Hamsource EZ-Gate 80

80 Ampere OR-Gate Battery Backup System

With Three Stage Battery Charger

This is a UPS for powering the ham shack. The UPS is made from a dual Schottky diode connected as an OR-Gate. The device also has a three stage battery charger and digital metering circuit. Connections are ¼ inch studs to handle the 80 ampere capacity.

The radio, or other equipment, connects to the OR-Gate output. One input comes from the 12 volt power supply, and the other input connects to the 12 volt battery. Whichever voltage is higher passes through to the output. The unit can handle 80 amperes.

A standard 12 volt power supply for running radios has an output voltage of 13.8 volts. A fully charged battery sits at 13.5 volts. Therefore when the power is connected and operating, the power supply's current is passed through the OR-Gate. If however, the power supply turns off, then the output comes from the battery. Switching is at the speed of electrons. . . there is no glitch. So, if the power mains go out, the radio is instantaneously connected to the battery. As soon as the power is restored, the power supply will be instantaneously reconnected to the gate's output again.

The EZ-Gate 80 contains a three-stage battery charger to charge the attached lead-acid battery from the connected power supply. The charger is capable of supplying up to 20 amperes in a safe voltage-controlled manner. The three LED's indicate the charger's status.

The front panel meter displays the battery's voltage and the charging current. Also, the 3-color LED indicates the battery's go/no-go voltage.

Installation:

Place the EZ-Gate 80 in any convenient dry location. It may be fastened down using number 8 screws in the mounting holes. Make sure there is sufficient space in front of the unit to permit easy connecting to the heavy wires.

Wiring:

Plan your wiring appropriately. A system supplying and using 80 amperes needs heavy large wires (low gauge numbers), and proper lugs. Keep all leads as short as possible. Voltage drops need to be kept at a minimum. We recommend using #10 gauge wire for all short runs under 6 feet, and #8 gauge for long runs, up to 20 feet. Powerwerx.com's AZ-10 and AZ-8 wire is recommended for flexibility and utility. Use the RED colored wire for the POSITVE lead, and the BLACK colored wire for the NEGATIVE lead.

Connecting:

Always use insulated ¼ inch lugs on the wires connecting to the EZ-Gate 80. The insulated type lugs cannot short out if they were to become loose. Note that the (BLACK) NEGATIVE leads all connect to the left stud pair. The (RED) POSITIVE leads are on the right. DOUBLE CHECK THIS. Tighten down the ¼ inch nuts.

Confirming Performance

A. OR-Gate Checkout.

1. Connect the power supply and radio.

1. Turn on the power supply. The GREEN charge LED will light to confirm that power is available for charging. Turn on the radio, it should be powered.

2. Connect the battery. Turn off the power supply. The LCD meter should read the battery's voltage. The radio should now be powered from the battery.

B. Charging Circuit Checkout: Connect the power supply and battery.

1. Turn off the radio. Turn on the power supply. The GREEN charge LED will light to confirm that power is available for charging. The charging current is displayed on the LCD meter.

2. Turn off the power supply. The charging current should reduce to near 0 amps. Note that there is a residual current of 0.04 amperes and this value should be overlooked.

The Gate Circuit:

The gate circuit is made from a IXYS dual Schottky diode. This device is made to handle up to 120 amperes. We have chosen to rate the EZ-Gate 80 at 80 amperes in order to assure safe performance and reasonably low through-put voltage loss. The diode package is sturdily mounted on the bottom plate to affect good heat dissipation and lower voltage drop. The drop is 0.3 volts at 20 amperes.

The Charging Circuit.

The charger integrated circuit is an analog voltage and current regulator. It measures the battery's voltage in order to control the charging current. The charging current is limited by the circuit to be 10 amperes, or 20 amperes if the jumper (fuse) is inserted. Note: The fuse is used only as a high current jumper.

The charger has three stages: First, it applies a bulk charge current to the battery. Then, if required, it raises the end point charge voltage slightly to affect a peak (absorption) charge. And lastly, the charger regulates the current to reach and maintain the voltage at 13.5 volts. A logic circuit within monitors the charge state and the charge history to reset the charge cycle. It also decides if the battery had been discharged somewhat in order to turn on the peak voltage charge.

The battery charging circuit is a feedback circuit with relatively low forward gain. As the battery's voltage rises, the charge current continually diminishes. This assures a very safe charge. Large batteries or banks of batteries will take high current for quite a while until the charge has raised the voltage. The voltage on small batteries will rise rapidly reducing the current quickly.

Note that the charger end values are related to the power supply voltage at the EZ-Gate 80's terminal. A power supply voltage of 14 – 14.2 volts will assure meeting all end voltage and battery charging criteria. A power supply of 13.8 volts is fine, but it takes longer to fully charge to reach the float condition.

The Meter Circuit.

The meter is connected to the chargers output which is also the battery terminal. The volt reading is the battery's voltage. The ampere reading is the charging current going to the battery. It does not read the battery's discharging current. The voltmeter range is 0 – 20 Vdc, with an accuracy of + - 2 mV. The current reading is 0.04 to 20.00 amperes, with an accuracy of + - 0.04 amperes.

Note: Current readings below 0.04 amperes may not be accurate. Sometimes a voltage reading occurs when no battery is connected; it should be ignored. As soon as a battery is connected the reading will be accurate.

Operating Tip:

The OR-Gate passes current from whichever source has the higher voltage. For it to operate flawlessly, there need to be minimum voltage losses on the connecting wires. For example, if the power supply voltage is dragged down by a heavy load, then the battery will begin to supply current. So, it is extremely important to measure the voltages at the EZ-Gate 80's terminals to confirm low wiring losses under load conditions.

Specifications:

1. Operating voltage: Up to 16 volts (damage at 20 volts)2. Maximum Current: 80 amperes.

3. Gate forward voltage drop: 0.3 volts @ 10 amps

   0..5 volts @ 50 amps

4. Battery Charger:

   Green - Bulk charge - up to 10 amperes or 20 amperes w/fuse

   Red – Bulk Charge – PEAK Voltage limit is 14 volts

   Yellow – Bulk charge – FLOAT Voltage limit is 13.6 volts

   Note: Red LED when battery history showed discharge. Turns to Yellow when current is 1 ampere, or 2 amperes w/fuse in.

5. Battery Charger IC: Texas Instruments UC3906
6. Charger FET: International Rectifier IRF 5210
7. Current Sense Resistor in LCD Meter: 0.010 ohms.
8. OR-Gate Diode: IXYS # DSS2x121 005B Dual 120 Amp Schottky Diode
9. Battery LED:

    Green: 11.5 to 15 volts

    Red: Above 15 volts

    Yellow: Below 11.5 volts
10. Dimensions: 8 3/8 x 4 x 1 ½ in., 117 x 58 x 22 mm
11. Weight: 17 ounces
12. Mounting Hole Centers: Rectangular 7 7/8 x 2 9/16 in., 110 x 36 mm

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