

# SOLAR PV TROUBLESHOOTING LEARNING SYSTEM

950-SPT1



Required 95-SPA1

Installing and maintaining solar photovoltaic (PV) systems requires hands-on skills and troubleshooting ability across the types of PV systems commonly used such as AC, DC, and grid-connected. Budding engineers and designers need to understand the technologies used in these systems as well.

**CURRICULUM IS THE KEY TO LEARNING**

## Learning Topics:

- Module Operation
- PV Module Performance
- PV Array Connection
- Solar Batteries
- DC Solar PV Systems
- Charge Controllers
- AC Solar PV Systems
- PV Inverters
- Grid-Connected Systems
- Energy Conservation & Demand
- Solar PV System & Component Sizing
- Solar PV System Performance
- Troubleshooting Components
- System Troubleshooting
- PV Maintenance

Amatrol's 950-SPT1 Solar Photovoltaic Troubleshooting Learning System allows students to develop the specialized skills and knowledge needed for working with the common types of PV systems. The 950-SPT1 teaches students connection, operation, programming, and troubleshooting of AC/DC and grid-connected systems. The curriculum is PC-based multimedia that is highly interactive. It allows students to use the learning style best for them – reading, listening, visual. The 950-SPT1 supports the NABCEP (North American Board of Certified Energy Practitioners) test for Certified Solar Photovoltaic System Installer.

The 950-SPT1 includes all components needed to develop hands-on, job-ready skills: all solar specific components as well as balance of system items. The learning system contains a mobile workstation, component panels with breakers, combiner box, MPPT charge controller, lamps, batteries, meters, grid-connected inverter, a fault insertion system, PC-based multimedia student curriculum, and instructor's assessment guide. The required 95-SPA1 two-panel array provides a complete solar PV troubleshooting experience.



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# DESIGNED FOR LEARNING

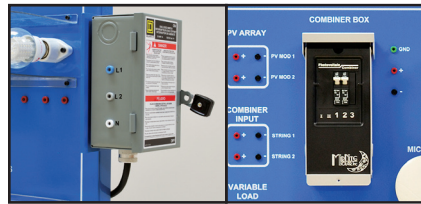


**Student Reacting to Electrical Fault**

can identify specific areas the student needs to improve and target those areas. It also allows instructors to set-up faults ahead of time, allowing students to perform self-directed study when appropriate.

## Balance of System Components – Replicates Real World PV System

Developing installation and troubleshooting skills for PV systems requires all the components commonly found in these systems. Elements included on the 950-SPT1 such as power distribution panels, a combiner box, disconnects, and circuit breakers are essential to create realistic systems and troubleshooting situations.



**Circuit Breaker**

**Combiner Box**

## Grid-Connected and Micro Inverters

Solar applications are increasingly including grid-connected capability. In fact, grid-connected is the most common type of PV system being purchased today. This is a key component that allows maximum economic return – owners can sell excess power to the utility. Likewise, when solar power is not sufficient, additional power is often needed from the electrical grid.

Amatrol's 950-SPT1 includes a micro inverter in addition to the grid-tie inverter. This is also a very popular option that is frequently used to assign an inverter to each PV string. Both of these inverters are required to teach skills across all major types of AC systems including stand-alone AC, grid-connected AC, and grid-connected AC with storage.



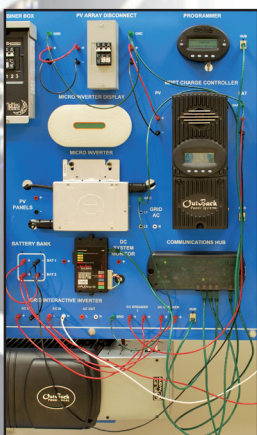
**Grid-Connected & Micro Inverters**

## Modern Communications and Programming

Modern solar technology installations frequently include network communications. The inverters and charge controller on Amatrol's Solar PV Troubleshooting enable students to learn how to network system components. Students also learn how to troubleshoot at the system level as well. The inverter and charge controller feature many modern programming capabilities which allow students to learn how to program the more sophisticated systems they are likely to encounter.

## Mobile, Multiple PV Panels (Required 95-SPA1 Solar PV Array Station)

The required PV array for the 950-SPT1 contains multiple panels so that students can learn to connect a realistic array. Most solar technology applications have multiple panels. Students need to learn about the effects of series and parallel connections, which require more than one panel. Additionally, the 95-SPA1 Solar PV Array Station is mobile, allowing instructors to take advantage of sunny days without having to move the entire trainer. The array is equipped with sun simulation as well to enable indoor use.



**Mate & Network Cables**

## TECHNICAL DATA

### PV Systems Configurations

Pre-mounted components that allow creation of the following PV systems:

- DC charge controlled
- AC stand-alone
- AC grid-connected without battery backup
- AC grid-connected with battery backup

### Mobile Workstation

- Dimensions 72" (183 cm) L x 72" (183 cm) H x 28" (71 cm) W
- Swivel casters (4) with 2 locking
- Square tube steel, welded and braced

### Component Panels

The panels include the following components:

- DC disconnect switch with breaker
- AC disconnect switch with breaker
- Battery bank disconnect Switch with breaker
- Grid-tie inverter, 2.5kW
- MPPT charge controller with built-in programming interface
- Remote programmer unit for both charge controller and inverter
- Software for programming and monitoring
- Combiner box
- Bypass diode
- DC Distribution panel with breakers
- AC Distribution panel with breakers
- Utility power meters
- Ground fault detection and interruption device
- Surge arrester
- DC-AC inverter
- AC lamps
- DC lamps
- DC-powered fan
- Manual switches
- Battery bank interface connection panel
- Batteries, AGM sealed type, 12 volt
- Lockout / tagout kit
- Interface connector to separate PV array
- Connector lead set
- Multi-meter
- Clamp-on ammeter
- Wattmeter

### Fault Insertion System

- Faults to recreate actual component and system failure
- Troubleshooting test points for systems-level troubleshooting without disassembling components
- Electrical fault insertion using a computer-based fault insertion system, which includes PC-based software for control and tracking.

### Multimedia, PC-Based Student Curriculum, M20104 Instructor's Assessment Guide, C20104



**95-SPA1**