

Locus Engineering Inc.



E2620 Auxilliary Power Unit (APU) & Battery Monitor

User Guide

August 07, 2018

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Please read and understand this guide before using the unit. It contains important safety information as well as operating and maintenance advice.

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Description

The E2620 Auxilliary Power Unit (APU) and Monitor is an inverter, charger, and monitor unit designed to run non-life essential equipment from an external sealed lead acid battery. The unit is easy to use and allows equipment to be away from a 120VAC wall outlet source for a few hours while using on-board power to operate it.

Features

- allows mobility away from line power
- up to 400W of 120VAC pure sine wave power to run non-life critical equipment
- ~4.6hrs@ 150W, ~2.3hrs@300W, ~1.7hrs@400W (70Ah battery)
- overload, undervoltage, and overvoltage protected
- easy to use single rotary switch controls Off, Standby, Run
- battery monitor displays internal temperature, battery voltage, battery guard voltage
- graceful low voltage warning with bargraph display, voltmeter, and flashing light allows time to return
- customizable product and installation
- includes both inverter and charger connected to battery for convenient operation
- thermostat controlled fans
- environmentally protected
- battery recharging within 4 hrs

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Specifications

Operating Temperature	-20C to +70C
Storage Temperature	-40C to +85C
Power	external sealed lead acid battery, 12V nominal, ~70Ahr capacity
Battery Life	approx. 2-3 hrs continuous with a 300W load
Battery Guard Capacity	40A max
Battery Guard Cutoff	11.25V (programmable)
Inverter Type	12VDC to 120VAC pure sine wave
Inverter Output Power	up to 400W, 85% efficiency
Inverter Input Current	~30A @ 300W, ~40A @ 400W
Charger Battery Capacity	50Ah to 500Ah
Charger Input Current	6A max @ 120VAC
Charger Output Current	25A max @ 12V to 15.7V
Charge Time	approx. 4 hrs
Fan Turn On Temp.	27C
Fan Turn Off Temp.	25C
Fan Controller	dual analog and digital control
Temp. Sensor	+/- 1C
Volt.Sensor	+/- 0.1V
Inverter Charger Size	16"L x 14.75W" x 4.5H" 40.6cm x 37.5cm x 11.4cm
Battery Monitor Size	4.4"L x 2.4"W x 2.0"H 11.2cm x 6.1cm x 5.1cm
Weight not incl. batteries	15.9lbs or 7.2kg

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Detailed Description

The Auxilliary Power Unit or APU is housed in a rectangular modular aluminum enclosure which is black anodized for protection against corrosion, and to help with heat dissipation. This unit includes a battery cable, a 40A battery guard, a 600W inverter, a 25A battery charger, a fan controller, and a connector to the battery monitor.

Power Input

Battery power at a nominal 12V enters the unit via the battery cable to a terminal block, which is a common connection point for the other system components.

Battery Guard

The battery guard is a protective switch between the battery and the inverter which is normally on when the input battery voltage is above a programmed threshold. Once the battery voltage drops below this threshold, the switch is turned off so the inverter load does not discharge the battery any further in order to protect the battery against excessive discharge which would adversely affect its lifetime. The battery guard is limited to a 40A load which represents a ~400W maximum load at the inverter output. Loads greater than 400W will cause the battery guard to shutdown until the overload is removed. The battery guard is enabled on or off by the battery monitor.

Inverter

The inverter converts the 12VDC battery power to a 120VAC pure sine wave output through two standard 120VAC outlets. A USB port is also available to power or recharge 5V USB devices. The output power rating is up to 600W continuous although the

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battery guard limits this to about 400W. The input current is approximately 10A per 100W of output load after taking into account the 85% inverter efficiency.

The battery duration can be estimated from

$$\text{hours} = \text{battery capacity in Ah} \times 10 / \text{load power in watts}$$

E.g. for a 70Ah battery with a 300W output load,

$$\text{hours} = 70\text{Ah} \times 10 / 300\text{W} = 2.3\text{h}$$

Battery Charger

A 25A battery charger recharges the battery whenever it's power cord is plugged into a 120VAC outlet. Normally the power cord is stored inside the enclosure to protect it. The battery charger has an intelligent charge algorithm that recharges the battery in a manner to offer the maximum life for the battery. A discharged battery can be expected to be recharged in 3-4 hours. To ensure the quickest battery recharge, it is recommended to not recharge the battery while the inverter is running. For loads of 250W and greater, the inverter input current will be greater than the battery charger current, so the battery will never recharge. For lighter loads there is a possibility the battery guard may shutdown due to overvoltage on the battery during the final charge phase.

Cooling

The inverter, battery guard, and battery charger produce heat due to inefficiencies. The inverter and charger have internal fans to remove internal heat, and this heat then needs to be removed from inside the enclosure to the outside. A fan controller controls two fans based on the values of two temperature sensors. Above an internal temperature of 27C, the fans turn on and stay on until the temperature has lowered to below 25C.

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Battery Monitor

The battery monitor provides a switch function, a monitor function, and a warning function. The switch has Off, Standby, and On settings. When Off, the system draws no power. In Standby mode, only the battery monitor is on, and the battery voltage (VB), the battery guard output voltage (VG), and the internal temperature (in °C) are displayed in sequence. The battery voltage includes a bargraph display indicating the remaining battery capacity. Each bar represents 10% starting from 100%, so eight bars represent 100% capacity, and a single bar represents 30%. There are two LEDs on the battery monitor. The red LED turns on when the battery guard has turned off due to the battery voltage dropping below the programmed threshold; the inverter will also be off at this point. The orange LED is a graceful low voltage warning which flashes faster as the battery voltage drops beyond 20% capacity. Its purpose is to alert the operator that the battery will soon be depleted and that the connected equipment will also soon be shut off. The rate of battery depletion and the remaining time to seek a battery recharge and equipment reconnection to an alternate 120VAC outlet will depend on the equipment load.

The connector for the battery monitor is located behind the access door at the rear of the unit, and located between the inverter and the charger. Normally the battery monitor cable remains connected.

Installation

It is recommended that the APU unit and battery monitor be installed by a professional installer with regard to the specific installation requirements.

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Location

The APU should be mounted in a horizontal position and protected from the elements and out of the way. The unit can be mounted on a shelf with a retainer to prevent it from being dislodged while in motion. The unit mount should also include drain holes to prevent any water from accumulating.

Cooling Considerations

The airflow is from the rear intake louvers (at the sides) to the front exhaust louvers, so a generous airspace over one inch should be allowed for around both the intake and the exhaust louvers as well as a straight and unimpeded access to open air. The mount should not restrict or contain the air otherwise the inverter will shut down due to excessive heat buildup.

Connections

Equipment power plugs can be plugged into the inverter, and the access door closed to prevent any rain or snow from entering the unit. The equipment power cables can be restrained with VELCRO hook and loop fastener straps. The battery monitor should be located where the operator can see the display and warning LEDs, as well as operate the power switch. The battery monitor cable is connected to the unit within the access door. It is a keyed twist and turn connector.

Battery

The battery should be selected for capacity while considering the weight. The battery should be mounted such that the battery cable is free to move without strain. The battery cable is supplied with a mating high power connector and fused leads for the battery. The mating connector needs to be attached to the battery enclosure in a manner that prevents rain entry.

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System Check

Once the battery, battery monitor, and equipment are connected, turn the battery monitor switch to Standby and check that the battery voltage, battery guard voltage, and temperature are displayed. Turn the battery monitor switch to On, and verify that the battery guard voltage closely matches the battery voltage, and that the equipment is on and functioning. Ensure that the inverter switch behind the access door is on, and the attached equipment is on.

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Safety

- Charge the unit at room temperature and in a well ventilated space.
- Do not place foreign objects inside the enclosure.
- Do not operate the unit if wet. Turn off the unit and open the access door as soon as possible to drain and remove any water or dampness, and let the unit dry.
- Dispose of depleted batteries at your local battery recycler.
- Ensure that the total attached electrical load is within the limits of the inverter.
- Ensure the access door is closed to protect against rain or snow.
- To ensure the quickest battery recharge, it is recommended to not charge the battery while the inverter is running.

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Maintenance

The inverter charger unit requires little maintenance beyond replacing the battery once it has reached its end of life.

The enclosure and battery monitor can be cleaned with a damp cloth and mild soap.

Coil the charger cable and store it inside the unit when not in use.

Troubleshooting

Unit doesn't work

- check battery voltage is present when switch is in standby
- check battery guard voltage is present when switch is on
- remove and check fuse for continuity using a multimeter set to ohms
- recharge battery if voltage bargraph display is off
- open the access door and check that inverter switch is on

Overheating and Shutdown

- return equipment indoors
- allow unit to cool down before re-charging battery

Short Battery Life

- have battery checked and replace battery if necessary

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Support

Product support is available at eng@locus-engineering.com and at 613-831-2172. We also welcome your feedback in order to continually improve our products.

The E2620 Auxilliary Power Unit (APU) and Monitor is easily customizable to meet the needs for a variety of installations. Contact Locus Engineering with the details of your application at eng@locus-engineering.com

Warranty

Locus Engineering Inc. warrants this product to be free of defects in workmanship and materials for a one year period. It is understood that this unit is a prototype unit that may require modifications or improvements to meet customer requirements. This unit will be repaired or modified within the warranty period subject to the following conditions:

- the warranty will not apply to normal wear or consumable items such as batteries
- the warranty will not apply to reverse battery installation
- the warranty will not apply if unauthorized repairs or modifications are made