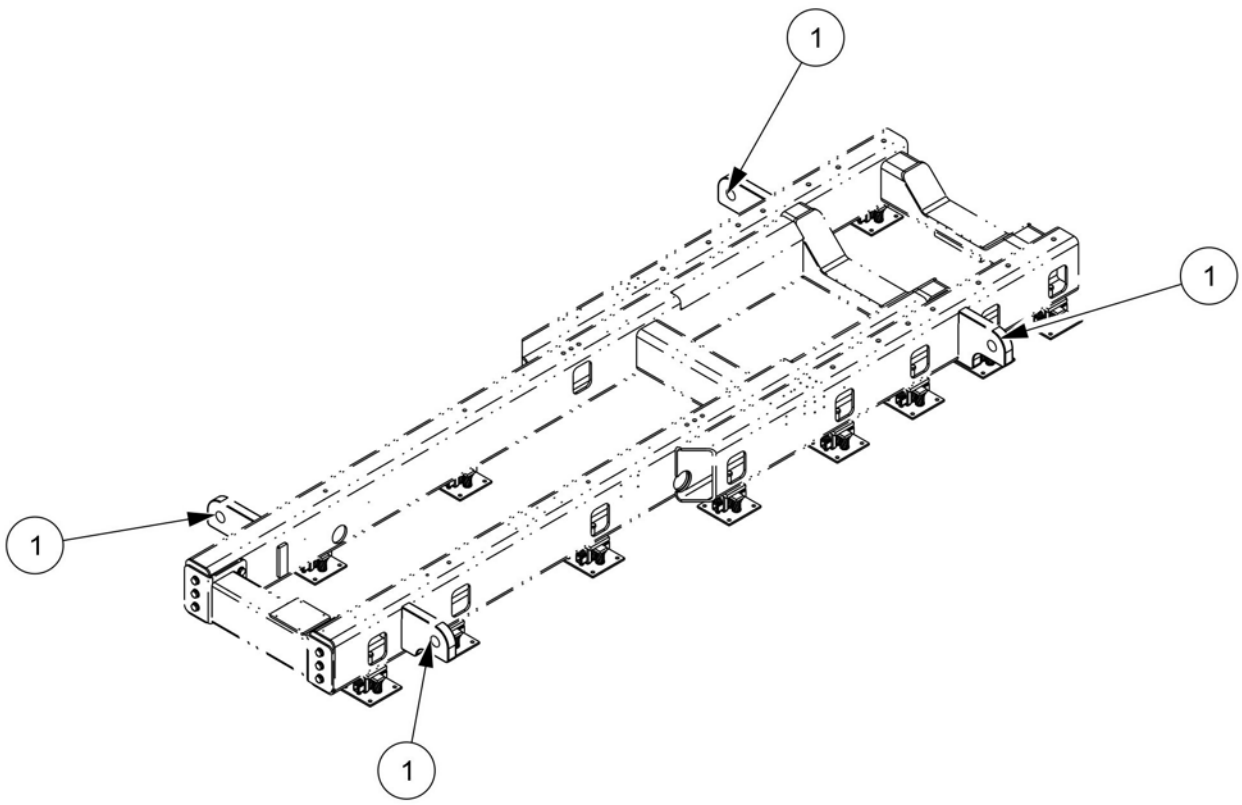


No.	Description	No.	Description
1	Adjustment bolt	2	Jam nut

FIGURE 32. ADJUSTMENT BOLT AND JAM NUT

5. Use all four lifting eyes to lift the generator set. The generator set may be lifted with an overhead crane or with jacks under the lifting eyes.

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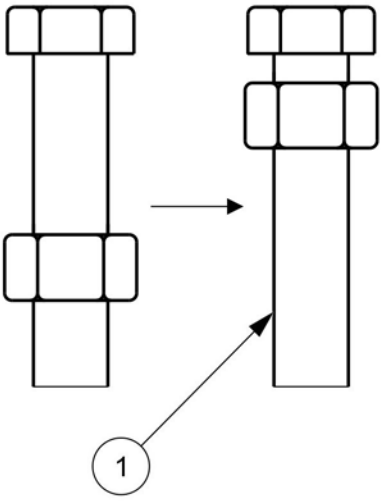


No.	Description	No.	Description
1	Lifting eyes		

FIGURE 33. LIFTING EYES

6. Make sure that all isolators are aligned to the isolator mounting locations in the generator set skid.
7. Spin the jam nut to move it towards the head on the isolator adjustment bolt.
8. Apply anti-seize lubricant to the threads of the isolator adjustment bolt.

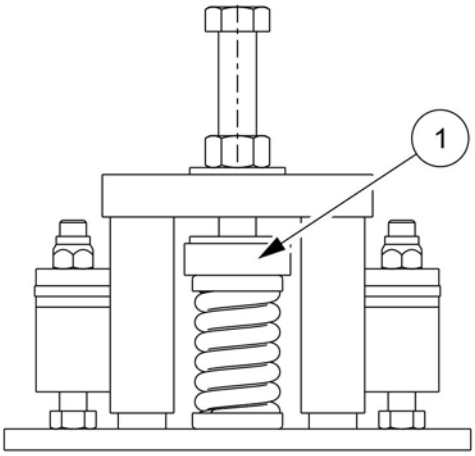
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No.	Description	No.	Description
1	Anti-seize lubricant		

FIGURE 34. ADJUSTMENT BOLT

9. Install each isolator adjustment bolt to the point that it makes contact with the spring plate. Do not tighten further until instructed.



No.	Description	No.	Description
1	Spring plate		

FIGURE 35. SPRING PLATE

10. After all the isolator adjustment bolts are started, lower the generator set onto the vibration isolators.

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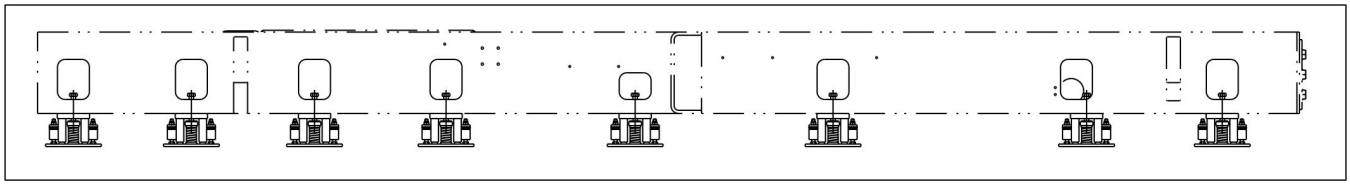
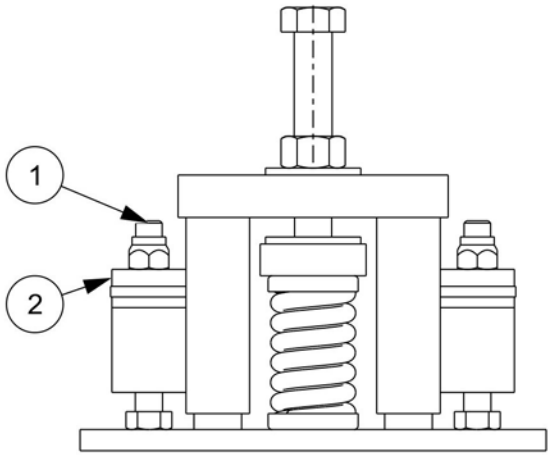


FIGURE 36. GENERATOR SET SKID ON THE VIBRATION ISOLATORS

11. When the generator set is fully supported by the isolators, remove the lifting equipment.
12. Complete installation of the generator set. The generator set must be full of coolant and oil before the isolators are adjusted.
13. Loosen the uplift nuts so that there is a gap between the nut and the rubber grommet.



No.	Description	No.	Description
1	Uplift nut	2	Rubber grommet

FIGURE 37. UPLIFT NUTS

14. Adjust the isolators by turning the head of the adjustment bolts for isolator number 1 a full revolution clockwise. See **Figure 38** for isolator 1 location.

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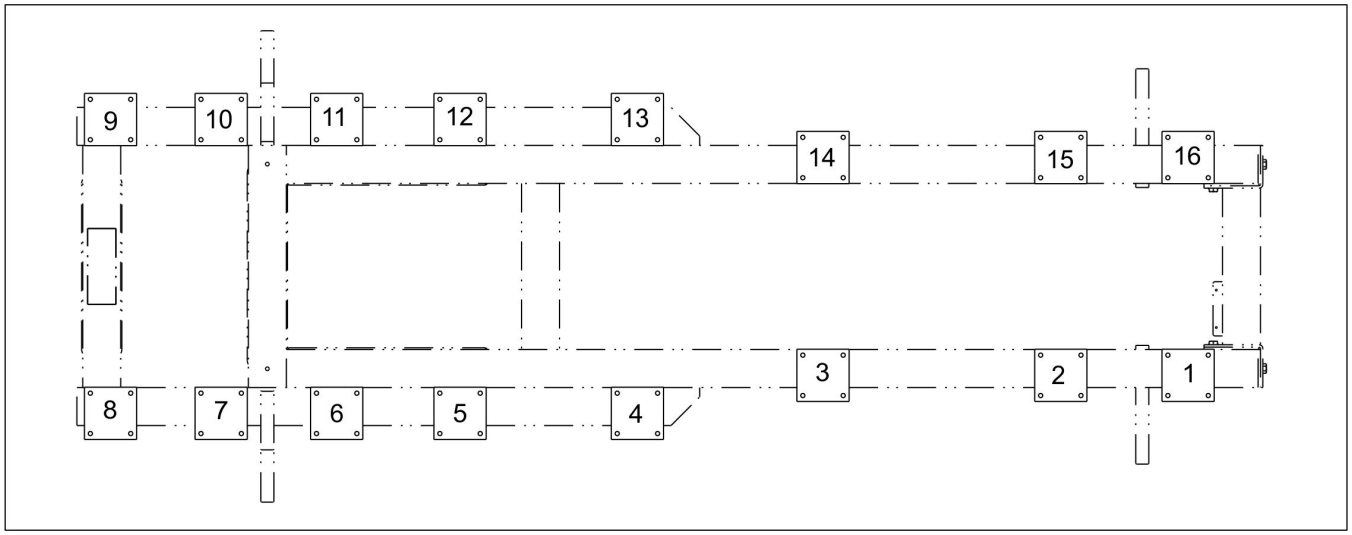
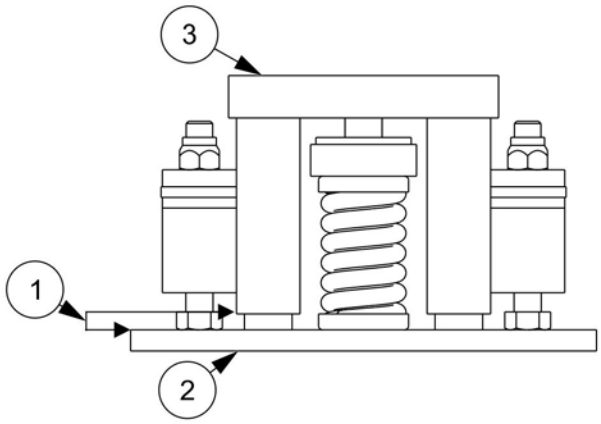


FIGURE 38. ISOLATOR LOCATIONS

15. Check the limit stop locknuts to make sure the gap between the limit stop locknuts and the rubber grommets are maintained.
16. Repeat steps 14 and 15 for isolators 2 through 14 (**Figure 38**).
17. Repeat steps 14, 15, and 16 until the gap between the the isolator top plate and the isolator base plate on all isolators is 0.25 inch (6.3 mm) minimum. Adjust each isolator adjustment bolt only one full revolution at a time.

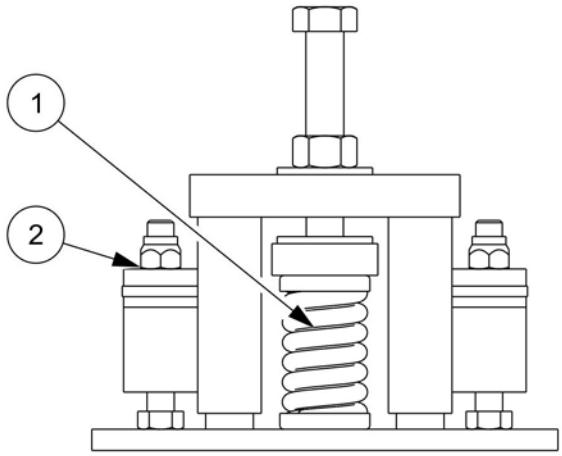
NOTICE
If one isolator reaches 1/4 inch gap befor the other isolators, continue adjusting that isolator along with the other isolators until the gap is at least 0.25 inch on all isolators.



No.	Description	No.	Description
1	0.25 inch (6.3 mm) minimum	3	Top plate
2	Base plate		

FIGURE 39. LIMIT STOP NUT GAP

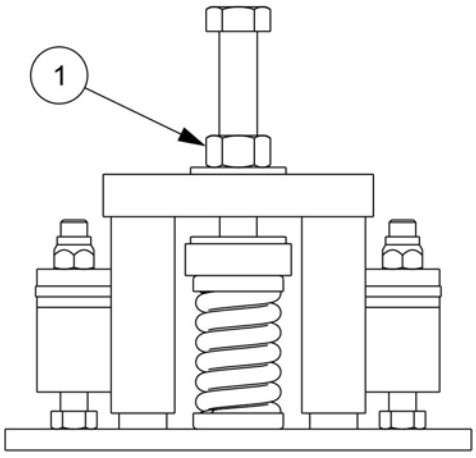
18. Periodically check the gap between the isolator spring coils. The gap cannot be less than 0.04 inch (1 mm). Adjust isolators as necessary.
19. Adjust the uplift nuts on all isolators so that there is a 1/4 to 3/8 inch (6.3 to 9.5 mm) gap between the uplift nut and the rubber grommet.



No.	Description	No.	Description
1	Spring coil gap	2	Uplift nut gap

FIGURE 40. UPLIFT NUT GAP AND SPRING COIL GAP

20. Torque the jam nut against the generator set skid to 530 Nm (119 ft-lb) lock the isolator adjustment bolt in place.



No.	Description	No.	Description
1	Jam nut		

FIGURE 41. JAM NUT

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7 Mechanical Connections

The generator set mechanical system installation includes connecting the fuel, exhaust, ventilation, and cooling systems. Before starting any type of fuel installation, all pertinent state and local codes must be complied with and the installation must be inspected before the unit is put in service.

7.1 Fuel System

Cummins engines normally use a diesel fuel specified to ASTM D975 grade 2 or BS EN 590:2000 is for automotive diesel, BS 2869:2010+A1:2011 Fuel oils for agricultural, domestic and industrial engines and boilers.

In all fuel system installations, cleanliness is of the utmost importance. Make every effort to prevent entrance of moisture, dirt, or contaminants of any kind into the fuel system. Clean all fuel system components before installing.

NOTICE
A fuel filter/strainer/water separator of 100-120 mesh or equivalent (approximately 150 microns nominal) must be fitted between either the main tank and day tank or between the main tank and the engine.

NOTICE
A 10 micron vent filter must be installed on the day tank. Refer to Service Bulletin 3379001

Use only compatible metal fuel lines to avoid electrolysis when fuel lines must be buried. Buried fuel lines must be protected from corrosion.

NOTICE
Never use galvanized or copper fuel lines, fittings, or fuel tanks. Condensation in the tank and lines combines with the sulfur in diesel fuel to produce sulfuric acid. The molecular structure of the copper or galvanized lines or tanks reacts with the acid and contaminates the fuel.

A mechanical check valve in the supply line is recommended for all installations and required for indoor automatic or remote starting installations.

Use of an electric solenoid valve is also acceptable but will require additional hardware. A current transformer relay can be used to signal the valve when engine fuel supply pump runs periodically.

Separate fuel return lines to the day tank or supply tank must be provided for each generator set in a multiple-set installation to prevent the return lines of idle sets from being pressurized. Fuel return lines must not contain a shutoff device. Engine damage will occur if the engine is run with the return fuel lines blocked or restricted.

NOTICE
Never install a shutoff device in fuel return line(s). If fuel return line(s) is blocked or exceeds fuel restriction limit, engine damage will occur.

NOTICE
A base mounted fuel tank may be part of the generator set build. An additional external fuel system may be required if the on board fuel capacity is not sufficient for the application.

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7.1.1 Fuel Return Restrictions (or Pressure) Limit

Fuel return drain restriction (consisting of friction head and static head) between the engine injector return line connection and the fuel tank must not exceed the limit stated in the model-specific generator set *Specification Sheet*.

7.1.2 Fuel Line Connections

⚠ WARNING

Combustible Liquid

Fuel leaks are a fire and explosion hazard which can cause severe personal injury or death.

Always use flexible tubing between the engine and fuel supply to avoid line failure and leaks due to vibration. The fuel system must meet all application codes.

⚠ WARNING

Combustible Liquid

Ignition of fuel is a fire and explosion hazard which can cause severe personal injury or death.

Do not route fuel lines near electrical wiring.

⚠ WARNING

Hot Surface

Hot surfaces can ignite fuel. Ignited fuel is a fire and explosion hazard which can cause severe burns or death.

Do not route fuel lines near hot exhaust parts.

NOTICE

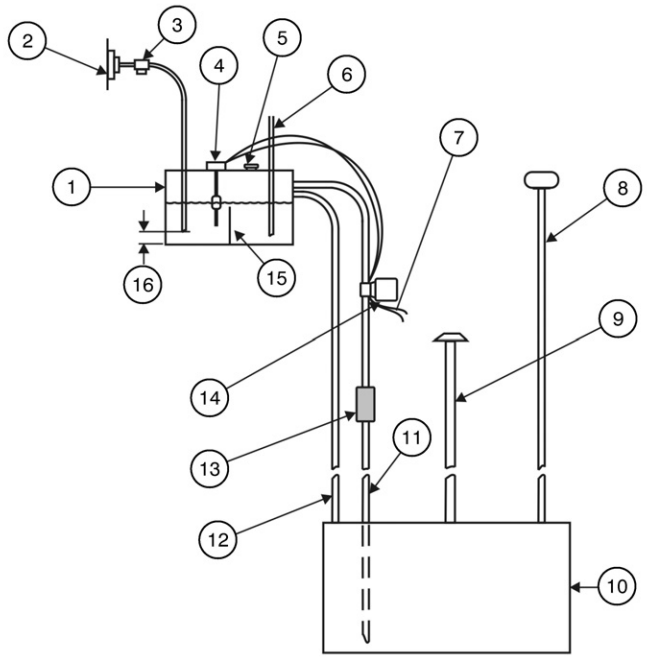
Fuel lines must be routed and secured to maintain a 12.7 mm (½ inch) minimum clearance from electrical wiring and a 51 mm (2 inch) minimum clearance from hot exhaust parts.

Flexible lines for connecting between the engine and the skid mounted fuel tank (if fitted) are supplied as standard equipment.

Flexible lines for connecting between the engine and an external fuel supply must be used between the engine fuel system, and the fuel supply and return lines to protect the fuel system from damage caused by vibration, expansion, and contraction.

For additional information refer to T-030 Application Manual ***https://powersuite.cummins.com/PS5/PS5Content/.../en/.../T-030.pdf***

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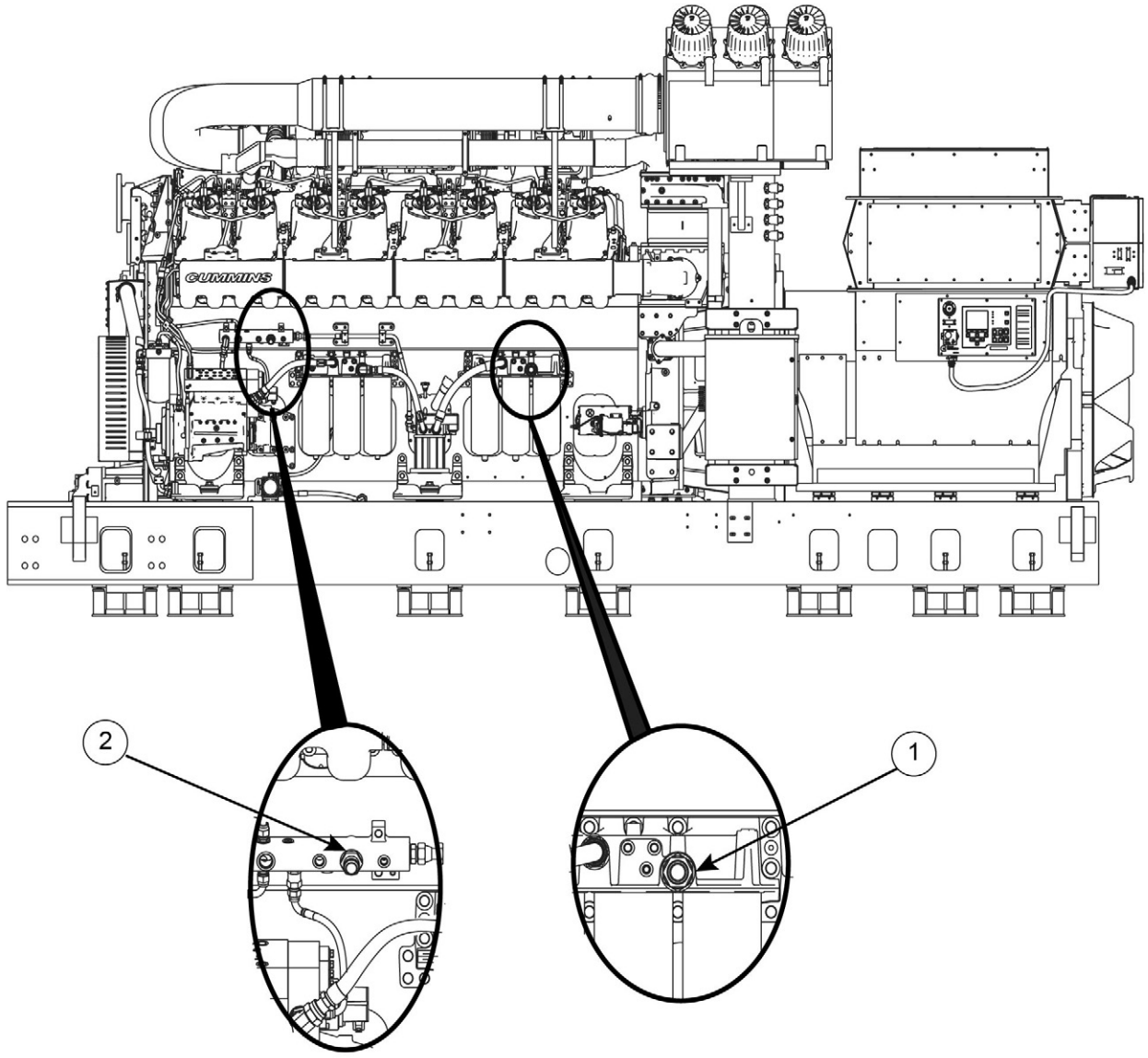
No.	Description	No.	Description
1	Day Tank/Skid Mounted Fuel Tank	9	Fill Pipe
2	Engine Fuel Pump	10	Main Fuel Tank
3	Shut Off Valve	11	Supply Line
4	Float Switch	12	Larger Overflow Line 120 Mesh Fuel Strainer
5	Vented Fill Cap with 10 micron filter	13	120 Mesh Fuel Strainer
6	Injector Fuel Return Line	14	Fuel Transfer Pump Electric Motor Driven
7	Connect to AC Output	15	Baffle
8	Vent Pipe	16	25.4 mm (1 inch) Clearance

FIGURE 42. TYPICAL FUEL SUPPLY INSTALLATION

7.1.3 Engine Fuel Connections

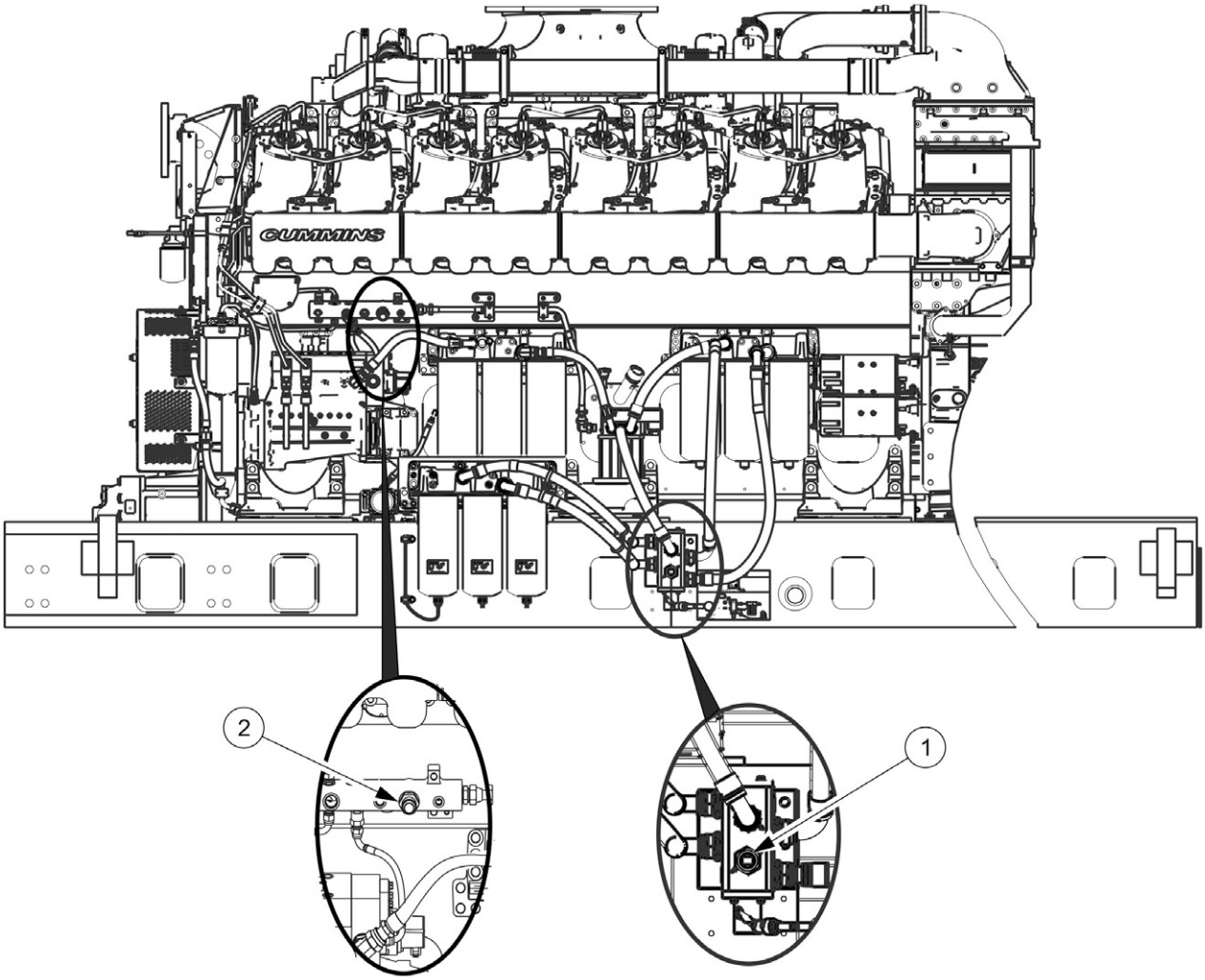
Identification tags are attached to the fuel supply line and fuel return line connections. All models require a fuel return line from the injectors to the tank.

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No.	Description	No.	Description
1	Fuel Inlet	2	Fuel Outlet
Refer to **Appendix B on page 277** the for dimensional location of fuel line connections			

FIGURE 43. FUEL CONNECTION LOCATIONS



No.	Description	No.	Description
1	Fuel Inlet	2	Fuel Outlet
Refer to **Appendix B on page 277** the for dimensional location of fuel line connections			

FIGURE 44. FUEL CONNECTION LOCATIONS - DUPLEX FUEL FILER

TABLE 13. FUEL CONNECTION GUIDELINES

	Fuel Inlet	Fuel Outlet
Connection Size	#20 JIC 37deg	#16 JIC 37deg
Hose Type	Eaton FC-350-20 or Equivalent	Eaton FC-350-20 or Equivalent
Max Restriction	Refer to **Section 5.1 on page 43**.	

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7.1.4 Supply Tank

The fuel supply tank, day tank, or other reservoir must be arranged so that the highest fuel level does not exceed the maximum height above the fuel injectors specified for the engine. The lowest level must not fall below the specified lift height of the engine fuel lift pump. In critical start applications, the lowest level should not be less than 150 mm (6 inches) above the engine fuel pump inlet to make sure there is no air in the fuel line during startup. Provisions must be made for draining or pumping out water.

For critical start applications, where generator sets are paralleled or must satisfy emergency start-time requirements, it is recommended that a fuel tank or reservoir be located such that the lowest possible fuel level is not less than 150 mm (6 in) above the fuel pump inlet. This will prevent air from accumulating in the fuel line while the generator set is in standby, eliminating the period during startup when it has to be purged.

Locate the fuel tank as close as possible to the generator set and within the restriction limitations of the fuel pump.

Install a fuel tank that has sufficient capacity to supply the generator set depending on its application:

- Continuous power
- Prime power
- Standby power

Refer to the Engine Fuel Consumption section for fuel consumption data.

If the fuel inlet restriction exceeds the defined limit due to the distance/customer-supplied plumbing between the generator set and the main fuel tank, a transfer tank (sometimes referred to as a day tank) and auxiliary pump will also be required. If an overhead main fuel tank is installed, a transfer tank and float valve will be required to prevent fuel head pressures from being placed on the fuel system components.

For additional information on the size and installation of a supply tank for the application, consult your local authorized Cummins distributor or dealer.

7.1.5 Fuel Inlet Pressure/Restriction Limit

Engine performance and fuel system durability is compromised if the fuel inlet pressure or restriction limits are not adhered to. Fuel inlet pressure or restriction must not exceed the limits stated in the model-specific generator set *Specification Sheet*.

7.1.6 Day Tank

Some generator set installations may include a fuel day tank. They are used when fuel inlet restriction limits cannot be met, or the supply tank is overhead and presents problems of high fuel head pressure for the fuel inlet and return lines.

7.1.6.1 Supply Tank Lower Than Engine

⚠ WARNING

Combustible Liquid

Spilled fuel is a fire and explosion hazard which can cause severe personal injury or death.

Provide an overflow line to the supply tank from the day tank.

NOTICE

The supply tank top must be below the day tank top to prevent siphoning from the fuel supply to the day tank.

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With this installation, the day tank is installed near the generator set, below the fuel injection system and within the fuel inlet restriction limit. Install a fuel transfer pump, to pump fuel from the supply tank to the day tank. A float switch in the day tank controls operation of the auxiliary fuel pump.

Provide a return line from the engine injection system return connection to the day tank. Plumb the return line to the bottom of day tank as shown in Figure 42 on page 81. Provide a day tank overflow line to the supply tank in case the float switch fails to shut off the fuel transfer pump.

7.1.6.2 Supply Tank Higher Than Engine

With this installation, the day tank is installed near the generator set, above the fuel injection system and within the fuel return restriction limit. Include an automatic fuel shutoff valve in the fuel line between the fuel supply tank and the day tank to stop fuel flow when the generator set is off.

Provide a return line from the engine injection system return connection to the day tank. Plumb the return line to the bottom of day tank as shown in Figure 42 on page 81.

NOTICE
Spilled fuel can create environmental hazards. Check local requirements for containment and prevention of draining to sewer and ground water.

7.1.7 Prime the Engine

Do the following to cycle the generator set keyswitch. Cycling the keyswitch runs the fuel supply pump (FSP) and primes the engine.

1. Pull the Emergency Stop switch out.
2. Wait for two minutes.
3. Push the Emergency Stop switch in.
4. Wait for one minute.
5. Pull the Emergency Stop switch out.

7.2 Exhaust System

⚠ WARNING
Toxic Gases ***Inhalation of exhaust gases can cause asphyxiation and death.*** ***Use extreme care during installation to provide a tight exhaust system. Terminate exhaust pipes away from enclosed or sheltered areas, windows, doors, and vents. Do not use exhaust heat to warm a room, compartment, or storage area.***

⚠ WARNING
Hot Surface ***Hot surfaces can start a fire which can cause severe burns or death.*** ***Use an approved thimble where exhaust pipes pass through wall or partitions.***

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NOTICE

Weight applied to the engine manifold can result in turbocharger damage. Support the silencer and exhaust piping so no weight or stress is applied to the engine exhaust elbow.

NOTICE

Liability for injury, death, damage, and warranty expense due to use of unapproved silencers or modifications to the exhaust system becomes the responsibility of the person installing the unapproved silencer or performing the modification. Contact your authorized distributor for approved exhaust system parts.

Pipe exhaust gases to the outside of any enclosure/room. Locate the exhaust outlets away from any air inlets to avoid gases re-entering the enclosure/room. Exhaust installations are subject to various detrimental conditions such as extreme heat, infrequent operation, and light loads. Regularly inspect the exhaust system both visually and audibly to see that the entire system remains fume tight and safe for operation.

NOTICE

Enclosed generator sets are not generally designed to be used in a building. If the generator set is to be used in a building, additional requirements must be applied.

Where an enclosed generator set is used in a building, the exhaust system should be extended to vent the exhaust gases. Use sealed joint type fittings where possible to provide a tight exhaust system. Use of slip type fittings (secured with a clamp) may allow leakage of exhaust gases into the building if not fitted correctly. Check to make sure there are no exhaust leaks.

NOTICE

Flexible pipes must be installed vertically and must be aligned fully with engine and exhaust tubes. The pipes must not have any bends or curves.

When a unit is provided with a partially installed or incomplete exhaust system, exhaust piping and chimneys shall be designed, constructed, and installed in accordance with the Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines, NFPA 37, or applicable local standards. Build according to the code requirements in effect at the installation site.

For indoor installation, the exhaust system should use sealed joint type fittings where possible to provide a tight exhaust system. Use of slip type fittings (secured with a clamp) may allow leakage of exhaust gases into the building if not fitted correctly fitted. Check to make sure there are no exhaust leaks.

Use an approved thimble (see **Figure 49 on page 89**) where exhaust pipes pass through a wall or partition. Insulated wall/roof thimbles are used where exhaust pipes pass through a combustible roof or wall. This includes structures, such as wood framing or insulated steel decking, etc. Uninsulated wall/roof thimbles are used where exhaust pipes pass through a non-combustible wall or roof, such as concrete. When a unit is provided with a partially installed or incomplete exhaust system, exhaust piping and chimneys shall be designed, constructed, and installed in accordance with the Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines, NFPA 37, or applicable local standards. Build according to the code requirements in effect at the installation site.

Rain caps are available for the discharge end of vertical exhaust pipes. The rain cap clamps onto the end of the pipe and opens due to exhaust discharge force from the generator set. When the generator set is stopped, the rain cap automatically closes, protecting the exhaust system from rain, snow, etc.

Use a section of flexible exhaust pipe between the engine and remainder of exhaust system. Support the exhaust system to prevent weight from being applied to engine exhaust outlet elbow/turbocharger connection.

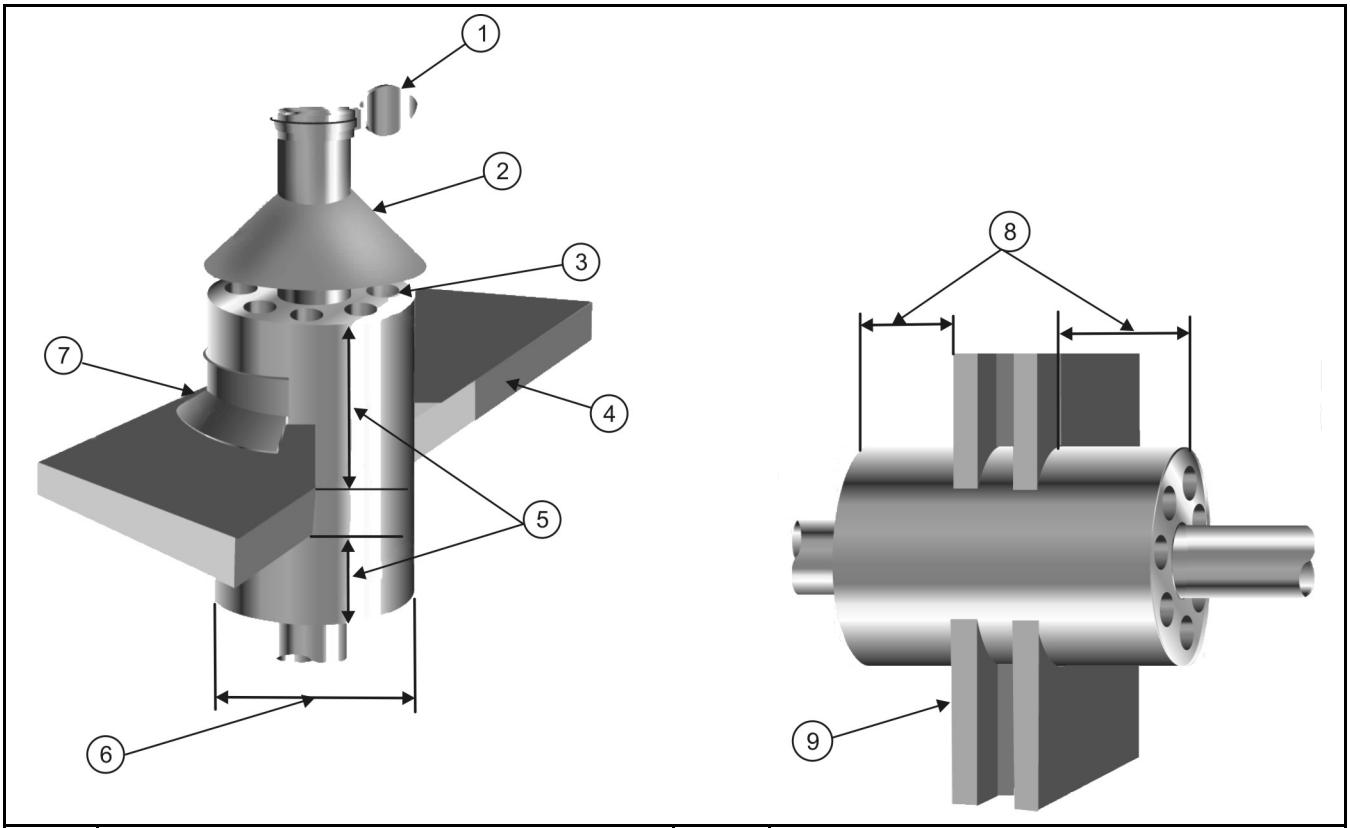
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The exhaust system design should meet local code requirements.

Avoid sharp bends by using sweeping, long radius elbows and provide adequate support for the silencer and tailpipe. Pitch a horizontal run of exhaust pipe downward (away from engine) to allow any moisture condensation to drain away from the engine. If an exhaust pipe must be turned upward, install a condensation trap at the point where the rise begins (see **Figure 46 on page 88**).

Shield or insulate exhaust lines if there is danger of personal contact. Allow at least 305 mm (12 inches) of clearance if the pipes pass close to a combustible wall or partition. Before installing insulation on exhaust system components, check the exhaust system for leaks while operating the generator set under full load and correct all leaks.

Refer to T-030, *Liquid Cooled Generator Set* Application Manual for more detailed information about sizes of exhaust system pipes and fittings.



No.	Description	No.	Description
1	Rain Cap	6	Exhaust Pipe Diameter Plus 304 mm (12 Inches)
2	Drip Cap	7	Flashing
3	Holes in End of Inner Sleeve	8	230 mm (9 Inches) Minimum
4	Roof	9	Outside or Dividing Wall
5	230 mm (9 inches) Minimum		

FIGURE 45. EXHAUST THIMBLE

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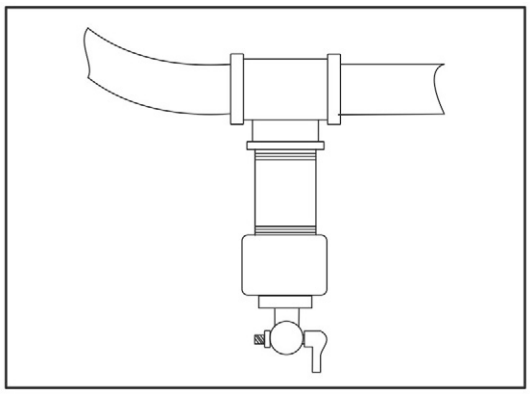
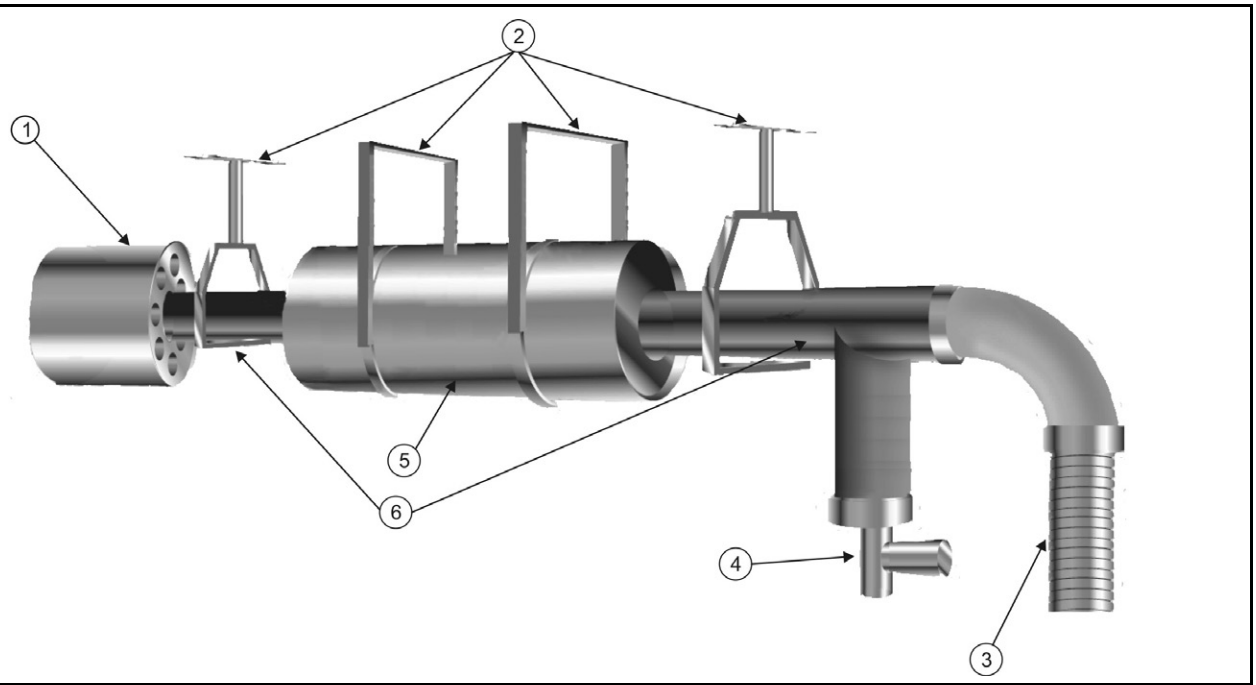


FIGURE 46. CONDENSATION TRAP

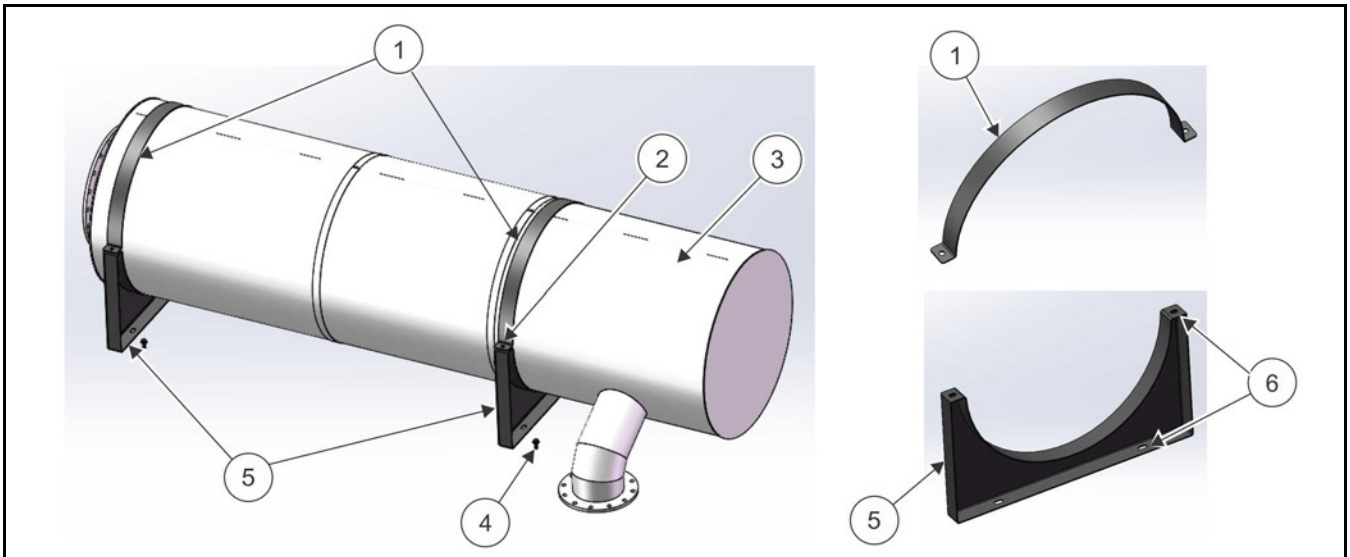


No.	Description	No.	Description
1	Exhaust Thimble	4	Water Trap with Drain
2	Support Brackets	5	Muffler
3	Flexible Bellows	6	Exhaust Pipe

FIGURE 47. TYPICAL SUSPENDED EXHAUST SYSTEM

The bottom of the muffler is being supported by two mounting brackets with 4 M20 screws under the mounting brackets used to fix them. Two clamps on the top of the silencer fits with mounting brackets and 4 M20 screws, nuts, and gaskets. Installation torque for the screw following Q/STB 12.521.5-2000 is required.

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No.	Description	No.	Description
1	Clamps (Width 80 mm, Thickness 5 mm)	4	M20 x 30 Screw (4)
2	M20 x 30 Screw and nut (4)	5	Mounting Brackets
3	Muffler	6	Waist Holes

FIGURE 48. MUFFLER ASSEMBLY INSTALLATION (4 IN 1)

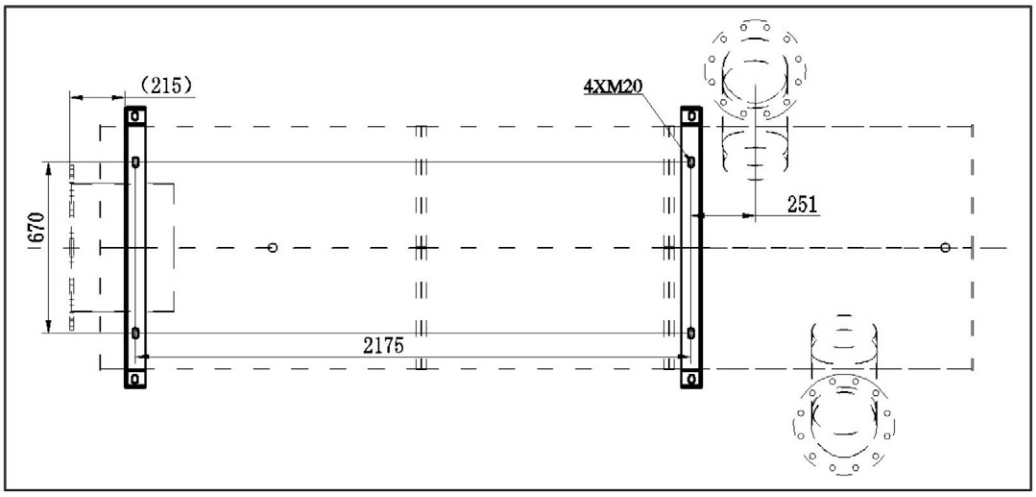


FIGURE 49. MUFFLER INSTALLATION HOLES (WITH DISTANCE FOR BRACKET INSTALLATION)

7.3 Ventilation and Cooling

⚠ WARNING

Toxic Gases

Engine and radiator cooling air may carry carbon monoxide gas, which can cause asphyxiation and death.

Pipe exhaust gas outside and away from windows, doors, or other inlets to buildings. Do not allow exhaust gas to accumulate in habitable areas.

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Generator sets create considerable heat that must be removed by proper ventilation.

Generator sets in factory-mounted housings for outdoor installation are designed for proper cooling and ventilation.

Indoor installations require careful design with respect to cooling and ventilation. In an indoor installation, all radiator cooling air must be discharged to the out-of-doors. Duct adapter kits are available.

Outdoor installations normally rely on natural air circulation but indoor installations need properly sized and positioned vents for required airflow.

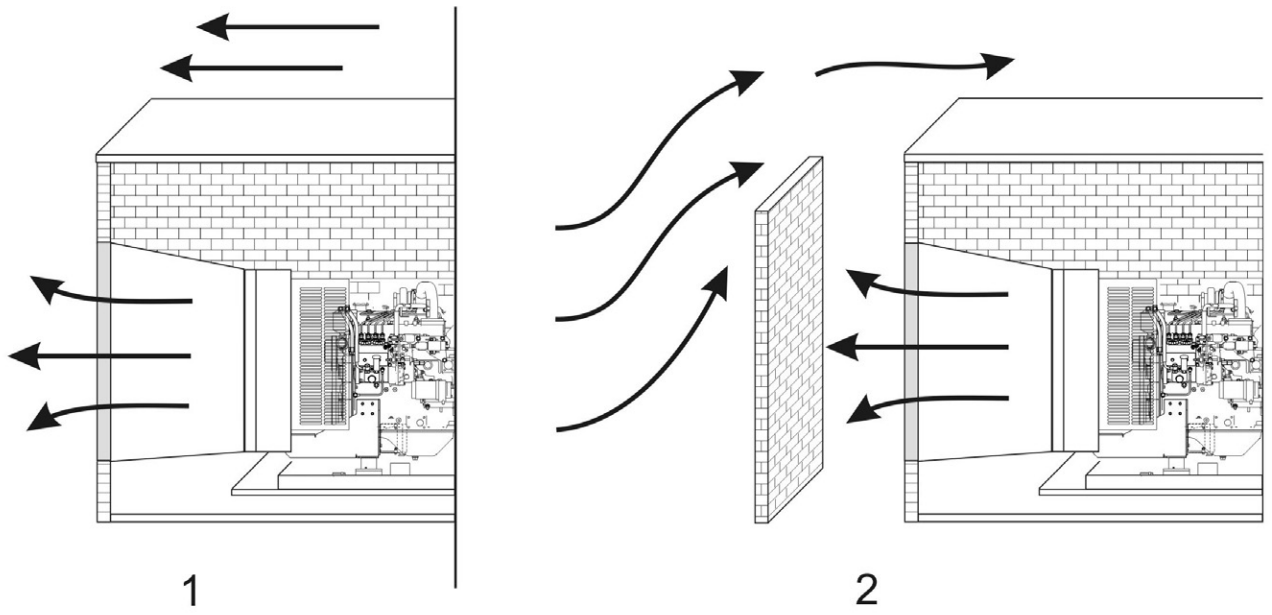
Transfer the stray voltage from the cooling system to the ground through the skid.

7.4 Vents and Ducts

1. For indoor installations, locate vents so incoming air passes through the immediate area of the installation before exhausting. Install the air outlet higher than the air inlet to allow for convection air movement.
2. Size the vents and ducts so they are large enough to allow the required flow rate of air.
3. Wind will restrict free airflow if it blows directly into the air outlet vent. Locate the outlet vent so the effects of wind are eliminated, or if the outlet vent cannot be located as mentioned, install a wind barrier. See **Figure 50**.

NOTICE
The "free area" of ducts must be as large as the exposed area of the radiator. Refer to the generator set Specification Sheet for the airflow requirements and allowed airflow restriction.

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No.	Description	No.	Description
1	Prevailing Wind Away from Air Outlet Vent	2	Prevailing Wind Towards Air Outlet Vent, Wind Barrier Installed

FIGURE 50. WIND BARRIER

7.5 Dampers

Dampers or louvers protect the generator set and equipment room from the outside environment. Their operation of opening and closing should be controlled by operation of the generator set.

In cold climates, the radiator exhaust air can be recirculated to modulate the ambient air temperature in the generator set room. This will help the generator set warm up faster, and help to keep fuel temperatures higher than the cloud point of the fuel. If recirculation dampers are used, they should be designed to 'fail closed', with the main exhaust dampers open, so that the generator set can continue to operate when required. Designers should be aware that the generator set room operating temperature will be very close to the outdoor temperature, and either not route water piping through the generator set room, or protect it from freezing.

7.6 Air Inlet and Outlet Openings

Louvers and screens over air inlet and outlet openings restrict air flow and vary widely in performance.

A louver assembly with narrow vanes, for example, tends to be more restrictive than one with wide vanes. The effective open area specified by the louver or screen manufacturer should be used.

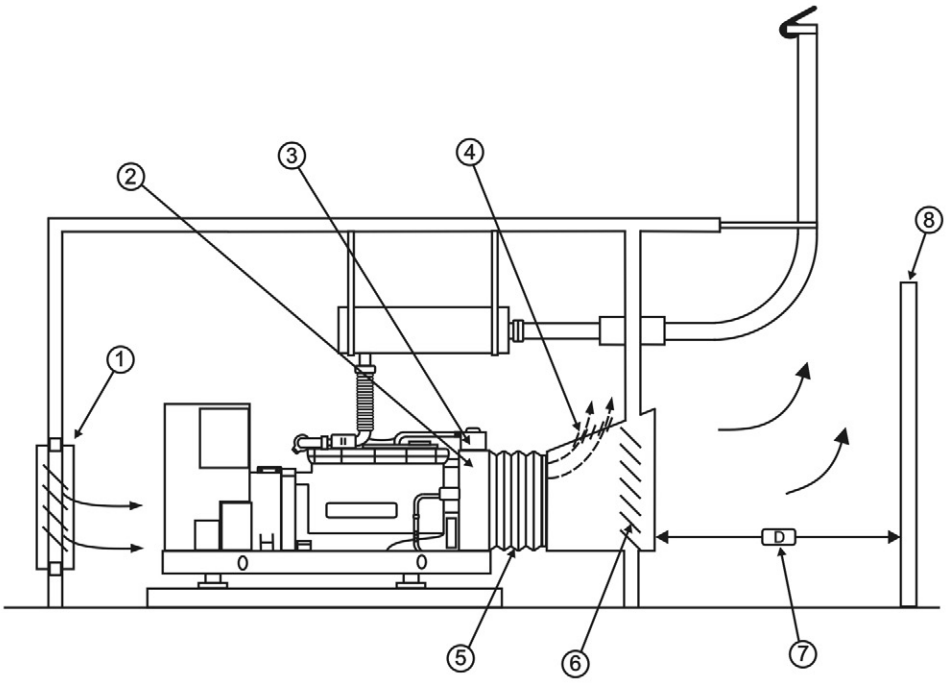
Radiator set cooling air is drawn past the control end of the set by a pusher fan that blows air through the radiator. Locate the air inlet to the rear of the set. Make the inlet vent opening 1.5 times larger than the radiator area.

Locate the cooling air outlet directly in front of the radiator and as close as possible. The outlet opening must be at least as large as the radiator area. Length and shape of the air outlet duct should offer minimum restriction to airflow.

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A flexible duct connector must be provided at the radiator to prevent exhaust air recirculation around the radiator, to take up generator set movement and vibration, and to prevent transmission of noise. Attach the flexible duct using screws and nuts so that the duct can be removed for maintenance purposes. Before installing the duct, remove the radiator core guard.

Enclosed generator sets are primarily designed to work in an open environment. When considering installing an enclosed generator set in an enclosed environment specific application factors must be considered (air flow, exhaust gas extraction, fuel supply and storage, etc.). For advice, contact the Application Engineering Group at Cummins.



No.	Description	No.	Description
1	Cool Air Inlet Damper	5	Flexible Duct Connector
2	Engine Driven Fan	6	Hot Air Outlet Damper
3	Radiator	7	Distance Should Not be Less Than Height of Radiator
4	Thermostat Controlled Re-Circulating Damper	8	Wind/Noise Barrier

FIGURE 51. TYPICAL OPEN GENERATOR SET INSTALLATION

7.7 HMI Pedestal (S9 Alternator)

7.7.1 Tools

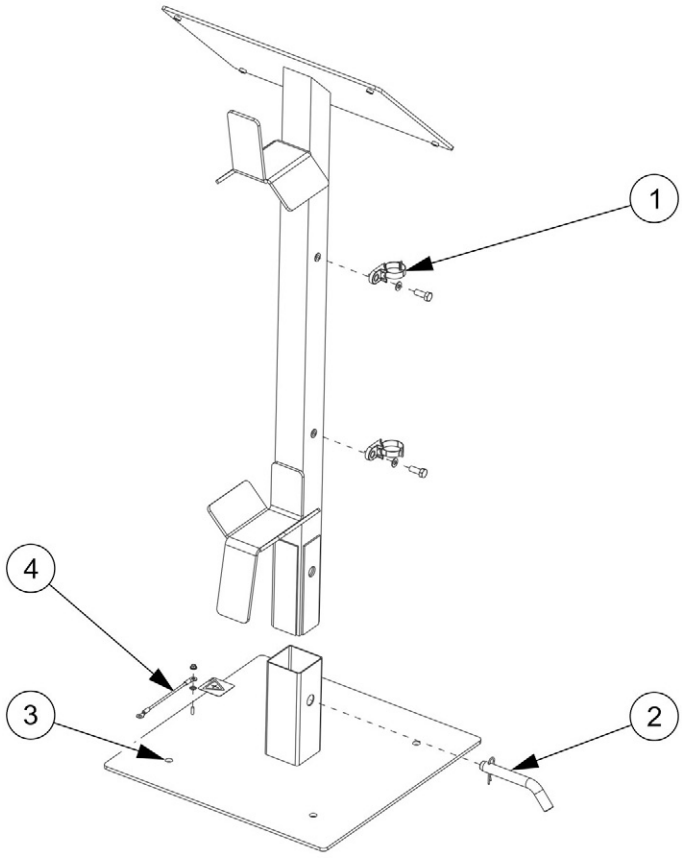
- Torque Wrench - 26 Nm (20 ft-lb)
- 13 mm socket

7.7.2 Installation Instructions

1. Make sure all sources of potential energy are isolated. Lock the generator set out of service.

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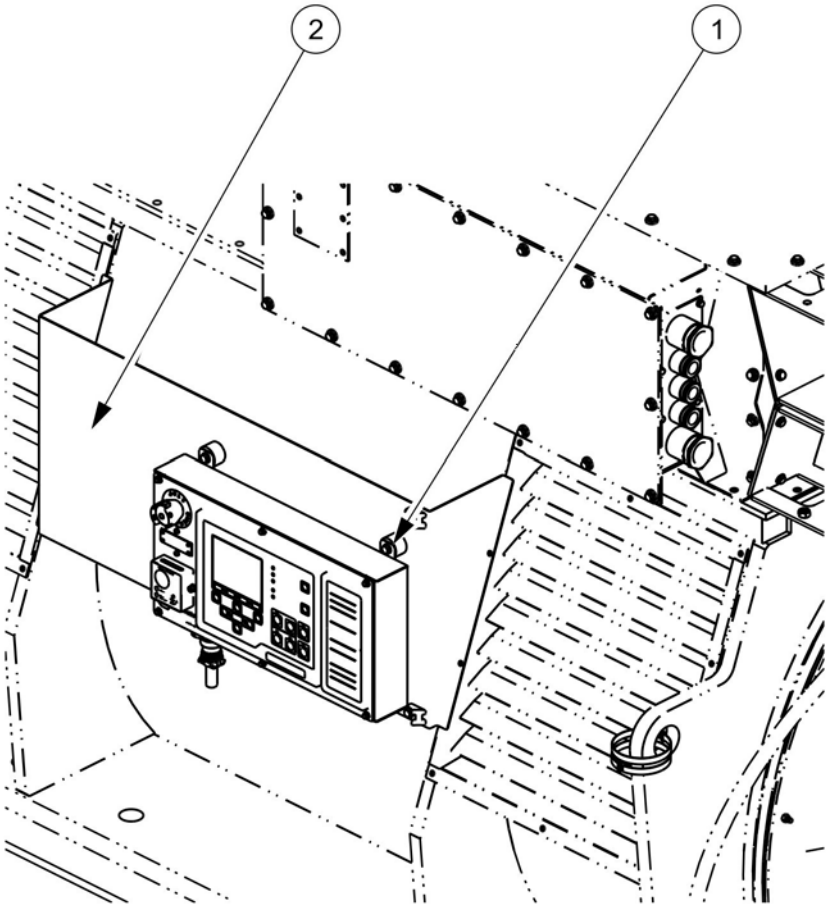
2. Make sure that the locking pin and cotter pin is installed in the pedestal (2, **Figure 52 on page 93**).
3. Attach the pedestal to the floor with four M12 bolts. The holes in the pedestal (3, **Figure 52 on page 93**) have a 530 mm square pattern.
4. Attach the mounting clamps (1, **Figure 52 on page 93**) to the pedestal.
5. Make sure the ground strap (4, **Figure 52 on page 93**) is properly connect to earth ground.
6. Remove four bolts and vibration isolators (1, **Figure 53 on page 94**) from the existing control display.
7. Move the control display from the alternator mounting bracket (2, **Figure 54 on page 95**) to the stand.
8. Attach the control display to the pedestal with four bolts (1, **Figure 54 on page 95**). Torque bolts to 26 Nm (19.2 ft-lb).
9. Route the control display harness from the alternator to the control display on the pedestal. Connect the harness to the control display (**Figure 55 on page 95**).
10. Return the generator set to service.



No.	Description	No.	Description
1	Cable clamp	3	Mounting holes
2	Locking and cotter pin	4	Ground strap

FIGURE 52. HMI PEDESTAL

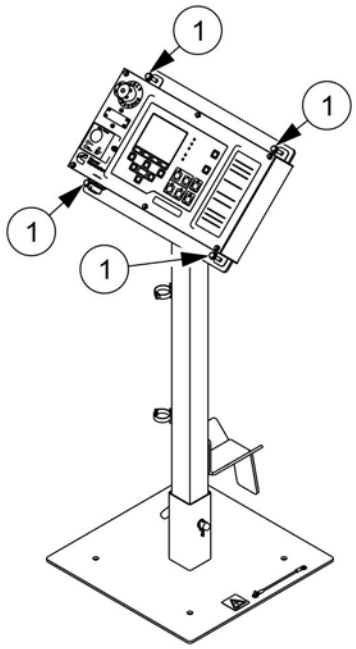
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No.	Description	No.	Description
1	Mounting bolt and vibration isolator	2	Mounting bracket

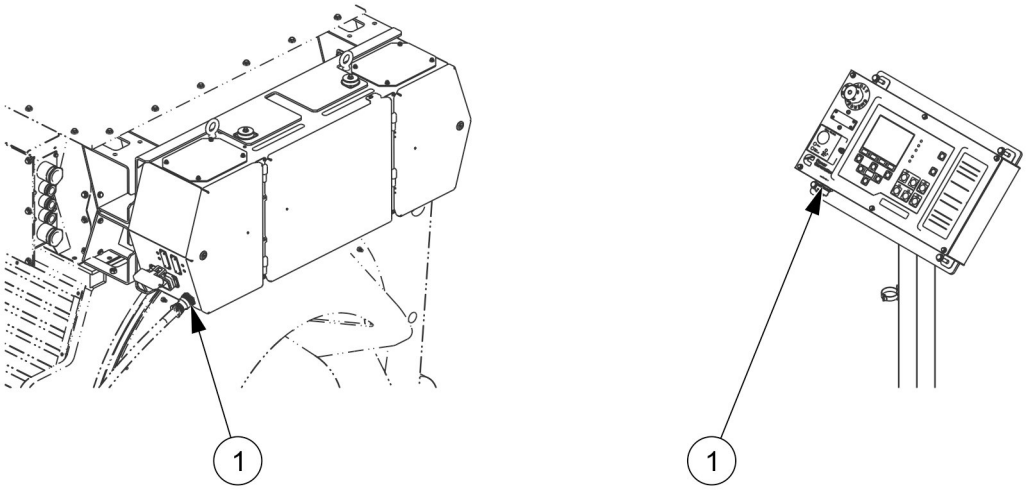
FIGURE 53. HMI CONTROL DISPLAY ON ALTERNATOR MOUNTING BRACKET

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No.	Description	No.	Description
1	Mounting bolts		

FIGURE 54. HMI CONTROL DISPLAY ON THE HMI PEDESTAL



No.	Description	No.	Description
1	HMI Connections		

FIGURE 55. HMI CONNECTIONS

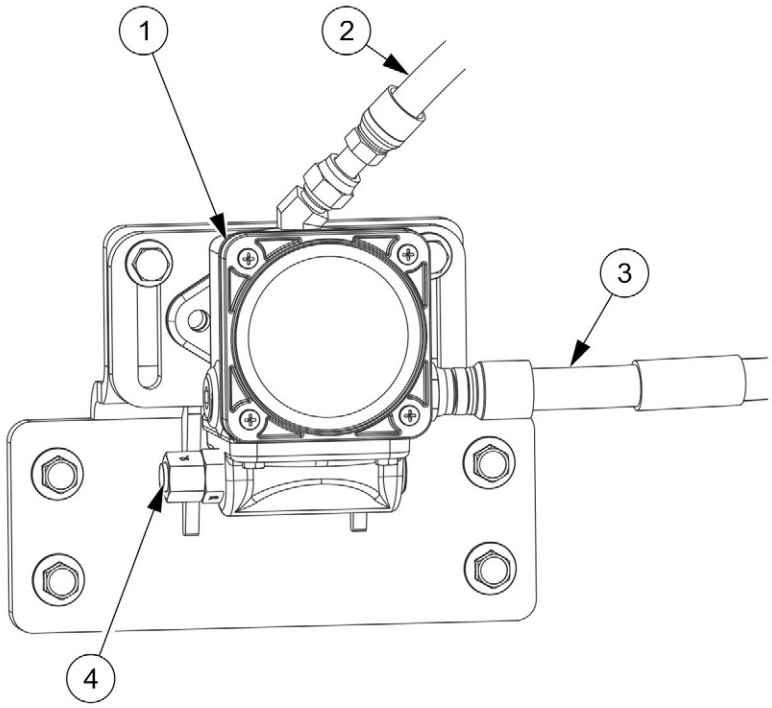
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7.8 Oil Maintainer System

The oil maintainer system is an optional feature available of the generator set. The oil maintainer system includes an oil level regulator and connection points. An auxiliary oil tank and tank mounting hardware is provided by the end user.

The oil maintainer system ensures a proper level of engine lubricating oil.

NOTICE
The regulator should not be used as an oil level sight glass. The oil regulator does not accurately reflect the level of oil in the engine oil pan.



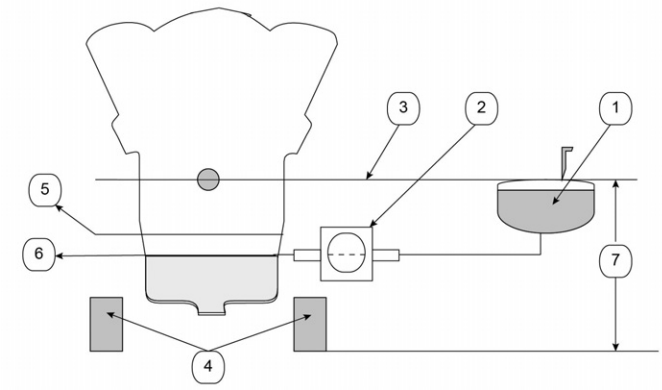
No.	Description	No.	Description
1	Oil regulator	3	Supply line to the engine oil pan
2	Vent line to the engine	4	Bulk supply line connection from auxiliary oil tank

FIGURE 56. OIL MAINTAINER

7.8.1 Oil Maintainer System Installation Guidelines

NOTICE
Generator set damage can result from failure to comply with these guidelines. Failure to comply with these guidelines can result in generator set under lubrication or generator set lubrication system overflow. This under lubrication and overflow can ultimately lead to generator set damage. Consult with your local distributor for further information.

- The oil maintainer system must be supplied with clean oil from an auxiliary tank.
- The maximum capacity of the auxiliary tank is 208 liters (55 US gal).
- To ensure proper flow rate, locate the auxiliary tank within 3 meters (9.8 ft) of the generator set.
- To prevent overfill of the engine, do not locate the auxiliary tank above the center line of the engine.



No.	Description	No.	Description
1	Auxiliary Oil Tank	5	Engine Oil Full Mark
2	Oil Maintainer Regulator	6	Engine Oil Add Mark
3	Engine center line	7	Engine center line and top of auxiliary oil tank should be equal distance from the skid base
4	Skid base		

FIGURE 57. TYPICAL OIL MAINTAINER INSTALLATION

7.9 Breakerless Conductor Connections

7.9.1 Overload and Short Circuit Protection of Generator

NFPA 70: National Electrical Code compliant generator sets are required to be protected from an overload. Cummins generator sets with UL Listed AmpSentry Protective Relay as a standard feature do not require a circuit breaker or other protective device for NEC compliance or UL 2200 Listing.

CEC: Each conductor between the generator terminal and the point where load receives supply of generator current must be protected by an overcurrent device in accordance with the requirement of CEC 14-100: Overcurrent Protection of Conductor.

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UL label indicates to the Authority Having Jurisdiction (AHJ) that the generator set incorporates a UL Listed Protective Relay that provides overload and short circuit protection for the generator and its conductors. The generator set does not require use of a circuit breaker or other protective device for NFPA 70: National Electrical Code compliance or UL 2200 Listing.

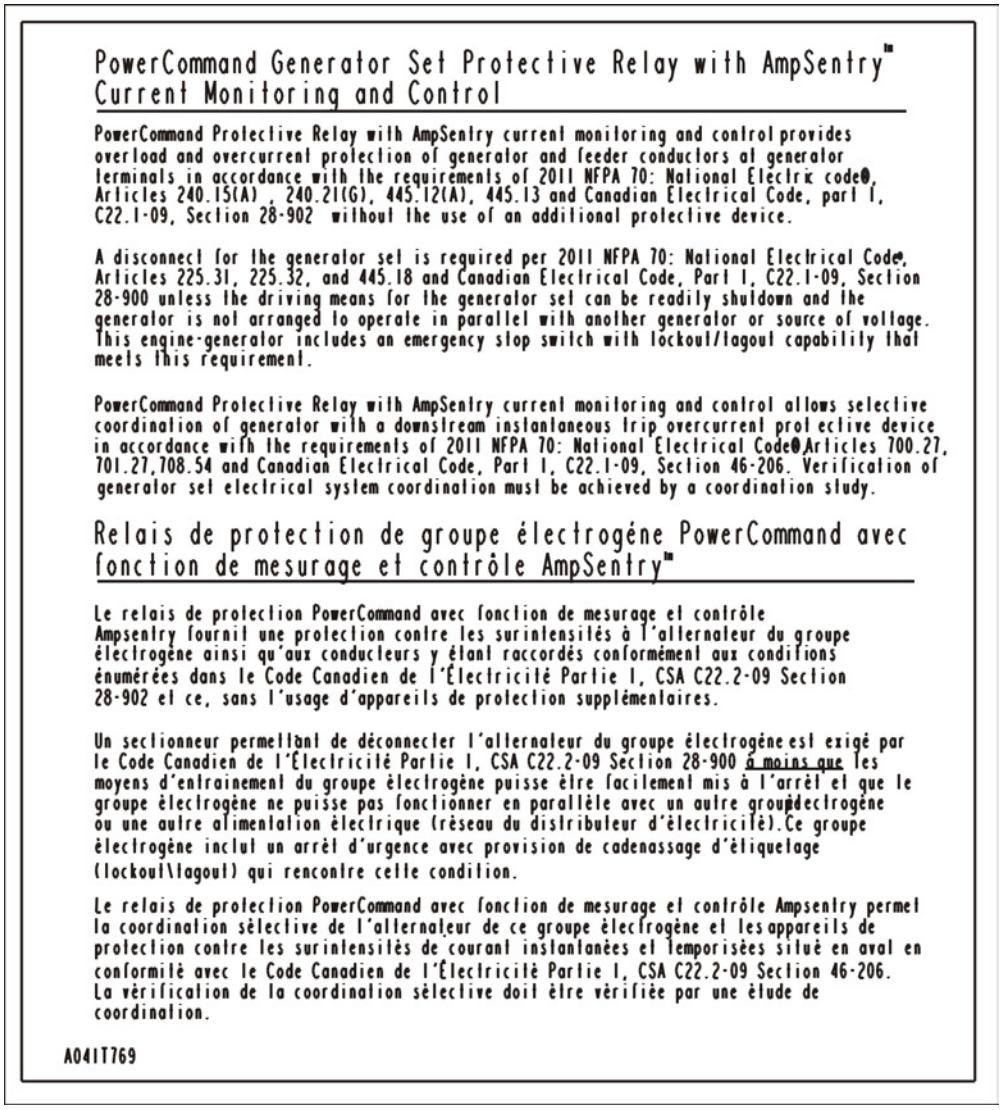
If Amp Sentry is not being used as the primary overload device, the size of the circuit breaker **must** be rated equal to or greater than the generator set voltage with a current rating at least 100 percent (inclusive) of the rated output current of the unit and no more than 125 percent. The circuit breaker **must** be installed no more than 25 feet (7.6 m) from the generator set output terminals.

7.9.1.1 AmpSentry Labels

These are typical labels for UL compliant generator sets produced after January 2012.



FIGURE 58. POWER COMMAND 3.3 LABEL



PowerCommand Generator Set Protective Relay with AmpSentry™ Current Monitoring and Control

PowerCommand Protective Relay with AmpSentry current monitoring and control provides overload and overcurrent protection of generator and feeder conductors at generator terminals in accordance with the requirements of 2011 NFPA 70: National Electric code®, Articles 240.15(A) , 240.21(G), 445.12(A), 445.13 and Canadian Electrical Code, part I, C22.1-09, Section 28-902 without the use of an additional protective device.

A disconnect for the generator set is required per 2011 NFPA 70: National Electrical Code®, Articles 225.31, 225.32, and 445.18 and Canadian Electrical Code, Part I, C22.1-09, Section 28-900 unless the driving means for the generator set can be readily shutdown and the generator is not arranged to operate in parallel with another generator or source of voltage. This engine-generator includes an emergency stop switch with lockout/tagout capability that meets this requirement.

PowerCommand Protective Relay with AmpSentry current monitoring and control allows selective coordination of generator with a downstream instantaneous trip overcurrent protective device in accordance with the requirements of 2011 NFPA 70: National Electrical Code®Articles 700.27, 701.27,708.54 and Canadian Electrical Code, Part I, C22.1-09, Section 46-206. Verification of generator set electrical system coordination must be achieved by a coordination study.

Relais de protection de groupe électrogéne PowerCommand avec fonction de mesurage et contrôle AmpSentry™

Le relais de protection PowerCommand avec fonction de mesurage et contrôle Ampsentry fournit une protection contre les surintensités à l'alternateur du groupe électrogène ainsi qu'aux conducteurs y étant raccordés conformément aux conditions énumérées dans le Code Canadien de l'Électricité Partie I, CSA C22.2-09 Section 28-902 et ce, sans l'usage d'appareils de protection supplémentaires.

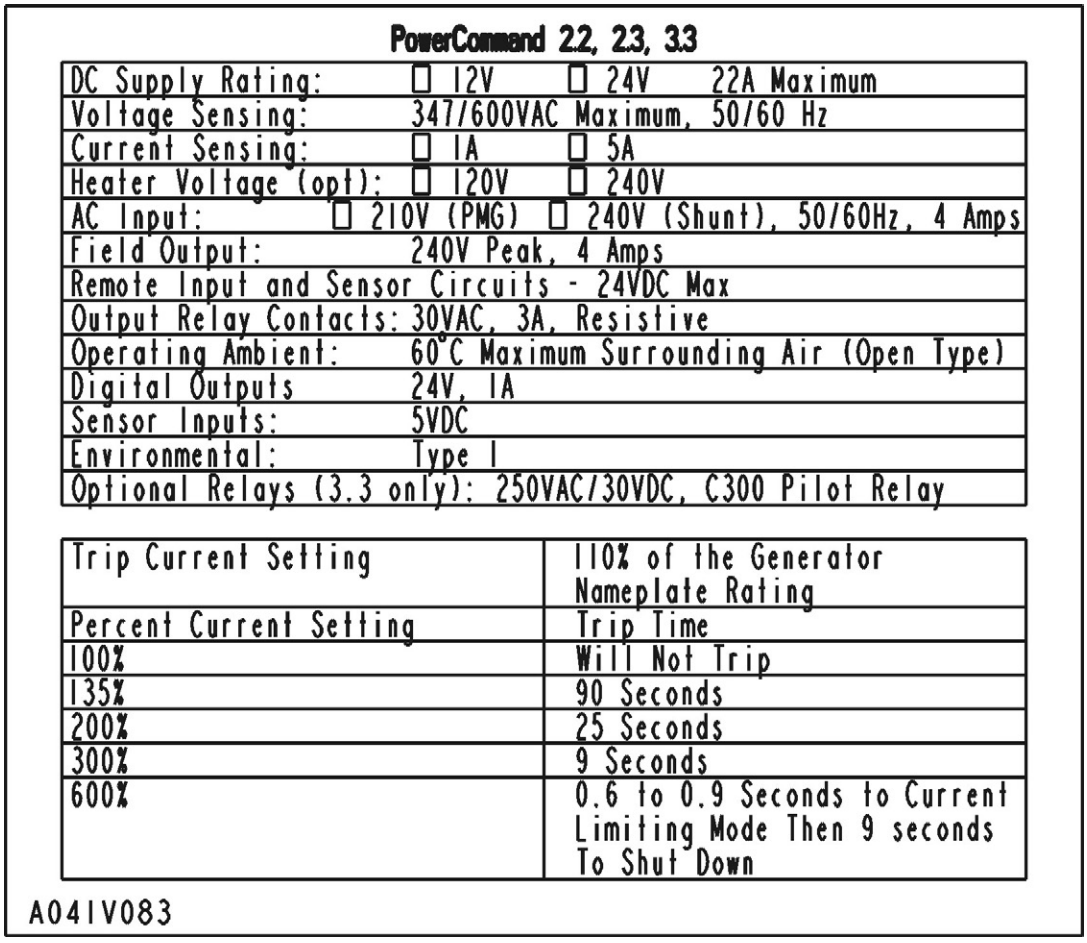
Un sectionneur permettant de déconnecter l'alternateur du groupe électrogène est exigé par le Code Canadien de l'Électricité Partie I, CSA C22.2-09 Section 28-900 à moins que les moyens d'entrainement du groupe électrogène puisse être facilement mis à l'arrêt et que le groupe électrogène ne puisse pas fonctionner en parallèle avec un autre groupeélectrogène ou une autre alimentation électrique (réseau du distributeur d'électricité).Ce groupe électrogène inclut un arrêt d'urgence avec provision de cadenassage d'étiquetage (lockout\tagout) qui rencontre cette condition.

Le relais de protection PowerCommand avec fonction de mesurage et contrôle Ampsentry permet la coordination sélective de l'alternateur de ce groupe électrogène et les appareils de protection contre les surintensités de courant instantanées et temporisées situé en aval en conformité avec le Code Canadien de l'Électricité Partie I, CSA C22.2-09 Section 46-206. La vérification de la coordination sélective doit être vérifiée par une étude de coordination.

A041T769

FIGURE 59. TYPICAL INFORMATION LABEL

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PowerCommand 2.2, 2.3, 3.3

DC Supply Rating:	☐ 12V ☐ 24V 22A Maximum
Voltage Sensing:	347/600VAC Maximum, 50/60 Hz
Current Sensing:	☐ 1A ☐ 5A
Heater Voltage (opt):	☐ 120V ☐ 240V
AC Input:	☐ 210V (PMG) ☐ 240V (Shunt), 50/60Hz, 4 Amps
Field Output:	240V Peak, 4 Amps
Remote Input and Sensor Circuits - 24VDC Max	
Output Relay Contacts:	30VAC, 3A, Resistive
Operating Ambient:	60°C Maximum Surrounding Air (Open Type)
Digital Outputs	24V, 1A
Sensor Inputs:	5VDC
Environmental:	Type 1
Optional Relays (3.3 only):	250VAC/30VDC, C300 Pilot Relay

Trip Current Setting	110% of the Generator Nameplate Rating
Percent Current Setting	Trip Time
100%	Will Not Trip
135%	90 Seconds
200%	25 Seconds
300%	9 Seconds
600%	0.6 to 0.9 Seconds to Current Limiting Mode Then 9 seconds To Shut Down

A041V083

FIGURE 60. POWER COMMAND 2.2, 2.3, AND 3.3 SPECIFIC CHECK LABEL

7.9.2 AmpSentry Protective Relay Time-Over Current Characteristic Curve

The protection provided is shown in the figure below, which shows the time-current characteristic of the supplied protection. This protection curve is specifically designed to protect the generator supplied, so adjustments to the operation points for this curve are not allowed.

NOTICE
The values shown on the current scale are shown based on the value of 1.0 being equal to the nameplate rated current of the generator set for the specific operating voltage.

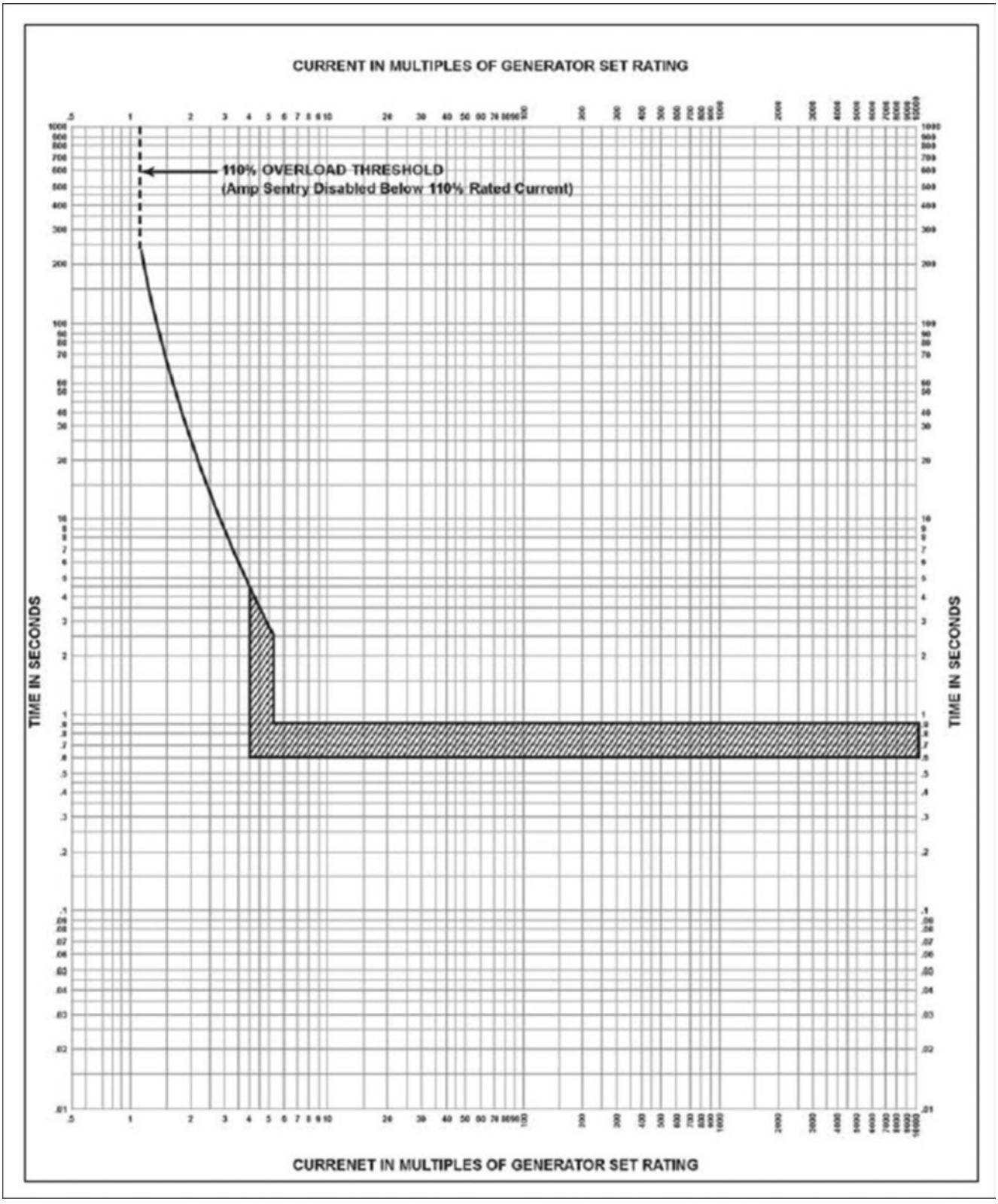


FIGURE 61. AMPSENTRY PROTECTIVE RELAY TIME OVER-CURRENT CHARACTERISTIC CURVE

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7.9.3 Coordination of Protective Devices

Conduct a selective coordination (discrimination) study on the distribution system that incorporates the generator set when choosing a generator set. Visit **power.cummins.com** for a copy of document R-1053, or it can be found using SKM Power Tools for Windows library or from your distributor.

7.9.4 Additional AmpSentry Protective Relay Information

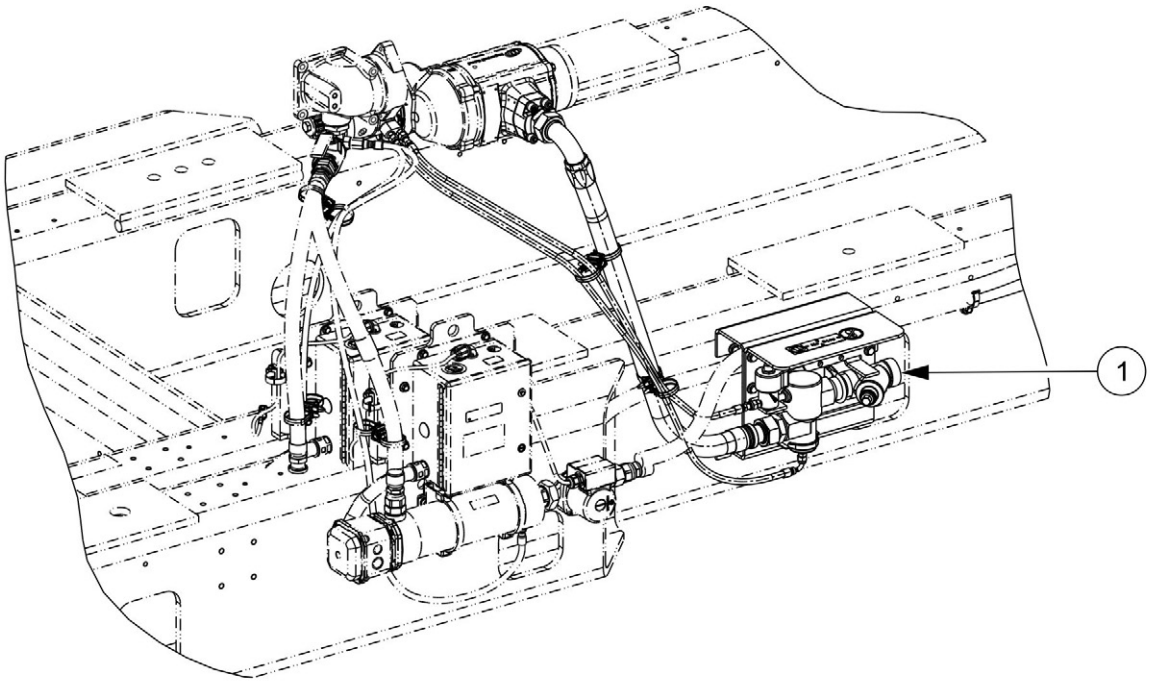
TABLE 14. ADDITIONAL AMPSENTRY INFORMATION FOR POWERCOMMAND 3.X CONTROL

Trip Current	110% Generator Set Nameplate FLA		
Percentage of Trip Current	100	300	600
Trip Times	500 seconds	10 seconds	1 second
Temperature	70°C Maximum Surrounding Air Ambient		

7.10 Air Starter

Connect a 550 to 1034 kPa (80 to 150 psi) air source to the port shown in **Figure 62 on page 102**.

Table 15 on page 103 gives performance data for the starter.



No.	Description	No.	Description
1	Air connection port		

FIGURE 62. AIR CONNECTION PORT

TABLE 15. AIR STARTER PERFORMANCE DATA

Pressure (psig)	Breakaway Torque (ft-lb)	Speed @ Maximum Power (rpm)	Maximum Power (hp)	Flow @ Maximum Power (scfm)
30	60	900	8	370
60	135	1290	23	590
90	215	1515	40	820
120	295	1675	55	1050
150	372	1780	70	1290

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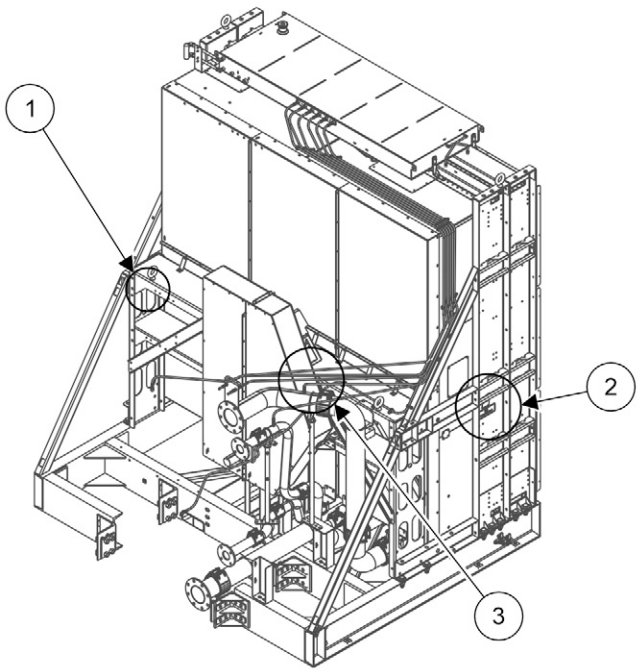
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8 Radiator Assembly Instructions

8.1 Radiator Identification

8.1.1 Radiator Identification

Several types of radiators are used depending on the generator set configuration. The radiator part number is printed on the radiator data plate and can be found in one of the indicated locations.



No.	Description	No.	Description
1	Near Left Rear Lifting Eye	3	On Right Side of Belt Guarding
2	On Right Side Core Support		

FIGURE 63. RADIATOR DATA PLATE LOCATIONS

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TABLE 16. RADIATOR PART NUMBER AND INSTALLATION CHAPTER REFERENCE

Model	Radiator Chapter
A048D623	Section 8.3 on page 109
A048D645	
A048D652	
A052D767	
A052D765	
A049E410	
A065K735	
A065K736	
A065K741	
A065K742	
A065K746	
A063X313	
A063X314	
A053J805	
A054B569	
A072Y755	
A065H332	
A078R238	
A078R241	
A078T815	
A078T816	
A078T818	
A078T819	
A078L535	Section 8.4 on page 175
A078L534	
A076E016	

8.2 Remote Radiator Installation

Special requirements apply if your generator set includes a remote radiator. For more information, refer to Section 8.2.1 on page 107.

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8.2.1 Remote Radiator Cooling

The remote radiator cooling substitutes a remote mounted radiator and an electrically driven fan in place of generator set mounted components. Removal of the radiator and the fan from the generator set reduces noise levels without forcing dependence on a continuous cooling water supply (necessary with heat exchanger cooling). The remote radiator installation must be completely protected against freezing.

Remote radiator plumbing will vary with installation. Follow recommendations given in Application Manual T-030. See product for friction head and static head limits.

NOTICE
Before filling the cooling system, make sure all hardware is tight. This includes hose clamps, cap screws, fittings, and connections. Use flexible coolant lines with heat exchanger or remote mounted radiator.

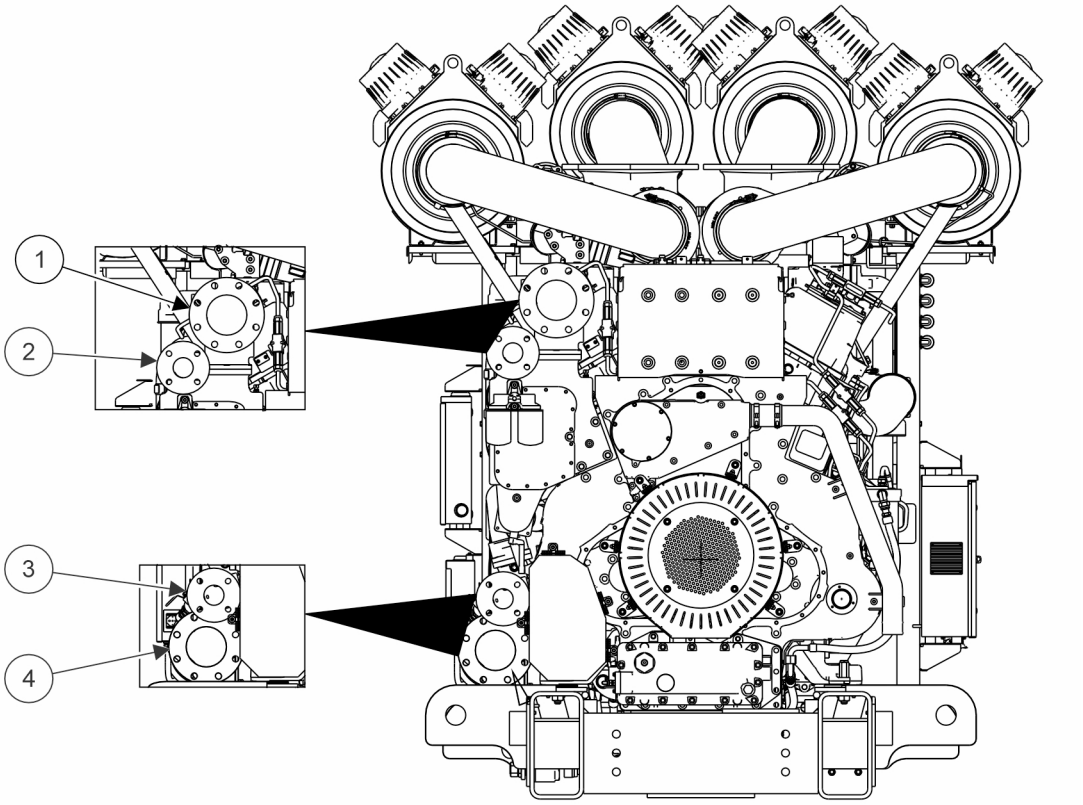
NOTICE
All customer connections must be fully supported where they interface with flexible coolant flange. The support must be located within 100 mm from the flexible flange connection.

8.2.2 Remote Radiator Installation

Installations set up for remote radiator cooling may or may not include flanges. Refer to **Appendix B on page 277** for outline drawings showing remote radiator installations.

A low coolant level sender and a wiring harness are supplied with the generator set. Once the low coolant level sender is installed, refer to **Appendix A** for information on connecting the wiring harness.

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No.	Description	No.	Description
1	HT outlet	3	LT inlet
2	LT outlet	4	HT inlet

FIGURE 64. REMOTE RADIATOR COOLING COMPONENTS (INCLUDES FLANGES)

Table 17 shows specifications for the coolant piping.

NOTICE
Engine flanges will be damaged if raised face flanges are used for coolant connections. Use flat face style flanges.

TABLE 17. COOLANT PIPING SPECIFICATIONS

Connection	Maximum Bending Moment (Nm)	Maximum Bending Moment (ft-lb)	Maximum Length of Unsupported Schedule 40 Pipe with water (ft (mm))
LT inlet	55.73	41.10	2.79 (850.4)
LT outlet	38.00	28.00	2.30 (701)
HT inlet	76.67	56.50	1.90 (579)

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Connection	Maximum Bending Moment (Nm)	Maximum Bending Moment (ft-lb)	Maximum Length of Unsupported Schedule 40 Pipe with water (ft (mm))
HT outlet	73.33	54.10	1.87 (570)

8.3 Radiator Installation on Skid - A048D623, A048D645, A048D652, A052D767, A052D765, A049E410, A065K735, A065K736, A065K741, A065K742, A065K746, A063X313, A063X314, A053J805, A054B569, A072Y755, A065H332, A078R238, A078R241, A078T815, A078T816. A078T818, A078T819

8.3.1 Required Tools, Parts, and Consumables

The following tools are required to complete this installation.

- Tape measure
- Level
- Torque Wrenches
  - 40-200 in-lb, 3/8 inch drive
  - 15-75 ft-lb, 3/8 inch drive
  - 50-250 ft-lb, 1/2 inch drive
  - 120-600 ft-lb, 3/4 inch drive
- Toe Jacks, Fork Lift, or Overhead Crane capable of lifting generator set
  - If using overhead crane, appropriately sized rigging equipment
- Pipe wrench, 24 inch
- Hex socket
  - 6 mm
  - 8 mm
  - 17 mm
  - 5/16 inch
- Paint marker
- Socket
  - 36 mm
  - 1/2 inch
  - 15/16 inch
  - 1 1/8 inch

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- Deep socket
  - 9/16 inch
  - 15 mm
- Combination wrench
  - 1 1/16 inch
  - 1 1/4 inch
- 3/4 inch drive extension, 8 inch
- Belt tension tool (A050L945)
- Standard 6 inch (150 mm) Vernier calipers
- Steel bar (A059R243)
- Clamp (A001G779)
- Clean rags
- Molykote (MoS")
- ½ inch internal to 3/8 inch external square drive adapter
- 3/8 inch drive, 12 point, 21 mm torque adapter with 2 inch offset
- Jeweler files, or 150 grit or finer emery cloth

8.3.2 Safety Precautions

⚠ WARNING

Automated Machinery

Accidental or remote starting of the generator set can cause severe personal injury or death.

Isolate all auxiliary supplies and use an insulated wrench to disconnect the starting battery cables (negative [–] first).

⚠ WARNING

Electrical Generating Equipment

Incorrect operation and maintenance can result in severe personal injury or death.

Make sure that only suitably trained and experienced service personnel perform electrical and/or mechanical service.

⚠ WARNING

Combustible Gases

Ignition of battery gases is a fire and explosion hazard which can cause severe personal injury or death.

Using an insulated wrench, disconnect the negative (–) cable first and reconnect it last. Make certain hydrogen from the battery, engine fuel, and other explosive fumes are fully dissipated. This is especially important if the battery has been connected to a battery charger.

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⚠ WARNING

Combustible Gases

Ignition of battery gases is a fire and explosion hazard which can cause severe personal injury or death.

Do not smoke, or switch the trouble light ON or OFF near a battery. Touch a grounded metal surface first before touching batteries to discharge static electricity. Stop the generator set and disconnect the battery charger before disconnecting battery cables. Using an insulated wrench, disconnect the negative (–) cable first and reconnect it last.

⚠ WARNING

Electric Shock Hazard

Voltages and currents present an electrical shock hazard that can cause severe burns or death.

Make sure that only service personnel who are trained and experienced perform electrical and mechanical component installations. Follow all local requirements when working on electrical equipment. Isolate all forms of electrical energy before working on the generator set.

⚠ CAUTION

Hazardous Voltage

Contact with high voltages can cause severe electrical shock, burns, or death.

Disconnect the battery charger before isolating the battery.

⚠ CAUTION

Sharp Edges

Sharp edges/burrs on housing parts can cause cuts and puncture wounds.

When handling housing parts, use appropriate PPE.

Read these instructions completely and become familiar with safety warnings, cautions, and procedures before starting the installation.

The installer must be familiar with the techniques of working on heavy machinery. A hoist must be available which can support the weight of the radiator, with an appropriate lifting strength margin.

Turn off or remove AC power from the battery charger and then use an insulated wrench to remove the negative (**–**) battery cable from the set starting battery. This prevents the generator set from starting while working on it and to avoid circuit board damage, caused by voltage spikes when removing and replacing circuit board connectors.

8.3.3 Preparing for the Installation

When installing the generator set, make sure to consider what is needed to install the cooling system.

1. Make sure to have all of the necessary tools and any additional items needed to complete the installation.

   The following items must be supplied by the customer to complete the installation.

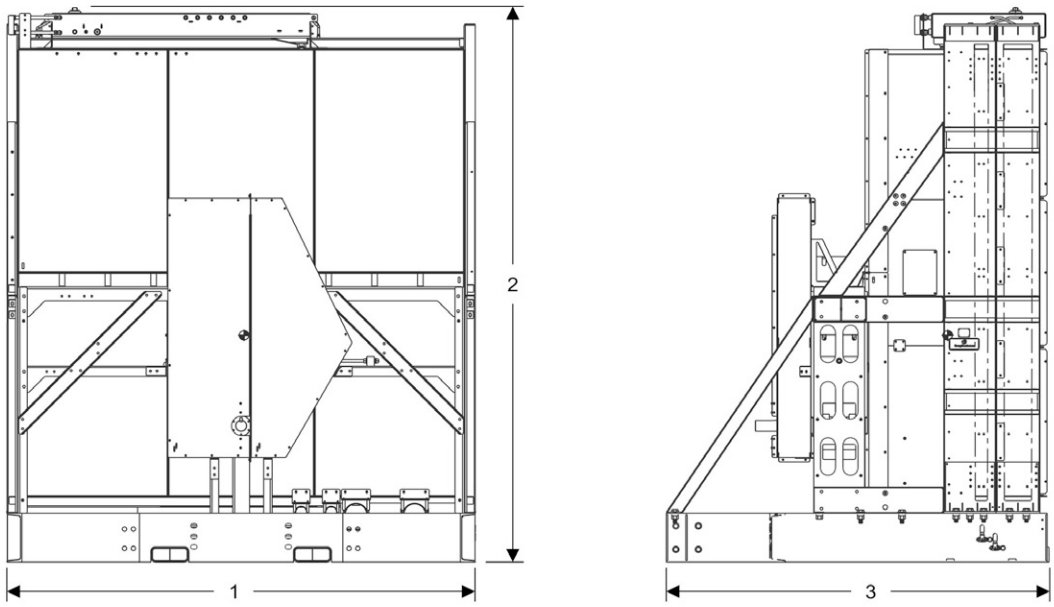
   - Cable ties to be used when installing the vent lines
   - Coolant mixture:
     - For 94 ft^2 radiators: fully formulated, a 50% EG coolant mixture.
     - For 84 ft^2 radiators: fully formulated, a 50% EG coolant mixture.

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- For 61 ft² radiators: fully formulated, a 50% EG coolant mixture.
- For fill volumes, refer to **Chapter 5**.

- High strength tread locking compound (Loctite 277 or equivalent)
- Anti-seize (Loctite C5-A or equivalent)
- Thread sealant (Loctite 592 or equivalent)
- Dielectric grease (Loctite 8423 or equivalent)

2. Apply the appropriate Hot Surface Warning Labels, included in the radiator kit, to the applicable parts as required per local codes and standards.
3. Make sure to have allowed enough space to install the radiator. Basic radiator dimensions are shown in **Figure 65**.



No.	Description	No.	Description
84 ft² High Ambient Radiator			
1	3029 mm (119.26 in)	3	2305 mm (90.75 in)
2	3767 mm (148.3 in)		
94 ft² Enhanced High Ambient Radiator			
1	3172 mm (124.9 in)	3	2591 mm (102 in)
2	3752 mm (147.7 in)		
61 ft² Radiator			
1	2610 mm (102.8 in)	3	2347 mm (92.4 in)
2	3355 mm (132 in)		

FIGURE 65. RADIATOR DIMENSIONS

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8.3.4 Radiator Rigging Instructions

⚠ WARNING

Heavy Load

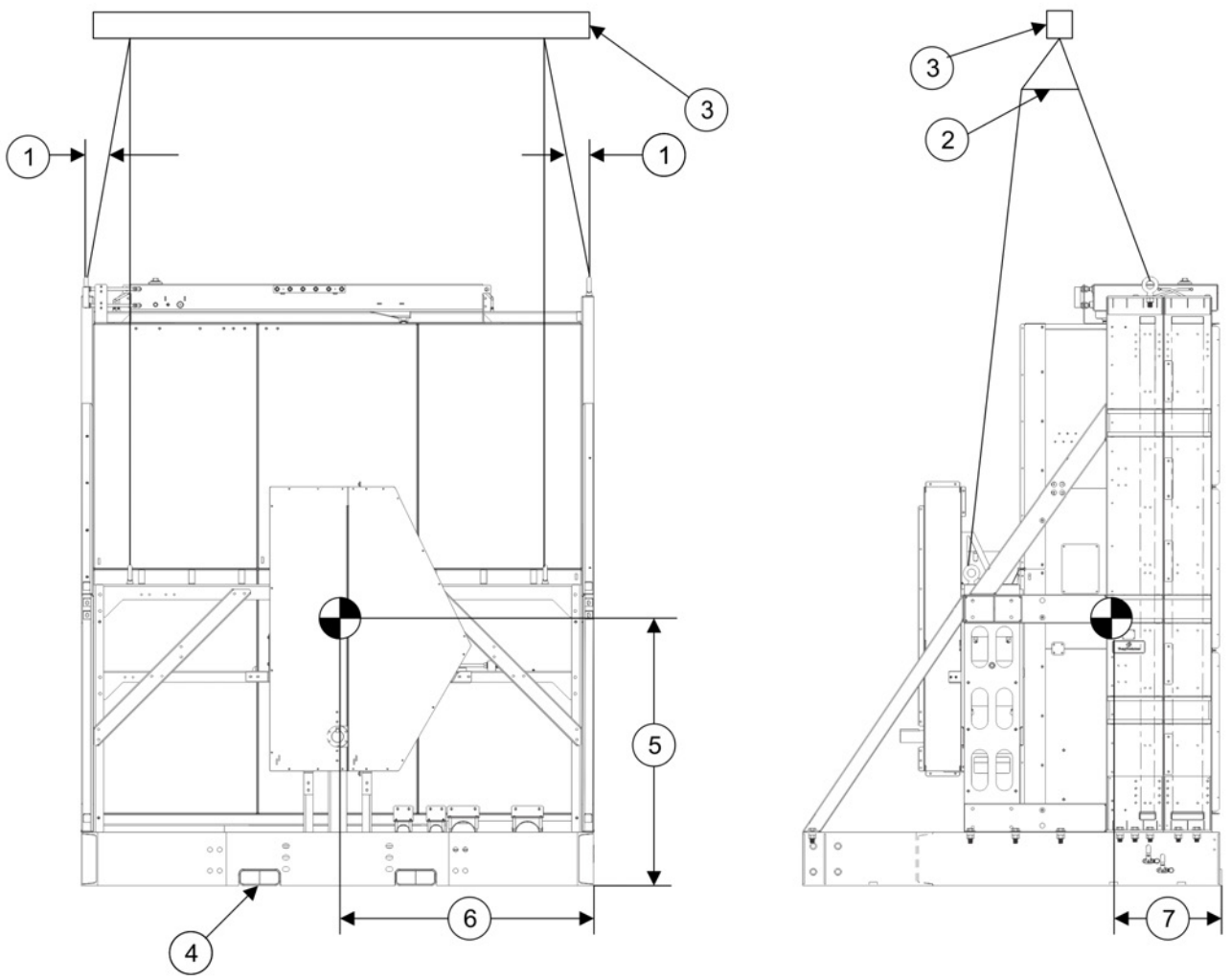
Incorrect lifting or repositioning can cause severe personal injury or death.

Make sure that only suitably trained or experienced personnel transport and handle radiator and associated components.

NOTICE

Do not lift the generator set with the radiator installed. Damage can occur.

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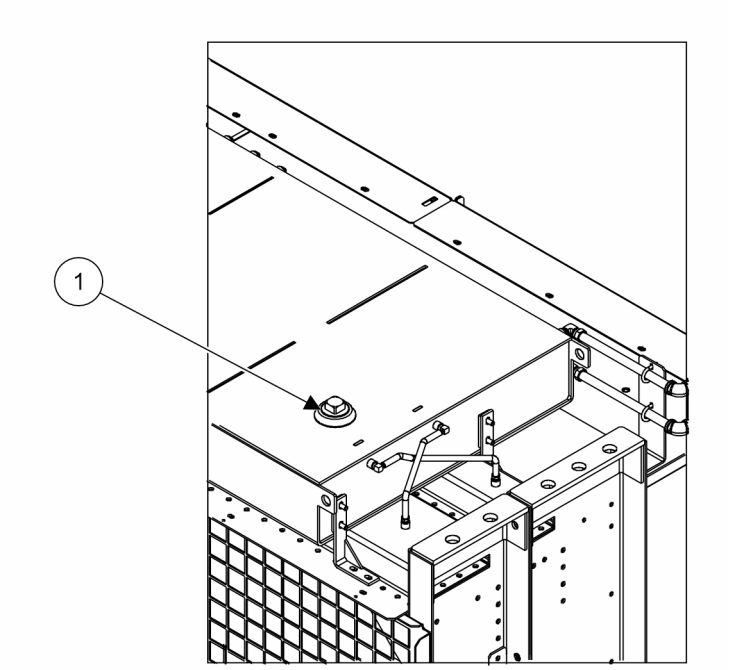
Item	Description	Item	Description
1	Angle 10° maximum	5	61 ft² radiator - 1542 mm (60.71 in) 84 ft² radiator - 1574 mm (61.97 in) 94 ft² radiator - 1535 mm (60.43 in)
2	Spreader bar to avoid damage to the fan guard	6	61 ft² radiator - 1300 mm (51.18 in) 84 ft² radiator - 1500 mm (59.06 in) 94 ft² radiator - 1566 mm (61.65 in)
3	Lifting beam	7	61 ft² radiator - 591 mm* (23.27 in) 84 ft² radiator - 634 mm (24.96 in) 94 ft² radiator - 686 mm (27.01 in)
4	Fork tube (quantity 2) 254 mm X 102 mm (10.0 in X 4.0 in)		Dry weight: 61 ft² radiator - 4456 kg (9,824 lb) 84 ft² radiator - 4581 kg (10,100 lb) 94 ft² radiator - 5130 kg (11,310 lb)

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Cables must not exceed a 45° angle from vertical in any direction. *Measured from the duct flange, which is the furthest rearward part.

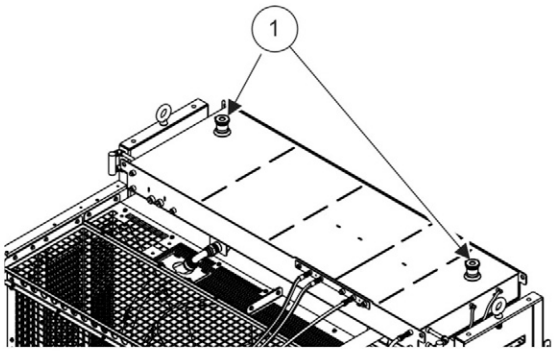
FIGURE 66. RADIATOR RIGGING

8.3.5 Install Fill Neck



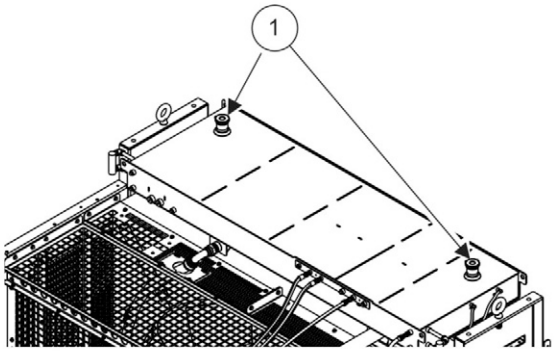
No.	Description	No.	Description
1	Fill neck plug		

FIGURE 67. FILL NECK PLUG LOCATION (84 AND 94 SQ FT RADIATORS)



No.	Description	No.	Description
1	Fill neck plugs		

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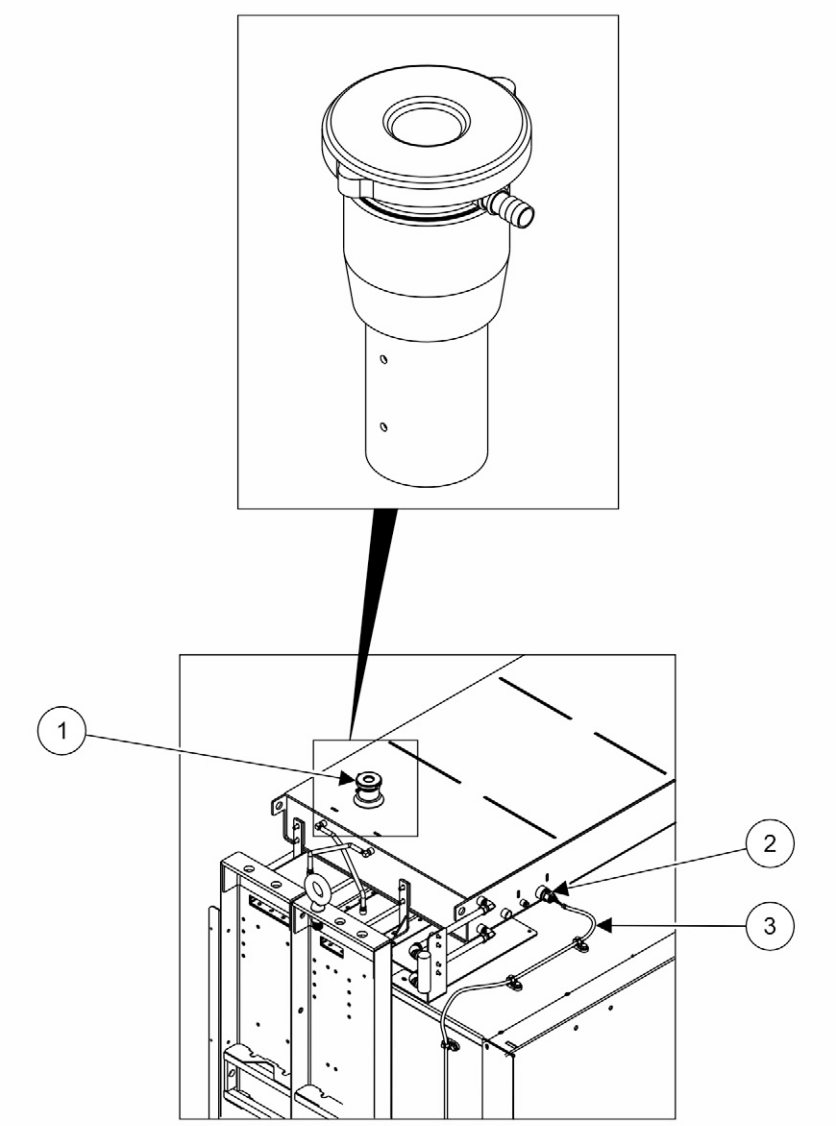


No.	Description	No.	Description

FIGURE 68. FILL NECK PLUG LOCATIONS (61 SQ FT RADIATOR)

1. Remove and dispose of the fill neck plug (1).
2. Apply thread sealant to the threads of the radiator fill neck (1, **Figure 69**). Make sure that the sealant covers the entire circumference of the fill neck threads.
3. Install the radiator fill neck into the radiator expansion tank. Make sure that the barbed fitting for the coolant overflow line points toward the left side (outboard) of the radiator when the fill neck is tightened.
4. Attach the coolant overflow line to the fill neck.
5. Route the overflow line down the left side of the radiator.
6. Secure the overflow line with cable ties.

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No.	Description	No.	Description
1	Fill neck	3	Low coolant level harness
2	Low coolant level sensor		

FIGURE 69. FILL NECK AND LOW COOLANT LEVEL SENSOR

8.3.6 Attach the Low Coolant Level Sensor

NOTICE
Numbers in parenthesis refer to Figure 69.

⚠ CAUTION

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⚠ CAUTION

Equipment Damage

Power tools can damage the low coolant level sensor.

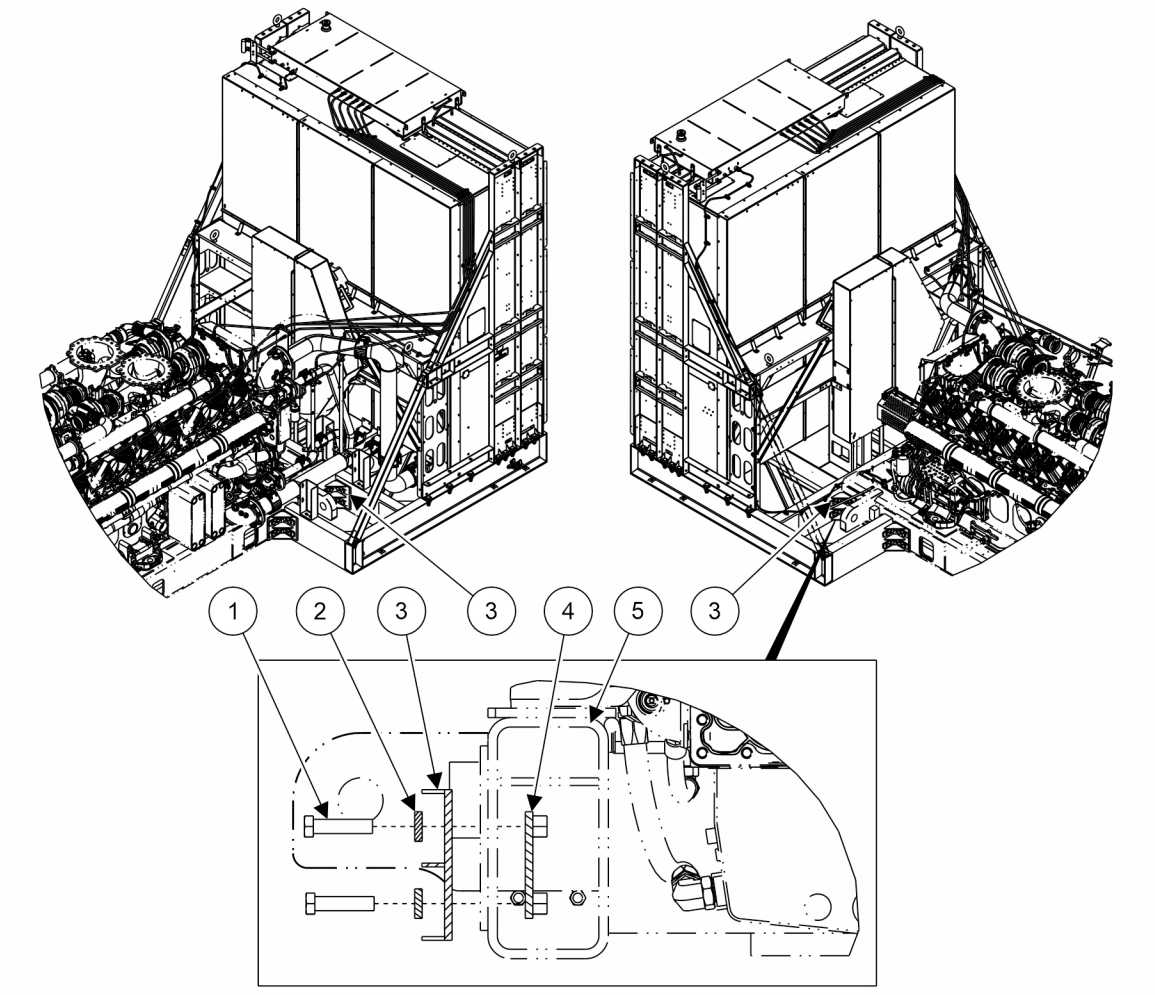
After installing by hand, use a manual torque wrench to complete the installation of the sensor

1. Remove and dispose of the internal hex plug in the radiator expansion tank.
2. Install the low coolant level sensor (2) by hand to be sure the sensor does not get damaged.
3. When the low coolant level sensor (2) is hand tight, use a manual torque wrench to tighten the sensor to 20 Nm (15 ft-lb).
4. Install the low coolant level harness (3) and retaining clips. Route the harness down the left side of the radiator.
5. Tighten retaining clip bolts to 52 Nm (38 ft-lb).

8.3.7 Install Front Radiator L-brackets on Generator Set Skid

NOTICE

Numbers in parenthesis refer to Figure 70 unless otherwise specified.



No.	Description	No.	Description
1	Bolt – M24 x 100 mm	4	Nut plate
2	Washer plate	5	Generator set skid
3	L-bracket		

FIGURE 70. FRONT LEFT AND RIGHT RADIATOR L-BRACKETS

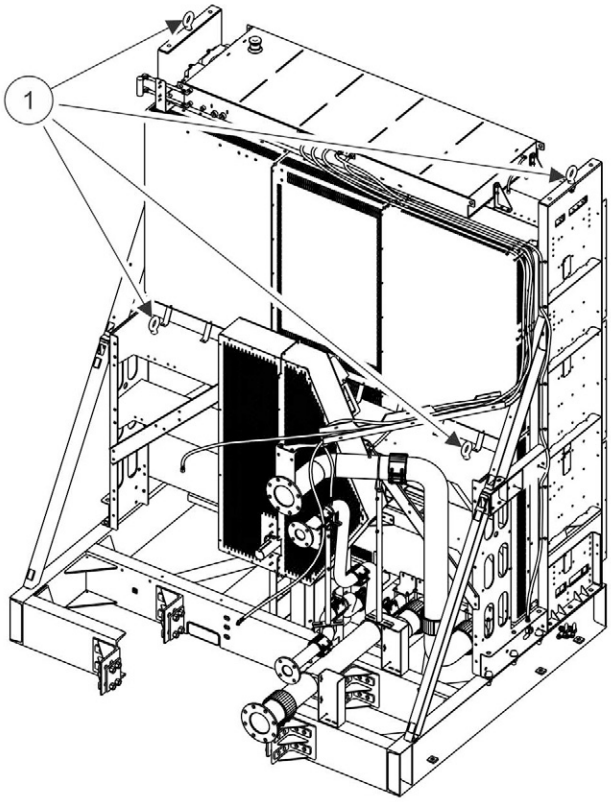
1. Apply anti-seize compound to threads of bolts (1).
2. Loosely install two L-brackets (3) on the generator set skid (5) at the front right and left radiator mounting locations. Use four bolts (1), two washer plates (2), and one nut plate (4) for each L-bracket (3).

8.3.8 Position the Radiator to the Generator Set

Do the following if using an overhead crane to position the radiator.

1. Connect lifting equipment to the four radiator lifting eye bolts (1, **Figure 71**). A spreader bar is required to allow for a vertical lift on the eye bolts.
2. Position the radiator to the generator set.

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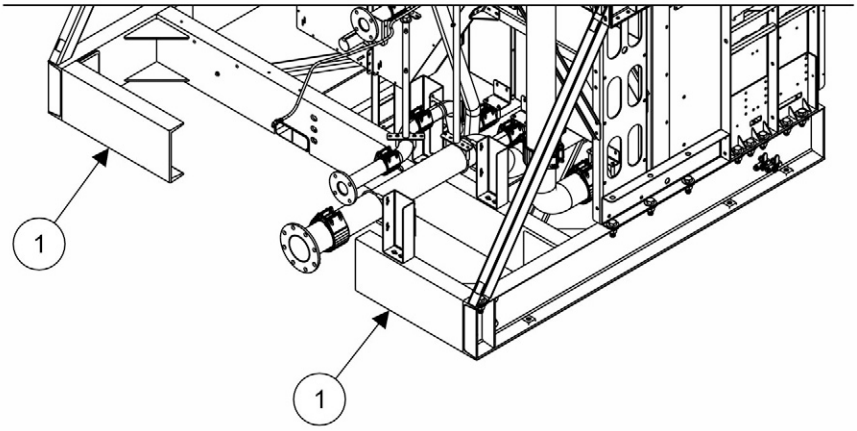
No.	Description	No.	Description
1	Lifting eye bolt		

FIGURE 71. RADIATOR EYE BOLTS

Do the following if using a fork lift or other method to position the radiator.

1. Remove the cross beams (1, **Figure 72**) from the radiator skid if necessary for access to fork lift pickets or allow for clearance of the generator set front lifting eyes.
2. Position the radiator to the generator set.
3. After the radiator has been positioned, reinstall the cross beams (1, **Figure 72**). Torque the cross beam bolts to 610 Nm (450 ft-lb).

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No.	Description	No.	Description
1	Cross beam		

FIGURE 72. CROSS BEAMS ON RADIATOR SKID

8.3.9 Install Vibration Isolators

The vibration isolators need to be installed following the installation guidelines from the manufacturer. The vibration isolator must be installed (1, **Figure 136**) so that it is in the locked shipping position. The vibration isolator must not provide any spring isolation (solid block) to allow for proper radiator alignment.

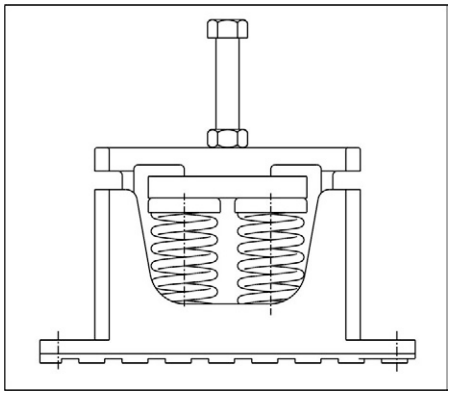


FIGURE 73. VIBRATION ISOLATOR

1. Lift the radiator and place it in its final location on the locked vibration isolators. Make sure the holes in the radiator skid are centered to the vibration isolator attachment bolt location.
2. Lift the generator set and bring it into alignment with the radiator skid.
3. Place the generator set on the locked vibration isolators. Make sure the holes in the generator set skid are centered to the vibration isolator attachment bolt location.
4. Make sure the generator set and radiator are against each other (no gaps) at the chassis front cross member and the radiator cross frame.
5. Left to right measurements between the radiator frame and chassis are helpful for placement but are not final measurements for alignment.
6. When the generator set and radiator appear to be aligned and ready to be bolted together, proceed to Fan Drive Alignment.

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8.3.10 Fan Drive Alignment

The following gives the procedure to align the radiator to the generator set.

1. Remove engine vibration damper center cover.

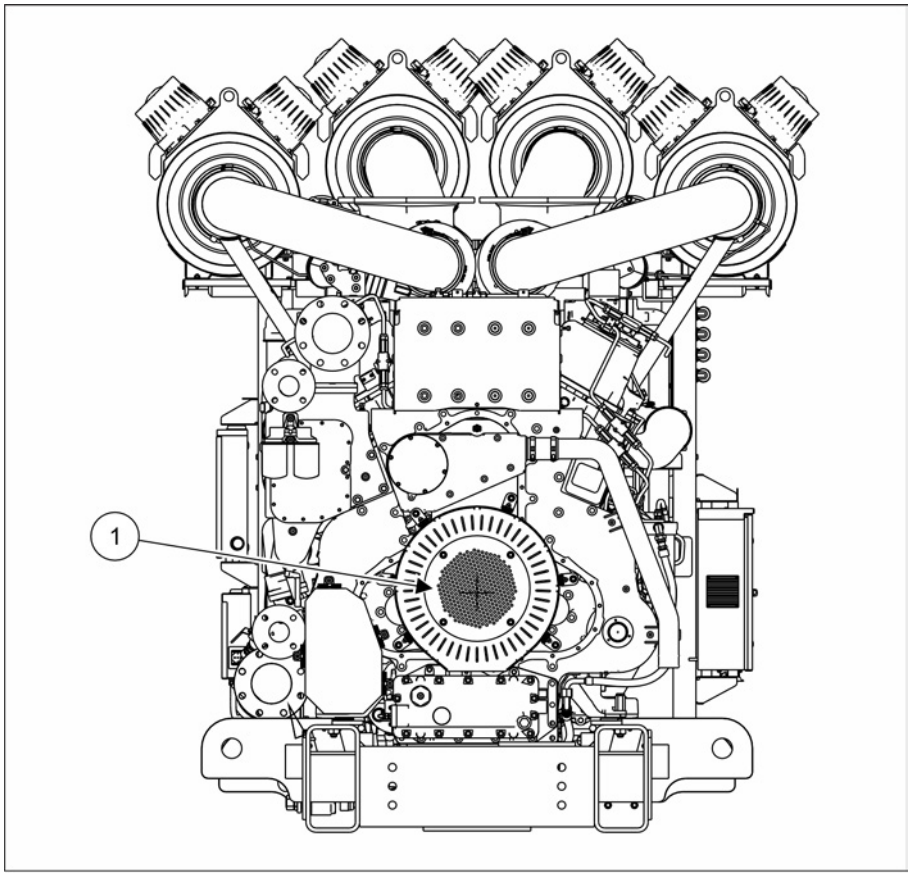


FIGURE 74. ENGINE DAMPENER CENTER COVER

2. Clean the mounting surface for the engine vibration dampener with degreaser.
3. Clean the fan drive input shaft with degreaser.
4. Install the fan drive alignment bar (A059R243) from the radiator installation kit in the radiator fan drive input shaft keyway.

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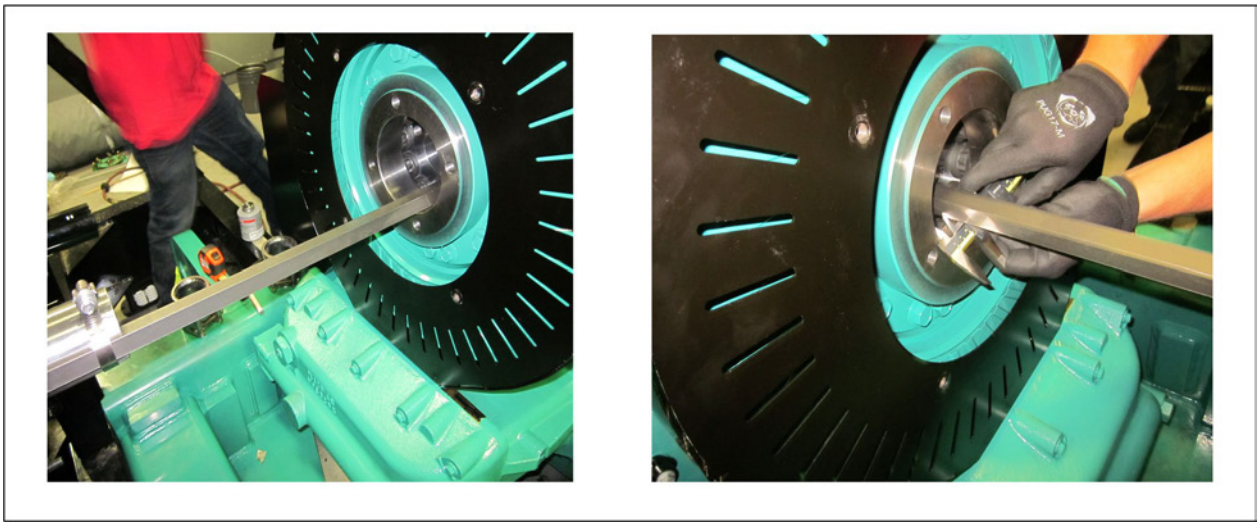


FIGURE 75. FAN DRIVE ALIGNMENT

5. The radiator end of the square bar must fit snugly into the fan shaft key way. Clamp into place with hose clamp around the radiator fan drive input shaft.
6. The other end of the bar fits inside the center bore of the vibration dampener.
7. Carefully rotate the fan shaft by hand. The bar should never contact the inside bore of the damper. Contact with the inside bore indicates gross misalignment.
8. When the bar rotates freely inside the damper bore, measure and record the distance from the bar to the outer diameter of the damper bore at the 12:00 and 6:00 o'clock positions (vertical), and at the 3:00 and 9:00 o'clock positions (horizontal). The difference between the two vertical measurements and the two horizontal measurements must be 12.5 mm (0.49 in) or less.

TABLE 18. EXAMPLE MEASUREMENTS

	Measurement	Position	Status
	17	3:00	
	21	9:00	
Difference	4		Good
	10	12:00	
	28	6:00	
Difference	18		Needs vertical adjustment

9. Options for Horizontal adjustment are:
   - Move the radiator or generator set.
   - Move the fan belt drive input shaft bearing assemblies right or left (±3 mm of adjustment).
   - For radiators built up to 2018, the preference is to only make horizontal adjustments due to a smaller clearance around the radiator input shaft.

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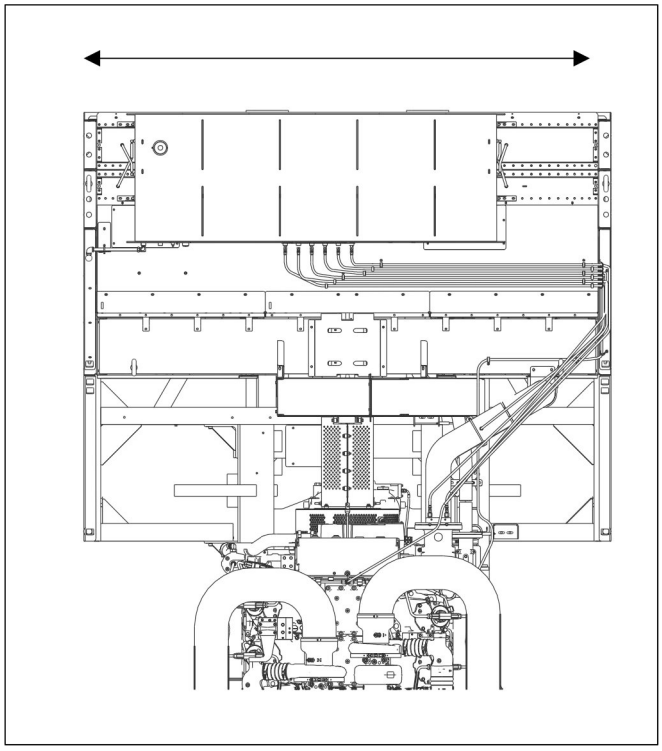


FIGURE 76. HORIZONTAL ADJUSTMENT

10. Options for vertical adjustment are:
    - Place shims under the generator set or radiator vibration isolators.
    - Add or remove shims under the fan belt drive input shaft bearings (±3 mm of adjustment).
    - For radiators built after 2018, both horizontal and vertical adjustment is possible.

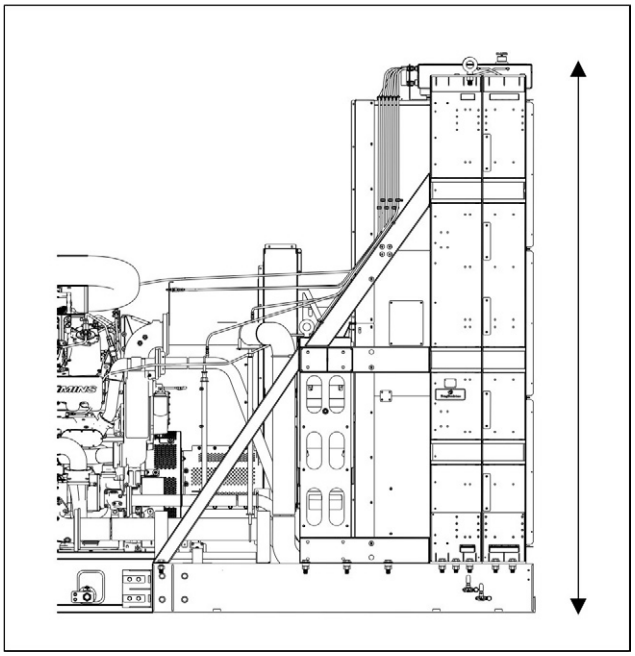
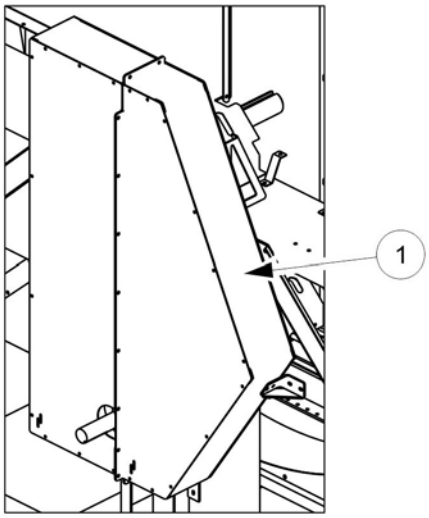


FIGURE 77. VERTICAL ADJUSTMENT

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8.3.10.1 Move the Fan Belt Drive Input Shaft Bearing Assemblies Right or Left

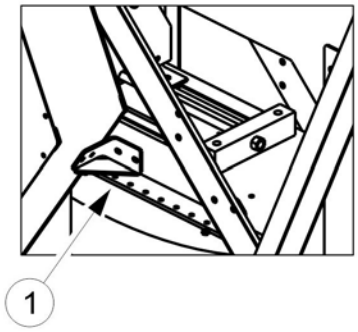
1. Remove the fan drive belt guards.



No.	Description	No.	Description
1	Radiator belt guard		

FIGURE 78. RADIATOR BELT GUARD

2. Loosen four tensioner 5/8" locking bolts and nuts located under the radiator support cross member.

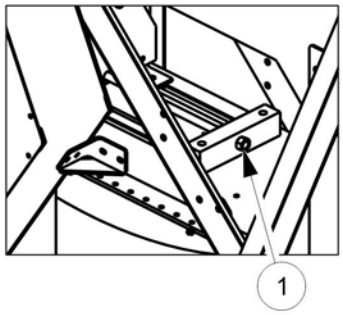


No.	Description	No.	Description
1	Tensioner locking bolts under radiator support cross member		

FIGURE 79. TENSIONER LOCKING BOLT LOCATION

3. Turn the tensioner adjustment screw counterclockwise to loosen the fan drive belts.

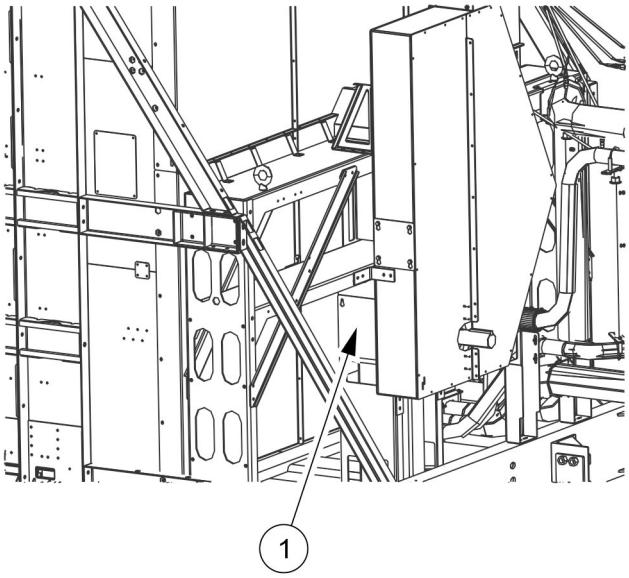
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No.	Description	No.	Description
1	Tensioner adjustment screw		

FIGURE 80. TENSIONER ADJUSTMENT SCREW

4. Remove the two input shaft bearing guards.

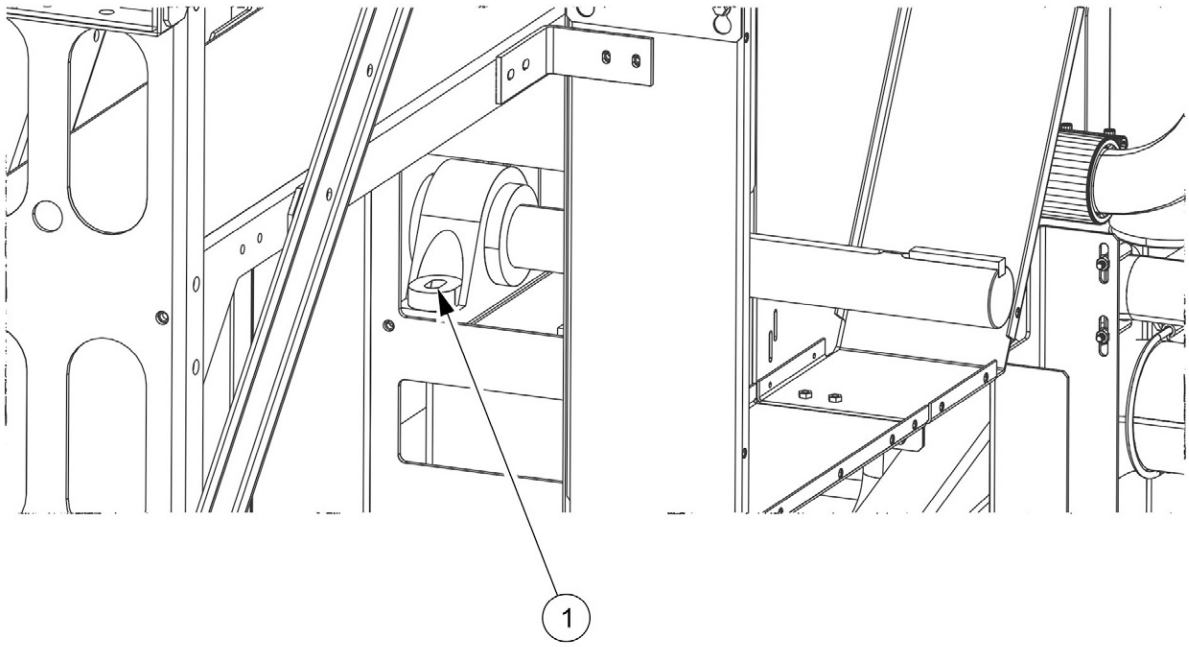


No.	Description	No.	Description
1	Bearing guard		

FIGURE 81. BEARING GUARDS

5. Loosen the two bolts (per bearing) that secure the bearing to the radiator center support.

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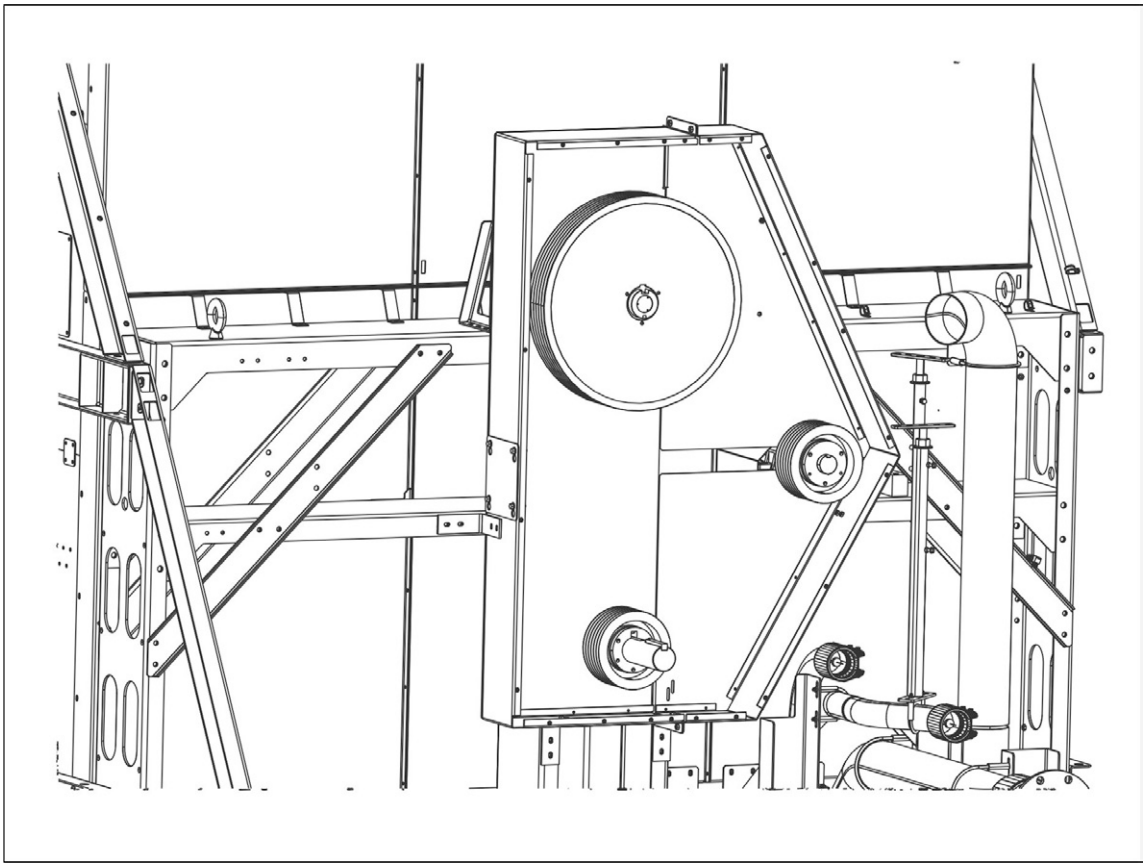


No.	Description	No.	Description
1	Bearing mounting hardware		

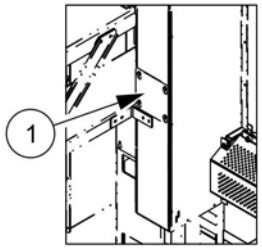
FIGURE 82. BEARING MOUNTING HARDWARE

6. Slide the fan belt drive input shaft in the direction needed.
7. Use a straightedge to align the input shaft pulley to the fan drive pulley, and the input shaft pulley to the idler shaft pulley.

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8. Torque the hardware that secures the bearing assemblies to the radiator center support to 255 Nm (188 ft-lb).
9. Remove the fan drive belt inspection cover.



No.	Description	No.	Description
1	Fan drive belt inspection cover		

FIGURE 83. FAN DRIVE BELT INSPECTION COVER

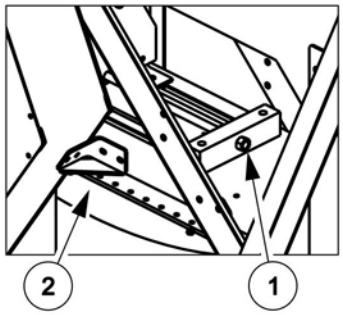
10. Use a belt tension tool to set the belt tension for the belts.
11. Turn the tensioner adjustment screw clockwise to increase fan drive belt tension.
    - Belt span

      40.5 inches (1028.7 mm)
    - New belt deflection force

      60 Hz - 20.1 lb (9.12 kg)

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50 Hz - 22.1 lb (10.02 kg)



No.	Description	No.	Description
1	Tensioner adjustment screw	2	Tensioner locking bolts under radiator support cross member

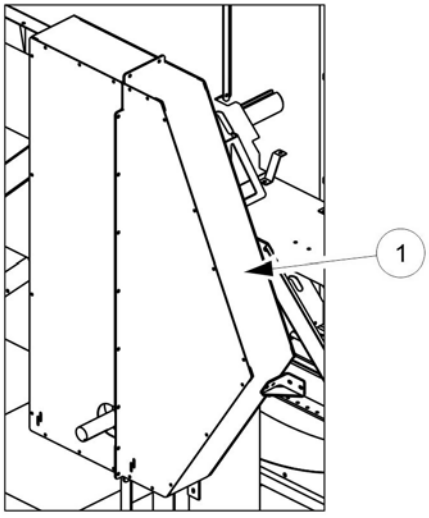
FIGURE 84. TENSIONER ADJUSTMENT SCREW AND LOCKING BOLTS

12. Torque the four tensioner locking bolts underneath the radiator support cross member to 290 Nm (214 ft-lb).

8.3.10.2 Add or Remove Shims Under the Fan Belt Drive Input Shaft Bearings

Insert the body content of the topic

1. Remove the fan drive belt guards.

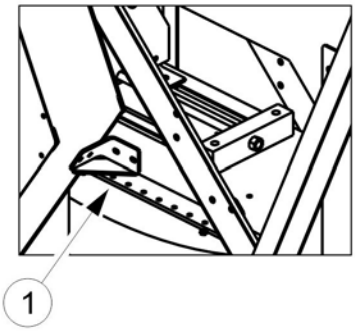


No.	Description	No.	Description
1	Radiator belt guard		

FIGURE 85. RADIATOR BELT GUARD

2. Loosen four tensioner 5/8" locking bolts and nuts located under the radiator support cross member.

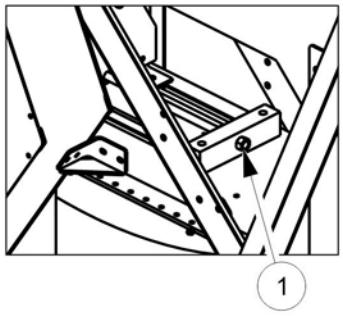
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No.	Description	No.	Description
1	Tensioner locking bolts under radiator support cross member		

FIGURE 86. TENSIONER LOCKING BOLT LOCATION

3. Turn the tensioner adjustment screw counterclockwise to loosen the fan drive belts.

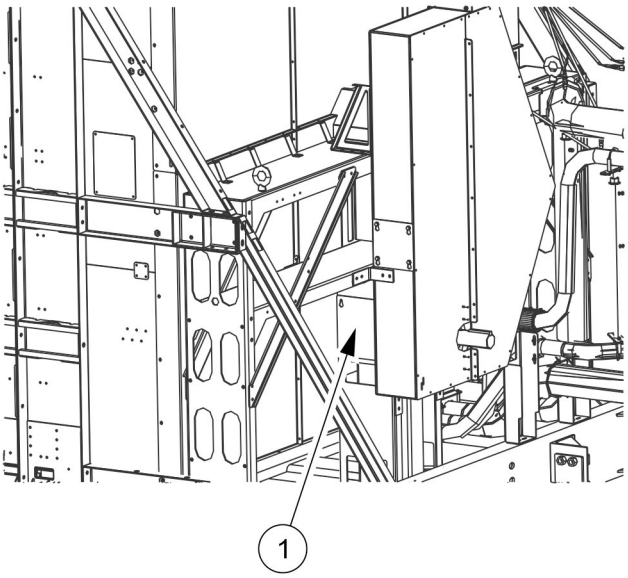


No.	Description	No.	Description
1	Tensioner adjustment screw		

FIGURE 87. TENSIONER ADJUSTMENT SCREW

4. Remove the two input shaft bearing guards.

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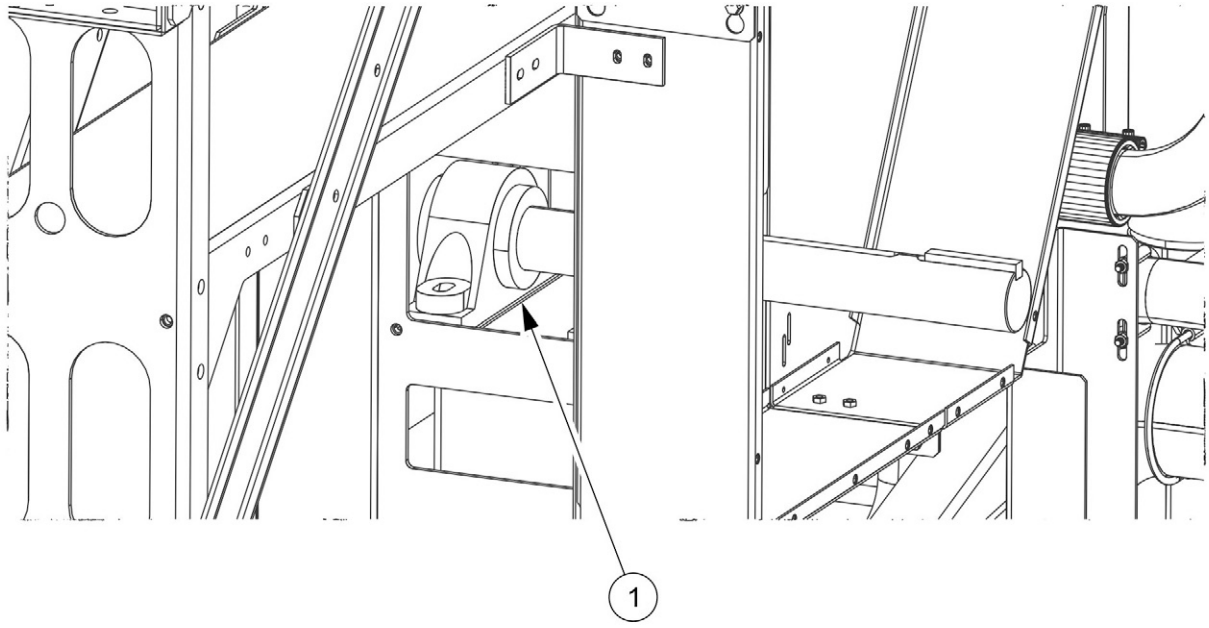


No.	Description	No.	Description
1	Bearing guard		

FIGURE 88. BEARING GUARDS

5. Loosen the two bolts (per bearing) that secure the bearing to the radiator center support **Figure 82 on page 127**.
6. Add or remove shims under the bearing assembly.

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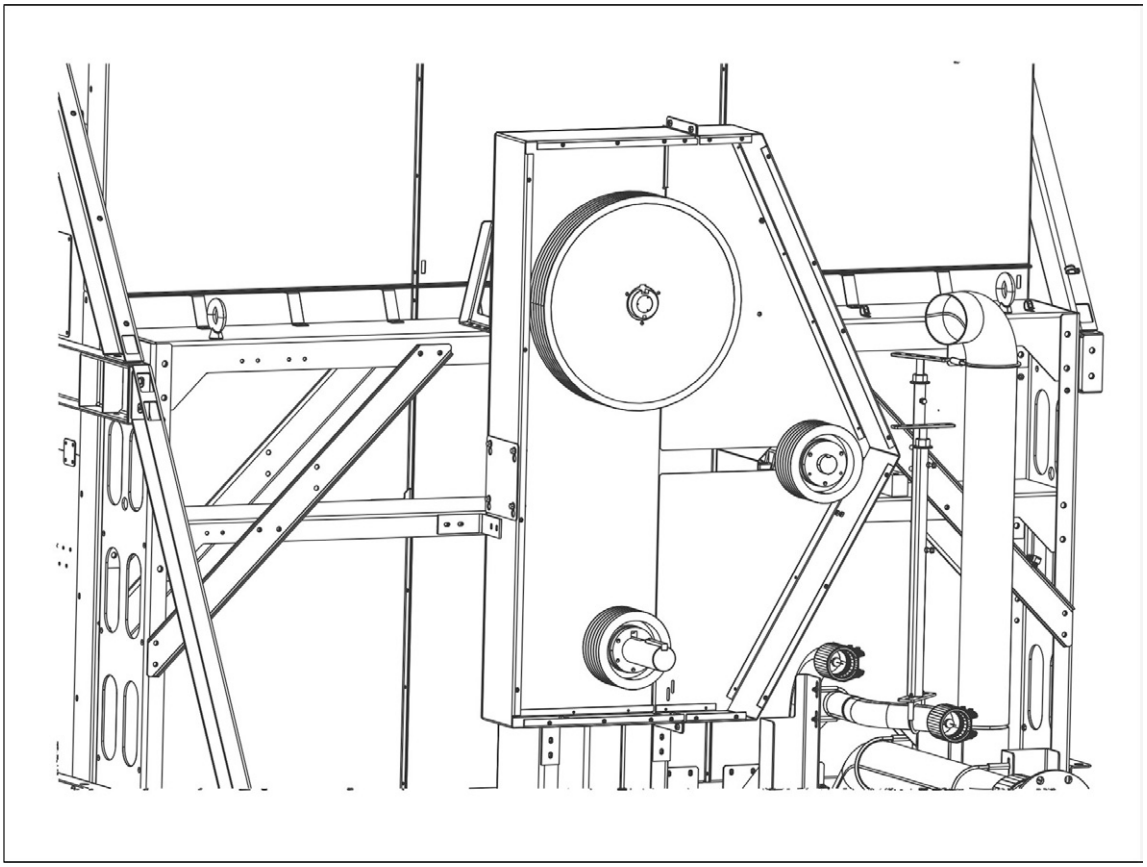


No.	Description	No.	Description
1	Bearing shims		

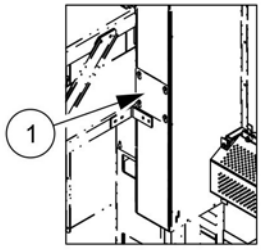
FIGURE 89. BEARING SHIMS

7. Use a straightedge to align the input shaft pulley to the fan drive pulley, and the input shaft pulley to the idler shaft pulley.

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8. Torque the hardware that secures the bearing assemblies to the radiator center support to 255 Nm (188 ft-lb).
9. Remove the fan drive belt inspection cover.



No.	Description	No.	Description
1	Fan drive belt inspection cover		

FIGURE 90. FAN DRIVE BELT INSPECTION COVER

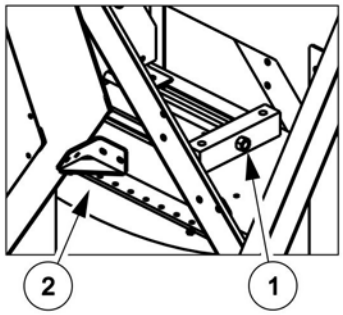
10. Use a belt tension tool to set the belt tension for the belts.
11. Turn the tensioner adjustment screw clockwise to increase fan drive belt tension.
    - Belt span

      40.5 inches (1028.7 mm)
    - New belt deflection force

      60 Hz - 20.1 lb (9.12 kg)

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50 Hz - 22.1 lb (10.02 kg)



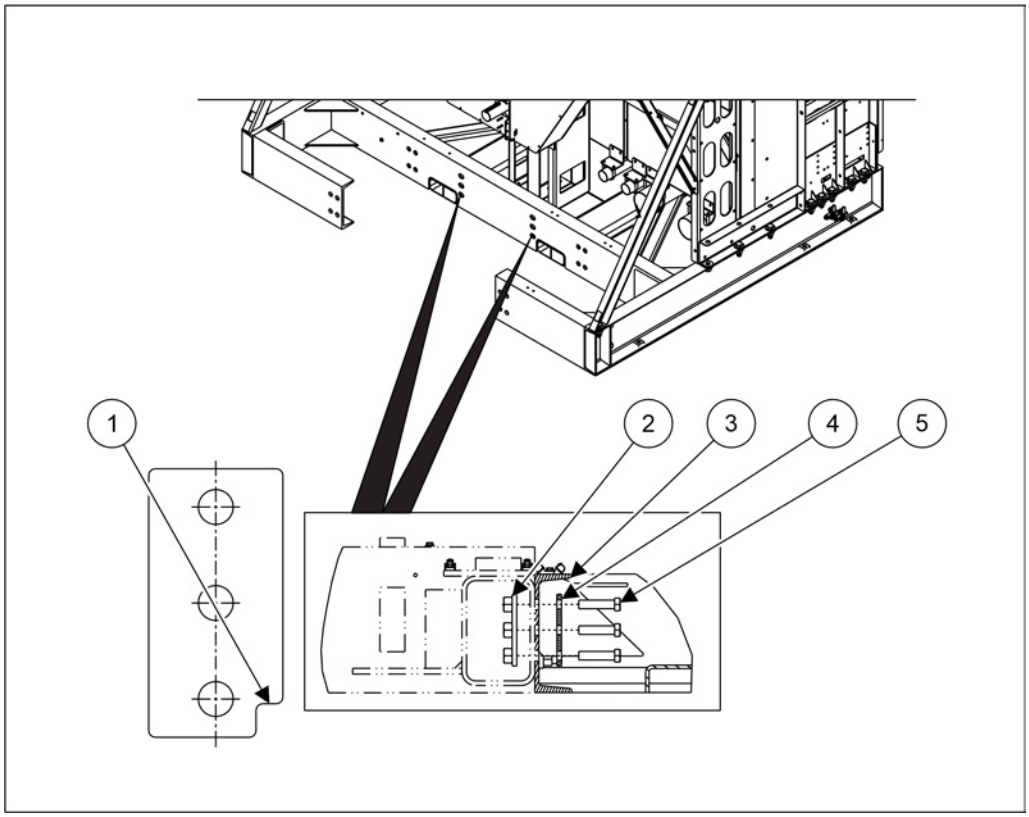
No.	Description	No.	Description
1	Tensioner adjustment screw	2	Tensioner locking bolts under radiator support cross member

FIGURE 91. TENSIONER ADJUSTMENT SCREW AND LOCKING BOLTS

12. Torque the four tensioner locking bolts underneath the radiator support cross member to 290 Nm (214 ft-lb).

8.3.11 Install Front Middle Clamping Plates

NOTICE
Numbers in parenthesis refer to Figure 141 unless otherwise specified.



No.	Description	No.	Description
1	Notch in washer plate	4	Washer plate
2	Nut plate	5	Bolt – M24 x 100 mm
3	Clamping plate		

FIGURE 92. FRONT MIDDLE CLAMPING PLATE

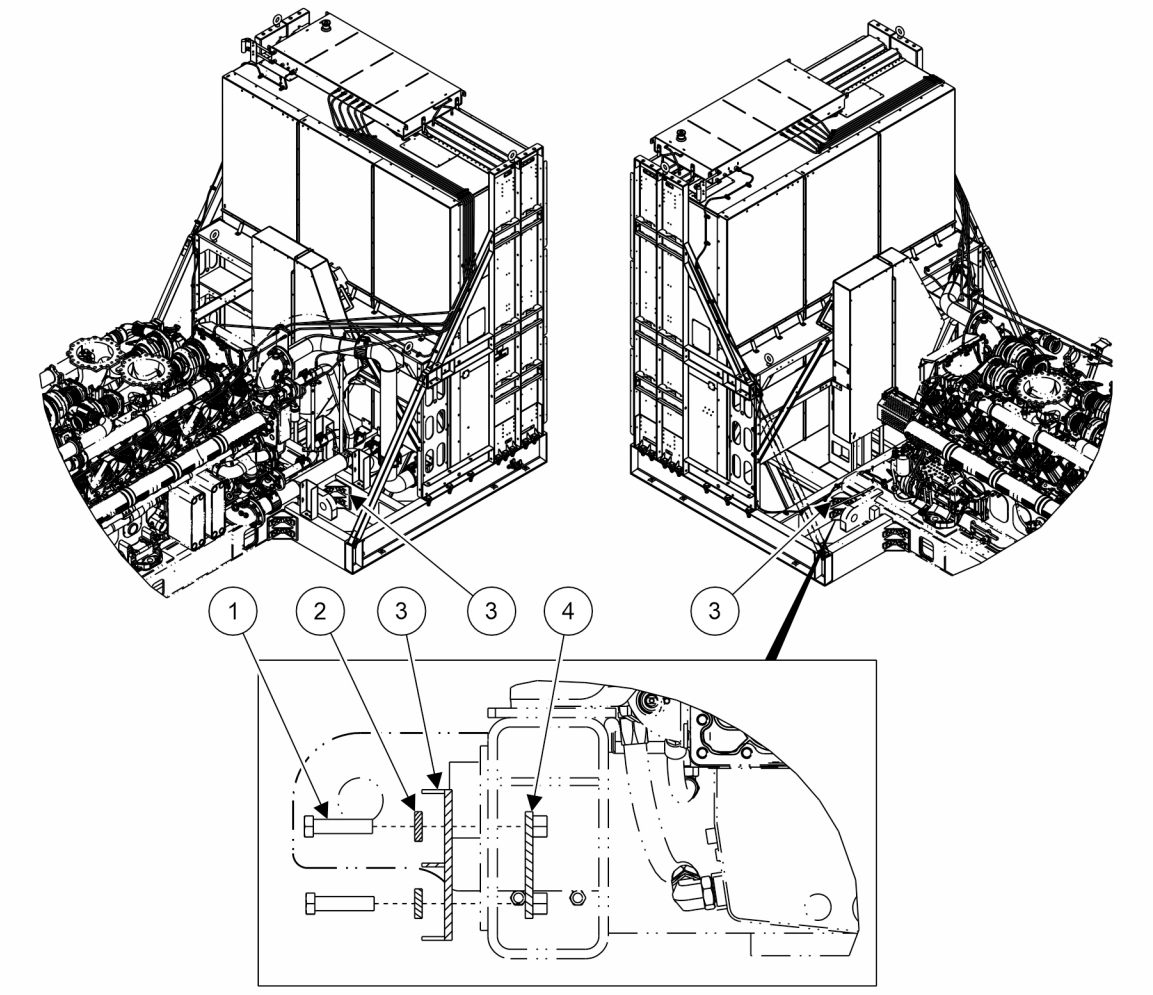
1. Apply anti-seize compound to mounting bolt (5) threads.
2. Loosely install each clamping plate (3) to the front radiator mounts with one nut plate (2), one washer plate (4), and three bolts (5).

NOTICE
The notch in the washer plate faces down and toward the fork tubes in the radiator skid.

8.3.12 Install Front Radiator L-brackets Remaining Hardware

NOTICE
Numbers in parenthesis refer to Figure 142 unless otherwise specified.

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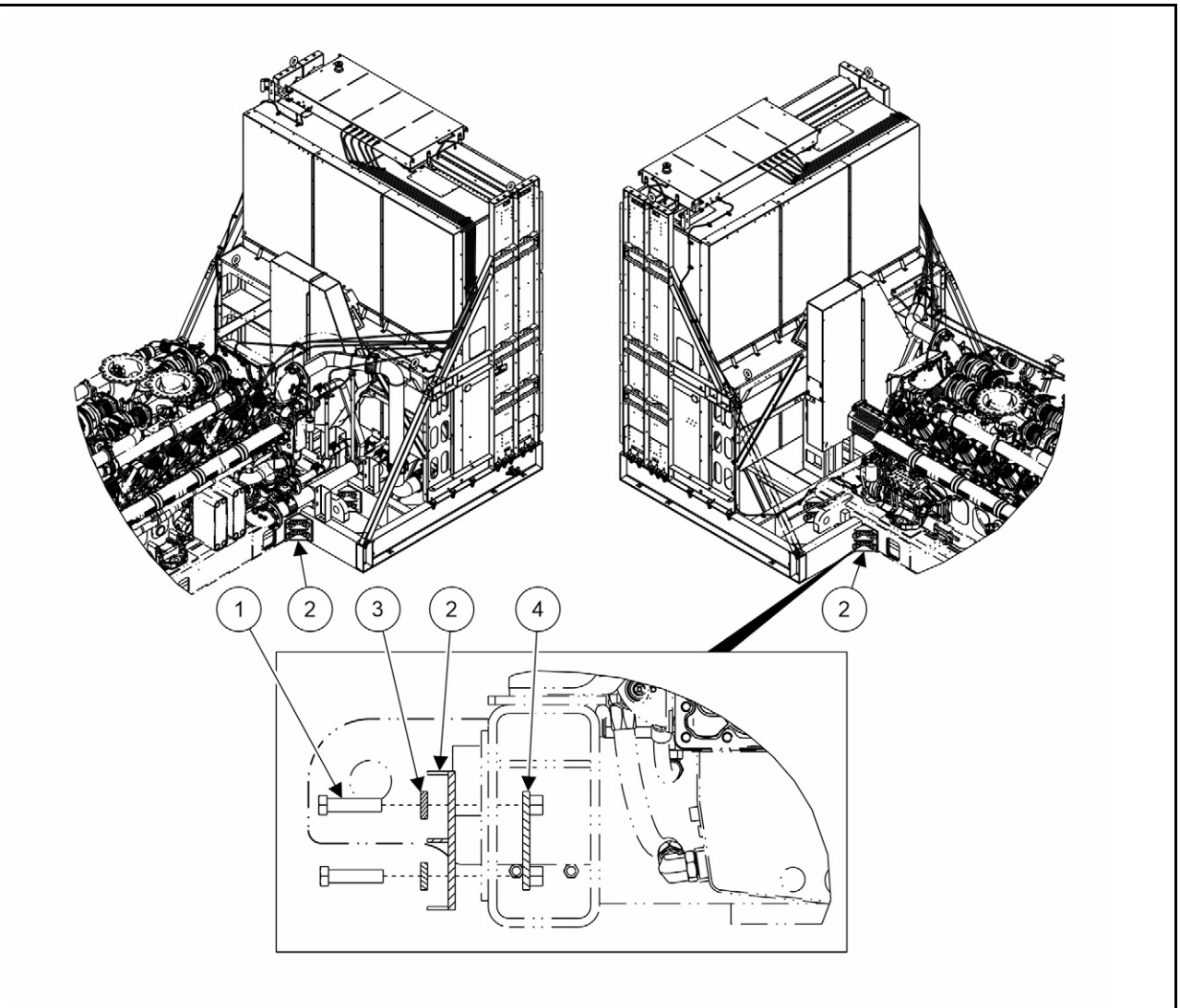
No.	Description	No.	Description
1	Bolt – M24 x 100 mm	3	L-bracket
2	Washer plate	4	Nut plate

FIGURE 93. FRONT LEFT AND RIGHT RADIATOR L-BRACKETS REMAINING HARDWARE

1. Apply anti-seize compound to threads of bolts (1).
2. Loosely install each L-bracket to radiator skid with remaining washer plates (2), nut plates (4), and bolts (1).

8.3.13 Install Rear L-brackets

NOTICE
Numbers in parenthesis refer to Figure 143 unless otherwise specified.



No.	Description	No.	Description
1	Bolt – M24 x 100 mm	3	Washer
2	L-bracket	4	Nut plate

FIGURE 94. REAR L-BRACKETS

1. Apply anti-seize compound to mounting bolt threads.
2. Loosely install each L-bracket (2) to generator set and radiator skid with two nut plates (4), four washers (3), and eight bolts (1).

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8.3.14 Tighten and Torque L-bracket bolts

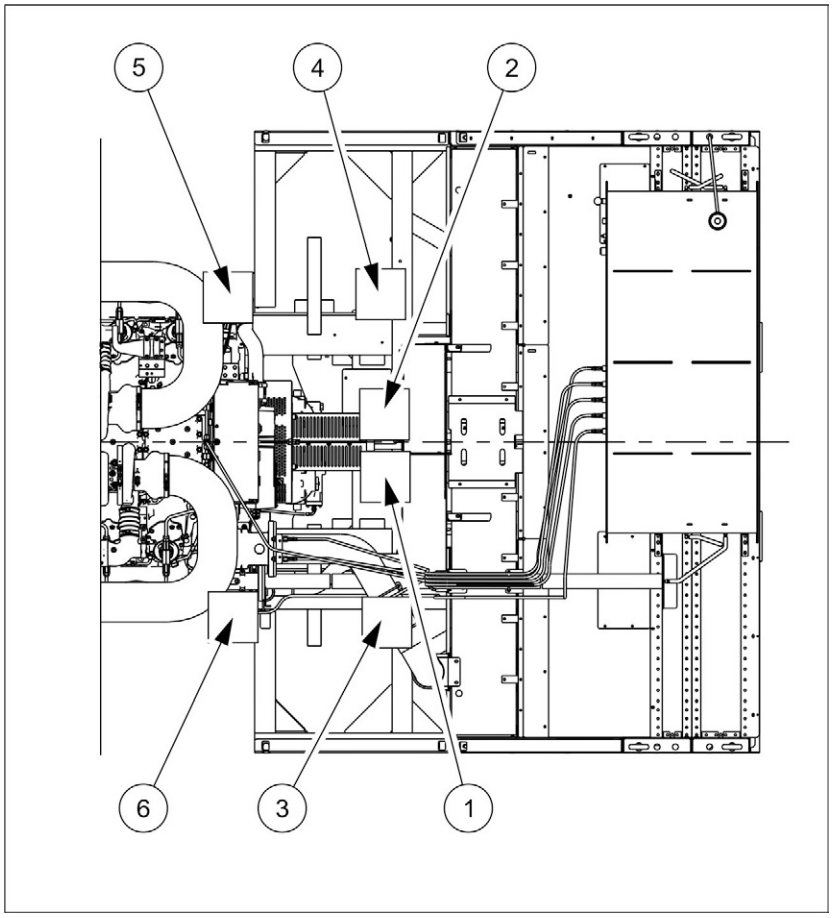


FIGURE 95. L-BRACKET LOCATIONS

1. Tighten the 6 M24 bolts at the front middle locations (locations 1 and 2 in **Figure 95**).
2. Tighten the 16 M24 bolts at the front left and right locations (locations 3 and 4 in **Figure 95**).
3. Tighten the 16 M24 bolts at the rear left and right locations (locations 5 and 6 in **Figure 95**).
4. Torque the 6 M24 bolts at the front middle locations (locations 1 and 2 in **Figure 95**) to 552 Nm (407 ft-lb).
5. Torque the 16 M24 bolts at the front left and right locations (locations 3 and 4 in **Figure 95**) to 552 Nm (407 ft-lb).
6. Torque the 16 M24 bolts at the rear left and right locations (locations 5 and 6 in **Figure 95**) to 522 Nm (407 ft-lb).
7. The radiator lifting equipment may be removed as long as the radiator is properly supported on isolators at the same height as the generator set skid.

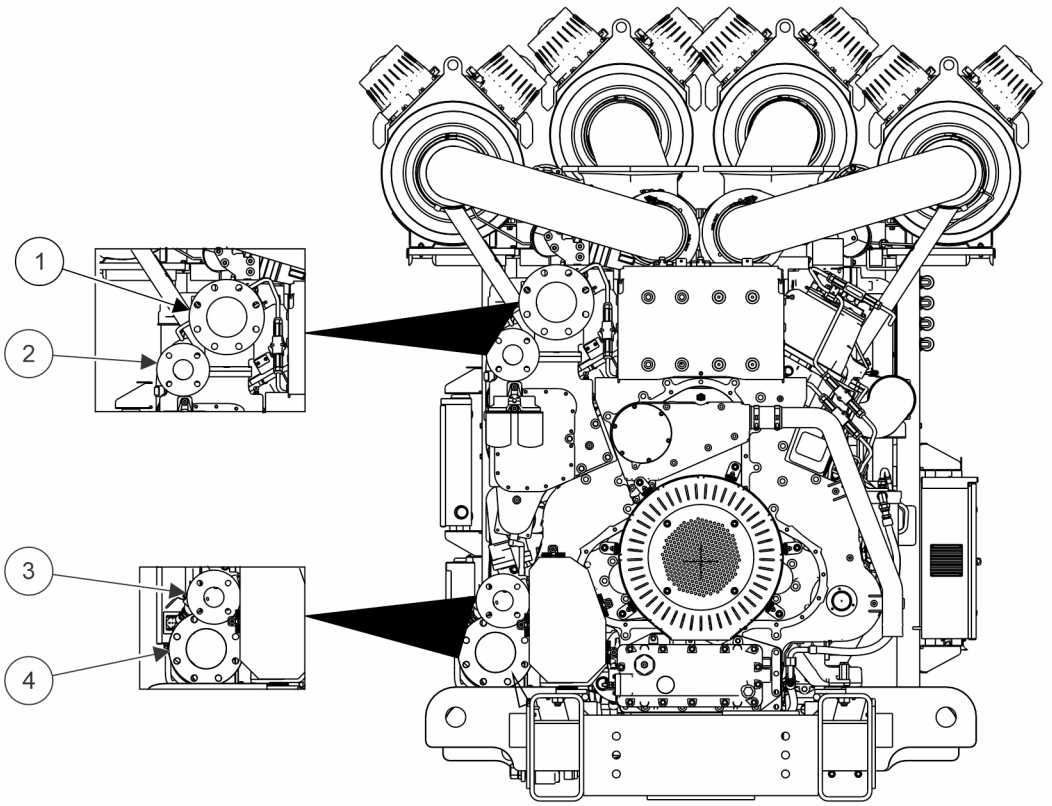
8.3.15 Remove Flange Shipping Covers

1. Remove the shipping covers from the generator set cooling system flanges.

NOTICE
There may be coolant behind the inlet flanges, use an appropriate catch pan. Dispose of coolant according to local codes.

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2. Clean the generator set cooling system flanges.



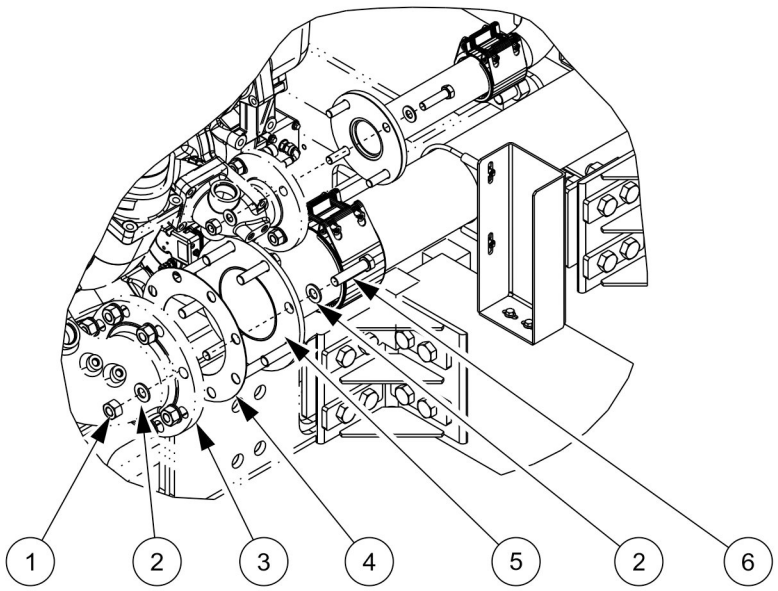
No.	Description	No.	Description
1	HT outlet	3	LT inlet
2	LT outlet	4	HT inlet

FIGURE 96. COOLING SYSTEM FLANGES

8.3.16 Install HT Inlet Coolant Flange

NOTICE
Numbers in parenthesis refer to Figure 97 unless specified otherwise.

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No.	Description	No.	Description
1	Nut – ⅝ inch	4	Gasket
2	Washer – ⅝ inch	5	HT inlet pipe
3	HT inlet flange	6	Bolt – ⅝ x 2½ inch

FIGURE 97. HT INLET COOLANT FLANGE

1. Apply anti-seize lubricant to bolt (6) threads.
2. Install HT inlet pipe (5) to HT inlet flange (3) with flange gasket (4), bolts – ⅝ x 2½ inch (6), washers – ⅝ inch (2), and nuts – ⅝ inch (1).
3. Torque the bolts and nuts to 311 Nm (229 ft-lb) using the following torque sequence.
   a. Torque position 1, then position 5 shown in **Figure 98**.
   b. Torque position 8, then position 3 shown in **Figure 98**.
   c. Torque position 6, then position 2 shown in **Figure 98**.
   d. Torque position 7, then position 4 shown in **Figure 98**.

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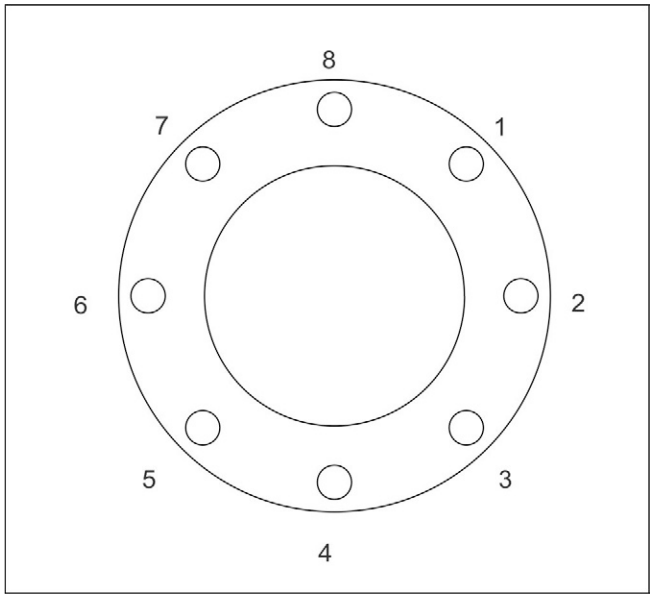
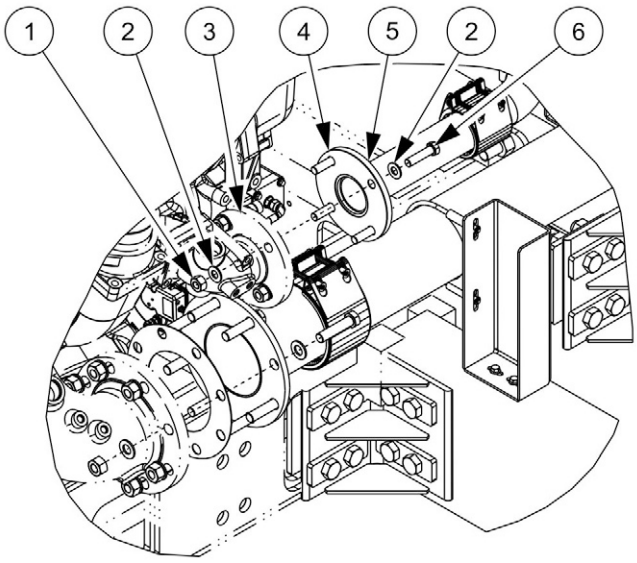


FIGURE 98. HT FLANGE TORQUE SEQUENC NUMBERS

8.3.17 Install LT Inlet Coolant Flange

NOTICE
Numbers in parenthesis refer to Figure 99 unless specified otherwise.

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No.	Description	No.	Description
1	Nut – ¾ inch	4	Gasket
2	Washer – ¾ inch	5	LT inlet pipe
3	LT inlet flange	6	Bolt – ¾ inch x 3 inch

FIGURE 99. LT INLET COOLANT FLANGE

1. Apply anti-seize lubricant to bolt (6) threads.
2. Install LT inlet pipe (5) to LT inlet flange (3) with flange gasket (4), bolts – ¾ x 3 inch (6), washers – ¾ inch (2), and nuts – ¾ inch (1).
3. Torque the bolts and nuts to 175 Nm (129 ft-lb) using the following torque sequence.
   a. Torque position 1, then position 3 shown in **Figure 100**.
   b. Torque position 2, then position 4 shown in **Figure 100**.

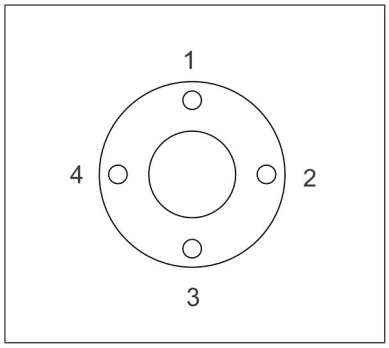
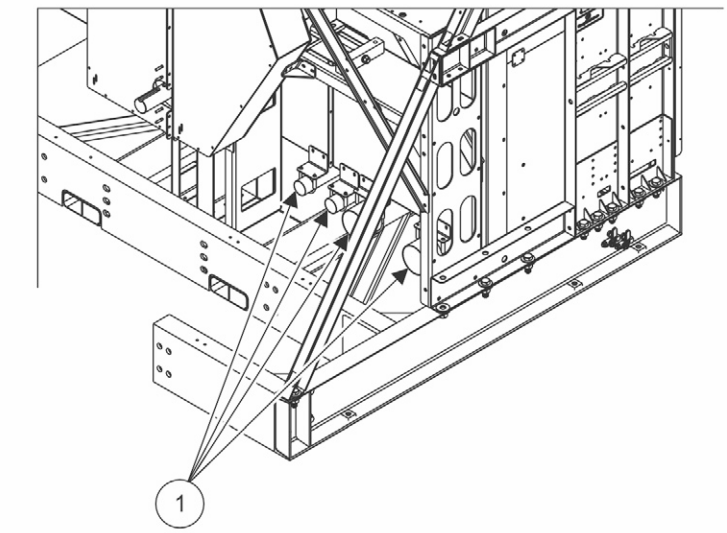


FIGURE 100. LT FLANGE TORQUE SEQUENC NUMBERS

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8.3.18 Remove Radiator Shipping Plugs and Install LT and HT Inlet Pipe Support Brackets

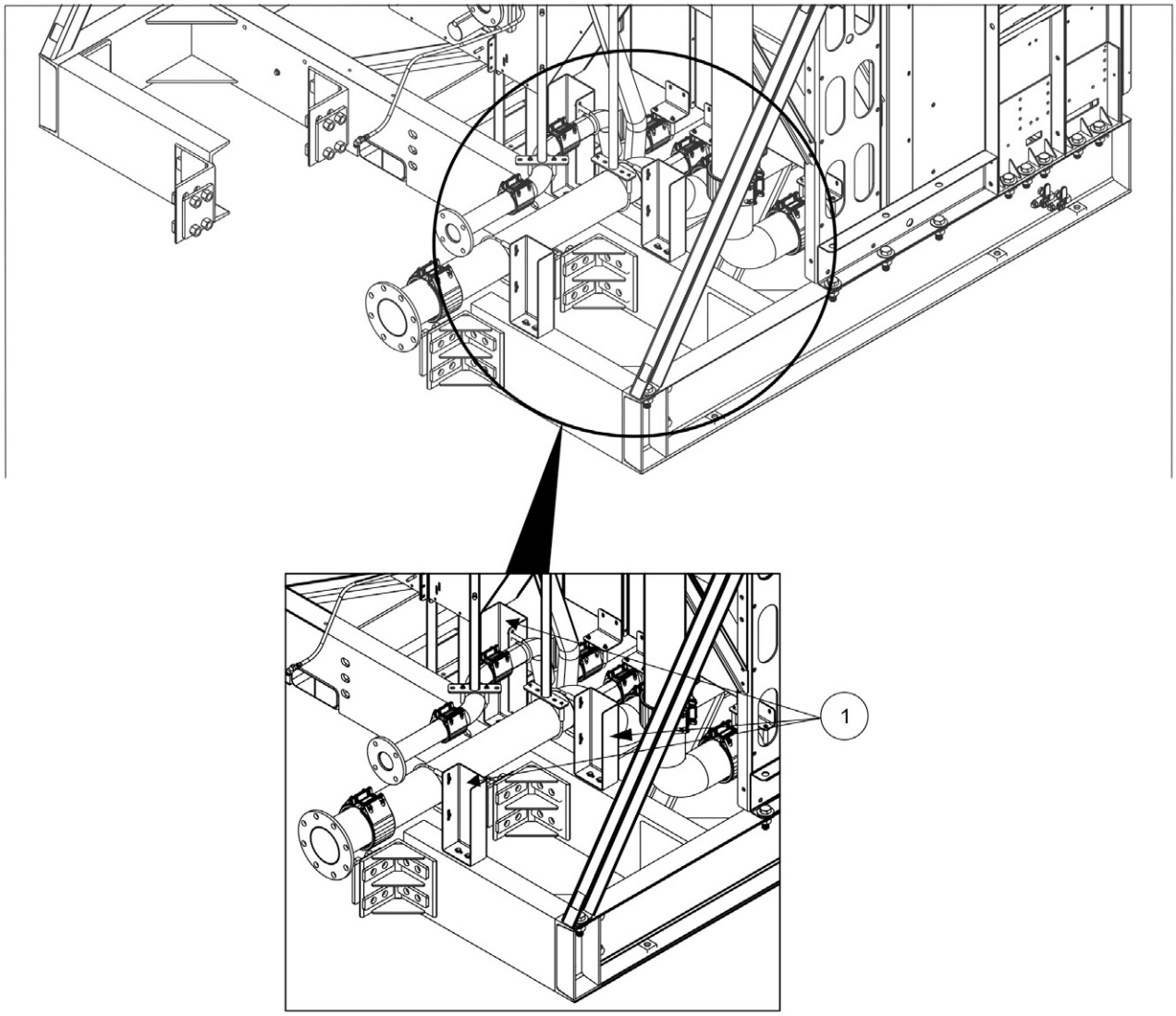


No.	Description
1	Shipping plug

FIGURE 101. RADIATOR SHIPPING PLUG LOCATIONS

1. Remove shipping plugs (1, **Figure 101**).
2. Clean coolant pipe connections at radiator.
3. Install LT and HT inlet pipe support brackets on radiator skid (1, **Figure 102**).

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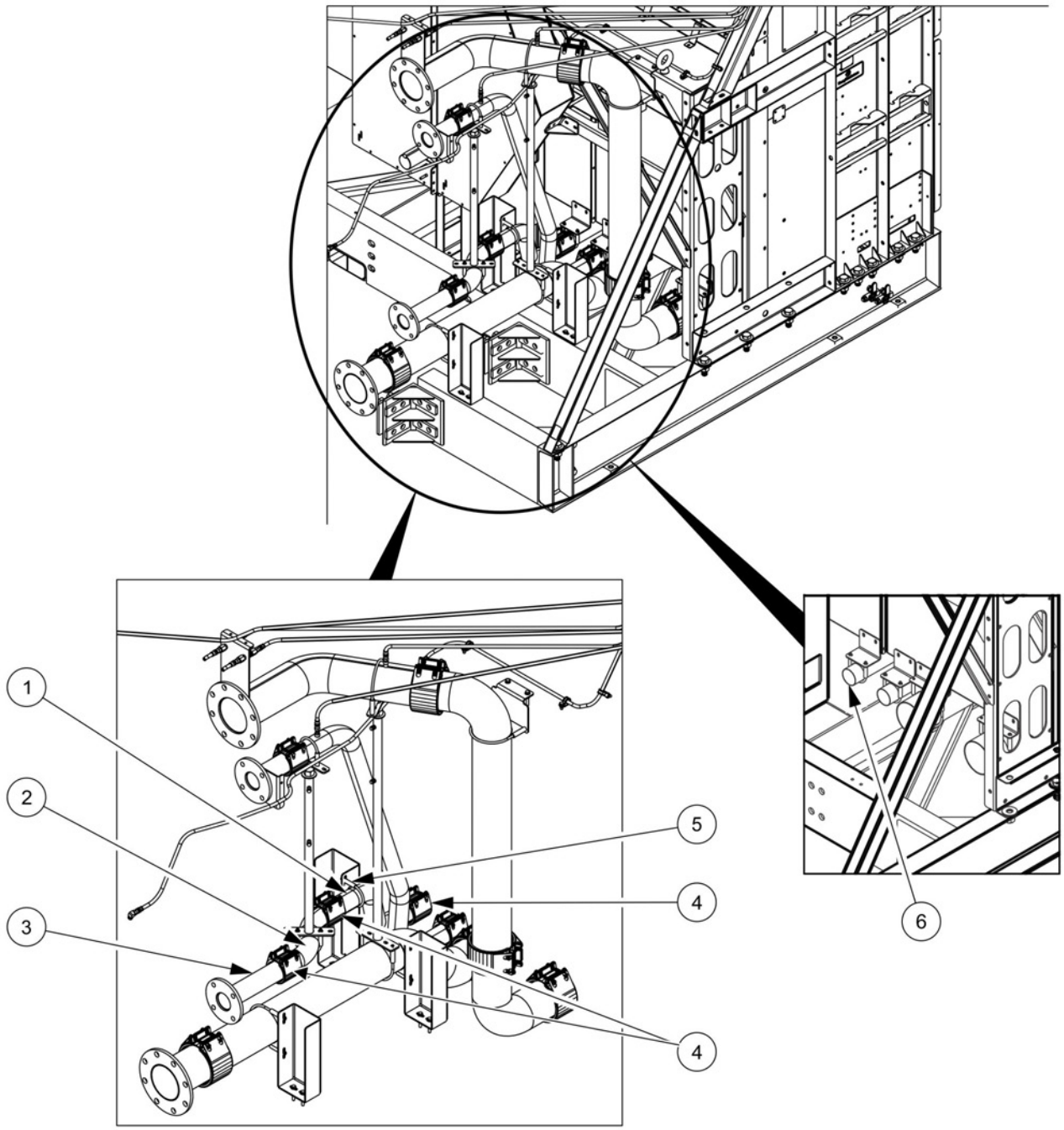


No.	Description
1	Support bracket

FIGURE 102. LT AND HT INLET PIPE SUPPORT BRACKETS

8.3.19 Install LT Inlet Pipe on Radiator

NOTICE
Numbers in parenthesis refer to Figure 103 unless specified otherwise.



No.	Description	No.	Description
1	Radiator tube	4	Pipe coupler
2	S-bend tube	5	U-bolt
3	Engine tube	6	Radiator LT outlet

FIGURE 103. LT INLET PIPE INSTALLATION

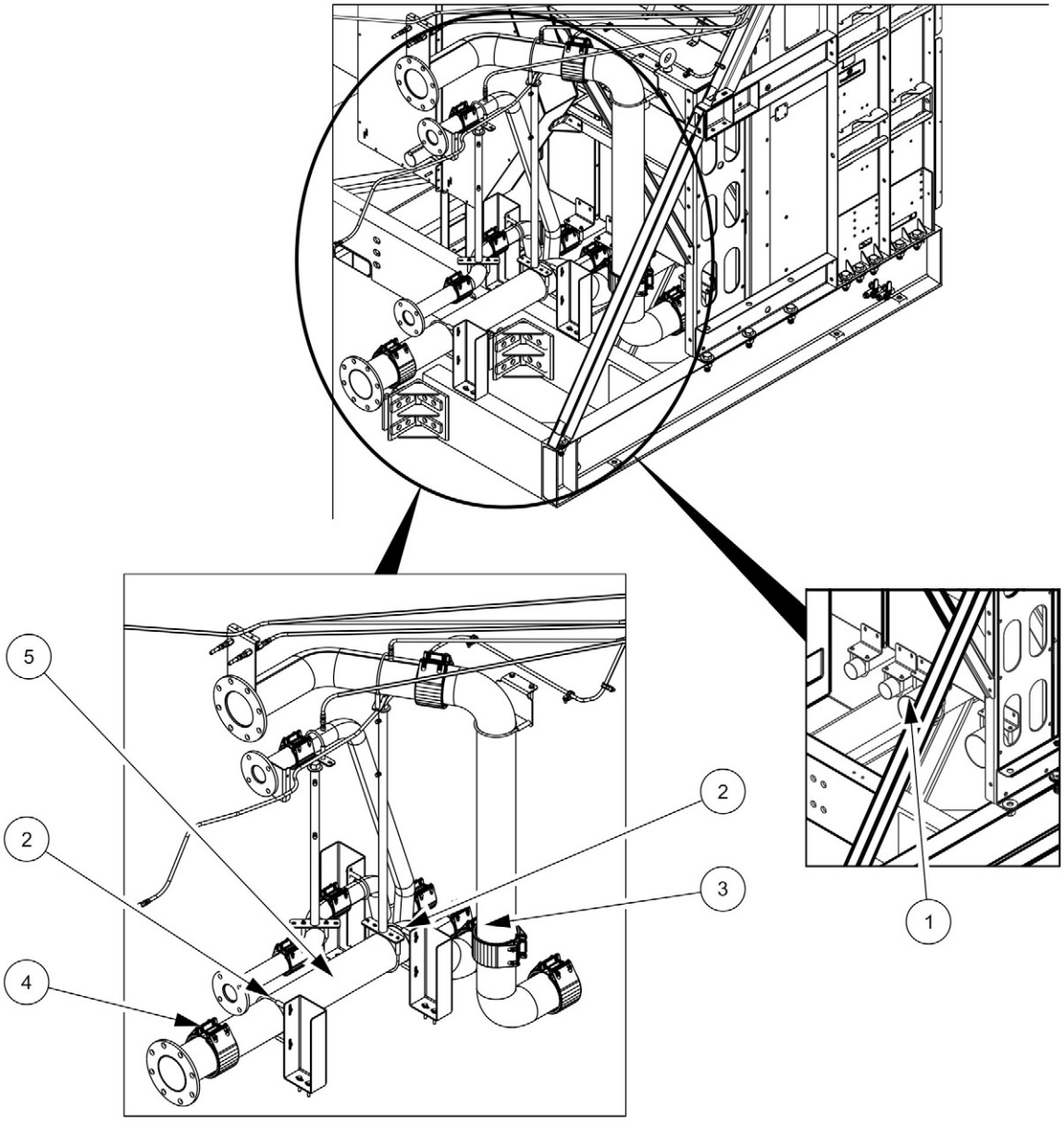
1. Apply anti-seize lubricant to pipe coupler (4) bolts.

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2. Center pipe coupler (4) over the gap in the tubing. Use a paint marker to mark the coupling location on the tube before installation.
3. Loosely tighten the pipe coupler (4) at the radiator connection point (6).
4. Apply thread locking compound to U-bolt (5) threads. Use the U-bolt (5) to loosely attach tube to support bracket.
5. Slide pipe coupler (4) onto the smaller S-bend tube (2). Align the S-bend tube (2) to the engine tube (3) and the radiator tube (1).
6. Center pipe couplers (4) over the gap in the tubes (1, 2, and 3). Make sure the tubes are vertically and horizontally aligned.
7. Use a two step, alternating torque sequence to tighten the pipe couplers.
    a. First, use alternating sequence to torque the pipe couplers to 6 Nm (4.4 ft-lb).
    b. Second, use alternating sequence to torque the pipe couplers to 13 Nm (9.6 ft-lb).
8. Torque the U-bolt (5) that attaches the radiator tube (1) to the tube support bracket to 50 Nm (37 ft-lb).

8.3.20 Install HT Inlet Tube

NOTICE
Numbers in parenthesis that follow refer to Figure 104 unless specified otherwise.



No.	Description	No	Description
1	Radiator HT Inlet	4	Pipe coupler
2	U-bolt	5	HT inlet tube
3	Pipe coupler (behind outlet tube)		

FIGURE 104. HT INLET TUBE INSTALLATION

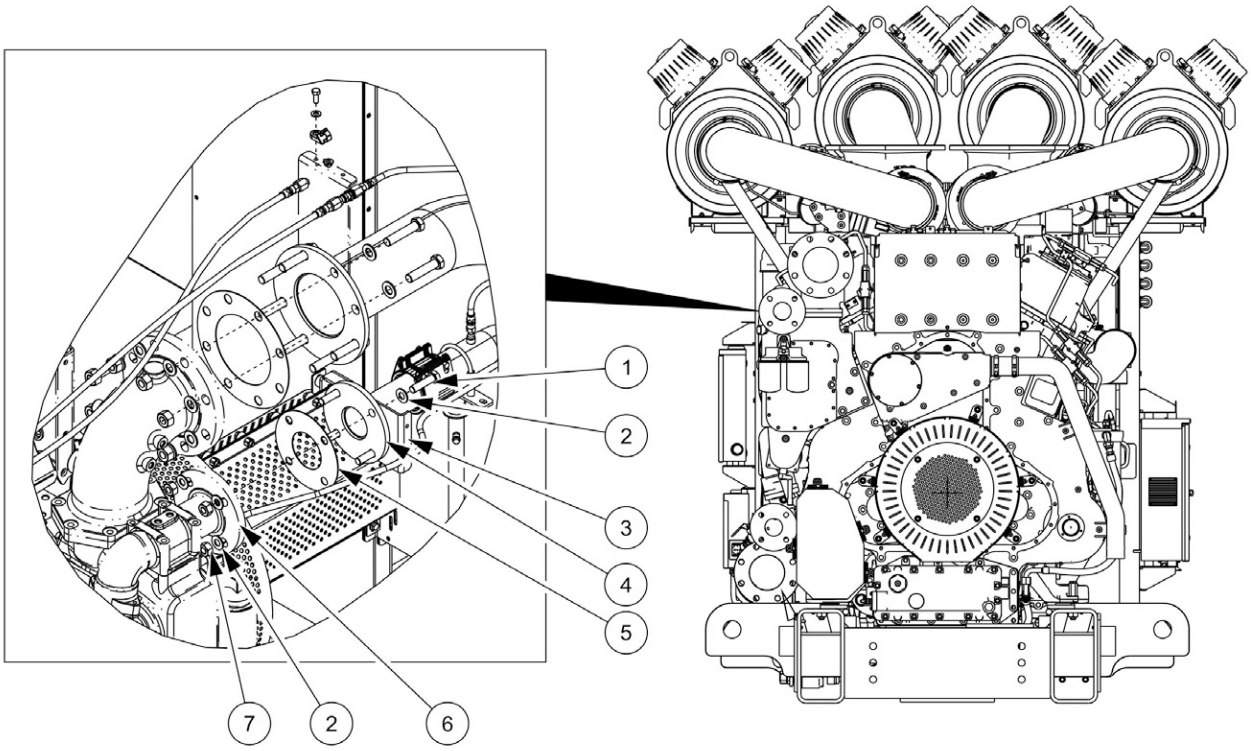
1. Apply anti-seize lubricant to pipe coupler (3 and 4) bolts.
2. Slide pipe couplers (3 and 4) onto HT inlet tube (5).
3. Place the HT inlet tube (5) between the engine connection tube and the radiator connection point (1).
4. Center pipe couplings (3 and 4) over the gaps in the inlet tube (5). Make sure the tubes are aligned vertically and horizontally.

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5. Apply thread locking compound to U-bolt (2) threads. Loosely install two U-bolts (2) that attach the HT inlet tube (5) to the support brackets.
6. Use a two-step, alternating torque sequence to tighten the pipe couplers.
   a. First, use alternating sequence to torque the pipe couplers to 10 Nm (4.4 ft-lb).
   b. Second, use alternating sequence to torque the pipe couplers to 21 Nm (9.6 ft-lb).
7. Torque the U-bolt (2) that attaches the HT inlet tube to the tube support bracket to 50 Nm (37 ft-lb).

8.3.21 Install LT Outlet Coolant Flange

NOTICE
Numbers in parenthesis refer to Figure 105 unless specified otherwise.



No.	Description	No.	Description
1	Bolt – ⅝ inch x 2½ inch	5	Gasket
2	Washer – ⅝ inch	6	LT inlet flange
3	Vent line support bracket	7	Nut – ⅝ inch
4	LT outlet pipe		

FIGURE 105. LT OUTLET COOLANT FLANGE

1. Apply anti-seize lubricant to bolt (1) threads.

2. Install LT outlet pipe (4) to LT outlet flange (6) with flange gasket (5), bolts – ⅝ x 2½ inch (1), washers – ⅝ inch (2), and nuts – ⅝ inch (7).
3. Torque the bolts and nuts to 175 Nm (129 ft-lb) using the following torque sequence.
   a. Torque position 1, then position 3 shown in **Figure 106**.
   b. Torque position 2, then position 4 shown in **Figure 106**.

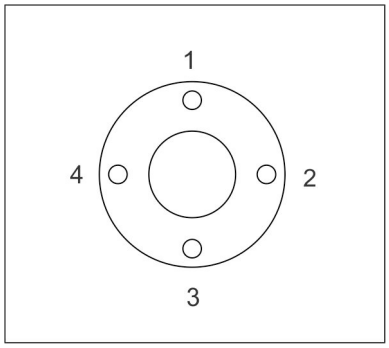
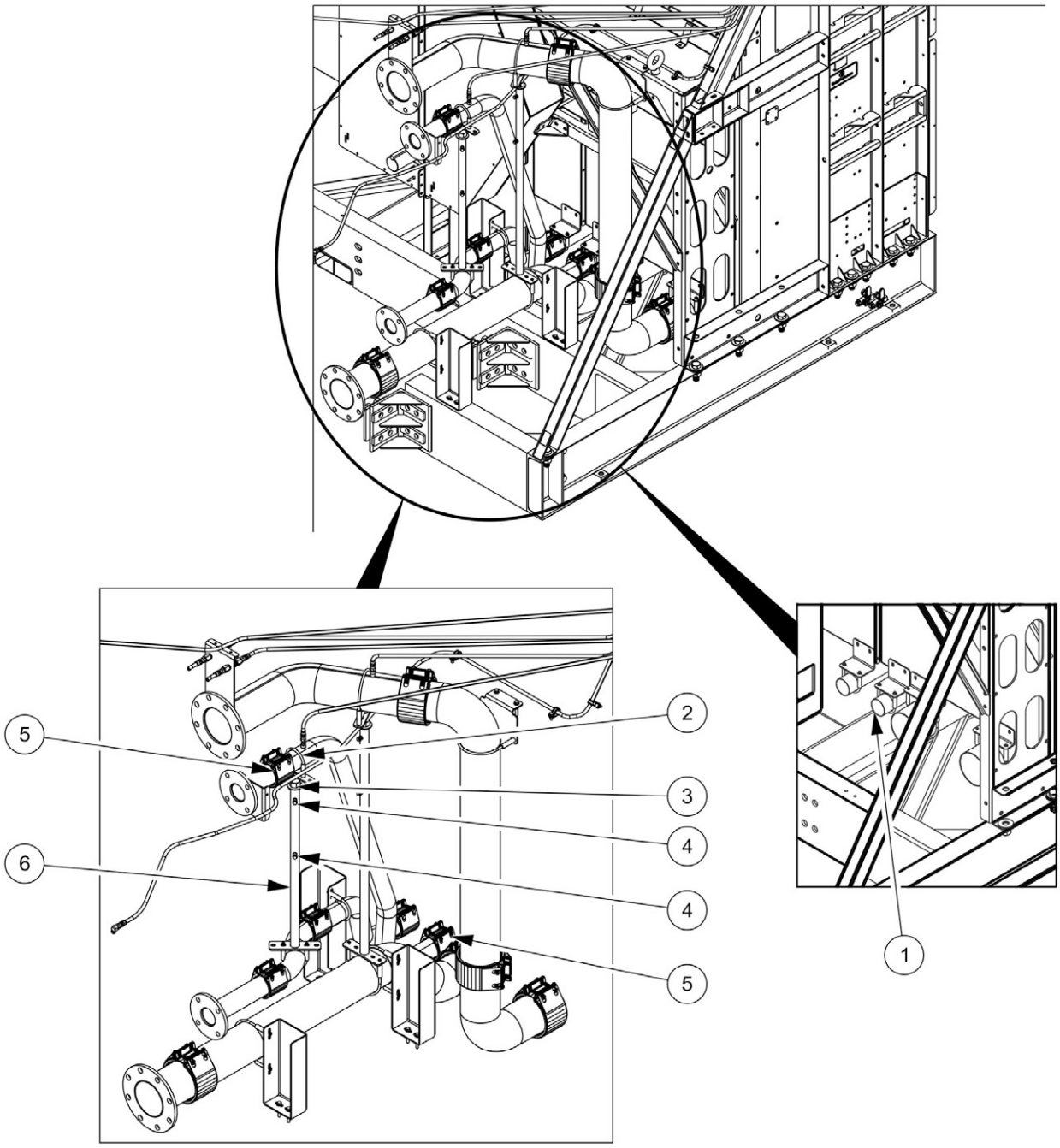


FIGURE 106. LT FLANGE TORQUE SEQUENCE NUMBERS

8.3.22 Install LT Outlet Tubing

NOTICE
Numbers in parenthesis refer to Figure 107 unless specified otherwise.

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No.	Description	No.	Description
1	Radiator LT Inlet	4	Lock bolt
2	U-bolt	5	Pipe coupler
3	Adjustment screw	6	Tube support

FIGURE 107. LT OUTLET TUBING INSTALLATION

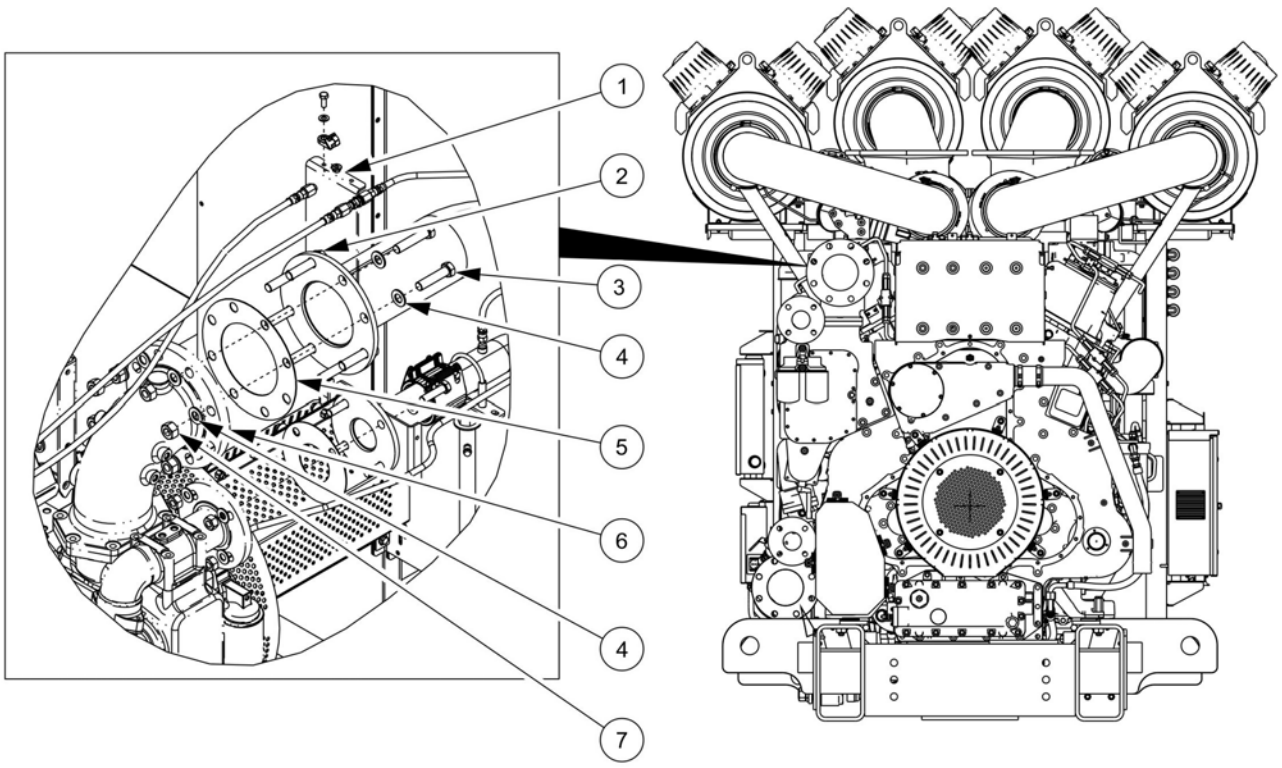
1. Apply anti-seize lubricant to pipe coupler (5) bolts.

2. Slide pipe couplers (5) onto LT outlet tube. Use a paint marker to mark centered coupling location on the tube before installation.
3. Place the LT outlet tube between the engine connection tube and the radiator connection point (1).
4. Center the pipe couplers over the gaps in the tubes. Make sure that the tubes are aligned both vertically and horizontally.
5. Loosely attach the pipe coupler (5) at the radiator connection point (1).
6. Apply thread locking compound to U-bolt (2) threads. Use U-bolts (2) and the support brace to install the LT outlet tube support (6).
7. Use two lock bolts (4) and the adjustment screw (3) to adjust the height of the LT outlet tube support (6).
8. Check the pipe couplers (5) for proper tube alignment and coupler placement.
9. Use a two-step, alternating torque sequence to tighten the pipe couplers.
    a. First, use alternating sequence to torque the pipe couplers to 6 Nm (4.4 ft-lb).
    b. Second, use alternating sequence to torque the pipe couplers to 13 Nm (9.5 ft-lb).
10. Apply a thread locking compound to the lock bolts (4).
11. Torque the lock bolts (4) to 40 Nm (30 ft-lb).
12. Torque U-bolts (2) to 50 Nm (37 ft-lb).

8.3.23 Install HT Outlet Coolant Flange

NOTICE
Numbers in parenthesis refer to Figure 108 unless specified otherwise.

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No.	Description	No.	Description
1	Vent line support bracket	5	Gasket
2	Bolt – ¾ X 3½ inch	6	HT inlet flange
3	Bolt – ¾ X 3¼ inch	7	Nut – ¾ inch
4	Washer – ¾ inch		

FIGURE 108. HT OUTLET COOLANT FLANGE

1. Apply anti-seize lubricant to bolt (7) threads.
2. Install HT outlet pipe and vent line support bracket (1) to HT outlet flange (6) with flange gasket (5), bolts (2 and 3), washers (4), and nuts (7). Use the ¾ inch X 3½ inch bolts (2) to attach the vent line support bracket (1).
3. Torque the bolts and nuts to 311 Nm (229 ft-lb) using the following torque sequence.
   a. Torque position 1, then position 5 shown in **Figure 109**.
   b. Torque position 8, then position 3 shown in **Figure 109**.
   c. Torque position 6, then position 2 shown in **Figure 109**.
   d. Torque position 7, then position 4 shown in **Figure 109**.

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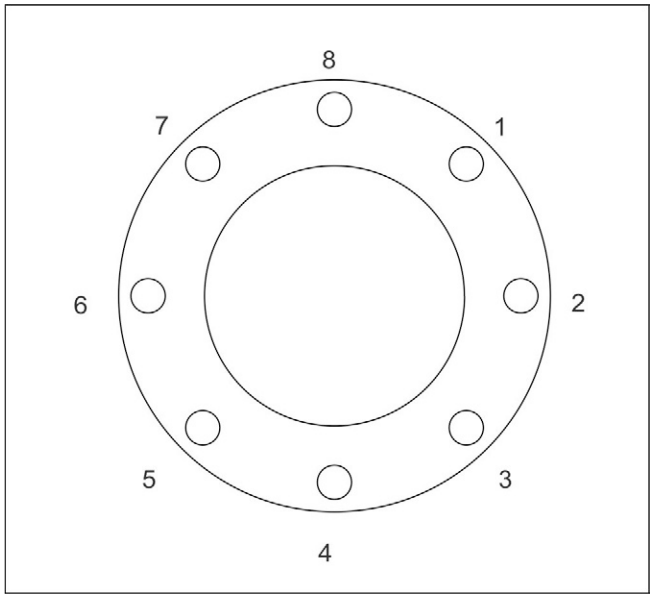
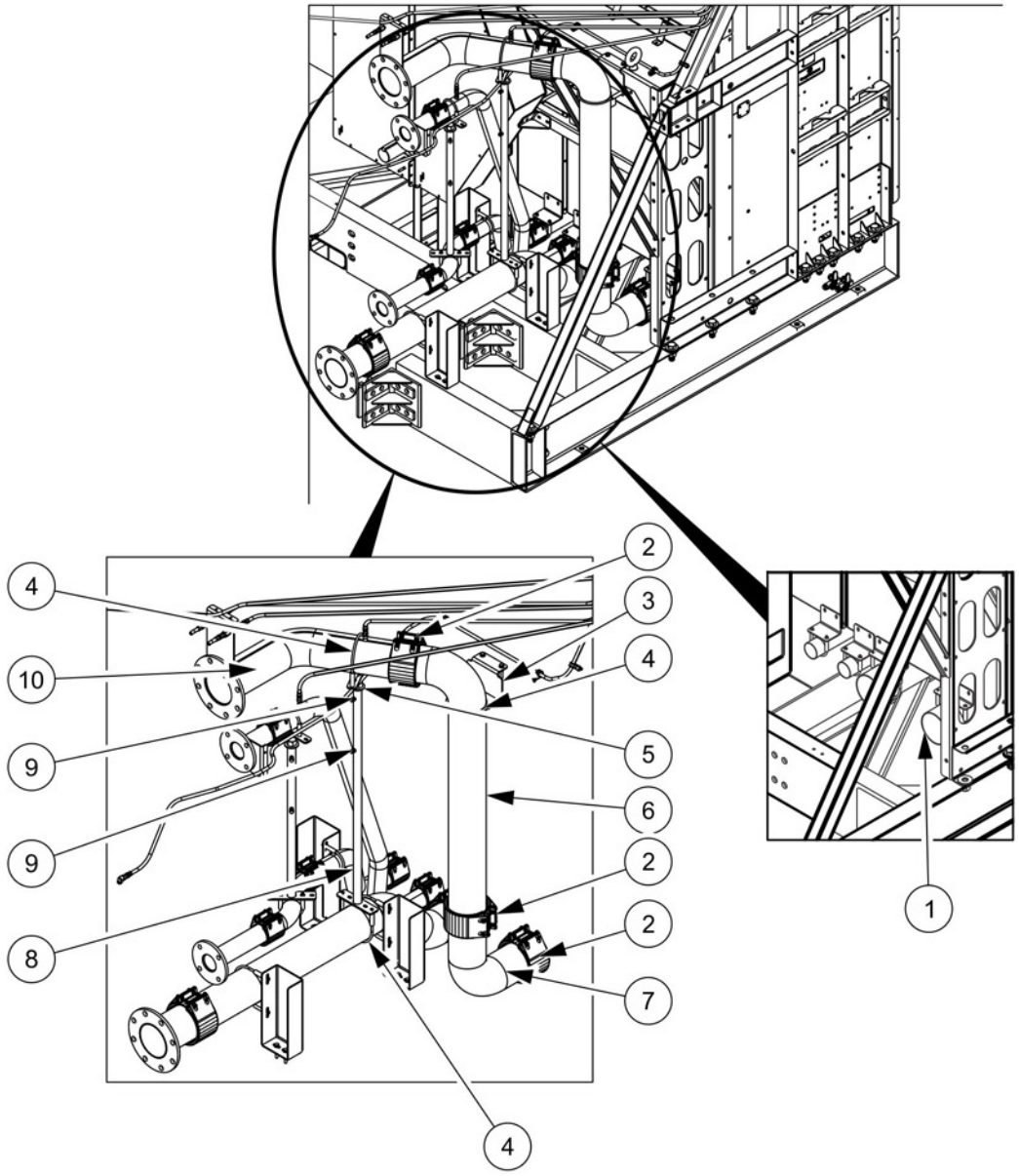


FIGURE 109. HT FLANGE TORQUE SEQUENCE NUMBERS

8.3.24 Install HT Outlet Tubing

NOTICE
Numbers in parenthesis refer to Figure 110 unless specified otherwise.

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No.	Description	No.	Description
1	Radiator HT Outlet	6	HT outlet tube
2	Pipe coupler	7	HT radiator outlet tube
3	HT outlet tube support (94 ft^2 radiator only)	8	Tube support
4	U-bolt	9	Lock bolt
5	Adjustment screw	10	HT engine outlet tube

FIGURE 110. HT OUTLET TUBING INSTALLATION

1. Install HT outlet tube support bracket (3) with two bolts, two flange nuts, and two washers.
2. Apply anti-seize lubricant to pipe coupler (2) bolts.

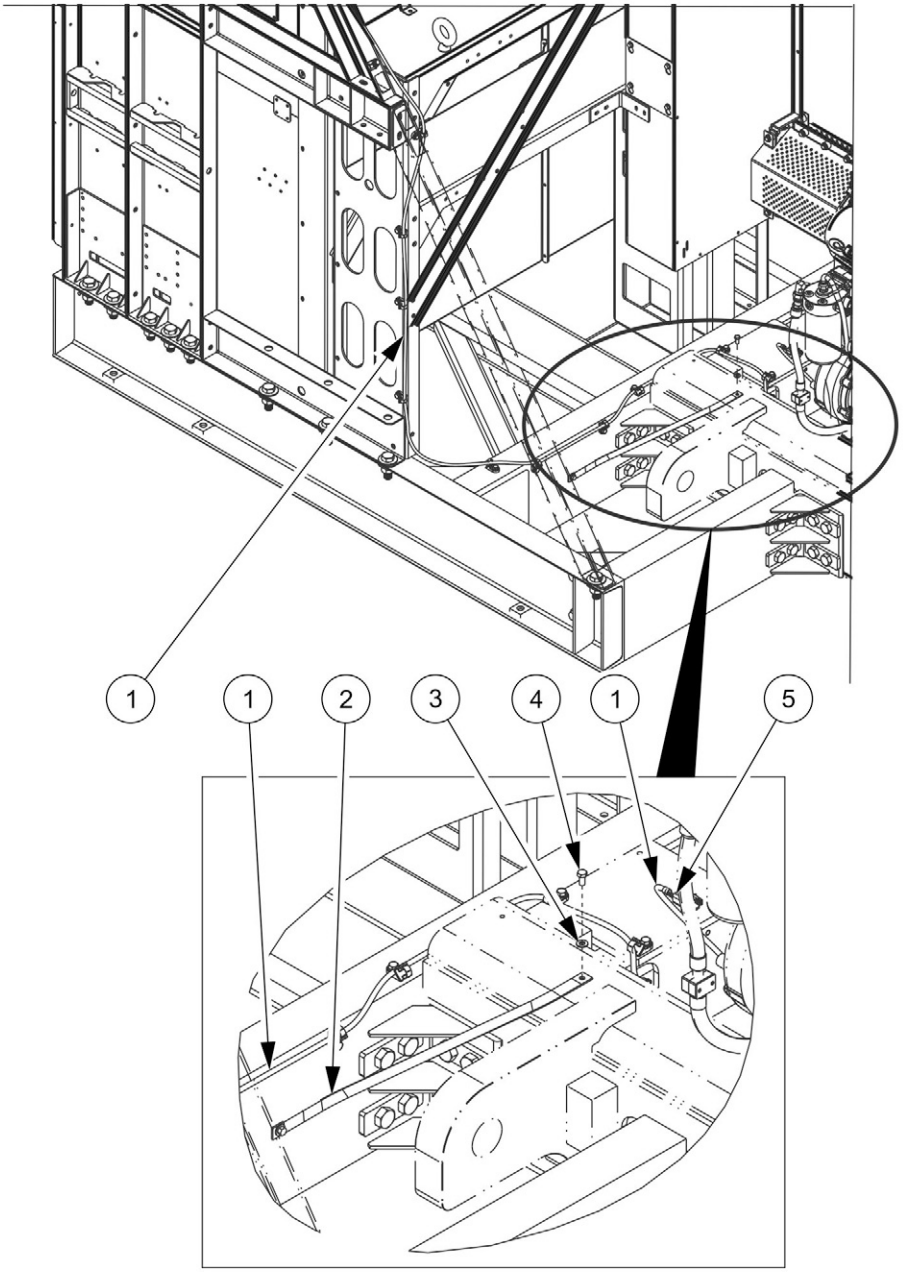
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3. Slide pipe coupler (2) onto HT radiator outlet tube (7). Use a paint marker to mark centered coupling location on the tube before installation.
4. Place the HT radiator outlet tube (7) on the radiator connection point (1).
5. Center the pipe coupler (2) over the gap in the tube. Make sure that the tubes are aligned both vertically and horizontally.
6. Loosely attach the pipe coupler (2) at the radiator connection point (1).
7. Slide one pipe coupler (2) onto the HT engine outlet tube (10) and one pipe coupler (2) onto the HT radiator outlet tube (7).
8. Align HT outlet tube (6) to HT engine outlet tube (10) and HT radiator outlet tube (7).
9. Center pipe couplers (2) over the gaps in the tubes. Make sure the tubes are aligned both vertically and horizontally.
10. Loosely tighten pipe coupler bolts.
11. Apply thread locking compound to U-bolt (4) threads. Loosely install U-bolt on HT outlet tube support bracket (3).
12. Apply thread locking compound to U-bolt (4) threads. Use U-bolts (4) and the support brace to install the HT outlet tube support (3).
13. Use two lock bolts (9) and the adjustment screw (5) to adjust the height of the HT outlet tube support (6).
14. Check the pipe couplers (2) for proper tube alignment and coupler placement.
15. Use a two-step, alternating torque sequence to tighten the pipe couplers.
    a. First, use alternating sequence to torque the pipe couplers to 10 Nm (7.4 ft-lb).
    b. Second, use alternating sequence to torque the pipe couplers to 21 Nm (15.5 ft-lb).
16. Apply a thread locking compound to the lock bolts (9).
17. Torque the lock bolts (9) to 40 Nm (30 ft-lb).
18. Torque U-bolts (4) to 50 Nm (37 ft-lb).

8.3.25 Complete Installation of Low Coolant Level Sensor Harness

NOTICE
Numbers in parenthesis refer to Figure 111 unless specified otherwise.

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No.	Description	No.	Description
1	Low coolant level sensor harness	4	Bolt
2	Ground strap	5	P1 connector on engine harness
3	Washer		

FIGURE 111. LOW COOLANT LEVEL SENSOR HARNESS CONNECTION TO ENGINE HARNESS

1. Connect the low coolant level sensor harness (1) to the engine harness (5).
2. Install the radiator ground strap (2).
    a. Apply dielectric grease to the ground strap mounting locations.

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b. Install the ground strap (2) with existing hardware.

c. Install the ground strap (2) to the generator set skid with one bolt (4) and one washer (3).

d. Torque bolts to 52 Nm (38 ft-lb).

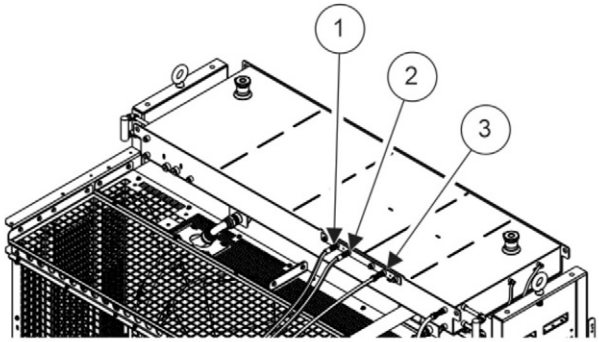
8.3.26 Install Vent Lines (61 Sq Ft Radiator)

The vent lines come installed on the radiator expansion tank (**Figure 112**). All the vent lines are bundled together and secured to the radiator.

1. Separate the vent lines and identify each line by part number.

All vent lines must be secured to the generator set using clips and cable ties.

All vent lines must be either vertical or inclined between the engine and radiator. No sags are permitted.

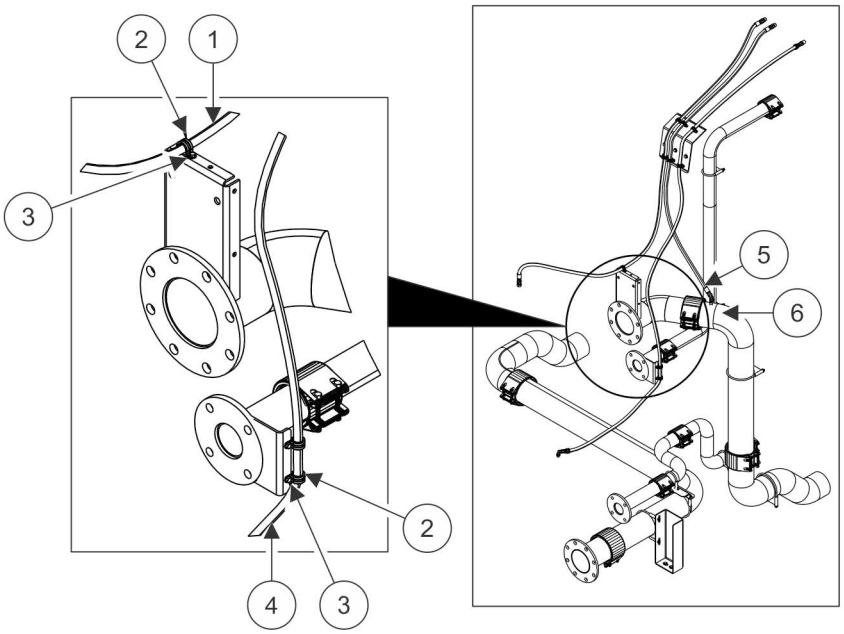


No.	Description	No.	Description
1	HT Engine Vent Line	3	LT Engine Vent Line
2	HT Outlet Tube Vent Line		

FIGURE 112. RADIATOR VENT LINES

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8.3.26.1 Install Vent Lines on Outlet Tubes and Vent Line Support Brackets



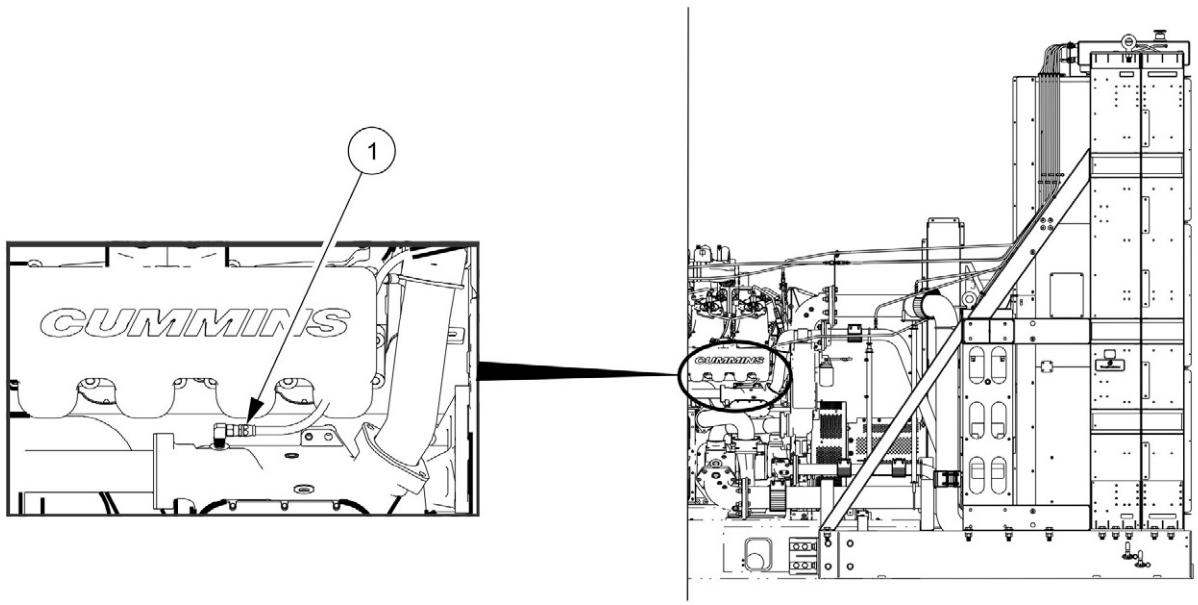
No.	Description	No.	Description
1	HT Engine Vent Line	4	LT Engine Vent Line
2	Hose Clip	5	HT Outlet Tube Vent Line
3	Bolt	6	HT Outlet Tube

FIGURE 113. VENT LINES ON OUTLET TUBES AND VENT LINE SUPPORT BRACKETS

1. Install the HT engine vent line (1) onto the HT vent line support bracket with one bolt (1) and one hose clip (3).
2. Install the HT outlet tube vent line (5) onto the HT outlet tube (6).
3. Install the LT engine vent line (4) onto the LT vent line support bracket using two bolts (3) and two hose clips (2).
4. Torque the vent lines to 20 Nm (9 ft-lb).

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8.3.26.2 Install LT Engine Vent Line



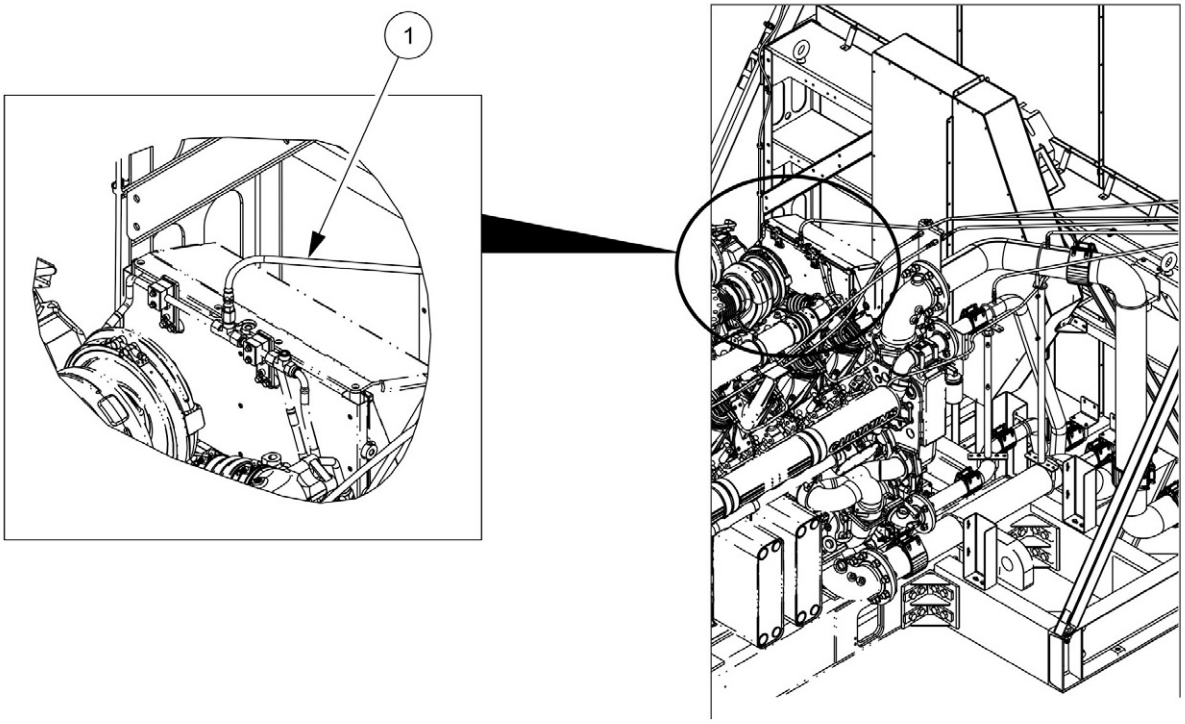
No.	Description
1	Vent Line

FIGURE 114. LT ENGINE VENT LINE

1. Remove the M14 plug in the LT thermostat housing.
2. Install the LT engine vent line fitting.
3. Install the LT engine vent line (1).
4. Torque the vent line to 27 Nm (20 ft-lb).

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8.3.26.3 Install HT Engine Vent Line



No.	Description
1	Vent Line

FIGURE 115. HT ENGINE VENT LINE

1. Remove any shipping plugs.
2. Install vent line (1).
3. Torque vent line to 52 Nm (38 ft-lb).

8.3.27 Install Vent Lines (84 and 94 Sq Ft Radiator)

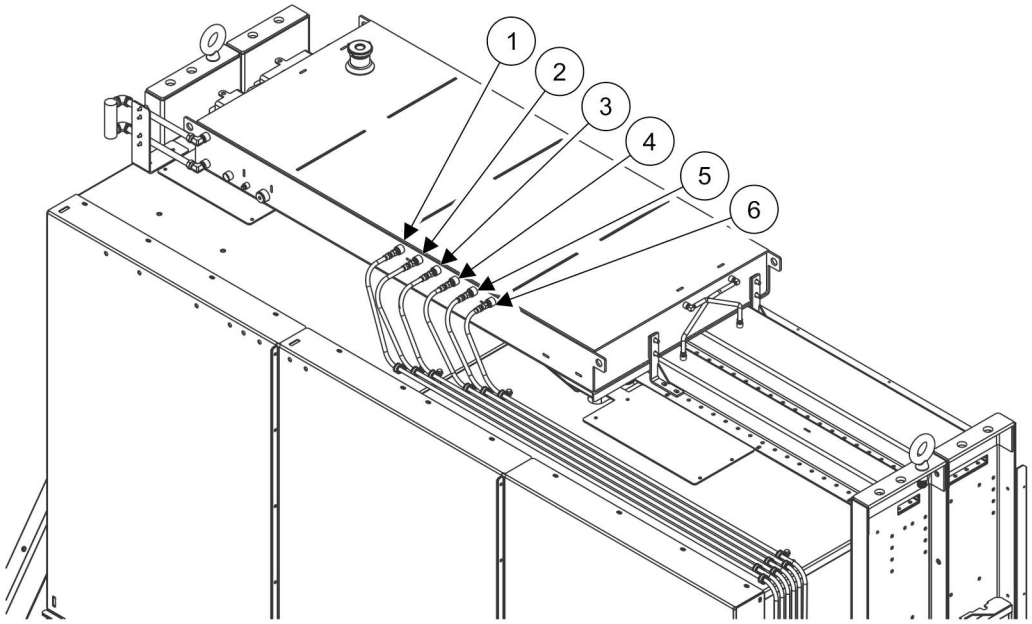
The vent lines come installed on the radiator expansion tank (**Figure 116**). All the vent lines are bundled together and secured to the radiator.

1. Separate the vent lines and identify each line by part number.

All vent lines must be secured to the generator set using clips and cable ties.

All vent lines must be either vertical or inclined between the engine and radiator. No sags are permitted.

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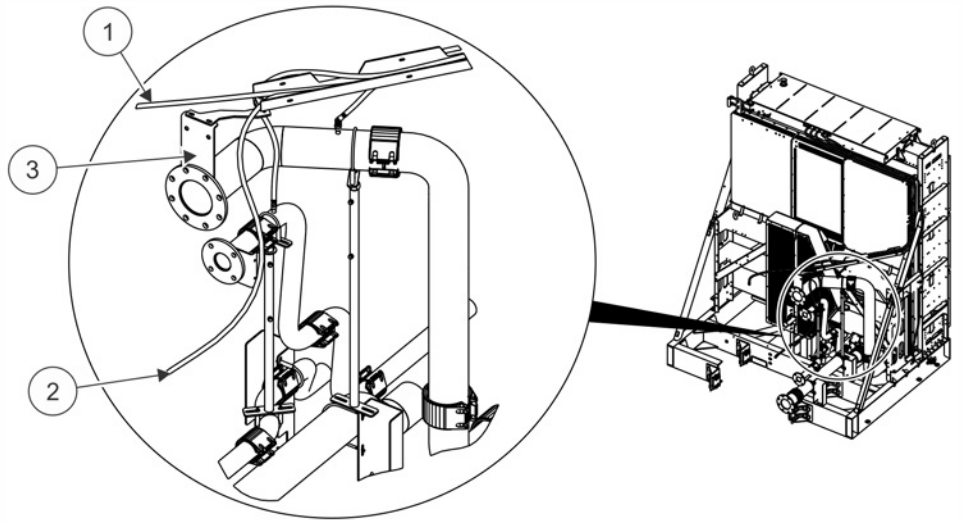
No.	Description	No.	Description
1	LT Outlet Tube 84 sq ft²: 4605 mm (181.30 in) 94 sq ft²: 5118 mm (201.50 in)	4	HT Engine Vent Line 84 sq ft²: 5071 mm (199.65 in) 94 sq ft²: 5499 mm (216.50 in)
2	HT Outlet Tube 84 sq ft²: 4512 mm (177.64 in) 94 sq ft²: 5029 mm (198 in)	5	LT Engine Vent Line 84 sq ft²: 5193 mm (204.45 in) 94 sq ft²: 6161 mm (242.56 in)
3	LT Aftercooler Vent Line 84 sq ft²: 4229 mm (166.50 in) 94 sq ft²: 4515 mm (177.76 in)	6	HT Aftercooler Vent Line 84 sq ft²: 3978 mm (156.61 in) 94 sq ft²: 4425 mm (174.21 in)

FIGURE 116. RADIATOR VENT LINES

8.3.27.1 Install Vent Lines on HT Vent Line Support Bracket (Spec A Only)

NOTICE
Numbers in parenthesis refer to Figure 117 unless specified otherwise.

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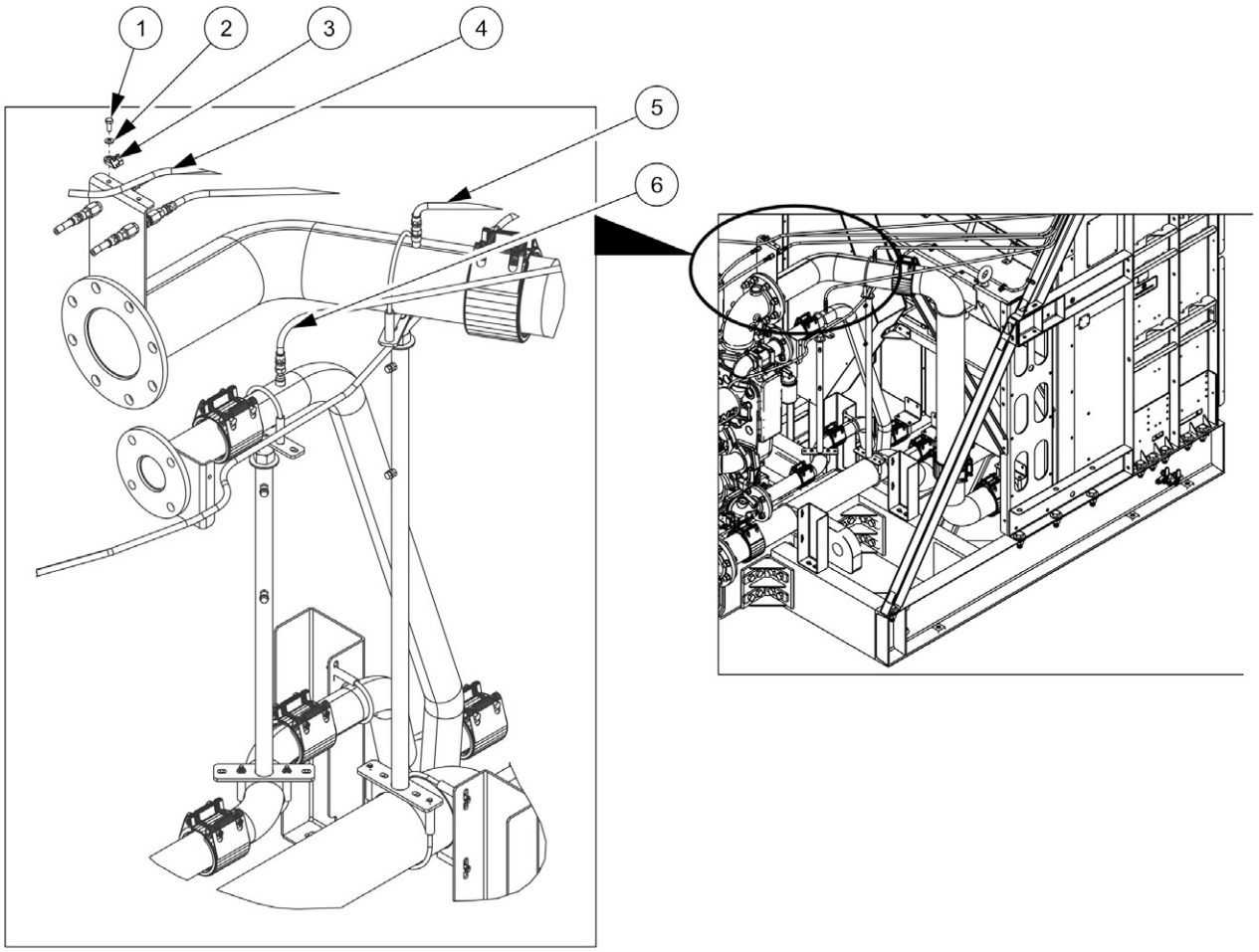
No.	Description	No.	Description
1	HT Vent Line 84 sq ft^2: 4229 mm (166.50 in) 94 sq ft^2: 4515 mm (177.76 in)	3	HT vent line support bracket
2	LT Vent Line 84 sq ft^2: 3978 mm (156.61 in) 94 sq ft^2: 4425 mm (174.21 in)		

FIGURE 117. VENT LINES ON HT VENT LINE SUPPORT BRACKET

1. Install vent lines (1 and 2) on the HT vent line support bracket. Use Loctite 592 or similar thread sealant on all threads.
2. Torque the vent lines to 12 Nm (9 ft-lb).

8.3.27.2 Install Vent Lines on Outlet Tubes and HT Vent Line Support Bracket

NOTICE
Numbers in parenthesis refer to Figure 118 unless otherwise specified.



No.	Description	No.	Description
1	Screw	4	Vent Line 84 sq ft²: 5071 mm (199.65 in) 94 sq ft²: 5499 mm (216.50 in)
2	Washer	5	Vent Line 84 sq ft²: 4512 mm (177.64 in) 94 sq ft²: 5029 mm (198 in)
3	Cable clamp and cable tie	6	Vent Line 84 sq ft²: 4605 mm (181.30 in) 94 sq ft²: 5118 mm (201.50 in)

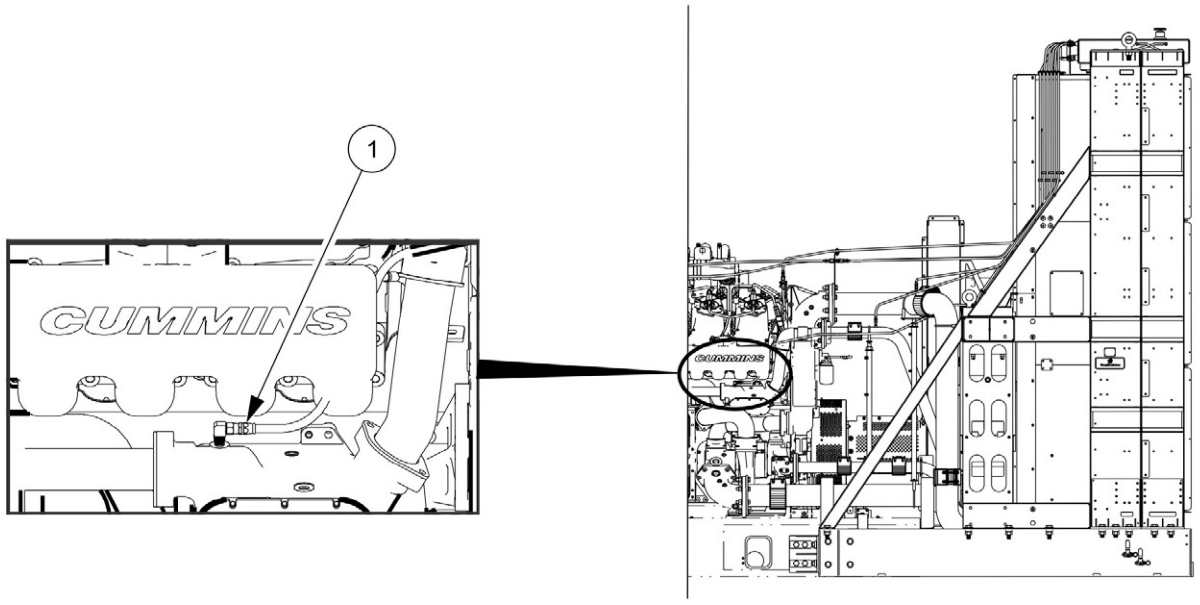
FIGURE 118. VENT LINES ON OUTLET TUBES AND HT VENT LINE SUPPORT BRACKET

1. Install vent line (4) on vent line support bracket with one screw (1), one washer (2), one cable clamp (3), and a cable tie.
2. Install vent line (5) on the HT outlet tube.
3. Install vent line (6) on the LT outlet tube.
4. Torque vent lines to 20 Nm (9 ft-lb).

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8.3.27.3 Install LT Engine Vent Line

NOTICE
Numbers in parenthesis refer to Figure 119 unless specified otherwise.



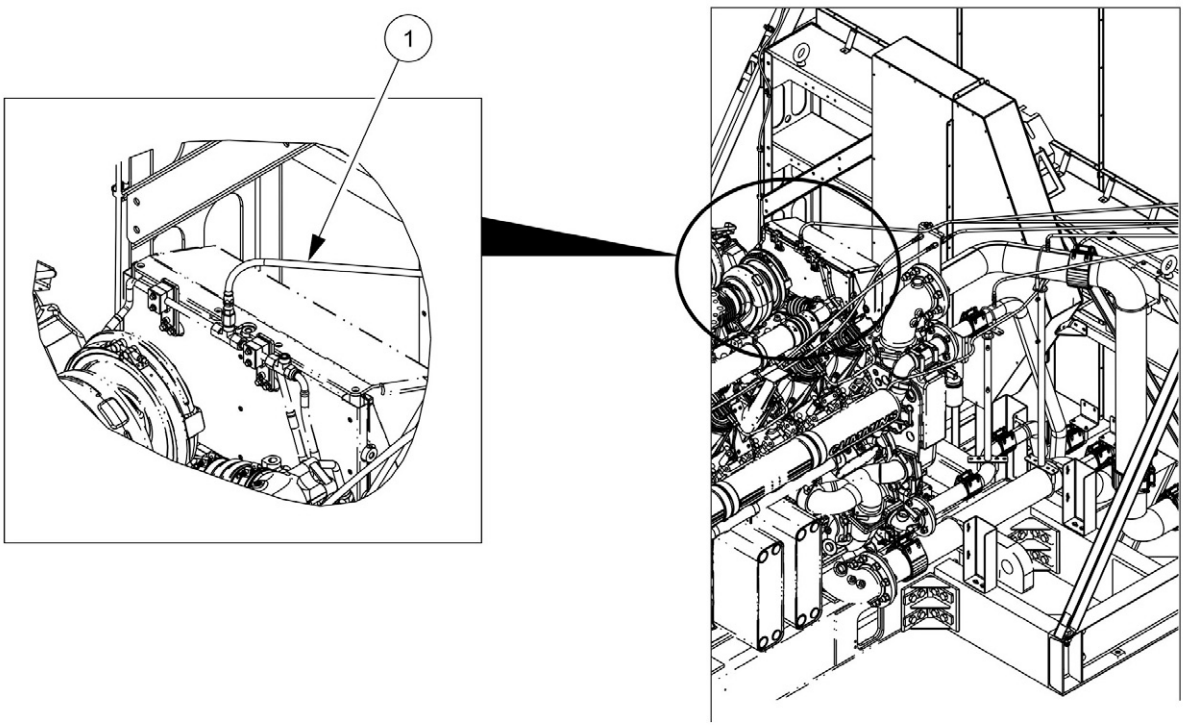
No.	Description
1	Vent Line 84 sq ft^2: 5193 mm (204.45 in) 94 sq ft^2: 6161 mm (242.56 in)

FIGURE 119. LT ENGINE VENT LINE

1. Remove the M14 plug in the LT thermostat housing.
2. Install the LT engine vent line fitting.
3. Install the LT engine vent line (1).
4. Torque the vent line to 27 Nm (20 ft-lb).

8.3.27.4 Install HT Engine Vent Line

NOTICE
Numbers in parenthesis refer to Figure 120 unless specified otherwise.



No.	Description
1	Vent Line 84 sq ft²: 5071 mm (199.65 in) 94 sq ft²: 5499 mm (216.50 in)

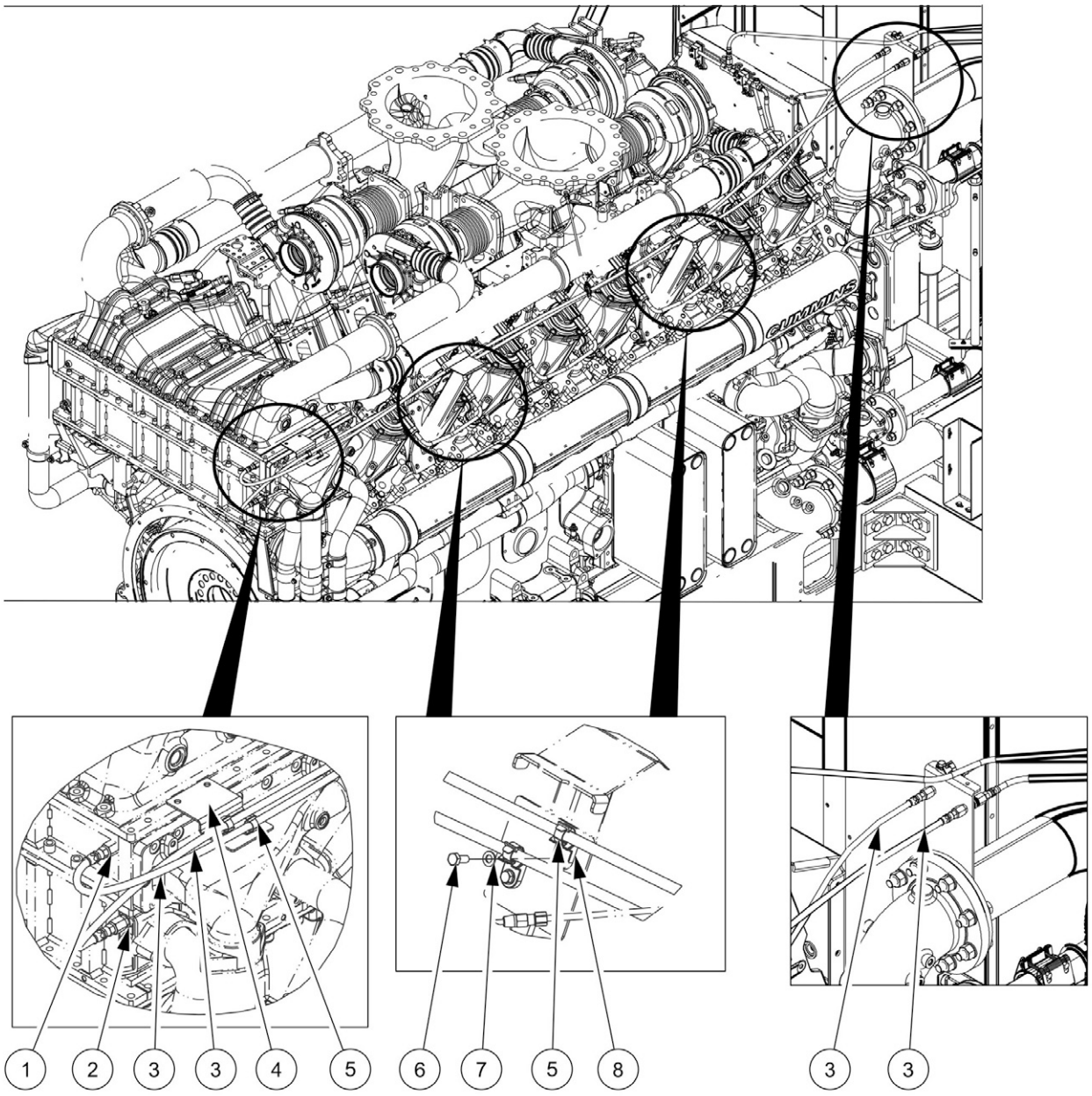
FIGURE 120. HT ENGINE VENT LINE

1. Remove any shipping plugs.
2. Install vent line (1).
3. Torque vent line to 52 Nm (38 ft-lb).

8.3.27.5 Install HT and LT Aftercooler Vent Lines (Spec A Only)

NOTICE
Numbers in parenthesis refer to Figure 121 unless otherwise specified.

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No.	Description	No.	Description
1	HT aftercooler vent	5	Cable tie
2	LT aftercooler vent	6	Screw
3	Vent Line	7	Washer
4	Bracket	8	Cable clamp

FIGURE 121. HT AND LT AFTERCOOLER VENT LINES

1. Install aftercooler vent line support bracket (4) and attachment clips.
2. Torque support bracket (4) to 52 Nm (38 ft-lb).
3. Torque attachment clips to 27 Nm (20 ft-lb).

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4. Remove M14 plugs in HT and LT aftercooler.
5. Install HT and LT aftercooler vent line fittings.
6. Install HT and LT aftercooler vent lines (3).
7. Run vent lines (3) along the right bank of the engine. Attach the vent lines (3) to the air cleaner support brackets with cable ties (5).
8. Install vent lines (3) on vent line support bracket.

8.3.28 Install Radiator Fan Drive Shaft

For radiator fan dive shaft installation steps see **Section 8.5 on page 213**

8.3.29 Grease Fan Bearings

Fan bearings should be greased immediately with initial installation of radiator, then at regular intervals following the maintenance schedule. When operating in hot, dirty, or wet environments, the bearing re-grease interval will need to be increased. The timing can vary from daily to weekly. historical experience with bearings operating under the specific conditions will help determine the correct interval. Contact your authorized distributor for assistance.

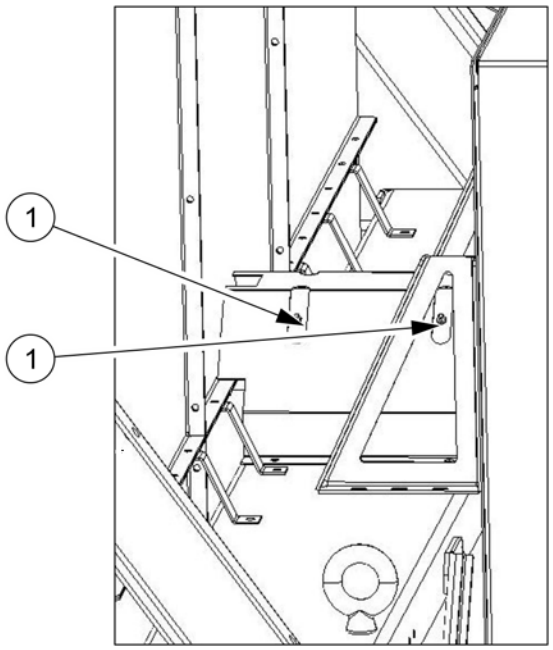
8.3.29.1 Tools and Consumables

- Grease gun (flexible hose recommended)
- 9/16 inch socket
- Fan drive bearing grease (Mobil One Synthetic, part number A049B381)

8.3.29.2 Procedure

1. Locate the fan shaft zerks. The zerks are accessible through slots in the bearing guard.

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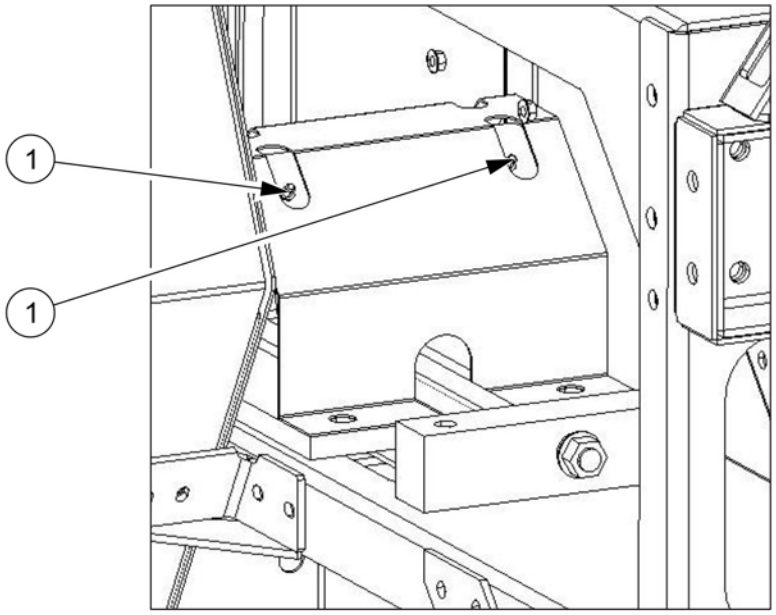


No.	Description	No.	Description
1	Fan shaft zerks		

FIGURE 122. FAN SHAFT ZERKS

2. Wipe the grease zerks clean of any foreign material.
3. Put the grease gun onto the zerks. Make sure the grease gun nozzle is fully engaged on the zerk fitting.
4. Pump about 0.42 oz of grease into each zerk.
5. Locate the idler shaft zerks. the zerks are accessible through the slots in the bearing guard.

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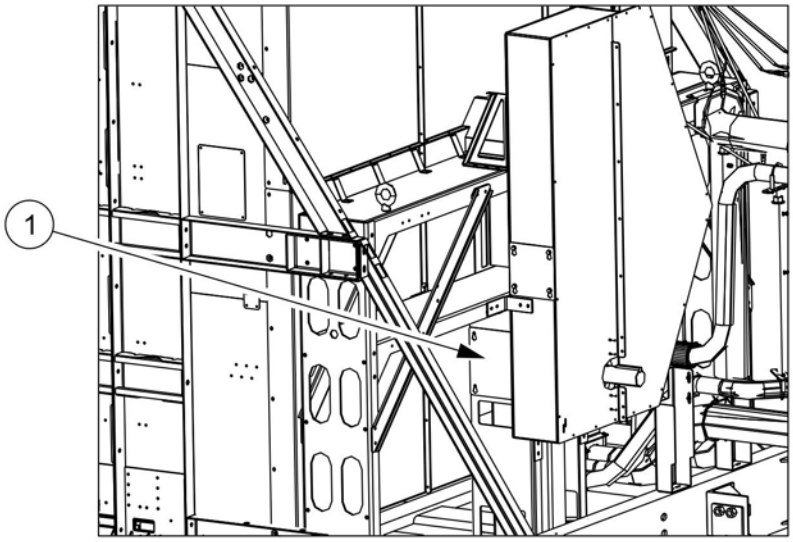


No.	Description	No.	Description
1	Idler shaft zerks		

FIGURE 123. IDLER SHAFT ZERKS

6. Wipe the grease zerks clean of any foreign material.
7. Put the grease gun onto the zerks. Make sure the grease gun nozzle is fully engaged on the zerk fitting.
8. Pump about 0.28 oz of grease into each zerk.
9. Remove the inspection cover.

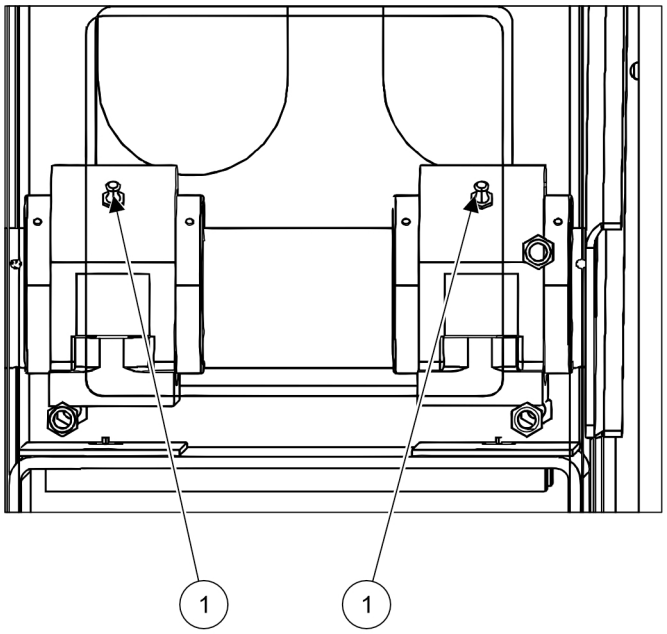
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No.	Description	No.	Description
1	Inspection cover		

FIGURE 124. INSPECTION COVER

10. Locate the input shaft zerks. the zerks are accessible through the slots in the bearing guard.

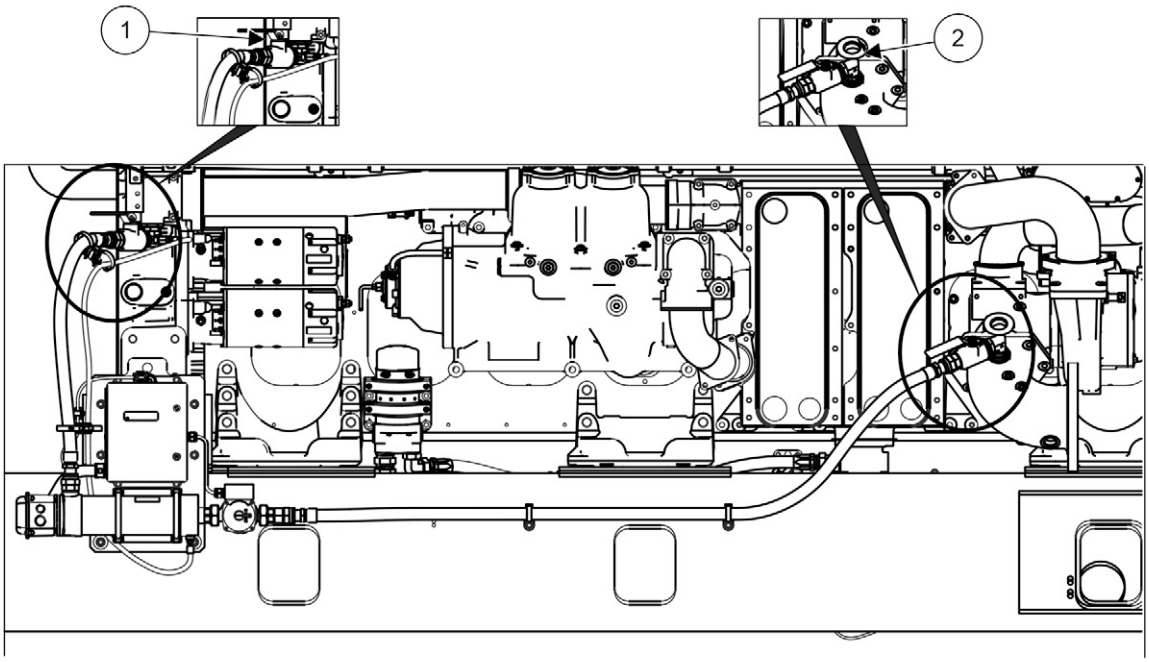


No.	Description	No.	Description
1	Input shaft zerks		

FIGURE 125. IDLER SHAFT ZERKS

11. Wipe the grease zerks clean of any foreign material.
12. Put the grease gun onto the zerks. Make sure the grease gun nozzle is fully engaged on the zerk fitting.
13. Pump about 0.63 oz of grease into each zerk.
14. Use a baring device to turn the engine 3 full turns. Take note of fan blade location for counting.
15. Pump about 0.42 oz of grease into each fan shaft zerk.
16. Pump about 0.28 oz of grease into each idler shaft zerk.
17. Pump about 0.63 oz of grease into each input shaft zerk.
18. Install the inspection cover. Tighten the four bolts

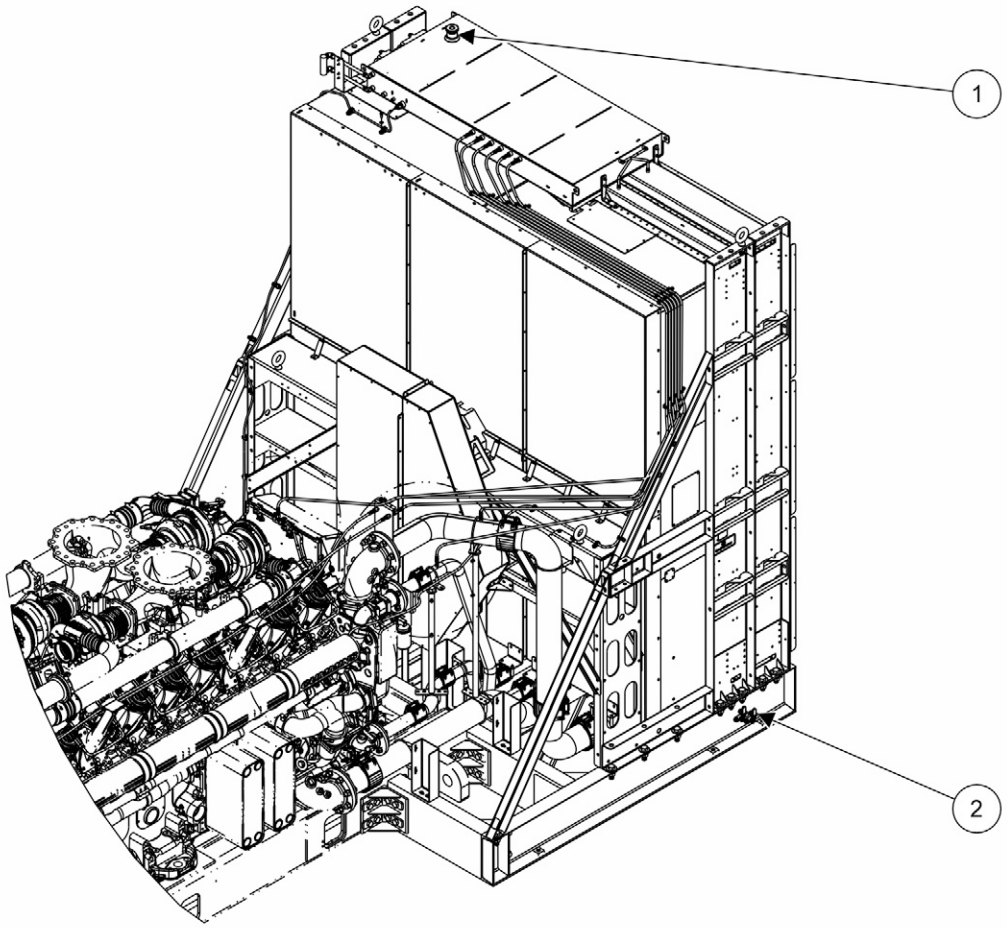
8.3.30 Fill Radiator



No.	Description	No.	Description
1	Outlet Isolation Valve	2	Inlet Isolation Valve

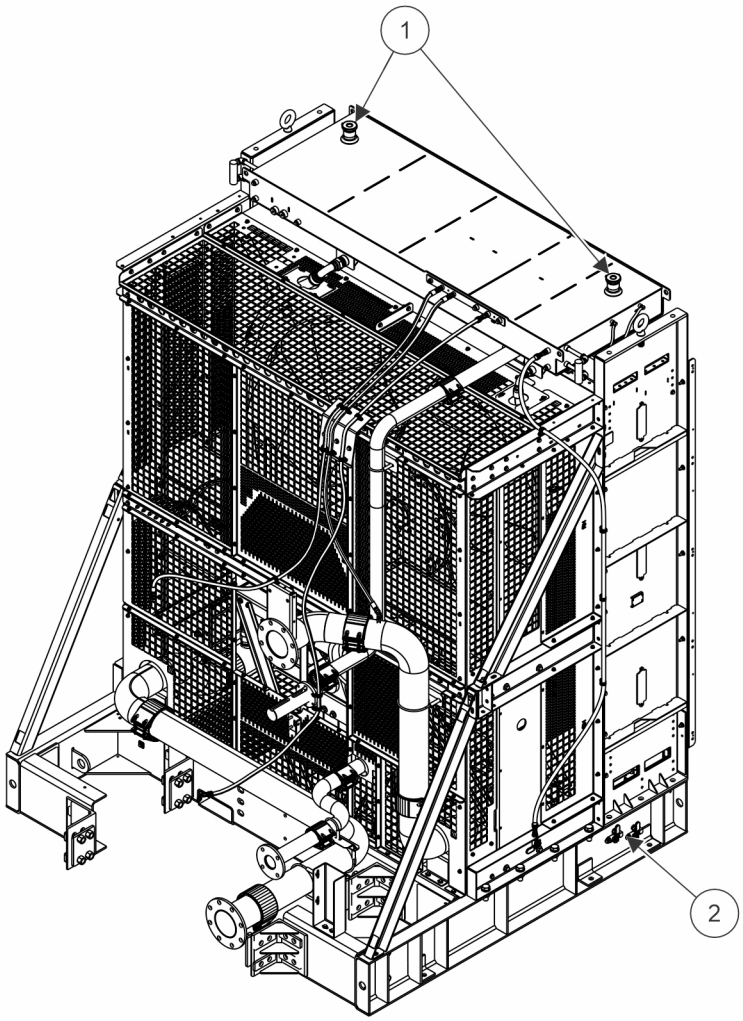
FIGURE 126. COOLANT HEATER ISOLATION VALVES

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No.	Description	No.	Description
1	Fill Neck	2	Drain Valves

FIGURE 127. RADIATOR FILL LOCATION (84 AND 94 SQ FT)



No.	Description	No.	Description
1	Fill Necks	2	Drain Valves

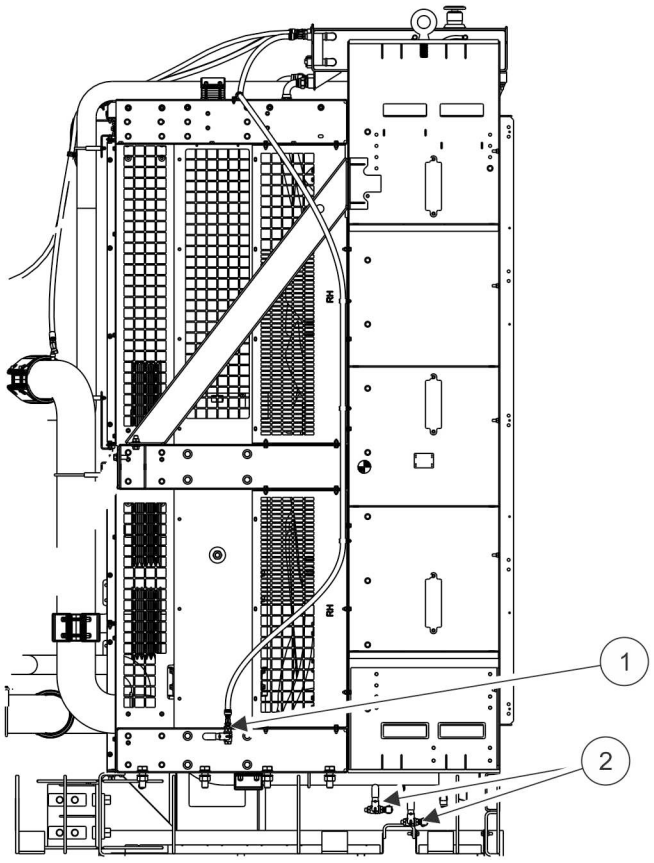
FIGURE 128. RADIATOR FILL LOCATIONS (61 SQ FT)

1. Open the inlet isolation valve and the outlet isolation valve on the coolant heater (**Figure 126**).
2. Remove the radiator pressure cap on the fill neck.
3. Fill the radiator from the fill neck (Spec A or B) or bottom fill via the drain valves (Spec B only, see **Section 8.3.31 on page 174**).
   - Fill rate - 5 gpm (19 Lpm)
   - For fill volumes, refer to **Chapter 5 on page 43**.
4. Check for coolant leaks during and after the radiator coolant fill.
5. Install the radiator pressure cap.
6. Test run the generator set for 10 minutes with the coolant temperature above 82 °C (180 °F).
7. Check for coolant leaks at the generator set and the radiator.
8. Check the coolant level and top off if needed.

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8.3.31 Fill Radiator Using Bottom Fill Option (Spec B Only)

NOTICE
Bottom fill option must be installed prior to performing this procedure.



No.	Description	No.	Description
1	Ball Valve Connected to Surge Tank	2	Drain Valves

FIGURE 129. RADIATOR BOTTOM FILL COMPONENTS

1. Open the inlet isolation valve and the outlet isolation valve on the coolant heater (**Figure 126**).
2. Fill the radiator.
   - Fill rate - 5 gpm (19 Lpm)
   - For fill volumes, refer to **Chapter 5 on page 43**.
   a. Open the ball valve connected to the surge tank.
   b. Pump in the coolant via the drain valves. If coolant flows out of the ball valve, the coolant needs to be drained to the appropriate coolant level.
3. Check for coolant leaks during and after the radiator coolant fill.
4. Close and lock all of the ball valves.

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5. Test run the generator set for 10 minutes with the coolant temperature above 82 °C (180 °F).
6. Check for coolant leaks at the generator set and the radiator.
7. Check the coolant level and top off if needed.

8.4 Radiator Installation on Skid - A078L534, A078L535, and A076E016

8.4.1 Required Tools, Parts, and Consumables

The following tools are required to complete this installation.

- Tape measure
- Level
- Torque Wrenches
  - 40-200 in-lb, 3/8 inch drive
  - 15-75 ft-lb, 3/8 inch drive
  - 50-250 ft-lb, 1/2 inch drive
  - 120-600 ft-lb, 3/4 inch drive
- Toe Jacks, Fork Lift, or Overhead Crane capable of lifting generator set
  - If using overhead crane, appropriately sized rigging equipment
- Pipe wrench, 24 inch
- Hex socket
  - 6 mm
  - 8 mm
  - 17 mm
  - 5/16 inch
- Paint marker
- Socket
  - 36 mm
  - 1/2 inch
  - 15/16 inch
  - 1 1/8 inch
- Deep socket
  - 9/16 inch
  - 15 mm
- Combination wrench
  - 1 1/16 inch
  - 1 1/4 inch
- 3/4 inch drive extension, 8 inch
- Belt tension tool (A050L945)

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- Standard 6 inch (150 mm) Vernier calipers
- Steel bar (A059R243)
- Clamp (A001G779)
- Clean rags
- Molykote (MoS")
- ½ inch internal to 3/8 inch external square drive adapter
- 3/8 inch drive, 12 point, 21 mm torque adapter with 2 inch offset
- Jeweler files, or 150 grit or finer emery cloth

8.4.2 Safety Precautions

⚠ WARNING

Automated Machinery

Accidental or remote starting of the generator set can cause severe personal injury or death.

Isolate all auxiliary supplies and use an insulated wrench to disconnect the starting battery cables (negative [–] first).

⚠ WARNING

Electrical Generating Equipment

Incorrect operation and maintenance can result in severe personal injury or death.

Make sure that only suitably trained and experienced service personnel perform electrical and/or mechanical service.

⚠ WARNING

Combustible Gases

Ignition of battery gases is a fire and explosion hazard which can cause severe personal injury or death.

Using an insulated wrench, disconnect the negative (–) cable first and reconnect it last. Make certain hydrogen from the battery, engine fuel, and other explosive fumes are fully dissipated. This is especially important if the battery has been connected to a battery charger.

⚠ WARNING

Combustible Gases

Ignition of battery gases is a fire and explosion hazard which can cause severe personal injury or death.

Do not smoke, or switch the trouble light ON or OFF near a battery. Touch a grounded metal surface first before touching batteries to discharge static electricity. Stop the generator set and disconnect the battery charger before disconnecting battery cables. Using an insulated wrench, disconnect the negative (–) cable first and reconnect it last.

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⚠ WARNING

Electric Shock Hazard

Voltages and currents present an electrical shock hazard that can cause severe burns or death.

Make sure that only service personnel who are trained and experienced perform electrical and mechanical component installations. Follow all local requirements when working on electrical equipment. Isolate all forms of electrical energy before working on the generator set.

⚠ CAUTION

Hazardous Voltage

Contact with high voltages can cause severe electrical shock, burns, or death.

Disconnect the battery charger before isolating the battery.

⚠ CAUTION

Sharp Edges

Sharp edges/burrs on housing parts can cause cuts and puncture wounds.

When handling housing parts, use appropriate PPE.

Read these instructions completely and become familiar with safety warnings, cautions, and procedures before starting the installation.

The installer must be familiar with the techniques of working on heavy machinery. A hoist must be available which can support the weight of the radiator, with an appropriate lifting strength margin.

Turn off or remove AC power from the battery charger and then use an insulated wrench to remove the negative (–) battery cable from the set starting battery. This prevents the generator set from starting while working on it and to avoid circuit board damage, caused by voltage spikes when removing and replacing circuit board connectors.

8.4.3 Preparing for the Installation

When installing the generator set, make sure to consider what is needed to install the cooling system.

1. Make sure to have all of the necessary tools and any additional items needed to complete the installation.

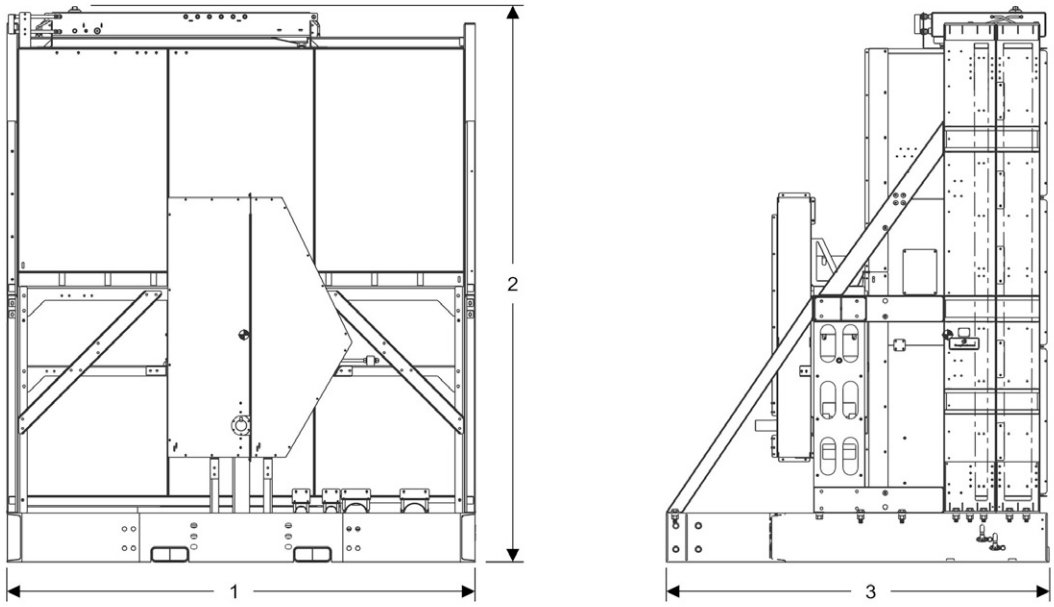
   The following items must be supplied by the customer to complete the installation.

   - Cable ties to be used when installing the vent lines
   - Coolant mixture:
     - For 84 ft^2 radiators: fully formulated, a 50% EG coolant mixture.
     - For 61 ft^2 radiators: fully formulated, a 50% EG coolant mixture.
     - For fill volumes, refer to **Chapter 5**.
   - High strength tread locking compound (Loctite 277 or equivalent)
   - Anti-seize (Loctite C5-A or equivalent)
   - Thread sealant (Loctite 592 or equivalent)
   - Dielectric grease (Loctite 8423 or equivalent)

2. Apply the appropriate Hot Surface Warning Labels, included in the radiator kit, to the applicable parts as required per local codes and standards.

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3. Make sure to have allowed enough space to install the radiator. Basic radiator dimensions are shown in **Figure 130**.



No.	Description	No.	Description
84 ft² High Ambient Radiator			
1	3022.6 mm (119 in)	3	2336.8 mm (92 in)
2	3759.2 mm (148 in)		
61 ft² Radiator			
1	2616.2 mm (103 in)	3	2336.8 mm (92 in)
2	3371 mm (132.7 in)		

FIGURE 130. RADIATOR DIMENSIONS

8.4.4 Radiator Rigging Instructions

⚠ WARNING

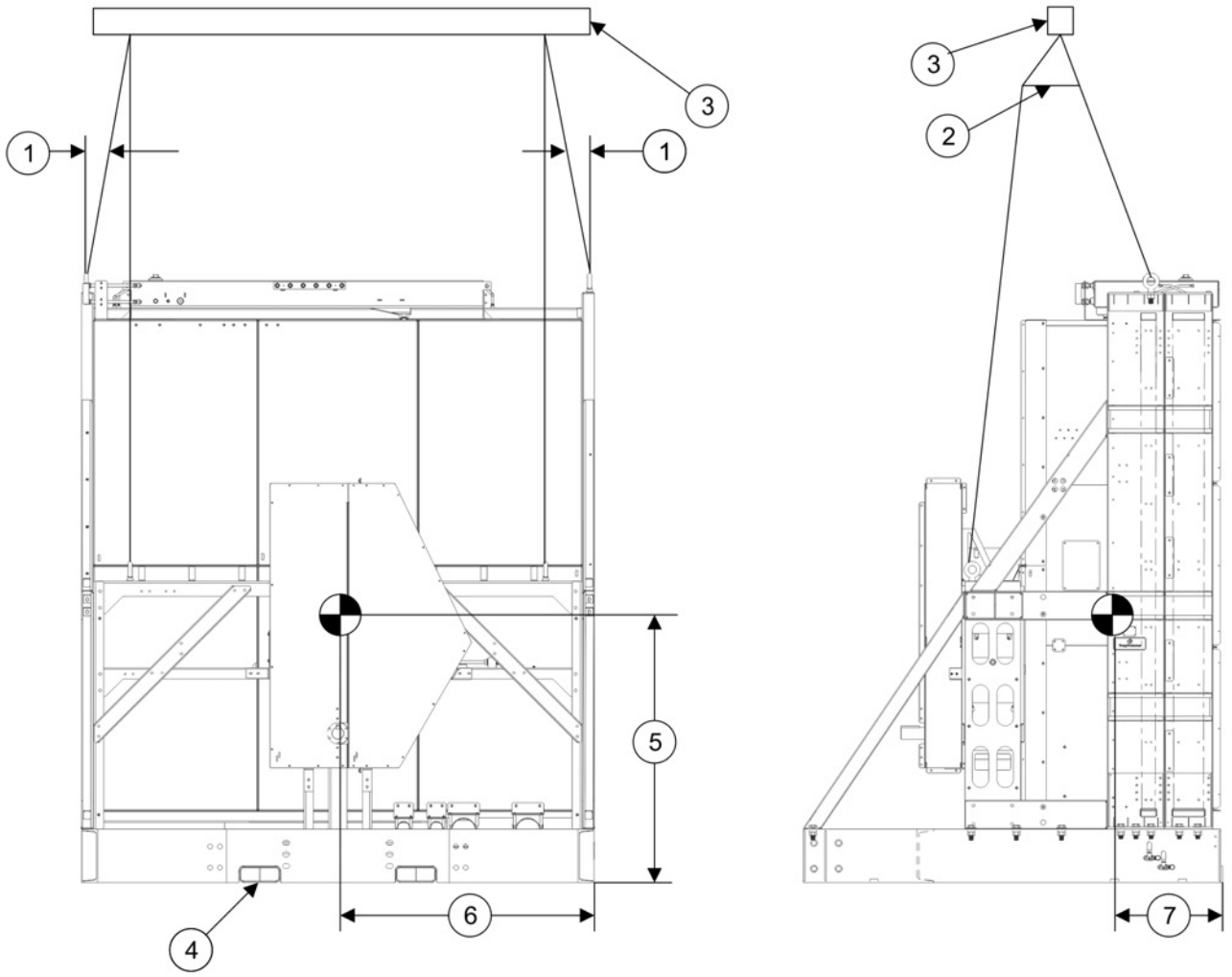
Heavy Load

Incorrect lifting or repositioning can cause severe personal injury or death.

Make sure that only suitably trained or experienced personnel transport and handle radiator and associated components.

NOTICE

Do not lift the generator set with the radiator installed. Damage can occur.



Item	Description	Item	Description
1	Angle 10° maximum	5	61 ft² radiator - 1271 mm (50.03 in) 84 ft² radiator - 1472 mm (57.95 in)
2	Spreader bar to avoid damage to the fan guard	6	61 ft² radiator - 1285 mm (50.59 in) 84 ft² radiator - 1500 mm (59.06 in)
3	Lifting beam	7	61 ft² radiator - 848 mm (33.38 in) 84 ft² radiator - 768 mm (30.23 in)
4	Fork tube (quantity 2) 254 mm X 102 mm (10.0 in X 4.0 in)		Dry weight: 61 ft² radiator - 4620 kg (10185.3 lb) 84 ft² radiator - 4836 kg (10,660 lb)
Cables must not exceed a 45° angle from vertical in any direction.			

FIGURE 131. RADIATOR RIGGING

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8.4.5 Attach the Low Coolant Level Sensor

⚠ CAUTION

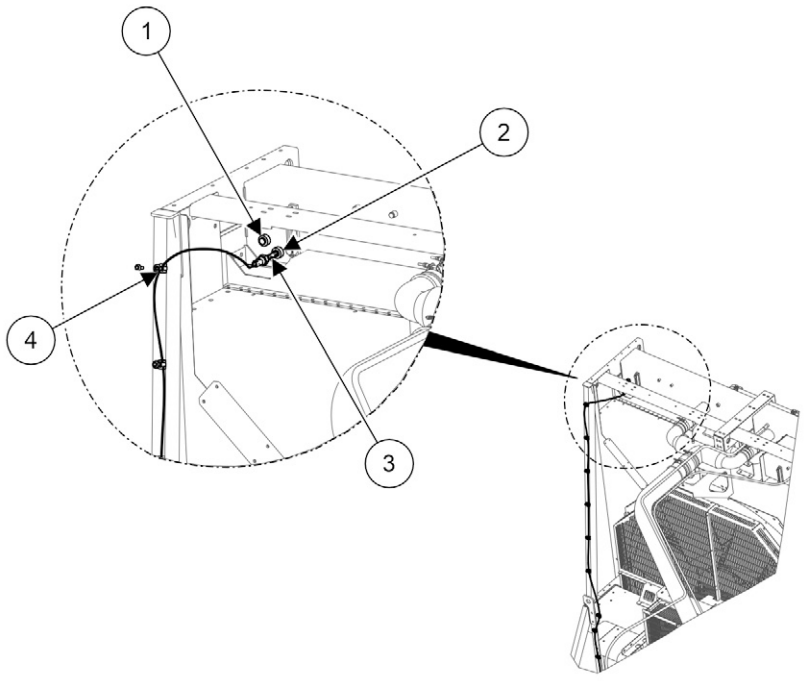
Equipment Damage

Power tools can damage the low coolant level sensor.

After installing by hand, use a manual torque wrench to complete the installation of the sensor

NOTICE

Numbers in parenthesis refer to components identified in the figure below.



Item	Description	Item	Description
1	Low Coolant Level Warning Port	3	Low Coolant Level Sensor
2	Low Coolant Level Shutdown Port	4	Low Coolant Level Harness

FIGURE 132. RADIATOR RIGGING

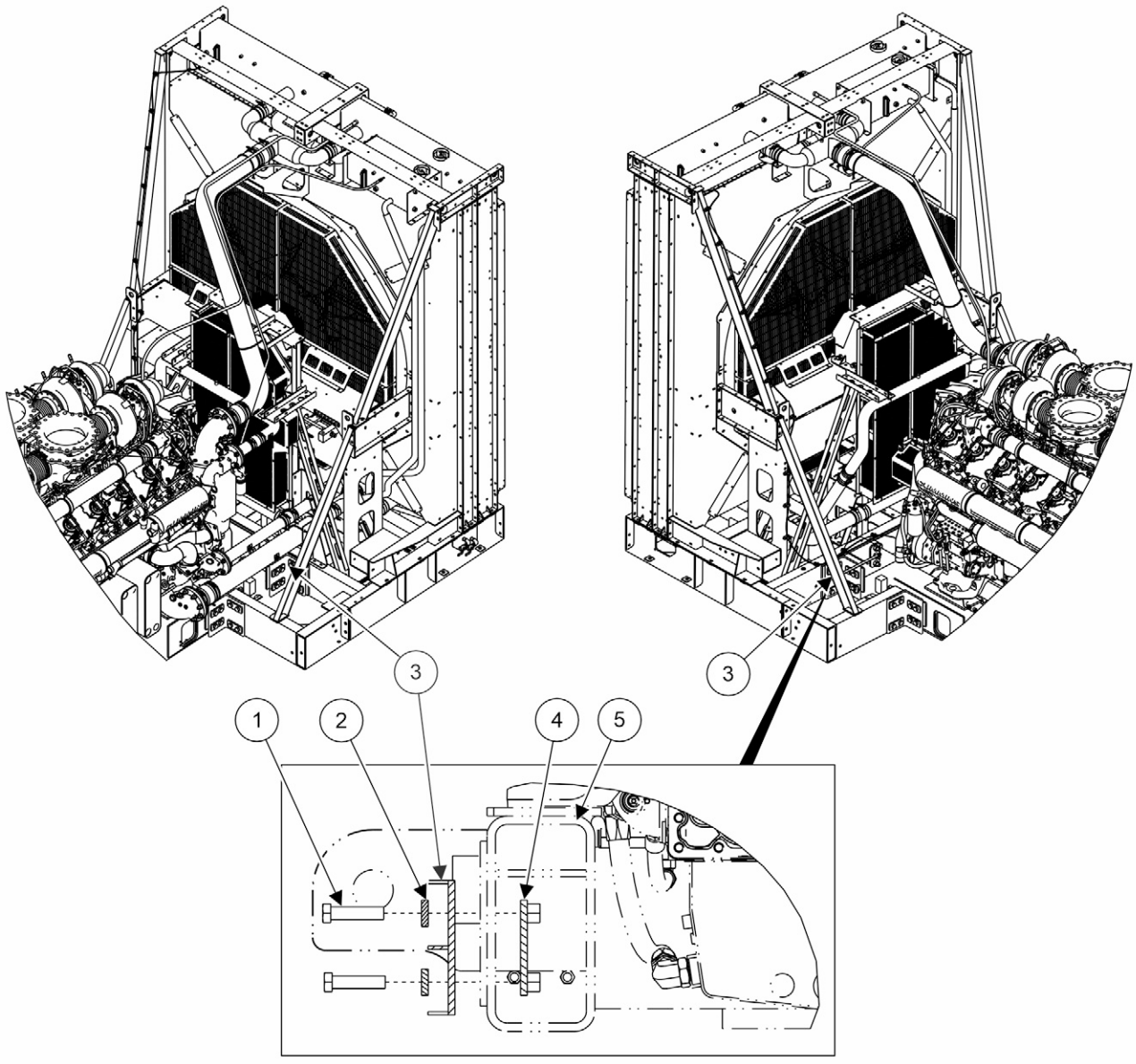
1. Remove and dispose of the internal hex plug in the radiator expansion tank.
2. Install the low coolant level sensor (3) by hand to be sure the sensor does not get damaged.
3. When the low coolant level sensor (3) is hand tight, use a manual torque wrench to tighten the sensor to 20 Nm (15 ft-lb).
4. Install the low coolant level harness (4) and retaining clips. Route the harness down the left side of the radiator.
5. Tighten retaining clip bolts to 52 Nm (38 ft-lb).

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8.4.6 Install Front Radiator L-brackets on Generator Set Skid

NOTICE
Numbers in parenthesis refer to Figure 133 unless otherwise specified.

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No.	Description	No.	Description
1	Bolt	4	Nut plate
2	Washer plate	5	Generator set skid
3	L-bracket		

FIGURE 133. FRONT LEFT AND RIGHT RADIATOR L-BRACKETS

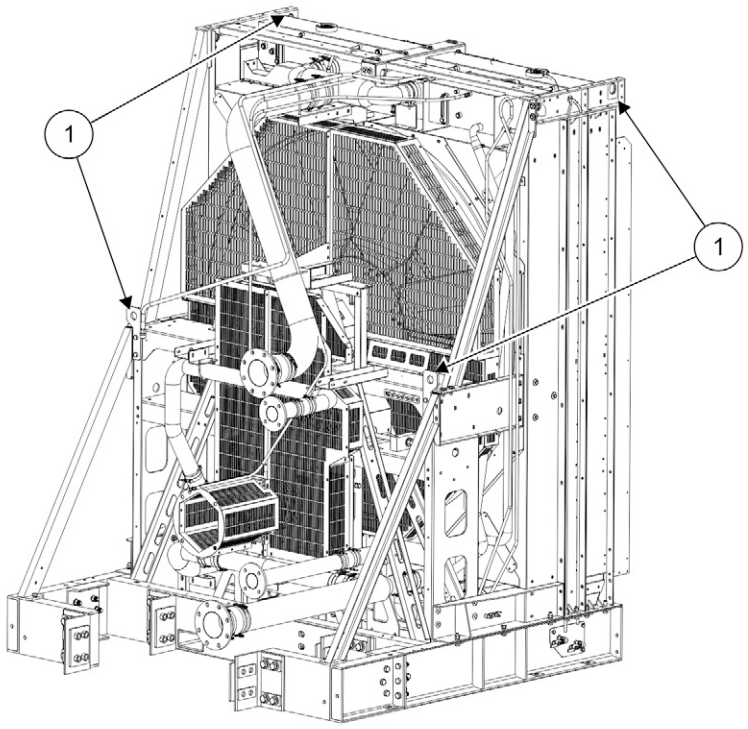
1. Apply anti-seize compound to threads of bolts (1).
2. Loosely install two L-brackets (3) on the generator set skid (5) at the front right and left radiator mounting locations. Use four bolts (1), two washer plates (2), and one nut plate (4) for each L-bracket (3).

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8.4.7 Position the Radiator to the Generator Set

Do the following if using an overhead crane to position the radiator.

1. Connect lifting equipment to the four radiator lifting eye bolts (1, **Figure 134**). A spreader bar is required to allow for a vertical lift on the eye bolts.
2. Position the radiator to the generator set.



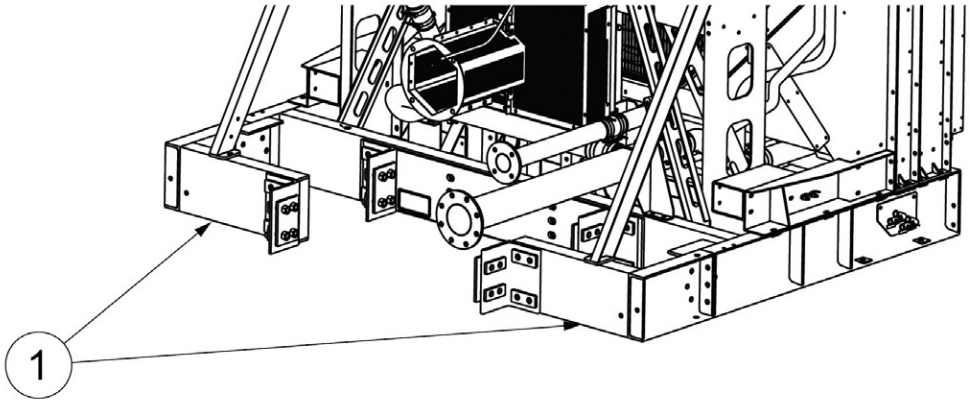
No.	Description	No.	Description
1	Lifting eye bolt		

FIGURE 134. RADIATOR EYE BOLTS

Do the following if using a fork lift or other method to position the radiator.

1. Remove the cross beams (1, **Figure 135**) from the radiator skid if necessary for access to fork lift pickets or allow for clearance of the generator set front lifting eyes.
2. Position the radiator to the generator set.
3. After the radiator has been positioned, reinstall the cross beams (1, **Figure 135**). Torque the cross beam bolts to 610 Nm (450 ft-lb).

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No.	Description	No.	Description
1	Cross beam		

FIGURE 135. CROSS BEAMS ON RADIATOR SKID

8.4.8 Install Vibration Isolators

The vibration isolators need to be installed following the installation guidelines from the manufacturer. The vibration isolator must be installed (1, **Figure 136**) so that it is in the locked shipping position. The vibration isolator must not provide any spring isolation (solid block) to allow for proper radiator alignment.

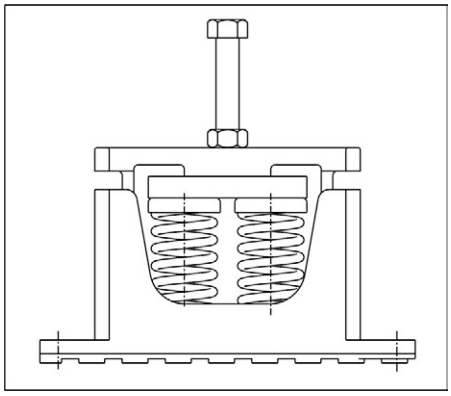


FIGURE 136. VIBRATION ISOLATOR

1. Lift the radiator and place it in its final location on the locked vibration isolators. Make sure the holes in the radiator skid are centered to the vibration isolator attachment bolt location.
2. Lift the generator set and bring it into alignment with the radiator skid.
3. Place the generator set on the locked vibration isolators. Make sure the holes in the generator set skid are centered to the vibration isolator attachment bolt location.
4. Make sure the generator set and radiator are against each other (no gaps) at the chassis front cross member and the radiator cross frame.
5. Left to right measurements between the radiator frame and chassis are helpful for placement but are not final measurements for alignment.
6. When the generator set and radiator appear to be aligned and ready to be bolted together, proceed to Fan Drive Alignment.

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8.4.9 Fan Drive Alignment

The following gives the procedure to align the radiator to the generator set. **This video** shows the procedure.

1. Remove engine vibration damper center cover.

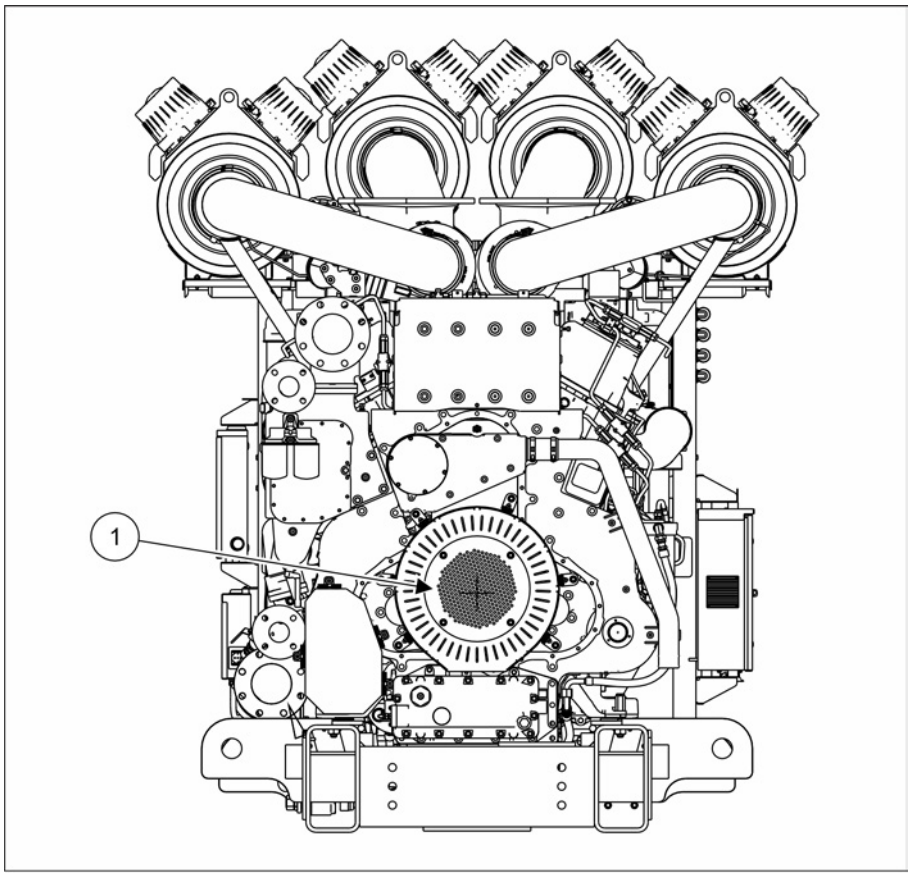


FIGURE 137. ENGINE DAMPENER CENTER COVER

2. Clean the mounting surface for the engine vibration dampener with degreaser.
3. Clean the fan drive input shaft with degreaser.
4. Install the fan drive alignment bar from the radiator installation kit in the radiator fan drive input shaft keyway.

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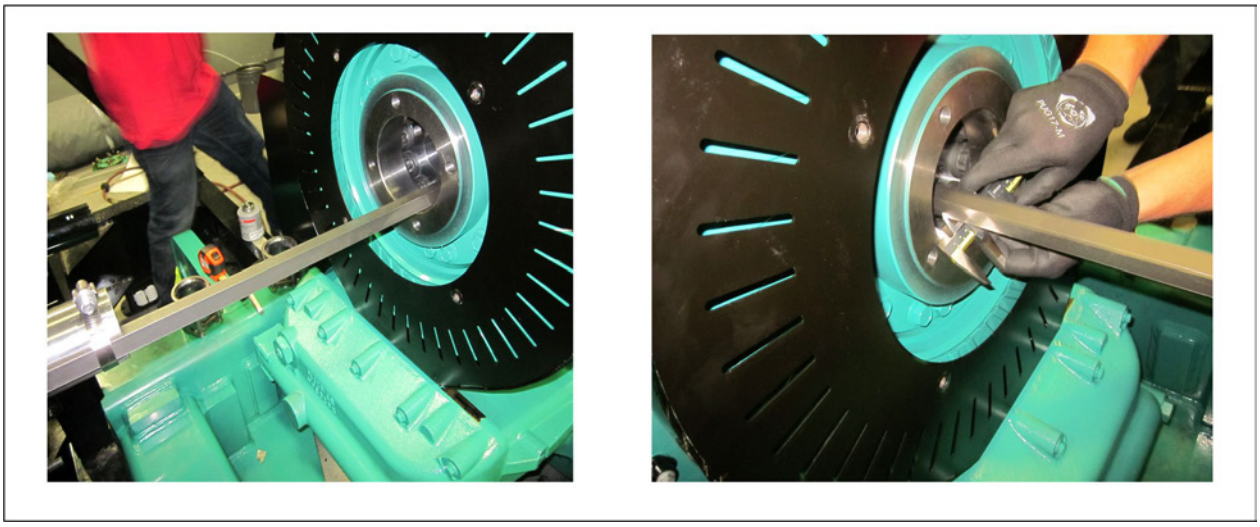


FIGURE 138. FAN DRIVE ALIGNMENT

5. The radiator end of the square bar must fit snugly into the fan shaft key way. Clamp into place with hose clamp around the radiator fan drive input shaft.
6. The other end of the bar fits inside the center bore of the vibration dampener.
7. Carefully rotate the fan shaft by hand. The bar should never contact the inside bore of the damper. Contact with the inside bore indicates gross misalignment.
8. When the bar rotates freely inside the damper bore, measure and record the distance from the bar to the outer diameter of the damper bore at the 12:00 and 6:00 o'clock positions (vertical), and at the 3:00 and 9:00 o'clock positions (horizontal). The difference between the two vertical measurements and the two horizontal measurements cannot be greater than 12.5 mm (1/2 inch).

TABLE 19. EXAMPLE MEASUREMENTS

	Measurement	Position	Status
	17	3:00	
	19	9:00	
Difference	2		Good
	10	12:00	
	28	6:00	
Difference	18		Needs vertical adjustment

9. Options for Horizontal adjustment are:
   - Move the radiator or generator set.
   - Move the fan belt drive input shaft bearing assemblies right or left as per below table..

TABLE 20. HORIZONTAL ADJUSTMENT

Part Number	**Adjustment**
A076E016, A078L535, A078L534	(±4 mm of adjustment)

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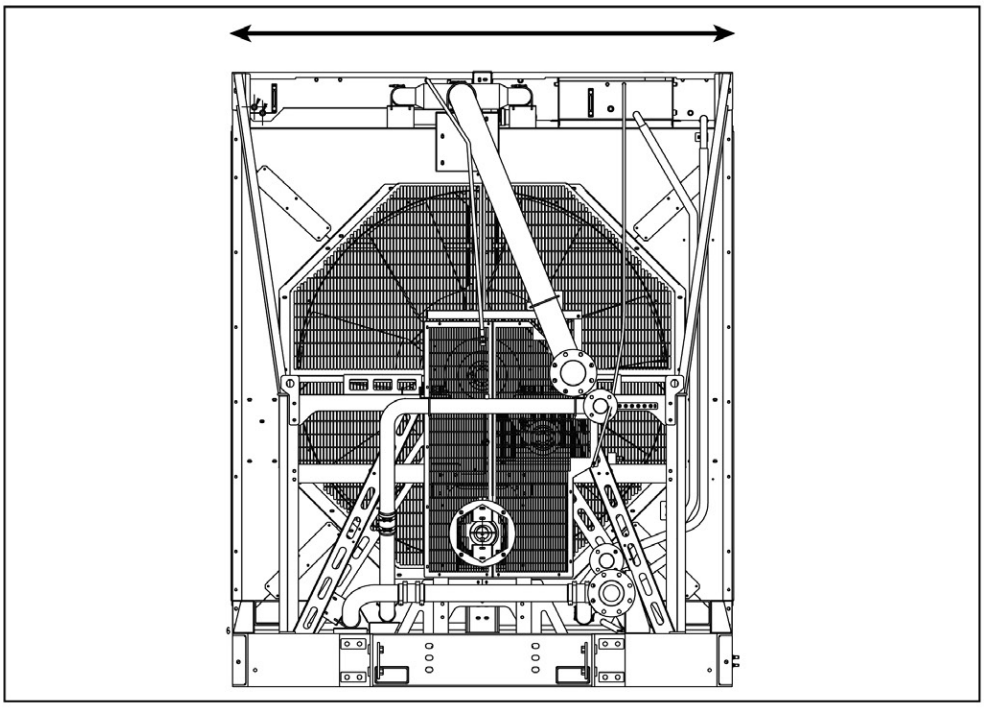


FIGURE 139. HORIZONTAL ADJUSTMENT

10. Options for vertical adjustment are:
    - Place shims under the generator set or radiator vibration isolators.
    - Add or remove shims under the fan belt drive input shaft bearings as per below table.

TABLE 21. VERTICAL ADJUSTMENT

Part Number	Adjustment
A076E016, A078L535, A078L534	(±4 mm of adjustment)

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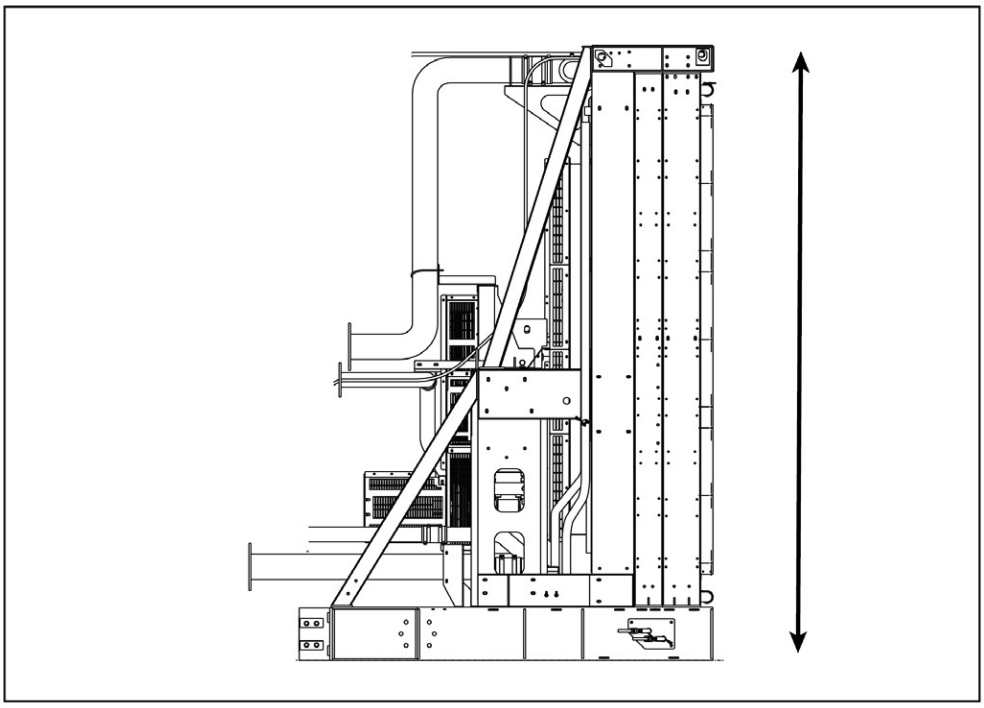
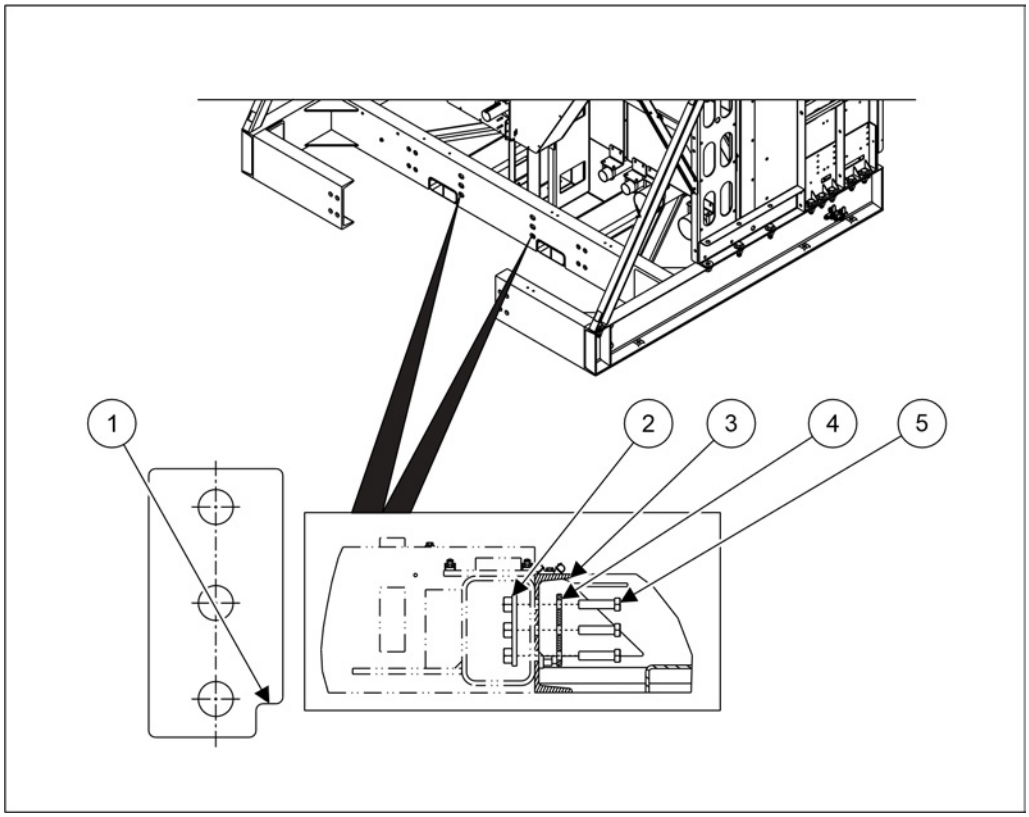


FIGURE 140. VERTICAL ADJUSTMENT

8.4.10 Install Front Middle Clamping Plates

NOTICE
Numbers in parenthesis refer to Figure 141 unless otherwise specified.



No.	Description	No.	Description
1	Notch in washer plate	4	Washer plate
2	Nut plate	5	Bolt – M24 x 100 mm
3	Clamping plate		

FIGURE 141. FRONT MIDDLE CLAMPING PLATE

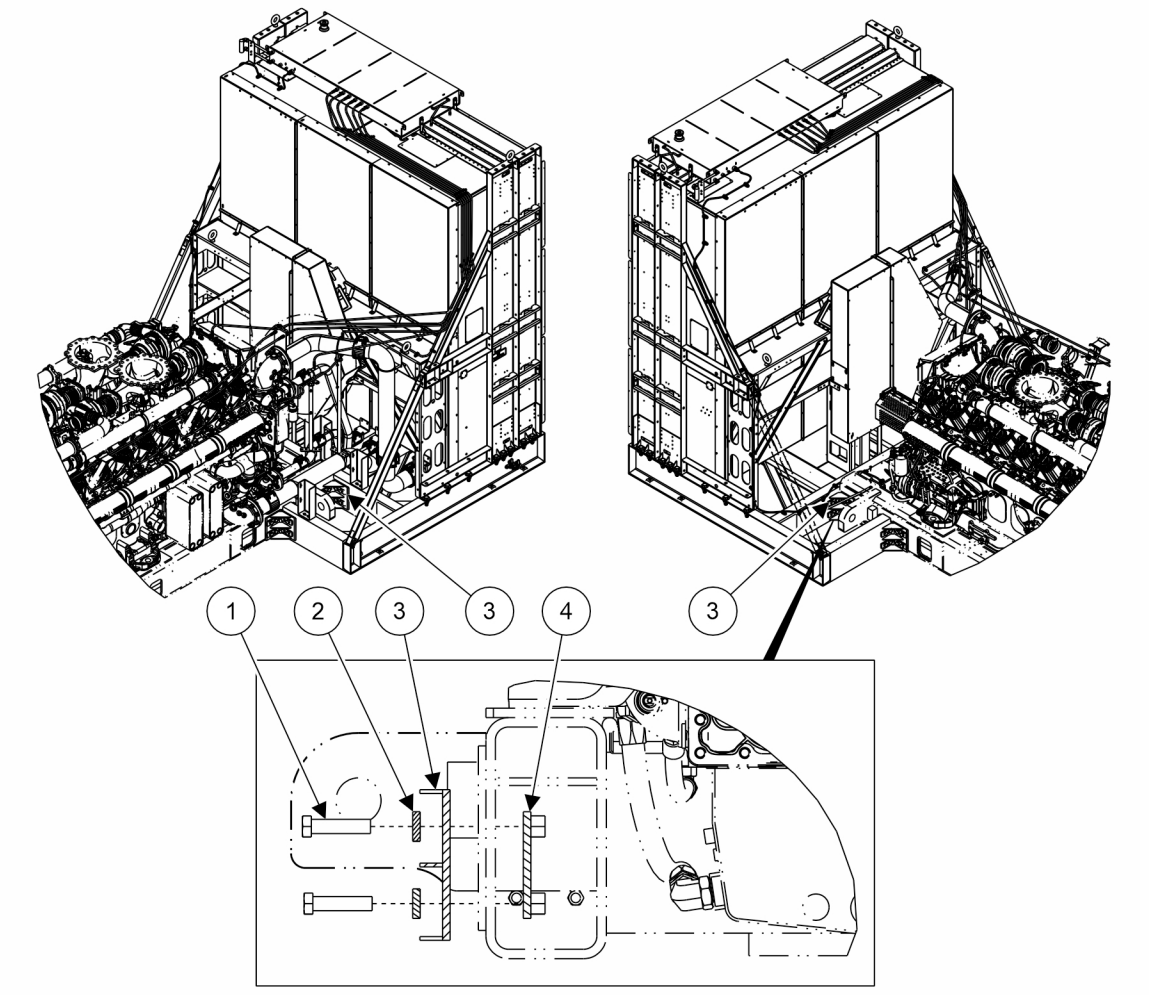
1. Apply anti-seize compound to mounting bolt (5) threads.
2. Loosely install each clamping plate (3) to the front radiator mounts with one nut plate (2), one washer plate (4), and three bolts (5).

NOTICE
The notch in the washer plate faces down and toward the fork tubes in the radiator skid.

8.4.11 Install Front Radiator L-brackets Remaining Hardware

NOTICE
Numbers in parenthesis refer to Figure 142 unless otherwise specified.

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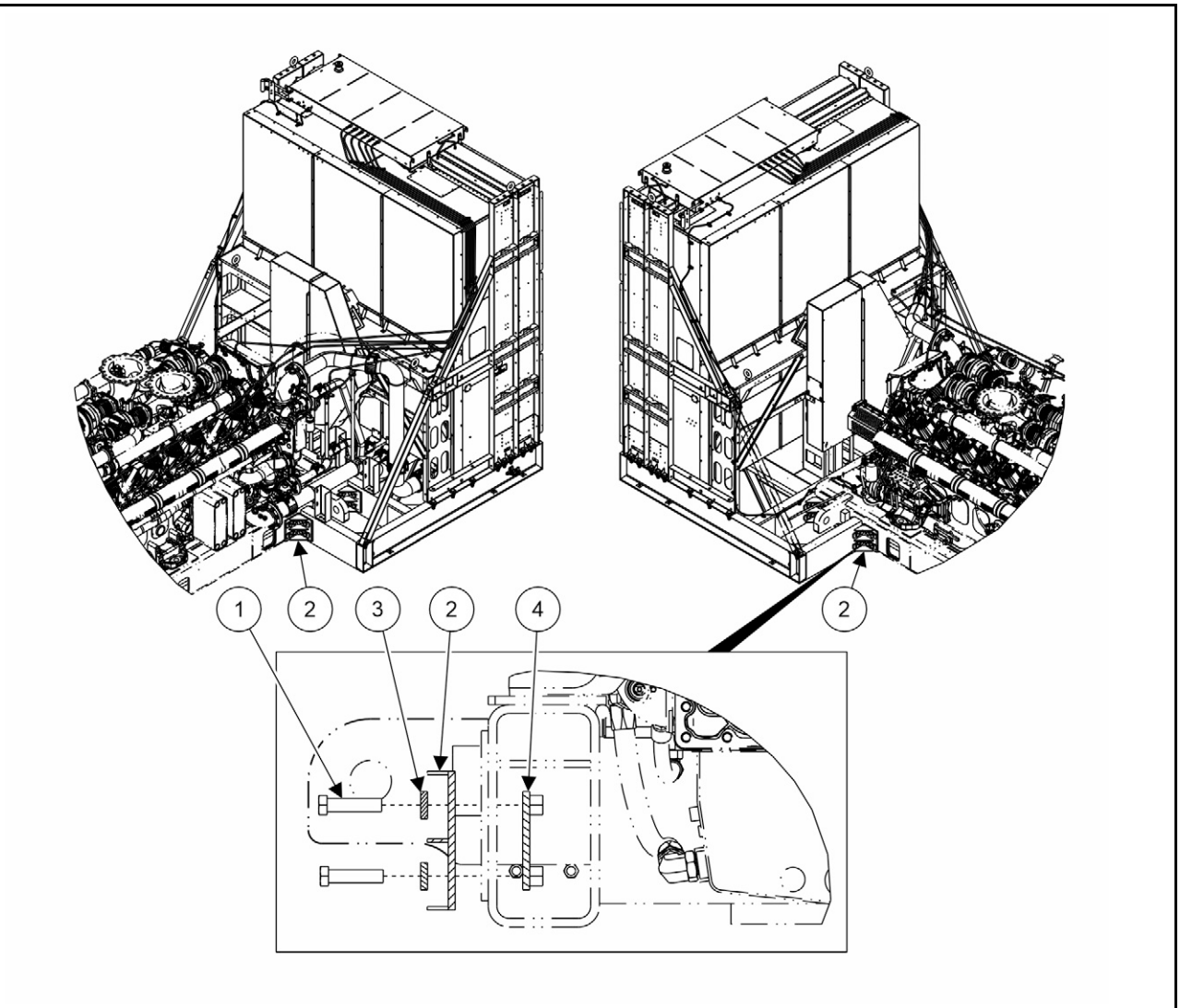
No.	Description	No.	Description
1	Bolt – M24 x 100 mm	3	L-bracket
2	Washer plate	4	Nut plate

FIGURE 142. FRONT LEFT AND RIGHT RADIATOR L-BRACKETS REMAINING HARDWARE

1. Apply anti-seize compound to threads of bolts (1).
2. Loosely install each L-bracket to radiator skid with remaining washer plates (2), nut plates (4), and bolts (1).

8.4.12 Install Rear L-brackets

NOTICE
Numbers in parenthesis refer to Figure 143 unless otherwise specified.



No.	Description	No.	Description
1	Bolt – M24 x 100 mm	3	Washer
2	L-bracket	4	Nut plate

FIGURE 143. REAR L-BRACKETS

1. Apply anti-seize compound to mounting bolt threads.
2. Loosely install each L-bracket (2) to generator set and radiator skid with two nut plates (4), four washers (3), and eight bolts (1).

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8.4.13 Tighten and Torque L-bracket Bolts

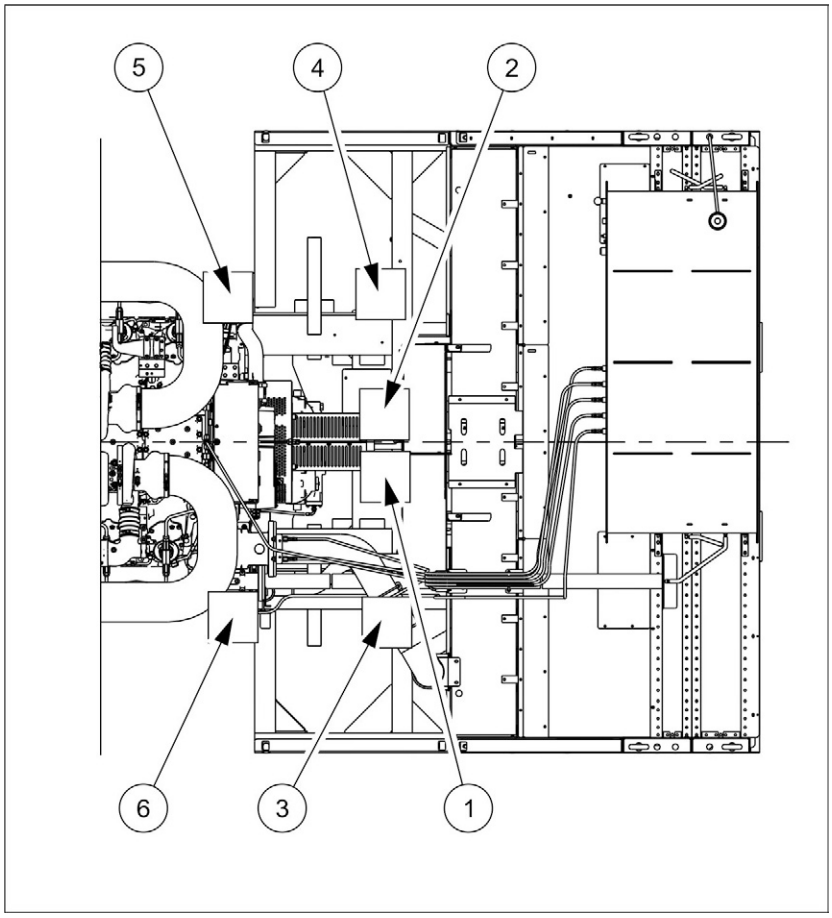


FIGURE 144. L-BRACKET LOCATIONS

1. Tighten the 6 bolts at the front middle locations (locations 1 and 2).
2. Tighten the 8 bolts at the front left and right locations (locations 3 and 4).
3. Tighten the 8 bolts at the rear left and right locations (locations 5 and 6).
4. Torque the 4 bolts at the front middle locations (locations 1 and 2) to 732 Nm (540 ft-lb).
5. Torque the 16 bolts at the front left and right locations (locations 3 and 4) to 732 Nm (540 ft-lb).
6. Torque the 16 bolts at the rear left and right locations (locations 5 and 6) to 732 Nm (540 ft-lb).
7. The radiator lifting equipment may be removed as long as the radiator is properly supported on isolators at the same height as the generator set skid.

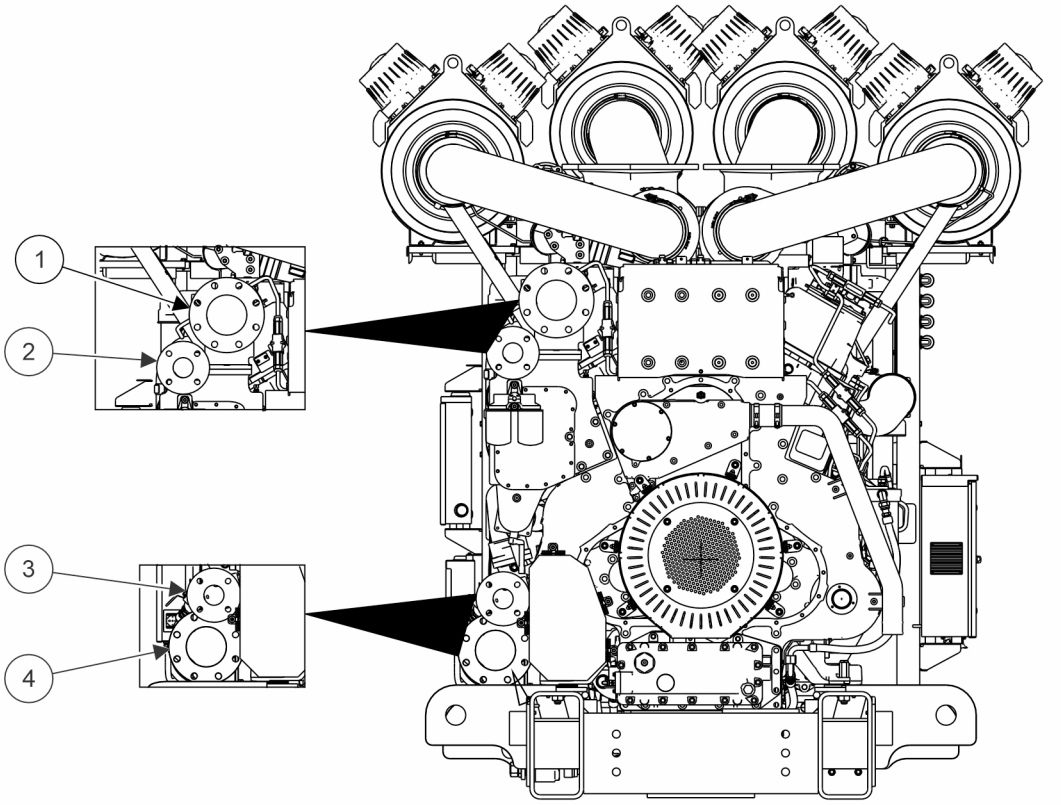
8.4.14 Remove Flange Shipping Covers

1. Remove the shipping covers from the generator set cooling system flanges.

NOTICE
There may be coolant behind the inlet flanges, use an appropriate catch pan. Dispose of coolant according to local codes.

2. Clean the generator set cooling system flanges.

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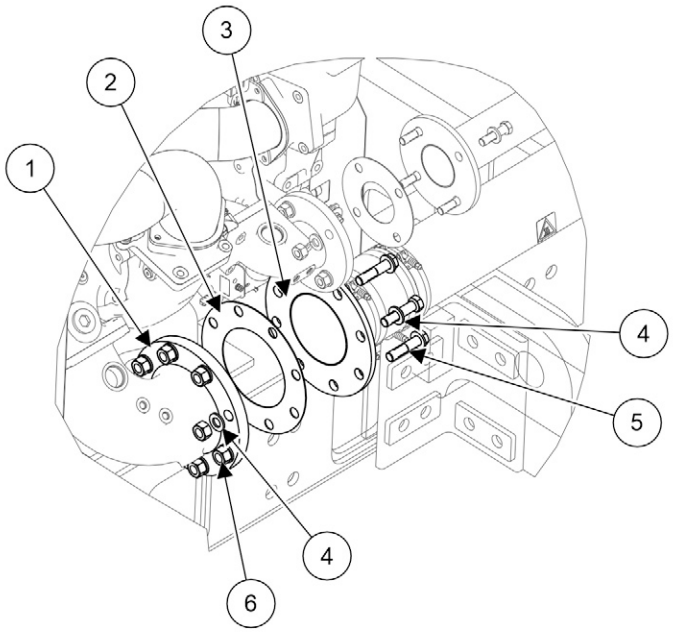
No.	Description	No.	Description
1	HT outlet	3	LT inlet
2	LT outlet	4	HT inlet

FIGURE 145. COOLING SYSTEM FLANGES

8.4.15 Install HT Inlet Coolant Flange

NOTICE
Numbers in parenthesis refer to Figure 146 unless specified otherwise.

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No.	Description	No.	Description
1	HT inlet flange	4	Washer
2	Gasket	5	Bolt
3	HT inlet pipe	6	Nut

FIGURE 146. HT INLET COOLANT FLANGE

1. Apply anti-seize lubricant to bolt (5) threads.
2. Install HT inlet pipe (3) to HT inlet flange (1) with flange gasket (2), bolts (5), washers (4), and nuts (6).
3. Torque the bolts and nuts to 311 Nm (229 ft-lb) using the following torque sequence.
   a. Torque position 1, then position 5 shown in **Figure 147**.
   b. Torque position 8, then position 3 shown in **Figure 147**.
   c. Torque position 6, then position 2 shown in **Figure 147**.
   d. Torque position 7, then position 4 shown in **Figure 147**.

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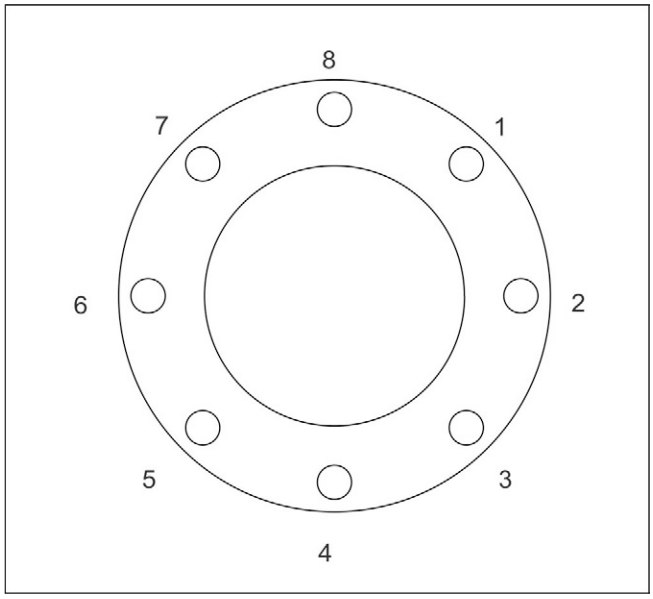
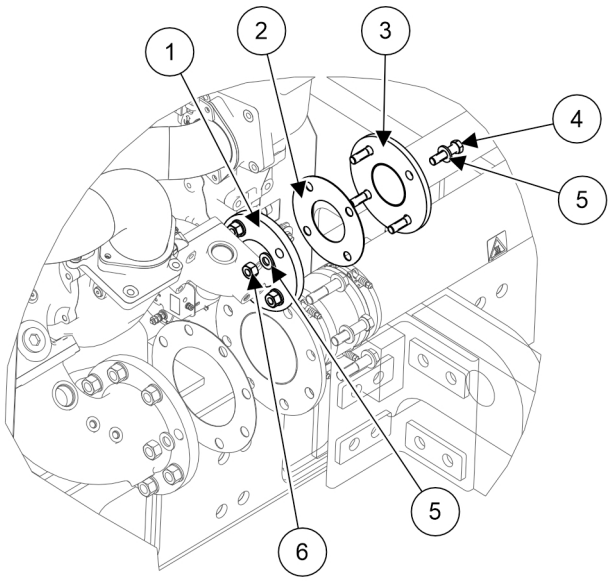


FIGURE 147. HT FLANGE TORQUE SEQUENCE NUMBERS

8.4.16 Install LT Inlet Coolant Flange

NOTICE
Numbers in parenthesis refer to Figure 148 unless specified otherwise.

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No.	Description	No.	Description
1	LT inlet flange	4	Bolt
2	Gasket	5	Washer
3	LT inlet pipe	6	Nut

FIGURE 148. LT INLET COOLANT FLANGE

1. Apply anti-seize lubricant to bolt (4) threads.
2. Install LT inlet pipe (3) to LT inlet flange (1) with flange gasket (2), bolts (4), washers (5), and nuts (6).
3. Torque the bolts and nuts to 175 Nm (129 ft-lb) using the following torque sequence.
   a. Torque position 1, then position 3 shown in **Figure 149**.
   b. Torque position 2, then position 4 shown in **Figure 149**.

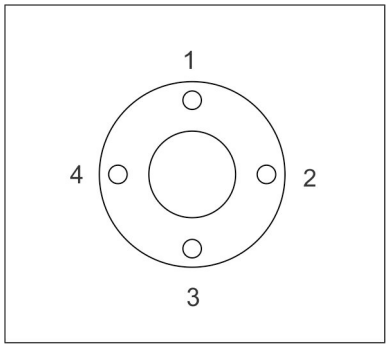


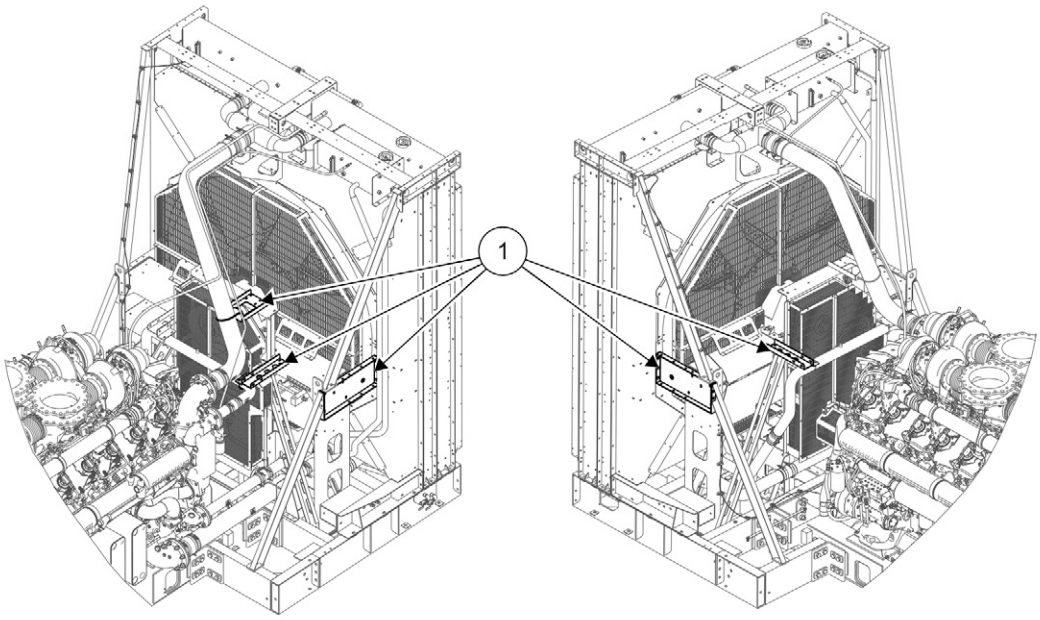
FIGURE 149. LT FLANGE TORQUE SEQUENC NUMBERS

8.4.17 Install LT and HT Inlet Pipe Support Brackets

1. Clean coolant pipe connections at radiator.
2. The pipe installation bracket is pre-installed, and it does not need to be tightened.

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3. Visually check that the pipe and hose are parallel and there is no obvious dislocation. Make sure the flange mounting surface bolt is flat and not misaligned.
4. Install LT and HT inlet pipe support brackets on radiator skid (1, **Figure 150**).
5. The locking torque of the pipe bracket and U-bolt is 20-25 Nm.



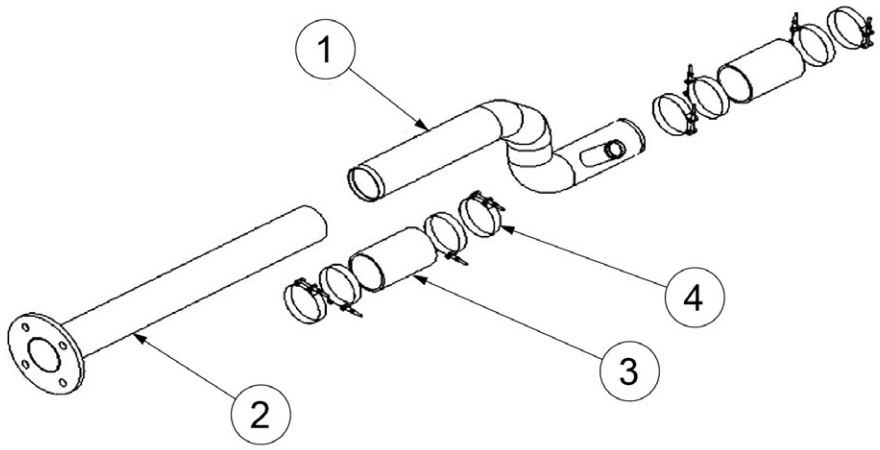
No.	Description
1	Support bracket

FIGURE 150. LT AND HT INLET PIPE SUPPORT BRACKETS

8.4.18 Install LT Inlet Pipe on Radiator

NOTICE
Numbers in parenthesis refer to Figure 151 unless specified otherwise.

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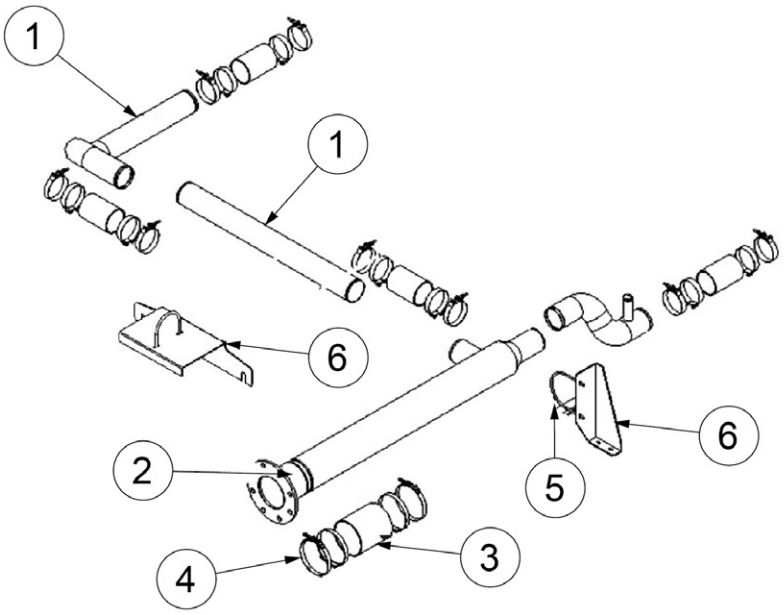
No.	Description	No.	Description
1	LT Inlet Tube	3	High Temperature Hoses
2	DIN Pipe	4	Clamp

FIGURE 151. LT INLET PIPE INSTALLATION

1. Inspect the pipe before installation for any damage.
2. Center LT S-pipe (2) with radiator hose (3). Loosely tighten the pipe (2) at the radiator connection point.
3. Connect and align the DIN pipe (2) to the engine tube (1) with the high temp hose (3) and clamp (4).
4. Make sure the tubes are vertically and horizontally aligned with engine flange.
5. Use a torque wrench to tighten the flange, hose and clamps. (4)
   a. First, use alternating sequence to torque DIN flange to 175 Nm (129 ft-lb).
   b. Second, torque the hose clamps (4) to 11 Nm (8.1 ft-lb).
6. Torque the U-bolt (5) that attaches the radiator tube (1) to the tube support bracket to 25 Nm (18 ft-lb).

8.4.19 Install HT Inlet Tube

NOTICE
Numbers in parenthesis that follow refer to Figure 152 unless specified otherwise.



No.	Description	No	Description
1	Engine HT Inlet	4	Clamp
2	DIN pipe	5	U-bolt
3	High Temperature Hose	6	Support Bracket

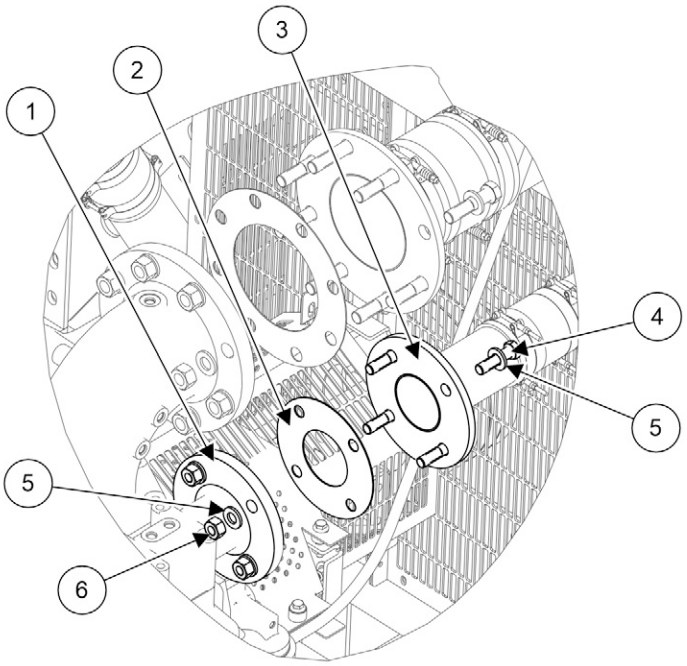
FIGURE 152. HT INLET TUBE INSTALLATION

1. Inspect the pipes before installation, for any damage.
2. Connect the high temperature hose (3) at radiator end on both sides and hand tighten the clamps (4) on both sides at the bottom tank.
3. Connect the DIN pipe (2) and align with both high temperature hoses (4) and hand tighten with the clamp (4).
4. Torque DIN pipe high temperature hose (3) and align the clamp (4) in proper direction.
5. Apply thread locking compound to U-bolt (5) threads. Loosely install two U-bolts (5) that attach the HT inlet tube (1) to the support brackets (6).
6. Use an alternating sequence to torque the DIN flange to 311 Nm (229 ft-lb).
   a. Use a torque wrench to torque hoses (3) clamp to 11Nm (8 ft-lb).
   b. Torque the U-bolt (2) that attaches the HT inlet tube (1) to the tube support bracket to 25 Nm (18 ft-lb).

8.4.20 Install LT Outlet Coolant Flange

NOTICE
Numbers in parenthesis refer to Figure 153 unless specified otherwise.

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No.	Description	No.	Description
1	LT outlet pipe	4	Bolt
2	Gasket	5	Washer
3	LT outlet flange	6	Nut

FIGURE 153. LT OUTLET COOLANT FLANGE

1. Apply anti-seize lubricant to bolt (4) threads.
2. Install LT outlet pipe (1) to LT outlet flange (3) with flange gasket (2), bolts (4), washers (5), and nuts (6).
3. Torque the bolts and nuts to 175 Nm (129 ft-lb) using the following torque sequence.
   a. Torque position 1, then position 3 shown in **Figure 154**.
   b. Torque position 2, then position 4 shown in **Figure 154**.

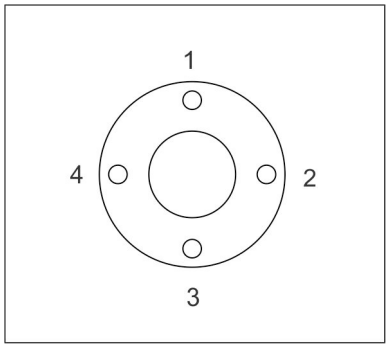
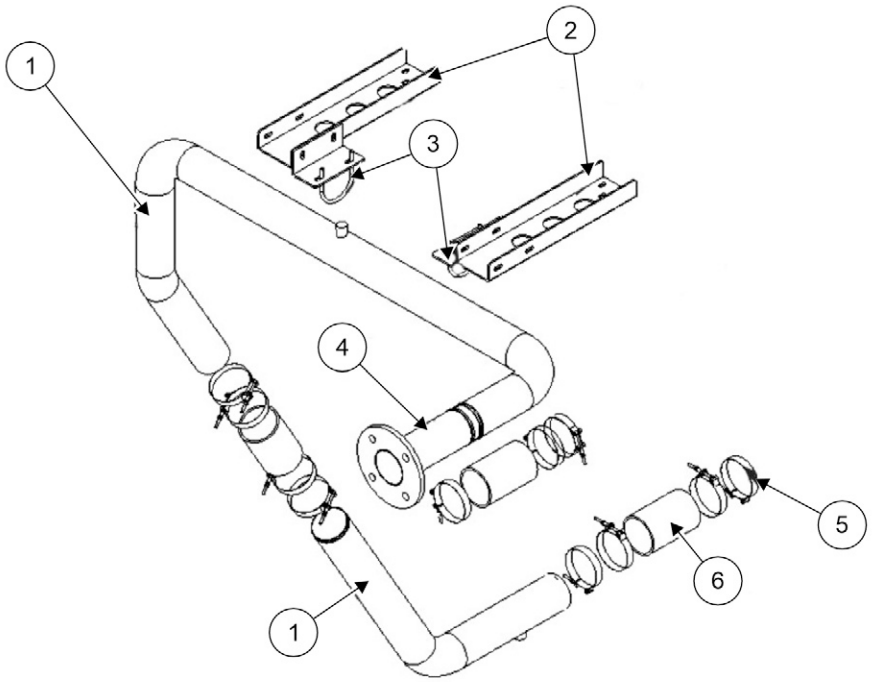


FIGURE 154. LT FLANGE TORQUE SEQUENCE NUMBERS

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8.4.21 Install LT Outlet Tubing

NOTICE
Numbers in parenthesis refer to Figure 155 unless specified otherwise.



No.	Description	No.	Description
1	LT Outlet Tube	4	DIN Connection
2	Support Bracket	5	Clamp
3	U-Bolt	6	High Temperature Hose

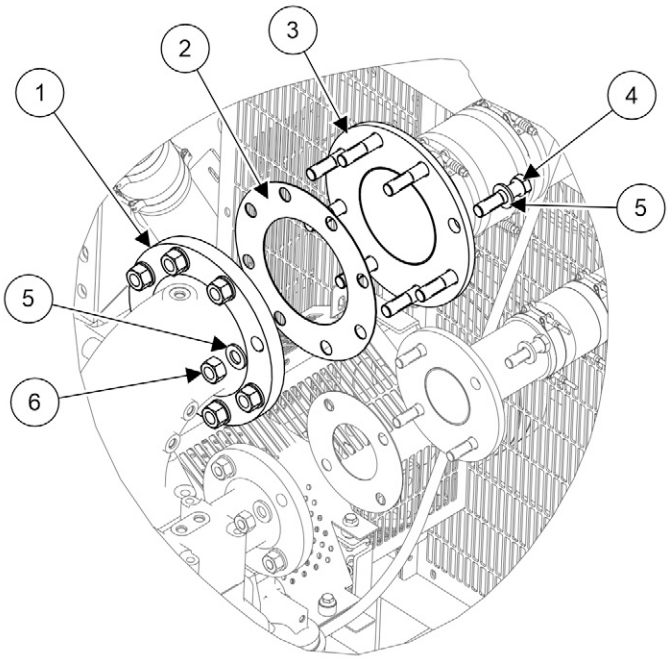
FIGURE 155. LT OUTLET TUBING INSTALLATION

1. Connect the LT high temperature hose (6) at radiator and hand tighten the clamp (5).
2. Place the S-bend tube between the DIN Connection tube (4) and the radiator connection. Align the S-bend in proper direction and hand tighten the clamp (5).
3. Align the clamp (5) in proper direction and torque both clamps.
4. Apply thread lock to U-bolt (3) threads. Use U-bolts and fix S-bend to the support bracket (2) on the radiator.
5. Torque the U-bolt (3) that attaches the LT outlet tube (1) to the support bracket (2) to 25 Nm (18 ft-lb).
6. Use two step torque wrench and torque the clamp.
7. Torque all the high temperature hose (6) clamps (5) to 11 Nm (8.11 ft-lb).

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8.4.22 Install HT Outlet Coolant Flange

NOTICE
Numbers in parenthesis refer to Figure 156 unless specified otherwise.



No.	Description	No.	Description
1	HT Inlet Flange	4	Bolt, 3/4 inch - 10 X 3.5 inch
2	Gasket	5	Washer
3	HT Outlet Pipe	6	Nut

FIGURE 156. HT OUTLET COOLANT FLANGE

1. Apply anti-seize lubricant to bolt (4) threads.
2. Install HT outlet pipe (3) to HT inlet flange (1) with flange gasket (2), bolts (4), washers (5), and nuts (6).
3. Torque the bolts and nuts to 311 Nm (229 ft-lb) using the following torque sequence.
   a. Torque position 1, then position 5 shown in **Figure 157**.
   b. Torque position 8, then position 3 shown in **Figure 157**.
   c. Torque position 6, then position 2 shown in **Figure 157**.
   d. Torque position 7, then position 4 shown in **Figure 157**.

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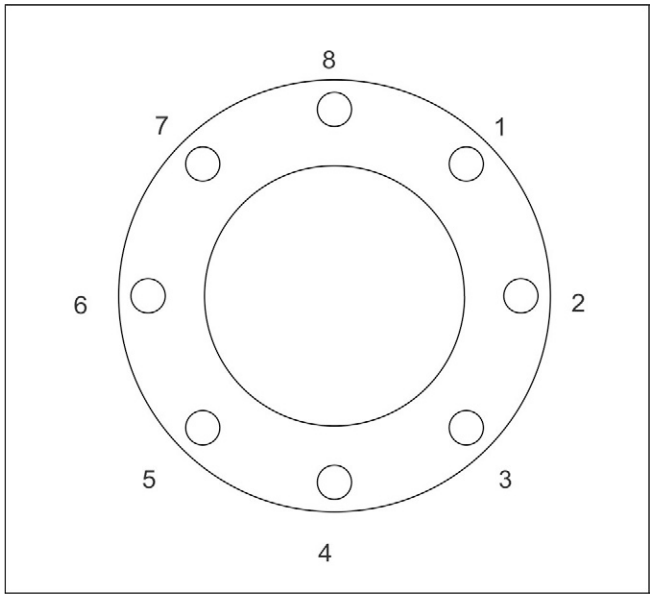
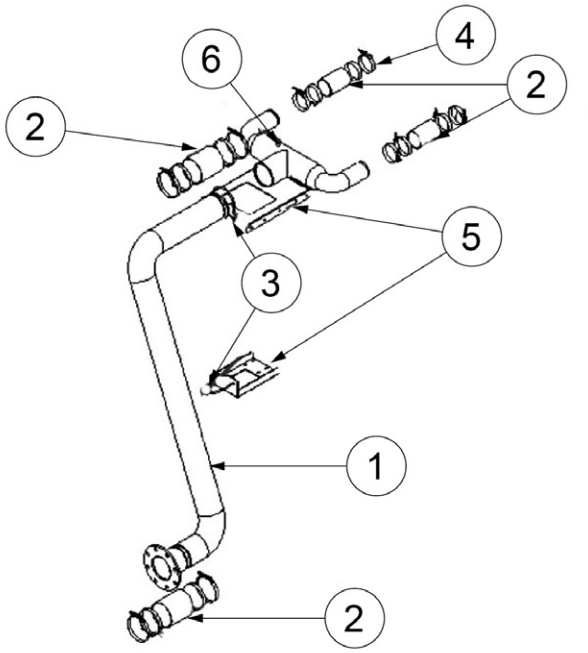


FIGURE 157. HT FLANGE TORQUE SEQUENCE NUMBERS

8.4.23 Install HT Outlet Tubing

NOTICE
Numbers in parenthesis refer to Figure 158 unless specified otherwise.

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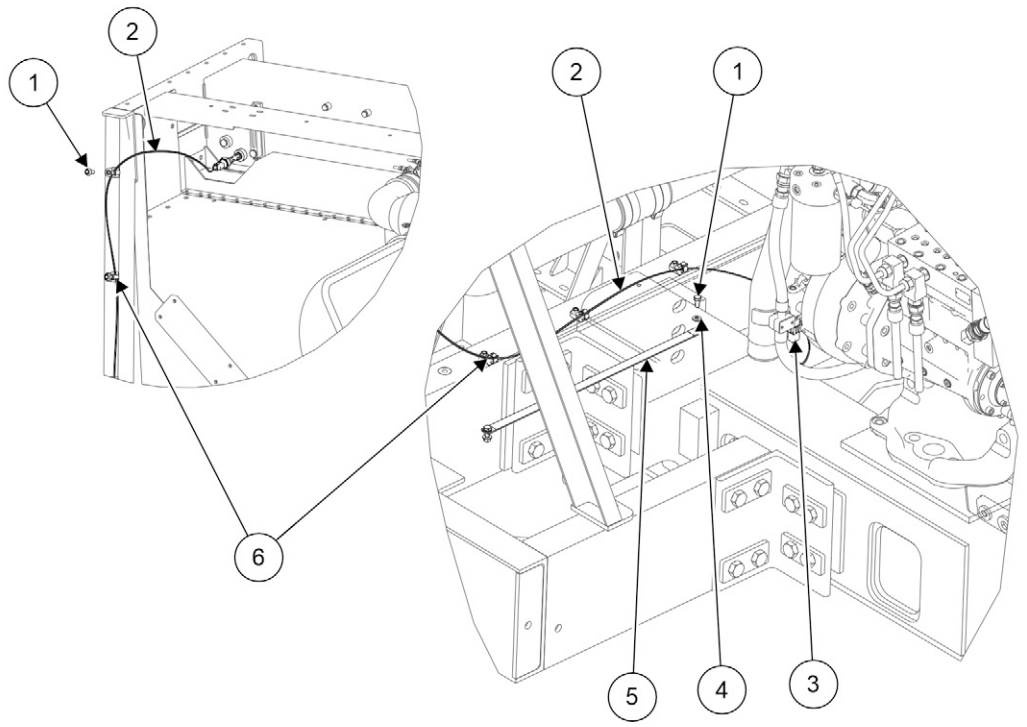
No.	Description	No.	Description
1	Radiator HT Outlet	4	Clamp
2	High temperature hose	5	Support bracket
3	U-bolt	6	C-bend Pipe

FIGURE 158. HT OUTLET TUBING INSTALLATION

1. Connect the HT C-bend pipe (6) with high temperature hose (2) at both ends of the radiator and hand tighten the clamp (4).
2. Place the S-bend tube between the DIN Connection tube and the radiator connection. Align the S-bend in proper direction and hand tighten.
3. Connect the outlet tube (1) in left side end with the high temperature hose (2). Align in proper direction and hand tighten the clamp (4) on both ends.
4. Fix the straight pipe (1) between right side hose and left side and hand tighten the clamp (4).
5. Apply thread locking compound to U-bolt (3) threads. Use U-bolts and fix the HT pipe on radiator with support bracket (5).
6. Torque the U-bolt (4) that attaches the HT outlet tube (1) to the tube support bracket (5) to 25 Nm (18 ft-lb).
7. Use two step torque wrench and torque all hose clamps 11 Nm (8 ft-lb).

8.4.24 Complete Installation of Low Coolant Level Sensor Harness

NOTICE
Numbers in parenthesis refer to Figure 159 unless specified otherwise.



No.	Description	No.	Description
1	Hex Screw	4	Washer
2	Low coolant level sensor harness	5	Ground strap
3	P1 connector on engine harness	6	Cable Clamp

FIGURE 159. LOW COOLANT LEVEL SENSOR HARNESS CONNECTION TO ENGINE HARNESS

1. Connect the low coolant level sensor harness (2) to the engine harness (3).
2. Install the radiator ground strap (5).
    a. Apply dielectric grease to the ground strap mounting locations.
    b. Install the ground strap (5) with existing hardware.
    c. Install the ground strap (5) to the generator set skid with one hex screw (1) and one washer (4).
    d. Torque bolts to 52 Nm (38 ft-lb).
3. Route wiring harness along radiator frame and secure with cable clamps.

8.4.25 Install Vent Lines

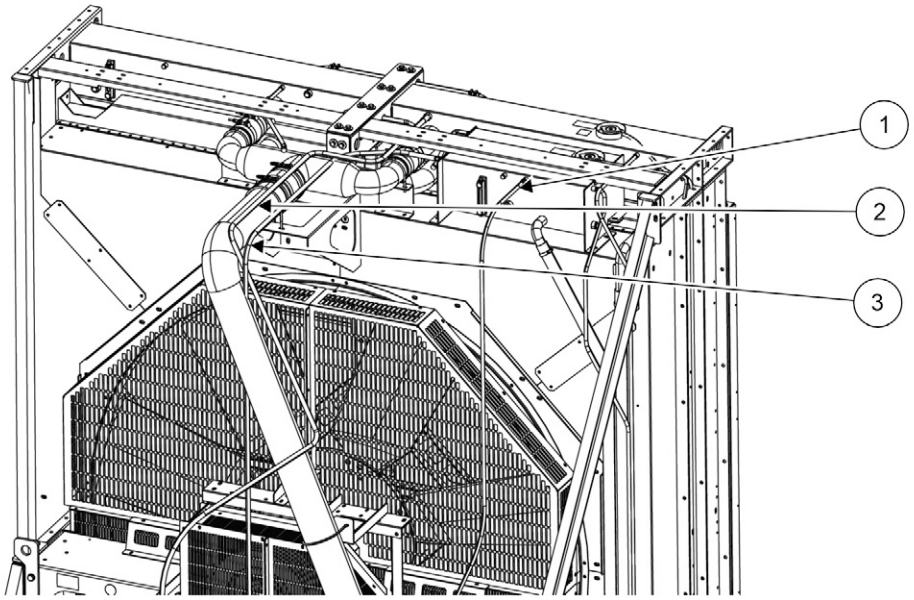
The vent lines are shipped loose in a kit that is required to be installed on to the radiator expansion tank.

1. Separate the vent lines and identify each line by part number.

All vent lines must be secured to the generator set using clips and cable ties.

All vent lines must be either vertical or inclined between the engine and radiator. No sags are permitted.

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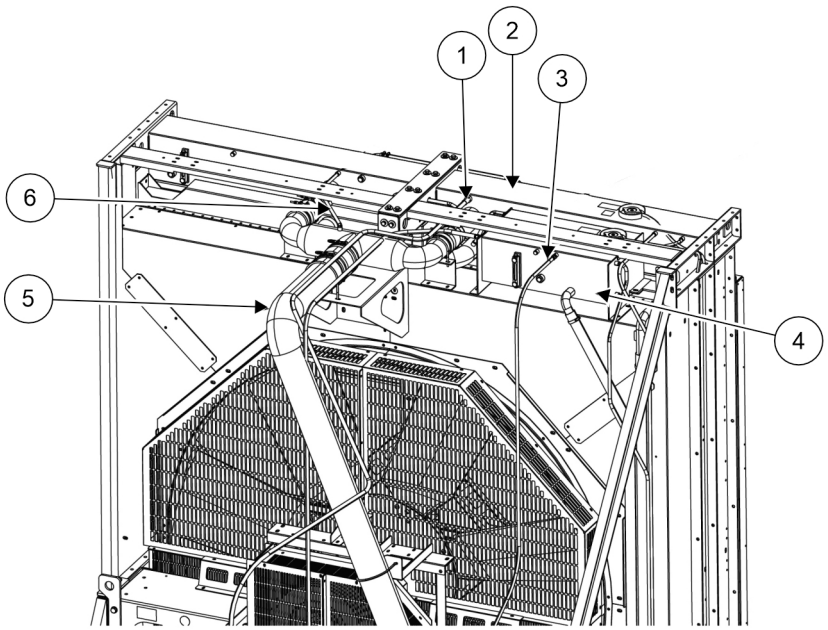


No.	Description	No.	Description
1	LT Engine Vent Line (3700 mm or 3900 mm - ¼ in. NPT)	3	LT Engine Outlet Tube Vent Line (2750 mm or 4100 mm - ¼ in. NPT)
2	HT Engine Vent Line (3400 mm or 3600 mm - ½ in. NPT)		

FIGURE 160. RADIATOR VENT LINES

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8.4.25.1 Install Vent Lines on HT and LT Top Tank



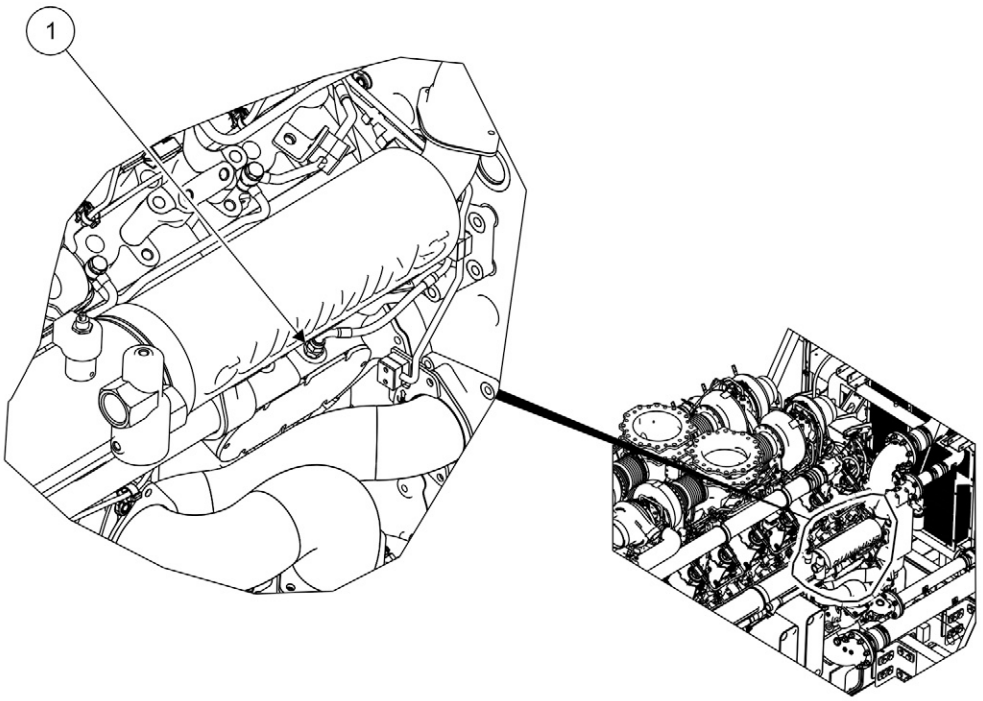
No.	Description	No.	Description
1	HT Engine Vent Line	4	LT Top Tank
2	HT Top Tank	5	HT Outlet Tube
3	LT Engine Vent Line	6	HT Outlet Tube Vent Line

FIGURE 161. VENT LINES ON OUTLET TUBES AND VENT LINE A076E016

1. Install the HT engine vent line (1) on radiator HT top tank (2) and route the vent line to the HT outlet tube (5) with the help of cable tie as shown.
2. Install the LT engine vent line (3) to LT top tank (4) and route the vent line from fan guard to LT DIN pipe support bracket with DIN pipe.
3. Install the HT outlet tube vent line (6) on radiator HT top tank and connect with HT C-pipe connection.
4. Torque the vent lines to 20 Nm (9 ft-lb).

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8.4.25.1.1 Install LT Engine Vent Line



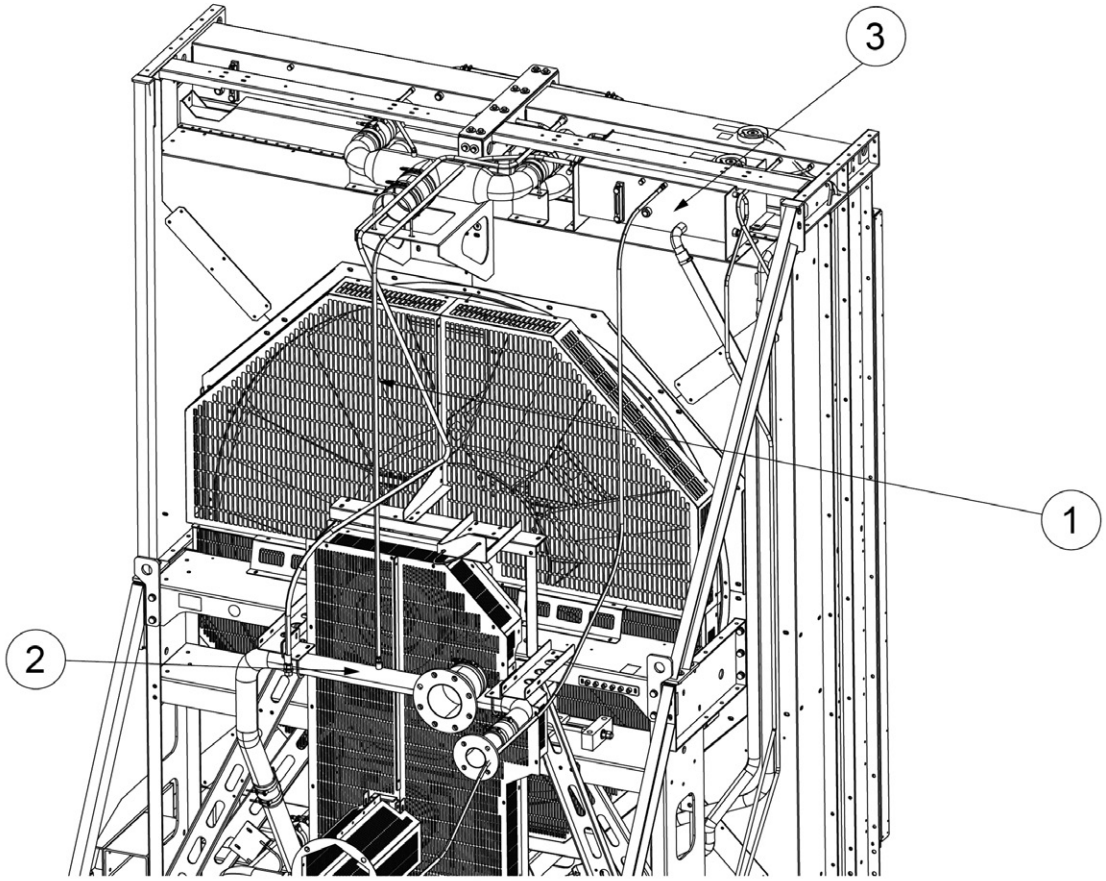
No.	Description
1	Vent Line

FIGURE 162. LT ENGINE VENT LINE

1. Remove the M14 plug in the LT thermostat housing.
2. Install the LT engine vent line fitting.
3. Install the LT engine vent line (1).
4. Torque the vent line to 27 Nm (20 ft-lb).

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8.4.25.1.2 Install LT Vent Line on LT Engine Outlet Pipe



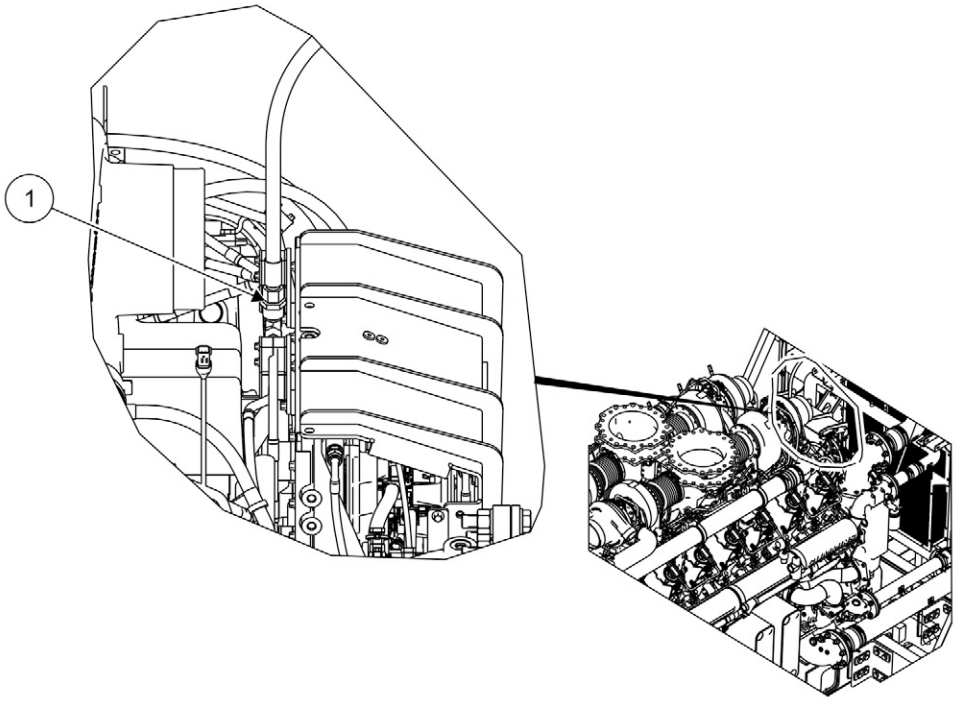
No.	Description	No.	Description
1	LT Tube Vent Line	3	LT Top Tank
2	LT Engine Outlet Tube		

FIGURE 163. LT VENT LINES ON LT ENGINE OUTLET PIPE

1. Remove the plug from LT engine outlet tube (2) and from LT top tank (3).
2. Install the LT tube vent line (1) fitting.
3. Install the LT tube vent line (1) to LT top tank and to the LT engine outlet tube (2).
4. Use two step torque range to Torque the vent line to 27 Nm (20 ft-lb).

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8.4.25.1.3 Install HT Engine Vent Line



No.	Description
1	Vent Line

FIGURE 164. HT ENGINE VENT LINE

1. Remove any shipping plugs.
2. Install vent line (1).
3. Torque vent line to 52 Nm (38 ft-lb).

8.4.26 Install Radiator Fan Drive Shaft

For radiator fan dive shaft installation steps see **Section 8.5 on page 213**

8.4.27 Grease Fan Bearings

Fan bearings should be greased immediately with initial installation of radiator, then at regular intervals following the maintenance schedule. When operating in hot, dirty, or wet environments, the bearing re-grease interval will need to be increased. The timing can vary from daily to weekly. historical experience with bearings operating under the specific conditions will help determine the correct interval. Contact your authorized distributor for assistance.

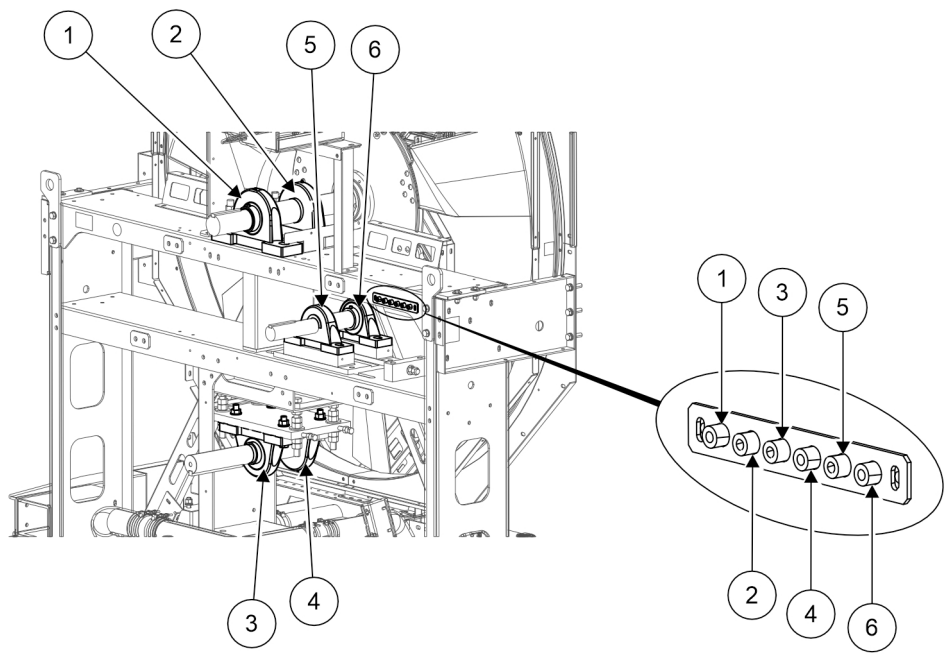
8.4.27.1 Tools and Consumables

- Grease gun (flexible hose recommended)
- 9/16 inch socket
- Fan drive bearing grease (Mobil One Synthetic, part number A049B381)

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8.4.27.2 Procedure

The grease fittings shown below correspond to the indicated bearing.



No.	Description	No.	Description
1	Fan Shaft Rear Bearing	4	Drive Shaft Forward Bearing
2	Fan Shaft Forward Bearing	5	Idler Shaft Rear Bearing
3	Drive Shaft Rear Bearing	6	Idler Shaft Forward Bearing

FIGURE 165. BEARING SEATS

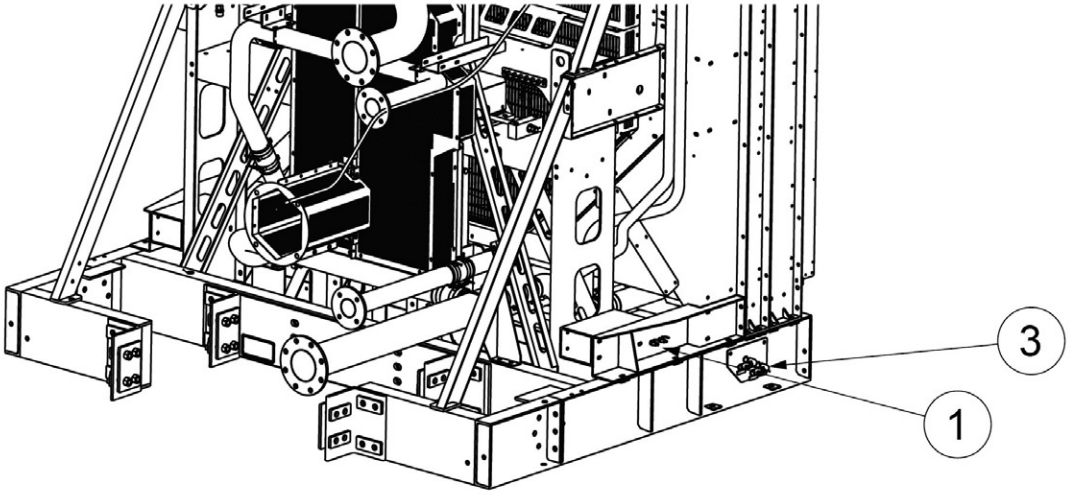
1. The bearing seat needs to be lubricated regularly; the locations as shown in the figure.
2. Wipe the grease fittings clean of any foreign material.
3. Put the grease gun onto the grease fitting. Make sure the grease gun nozzle is fully engaged on the grease fitting.
4. Pump about 0.52 oz of grease into each grease fitting in order from 1 through 6.

8.4.28 Fill Radiator Using Bottom Fill Option

NOTICE
Bottom fill option must be installed prior to performing this procedure.

NOTICE
If using the top fill option, make sure that fill rate should be 13 Lpm to avoid overfill of coolant in the radiator.

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No.	Description	No.	Description
1	Filling Valve	2	Drain Valves
2	Surge Tank		

FIGURE 166. RADIATOR BOTTOM FILL COMPONENTS

1. Open the inlet isolation valve and the outlet isolation valve on the coolant heater.
2. Fill the radiator.
   - Fill rate - 5 gpm (19 Lpm)
   - For fill volumes, refer to **Chapter 5 on page 43**.
3. Open the ball valve connected to the surge tank.
4. Pump in the coolant via the drain valves. If coolant flows out of the ball valve, the coolant needs to be drained to the appropriate coolant level.
5. Check for coolant leaks during and after the radiator coolant fill.
6. Close and lock all of the ball valves.
7. Test run the generator set for 10 minutes with the coolant temperature above 82 °C (180 °F).
8. Check for coolant leaks at the generator set and the radiator.
9. Check the coolant level and top off if needed.

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8.5 Install Radiator Fan Drive Shaft

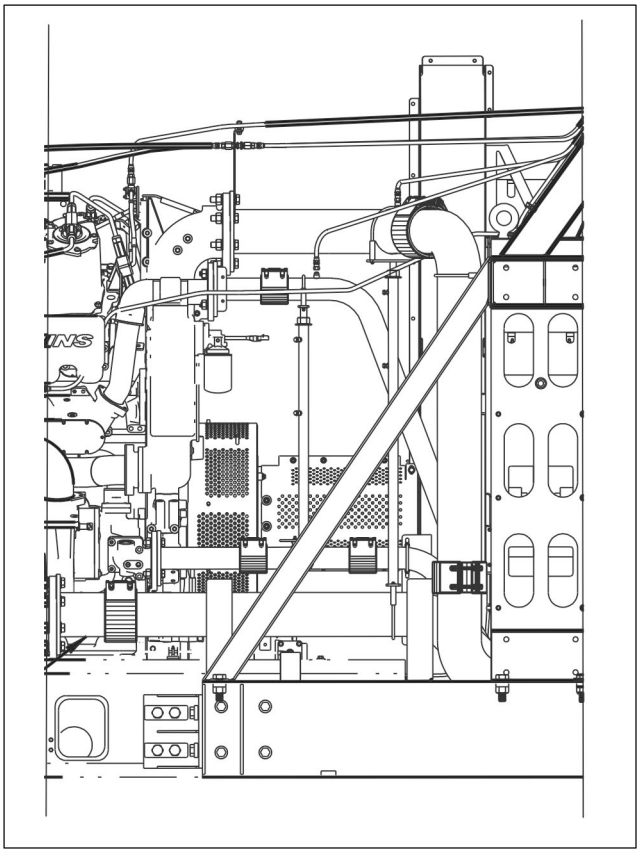


FIGURE 167. RADIATOR FAN DRIVE SHAFT

1. Clean radiator fan drive input shaft and installation key.

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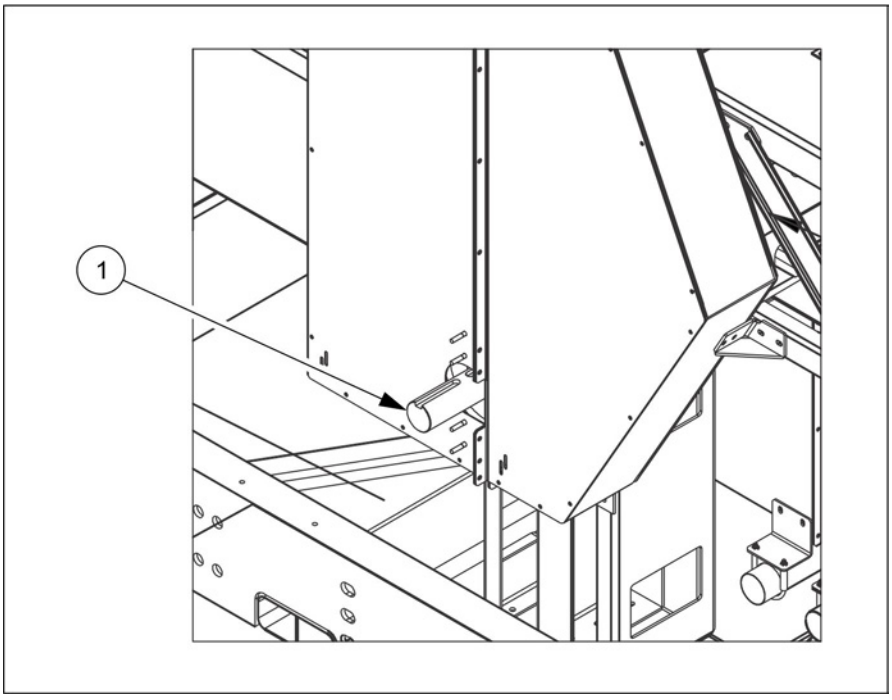


FIGURE 168. INPUT SHAFT AND INSTALLATION KEY SLOT

8.5.1 Install Fan Guard Adapters

1. Install engine vibration dampener guard adapter. Torque bolts to 52 Nm (38 ft-lb).

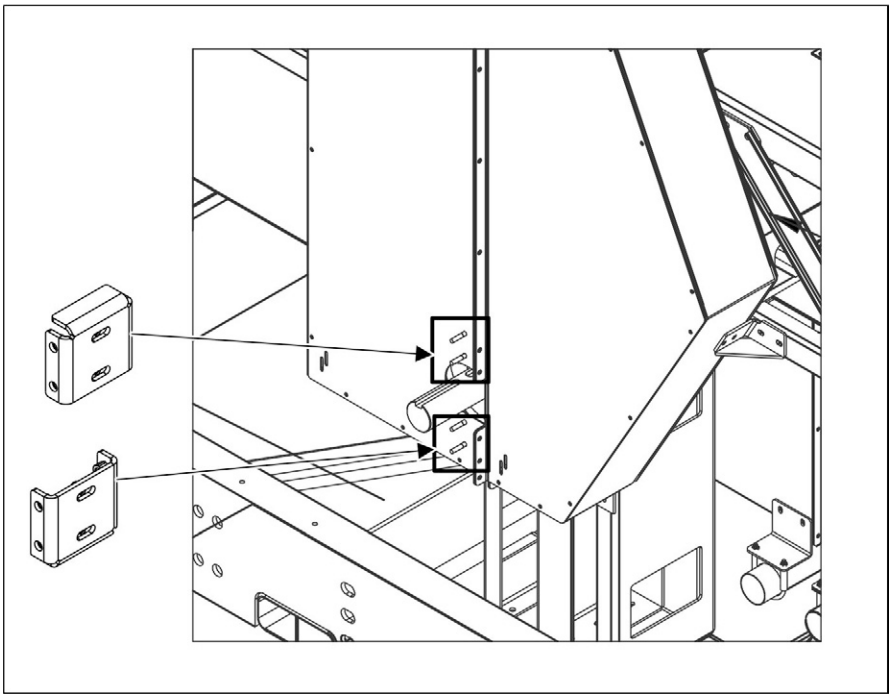


FIGURE 169. FAN DRIVE GUARD BRACKET DETAIL

2. Install radiator side guard adapter brackets. Torque bolts to 52 Nm (38 ft-lb).

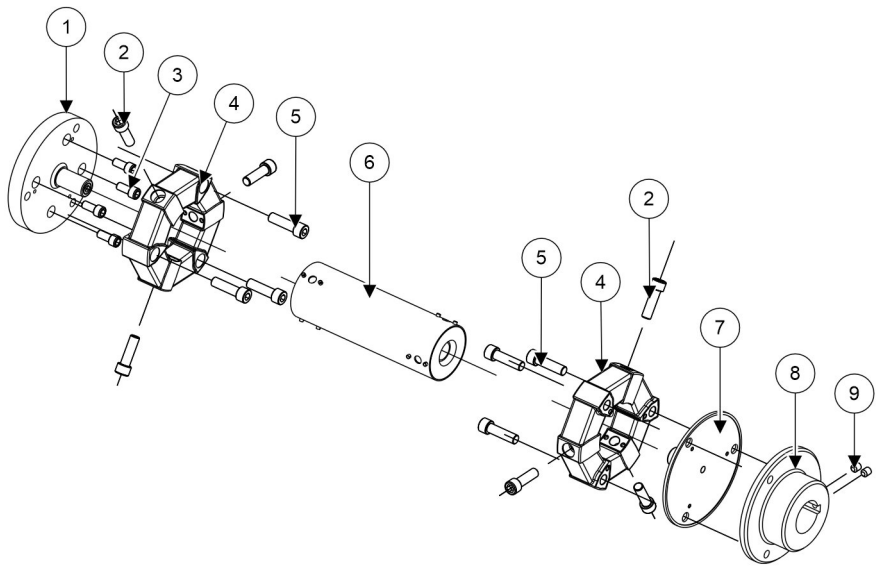
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8.5.2 Install Fan Drive Shaft Rubber Coupling

1. Loosen fan drive hub set screws (9, **Figure 170**).
2. Align fan drive hub (8, **Figure 170**) with shaft key and slide the fan drive hub onto the fan shaft.

NOTICE
Do not tighten fan drive hub set screws at this time.

3. Install the engine hub assembly (1, **Figure 170**) on the engine vibration dampener using quantity 4 M16 x 35 mm socket head screws (3, **Figure 170**). Torque to 250 Nm (184 ft-lb).
4. Slide two rubber elements (4, **Figure 170**), fan hub flange (7, **Figure 170**) onto the coupling drive shaft (6, **Figure 170**).



No.	Description	No.	Description
1	Engine Hub Assembly	6	Coupling Drive Shaft
2	M20 x 65 mm Socket Head Screw	7	Fan Hub Flange
3	M16 x 35 mm Socket Head Screw	8	Fan Drive Hub
4	Rubber Element	9	Set Screw
5	M20 x 70 mm Socket Head Screw		

FIGURE 170. RADIATOR FAN DRIVE PARTS

NOTICE
The socket head screws that attach the rubber elements to the coupling drive shaft come with a specific thread locking compound applied. Do not use other thread locking compound or damage will occur to the rubber elements.

5. Lift the coupling drive shaft with all the assembled parts and slide it on to the engine hub assembly.

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6. Hand thread quantity 3 – M20 x 70 mm socket head screws (5, Figure 170) through the rubber element and fan hub flange into the fan hub (4, 7 and 8, Figure 170). Start each bolt with 2 to 3 threads of engagement.
7. Hand thread quantity 6 – M20 X 65 mm socket head screws (2, Figure 170) through both rubber elements into the coupling drive shaft (4 and 6, Figure 170). Start each bolt with 2 to 3 threads of engagement.

NOTICE
All M20 screws must be torqued in the order prescribed below. Deviation from this order could result in premature failure of or damage to the rubber element(s).

8. Use a two-step process to torque all M20 x 70 mm socket head screws.
   a. First torque step, 250 Nm (184 ft-lb).
   b. Second torque step, 500 Nm (368 ft-lb).
9. Use a two-step process to torque all M20 x 65 mm socket head screws.
   a. First torque step, 250 Nm (184 ft-lb).
   b. Second torque step, 500 Nm (368 ft-lb).
10. Torque fan drive hub setscrews to 50 Nm (37 ft-lb).

8.5.3 Install Fan Drive Shaft U-joint Coupling

1. Clean the coupling assembly (item 1 Figure 171 on page 217) making sure the mating surfaces are free of debris, preservatives and grease.

NOTICE
Do not separate the drive shaft spline drive slip joint in any case. These components are to remain meshed together at all times.

NOTICE
A light coating of oil or rust inhibitor on all metal surfaces is acceptable. Care should be taken that the rubber element of the drive shaft does not come in contact with any chemicals.

2. Slide the drive shaft and hub end assembly (item 6 Figure 171 on page 217) onto the fan input shaft.

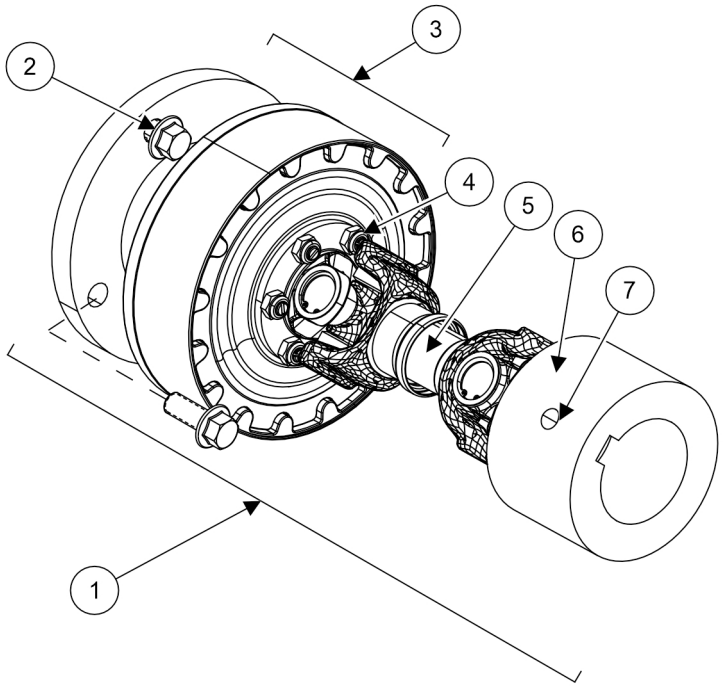
NOTICE
The drive shaft hub end is designed with a shaft stop. Seat the hub end fully on the radiator fan drive input shaft prior to torquing the M16 set screw.

3. Install the M16 set screw (item 7 Figure 171 on page 217) to lock the hub in place over the shaft key. Torque to 150 Nm (110.5 ft-lb).
4. Use an appropriate lifting device to support the rubber element (item 3 Figure 171 on page 217) during installation. Lift the rubber element to the engine vibration damper and loosely install the M16 flange head hex screws (item 2 Figure 171 on page 217).

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5. Extend the u-joint flange over the studs of the rubber element and install the hex nuts. Torque to 49 Nm (36 ft-lb) using a crow foot wrench. Perform an overcheck to verify all hex nuts are properly torqued. Scribe or mark with ink each nut upon validation of torque completion.

NOTICE
It may be necessary to start all the hex nuts on the studs prior to seating the flange.



No.	Description	No.	Description
1	Radiator Fan Drive shaft Assembly	5	Drive Shaft and Hub End Assembly
2	M16 x 40 mm Flange Head Hex Screw	6	Hub End
3	Rubber Element End	7	Fan Hub M16 Set Screw
4	M10 Hex Nut		

FIGURE 171. RADIATOR FAN DRIVE PARTS

6. Hand-tighten all flange head hex screws for the rubber element to the vibration damper.

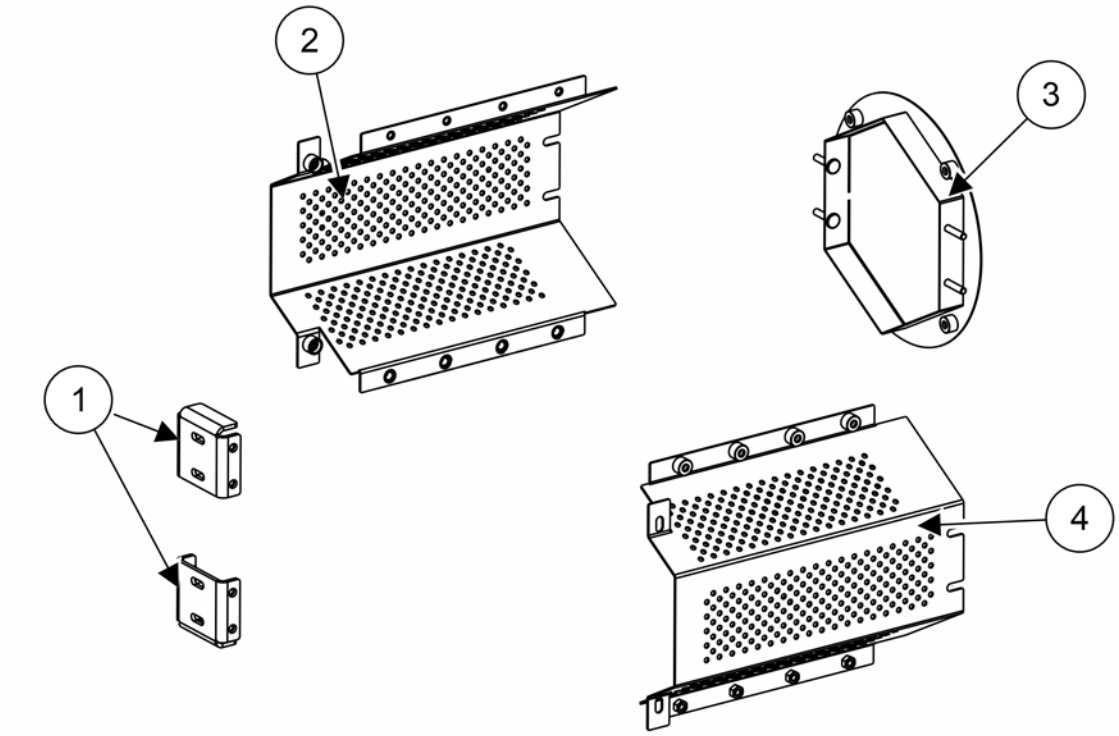
NOTICE
When using a torque adapter, always maintain a 90° angle between the torque adapter and torque wrench handle. For use of torque adapters of other lengths than the recommended, calculate the appropriate torque correction as recommended by the torque adapter manufacturer.

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7. Torque flange head hex screws to 215 Nm (158.5 ft-lb) in a star pattern using a 2 in (50.8 mm) torque adapter. Perform an overcheck to verify all hex nuts are properly torqued. Scribe or mark with ink each nut upon validation of torque completion.

NOTICE
The u-joints are greased form the factory and do not require additional grease at time of installation.

8.5.4 Install the Fan Drive Shaft Coupling Guard

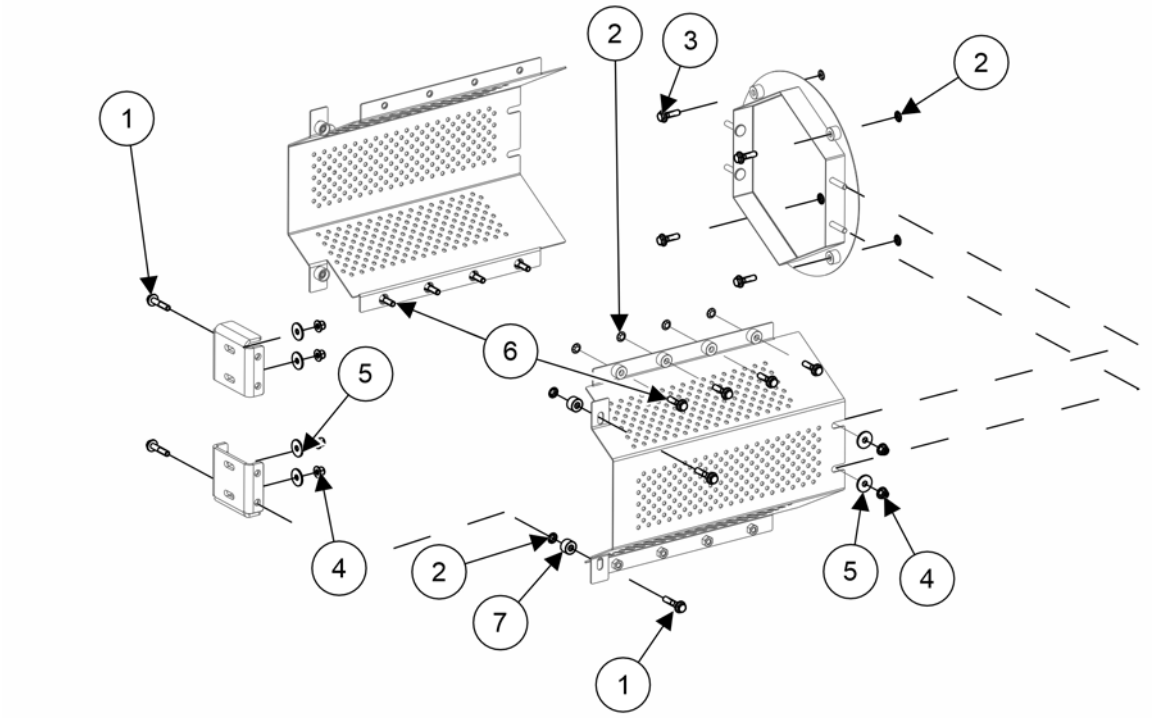


No.	Description	No.	Description
1	Radiator Guard Bracket	3	Engine Vibration Damper Guard Bracket
2	Right Side Guard	4	Left Side Guard

FIGURE 172. FAN DRIVE GUARD DETAIL

1. Prepare the right and left side guard brackets for installation:
   a. Using quantity 4 – insert one M10 x 50 mm hex flange head screw (1, **Figure 173**) through each of the 4 holes at the radiator end of the right and left brackets. Install one spacer (7, **Figure 173**) and one push on nut (2, **Figure 173**) after each hex flange head screw has been inserted through the guard.
   b. Using quantity 8 – insert one M10 x 40 mm hex flange head screw (6, **Figure 173 on page 219**) through each of the 4 holes along the top of the left side guard and along the bottom of the right side guard. Install one push on nut (2, **Figure 173**) after each hex flange head screw has been inserted through the guard1

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No.	Description	No.	Description
1	M10 x 50 mm Hex Flange Head Screw	5	M10 Flat Washer
2	M10 Push On Nut	6	M10 x 40 mm Hex Flange Head Screw
3	M10 x 35 mm Hex Flange Head Screw	7	Spacer
4	M10 Hex Flange Nut		

FIGURE 173. FAN DRIVE GUARD FASTENER DETAIL

2. Install the right side coupling guard to the engine vibration dampener adapter and the radiator side adapter brackets:
   a. Using quantity 2 – M10 hex flange nuts and flat washer (4 and 5, **Figure 173**) install to the studs of the vibration damper guard bracket. Torque to 52 Nm (38 ft-lb).
   b. Tighten the quantity 2 – M10 x 50 mm hex flange head screws (1, **Figure 173**), torque to 52 Nm (38 ft-lb).
3. Install the left side coupling guard to the engine vibration dampener adapter and the radiator side adapter brackets:
   a. Using quantity 2 – M10 hex flange nuts and flat washer (4 and 5, **Figure 173**) install to the studs of the vibration damper guard bracket. Torque to 52 Nm (38 ft-lb).
   b. Tighten the quantity 2 – M10 x 50 mm hex flange head screws (1, **Figure 173**), torque to 52 Nm (38 ft-lb).
4. Tighten the quantity 8 – M10 x 40 mm hex flange head screws (6, **Figure 173**), torque to 52 Nm (38 ft-lb).

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9 DC Control Wiring

⚠ WARNING

Electric Shock Hazard

Voltages and currents present an electrical shock hazard that can cause severe burns or death.

Avoid contact with the voltage sense and bus sense leads; voltages of up to 600 VAC may still be present. These voltages could be live even when the generator set is switched off.

⚠ WARNING

Electric Shock Hazard

Voltages and currents present an electrical shock hazard that can cause severe burns or death.

Make sure all power is off before performing control wire installation.

⚠ WARNING

Electric Shock Hazard

Voltages and currents present an electrical shock hazard that can cause severe burns or death.

To prevent accidental electrocution, stand on a clean dry wooden platform or clean rubber insulating mat, make sure your clothing and shoes are dry, remove all jewelry, and use tools with insulated handles.

The generator set control box contains connection points for remote control and monitor options.

NOTICE

Always run control circuit wiring in a separate metal conduit from the AC power cables to avoid inducing currents that could cause problems within the control.

Use cable ties to keep control wiring away from sharp edges and AC power cables within the control housing.

NOTICE

Stranded copper wire must be used for all customer connections to the control panel. Solid copper wire may break due to the generator set vibration.

Use flexible conduit for all wiring connections to the generator set.

9.1 Guidelines for Customer Connections to the Control System

- Torque terminals to 0.5 Nm (4.4 in-lb)
- Wire type: Use 60 C rated minimum copper wire
- Terminal screws (if fitted) are slotted 0.6 mm
- Use flat bladed screwdriver with 2.5 mm blade

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- Strip wire length to 6.0 mm (0.236 in) for screw type terminals and 10 mm (0.75 in) for push type terminals

9.1.1 Digital Connections

Connection points, other than relayed outputs and network are considered digital connections. The type/gauge wire to use for these connections are:

- Less than 305 m (1000 ft), use 0.5 mm^2 (20 gauge) stranded copper wire.
- 305 m to 610 m (1000 ft to 2000 ft), use 0.75 mm^2 (18 gauge) stranded copper wire.

9.1.2 Relay Connections

Due to the wide variety of devices that can be attached to the relay outputs, the electrical contractor must determine the gauge of the stranded copper wire that is used.

9.2 PowerCommand 3.x TB1 Customer Connections

Refer to **Appendix A on page 253** for information on TB1 customer connections.

9.2.1 Configurable Outputs

Each output has normally-open contacts. The contacts can be used to control small devices, indicator lamps, or relays.

The contacts are programmed to energize by entering a code number for the desired event.

NOTICE
Using the InPower service tool or accessing the Setup submenus is required to modify the customer outputs. Contact an authorized distributor for assistance.

9.2.1.1 Contact Ratings for Configurable Outputs

TABLE 22. CONTACT RATINGS FOR CONFIGURABLE OUTPUTS

Description	Value
Maximum Voltage	30 VDC
Maximum Current	3.5 Amps

9.2.2 Remote Start

⚠ **WARNING**
Automated Machinery ***Accidental or remote starting of the generator set can cause severe personal injury or death.*** ***Make sure that the generator set cannot be started accidentally or remotely before starting work on the generator.***

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NOTICE

Remote start terminals should only be used for a remote application. Remote start terminals are not to be shorted if the remote start function is not intended to be used.

When the control is in Auto/Remote mode, grounding this input initiates the engine cranking and start sequence. This circuit must be opened to permit resetting a shutdown condition with the Reset input. (The remote stop is actually the removal of the remote start signal to the control.)

9.2.3 Configurable Inputs

Grounding any one of these inputs activates the corresponding warning or shutdown sequence.

External sensing equipment must be connected to the designated digital input.

The nature of the fault is an optional customer selection. Example inputs: Low Coolant Level, Low Fuel Level, Ground Fault, etc.

NOTICE

The InPower service tool or access to the Setup submenus is required to modify the customer fault inputs. Contact your authorized distributor for assistance.

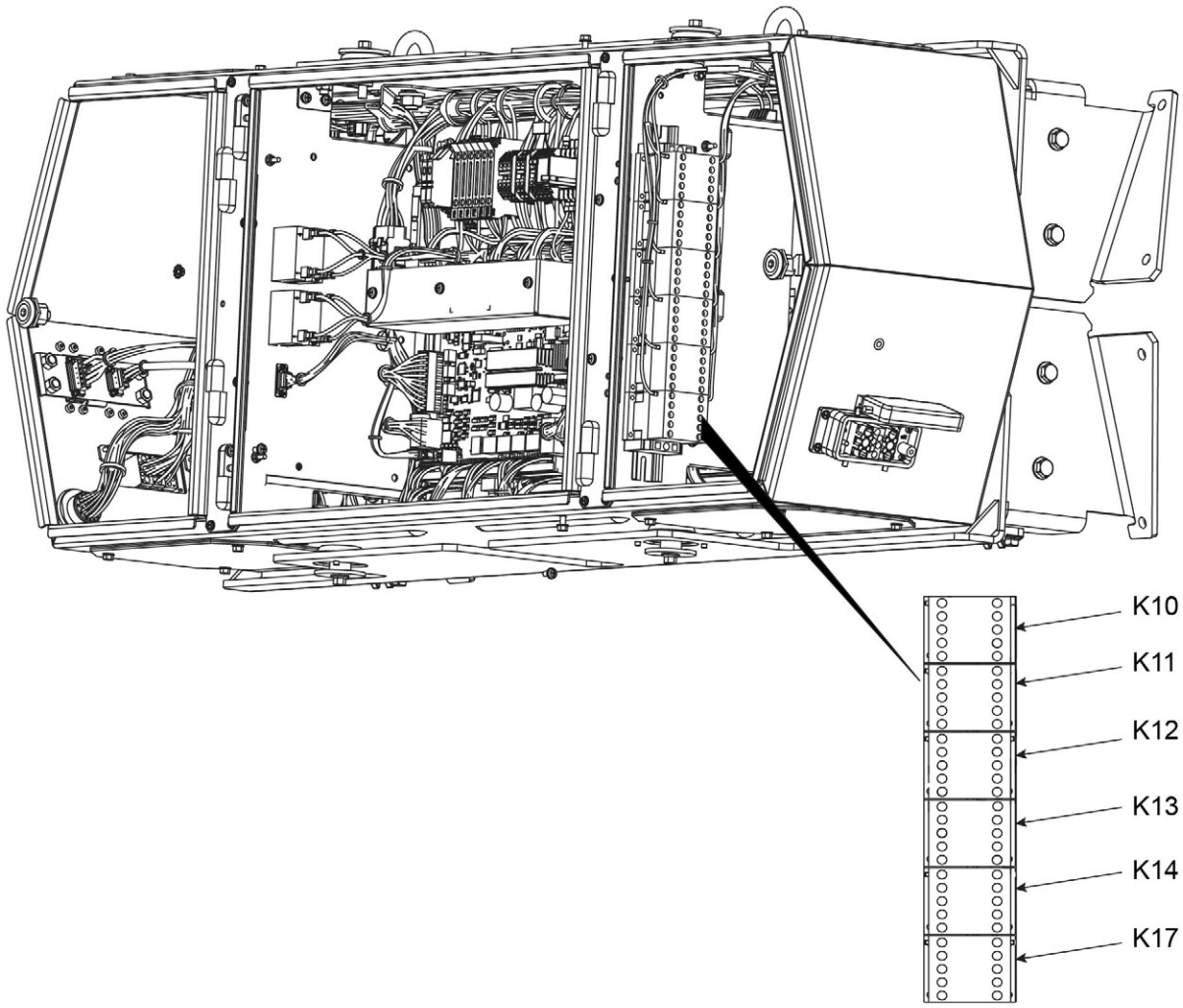
9.2.4 Remote Emergency Stop

Opening this input causes an immediate shutdown. Emergency stop must be reset at the remote panel, then at the front panel.

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9.3 Customer Relays

9.3.1 Location of Customer Relays



No.	Description	No.	Description
K10	Configurable Output 1	K11	Configurable Output 4
K11	Configurable Output 3	K13	Common Alarm
K14	Configurable Output 5	K17	Configurable Output 6

FIGURE 174. LOCATION OF CUSTOMER RELAYS

9.3.1.1 Configurable Outputs

This relay is connected to the corresponding configurable output on the control. If the configurable output is active, the relay is active. If the configurable output is inactive, the relay is inactive.

This relay allows the configurable output to control larger devices, and it isolates the control from these devices.

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9.3.1.2 Common Alarm

This output is active as long as any shutdown fault or warning fault is active.

9.3.1.3 Contact Specifications

The contacts are rated at 10 A at 600 VAC.

9.3.1.4 Schematic

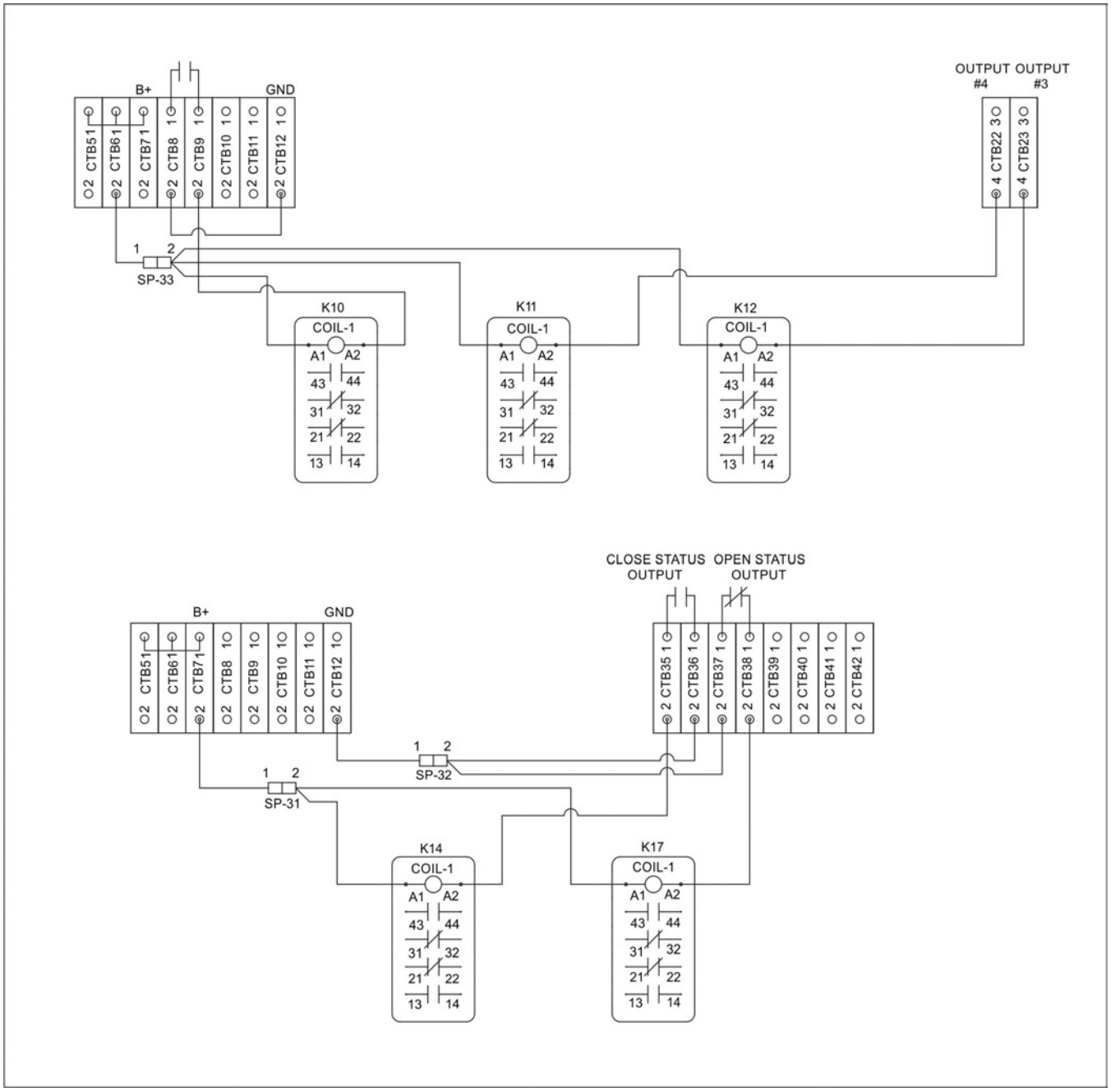


FIGURE 175. SCHEMATIC

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9.4 Paralleling Circuit Breaker Control Relays

9.4.1 Paralleling Circuit Breaker Control Relays Installation

The circuit breaker control and monitor function manages opening and closing the generator set breaker. It also manages sensing/determining both generator set and utility breaker positions. The generator set breaker is controlled with two separate relays -one for closing and one for opening.

The control logic instructs the generator set breaker to always (except for a short delay) close or always open the breaker. Opening the breaker always takes priority over any close.

Only two functions can close the breaker - either a dead bus close or the permissive close (sync check).

In single generator set applications, the relay contact used for breaker closing is capable of being set up to trip the breaker on fault shutdowns only and the breaker position is not sensed.

TABLE 23. BREAKER CONTROL FUNCTIONS

Connector Pin	Signal Name	Signal Type	Description of Default Function
CTB39-1	Genset CB Close Status	Relay Output	Contact for closing generator set breaker, ratings 5A 30 VDC inductive L/R = 7 msec
CTB40-1 (Return)			
CTB42-1	Genset CB Open Status	Relay Output	Contact for opening generator set breaker, ratings 5A 30 VDC inductive L/R = 7 msec
CTB41-1 (Retrun)			
CTB42-1			
CTB43-1	Utility CB Close Status	Relay Output	Contact for closing utility breaker, ratings 5A 30 VDC inductive L/R = 7 msec
CTB44-1 (Return)			
CTB45-1	Utility CB Open Status	Relay Output	Contact for opening utility breaker, ratings 5A 30 VDC inductive L/R = 7 msec
CTB46-1 (Return)			

Paralleling circuit breaker control relays are located in the right side of the generator set control box.

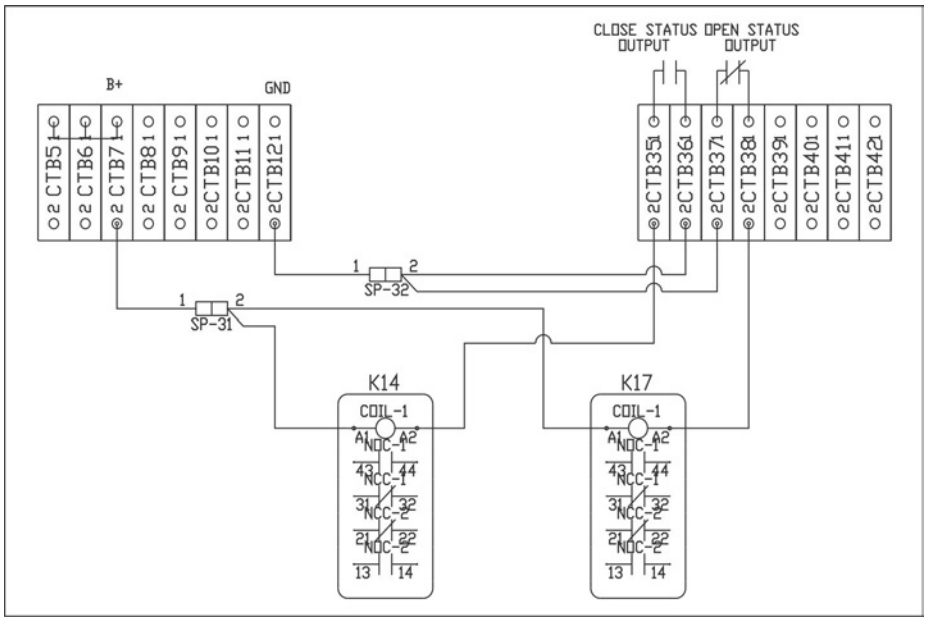


FIGURE 176. WIRING DIAGRAM OF PARALLELING CIRCUIT BREAKER CONTROL RELAYS

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9.5 Ground Fault Relays

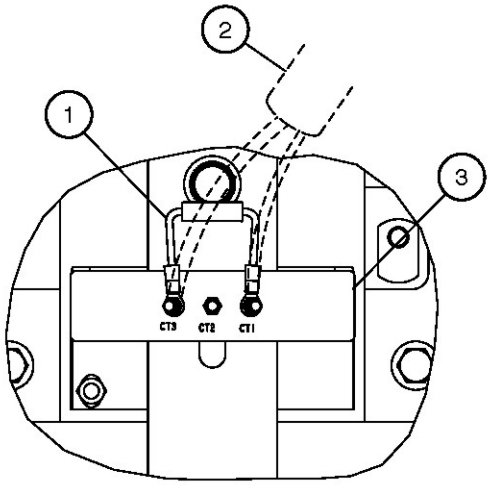
A Ground Fault Relay (GFR) continuously monitors the neutral-to-ground connection and activates a fault alarm when the connection is broken. During generator set operation, the relay continuously monitors the line-to-neutral and activates a fault alarm when a ground fault is sensed.

A control reset will clear the fault at the control panel and will also reset the ground fault relay. The Ground Fault Relay is in customer scope.

9.5.1 Ground Fault Relay with Local Current Transformer

The ground fault relay with a local Current Transformer (CT) is used on generator sets that have their neutrals bonded to ground internally in the circuit breaker or entrance enclosure. The ground bonding jumper is connected between the neutral (L0) bus bar and the equipment grounding bus and passes through the ground fault sensing CT which drives the GFI relay. Generator sets with this feature power separately derived systems via 4-pole transfer switches that switch the neutral conductor as well as the three phases.

For installations with a local current transformer, the current transformer is mounted inside the control box. The meter harness with resistor is installed on the transformer. The relay harness is connected from the relay to the current transformer.



No.	Description	No.	Description
1	CT Meter Harness with Burden Resistor	3	Current Transformer
2	Relay Harness		

FIGURE 177. GROUND FAULT METER HARNESS

9.5.2 Ground Fault Relay with Remote Current Transformer

The ground fault relay with a remote CT is used on generator sets with floating neutrals (L0) that are not connected to ground at the set. These generator sets power non-separately derived systems via 3-pole transfer switches which solidly bond the neutral conductors in both the neutral and emergency sides.

For installations with a remote current transformer, the current transformer is mounted on a transformer assembly at a location away from the generator set. The meter harness with resistor is installed on the current transformer. The relay harness is connected from the relay to the current transformer.

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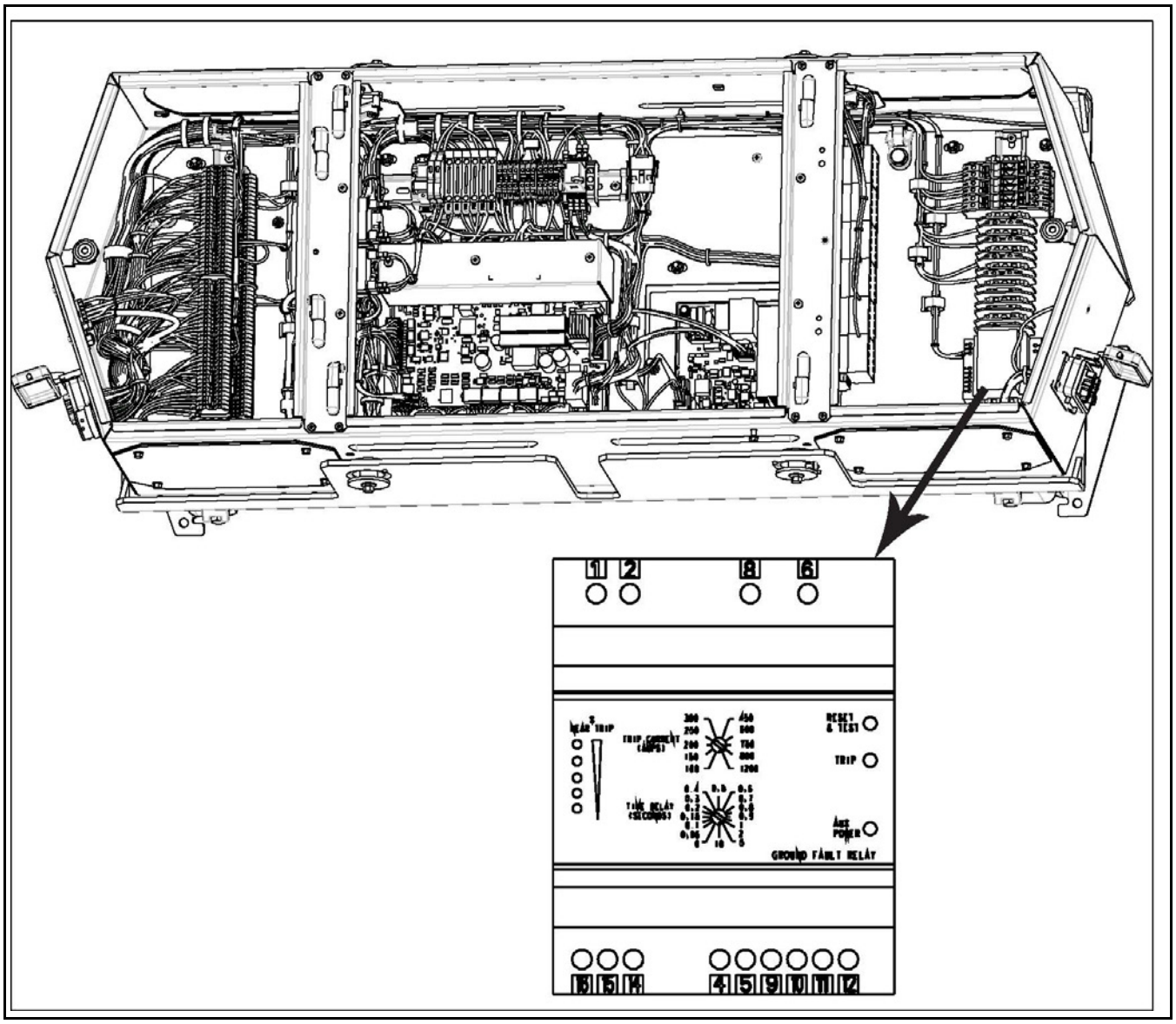


FIGURE 178. GROUND FAULT RELAY

9.5.3 Ground Fault Relay Installation

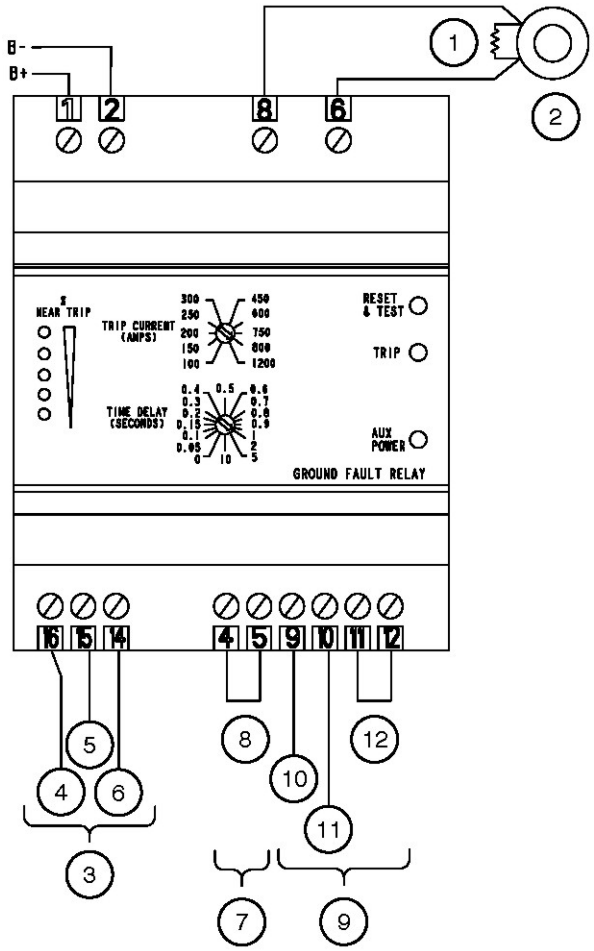
Refer to the following figure when making wiring connections. The connection points on the ground fault relay that are used include:

- GFR-1 - B+
- GFR-2 - B–
- GFR-6 to CT3
- GFR-8 to CT1
- GFR-14 (Signal) to TB1-14
- GFR-15 (Signal Return) to TB1-15

The two leads connected from GFR-14 and GFR-15 to TB1-14 and 15 are configurable inputs.

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The maximum AC terminal voltage for the ground fault relay is 600 VAC. The supply voltage is 12-48 VDC. The continuous current is 5 amps.

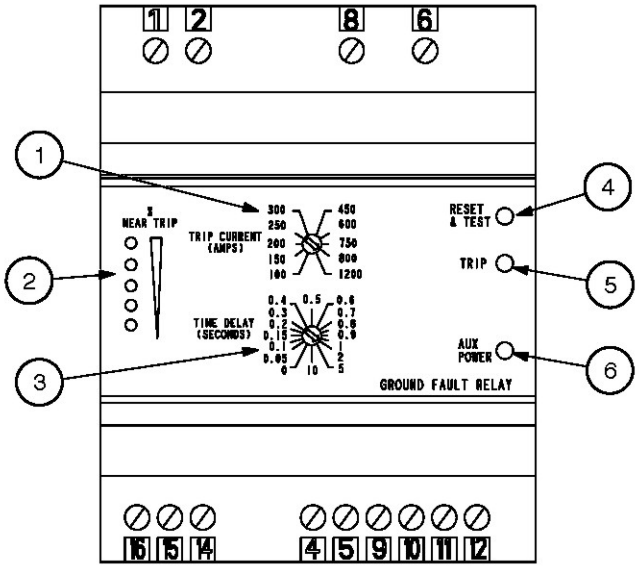


No.	Description	No.	Description
1	Burden Resistor	7	Optional
2	Current Transformer	8	Link for Latching Relay
3	Output Signal	9	Not Used
4	N.O.	10	Analogue +
5	Com.	11	Output –
6	N.C.	12	Link for 200µ Shunt

FIGURE 179. GROUND FAULT RELAY WIRING CONNECTIONS

The relay has a time delay setting of zero to ten seconds and a current setting of 100 to 1200 amperes. Adjust the Current and Time Delay controls on the ground fault relay to the customer's specifications.

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No.	Description	No.	Description
1	Trip Current Control	4	Reset and Test Button
2	Percent Near Trip Indicators	5	Test Button
3	Time Delay Control	6	Auxiliary Power Indicator

FIGURE 180. GROUND FAULT RELAY

10 AC Electrical Connections

⚠ WARNING

Arc Flash and Shock Hazard

Voltages and currents present an electrical shock hazard that can cause severe burns or death.

Make sure that only service personnel who are trained and experienced perform electrical and mechanical component installations. The AC sensing harness and other cabling will become energized when the generator set is in operation.

⚠ WARNING

Hazardous Voltage

Contact with high voltages can cause severe electrical shock, burns, or death.

Make sure that only personnel who are trained and qualified to work on this equipment are allowed to operate the generator set and perform maintenance on it.

⚠ WARNING

Automated Machinery

Accidental or remote starting of the generator set can cause severe personal injury or death.

Isolate all auxiliary supplies and use an insulated wrench to disconnect the starting battery cables (negative [–] first).

⚠ WARNING

Combustible Gases

Ignition of battery gases is a fire and explosion hazard which can cause severe personal injury or death.

Do not smoke, or switch the trouble light ON or OFF near a battery. Touch a grounded metal surface first before touching batteries to discharge static electricity. Stop the generator set and disconnect the battery charger before disconnecting battery cables. Using an insulated wrench, disconnect the negative (–) cable first and reconnect it last.

⚠ WARNING

Electric Shock Hazard

Voltages and currents present an electrical shock hazard that can cause severe burns or death.

Avoid contact with the voltage sense and bus sense leads; voltages of up to 600 VAC may still be present. These voltages could be live even when the generator set is switched off.

This section provides the procedure that is used to connect the AC electrical system of the generator set.

Before making any AC electrical connections, make certain the generator set cannot be accidentally started. Make sure the Operator Panel is in OFF mode. Turn off or remove AC power from the battery charger and then remove the negative (–) battery cable from the set starting battery using an insulated wrench.

If the generator set is being installed in an application where it may parallel with other generators or utility sources, the generator set control system may be energized from an external source. Lock out tag out any external source that can provide AC power to the generator set.

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NOTICE

Ventilate the battery area before working on or near battery. Wear goggles. Stop the generator set and disconnect the battery charger before disconnecting battery cables. Disconnect negative (–) cable first and reconnect last using an insulated wrench.

Connecting the generator set AC electrical system involves:

- Installation of transfer switch
- Generator output voltage selection
- Load cable connection
- Standard and optional AC equipment connections (e.g., control box heater, coolant heater, etc.).

For all output connections, including when field connection is made at the alternator terminations, installation should be completed with conductors of appropriate size, type, and rating specified in local codes (or UL). For UL compliant installations, use conductor size, X AWG, 75 °C or 90 °C copper wire, 600V. Where X AWG is the conductor size specified by the local electrical code for 75 °C at the rated output current for the generator set. Use copper conductors only. For non-UL compliant installations, use cable sizes, composition, and rating per local codes. Strain relief, bending space, raceway, and other installation features should be completed in compliance with local code.

Local regulations often require that wiring connections be made by a licensed electrician, and that the installation be inspected and approved before operation. All connections, wire sizes, materials used, etc. must conform to the requirements of electrical codes in effect at the installation site.

Before starting the generator set, check to make sure that all electrical connections are secure, and that all wiring is complete. Replace and secure any access panels that have been removed during installation. Check that the load cables from the generator set are properly connected.

NOTICE

Backfeed to a utility system can cause electrocution or property damage. Do not connect to any building electrical system except through an approved device and after the building main switch is opened.

10.1 AC Distribution Panel Connections

NOTICE

Make sure that all circuit breakers are in the OFF position before applying power to the AC distribution panel. Other options may require additional installation before connecting to power.

10.1.1 Single Phase AC Distribution Panel

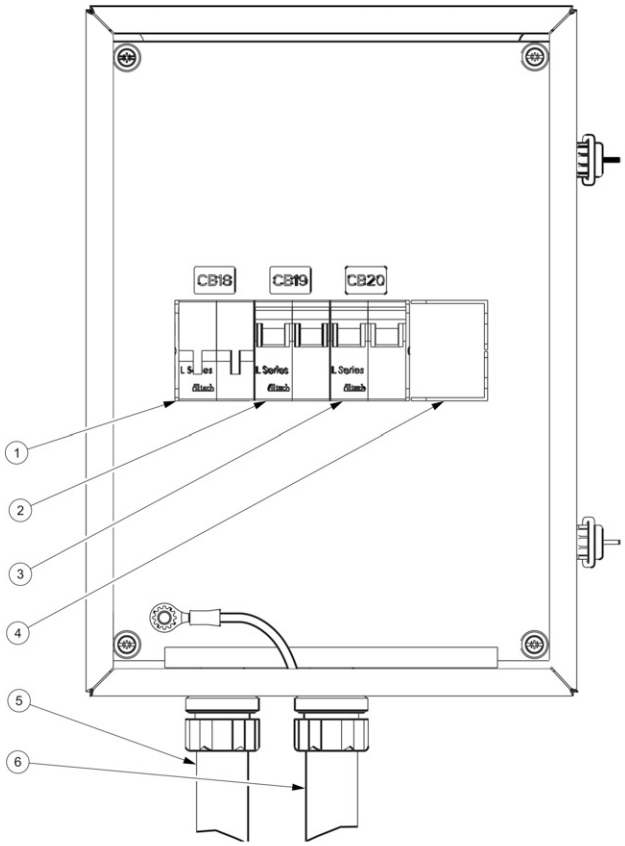
The AC distribution panel provides a central 120/240 VAC power source for all single phase generator set accessories.

All connections use 60 to 75° C conductors and must comply with the National Electric Code and all applicable local codes and standards.

The distribution panel receives 40 amp, 120/240 VAC power feed. The two line conductors connect to the 40 amp main circuit breaker. The circuit breaker is listed for 18 AWG (0.823 mm^2) to 3 AWG (26.7 mm^2) conductors, copper (Cu).

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The grounding conductor, if used, connects to the ground bar. The ground bar accomodates 14 AWG (2.08 mm^2) to 4 AWG (21.2 mm^2) conductors, Cu.



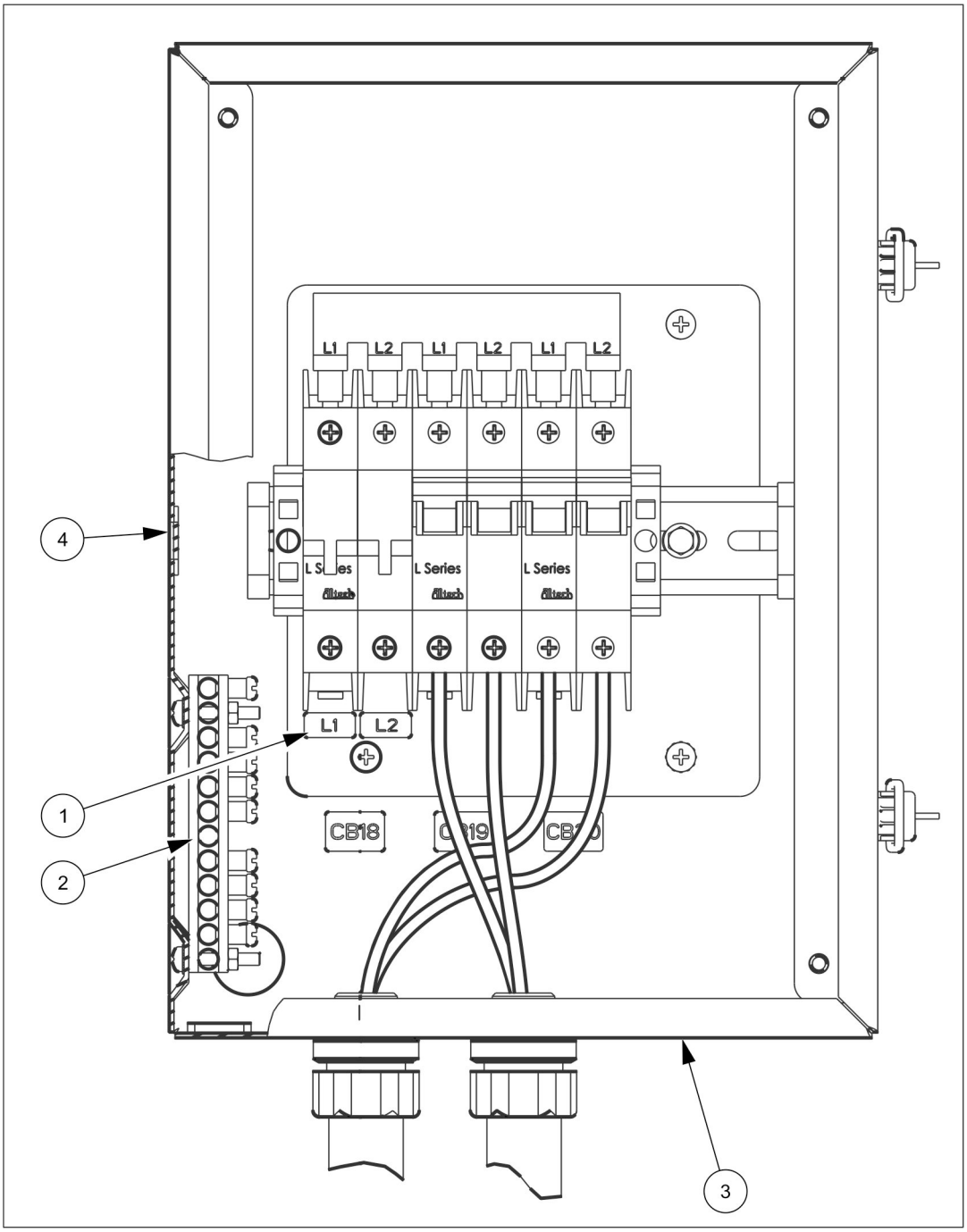
NOTICE

Panel door removed for clarity

No.	Description	No.	Description
1	40 A Main Circuit Breaker (CB18)	4	Knockout for 15A Customer Supplied Circuit Breaker
2	20 A Alternator Heater Circuit Breaker (CB19)	5	Control Box Heater AC Supply
3	5A Control Box Heater Circuit Breaker (CB20)	6	Alternator Heater AC Supply

FIGURE 181. AC DISTRIBUTION PANEL FEATURES

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No.	Description	No.	Description
1	Single phase connection from main	3	Customer supply wiring entrance (120/240 VAC)
2	Ground busbar	4	Knockout for customer supplied accessory wiring (if extra circuit breaker is installed)

FIGURE 182. AC DISTRIBUTION PANEL CONNECTIONS

Numbers in parenthesis that follow refer to numbers in **Figure 182**. Also see **Appendix A on page 253**.

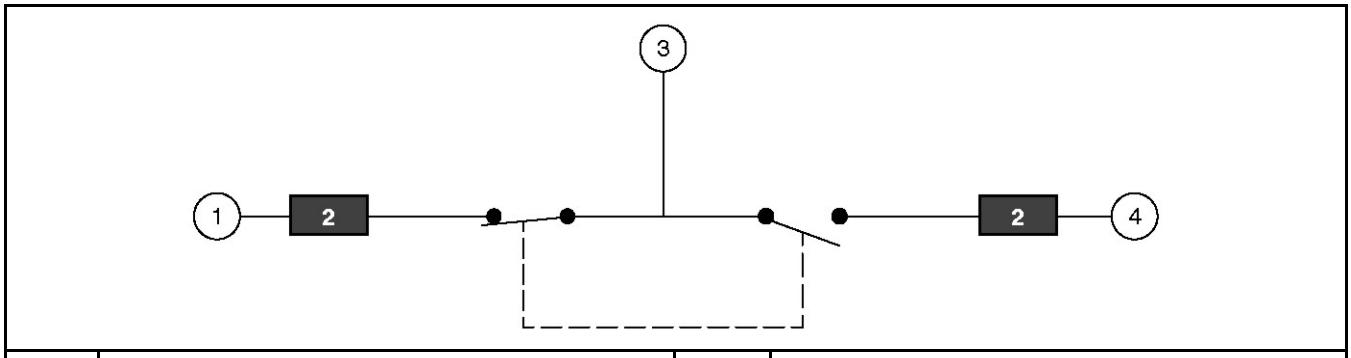
1. Route the customer power supply to the panel knockout located on the bottom of the distribution box.
2. Connect the main phase wire to the breaker (1) shown.

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3. Where applicable with local codes, connect the ground (2) to the location shown.

10.2 Transfer Switch

A transfer switch must be used for switching the load from the normal power source to the generator set (see **Figure 183**). Follow the installation instructions provided with the transfer switch when connecting the load and control wiring.



No.	Description	No.	Description
1	Normal Power Source	3	Load
2	Overcurrent Protective Device	4	Emergency Power Source

FIGURE 183. TYPICAL LOAD TRANSFER FUNCTION

10.3 Load Connections

NOTICE
Flexible conduit and stranded conductors must be used for connections to take up movement of the generator set.

All loads are connected to the alternator by bolting stranded load wires to the appropriate terminals on the alternator reconnection terminal block or circuit breaker lugs. The terminals are marked U, V, W, and N to indicate the line and neutral connections. (Reference: U, V, and W correspond with L1, L2 and L3; and N with L0 respectively). See **Appendix B on page 277** for details about the following:

- Load connections
- Conduit
- Cable Size

10.3.1 Generator Set Load Cable Installation

To ensure optimum performance of the generator set, load cables passing through cable gland plates must be adequately protected and secured.

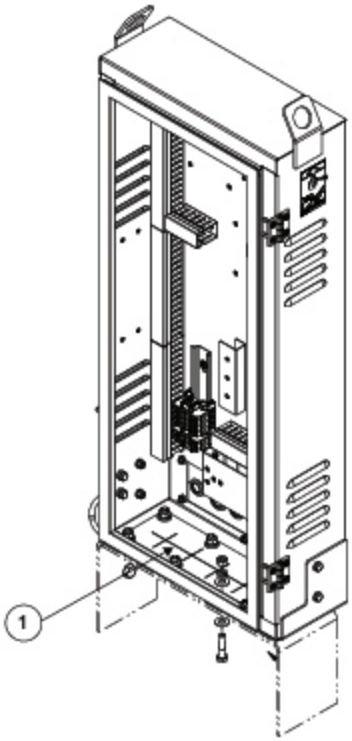
10.3.2 Cabling through Non-Ferrous Gland Plates

Single core load cables must be secured using non-ferrous cable glands.

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10.3.3 Cabling through Ferrous Gland Plates

Single core load cables must pass through the same hole, or slotted cable grommet holes as illustrated (see **Figure 184**). Cable glands must be made from non-ferrous material.



No.	Description
1	Cable Gland Grommet

FIGURE 184. FERROUS GLAND PLATES

10.3.4 Distribution Cables

Single core power distribution cables should be grouped in a trefoil formation as illustrated (See **Figure 185**). (Trefoil grouping provides optimum cable loading and reduces electrical emissions). To minimize cable temperature rise and reduce cable de-rate factors, cable groups where possible, should be spaced to provide ventilation. Cable groups must be secured with non-ferrous material.

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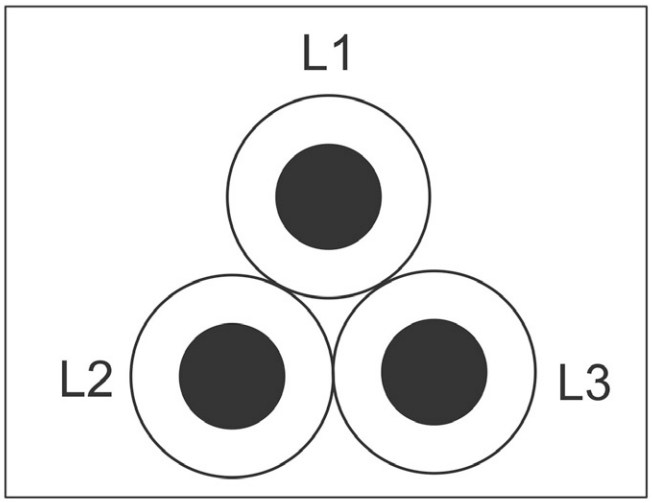


FIGURE 185. TREFOIL FORMATION

10.4 Load Balancing

When connecting loads to the generator set, balance the loads so that the current flow from each line terminal (L1, L2, and L3) is about the same. This is especially important if both single phase and three phase loads are connected. Any combination of single phase and three phase loading can be used as long as each line current is about the same, within 10 percent of median value and no line current exceeds the name plate rating of the generator. Check the current flow from each line after connections by observing the Operator Panel ammeter.

10.5 Alternator Heaters

10.5.1 Alternator Heater Connection

⚠ WARNING

Electric Shock Hazard

Voltages and currents present an electrical shock hazard that can cause severe burns or death.

Water or moisture inside an alternator increases the possibility of flashing and electrical shock. Do not use an alternator which is not dry inside and out.

An alternator heater(s) is used to help keep the alternator free of condensation when the generator set is not running. During cool and humid conditions, condensation can form within an alternator, creating flashing and shock hazards.

Connect the heater(s) terminals to a source of power that will be on during the time the engine is not running. Be sure the supply voltage and circuit amperage is correct for the heater element rating.

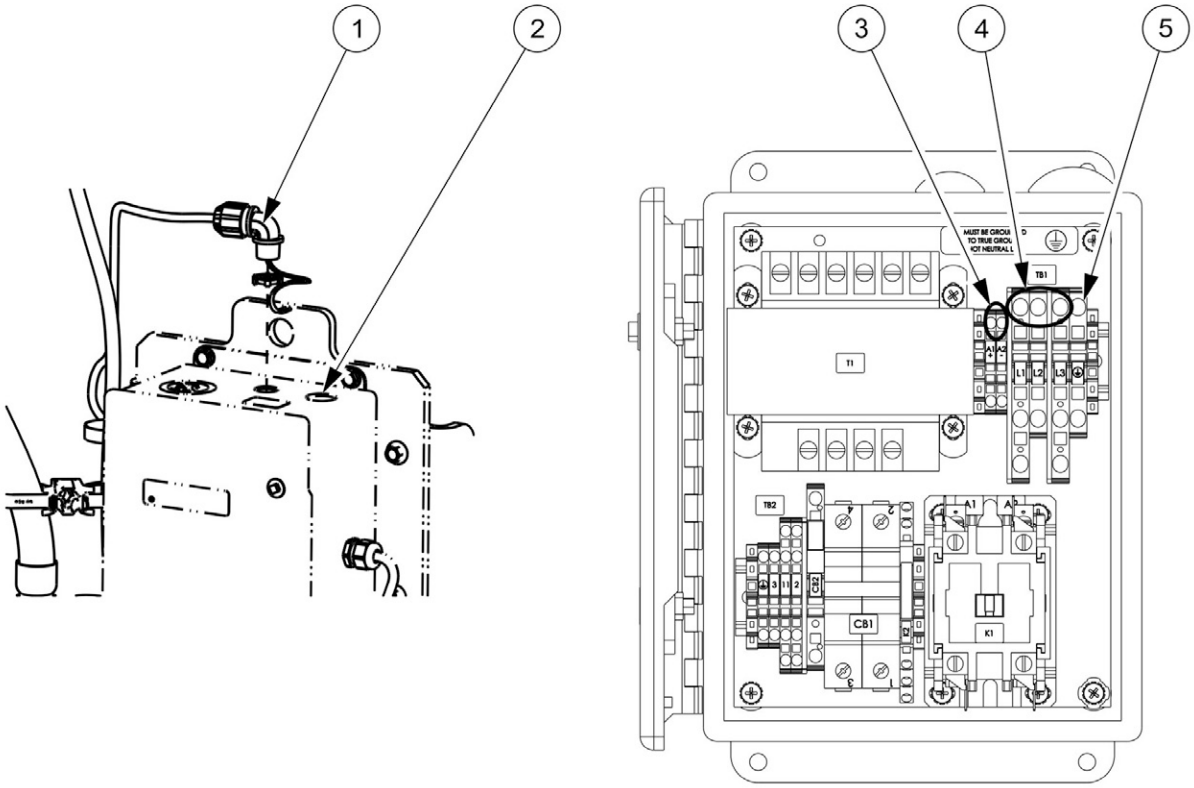
10.6 Coolant Heater

The coolant heater preheats the high temperature coolant circuit. This assists engine starts in cold ambient conditions. The coolant heater system operates when the generator set is not running and three phase AC power is provided to the coolant heater. The system turns off only when a generator set start cycle is initiated or the coolant heater is isolated from AC power.

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10.6.1 Coolant Heater Connection

1. Connect the AC power wires to L1, L2, L3, and ground (**Figure 186 on page 238**). Use the top entry for AC power wires. Ensure the wires are routed and secured away from transformer and the enclosure door latches.

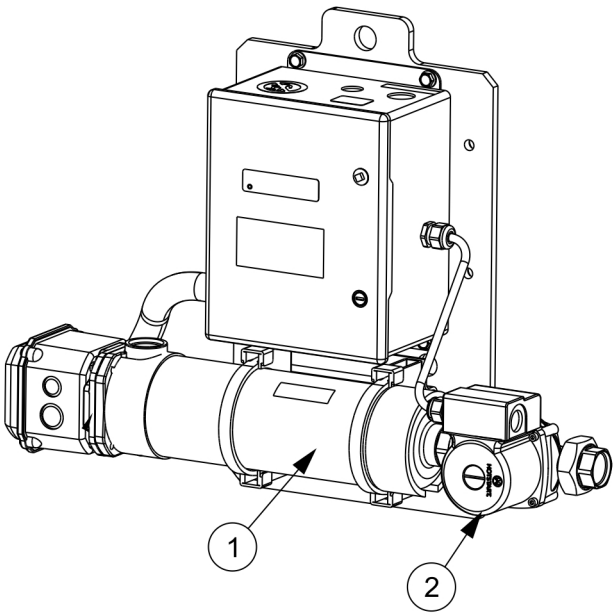


No.	Description	No.	Description
1	Coolant Heater Control Harness	4	L1, L2, and L3
2	AC Power Wires Entry Location	5	Ground
3	A1 (+) and A2 (-)		

FIGURE 186. WIRING

2. Ensure the isolating ball valves for the coolant heater are open.
3. Fill the generator set with Cummins approved coolant. The fill rate is 19 lpm (5 gpm).
4. Check the coolant system for leaks. Repair as necessary.
5. Remove lockout-tagout devices and power-up the generator set control.
6. Apply AC power to the coolant heater and check for proper operation (**Figure 187 on page 239**).
   - The coolant heater circulation pump should be running when the generator set is off.
   - The coolant heater heating element turns on when the coolant temperature is below 37.7 °C (100 °F).

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No.	Description	No.	Description
1	Heating Element	2	Circulation Pump

FIGURE 187. HEATING ELEMENT AND CIRCULATION PUMP

10.7 Annunciators

10.7.1 PowerCommand Universal Annunciator

A universal annunciator provides lamps and a horn to annunciate the operating status and fault conditions of an emergency power system. It is designed for connection to either a 12 VDC or a 24 VDC control system. It can be configured to be either a positive or negative signal device.

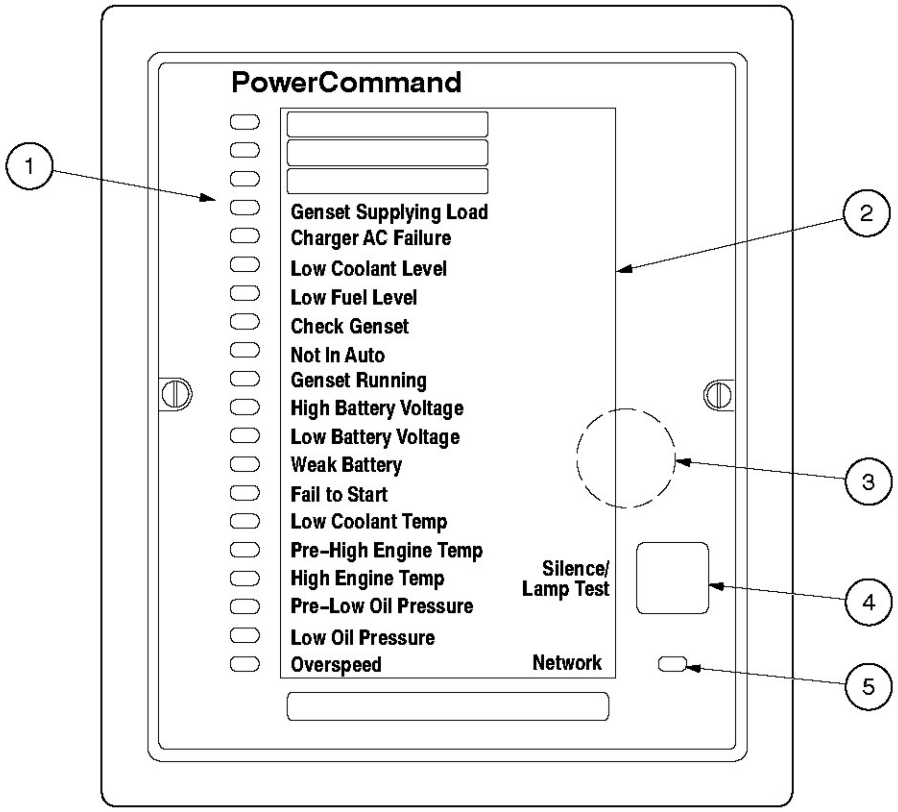
Two versions of the PowerCommand universal annunciator are available.

- Panel Mounted
- Panel with Enclosure

The universal annunciator can communicate using either a PCCNet or a Modbus network.

Refer to the PowerCommand Universal Owners Manual for more information.

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No.	Description	No.	Description
1	System Status Lamps	4	Silence/Lamp Test Button
2	Insert Card	5	Network Status Lamp
3	Horn		

FIGURE 188. ANNUNCIATOR COMPONENTS

10.8 Battery Commissioning - Maintenance Free

NOTICE
Commissioning is to be undertaken by suitably trained and qualified service personnel only.

The battery(s) are supplied and installed with 70% State of Charge (SOC), enough to start the generator set.

The set mounted battery charger will then charge the battery to the maximum level.

If the battery(s) have been disconnected/removed, the battery(s) will need commissioning:

1. Pre-commissioning procedure
2. Charging
3. Fitting the battery to the generator set

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10.8.1 Safety Precautions

Servicing of batteries are to be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

10.8.1.1 General Precautions

⚠ WARNING

Combustible Gases

Ignition of battery gases is a fire and explosion hazard which can cause severe personal injury or death.

Laying tools or metal objects across the battery can cause arcing. Never lay tools or metal objects across the top of the battery.

- Use proper PPE. Do not wear jewelry. Remove any conductive items from pockets. These items can fall into equipment and result in a short circuit, which can cause shock or burning. Refer to local standards for PPE details.
- Use tools with insulated handles to prevent the risk of electric shock.

10.8.1.2 Fire Hazard

NOTICE

During the charging of a battery, explosive gases are given off. Keep the battery area well ventilated and away from naked flames and sparks. Do not smoke.

- Before disconnecting a battery, isolate the utility powered battery charger (where fitted).
- To disconnect the battery, use an insulated wrench to disconnect the negative cable first.
- To connect the battery, use an insulated wrench to connect the negative cable last.

10.8.2 Pre-Commissioning Procedure

1. Check for any damage to the battery case or terminals, and make sure that the battery is clean and dry.
2. Remove the vent plugs and break any seals (if present), taking care not to damage the plates or separators. The broken seal will fall into the bottom of the chamber and do no harm.

10.8.3 Connecting the Battery to the Generator Set

1. Secure the battery. Battery hold-down bolts must be tight, but not over-tight.
2. Smear the terminals with petroleum jelly, if necessary.
3. Fit the vents firmly in position and ensure that the battery is clean and dry.
4. Verify correct polarity when connecting the battery to the set. Even momentary incorrect connection can cause damage to the electrical system.
5. Use an insulated wrench connect the positive generator cable first, followed by the negative cable. Terminal connections must be tight, but not over-tight.

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10.9 Grounding

⚠ WARNING

Electric Shock Hazard

Voltages and currents present an electrical shock hazard that can cause severe burns or death.

Make sure that only service personnel who are trained and experienced perform electrical and mechanical component installations. Bonding and grounding must be done properly. All metallic parts that could become energized under abnormal conditions must be properly grounded.

The following is a brief description of system and equipment grounding of permanently installed AC generators within a facility wiring system.

NOTICE

It is important to follow the requirements of the local electrical code.

NOTICE

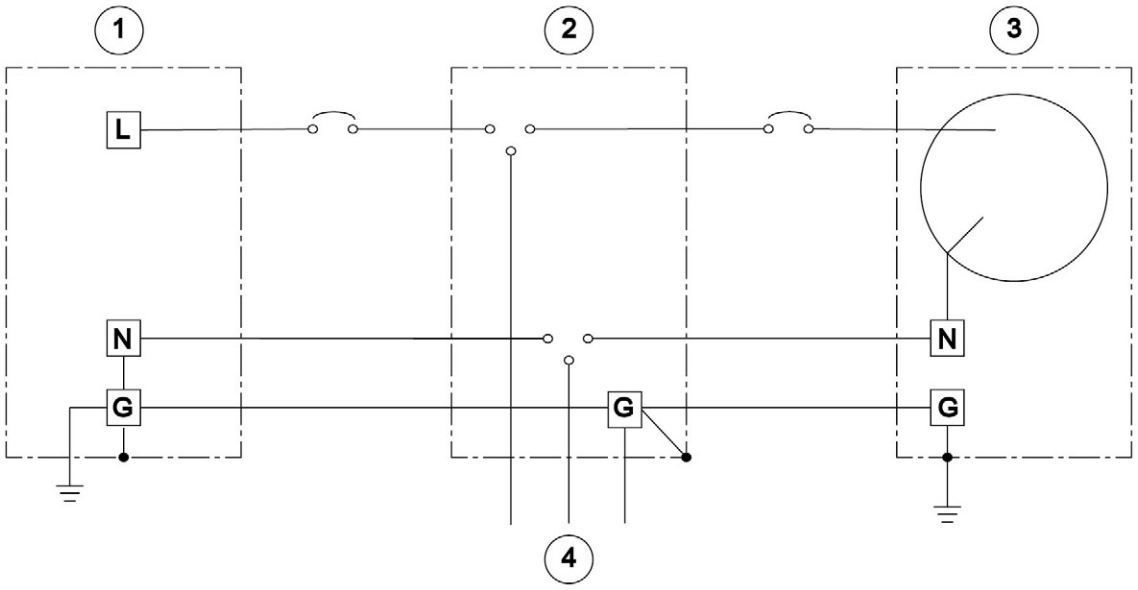
A UL-listed grounding electrode terminal within its ratings and suitable for the application must be installed and labeled "Grounding Electrode Terminal" for UL compliance.

Figure 189, Figure 190 and Figure 191 illustrate typical system grounding for a 2-pole, 3-pole, and 4-pole Automatic Transfer Switch (ATS). In the 2-pole and 3-pole ATS, note that the generator neutral is connected to the ATS and is NOT bonded to ground at the generator. In the 4-pole ATS system, a grounding electrode conductor and a bonding jumper are used to connect the generator neutral to ground.

Make sure the generator set is grounded to earth in one location only. On generator sets without a circuit breaker, ground to the point indicated on the top of the generator. On generator sets with circuit breakers, use the ground lug provided in the circuit breaker box.

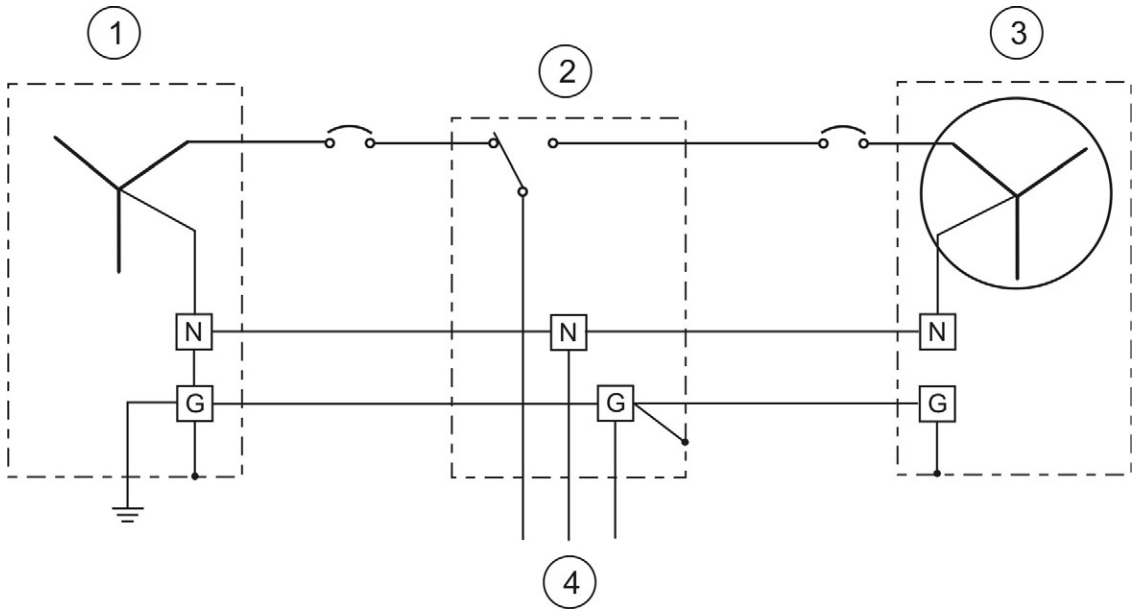
The grounding electrode terminal is not provided. Make sure UL listed terminals are used, are sized for the generator set ratings, and are suitable for the application.

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No.	Description	No.	Description
1	Service Entrance	3	Generator Set
2	2-Pole ATS	4	Load

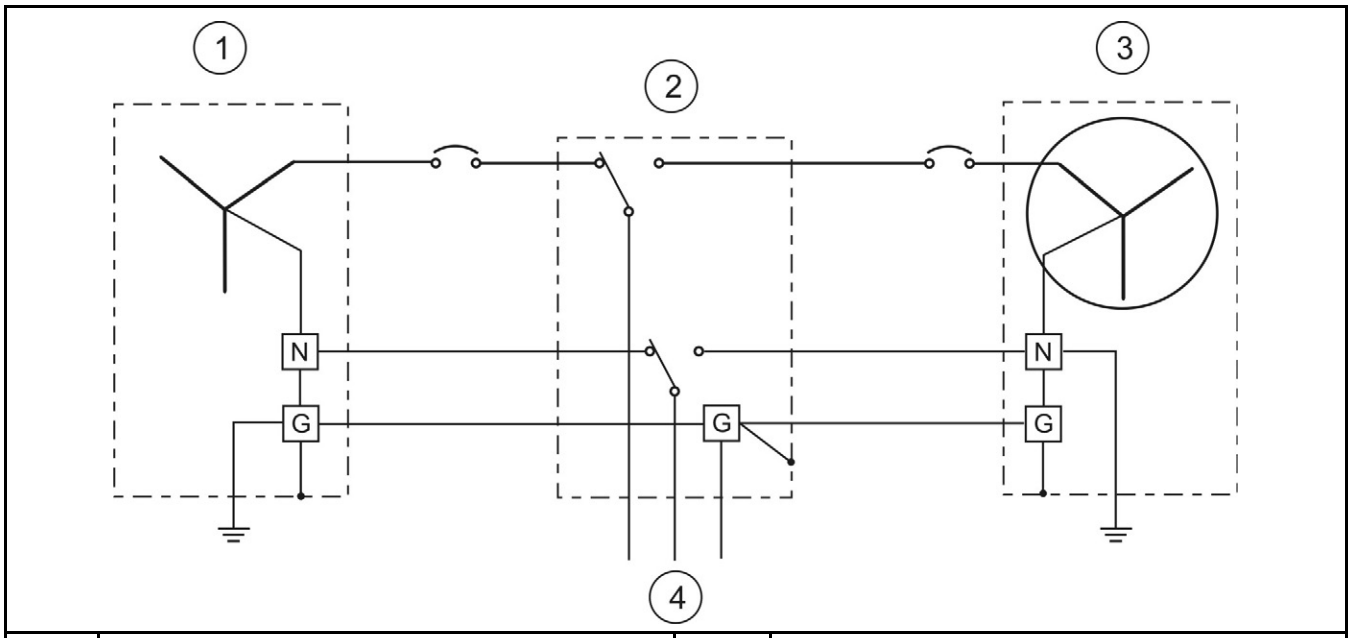
FIGURE 189. TYPICAL SYSTEM - ONE-PHASE, THREE WIRE UTILITY, TWO-POLE ATS



No.	Description	No.	Description
1	Service Entrance	3	Generator Set
2	3-Pole ATS	4	Load

FIGURE 190. TYPICAL SYSTEM - THREE-PHASE, FOUR WIRE UTILITY, THREE-POLE ATS

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No.	Description	No.	Description
1	Service Entrance	3	Generator Set
2	4-Pole ATS	4	Load

FIGURE 191. TYPICAL SYSTEM - THREE-PHASE, FOUR WIRE UTILITY, FOUR-POLE ATS

11 Pre-Start Preparation

⚠ WARNING

Electrical Generating Equipment

Incorrect operation and maintenance can result in severe personal injury or death.

Make sure that only suitably trained and experienced service personnel perform electrical and/or mechanical service.

Before an initial start of the generator set, complete the Installation Checklist, see **Chapter 12 on page 247**.

11.1 Electrical System

Verify all electrical connections are secure and all wiring is complete and inspected. Replace and secure any access panels that may have been removed during installation.

11.2 Battery Connections

⚠ WARNING

Automated Machinery

Accidental or remote starting of the generator set can cause severe personal injury or death.

Make sure that the generator set cannot be started accidentally or remotely before starting work on the generator.

⚠ WARNING

Combustible Gases

Ignition of battery gases is a fire and explosion hazard which can cause severe personal injury or death.

Do not smoke, or switch the trouble light ON or OFF near a battery. Touch a grounded metal surface first before touching batteries to discharge static electricity. Stop the generator set and disconnect the battery charger before disconnecting battery cables. Using an insulated wrench, disconnect the negative (–) cable first and reconnect it last.

Starting the unit requires one or more batteries. For more information on batteries, refer to the Model Specifications section. To prevent arcing, use an insulated wrench to connect the positive battery cable, then connect the negative battery cable.

If an automatic transfer switch is installed without a built-in charge circuit, connect a separate battery charger. Proper selection and maintenance of batteries and battery chargers is essential for system reliability.

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11.3 Site-Specific Configuration

NOTICE
Site-specific configuration is to be undertaken by suitably trained and qualified service personnel only.

The generator set is configured at the factory. Before starting the generator set, any site-specific configuration should be completed by qualified service personnel.

11.4 Starting

Refer to the generator set Operator manual for important safety precautions and recommended procedures for starting the generator set and verifying proper operation. Start the generator set and verify all engine and generator set menus are displaying the correct values.

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12 Installation Checklist

12.1 Checklist

Tick	General Items
	Generator set wattage capacity is sufficient to handle maximum anticipated load.
	At least 3 feet (914.4 mm) of clearance (or greater for housing door) is provided around the entire generator set for service and ventilation.
	The generator set is located in an area not subject to flooding.
	All operating personnel have read and are familiar with the generator set Operator manual, all health and safety procedures, warnings, cautions, precautions, and the other documentation supplied with the generator set.
	All operators have been thoroughly briefed on preventative maintenance procedures.
	All operators have read and understand all important safety instructions.
	Any parts requiring software have been checked for the latest version. Contact service representative for more information.
	Generator Set Support
	The floor, roof, or earth on which the generator set rests is strong enough and will not allow shifting or movement. Observe local codes on soil bearing capacity due to freezing and thawing.
	The generator set is properly supported and retained to an approved base
	The supporting base is large enough and is of non-combustible material, extending 6 inches (152.4 mm) all around the generator set.
	Cooling Air Flow
	Generator set air inlet is faced into direction of strongest, prevailing winds.
	Air inlet openings are unrestricted and are at least 1 to $1^{1}/_{2}$ times larger than air outlet area.
	Cooling air outlet is on downwind side of building (if not, wind barrier is constructed).
	Proper ducting material (sheet metal, canvas) is used between radiator and air outlet.
	Diesel Fuel System
	Fuel tanks meet or exceed all Local, State, or National codes (if applicable).
	Fuel lines are properly installed, supported, and protected against damage.
	The fuel filters have been installed.
	Approved flexible fuel line is installed between the main fuel supply and the generator set's fuel system near the generator set, to protect it against damage caused by vibration, expansion, and contraction.
	Strainer or fuel screen (100 to 200 mesh) is installed in the fuel supply line to protect the fuel lift pump, day tank transfer pump, or float valve seat from fuel tank debris (if applicable).
	The fuel filter assembly shipped with the generator set is installed and operational (if applicable).
	Fuel supply shutoff valves are installed to prevent fuel flow in case of leaks.
	No shutoff valves are installed on engine fuel return line (if applicable).

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	External fuel pumps are connected and operational at all times - generator set started or shut down (if applicable).
	A 10 micron filter is installed on the day tank vent.
	Fuel tanks are filled with the correct grade / type of fuel (if applicable).
	Fuel system is properly primed.
	No fuel leaks are found in supply line or engine fuel system.
	Exhaust System
	The breather tube routing is set up to blow the fumes away from the generator set (if applicable)
	Operators are thoroughly briefed on the dangers of carbon monoxide gas.
	If the installation includes a heavy duty air cleaner, it has been installed.
	Areas around generator set are well ventilated. No possibility of exhaust fumes entering building doors, windows, or intake fans.
	Exhaust gases are piped safely outside and away from building.
	The correct length of approved rigid pipe is connected to the generator set flexible pipe using approved securing methods with no weight resting on engine exhaust components. There are no bends in flex section.
	Condensation drain is provided in lowest section of exhaust piping.
	Exhaust piping is insulated to guard against burns to personnel.
	Exhaust piping passing through walls or ceilings have approved fire-proof materials and are in compliance with all codes.
	Exhaust piping is large enough in diameter to prevent excessive back pressure on engine.
	Verify that the pyrometer meters are functioning.
	AC and DC Wiring
	For bottom entry circuit breaker installations, the cable chute has been installed (if applicable).
	Wire sizes, insulation, conduits and connection methods all meet applicable codes.
	AC and DC wires are separated in their own conduit to prevent electrical induction.
	All load, line and generator connections are well made and correct.
	Flexible conduit is used between the generator and the building or surrounding structure.
	Check phase rotation.
	Generator Set Pre-Start
	Generator set engine is properly serviced with oil and coolant.
	Battery charger is installed using the appropriate cable size and is operational.
	Battery charger is configured for the proper DC battery voltage, battery type, and float voltage.
	Batteries are properly installed, serviced and charged.
	Battery temperature sensor is connected and operational (if applicable).
	All wiring to the customer terminal block is installed correctly.
	Engine coolant heater is connected and operational.
	All generator set covers and safety shields are installed correctly.

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	All fuel and coolant shutoff valves are operational.
	Radiator fan and other external moving parts including drive belts are unrestricted.

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13 Manufacturing Facilities

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Phone +1 954 431 551 Fax +1 954 433 5797	Phone +52 444 870 6700 Fax +52 444 824 0082	

13.1 How to Obtain Service

When a product requires servicing, contact the nearest Cummins service provider. To locate the distributor, go to **www.cummins.com/support** and select Find a Sales or Service Location. When contacting the service provider, always supply the complete model, specification, and serial number as shown on the nameplate.

13.1.1 Locating a Distributor

In the U.S. and Canada

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To easily locate the nearest certified distributor/dealer for Cummins generator sets in your area, or for more information, contact us at 1-800-CUMMINS™ (1-800-286-6467) or visit **www.cummins.com/support**.

If unable to contact a distributor using the automated service, consult the Internet.

If unable to arrange a service or resolve an issue, contact the Service Manager at the nearest Cummins distributor for assistance.

When contacting the distributor, always supply the complete Model, Specification, and Serial Number as shown on the product nameplate.

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Appendix A. Wiring Diagrams

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A.1 Schematic Diagram A041F331 with PowerCommand 3.3 Control

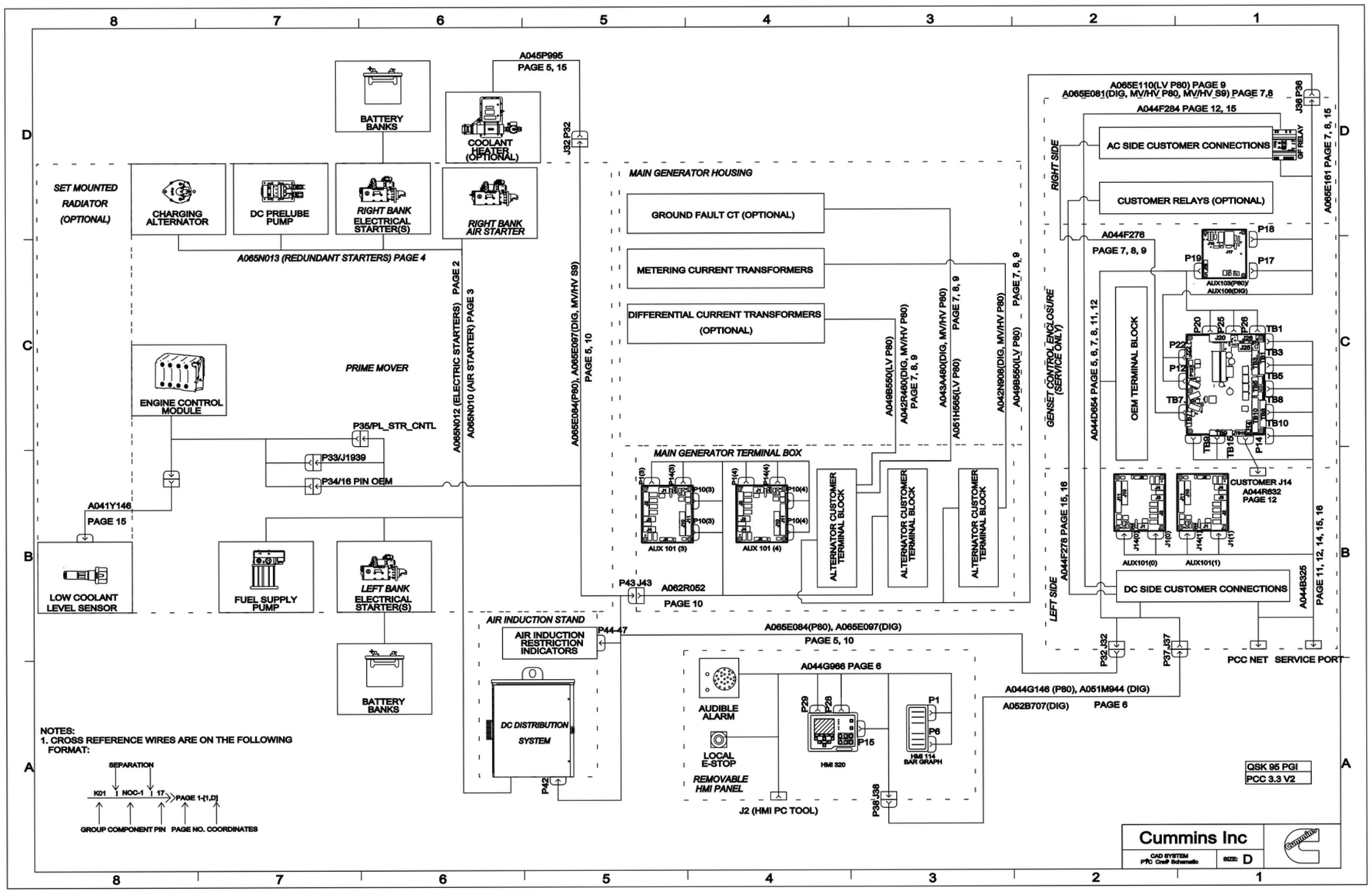


FIGURE 192. SCHEMATIC DIAGRAM (SHEET 1 OF 21)

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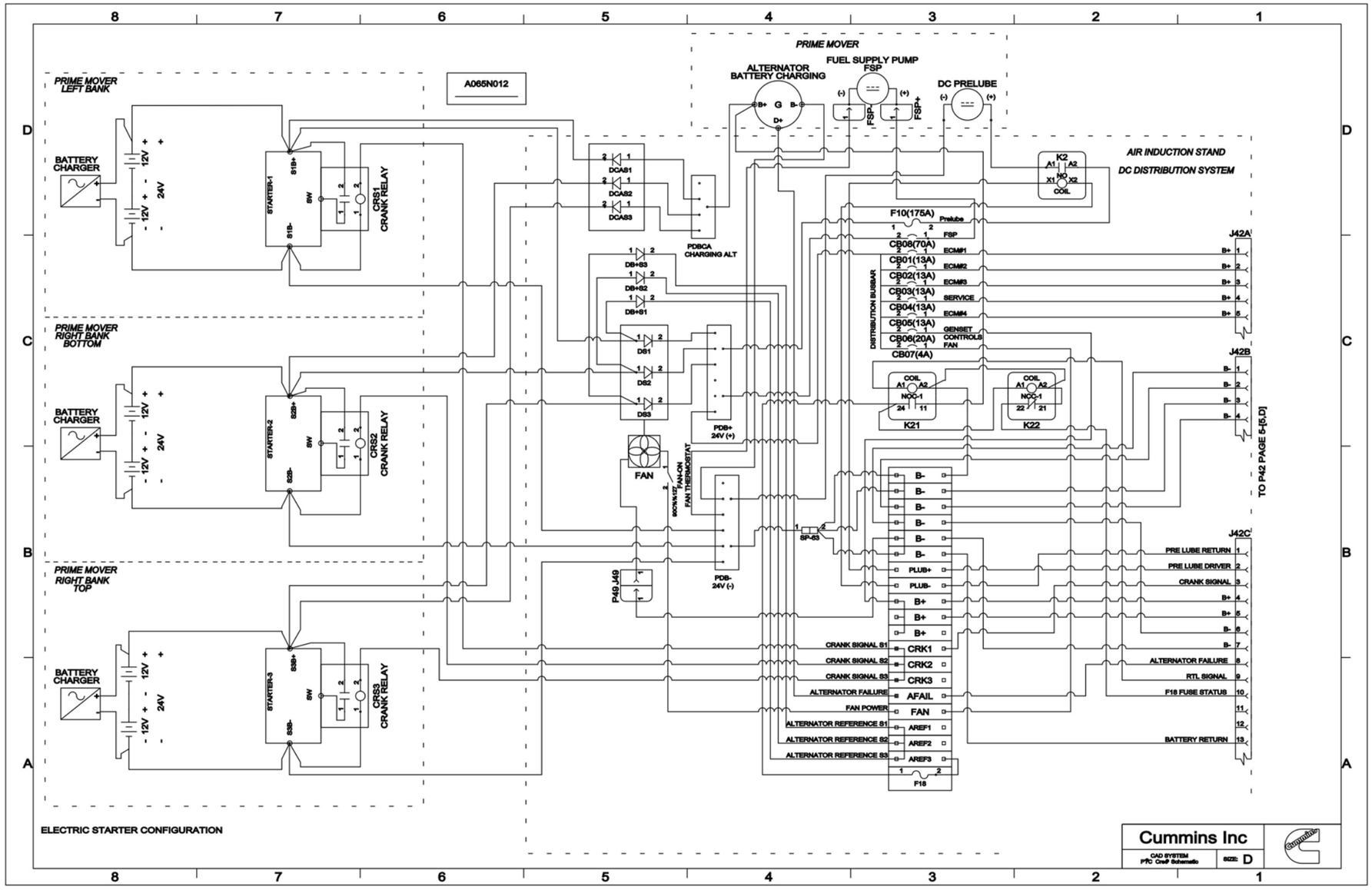


FIGURE 193. SCHEMATIC DIAGRAM (SHEET 2 OF 21)

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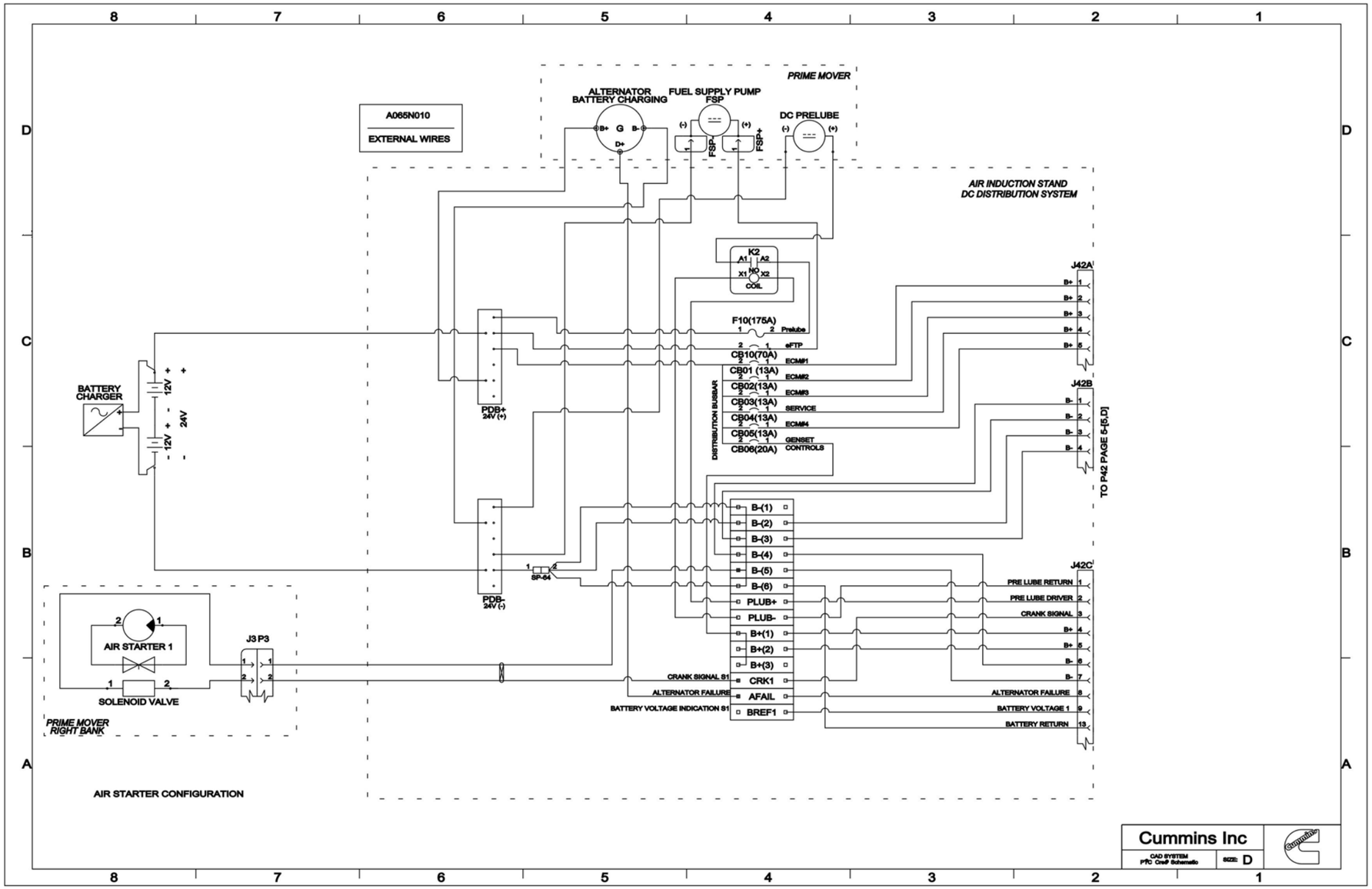


FIGURE 194. SCHEMATIC DIAGRAM (SHEET 3 OF 21)

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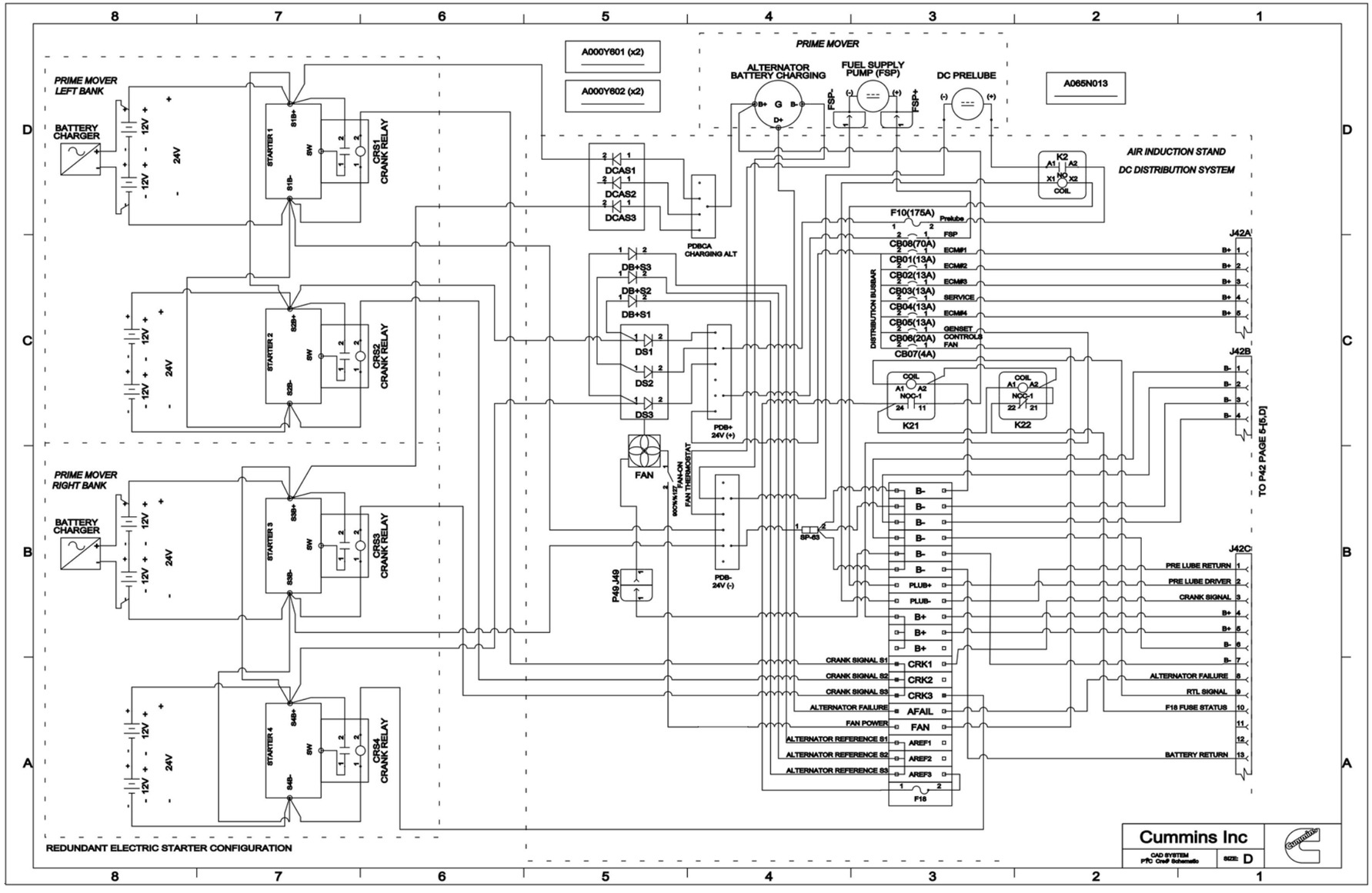


FIGURE 195. SCHEMATIC DIAGRAM (SHEET 4 OF 21)

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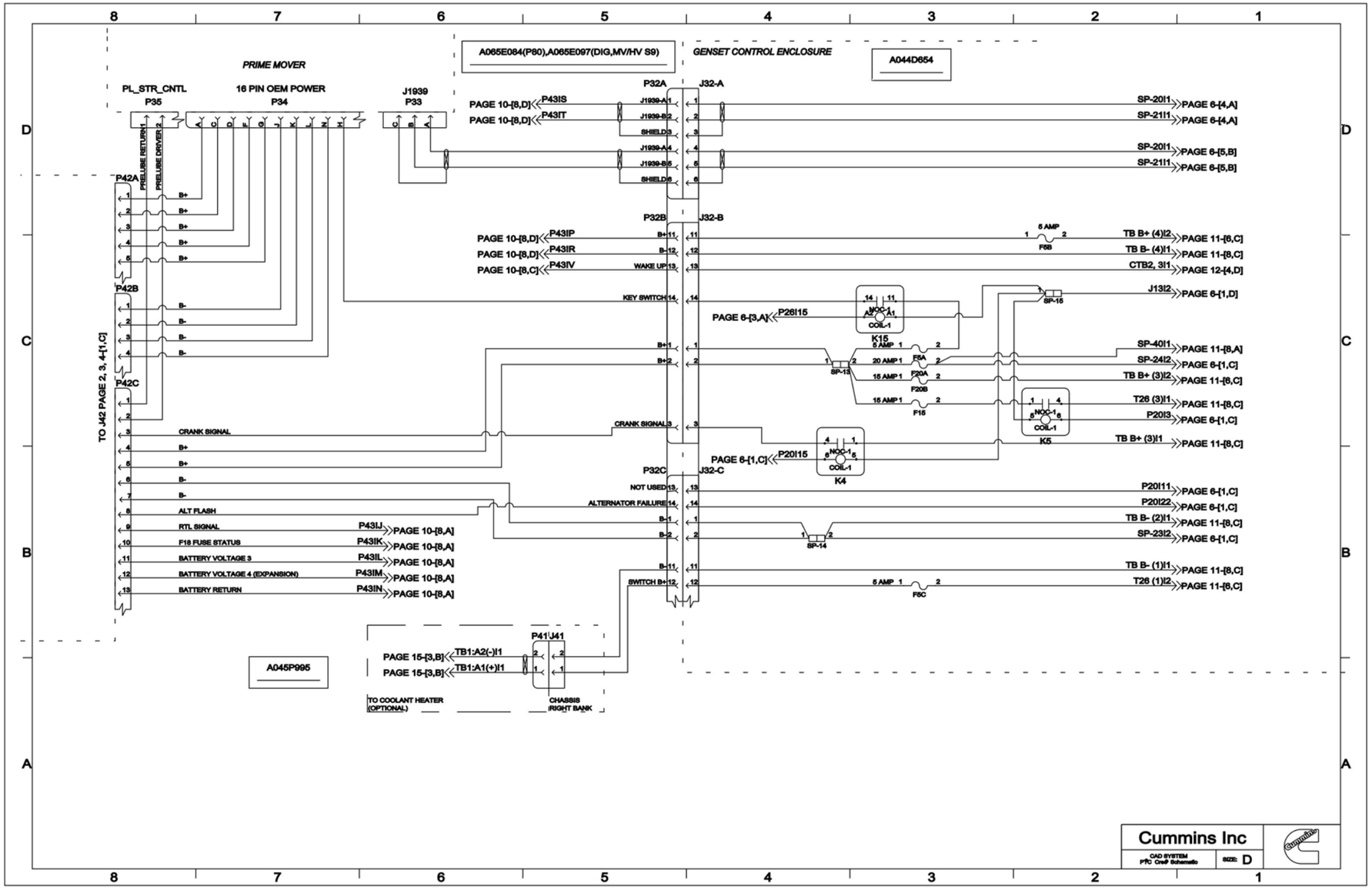


FIGURE 196. SCHEMATIC DIAGRAM (SHEET 5 OF 21)

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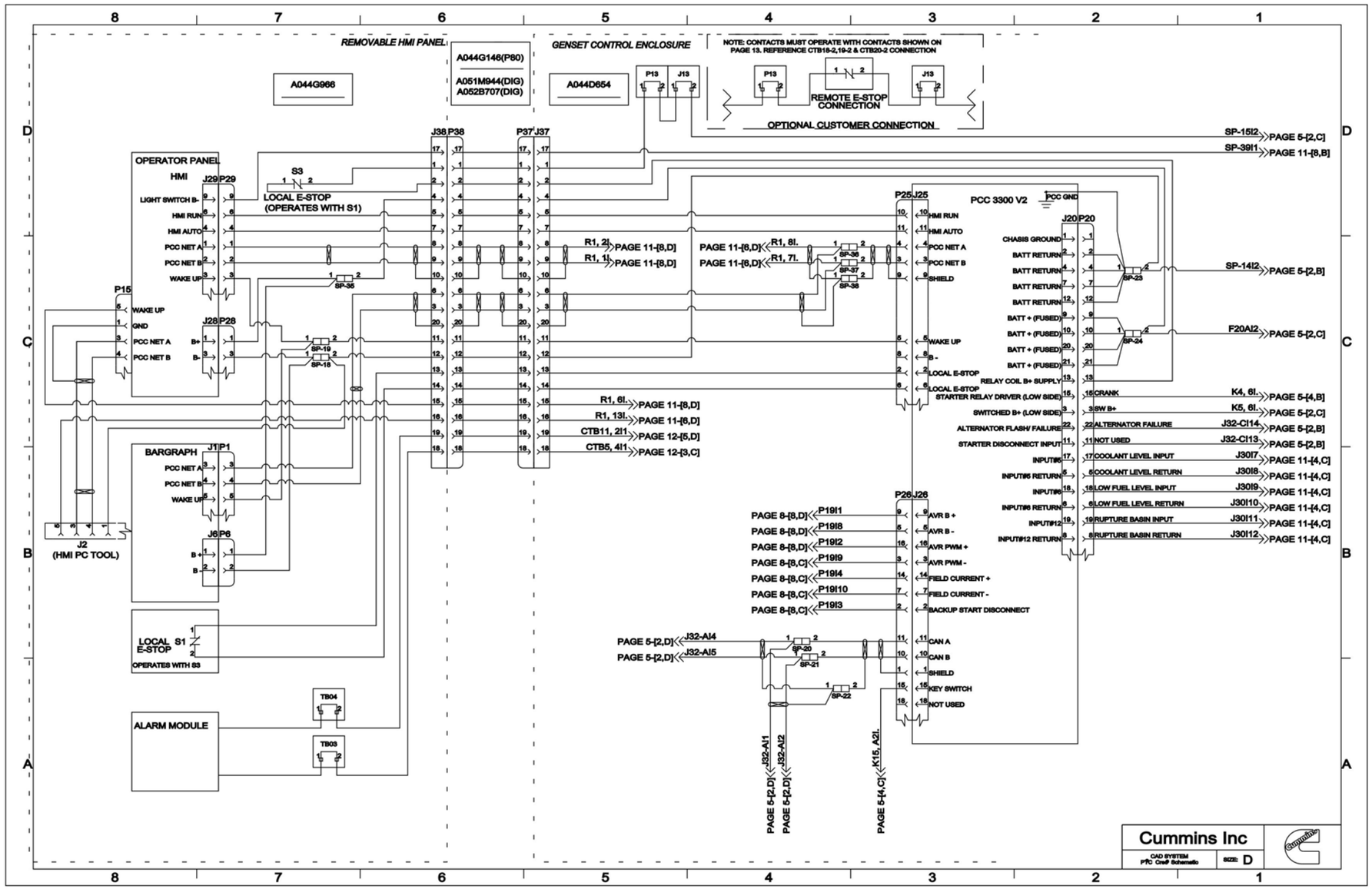


FIGURE 197. SCHEMATIC DIAGRAM (SHEET 6 OF 21)

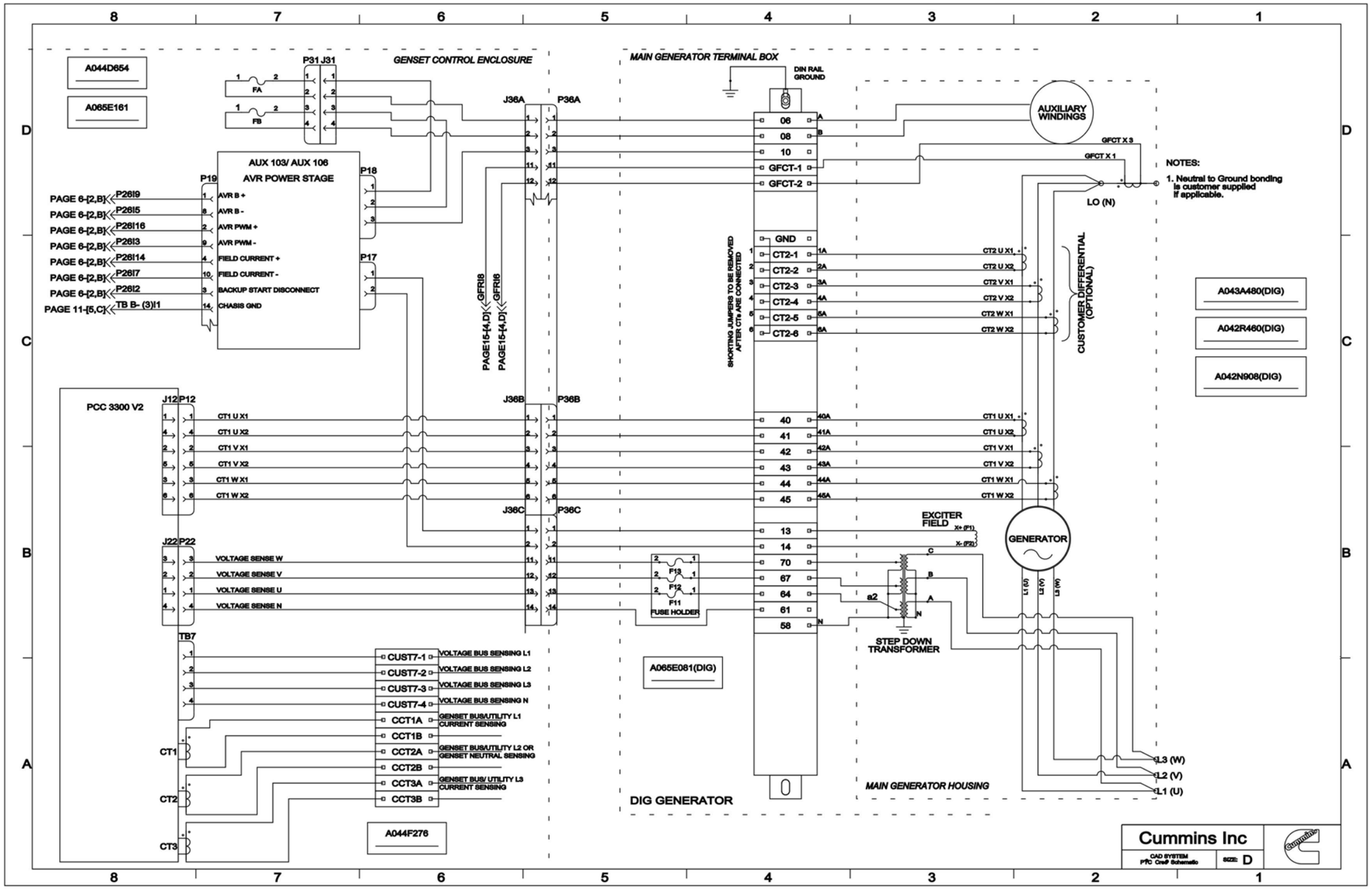


FIGURE 198. SCHEMATIC DIAGRAM (SHEET 7 OF 21)

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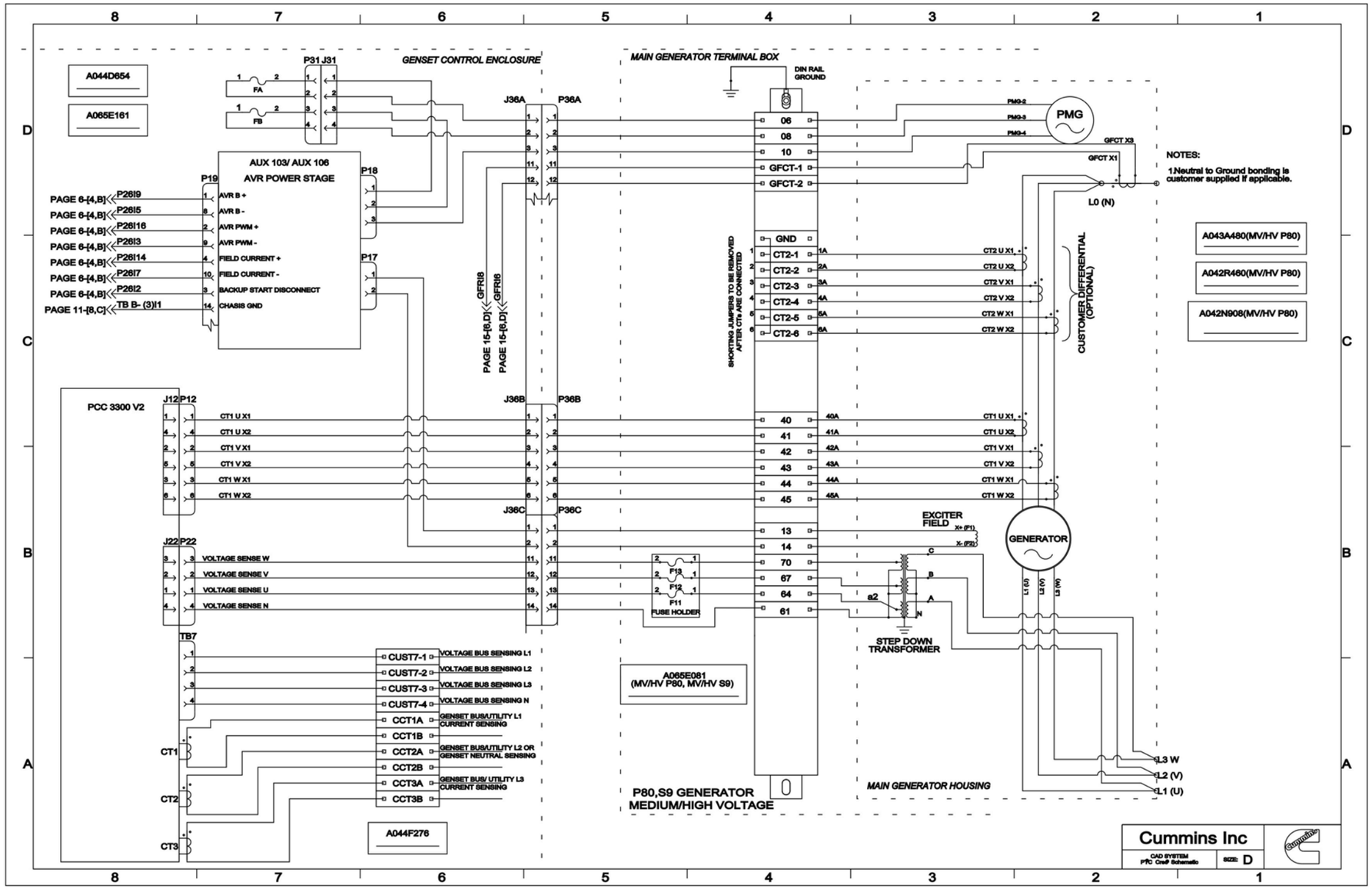


FIGURE 199. SCHEMATIC DIAGRAM (SHEET 8 OF 21)

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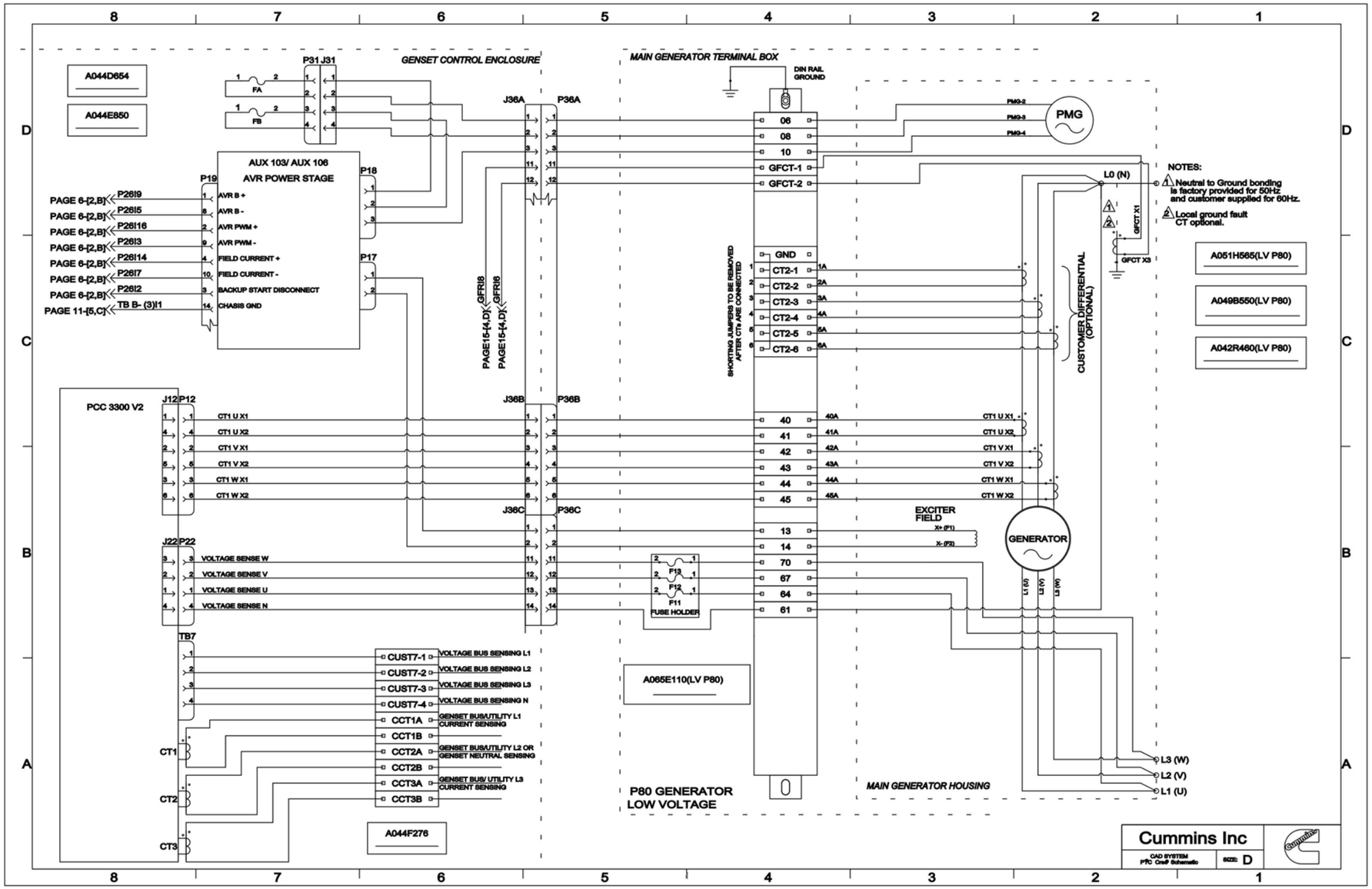


FIGURE 200. SCHEMATIC DIAGRAM (SHEET 9 OF 21)

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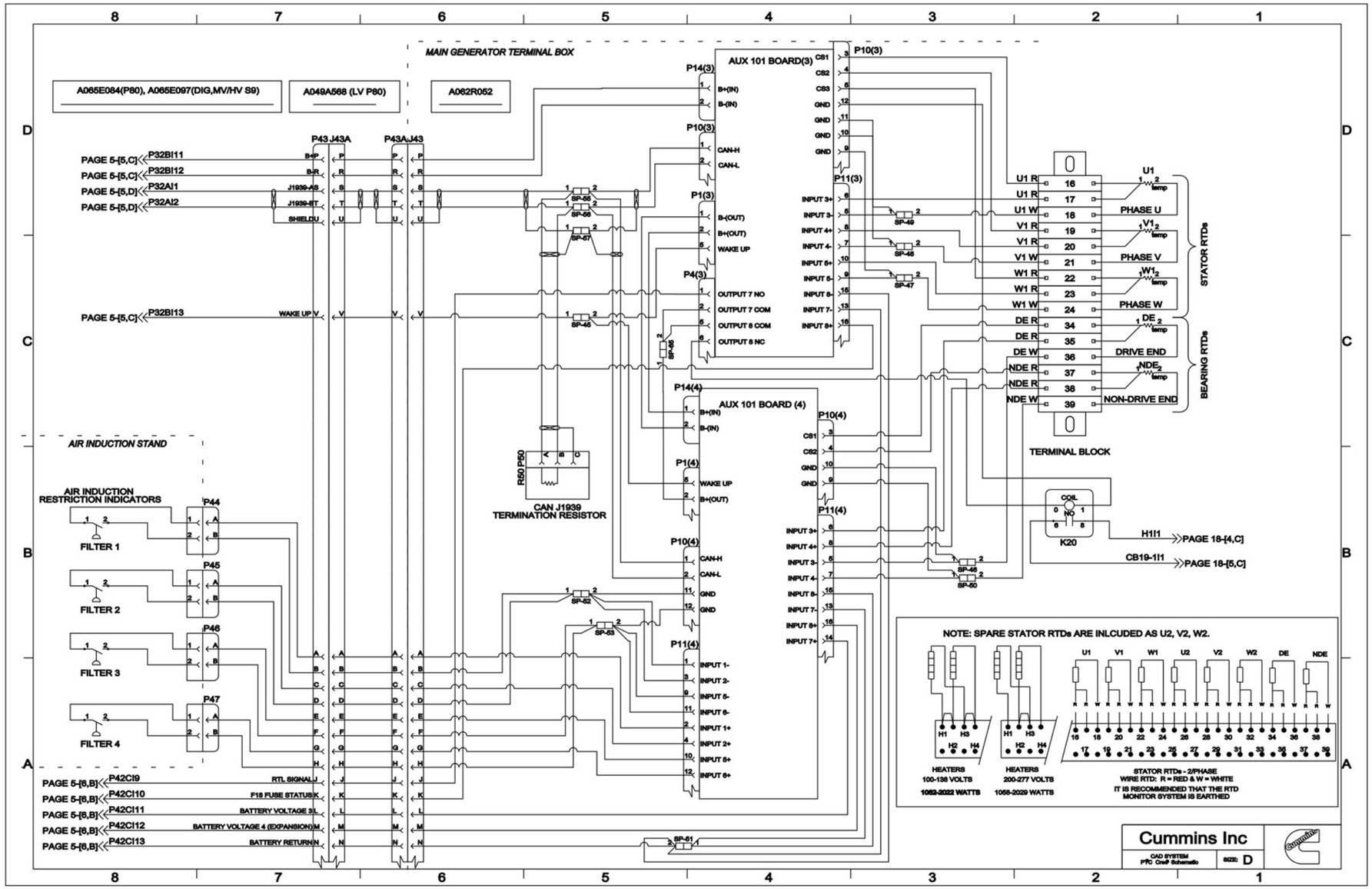


FIGURE 201. SCHEMATIC DIAGRAM (SHEET 10 OF 21)

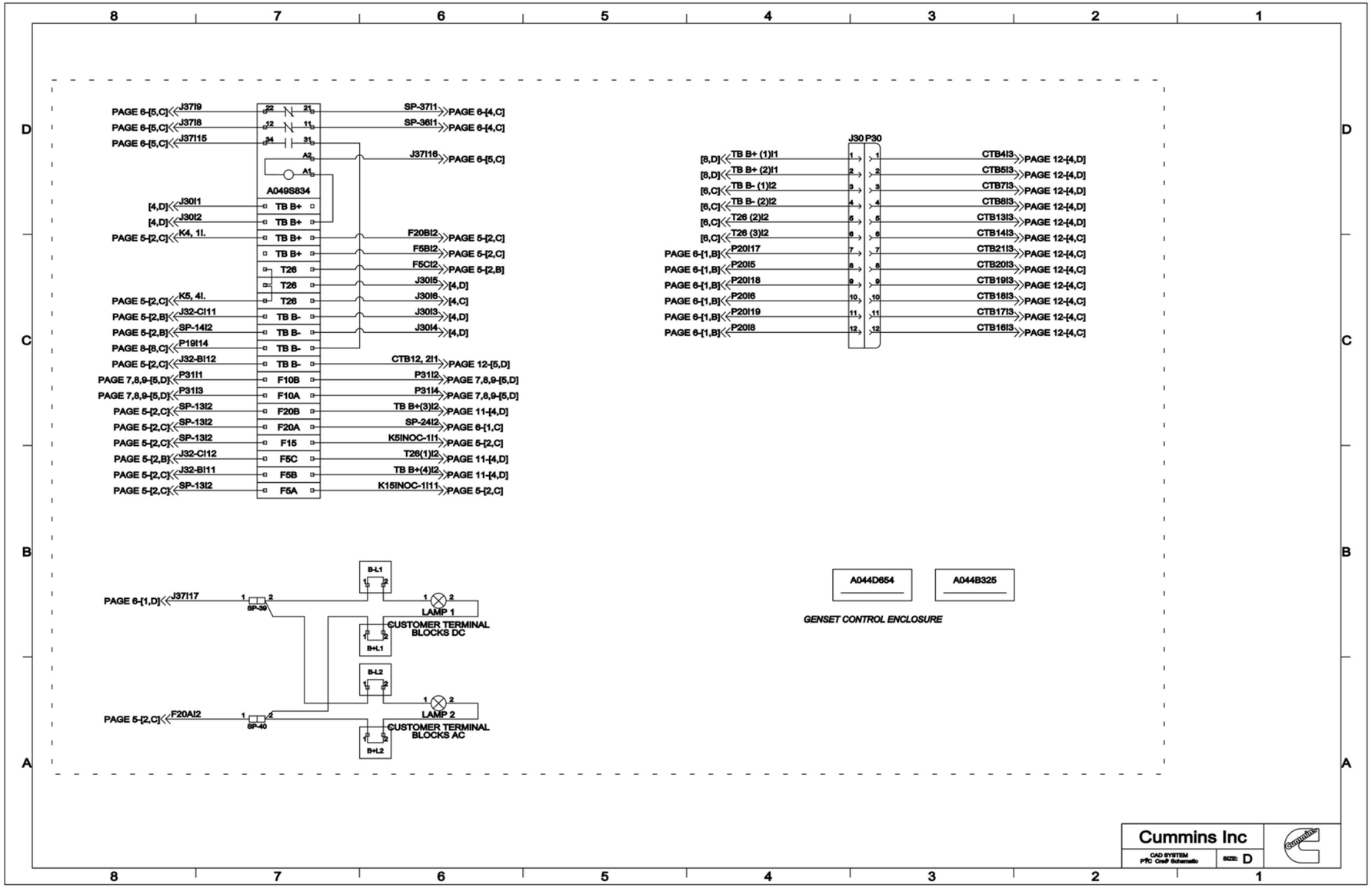


FIGURE 202. SCHEMATIC DIAGRAM (SHEET 11 OF 21)

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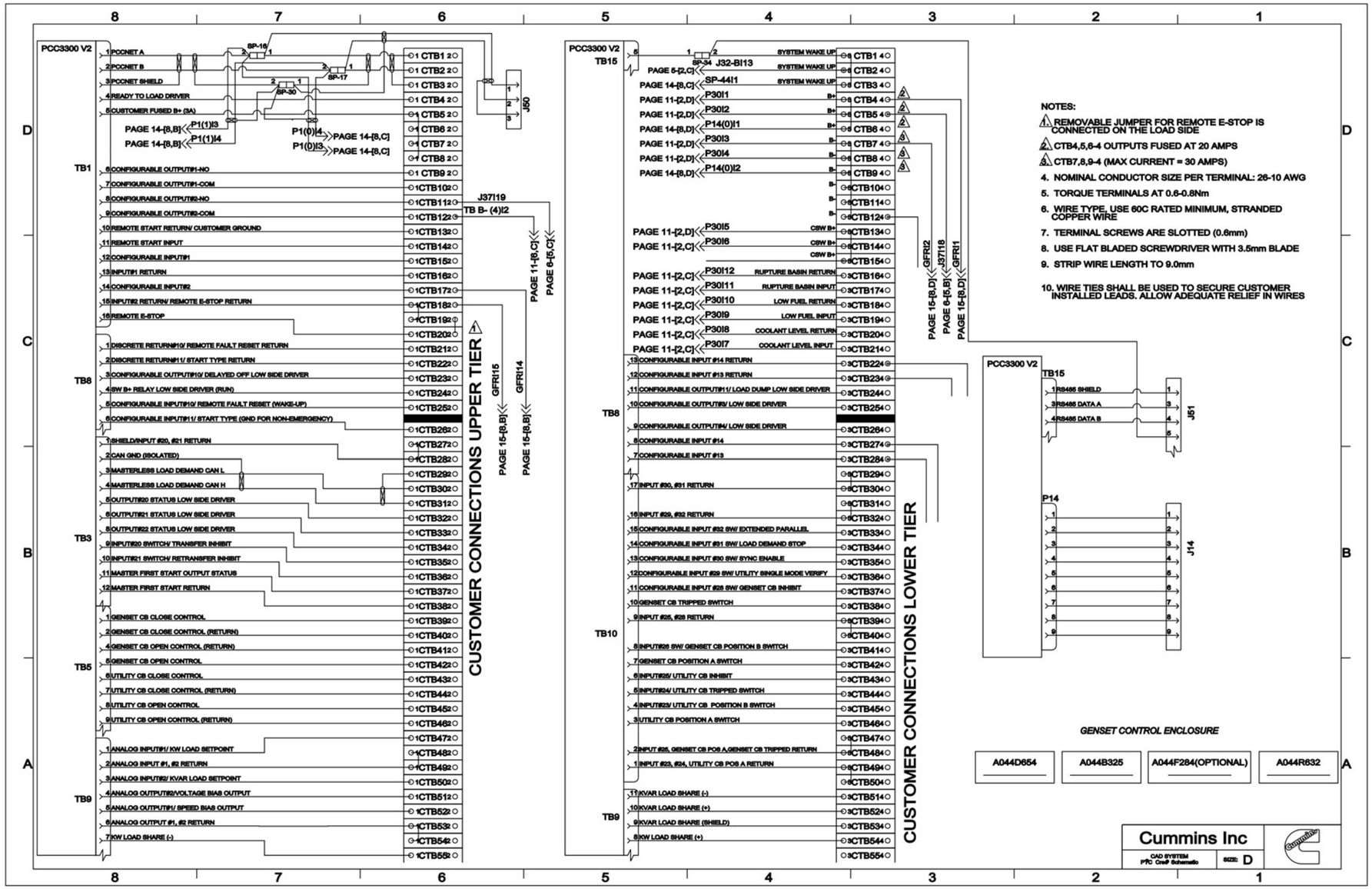


FIGURE 203. SCHEMATIC DIAGRAM (SHEET 12 OF 21)

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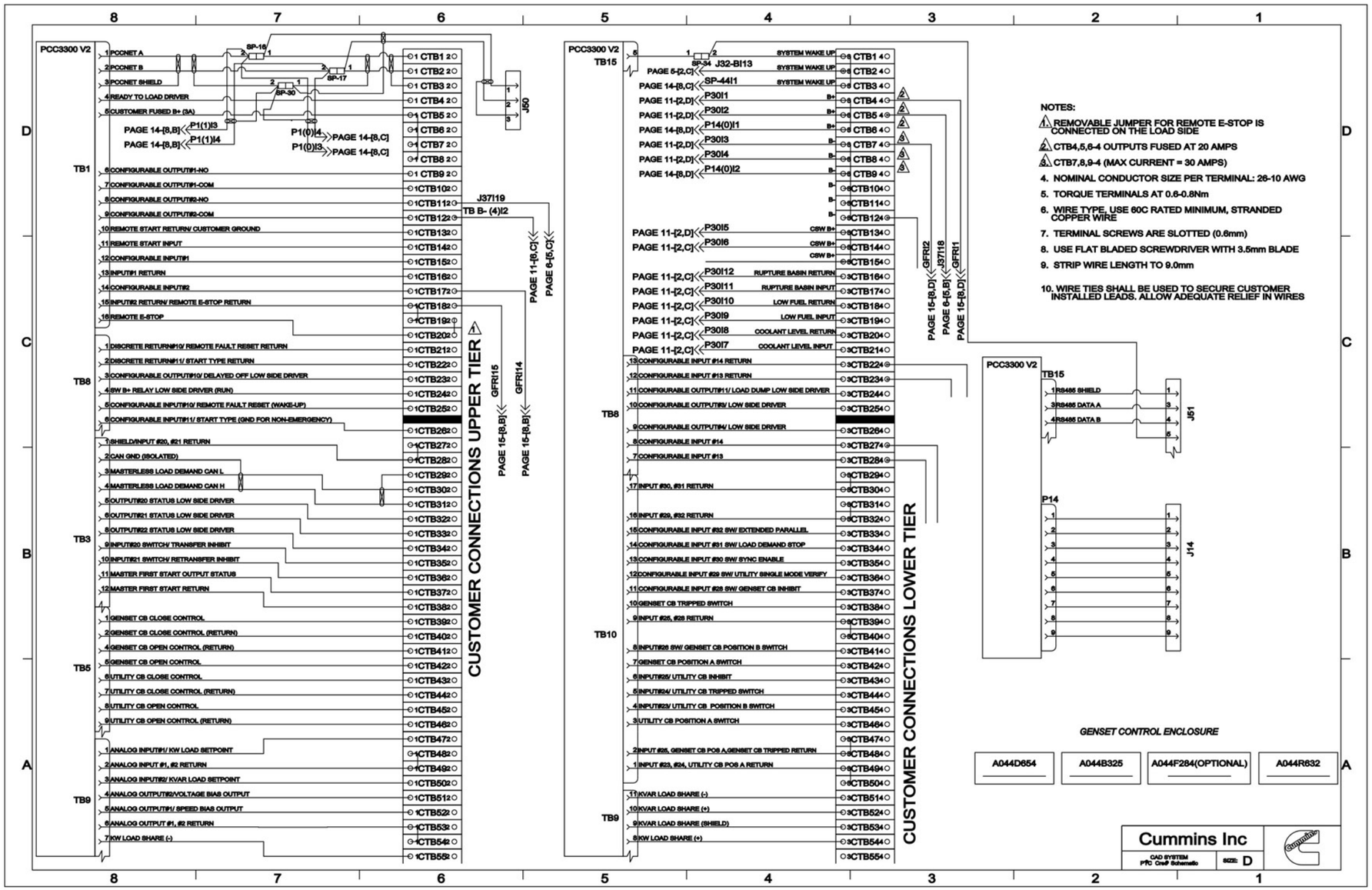


FIGURE 204. SCHEMATIC DIAGRAM (SHEET 13 OF 21)

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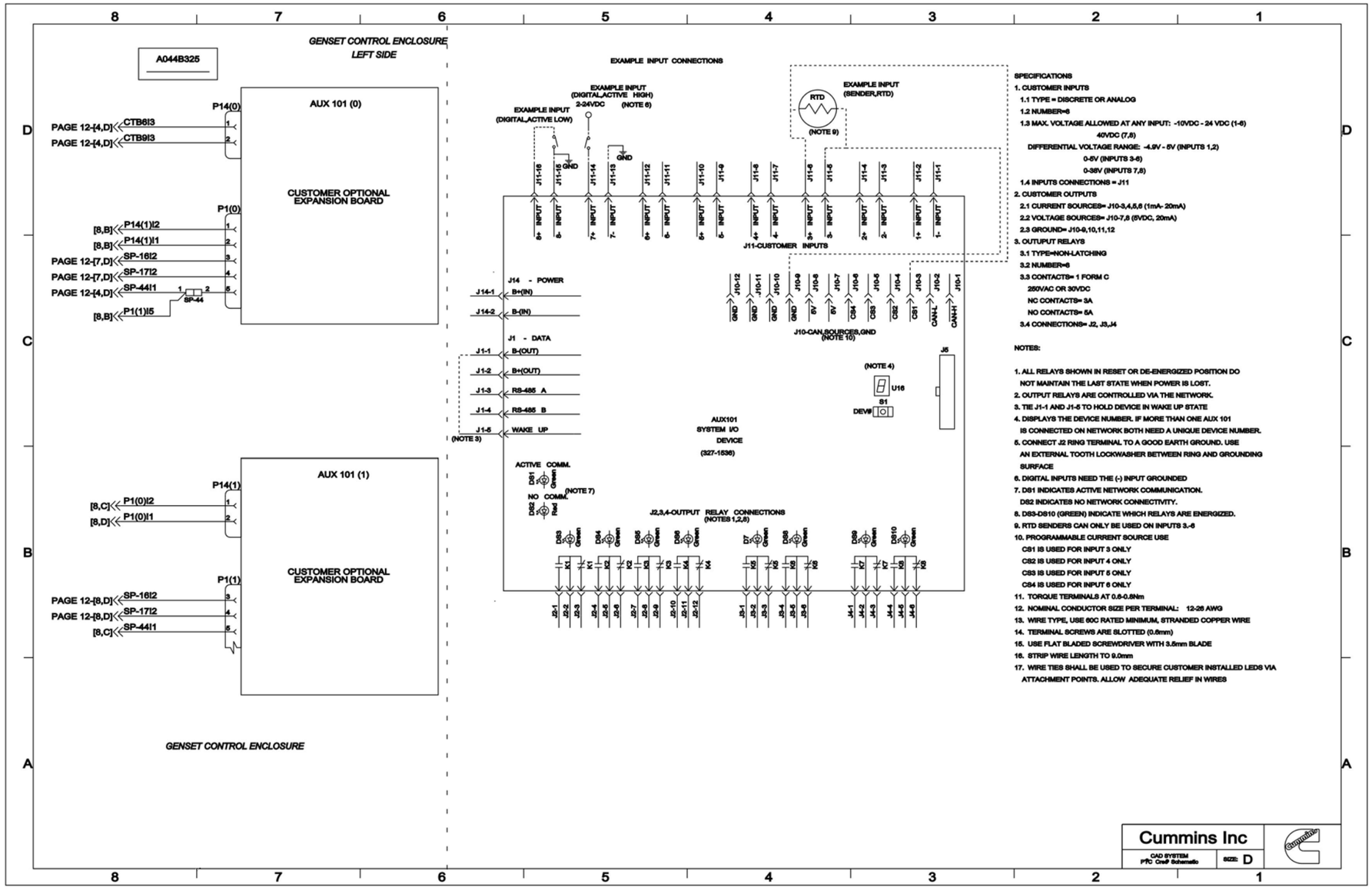


FIGURE 205. SCHEMATIC DIAGRAM (SHEET 14 OF 21)

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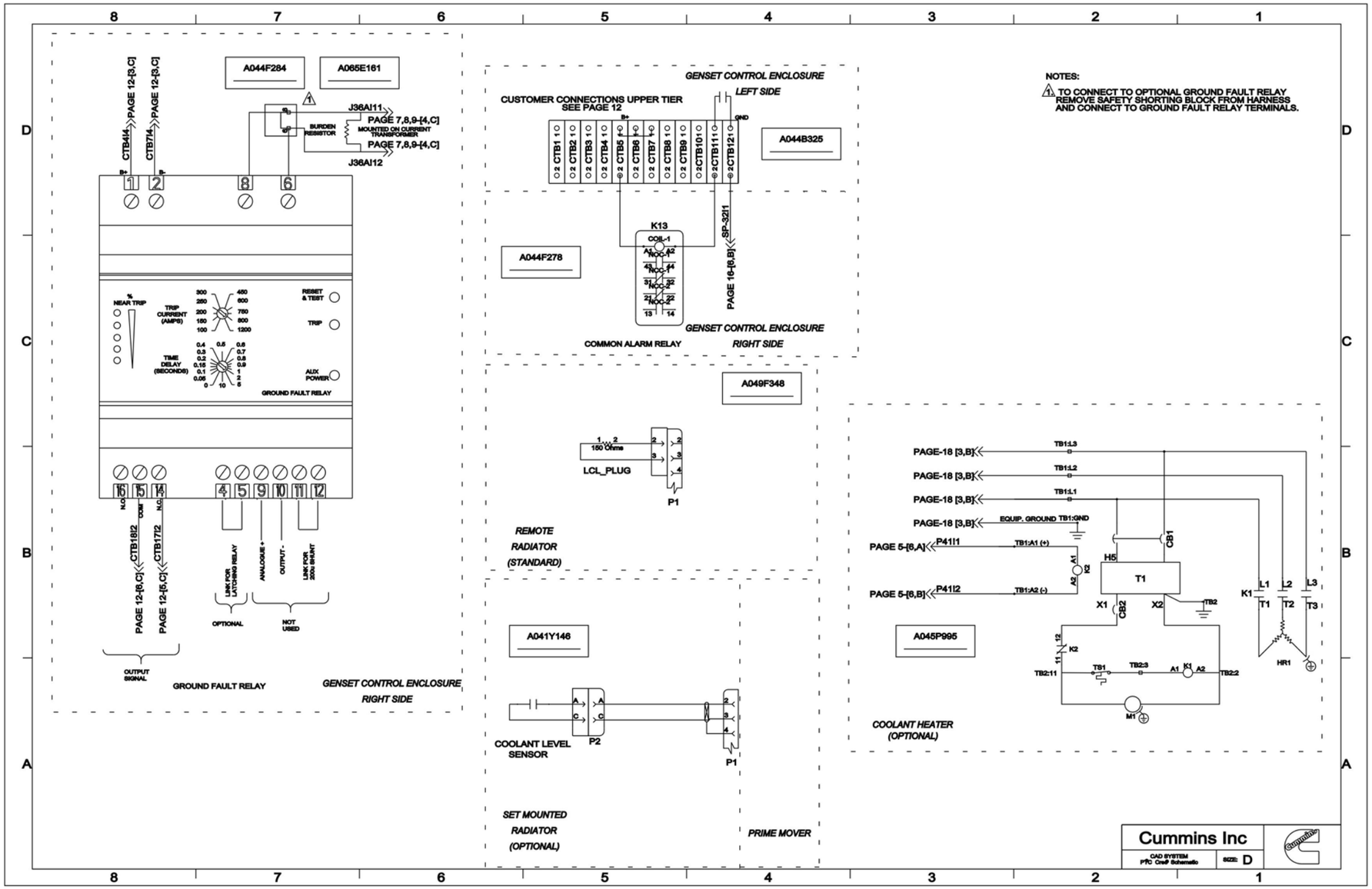


FIGURE 206. SCHEMATIC DIAGRAM (SHEET 15 OF 21)

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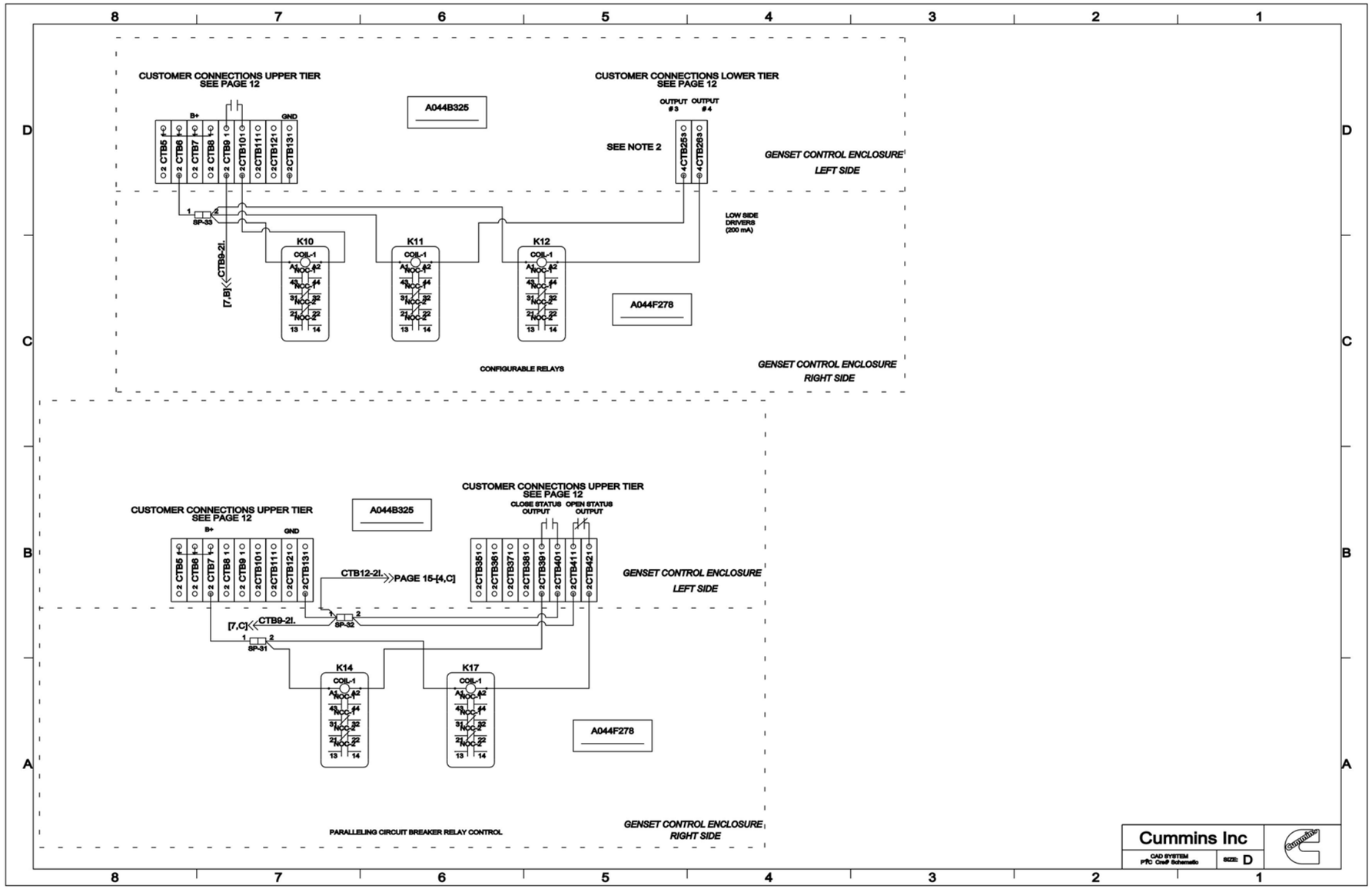


FIGURE 207. SCHEMATIC DIAGRAM (SHEET 16 OF 21)

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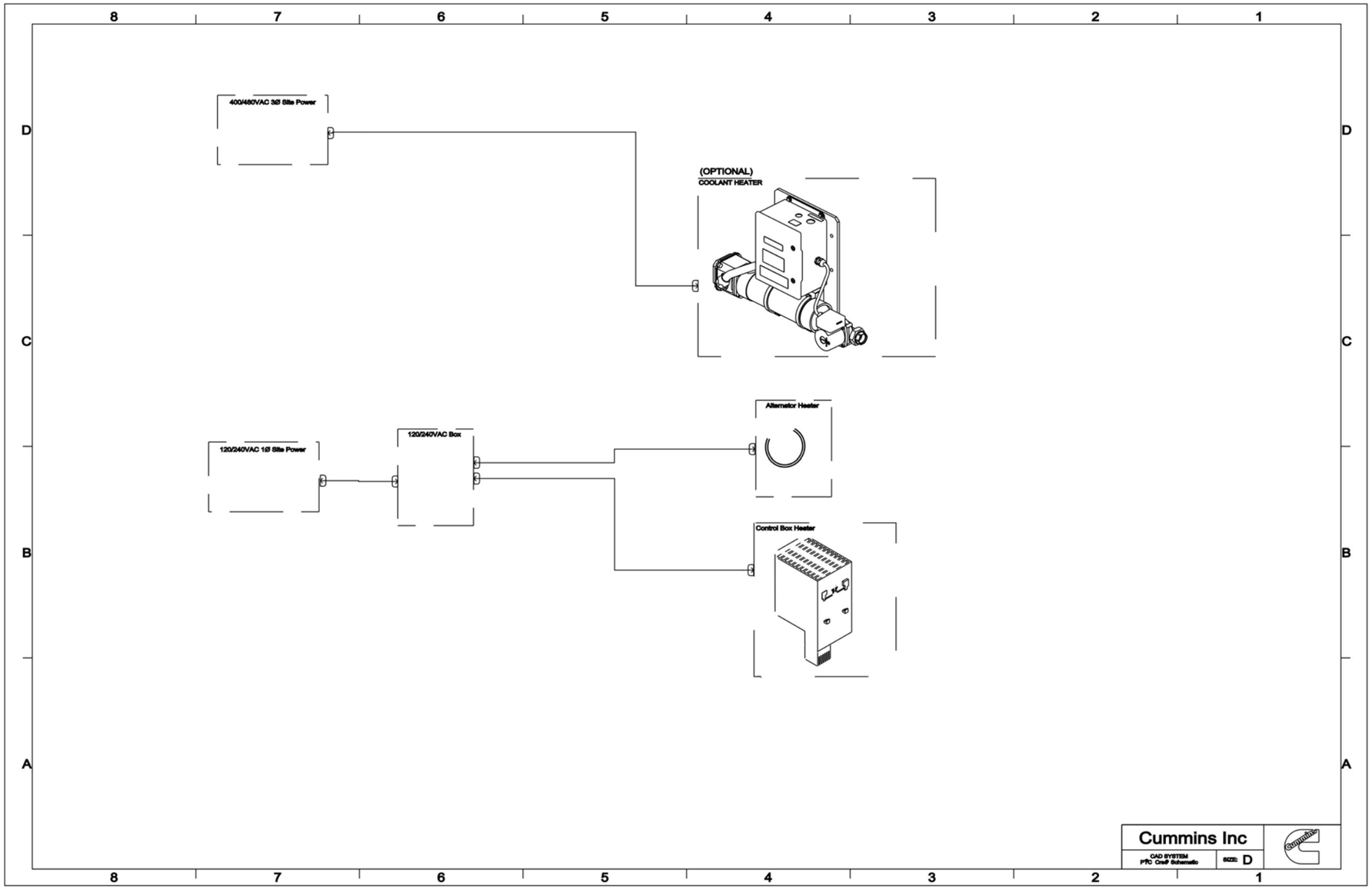


FIGURE 208. SCHEMATIC DIAGRAM (SHEET 17 OF 21)

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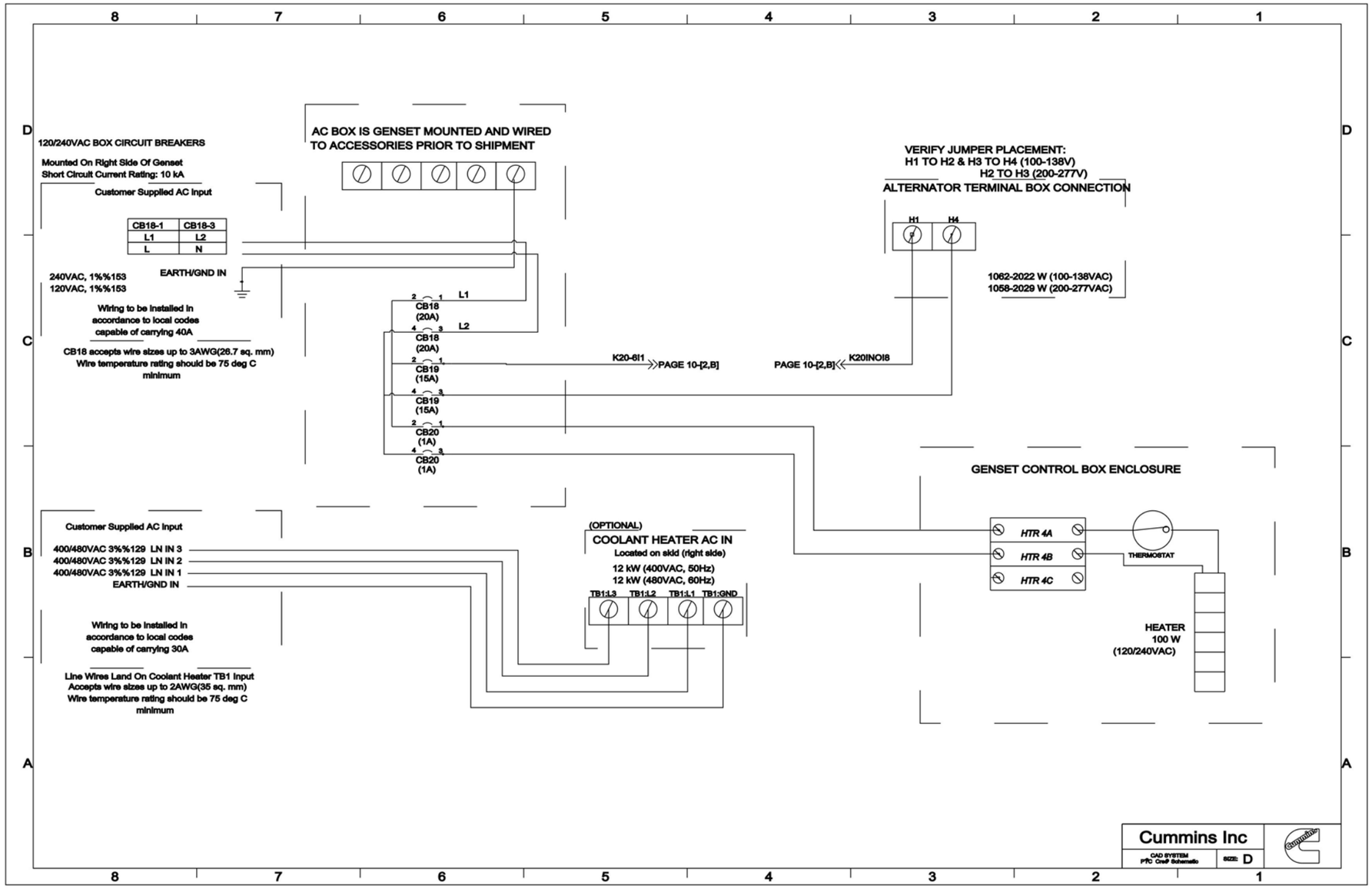


FIGURE 209. SCHEMATIC DIAGRAM (SHEET 18 OF 21)

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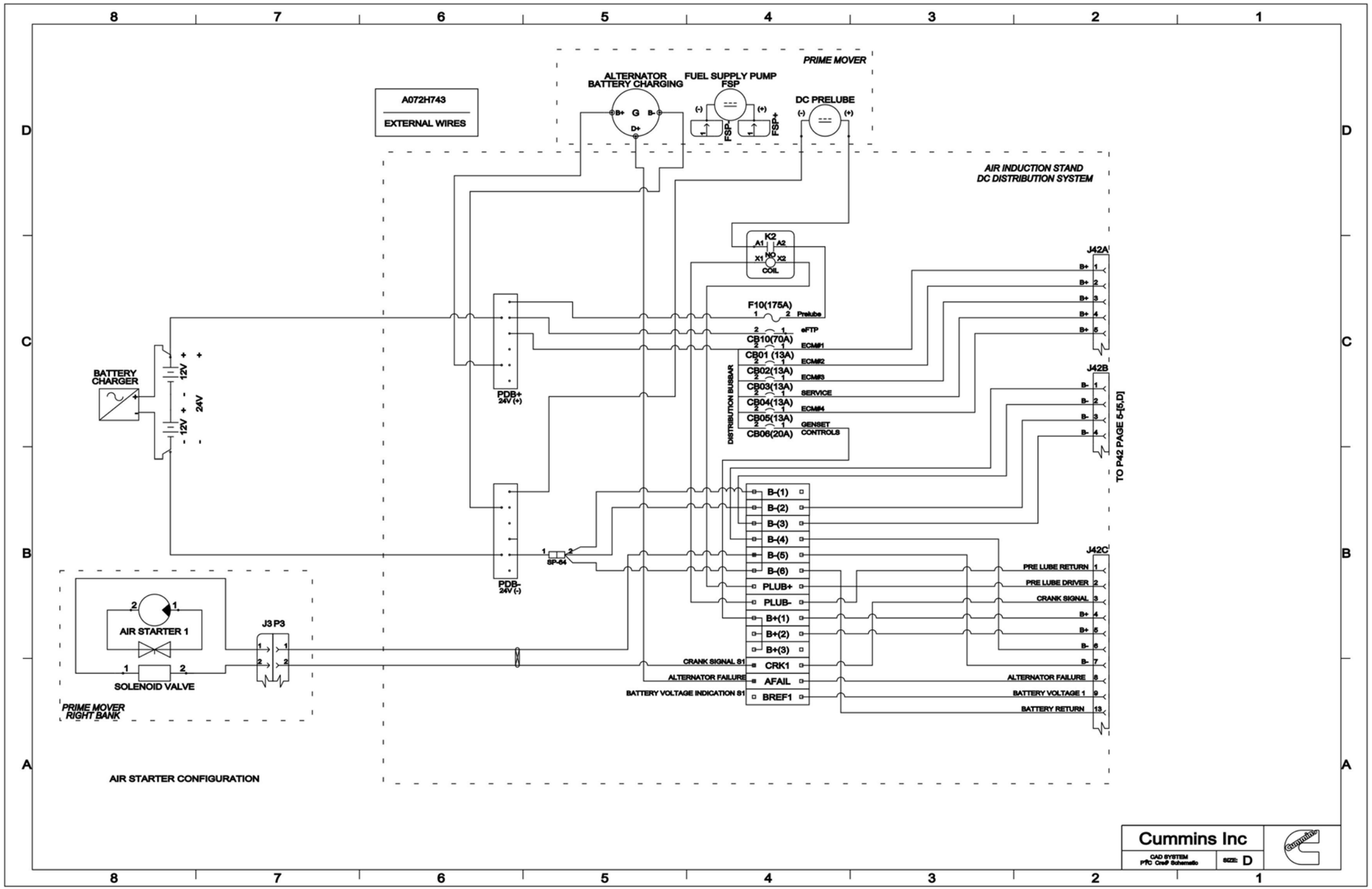


FIGURE 210. SCHEMATIC DIAGRAM (SHEET 19 OF 21)

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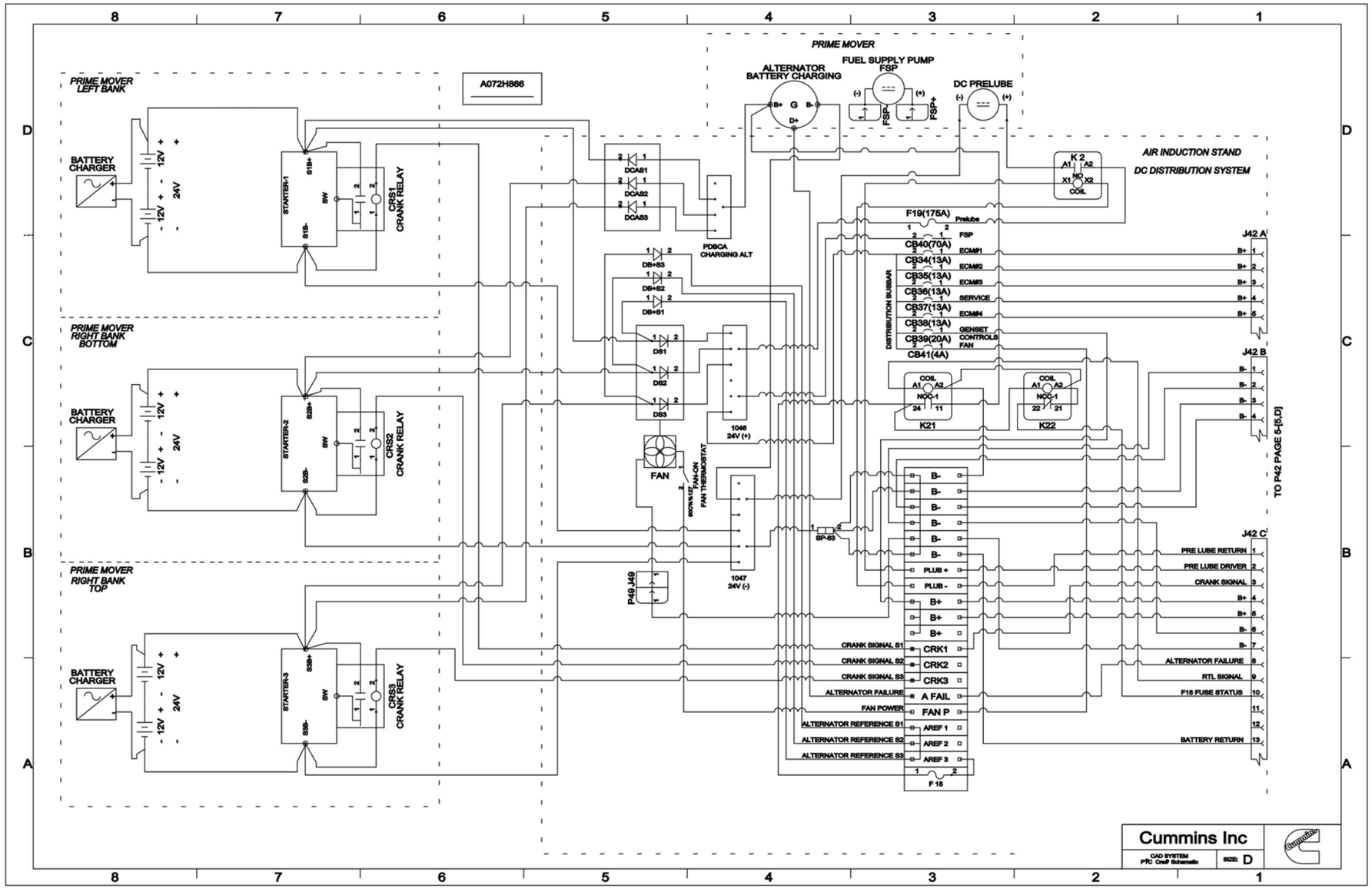


FIGURE 211. SCHEMATIC DIAGRAM (SHEET 20 OF 21)

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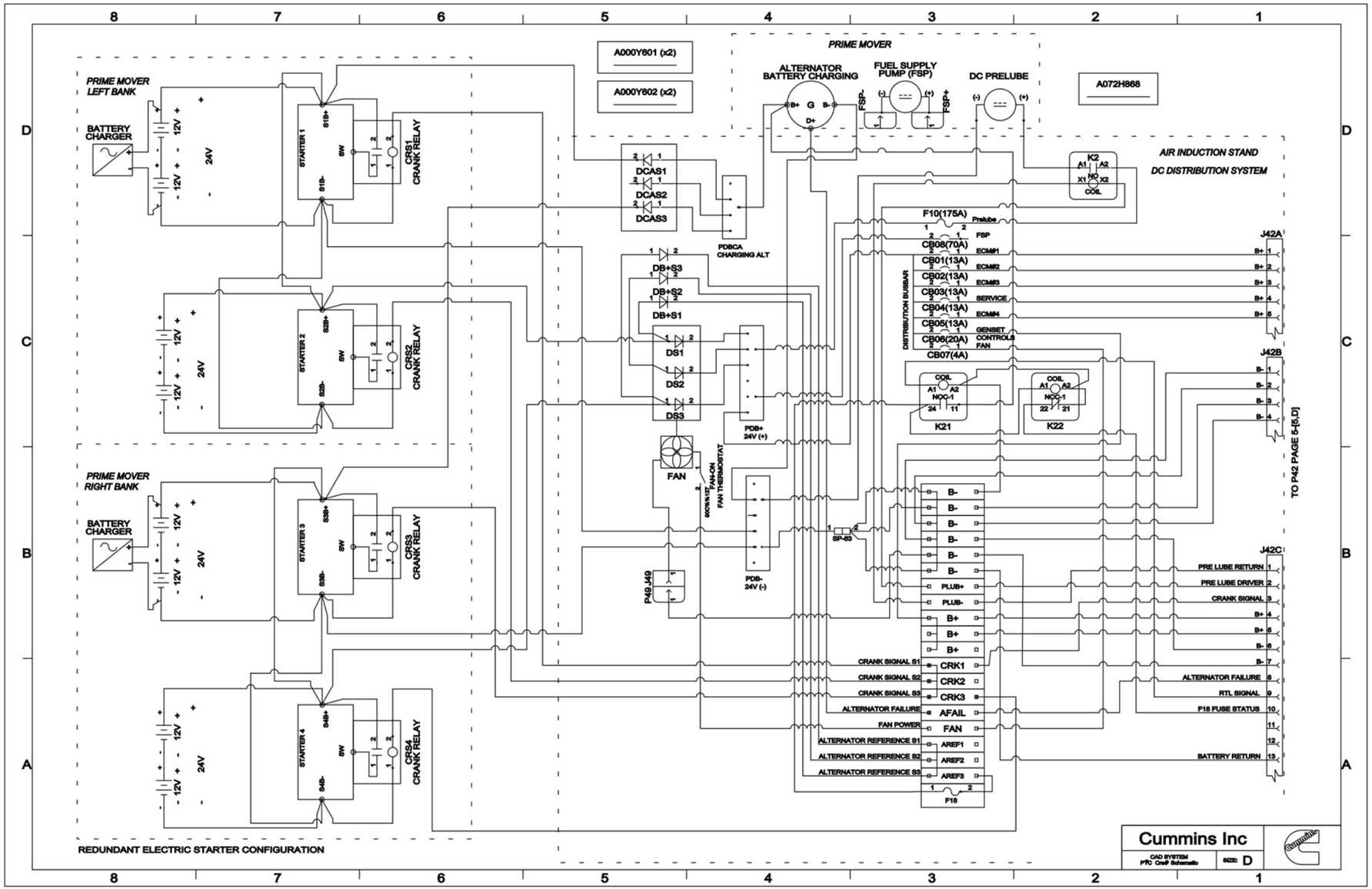


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B.1 Outline Drawing A067K080 – Normal Duty Air Cleaner with 94 Square Foot Radiator

ALTERNATOR	WINDING	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT WITH NO RADIATOR* Kg [LBS]	GENSET WEIGHT WITH RADIATOR* Kg [LBS]	C OF G WITH RADIATOR DIM A (SHEET 2) * mm [inch]	C OF G WITH RADIATOR DIM B (SHEET 2) * mm [inch]	C OF G WITHOUT RADIATOR DIM A* mm [inch]	C OF G WITHOUT RADIATOR DIM B* mm [inch]
S9HID-G42	851	7750 [17086]	24597 [54227]	30947 [68226]	1145 [45]	3777 [148]	1038 [40]	2875 [113]
S9HID-H42	991	8200 [18078]	25047 [55219]	31397 [69218]	1142 [44]	3729 [146]	1036 [40]	2831 [111]
S9HID-G42	991	7750 [17086]	24597 [54227]	30947 [68226]	1145 [45]	3777 [148]	1038 [40]	2875 [113]
S9HID-G42	961	7750 [17086]	24597 [54227]	30947 [68226]	1145 [45]	3777 [148]	1038 [40]	2875 [113]
S9HID-H42	961	8200 [18078]	25047 [55219]	31397 [69218]	1142 [44]	3729 [146]	1036 [40]	2831 [111]
S9HID-G42	983	7750 [17086]	24597 [54227]	30947 [68226]	1145 [45]	3777 [148]	1038 [40]	2875 [113]
S9HID-H42	983	8200 [18078]	25047 [55219]	31397 [69218]	1142 [44]	3729 [146]	1036 [40]	2831 [111]
S9HID-H42	851	8200 [18078]	25047 [55219]	31397 [69218]	1142 [44]	3729 [146]	1036 [40]	2831 [111]

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS WITH IMPERIAL INCH CONVERSIONS IN "[ ]".

   1.1 IN EVENT OF A DISCREPANCY BETWEEN METRIC AND IMPERIAL DIMENSIONS, THE METRIC DIMENSIONS CONTROL.

2. ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCED.

3. WEIGHT: REFER TO TABLE FOR STANDARD GENSET WITH E127-2 (ENHANCED HIGH AMBIENT) COOLING SYSTEM.

   *3.1 INCLUDES WEIGHT OF 606 LITERS [160 GALLONS] SUPPLIED ENGINE OIL.(530 Kg/1168 LBS)

   **3.2 INCLUDES DRY WEIGHT OF RADIATOR 5130 Kg [11310 LBS] (SHIPS LOOSE).

   **3.3 INCLUDES WEIGHT FOR 1196 LITERS [316 GALLONS] OF NON-SUPPLIED COOLANT. (1216 Kg/2780 LBS)

4. LARGEST NOMINAL DIMENSIONS:
   4.1 LENGTH 8307 [327.0]
   4.2 WIDTH 3172 [124.9] RADIATOR
   4.3 HEIGHT 3791 [149.2] TOP OF RADIATOR CAP
   4.4 DOES NOT INCLUDE THE HEIGHT OF THE VIBRATION ISOLATOR

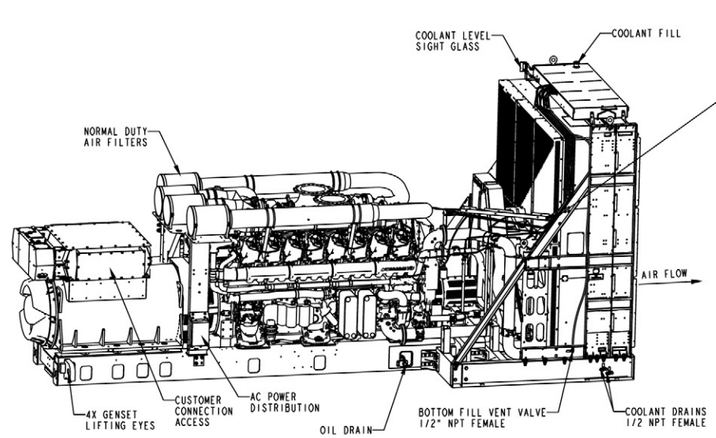
5 LIFTING INSTRUCTIONS: GENSET SHALL NOT BE LIFTED USING THE LIFTING EYES WHEN ATTACHED TO THE RADIATOR. RADIATOR AND GENSET SHALL ALWAYS BE LIFTED SEPARATELY PER INSTALLATION MANUAL AND LIFTING DIAGRAMS.

5.1 NOTE: GENSET SHALL NOT BE LIFTED USING THE LIFTING EYES WHEN ATTACHED TO THE RADIATOR. THEY ARE TO BE LIFTED SEPARATELY PER INSTALLATION MANUAL AND LIFTING DIAGRAMS

6. ALLOW 1 METER OF SPACE AROUND THE GENSET FOR SERVICE.

7 ISOLATORS ARE MODELED IN THEIR UNCOMPRESSED STATE AND THEIR HEIGHT CHANGE UNDER LOAD MUST BE CONSIDERED FOR SITE CONNECTIONS. WHEN PROPERLY INSTALLED, STANDARD GENESET ISOLATORS WILL DEFLECT APPROXIMATELY 13 mm FROM THEIR UNCOMPRESSED HEIGHT. RESTRAINED ISOLATORS WILL INCREASE IN HEIGHT BY APPROXIMATELY 5 mm. CUSTOMER EXHAUST AND SITE CONNECTIONS SHALL BE CAPABLE OF ACCOMMODATING THIS RANGE.

8. SEE NOTES ON SHEET 8 AND 10.



STANDARD GENSET CONFIGURATION
WITH S9HID-G42 ALTERNATOR AND E127-2
(ENHANCED HIGH AMBIENT) COOLING SYSTEM SHOWN

LAST DATUM LETTER USED: - | LAST REFERENCE LETTER USED: W
MODEL/PLATFORM: C325D6 | THIS PART IS SIMILAR TO: A049H712
Cummins Inc.
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES | SIZE: A1 | SCALE:0.04
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009 | THIRD ANGLE PROJECTION | CAD SYSTEM PTC® Creo® Parametric

FIGURE 213. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 94 SQUARE FOOT RADIATOR (SHEET 1 OF 10)

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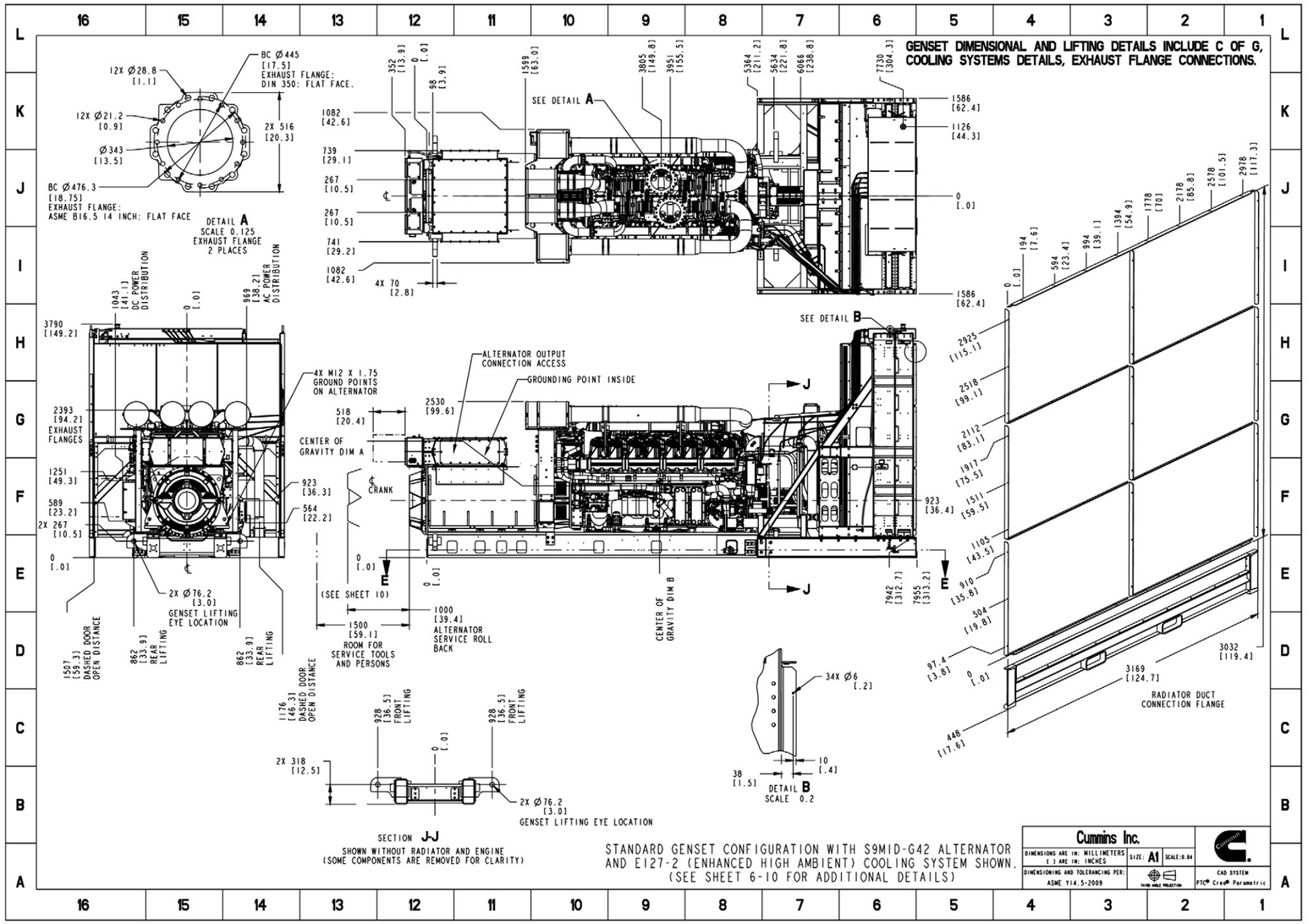


FIGURE 214. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 94 SQUARE FOOT RADIATOR (SHEET 2 OF 10)

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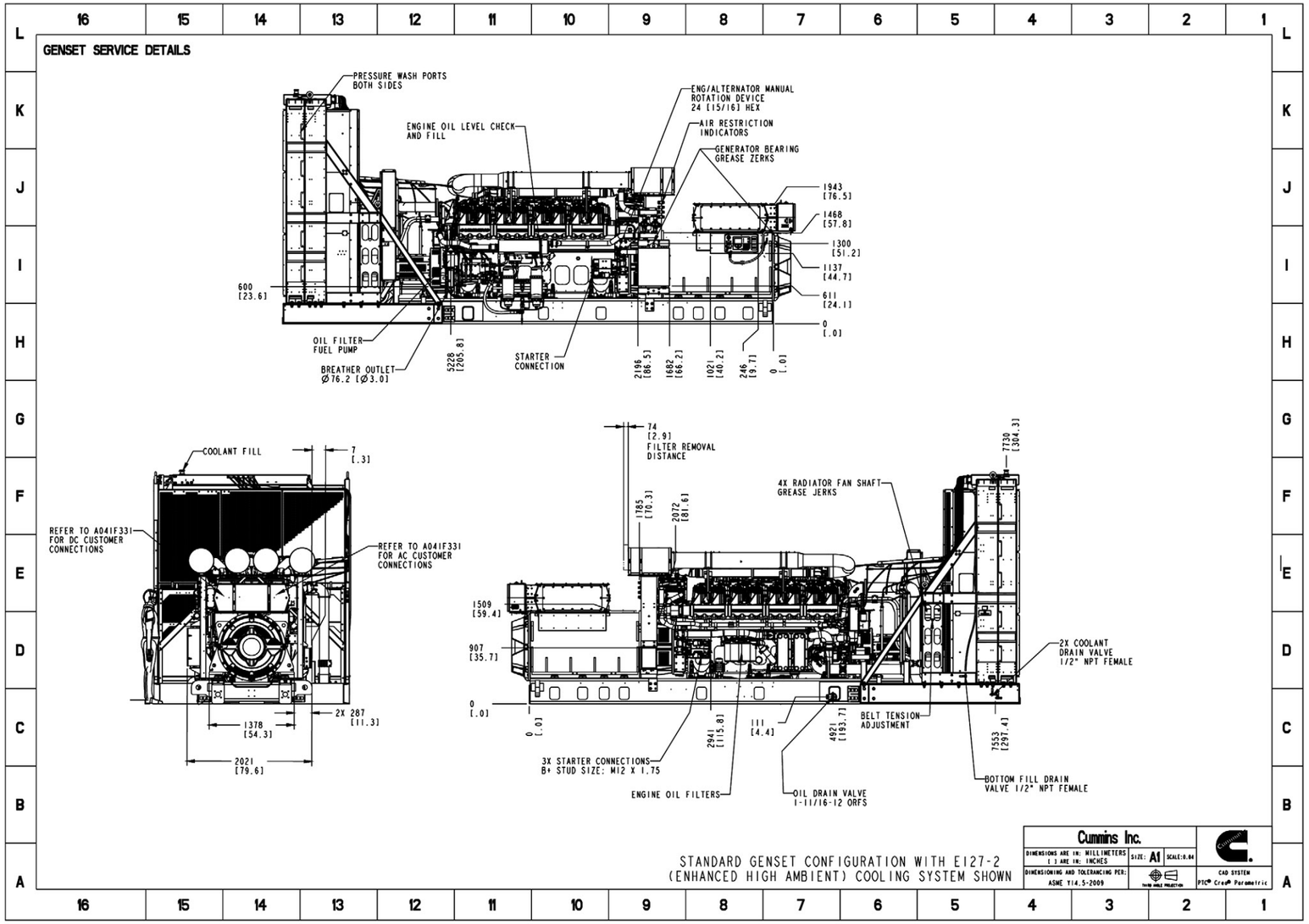


FIGURE 215. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 94 SQUARE FOOT RADIATOR (SHEET 3 OF 10)

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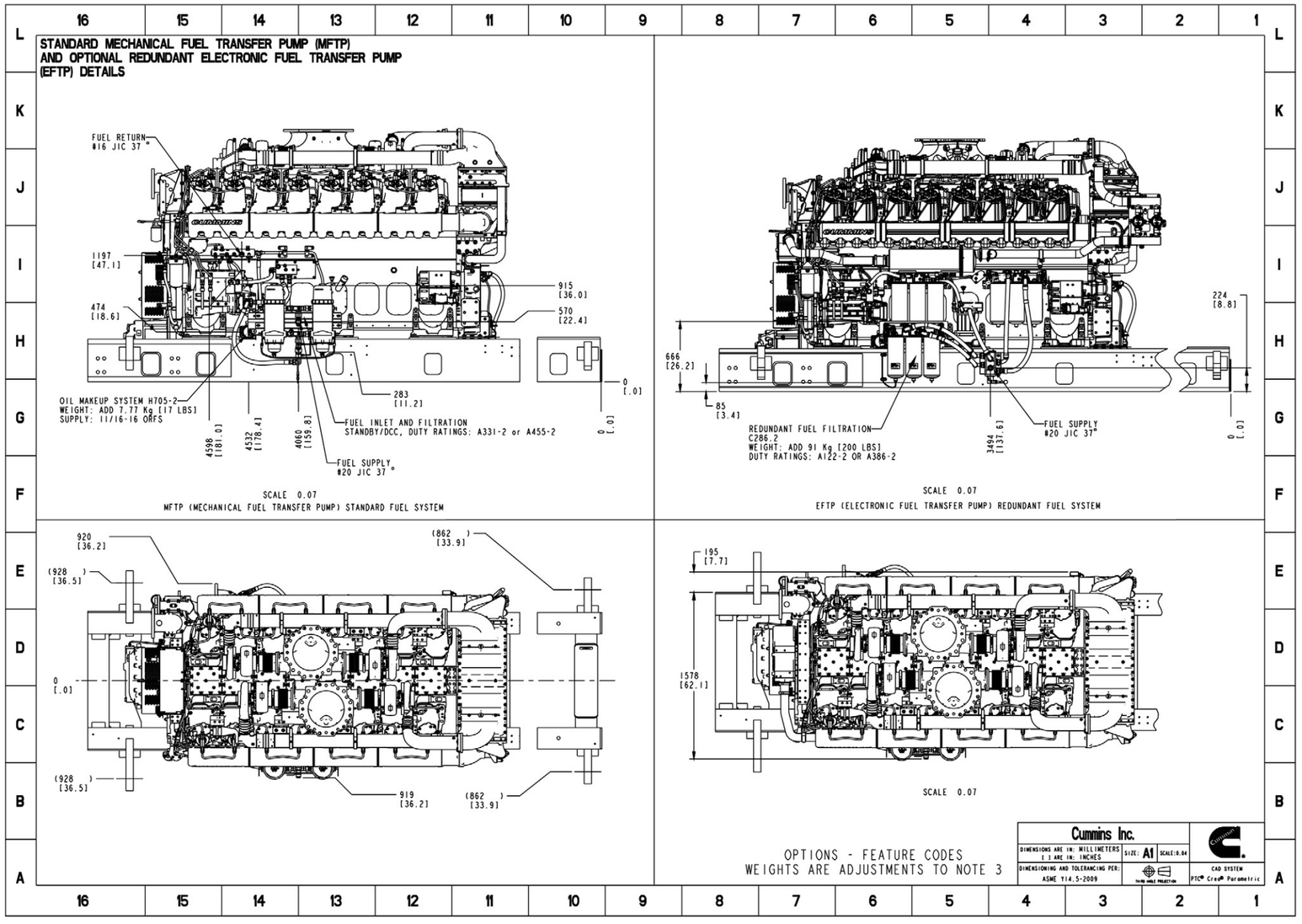


FIGURE 216. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 94 SQUARE FOOT RADIATOR (SHEET 4 OF 10)

Copyright © 2025 Cummins Inc.

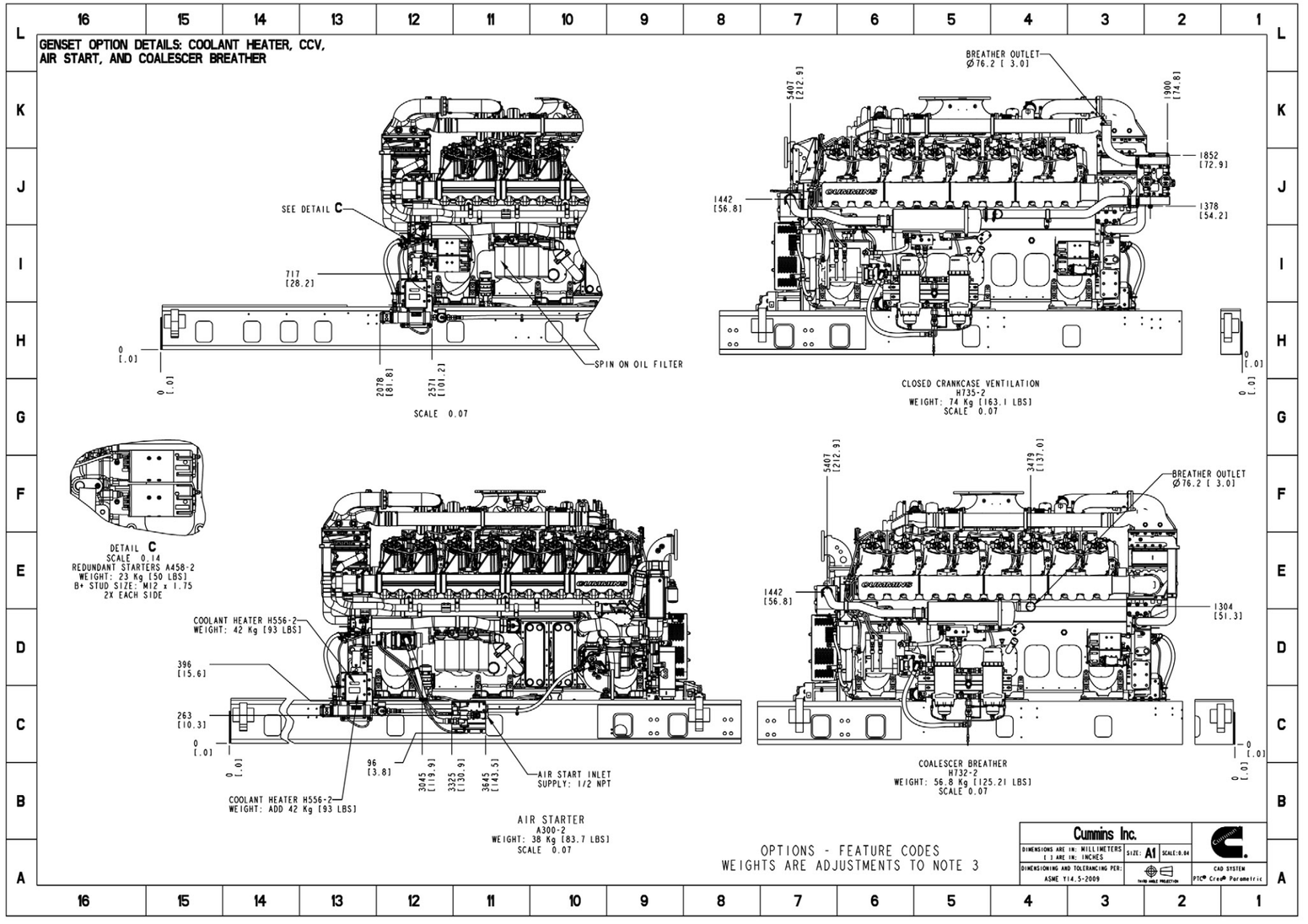


FIGURE 217. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 94 SQUARE FOOT RADIATOR (SHEET 5 OF 10)

Copyright © 2025 Cummins Inc.

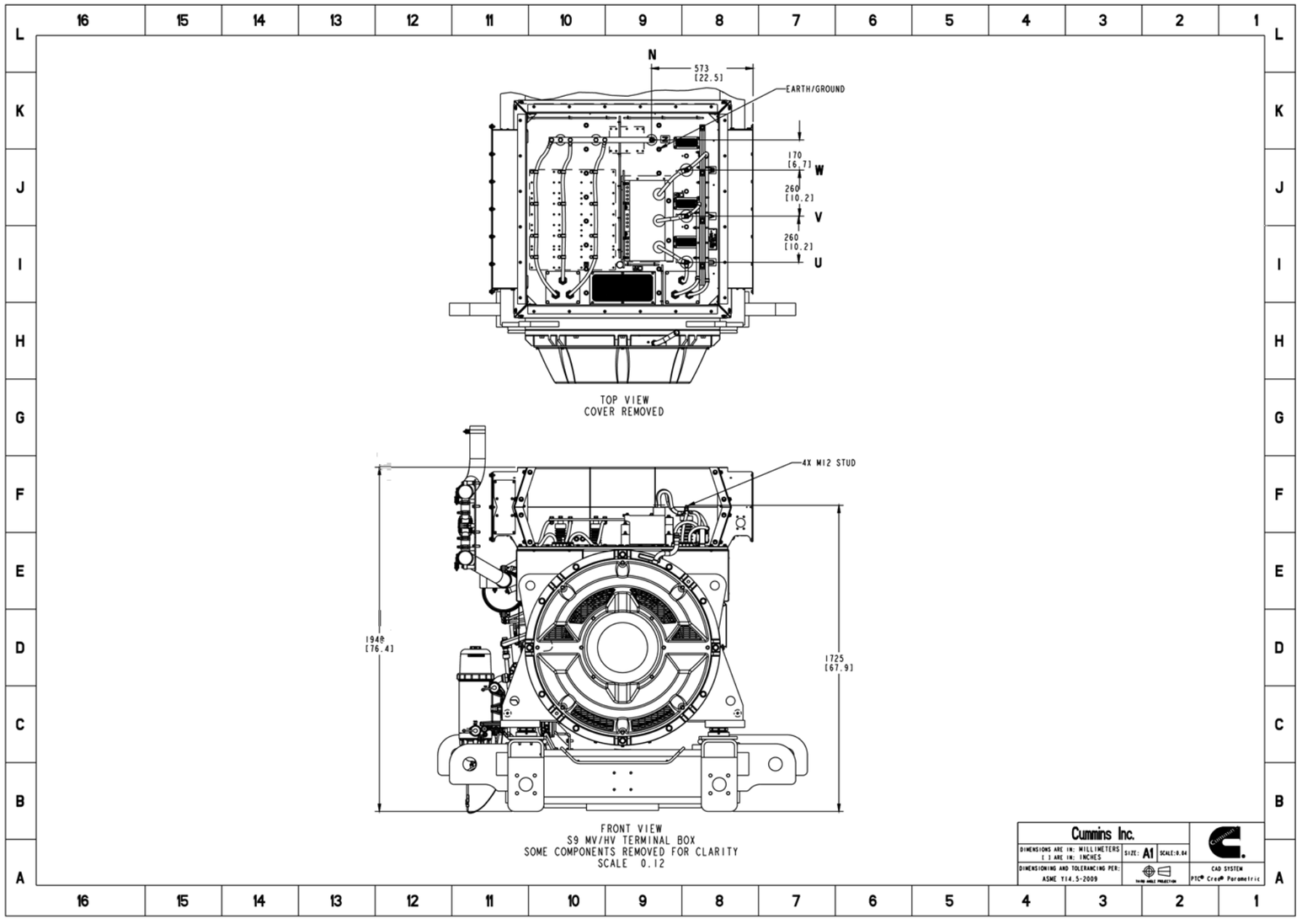


FIGURE 218. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 94 SQUARE FOOT RADIATOR (SHEET 6 OF 10)

Copyright © 2025 Cummins Inc.

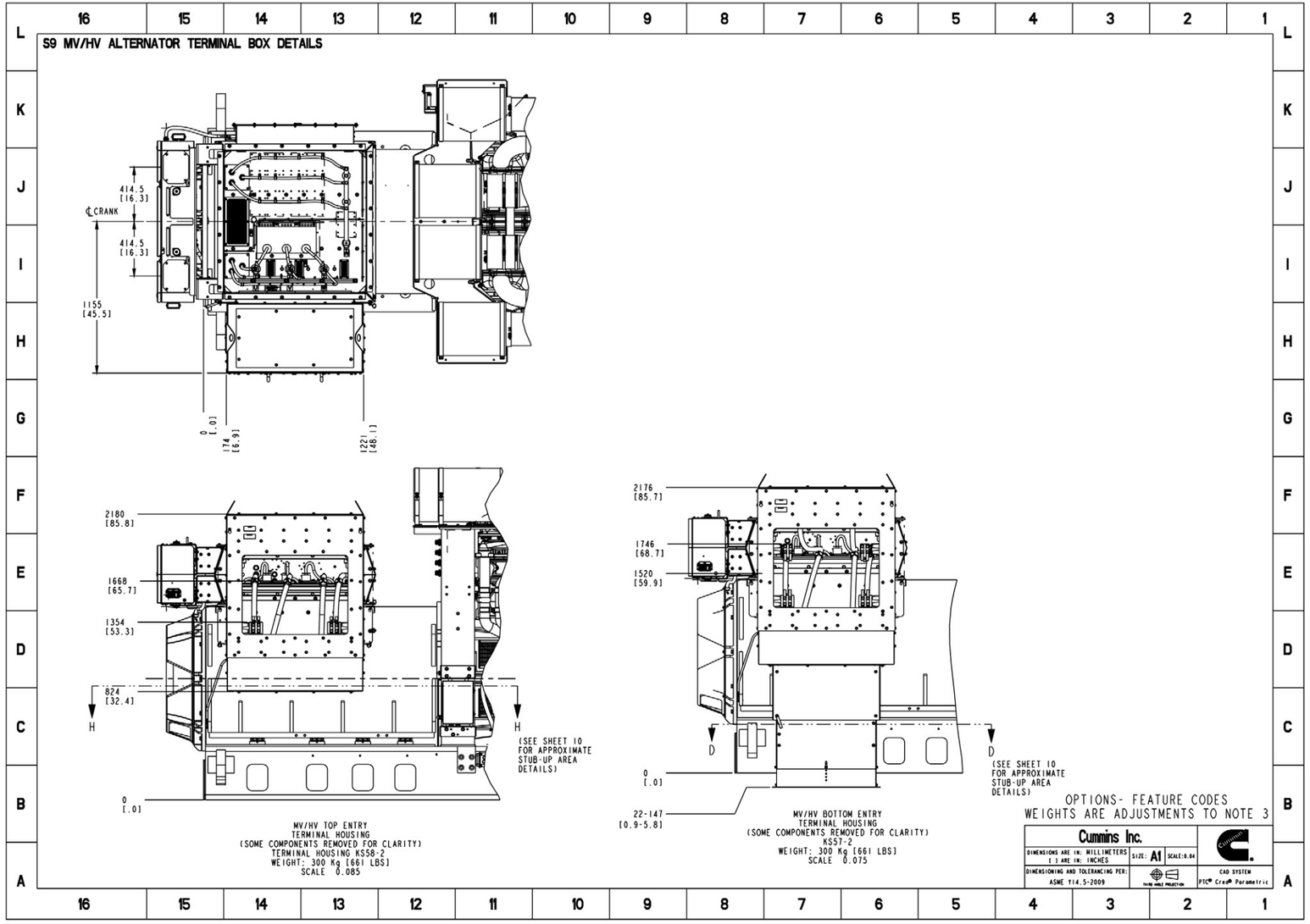


FIGURE 219. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 94 SQUARE FOOT RADIATOR (SHEET 7 OF 10)

 Copyright © 2025 Cummins Inc.

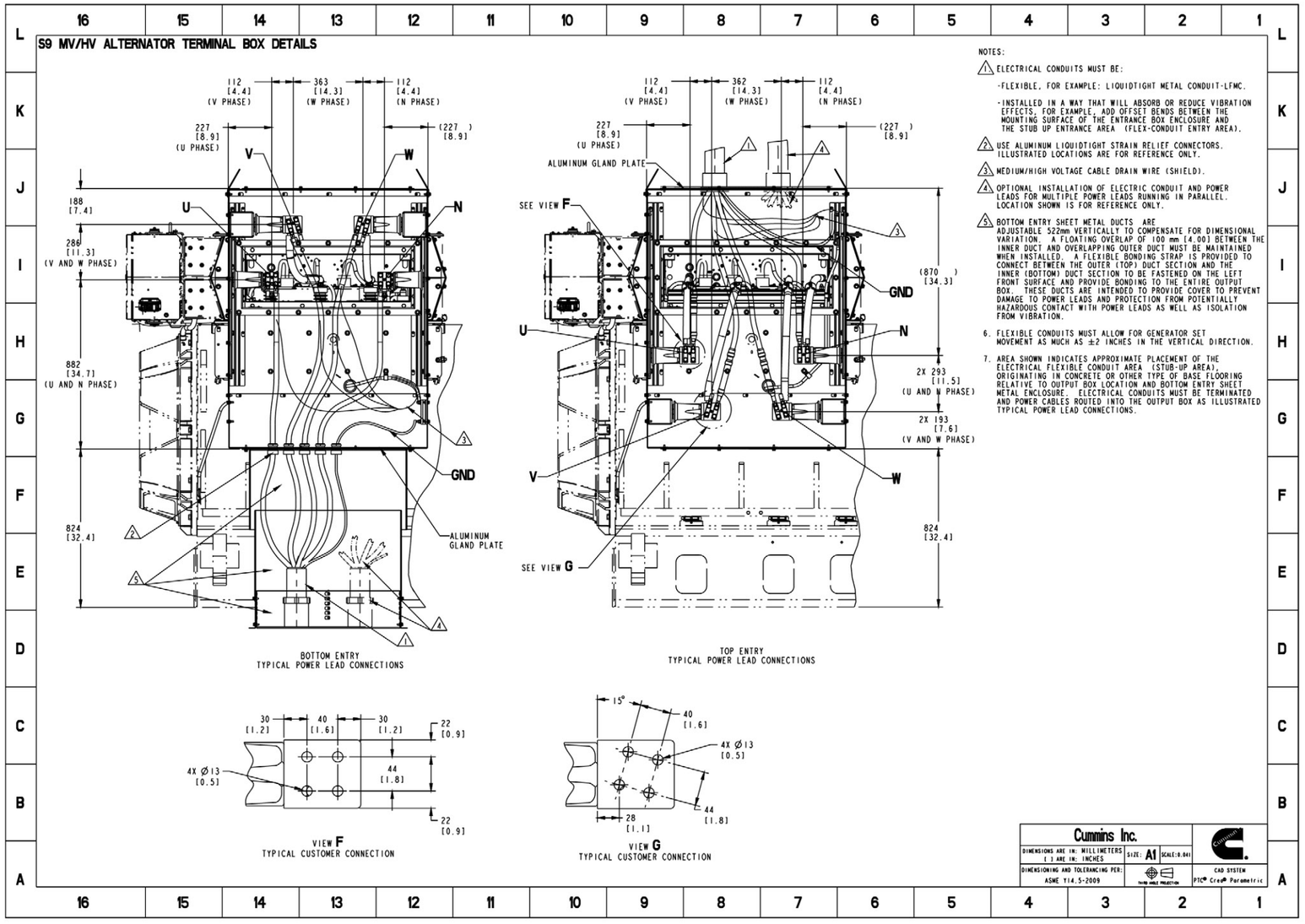


FIGURE 220. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 94 SQUARE FOOT RADIATOR (SHEET 8 OF 10)

Copyright © 2025 Cummins Inc.

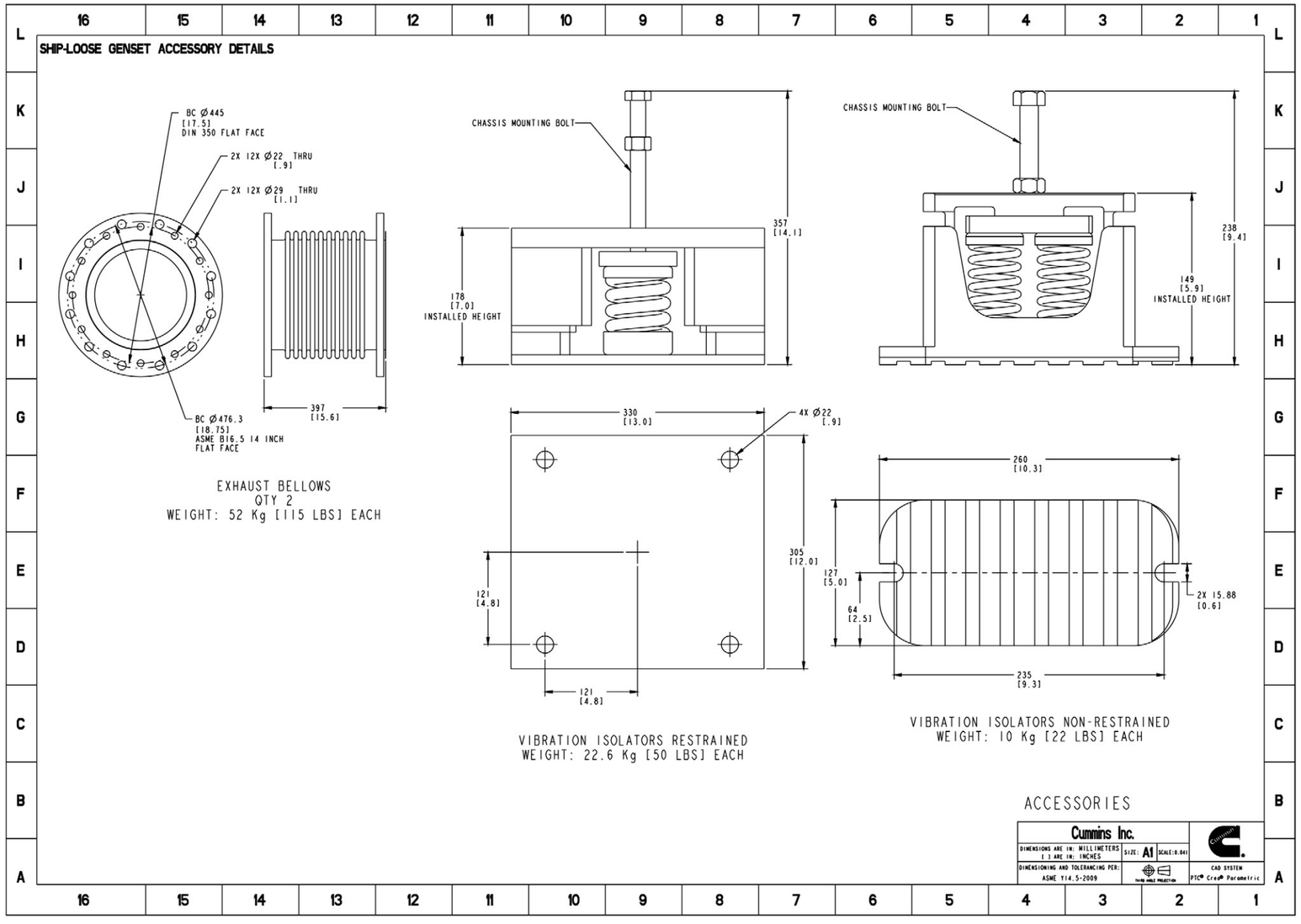


FIGURE 221. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 94 SQUARE FOOT RADIATOR (SHEET 9 OF 10)

Copyright © 2025 Cummins Inc.

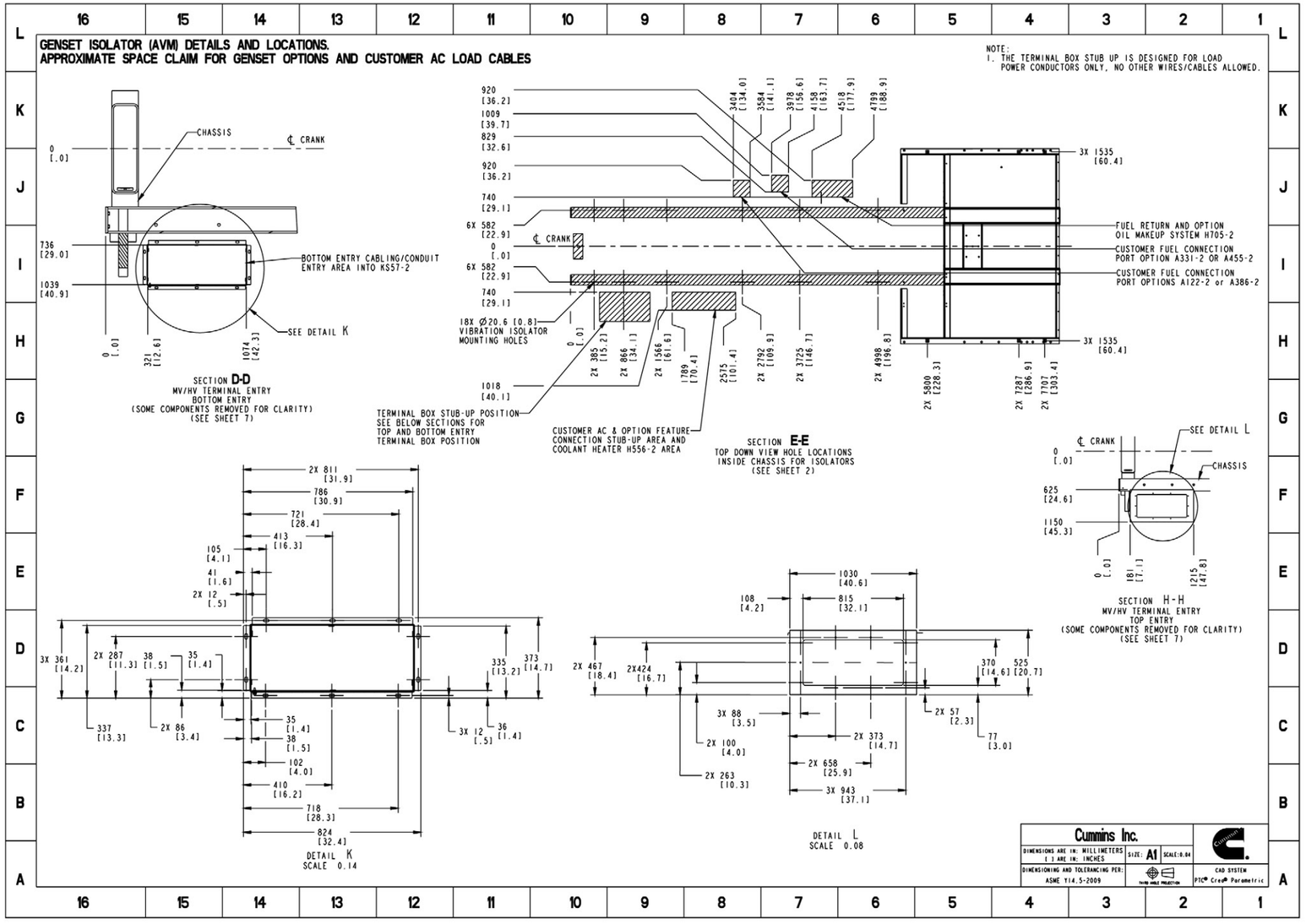


FIGURE 222. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 94 SQUARE FOOT RADIATOR (SHEET 10 OF 10)

Copyright © 2025 Cummins Inc.

B.2 Outline Drawing A067R482 – Normal Duty Air Cleaner with 84 Square Foot Radiator

ALTERNATOR	WINDING	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT WITH NO RADIATOR* Kg [LBS]	GENSET WEIGHT WITH RADIATOR* Kg [LBS]	C OF G WITH RADIATOR DIM A (SHEET 2)* mm [inch]	C OF G WITH RADIATOR DIM B (SHEET 2)* mm [inch]	C OF G WITHOUT RADIATOR DIM A* mm [inch]	C OF G WITHOUT RADIATOR DIM B* mm [inch]
S9MID-G42	851	7750 [17086]	24597 [54227]	29797 [65691]	1122 [44]	3612 [142]	1038 [40]	2875 [113]
S9HID-H42	991	8200 [18078]	25047 [55219]	30247 [66683]	1142 [45]	3588 [141]	1064 [42]	2860 [113]
S9HID-G42	991	7750 [17086]	24597 [54227]	29797 [65691]	1145 [45]	3636 [143]	1067 [42]	2903 [114]
S9HID-G42	961	7750 [17086]	24597 [54227]	29797 [65691]	1145 [45]	3636 [143]	1067 [42]	2903 [114]
S9HID-H42	961	8200 [18078]	25047 [55219]	30247 [66683]	1142 [45]	3588 [141]	1064 [42]	2860 [113]
S9HID-G42	983	7750 [17086]	24597 [54227]	29797 [65691]	1145 [45]	3636 [143]	1067 [42]	2903 [114]
S9HID-H42	983	8200 [18078]	25047 [55219]	30247 [66683]	1142 [45]	3588 [141]	1064 [42]	2860 [113]
S9MID-H42	851	8200 [18078]	25047 [55219]	30247 [66683]	1142 [45]	3588 [141]	1064 [42]	2860 [113]

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS WITH IMPERIAL INCH CONVERSIONS IN "[ ]".

   1.1 IN EVENT OF A DISCREPANCY BETWEEN METRIC AND IMPERIAL DIMENSIONS, THE METRIC DIMENSIONS CONTROL.

2. ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCED.

3. WEIGHT: REFER TO TABLE FOR STANDARD GENSET WITH E127-2 E128-2 COOLING SYSTEM.

   *3.1 INCLUDES WEIGHT OF 606 LITERS [160 GALLONS] SUPPLIED ENGINE OIL.(530 Kg/1168 LBS)

   **3.2 INCLUDES DRY WEIGHT OF RADIATOR 4555 Kg [10042 LBS] (SHIPS LOOSE)

   **3.3 INCLUDES WEIGHT FOR 1120.5 LITERS [296 GALLONS] OF NON-SUPPLIED COOLANT. (1139 Kg/2511 LBS)

4. LARGEST NOMINAL DIMENSIONS:
   4.1 LENGTH 8025 [316.0]
   4.2 WIDTH 3028 [119.2] RADIATOR
   4.3 HEIGHT 3758 [148] TOP OF RADIATOR CAP
   4.4 DOES NOT INCLUDE THE HEIGHT OF THE VIBRATION ISOLATOR

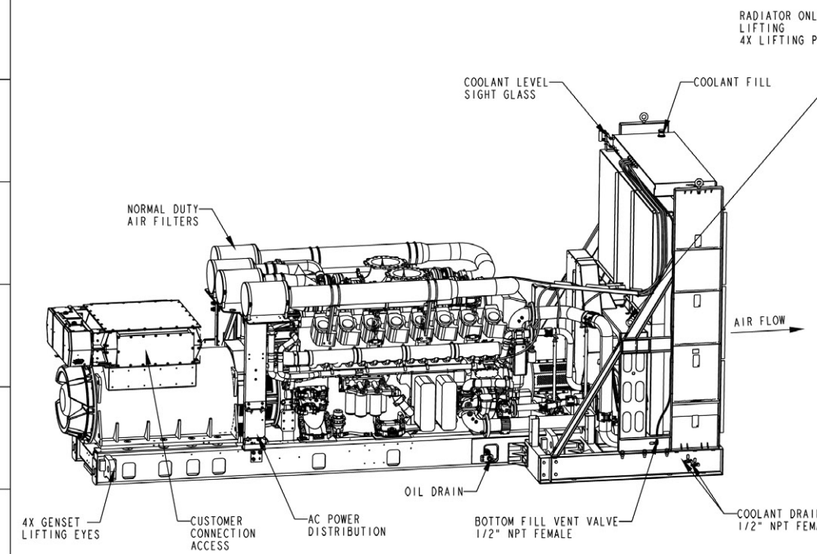
△5 LIFTING INSTRUCTIONS: REFER TO GENSET INSTALLATION MANUAL AND LIFTING LABEL

   5.1 GENSET SHALL NOT BE LIFTED USING THE LIFTING EYES WHEN ATTACHED TO THE RADIATOR. RADIATOR AND GENSET SHALL ALWAYS BE LIFTED SEPARATELY PER INSTALLATION MANUAL AND LIFTING DIAGRAMS.

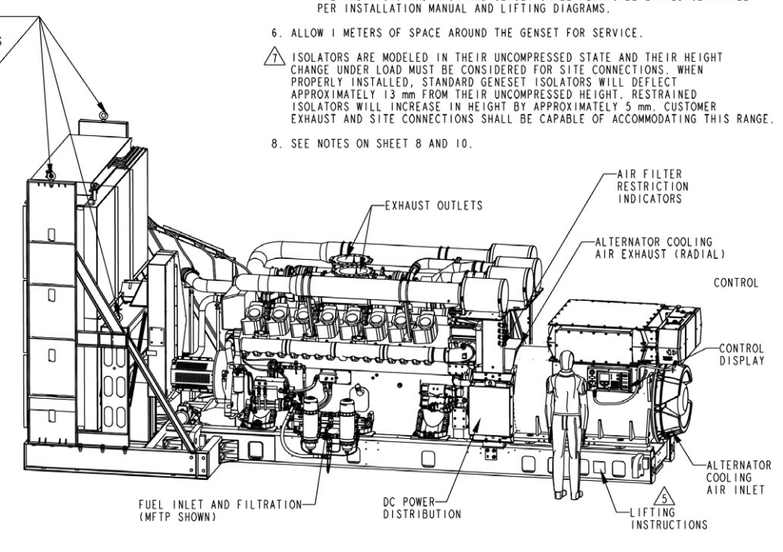
6. ALLOW 1 METERS OF SPACE AROUND THE GENSET FOR SERVICE.

△7 ISOLATORS ARE MODELED IN THEIR UNCOMPRESSED STATE AND THEIR HEIGHT CHANGE UNDER LOAD MUST BE CONSIDERED FOR SITE CONNECTIONS. WHEN PROPERLY INSTALLED, STANDARD GENESET ISOLATORS WILL DEFLECT APPROXIMATELY 13 mm FROM THEIR UNCOMPRESSED HEIGHT. RESTRAINED ISOLATORS WILL INCREASE IN HEIGHT BY APPROXIMATELY 5 mm. CUSTOMER EXHAUST AND SITE CONNECTIONS SHALL BE CAPABLE OF ACCOMMODATING THIS RANGE.

8. SEE NOTES ON SHEET 8 AND 10.



RIGHT SIDE



LEFT SIDE

STANDARD GENSET CONFIGURATION
WITH S9HID-H42 ALTERNATOR AND E127-2,
E128-2 COOLING SYSTEM SHOWN

LAST DATUM LETTER USED: A	LAST REFERENCE LETTER USED: T
MODEL/PLATFORM: C325D6	THIS PART IS SIMILAR TO: A049P688
Cummins Inc.	
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES	SIZE: A1 SCALE:0.04
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION
	CAD SYSTEM PTC® Creo® Parametric

FIGURE 223. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 84 SQUARE FOOT RADIATOR (SHEET 1 OF 10)

Copyright © 2025 Cummins Inc.

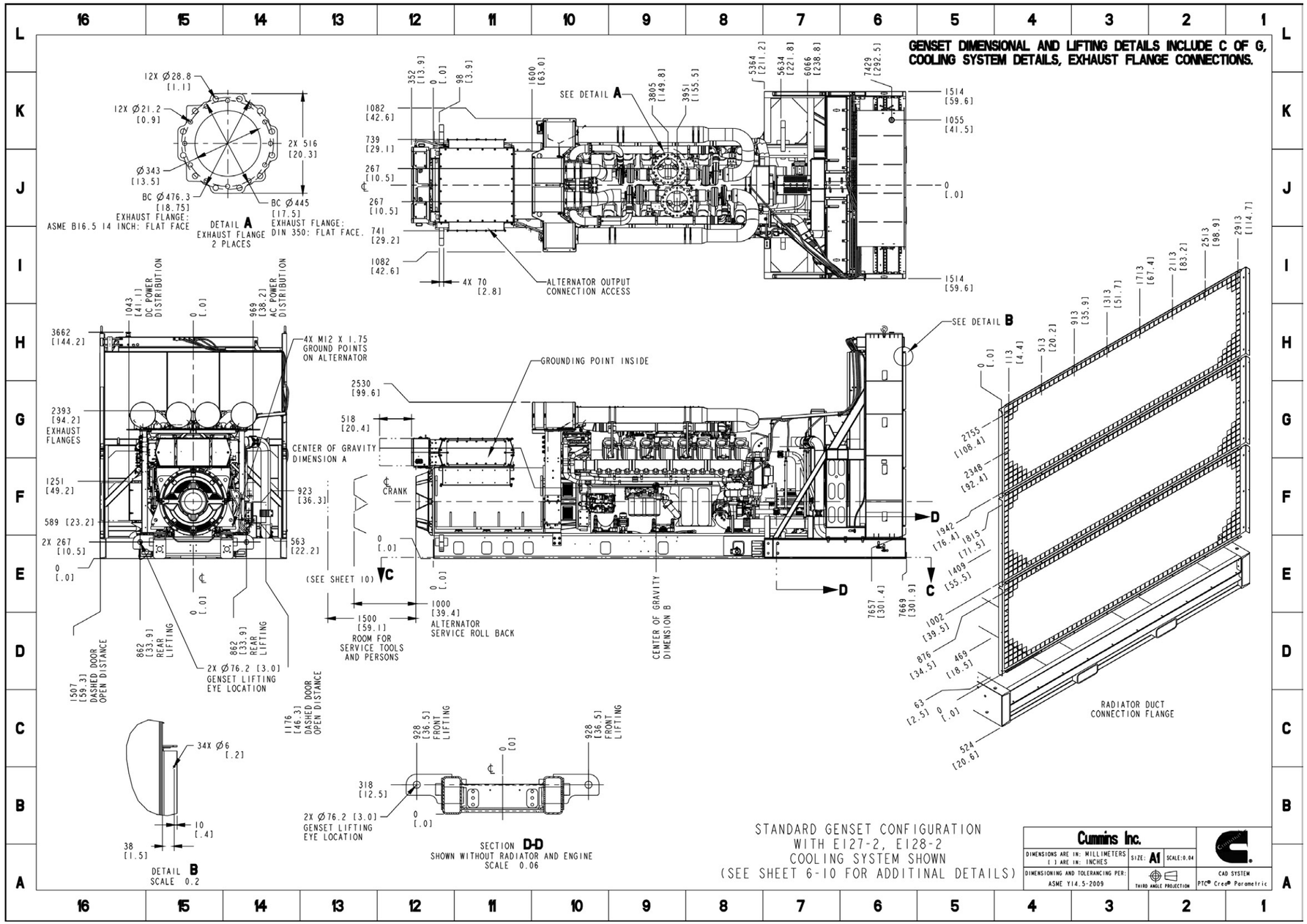


FIGURE 224. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 84 SQUARE FOOT RADIATOR (SHEET 2 OF 10)

Copyright © 2025 Cummins Inc.

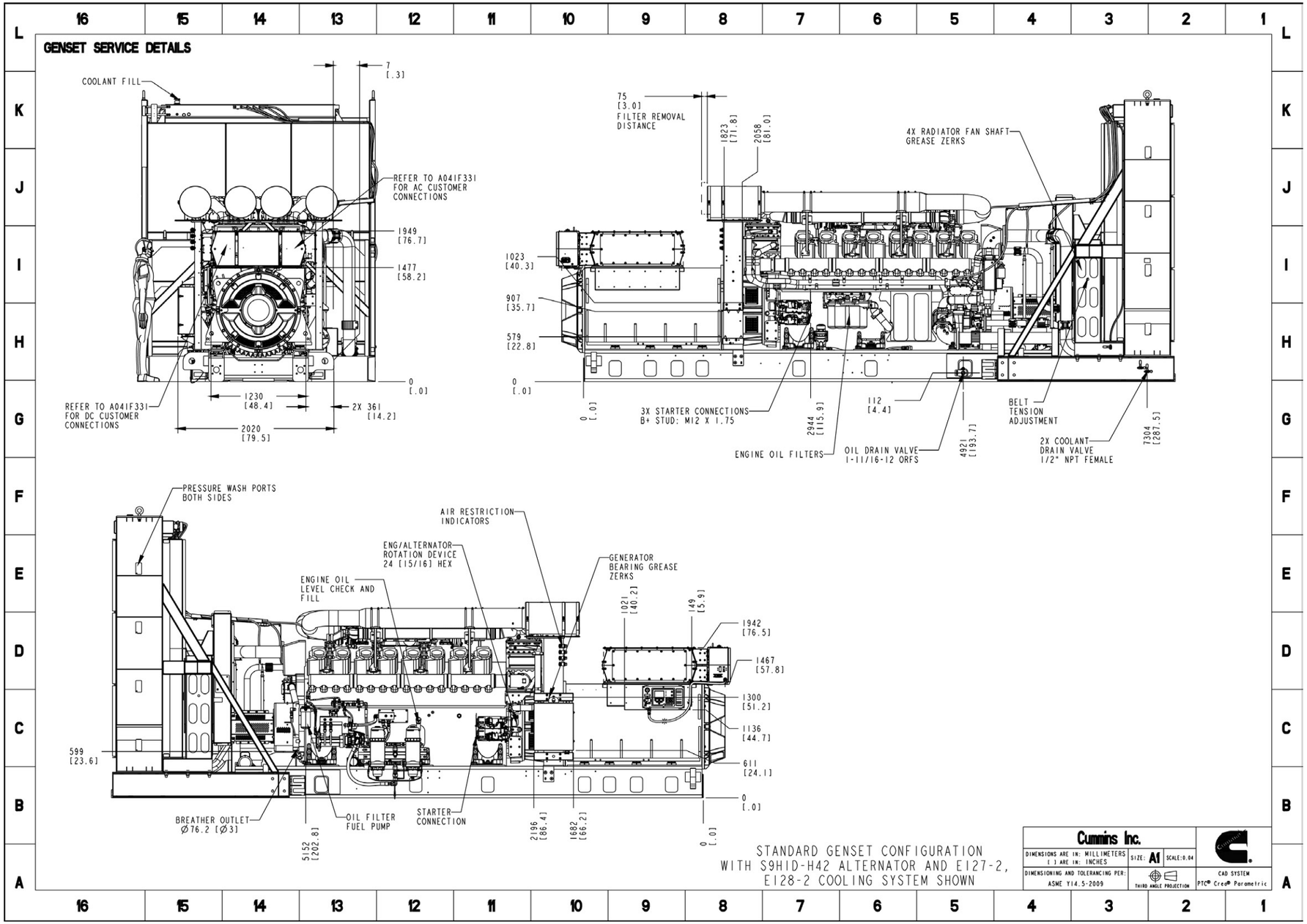


FIGURE 225. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 84 SQUARE FOOT RADIATOR (SHEET 3 OF 10)

Copyright © 2025 Cummins Inc.

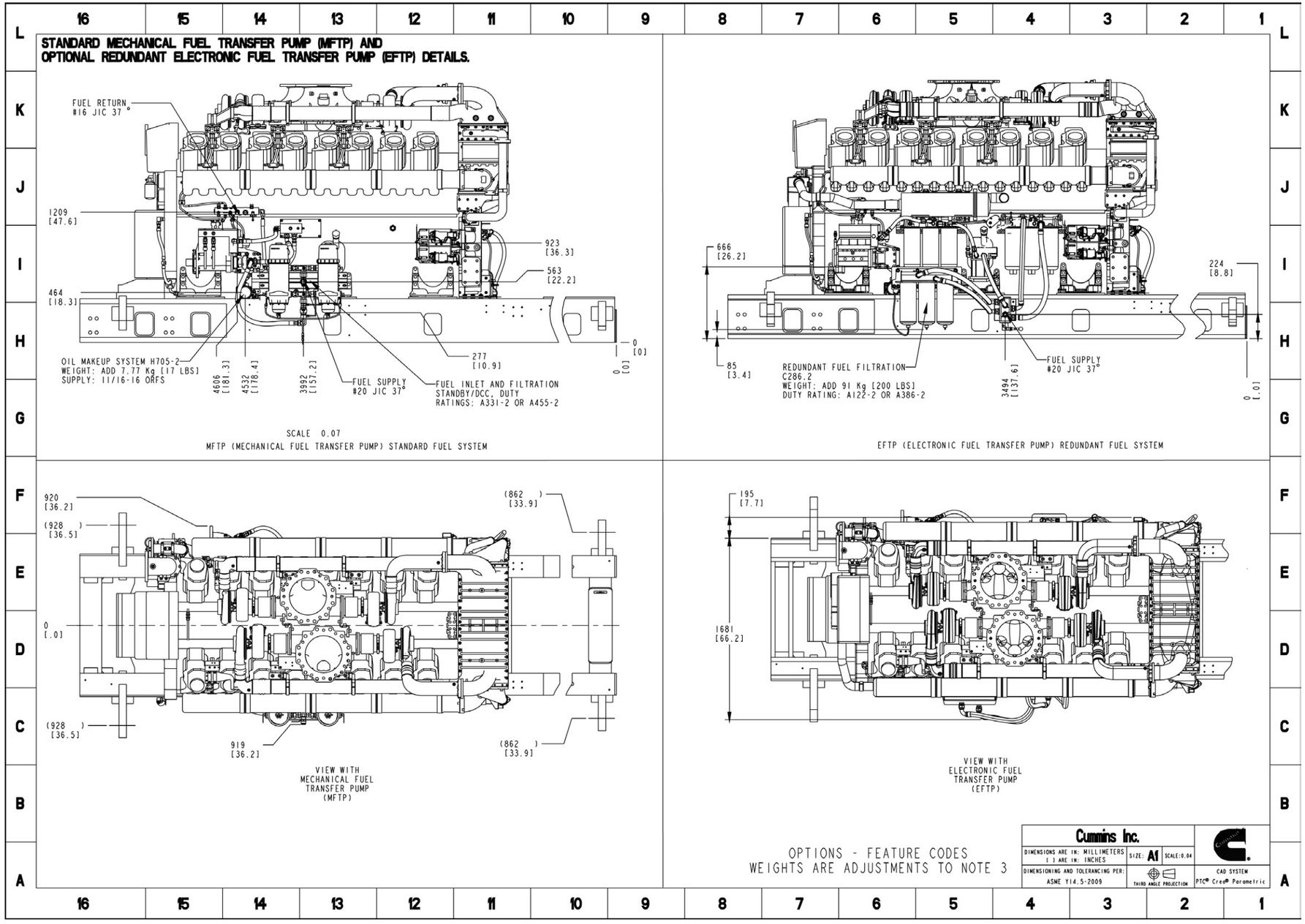


FIGURE 226. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 84 SQUARE FOOT RADIATOR (SHEET 4 OF 10)

Copyright © 2025 Cummins Inc.

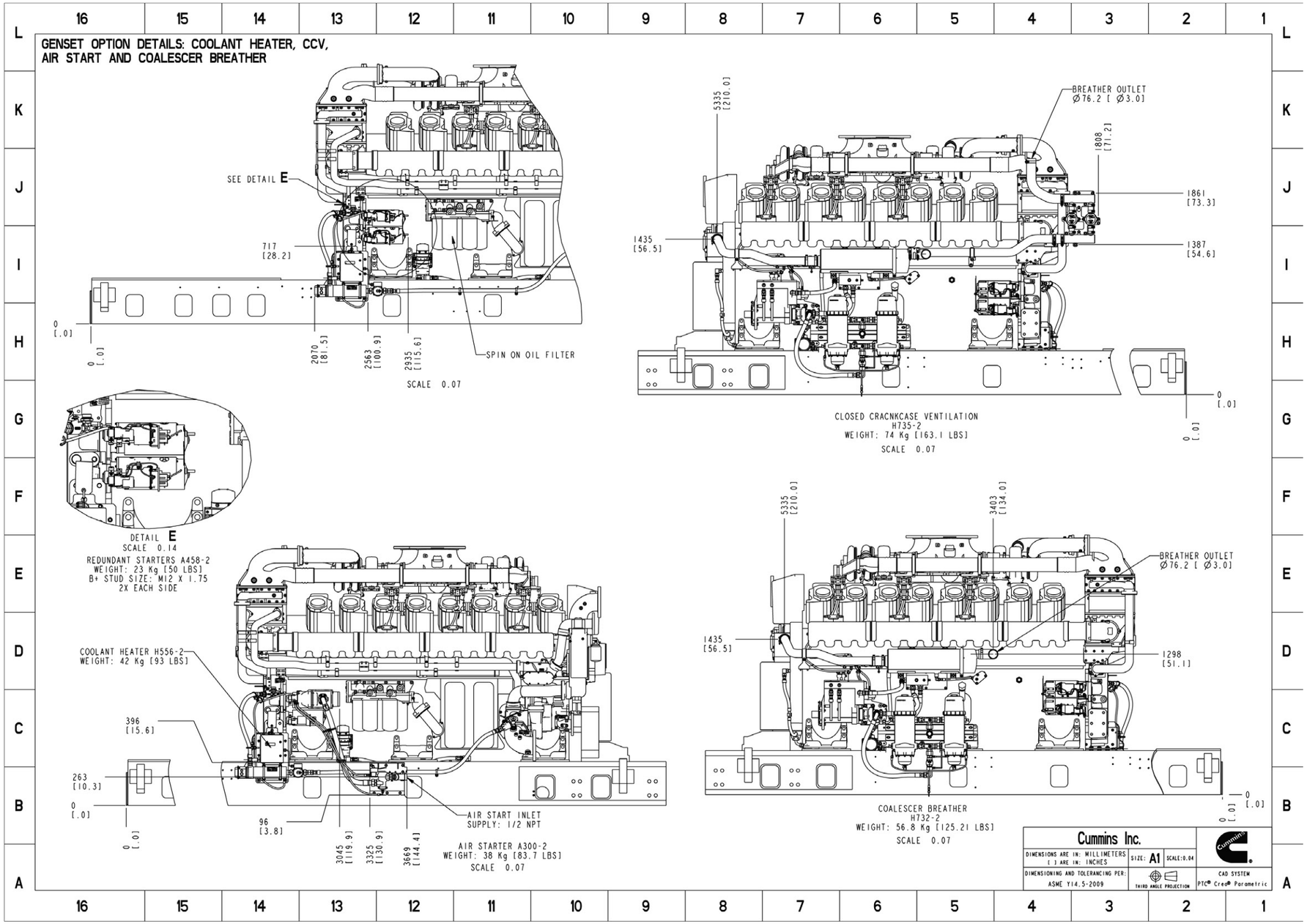


FIGURE 227. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 84 SQUARE FOOT RADIATOR (SHEET 5 OF 10)

Copyright © 2025 Cummins Inc.

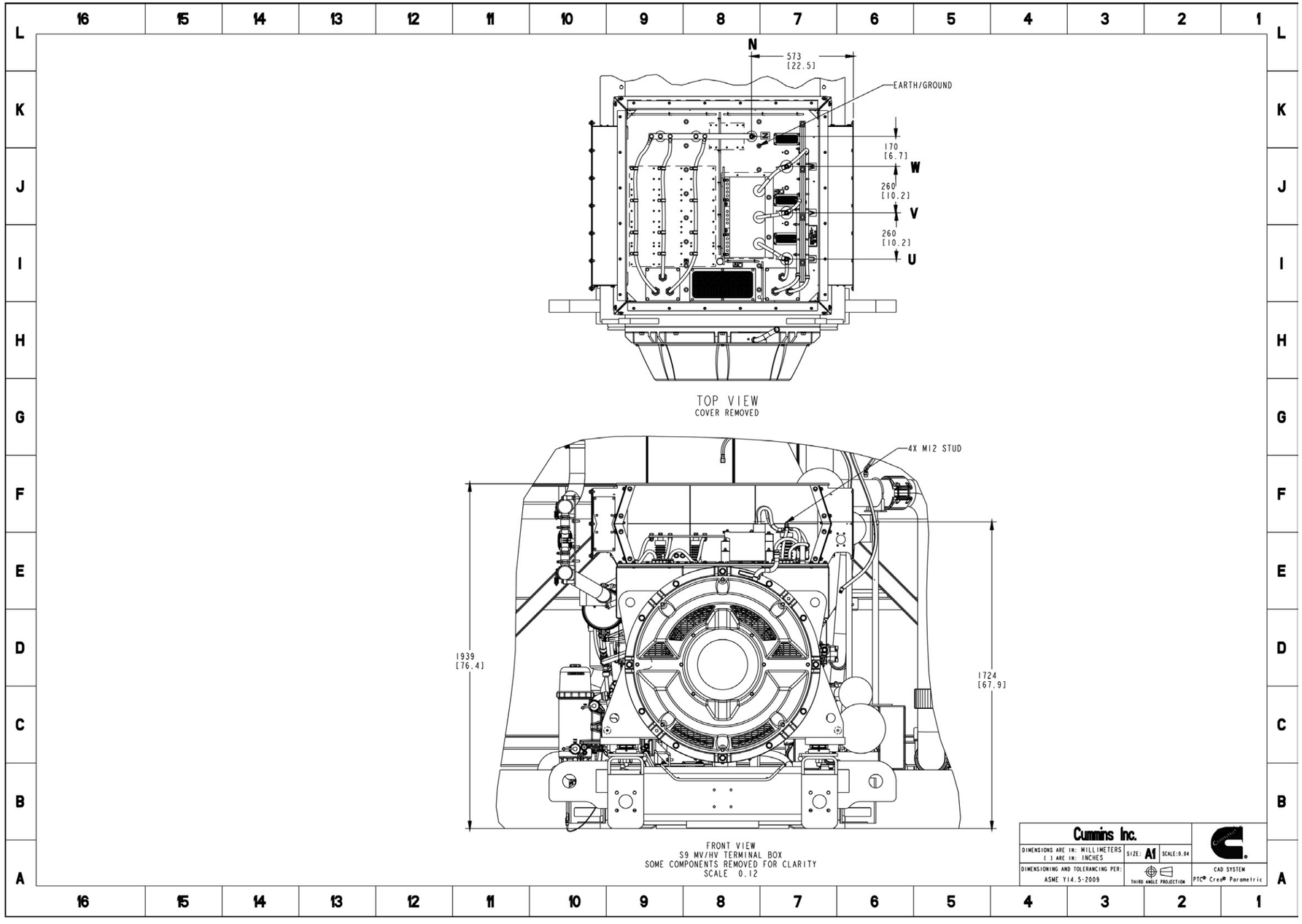


FIGURE 228. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 84 SQUARE FOOT RADIATOR (SHEET 6 OF 10)

Copyright © 2025 Cummins Inc.

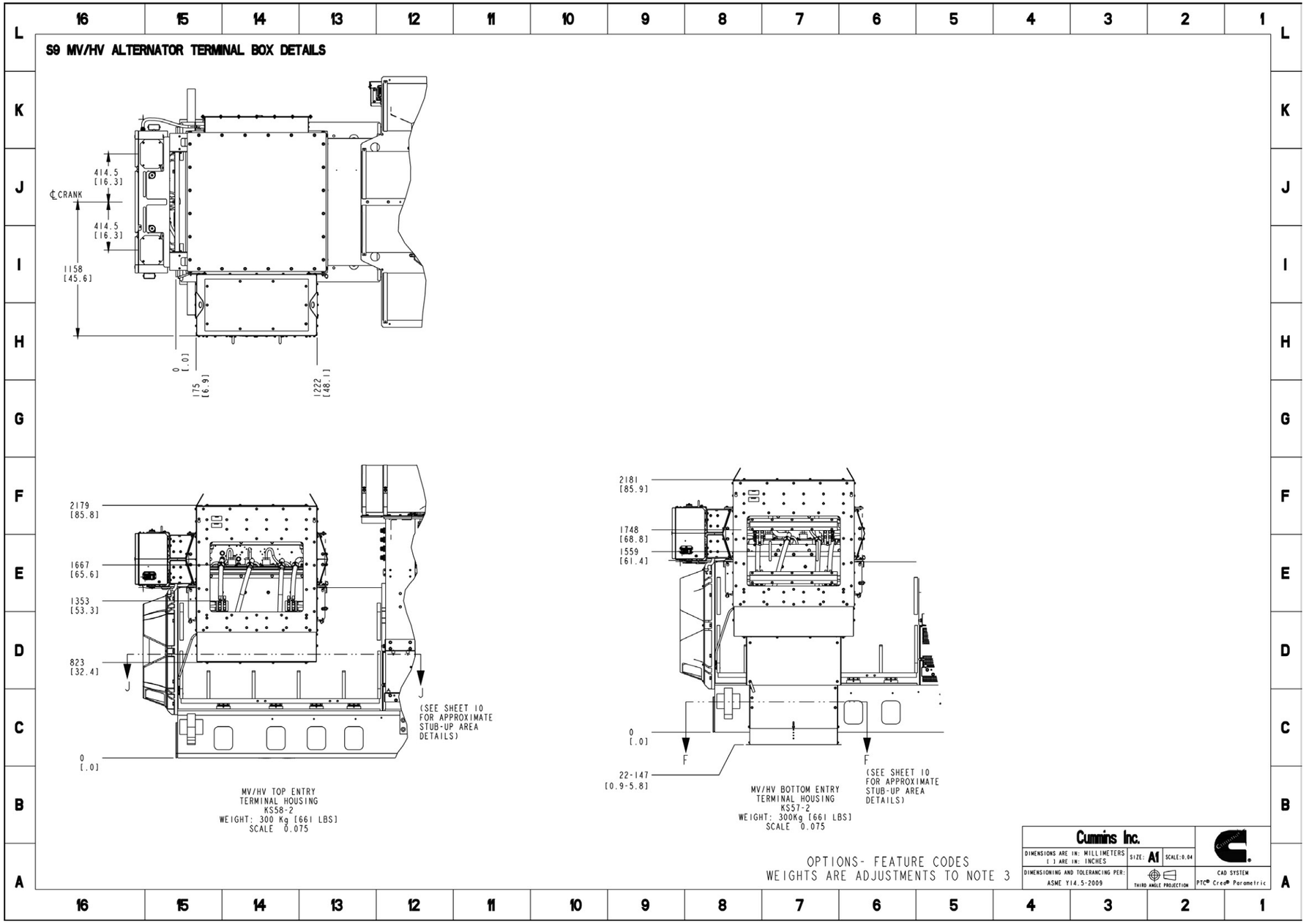


FIGURE 229. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 84 SQUARE FOOT RADIATOR (SHEET 7 OF 10)

 Copyright © 2025 Cummins Inc.

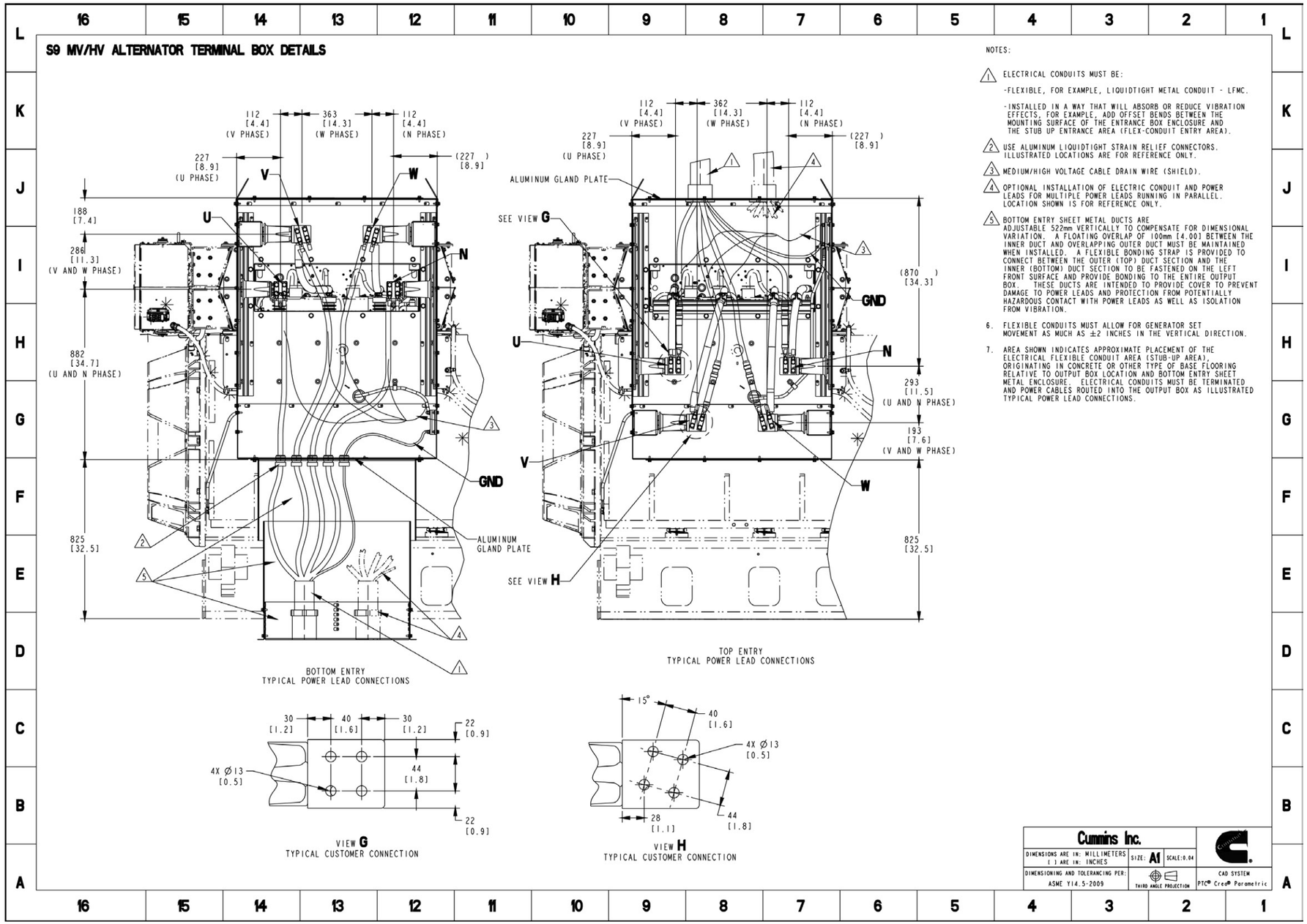


FIGURE 230. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 84 SQUARE FOOT RADIATOR (SHEET 8 OF 10)

Copyright © 2025 Cummins Inc.

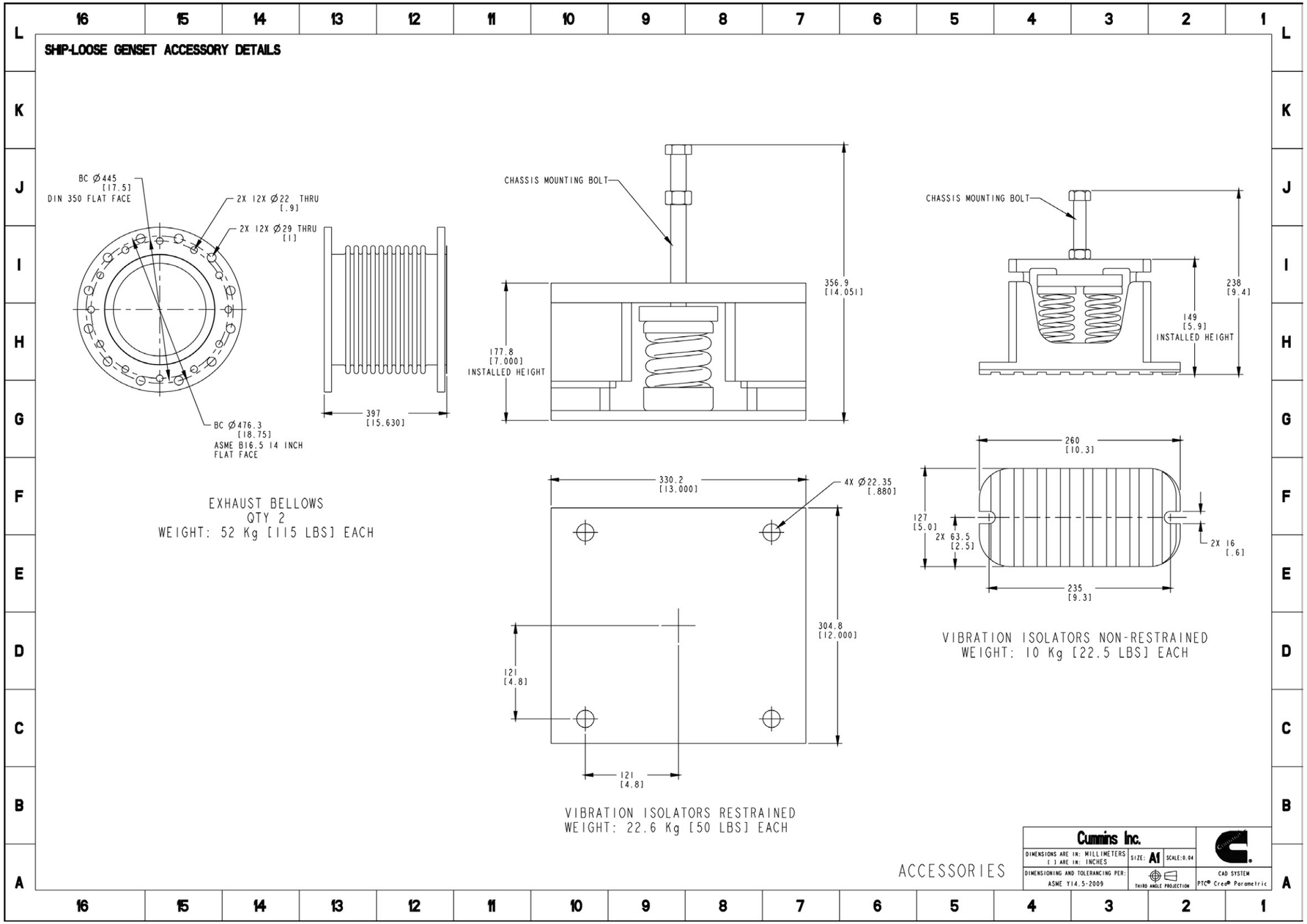


FIGURE 231. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 84 SQUARE FOOT RADIATOR (SHEET 9 OF 10)

 Copyright © 2025 Cummins Inc.

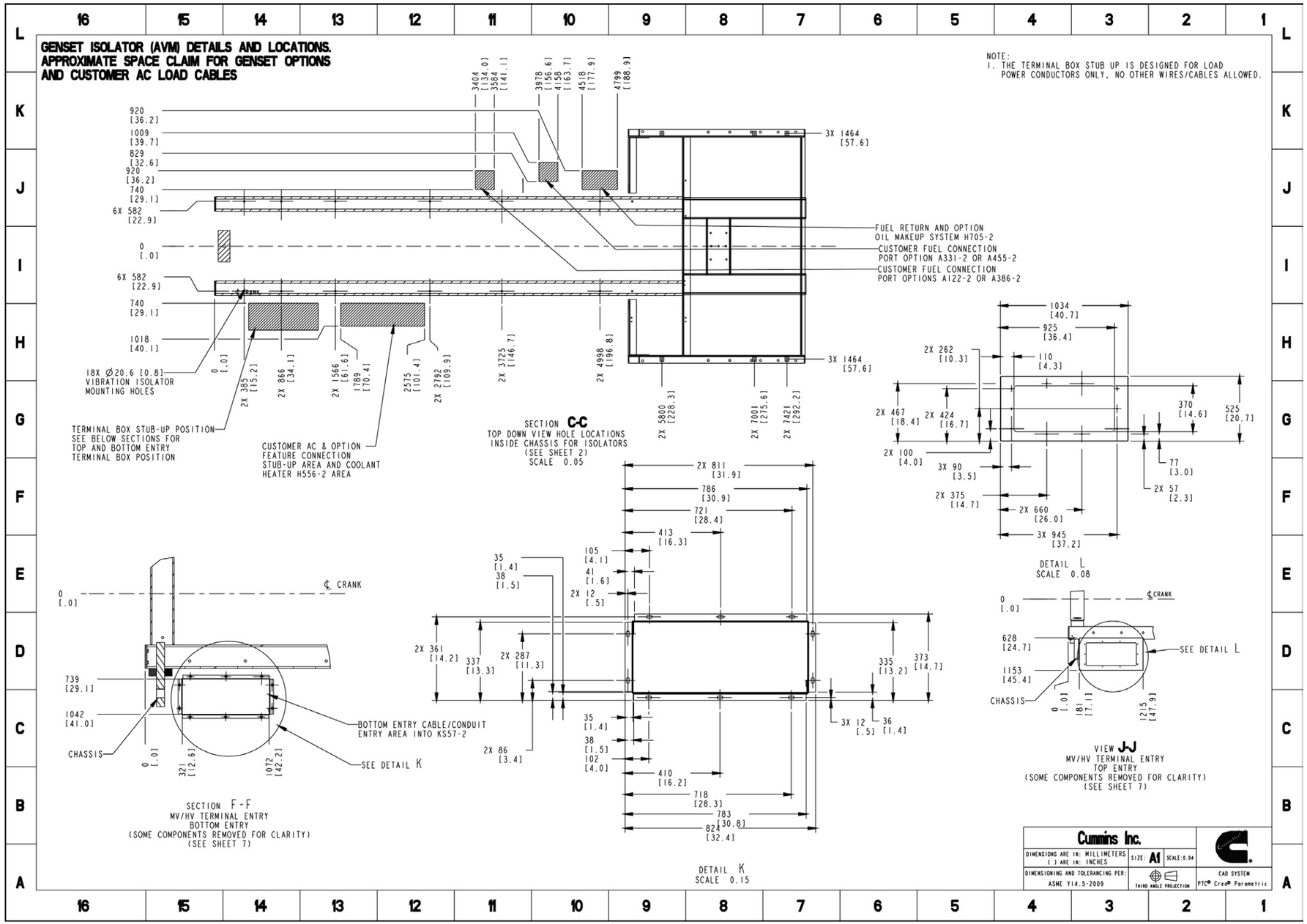


FIGURE 232. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 84 SQUARE FOOT RADIATOR (SHEET 10 OF 10)

Copyright © 2025 Cummins Inc.

B.3 Outline Drawing A068A473 – Normal Duty Air Cleaner with 61 Square Foot Radiator

ALTERNATOR	WINDING	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT WITH NO RADIATOR* Kg [LBS]	GENSET WEIGHT WITH RADIATOR* Kg [LBS]	C OF G WITH RADIATOR DIM A (SHEET 2)* mm [inch]	C OF G WITH RADIATOR DIM B (SHEEET 2)* mm [inch]	C OF G WITHOUT RADIATOR DIM A* mm [inch]	C OF G WITHOUT RADIATOR DIM B* mm [inch]
S9MID-G42	851	7750 [17086]	24597 [54227]	30218 [66619]	1132 [44]	3671 [144]	1038 [40]	2875 [113]
S9HID-H42	991	8200 [18078]	25047 [55219]	30668 [67611]	1129 [44]	3624 [142]	1036 [40]	2831 [111]
S9HID-G42	991	7750 [17086]	24597 [54227]	30218 [66619]	1132 [44]	3671 [144]	1038 [40]	2875 [113]
S9HID-G42	961	7750 [17086]	24597 [54227]	30218 [66619]	1132 [44]	3671 [144]	1038 [40]	2875 [113]
S9HID-H42	961	8200 [18078]	25047 [55219]	30668 [67611]	1129 [44]	3624 [142]	1036 [40]	2831 [111]
S9HID-G42	983	7750 [17086]	24597 [54227]	30218 [66619]	1132 [44]	3671 [144]	1038 [40]	2875 [113]
S9HID-H42	983	8200 [18078]	25047 [55219]	30668 [67611]	1129 [44]	3624 [142]	1036 [40]	2831 [111]
S9MID-H42	851	8200 [18078]	25047 [55219]	30668 [67611]	1129 [44]	3624 [142]	1036 [40]	2831 [111]

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS WITH IMPERIAL INCH CONVERSIONS IN "[]".
   1.1 IN EVENT OF A DISCREPANCY BETWEEN METRIC AND IMPERIAL DIMENSIONS, THE METRIC DIMENSIONS CONTROL.
2. ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCED.
3. WEIGHT: REFER TO TABLE FOR STANDARD GENSET WITH E128-2 COOLING SYSTEM.
   *3.1 INCLUDES WEIGHT OF 606 LITERS [160 GALLONS] SUPPLIED ENGINE OIL.(530 KG/1168 LBS)
   **3.2 INCLUDES DRY WEIGHT OF RADIATOR 4657 KG [10267 LBS] (SHIPS LOOSE)
   **3.3 INCLUDES WEIGHT FOR 1238 LITERS [327 GALLONS] OF NON-SUPPLIED COOLANT. (1336 KG/2947 LBS)
4. LARGEST NOMINAL DIMENSIONS:
   4.1 LENGTH 7912 [311.5]
   4.2 WIDTH 2610 [102.7] RADIATOR
   4.3 HEIGHT 3366 [132.5] TOP OF RADIATOR CAP
   4.4 DOES NOT INCLUDE THE HEIGHT OF THE VIBRATION ISOLATOR

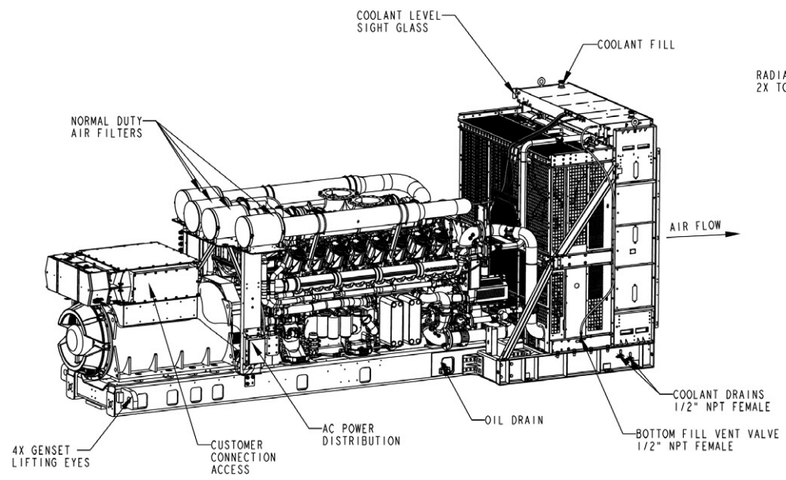
△5 LIFTING INSTRUCTIONS: REFER TO GENSET INSTALLATION MANUAL AND LIFTING LABEL

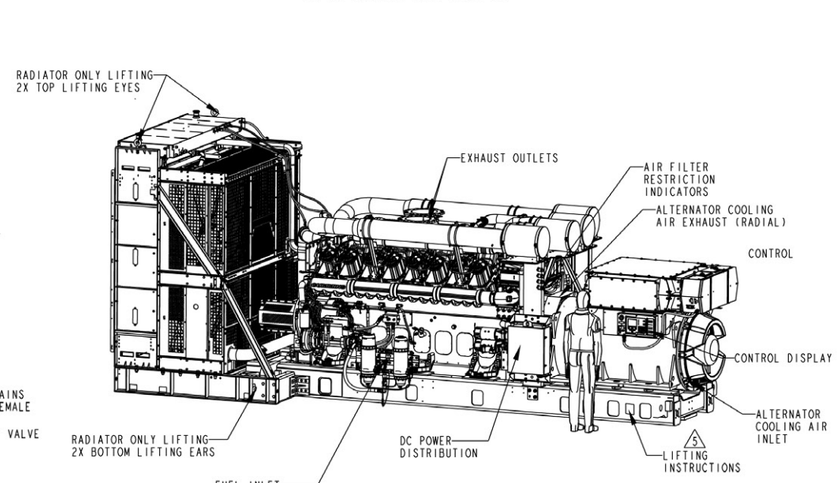
   5.1 GENSET SHALL NOT BE LIFTED USING THE LIFTING EYES WHEN ATTACHED TO THE RADIATOR. RADIATOR AND GENSET SHALL ALWAYS BE LIFTED SEPARATELY PER INSTALLATION MANUAL AND LIFTING DIAGRAMS.

6. ALLOW 1 METERS AROUND THE GENSET FOR SERVICE.

△7 ISOLATORS ARE MODELED IN THEIR UNCOMPRESSED STATE AND THEIR HEIGHT CHANGE UNDER LOAD MUST BE CONSIDERED FOR SITE CONNECTIONS. WHEN PROPERLY INSTALLED, STANDARD GENESET ISOLATORS WILL DEFLECT APPROXIMATELY 13 mm FROM THEIR UNCOMPRESSED HEIGHT. RESTRAINED ISOLATORS WILL INCREASE IN HEIGHT BY APPROXIMATELY 5 mm. CUSTOMER EXHAUST AND SITE CONNECTIONS SHALL BE CAPABLE OF ACCOMMODATING THIS RANGE..

8. SEE NOTES ON SHEET 9 AND 11.





STANDARD GENSET CONFIGURATION WITH S9HID-H42 ALTERNATOR AND E165-2 COOLING SYSTEM SHOWN

LAST DATUM LETTER USED: A	LAST REFERENCE LETTER USED: W
MODEL/PLATFORM: C3250D6	THIS PART IS SIMILAR TO: A065K012
Cummins Inc.	
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES	SIZE: A1 SCALE:0.04
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION
	CAD SYSTEM PTC® Creo® Parametric

FIGURE 233. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 1 OF 11)

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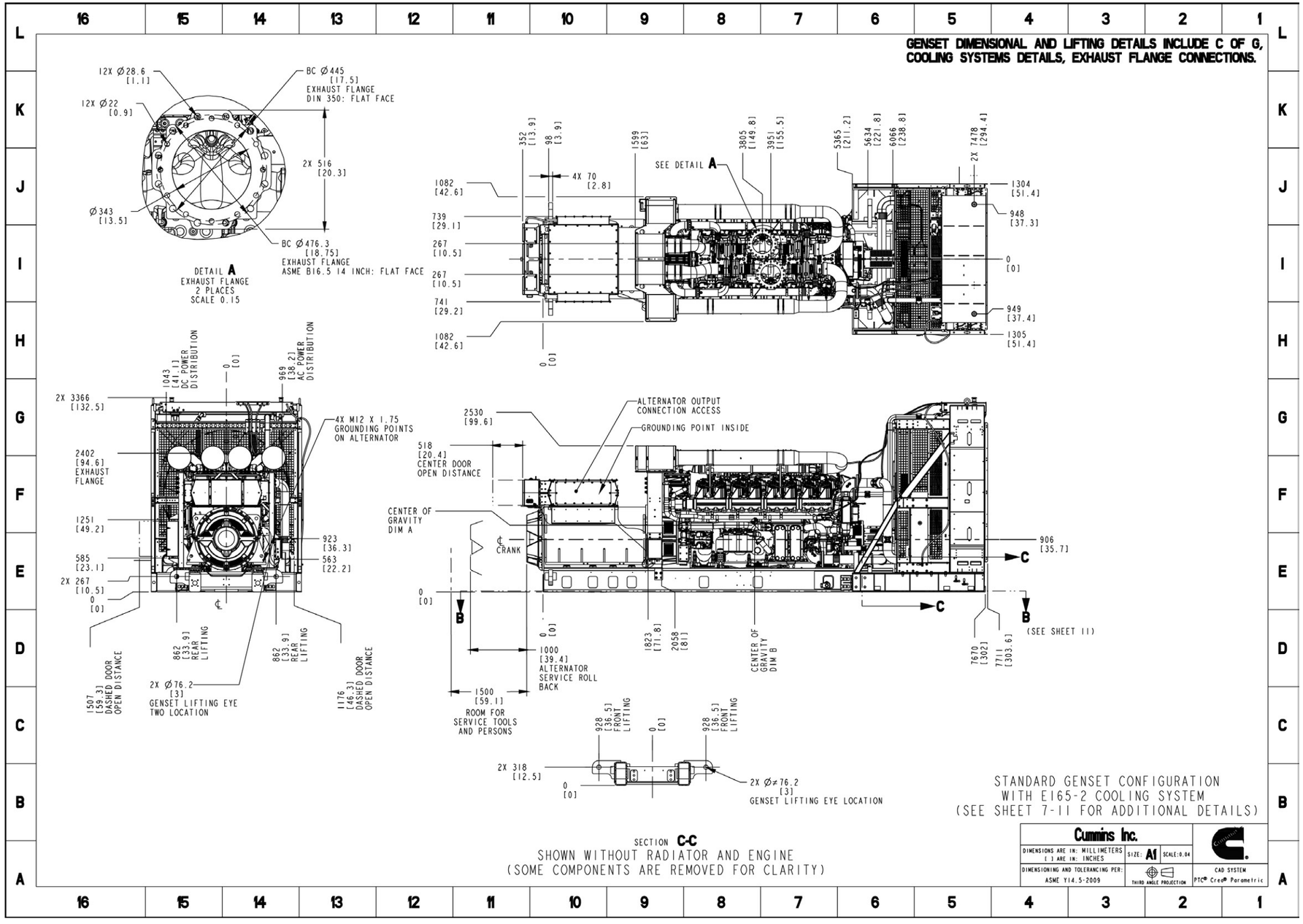


FIGURE 234. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 2 OF 11)

Copyright © 2025 Cummins Inc.

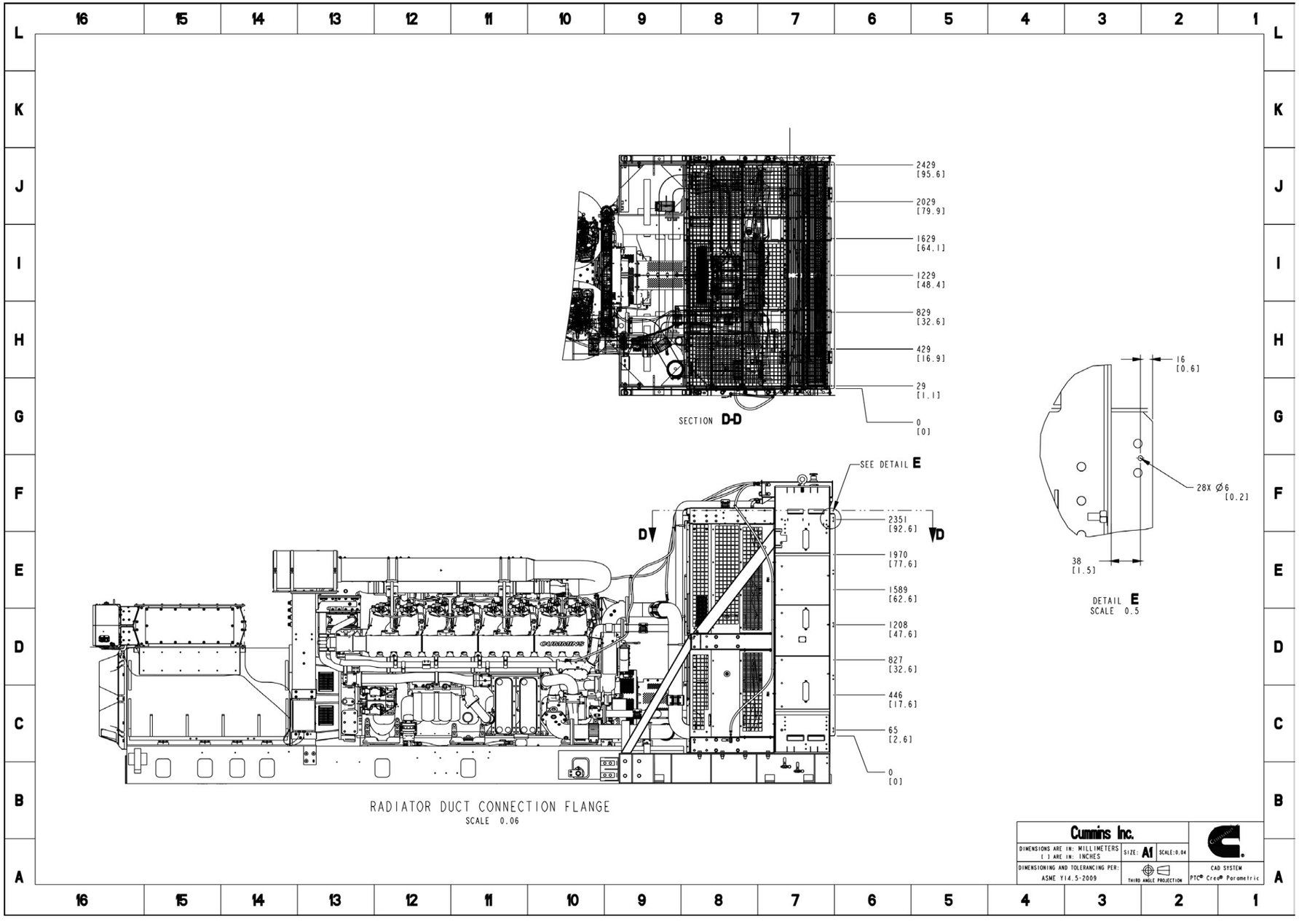


FIGURE 235. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 3 OF 11)

Copyright © 2025 Cummins Inc.

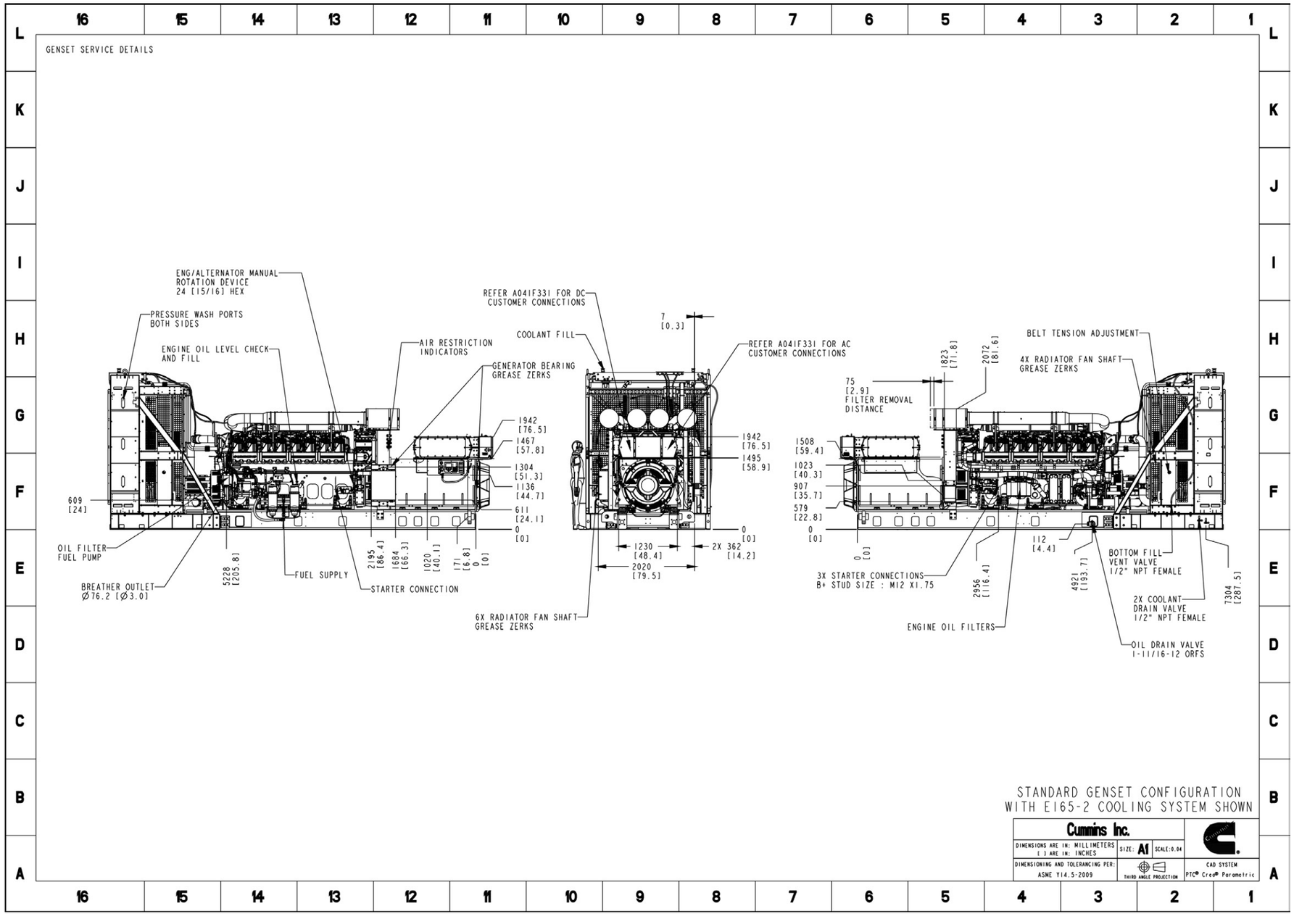


FIGURE 236. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 4 OF 11)

Copyright © 2025 Cummins Inc.

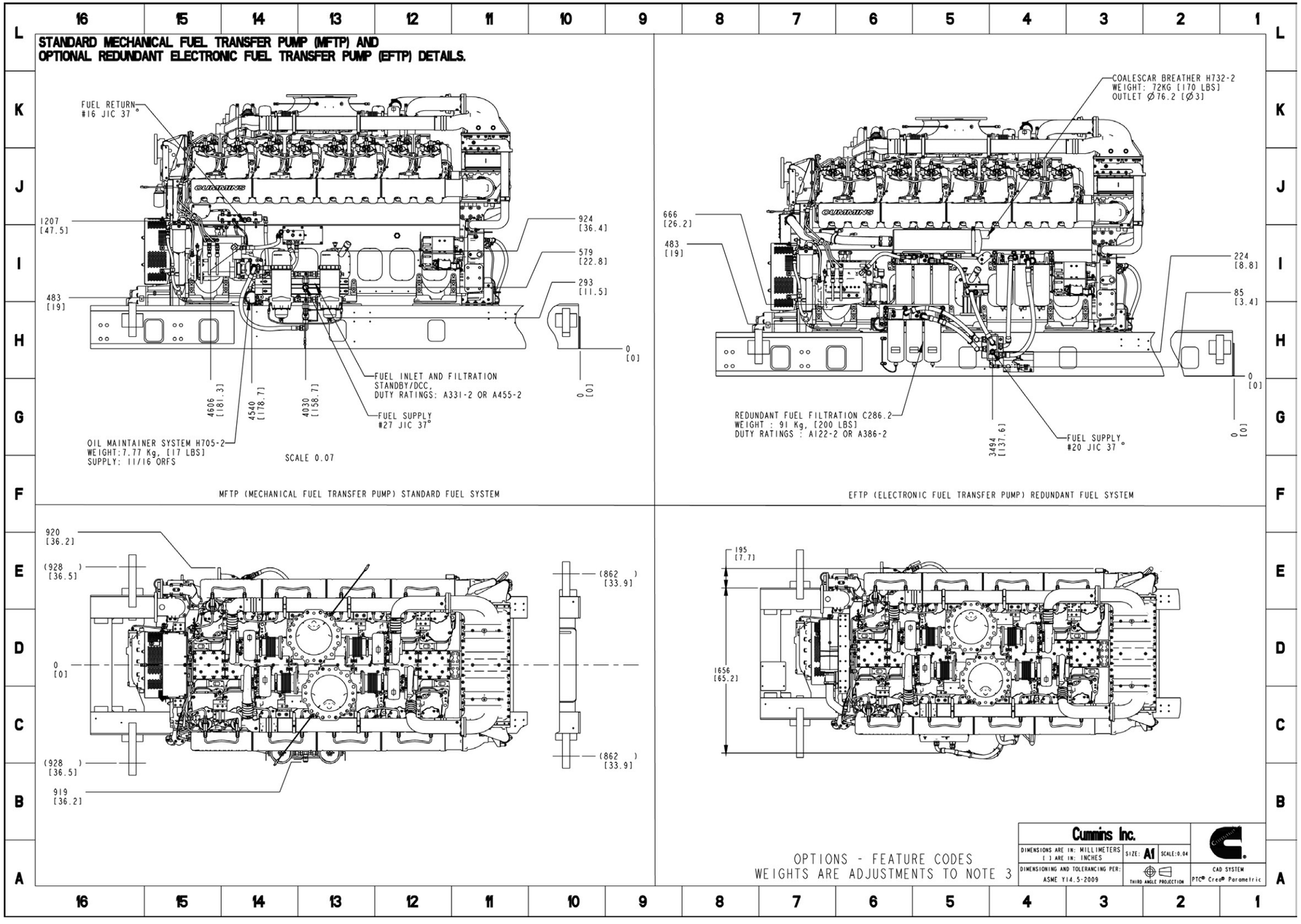


FIGURE 237. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 5 OF 11)

Copyright © 2025 Cummins Inc.

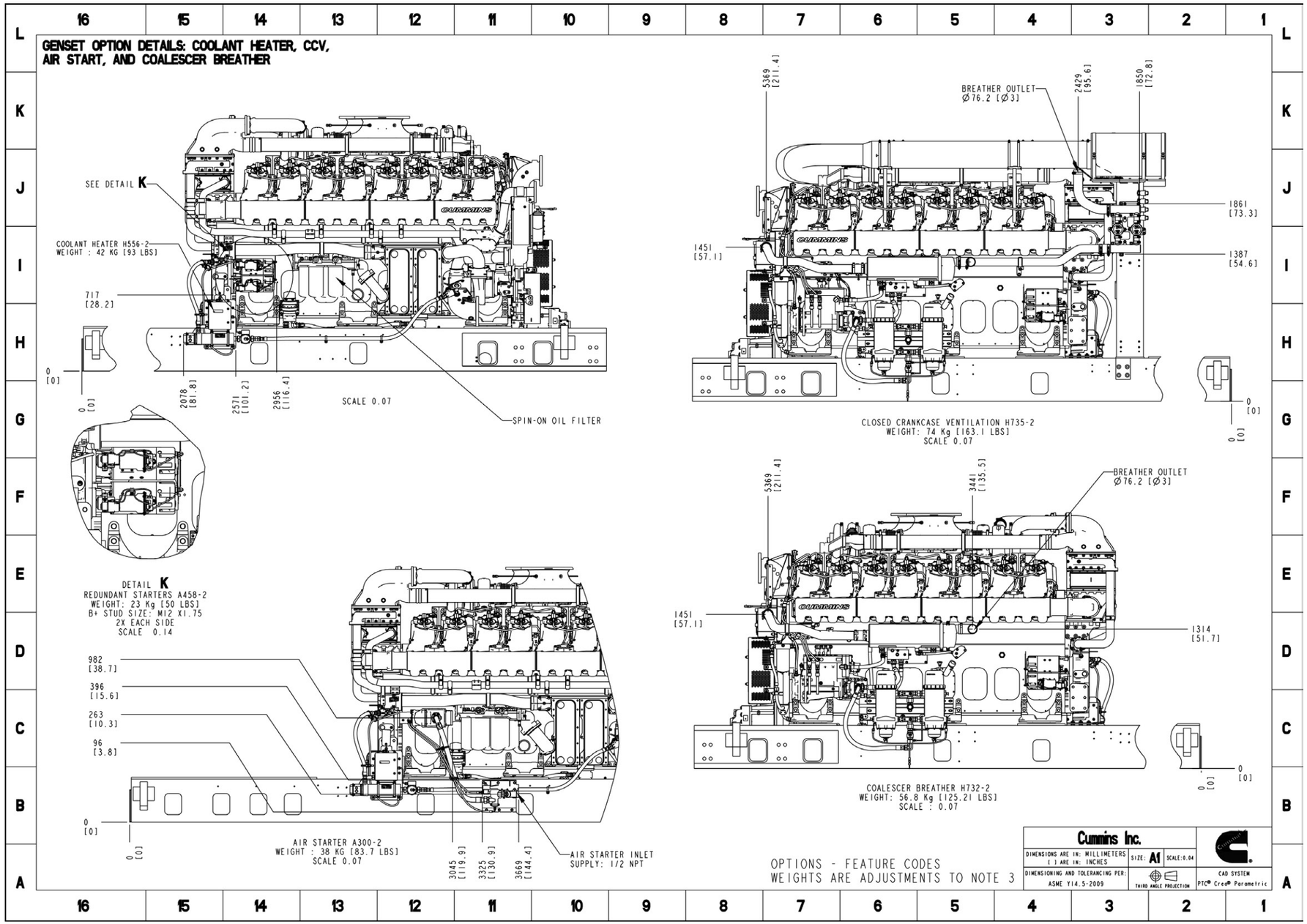


FIGURE 238. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 6 OF 11)

Copyright © 2025 Cummins Inc.

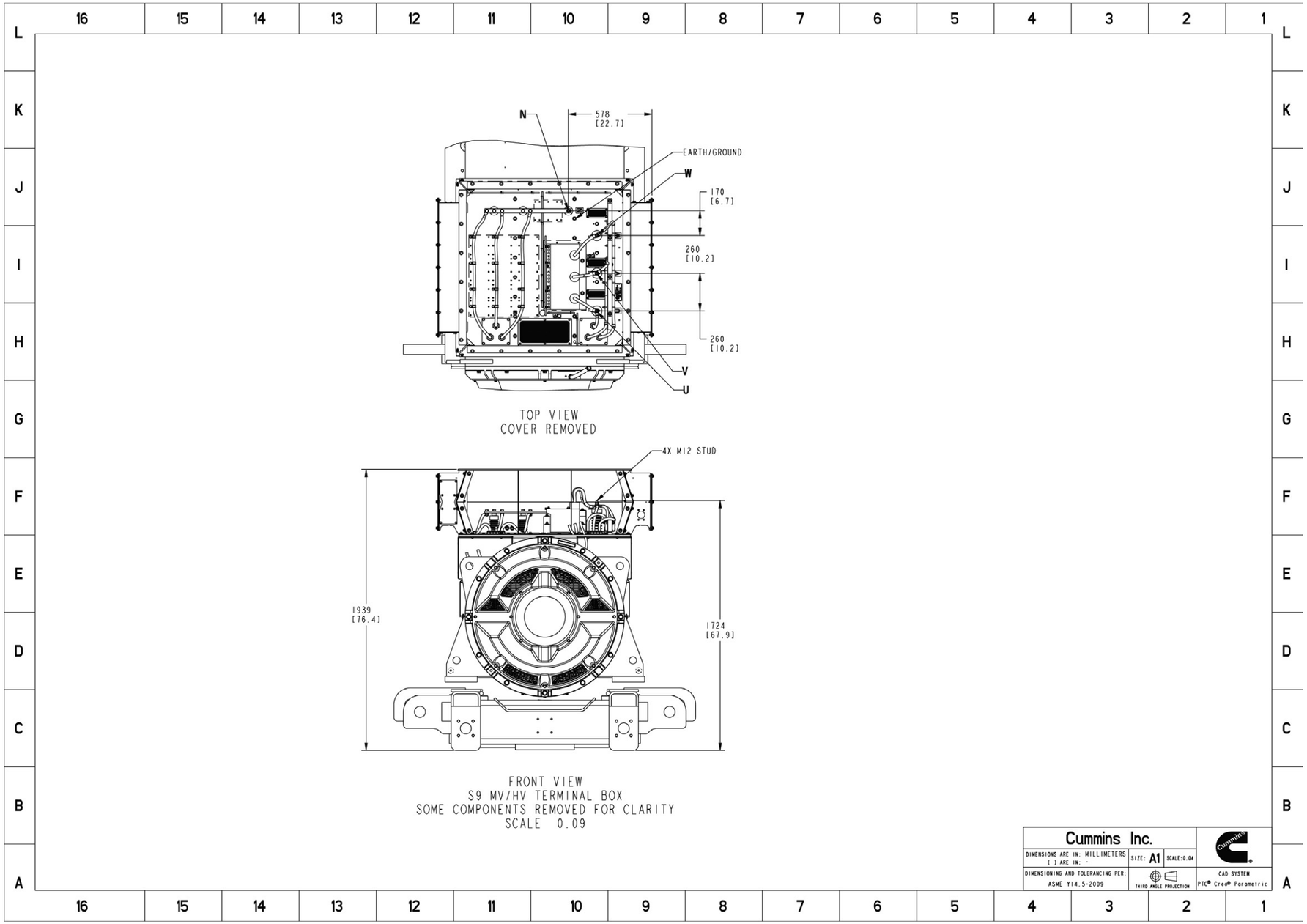


FIGURE 239. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 7 OF 11)

Copyright © 2025 Cummins Inc.

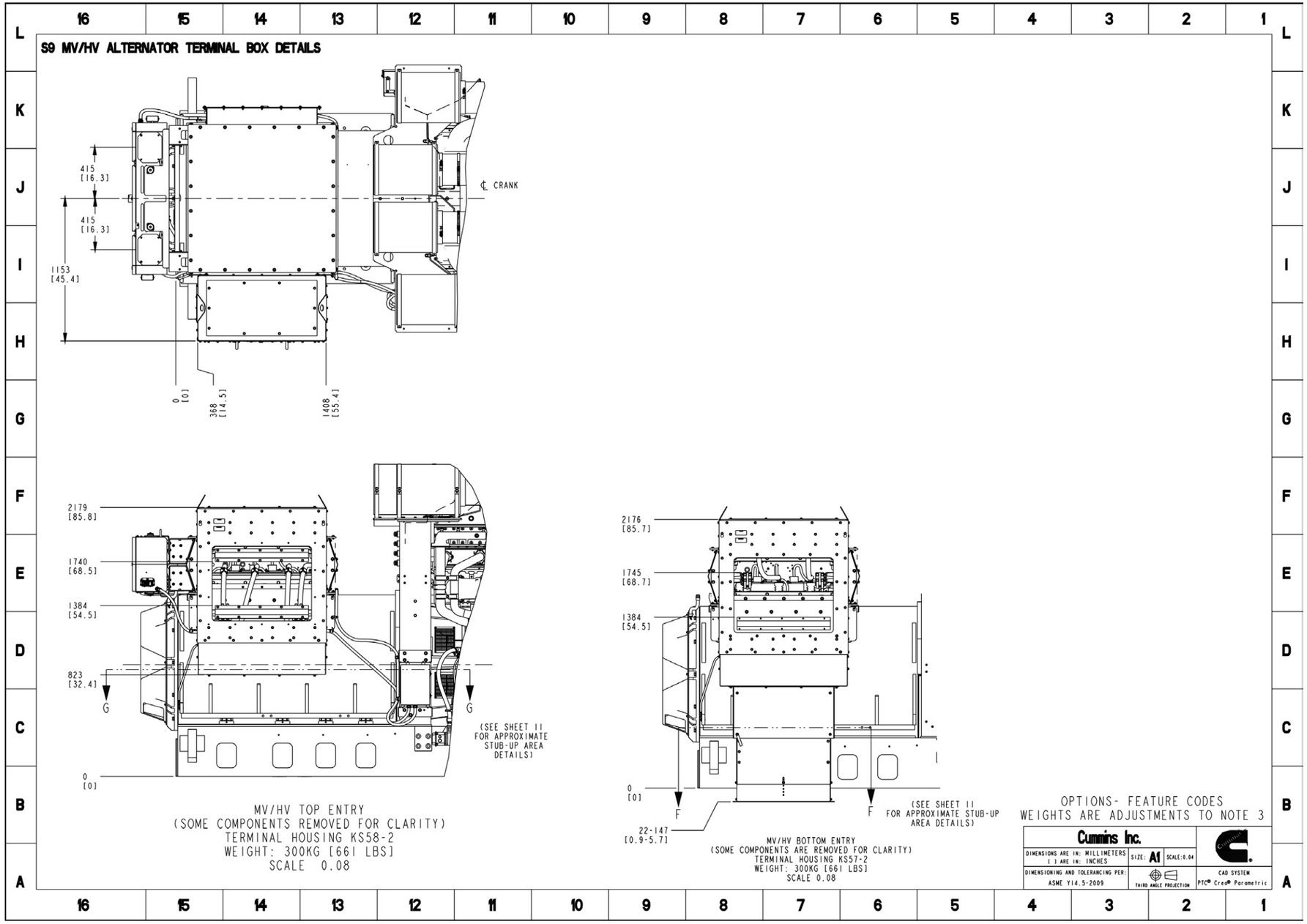


FIGURE 240. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 8 OF 11)

Copyright © 2025 Cummins Inc.

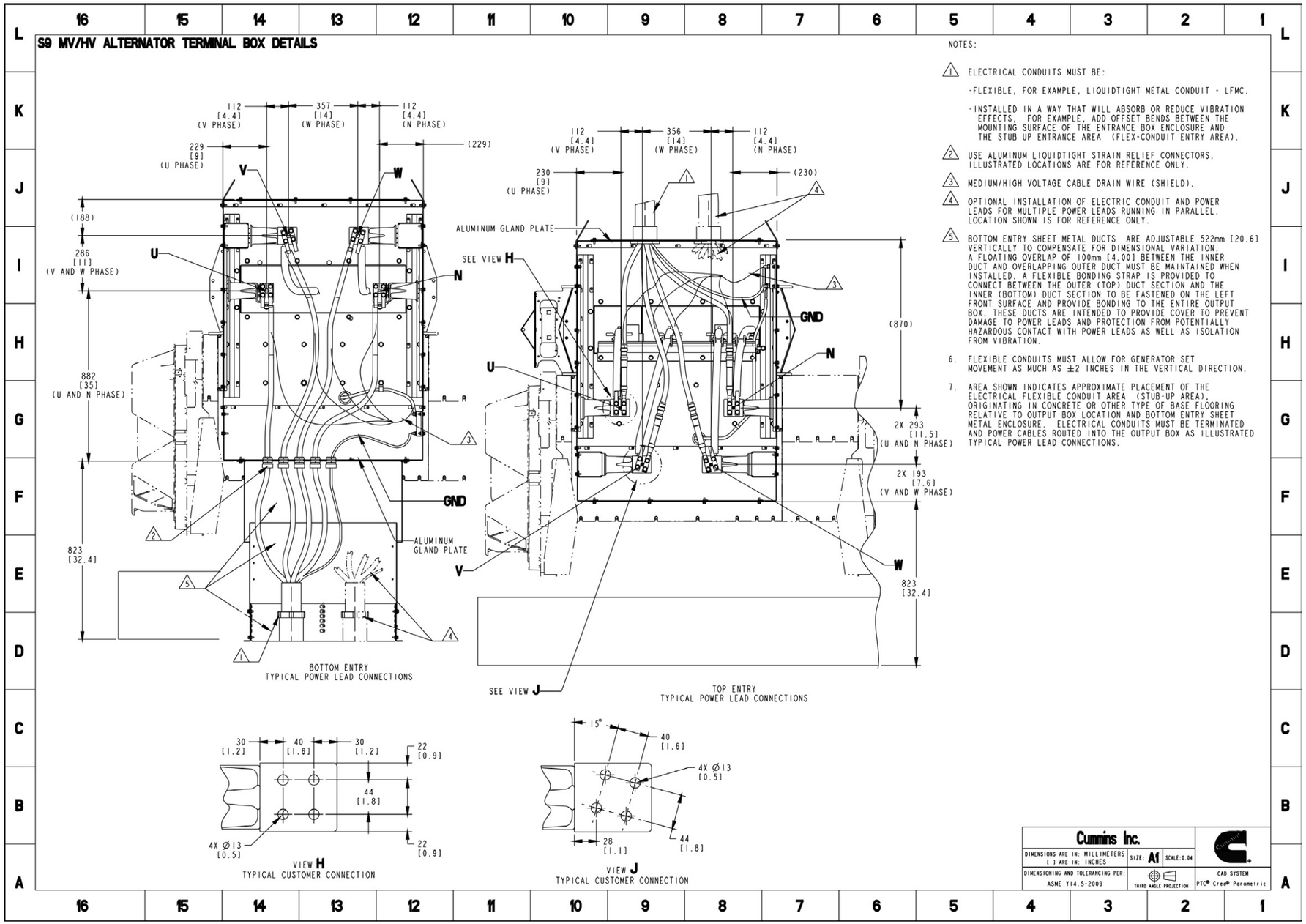


FIGURE 241. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 9 OF 11)

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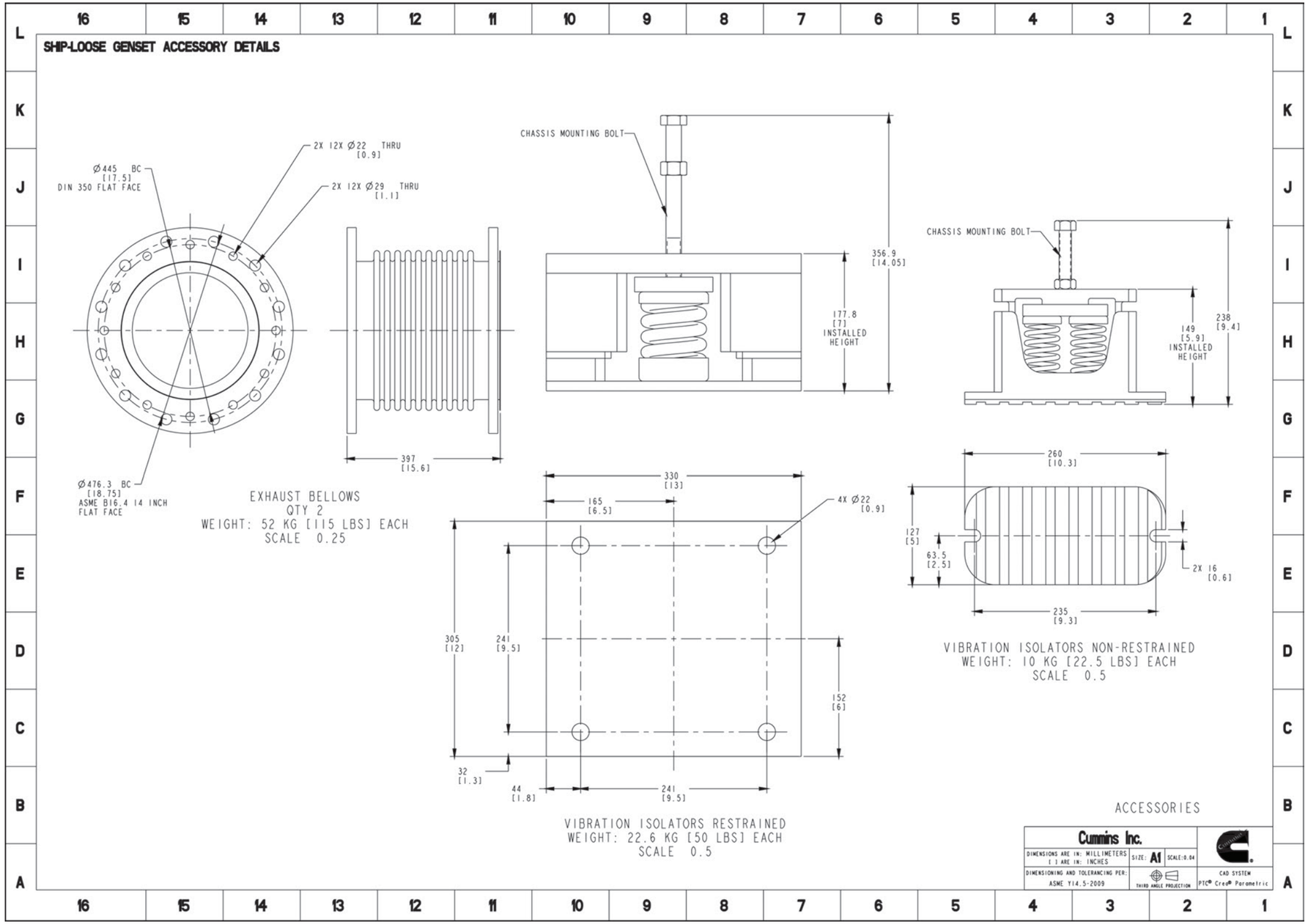


FIGURE 242. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 10 OF 11)

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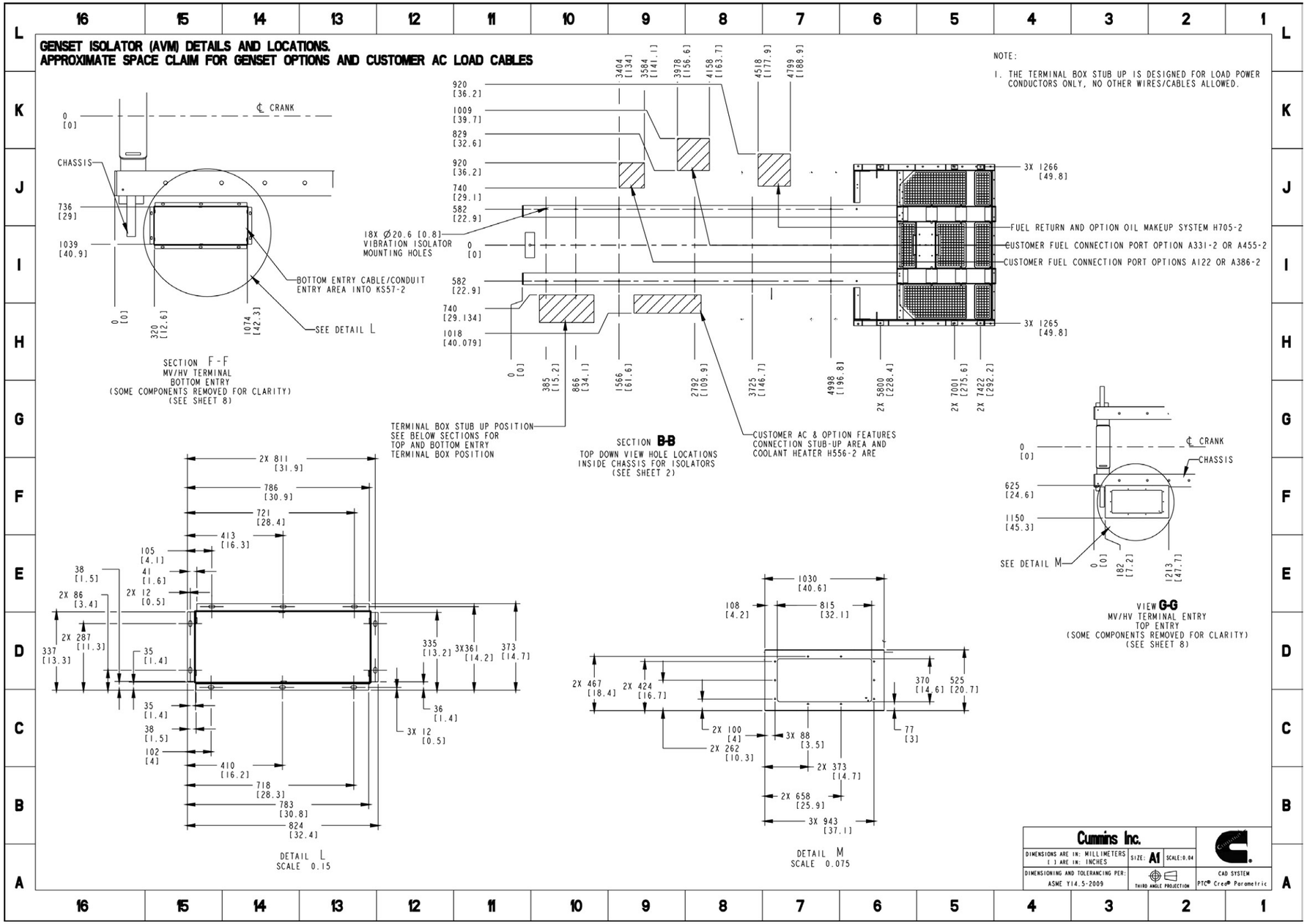


FIGURE 243. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 11 OF 11)

Copyright © 2025 Cummins Inc.

B.4 Outline Drawing A067M933 – Normal Duty Air Cleaner Without Radiator

ALTERNATOR	WINDING	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT* Kg [LBS]	C OF G DIM A* mm [Inch]	C OF G DIM B* mm [Inch]
S9MID-G42	851	7750 [17086]	24597 [54227]	1038 [40]	2875 [113]
S9HID-H42	991	8200 [18078]	25047 [55219]	1036 [40]	2831 [111]
S9HID-G42	991	7750 [17086]	24597 [54227]	1038 [40]	2875 [113]
S9HID-G42	961	7750 [17086]	24597 [54227]	1038 [40]	2875 [113]
S9HID-H42	961	8200 [18078]	25047 [55219]	1036 [40]	2831 [111]
S9HID-G42	983	7750 [17086]	24597 [54227]	1038 [40]	2875 [113]
S9HID-H42	983	8200 [18078]	25047 [55219]	1036 [40]	2831 [111]
S9MID-H42	851	8200 [18078]	25047 [55219]	1036 [40]	2831 [111]

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS WITH IMPERIAL INCH CONVERSIONS IN "[ ]".

1.1 IN EVENT OF A DISCREPANCY BETWEEN METRIC AND IMPERIAL DIMENSIONS, THE METRIC DIMENSIONS CONTROL.

2. ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCED.

3. WEIGHT: REFER TO TABLE FOR STANDARD GENSET

*3.1 INCLUDES WEIGHT OF 606 LITERS [160 GALLONS] SUPPLIED ENGINE OIL.(530 KG/1168 LBS)

3.2 DOES NOT INCLUDE NON- SUPPLIED 378.5 LITERS [100 GALLONS] OF ENGINE COOLANT CAPACITY

4. LARGEST NOMINAL DIMENSIONS:
4.1 LENGTH: 6422 [252.8]
4.2 WIDTH: 2164 [85.2]
4.3 HEIGHT: 2530 [99.6]
4.4 DOES NOT INCLUDE THE HEIGHT OF THE VIBRATION ISOLATOR

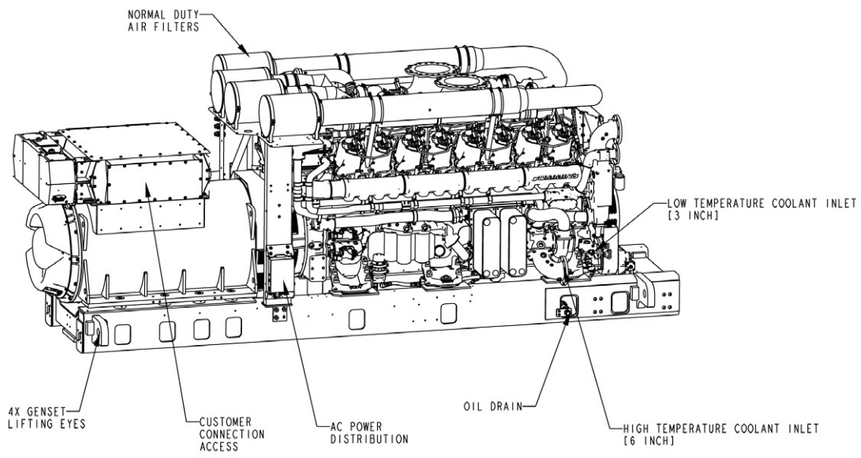
△5 LIFTING INSTRUCTIONS: REFER TO GENSET INSTALLATION MANUAL AND LIFTING LABEL.

5.1 GENSET SHALL NOT BE LIFTED USING THE LIFTING EYES WHEN ATTACHED TO THE RADIATOR. THEY ARE TO BE LIFTED SEPARATELY PER INSTALLATION MANUAL AND LIFTING DIAGRAMS.

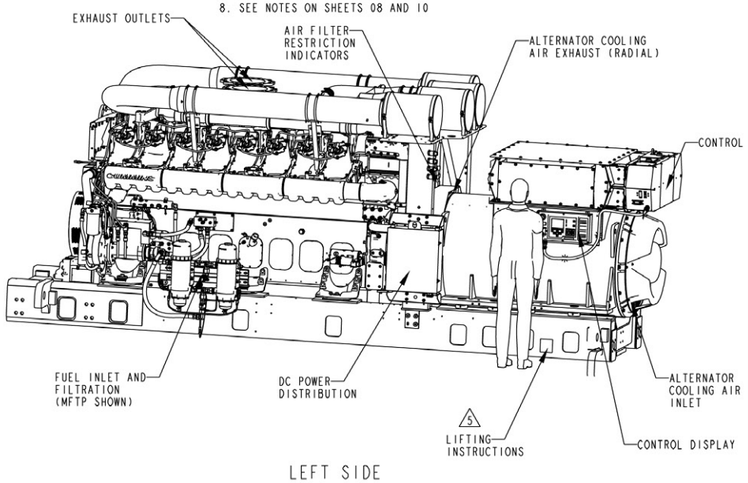
6. ALLOW 1 METER SPACE AROUND THE GENSET FOR SERVICE.

△7 ISOLATORS ARE MODELED IN THEIR UNCOMPRESSED STATE AND THEIR HEIGHT CHANGE UNDER LOAD MUST BE CONSIDERED FOR SITE CONNECTIONS. WHEN PROPERLY INSTALLED, STANDARD GENESET ISOLATORS WILL DEFLECT APPROXIMATELY 13 mm FROM THEIR UNCOMPRESSED HEIGHT. RESTRAINED ISOLATORS WILL INCREASE IN HEIGHT BY APPROXIMATELY 5 mm. CUSTOMER EXHAUST AND SITE CONNECTIONS SHALL BE CAPABLE OF ACCOMMODATING THIS RANGE.

8. SEE NOTES ON SHEETS 08 AND 10



RIGHT SIDE



LEFT SIDE

STANDARD GENSET CONFIGURATION WITH S9HID-H42 ALTERNATOR AND E127-2 (ENHANCED HIGH AMBIENT) COOLING SYSTEM SHOWN.

LAST DATUM LETTER USED: •	LAST REFERENCE LETTER USED:
MODEL/PLATFORM: C3250D6	THIS PART IS SIMILAR TO: A049P662
Cummins Inc.	
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES	SIZE: A1 SCALE: 0.04
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION
	CAD SYSTEM PTC® Creo® Parametric

FIGURE 244. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 1 OF 10)

Copyright © 2025 Cummins Inc.

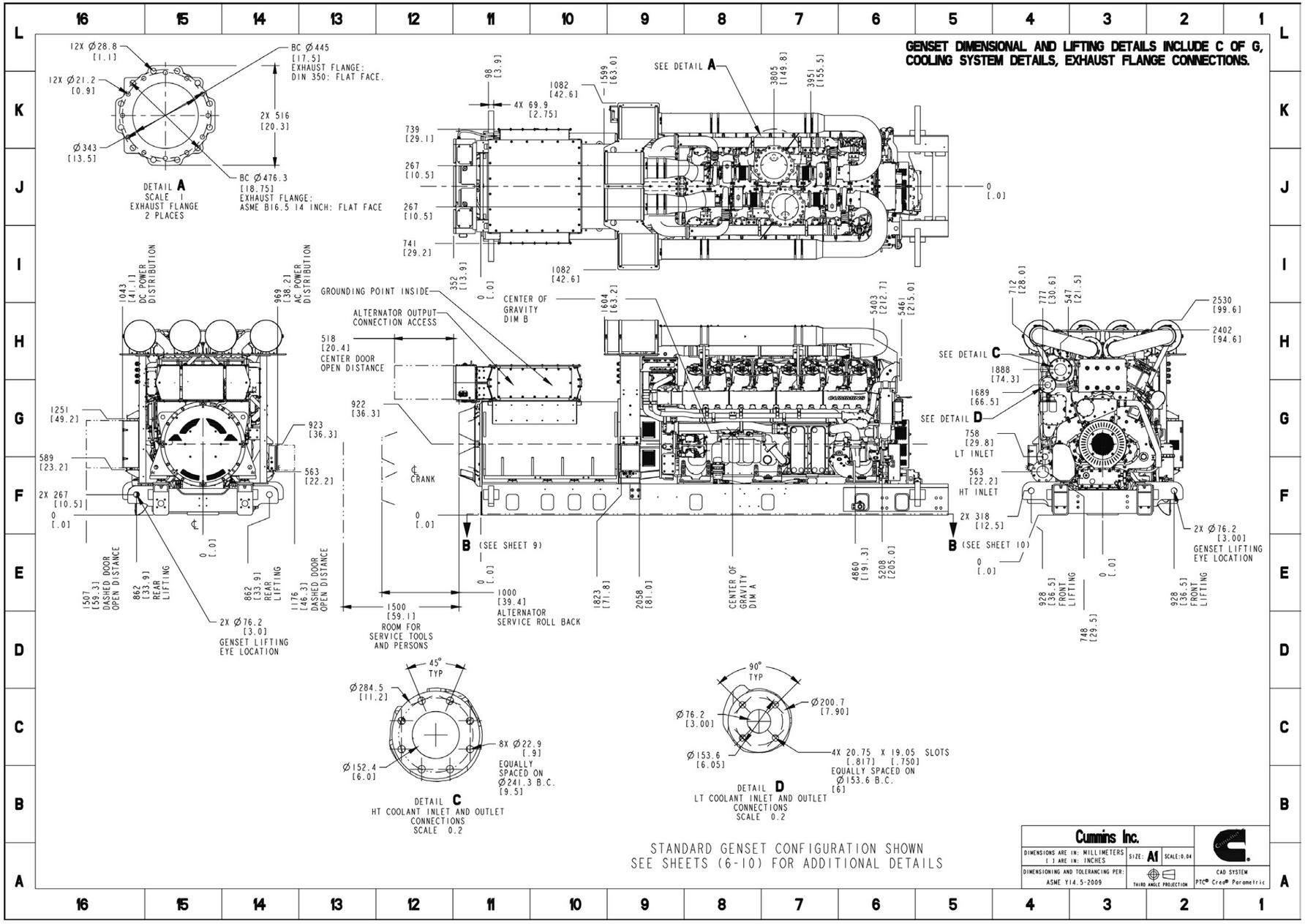


FIGURE 245. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 2 OF 10)

Copyright © 2025 Cummins Inc.

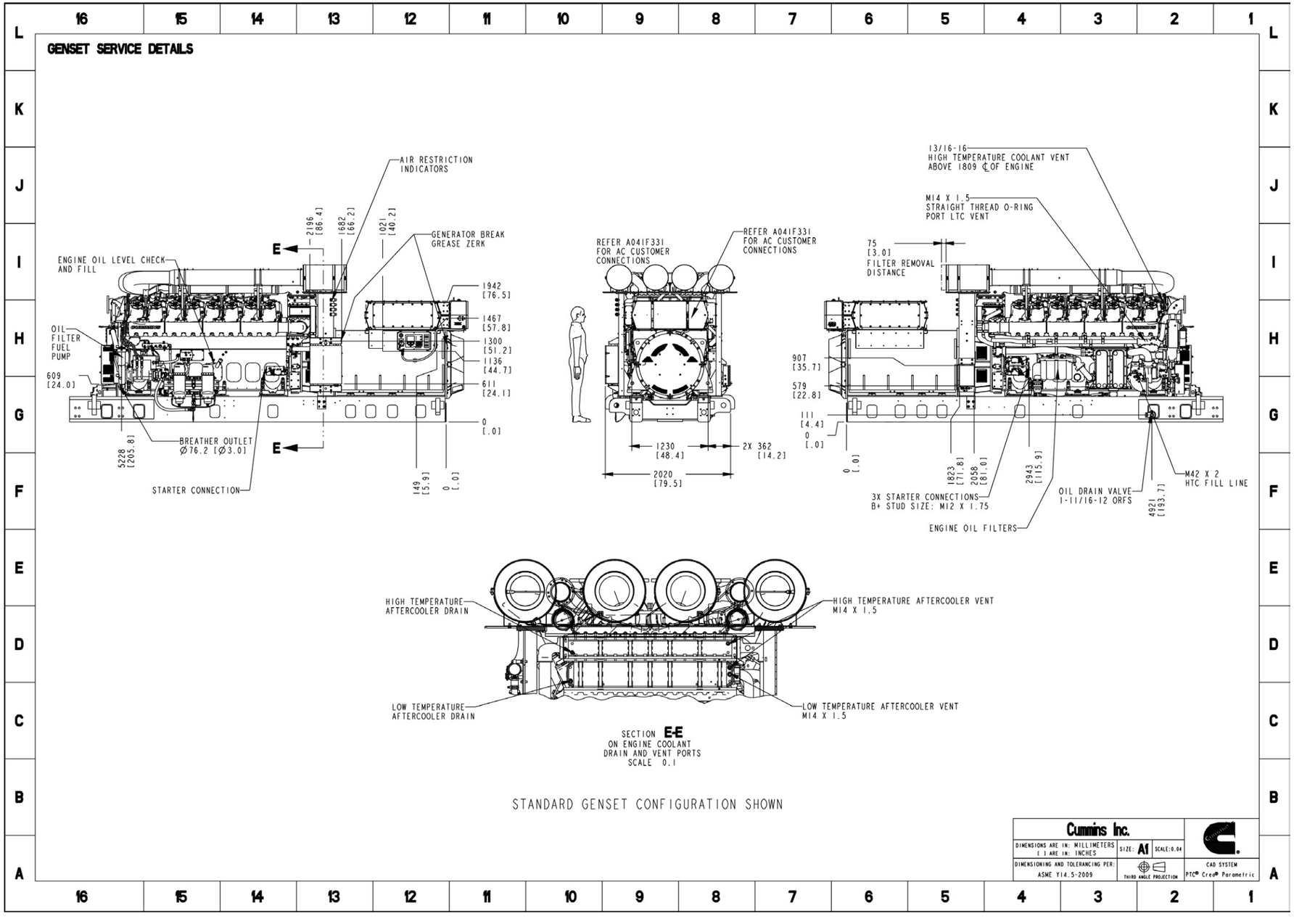


FIGURE 246. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 3 OF 10)

Copyright © 2025 Cummins Inc.

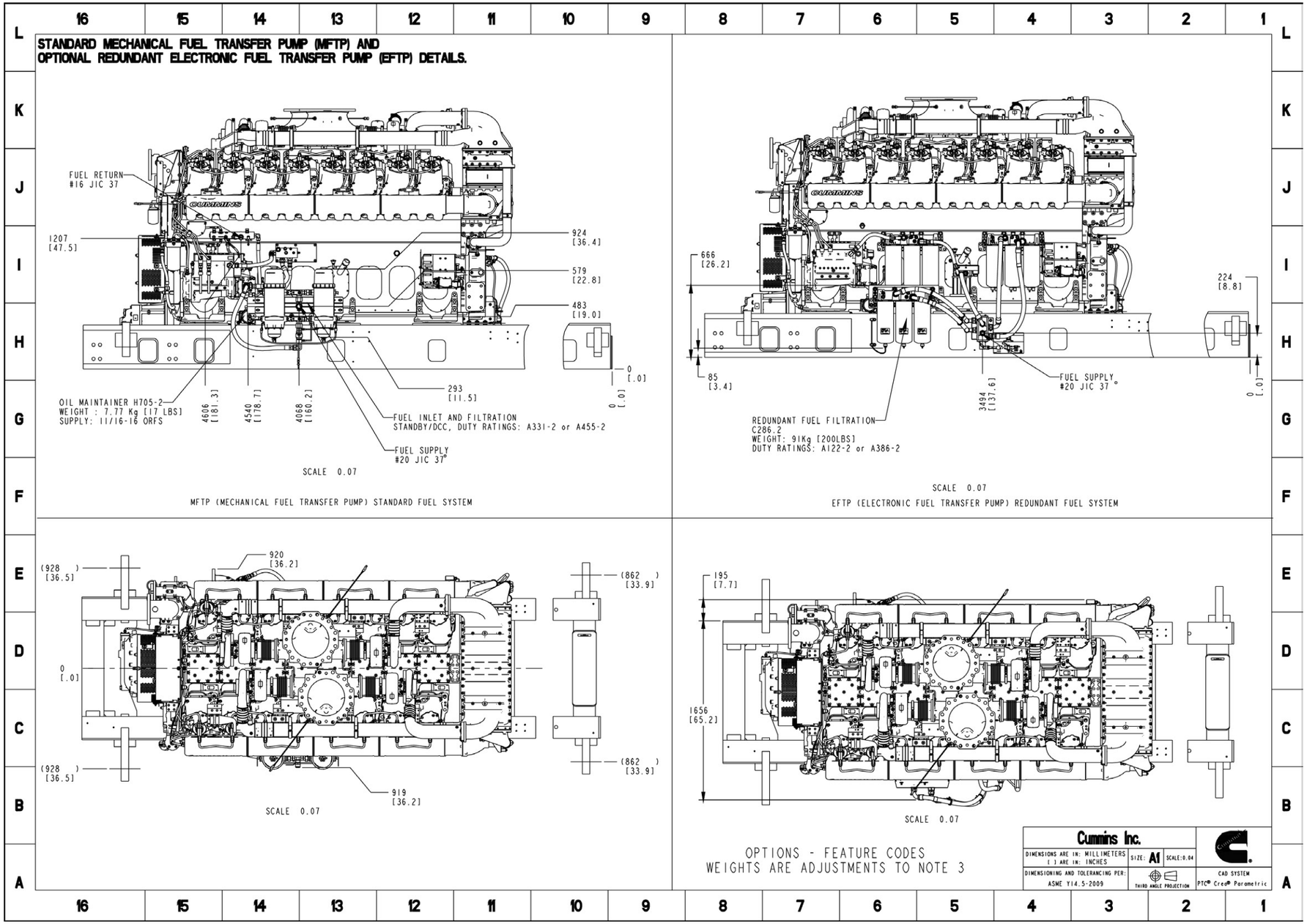


FIGURE 247. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 4 OF 10)

Copyright © 2025 Cummins Inc.

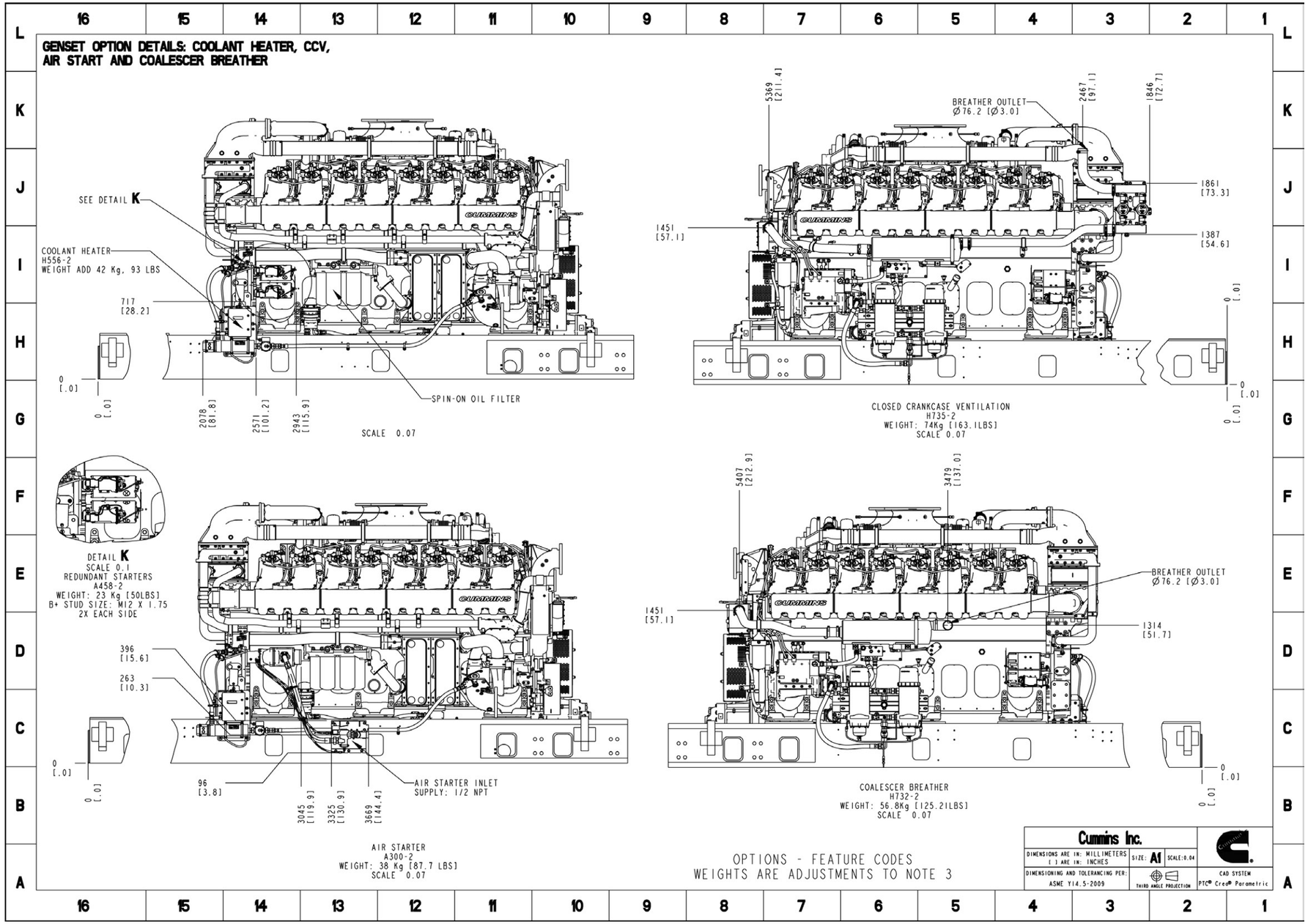


FIGURE 248. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 5 OF 10)

Copyright © 2025 Cummins Inc.

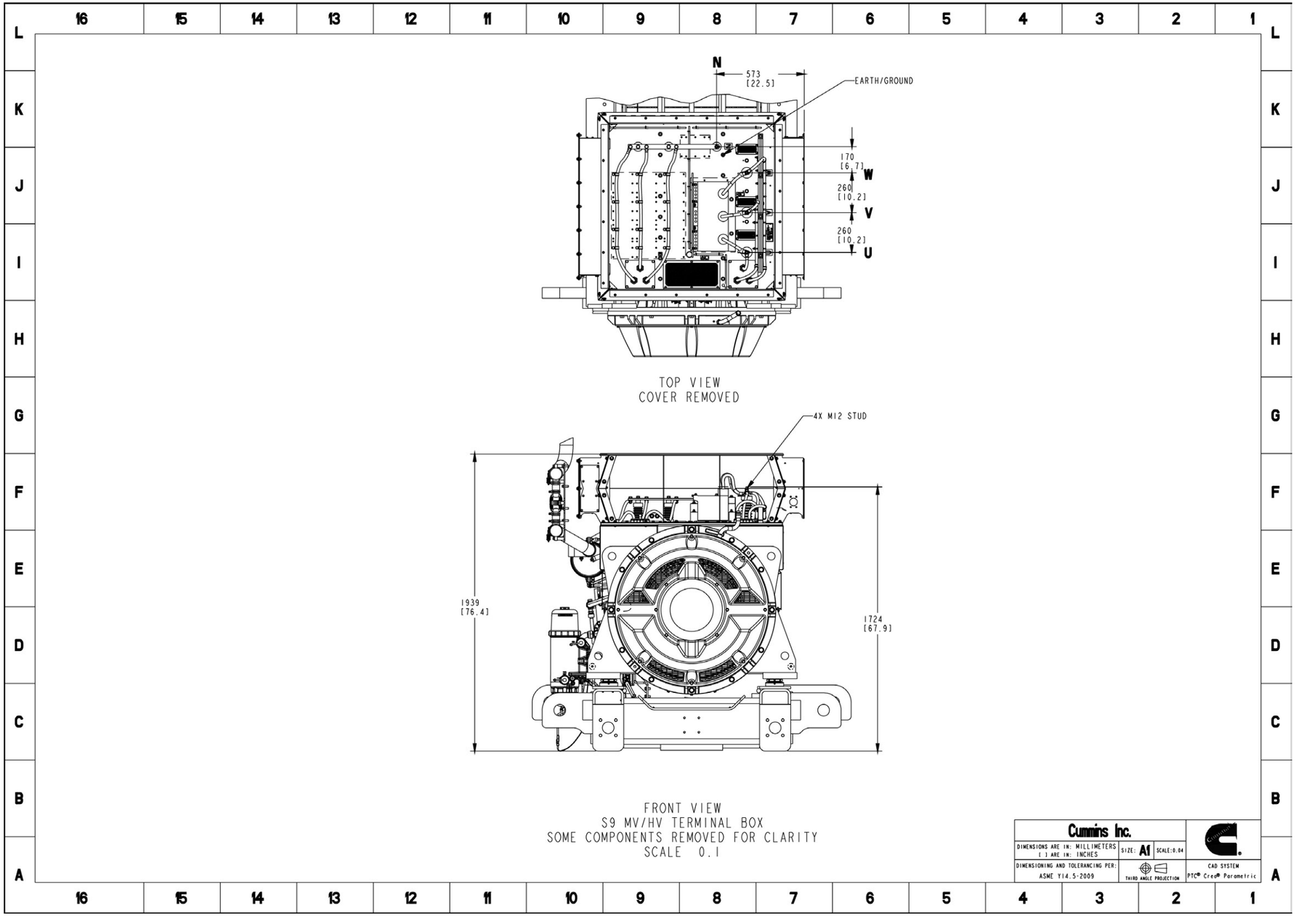


FIGURE 249. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 6 OF 10)

Copyright © 2025 Cummins Inc.

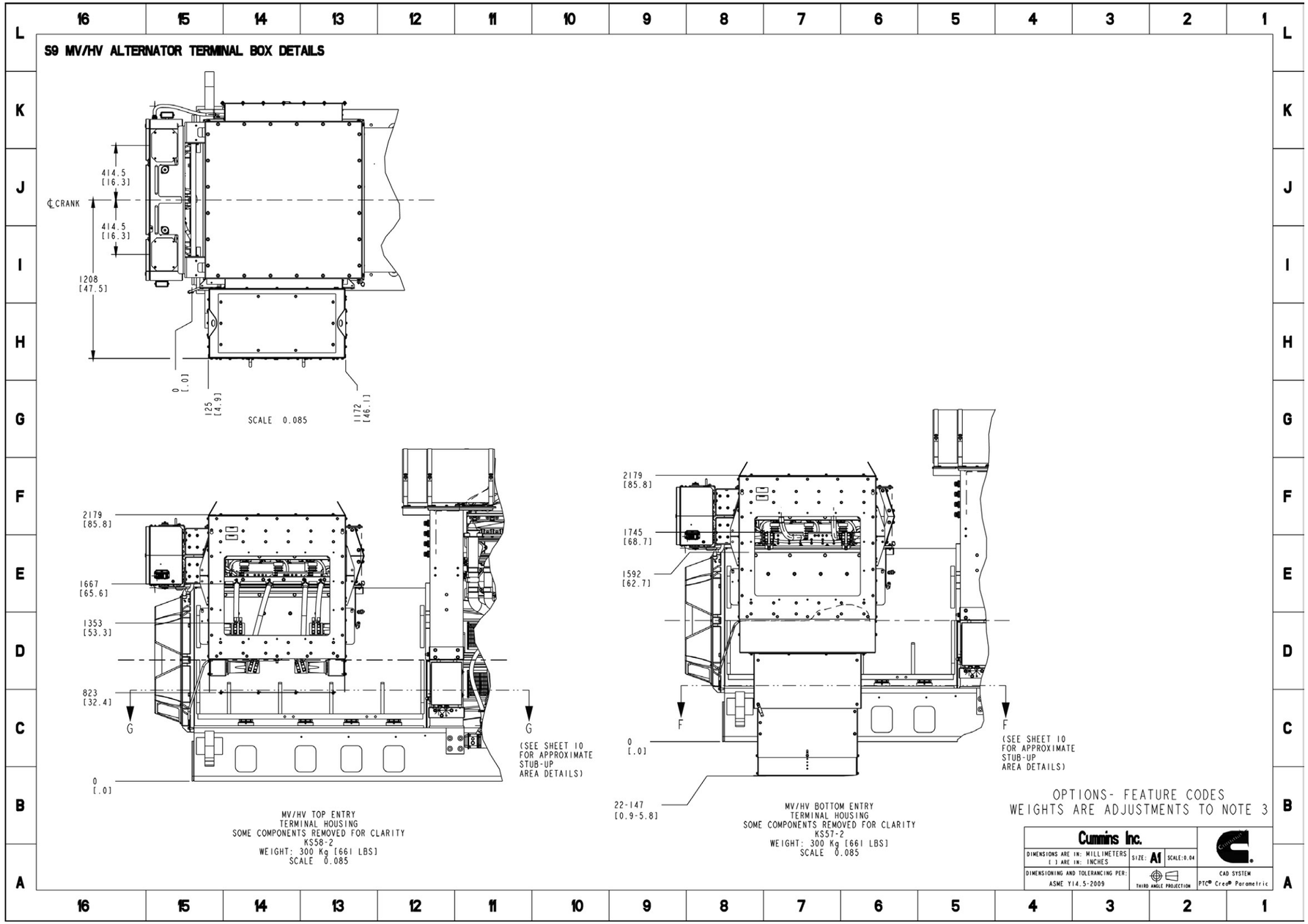


FIGURE 250. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 7 OF 10)

Copyright © 2025 Cummins Inc.

FIGURE 251. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 8 OF 10)

Copyright © 2025 Cummins Inc.

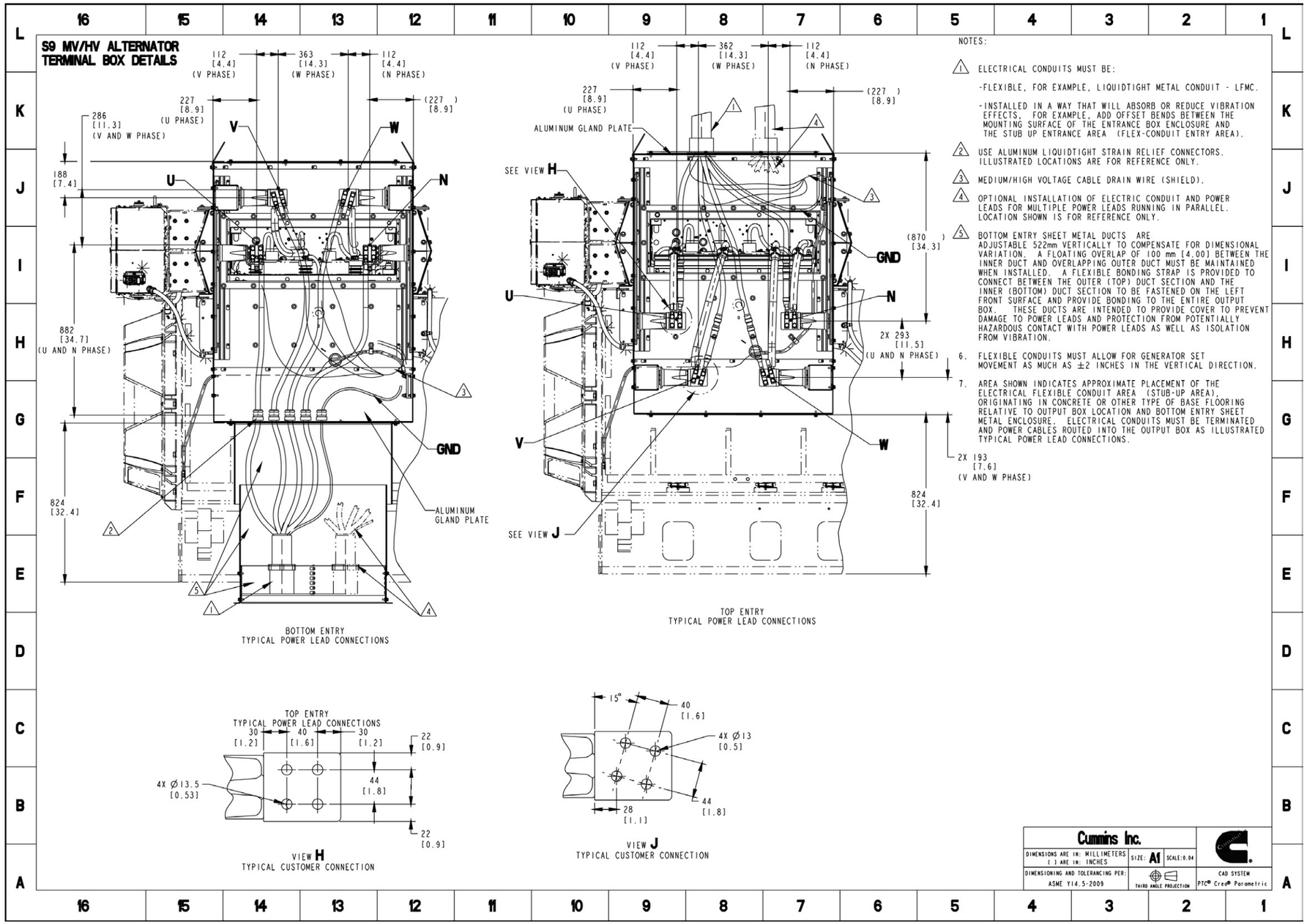


FIGURE 252. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 8 OF 10)

Copyright © 2025 Cummins Inc.

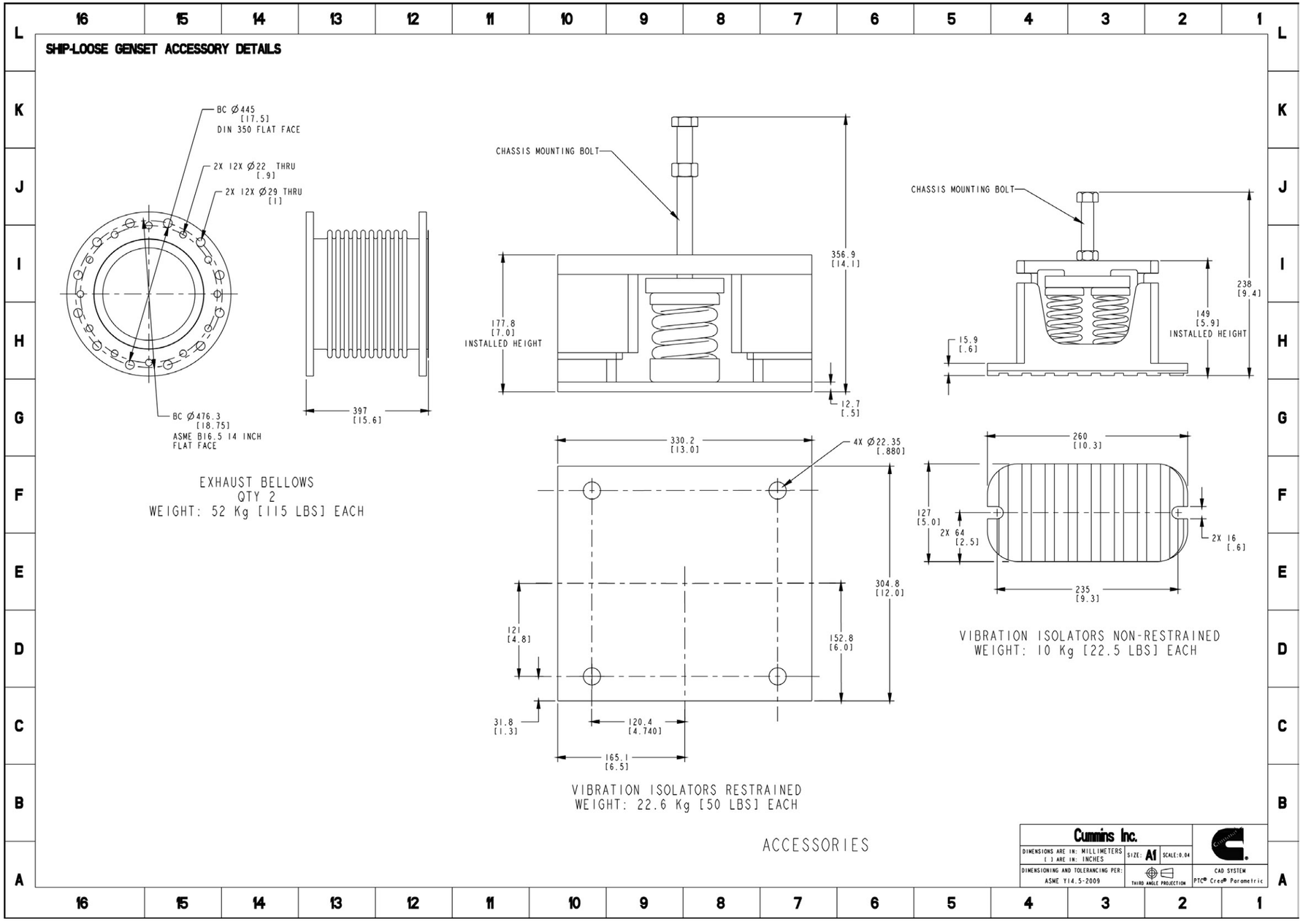


FIGURE 253. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 9 OF 10)

Copyright © 2025 Cummins Inc.

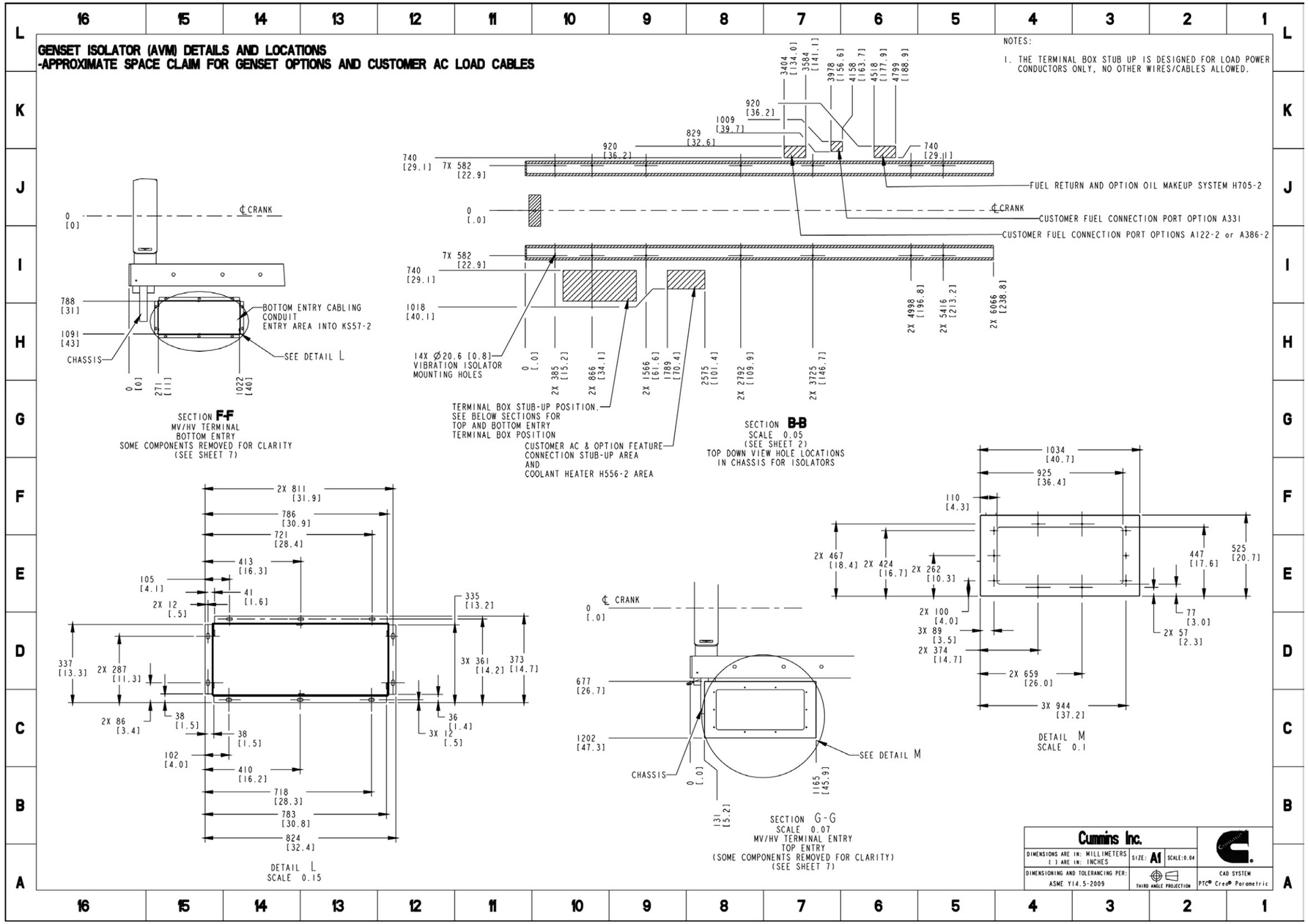


FIGURE 254. OUTLINE DRAWING – NORMAL DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 10 OF 10)

Copyright © 2025 Cummins Inc.

B.5 Outline Drawing A067U304 – Heavy Duty Air Cleaner and 94 Square Foot Radiator

ALTERNATOR	WINDING	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT WITH NO RADIATOR* Kg [LBS]	GENSET WEIGHT WITH RADIATOR* Kg [LBS]	C OF G WITH RADIATOR DIM A (SHEET 2)* mm [Inch]	C OF G WITH RADIATOR DIM B (SHEET 2)* mm [Inch]	C OF G WITHOUT RADIATOR DIM A* mm [Inch]	C OF G WITHOUT RADIATOR DIM B* mm [Inch]
S9MID-G42	851	7750 [17086]	24897 [54888]	31423 [69276]	1153 [45]	3751 [147]	1049 [41]	2853 [112]
S9HID-H42	991	8200 [18078]	25347 [55881]	31873 [70268]	1149 [45]	3705 [145]	1046 [41]	2811 [110]
S9HID-G42	991	7750 [17086]	24897 [54888]	31423 [69276]	1153 [45]	3751 [147]	1049 [41]	2853 [112]
S9HID-G42	961	7750 [17086]	24897 [54888]	31423 [69276]	1153 [45]	3751 [147]	1049 [41]	2853 [112]
S9HID-H42	961	8200 [18078]	25347 [55881]	31873 [70268]	1149 [45]	3705 [145]	1046 [41]	2811 [110]
S9HID-G42	983	7750 [17086]	24897 [54888]	31423 [69276]	1153 [45]	3751 [147]	1049 [41]	2853 [112]
S9HID-H42	983	8200 [18078]	25347 [55881]	31873 [70268]	1149 [45]	3705 [145]	1046 [41]	2811 [110]
S9MID-H42	851	8200 [18078]	25347 [55881]	31873 [70268]	1149 [45]	3705 [145]	1046 [41]	2811 [110]

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS WITH IMPERIAL INCH CONVERSIONS IN "[]".
   1.1 IN EVENT OF A DISCREPANCY BETWEEN METRIC AND IMPERIAL DIMENSIONS, THE METRIC DIMENSIONS CONTROL.
2. ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCED.
3. WEIGHT: REFER TO TABLE FOR STANDARD GENSET WITH E127-2 (ENHANCED HIGH AMBIENT) COOLING SYSTEM.
   *3.1 INCLUDES WEIGHT OF 606 LITERS [160 GALLONS] SUPPLIED ENGINE OIL.(530 Kg/1168 LBS)
   **3.2 INCLUDES DRY WEIGHT OF RADIATOR 5130 Kg [11310 LBS] (SHIPS LOOSE)
   **3.3 INCLUDES WEIGHT FOR 1196 LITERS [316 GALLONS] OF NON-SUPPLIED COOLANT. (1216 Kg/2780 LBS)
4. LARGEST NOMINAL DIMENSIONS:
   4.1 LENGTH 8311 [327.2]
   4.2 WIDTH 3172 [124.9] RADIATOR
   4.3 HEIGHT 3791 [149.3] TOP OF RADIATOR CAP
   4.4 DOES NOT INCLUDE THE HEIGHT OF THE VIBRATION ISOLATOR

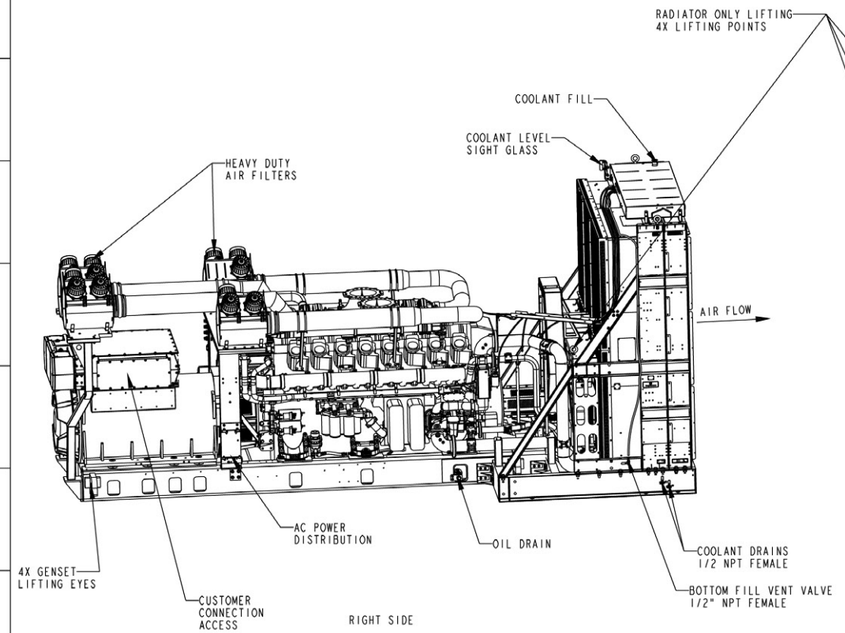
△5 LIFTING INSTRUCTIONS: REFER TO GENSET INSTALLATION MANUAL AND LIFTING LABEL

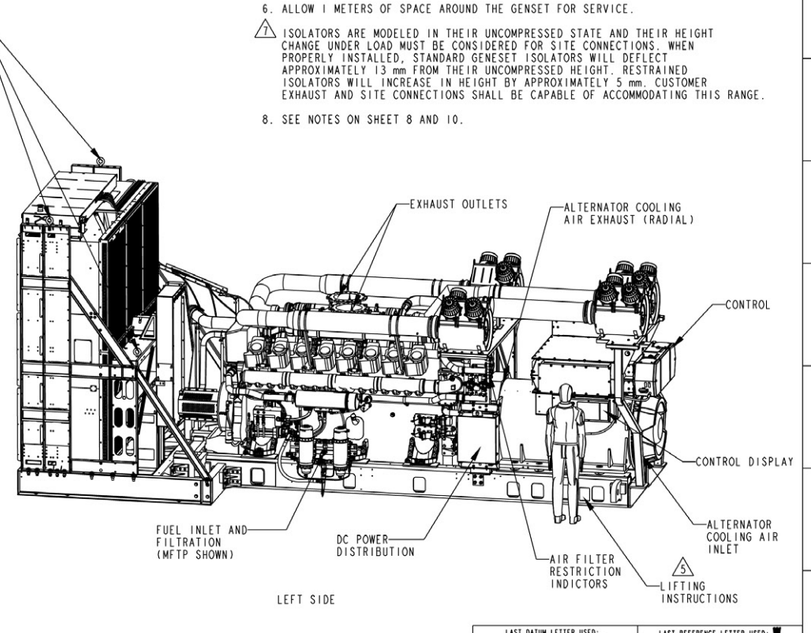
5.1 GENSET SHALL NOT BE LIFTED USING THE LIFTING EYES WHEN ATTACHED TO THE RADIATOR. RADIATOR AND GENSET SHALL ALWAYS BE LIFTED SEPARATELY PER INSTALLATION MANUAL AND LIFTING DIAGRAMS.

6. ALLOW 1 METERS OF SPACE AROUND THE GENSET FOR SERVICE.

△7 ISOLATORS ARE MODELED IN THEIR UNCOMPRESSED STATE AND THEIR HEIGHT CHANGE UNDER LOAD MUST BE CONSIDERED FOR SITE CONNECTIONS. WHEN PROPERLY INSTALLED, STANDARD GENESET ISOLATORS WILL DEFLECT APPROXIMATELY 13 mm FROM THEIR UNCOMPRESSED HEIGHT. RESTRAINED ISOLATORS WILL INCREASE IN HEIGHT BY APPROXIMATELY 5 mm. CUSTOMER EXHAUST AND SITE CONNECTIONS SHALL BE CAPABLE OF ACCOMMODATING THIS RANGE.

8. SEE NOTES ON SHEET 8 AND 10.





STANDARD GENSET CONFIGURATION WITH S9HID-H42 ALTERNATOR, E127-2 (ENHANCED HIGH AMBIENT) COOLING SYSTEM AND D036-2 SHOWN

LAST DATUM LETTER USED: A	LAST REFERENCE LETTER USED: W
MODEL/PLATFORM: C325D6	THIS PART IS SIMILAR TO: A045P692
Cummins Inc.	
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES	SIZE: A1 SCALE:0.04
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION
	CAD SYSTEM PTC® Creo® Parametric

FIGURE 255. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER AND 94 SQUARE FOOT RADIATOR (SHEET 1 OF 10)

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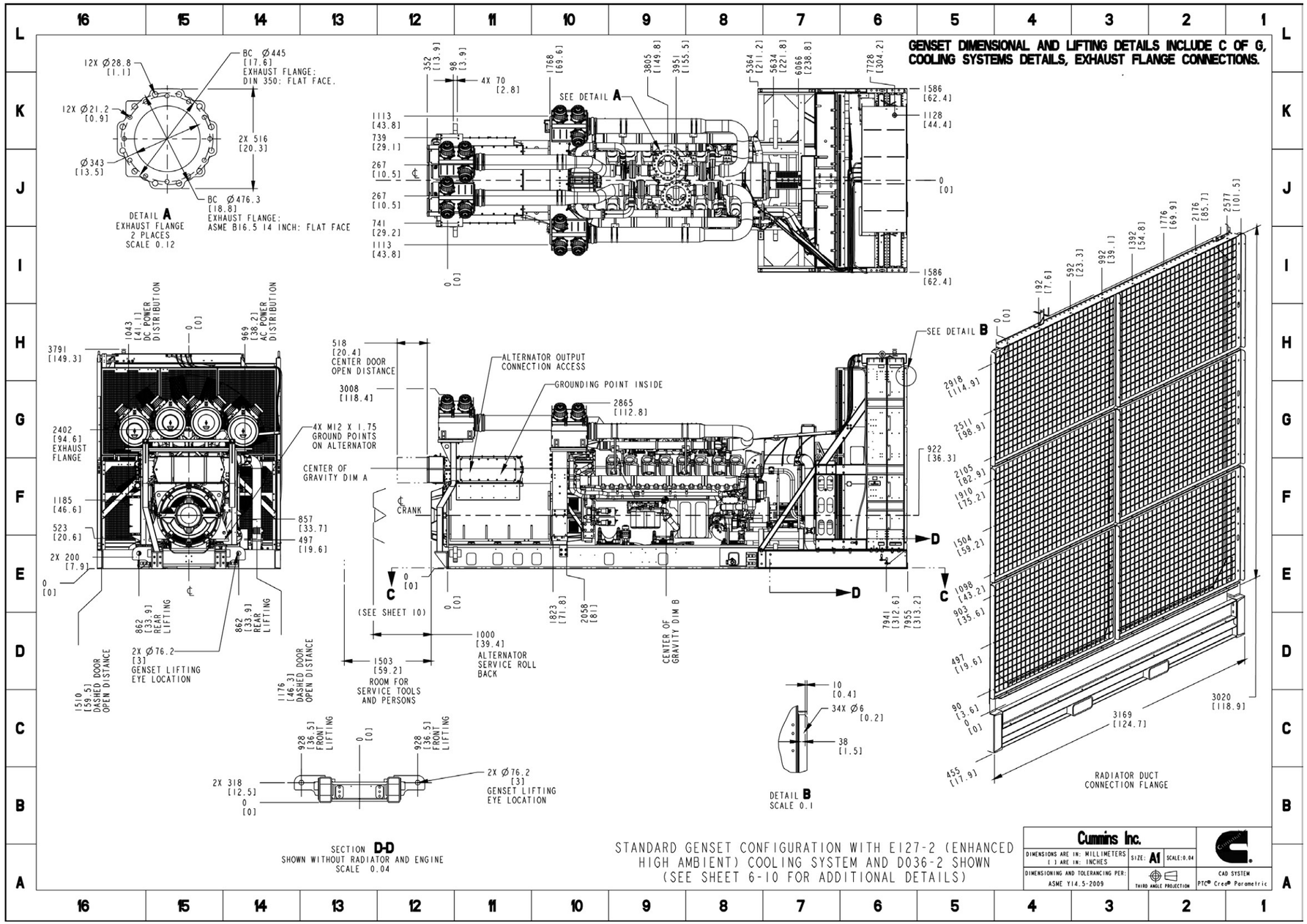


FIGURE 256. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER AND 94 SQUARE FOOT RADIATOR (SHEET 2 OF 10)

Copyright © 2025 Cummins Inc.

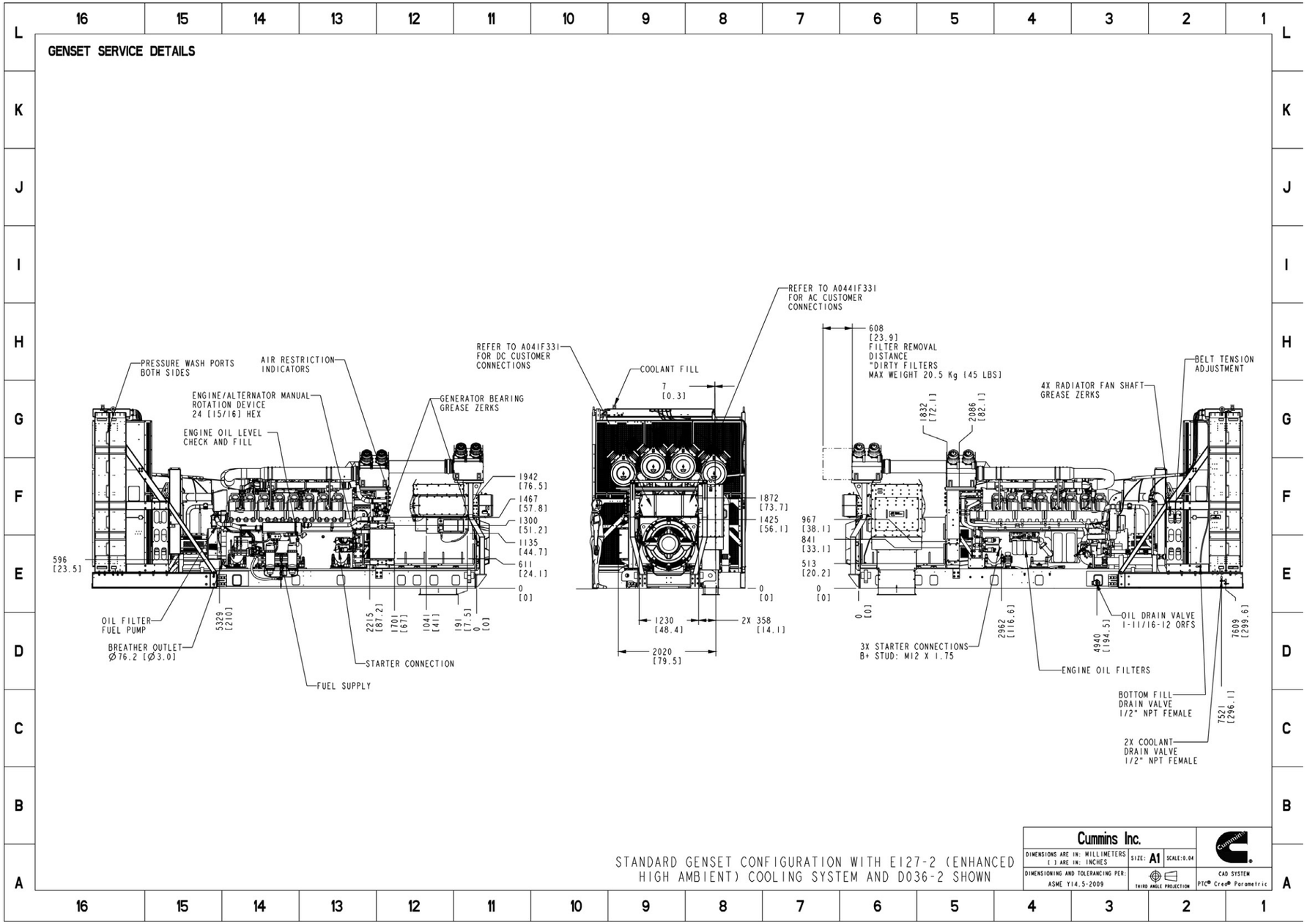


FIGURE 257. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER AND 94 SQUARE FOOT RADIATOR (SHEET 3 OF 10)

Copyright © 2025 Cummins Inc.

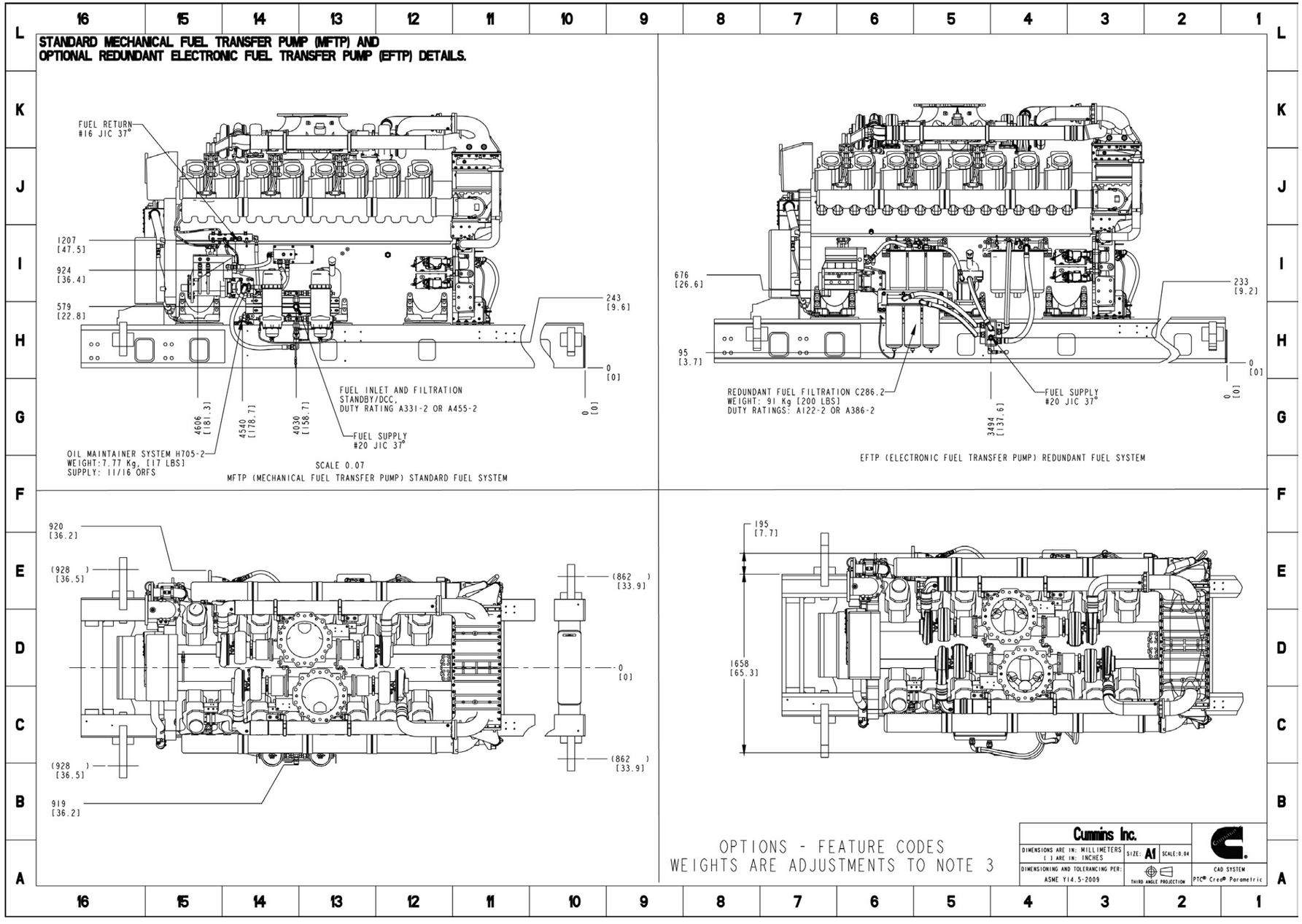


FIGURE 258. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER AND 94 SQUARE FOOT RADIATOR (SHEET 4 OF 10)

Copyright © 2025 Cummins Inc.

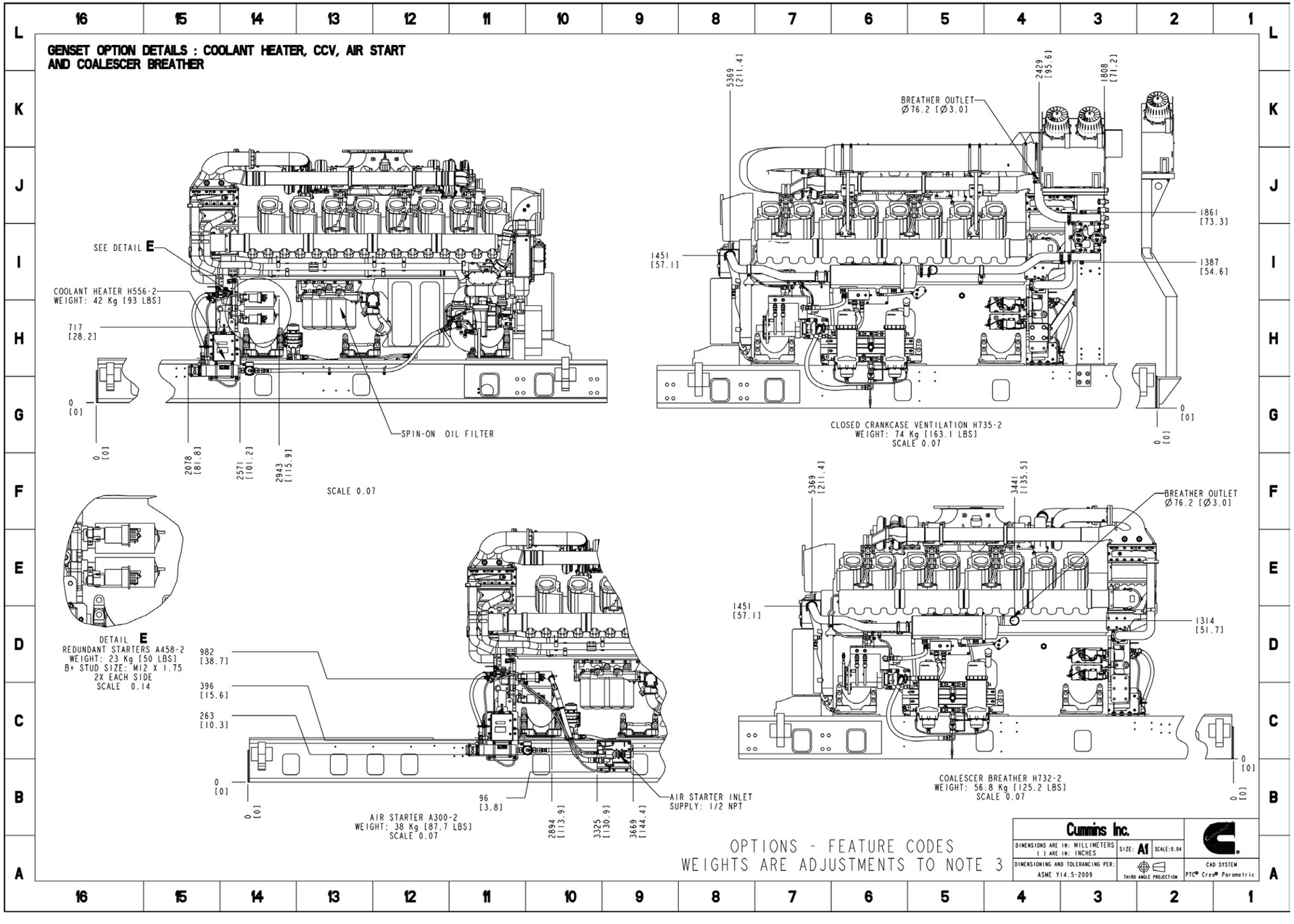


FIGURE 259. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER AND 94 SQUARE FOOT RADIATOR (SHEET 5 OF 10)

Copyright © 2025 Cummins Inc.

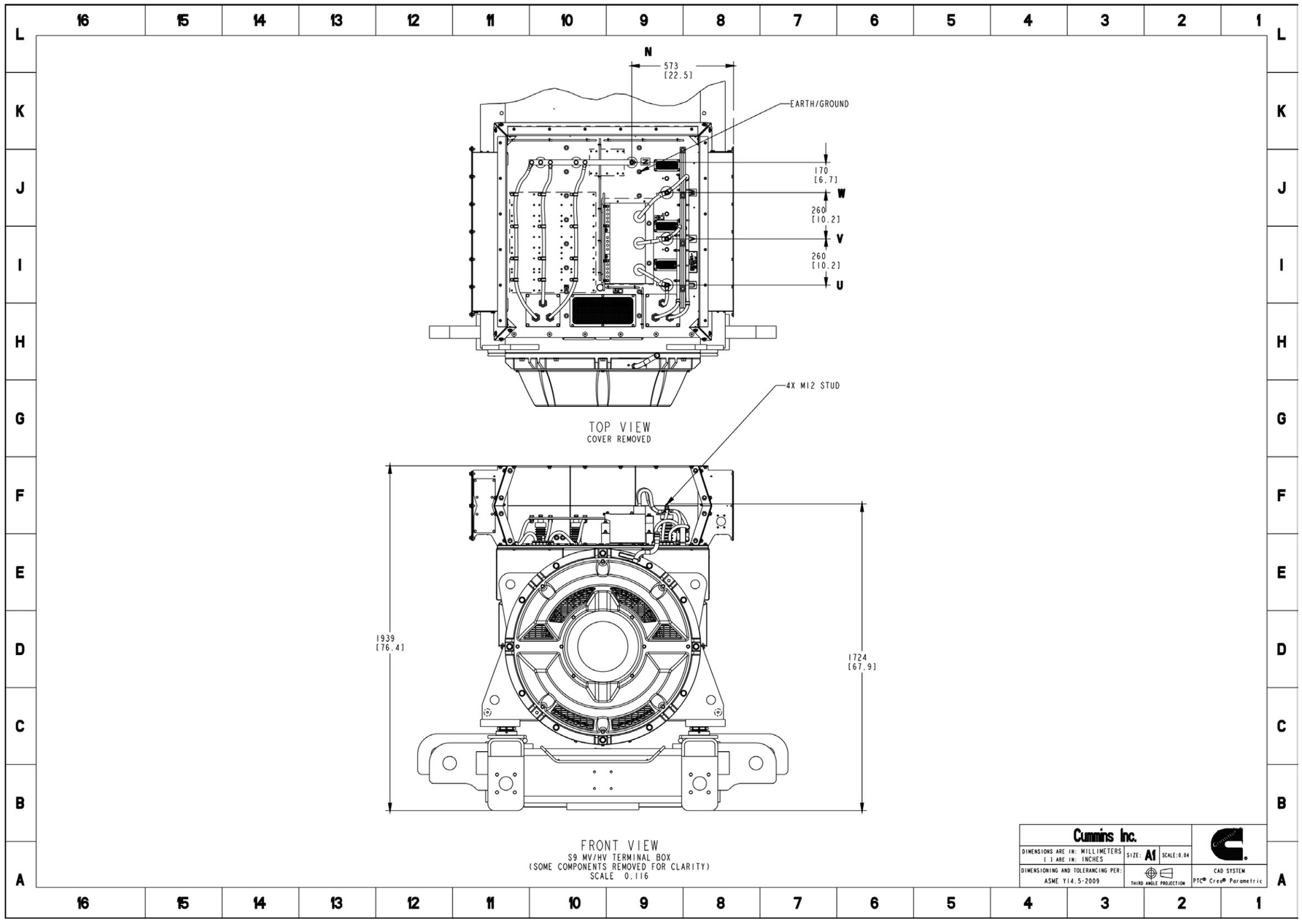


FIGURE 260. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER AND 94 SQUARE FOOT RADIATOR (SHEET 6 OF 10)

Copyright © 2025 Cummins Inc.

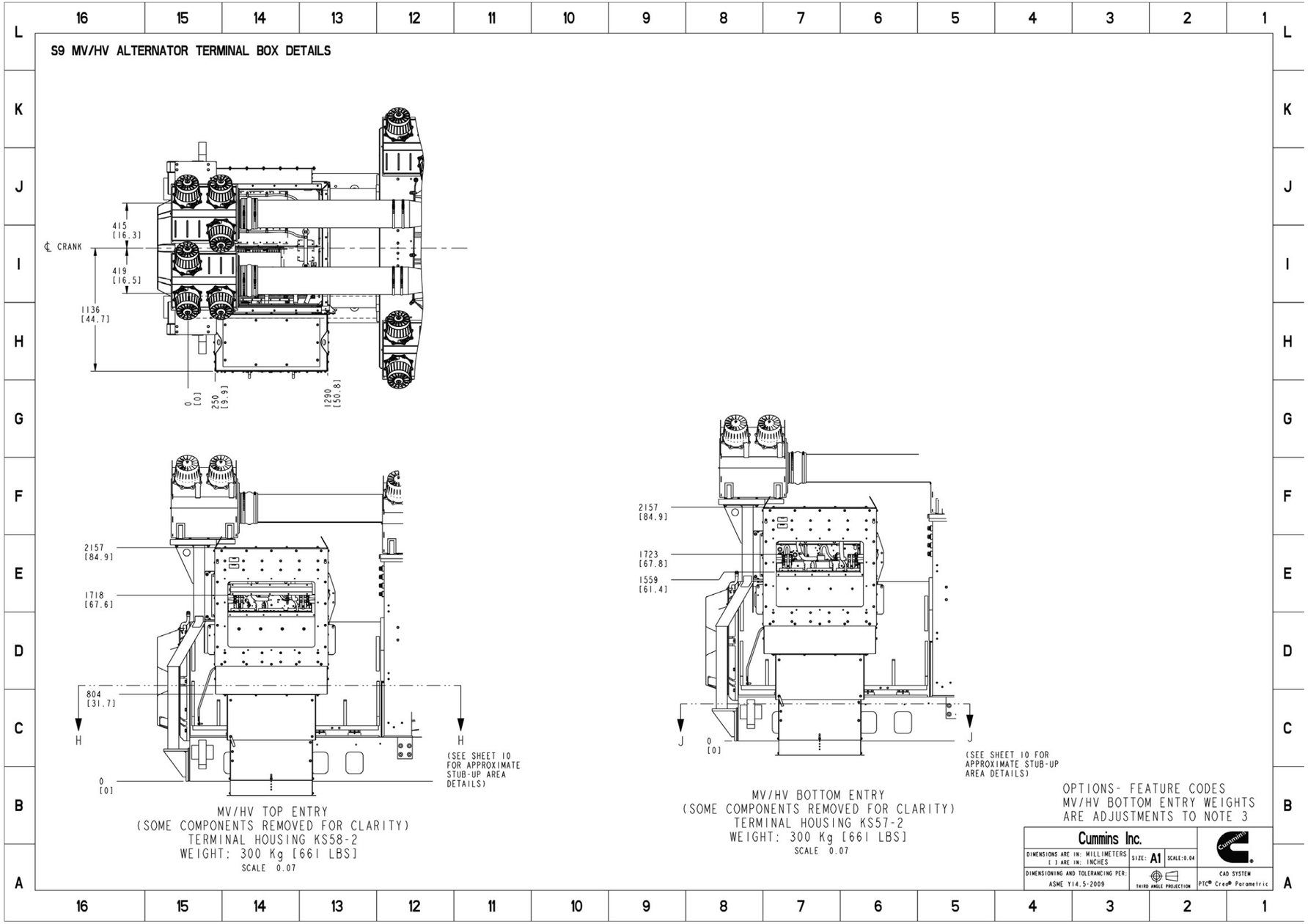


FIGURE 261. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER AND 94 SQUARE FOOT RADIATOR (SHEET 7 OF 10)

Copyright © 2025 Cummins Inc.

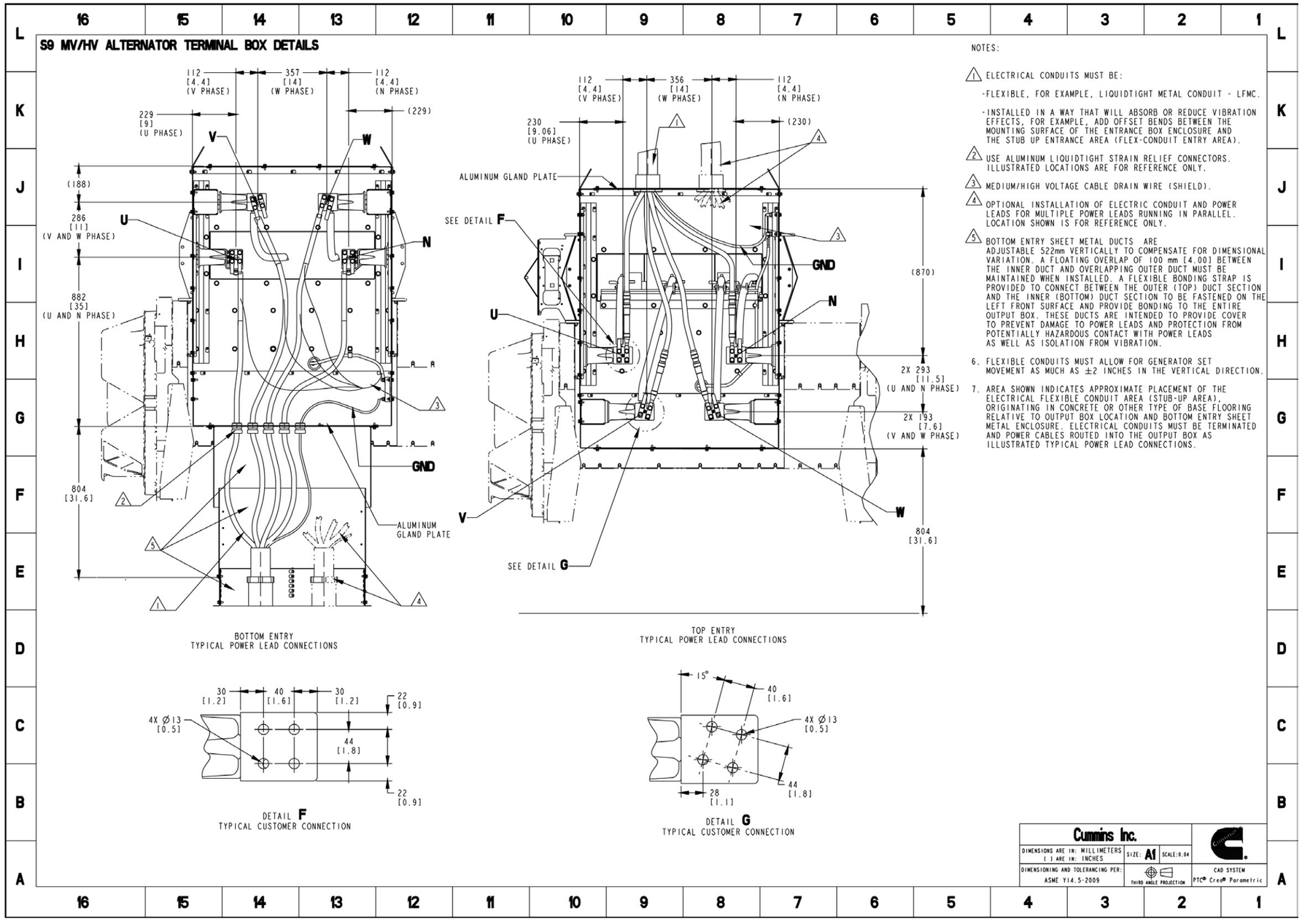


FIGURE 262. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER AND 94 SQUARE FOOT RADIATOR (SHEET 8 OF 10)

Copyright © 2025 Cummins Inc.

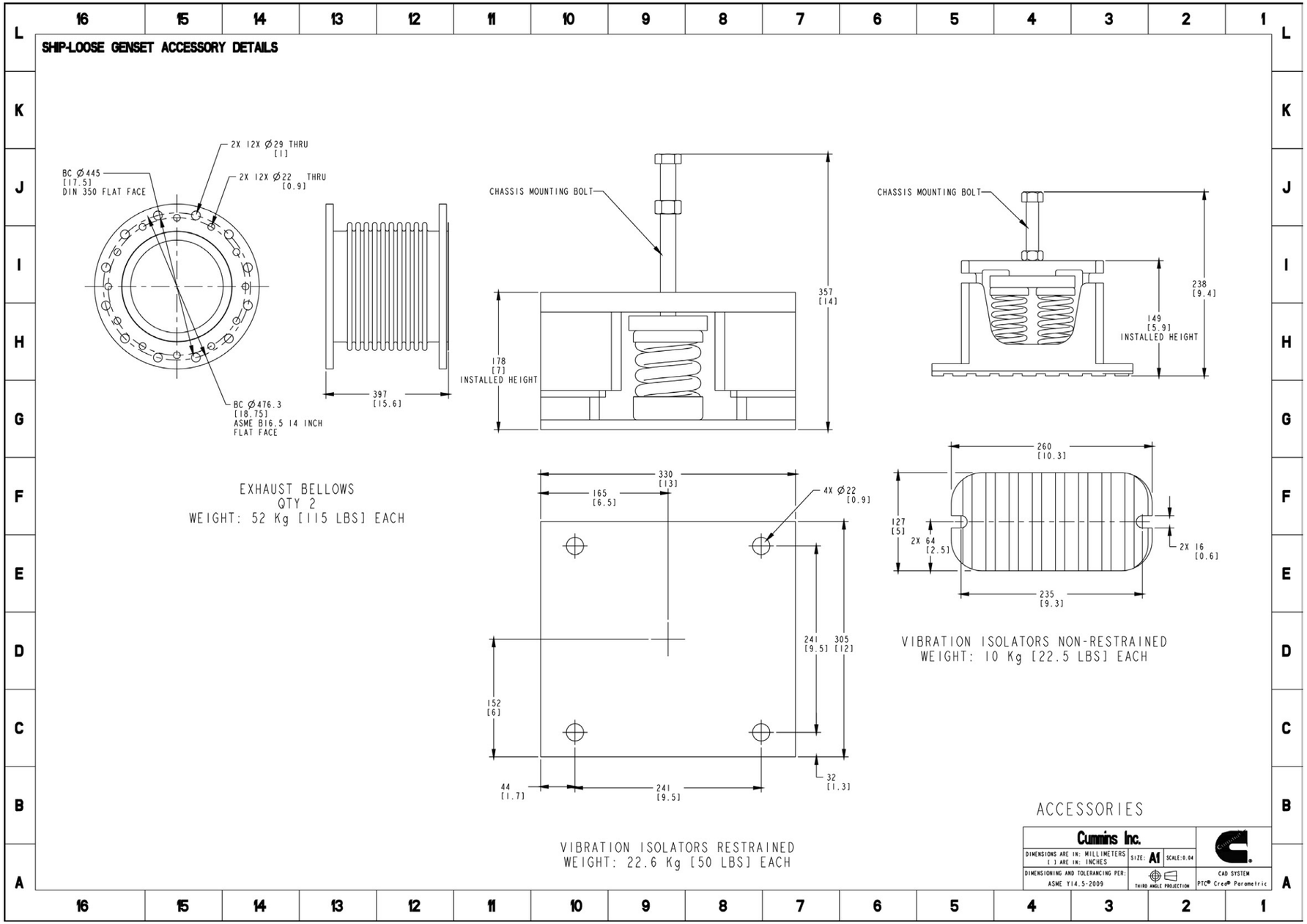


FIGURE 263. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER AND 94 SQUARE FOOT RADIATOR (SHEET 9 OF 10)

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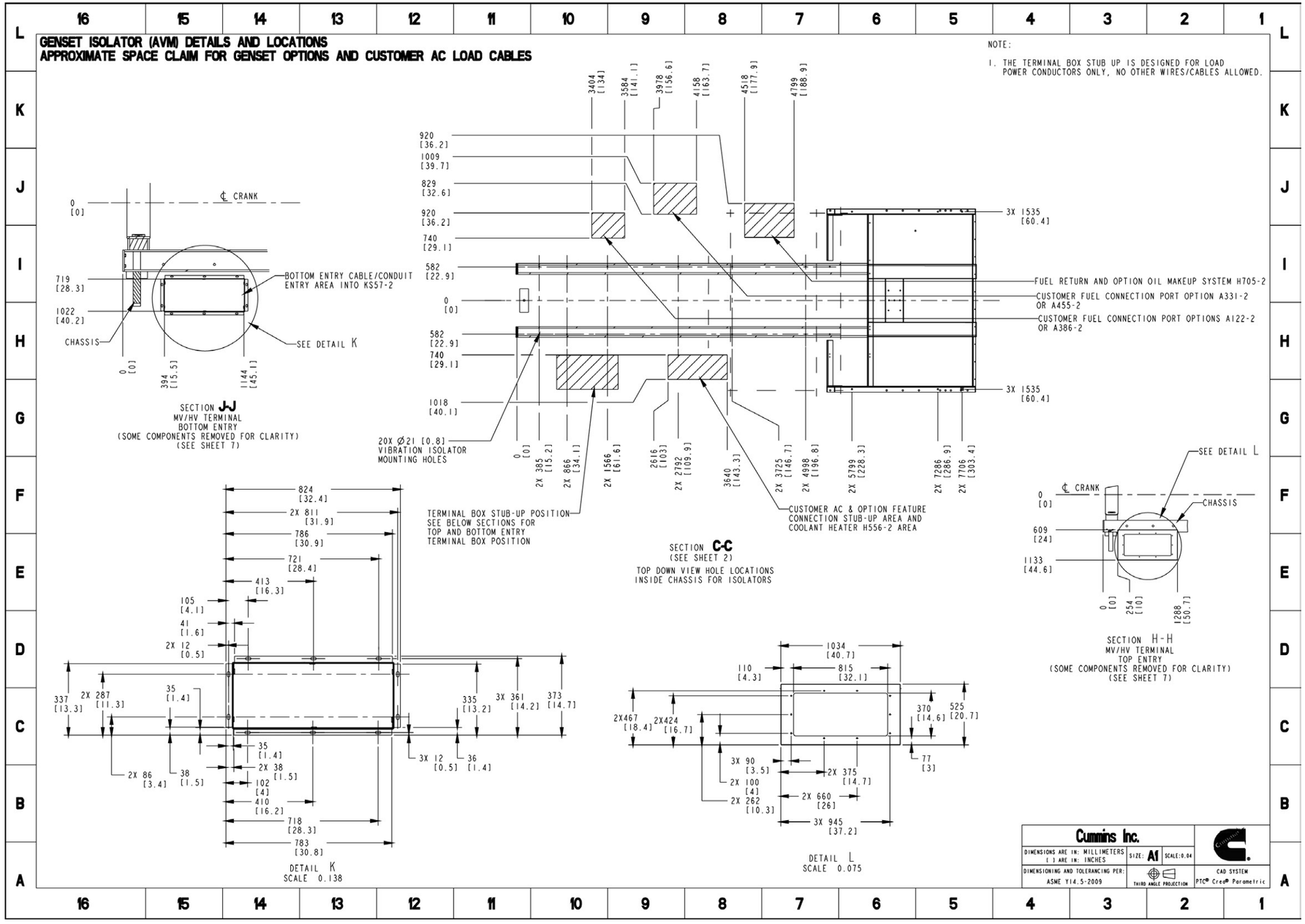


FIGURE 264. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER AND 94 SQUARE FOOT RADIATOR (SHEET 10 OF 10)

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B.6 Outline Drawing A068G150 – Heavy Duty Air Cleaner with 84 Square Radiator

ALTERNATOR	WINDING	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT WITH NO RADIATOR* Kg [LBS]	GENSET WEIGHT WITH RADIATOR* Kg [LBS]	C OF G WITH RADIATOR DIM A (SHEET 2)* mm [inch]	C OF G WITH RADIATOR DIM B (SHEET 2)* mm [inch]	C OF G WITHOUT RADIATOR DIM A* mm [inch]	C OF G WITHOUT RADIATOR DIM B* mm [inch]
S9MID-G42	851	7750 [17086]	24897 [54888]	30097 [66352]	1130 [44]	3587 [141]	1049 [41]	2853 [112]
S9HID-H42	991	8200 [18078]	25347 [55881]	30547 [67345]	1126 [44]	3541 [139]	1046 [41]	2811 [110]
S9HID-G42	991	7750 [17086]	24897 [54888]	30097 [66352]	1130 [44]	3587 [141]	1049 [41]	2853 [112]
S9HID-G42	961	7750 [17086]	24897 [54888]	30097 [66352]	1130 [44]	3587 [141]	1049 [41]	2853 [112]
S9HID-H42	961	8200 [18078]	25347 [55881]	30547 [67345]	1126 [44]	3541 [139]	1046 [41]	2811 [110]
S9HID-G42	983	7750 [17086]	24897 [54888]	30097 [66352]	1130 [44]	3587 [141]	1049 [41]	2853 [112]
S9HID-H42	983	8200 [18078]	25347 [55881]	30547 [67345]	1126 [44]	3541 [139]	1046 [41]	2811 [110]
S9MID-H42	851	8200 [18078]	25347 [55881]	30547 [67345]	1126 [44]	3541 [139]	1046 [41]	2811 [110]

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS WITH IMPERIAL INCH CONVERSIONS IN "[ ]".

   1.1 IN EVENT OF A DISCREPANCY BETWEEN METRIC AND IMPERIAL DIMENSIONS, THE METRIC DIMENSIONS CONTROL.

2. ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCED.

3. WEIGHT: REFER TO TABLE FOR STANDARD GENSET WITH E127-2, E128-2 COOLING SYSTEM AND D036-2

   *3.1 INCLUDES WEIGHT OF 606 LITERS [160 GALLONS] SUPPLIED ENGINE OIL.(530 Kg/1168 LBS)

   **3.2 INCLUDES DRY WEIGHT OF RADIATOR 4555 Kg [10042 LBS] (SHIPS LOOSE)

   **3.3 INCLUDES WEIGHT FOR 1120.5 LITERS [296 GALLONS] OF NON-SUPPLIED COOLANT. (1139 Kg/2511 LBS)

4. LARGEST NOMINAL DIMENSIONS:
   4.1 LENGTH 8021 [315.8]
   4.2 WIDTH 3029 [119.3] RADIATOR
   4.3 HEIGHT 3662 [144] TOP OF RADIATOR CAP
   4.4 DOES NOT INCLUDE THE HEIGHT OF THE VIBRATION ISOLATOR

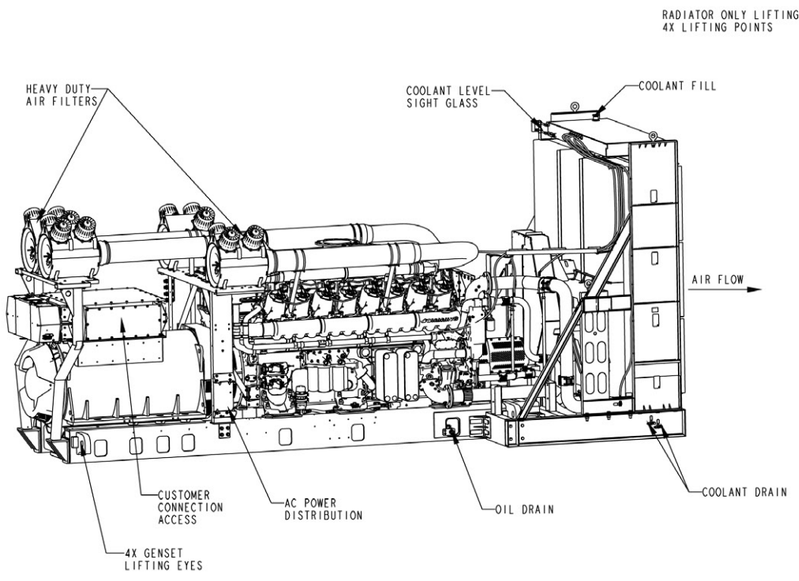
5. LIFTING INSTRUCTIONS: REFER TO GENSET INSTALLATION MANUAL AND LIFTING LABEL.

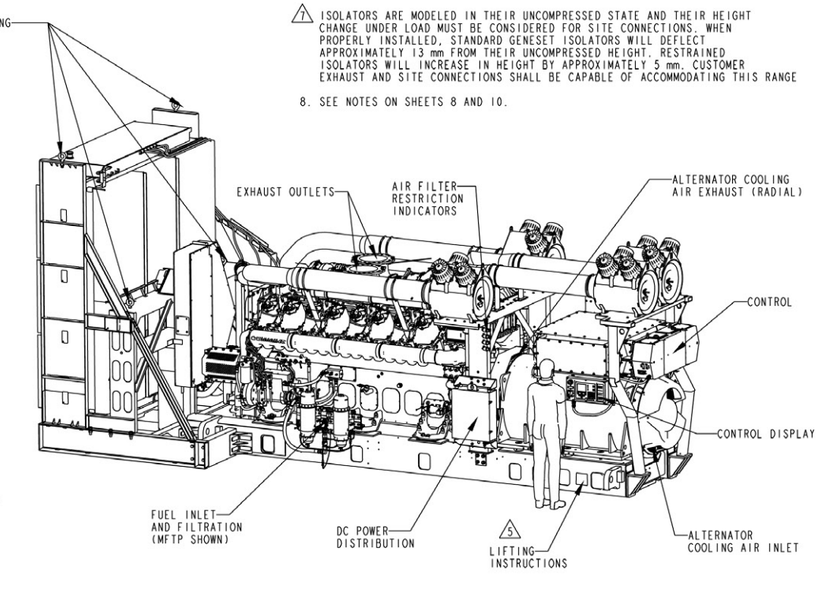
   5.1 GENSET SHALL NOT BE LIFTED USING THE LIFTING EYES WHEN ATTACHED TO THE RADIATOR. RADIATOR AND GENSET SHALL ALWAYS BE LIFTED SEPARATELY PER INSTALLATION MANUAL AND LIFTING DIAGRAMS.

6. ALLOW 1 METER OF SPACE AROUND THE GENSET FOR SERVICE.

7. ISOLATORS ARE MODELED IN THEIR UNCOMPRESSED STATE AND THEIR HEIGHT CHANGE UNDER LOAD MUST BE CONSIDERED FOR SITE CONNECTIONS. WHEN PROPERLY INSTALLED, STANDARD GENESET ISOLATORS WILL DEFLECT APPROXIMATELY 13 mm FROM THEIR UNCOMPRESSED HEIGHT. RESTRAINED ISOLATORS WILL INCREASE IN HEIGHT BY APPROXIMATELY 5 mm. CUSTOMER EXHAUST AND SITE CONNECTIONS SHALL BE CAPABLE OF ACCOMMODATING THIS RANGE

8. SEE NOTES ON SHEETS 8 AND 10.





STANDARD GENSET CONFIGURATION WITH S9HID-H42 ALTERNATOR AND E127-2 (ENHANCED HIGH AMBIENT) COOLING SYSTEM SHOWN.

LAST DATUM LETTER USED: A	LAST REFERENCE LETTER USED: W
MODEL/PLATFORM: C325D6	THIS PART IS SIMILAR TO: A049P696
Cummins Inc.	
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES	SIZE: A1 SCALE:0.04
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION
	CAD SYSTEM PTC® Creo® Parametric

FIGURE 265. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 84 SQUARE RADIATOR (SHEET 1 OF 10)

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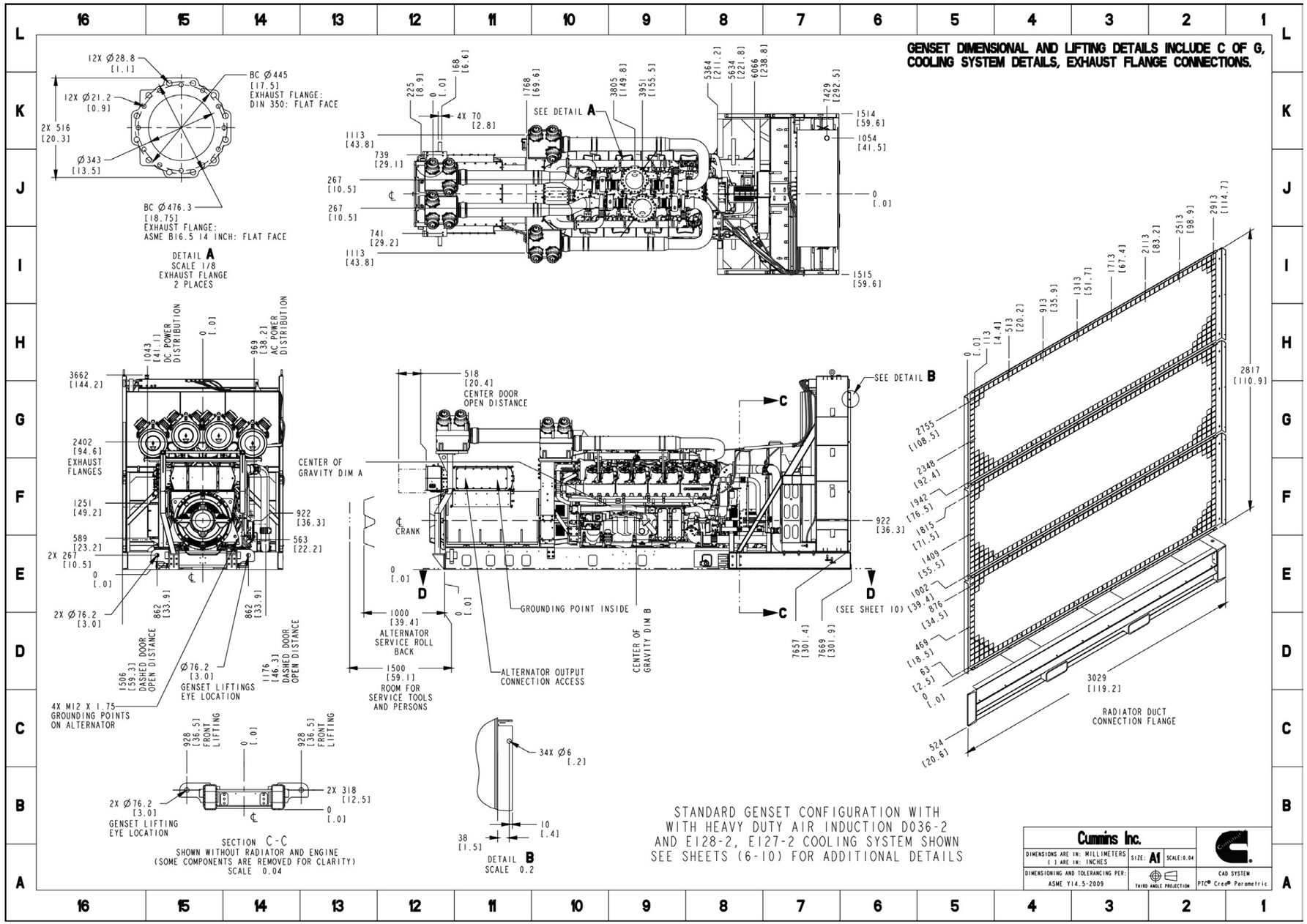


FIGURE 266. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 84 SQUARE RADIATOR (SHEET 2 OF 10)

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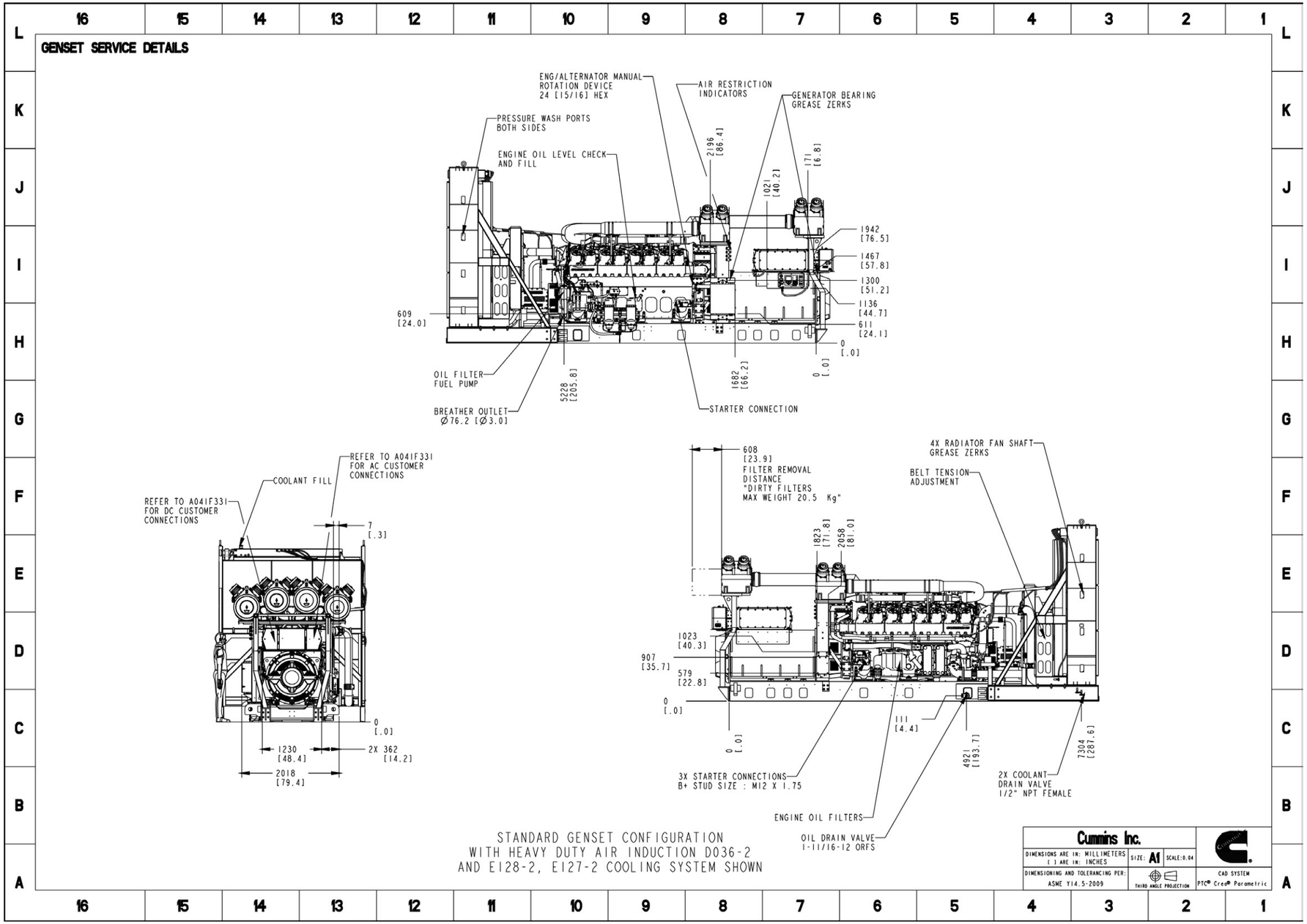


FIGURE 267. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 84 SQUARE RADIATOR (SHEET 3 OF 10)

Copyright © 2025 Cummins Inc.

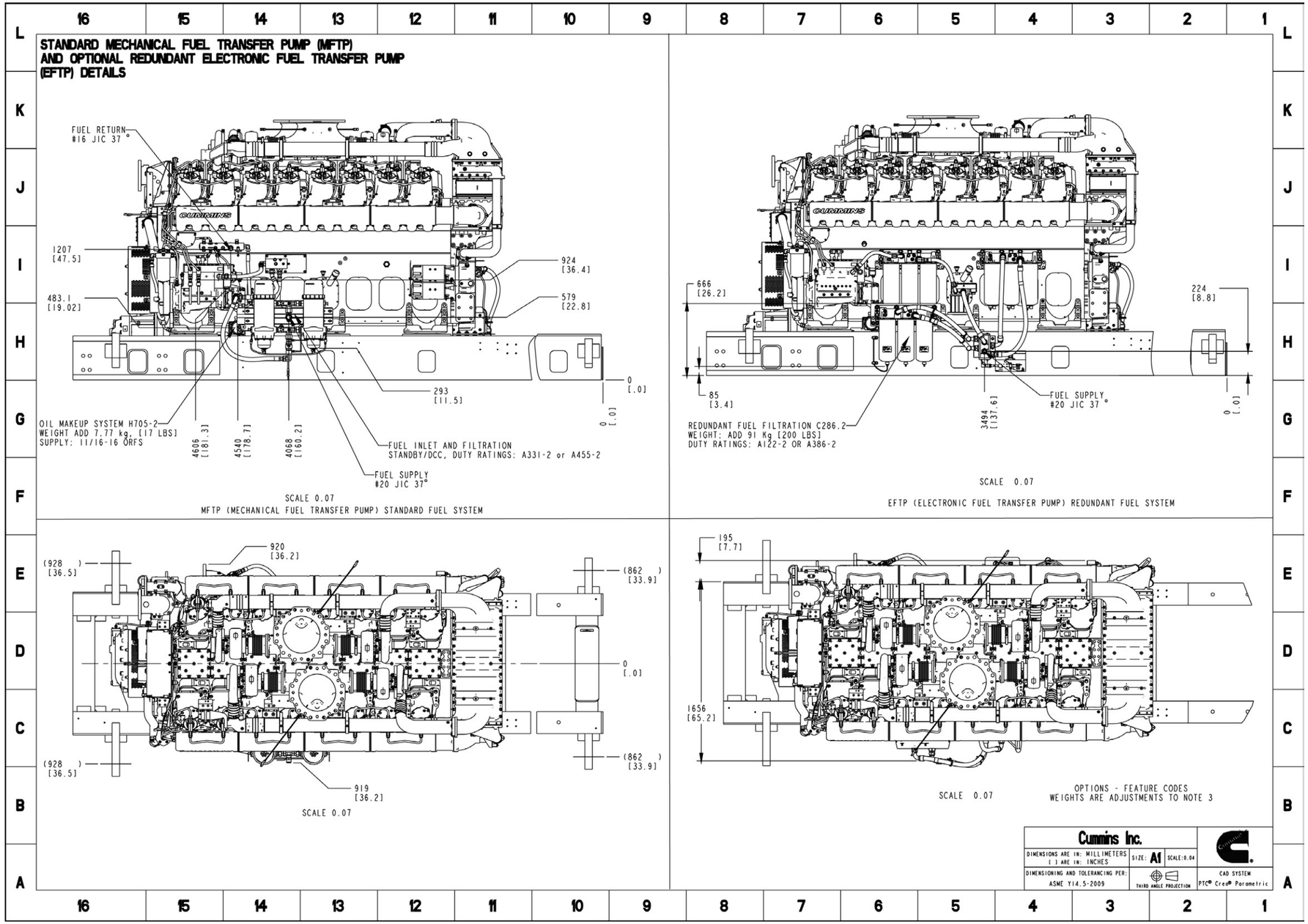


FIGURE 268. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 84 SQUARE RADIATOR (SHEET 4 OF 10)

Copyright © 2025 Cummins Inc.

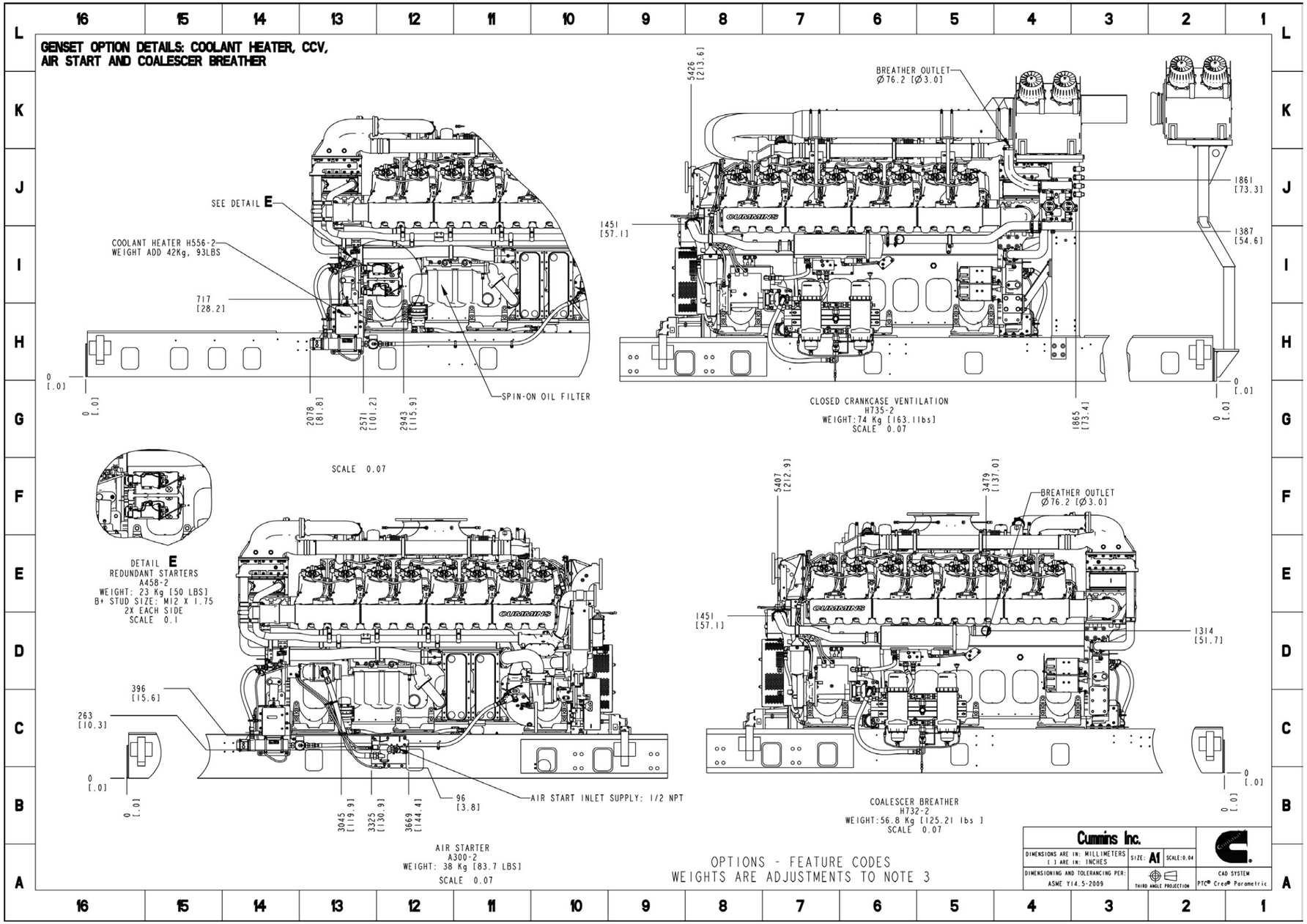


FIGURE 269. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 84 SQUARE RADIATOR (SHEET 5 OF 10)

Copyright © 2025 Cummins Inc.

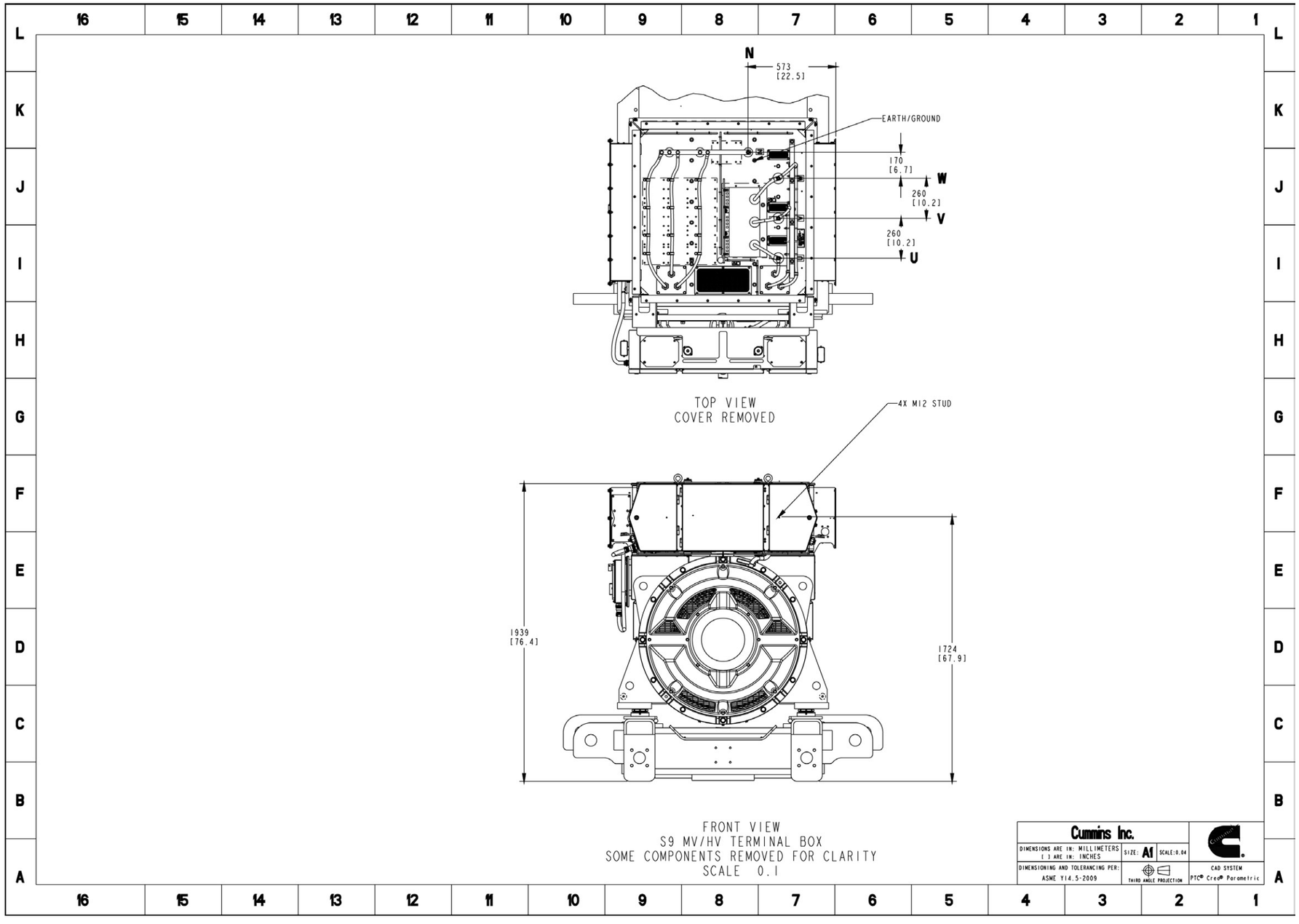
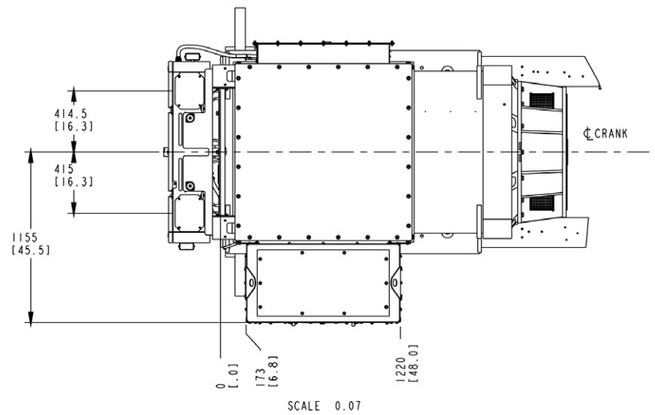


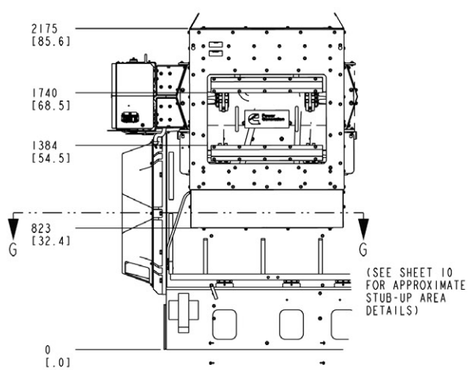
FIGURE 270. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 84 SQUARE RADIATOR (SHEET 6 OF 10)

Copyright © 2025 Cummins Inc.

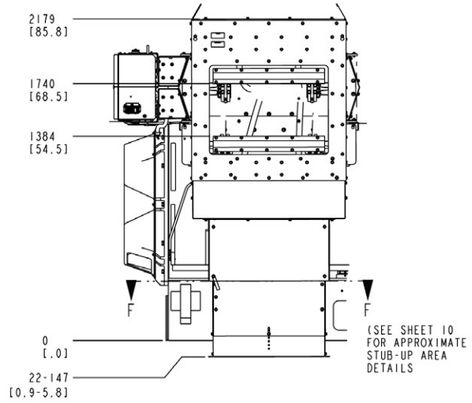
S9 MV/HV ALTERNATOR TERMINAL BOX DETAILS



SCALE 0.07



MV/HV TOP ENTRY
(SOME COMPONENTS REMOVED FOR CLARITY)
TERMINAL HOUSING
KS58-2
WEIGHT: 300 Kg [661 LBS]



MV/HV BOTTOM ENTRY
(SOME COMPONENTS REMOVED FOR CLARITY)
TERMINAL HOUSING
KS57-2
WEIGHT: 300 Kg [661 LBS]

Cummins Inc.	
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES	SIZE: A1 SCALE:0.04
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION
	CAD SYSTEM PTC® Creo® Parametric

FIGURE 271. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 84 SQUARE RADIATOR (SHEET 7 OF 10)

Copyright © 2025 Cummins Inc.

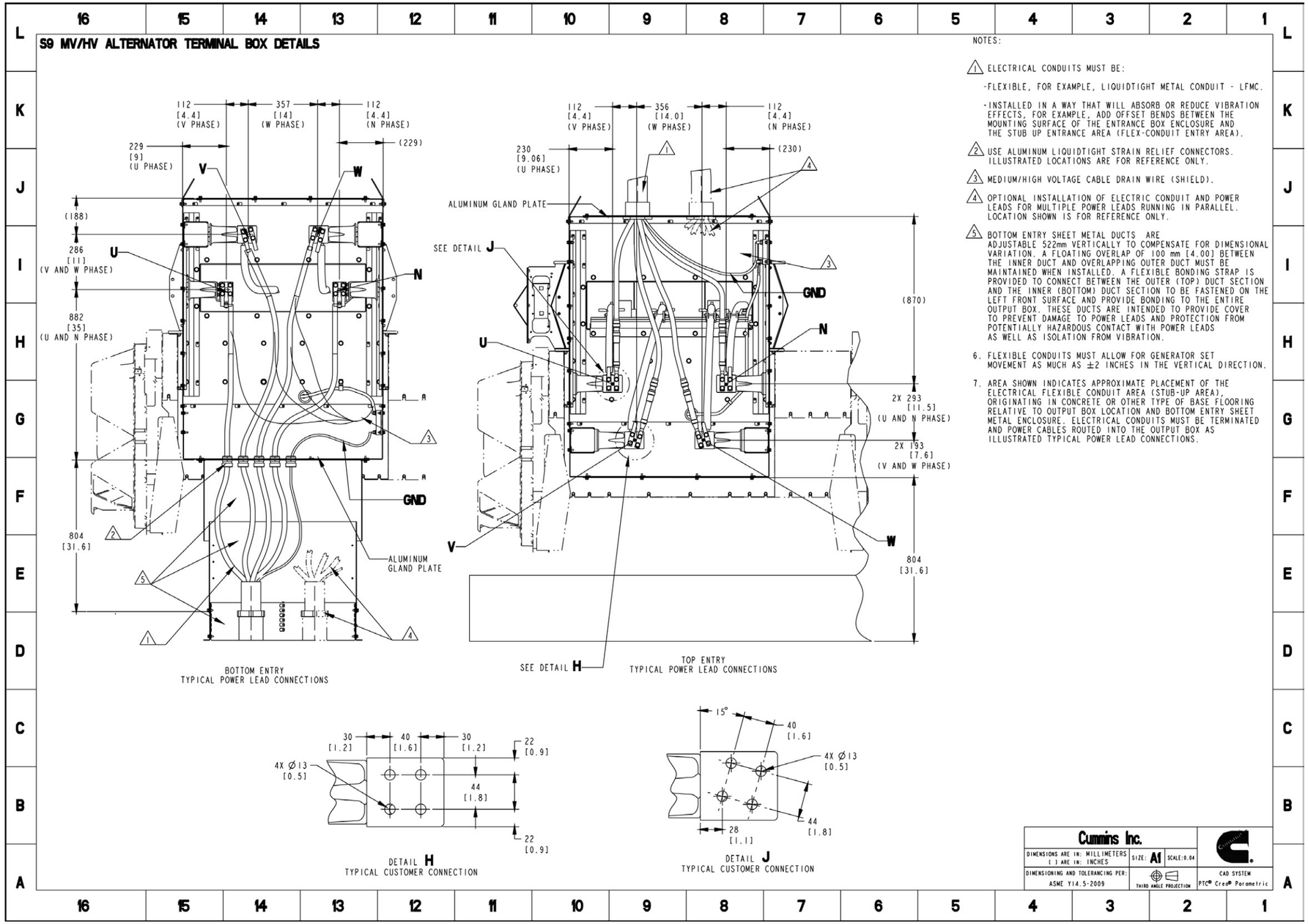


FIGURE 272. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 84 SQUARE RADIATOR (SHEET 8 OF 10)

Copyright © 2025 Cummins Inc.

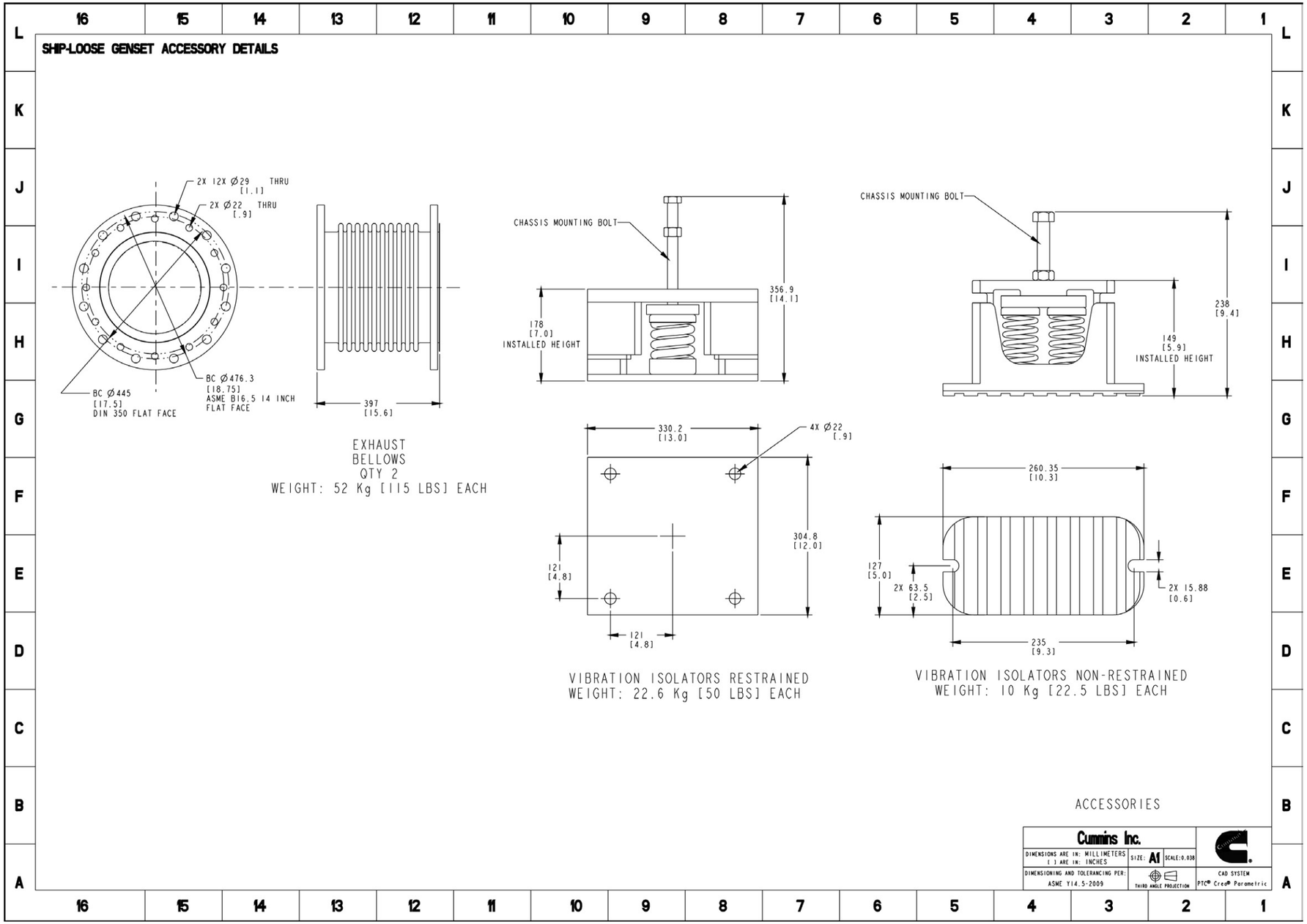


FIGURE 273. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 84 SQUARE RADIATOR (SHEET 9 OF 10)

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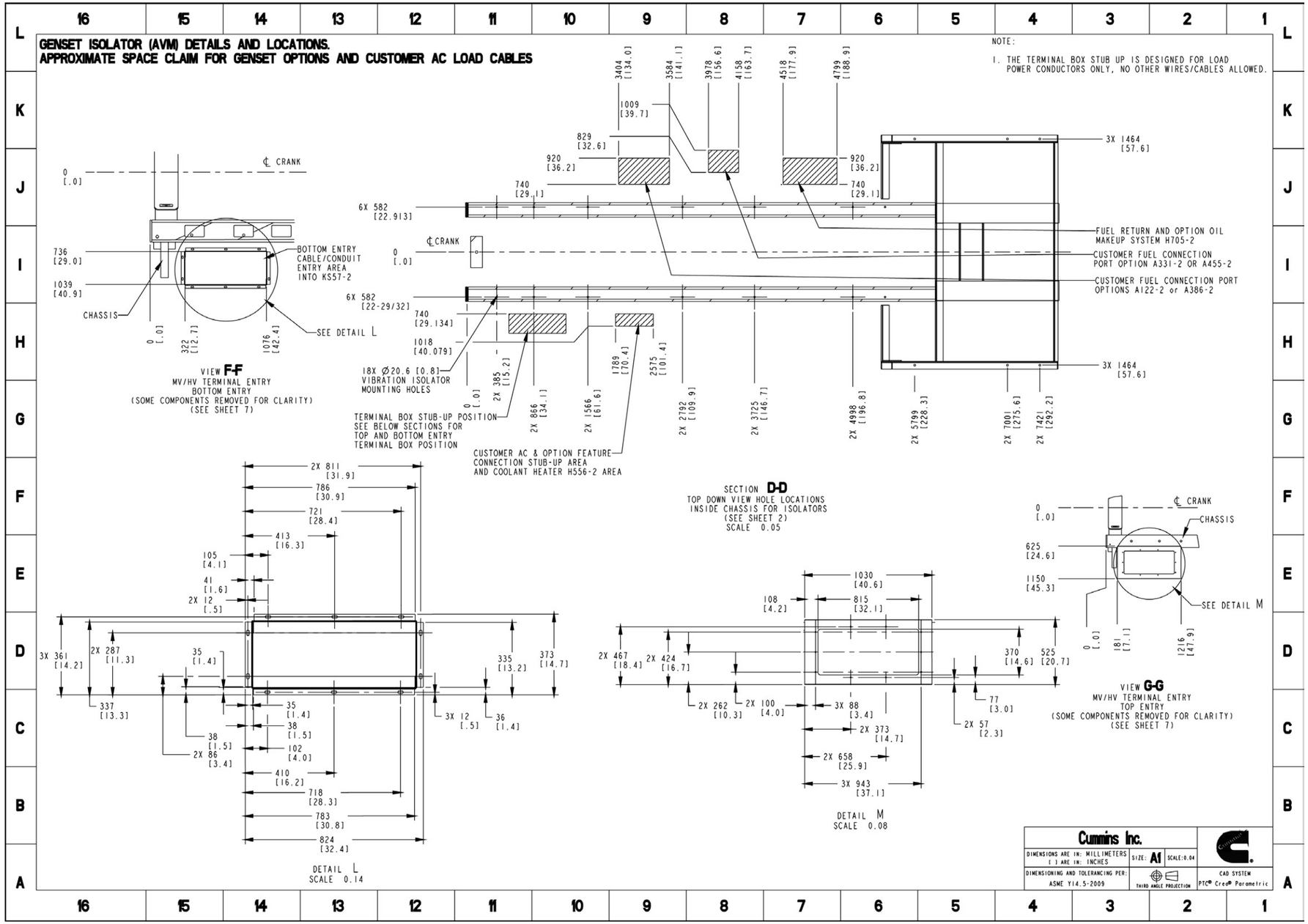


FIGURE 274. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 84 SQUARE RADIATOR (SHEET 10 OF 10)

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B.7 Outline Drawing A068C508 – Heavy Duty Air Cleaner with 61 Square Foot Radiator

ALTERNATOR	WINDING	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT WITH NO RADIATOR* Kg [LBS]	GENSET WEIGHT WITH RADIATOR* Kg [LBS]	C OF G WITH RADIATOR DIM A (SHEET 2)* mm [inch]	C OF G WITH RADIATOR DIM B (SHEET 2)* mm [inch]	C OF G WITHOUT RADIATOR DIM A* mm [inch]	C OF G WITHOUT RADIATOR DIM B* mm [inch]
S9MID-G42	851	7750 [17086]	24897 [54888]	30518 [67281]	1140 [44]	3646 [143]	1049 [41]	2853 [112]
S9HID-H42	991	8200 [18078]	25347 [55881]	30968 [68273]	1137 [44]	3600 [141]	1046 [41]	2811 [110]
S9HID-G42	991	7750 [17086]	24897 [54888]	30518 [67281]	1140 [44]	3646 [143]	1049 [41]	2853 [112]
S9HID-G42	961	7750 [17086]	24897 [54888]	30518 [67281]	1140 [44]	3646 [143]	1049 [41]	2853 [112]
S9HID-H42	961	8200 [18078]	25347 [55881]	30968 [68273]	1137 [44]	3600 [141]	1046 [41]	2811 [110]
S9HID-G42	983	7750 [17086]	24897 [54888]	30518 [67281]	1140 [44]	3646 [143]	1049 [41]	2853 [112]
S9HID-H42	983	8200 [18078]	25347 [55881]	30968 [68273]	1137 [44]	3600 [141]	1046 [41]	2811 [110]
S9MID-H42	851	8200 [18078]	25347 [55881]	30968 [68273]	1137 [44]	3600 [141]	1046 [41]	2811 [110]

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS WITH IMPERIAL INCH CONVERSIONS IN "[ ]".

   1.1 IN EVENT OF A DISCREPANCY BETWEEN METRIC AND IMPERIAL DIMENSIONS, THE METRIC DIMENSIONS CONTROL.

2. ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCED.

3. WEIGHT: REFER TO TABLE FOR STANDARD GENSET WITH E128-2 COOLING SYSTEM.

   *3.1 INCLUDES WEIGHT OF 606 LITERS [160 GALLONS] SUPPLIED ENGINE OIL.(530 Kg/1168 LBS)

   **3.2 INCLUDES DRY WEIGHT OF RADIATOR 4657 Kg [10267 LBS] (SHIPS LOOSE)

   **3.3 INCLUDES WEIGHT FOR 1238 LITERS [327 GALLONS] OF NON-SUPPLIED COOLANT.(1336 Kg/2947 LBS)

4. LARGEST NOMINAL DIMENSIONS:
   4.1 LENGTH 8063 [317.4]
   4.2 WIDTH 2610 [102.7] RADIATOR
   4.3 HEIGHT 3366 [132.5] TOP OF RADIATOR CAP
   4.4 DOES NOT INCLUDE THE HEIGHT OF THE VIBRATION ISOLATOR

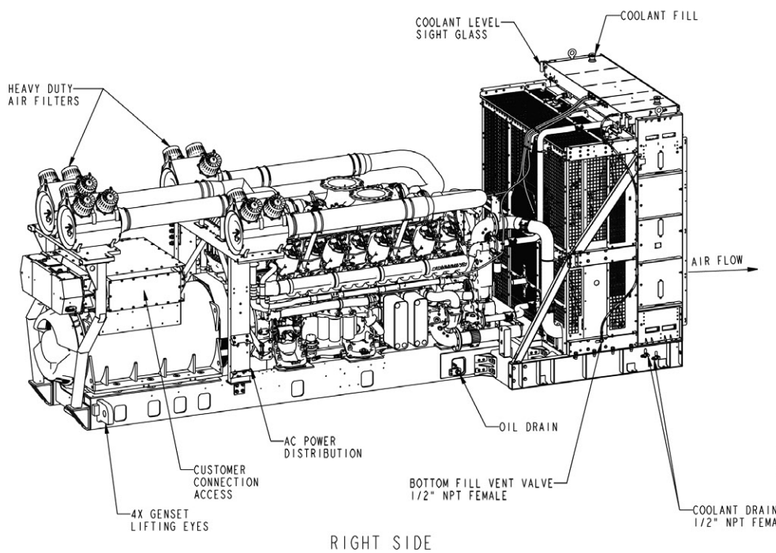
△5 LIFTING INSTRUCTIONS: REFER TO GENSET INSTALLATION MANUAL AND LIFTING LABEL

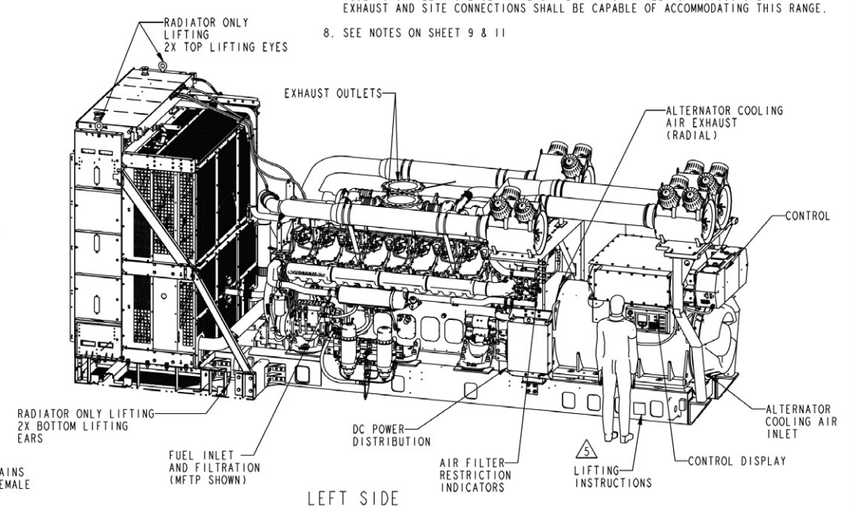
   5.1 GENSET SHALL NOT BE LIFTED USING THE LIFTING EYES WHEN ATTACHED TO THE RADIATOR. RADIATOR AND GENSET SHALL ALWAYS BE LIFTED SEPARATELY PER INSTALLATION MANUAL AND LIFTING DIAGRAMS.

6. ALLOW 1 METER OF SPACE AROUND THE GENSET FOR SERVICE.

△7 ISOLATORS ARE MODELED IN THEIR UNCOMPRESSED STATE AND THEIR HEIGHT CHANGE UNDER LOAD MUST BE CONSIDERED FOR SITE CONNECTIONS. WHEN PROPERLY INSTALLED, STANDARD GENESET ISOLATORS WILL DEFLECT APPROXIMATELY 13 mm FROM THEIR UNCOMPRESSED HEIGHT. RESTRAINED ISOLATORS WILL INCREASE IN HEIGHT BY APPROXIMATELY 5 mm. CUSTOMER EXHAUST AND SITE CONNECTIONS SHALL BE CAPABLE OF ACCOMMODATING THIS RANGE.

8. SEE NOTES ON SHEET 9 & 11





LAST DATUM LETTER USED: .	LAST REFERENCE LETTER USED: W
MODEL/PLATFORM: C325D6	THIS PART IS SIMILAR TO: A065K152
Cummins Inc.	
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES	SIZE: A1 SCALE:0.04
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION
	CAD SYSTEM PTC® Creo® Parametric

STANDARD GENSET CONFIGURATION
WITH S9HID-H42 ALTERNATOR AND HEAVY DUTY AIR
INDUCTION D036-2 AND E165-2 COOLING SYSTEM SHOWN

FIGURE 275. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 1 OF 11)

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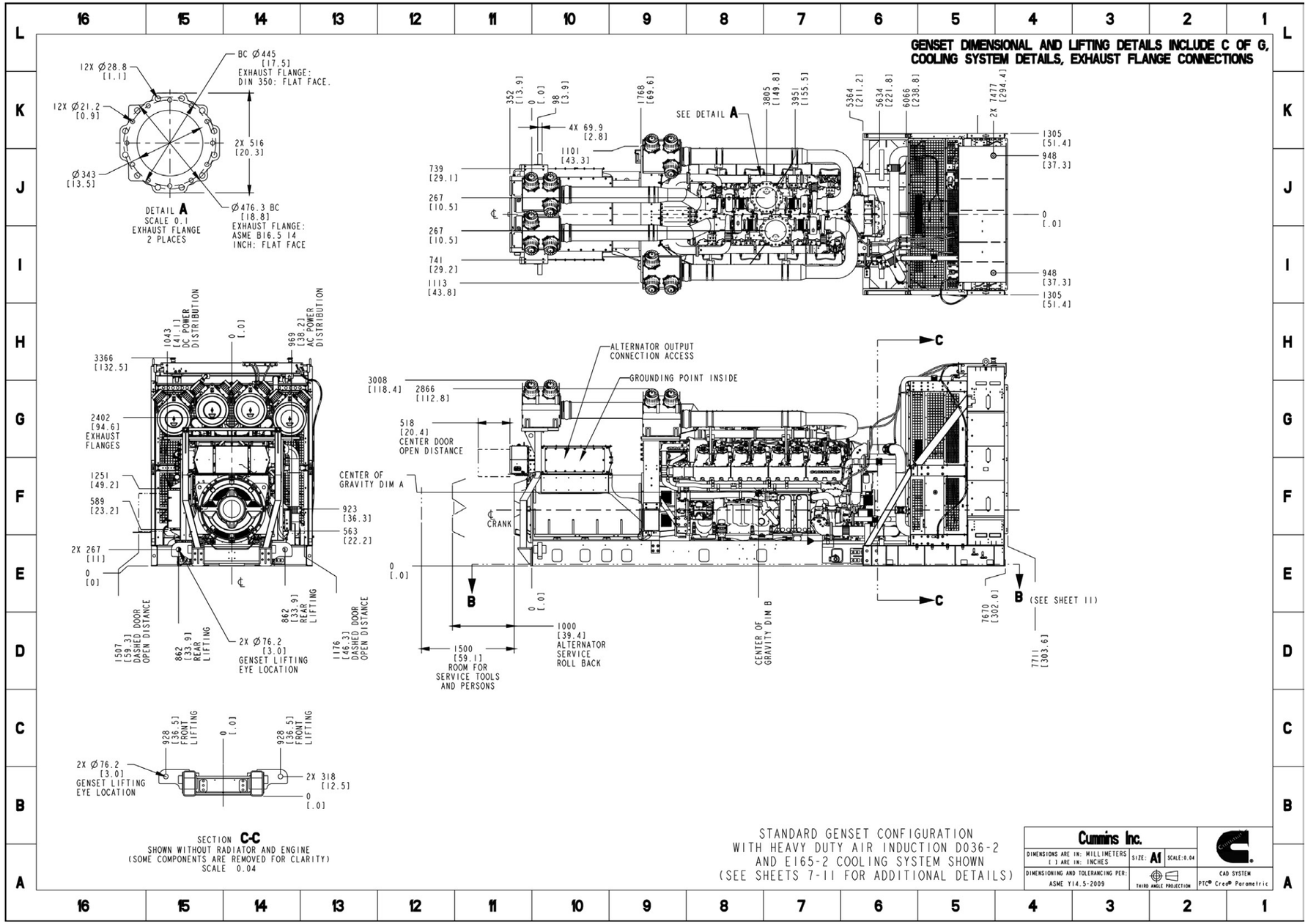


FIGURE 276. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 2 OF 11)

Copyright © 2025 Cummins Inc.

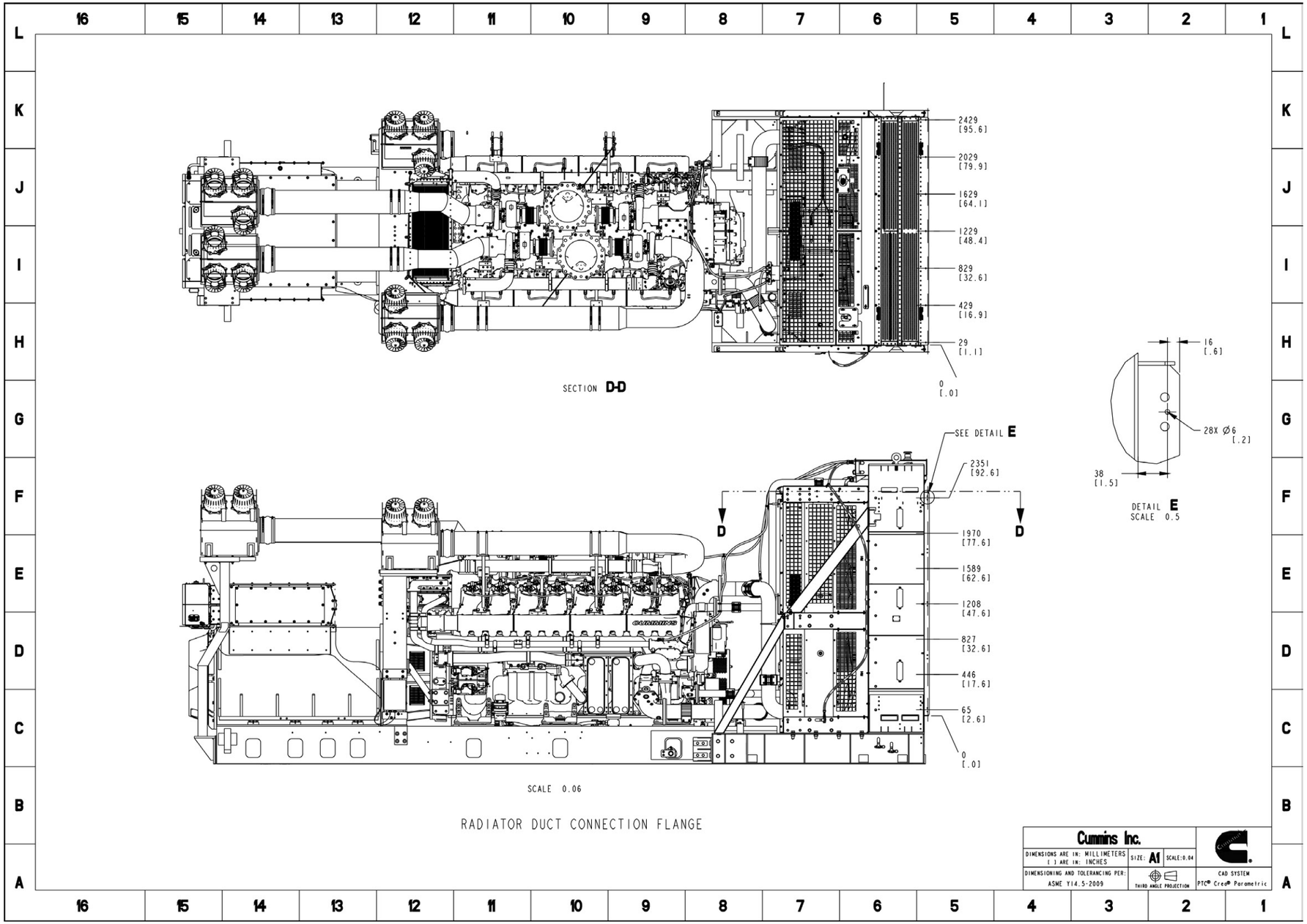


FIGURE 277. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 3 OF 11)

Copyright © 2025 Cummins Inc.

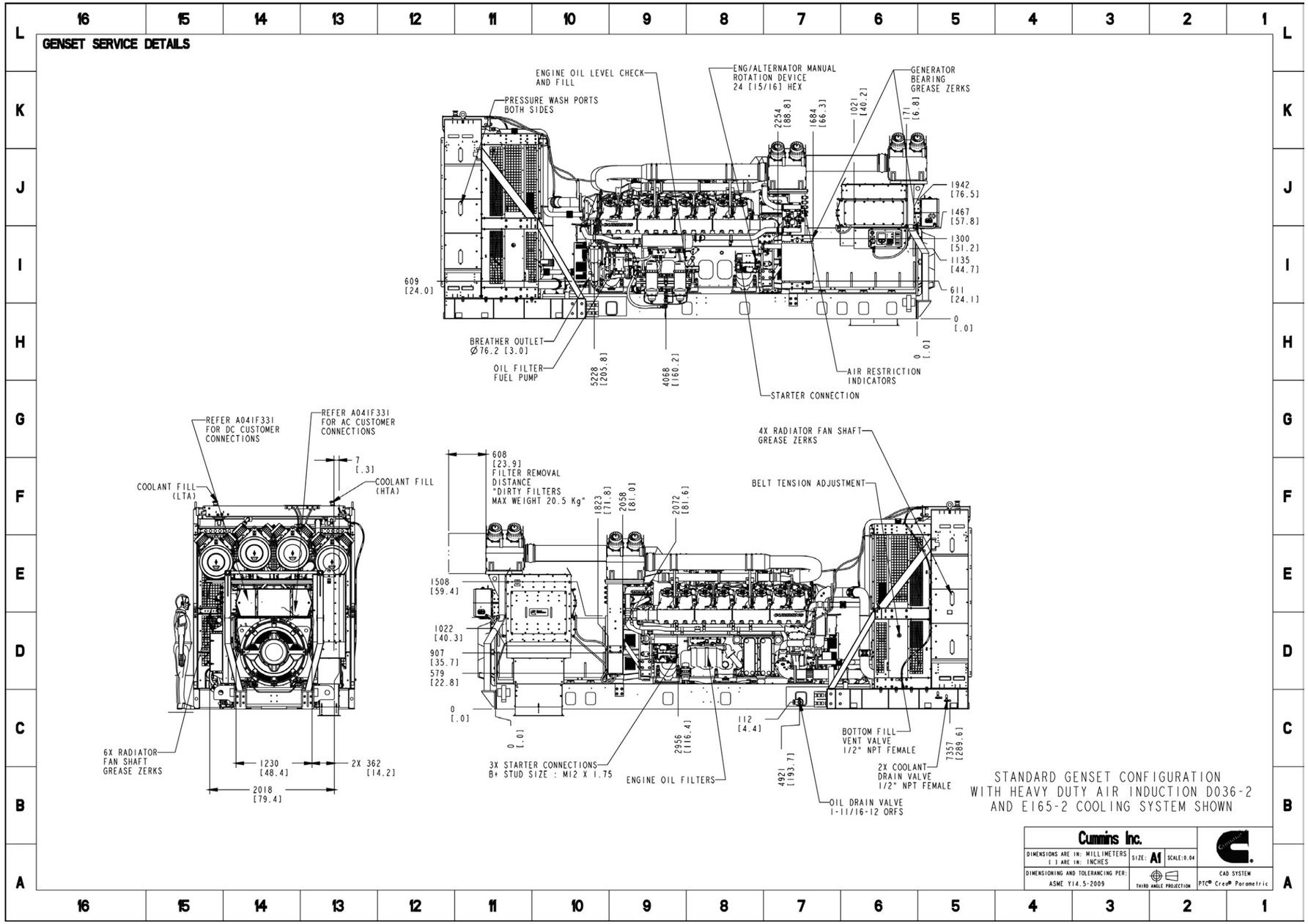


FIGURE 278. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 4 OF 11)

Copyright © 2025 Cummins Inc.

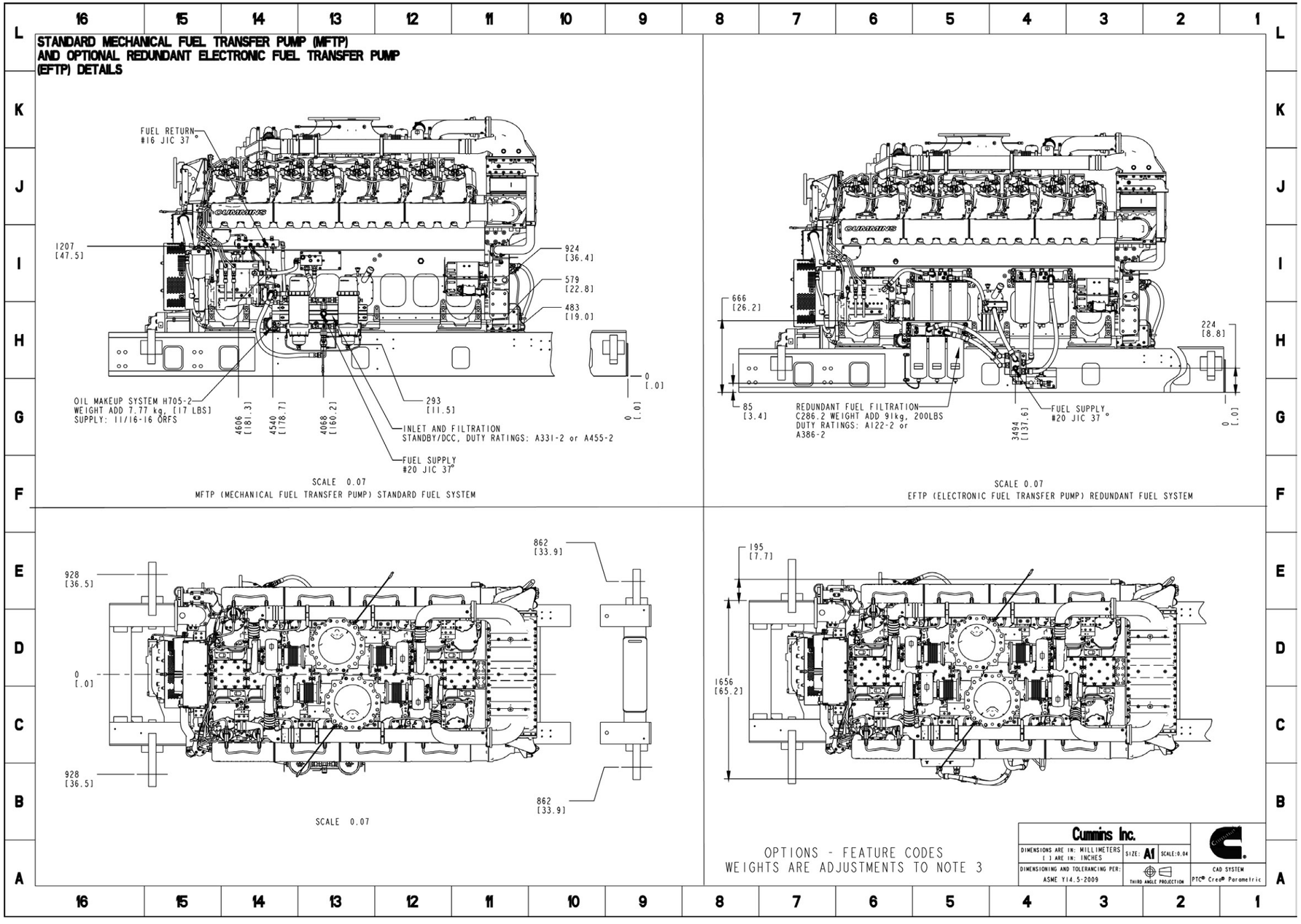


FIGURE 279. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 5 OF 11)

Copyright © 2025 Cummins Inc.

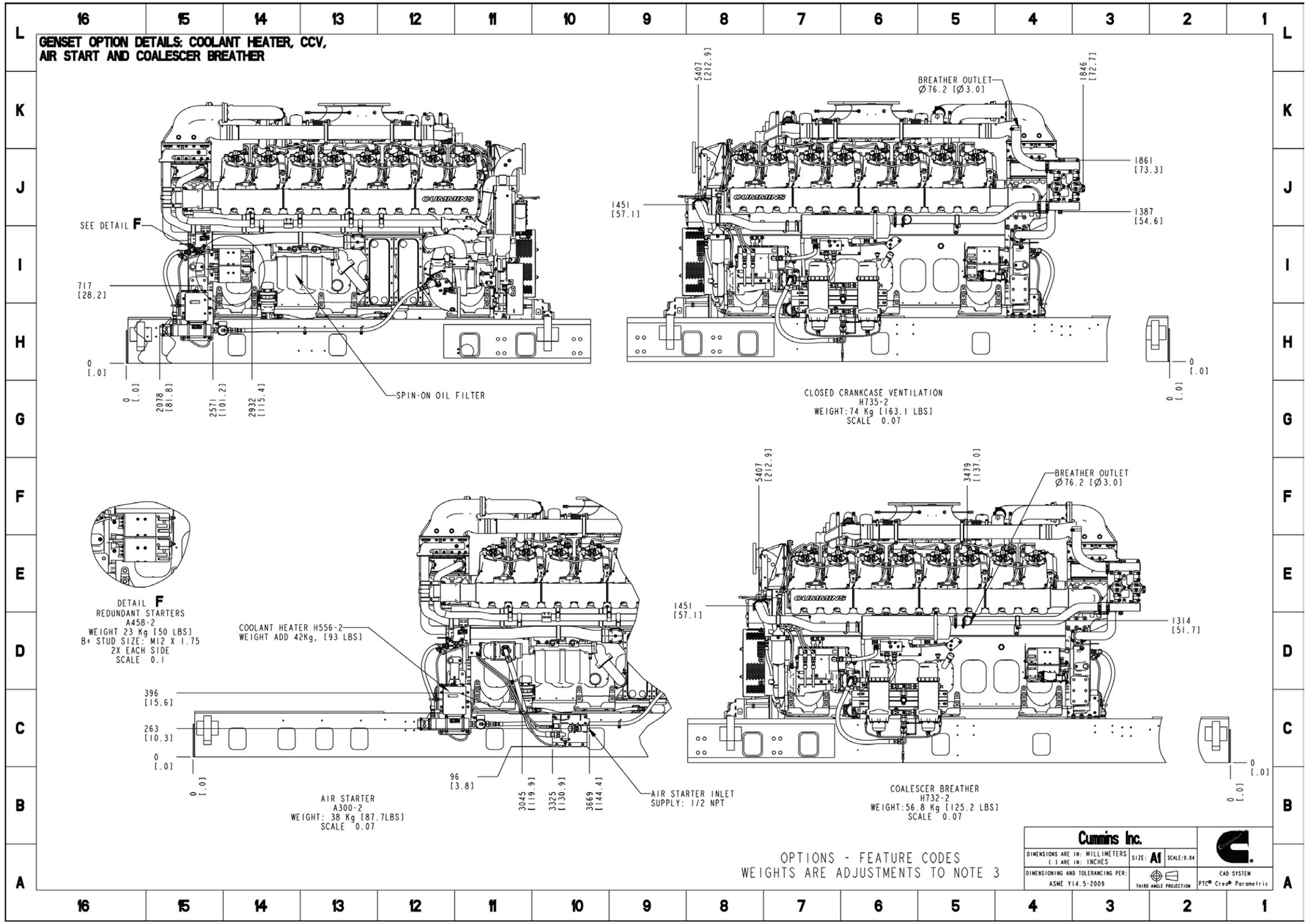


FIGURE 280. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 6 OF 11)

Copyright © 2025 Cummins Inc.

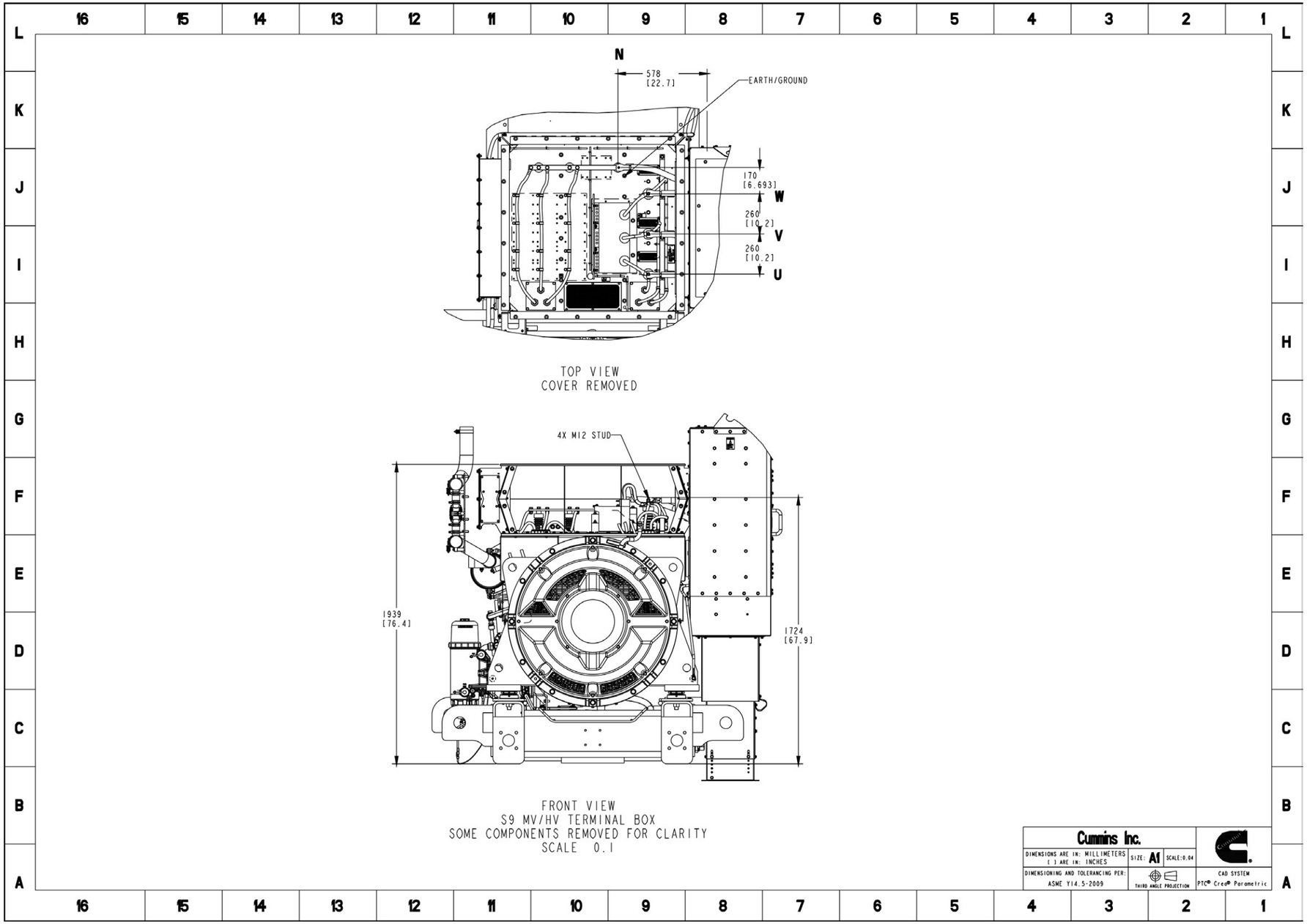


FIGURE 281. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 7 OF 11)

Copyright © 2025 Cummins Inc.

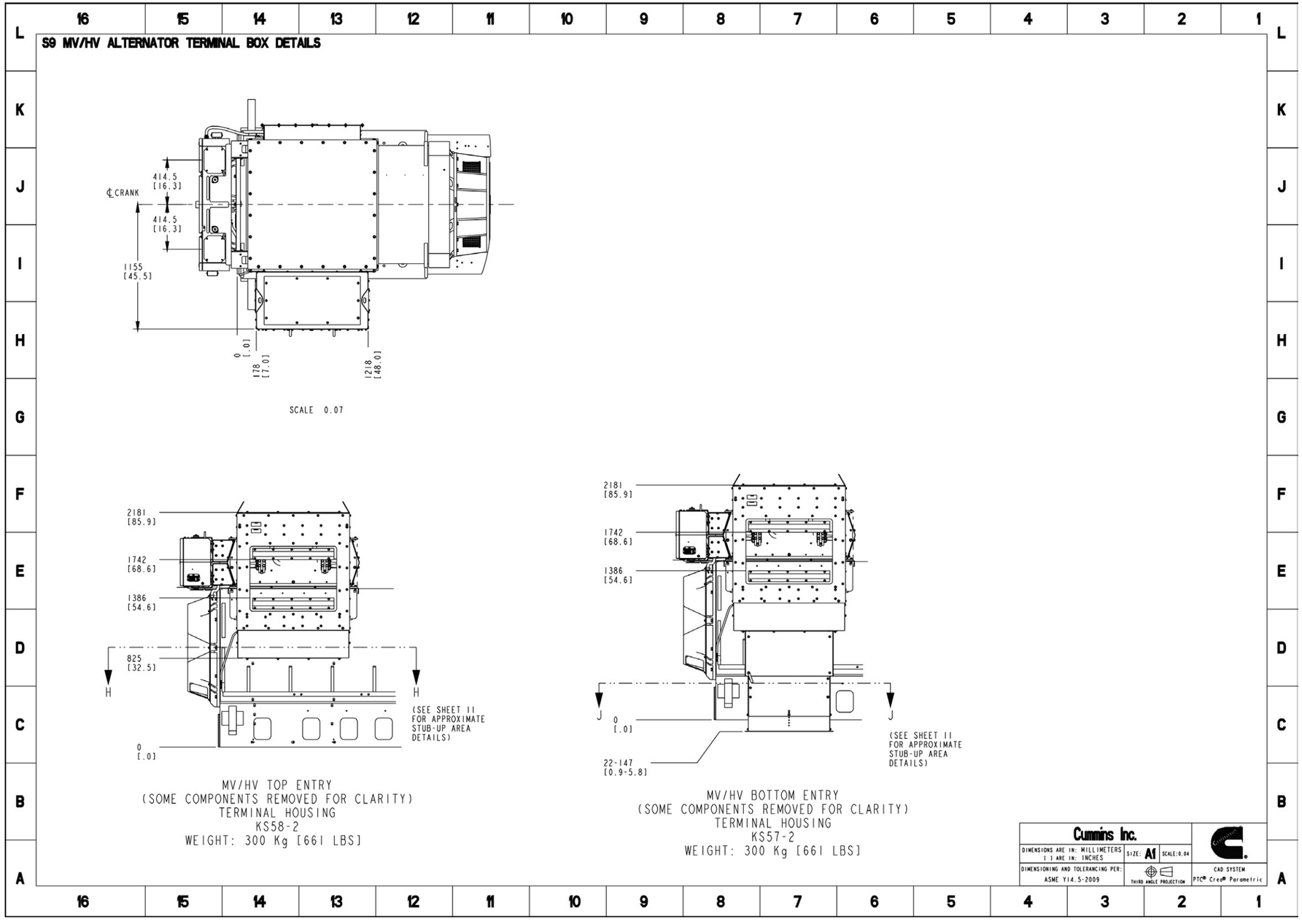


FIGURE 282. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 8 OF 11)

Copyright © 2025 Cummins Inc.

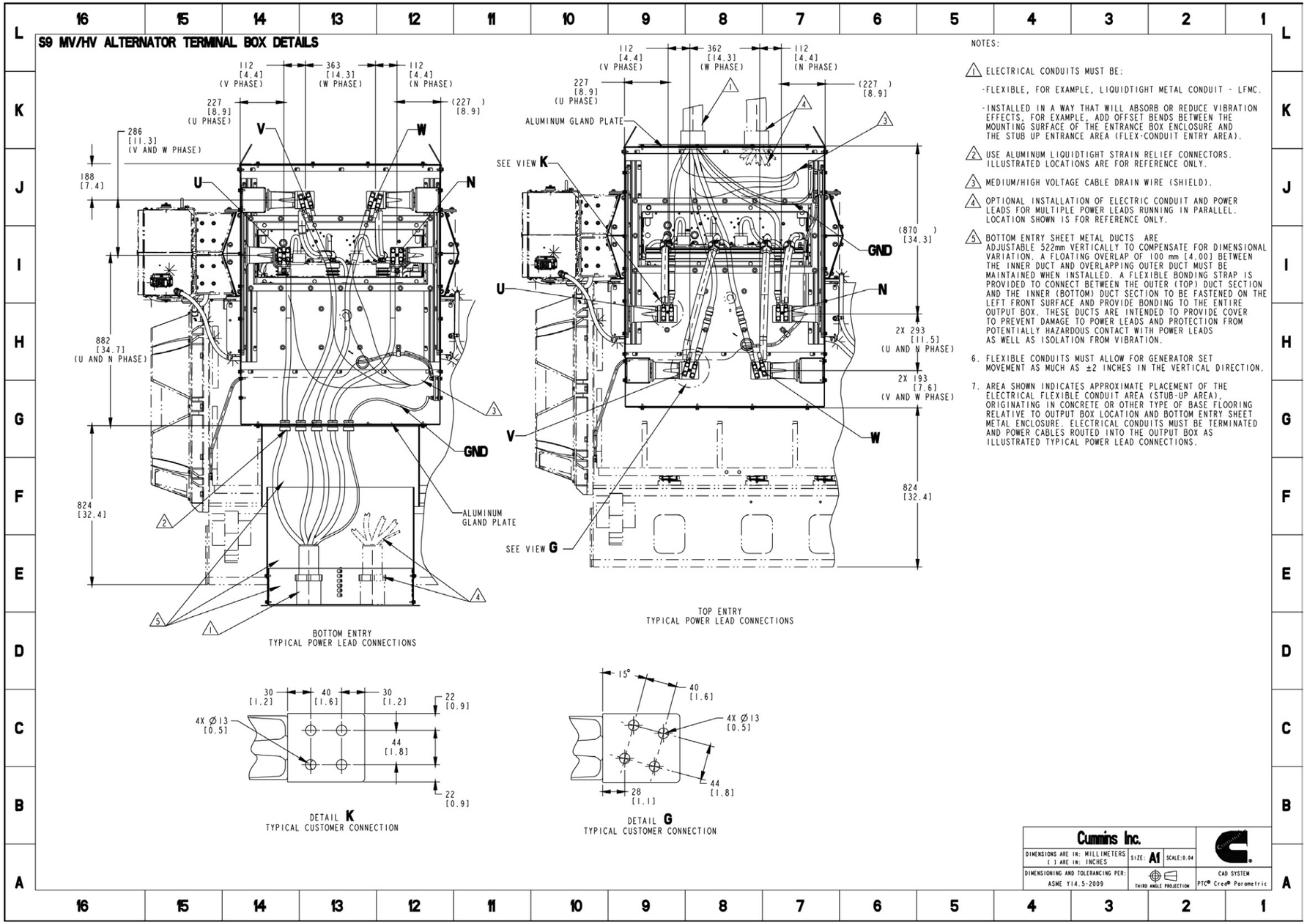


FIGURE 283. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 9 OF 11)

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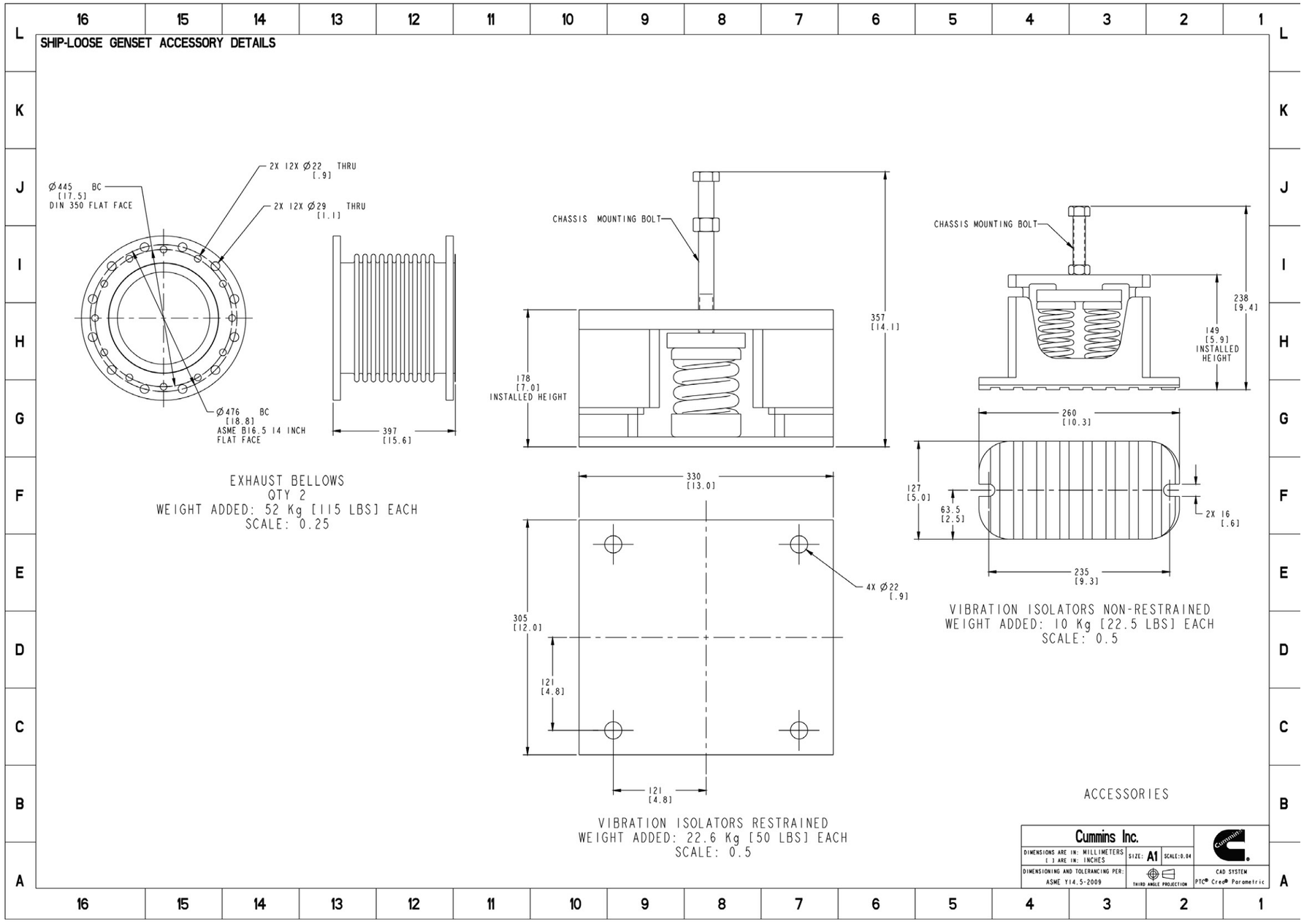


FIGURE 284. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 10 OF 11)

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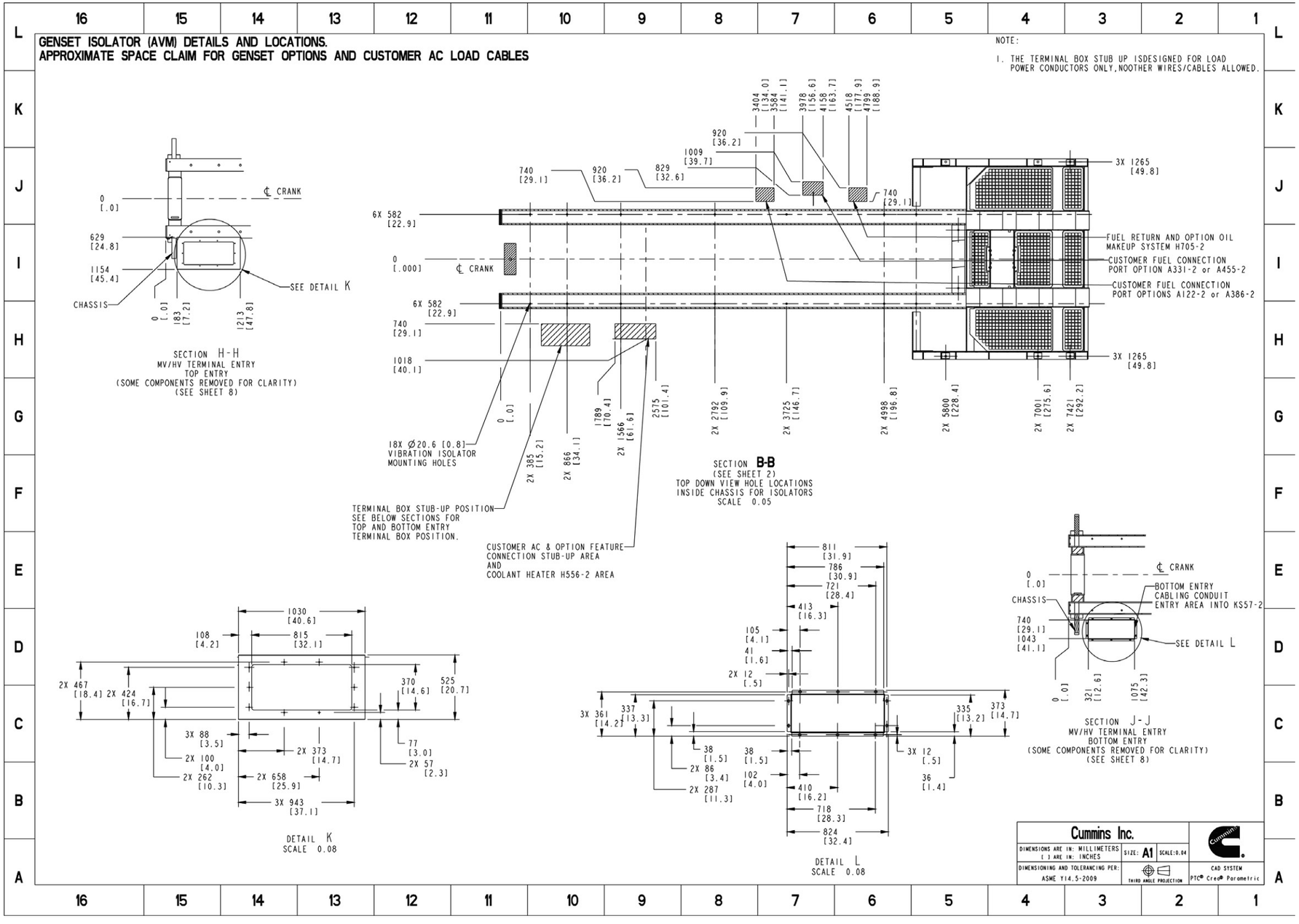
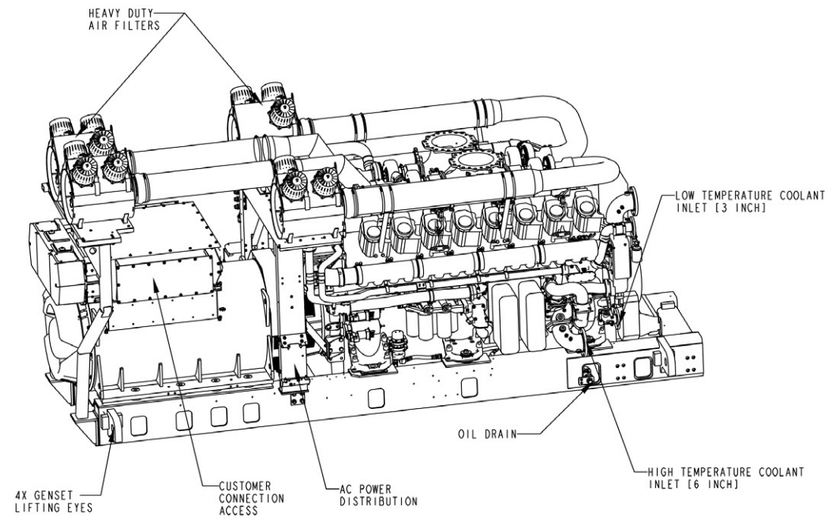


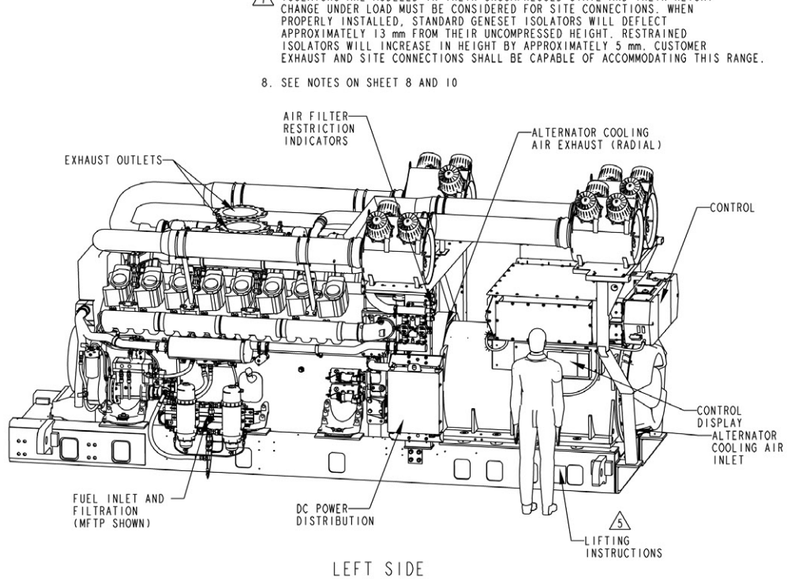
FIGURE 285. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITH 61 SQUARE FOOT RADIATOR (SHEET 11 OF 11)

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B.8 Outline Drawing A067S625 – Heavy Duty Air Cleaner Without Radiator

ALTERNATOR	WINDING	ALTERNATOR WEIGHT Kg [LBS]	GENSET WEIGHT* Kg [LBS]	C OF G DIM A* (SHEET 2) mm [Inch]	C OF G DIM B* (SHEET 2) mm [Inch]
S9MID-G42	851	7750 [17086]	24897 [54888]	1049 [41]	2853 [112]
S9HID-H42	991	8200 [18078]	25347 [55881]	1046 [41]	2811 [110]
S9HID-G42	991	7750 [17086]	24897 [54888]	1049 [41]	2853 [112]
S9HID-G42	961	7750 [17086]	24897 [54888]	1049 [41]	2853 [112]
S9HID-H42	961	8200 [18078]	25347 [55881]	1046 [41]	2811 [110]
S9HID-G42	983	7750 [17086]	24897 [54888]	1049 [41]	2853 [112]
S9HID-H42	983	8200 [18078]	25347 [55881]	1046 [41]	2811 [110]
S9MID-H42	851	8200 [18078]	25347 [55881]	1046 [41]	2811 [110]





NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS WITH IMPERIAL INCH CONVERSIONS IN "[ ]".

   1.1 IN EVENT OF A DISCREPANCY BETWEEN METRIC AND IMPERIAL DIMENSIONS, THE METRIC DIMENSIONS CONTROL.

2. ALL DIMENSIONS ARE REFERENCE, UNLESS SPECIFICALLY TOLERANCED..

3. WEIGHT: REFER TO TABLE FOR STANDARD GENSET WITH D036-2.

   *3.1 INCLUDES WEIGHT OF 606 LITERS [160 GALLONS] SUPPLIED ENGINE OIL.(530 KG/1168 LBS)

   **3.2 DOES NOT INCLUDE NON-SUPPLIED 378.5 LITERS [100 GALLONS] OF ENGINE COOLANT CAPACITY.

4. LARGEST NOMINAL DIMENSIONS:
   4.1 LENGTH: 6415 [252.6]
   4.2 WIDTH: 2594 [102.1]
   4.3 HEIGHT: 3009 [118.5]
   4.4 DOES NOT INCLUDE THE HEIGHT OF VIBRATION ISOLATOR

5. LIFTING INSTRUCTIONS: REFER TO GENSET INSTALLATION MANUAL AND LIFTING LABEL.

   NOTE: GENSET SHALL NOT BE LIFTED USING THE LIFTING EYES WHEN ATTACHED TO THE RADIATOR. RADIATOR AND GENSET SHALL ALWAYS BE LIFTED SEPARATELY PER INSTALLATION MANUAL AND LIFTING DIAGRAMS.

6. ALLOW 1 METER OF SPACE AROUND THE GENSET FOR SERVICE.

7. ISOLATORS ARE MODELED IN THEIR UNCOMPRESSED STATE AND THEIR HEIGHT CHANGE UNDER LOAD MUST BE CONSIDERED FOR SITE CONNECTIONS. WHEN PROPERLY INSTALLED, STANDARD GENESET ISOLATORS WILL DEFLECT APPROXIMATELY 13 mm FROM THEIR UNCOMPRESSED HEIGHT. RESTRAINED ISOLATORS WILL INCREASE IN HEIGHT BY APPROXIMATELY 5 mm. CUSTOMER EXHAUST AND SITE CONNECTIONS SHALL BE CAPABLE OF ACCOMMODATING THIS RANGE.

8. SEE NOTES ON SHEET 8 AND 10

STANDARD GENSET WITH S9HID-H42 ALTERNATOR AND HEAVY DUTY AIR INDUCTION CONFIGURATION D036-2 SHOWN

LAST DATUM LETTER USED: A	LAST REFERENCE LETTER USED: B
MODEL/PLATFORM: C325D6	THIS PART IS SIMILAR TO: A045P698
Cummins Inc.	
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES	SIZE: A1 SCALE: 0.04
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION
	CAD SYSTEM PTC® Creo® Parametric

FIGURE 286. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 1 OF 10)

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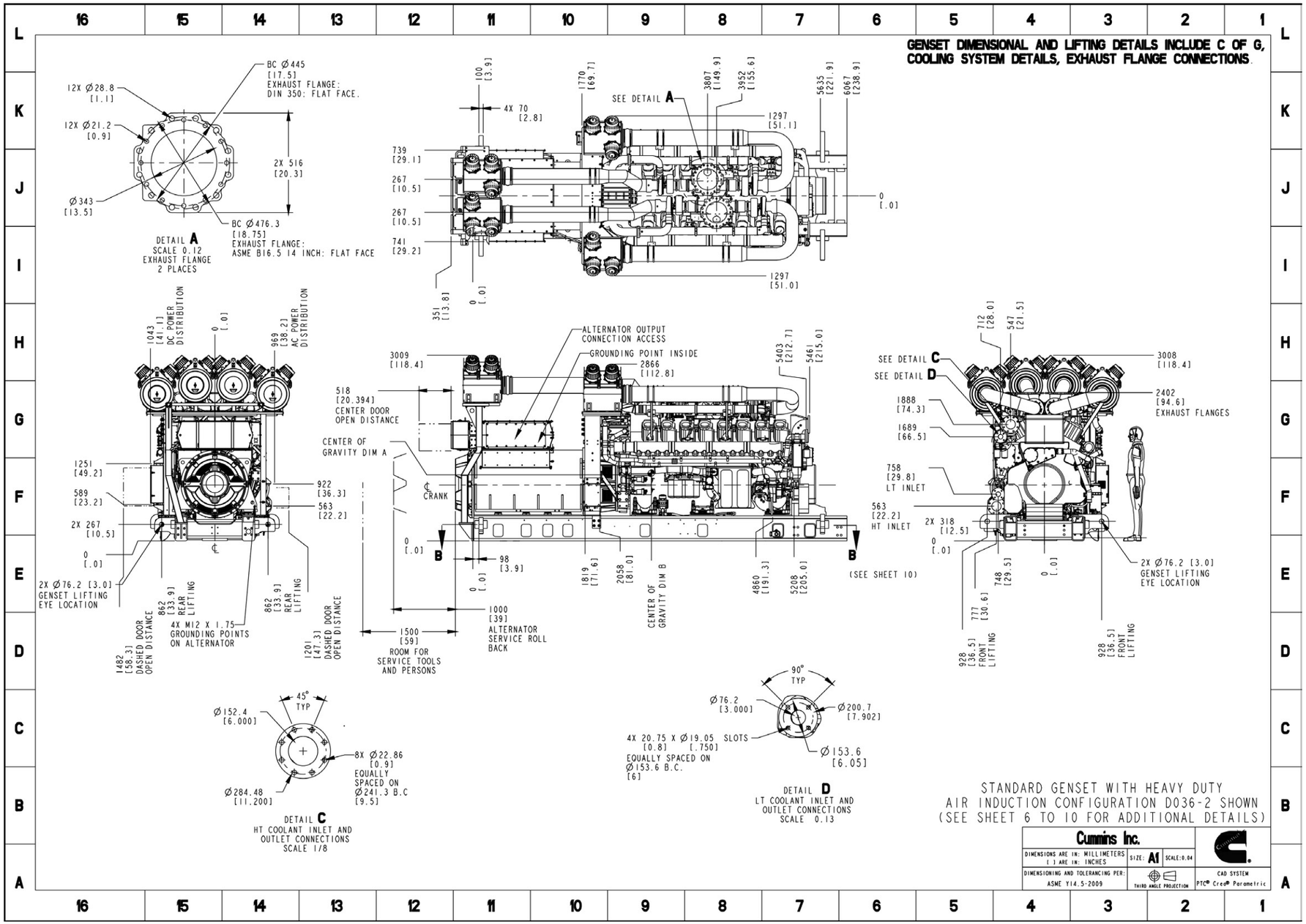


FIGURE 287. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 2 OF 10)

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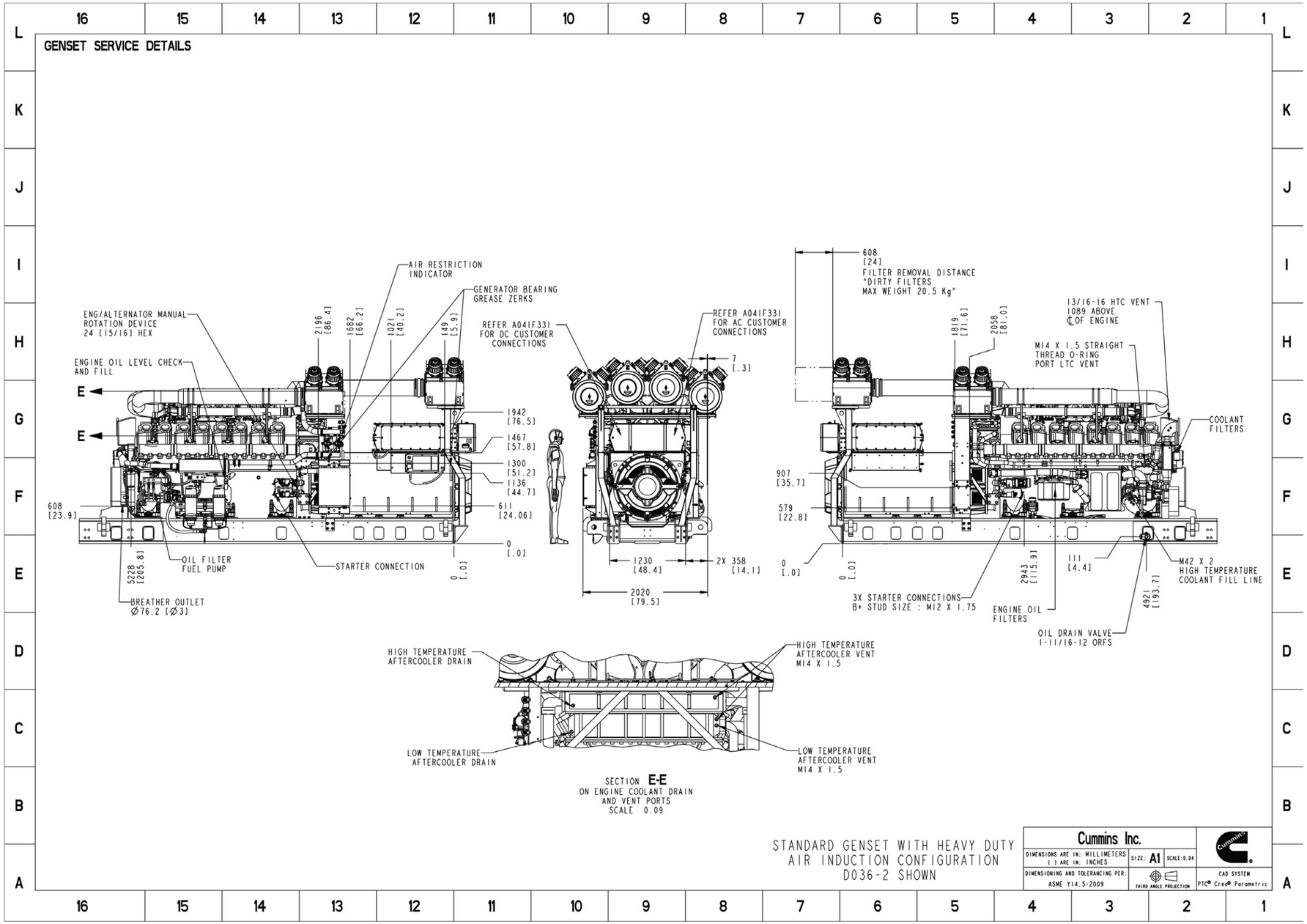


FIGURE 288. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 3 OF 10)

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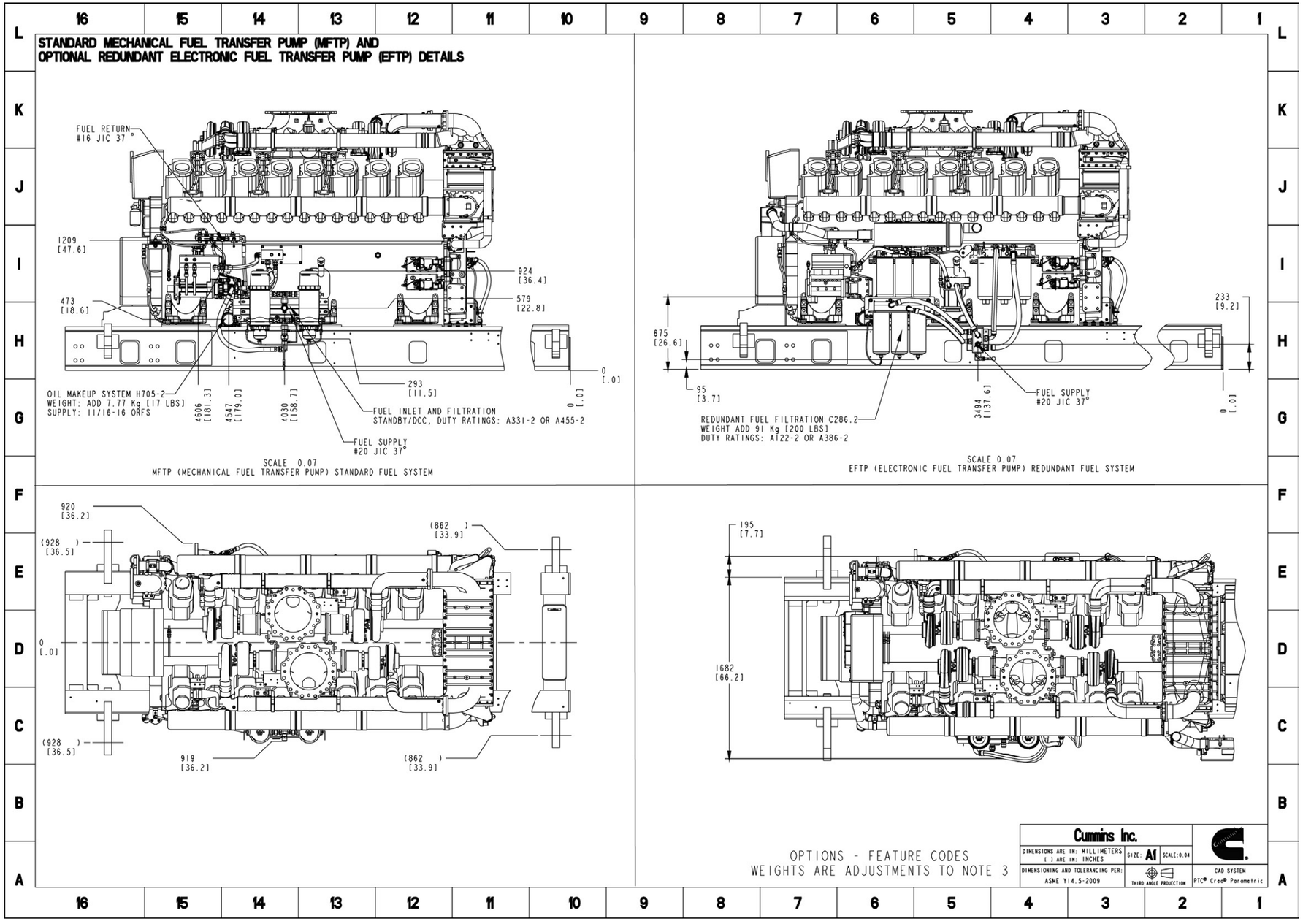


FIGURE 289. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 4 OF 10)

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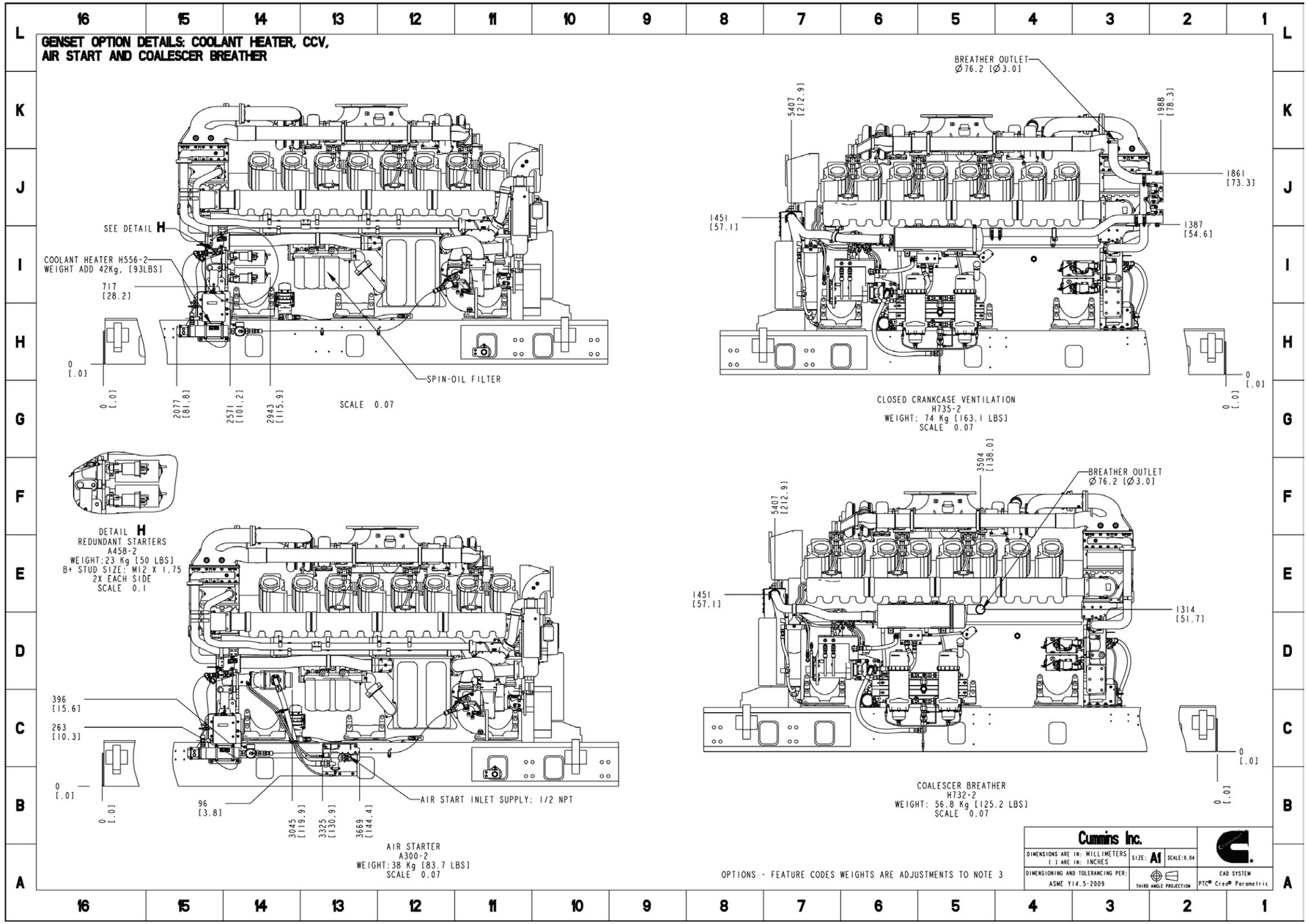


FIGURE 290. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 5 OF 10)

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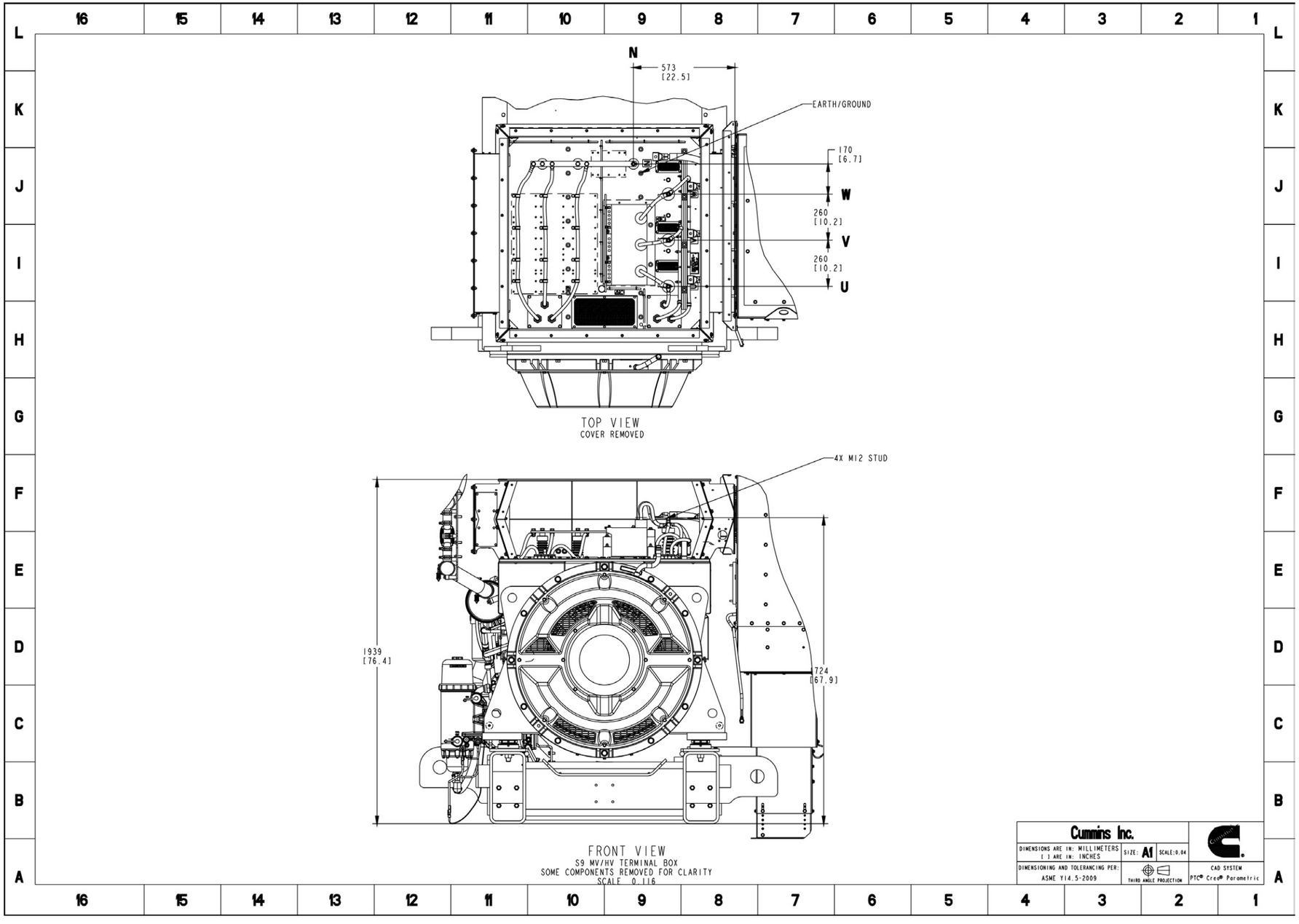


FIGURE 291. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 6 OF 10)

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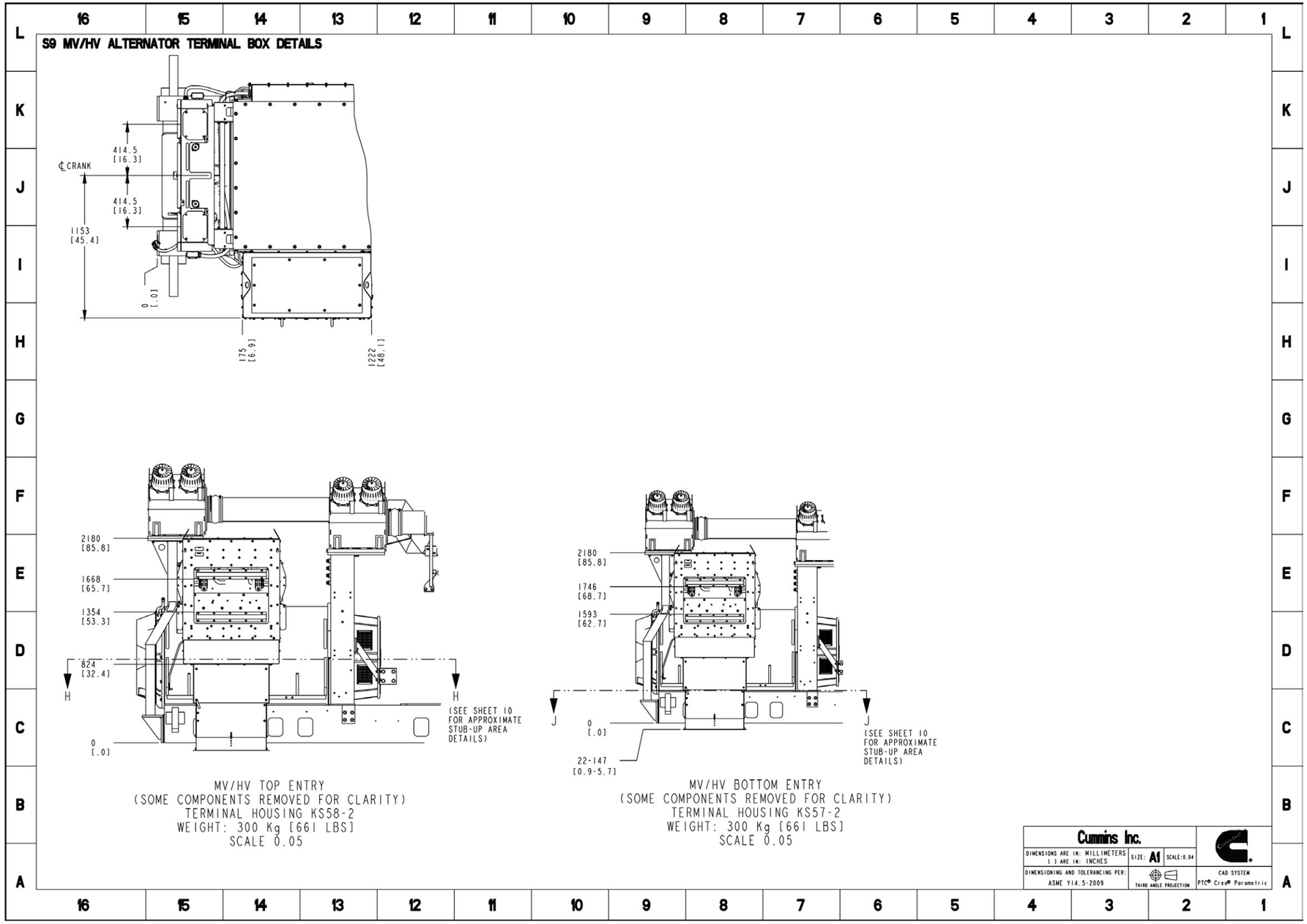


FIGURE 292. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 7 OF 10)

Copyright © 2025 Cummins Inc.

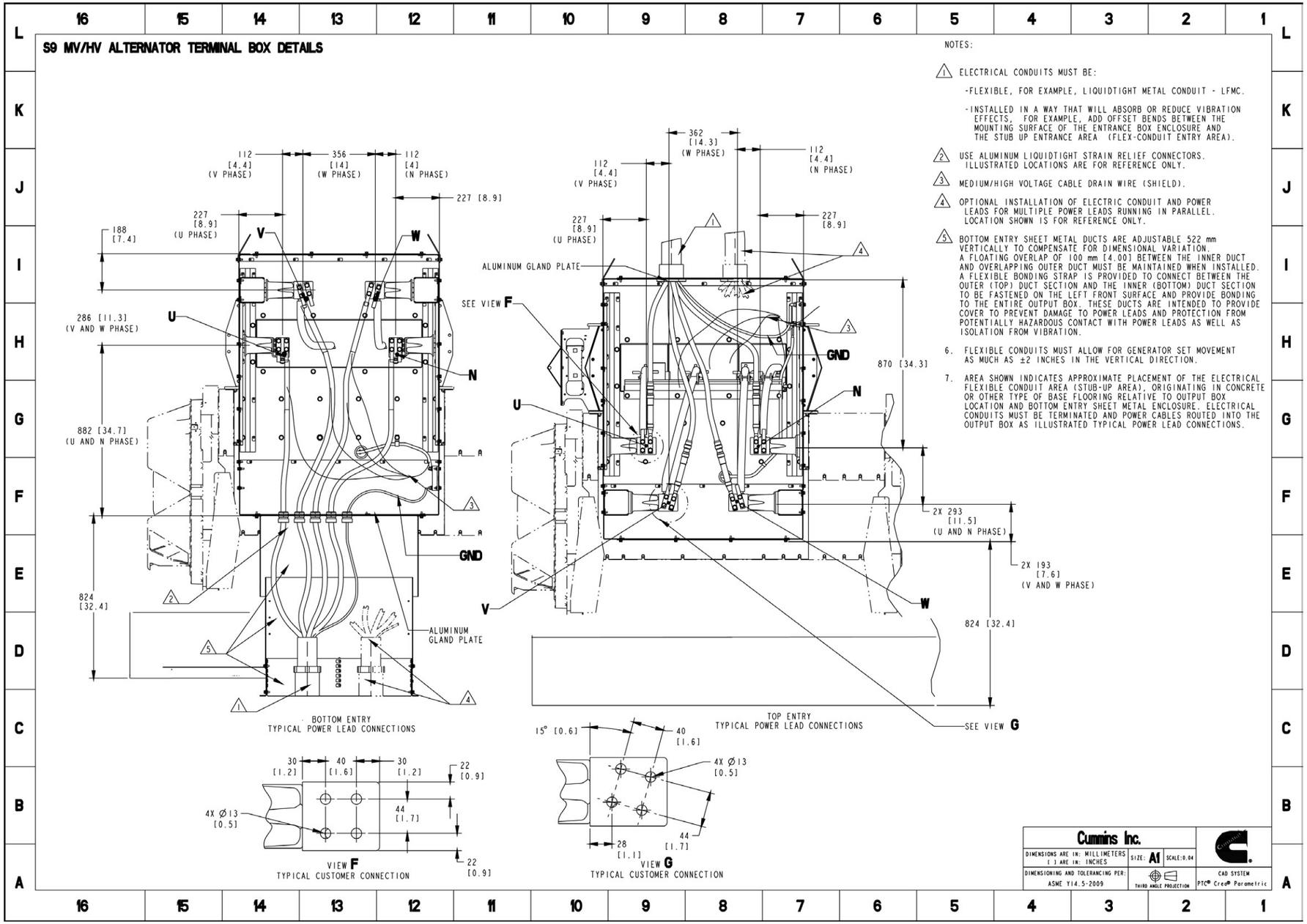


FIGURE 293. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 8 OF 10)

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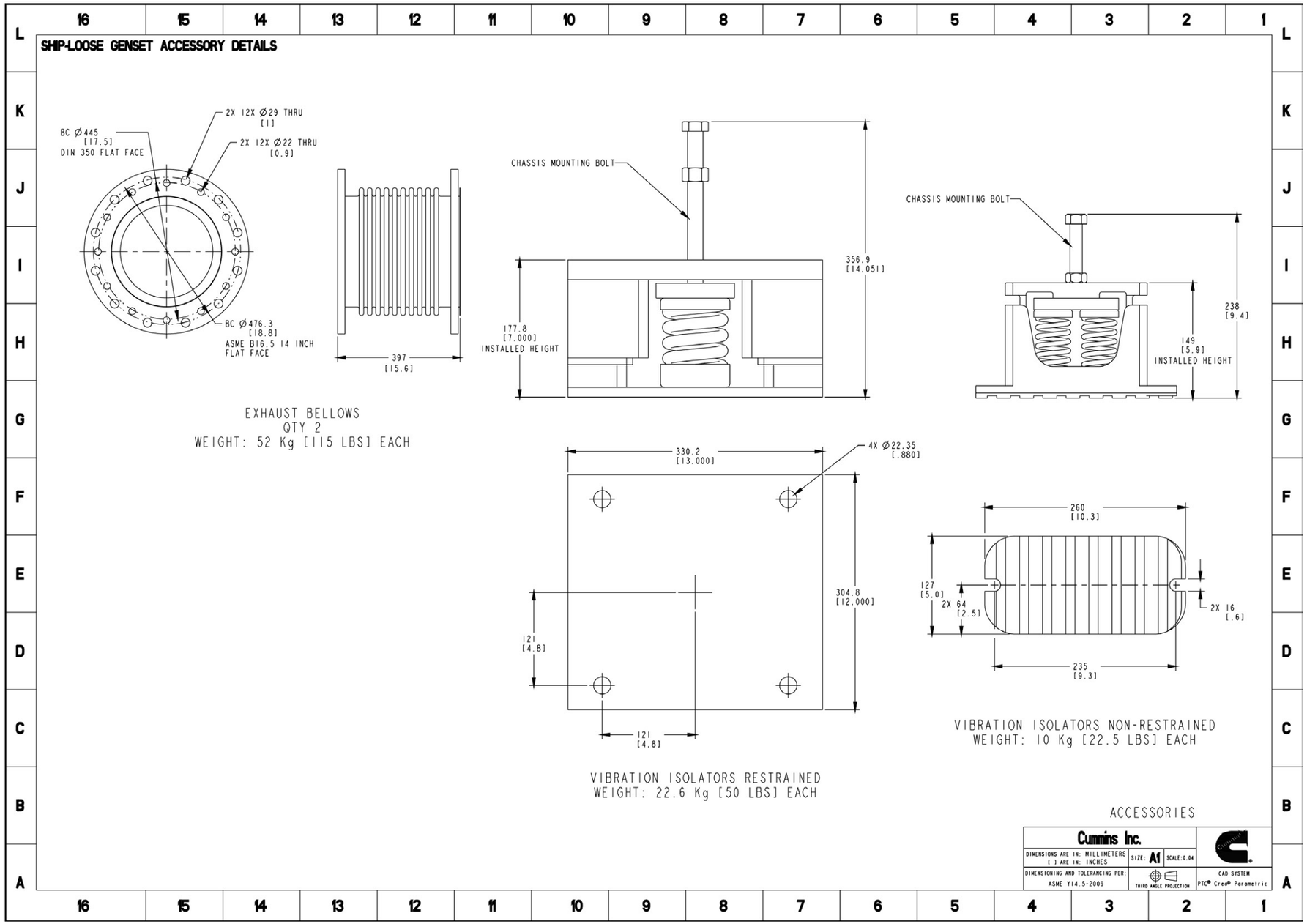


FIGURE 294. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 9 OF 10)

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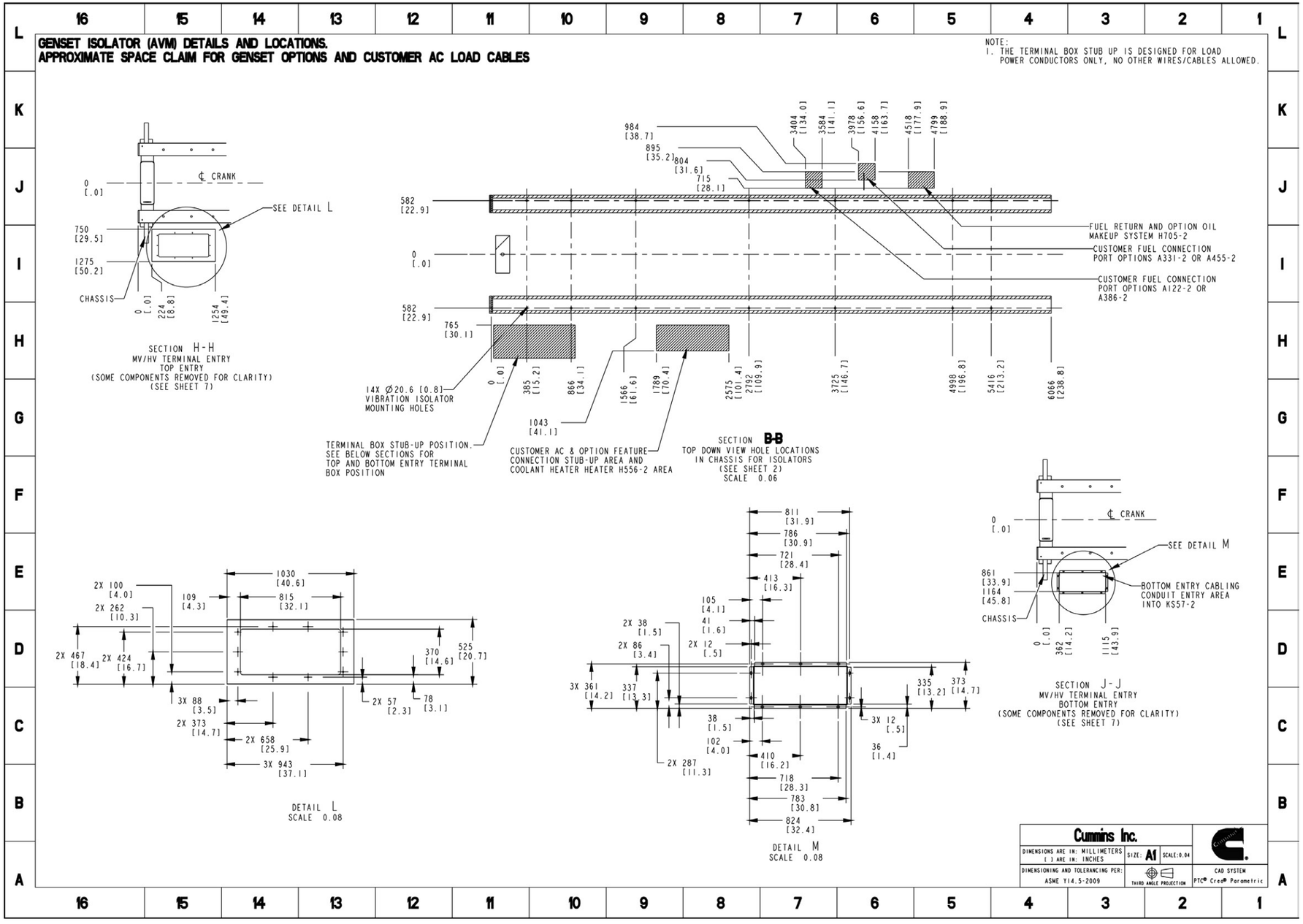


FIGURE 295. OUTLINE DRAWING – HEAVY DUTY AIR CLEANER WITHOUT RADIATOR (SHEET 10 OF 10)

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Appendix C. Installation Drawing

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The drawings included in this section are representative. For current complete information, refer to the drawing package that was shipped with the unit.

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C.1 Exhaust Installation Drawing (A044P246)

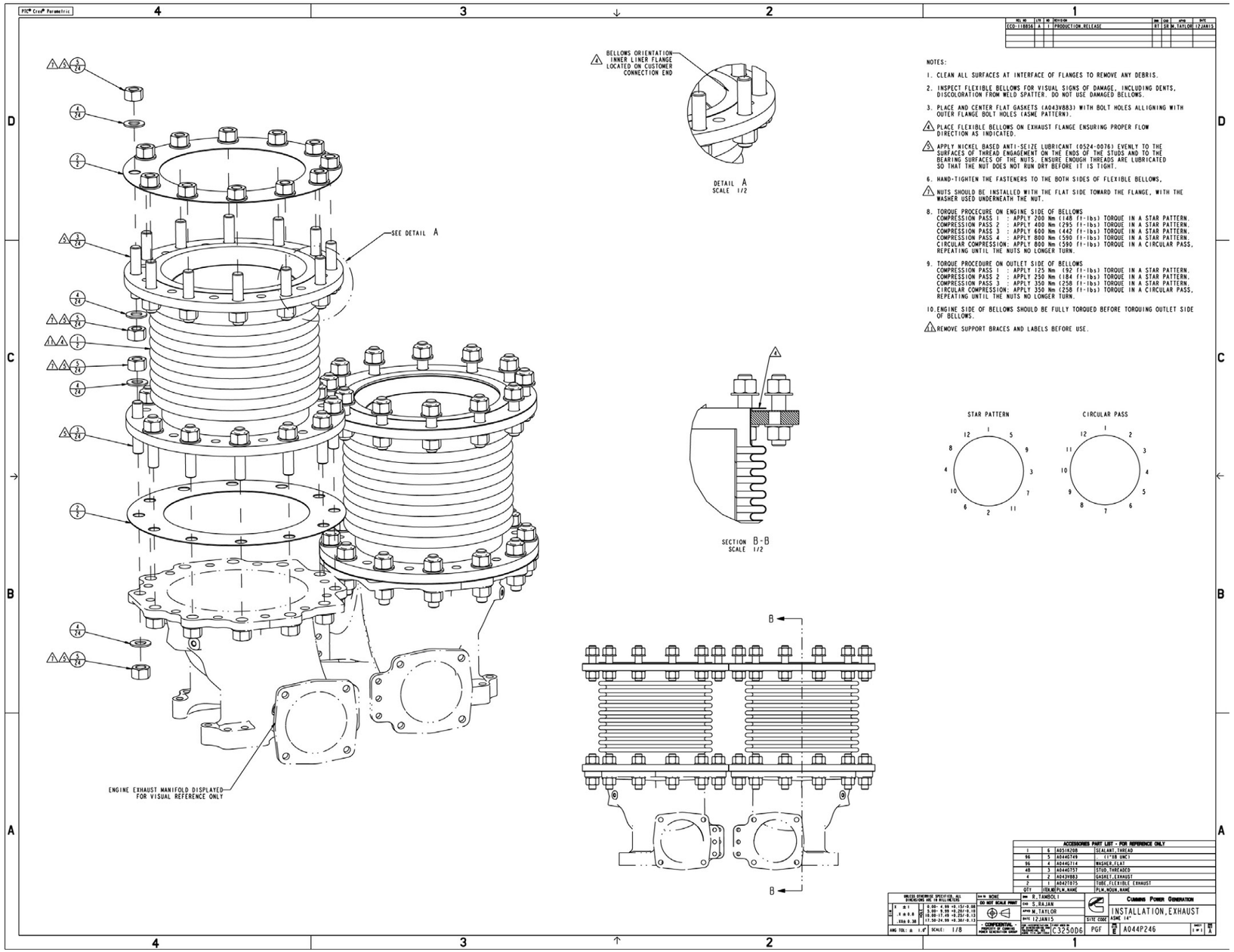


FIGURE 296. EXHAUST INSTALLATION DRAWING (A044P246)

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C.2 Exhaust Installation Drawing (A049Y822)

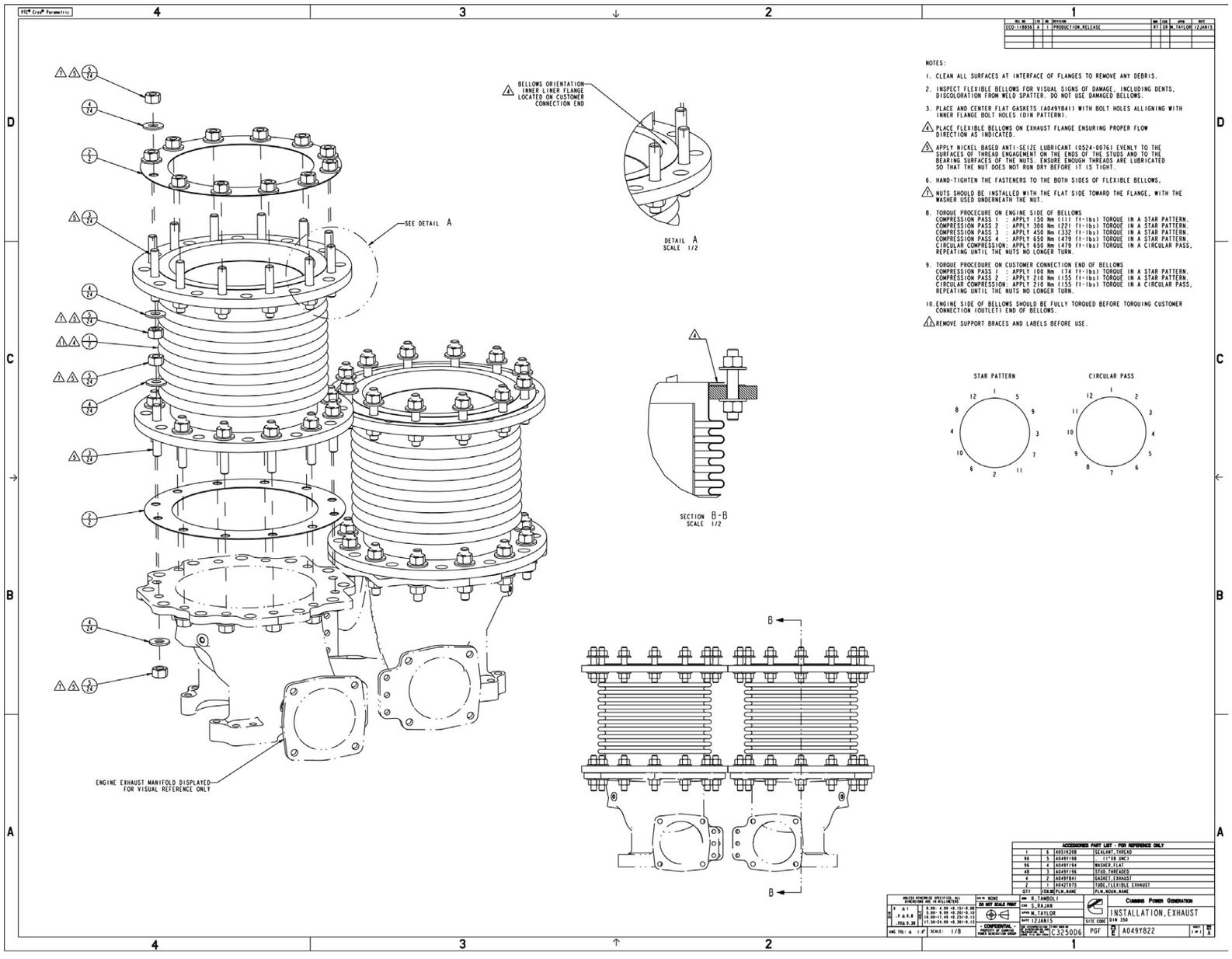


FIGURE 297. EXHAUST INSTALLATION DRAWING (A049Y822)

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C.3 Fuel Transfer Installation Drawing (A045B223)

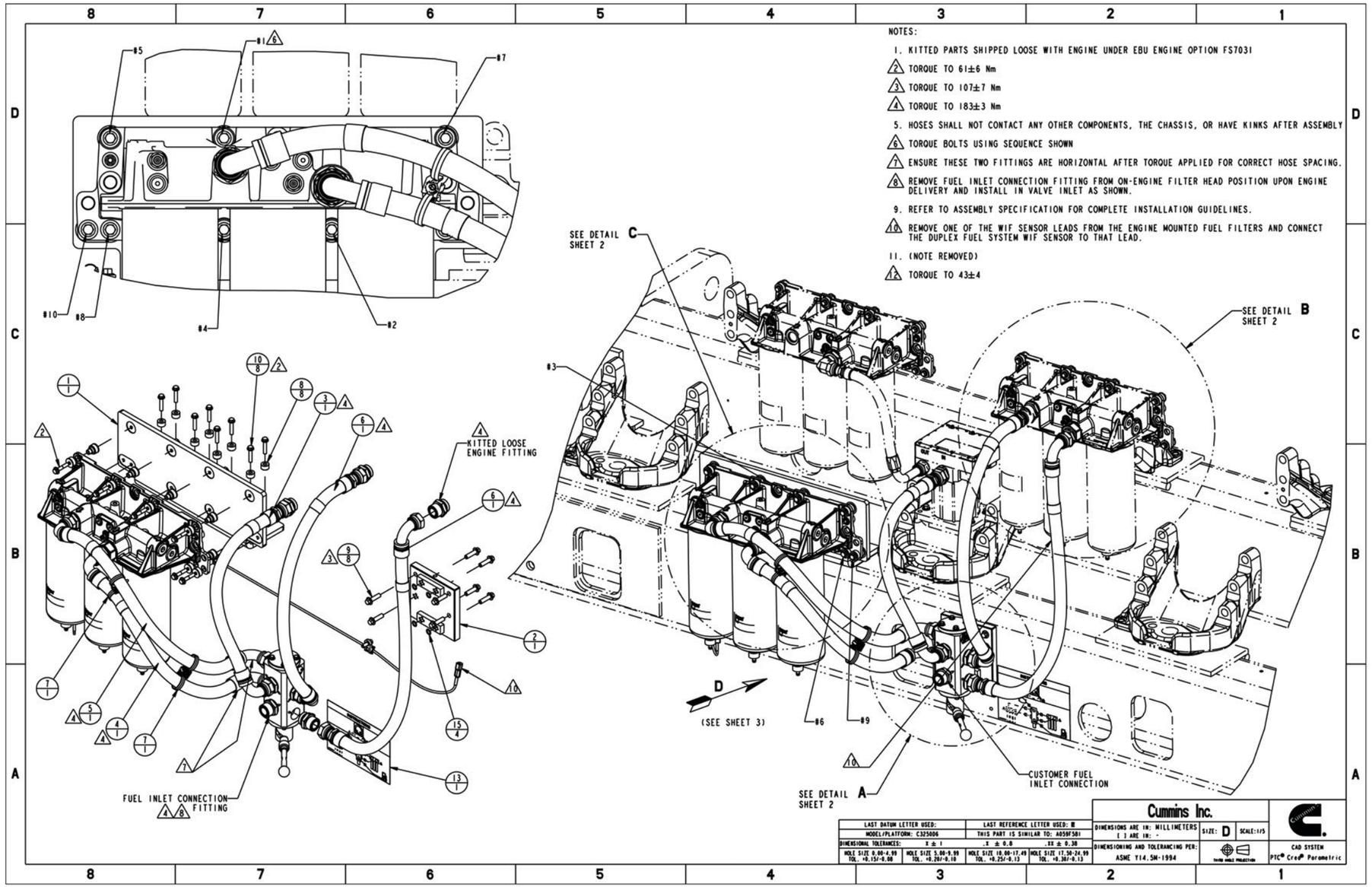


FIGURE 298. FUEL TRANSFER INSTALLATION DRAWING (A045B223) (SHEET 1)

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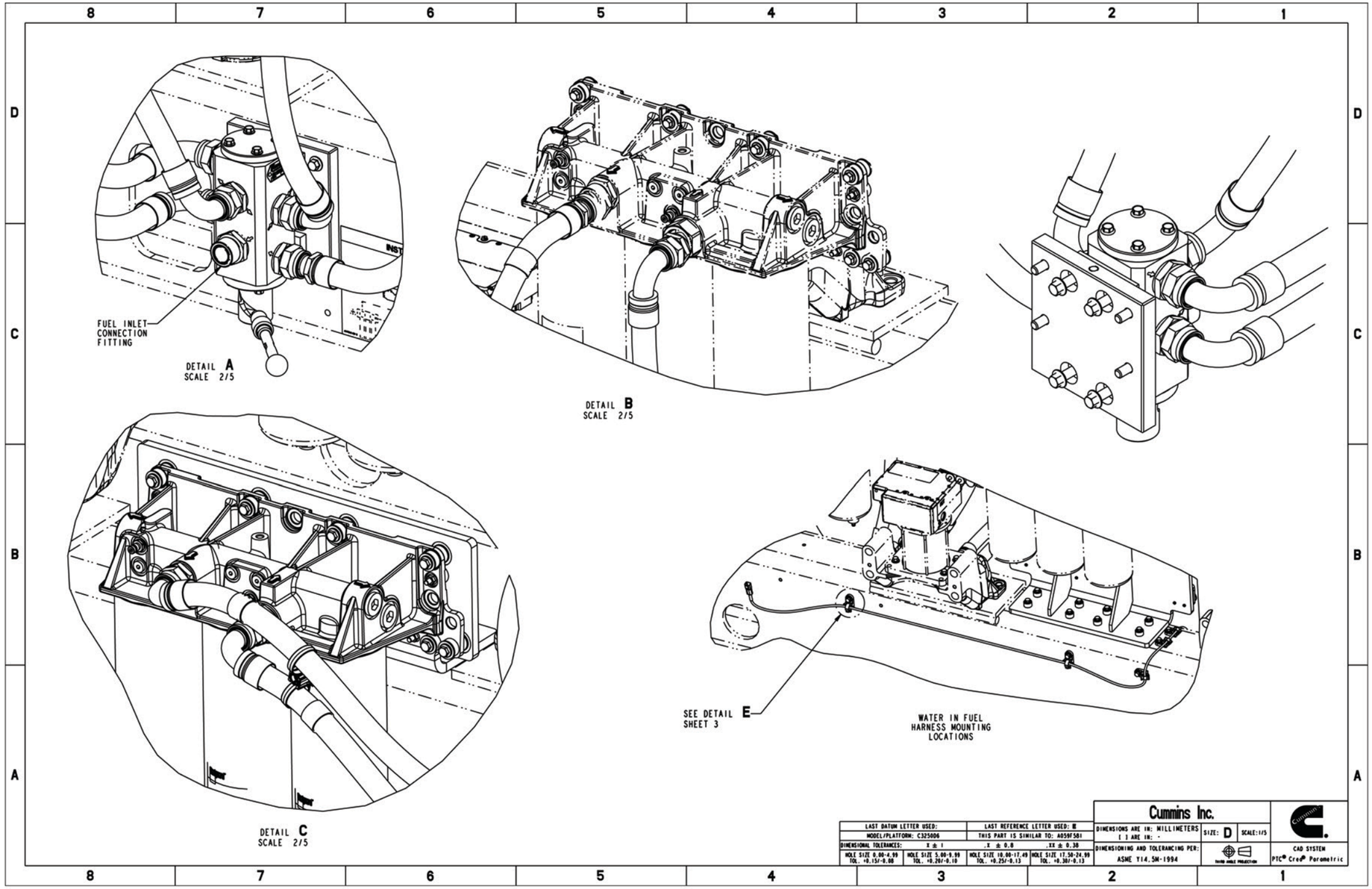


FIGURE 299. FUEL TRANSFER INSTALLATION DRAWING (A045B223) (SHEET 2)

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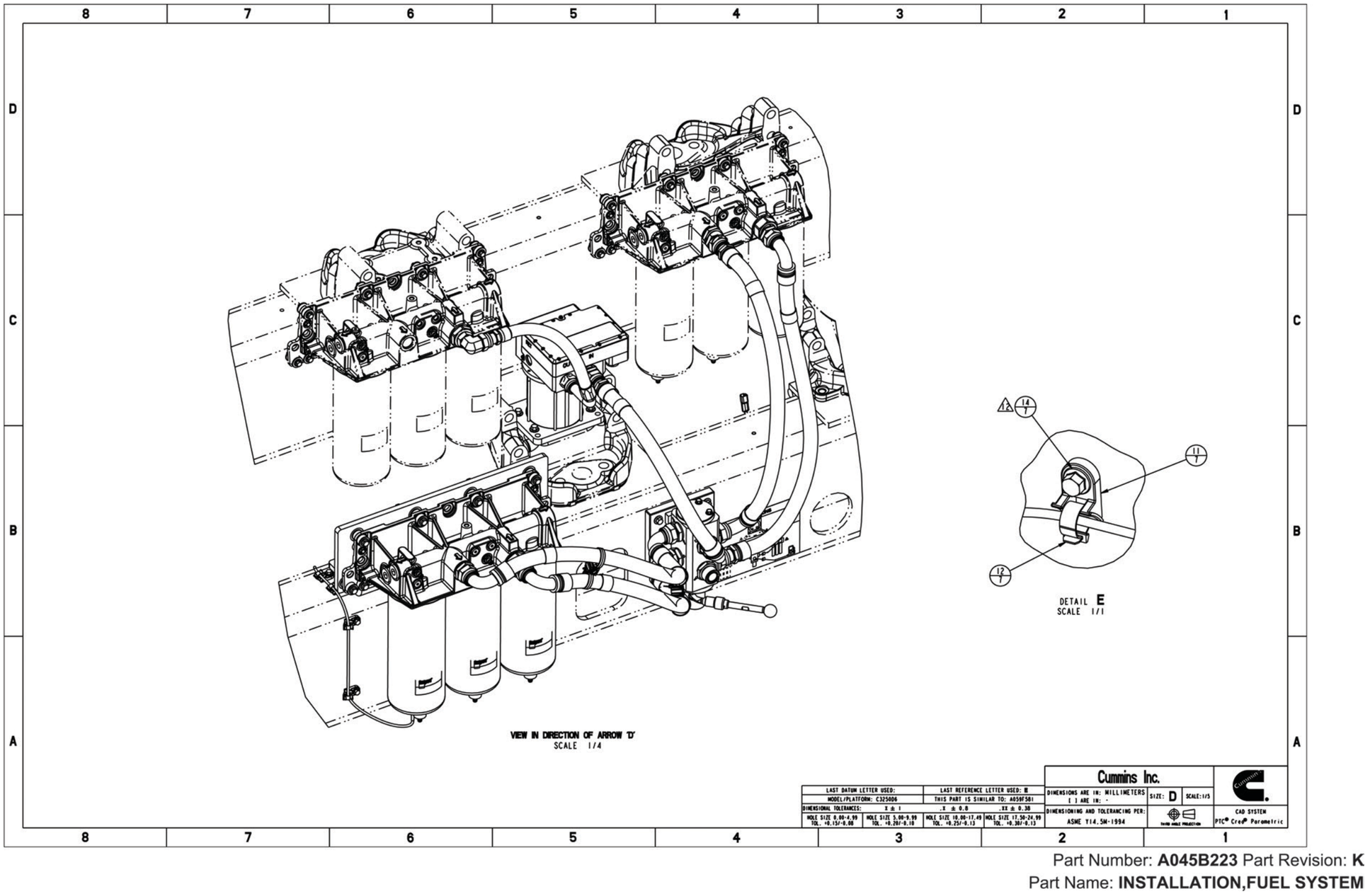


FIGURE 300. FUEL TRANSFER INSTALLATION DRAWING (A045B223) (SHEET 3)

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C.4 A048D629 Radiator Installation Drawing

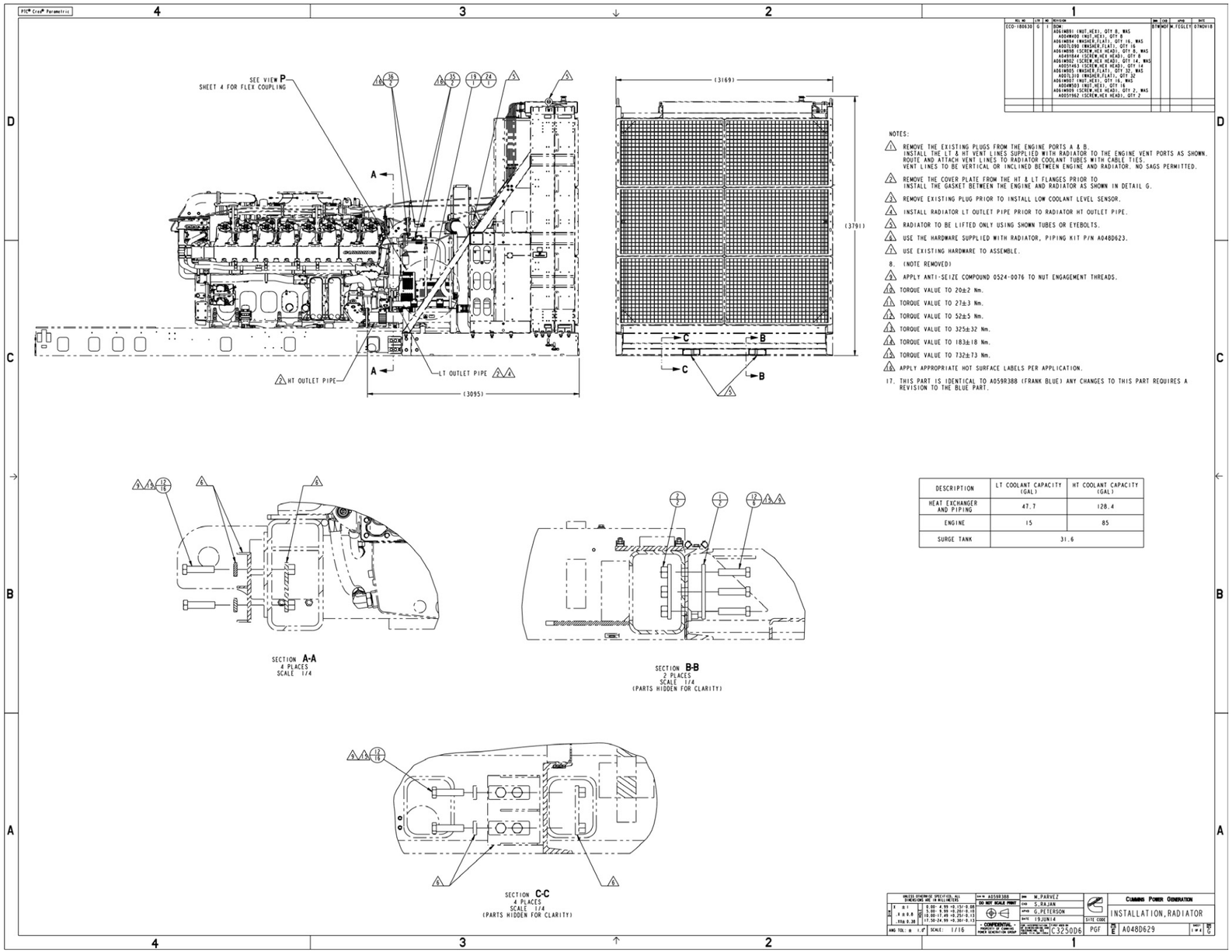


FIGURE 301. RADIATOR INSTALLATION DRAWING (SHEET 1)

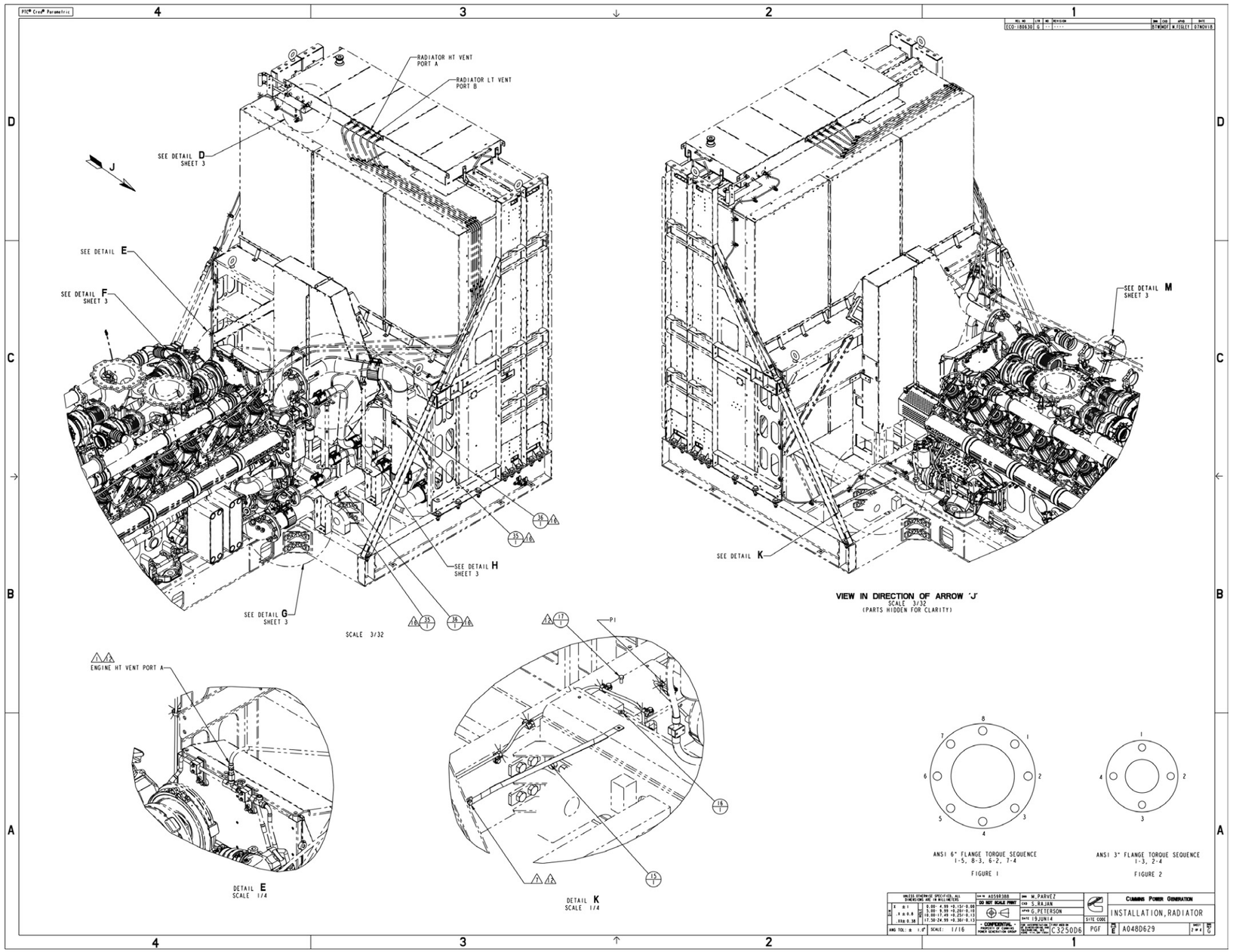


FIGURE 302. RADIATOR INSTALLATION DRAWING (SHEET 2)

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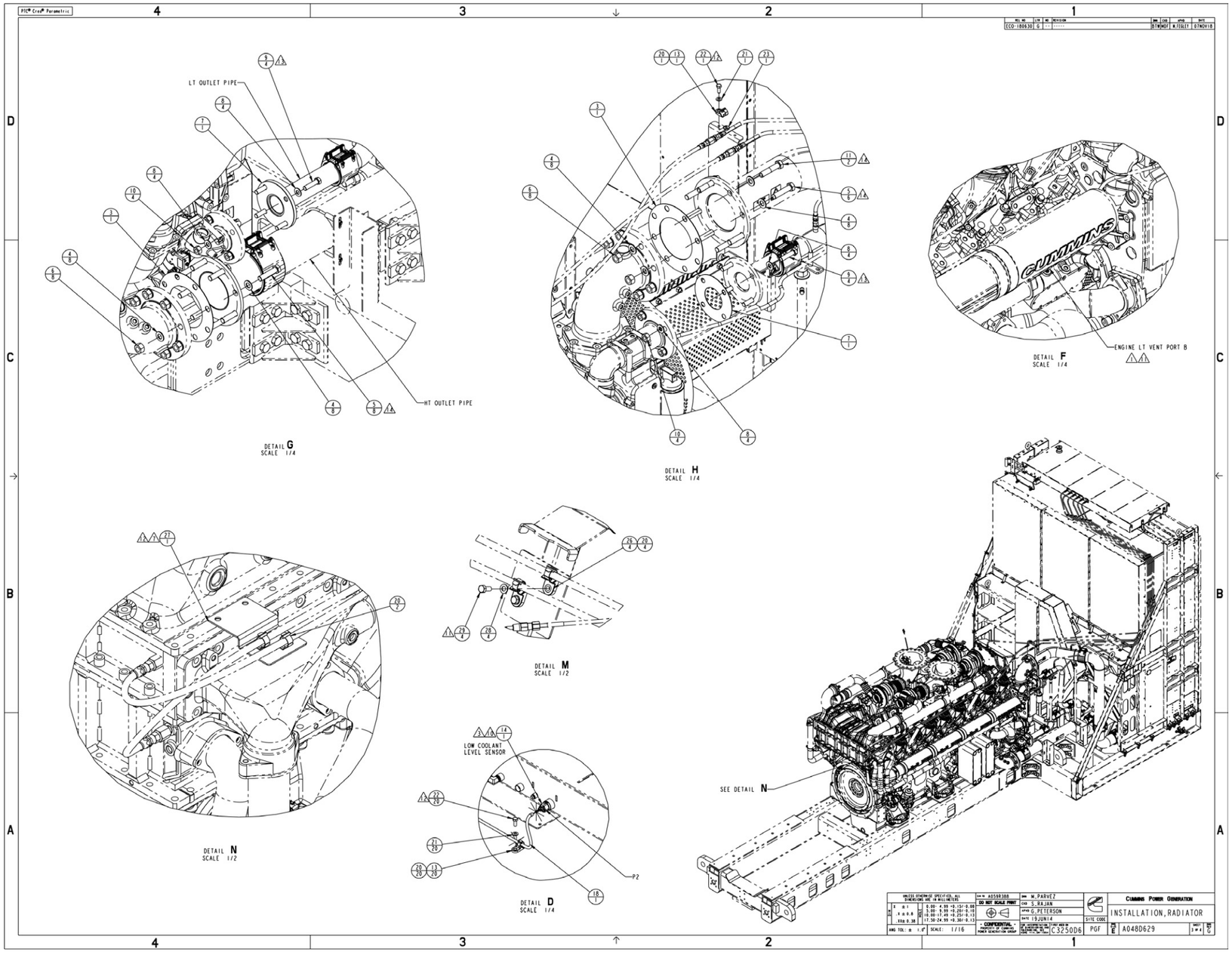


FIGURE 303. RADIATOR INSTALLATION DRAWING (SHEET 3)

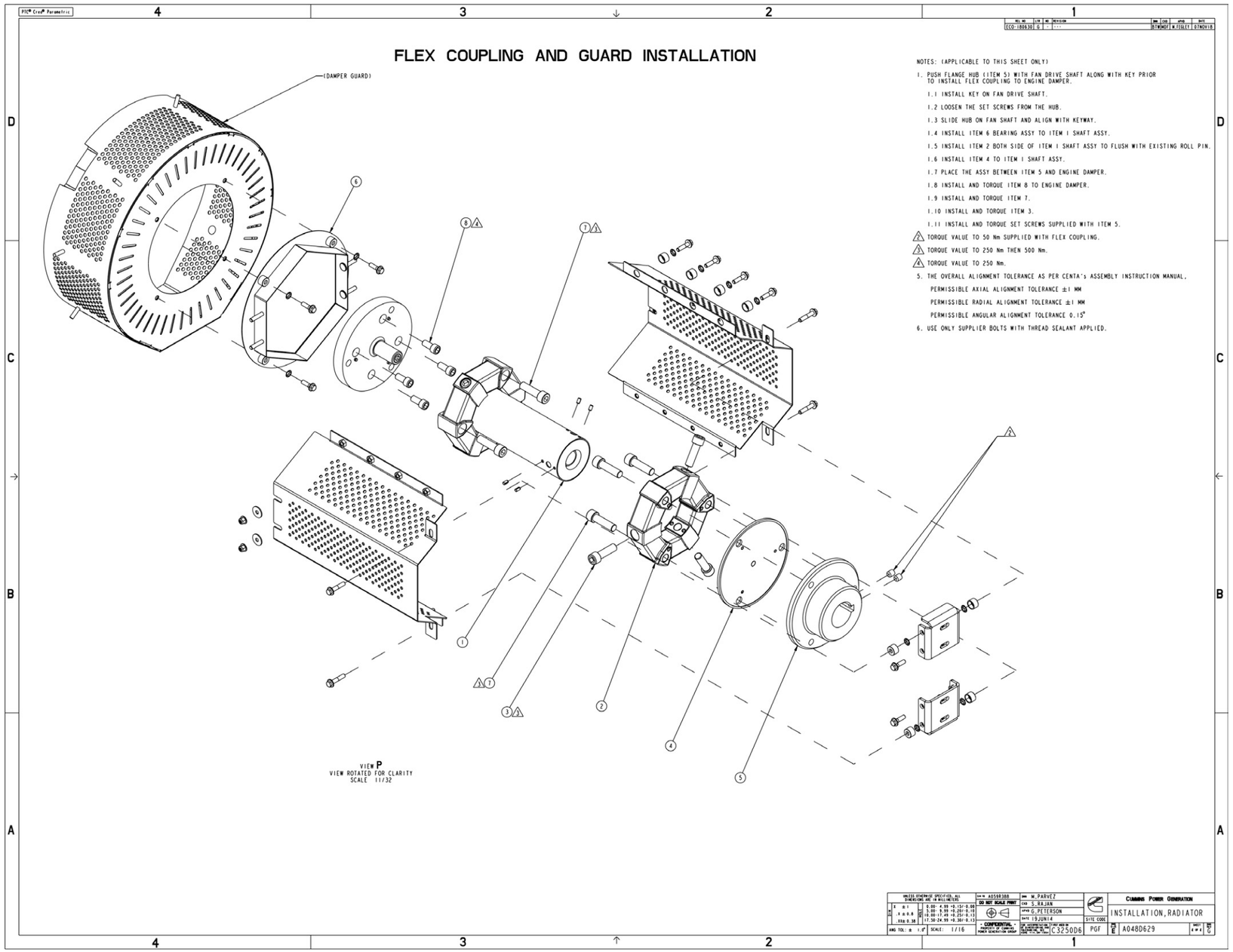


FIGURE 304. RADIATOR INSTALLATION DRAWING (SHEET 4)

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C.5 A048D623 Radiator Piping Kit Installation Drawing

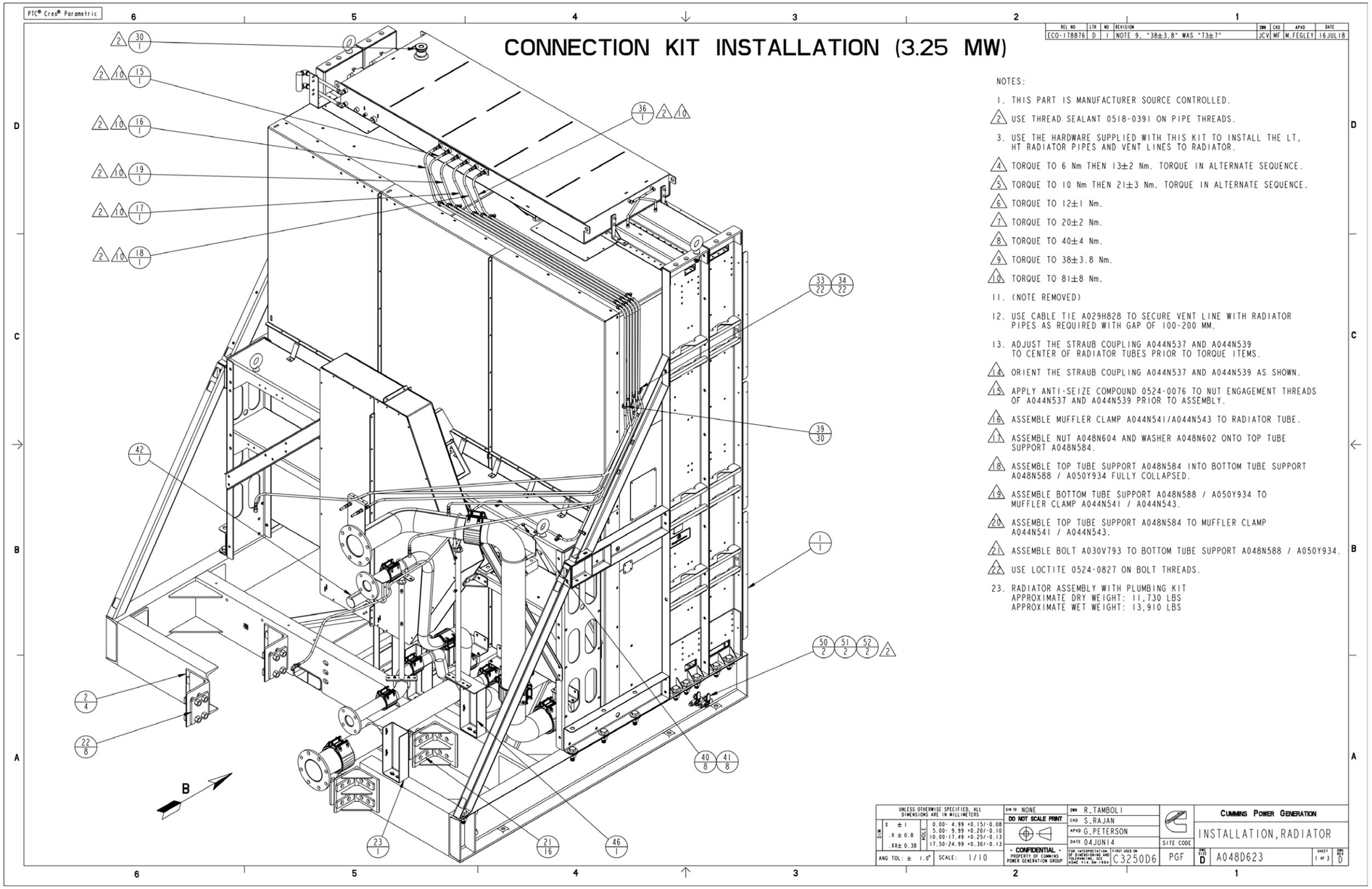


FIGURE 305. A048D623 RADIATOR PIPING KIT SHEET 1 OF 3

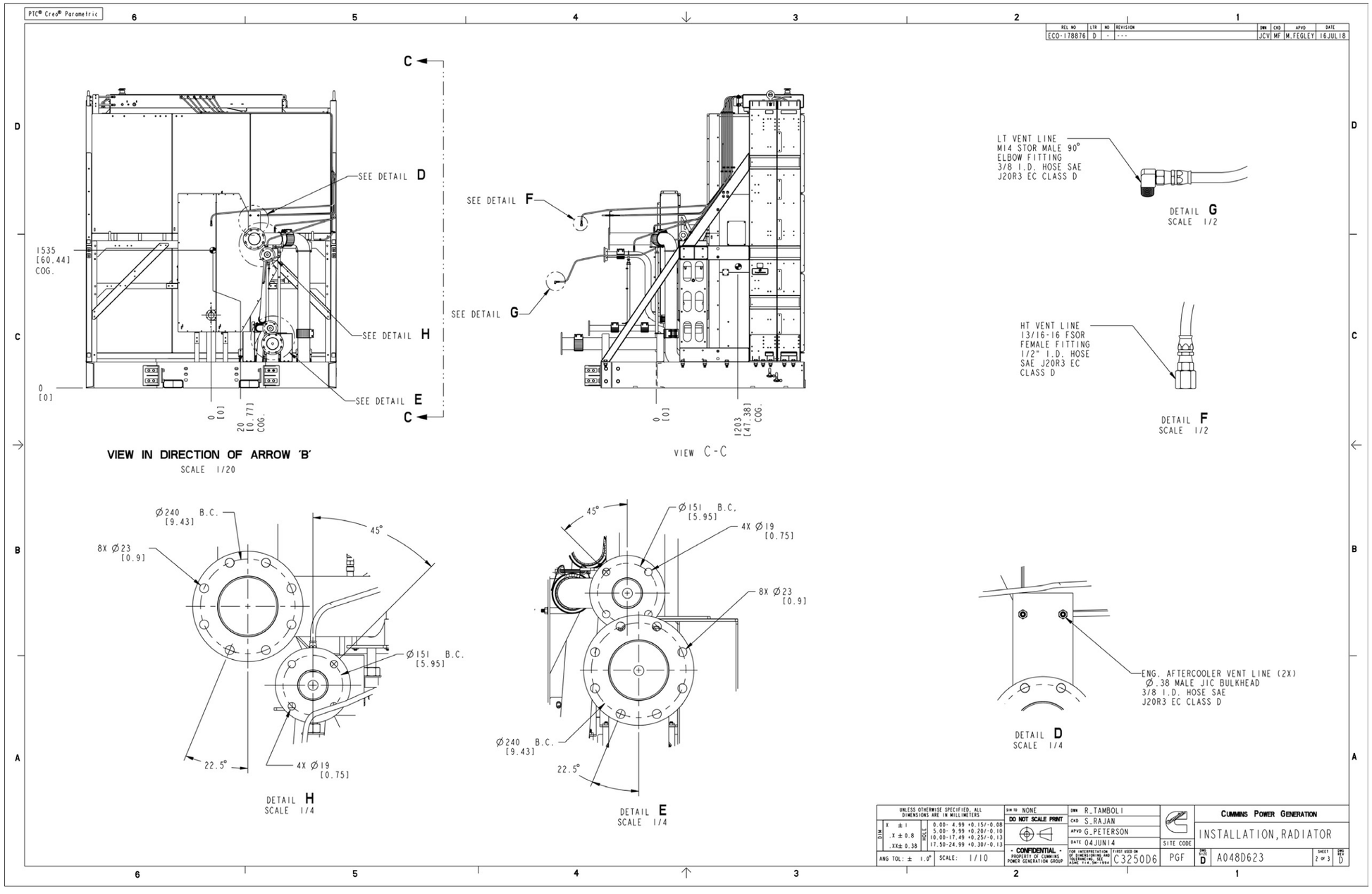


FIGURE 306. A048D623 RADIATOR PIPING KIT SHEET 2 OF 3

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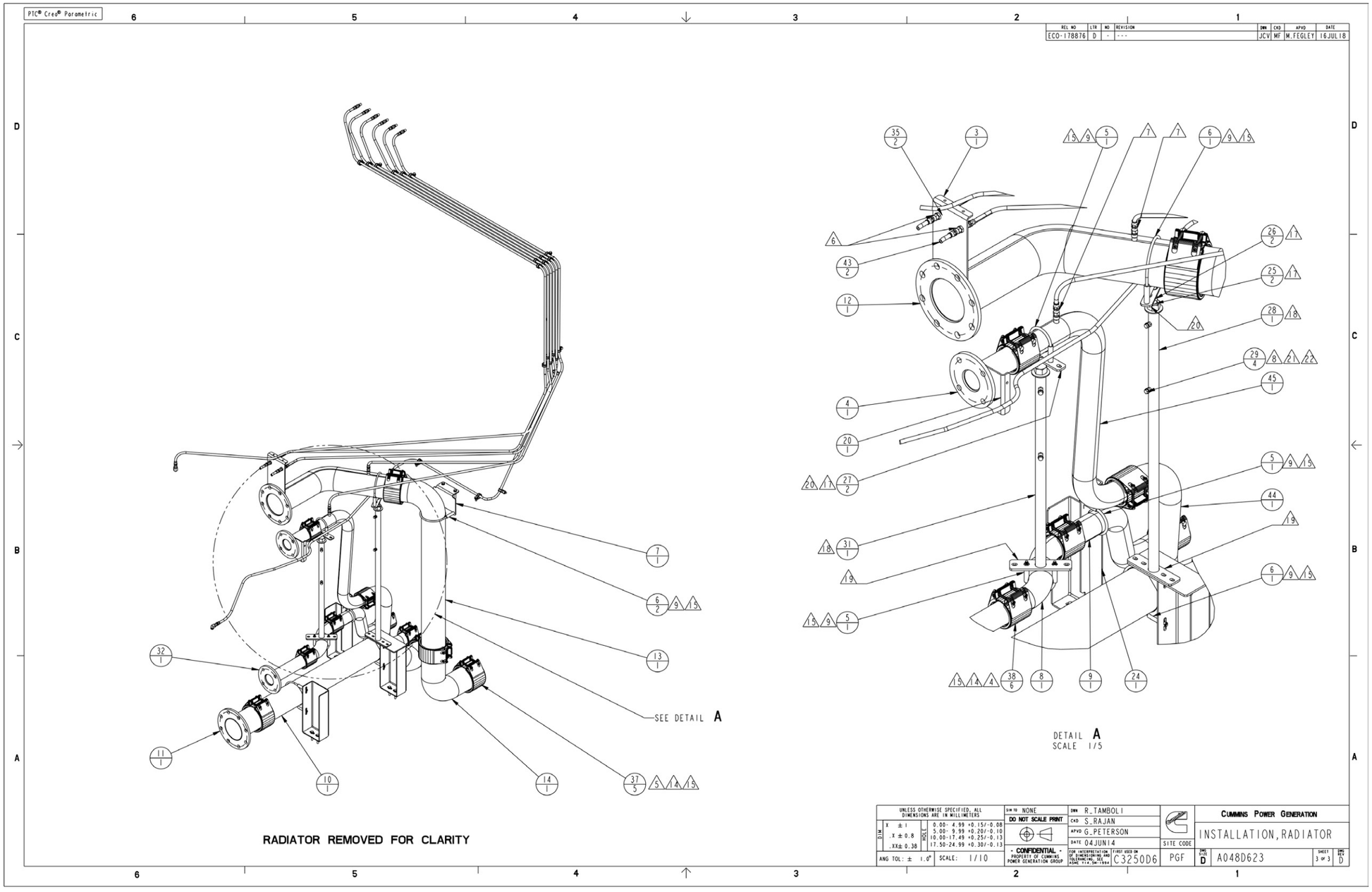


FIGURE 307. A048D623 RADIATOR PIPING KIT SHEET 3 OF 3

C.6 A048D652 Radiator Piping Kit Installation Drawing

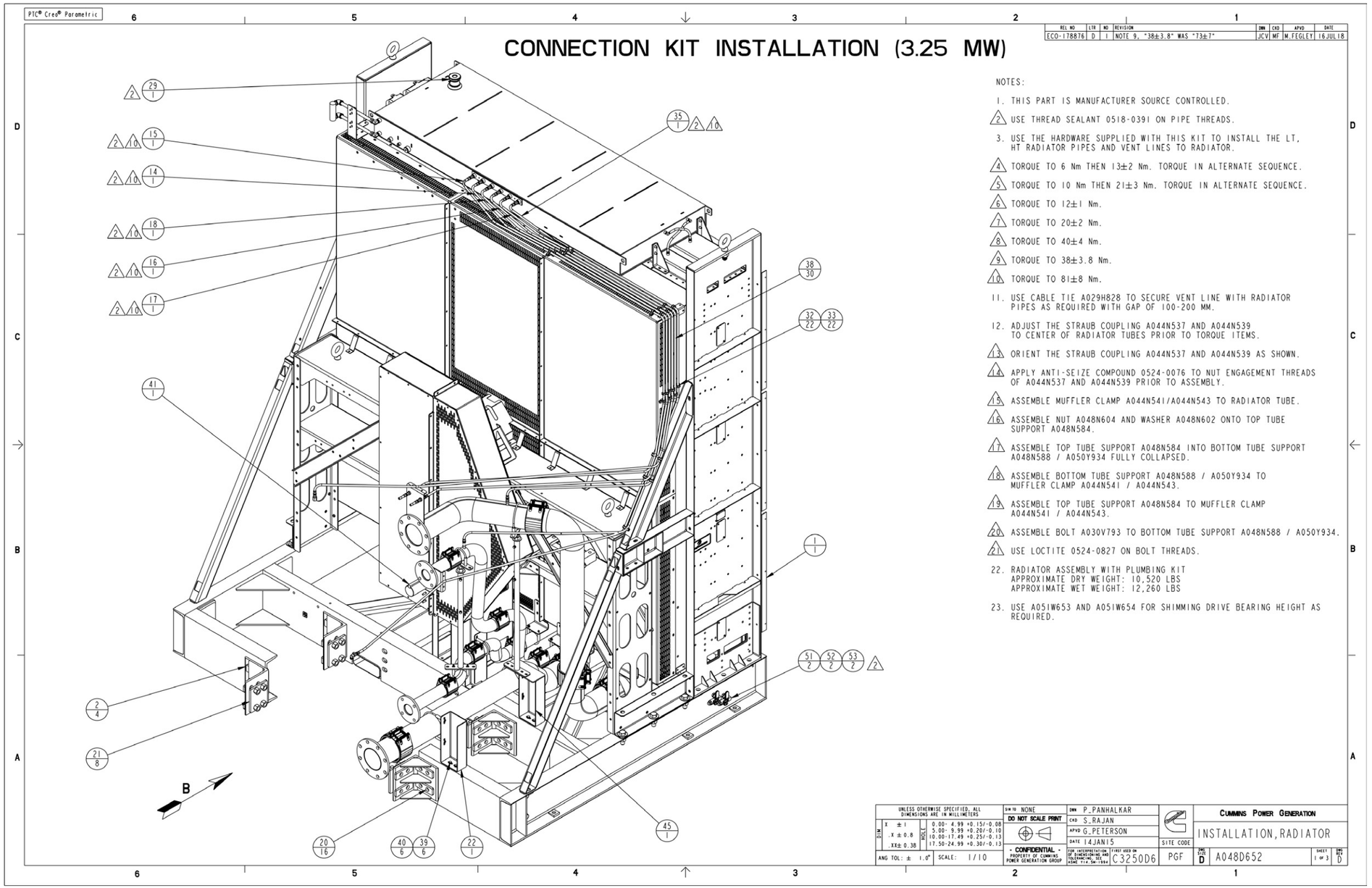


FIGURE 308. A048D652 RADIATOR PIPING KIT SHEET 1 OF 3

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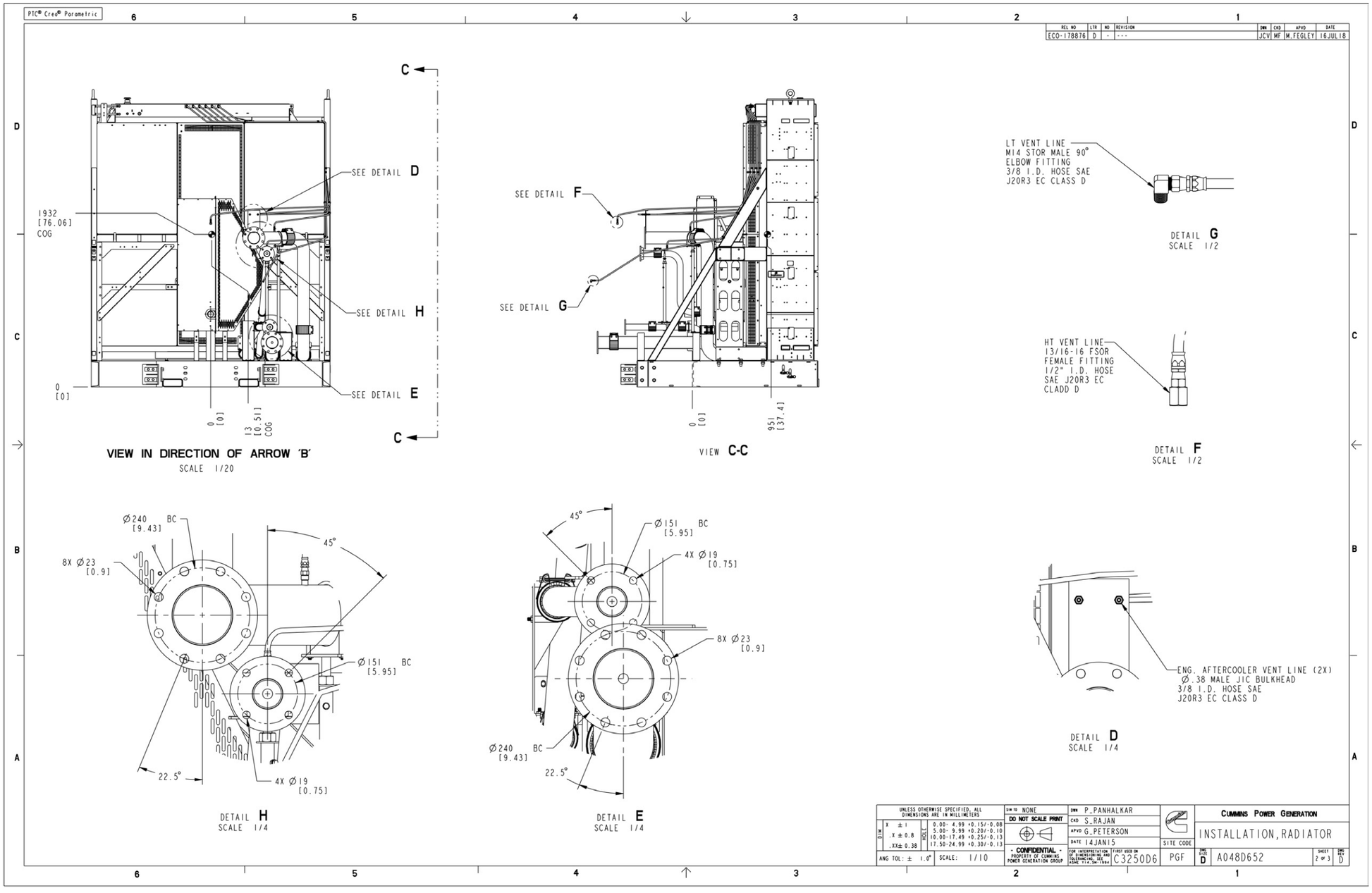


FIGURE 309. A048D652 RADIATOR PIPING KIT SHEET 2 OF 3

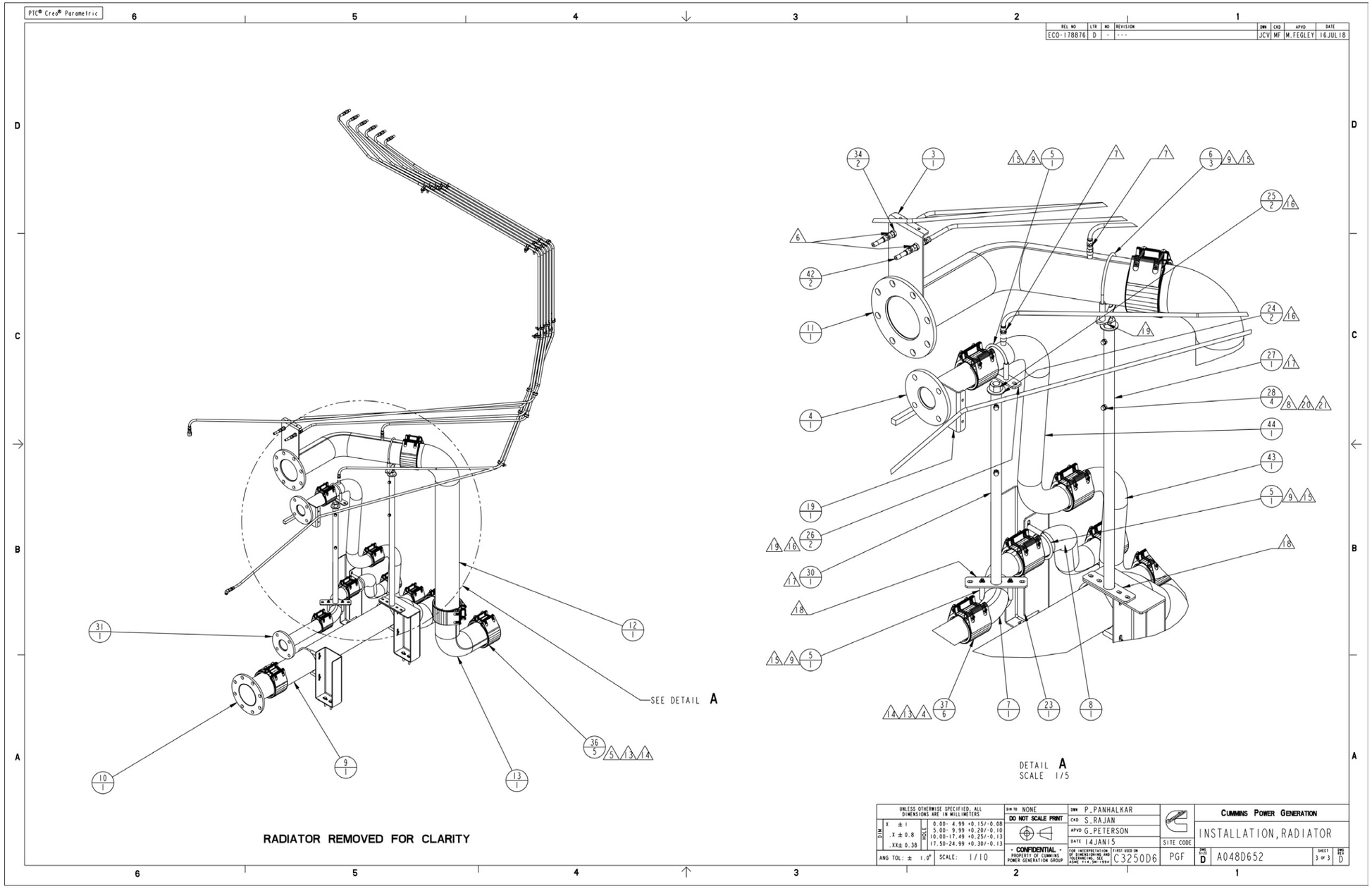


FIGURE 310. A048D652 RADIATOR PIPING KIT SHEET 3 OF 3

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C.7 A049E410 Radiator Piping Kit Installation Drawing

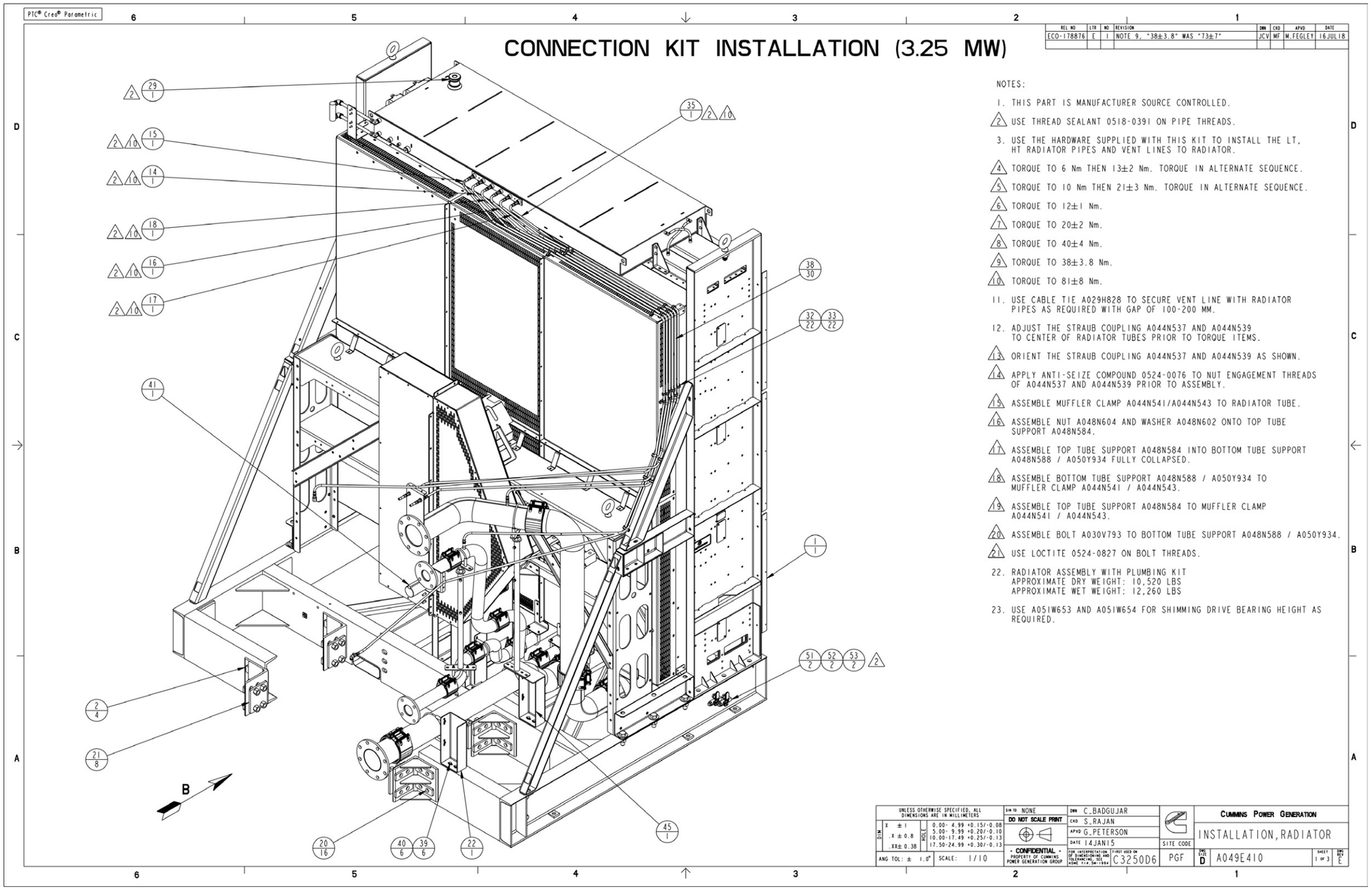


FIGURE 311. A049E410 RADIATOR PIPING KIT SHEET 1 OF 3

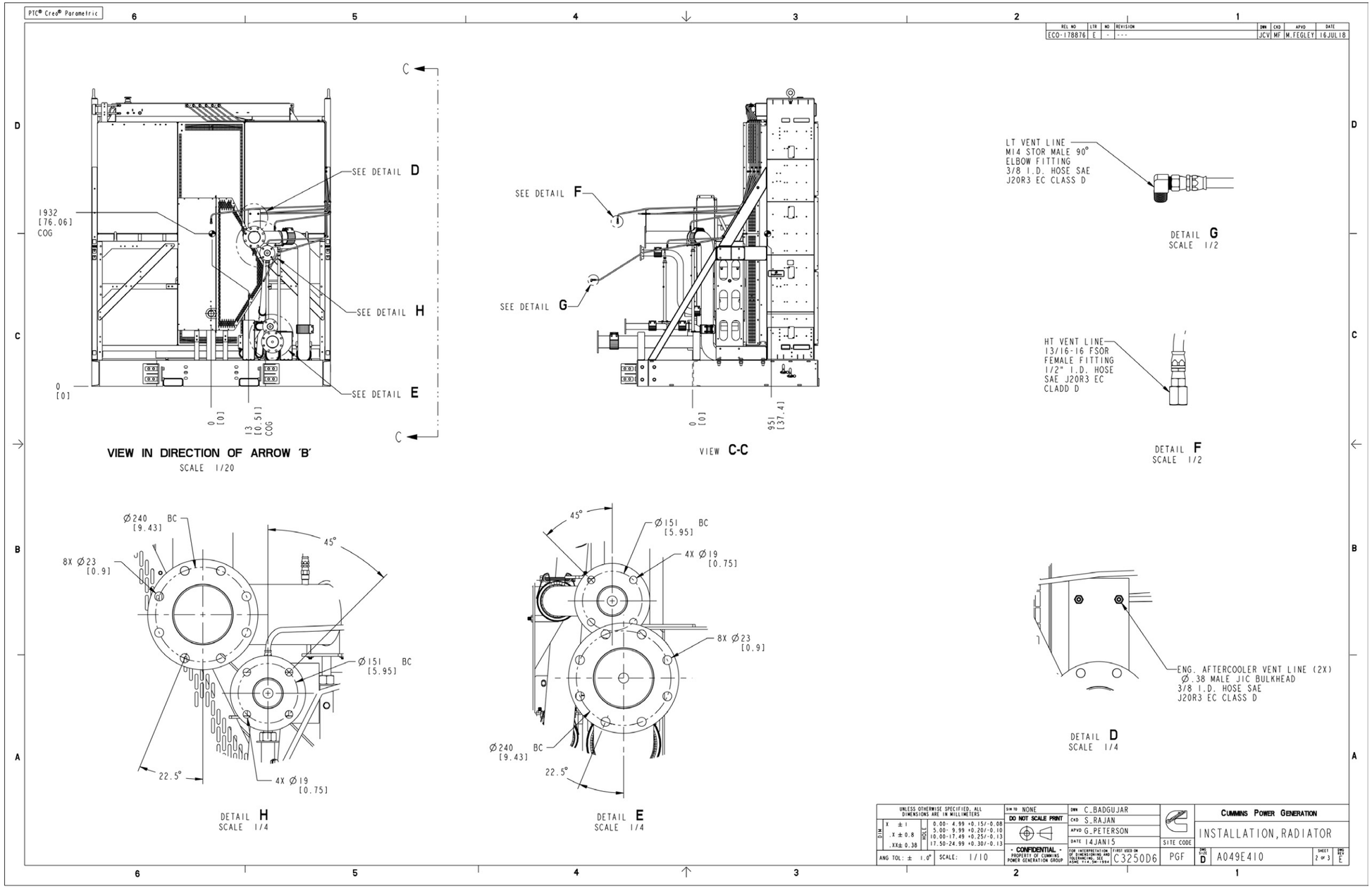


FIGURE 312. A049E410 RADIATOR PIPING KIT SHEET 2 OF 3

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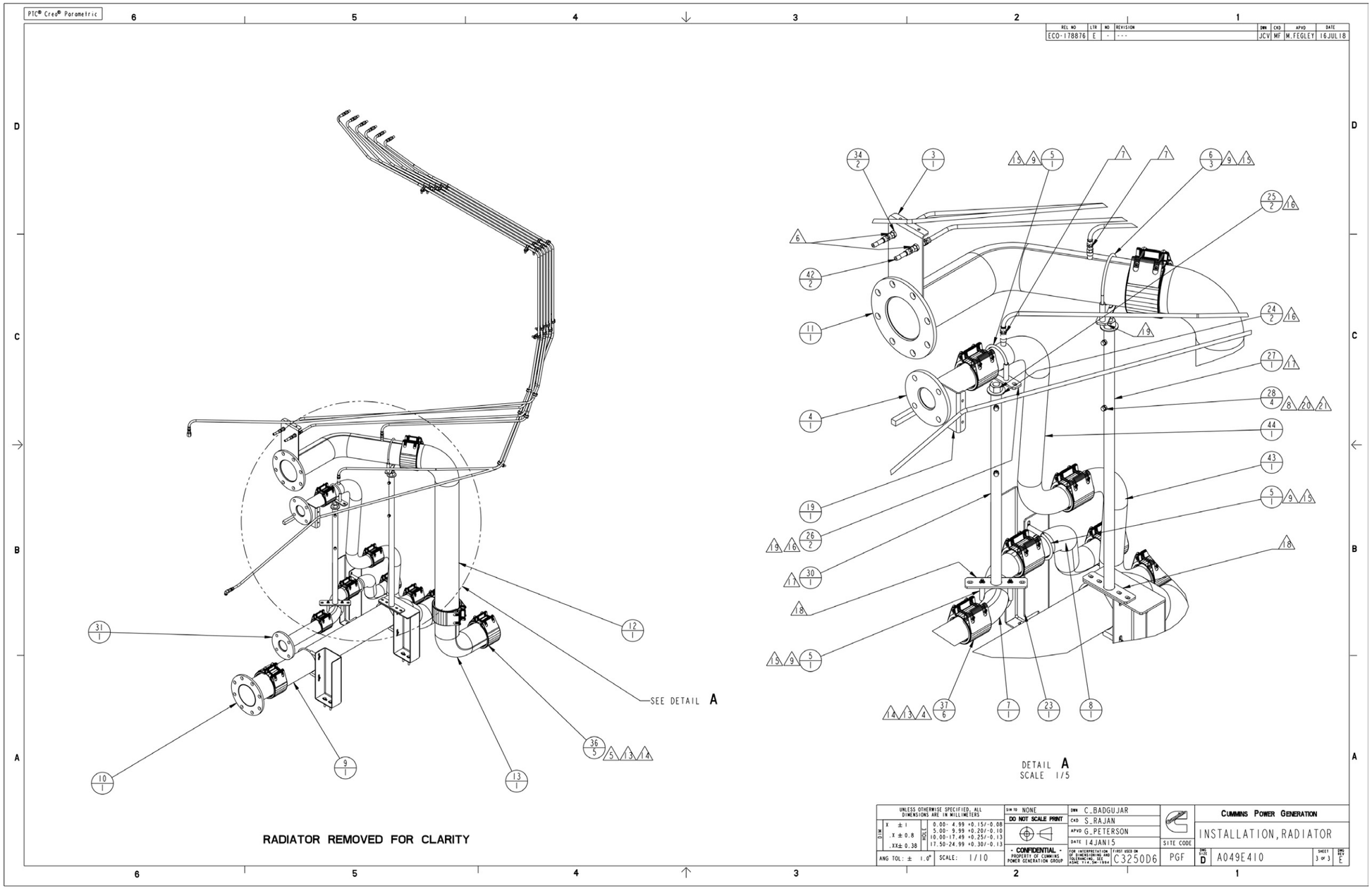


FIGURE 313. A049E410 RADIATOR PIPING KIT SHEET 3 OF 3

C.8 A052D765 Radiator Piping Kit Installation Drawing

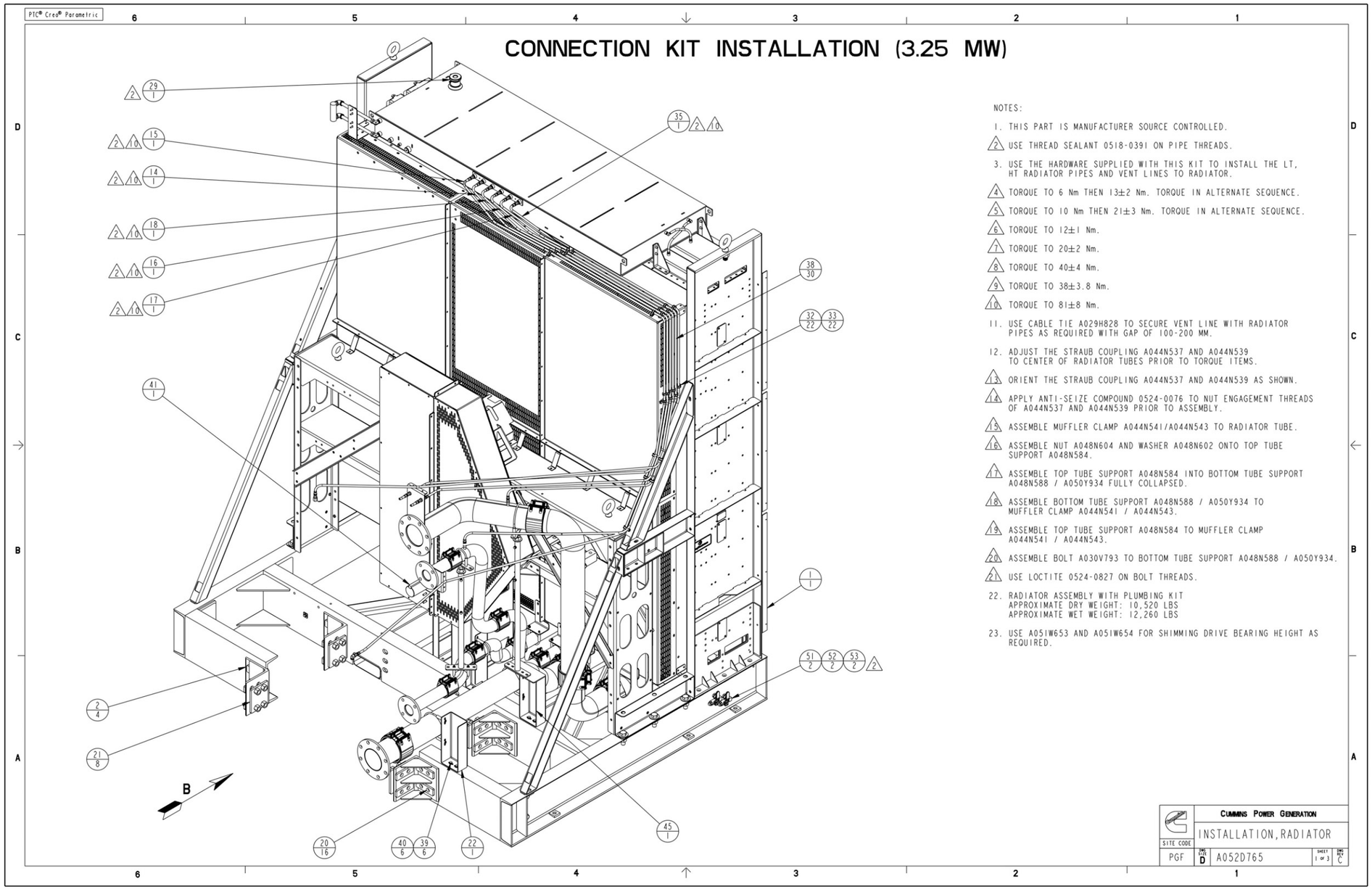


FIGURE 314. A052D765 RADIATOR PIPING KIT SHEET 1 OF 3

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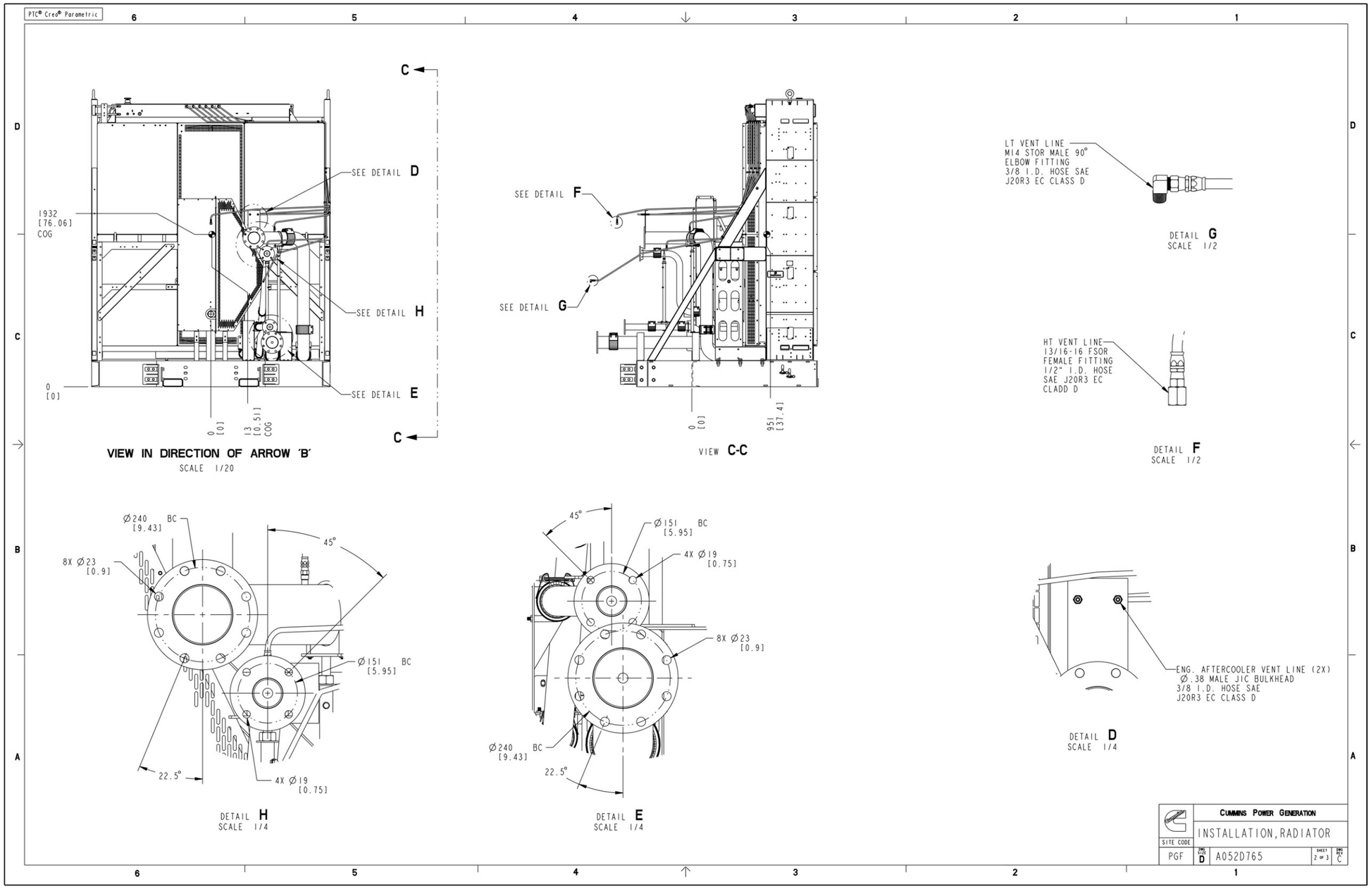


FIGURE 315. A052D765 RADIATOR PIPING KIT SHEET 2 OF 3

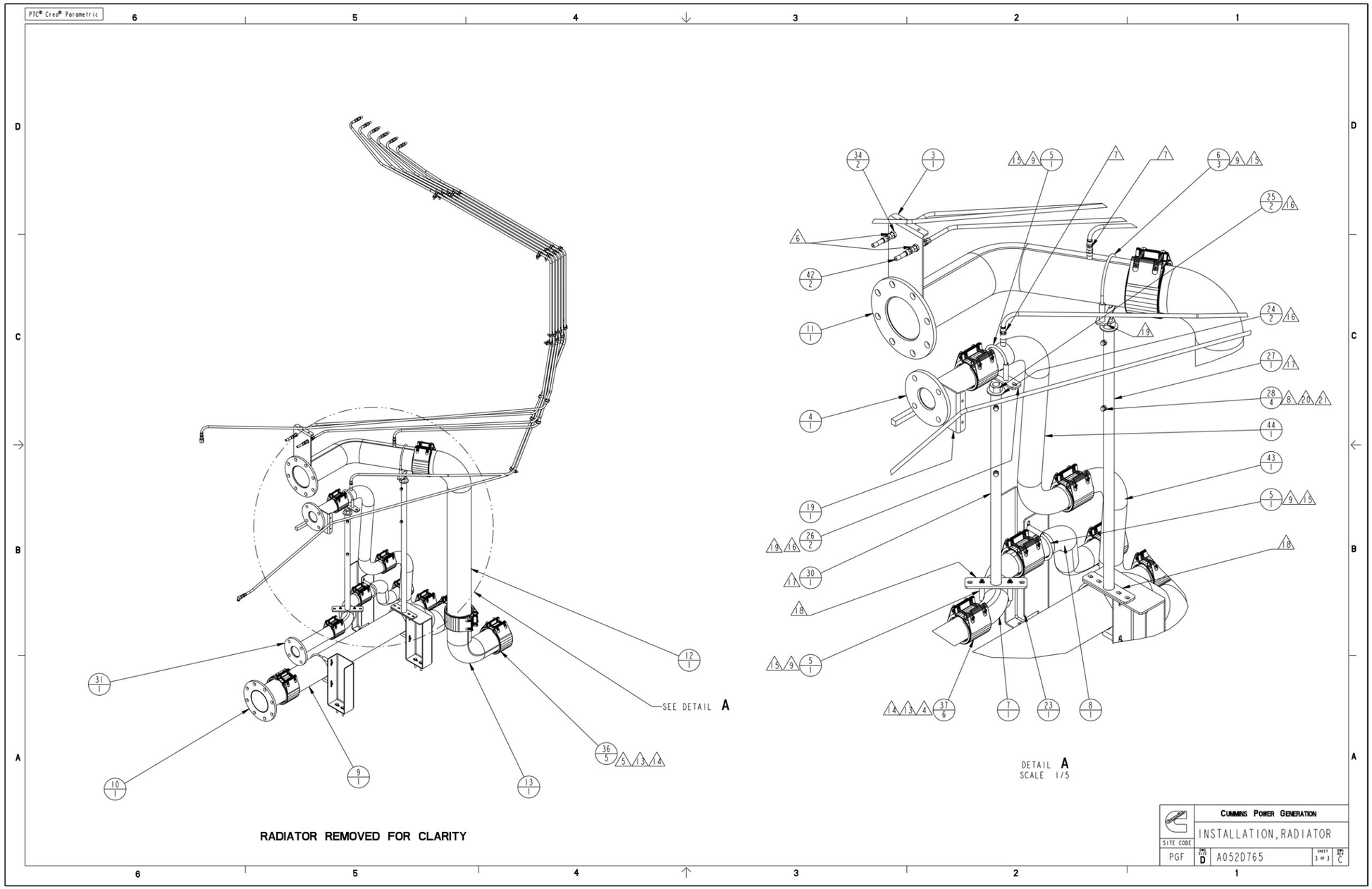


FIGURE 316. A052D765 RADIATOR PIPING KIT SHEET 3 OF 3

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C.9 A052D767 Radiator Piping Kit Installation Drawing

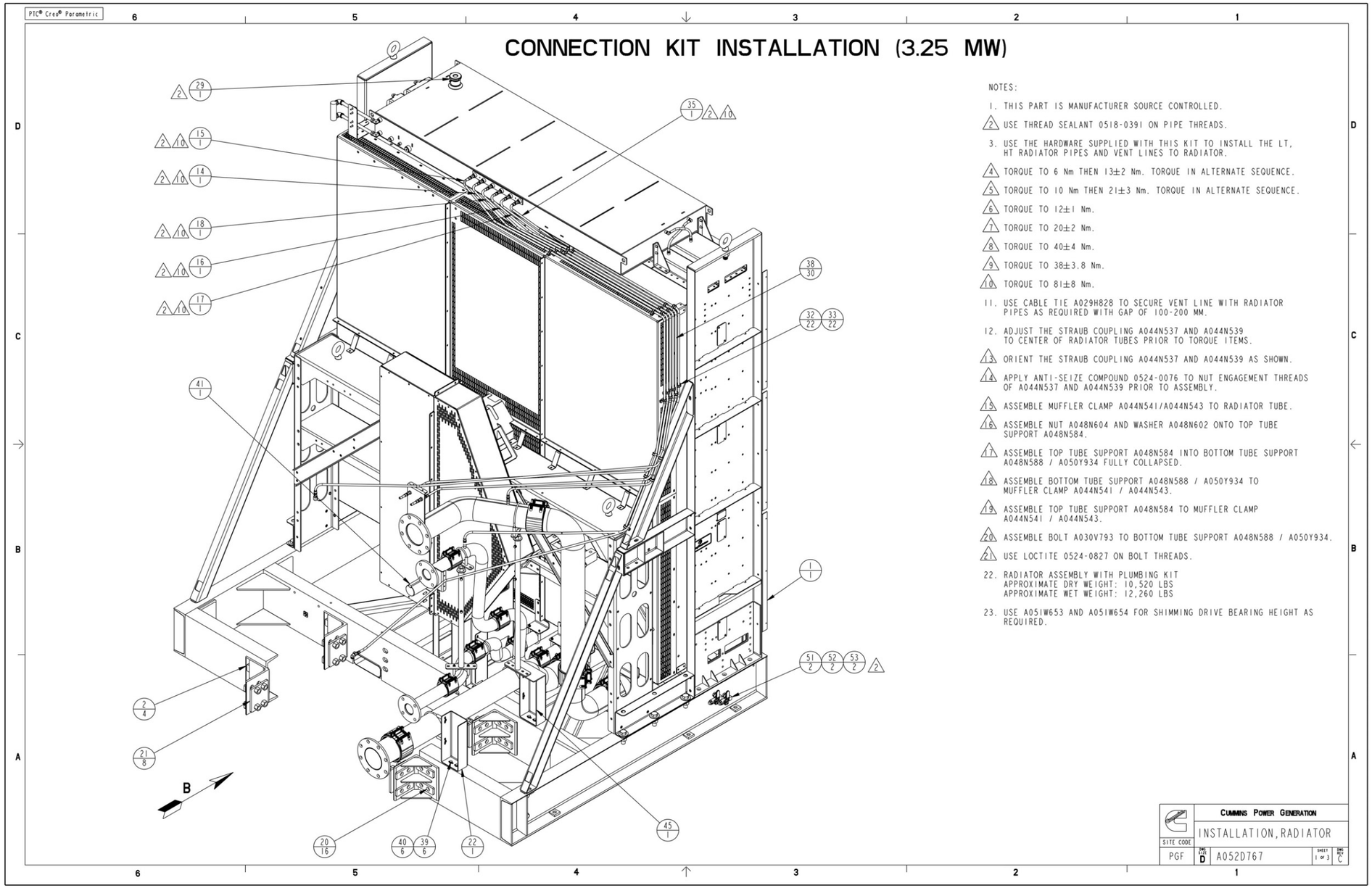


FIGURE 317. A052D767 RADIATOR PIPING KIT SHEET 1 OF 3

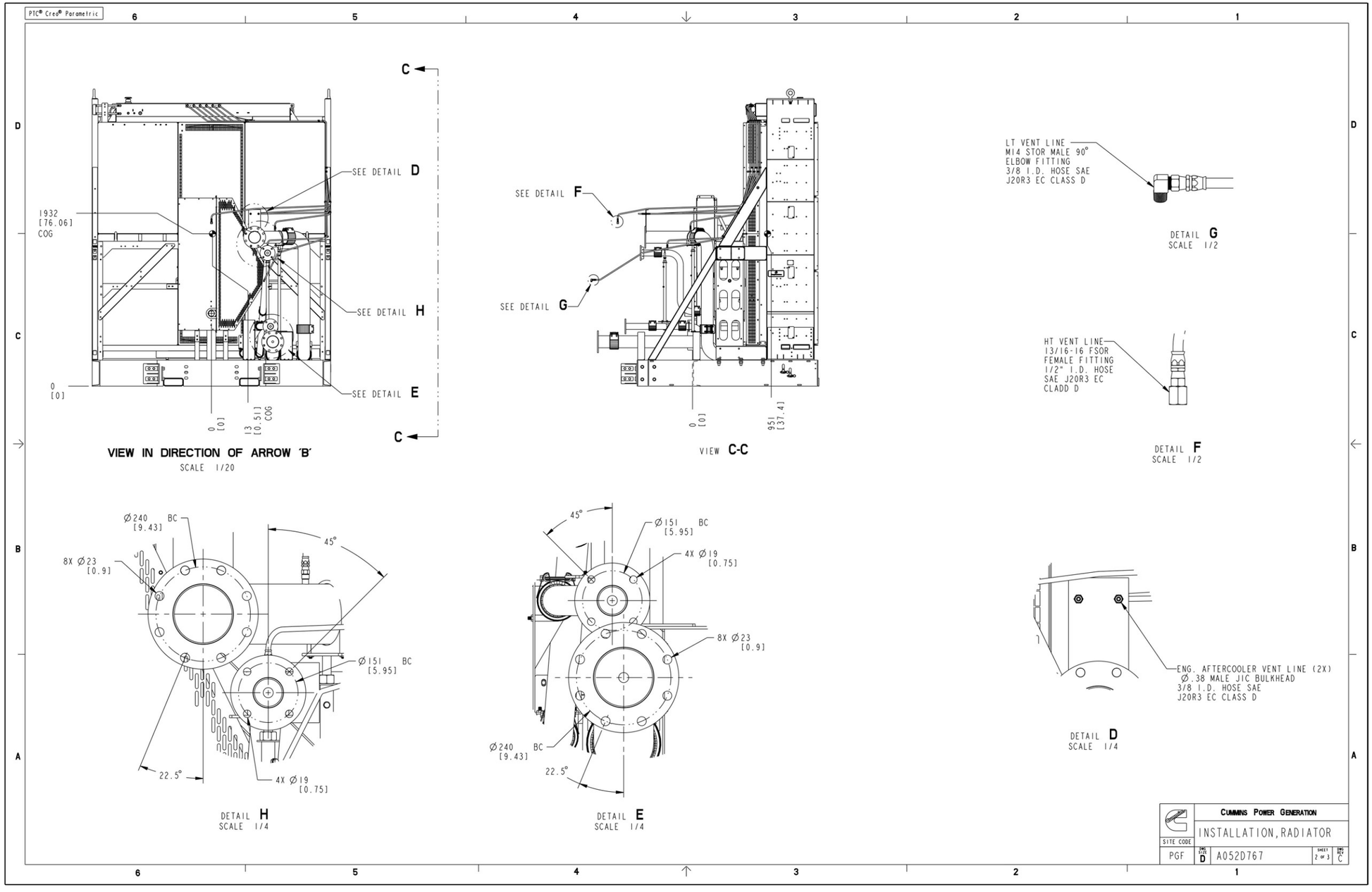


FIGURE 318. A052D767 RADIATOR PIPING KIT SHEET 2 OF 3

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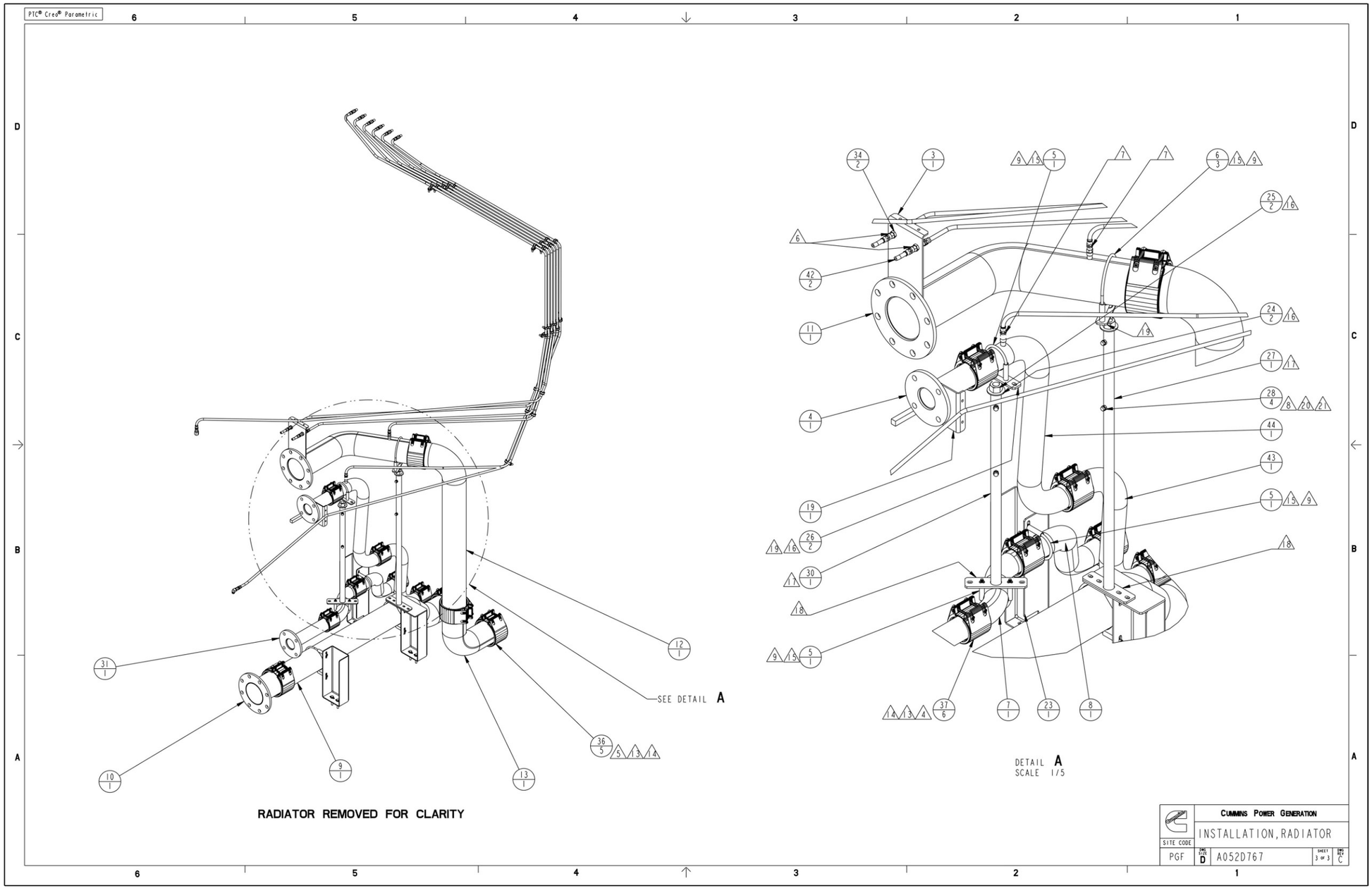
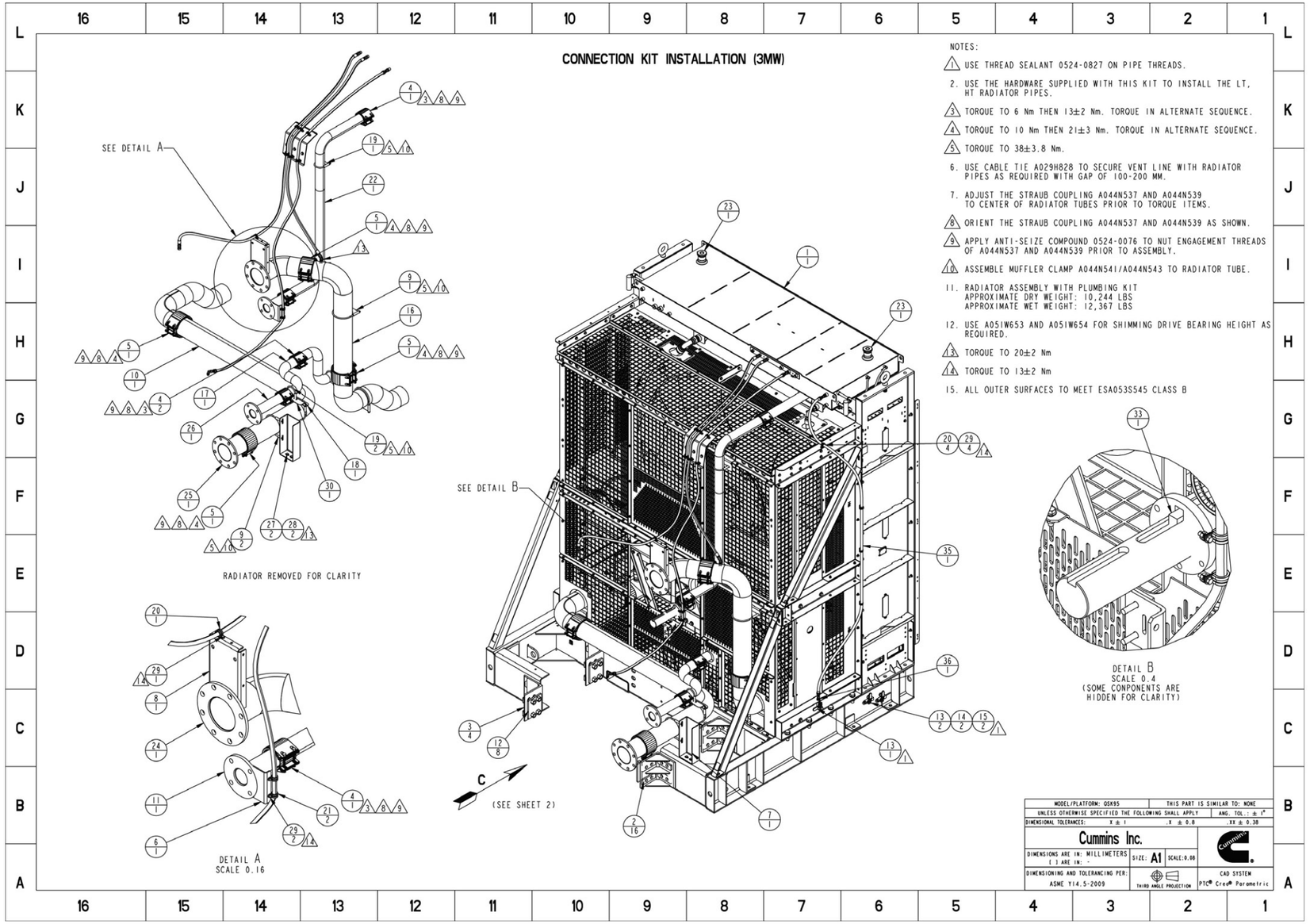


FIGURE 319. A052D767 RADIATOR PIPING KIT SHEET 3 OF 3

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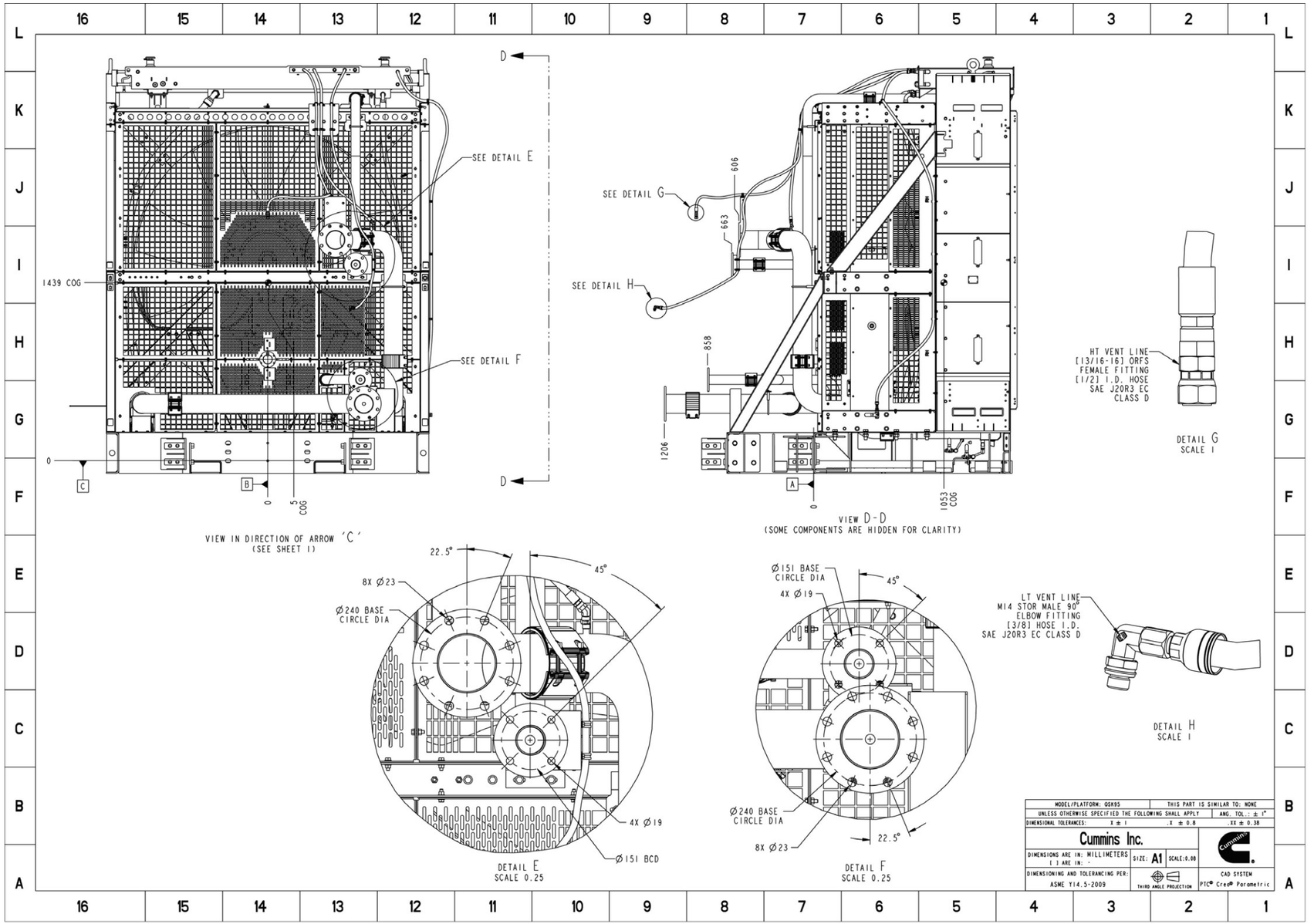
C.10 A063X314 Radiator Piping Kit Installation Drawing



Part Number: **A063X314** Part Revision: **B**
Part Name: **INSTALLATION,RADIATOR**

FIGURE 320. A063X314 RADIATOR PIPING KIT SHEET 1 OF 2

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Part Number: **A063X314** Part Revision: **B**
Part Name: **INSTALLATION,RADIATOR**

FIGURE 321. A063X314 RADIATOR PIPING KIT SHEET 2 OF 2

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C.11 A041T283 Air Starter Installation Drawing

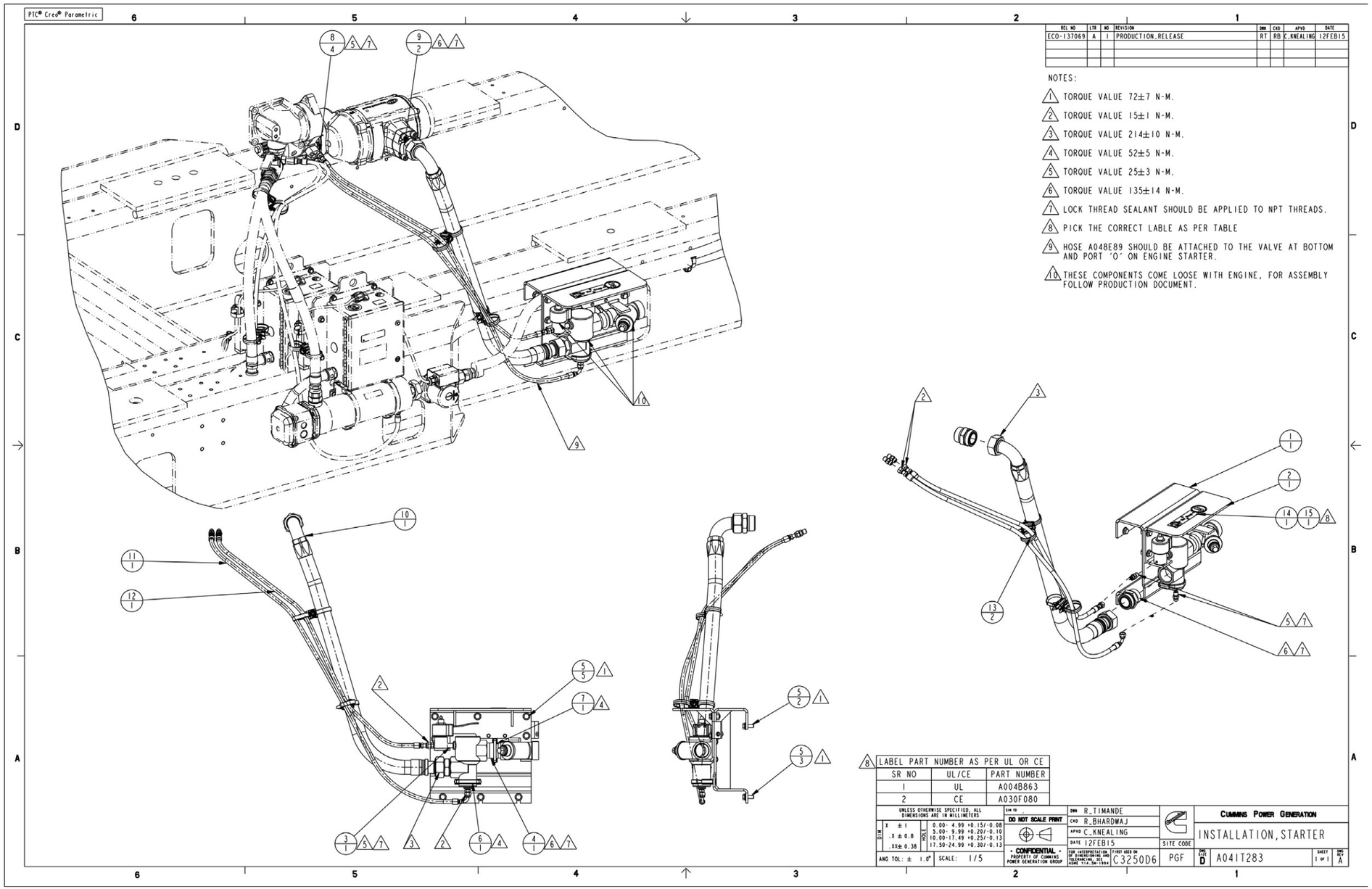


FIGURE 322. A041T283 AIR STARTER INSTALLATION DRAWING

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