



**Technical Diagnostic Services Training Institute**

## **Uninterruptible Power Supply (UPS) Systems and Battery Maintenance 36 Hours**

### **Who Should Attend?**

Supervisors, electricians, technicians and others who need an understanding of the principles and techniques of UPS and Battery testing and maintenance.

### **Course Description:**

The course begins with a discussion of the need for UPS systems with comparisons between various UPS topologies and their modes of operation. Battery fundamentals are discussed next including operation, maintenance, safety, and testing. A solid working knowledge of the typical electrical components found within a UPS system is developed before exploring how AC is converted to DC and then inverting DC back to AC.

When all of the above elements of a UPS are understood, a theoretical rectifier and inverter feedback loop are thoroughly discussed. This will be followed by a trouble shooting exercise. The students are given failure scenarios where they work in groups to find which circuit component has opened, shorted or significantly changed in value to produce the alarm condition described. The course finale includes a general discussion on UPS system troubleshooting.

### ***TDSTI***

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## Technical Diagnostic Services Training Institute

### Outline:

#### **I. UPS Operation Overview**

- A) The Need for UPS System
- B) Power System Disturbances
- C) Basic Type of UPS Systems

#### **II. Battery Maintenance**

- A) Battery Cell Operation
- B) Battery Safety Hazards
- C) Battery Inspections

#### **III. Passive Electronic Components**

- A) Resistors Circuits
- B) Capacitor Circuits
- C) Inductor Circuits

#### **IV. Semiconductors**

- A) Diodes
- B) SCR's
- C) Transistors

#### **V. Logic Gates**

- A) AND/NAND Gates
- B) OR/NOR Gates
- C) Inverter Gate
- D) D Type Flip Flop
- E) XOR/XNOR Gates

#### **VI. Operational Amplifiers**

- A) Inverting Op Amp
- B) Non-inverting Op Amp
- C) Differential Op Amp
- D) Unity Gain Op Amp
- E) Summing Op Amp
- F) Integrating Op Amp
- G) Comparator Op Amp

#### **VII. AC to DC Conversion**

- A) Full Bridge
- B) Three Phase
- C) Six Pulse

#### **VIII. DC to AC Inversion**

- A) Quasi Square wave
- B) PWM waveform

#### **IX. UPS System Overview**

- A) Rectifier Stage
- B) Inverter Stage

#### **X. UPS System Trouble Shooting**

- A) Basic Use of Test Equipment
- B) Rectifier Trouble Shooting
- Inverter Trouble Shooting

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