



**TECHNICAL DATA SHEET
AIRCRAFT GROUND POWER UNIT
MODEL NO. B809D**

2015 Mitchell Blvd. Schaumburg, IL 60193 Phone: 847-891-4444 Fax: 847-891-9111 Web: essexelectro.com

COGNIZANT SERVICE: U.S.A.F.

NATIONAL STOCK NUMBER: 6115-01-582-7927



OVERALL DIMENSIONS AND WEIGHT:

Height: 63 Inches

Length: 103 Inches

Width: 66 Inches

Weight (Dry): 4,372 Lbs.

FUNCTIONAL DESCRIPTION:

The Essex Electro Engineers, Inc., Model #B809D Ground Power Unit, is intended for use in supplying 90 KVA, 0.8 power factor, 115/200 volt, 3 phase, 400 hertz, 28.5 and 270 volts D.C. electrical power for starting and servicing aircraft.

The Ground Power Unit basically consists of a diesel engine driving a 400 cycle, brushless generator. The generator will supply 400 cycle power for servicing aircraft. All the necessary electrical controls and instruments are furnished on a control panel. The diesel engine and generator, along with all the necessary components are enclosed within a sheet metal enclosure for operation in inclement environments. The entire unit is mounted on a four-wheel, steerable trailer.

The engine is a heavy duty, electronically controlled, diesel engine. Each engine is equipped with an oil cooler, full flow oil filter, fuel oil strainer and fuel oil filter, an air cleaner, a fan, radiator and a starting motor. The engine comes equipped with a cold weather starting

aid for temperatures as low as -25° F. The engine can operate on a variety of diesel and aircraft fuels from DF-1 to JP-8. The engine enclosure has all necessary panels and doors to provide for proper ease of maintenance and/or repair.

The generator is a synchronous alternating current generator of the brushless revolving-field type of single bearing construction. Generator excitation current is supplied from a direct connected, brushless rotating D.C. exciter. Eyebolts installed in the generator frame enable the complete generator to be lifted with a conventional overhead hoist for repairs and/or overhaul. A heavy steel wrapper cover of drip-proof construction encloses the frame assembly. The generator comes with a reconnection panel to reconnect the output of the generator for high voltage operation.

The Voltage Regulator is an automatic, solid-state type Voltage Regulator. The Voltage Regulator output is controlled by



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a switching transistor which is phase angle fired. An integrated circuit voltage sensing circuit controls the relative on-off cycle of the switching transistor to control total rotating exciter field current.

Various safety controls are provided to protect the Power Unit from adverse conditions. A fault system is provided which contains a solid state Generator Fault Detector and an Engine Speed and Fault Detector.

All operating controls and instrumentation necessary for proper operation of the Ground Power Unit are located on the control panel.

Illumination lighting is furnished on the control panel for night operation. Reflectors are furnished on the trailer.

The trailer is a four-wheel, steerable type with a tow bar. The trailer has a spring leaf suspension system with pneumatic type tires.

TECHNICAL DESCRIPTION:

ENGINE:

Prime Mover Cummins QSB-155
Horsepower 155HP @ 2200 RPM
Engine Speed 2000 RPM

GENERATOR DESCRIPTION: 72KW, 400Hertz continuous load at 0.8 power factor, at rated voltage.

AC OUTPUT VOLTAGE: Three phase, four wire, 115 volts line-to-neutral and 200 volts line-to-line (115/200 volts). Reconnectable 230/400 Volts. MEETS MIL-STD-704E

28.5 VDC OUTPUT TRANSFORMER RECTIFIER CONTROL POWER:

Nominal Voltage 28.5 Volts DC
Steady State Voltage 26 to 29 Volts DC
Ripple Amplitude 1.5 Volts Maximum
Amperage 20 Amps

270 VOLTS DC OUTPUT RECITIFIER:

Nominal Voltage 270 Volts DC
Steady State Voltage 270 ± 1%
Ripple Amplitude 3 Volts Maximum
Distortion Factor 0.015 Maximum
Amperage 259 Amps Continuous
Response Time 10 ms
Pulsed Load Within Figure 1 and 2 of Drawing No. 200224071



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TECHNICAL DESCRIPTION:
(Continued)

ENVIRONMENTAL OPERATING EXTREMES:

Temperature -40° F to 125° F

Altitude Sea Level to 8000 Ft.

AC ELECTRICAL OUTPUT POWER CHARACTERISTICS:

Voltage Unbalance Maximum difference between line-to-line voltage not more than 3% of rated voltage under a condition of a single phase, line-to-line, unity power factor load of 33% of rated phase current with no other load on the generator.

Voltage Phase Unbalance Maximum difference between the line-to-neutral voltage of any two phases at no load is less than 1 volt, and the maximum difference between the output voltage of any two phases at any load up to and including rated load does not exceed 1% at a balanced three phase load.

Voltage Waveform:

Deviation Factor Deviation factor for line-to-line and line-to-neutral voltage waveform for each voltage test point is less than 5%.

Harmonic Content From no load to full load, the Root Mean Square (RMS) value of the sum of all the harmonics components in the output voltage waveform line-to-line, and also line-to-neutral, does not exceed 3% of the RMS value of the rated voltage. Also, the RMS value of any single component does not exceed 2%.

Voltage Modulation Not exceeding 1% of peak-to-peak voltage on any load up to and including rated load.

Continuous Output Range Will supply continuous load of from 0-72 KW with a power factor from 1 to 0.8 lagging.

Line Drop Compensation Automatically adjustable line drop compensator capable of supplying an increase of up to 6 volts line-to-neutral to compensate for cable drop.

Output Voltage Sensing Disconnects power from the load bus when a break at the set output connections (local) or the sensing wires (remote) occurs. Manual switching between modes is required.



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TECHNICAL DESCRIPTION:
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Safety Interlock	Current sensing device/circuit which senses the current (down to 5 milliamps) in the E and F loop of the output power cable and enables the output power contactor to be energized when DC current is present.
DC Voltage for Safety Interlock	28 VDC, ± 2 Volts at 2 Amperes minimum
Load Bank Test Switch	A toggle switch which, when activated, disables the E and F interlock circuit and allows power to be supplied without the 28 VDC feedback on the F circuit.
Output Power Cable (Supplied with Set) (AC Cable Only)	An AC cable is supplied for 115/200 VAC operation with remote sensing and is 65 ft. long.
Voltage Transient Performance	MIL-STD-704E, Figure 4
Voltage Phase Difference	116° to 122°
Crest Factor	1.36 min.
Steady State Voltage	108 to 118 VAC for 115/200 VAC operation 216 to 236 VAC for 230/400 VAC operation

CONTROL SYSTEMS:

Governing System:

Voltage Regulation	Voltage regulator regulates the output voltage to be within 1.0% of rated output voltage
Frequency Regulation	The governor system shall maintain isochronous operation of the set to be within 0.5% of the rated frequency.
AC Output Protection	An AC electrical output protective circuit, when activated, disconnects the load bus and activates a fault indication system.
Overvoltage	Activates at an output voltage of 132 volts for 115/200 VAC operation and 264 volts for 230/400 VAC operation within one second.
Undervoltage	Activates at an output voltage of 105 volts for 115/200 VAC operation and 204 volts for 230/400 VAC operation within three seconds.



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TECHNICAL DESCRIPTION:
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- Overfrequency Activates when the steady state output frequency exceeds 410 Hertz within one second.
- Underfrequency Activates when the steady state output frequency drops below 390 Hertz within one second.
- Short Circuit Protection Disconnects power from the load bus within 50 milliseconds in the event of a short circuit in any output phase.
- Overload Protection Activates the load contactor to open if current in any output line exceeds 125%, $\pm 2\%$

270 VDC Output Protection:

- Overvoltage Within limits of MIL-STD-704E, Figure 8
- Undervoltage Within limits of MIL-STD-704E, Figure 8
- Overload Activates load connector to open if current exceeds 280 amperes for more than five minutes, or if current exceeds 300 amperes for more than 30 seconds.
- Thermal Protection Thermal protection shall be provided to protect the 270VDC circuitry from overheating.
- Short Circuit Protection Activates load contactor to open if current exceeds 320 amperes for more than 0.5 second.
- Cable Interlock Prevents power from being applied to the output power cable when it is not connected to the aircraft.

Engine Protective Circuit: An engine protective circuit, when activated, shall shut down the engine operation and activate fault indication system.

- Overtemperature When engine coolant or cylinder head temperature exceeds the maximum value defined by the engine manufacturer, the engine shall shut down.
- Overspeed When engine operational speed exceeds the speed defined by the engine manufacturer by 10%, the engine shall shut down.
- Low Oil Pressure When engine oil pressure falls below the allowable oil pressure specified by the engine manufacturer, the engine shall shut down.



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Low Fuel Shut-Off When 15 minutes (± 5 minutes) of engine run time remains, an warning indicator shall illuminate.

BUILT-IN-TEST (BIT) BIT circuitry incorporated to continuously monitor the generator set performance, engine function, and protective circuit operation and inhibit the set from operation when a malfunction is detected; also activates a fault indication.

FAULT INDICATION SYSTEM Fault indicator lights or equivalent to display the set fault conditions as activated by protective circuits or BIT.

AUDIO NOISE Maximum of 80 dBA at 7 meters from the perimeter of the set when measured at 1.2 meters above the ground.

EMISSIONS Latest EPA standards

VIBRATION SEVERITY:

Engine Generator Set Maximum displacement of 3 mils and a maximum velocity of 0.70 inches per second on an X/Y axis.

Subassemblies (Control Boxes, Control Panel, Fenders, etc.) Maximum displacement of 4 mils and a maximum velocity of 0.70 inches per second on an X/Y axis.

OPERATIONAL ENVIRONMENT:

Operational Temperature Range -40°F to 125°F

Storage Temperature Range -65°F to 160°F

Operational Altitude 5,000 feet

Unit Wind Resistance 45 MPH

Blowing Rain 20 MPH @ 4 inches/hour

Solar Radiation Desert conditions

Fungus (Tropical Conditions) Material used is anti-fungal

Salt Laden Moisture Part time - 5% salt fog; 5% salt solution with fallout of 3.0ml/80cm³/hr

Sand and Dust (Desert Conditions) 0.062 grams/ft³ windblown sand (150-1000 microns particle size) or 40 MPH windblown dust (less and 150 microns particle size)



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TECHNICAL DESCRIPTION:
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START SYSTEM RELIABILITY:

- Cold Start Capability Engine starts at temperature down to -25°F without external assistance. Ether will not be used.
- Battery (2) - PN: 88-20525, Optima 800 batteries
- Charge System Voltage 14.8 VDC for 12 VDC start system (temperature dependent)
- Charging System Current 40 to 60 amperes

OPERATION AND MAINTENANCE PANELS:

- Operator Panel Commercial practice (See Attached)
- Maintenance Panel Commercial practice (See Attached)

MULTIFUEL CAPABILITY JP-8 primary, and JP-5, DF-1, DF-2, DF-A, Jet A and Jet A1 secondary

CONTINUOUS OPERATION

WITHOUT REFUELING 8 hours under full output power

TRANSPORTABILITY Transportable on C-141, C-130, C-5, C-17, KC-10, and KC-135 aircraft.

MAINTENANCE:

Tools No special tool will be required unless approved by the procuring activity.

Inspection and Servicing of Fluids
(Fuel, Oil and Coolant) Technician will be able to visually inspect and service fluids without removing any components.

ENVIRONMENTAL FACTORS No ozone depleting chemicals and no items on EPA 17 list are utilized.

PAINT COLOR FED-STD-595, semi-gloss green, Color #24052. Chemical Agent Resistant Coating (CARC) not used.

CORROSION PREVENTION Commercial practices



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MOBILITY MIL-M-8090F, Type II, Class II

FIRE PREVENTION, SAFETY,
DESIGN & CONSTRUCTION Best commercial practices

QUALIFICATION Designed and tested in accordance with U.S. Air Force Drawing/
Specification No. 200224071. Approved for use by U.S. Air
Force on all aircraft. Approved for use by Lockheed on the F-22
aircraft.