ULTRA-TECH
Enterprises, Inc.

INSTRUCTION and OPERATIONS MANUAL

for

RELAY TESTER w/TIMER/COUNTER

MODEL NUMBER 15967-00

CAUTION

Be sure to read and become thoroughly familiar with the entire contents of this manual before attempting to operate the "**R**elay **T**ester **w/T**imer**/C**ounter."

DOCUMENT NO. 15967-99 Rev B

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GENERAL DESCRIPTION

The "**R**elay **T**ester **w/T**imer**/C**ounter" is an electronic device designed to enable an operator to measure the voltage and current characteristics of both AC and DC relays. It also measures the relay actuation and de-actuation time as well as testing the Code Rate and Duty Cycle of a self-cycling Code Relay. The relay tester relies on external power to provide voltage to the relay under test. The relay tester features its own digital multimeter, a polarity switch, an amp/voltage selector switch, and a timer switch. The portable relay tester includes test leads and battery leads, and is housed in a durable, weather resistant, carrying case. The lid is easily removable for operational versatility.

The "**R**elay **T**ester **w/T**imer**/C**ounter" uses two power rheostats to control the output voltage to the coil of the relay under test. One control is for fine adjustment, and the other is for coarse adjustment. The digital multimeter requires no connection to the relay under test as it is connected through the control switch to the relay terminal on the tester. Testing of relays with this test equipment is for **"OUT OF CIRCUIT"** relays only. It is for bench testing only.

Control Panel

1. *NORM/REV Switch* Reverses the polarity of the relay output jacks. With the switch in the *NORM* position, the red post is positive and the black is negative. When switched to the *REV* position, black is positive and red is negative. The meter reads negative values when the switch is in the reverse position.

2. *AMPS/VOLTS Switch* This switch controls the manner in which the digital multimeter is connected to the Relay Terminals. In the *AMPS* position, the meter is connected in series with the relay terminals for current measurement. In the *VOLTS* position, the meter is connected across the relay terminals for voltage measurements across the relay coil.

3. *Relay Terminals* The relay terminals are standard banana jacks and are used to connect the relay under test to the relay tester. The polarity of the relay terminals is controlled by the *NORM/REV* switch.

4. *Battery Terminals* These terminals are standard banana jacks and are used to connect an external battery or AC power source to the relay tester. The red jack is positive and black is negative.

5. *Meter Lead, Volts t*his meter lead is connected to the Volt/Ohm input jack of the meter.

6. *Meter Lead, Common t*his meter lead is connected to the Common input jack of the meter.

7. *Meter Lead, Amp* This meter lead is connected to the Amp input jack of the meter, and is normally plugged in to the 2 A Max jack on the meter. This is the fused current input of the meter.

8. *Digital Multimeter t*he digital multimeter in the relay tester is wired to the tester to eliminate any additional connections from the meter to the relay under test. The connection type is controlled by the *AMPS/VOLTS* Switch. The meter must be turned on and the proper measurement function selected to correspond to the measurement mode selected by the *AMPS/VOLTS* selector switch. For complete meter operating instructions and specifications please refer to the meter operations manual which is included with your relay tester.

9. *CB1, CB2 and CB3* ,CB1 and CB2 are 2 amp circuit breakers which provide input current overload protection for the relay tester, where as CB3 provides output current overload protection. If one of these breakers trips, review the setup and operation procedure for the relay tester to make sure the tester is properly connected. After verification of connections, turn the relay tester off, and push the tripped circuit breaker to reset.

10. *Fine Adjust Control t*his control varies the voltage output to the relay coil of the relay under test.

11. *Coarse Adjust Control* this control varies the voltage output to the relay coil of the relay under test.

12. *Panel Access Screws* these five screws hold the front panel into the relay tester case and require removal to replace the meter battery.

13. *PICK/DROP Switch t*his applies or removes the voltage to the relay coil via the RELAY terminals. (PICK-ON/DROP-OFF).

14. *COUNT/STOP Switch t*his control allows the timer to COUNT or causes the timer to STOP counting. With Relay contacts connected, it will display Pick-UP and Drop-AWAY TIME. With no relay contacts connected, it will display elapsed time.

15. *MODE Button*:
    SEC selects Seconds, counts in increments of tenths of seconds to 99.9 seconds.
    MIN selects Minutes, counts in increments of tenths of minutes to 99.9 minutes.
    CPM selects Code Rate.

16. *RESET Button*: Resets counter to zero.

17. *CODE/DUTY Button*: this control selects either auto or manual timer mode when in MIN or SEC . It selects Code Rate or Duty Cycle mode when in CPM.

OPERATION

The basic function of the Multiple Portable Relay Tester is to make voltage and current measurements of the coil of the relay under test. It also measures the time difference between when power is applied to a relay coil until the FRONT contacts close and the difference between when power is removed from the relay coil until the BACK contacts close as well as the code rate and duty cycle of a Code Relay. To make a basic test of a relay, follow the steps below. For a detailed test procedure, please refer to the recommended test procedure in Ultra-Tech Document No. 15967-98. **Caution: Do not operate the relay tester with both the fine and coarse adjustments rotated fully clockwise for long duration, or damage may result to the unit.**

1. Place the **PICK/DROP** switch to **DROP** position.

2. Place the **COUNT/STOP** switch to **STOP**.

3. Place the **NORM/REV** switch in the **NORM** position.

4. Turn the **Fine** Adjust control **fully counter clockwise**.

5. Turn the **Coarse** Adjust control **fully counter clockwise**.

6. Using the adapter leads provided, connect the relay coil of the relay to be tested to the Relay terminals, observing proper polarity. **Note**: Disconnect all other resistors, capacitors, diodes, etc. from the relay coil to preclude them from loading the relay tester. Accurate measurements are possible only when nothing other than the relay coil is connected to the tester. Using the adapter leads provided, connect the power source to the “Battery” terminals. If Dc is used, it is important that positive terminal is connected to the red battery terminal.

7. Place the rotary selector switch on the digital multimeter in the DC or AC Volts position.

8. Place the **AMPS/VOLTS** selector switch in **Volts** position.

9. Set **PICK/DROP** switch to **PICK** position.

10. Rotate the **Fine** Adjust control **fully clockwise**.

11. While observing the meter, slowly rotate the Coarse Adjust control clockwise until the relay “picks up” and then slowly rotate the Fine Adjust control counter clockwise until the relay “drops away.” Slowly rotate the Fine Adjust control clockwise until the relay “picks up” and note the voltage.

12. Slowly rotate the Fine Adjust control counter clockwise until the relay “drops away” and note the voltage.

13. Set the **PICK/DROP** switch to **DROP** position.

14. Turn the Fine Adjust control fully counter clockwise.

15. Turn the Coarse Adjust control fully counter clockwise.

16. Place the rotary selector switch on the digital multimeter in the DC or AC Amps position.

17. Place the **AMPS/VOLTS** selector switch in **AMPS** position.

18. Set **PICK/DROP** switch to **PICK** position.

19. Rotate the Fine Adjust control fully clockwise.

20. While observing the meter, slowly rotate the Coarse Adjust control clockwise until the relay “picks up” and then slowly rotate the Fine Adjust control counter clockwise until the relay “drops away.” Slowly rotate the Fine Adjust control clockwise until the relay “picks up” and note the current.

21. Slowly rotate the Fine Adjust control counter clockwise until the relay “drops away” and note the current.

END OF TEST

TEST PROCEDURE FOR TESTING ACTUATION AND DE-ACTUATION TIME OF FRONT AND BACK RELAY CONTACTS.

1. Set **PICK/DROP** switch to **DROP** position.

2. Set **COUNT/STOP** switch to **STOP** position.

3. Connect battery leads to **BATT** terminals (observe polarity, red on positive). Battery voltage requires a minimum of 8 volts for the timer display to function properly. (8 to 15 Vdc or Vac).

4. Set **NORM/REV** switch to **NORM** position.

5. Set **VOLTS/AMP** switch to **VOLTS** position.

6. Set **FINE** and **COARSE** adjustments **fully clockwise**.

7. Connect relay leads (for coil) to **RELAY** terminals (observe polarity, red on positive).

8. Connect the **FRONT-HEEL-BACK** relay contacts to terminals.

9. Set **COUNT/STOP** switch to **COUNT** position.

10. Press **MODE** button of timer so that **SEC** position is lit (solid ON, each time you press this button, it will step through MIN-SEC-CPM positions). If the SEC indicator is Flashing, press the Code/Duty button once.

11. Momentarily depress the **RESET** button to reset timer to zero.

12. Set **PICK/DROP** switch to **PICK**.

13. Take timer reading. This reading is the time difference from the time voltage is applied to the relay coil to the time the FRONT contacts close. (Actuation Time)

14. Momentarily depress the **RESET** button to reset timer.

15. Set **PICK/DROP** switch to **DROP**.

16. Take timer reading. This reading is the time difference from the time voltage is removed from the relay coil to the time the BACK contacts close. (De-Actuation Time).

17. Repeat any tests if necessary.

END OF TEST

Note: SEC counts in increments of tenths of seconds to 99.9 seconds.
MIN counts in increments of tenths of minutes to 99.9 minutes.

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TEST PROCEDURE FOR TESTING THE CODE RATE AND DUTY CYCLE OF A SELF-CYCLING CODE RELAY.

1. Set **PICK/DROP** switch to **DROP** position.

2. Set **COUNT/STOP** switch to **STOP** position.

3. Connect battery leads to **BATT** terminals (observe polarity, red on positive). Battery voltage requires a minimum of 8 volts for the timer display to function properly. (8 to 15 Vdc or Vac).

4. Set **NORM/REV** switch to **NORM** position.

5. Set **VOLTS/AMP** switch to **VOLTS** position.

6. Set **FINE** and **COARSE** adjustments **fully clockwise**.

7. Connect relay leads (for coil) to **RELAY** terminals (observe polarity, red on positive).

8. Connect the **FRONT-HEEL-BACK** relay contacts to terminals. (for this test, FRONT and HEEL contacts is all that is required).

9. Press **MODE** button of timer so that **CPM** position is lit (solid ON for CODE RATE, each time you press this button, it will step through MIN-SEC-CPM positions). If the CPM indicator is Flashing, press the Code/Duty button once.

10. Set **PICK/DROP** switch to **PICK**.

11. Take **Code Rate** (CPM) reading displayed on meter.

12. Press the **CODE/DUTY** button once. The CPM indicator will be Flashing which indicates Duty Cycle.

13. Take the **DUTY CYCLE** reading displayed on meter.

14. To end this test, set **PICK/DROP** switch to **DROP**.

15. Repeat any tests if necessary.

END OF TEST

Note: SEC counts in increments of tenths of seconds to 99.9 seconds.
MIN counts in increments of tenths of minutes to 99.9 minutes.
CPM counts the CODE RATE (cycles-per-minute) or DUTY CYCLE.

PROCEDURE FOR MANUALLY RUNNING A TIMING TEST FOR ANY EXTERNAL EVENT.

1. Connect battery leads to **BATT** (observe polarity, red on positive). Battery voltage requires a minimum of 8 volts for the timer display to function properly. (8 to 15 Vdc or Vac).

2. Verify that there are no relay contacts (FRONT-HEEL-BACK) connected to the test equipment.

3. Set **COUNT/STOP** switch to **STOP** position. (Other switches are not applicable for this timing test).

4. Press the **MODE** button on the timer for either **MIN or SEC**. (This will depend on the expected timing for the event you are monitoring). (Indicator solid ON, each time you press this button, it will step through MIN-SEC-CPM positions). If the MIN or SEC indicator is Flashing, press the Code/Duty button once.

5. Momentarily press the **RESET** button on the timer. (Resets to 0).

6. Press the **CODE/DUTY** button to start the timer. Indicator will start Flashing. This is Timing mode.

7. When the event is completed, press the **CODE/DUTY** button to stop the timer. Indicator will go to solid ON.

8. Timer Display will display elapsed time of event.

9. Repeat test if necessary (steps 4–7).

END OF TEST

DIGITAL MULTIMETER BATTERY REPLACEMENT INSTRUCTIONS

1. Disconnect all cables from the battery terminal, relay terminals, and the three (3) meter jumper leads, and place the Multi-meter switch in the OFF position.
2. Remove the five countersunk screws from the front panel (see figure 1, reference #12).
3. Remove the panel from the case and place on a soft surface being careful not to scratch the front panel.
4. Removed the two (2) nylon lock nuts from the meter bracket (the bracket opposite the three (3) banana jacks) and remove the bracket.
5. Slide the meter out from the remaining bracket.
6. Replace the battery with a Neda type 1604 or equivalent 9-volt alkaline battery.

7. Replace the meter in the relay tester panel, re-install the meter bracket, and replace the two (2) nylon lock nuts.

8. Replace the front panel and fasten down with the five (5) Phillips head screws.

9. Re-attach meter leads, battery leads, and relay leads if applicable.

Specifications

Physical

Height	6.0”	Width:	11.5”
Length:	13.5”	Weight:	9.7 lbs.

Electrical

Output Current Relay Terminals:
0.8 Amp continuous
1.9 Amp Intermittent

Note: The relay tester has a solid state over current detector circuit designed to trip the circuit breakers before the 2 Amp meter fuse blows. If an over current condition occurs, either CB1, CB2 or CB3 will trip.

Environmental

Operating Temperature:	-20 to +50 degrees C
Relative Humidity:	0 to 80%
Storage Temperature:	-40 to 70 degrees C
Relative Humidity:	0 to 95%

* See meter manual for complete meter specifications.

WARRANTY

Ultra-Tech Enterprises, Inc. (the "Company"), will repair or replace, at the Company's option, its products free of charge if such products are found to be defective in material or workmanship, for the period of one year from the date of purchase, except as follows:

Transportation charges to the Company's designated repair station for defective and replacement parts or service are the responsibility of the purchaser. This warranty does not apply, if: (I) the product has been damaged by improper connection or disconnection with any electrical device; (ii) the product has been damaged in shipping; (iv) the product has been damaged due to an act of God, accident, misuse, abuse, negligence or any other use than the product's intended use as set forth in the specifications; or (v) the device has suffered damage from an external blow or trauma. This warranty does not cover cosmetic damage and may not be transferred to any person or entity. The Company will provide warranty service as provided herein as soon, as is commercially reasonable.

THE SOLE REMEDY UNDER THIS WARRANTY IS THE REPAIR OR REPLACEMENT OF THE PRODUCT AS PROVIDED HEREIN. IN NO EVENT SHALL THE COMPANY BE LIABLE FOR ANY INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ON THIS PRODUCT. IN ANY EVENT, IF DAMAGES ARE AWARDED, THEY WILL BE LIMITED TO THE COST OF THIS PRODUCT.

EXCEPT TO THE EXTENT PROHIBITED BY ANY APPLICABLE STATE OF FEDERAL LAW, ALL IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED.

Some states do not allow the exclusion or limitation of incidental, indirect, or consequential damages, or allow limitations to the length of an implied warranty, in which case the foregoing warranty shall be extended to conform to the minimum requirement of such applicable law.

To obtain service under this warranty, it is necessary to obtain a Return Merchandise Authorization (RMA) from the Company prior to returning equipment for service. RMA numbers must be clearly marked on the outside of the shipping package in which the merchandise is returned. Failure to follow the Company's RMA procedure may result in delays in obtaining requested service and or refusal of the Company to accept packages not marked clearly with the appropriate RMA number.