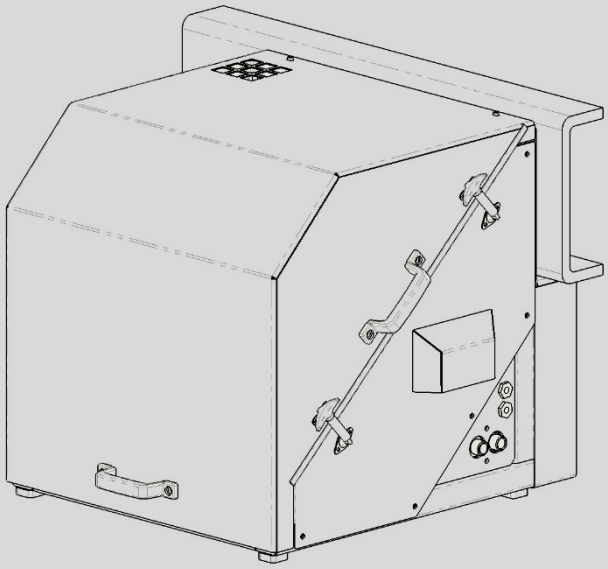
OPERATORS MANUAL

Auxiliary Power Unit

MODEL
APU MKII



SPECIFICATIONS

Weight:		490 LB [222 KG]
Fuel Usage:	Full load 3.5 kW	0.66 GPH [2.5 LPH]
	No load	0.44 GPH [1.6LPH]
Fuel Type:		ULSD
Fuel Storage:	Capacity	External tank
	Secondary containment	X GAL [X L]
Heat Output:	Max from coolant	37,000 BTU/HR
	Electric heat power	3.5 kW
Generator:	Engine	Kubota Z482
	Generator	Mecc Alte
	Engine continuous power	3.5 kW
	Voltage	230V
	Aux power	3.5 kW @ 60Hz

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1 Introduction

⚠WARNING Read and understand this manual before operating the machine to avoid serious injury or death.

1.1 General Description

The ESI APU-2 is a portable diesel engine generator set with a heat exchanger system to transfer heat through coolant to another circuit such as a truck engine. The secondary coolant circuit has integrated quick disconnects and a circulation pump to maintain coolant flow. This generator set is designed for outdoor use and has been tested in extreme arctic conditions. In addition to providing heat through the heat exchanger the unit also provides AC power for auxiliary use.

1.2 Manual Applicability

This manual is applicable to the following Equipment Source Incorporated (ESI) machine models:

Model	ESI No.	Description
APU-2	1006100	APU Genset with heat exchanger

This manual should be kept with the machine at all times. Immediately contact Equipment Source Incorporated (manufacturer) or an authorize dealer to obtain a copy of this manual if missing or damaged. Refer to www.equipmentsourceinc.com for current contact information.

1.3 Manual Scope

This manual contains basic operating and maintenance instructions for the above listed product(s). Specific information concerning truck installation is not included in this manual. For detailed service instructions concerning specific electrical or mechanical components, refer to the operation and maintenance manual provided by the manufacture of the component or contact an authorized service provider.

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2 IMPORTANT SAFETY INSTRUCTIONS

⚠WARNING

- Never attempt to operate this machine indoors. Exhaust fumes from the engine can kill.
- SAVE THESE INSTRUCTIONS. This manual contains important instructions that should be followed during the operation and maintenance of the generator.

2.1 Training

- Never allow untrained personnel to operate or service the machine. Take time to read the manual and discuss safe practices operators.
- Read and understand the operating section of this manual.
- Take time to familiarize yourself with the controls and instructional placards before operating or servicing.
- Contact your dealer if additional training is necessary.

2.2 Operating

- The frame of the machine shall be connected to a good truck ground lug.
- Generators vibrate in normal use. During and after the use of the generator, inspect the generator as well as connection fittings. Have damaged items repaired or replaced as necessary. Do not use cords that show signs of damage such as broken or cracked insulation.

2.3 Service

- Only trained service technicians should attempt to service the machine.
- Properly shutdown the machine and let cool completely before attempting to service any component.
- Never modify the machine

3 Transporting and Storage

3.1 Dimensions and Weights

Unit Weights *: Wet .....490 LB [222 KG]

*All weights are approximate

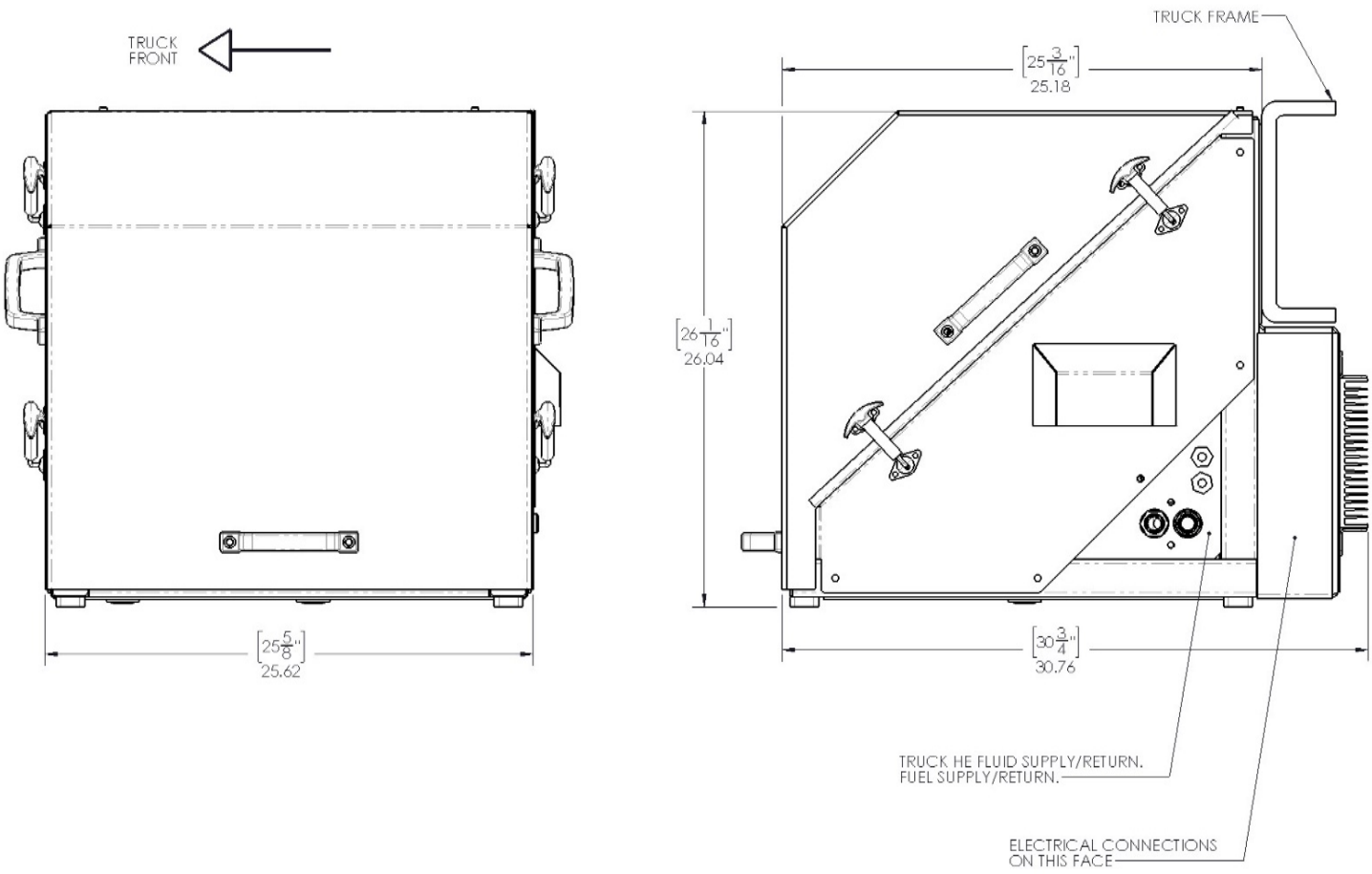


Figure 1. Machine dimensions PN 106100.

3.2 Mounting

⚠CAUTION

- Support generator while marking holes to be drilled in truck frame
- Don't get under the unit until all bolts are securely in place

- 4x 2.5" long bushings are provided to bolt the unit to the truck frame. The bushings are sized for ½" bolts. It is recommended that the bolt head be on the truck side and the nut (locking nut) be on the inside of the APU. It is recommended that a grade 8 bolt be used. The hole pattern is shown in the figure below.

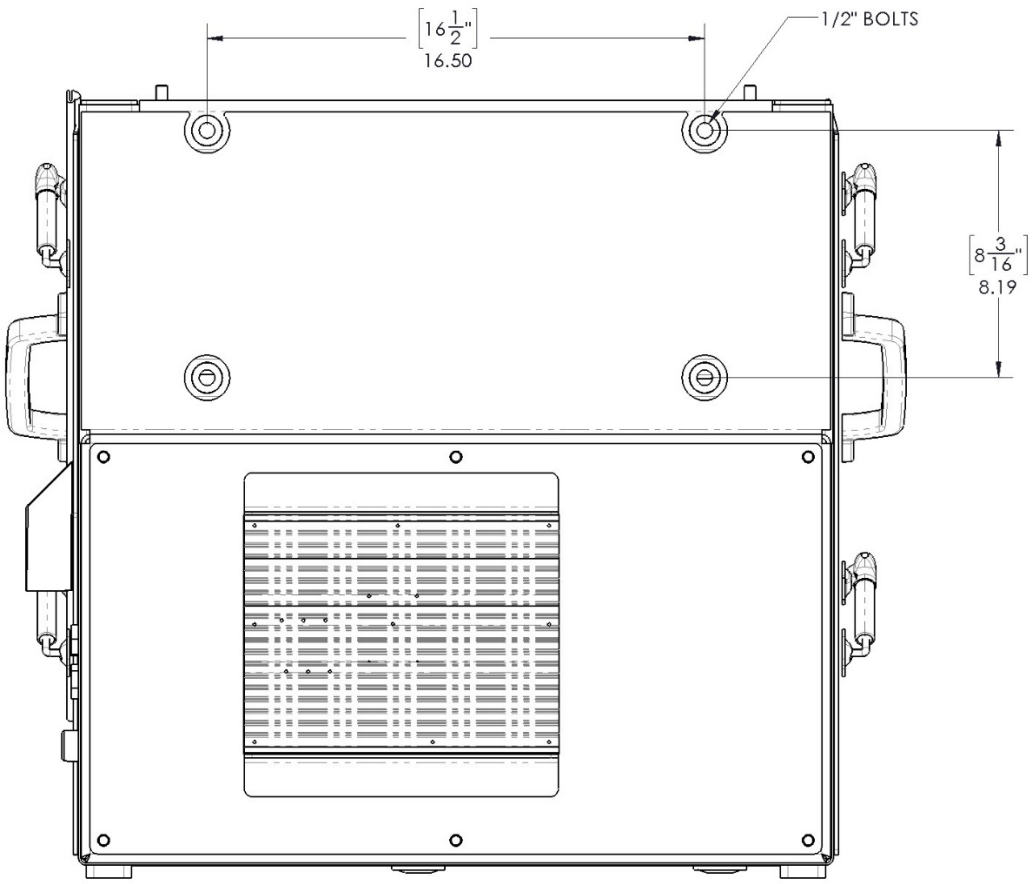


Figure 2. Machine mounting holes

3.3 Storage

NOTICE In order to reduce the unnecessary accumulation of dirt on the machine it is recommended that the air intake and top of muffler area be covered if not in use.

3.3.1 Long-Term Storage (more than 60 days or seasonal)

1. Close fuel supply and return valves if used
2. Remove from the vehicle if applicable

3.4 Preparing the Machine for Seasonal Operation

Follow this procedure to prepare the machine for seasonal operation or any time the machine is removed from long-term storage:

1. Remove any protective coverings from the exhaust outlet and air intake areas
2. Clean the inside of the enclosure to remove any debris
3. Clean inverter cooling fins of mud or debris
4. Check containment for accumulation of liquids
5. Check and or replace engine air filter
6. Inspect electrical system and controls for damage
7. Inspect fuel system for wear or damage
8. Replace fuel filter
9. Check engine fluids (oil and coolant)
10. Verify both circulation pumps work*
    - * APU circulation pump may not function unless the automatically resetting temperature switch is reset by a temperature lower than 40^{o} F. With the APU off but the truck accessory power on, flip the momentary switch inside the APU (near electrical ports under exhaust) to test pump. You should be able to either hear the pump or feel with your hands that the pump comes on.
11. Check external fuel supply
12. Check external coolant circuit hoses and fittings and run external circuit to ensure no air is trapped in the APU pump. Running the vehicle/truck long enough for circulation will also remove air from the system.
13. Run APU for 1 hour to verify operation of all components. External heat exchange loop should become warm to the touch when proper circulation is occurring.

4 Operation

NOTICE Failure to properly connect external heat exchange loop will cause the APU to automatically shut down due to heat build-up.

Figure 3. APU Controls

4.1 Controls

4.1.1 General Guidelines

The APU-2 model is controlled from the cab of a truck with a control box and start key.

4.2 Recommended Fuels and Fueling Instructions

Use ULSD No.1 or ULSD No.2. The fuel source is typically from the same tank as the truck it is mounted on.

4.3 Engine Heat

When operating the APU in cold weather the APU circulation pump will automatically turn on if the engine block temperature drops below 40^{o} F. It will then circulate warm coolant from the truck (via the heat exchanger) through the engine block until it reaches approximately 140^{o} F. The pump will then shut down until the snap disc resets at 40^{o} F again. By doing this the pump life is enhanced and the APU is always warm enough to start when needed.

4.4 Pre-Startup Checklist

Use the following checklist to determine whether the machine can be safely started and operated:

1. **Engine oil and coolant levels normal**
2. **Air inlet is free of obstructions and inverter fins clean**
3. **Heat exchange lines are connected to the truck**

4.5 Startup

Startup is very simple, turn the key on the control box to warm the glow plugs up for 10 sec and then turn on.

1. **Turn on the cab mounted key to start the APU**

4.6 Monitoring and Operation

4.6.1 Daily Inspection

- Listen for abnormal sounds
- Check fluid levels
- Check containment for accumulation of liquids. Drain water if necessary.
- Observe recommended maintenance schedule

4.7 Shutdown

Shutdown procedure:

1. **Shutdown the APU by turning the key to the “OFF” position**

4.8 Auxiliary Power Connection

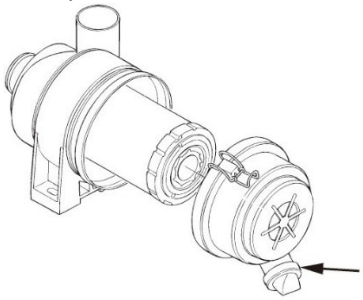
The APU has the ability to deliver 3.5 kW of AC power (230 V). The APU should not be run for long periods without any electrical load to prevent under-loading or “wet stacking” the engine. Refer to the wire color codes for AC generator connections (Figure 5).

5 Maintenance

⚠CAUTION Some of the following maintenance operations should only be completed by a trained technician. Do not attempt to open electrical panel unless you are a trained technician.

Care should be taken in opening electrical panel as some wires are not long and you may damage them if you are not careful and support the inverter panel before unplugging the inverter.

5.1 Maintenance Schedule

Interval (Hours)	Maintenance Instruction	Notes
Every 50 hours	▪ Check fuel and coolant tube clamps for leaks ▪ Check air filter	▪ Engine coolant circuit is independent of truck circuit ▪ Open the evacuator valve once a week under normal conditions or daily when used in extremely dusty conditions. 
50 hours (initial) 100 hours	▪ Change engine oil	▪ Engine Oil: SAE30, SAE10W-30 or 15-40 Must be API Spec: CF, CF-4, CG-4, CH-4 or CI-4 ▪ Oil Capacity: 0.66 GAL [2.5 L]
200 hours	▪ Oil filter cartridge	▪ Kubota P/N: 15426-32430
400 hours	▪ Inline fuel filter	▪ Kubota P/N: 12581-43012

Every 1000 hours Or 12 months	▪ Change fuel filter ▪ Check air filter ▪ Check engine belt	▪ Air filter, Donaldson P/N: P822686
Every 3000 hours Or 12 months	▪ Change oil and oil filters ▪ Change Fuel Filters ▪ Change engine belt	▪ Engine oil: SAE30, SAE10W-30 or 15-40 Engine oil must meet API Spec: CF, CF-4, CG-4, CH-4 or CI-4
Every 3500 hours	▪ Replace circulation pumps	▪ Jabsco P/N: 50840-0012
Every 6000 hours Or 3 years	▪ Change coolant	▪ Use Rottella ELC or equivalent
Every 9000 hours	▪ Injection pump service ▪ Valve clearance service	▪ Contact Kubota service rep. for valve and fuel injection service

Table 1. Maintenance Schedule

5.2 Engine Service

Use engine operator's or service manual provided for further instruction on how to complete routine service or trouble shooting.

6 Basic Trouble Shooting

⚠CAUTION Some of the following maintenance operations should only be completed by a trained technician. Do not attempt to open electrical panel unless you are a trained technician.

Use the following troubleshooting guidelines to resolve problems that may encountered while operating the APU-2 generator. Contact your service representative or refer to the manuals specific to the Dynagen or engine if the problem cannot be resolved using this guide.

6.1 Pump trouble shooting

The APU-2 model has two coolant circulation pumps. The APU circulation pump circulates warm coolant from the heat exchanger through the engine block while the APU is NOT running but the truck is running. The truck circulation pump moves heat away from the APU to the truck engine block while the APU is running and the truck is not running.

The truck circulation pump (truck side of APU engine) is designed to run the entire time the APU engine is running. The APU circulation pump is designed to turn on only when the APU engine block drops below 40^{o}F. The APU circulation pump will then run until the block gets to 140^{o}F and then shut off. By doing this the APU circulation pump is not required to run the entire time the truck is running but only when the APU gets cold.

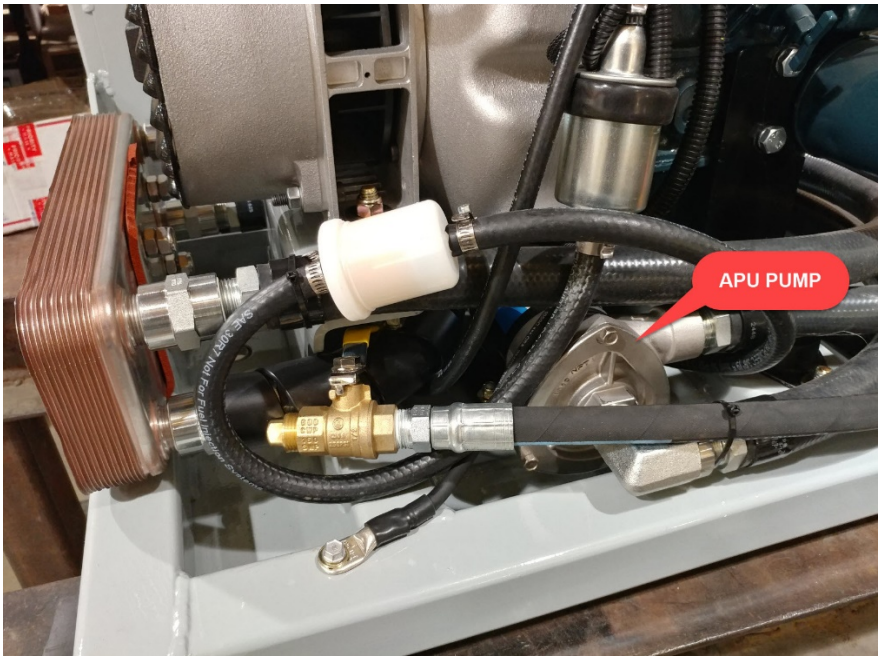
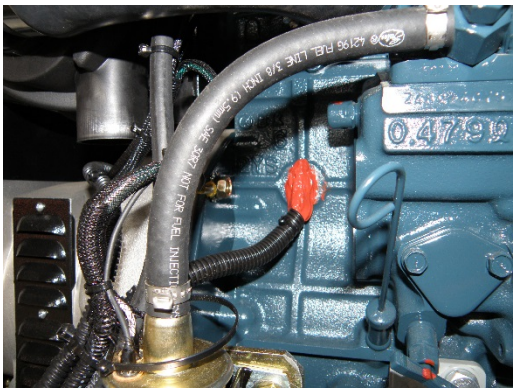


Figure 4. APU circulation pump

Table 2. Circulation Pump diagnostics

Problem	Solution
Truck circulation pump (Fig. 4A) not pumping heat away from APU to truck (APU overheats and shuts down) **Truck circulation pump should be running while APU is running.**	▪ Check 10 AMP inline fuse ▪ There may be an air pocket in the pump preventing it from pumping. Run the truck engine enough for it to circulate coolant and flush out the air. **APU should not be running while the truck is running**.
APU circulation pump does not run and APU gets very cold even though truck has been running. **APU circulation pump does not run while APU is running, the built in engine pump circulates the coolant.**	▪ Check 10 AMP inline fuse ▪ If it is warmer than 40°F it is possible the snap disc has not reset. If it is colder than 40°F and the motor has power the snap disc may be faulty. The snap disk is located to the left of the oil dip stick and is bonded to the engine block with red RTV. Test the APU pump with manual over-ride switch on firewall. 

6.2 Generator Engine Trouble Shooting

Table 3. Engine Trouble Shooting Guide

Engine does not start	▪ Check for battery power at the starter ▪ Check connectors for corrosion ▪ Check battery ground connection
Engine cranks but does not start	▪ Check fuel supply ▪ Check fuel filter and that engine is getting fuel

7 Electrical Schematics

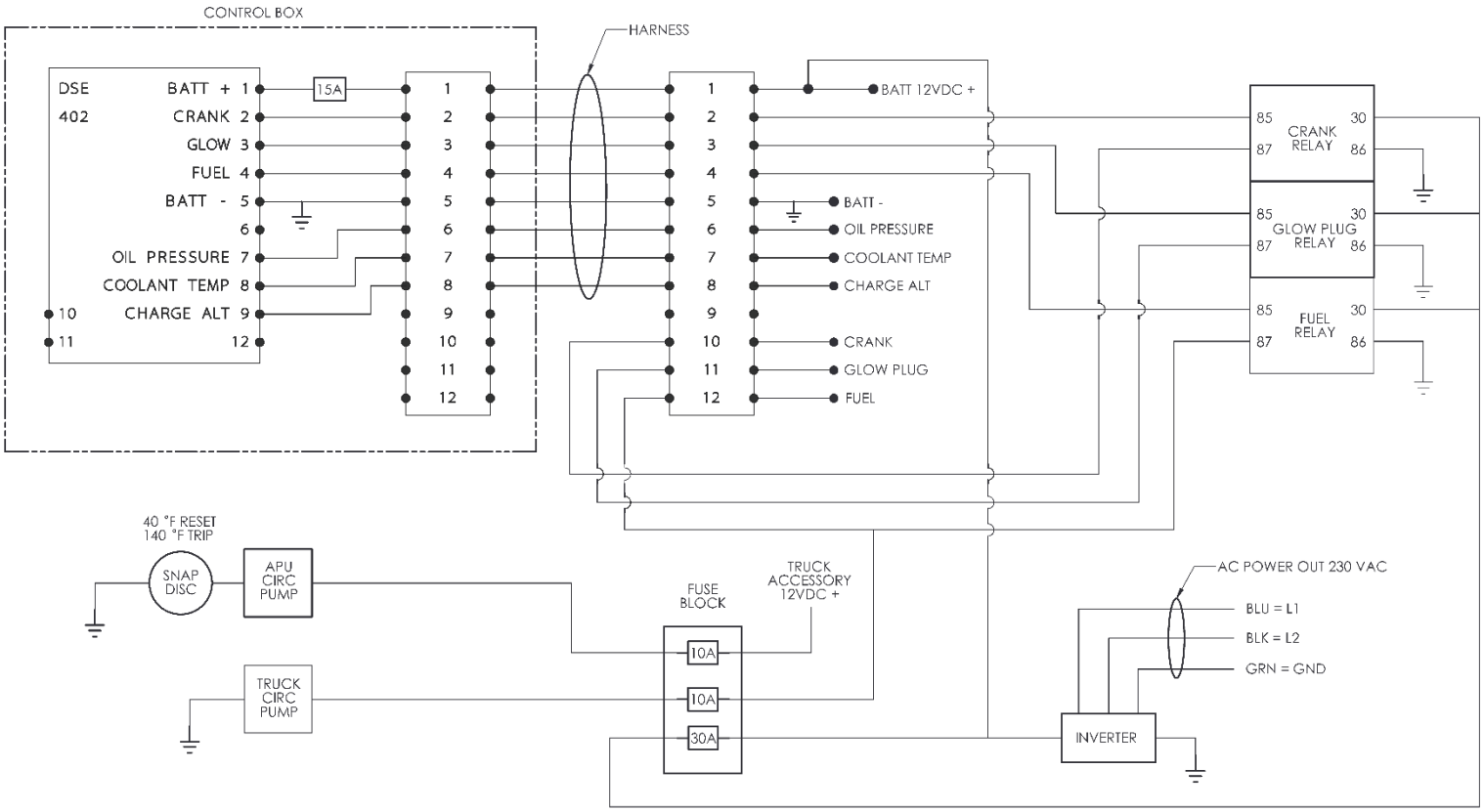


Figure 5. Electrical schematic

8 Maintenance Records

Table 4. Machine Data

Machine Serial Number	
Engine Serial Number	
Generator Serial Number	

Table 5. Maintenance Records

▪ Date ▪ Engine Hours ▪ Service Personnel ▪ Service Location	**Description of work completed**

