





Diesel Generator

INSTRUCTION MANUAL





This manual should be thoroughly read and understood before any attempt is made to transport, operate, service or repair this unit. It explains the correct procedures, which if followed, will result in operator safety, optimum performance and long life of the equipment. Do not allow untrained or unqualified individuals to have any contact with, or remain in the vicinity of this equipment when it is in operation. Please pay particular attention to any item marked as  "WARNING" or  "CAUTION." A copy of this manual should be provided in the equipment for immediate reference. For detailed engine information, refer to the Engine Instruction Manual also provided.

DCA-40SSKU4F

FOREWORD

This manual should be thoroughly read and understood before any attempt is made to transport, operate, service or repair this unit. It explains the correct procedures, which if followed, will result in operator safety, optimum performance and long life of the equipment. Do not allow untrained or unqualified individuals to have any contact with, or remain in the vicinity of this equipment when it is in operation.

Please pay particular attention to any item marked as  “WARNING” or  “CAUTION.”

A copy of this manual should be provided in the equipment for immediate reference. For detailed engine information, refer to the Engine Instruction Manual also provided.

Your new generator was carefully tested and adjusted before leaving the factory. This does not prevent the possibility of damage during shipment! For this reason, it must be given a careful inspection and checked for proper operation before being placed in service.

All information contained in this manual is based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice.

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SAFETY INFORMATION



This is the WARNING and CAUTION symbol. When it is seen, either in this manual or on the equipment, be alert as this is a point of possible serious personal injury, death or damage to the equipment or other property.

- WARNING:** This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.
- CAUTION:** This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.
- NOTICE:** These symbols show handling precautions for effective and many years of satisfactory operation.

Some of the items shown by, "CAUTION" may also cause death or serious injury.

Be sure to observe all the items, as they are important for safe operation.

Keep these labels visible at all times. If lost or damaged, contact your nearest dealer or MULTIQUIP INC. parts department for replacements. If the equipment is to be operated by someone unfamiliar with its operation, they should receive adequate instruction and be advised to read the instruction manual carefully.

Do not perform unauthorized modifications to the equipment. This may affect the safety, performance or life of the equipment. If the equipment has been modified, used incorrectly, or had unauthorized parts installed, the manufactures warranty will become invalid.



WARNING ENGINE EXHAUST

Provide adequate ventilation when operating this equipment. Do not operate it in any enclosed or confined space. Diesel engines consume oxygen and give off harmful emissions. Never discharge the exhaust in the direction of nearby personnel, animals, equipment, machinery or buildings.



WARNING ELECTRICAL SHOCK

Any source of high voltage is a source of potentially LETHAL voltage. Maintain all electrical cords and connections in proper condition. Do not operate the unit in the rain, around standing water or when wet. This also applies when connecting accessories (Battery charger, Water heater) to a grounded permanent wiring system. **Always properly ground the generator before operating.** Never allow untrained or unqualified individuals to operate or remain in the vicinity of the equipment when it is operating.



WARNING HOT and MOVING PARTS

The enclosure contains hot and moving parts. The equipment should be operated with all doors closed and protective covers in place. Always stop the engine and allow an adequate amount of time for proper cooling before attempting any service or maintenance. Under some conditions the external surface of the enclosure may also become very warm.



WARNING HOT COOLANT

To avoid severe burns do not loosen the radiator cap to service or repair the cooling system until adequate time has been given for the equipment to cool completely.



WARNING DIESEL FUEL

Handle fuel safely, Diesel fuel is highly flammable and can cause fire and explosion. Do not refuel with the engine hot or running. Diesel fuel must not be handled while smoking or around any type of sparks or open flames. Do not allow combustible material in the area while handling fuel. Immediately clean up any spilled fuel and dispose of it and any materials used properly.



**WARNING
START FIRES**

Operation of this equipment may create sparks that can start fires around dry vegetation.
A spark arrestor may be required.
The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.



**WARNING
ARC FLASH**

Appropriate personal protection equipment and tools required when working on this equipment.



**CAUTION
AUTO – OFF / RESET – MANUAL SWITCH**

Ensure the Auto – Off / Reset – Manual Switch is in the Off / Reset position. If it is not, when the battery cables are connected, the engine will crank and attempt to start.
Also, when in the Auto starting mode, keep people away from the machine, because the engine will crank and attempt to start without prior notice.



**CAUTION
BATTERY HANDLING**

Dangerous and combustible gases are produced during normal battery operation, and so are always present. However they are more prevalent during rapid charging and discharging, so adequate ventilation must be provided. Particular care should also be taken to avoid flames or sparks in the area as extremely violent explosions can occur. Batteries also contain acid that is extremely corrosive; do not allow any type of personal contact.
Also, please disconnect the battery cable when the unit is not in operation.



**CAUTION
LIFTING**

A centrally located lifting position is provided on top of the unit and is the only safe method of lifting.



**CAUTION
STACKING**

Improper stacking of machines can cause severe personal injury or death. When stacking, be sure to observe the following: Check that the bonnet of the machine is free from damage and the fixing bolts are tightened properly. Place the machine on a solid foundation which will withstand the weight. Machines can be placed two high, but the stacked machines must be equal to or smaller than those below. Timbers should be placed under the stacked machine to prevent damage to machines below. Do not operate machines when they are stacked.

**CALIFORNIA
Proposition 65 Warning**

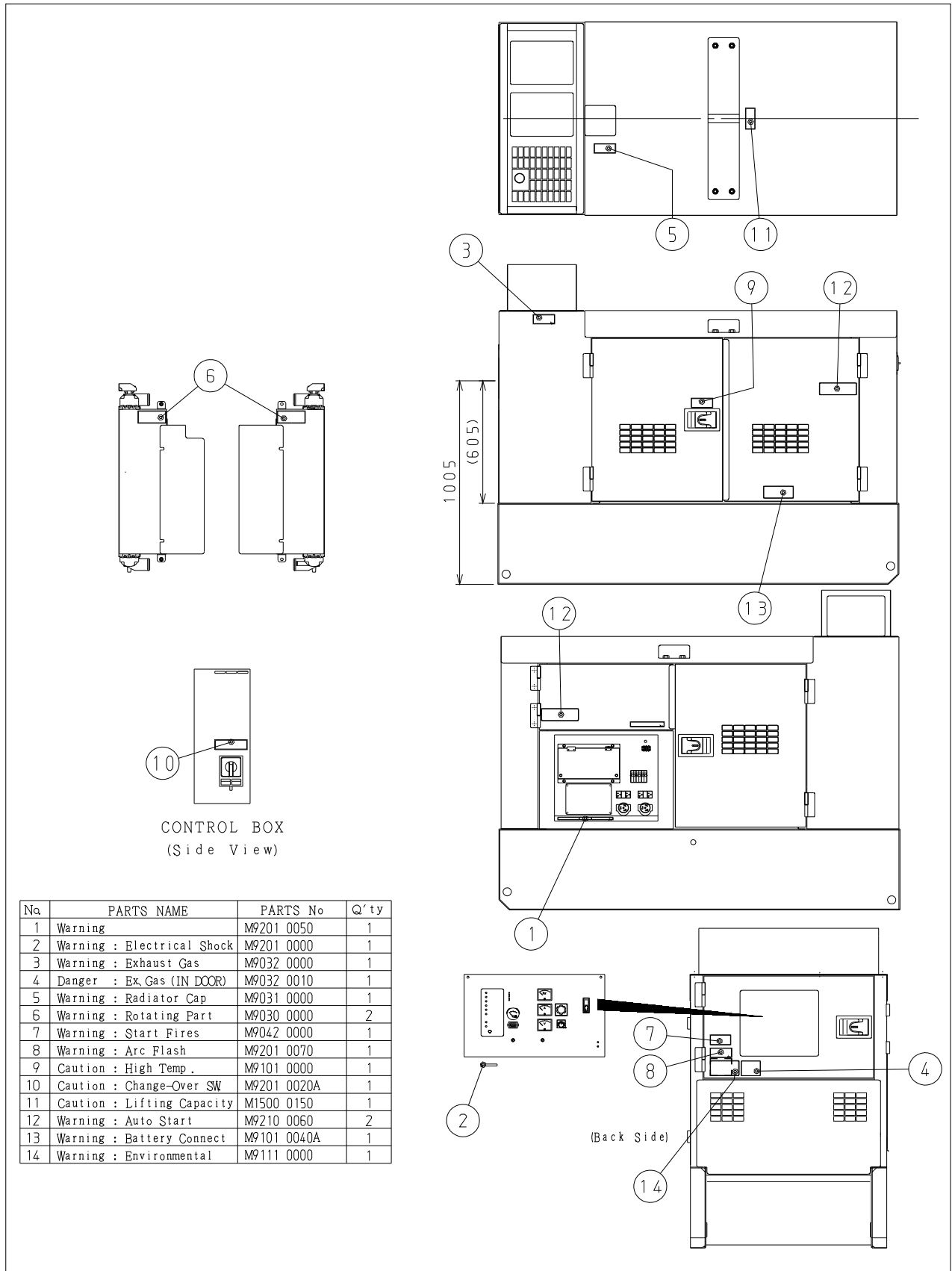
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

SAFETY LABEL

Safety labels are attached to the following positions of the machine.

- Keep these safety labels clean at all times.
- When safety labels are damaged or lost, contact your nearest dealer or MULTIQUIP INC. parts department for replacements.



SPECIFICATIONS

| | | | |
|---------------------|-------------------------------------|---|-------------------|
| GENERATOR | Model | DCA-40SSKU4F | |
| | Type | Revolving field, protection type synchronous generator | |
| | Armature Connection | Star with Neutral | Zigzag |
| | Phase | 3 | Single |
| | Standby Output | 37.8 kVA (31.7 kW) | 27.3 kW |
| | Prime Output | 36 kVA (28.8 kW) | 26 kW |
| | Voltage | 240 or 480 V | 240 / 120 V |
| | Frequency | 60 Hz | |
| | Speed | 1800 rpm | |
| | Power Factor | 0.8 | 1.0 |
| | Aux. AC Power | Single Phase, 60 Hz | |
| | Voltage | 120 V | |
| | Output | 4.8 kW (2.4 kW × 2) | |
| | ENGINE | Model | KUBOTA V2408-CR-T |
| Emission Regulation | | EPA Final Tier-4 | |
| Type | | 4-Cycles, water-cooled, direct injection, turbocharged and cooled EGR | |
| No. of Cylinders | | 4 cylinders | |
| Bore × Stroke | | 3.43 in. × 4.03 in. (87 mm × 102.4mm) | |
| Rated Output | | 44.2 HP / 1800 rpm | |
| Displacement | | 149 cu. in. (2.43 L) | |
| Starting | | Electric | |
| Fuel Tank Capacity | | 67.4 gal. (255L) | |
| Coolant Capacity | | 2.77 gal. (10.5 L) *1 | |
| Lube Oil Capacity | | 2.56 gal. (9.7 L) | |
| Fuel Consumption | | 2.24 gal. (8.49 L) / hr (at full load) | |
| Battery | | 27 (CCA 0°F 800A)×1 | |
| Fuel | | Diesel fuel (JIS No.2, ASTM No.2 or equivalent) (Ultra low sulfur diesel fuel only.) | |
| Lubricating oil | API service class CJ-4 or JASO DH-2 | | |

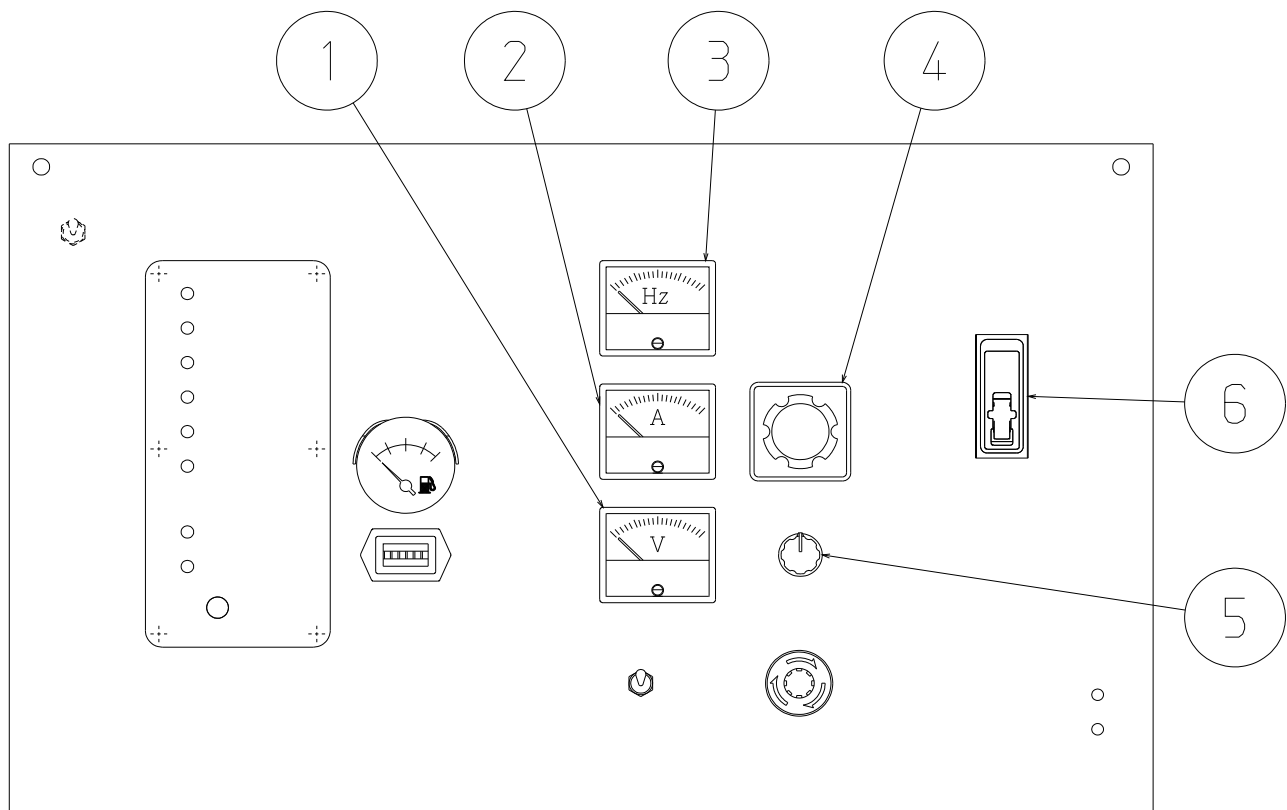
※1 Coolant capacity : engine, radiator, reserve tank and hoses.

GENERAL INFORMATION

This generator consists of alternator, control panel and water cooled diesel engine with a common base and a noise suppressing protective cover. The alternator is a four-pole, revolving-field, synchronous, single ball bearing type. The rotor of the alternator is directly connected to the engine flywheel by a flexible plate. The alternator and engine are connected by the coupling housing. A brushless excitation system with an Automatic Voltage Regulator (A.V.R.) is provided. This allows very stable voltage, excellent reserve power for starting large motor-powered equipment, and greatly reduces maintenance and service requirements. Engine protection is provided by an automatic shutdown system that constantly monitors for high water temperature and low oil pressure. Generator protection is provided by circuit breakers that automatically trip in the event of a short circuit or overcurrent. Due to the high structural strength, superior noise suppression and excellent voltage characteristics, these units are suitable for virtually any type of application.

CONTROL PANELS

GENERATOR CONTROL PANEL



1. A.C. Voltmeter

This meter indicates phase to phase voltage of the output terminals.

2. A.C. Ammeter

This meter indicates the current flowing to the load connected to the output terminals.

3. Frequency Meter

This meter indicates the output frequency of the generator.

4. Ammeter Change-over Switch

This switch allows the A.C. ammeter to indicate the current flowing to the load connected to any phase of the output terminals, or to be switched off.

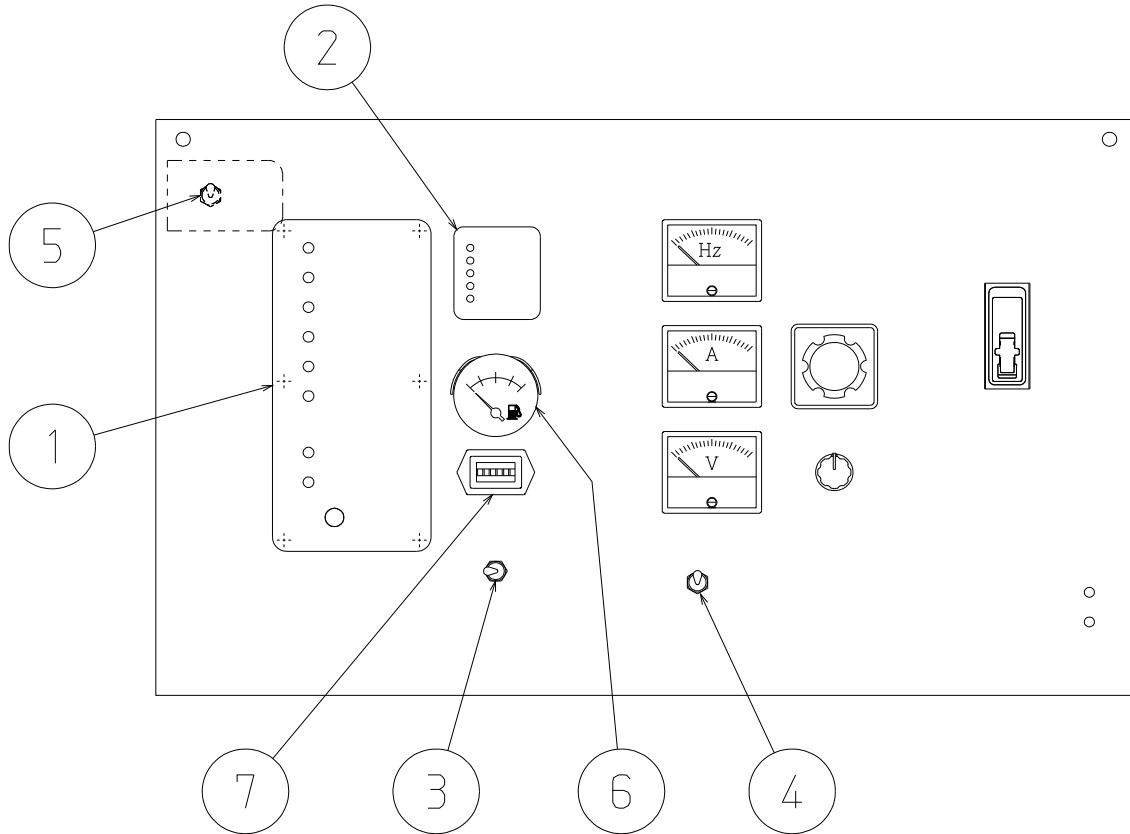
5. Voltage Regulator

This allows manual adjustment of the generator output voltage.

6. Three Phase Circuit Breaker

This circuit breaker connects or disconnects the generator output from the output terminals.

ENGINE CONTROL PANEL



1. Warning Lamp Unit

This unit indicates diagnostic trouble by eight different lamps. (Meanings shown below)

(1)/(2). Pre-Alarm Lamp / Shutdown Lamp

When engine failure occurs during operation, these lamps turn on or blink.

(3). Battery Charge Lamp

When engine battery level is too low, this lamp will turn on.

(4). Fuel Filter Water Level Lamp

This lamp turns on when the water level in the fuel filter is extraordinary high.

(5). Fuel Leak Detected Lamp

This lamp turns on when fluid in the containment is higher than the allowable level.

(6). Preheat Lamp

This lamp turns on when the preheat process is running for DPF regeneration.

(7). HEST (High Exhaust System Temperature) Lamp

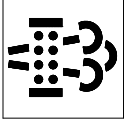


This lamp turns on during the regeneration process, during which the DPF exhaust gas temperature is very high.

IMPORTANT:

The area above and surrounding the machine during DPF regenerating should be free of any flammable object as temperatures can reach as high as 550°C (1022°F).

(8). Manual Regen Request Lamp



This lamp turns on to notify that DPF Regeneration is needed to reduce the increased soot levels.

2. Auto-Start / Stop Controller

This controller indicates diagnostic trouble in the engine and controls DPF regeneration. This unit has 5 different lamps meanings shown below.

(1). Low Oil Pressure

This lamp turns on when the lubricating oil pressure is extraordinarily low.

(2). High Coolant Temperature

This lamp turns on when the cooling water temperature is extraordinarily high

(3). Over Crank

This LED turns on when the unit has attempted to start and failed 3 times. The intervals between the 3 cycles are approximately 11 seconds.

(4). Over Speed

This lamp turns on when the engine speed is too high.

(5). Engine Started Lamp

This lamp turns on when the engine is running normally.

3. Auto Start / Stop Switch

This switch selects automatic or manual operation. The center position is off, fault reset.

4. Speed Control Switch

This switch selects high or low (Idle) engine speed. On high speed mode you can only run auto regen, and on low speed mode you can only run manual regen.

5. Diagnostic Switch

With this switch you can change between diagnostic mode or normal mode.

6. Fuel Gauge

This gauge indicates the fuel level in the tank

7. Hour Meter

This meter indicates the operational hours of the generator.

DIAGNOSTICS

Engine Fault Code Diagnostic procedures

1. Unload the unit and turn all circuit breakers to “OFF”.
2. Stop the engine and open the Control Panel.
3. Switch the **Diagnostic Switch** to “ON” position to start the diagnostic process. Make sure the switch is in “OFF” position after the procedures is completed.
4. Look at the warning lamp to find if there are any faults in the engine.
5. Refer to the Engine Instruction Manual for the contents/locations of the fault and troubleshooting procedures.

NOTICE:

- When a fault detected, the fault code will automatically be saved as a previous code in the ECM even after the fault is repaired.

OPTIONS

Battery Charger

When commercial AC power is supplied to the charge, it will automatically recharge and maintain the battery with no further attention from the user.

Water Heater

When commercial AC power is supplied to the heater, it will keep the water temperature at a satisfactory level for starting during cold conditions.

Low Coolant Level Switch

When the cooling water (coolant) level is lower than the allowable level, the warning lamp turns on and the engine will shut down.

Camlock Connector

Emergency Stop button

OPERATING PROCEDURES

TRANSPORTATION

A centrally located lifting position is provided on top of the unit and is the only safe method of lifting. When loading on a truck or trailer, use the tie down supports on each side of the unit to secure it.

NOTICE: Do not attempt to move or lift the machine with the engine running, as serious damage may occur.

INSTALLATION

Outdoor:

The installation site must be chosen very carefully. The site should be level and secure to prevent sliding or shifting. It should be relatively free from moisture and airborne dust and dirt. Allow sufficient space on all sides and overhead for service and maintenance. Adequate ventilation must be available to prevent overheating of the unit and to protect from exhaust fumes. Never discharge the exhaust in the direction of nearby personnel, animals, equipment, machinery, or buildings.

Indoor:

For indoor installation, additional precautions must be taken. Exhaust gases are extremely dangerous and must be properly vented to the outside. Adequate fresh air must be supplied for engine intake, and for the cooling system. Air discharged from the radiator and other areas must also be ducted to the outside. The design of these areas is critical and must be done carefully. Please contact your nearest dealer or MULTIQUIP INC. for details on required air volume and air flow.

STARTING

Initial Start-up

1. Inspect the whole unit for damage or any loosening of parts that may have occurred during shipment.
2. Check the engine oil and coolant levels, including the radiator expansion container (reserve tank). Replenish if necessary, see the Engine Instruction Manual for detail information.
3. Fill the fuel tank with the proper grade of fuel. Do not fill the fuel tank beyond its capacity.

WARNING: Ensure the Auto Start/Stop Switch is in the “Off / Reset” position.

4. Properly connect the battery cables.
5. Proceed to step 3 thru step 14 under Manual Starting.
6. Thoroughly check the operation and adjustment of the unit. It was carefully tested and adjusted before leaving the factory, but this does not prevent the possibility of damage during shipment!

Manual Starting

1. Inspect the whole unit for damage or any loosening of parts that may have occurred during or since the last operation.
2. Check the engine oil, coolant, and fuel levels. Replenish if necessary.
3. Place all Generator Circuit Breakers in the “OFF” position.
4. Make sure the Voltage Selector Switch is set at desired voltage (Only for units with multiple voltage ratings) and close all doors properly.
5. Make sure the Diagnostic Switch in the Control Box is in the “OFF” position. Close the Control Panel properly before proceeding.
6. Make sure the Engine Speed Switch is in the “LOW” position.
7. Turn the Auto Start/Stop Switch to the “Manual” position to start the engine. If the engine fails to start in 3 attempts, the Over Crank LED will turn on and the Auto Start/Stop Switch must be returned to the “Off / Reset” position before the next attempt.
8. During cold weather conditions, automatic preheat will be performed when the Auto Start/Stop Switch is turned to the “Manual” position. The Preheat Lamp will light, indicating that the pre-heating process has started. Depending on the ambient temperature, the pre-heating process may still be performing even after the Preheat Lamp is OFF.
9. After starting, allow the engine to run for 1-2 minutes for the warming up process. For operation in below freezing temperature areas, this warm-up period must be extended to 5-7 minutes.
10. During the warming up process, check for abnormal noise, vibration, fluid leakage or any indication of a problem. Check the Gauge Assembly Unit on the Control Panel. If everything is normal, let the engine warm-up process complete before proceeding.
11. After the warm-up process is completed, place the Engine Speed Switch to “HIGH” position and the unit will be ready for operation
12. Check the Frequency Meter for No-Load speed.
60Hz operation ----- Approx. 60.0Hz (1800 rpm)
13. Make sure the Voltmeter is displaying the specified voltage output. Adjust using the Voltage Regulator to the specified voltage if necessary.
14. When the Generator Circuit Breakers are set to the “ON” position electricity will be supplied through the output terminals and receptacles.

STOPPING

Manual Stopping

1. Unload the unit and place all the Generator Circuit Breakers to the “OFF” position.
2. Set the Engine Speed Switch to the “LOW” position and allow the unit to cool down for a few minutes.
3. Turn the Auto Start/Stop Switch to the “Off / Reset” position.
4. Allow a sufficient period of time for adequate cooling before proceeding. Inspect the whole unit for damage or any loosening of parts that may have occurred during the last operation.
5. After the engine has cooled down adequately, check the engine oil, coolant, and fuel levels. Replenish if necessary.

Auto Starting / Stopping

1. With the Auto Start/Stop Switch in the “Auto” position, the Auto Start/Stop Controller monitors remote start contacts. Closure of the remote start contacts will begin engine cranking. When the contacts are opened, cranking will stop or if running the engine will stop. All procedures of the Automatic Shutdown work as in Manual Starting/Stopping procedures.
2. If the engine does not start, please operate using the Manual Starting.

NOTICE: The Battery Charger Option can only be operated with the Manual Starting/Stopping

Emergency Stopping

1. Place all Generator Circuit Breakers to the “OFF” position.
2. Turn the Auto Start/Stop Switch to the “Off/Reset” position.

Automatic Shutdown System

This unit is equipped with engine protection devices that automatically shut down the engine if any of the faults below occur. The alarm LED will turn on to signify the reason for shutdown.

- Oil pressure in the system dropped to below 14.2 PSI. The Low Oil Pressure LED will turn on.
- Cooling water (coolant) temperature in the system reached 212 °F. The High Temperature LED will turn on.
- Engine unit has attempted to start and has failed 3 times. The Over Crank LED will turn on.

After the Automatic Shutdown, turn the Auto Start/Stop Switch to the “Off/Reset” position, place all Generator Circuit Breakers to the “OFF” position and allow sufficient time for adequate cooling. Perform the overall inspection and solve the problems that caused the shutdown before attempting to restart.

When the unit is ready to restart, make sure the Auto Start/Stop Switch is in “Off/Reset” position and all the Generator Circuit Breakers are in the “OFF” position. Complete step 4 through step 14 as explained in Manual Starting.

NOTICE: Although the unit is equipped with an engine protection device, regularly scheduled preventative maintenance is still very important. Refer to page 18 for Preventative Maintenance details.

DPF (Diesel Particulate Filter) REGENERATION

1. Manual Regeneration

If the “Manual Regen Request” LED illuminates during operation, perform a Manual regeneration by following these steps:

- 1) Place all Generator Circuit Breakers in the “OFF” position.
- 2) Press the “Regen Start” button and make sure the “DPF Regen” LED is illuminated.
- 3) Regeneration will start automatically and run for at least 30 minutes. When regeneration is completed, the DPF “Manual Regen Request” LED will turn off.

NOTICE: Manual Regeneration process will stop if the unit is loaded.

2. Auto Regeneration

Auto Regeneration process will automatically occur. No operator action require for this process. Allow the engine to run for at least 30 minutes to complete the automatic regeneration.

DPF SYSTEM ACTION

| Soot Level | Soot level 0 | Soot level 1 and 2 | Soot level 3 | Soot level 4 | Soot level 5 |
|----------------|-------------------|---------------------|-----------------|------------------------|-------------------------|
| DPF condition | Regen. Not needed | Moderate soot level | High soot level | Very high soot level | Service only soot level |
| Pre-Alarm Lamp | — | — | ○ | ○ | ○ |
| Shutdown Lamp | — | — | — | ○ (Engine Shutdown) | ○ (Engine Shutdown) |

NOTICE:

Unit derate occurs during soot level 4 and 5.

If the soot level is in level 5, the machine will shut down. Please call a dealer for further instruction.

IMPORTANT:

Inhibit regeneration in conditions where it may be unsafe for elevate exhaust temperatures.

Inhibit regeneration is only recommended when absolutely necessary.

IMPORTANT:

The area above and surrounding the machine during DPF regenerating should be free of any flammable object as temperatures can reach as high as 550°C (1022°F).

LOAD APPLICATION

CONNECTING THE LOAD

Do not connect this generator to another electrical system without an isolation transfer switch installed by a licensed electrician. The generator must always be properly grounded. Do not connect or disconnect the load cables with the engine running. Serious injury or death may occur.

1. Turn the Auto Start/Stop Switch to the “Off / Reset” position.
2. Place all Generator Circuit Breakers to the “OFF” position.
3. Select output cables with sufficient capacity. The voltage drop to the load should be less than 5%. Use adequate terminals on all cable ends.
4. Properly ground the generator.
5. Provide a suitable switch between the generator and the load for “ON” and “OFF” operation of the load. The Circuit Breakers on the generator should not be used for this purpose.

SUPPLYING ELECTRICITY TO THE LOAD

After all connections are properly completed, proceed as follows to supply the load.

1. Again, check that all Generator Circuit Breakers are in the “OFF” position and that the load “OFF” and “ON” switch is in the “OFF” position.
2. Complete all steps as explained in “4 through 13” under Manual Starting.
3. With the generator running, place the Generator Circuit Breaker in the “ON” position, and if no problems are detected, change the load switch to the “ON” position.
4. Electricity should now be supplied to the load.

DISCONNECTING ELECTRICITY FROM THE LOAD

1. Place the load “OFF” and “ON” switch to the “OFF” position.
2. Place all Generator Circuit Breakers to the “OFF” position, and allow the unit to cool for a few minutes.
3. Turn the Auto Start/Stop Switch to the “Off / Reset” position.
4. Disconnect the output and ground cables.
5. Perform step 4 and step 5 explained in Manual Stopping.

OUTPUT SELECTION

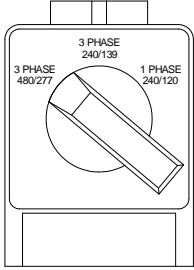
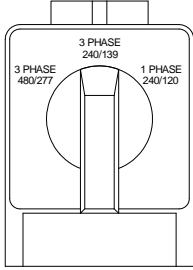
Following are the output voltage selections that are available from the generator. These are obtained by setting the Voltage Selector Switch. However, final fine adjustments must be made with the Voltage Regulator (VR) on the Generator Control Panel.

3-Phase 240V, 220V, 208V – Adjustable by VR

3-Phase 480V, 440V, 416V – Adjustable by VR

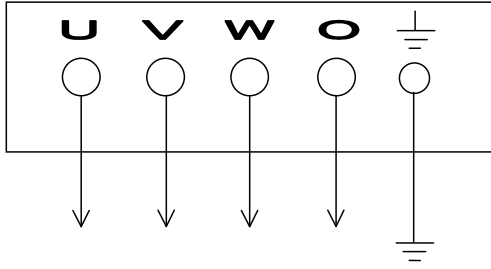
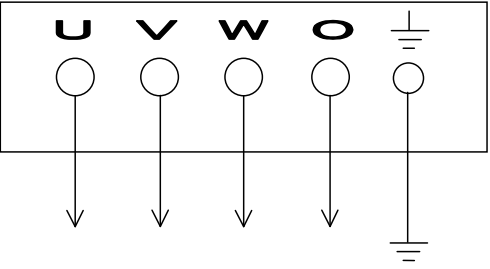
VOLTAGE SELECTOR SW
3 Phase 240 / 139V

VOLTAGE SELECTOR SW
3 Phase 480 / 277V



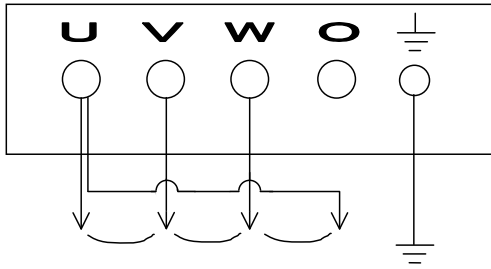
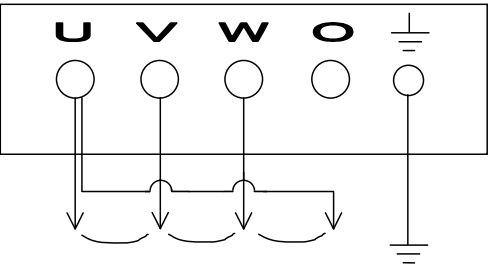
OUTPUT TERMINALS
3-Phase 240V, 220V, 208V

OUTPUT TERMINALS
3-Phase 480V, 440V, 416V



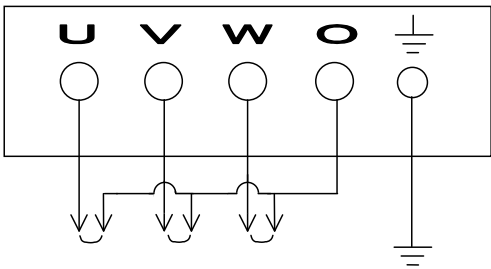
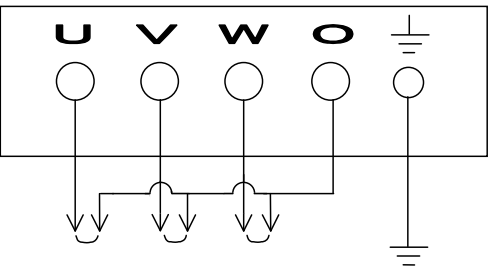
OUTPUT TERMINALS
1-Phase 240V, 220V, 208V

OUTPUT TERMINALS
1-Phase 480V, 440V, 416V



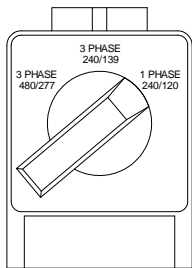
OUTPUT TERMINALS
1-Phase 139V, 127V, 120V

OUTPUT TERMINALS
1-Phase 277V, 254V, 240V

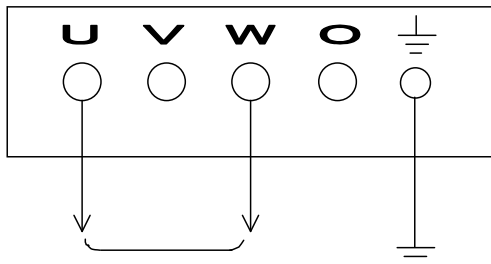


1-Phase 240 / 120V – Adjust to this Voltage by VR

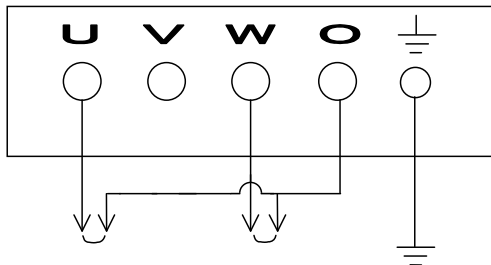
VOLTAGE SELECTOR SW
1Phase 240 / 120V



OUTPUT TERMINALS
1 – Phase 240V

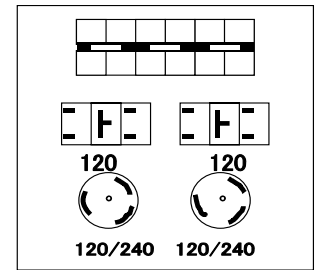


OUTPUT TERMINALS
1 – Phase 120V



Auxiliary AC Power

In addition to the AC single phase power from the Output Terminals, an Auxiliary AC Power Receptacle Panel is provided.



120 V Receptacles

These receptacles can be used anytime during operation. They are controlled by the circuit breakers located in this panel. Press the “Test Button” in the center of the receptacle to check the GFCI function.

GFCI Duplex NEMA 5-20R (120V, 20 A)

Twist Lock Dual Voltage Receptacles

To use these receptacles, place the Voltage Selector SW. in the 1-Phase 240/120 Voltage Position and adjust the output voltage to 240 volts with the Voltage Regulator on the Generator Control Panel. The 3-Phase Circuit Breaker on the Generator Control Panel must be in the “ON” position and the Circuit Breaker on the Auxiliary AC Power Receptacle Panel must also be in the “ON” position.

CS-6369 (240 / 120V, 50 A)

Simultaneous Power

Do not exceed the maximum available simultaneous power. The following chart states available power at various voltage and phase combination.

NOTICE: When the Voltage Selector SW. is in the 1-Phase 240/120V position, place the AC Voltmeter Change-over SW. to the U-W position and the AC Ammeter Change-over SW. to the U or W position to read the output.

SIMULTANEOUS POWER

| POWER IN USE | | RECEPTACLE POWER AVAILABLE |
|--------------------|--|-------------------------------|
| 240 / 480V 3-Phase | 240 / 120V 1-Phase or Twist Lock CS-6369 | Duplex NEMA 5-20R 120V Recpt. |
| kVA | kW | kW |
| 36.0 | 26.0 | 0 |
| 31.8 | 24.8 | 1.2 |
| 27.7 | 23.6 | 2.4 |
| 23.5 | 22.4 | 3.6 |
| 19.4 | 21.2 | 4.8 |

LOAD GUIDELINES

POWER FACTORS

Consult the following chart for power factors on some common loads. A load of up to the generators rated output (kW) multiplied by the power factor of the intended load can be connected. The power factor of the Generator is 0.8.

| LOAD TYPE | Power Factor |
|--|--------------|
| Single-Phase Induction Motors | 0.4 – 0.75 |
| 3-Phase Induction | 0.65 – 0.85 |
| Electric Heaters, Incandescent Lamps | 1 |
| Fluorescent Lamps, Mercury Lamps | 0.4 – 0.9 |
| Electronic Devices, Communication Equip. | 1 |
| Common Power Tools | 0.8 |

NOTICE:

When connecting induction motors and motor-driven equipment, pay close attention to the required starting capacity. This is considerably larger than the full load running capacity, which is usually listed on the nameplate. The generator output cables and connections must be chosen with these requirements in mind. When connecting resistance loads such as incandescent lamps or electric heaters, a load of up to the generators rated output (kW) can be connected.

WATTAGE REQUIREMENTS

Check the nameplate on the equipment and on the generator to insure that all requirements for wattage, amperage and frequency will be satisfactorily supplied.

Generally, the power listed on the equipment nameplate is its rated output. Equipment may require 130 – 150% more power than the rating on the nameplate. This is influenced by the efficiency, power factor, and starting system of the equipment.

If wattage is not available on the equipment, approximate wattage may be determined by multiplying the nameplate voltage by the nameplate amperage. (See below.)

$$\text{WATTS} = \text{VOLTAGE} \times \text{AMPERAGE (Single Phase)}$$

$$\text{WATTS} = 1.732 \times \text{VOLTAGE} \times \text{AMPERAGE (Three Phase)}$$

PREVENTIVE MAINTENANCE

The following is an estimated schedule of maintenance. The actual need will vary depending on the conditions each unit is subject to. Shorter intervals may be necessary. This covers only the most basic needs, for more specific information consult the enclosed engine manual.

| INSPECTION / MAINTENANCE | | Daily | 250 hours of Operation | 500 hours of Operation or Every 12 Months | 3000 hours of Operation or Every 36 months | Others |
|--|--|-------|------------------------|---|--|------------------------------------|
| ENGINE | Check Engine Oil and Coolant Level | X | | | | |
| | Check Fuel Filter / Water Bowl | X | | | | |
| | Check Air Cleaner | X | | | | |
| | Visual Walk Around Inspection | X | | | | |
| | Clean Air Cleaner Element | | X | | | |
| | Change Engine Oil and Replace Oil Filter ^{*a,b,c} | | X | (X) | | |
| | Check Engine Mounts | | | X | | |
| | Service Battery | | | X | | |
| | Check Crankcase Vent System | | | X | | |
| | Check Air Intake Hoses, Connection, and System | | | X | | |
| | Replace Fuel Filter Elements | | | X | | |
| | Check Automatic Belt Tensioner and Belt Wear | | | X | | |
| | Check Electrical Ground Connection | | | X | | |
| | Clean Radiator and Check Cooling System | | | X | | |
| | Coolant Solution Analysis-Add SCAs as Required | | | X | | |
| | Pressure Test Cooling System | | | X | | |
| | Check Engine Speed | | | X | | |
| | Check and Adjust Engine Valve Clearance | | | | | X |
| | Test Glow Plugs | | | | | X |
| | Flush and Refill Cooling System | | | | | 2 years or 2000 hours of operation |
| Clean Inside Fuel Tank | | | | | 1000 Hrs | |
| Diesel Particulate Filter ^{*d} | | | | | 4500 Hrs | |
| Test Thermostats | | | | | 6000 Hrs | |
| Replace Air Cleaner Elements ^{*e} | | | | | As Required | |
| Add Coolant | | | | | As Required | |
| Clean DEF Tank | | | | | As Required | |
| Clean Unit, Inside and Outside | | | | | As Required | |
| GEN | Measure Insulation Resistance Over 3MΩ | | X | | | |
| | Check Rotor Rear Support Bearing | | | X | | |

^{*a} During the initial operation of a new engine, change oil and filter between a minimum of 100 hours and a maximum of 500 hours. Service interval depends on oil type.

^{*b} When different kind of oil is to be used, remove all old oil before putting in new one.

^{*c} Engine Oil dilution may occur, during DPF regeneration if fuel mixed with the oil.

^{*d} Expectation for minimal service interval will be at least 4500 hours based on engine power. However, actual service should take place when indicated by diagnostic gauge. Please contact your nearest dealer or MULTIQIP INC. for DPF cleaning.

^{*e} Replace air cleaner element when restriction indicator shows a vacuum of 625mm (25in) H₂O.

Emission Carbon Deposition Check

Deposition of carbon (soot, unburned fuel) in the exhaust pipe line and muffler could cause not only system derates but also could lead to fires. To reduce soot and unburned fuel, run the unit at rated power until the exhaust gas become mostly colorless every 250 hours operation time. More carbon will be generated when the unit operates at less than 30% of rated power. In this case, perform the above procedures more frequently.

NOTE:

- Applying a large load suddenly to the unit when the carbon deposition is generated in the exhaust system could produce sparks and will lead to abnormal combustion. Therefore, apply load gradually and observe the exhaust gas color during the process.
- Sparks may come out of the exhaust gas outlet during load operation. Make sure the unit's surrounding is free from any flammable material.

TROUBLESHOOTING

The following chart gives only basic troubleshooting information. For more specific information request the Diesel Generator Repair Manual, from your local dealer or MULTIQUIP INC.

| PROBLEM | POSSIBLE CAUSE | PROCEDURE |
|-------------------------|--|--|
| No Voltage Output | Defective AC Voltmeter Wiring Connectors Loose Defective AVR Defective Rotating Rectifier | Check Output Voltage and replace if necessary Check and repair Replace if necessary Check and replace |
| Low Voltage Output | Engine RPM Low Wiring Connectors Loose Defective AVR | Check and adjust Check and repair Replace if necessary |
| High Voltage Output | Wiring Connectors Loose Defective AVR | Check and repair Replace if necessary |
| Circuit Breaker Tripped | Short Circuit in Load Overcurrent Defective Circuit Breaker Overcurrent Relay Actuated | Check and repair Confirm load requirement and reduce Check and replace Confirm load requirement and reset |

STORAGE

When the generator is to be stored for a long period of time the site must be chosen very carefully. It should not allow exposure to rain or direct sunlight. The location should be level and secure to prevent sliding or shifting. It should be relatively free from moisture and airborne dust and dirt.

1. Clean the unit thoroughly, inside and out.
2. Remove the battery, charge and store in a separate location.
3. Check the unit for any damage or missing parts and repair as needed.
4. For details on the engine, refer to the enclosed engine manual.

WIRING DIAGRAM

1. COLOR CODE

| COLOR CODE | | | |
|------------|------------|----|-------------|
| | WIRE COLOR | | WIRE COLOR |
| B | BLACK | R | RED |
| L | BLUE | W | WHITE |
| BR | BROWN | Y | YELLOW |
| G | GREEN | LB | LIGHT BLUE |
| GR | GRAY | LG | LIGHT GREEN |
| V | VIOLET | O | ORANGE |
| P | PINK | | |

2. WIRE SIZE

A. Wire size unit = mm²

B. No designation wire size:

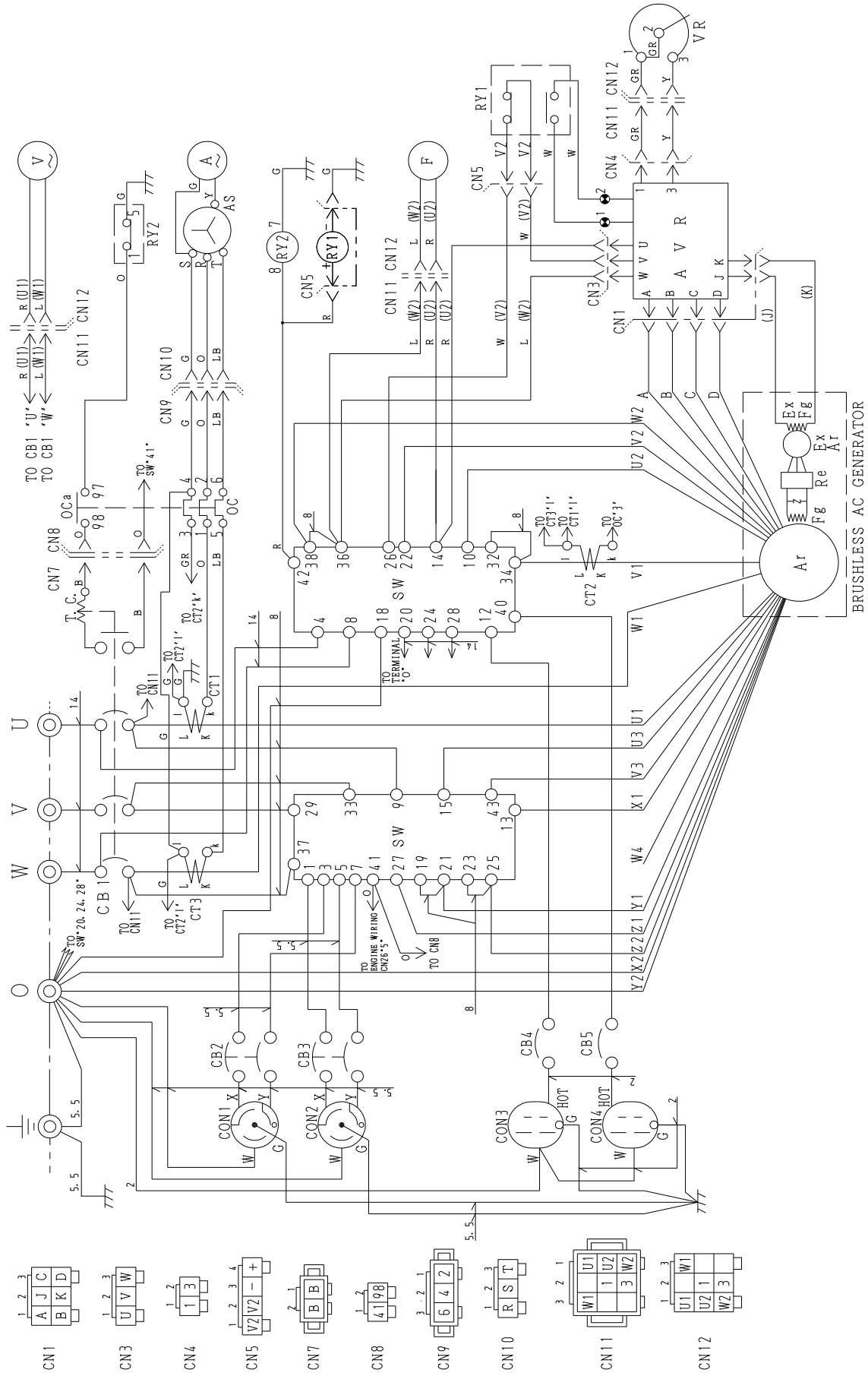
Generator Wiring Diagram = 1.25 mm²

Engine Wiring Diagram = 0.75 mm²

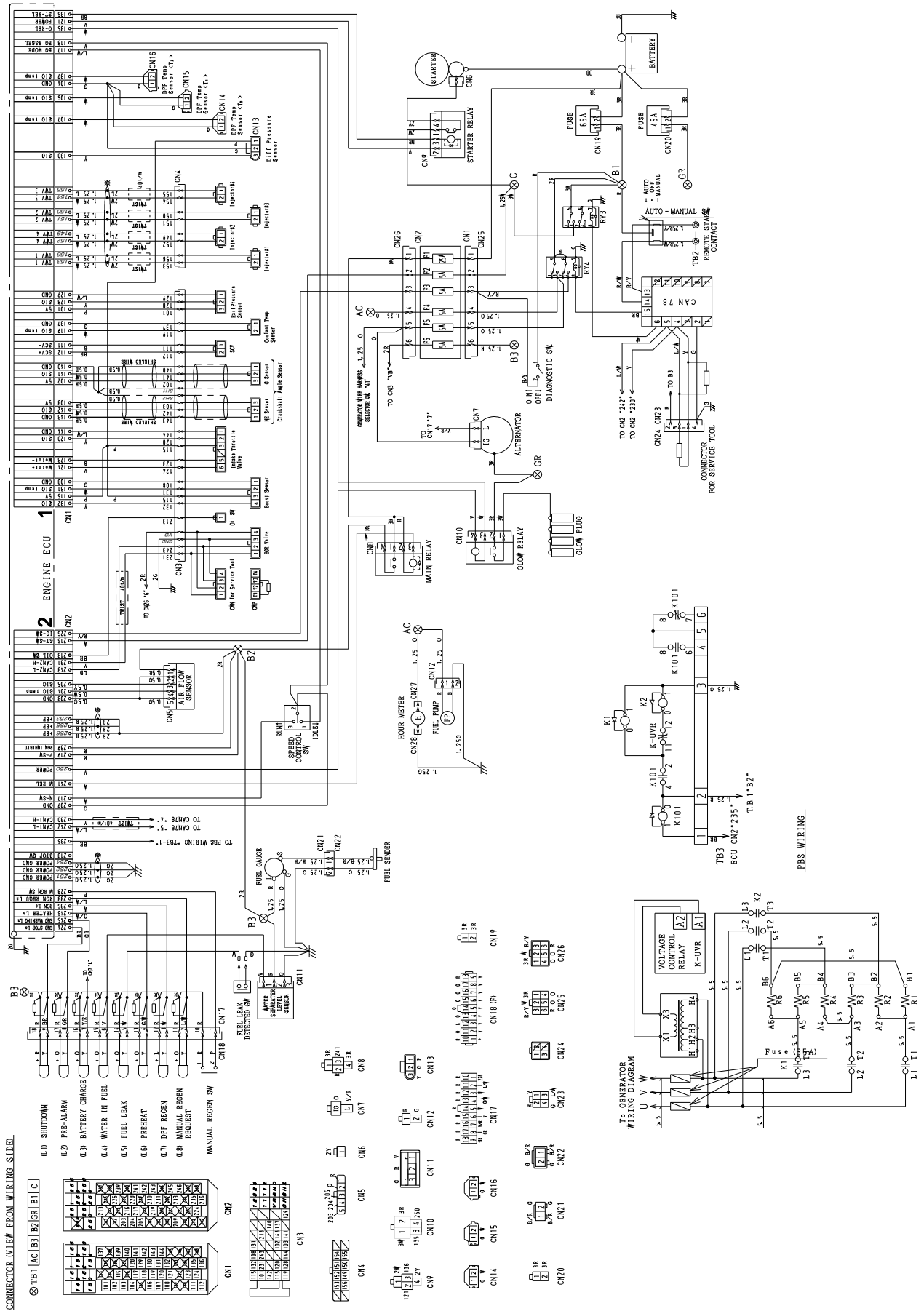
3. [GENERATOR WIRING DIAGRAM] SYMBOL

| SYMBOL | DESIGNATION |
|--------------|---------------------------------|
| Ar | MAIN GENERATOR ARMATURE WINDING |
| Fg | MAIN GENERATOR FIELD WINDING |
| ExAr | EXCITER ARMATURE WINDING |
| ExFg | EXCITER FIELD WINDING |
| Re | RECTIFIER |
| AVR | AUTOMATIC VOLTAGE REGULATOR |
| VR | VOLTAGE REGULATOR RHEOSTAT |
| CT 1,2,3 | CURRENT TRANSFORMER |
| AS | AMMETER CHANGE-OVER SWITCH |
| A~ | AC.AMMETER |
| V~ | AC.VOLTMETER |
| F | FREQUENCY METER |
| OC | OVER CURRENT RELAY |
| CB 1,2,3,4,5 | CIRCUIT BREAKER |
| CON1,2,3,4 | RECEPTACLE |
| SW | SELECTOR SWITCH |
| RY1,2 | RELAY UNIT |

GENERATOR WIRING DIAGRAM



ENGINE WIRING DIAGRAM



MANUFACTURED FOR MULTIQIP INC.
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