Universal Protective Relay Test Set

MULTI-AMP® Model SR-90

- **Digital metering**
- **Memory ammeter**
- **Units 1 and 2 work independently**

DESCRIPTION

The Multi-Amp® Model SR-90 Universal Protective Relay Test Set is a multipurpose, two-piece test set that accurately and efficiently tests electromechanical and solid-state protective relays.

Model SR-90 is a versatile protective relay test set that is field portable and has sufficient power (1.4 kVA) for testing any protective device requiring up to 420 amperes.

Model SR-90 is designed so the main control section (Unit 1) and the auxiliary section (Unit 2) can be used independently for testing simple protective devices.

To perform testing of more complex relays, Units 1 and 2 are easily interconnected to provide four simultaneous outputs of ac current or ac voltage, and dc current or dc voltage.

APPLICATIONS

Model SR-90 is designed for calibrating, acceptance testing and troubleshooting of protective relays, small molded-case circuit breakers and motor overload relays, and for timing circuit breakers.

This test set is ideal for field, shop or laboratory use at utilities, manufacturing plants, commercial complexes or other facilities that perform preventive maintenance on electrical equipment.

Types of Relays Model SR-90 Will Test

Table I - Unit 1

Relay Types	IEEE Device Number
Voltage-Controlled Overcurrent	27/51
Instantaneous Overcurrent	50
Overcurrent	51
Reclosing	79
Tripping	94
Molded-Case Circuit Breakers*	52
Motor Overload*	51/86

*The 140-ampere output tap may be overloaded up to three times its rating for short-time overloads.

Table II - Units 1 and 2

Relay Types All those in Table I plus:	IEEE Device Number
Time Delay	2
DC Under/Overcurrent	37/76
Under/Overvoltage	27/59
Directional Overcurrent	67
Ground Directional Overcurrent	67N
Differential	87

Table III - Units 1 and 2
With Either Model EPS-1000A or PVS-1000 Phase Shifters

Relay Types	IEEE Device Number
Distance	21
Synchronizing	25
Directional Power	32
Negative Sequence Overcurrent	46

FEATURES AND BENEFITS

The Control Unit—Unit 1

Includes the main current transformer with five selectable current ranges of:

0 to 8.75 amperes at 0 to 160 volts
0 to 17.5 amperes at 0 to 80 volts
0 to 35 amperes at 0 to 40 volts
0 to 70 amperes at 0 to 20 volts
0 to 140 amperes at 0 to 10 volts

- Also features four selectable ammeter ranges of 2 amperes, 20 amperes, 200 amperes and 2 kiloamperes.
- Memory ammeter provides preset test currents when testing small, molded-case circuit breakers and motor overload relays. Reduces preheating the relay under test, thus avoiding the possibility of producing erroneous test current readings. Pinpoints instantaneous pickup points on overcurrent and current differential relays.
- Incorporates a metered voltage range of 0 to 160 volts using the 8.75 ampere tap with the ac voltmeter selectable to either 20 or 200 volts.
- Selectable dc current or voltage is provided with output ranges of 2 amperes dc or 5 amperes dc and 150 Vdc or 300 Vdc.
- Solid-state, multifunction, digital timer.

The Auxiliary Unit—Unit 2

Includes outputs for:

- Additional ac current source with a range of 0 to 25 amperes and ac voltage source with selectable ranges of 0 to 300 volts or 0 to 600 volts.
- Harmonic restraint test source for providing half-wave rectified dc current from the 0 to 25 ampere output.
- AC initiate switch for energizing the test set in normal mode (connected to Unit 1), or in the bypass mode when it is operating as a stand-alone unit.

Also includes:

- An ac/dc voltage source, with selectable ranges of either 0 to 150 volts or 0 to 300 volts.
- A voltage relay section for dynamic testing voltage relays.
- A directional element test section for testing single-phase, directional elements with five calibrated values.
- The capacity to measure external ac or dc voltage when connected to Unit 1.
- A 500-Vdc insulation resistance test section.

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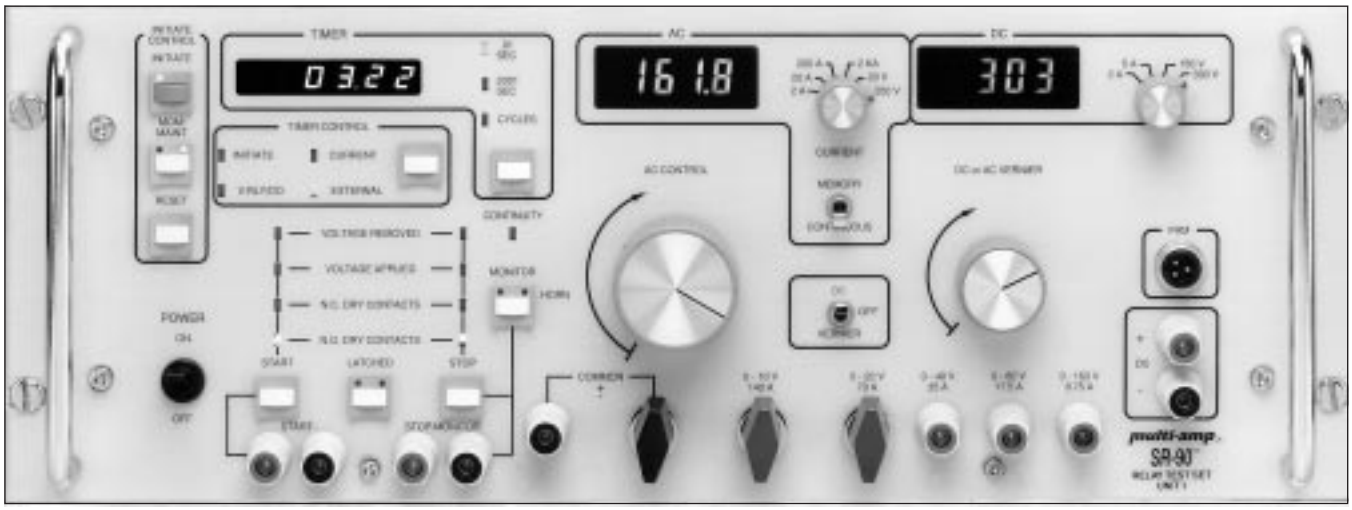
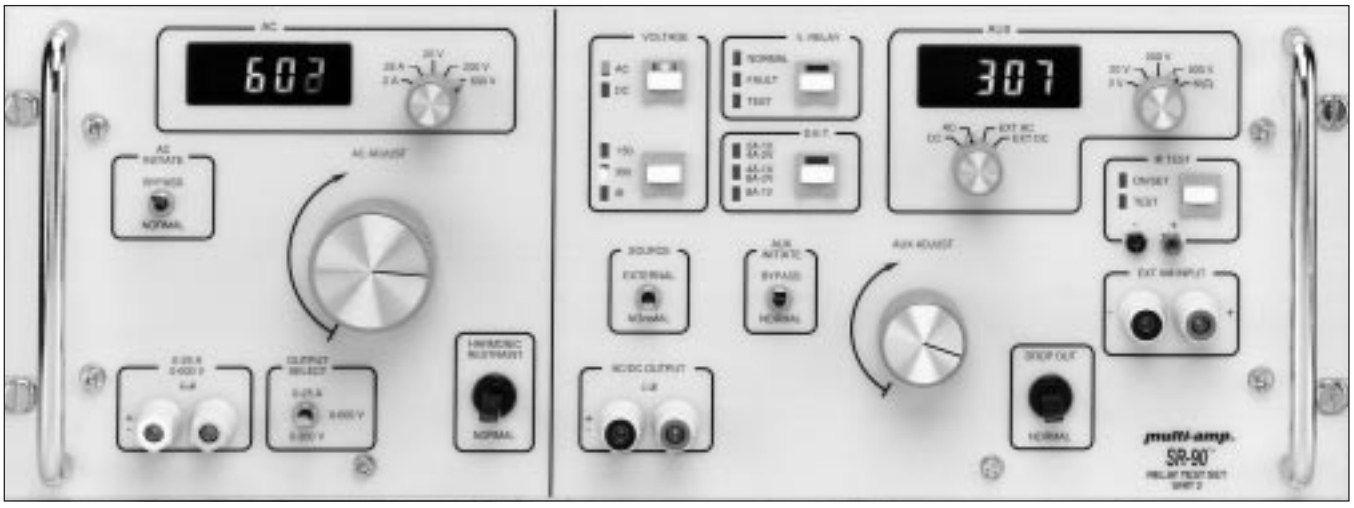


The Control Unit (Unit 1) of Model SR-90



The Auxiliary Unit (Unit 2) of Model SR-90

Model SR-90, with Units 1 and 2 stacked, tests a current differential relay in a panel.

Other Features and Benefits of Model SR-90

• **High-accuracy, all-digital metering:** This eliminates interpolation of readings associated with analog meters and allows the user to be more productive by taking faster more accurate readings of voltage and current.

• **Digital timer:** Multifunction, switch-selectable timer increases accuracy and flexibility with independent start and stop gates. Eliminates the need for a separate timer for timing circuit breakers. In addition, reclosing relays can be timed cumulatively.

• **Easy-to-read, backlit LED displays:** All-digital 3½ digit,0.5 in. (12 mm) displays allows current or voltage values to be read in all light levels, including direct sunlight and low-light conditions.

• **Initiate control circuit:** This provides both momentary and maintain modes to control output duration.

The momentary mode, in conjunction with the memory ammeter, permits "pulsed" application of the output to avoid damage or overheating of the relay while setting the test current.

In maintain mode, the output remains energized until turned off manually, or until a relay under test operates, which stops the timer and de-energizes the output automatically. An external jack is included to initiate output away from the test set.

• **Higher ac voltage output:** Unit 2 features a 0 to 600 volt output terminal for testing relays rated up to 600 volts.

• **Two high-capacity ac current outputs:** Output channels are designed to operate entirely independently of each other. One current channel provides five adjustable ranges, each rated at 1.4 kVA.

The second channel is continuously adjustable from 0 to 25 amperes at 1 kVA — more than sufficient capacity to perform slope tests on high-impedance current differential relays.

• **EMI and RF shielding:** Shielding reduces interference and prevents misoperation when using the test set in EHV switchyards and near portable two-way radios.

• **Environmentally tested:** To simulate the worst field conditions possible, Model SR-90 has been tested and qualified in accordance with Military Standard MIL-STD-810 for temperature, shock and vibration resistance.

The units are forced-air cooled to extend operation of the test set in high ambient temperatures. They will provide rated output at 122° F (50° C) for 5 minutes with an equal cool-down time.

• **Rack mountable:** Fixtures are provided for easy mounting in a standard, 19 in. (483 mm) rack.

• **Rugged, weatherproof enclosure:** In addition, Model SR-90 may be ordered in a rugged, portable enclosure.

The ribbed enclosure is made of durable, medium-density, polyethylene plastic—flexible enough to absorb shocks and vibration, yet lightweight.

The specially designed ribs add strength and protect the latches and handles during rough handling.

The units are easily stacked with the ribs acting to interlock both units together.

The enclosure is completely weather-proof and noncorrosive. The gasketed, tongue-and-grooved aluminum valance of the front and back lids and the lock-down, military-style latches protect the test set from dust and water intrusion.

The front and back lids can be removed quickly when putting the unit into service, yet remain sealed and secure during transport or storage.

• **Internal structure:** Panel-mounted printed circuit boards with locking ribbon connections improve reliability and make Model SR-90 easy to service.

SPECIFICATIONS

Input

115 V ±10%, 50/60 Hz, 1ϕ

OR

230 V ±10%, 50/60 Hz, 1ϕ

Outputs

Unit 1

0 to 140 A ac at 10 V
0 to 70 A ac at 20 V
0 to 35 A ac at 40 V
0 to 17.5 A ac at 80 V
0 to 8.75 A ac at 160 V
0 to 5 A dc at 8 V
0 to 150 Vdc at 1.0 A
0 to 300 Vdc at 0.5 A

Unit 2

0 to 25 A ac at 40 V
0 to 300 Vac at 0.5 A
0 to 600 Vac at 0.25 A
0 to 150 Vac at 1.0 A
0 to 300 Vac at 0.5 A
0 to 150 Vdc at 1.0 A
0 to 300 Vdc at 0.5 A
0 to 500 Vdc

Instrumentation

Model SR-90 features all-digital instrumentation with 3½-digit, 0.5-in. (12-mm) backlit LED displays. All accuracies are stated for 10 to100% of range.

Unit 1—Control Unit

AC Ammeter/Voltmeter

Ranges (switch-selected)

0 to 1.999/19.99/199.9/1999 A
0 to 19.99/199.9 V

Accuracy: ±1% of reading, ±1 digit

DC Ammeter/Voltmeter

Ranges (switch-selected)

0 to 1.999/5 A
0 to 199.9/300 V

Accuracy: ±1% of reading, ±1 digit

Unit 2—Auxiliary Unit

AC Ammeter/Voltmeter

Ranges (switch-selected)

0 to 1.999/25 A
0 to 19.99/199.9/600 V

Accuracy: ±1% of reading, ±1 digit

Multifunction AC/DC Voltmeter/ Insulation Tester

Voltmeter also may be used as an independent instrument in conjunction with the voltmeter selector switch to measure external ac or dc voltages up to 300 V, or insulation resistance.

Ranges (switch-selected)

Voltage: 0 to 1.999/19.99/ 199.9/500 V

Accuracy: ±1% of reading, ±1 digit

Resistance: 0.1 to 19.99 MΩ

Timer—Unit 1

The solid-state, digital timer measures the elapsed time of the test in either seconds or cycles.

Extensive noise-suppression circuitry and shielding are incorporated to ensure accurate and reliable operation under the most demanding field conditions.

The timer also utilizes a crystal-controlled oscillator allowing timer accuracy to be unaffected by the power line frequency.

Display: 6-digit, 0.3 in. (7 mm) LED display

Ranges (switch-selected)

0 to 99.9999 s
0 to 9999.99 s
0 to 99999.9 cycles

Accuracy: ±0.005% of range, ±1 digit in the seconds mode; ±0.5 in cycles mode

Start/Stop Gates

Two independent pushbuttons provide these timer operating modes:

- Timer starts/stops when dry contact is opened/closed.
- Timer starts/stops when voltage is applied/removed; ac potential (60 to 300 V rms) or dc potential (5 to 300 V).
- Timer starts when output is initiated.
- Timer stops when output current is interrupted.

Latch On/Off

A four-function pushbutton is used with the start/stop pushbuttons and start/stop binding posts to increase control over starting and stopping the timer.

Operating Temperature

32 to 122° F (0 to 50° C)

Storage Temperature

-4 to +158° F (-20 to +70° C)

Dimensions

With Lids On

10.75 H x 21 W x 24.5 D in.
273 H x 533 W x 622 D mm

With Lids Off

10.75 H x 21 W x 18.5 D in.
273 H x 533 W x 470 D mm

Weight

With Lids On

Unit 1: 80 lb (36 kg)
Unit 2: 72 lb (33 kg)

With Lids Off

Unit 1: 74 lb (34 kg)
Unit 2: 66 lb (30 kg)

ORDERING INFORMATION

Item (Qty)	Cat. No.
Model SR-90 with 115-volt input, 50/60 Hz in standard enclosure	
Units 1 and 2	SR-90-115
Unit 1 only	SR-90-115-1
Unit 2 only	SR-90-115-2
Model SR-90 with 115-volt input, 50/60 Hz without enclosure, for rack mounting	
Units 1 and 2	SR-90-115/RK
Unit 1 only	SR-90-115-1/RK
Unit 2 only	SR-90-115-2/RK
Model SR-90 with 230-volt input, 50/60 Hz in standard enclosure	
Units 1 and 2	SR-90-230
Unit 1 only	SR-90-230-1
Unit 2 only	SR-90-230-2
Model SR-90 with 230-volt input, 50/60 Hz without enclosure for rack mounting	
Units 1 and 2	SR-90-230/RK
Unit 1 only	SR-90-230-1/RK
Unit 2 only	SR-90-230-2/RK

Included Accessories

Carrying case for the following standard accessories	11437

Item (Qty)	Cat. No.
Cables (Unit 1)	
Input power cable	14460
Remote initiate cable	12806
Phase ref. cable	
Power cord body adapter, 15 A/20 A	12793
Cables (Unit 2)	
Input power cable	12684
Interconnect power cable to Unit 1	12685
Interconnect control cable to Unit 1	12681
Fuses [5 each]	
0.5 A, 250 V	982
1.0 A, 250 V	4139
1.5 A, 250 V	950
5.0 A, 250 V	952
8.0 A, 250 V	962
15.0 A, 250 V	963
Test leads (Unit 1)	
Ground [1]	11258
Current [1 pr]	15922
Voltage [3 pr]	1282
Test leads (Unit 2)	
Current [1 pr]	15922
Voltage [2 pr]	1282
High-voltage [1 pr]	1125
Instruction manual	12675