

# Microprocessor Based Relay Testing - Feeder Protection

4.5 Days, 3.2 CEUs

This hands-on course is designed for test technicians and other persons involved in setting, testing, and diagnosing microprocessor-based relays that protect feeder and bus systems. NETA and NFPA 70B maintenance and testing standards recommend testing relays either every two years or at other regular intervals. This course will present the fundamentals of microprocessor-based feeder protection, combined with hands-on testing of selected elements of the protective relays.

## Pre-Requisites

Student must bring a laptop and have full administration rights to install software, to complete the class labs. Laptop must have Windows XP/Vista/7/8, 600+ MHz processor, 4+GB hard drive space, 1+GB RAM, a CD-ROM drive. iPads and tablets without CD-ROM or USB ports are not acceptable.

Upon enrollment confirmation, an email containing instructions to install required software will be sent to the participant prior to attending the course. Please make sure you install the required software before attending the class.

## Lab and Classroom Attire

AVO Training Institute is committed to the personal safety of each participant and require long pants and ANSI rated "safety-toe" work shoes for lab activities. Lecture courses may involve a tour of a work or shop area and for this reason open-toe shoes and shorts are not considered appropriate attire for the classroom.

## Learning Objectives

To receive 3.2 CEUs, participants must attend 4.5 days of class (32 contact hours) and attain a minimum average grade of 80% (overall grade will consist of 50% lab practice and 50% final exam). Upon completion of this course and lab practice, the participant will demonstrate that he/she is able to:

- Outline how the relay is applied in the power system and identify critical components.
- Interpret external wiring connections and internal logic functions.
- Follow NETA standards when performing tasks with the microprocessor.
- Establish communication with the relay.
- Verify proper operation of relay indicators and output operation.
- Connect relay test set and perform metering check and field tests.
- Perform the following relay element tests and interpret the results:
  - Phase Time Overcurrent
  - Phase Instantaneous Overcurrent
  - Ground Time Overcurrent
  - Ground Instantaneous Overcurrent
  - Neutral Time Overcurrent
  - Neutral Instantaneous Overcurrent
  - Negative Sequence Time Overcurrent
  - Negative Sequence Instantaneous Overcurrent
  - Sensitive Ground Time Overcurrent
  - Sensitive Ground Instantaneous Overcurrent
  - Bus Undervoltage
  - Overvoltage
  - Line Undervoltage
  - Underfrequency
  - Synchrocheck

Note: Relays used in lab exercises will be SEL-751A, GE-SR750, and ABB REF615.

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## SCOPE

### Day 1\* (7 contact hours)

- I. Introduction (0.5 hour)
  - A. Schedule
  - B. Course Outline
- II. Introduction to Feeder Protection Fundamentals (3.5 hours)
  - A. Causes of Faults
  - B. Protection Requirements
  - C. Feeder Protection Application
  - D. Feeder Protection Components

#### AM BREAK

- E. Instrument Transformers
- F. Protective Relay Elements
- G. Protective Relay Testing

#### LUNCH

- III. SEL 751A (3 hours)
  - A. Relay Connections
  - B. Establish Communications
  - C. Event Record Data Management

#### PM BREAK

- D. Verify Operation of Front Panel LED's
- E. Verify Date and Time
- F. Conduct Meter Check

### Day 2 (7 contact hours)

- III. SEL 751A (cont'd) (7 hours)
  - G. Protective Element Testing

#### AM BREAK

- H. Clear Event Record

#### LUNCH

- I. Restore Relay Settings

#### PM BREAK

- I. Restore Relay Settings

### Day 3 (7 contact hours)

- IV. GE SR 750 (7 hours)
  - A. Relay Connections
  - B. Establish Communications

#### AM BREAK

- C. Event Record Data Management
- D. Verify Operation of Front Panel LED's

#### LUNCH

- E. Verify Date and Time
- F. Conduct Meter Check
- G. Protective Element Testing

#### PM BREAK

- H. Clear Event Record
- I. Restore Relay Settings

### Day 4 (7 contact hours)

- V. ABB REF615 (7 hours)
  - A. Relay Connections
  - B. Establish Communications
  - C. Event Record Data Management

#### AM BREAK

- D. Verify Operation of Front Panel LED's
- E. Verify Date and Time

#### LUNCH

- F. Conduct Meter Check
- G. Protective Element Testing

#### PM BREAK

- H. Clear Event Record
- I. Restore Relay Settings

### Day 5 - 1/2 Day (4 contact hours)

- VI. Conclusion (4 hours)
  - A. Review

#### AM BREAK

- B. Final Exam

\*Class scheduling times may vary based on discussions and size of class

AVO Training Institute is accredited by the International Association for Continuing Education and Training (IACET) and is accredited to issue the IACET CEU

# STANDARD EQUIPMENT LIST

## MICROPROCESSOR-BASED RELAY TESTING D/F

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REVISED 10/16/17, BY: DENNIS MOON/TER  
COURSE NUMBER 552  
4.5 DAYS  
6 STUDENTS MAXIMUM

### **TEXT**

|             |   |
|-------------|---|
| 1 / STUDENT | MPBRT D/F STUDENT PACKET  |
| 1 / STUDENT | RELAY MANUALS, SUPPORT SOFTWARE AND<br>MISC INFORMATION ON 4GB USB FLASH MEMORY |

### **AVO STUDENT EQUIPMENT**

|             |                                |
|-------------|--------------------------------|
| 1 / STUDENT | AVO LOGO MINI-SCREWDRIVER      |
| 1 / STUDENT | AVO LOGO SCIENTIFIC CALCULATOR |

### **TEST SET**

|                |          |
|----------------|----------|
| 1 / 2 STUDENTS | SMRT 410 |
|----------------|----------|

### **MPRT 8340 TEST LEAD SET QYY/PER STUDENT**

#### **(NOT REQUIRED WITH SMRT 36)**

|                |  |
|----------------|--|
| 1 / 2 STUDENTS | CURRENT LEADS, 8EA. (4 BLK, 4 RED)           |
| 1 / 2 STUDENTS | VOLTAGE/ MONITOR LEADS, 10EA. (5 BLK, 5 RED) |

### **RELAY QTY/PER STUDENT**

|                |                |
|----------------|----------------|
| 1 / 2 STUDENTS | 351A           |
| 1 / 2 STUDENTS | SEL 387        |
| 1 / 2 STUDENTS | MULTILIN SR750 |
| 1 / 2 STUDENTS | MULTILIN SR745 |

### **MISCELLANEOUS EQUIPMENT (INSTRUCTOR CONTROLLED TOOL KIT)**

|        |   |
|--------|---|
| 4 EA.  | GENDER CHANGER (MALE TO MALE)                               |
| 4 EA.  | GENDER CHANGER (FEMALE TO FEMALE)                           |
| 4 EA.  | GENDER CHANGER (MALE TO FEMALE)                             |
| 6 EA.  | RS232 SERIAL 6FT. (RS232 DB9 MALE TO DB9<br>FEMALE)         |
| 6 EA.  | RS232 SERIAL (FEMALE) TO USB 2.0 CABLE &<br>DRIVER SOFTWARE |
| 6 EA.  | RS232 NULL MODEM ADAPTER (MALE TO<br>FEMALE)                |
| 6 EA.  | POWER STRIP EXTENSION CORD 6FT.                             |
| 3 EA.  | POWER EXTENSION CORD 25FT.                                  |
| 60 EA. | SPADE CONNECTORS (SMALL 30 RED AND 30 BLK)                  |
| 6 EA.  | SCREWDRIVER 5 IN 1 (KLEIN TOOL)                             |