



January 1996

# Uninterruptible Power Supply

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## Precautions

Take the following precautions when using the ABB Uninterruptible Power Supply (UPS):

1. Incorrect wiring may result in damage of battery and charger. Be sure that wiring agrees with the connection diagram before energizing this equipment.
2. Verify that VSP1 and VSP2 on the main printed circuit board are selected for the proper voltage settings (115 VAC or 230 VAC). The UPS is shipped in the 230-VAC position to prevent damage to the power supply.
3. **High-voltage insulation tests are not recommended.** If you must perform a dielectric test on the control wiring, refer to the "Testing and Maintenance" section of this instruction booklet before performing tests. Failure to comply with these instructions may result in damage to the device.
4. Do not obstruct ventilation holes on the supporting housing of the battery pack. These holes dissipate any heat generated during charging of batteries. Obstruction of these ventilation holes will affect the overall life span of the battery pack.
5. Carefully select panel locations for these devices. Batteries are subject to changes caused by temperature variation. See the "Battery Storage" section in this booklet for more information.
6. Do not leave the capacity test switch in the "ON" position during normal operation.
7. Do not short out the red terminals to the black terminal on the front panel. This will damage the batteries and the charger.
8. Under normal charging operation the latching connector connects the "CHARGER" and "BATT +" terminals.

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## **Introduction**

The ABB Uninterruptible Power Supply (UPS) provides dependable backup power to the protective relay(s) in the event that the primary power source is lost. The UPS was specifically designed for use with the ABB Distribution Protection Unit (DPU) and the ABB Integrated Microprocessor Protective Relay System (IMPRS) relays. It converts the AC line voltage to DC control voltage and continues to provide that voltage for a period of time after the AC source is lost.

The UPS is housed in a metal case suitable for conventional semi-flush panel mounting. For decreased thermal build-up, the enclosure has been designed so that the battery pack (20 D cells) can be suspended either under the battery charging unit or in a location apart from the charging unit.

The following instructions contain the information to correctly install, operate, and test the ABB Uninterruptible Power Supply.

## Installation

Follow these instructions to install the UPS.

### Receiving and Handling

Upon receipt of the UPS (when not included as a part of a switchboard), examine it carefully for shipping damage. If damage is evident, file a claim and contact your local ABB representative. Use normal care and handling to avoid damage. Keep the UPS dry and clean.

### Connecting the UPS

Use stranded # 18 AWG wire to connect the battery to the UPS. Use a Faston connector for the battery termination and a ring lug for the UPS charger termination.

The UPS charger is shipped from the factory configured for 230 VAC. If 120-VAC input power is desired, change the position of the two plugs VSP1 and VPS2, located next to the transformer in the back left corner of the charger.

Cut out a panel space according to the dimensions shown in Figure 1. Figures 2 and 3 are schematics for connecting the UPS to a non-drawout DPU and a drawout DPU, respectively.

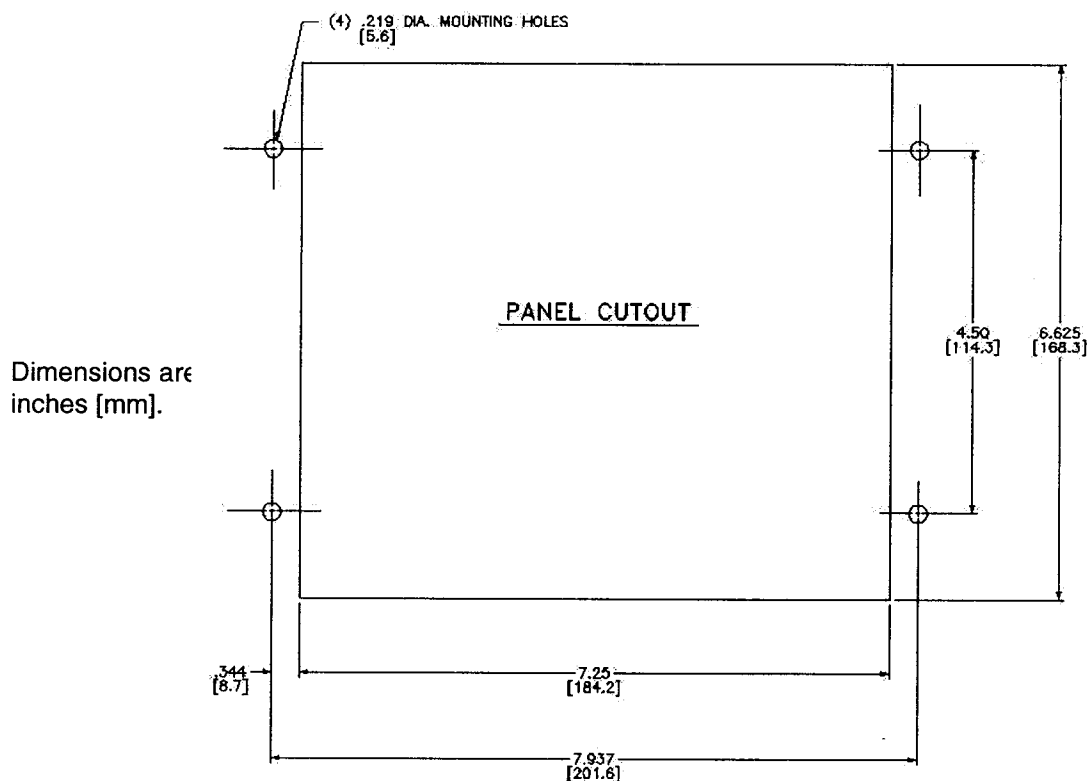
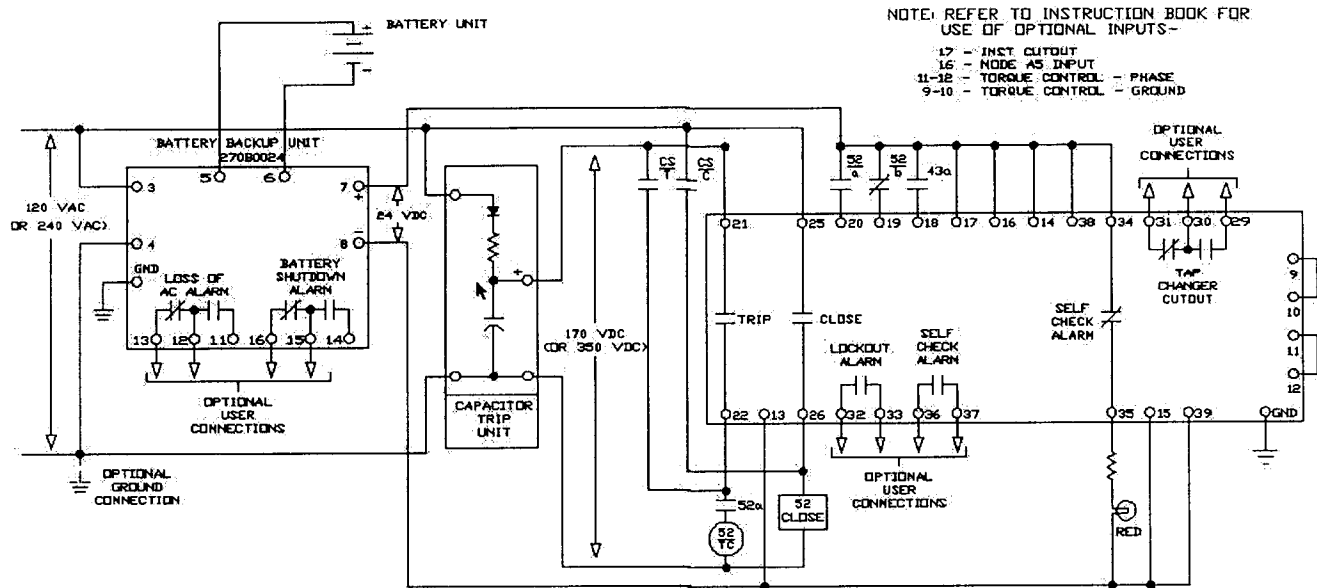
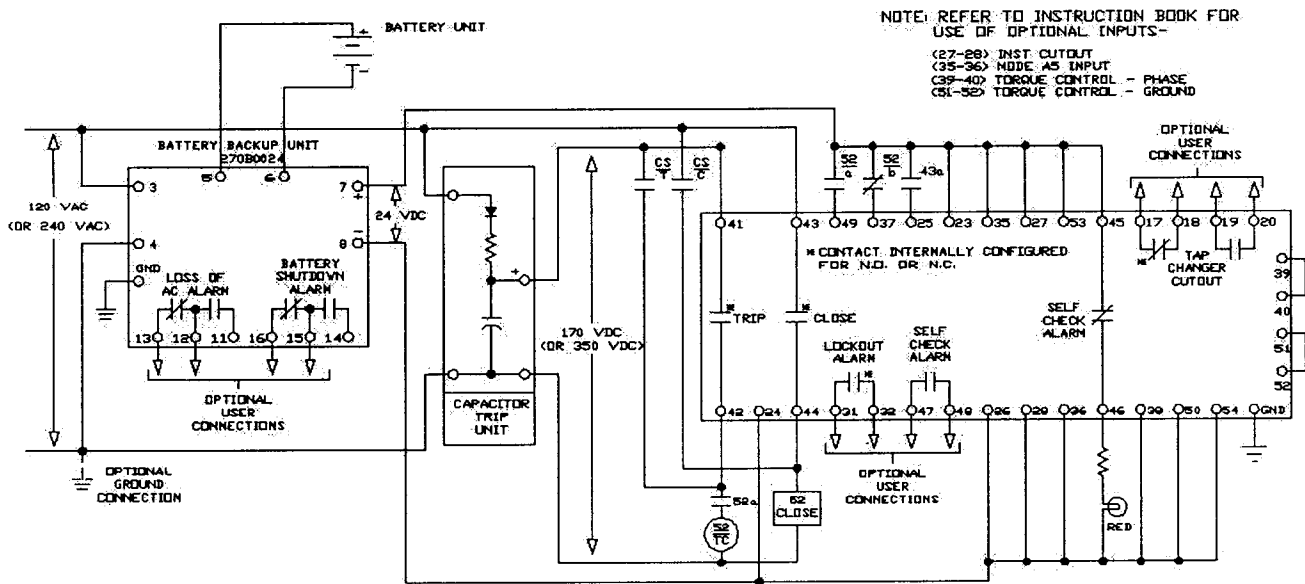


Figure 1. Panel Cutout



- NOTES:
1. DPU RATED FOR 24 VDC CONTROL.
  2. AC INPUT VOLTAGE RATING OF BATTERY BACKUP UNIT TO MATCH SOURCE VOLTAGE

Figure 2. UPS Connection to Non-Drawout DPU



- NOTES:
1. DPU RATED FOR 24 VDC CONTROL.
  2. AC INPUT VOLTAGE RATING OF BATTERY BACKUP UNIT TO MATCH SOURCE VOLTAGE.

Figure 3. UPS Connection to Drawout DPU

### **Operation**

Although the UPS requires little user interaction, the light-emitting diodes (LEDs) on the front panel indicate the status of operation. If the UPS has been in storage for a long time, you may need to manually start the unit.

#### **Starting the UPS**

The nickel-cadmium (NiCd) UPS is designed so that it can be stored for extended periods of time at room temperature in either a charged or a discharged condition with virtually no degradation in capacity or life expectancy. Even after long-term storage, just one or two normal charge/discharge cycles returns the battery to full capacity. During storage and transportation, the UPS and the 20 "D" cell pack are not connected; therefore, a battery output voltage may not be present. If AC voltage is not available to the input terminals of the UPS, you can activate the battery backup source by pressing the Manual Start (Battery) button on the front panel. Pressing the Manual Stop (Battery) button deactivates the battery start.

#### **LED Indications**

The Uninterruptible Power Supply has LEDs on the front panel that indicate the operating status of the UPS:

- AC Power
- Battery Charger
- Battery Power

Under normal operation the AC Power and Battery Charger LEDs are illuminated. The AC Power LED verifies that an AC power source is present. The Battery Charger LED confirms that the battery charging circuit is operating properly. The Battery Power LED lights when there is a loss of AC power to the charger. At this point the NiCd battery takes over as the voltage source to the load. In such a state the AC Power and Battery Charger LEDs are not lit.

If the Battery Charger and Battery Power LEDs are both illuminated, a low AC line condition exists. In this state the battery is being drained and is not properly charging.

#### **Test Terminals**

The battery test terminals are located on the front panel of the UPS for easy access during charger testing. Under normal operation the link connects the CHARGER and BATT + terminals together. A direct access to the battery terminals is available from the BATT + and BATT – terminals. You can measure the charge voltage from the battery across these two terminals with a voltmeter. A built-in 6-ohm load resistor used to test the battery's available capacity is mounted on the back of the UPS (see Figure 4).

A terminal labeled CAPACITY TEST is located on the front panel and connects to the 6-ohm load. To test the battery capacity, connect the link between BATT + and the CAPACITY TEST terminals, apply a voltmeter across the battery, and record the voltage drop over time. Do not short out the red terminals to the black terminals on the front panel. See "Battery Capacity Testing" under the "Testing and Maintenance" section of this booklet for more information.

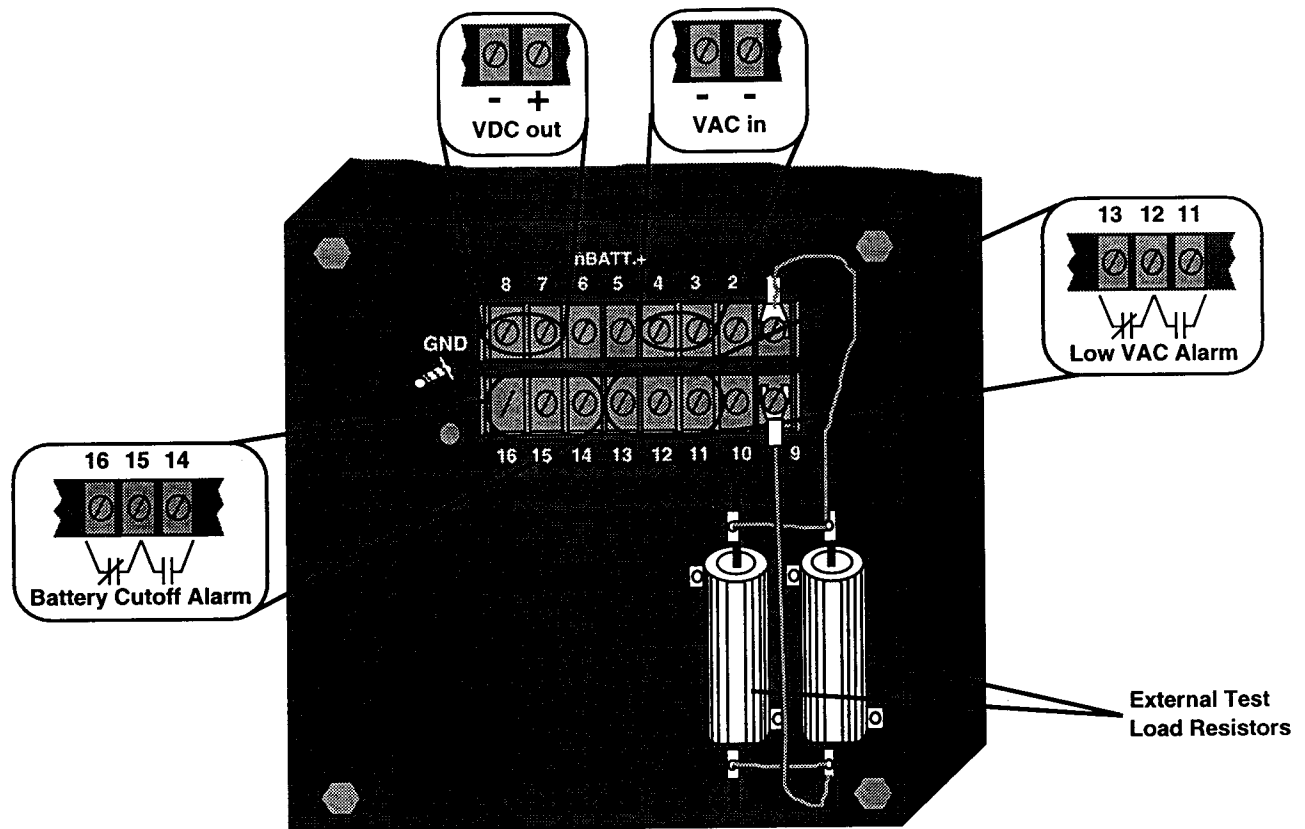


Figure 4. Rear Terminal Connections

## **Battery Life and Storage**

The battery pack contains 20 high-temperature nickel-cadmium (NiCd) "D" cells. The redesigned case dimensions are identical to the previous design and fit into the same panel cutout. The battery pack can be mounted remotely in a cooler part of the cabinet or in its support tray that attaches to the bottom two mounting bolts on the case.

Use and climate are the two biggest factors in the life of a battery in use. When a battery is being stored, climate and length of storage can affect the battery's longevity.

### ***In-Service Life***

The life expectancy of the sealed NiCd batteries is influenced by actual use, the temperature, and the charging and discharging parameters. These batteries perform best in a float state in which the battery is used primarily as a standby power source. The ideal operating temperature of NiCd batteries is at ambient temperature. However, these batteries are rated to operate within the temperature range of  $-20^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

Take precautions to avoid exposure to high temperatures. The UPS has been designed so that the battery pack can be mounted in the coolest part of the cabinet apart from the charging unit, or it can be suspended from the charger unit, depending on climate conditions.

### ***Storage (Shelf Life)***

The nickel-cadmium batteries may be stored for extended periods of time. At room temperature they gradually self-discharge over a period of three to six months from full capacity. To ensure maximum life capacity, avoid long exposure of the UPS to temperature extremes. Refer to the "Specifications and Tolerances" section of this booklet for temperature ranges. The batteries can continue to be stored in a discharged state without any damage to their life expectancy. To ensure long life, keep the batteries in moderate temperatures (room temperature or less) and store them in an open-circuit state.



## **Maintenance and Testing**

Periodically check the capacity and operation of the batteries.

### **Maintenance**

Check the batteries once a year to assure that they are maintaining at least 80% of their full capacity and that the continuous charging current between battery charger and battery is between 220mA–280mA.

### **Testing**

You can check the operation of the UPS by running these tests:

- High-potential testing
- Acceptance testing
- Battery Capacity testing
- Charging Current testing

#### **High-Potential Testing**

When performing high-potential tests on control wiring, disconnect the batteries and all wires from the rear terminal blocks.

#### **Acceptance Testing**

Because the batteries are shipped in a discharged state, the UPS must be energized to allow the batteries to achieve 100% capacity. After the batteries have finished charging:

1. Remove the AC voltage.
2. Verify that the loss of AC alarm contacts have changed states.
3. Measure the output voltage at the battery terminals. Voltage should be 24 VDC nominal (20 VDC to 28 VDC).

### Battery Capacity Testing

You may need to perform periodic capacity testing on the batteries. This test gives you an idea of approximately how much life is left in the batteries. Follow these steps to test the battery capacity.

1. Connect the UPS as shown in Figure 5.
2. Apply the rated AC voltage to the UPS, allowing the batteries sufficient time to fully charge.
3. After the battery has fully charged, place the terminal connector link between the BATT + and CAPACITY TEST terminals.
4. Turn the Capacity Test switch on. This places a 6-ohm resistive load on the battery.
5. Monitor and record the time it takes for the battery's voltage to drop below its cutoff voltage of 18 VDC (0.9 VDC per cell).
6. Turn off the Capacity Test switch to remove the load and avoid deep discharging the battery.
7. The batteries are rated at 4.3 A-hrs. The capacity test load current is about 4 A. This implies that a battery with a full capacity has a lifetime of about 30 minutes with a 6-ohm load. If the battery has only 0.5 of its capacity, it lasts about 15 minutes with the same load. Temperature affects these rates. Therefore, for best results perform tests at ambient temperature (23° C).
8. Place the UPS back in service by inserting the terminal connector link between the CHARGER and BATT+ and by restoring the AC voltage to the input circuit.

**Note:** The battery cutoff contacts are disabled when the Capacity Test is performed; therefore, when monitoring the time to discharge, you must manually stop the timer when  $V_{batt}$  approaches the cutoff voltage of 21.3 VDC.

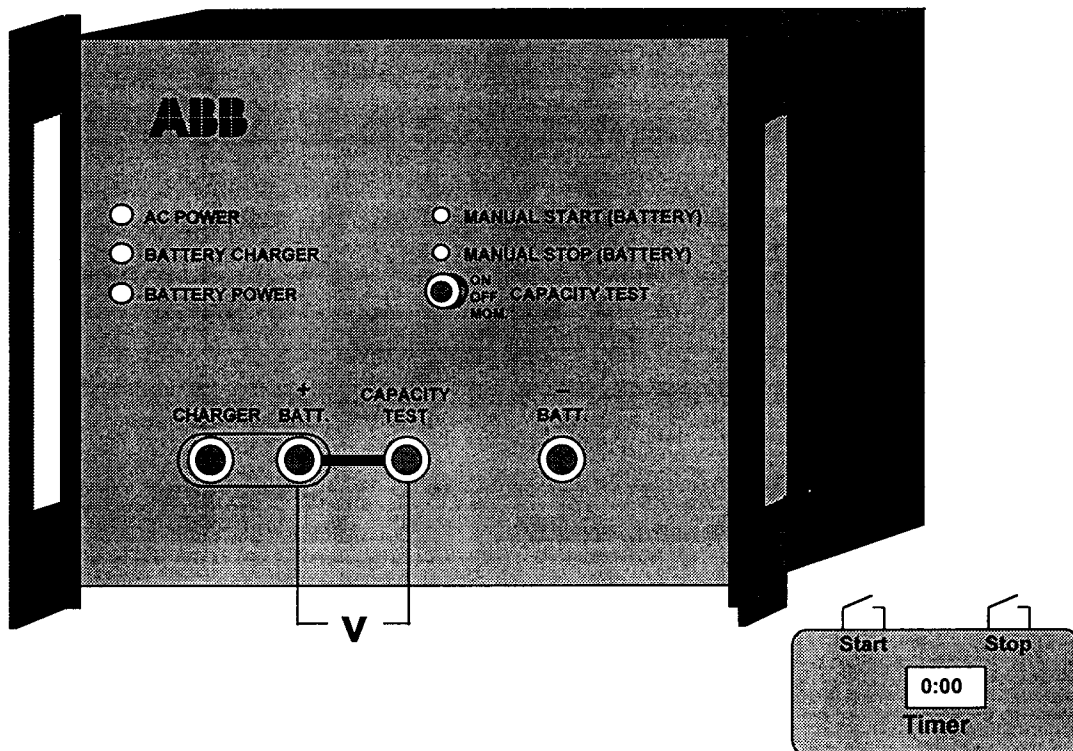
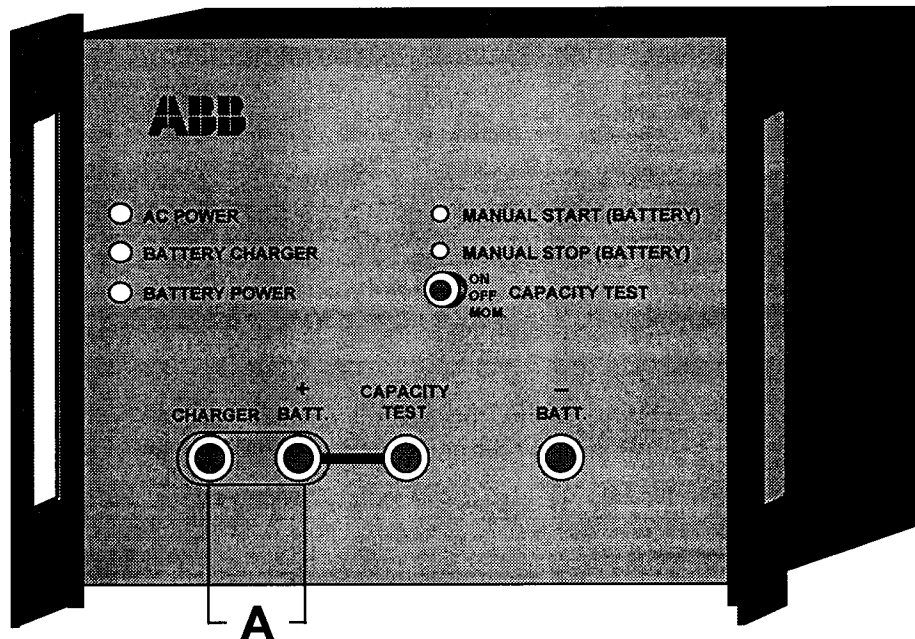


Figure 5. Capacity Test Wiring

## Charging Current Testing

Measure the battery charging current by installing an ammeter between the terminals labeled CHARGER and BATT + and then opening the shorting link between the two terminals (see Figure 6). Follow these steps to measure the charging current:

1. Connect an ammeter between the terminals labeled CHARGER and BATT +.
2. Remove the terminal connector link.
3. Monitor the charging current supplied by the UPS to the batteries. The current value should read between 220 mA and 280 mA.
4. Replace the terminal connector link when testing is complete.



**Figure 6. Charging Current Test Wiring**

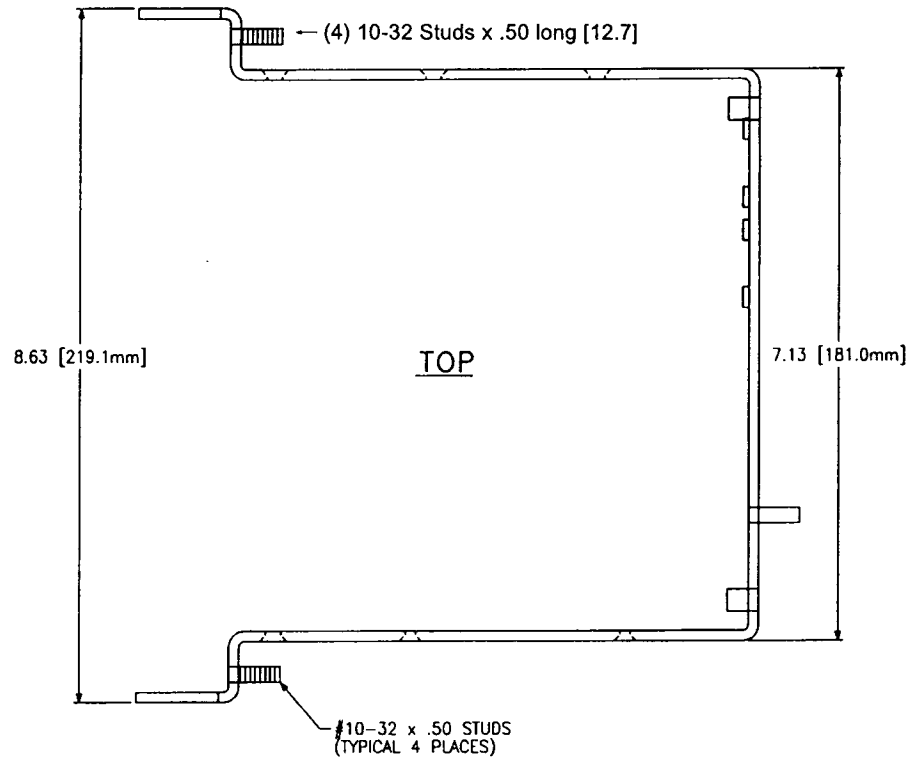
## Ratings and Tolerances

Table 1 shows the ratings and tolerances of the battery pack and the charger.

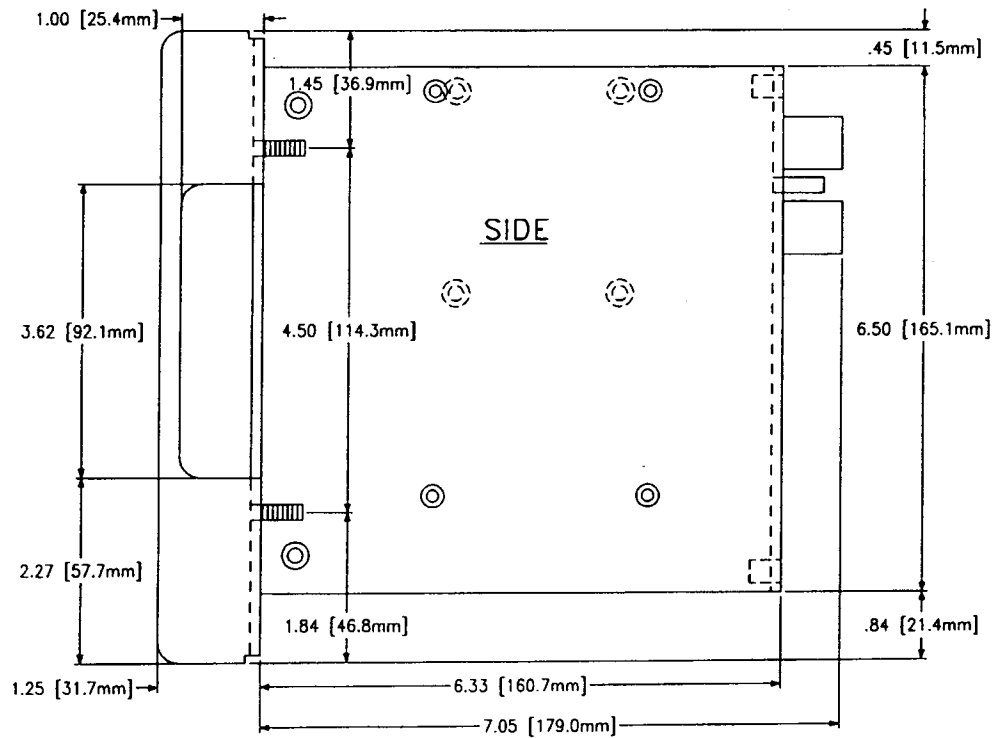
**Table 1. Ratings and Tolerances**

Parameter	Description
Battery Charger Cut off	$V_{out} = 21.3 \text{ VDC} (\pm 1.1 \text{ VDC})$ $V_{batt} = 23 \text{ VDC} (\pm 1.1 \text{ VDC})$
Low AC Cut off @ 120 VAC @ 230 VAC	$V_{in} = 95 \text{ VAC} (\pm 5 \text{ VAC})$ $V_{in} = 190 \text{ VAC} (\pm 10 \text{ VAC})$
Battery Charging Current	$I_{batt} = 250 \text{ mA nominal} (\pm 30 \text{ mA})$
Battery Voltage at Full Charge	$V_{batt} = 26 \text{ VDC} (\pm 2 \text{ VDC})$
UPS Charger Control Power	115 VAC nominal (104ñ127 VAC); user-configurable
Output	230 VAC nominal (208ñ254 VAC); 56 VA 24 VDC nominal (20ñ29 VDC) 0.75 ADC maximum load
Operating Temperature	ñ30°C to 70°C
NiCd Battery Pack Battery Type	Nickel cadmium (NiCd), high-temperature cells
Size	Twenty "D" cells, 1.2 V per cell
Capacity	4.3 A-hrs
Temperature Ranges	Storage: ñ40°C to 70°C Discharge: ñ20°C to 70°C Charge (standard): 0°C to 70°C

## Dimensions



Dimensions are inches [mm].



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**Ordering Information**

Catalog Number	Description
270B0024	UPS charger, NiCd battery pack (20 "D" cells), and the battery support tray
270B0024-LB	UPS charger and the battery support tray
270B0024-LT	UPS charger and the NiCd battery pack (20 "D" cells)
612024-T2	NiCd battery pack (20 "D" cells) only