MX PrimeGen

Power Generator

303453 Rev2

SERVICE AND MAINTENANCE MANUAL

TABLE OF CONTENTS

TABLE OF FIGURES

TABLES

1 COPYRIGHT, LIABILITY, AND CONTACT INFORMATION

This manual provides instructions for the installation, operation, performance, basic maintenance and troubleshooting of the MX Power Generator. In the event of unforeseen or special problems, do not take unauthorized remedial action. Contact GPT's Customer Service department to obtain the necessary information. All agreements, assurances, and legal relationships as well as all obligations of GPT, shall be governed by the respective valid purchase contract which is not influenced by the content of this document. For any technical issues or questions:

Global Power Technologies – Head Office
#16, 7875 – 57 Street SE
Calgary, Alberta
Canada T2C 5K7

Phone: 1-403-236-5556
Fax: 1-403-236-5575
Customer Service/Technical Support: 1-403-720-1190

Copyright	

Liability	Liability The user is expressly warned to consider and adopt all safety precautions that might be indicated by the activities herein and to avoid all potential hazards. The user assumes all risks in connection with such instructions. GPT shall not be liable for any special, consequential, exemplary, or other damages resulting, in whole or part, from the user's use of, or reliance upon this material.

Comments	GPT has compiled this publication with care, but GPT does not warrant that the information in this publication is free of errors. Comments, criticisms, and suggestions regarding the subject matter are invited. Any errors or omissions in the data should be brought to the attention of GPT. If required, affected pages will be revised and issued.

2 IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS – This manual contains important instructions for the MX PrimeGen Power Generator that should be followed during installation and maintenance of the generator and its batteries. Read the following safety warnings before beginning assembly, installation, or maintenance of the MX Power Generator.

1. Observe all prescribed accident prevention and safety rules. Do not perform work on the MX Power Generator alone—make sure there is somebody else working with you.
2. The installation of the MX Power Generator must conform with local codes or, in the absence of local codes, with CSA-B149.1 – Natural Gas and Propane Installation Code.
3. When installed, the MX Power Generator must be electrically grounded in accordance with local codes, or in the absence of local codes, with CSA C22.1 – Canadian Electrical Code.
4. The MX Power Generator is not intended to be used in underground mines. Do not use the MX system in underground mines.
5. The MX Power Generator and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures more than 34 kPa (5 psi).
6. The MX Power Generator must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 34 kPa (5 psi).
7. Do not use the MX Power Generator if any part has been under water. Immediately call a qualified service technician to inspect and to replace any part of the control system, gas control and generator that has been under water.
8. The MX Power Generator is designed to combust gaseous fuels which will result in combustion products of heat, carbon dioxide and water vapor. It may contain traces of carbon monoxide, unburnt hydrocarbons, and nitrous oxides. Emissions from combustion will depend on generator set-up and operation as well as the composition of the gas feed. It is imperative that these instructions be followed, and that gas supplied meets the gas specifications outlined in this manual.
9. The MX Power Generator must be mechanically installed according to the instructions contained within this manual. It must be securely anchored to a non-combustible surface when installed.
10. Installation and repair must be performed by a qualified service person. The MX Power Generator should be inspected before use and at least annually by a qualified service person. More frequent cleaning may be required as necessary. It is imperative that control compartment, air intakes, and circulating air passageways of the system are kept clean.
11. The MX Power Generator uses an internal combustion engine. Qualified service personnel should have mechanical knowledge on how to maintain engine fuel, lubrication, ignition, and cooling systems.
12. The MX Power Generator contains electrical and gas-related safety devices as identified throughout this manual. Tampering or rendering inoperative any of these safety devices may result in personal injury or death and possible damage to the equipment and is not permitted under any circumstances.
13. The MX Power Generator has some parts constructed from sheet metal. Every effort is made to ensure that edges have been deburred when manufactured, however sharp edges may still exist. Be cautious when handling. Wear gloves for safety.

14. Any guard or other protective device removed for servicing from the MX Power Generator must be re-installed prior to operating the system.
15. The MX contains sub-systems that combust gaseous fuel and others that run high electrical loads, all of which can pose high surface temperature hazards. Avoid exterior areas, as well as internal components of the generator to avoid burns or clothing ignition when in operation or cooling down.
16. The MX Power Generator contains rotating parts, hot surface temperatures, and high voltages. It also has remote start and stop capabilities. Do not begin work on the MX Power Generator unless it is shut-off manually, switched to LOC mode, and locked out so that the system cannot be started remotely or inadvertently. Follow the shutdown procedure in the MX Manual (302672).
17. The MX Power Generator uses natural gas or propane as fuel. In the event of a leak, there is a possibility of a fire and explosion.
18. Lethal voltages are present in this system. The MX Power Generator has either 120/240 VAC systems or 120/208 VAC as well as 24 VDC systems. Use accepted safety procedures for working on all electrical circuits. Follow all local electrical safety regulations.
19. Study the MX Power Generator wiring diagrams and schematics before working on electrical circuits and ensure that all tools used while working on electrical circuits are insulated.
20. The MX Power Generator contains batteries. Avoid touching live battery terminals and placing tools on or near the batteries. These can provide dangerous voltages and currents, even when the system is shut-off.
21. As soon as electrical cabinet doors are opened or terminal covers are removed, there is the danger of contacting hazardous voltages. Any operations inside the cabinets or with exposed electrical terminals must only be carried out by qualified electrical personnel. If in doubt, do not touch.
22. Sparking and arcing may occur if a wire is connected or disconnected with a heavy current flow. Arcing can burn skin or eyes and damage equipment.
23. The MX Power Generator includes spark plug electrode, which needs to be accessed during maintenance. Do not touch the conductor of a spark igniter electrode while it is energized.
24. The MX Power Generator is not intended for use as emergency power.
25. Keep the MX Power Generator's installation site clear and free from combustible materials, gasoline, and other flammable vapours and liquids. Maintain the minimum clearances specified in this manual.
26. Fuel supplied to the MX Power Generator must not contain liquids. Liquid hydrocarbons in the fuel supply pose a risk of fire and may result in serious damage and danger to the operator.
27. Do not exceed the fuel pressure stamped on the MX Power Generator's data plate without factory approval.
28. The MX Power Generator exhaust can be very hot. Do not touch any of the exhaust components or bring exposed skin near hot exhaust gases.
29. When the MX Power Generator is operating, surface temperatures of the exhaust can approach temperatures above 70°C (158°F). Avoid contact of skin and clothing with the surfaces of the exhaust to avoid burns. The MX unit must be installed so that the risk of contact by people is minimized.
30. The MX Power Generator is designed FOR OUTDOOR USE ONLY.

2.1 MANUAL ICONS AND SAFETY BANNERS

WARNING!

A banner with the word "WARNING!" below an icon with an exclamation point within a red triangle contain important information that, if not adhered to, can cause personal injury and/or property damage.

CAUTION!

A banner with the word "CAUTION!" below an icon with an exclamation point within a red triangle contain important information that, if not adhered to, can cause damage to the MX Power Generator.

NOTE: **A banner with the word "NOTE:" contains supplemental information that provide additional insight on specific topics throughout this manual.**

2.2 TECHNICALLY QUALIFIED PERSONNEL

This manual contains necessary information for the correct operation of the MX Power Generator and is intended for use by technically qualified service personnel. Qualified personnel are persons who are:

- ✓ Familiar with the erection, installation, commissioning, and operation of the device and of the system which is being installed or in which the device is being installed.
- ✓ Capable of performing switching operations according to safety technology standards and are authorized to switch the equipment on and off and to isolate it from voltage.
- ✓ Have mechanical knowledge on how to maintain engine fuel, lubrication, ignition, and cooling systems.
- ✓ Instructed according to the standards of safety technology in the care and use of safety equipment and trained in immediate rescue measures (first aid).
- ✓ Completed instructions with appropriate confirmation by an appropriately qualified instructor.

2.3 BATTERY SAFETY

1. Servicing of batteries are to be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.
2. When replacing batteries, use the same quantity and the following type batteries: Type 31 AGM batteries, 12V, 100-105 Ah.

CAUTION!

Do not dispose of battery or batteries in a fire. The battery is capable of exploding.

CAUTION!

Do not open or mutilate the battery or batteries. Released electrolyte has been known to be harmful to the skin and eyes and to be toxic.

CAUTION!

A battery presents a risk of electrical shock and high short circuit current.

3. The following precautions are to be observed when working on batteries:
   - Remove watches, rings, or other metal objects.
   - Use tools with insulated handles.
   - Wear rubber gloves and boots.
   - Do not lay tools or metal parts on top of batteries.
   - Disconnect charging source prior to connecting or disconnecting battery terminals.
   - Determine the battery is inadvertently grounded. When inadvertently grounded, remove source of ground. Contact with any part of a grounded battery is capable of resulting in electrical shock. The risk of such shock is reduced when such grounds are removed during installation and maintenance (applicable to a generator not having a grounded supply circuit).

2.4 START-STOP OPERATIONS

1. The MX Power Generator is equipped with an Emergency Shutdown (ESD) button that acts as the absolute emergency shutdown of the system. Operators must shut down the device prior to doing any maintenance or repair on the system.
2. A manual shut-off valve must be installed according to local standards at the fuel inlet to allow fuel supply to be cut off in the event of any problems. Refer to the MX Manual (302672) for details.

3 DATA PLATE

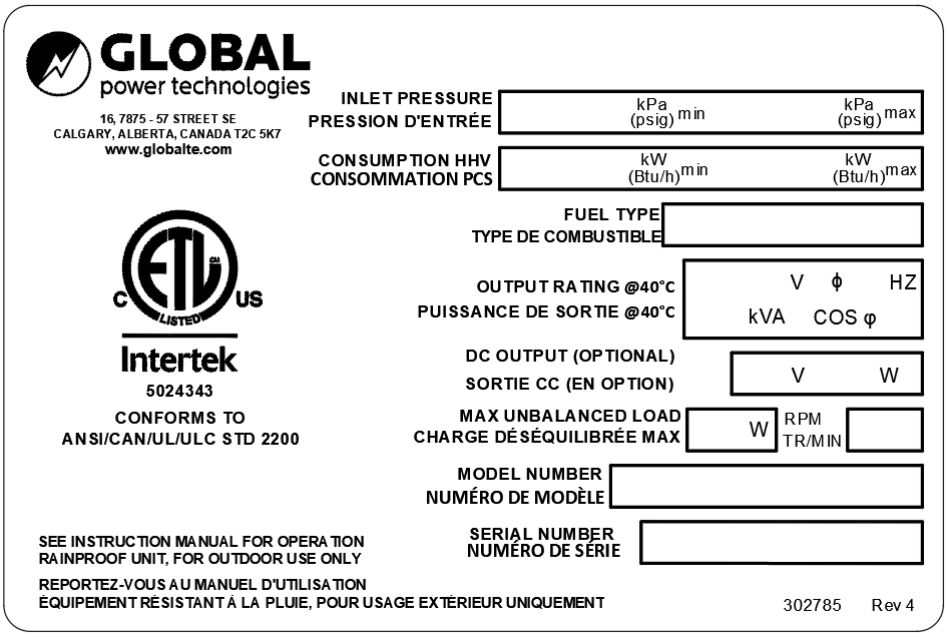

Figure 3-1 – Data Plate

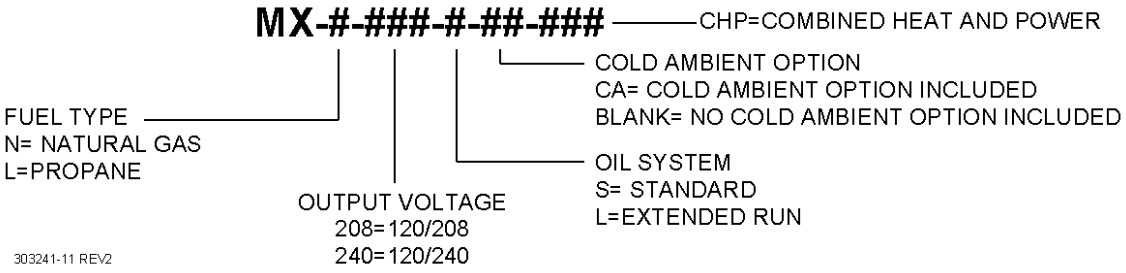

Figure 3-2 – MX Model Tree

The data plate shows important information about the MX Power Generator and can be used as a quick reference point when performing service or contacting GPT with questions. It is located on the inside of the electrical panel cabinet door. When contacting GPT, indicate both the complete Model Number and Serial Number of your MX unit.

The information listed on the data plate are as follows:

Inlet pressure	Minimum and maximum levels of inlet fuel pressure permitted
Consumption HHV	Minimum and maximum heating values permitted
Fuel Type	The type of fuel that the MX unit's fuel system is designed for L = Propane; N = Natural Gas
Output Rating @ 40°C	Nominal power output of the MX unit at 40°C (104°F)
DC Output	DC Power output if option is installed
Max Unbalanced Load	Maximum unbalanced load

4 RECOMMENDED MAINTENANCE INTERVALS

NOTE: **Oil change interval is dependent on many factors, such as number of engine starts, gas quality, average engine load, and more. We recommend taking periodic oil samples and getting them analyzed to verify validity of the recommended service intervals.**

4.1 STANDBY OIL CAPACITY SYSTEMS

Table 1 - Maintenance Schedule for Standby Oil Capacity Systems

STANDARD SYSTEM SERVICE RUNTIME	EVERY 2,250 HOURS	EVERY 9,000 HOURS	EVERY 18,000 HOURS	EVERY 27,000 HOURS
Change engine oil	X			
Change oil filter	X			
Change spark plugs		X	X	X
Check valve clearance		X	X	X
Change air filter*	*	X	X	X
Change enclosure filter*	*	X	X	X
Change O2 Sensor		X	X	X
Check CCV hoses if free		X	X	X
Check compression		X	X	X
Check water pump (leaks / bearing)		X	X	X
Change coolant**	**	**	X	**
Change water pump			X	
Change spark plug wire				X
Change ignition coils				X
Change radial air filter				X
Clean and regrease alternator bearings				X
Check fuel line for leak	X	X	X	X
Clean electrical contacts		X	X	X
Tighten electrical connections		X	X	X

*Check air and enclosure filters every 2,250 hours, change at least every 9,000 hours.
**Check coolant levels every 2,250 hours and top up as required.
Replace coolant at least every 18,000 hours.

4.2 EXTENDED RUNTIME OIL CAPACITY SYSTEMS

Table 2 - Maintenance Schedule for Extended Runtime Oil Capacity Systems

EXTENDED-RUN SYSTEM SERVICE RUNTIME	EVERY 2,250 HOURS	EVERY 9,000 HOURS	EVERY 18,000 HOURS	EVERY 27,000 HOURS
Change engine oil**	**	X	X	X
Change oil filter		X	X	X
Change spark plugs		X	X	X
Check valve clearance		X	X	X
Change air filter*	*	X	X	X
Change enclosure filter*	*	X	X	X
Change O2 Sensor		X	X	X
Check CCV hoses if free		X	X	X
Check compression		X	X	X
Check water pump (leaks / bearing)		X	X	X
Change coolant**	**	**	X	**
Change water pump			X	
Change spark plug wire				X
Change ignition coils				X
Change radial air filter				X
Clean and regrease alternator bearings				X
Check fuel line for leaks	X	X	X	X
Clean electrical contacts		X	X	X
Tighten electrical connections		X	X	X

*Check air and enclosure filters every 2,250 hours. Replace at least every 9,000 hours
**Check oil and coolant levels every 2,250 hours and top up as required.
Replace coolant at least every 18,000 hours.

5 RECOMMENDED PARTS FOR SERVICE

5.1 STANDBY OIL CAPACITY SYSTEMS

Table 3 - Maintenance Materials for Standby Oil Capacity Systems

SERVICE INTERVAL - STANDBY	QTY	GPT PN	DESCRIPTION
303146 – MX Filter and Top Up Kit: Standby Run, 2,250 Hours For every 2,250 hours outside of 9,000, 18,000, and 27,000 hours	1	302732	FILTER, OIL
	4	303046	OIL, ENGINE, SYNTHETIC, 1 GAL, 15W40
	1	302704	FILTER, AIR, 12x12x2, MERV9
	1	302756	AIR FILTER, PRIMARY RADIAL SEAL
	1	303045	COOLANT, 1 GAL, 60/40 EG, YELLOW VCS
303147 – MX Maintenance Kit: Standby Run, 9,000 Hours	1	302732	FILTER, OIL
	1	304653	OIL, ENGINE, SYNTHETIC, 5 GAL, 15W40
	3	302731	SPARK PLUG
	1	302733	SENSOR, O2, PRE-CAT EXHAUST, MX
	1	302704	FILTER, AIR, 12x12x2, MERV9
	1	302756	AIR FILTER, PRIMARY RADIAL SEAL
	1	303045	COOLANT, 1 GAL, 60/40 EG, YELLOW VCS
	1	303117	GASKET, CYLINDER HEAD COVER
	3	302745	WASHER, SEAL, VALVE COVER
303148 – MX Maintenance Kit: Standby Run, 18,000 Hours	1	302732	FILTER, OIL
	1	304653	OIL, ENGINE, SYNTHETIC, 5 GAL, 15W40
	3	302731	SPARK PLUG,
	1	302733	SENSOR, O2, PRE-CAT EXHAUST, MX
	1	302704	FILTER, AIR, 12x12x2, MERV9
	1	302756	AIR FILTER, PRIMARY RADIAL SEAL
	3	303045	COOLANT, 1 GAL, 60/40 EG, YELLOW VCS
	1	303606	PUMP, ASSY, 1” MHB, 24V, TERMINATED
	1	303117	GASKET, CYLINDER HEAD COVER
	3	302745	WASHER, SEAL, VALVE COVER
303149 – MX Maintenance Kit: Standby Run, 27,000 Hours	1	302732	FILTER, OIL
	1	304653	OIL, ENGINE, SYNTHETIC, 5 GAL, 15W40
	3	302731	SPARK PLUG
	1	302733	SENSOR, O2, PRE-CAT EXHAUST, MX
	1	302704	FILTER, AIR, 12x12x2, MERV9
	1	302756	AIR FILTER, PRIMARY RADIAL SEAL
	1	303045	COOLANT, 1 GAL, 60/40 EG, YELLOW VCS
	1	302737	COIL ASSY, IGNITION
	1	302736	CORD SET, RESISTIVE, SPARK PLUG
	1	302757	AIR FILTER, SAFETY RADIAL SEAL
	1	303117	GASKET, CYLINDER HEAD COVER
	3	302745	WASHER, SEAL, VALVE COVER

5.2 EXTENDED RUN OIL CAPACITY SYSTEMS

Table 4 - Maintenance Materials for Extended Run Oil Capacity Systems

SERVICE INTERVAL - EXTENDED	QTY	GPT PN	DESCRIPTION
303142 – MX Filter and Top Up Kit: Extended Run, 2,250 Hours For every 2,250 hours outside of 9,000, 18,000, and 27,000 hours	1	302704	FILTER, AIR, 12x12x2, MERV9
	1	302756	AIR FILTER, PRIMARY RADIAL SEAL
	1	303046	OIL, ENGINE, SYNTHETIC, 1 GAL, 15W40
	3	303045	COOLANT, 1 GAL, 60/40 EG, YELLOW VCS
303143 – MX Maintenance Kit: Extended Run, 9,000 Hours	1	302732	FILTER, OIL
	2	304653	OIL, ENGINE, SYNTHETIC, 5 GAL, 15W40
	3	302731	SPARK PLUG
	1	302733	SENSOR, O2, PRE-CAT EXHAUST, MX
	1	302704	FILTER, AIR, 12x12x2, MERV9
	1	302756	AIR FILTER, PRIMARY RADIAL SEAL
	1	303045	COOLANT, 1 GAL, 60/40 EG, YELLOW VCS
	1	303117	GASKET, CYLINDER HEAD COVER
	3	302745	WASHER, SEAL, VALVE COVER
303144 – MX Maintenance Kit: Extended Run, 18,000 Hours	1	302732	FILTER, OIL
	2	304653	OIL, ENGINE, SYNTHETIC, 5 GAL, 15W40
	3	302731	SPARK PLUG
	1	302733	SENSOR, O2, PRE-CAT EXHAUST, MX
	1	302704	FILTER, AIR, 12x12x2, MERV9
	1	302756	AIR FILTER, PRIMARY RADIAL SEAL
	3	303045	COOLANT, 1 GAL, 60/40 EG, YELLOW VCS
	1	303606	PUMP, ASSY, 1” MHB, 24V, TERMINATED
	1	303117	GASKET, CYLINDER HEAD COVER
	3	302745	WASHER, SEAL, VALVE COVER
303145 – MX Maintenance Kit: Extended Run, 27,000 Hours	1	302732	FILTER, OIL
	2	304653	OIL, ENGINE, SYNTHETIC, 5 GAL, 15W40
	3	302731	SPARK PLUG
	1	302733	SENSOR, O2, PRE-CAT EXHAUST, MX
	1	302704	FILTER, AIR, 12x12x2, MERV9
	1	302756	AIR FILTER, PRIMARY RADIAL SEAL
	1	303045	COOLANT, 1 GAL, 60/40 EG, YELLOW VCS
	1	302737	COIL ASSY, IGNITION
	1	302736	CORD SET, RESISTIVE, SPARK PLUG
	1	302757	AIR FILTER, SAFETY RADIAL SEAL
	1	303117	GASKET, CYLINDER HEAD COVER
	3	302745	WASHER, SEAL, VALVE COVER

6 TOOLS REQUIRED FOR SERVICE

The following items are required to perform service and maintenance on the MX Power Generator:

- MX Power Generator Maintenance Log
- Flat blade screwdrivers (from 2 mm to 6 mm)
- Philips screwdriver
- Ratchet with #2 Philips bit (low profile)
- 1/4" wrench, socket or nut driver
- 5/16" socket or nut driver
- 5/16" wrench
- 7/16" wrench, socket or nut driver
- 2x 9/16" wrenches
- 9/16" insulated wrench
- 5/8" deep socket with 2” extension
- 7/8" wrench
- 8 mm socket with short extension
- 10 mm wrench
- 10 mm crowfoot wrench
- 13 mm socket or nut driver
- 19 mm socket
- 65 mm 14-flute Toyota-compatible oil filter wrench
- Channel locks or crescent wrench capable of opening to 1-11/16" (for extended runtime systems only)
- Pliers
- Wire stripper/cutter
- 4x 22-18AWG butt splices
- Crimper appropriate for butt splices
- Torque wrench capable of 11nm (8 ft-lbs)
- Torque wrench capable of 18nm (13.25 ft-lbs)
- 0.008" (0.203 mm) feeler gauge
- 0.012" (0.305 mm) feeler gauge
- 3/8" hose, 36" length
- 1/2" silicone or rubber hose, 1' length minimum
- Catch tray
- 26L minimum oil disposal container
- 15L coolant disposal container
- 24L Volvo coolant VCS pre-mixed – GPT part number 303045
- Jumper wire with alligator clips
- Compression tester with 14 mm thread adapter
- Wire Brush or battery post terminal cleaning tool

7 ARRIVAL ON-SITE

Before shutting the system down for maintenance, perform the following checks while the unit is in operation:

1. Access the electrical panel using a flat blade screwdriver.
2. Inspect the electrical panel and note anything out of the ordinary on the maintenance log. Some things to look for during this initial inspection are:
   a. Are there any alarms based on the indicators on the door?
   b. Are there any alarms on the PLC?
   c. Are there any breakers tripped?
   d. Are there any signs of overheating?
   e. Are there any signs of loose wire connections?
   f. Are there any signs of swapped components?
3. Use the 7/16" driver to remove the front panel of the Engine Compartment.

CAUTION!

Do not use power tools to remove or install the side panel fasteners. Do not force the threads into engaging if they are not going in smoothly.

Apply anti-seize compound when re-installing the fasteners.

CAUTION!

Be careful when removing the panels. Grip both handles firmly. The removeable side panels weigh approximately 45 lb. (20.5 kg).

4. Inspect Engine Compartment, take note of anything out of the ordinary on the maintenance log. Things to look for include:
   a. Are there any odd noises?
      Consider the engine, coolant pump, radiator fans, circulation fans, etc.
   b. Are there any noticeable spills or leaks?
5. Make note of the wind shield spacing on the maintenance log.
6. Shut down the system by ramping down the load on the system and then pressing the STOP button to stop the generator.

CAUTION!

To avoid sudden disturbance to the generator, disconnect the loads gradually — 100 to 0% over a period of 3 minutes. This helps extend the life of the unit.

7. To ensure that the system is in lockout mode for service, set the switches and breakers as follows:
    a. LOC/REM: LOC.
    b. AUTO/MAN: MAN.
    c. LOCAL ON/OFF: OFF.
    d. Main System Breaker (Q1) and Battery Charger Breaker (Q2) in engine compartment: OFF.
    e. Main DC Control Breakers (Q3 and Q5) inside electrical panel: OFF.

CAUTION!

Before starting maintenance activities, ensure that the system is set as follows:

1. **LOC/REM switch is in LOC position**
2. **AUTO/MAN switch is in MAN position**
3. **LOCAL ON/OFF switch is in OFF position**

8 AIR SYSTEM

There are two major air systems in the MX Power Generator: the air feeding the engine and the air circulation in the engine compartment. Both air systems are filtered to keep the system free of foreign debris. Both enclosure and engine air filters should be periodically inspected every 2,250 hours of runtime and replaced if clogged.

Figure 8-1 – Engine Air Intake

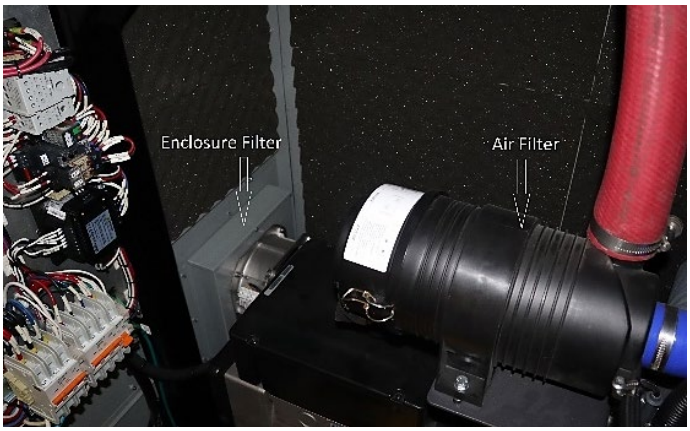

Figure 8-2 – Engine Air Circulation

During each service or maintenance visit, check the air systems as follows:

1. Inspect the engine enclosure filter and clear it of any debris. If dirty or the system's run time has exceeded 9,000 hours, replace this enclosure MERV9 air filter (GPT part number 302704).
2. Inspect the engine air intake screen located on the engine air intake elbow and clear it of any debris.
3. If included with MX unit, remove, and inspect the red engine air hose for dust build up on the inner wall, clean as required. Note this red hose is not found on cold ambient configurations of the MX.
4. Inspect the primary engine air filter. If dirt is visible, or the system's run time has exceeded 9,000 hours, replace the primary radial seal air filter (GPT part number 302756).
5. Within the primary air filter is the secondary safety air filter. If the engine run time has exceeded 27,000 hours, then this safety radial seal air filter (GPT Part number 302757) must be replaced.

9 BATTERY SYSTEM

9.1 BATTERY INSPECTION

WARNING!

Servicing of batteries are to be performed or supervised by personnel knowledgeable of batteries and the required precautions.

Keep unauthorized personnel away from batteries.

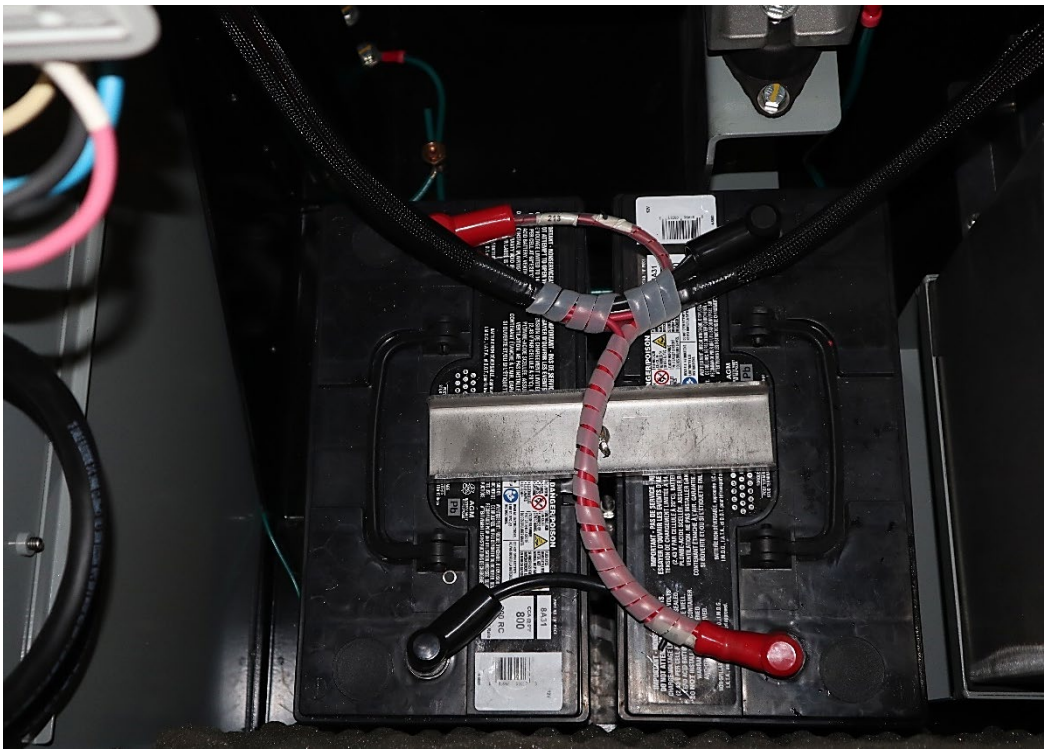

Figure 9-1 – MX Batteries

During each maintenance and service visit, inspect the battery as follows:

1. Check battery posts for corrosion. Clean any minor corrosion with wire brush or battery terminal cleaning tool. Severe corrosion may warrant replacement.
2. Measure the voltage of each battery to verify that voltage is between 12.6 and 14.8V.
    - If a battery measures below 12.6V, further charging may be required.
    - If this minimum voltage cannot be achieved by charging, the battery needs to be replaced.
    - If the battery voltage is higher than 14.8V, it also needs replacement.
    - Replacement batteries must be Type 31 AGM, 12V, 100-105Ah (GPT part number 70862).
3. Every 9,000 hours of operation, we recommend the battery positions be swapped. This ensures the batteries stay balanced, as only one position feeds the 12 VDC starting motor. Follow the steps in the battery replacement Section 9.2, as they are applicable.
4. Ensure terminals are tight and terminal boots are in place.
5. Record left battery voltage on the Maintenance log.

9.2 BATTERY REPLACEMENT

When replacing batteries, use only the batteries specified:

Type 31 AGM batteries, 12V, 100-105 Ah

These batteries are available to order from GPT. When ordering replacement batteries, please quote part number 70862.

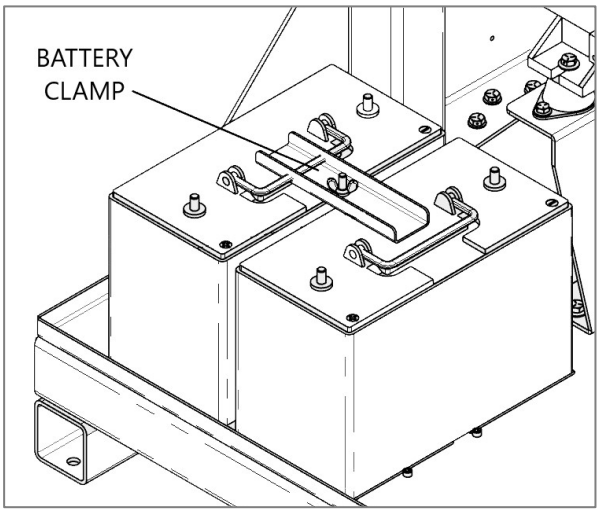

Figure 9-2 – MX Battery Clamp

To replace or swap batteries, follow these steps:

1. Use a 9/16" insulated wrench to loosen the battery terminals.
2. Remove wiring from the battery terminals.
3. Remove the wing nut securing the battery clamp and lift it off.
4. Swap battery positions or replace batteries as necessary.
5. Reinstall the battery clamp. The wingnut should be hand-tightened only; do not use tools or it may get overtightened.
6. Reinstall the wiring onto the battery terminals.
7. Ensure terminals are tight and terminal boots are in place.
8. Make a note of battery replacements or position swaps within the Maintenance Log.

CAUTION!

To avoid overtightening, do not use tools when tightening the battery clamp wing nut. Keep them hand tight.

WARNING!

A battery presents a risk of electrical shock and high short-circuit current. The following precautions are to be observed when working on batteries:

a. Remove watches, rings, or other metal objects.
b. Use tools with insulated handles.
c. Wear rubber gloves and boots.
d. Do not lay tools or metal parts on top of batteries.
e. Disconnect charging source prior to connecting or disconnecting battery terminals.
f. Determine if the battery is inadvertently grounded. When inadvertently grounded, remove source of ground. Contact with any part of a grounded battery is capable of resulting in electrical shock. The risk of such shock is reduced when such grounds are removed during installation and maintenance.

WARNING!

Do not dispose of battery or batteries in a fire. The battery is capable of exploding.

Do not open or mutilate the batteries. Released electrolyte has been known to be harmful to the skin and eyes and to be toxic.

10 OIL SYSTEM

As shown on the maintenance table above, an oil change needs to be performed on the MX Power Generator every 2250 hours of run time for systems with a standby oil reservoir or 9000 hours for systems with extended oil reservoir.

Before performing an oil change, make sure that the MX Power Generator is turned off and locked out and that the fuel supply is closed at the external valve. Refer to Section the MX Manual (302672) for full shutdown procedure.

Perform an oil change when oil is still warm, but not hot, to allow the oil to drain more efficiently. We recommend checking the oil system after the air and battery systems have been checked. This should leave the oil temperature at an appropriate level to allow safe and efficient oil drainage.

NOTE:	**Oil change interval is dependent on many factors, such as number of engine starts, gas quality, average engine load, and more. We recommend that customer take periodic oil samples and get them analyzed to verify validity of the recommended service intervals.**

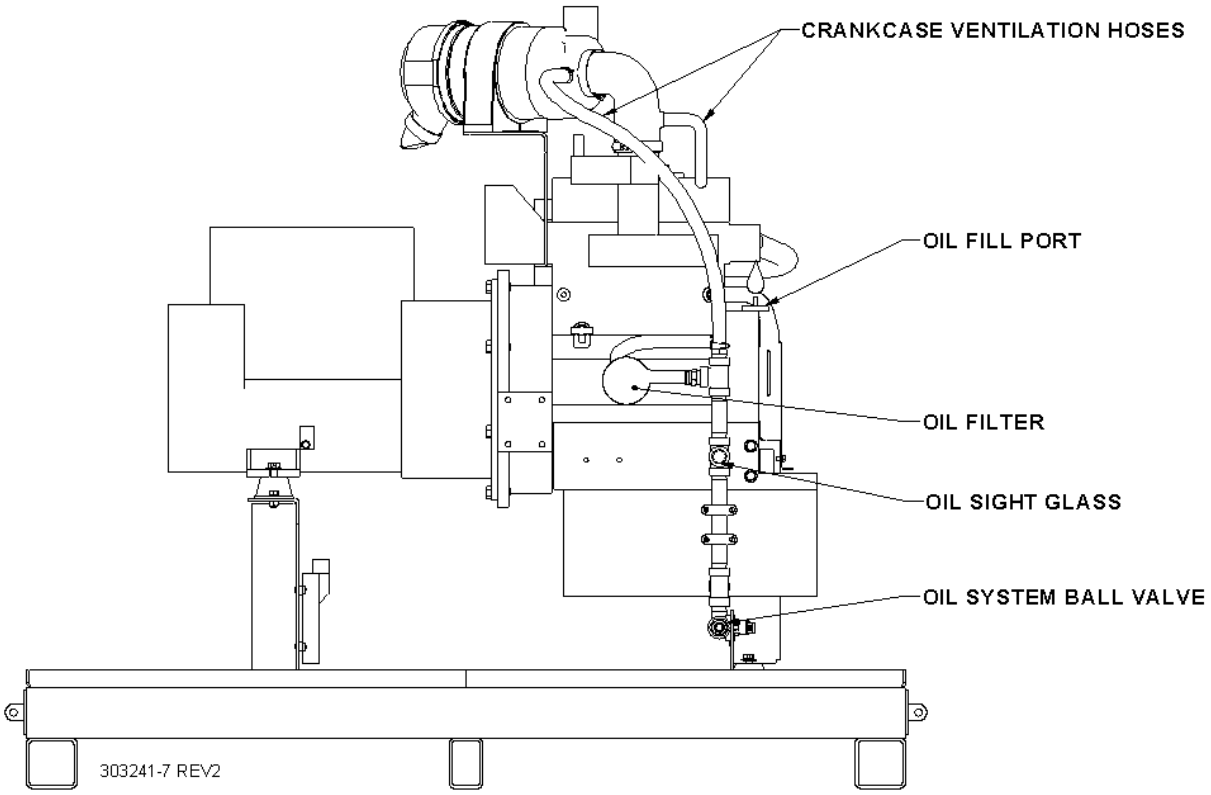

Figure 10-1 – Standby Oil Configuration

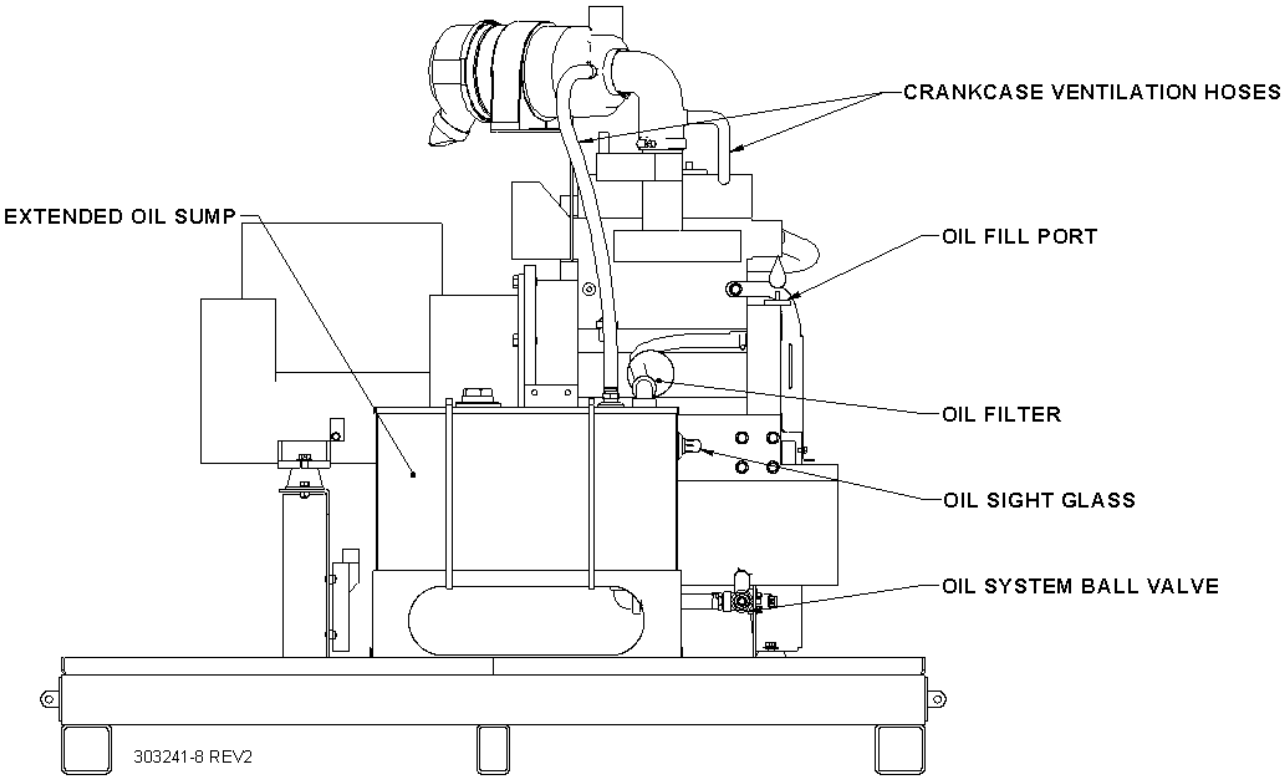

Figure 10-2 – Long Run Oil Configuration

1. Inspect oil hoses and crankcase ventilation hoses for damage or cracks especially near hose clamps.
2. Check all hose clamps are tight.
3. Open lower panel grommet.

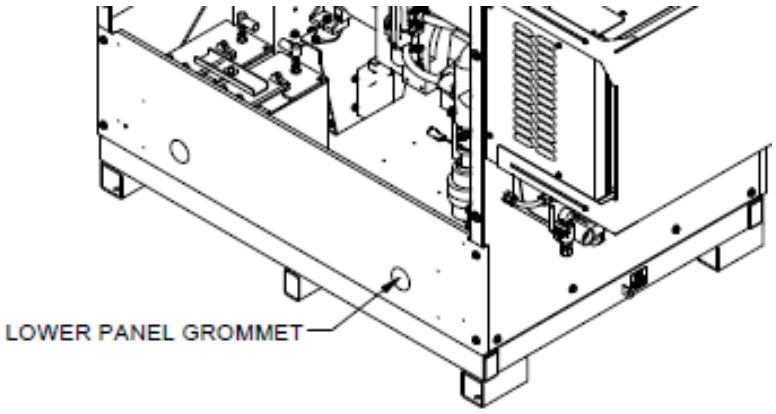

Figure 10-3 – MX Lower Panel Grommet

4. Install rubber or silicone hose over the hose barb on the oil system ball valve.
5. Place Catch tray or disposal container at other end of hose to collect draining oil.
6. Open the oil fill port on the engine.

7. Use channel locks or crescent wrench to open the oil fill port on the extended runtime reservoir (if applicable).
8. Open oil system ball valve and allow oil to drain.
9. Wait until the oil stops draining. Once the oil has finished draining, close the ball valve.
10. Address any leaks observed in initial system inspection.
11. Use Oil Filter Wrench to remove oil filter (turn counterclockwise).
12. Pre-lubricate the new oil filter seal by rubbing clean oil on the O-ring.
13. Install the new oil filter, GPT part number 302732, following the instructions on the filter body.
14. Add 12L of new oil, GPT part number 303046, to the engine oil fill port.
15. Add 24L of new oil to the extended runtime reservoir (if applicable).
16. Oil level should be at or just over halfway point on the oil sight glass when full (For standby oil configuration units). For extend oil sub, oil level should be just below the slot under the “F” on the Catch plate / full tab or just below the top of the Sight glass.

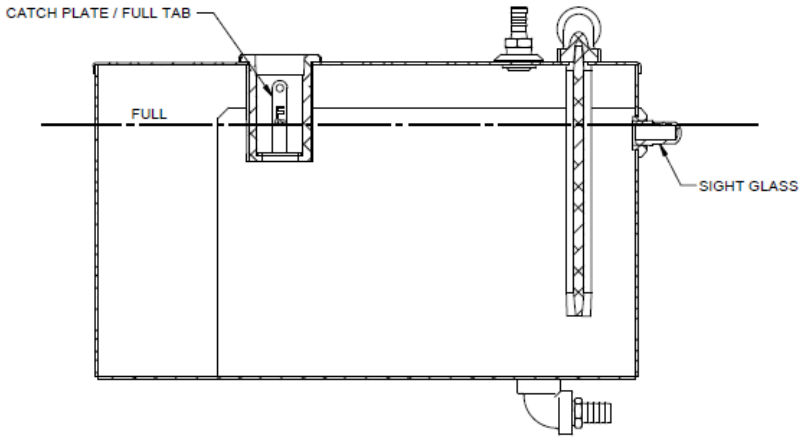

Figure 10-4 – Oil Reservoir

17. Allow a few minutes for the oil to settle in the system and top up as necessary.
18. Re-install engine oil fill port cap and extended runtime reservoir cap (if applicable).
19. Remove hose from drain barb and reinstall lower panel grommet.
20. Clean up any spills.

WARNING!

Only use MOBIL PEGASUS 1 15W40 engine oil with the MX PrimeGen. Failure to follow these instructions may damage the long run engine and void the unit's warranty.

11 COOLANT SYSTEM

Every 9,000 hours of runtime, check the radiator system for leaks. Before opening the radiator coolant reservoir, make sure that the engine has been shut down as outlined in the MX Manual (302672), and the fuel supply is turned off at the external fuel valve.

After engine has been shut down for maintenance, wait at least 20 minutes for the coolant to cool down and the system to depressurize. Use the expansion tank as an indicator of the coolant level once cooled down. It should be approximately 1/2 to 2/3 full.

Radiator coolant mixtures for the MX Power Generator are as follows:

- 60/40 ethylene glycol/water mixture can be used for all MX units.
- 50/50 ethylene glycol/water can be used for MX units in warmer ambient climates that remain above -5°C (23°F).
- Volvo Penta Yellow VCS coolant must be used to ensure extended engine life.

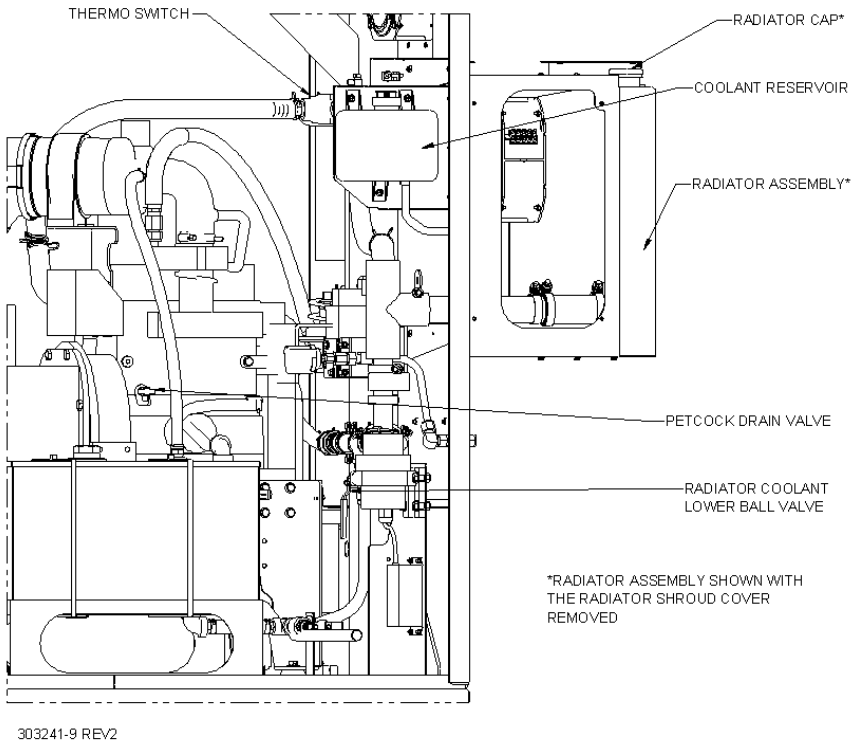

Figure 11-1 – Radiator Assembly

11.1 CHANGING COOLANT

WARNING!

Do not open the radiator coolant reservoir if it is hot to the touch. Allow it to cool for at least 20 minutes before proceeding.

1. Using a Phillips screwdriver, remove fasteners from the wind shield and radiator shroud cover.
2. Remove wind shield and radiator shroud cover.
3. Open radiator cap.

4. Using pliers, disconnect overflow hose from radiator.
5. Drain expansion tank into disposal container.
6. Reconnect overflow hose to radiator.
7. Attach 3/8” hose to coolant petcock on engine block.
8. Put hose from both the engine block petcock and the coolant drain into disposal bucket.
9. Open engine block petcock and ball valve to drain coolant.
10. Close engine block petcock and ball valve.

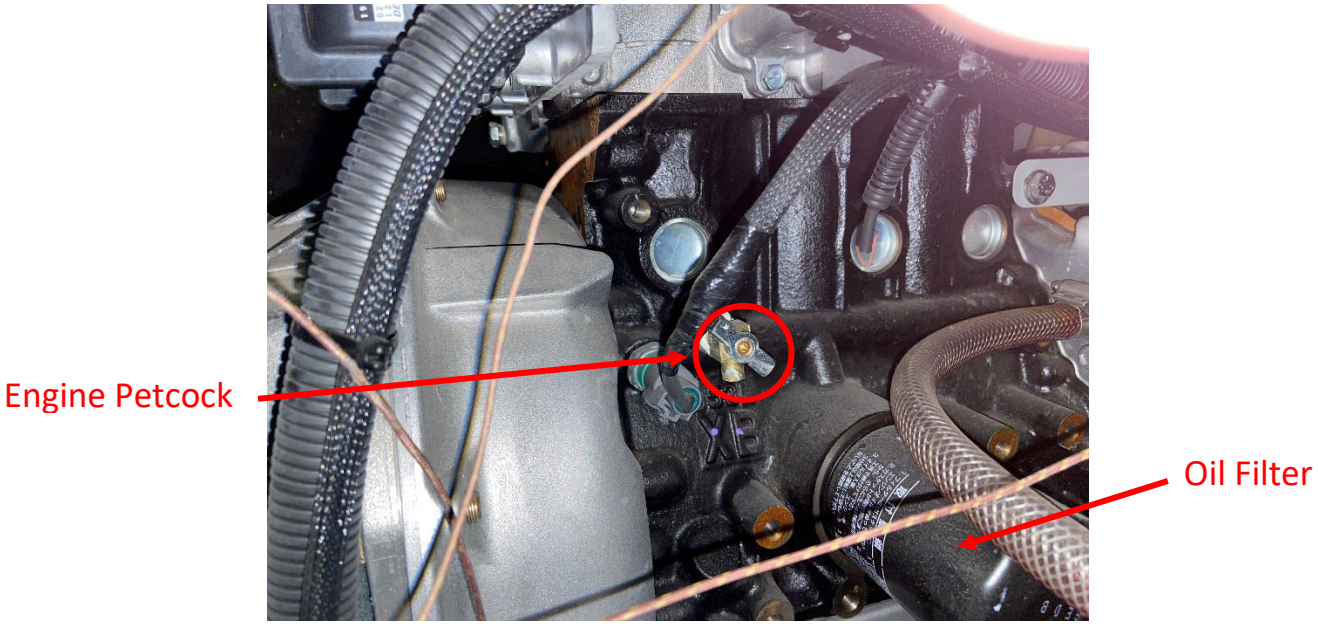

Figure 11-2 – Engine Block Petcock Location

NOTE:	**If you intend to replace the pump, this is when to do it, please see next section for details.**

11. Add coolant, GPT part number 303045, to system through the top of the radiator. Fill to bottom of the radiator cap neck.
12. Place the hose from the upper petcock into your fill container.
13. Open upper petcock and allow air to escape from engine until a steady flow of coolant is observed.
14. Close upper petcock.

WARNING!	**Only use Valvo VCS Yellow coolant with the MX Prime generator. Do not mix coolants. When adjusting coolant concentration or mixing new coolant, only use distilled water. Failure to follow these instructions may damage the radiator or coolant system and void the unit's warranty.**

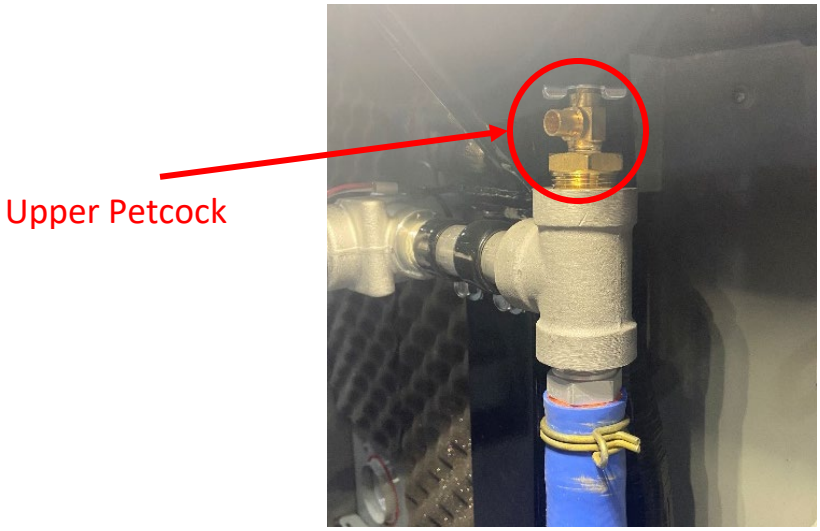

Figure 11-3 – Upper Petcock Location

15. Top up coolant level in radiator.
16. Take system out of service mode by setting switches and breakers as follows:
    a. LOC/REM: LOC.
    b. AUTO/MAN: MAN.
    c. LOCAL ON/OFF: ON.
    d. Main System Breaker (Q1) and Battery Charger Breaker (Q2) in engine compartment: OFF.
    e. Main DC Control Breakers (Q3 and Q5) inside electrical panel: ON.
17. Press “PUMP” button located near PLC screen to run the coolant pump.

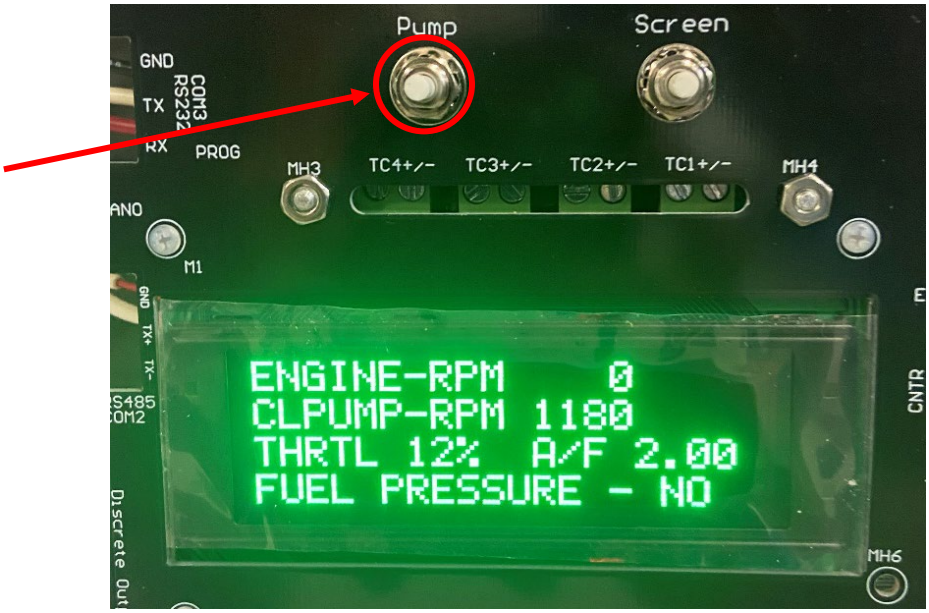

Figure 11-4 – Pump Button Location

18. After 30-60 seconds, press the “PUMP” button again to stop the coolant pump.
19. Top up coolant level in the radiator.
20. Repeat steps 18-20 until the level in the radiator stays at the bottom of the radiator cap neck.

21. Add coolant to expansion tank to the “NORMAL” line.
22. Install radiator cap.
23. Remove hose from engine petcock.
24. Start and idle engine for 20 mins, or until engine temperature exceed 80 Celsius.
25. Stop engine and allow coolant to cool for 20 mins.
26. Check coolant levels in radiator and coolant expansion tank, top up as required.
27. Clean up any coolant spills.
28. Re-install radiator shroud cover and wind shield.
29. Set wind shield spacing to distance noted on maintenance log.
30. If further maintenance is to be performed, return switches and breakers to lock out state as follows:
    a. LOC/REM: LOC.
    b. AUTO/MAN: MAN.
    c. LOCAL ON/OFF: OFF.
    d. Main System Breaker (Q1) and Battery Charger Breaker (Q2) in engine compartment: OFF.
    e. Main DC Control Breakers (Q3 and Q5) inside electrical panel: OFF.

11.2 REPLACING COOLANT PUMP

1. Drain coolant as described in steps 1-10 of ‘Changing Coolant’.
2. Set catch tray below coolant pump.
3. Disconnect pump connectors from cable harness.
4. Using 5/16” socket/nut driver, loosen hose clamps on the inlet and outlet of the pump.
5. Using 5/16” wrench and Philips screwdriver, remove the mounting hardware for the control box from the bracket.
6. Using 2x 9/16” wrenches, remove front 2 mounting bolts of pump. Loosen the bolts on the other side of the pump.
7. Rotate pump clockwise and work hose off outlet barb of pump.
8. Work hose off inlet barb of pump. Be careful to catch any coolant that may remain in the pump.
9. Insert inlet barb of new pump, GPT part number 302581, into hose.
10. Rotate pump counterclockwise so that the mounting feet hook under the mounting bolts and the outlet barb inserts into the hose.
11. Replace and tighten all mounting hardware for pump.
12. Tighten hose clamps.
13. Install mounting fasteners for the control box.
14. Attached pump connectors to cable harness
15. Continue with steps 11-24 of ‘Changing Coolant’.

11.3 TOPPING UP THE RADIATOR FLUID

If the radiator coolant level is noticeably low, it can also be topped up at the overflow tank during normal maintenance periods. Shut down the MX Power Generator as outlined in the MX Manual (302672) and turn the fuel supply has off at the external valve then top up the coolant as follows:

1. Open the overflow tank.
2. Pour coolant in the tank until it hits the “Normal” line.
3. Close the tank.

12 ELECTRICAL SYSTEM

12.1 CUSTOMER TERMINATIONS

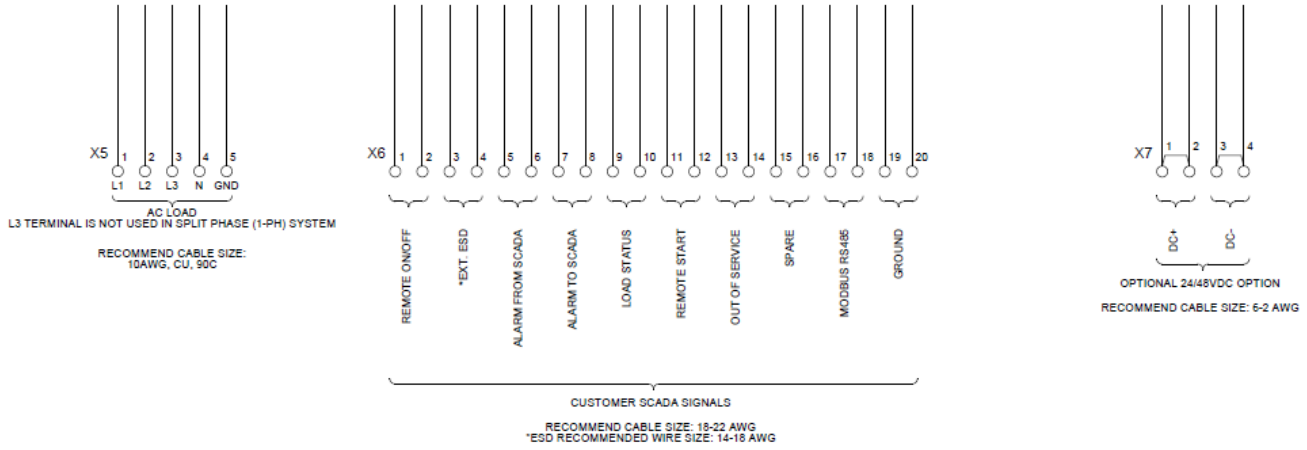

Figure 12-1 – Customer Wiring Terminations (3 Phase & Single-Phase Systems)

Table 5 - Customer Wiring Connections (3 Phase & Single-Phase Systems)

CONNECTION	DESCRIPTION	VOLTAGE OUTPUT
(**X5**)	AC Load, 60 Hz, Split Phase Recommend Cable Size: 10 AWG, Copper, 90C	120/240 V_{AC}
(**X6**) 1, 2	Remote On/Off	Dry Contact
(**X6**) 3, 4	External Emergency Shutdown (ESD)	Dry Contact
(**X6**) 5, 6	Alarm From SCADA	Dry Contact
(**X6**) 7, 8	Alarm to SCADA	Dry Contact
(**X6**) 9, 10	Customer Load Status	Dry Contact
(**X6**) 11, 12	Remote Start	Dry Contact
(**X6**) 13, 14	Out of Service Status	Dry Contact
(**X6**) 15, 16	*Spare, reserved for future use*	
(**X6**) 17, 18	Modbus RS-485 terminals	
(**X6**) 19, 20	Signal Ground Terminals	
(**X7**) 1,2,3,4	Optional 24/48 V_{DC} Converter terminals Recommended Cable Size: 6-2 AWG, Copper, 90C	Nominal 24/48 V_{DC}

Refer to MX Manual 302672 for operational instructions of all SCADA dry contacts on terminal block X6.

WARNING!

Ensure that the correct polarity is followed. Incorrect polarity may cause damage to the generator or customer equipment.

12.2 SENSOR LOCATIONS

Table 6 - List of Sensors

Sensor #	GPT PN #	Description
1	303451	Engine Enclosure Temperature Sensor
2	303451	Engine Coolant Outlet Temperature Sensor
3	304528	Engine Coolant Temperature Sensor
4	303451	Engine Coolant Inlet Temperature Sensor
5	61849	Fuel Sensor / Switch
6	302753	Oil Pressure Sensor / Switch
7	302735	Crank Position Sensor
8	302734	Exhaust Temperature Sensor
9	302733	Exhaust O_2 Sensor
10	300862	PLC (Electrical Box) Temperature Sensor
11	303451	Ambient Temperature Sensor

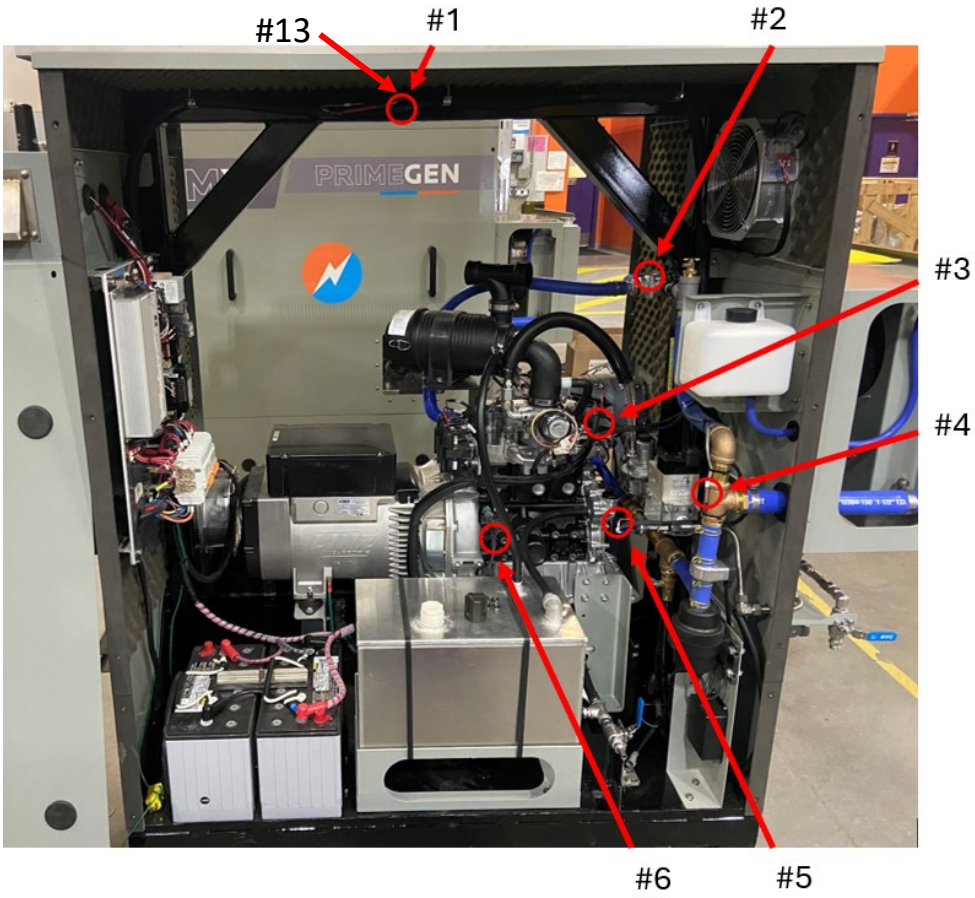

Figure 12-2 – MX Sensor Locations | Front Panel

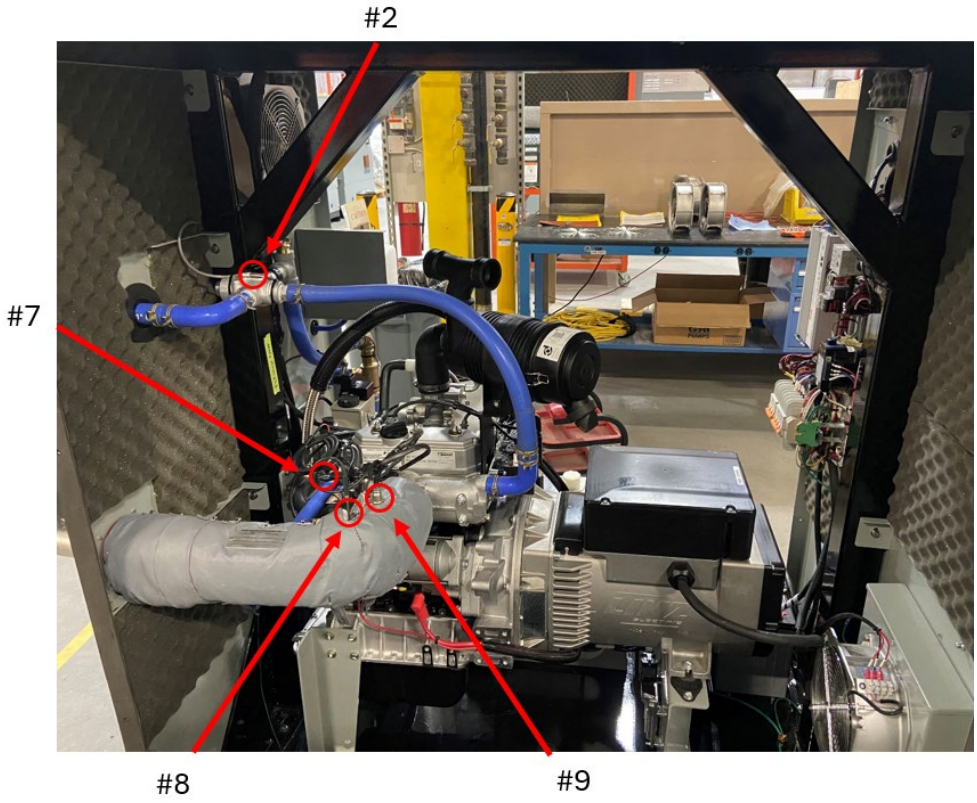

Figure 12-3 – MX Sensor Locations | Back Panel

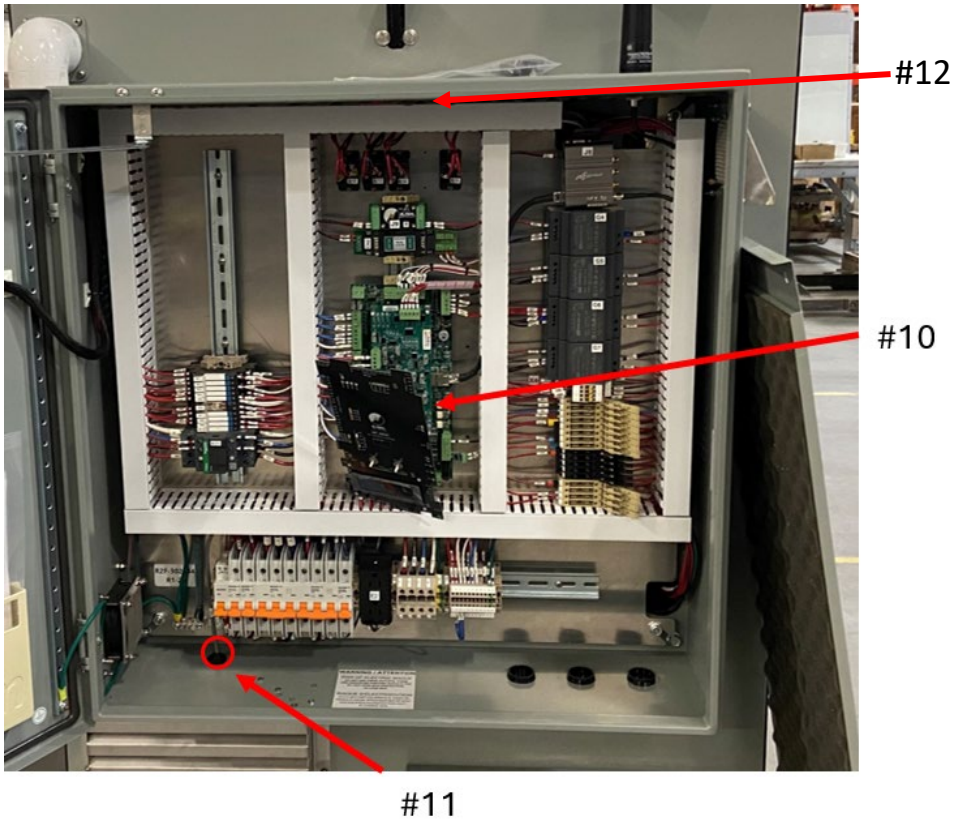

Figure 12-4 – MX Sensor Locations | Electrical Cabinet

12.3 INDIVIDUAL SENSORS

Figure 12-5 – #1 Engine Enclosure Temperature Sensor

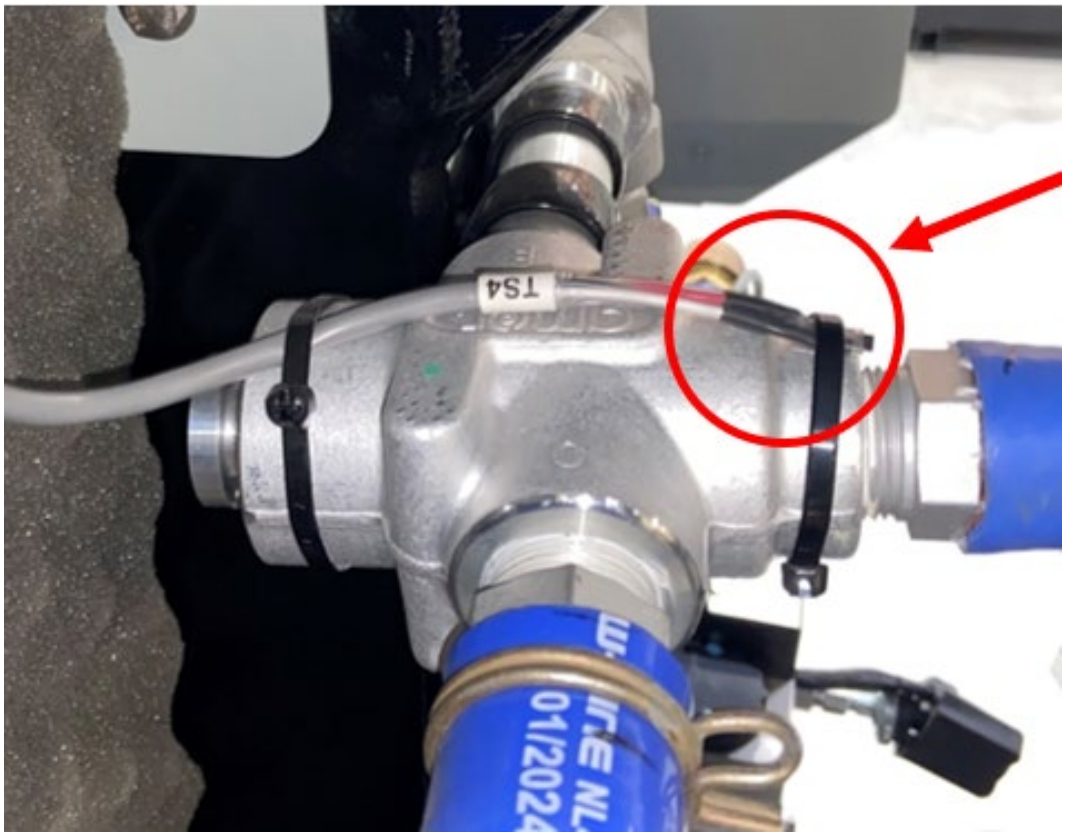

Figure 12-6 – #2 Radiator Outlet Temperature Sensor

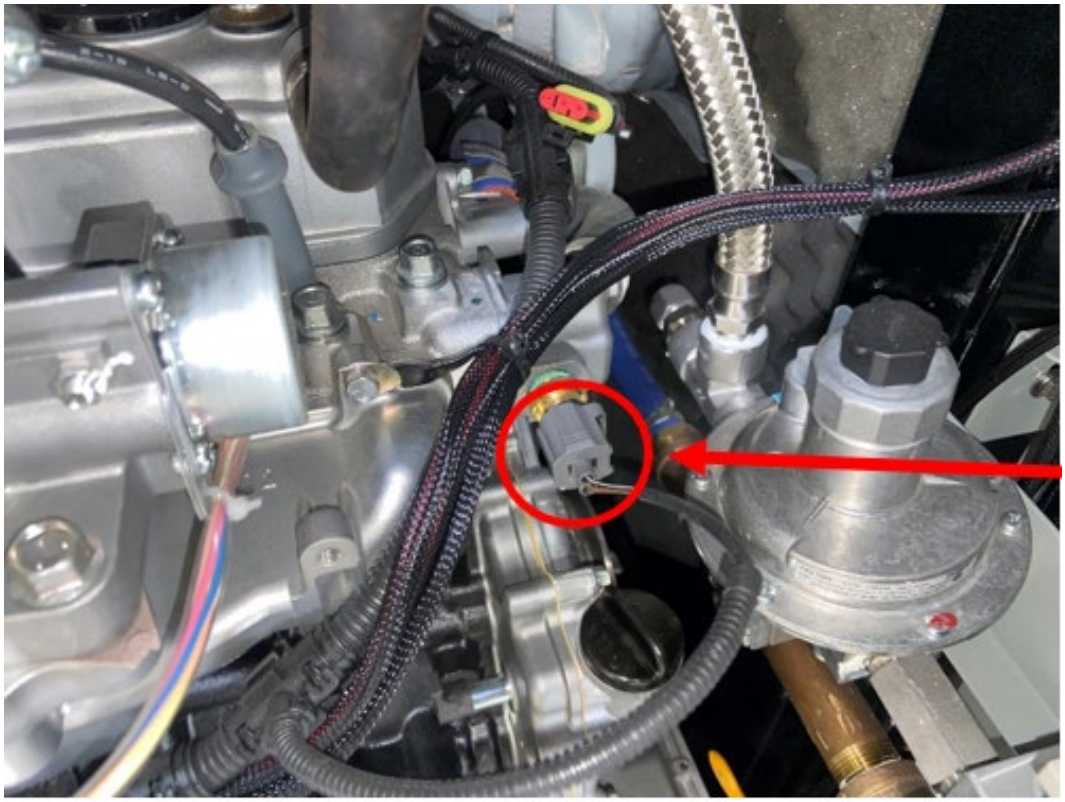

Figure 12-7 – #3 Engine Coolant Temperature Sensor

Figure 12-8 – #4 Radiator Inlet Temperature Sensor

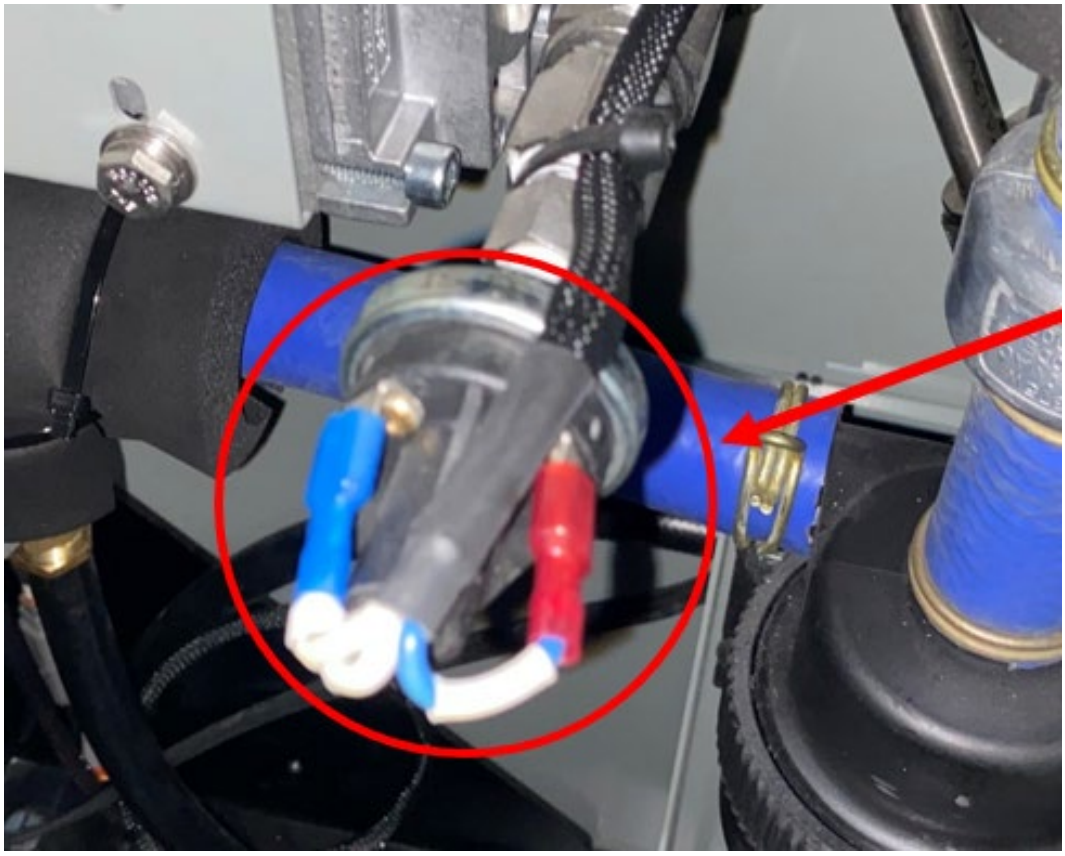

Figure 12-9 – #5 Fuel Sensor / Switch (Note: Remove rubber boot to access)

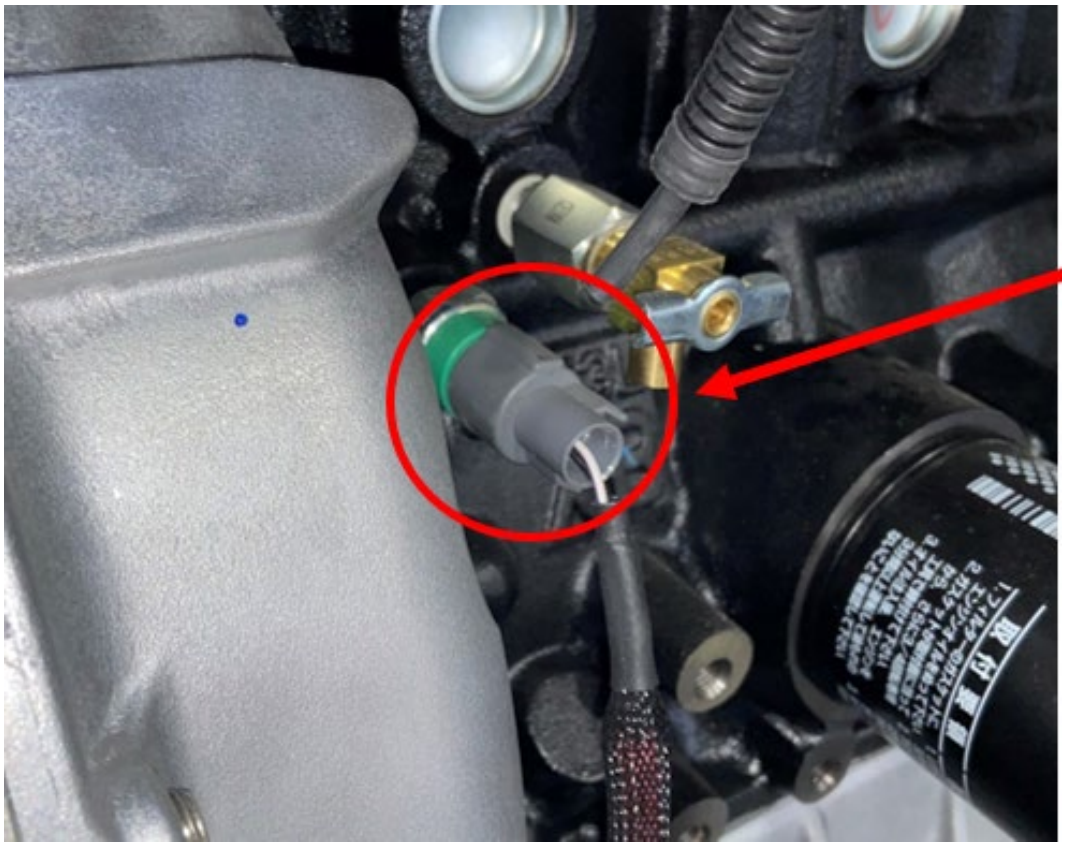

Figure 12-10 – #6 Oil Pressure Sensor / Switch

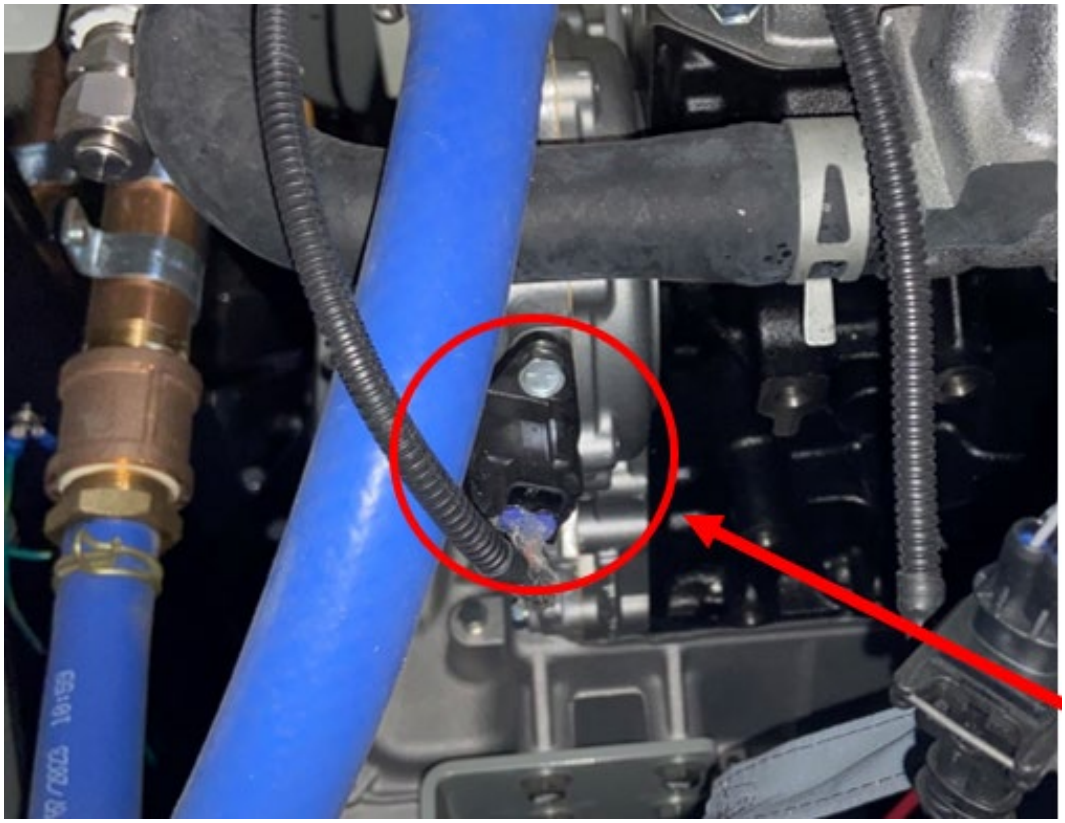

Figure 12-11 – #7 Crank Position Sensor

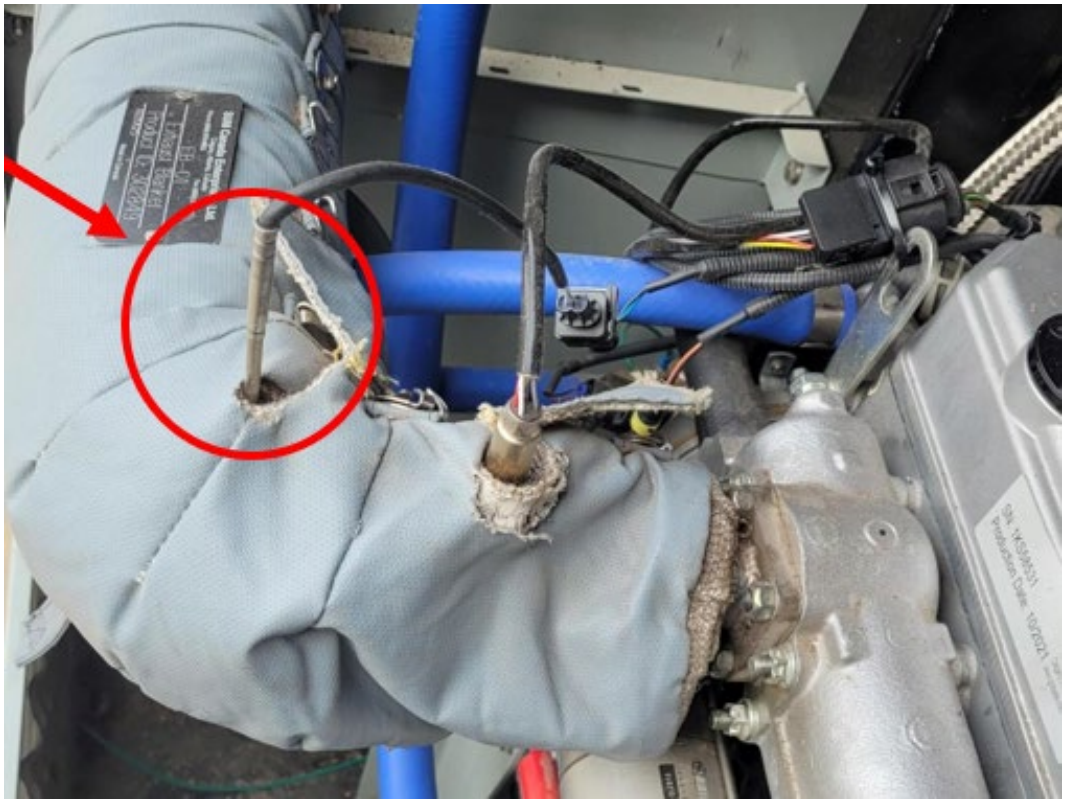

Figure 12-12 – #8 Exhaust Temperature Sensor

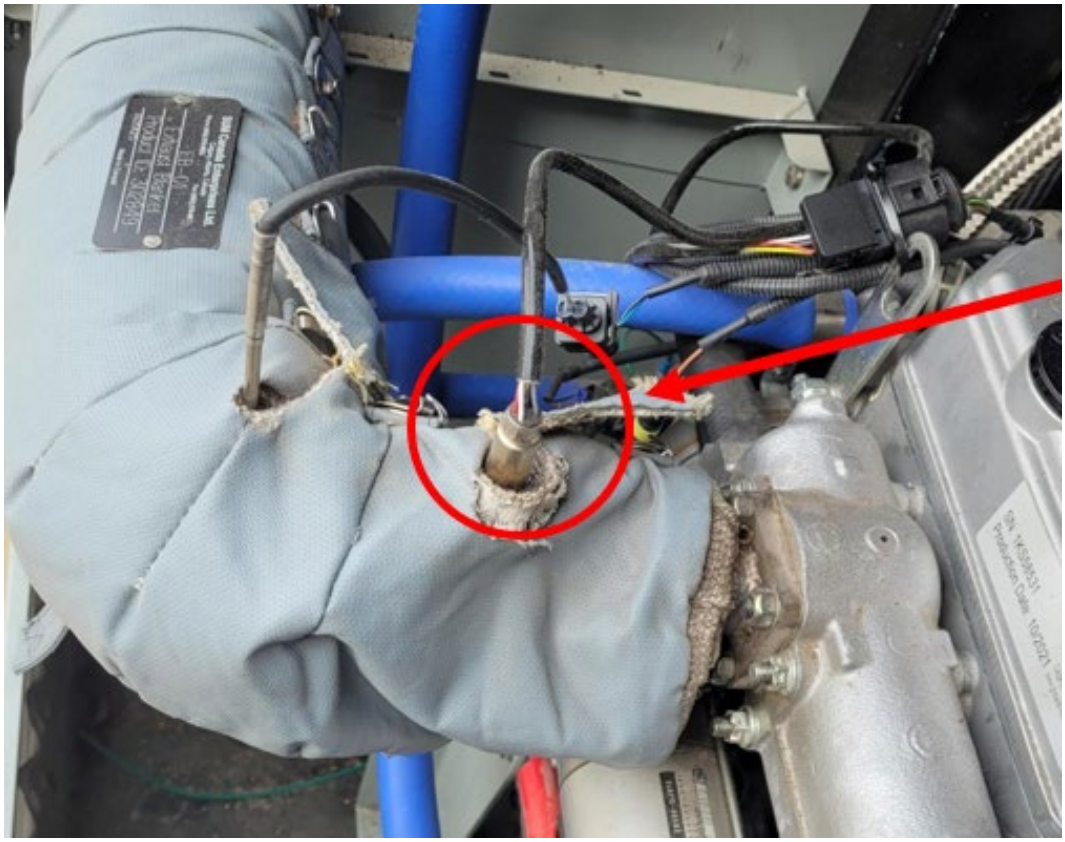

Figure 12-13 – #9 Exhaust O2 Sensor

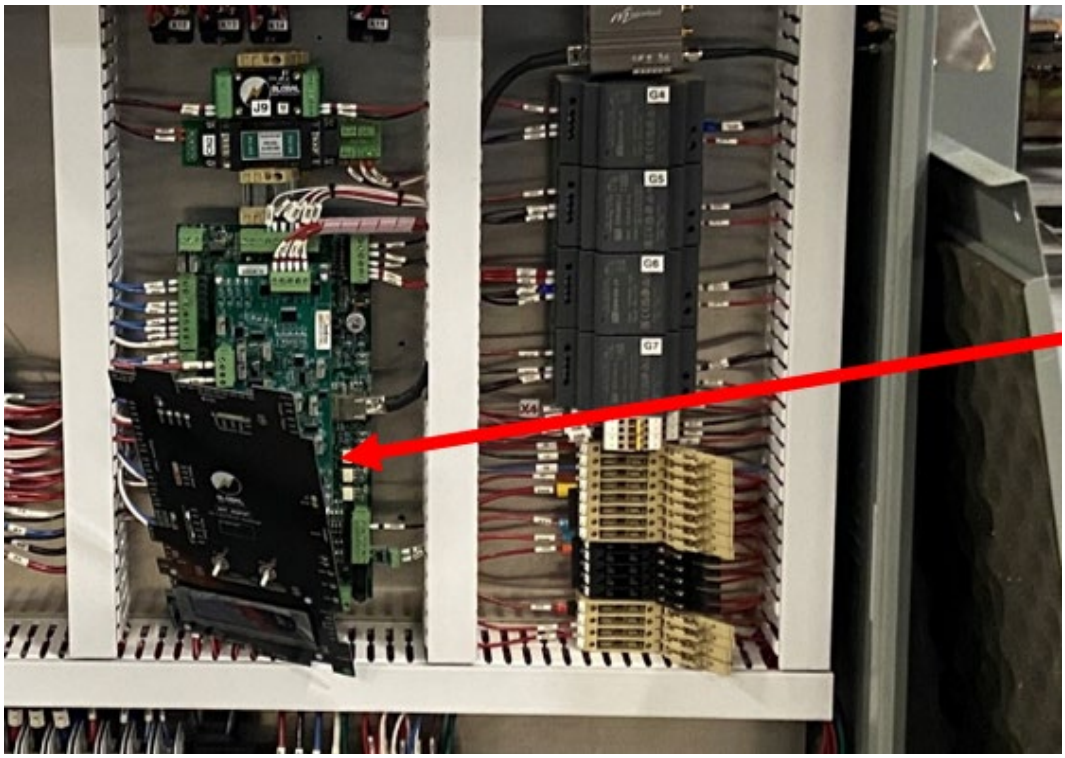

Figure 12-14 – #10 PLC (Electrical Box) Temperature Sensor

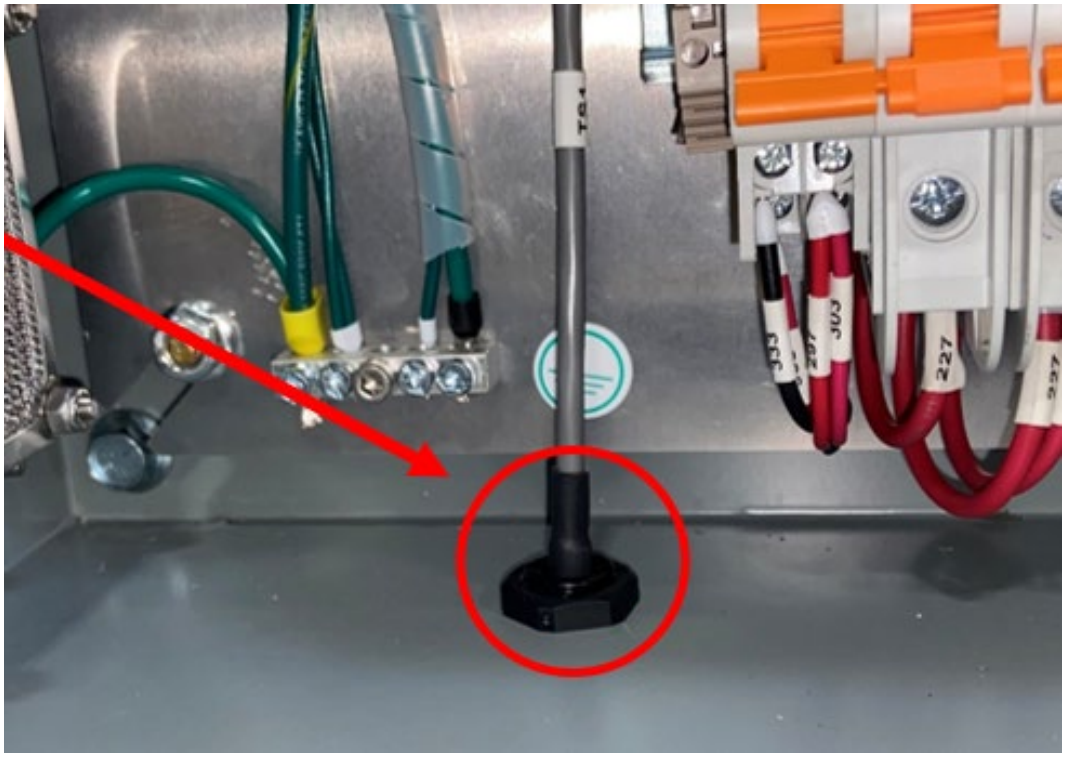

Figure 12-15 – #11 Ambient Temperature Sensor

12.4 CURRENT PROTECTION

The table below outlines circuit breakers and fuses are present on MX Prime Gen.

Table 7 - Circuit Breaker and Fuse Protection List

MARK	FUNCTION	RATING
Q3	MAIN DC BREAKER	30A, 1P
Q5	DC CONTROL BREAKER	10A, 1P
Q6	MAIN AC INPUT	1-Φ: 35A, 2P 3-Φ: 35A, 3P
Q7	CUSTOMER AC LOAD BREAKER	1-Φ: 32A, 2P 3-Φ: 30A, 3P
Q8	RECEPTACLE BREAKER	3A, 1P
F1	L1 VOLTAGE SENSING & PM	1A, 250VAC
F2	L2 VOLTAGE SENSING	1A, 250VAC
F3 +	L3 VOLTAGE SENSING	1A, 250VAC
F4	HEAT TRACE	6A, 125VAC
F5	24-24VDC CONVERTER (SOLENOID VALVE)	5A, 125VAC
F6	24-12VDC CONVERTER	5A, 125VAC
F7	24-24VDC CONVERTER (CONTROL)	5A, 125VAC
F8	24-5VDC CONVERTER	5A, 125VAC
F9	COOLANT PUMP	15A, 125VAC
F10	RADIATOR FAN 1	3A, 250VAC
F11	RADIATOR FAN 2	3A, 250VAC
F12	INTAKE FAN	3A, 250VAC
F13	EXHAUST FAN	3A, 250VAC
F14	ICU	5A, 125VAC
F15	MODEM	1A, 250VAC
F16	PLC	2A, 250VAC
F17	FAN (ELEC. ENCLOSURE)	1A, 250VAC
F18	THERMAL FUSE (ELEC. ENCLOSURE)	10A, 84ºC, 250V
F19	THERMAL FUSE (ENGINE ROOM)	10A, 84ºC, 250V

+ NOT USED IN 1-Φ

12.5 THERMAL FUSE LOCATIONS

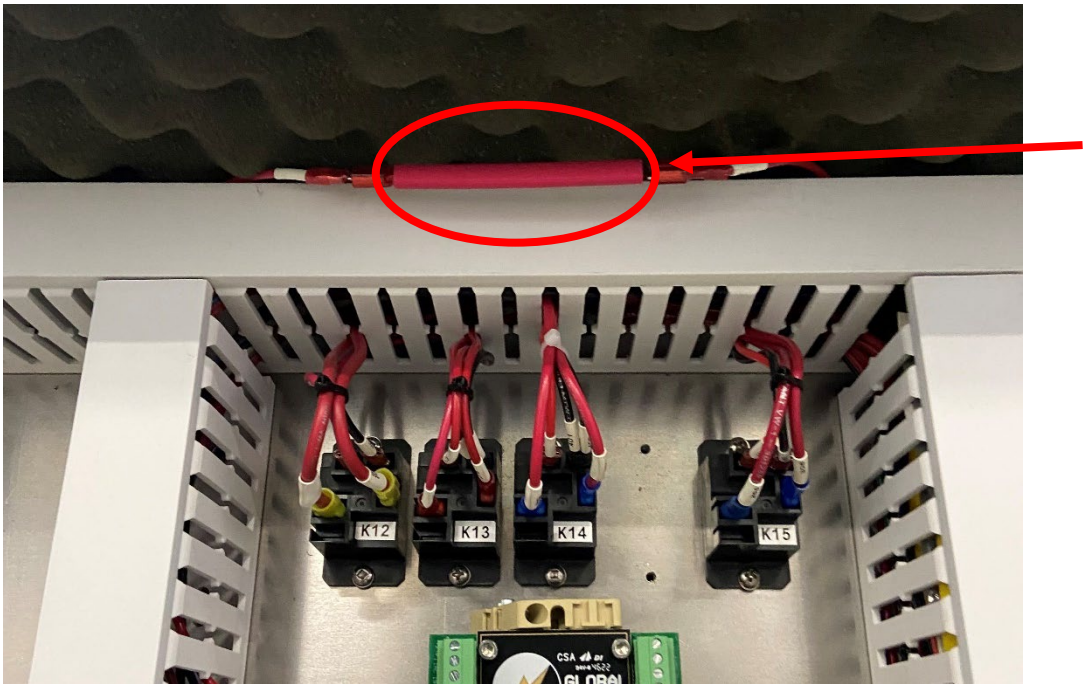

Figure 12-16 – Thermal Fuse (Electrical Room)

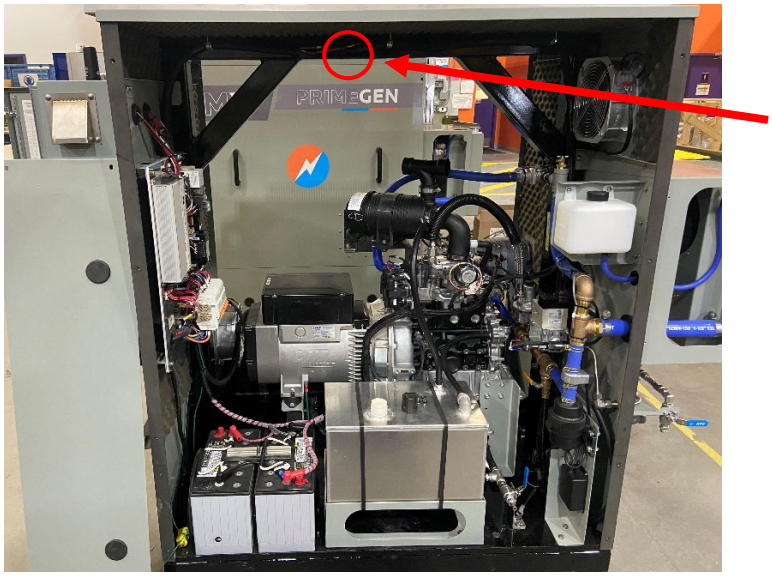

Figure 12-17 – Thermal Fuse (Engine Room)

Figure 12-18 – Thermal Fuse (Engine Room)

12.6 CHECKING ELECTRICAL CONNECTIONS

While the MX is powered down and all breakers are off:

- Check all screw terminals and ensure connections are still tight.
- Check all fuses for continuity and replace as required. See Table 4.
- Visually inspect all breakers for damage.
- Check all spade connections for signs of damage or ware. Ensure they are all still snug fitting.

13 REPLACING O_2 SENSOR

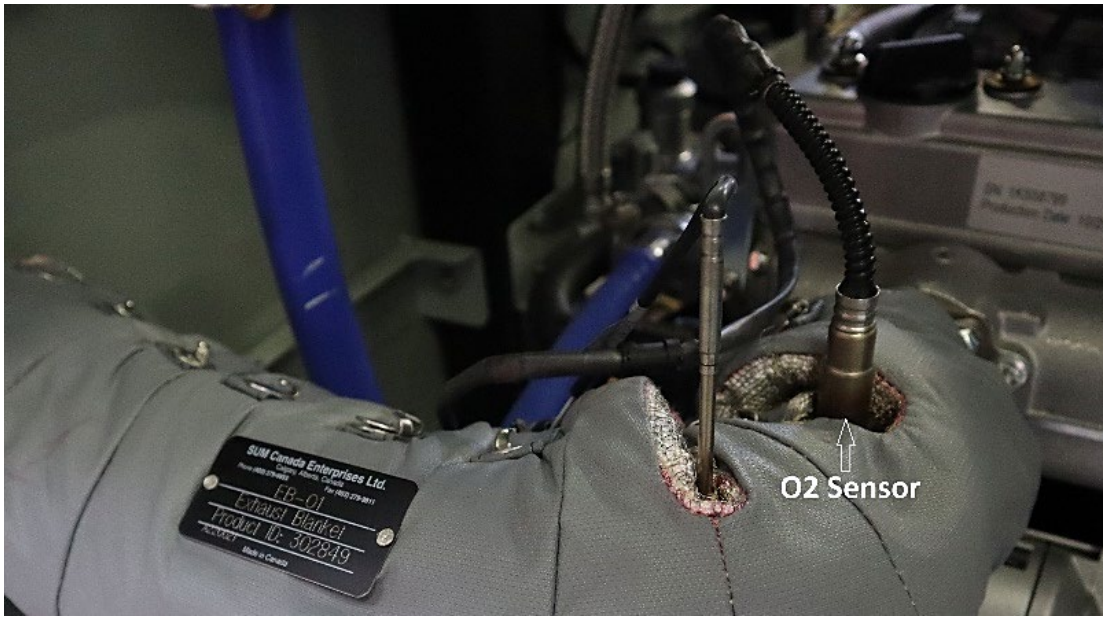

Figure 13-1 – O_2 Sensor Location

1. Remove exhaust blanket.
2. Use a flat blade screwdriver to release the retaining clip on the connector so that the O2 sensor can be disconnected from the wire harness.
3. Use 7/8” wrench to remove O2 Sensor from exhaust line.
4. Apply high temperature thread sealant (Grafoil GTS thread sealant) to threads on new O2 Sensor and install into exhaust line.
5. Connect sensor to wire harness.
6. Re-install exhaust jacket.

14 CHECKING AND ADJUSTING VALVE CLEARANCES

Assessing and adjusting the valves must be done when the engine is cold to ensure proper clearances.

1. Use 13mm driver and Philips driver to remove the crankshaft pulley cover guard.
2. Use 10mm wrench to remove valve cover.
3. Remove boots from spark plugs and drape off to the side.
4. Use 5/8” socket to remove spark plugs.
5. Use 19mm socket to rotate crankshaft clockwise until cylinder 1 is in compression Top Dead Center (TDC). Cylinder 1 is closest to the pulley. Cylinder 1 is in compression when both the intake and exhaust valves are closed (rocker arms in the up position) and the markings on the pulley and engine block aligned as shown.

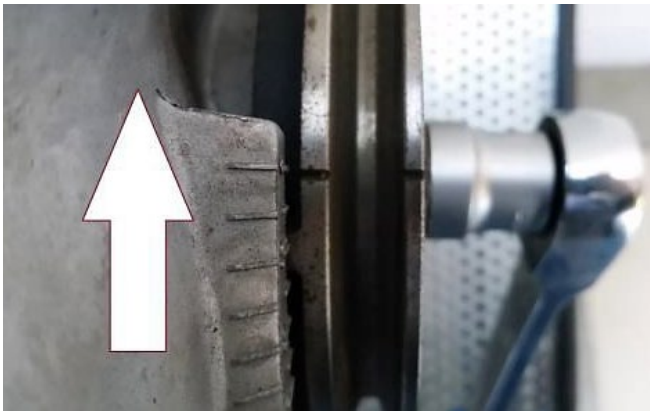

Figure 14-1 – Pulley & Engine Block Marking Alignment

6. Measure clearances of the valves marked ‘X’ below:

Cylinder Number	Valves	
	Intake	Exhaust
1	X	X
2	O	X
3	X	O

   a. To measure clearances, first use the 0.008” (0.203mm) feeler gauge. It should easily be inserted between the rocker arm and valve stem as shown.

Figure 14-2 – Rocker Arm & Valve Stem

b. Follow with the 0.012” (0.305mm) feeler gauge. This should not be able to insert between the rocker arm and valve stem.

c. Adjust valves that do not meet this specification.

- Hold the valve adjustment screw in place with flat blade screwdriver and loosen the set nut with the 10mm wrench.
- Rotate adjustment screw until the 0.008” feeler gauge can be inserted between the rocker arm and valve stem.
- Hold the screw in place and tighten set nut to 11Nm with a 10mm crowfoot wrench.
- Verify that the 0.008” gauge can be inserted, and the 0.012” gauge cannot.

7. Use 19mm socket to rotate crankshaft 360° clockwise, bringing cylinder 1 to exhaust top dead center. Align markings on pulley and engine block as before.

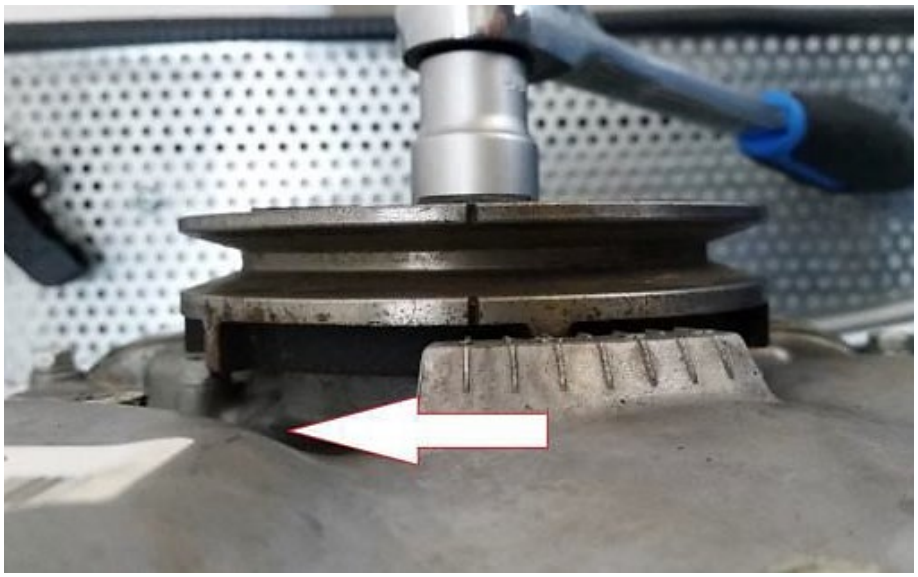

Figure 14-3 – Pulley & Engine Block Marking Alignment

8. Measure clearances of the valves marked ‘O’ above, adjust as required as stated in step 5.

Figure 14-4 – Rocker Arm & Valve Stem

WARNING!

Tighten the lock nuts of the setting screws after adjusting the valve clearance. Tightening torque is 11 N-m.

9. Remove and replace valve cover seal washers, GPT part number 302745.
10. Remove and replace cylinder head cover gasket, GPT part number 303117
11. Reinstall valve cover.
12. Reinstall the crankshaft pulley cover guard.

15 IGNITION SYSTEM

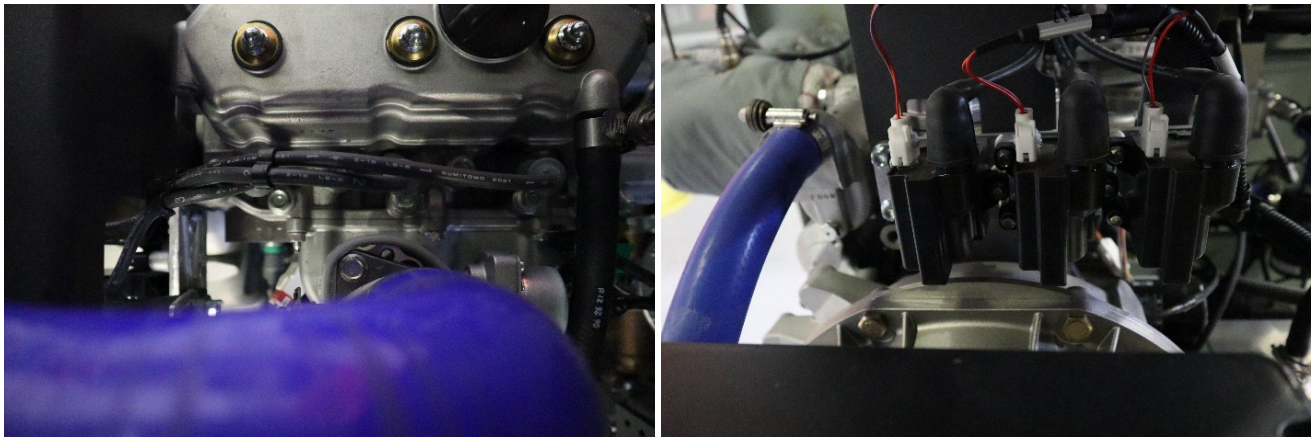

Figure 15-1 – MX Ignition System

15.1 SPARK PLUG REPLACEMENT

1. Disconnect ignition wires from spark plug.
2. Use 5/8” socket to remove old spark plug.
3. Thread new spark plug, GPT part number 302731, into engine block by hand.
4. Torque to 18Nm.
5. Repeat for remaining spark plugs.

15.2 SPARK PLUG WIRE REPLACEMENT

1. Disconnect boots from spark plugs.
2. Disconnect boots from ignition coils.
3. Install new wires, GPT part number 302736.

15.3 CHANGE IGNITION COILS

1. Use 8 mm socket to remove mounting fasteners.
2. Remove ignition coil.
3. Install new ignition coil, GPT part number 302737, and reinstall fasteners.

16 CYLINDER COMPRESSION TEST

1. Ensure no fuel is available to the system.
2. Take system out of service mode by setting switches and breakers as follows:
   a. LOC/REM: LOC.
   b. AUTO/MAN: MAN.
   c. LOCAL ON/OFF: ON.
   d. Main System Breaker (Q1) and Battery Charger Breaker (Q2) in engine compartment: ON.
   e. Main DC Control Breakers (Q3 and Q5) inside electrical panel: ON.
3. Remove rubber boot from fuel pressure switch and install jumper wire across switch contacts.

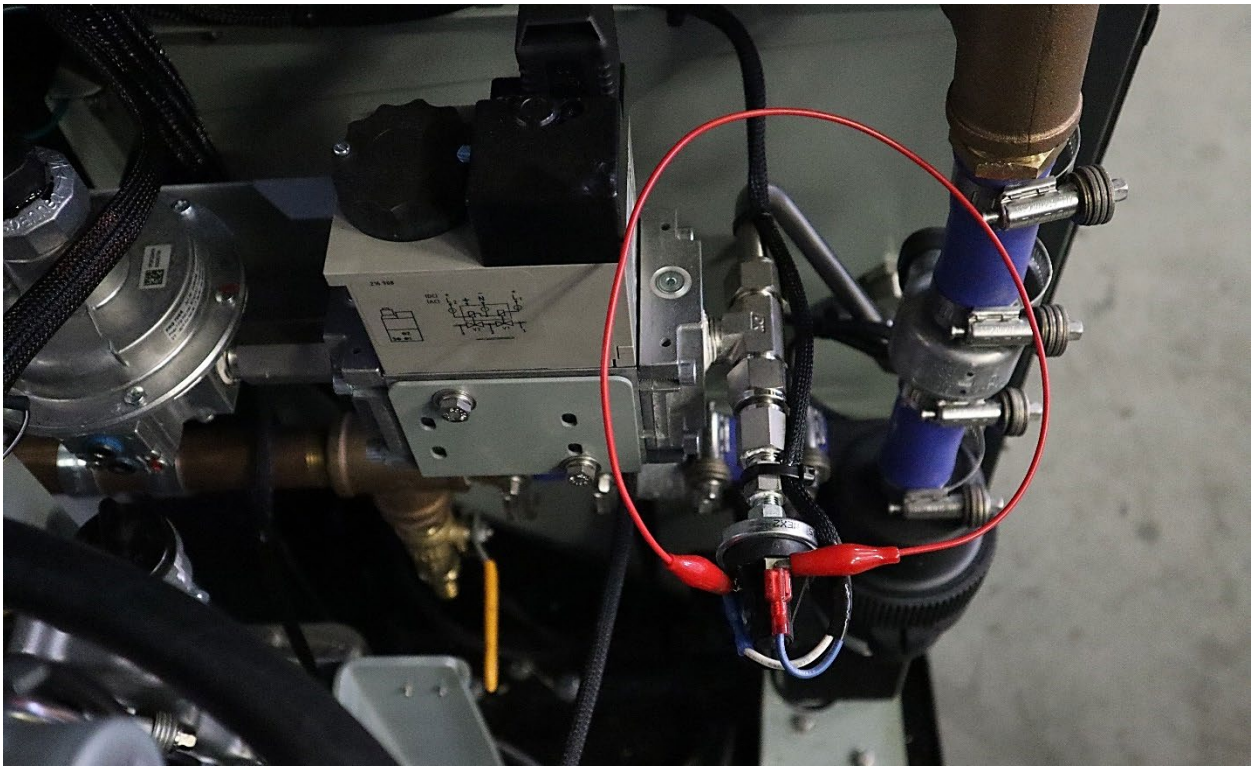

Figure 16-1 – Jumper Wire Placement

4. Disconnect ignition wire from spark plug #1.
5. Use 5/8” deep socket to remove the spark plug.
6. Thread compression tester into spark plug port.
7. Press start button and allow engine to crank until compression pressure reading stabilizes.
8. Press stop button.
9. Record pressure reading on maintenance log, acceptable compression is between 11 bar (160 psi) and 16 bar (232 psi).
10. Remove compression tester from port and reinstall spark plug.
11. Torque the spark plug to 18Nm.
12. Repeat steps 4-11 for spark plug #2 & #3.
13. Remove jumper wire from pressure switch and re-install rubber boot.

17 MAINTENANCE HOURS RESET

1. Take system out of service mode by setting switches and breakers as follows:
    a. LOC/REM: LOC.
    b. AUTO/MAN: MAN.
    c. LOCAL ON/OFF: ON.
    d. Main System Breaker (Q1) and Battery Charger Breaker (Q2) in engine compartment: ON.
    e. Main DC Control Breakers (Q3 and Q5) inside electrical panel: ON.
2. Press and hold the LCD button for 30 seconds while the engine is off to reset the maintenance hours timer to zero.

18 MX PRIMEGEN SITE INSTALLATION & COMMISSIONING REPORT

To receive a full warranty on the MX, please fill and sign and send both pages of the site installation and commissioning report. Send a picture, scan, or copy to customer.service@globalte.com.

MX UNIT INFORMATION			
Serial Number		Fuel Type	
Model Number		Regulator (Y/N)	

SITE INFORMATION			
Site Name			
Address			
City		State/Province	
Zip (if applicable)		Country	

SITE CONTACT & COMPANY INFORMATION			
Company Name			
Contact Name			
Phone		Email	

COMMISSIONING COMPANY INFORMATION (IF DIFFERENT THAN COMPANY CONTACT)			
Company Name			
Contact Name			
Phone		Email	

WARNING!

Before beginning any work on the MX power generator, read the installation, operation, and maintenance (IOM) manual 302672 thoroughly and pay special attention to all safety instructions. Ensure that the MX is installed as per Section 4 of the MX IOM manual 302672.

- [ ] Unit inspected for possible damage from shipping. Any findings documented and reported
- [ ] MX unit is secured to a solid level surface. (IOM section 4.1)
- [ ] MX unit is installed in an unclassified location and meets all local regulations
- [ ] Site maintains a minimum 1 m [40”] clearance from all sides of the unit. (IOM section 4.1.1)
- [ ] Intended fuel supply meets requirements (IOM section 4.1.2)
- [ ] Exhaust silencer assembly installed, and all exhaust clamps tightened (IOM section 4.4)
- [ ] Exhaust Cover has been installed (IOM section 4.4)
- [ ] Batteries voltage checked and connected (IOM section 4.4.1 & Service manual section 9)
- [ ] Oil and coolant/radiator lines checked for damage or leaks
- [ ] Coolant levels checked and filled as required (IOM section 4.4.2 & Service manual section 11)
- [ ] Oil levels checked and topped up as required (IOM section 9.7 & Service manual section 10)
- [ ] Fuel line installed and leak checked (IOM section 4.4.3)
- [ ] Electrical connections are tight and terminated correctly (IOM section 4.4.4)
- [ ] Confirm Supplied fuel pressure to MX is 2-5 PSI (or 10-28 PSI with optional regulator)
- [ ] Air filters installed and are clean (IOM section 9.5 & Service manual section 8)
- [ ] All customer wiring connections made (IOM section 4.4.4)
- [ ] MX unit is grounded using supplied grounding lug(s) on the skid
- [ ] Radiator wind-shield gap has been adjusted (IOM section 4.4.5)
- [ ] An external 120V AC power source may be required to charge the batteries or pre-warm the engine before startup if the temperature is below -5°C [23°F] (IOM section 5.2)
- [ ] Start engine (IOM section 5)
- [ ] Confirm engine ramps up and maintains proper engine speed (1800 for 60 Hz or 1500 for 50 Hz)
- [ ] Confirm external 120V AC power source is unplugged
- [ ] Confirm radiator fans turn on / cycle when engine temperature gets above 82°C [180°F]
- [ ] Turn on customer load. Confirm customer load is receiving power. The load should be gradually increased
- [ ] Confirm IOT is communicating (not applicable if cellular service is not available)

Notes: _____

_____

_____

_____

Site Representative Name | Site Representative Signature | Date

_____

Commissioning Person Name | Commissioning Person Signature | Date

19 MX GENERATOR MAINTENANCE LOG

Model Number:		Serial Number:	
Service Date:		MX Runtime:	
Wind Shield Distance:			
Switch Settings	LOC/REM		
	AUTO/MAN		
	LOCAL ON/OFF		
Radial Air Filter	Inspected / Replaced		
Safety Radial Air Filter	Inspected / Replaced		
Enclosure Filter	Inspected / Replaced		
Batteries	Inspected / Replaced		
Battery Voltage	Battery 1:	*Above 12.6V & Below 14.8V*	
	Battery 2:	*Above 12.6V & Below 14.8V*	
Engine Oil	Inspected / Replaced		
Engine Oil Filter	Replaced		
Coolant	Inspected / Replaced		
Coolant Pump	Inspected / Replaced		
Crankcase Vent Hoses	Inspected / Replaced		
O2 Sensor	Replaced		
Valve Clearances	Cylinder Number	Valves	
		Intake	Exhaust
	1	Inspected / Adjusted	Inspected / Adjusted
	2	Inspected / Adjusted	Inspected / Adjusted
	3	Inspected / Adjusted	Inspected / Adjusted
Spark Plug 1	Inspected / Replaced		
Spark Plug 2	Inspected / Replaced		
Spark Plug 3	Inspected / Replaced		
Spark Plug Wire 1	Inspected / Replaced		
Spark Plug Wire 2	Inspected / Replaced		
Spark Plug Wire 3	Inspected / Replaced		
Ignition Coil 1	Inspected / Replaced		
Ignition Coil 2	Inspected / Replaced		
Ignition Coil 3	Inspected / Replaced		
Cylinder 1 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 2 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 3 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Notes:			

Model Number:		Serial Number:	
Service Date:		MX Runtime:	
Wind Shield Distance:			
Switch Settings	LOC/REM		
	AUTO/MAN		
	LOCAL ON/OFF		
Radial Air Filter	Inspected / Replaced		
Safety Radial Air Filter	Inspected / Replaced		
Enclosure Filter	Inspected / Replaced		
Batteries	Inspected / Replaced		
Battery Voltage	Battery 1:	*Above 12.6V & Below 14.8V*	
	Battery 2:	*Above 12.6V & Below 14.8V*	
Engine Oil	Inspected / Replaced		
Engine Oil Filter	Replaced		
Coolant	Inspected / Replaced		
Coolant Pump	Inspected / Replaced		
Crankcase Vent Hoses	Inspected / Replaced		
O2 Sensor	Replaced		
Valve Clearances	Cylinder Number	Valves	
		Intake	Exhaust
	1	Inspected / Adjusted	Inspected / Adjusted
	2	Inspected / Adjusted	Inspected / Adjusted
	3	Inspected / Adjusted	Inspected / Adjusted
Spark Plug 1	Inspected / Replaced		
Spark Plug 2	Inspected / Replaced		
Spark Plug 3	Inspected / Replaced		
Spark Plug Wire 1	Inspected / Replaced		
Spark Plug Wire 2	Inspected / Replaced		
Spark Plug Wire 3	Inspected / Replaced		
Ignition Coil 1	Inspected / Replaced		
Ignition Coil 2	Inspected / Replaced		
Ignition Coil 3	Inspected / Replaced		
Cylinder 1 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 2 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 3 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Notes:			

Model Number:		Serial Number:	
Service Date:		MX Runtime:	
Wind Shield Distance:			
Switch Settings	LOC/REM		
	AUTO/MAN		
	LOCAL ON/OFF		
Radial Air Filter	Inspected / Replaced		
Safety Radial Air Filter	Inspected / Replaced		
Enclosure Filter	Inspected / Replaced		
Batteries	Inspected / Replaced		
Battery Voltage	Battery 1:	*Above 12.6V & Below 14.8V*	
	Battery 2:	*Above 12.6V & Below 14.8V*	
Engine Oil	Inspected / Replaced		
Engine Oil Filter	Replaced		
Coolant	Inspected / Replaced		
Coolant Pump	Inspected / Replaced		
Crankcase Vent Hoses	Inspected / Replaced		
O2 Sensor	Replaced		
Valve Clearances	Cylinder Number	Valves	
		Intake	Exhaust
	1	Inspected / Adjusted	Inspected / Adjusted
	2	Inspected / Adjusted	Inspected / Adjusted
	3	Inspected / Adjusted	Inspected / Adjusted
Spark Plug 1	Inspected / Replaced		
Spark Plug 2	Inspected / Replaced		
Spark Plug 3	Inspected / Replaced		
Spark Plug Wire 1	Inspected / Replaced		
Spark Plug Wire 2	Inspected / Replaced		
Spark Plug Wire 3	Inspected / Replaced		
Ignition Coil 1	Inspected / Replaced		
Ignition Coil 2	Inspected / Replaced		
Ignition Coil 3	Inspected / Replaced		
Cylinder 1 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 2 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 3 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Notes:			

Model Number:		Serial Number:	
Service Date:		MX Runtime:	
Wind Shield Distance:			
Switch Settings	LOC/REM		
	AUTO/MAN		
	LOCAL ON/OFF		
Radial Air Filter	Inspected / Replaced		
Safety Radial Air Filter	Inspected / Replaced		
Enclosure Filter	Inspected / Replaced		
Batteries	Inspected / Replaced		
Battery Voltage	Battery 1:	*Above 12.6V & Below 14.8V*	
	Battery 2:	*Above 12.6V & Below 14.8V*	
Engine Oil	Inspected / Replaced		
Engine Oil Filter	Replaced		
Coolant	Inspected / Replaced		
Coolant Pump	Inspected / Replaced		
Crankcase Vent Hoses	Inspected / Replaced		
O2 Sensor	Replaced		
Valve Clearances	Cylinder Number	Valves	
		Intake	Exhaust
	1	Inspected / Adjusted	Inspected / Adjusted
	2	Inspected / Adjusted	Inspected / Adjusted
	3	Inspected / Adjusted	Inspected / Adjusted
Spark Plug 1	Inspected / Replaced		
Spark Plug 2	Inspected / Replaced		
Spark Plug 3	Inspected / Replaced		
Spark Plug Wire 1	Inspected / Replaced		
Spark Plug Wire 2	Inspected / Replaced		
Spark Plug Wire 3	Inspected / Replaced		
Ignition Coil 1	Inspected / Replaced		
Ignition Coil 2	Inspected / Replaced		
Ignition Coil 3	Inspected / Replaced		
Cylinder 1 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 2 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 3 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Notes:			

Model Number:		Serial Number:	
Service Date:		MX Runtime:	
Wind Shield Distance:			
Switch Settings	LOC/REM		
	AUTO/MAN		
	LOCAL ON/OFF		
Radial Air Filter	Inspected / Replaced		
Safety Radial Air Filter	Inspected / Replaced		
Enclosure Filter	Inspected / Replaced		
Batteries	Inspected / Replaced		
Battery Voltage	Battery 1:	*Above 12.6V & Below 14.8V*	
	Battery 2:	*Above 12.6V & Below 14.8V*	
Engine Oil	Inspected / Replaced		
Engine Oil Filter	Replaced		
Coolant	Inspected / Replaced		
Coolant Pump	Inspected / Replaced		
Crankcase Vent Hoses	Inspected / Replaced		
O2 Sensor	Replaced		
Valve Clearances	Cylinder Number	Valves	
		Intake	Exhaust
	1	Inspected / Adjusted	Inspected / Adjusted
	2	Inspected / Adjusted	Inspected / Adjusted
	3	Inspected / Adjusted	Inspected / Adjusted
Spark Plug 1	Inspected / Replaced		
Spark Plug 2	Inspected / Replaced		
Spark Plug 3	Inspected / Replaced		
Spark Plug Wire 1	Inspected / Replaced		
Spark Plug Wire 2	Inspected / Replaced		
Spark Plug Wire 3	Inspected / Replaced		
Ignition Coil 1	Inspected / Replaced		
Ignition Coil 2	Inspected / Replaced		
Ignition Coil 3	Inspected / Replaced		
Cylinder 1 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 2 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 3 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Notes:			

Model Number:		Serial Number:	
Service Date:		MX Runtime:	
Wind Shield Distance:			
Switch Settings	LOC/REM		
	AUTO/MAN		
	LOCAL ON/OFF		
Radial Air Filter	Inspected / Replaced		
Safety Radial Filter	Inspected / Replaced		
Enclosure Filter	Inspected / Replaced		
Batteries	Inspected / Replaced		
Battery Voltage	Battery 1:	*Above 12.6V & Below 14.8V*	
	Battery 2:	*Above 12.6V & Below 14.8V*	
Engine Oil	Inspected / Replaced		
Engine Oil Filter	Replaced		
Coolant	Inspected / Replaced		
Coolant Pump	Inspected / Replaced		
Crankcase Vent Hoses	Inspected / Replaced		
O2 Sensor	Replaced		
Valve Clearances	Cylinder Number	Valves	
		Intake	Exhaust
	1	Inspected / Adjusted	Inspected / Adjusted
	2	Inspected / Adjusted	Inspected / Adjusted
	3	Inspected / Adjusted	Inspected / Adjusted
Spark Plug 1	Inspected / Replaced		
Spark Plug 2	Inspected / Replaced		
Spark Plug 3	Inspected / Replaced		
Spark Plug Wire 1	Inspected / Replaced		
Spark Plug Wire 2	Inspected / Replaced		
Spark Plug Wire 3	Inspected / Replaced		
Ignition Coil 1	Inspected / Replaced		
Ignition Coil 2	Inspected / Replaced		
Ignition Coil 3	Inspected / Replaced		
Cylinder 1 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 2 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Cylinder 3 Compression:	*Above 11 Bar (160 PSI) & Below 16 Bar (232 PSI)*		
Notes:			