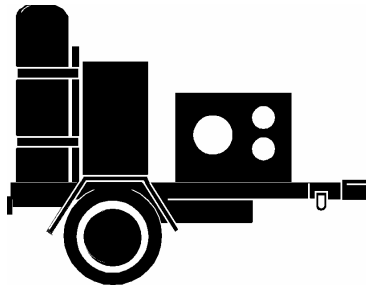


ENVIRONMENTAL CONTROL UNIT (ECU)
PART NUMBER 2001829
OPERATIONS AND MAINTENANCE MANUAL



Prepared by:

PowerSystems International, Inc.

860 Douglas Way • PO Box 530

Natural Bridge Station, VA 24579

1.0 SCOPE: This Operations and Maintenance Manual provides for the safe installation, operation and maintenance of the 2001829, Environmental Control Unit (ECU).

2.0 EQUIPMENT DESCRIPTION: The ECU provides heating, cooling and ventilation of the enclosed space created by the deployed shelter. It is powered by the 208VAC, three-phase 60 Hz trailer mounted generator set. The ECU is designed to provide proper heating or cooling over the ambient temperature range of 17 degrees to 120 degrees Fahrenheit. A thermostatic control that monitors return airflow is used to set and regulate temperatures. Airflow is directed to the shelter by way of insulated supply air ducts (see Section 6.2). Air is returned to the ECU via insulated return air ducts (see Section 6.2).

3.0 SAFETY

3.1 QUALIFIED PERSONNEL

For the purposes of this Manual, a qualified person is one who is familiar with the installation and operation of the specific equipment, and the hazards involved.

3.2 SIGNAL WORDS AND LABELS

Signal Words and Labels are used within this Manual. The words and symbols convey the following advice:

3.2.1 Danger: Danger refers to immediate hazards that will result in severe personal injury or possible death. The word **Danger** is displayed within a box and highlighted in bold text and precedes the instruction in a procedure.

3.2.2 Warning: Warning refers to a hazard or unsafe method or practice that may result in a severe personal injury or possible death. The word **Warning** is displayed within a box and highlighted in bold text and precedes the instruction in a procedure.

3.2.3 Caution: Caution refers to a hazard or unsafe method or practice that may result in equipment damage or personal injury. The word **Caution** is displayed within a box and highlighted in bold text and precedes the instruction in a procedure.

3.2.4 Important: Important refers to a hazard or unsafe method or practice that can result in equipment damage or related equipment damage. The word **Important!** is displayed and highlighted in bold text and precedes the instruction in a procedure.

3.3 GENERAL PRECAUTIONS: The following general precautions should be followed when performing any maintenance or service work on the ECU:

Danger: Placing the power switch to the “OFF” position does not completely de-energize the unit.

Danger: Disconnect ECU from power source before performing any maintenance or service work.

Danger: Do not work under a unit suspended by a sling device.

Danger: Do not use a heating torch on any part that contains refrigerant.

Danger: Do not work on ECU in confined spaces. R-407C is an asphyxiant.

Warning: Do not operate ECU without covers, guards and panels in place.

Warning: Do not inhale refrigerant gas.

Warning: Avoid contact of refrigerant gas to skin and mucous membranes.

Warning: Do not touch heater elements. Severe burns may result.

Caution: Do not direct compressed air towards skin.

Caution: Do not use any extreme source of heat to thaw a frozen coil. Use a hair dryer or a 60-watt maximum light bulb to thaw a frozen coil.

Important: Do not exceed 20 psi when using compressed air for cleaning.

Important: The ECU is charged with R-407C refrigerant. Compressor oil must be 3MA-P.O.E. or equivalent.

Important: Do not block the discharge of the condenser fan. Allow three feet for discharge.

Important: Do not operate ECU with return air ducts closed.

Important: Do not operate ECU with supply air ducts closed.

Important: Do not exceed 20 psi when using water for cleaning.

4.0 OPERATION

4.1 MAJOR COMPONENTS:

a) Compressor: The compressor is a hermetically sealed unit with thermal overload protection. The compressor is equipped with a soft start current limiting device with a starting delay of 64 seconds after start of the evaporator fan motor. A hot gas bypass system is used to minimize power fluctuations with compressor cycling.

b) Supply Fan: The evaporator fan motor is a 208-Volts AC, 3 Phase 60 Hz, TEFC, NEMA Frame with normally closed overload protection.

c) Condenser Fan: The condenser fan motor is a 208-Volts AC, 3 Phase 60 Hz, TEFC, NEMA Frame with normally closed overload protection controlled by system pressure.

NOTE: Based on the temperature outside, the condenser fan may run continuously.

d) Filter: The return air filter is a metalized permanent type filter. The filter is located behind the panel containing the return air duct transition.

e) Refrigerant: The ECU uses R-407C, A1/A1 Safety Group, Class III refrigerant.

f) Heater: The heaters are resistive strip type elements located behind the panel containing the supply air duct transitions. A high temperature cut-out protects the heaters.

g) Coils: Coils are copper tubed with aluminum fins.

4.2 INITIAL SET-UP:

Remove the Return and Supply Ducts from the Duct Transport Bags.

Remove the Return and Supply Duct Covers from the ECU by releasing the catches at each transition. The covers may be stored using the Velcro straps on the sides and top of the ECU.

Secure the Return and Supply Ducts to the transition using the same catches used to hold the covers.

IMPORTANT

**WAIT 3 MINUTES BEFORE RESTARTING ECU AFTER
SHUTDOWN.
START AND SHUTDOWN ECU IN VENT MODE ONLY.**

4.3 START-UP (Cool Mode): The following steps should be taken each time the ECU is started.

Turn ECU circuit breaker to the “ON” position.

Set the ECU Mode Selector Switch (S2) to the “VENT” position.

Place ECU Power switch (S1) to the “ON” position.

The circulating fan motor will turn on delivering air to the supply ducts providing ventilation.

To cool, place the Mode Selector Switch (S2) in “COOL” position.

Turn the thermostat counter-clockwise in the cooler direction. The compressor will start after a 1 minute time delay. The condenser fan motor will cycle on and off based on system pressure.

4.4 START-UP (Heat Mode): The following steps should be taken each time the ECU is started.

Turn ECU circuit breaker to the “ON” position.

Set the ECU Mode Selector Switch (S2) to the “VENT” position.

Place ECU Power switch (S1) to the “ON” position.

The circulating fan motor will turn on delivering air to the supply ducts providing ventilation.

To heat, place the Mode Selector Switch (S2) in “HEAT” position.

Turn the thermostat clockwise in the warmer direction. The heater elements will start to warm the air stream. Allow a few minutes for the heater elements to warm-up to operating temperature.

4.5 SHUTDOWN: The following steps should be taken each time the ECU is shutdown:

a) Place the unit Mode Selector switch (S2) to the “VENT” position.

b) Allow the ECU to run for 3 minutes.

c) Place the Power switch (S1) to the “OFF” position.

4.6 ECU CONTROLS: The DEG Instrument Panel is equipped with a power on/off switch (S1), a Mode Selector Switch (S2) to manually set the ECU operating mode and a thermostat to monitor return air. The three modes are:

HEAT: In the “HEAT” position, power is supplied to the ECU thermostat and fan motor. The heater elements will be energized as determined by the setting of the thermostat.

VENT: In the “VENT” position, power shall be applied to the ECU. The evaporator fan will be energized to provide ventilation.

COOL: In the “COOL” position, power is supplied to the ECU thermostat and fan motor. The compressor will be energized as determined by the setting of the thermostat.

5.0 MAINTENANCE: All ECUs must be inspected on a regular basis and condenser coils and filters cleaned when needed. Local conditions or severe environment applications may require frequent inspections and cleaning to ensure the ECU operates at peak efficiency. It is important to note that accumulations of dirt and debris may, particularly in desert conditions, cause erratic operation. See Section 8.0 for replacement part numbers.

WARNING

REFER TO SECTION “3.0 SAFETY” PRIOR TO PERFORMING MAINTENANCE WORK

IMPORTANT

REFER TO SECTION “6.2 DIMENSIONAL DATA AND COMPONENT LOCATION” FOR COMPONENT LOCATIONS

5.1 MONTHLY MAINTENANCE: Inspect the condenser coil(s) for dirt and debris. If excessive dirt or debris is present, clean the fins with either steam or a non-corrosive solvent to remove oil, pollen, dust, and soil. Do not use a direct high-pressure blast over 20 psi as damage to the coil may occur.

IMPORTANT

DO NOT USE A DIRECT HIGH PRESSURE BLAST OVER 20 PSI AS DAMAGE MAY OCCUR TO THE COILS

Check filter. If dirty replace or wash as necessary.

5.1.1 Filter Access: The return air filter is located behind the Return Air Duct Connector Panel (see Section 6.2). The Panel is secured to the ECU with quarter-turn fasteners. Use a 5/32” hex head wrench to turn the fasteners counter-clockwise to release the Panel.

5.2 QUARTERLY MAINTENANCE: With power off, manually operate the condenser fans to ensure free movement and check the motor bearings for wear. Ensure that all fan mounting hardware and wiring terminations are tight.

Inspect the compressor and condenser fan motor contactors. If the contacts appear severely burned or pitted, replace the contactors.

Check the heater connections. Ensure that all heater element mounting hardware and wiring terminations are tight.

5.2.1 Electrical Component Access: The electrical components are located behind access panels. The panels are located on each side of the ECU (see Section 6.2). Panels are secured to the ECU with quarter-turn fasteners. Use a 5/32" hex head wrench to turn the fasteners counter-clockwise to release the panels.

5.3 YEARLY MAINTENANCE: Apply power to the ECU. With the ECU operating in the cool mode, check and record the ambient temperature, compressor oil level, and compressor suction and discharge pressures. In addition, if the operating pressures indicate a problem of any kind, determine the system superheat and subcooling, and refer to Section 7.0 TROUBLE SHOOTING.

5.3.1 Compressor, Condenser, and Test Port Access: The Compressor, Condenser, and Test Ports are located behind the Compressor/Condenser Access Panel. The Panel is located on condenser fan end of the ECU (see Section 6.2). The panel is secured to the ECU with 5/16" fasteners. Use a 5/16" SAE wrench to remove the fasteners and release the Panel.

5.4 REPAIR SERVICE

In the event of a compressor burnout or filter clogging, it is imperative that the ECU piping system is thoroughly cleaned of all refrigerant and oil, and new filter-driers are installed. It is further recommended that the refrigerant not be reused. Whenever the refrigerant side of the ECU's piping has been exposed to atmospheric pressure for a period of time longer than that necessary to repair and charge the system, PSI recommends replacing the filter drier(s).

6.0 TECHNICAL DATA

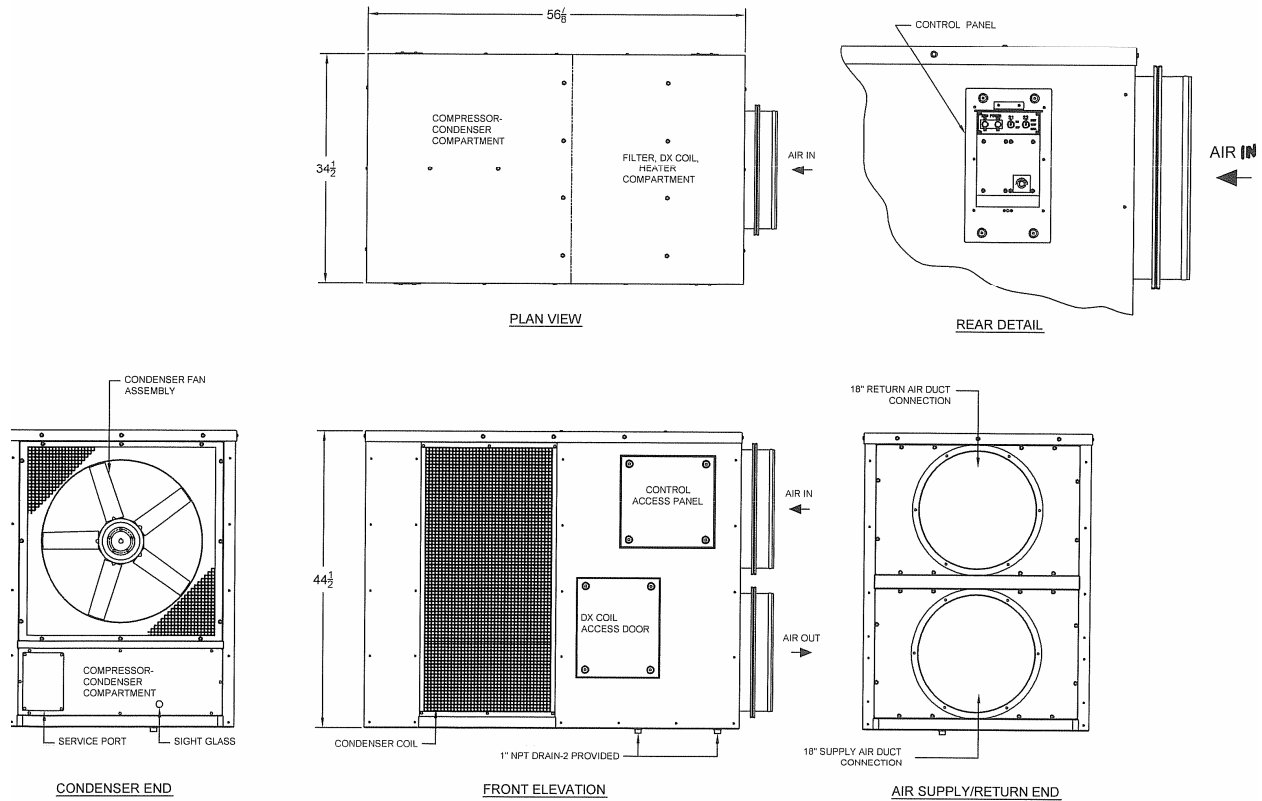
6.1 PHYSICAL DATA:

ECU Designation	2001829
Nominal Capacity, BTU/hr	96,000
Operating Charge, lbs. of R-407C	15.0
<u>Compressor Data</u>	
Number of Refrigeration Circuits	1
Quantity	1
Nominal Horsepower	8
<u>Condenser Coil Data</u>	
Quantity	2
<u>Evaporator Coil Data</u>	
Quantity	1
<u>Condenser Fan Data</u>	
Quantity	1
Nominal Horsepower	1.5
<u>Supply Fan Data</u>	
Quantity	1

Nominal Horsepower	2.0
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<u>ECU Designation</u>	<u>Total Weight Without Refrigerant, pounds</u>	<u>Length, inches</u>	<u>Width, inches</u>	<u>Height, inches</u>
2001829	630	56 7/8	34 1/2	44 1/2

6.2 DIMENSIONAL DATA AND COMPONENT LOCATION:



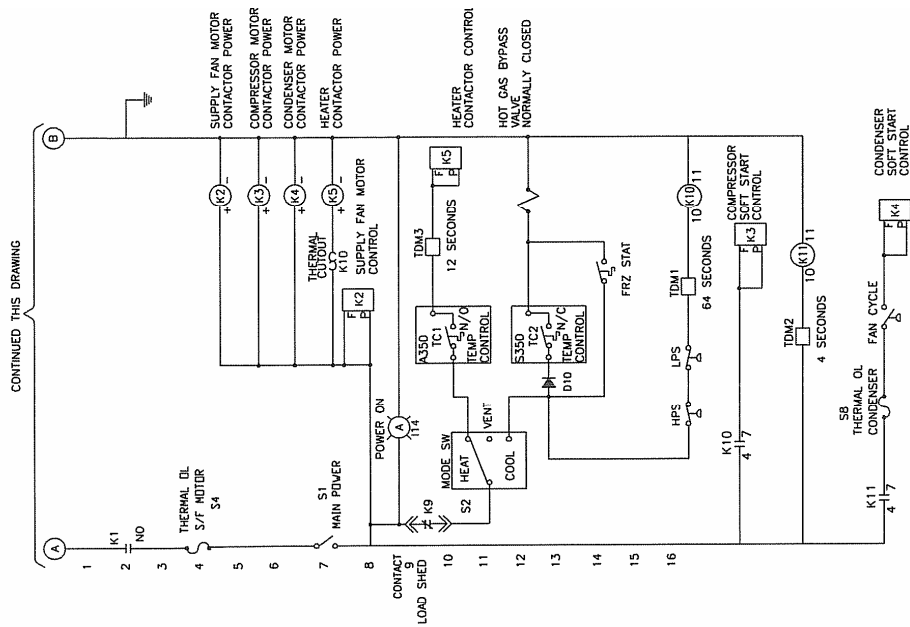
Duct connection dimensions are for reference only.

6.3 ELECTRICAL DATA

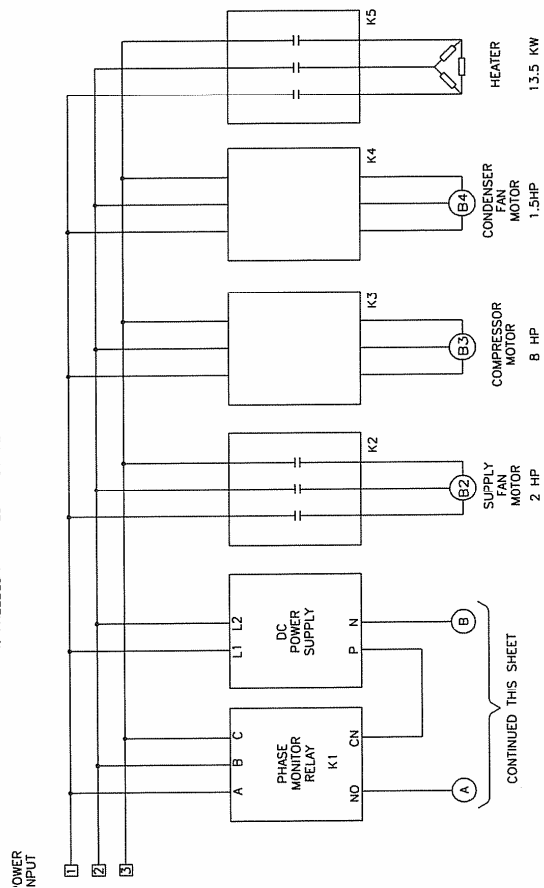
6.3.1 Horsepower and Run-Load Amps:

	<u>Qty.</u>	<u>Nominal Horsepower</u>	<u>FLA (each)</u>
<u>ECU 2001829</u>			
Compressor	1	8	31.8
Condenser Fan	1	1.5	5.3
Supply Fan	1	2.0	6.5

6.3.2 Electrical Schematic – Power and Controls Wiring:



- NOTE.
1. PHASE ROTATION 1-2-3.
 2. X - DENOTES CONTACTS CLOSED.
 3. THERMOSTAT FOR HEATING AND COOLING MAKE ON FALLING TEMPERATURE.
 4. FREEZE STAT MAKES AT 36 DEGREES F.



S2

MODE SWITCH POSITION	
CONTACTS	HEAT VENT COOL
1	2 X
1	3
	X

MAINTAINED CONTACTS

S1

POWER POSITION	
CONTACTS	OFF ON
1	2 X
	X

MAINTAINED CONTACTS

7.0 TROUBLE SHOOTING

WARNING

REFER TO SECTION "3.0 SAFETY" PRIOR TO TROUBLE SHOOTING
ECU

IMPORTANT

ECU IS EQUIPPED WITH A TIME DELAY TO PREVENT COMPRESSOR
DAMAGE. IF UNIT IS TURNED OFF AND THEN ON WITHIN A FEW
MINUTES THE COMPRESSOR WILL NOT START IMMEDIATELY.

THE CONDENSING FAN IS CONTROLLED BY SYSTEM PRESSURE AND
MAY OR MAY NOT TURN CONTINUOUSLY.

Symptom	Cause
Unit doesn't start	Power source is off. Power switch is in "Off" position.
ECU doesn't produce cold air	Selector switch is not in "Cool" position. Thermostat is not properly set. Refrigerant charge is low. Unit has a refrigerant leak. Return air is already cold. High Pressure Switch is tripped. Compressor is faulty.
Water does not drain from unit. Water is running out from the bottoms of the doors. Water is on fan.	Drain is clogged. Drain hose is kinked.
Coil is icy or frosty	Suction pressure is low. Evaporator coil is dirty. Filter is dirty. Ducts are closed.
Compressor doesn't run	Selector switch is not in "Cool" position. Thermostat is not properly set. Head pressure is high. Contactor is faulty. High Pressure Switch is tripped. Compressor is faulty.

Heater doesn't work	Selector switch is not in "Heat" position. Thermostat is not properly set. Return air is already hot.
Supply fan doesn't run	Power source is off. Power switch is in "Off" position. Contactor is faulty. ECU Circuit Breaker is tripped.
Condensing fan doesn't run	Head pressure is low. Contactor is faulty. Compressor is not operating. Light load conditions exist and Condensing fan is not required.

8.0 PARTS LIST

Reference Designator	Description	Part Number
K1	Phase Monitor	3001445-001
K2	Contactor, Supply Fan	3001454-001
K3	Soft Start, Compressor	3001948-001
K4	Soft Start, Condenser Fan	3001450-001
K5	Contactor, Elec. Heat	3001455-001
S1	Switch, on/off	3001446-001
S2	Switch, Mode	3001447-001
S3	Thermostats	3001468-001, 3001469-001
S5	Freeze stat	3001463-002
S6	Switch, High Pressure	3001464-001
S7	Switch, Low Pressure	3001465-001
S9	Switch, Fan Cycle	3001467-002
S10	Thermal Overload, Heater	3001478-001
E3	Timer	3000062-001
HR	Heater	3001522-001
PS	DC Power Supply	3001452-002
HGV	Solenoid, Hot Gas	3001477-001
SF B1	Motor, Supply Fan	3001949-001
COMP B2	Compressor	3001350-001
COND B3	Motor, Condenser Fan	3001671-001
Air Filter	Air Filter	3001428-002

