

3 APPLICATION NOTES – TESTING SPECIFIC DEVICES

This chapter gives details of how to test many common types of protection device using the 200ADM.

3.1 Over Current Relays

The configuration shown in figure 3.1 is suitable for testing over-current relays, and will measure the time delay between the time when the “on” pushbutton is pressed and the time the relay trips.

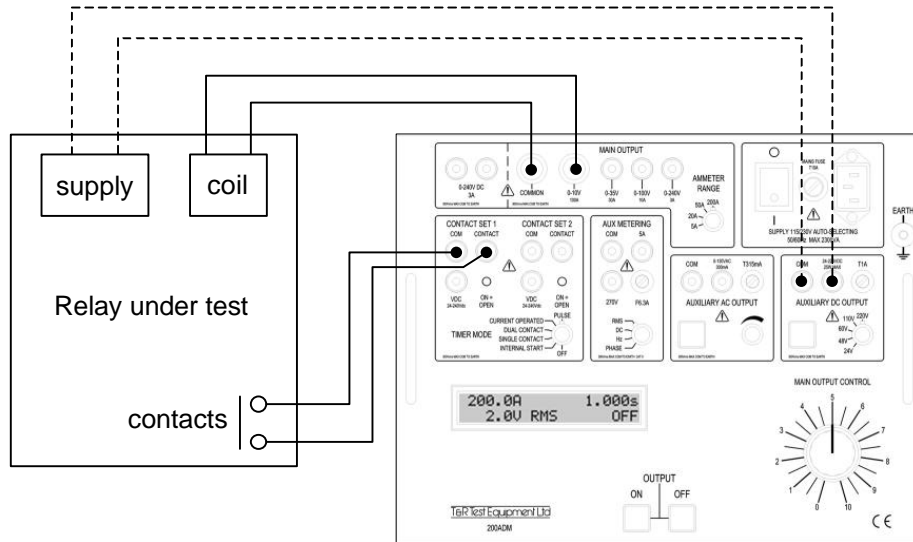


Figure 3.1 Connections for testing over-current relays

3.1.1 Connections

Ensure that the output is switched off and that the relay is isolated before making any connections.

Connect the relay contacts to contact set 1.

If the relay requires an auxiliary supply, identify the auxiliary supply connections on the relay and the voltage required. Set the correct voltage, and connect the auxiliary DC supply to the relay.

Connect the relay coil to the 10V output, selecting suitable leads from the lead set depending on the current to be injected. If the desired current is unobtainable during testing, it may be necessary to connect the relay coil to a higher voltage tap on the 200ADM.

3.1.2 Test procedure

Set the output control to zero (anti-clockwise) and the timer mode to “off”.

Select the desired ammeter range.

Press the “output on” pushbutton and increase the current using the output control until the desired test current is reached.

Switch the output off using the “output off” pushbutton.

Select “internal start” timer mode, and switch the output on. The unit now resets and starts the timer and starts injecting current into the relay. When the relay’s contacts change state, the timer will stop and the output will be switched off automatically.

3.2 Under and Over Voltage Relays

Testing under and over voltage relays involves the use of the main output and the auxiliary ac outputs. The main output is wired in series with the auxiliary ac output, and is used to add or subtract a voltage from the auxiliary output voltage. The auxiliary ac input is used to monitor the voltage to the relay.

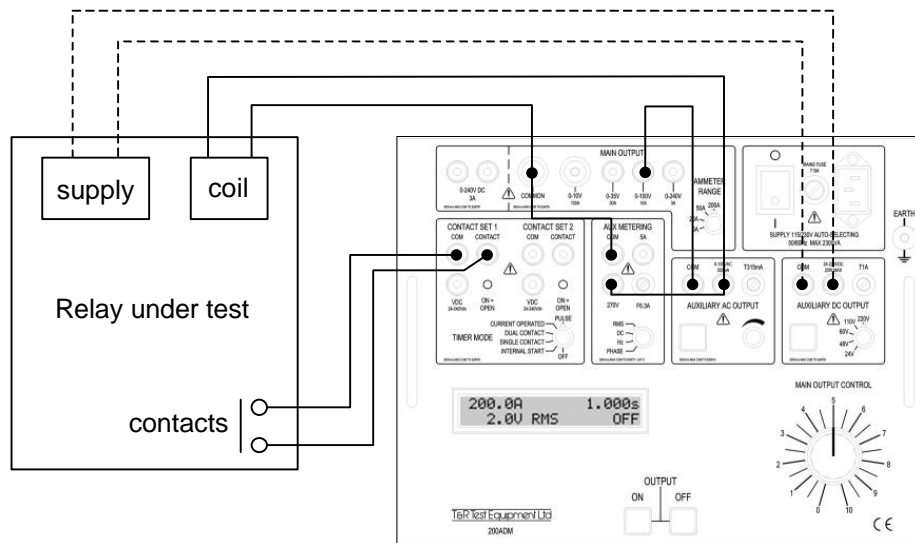


Figure 3.2 Connections for testing over voltage relays

3.2.1 Connections

Ensure that the outputs are switched off and that the relay is isolated before making any connections.

Connect the relay contacts to contact set 1.

If the relay requires an auxiliary supply, identify the auxiliary supply connections on the relay and the voltage required. Set the correct voltage, and connect the auxiliary DC supply to the relay.

Connect the main and auxiliary outputs as shown in figure 3.2, selecting the most appropriate main output for the relay under test.

3.2.2 Test procedure

Set the main and auxiliary ac output controls to zero (anti-clockwise) and the timer mode to “off”.

Select the auxiliary ac input mode to “rms”.

Switch the auxiliary ac output on, and increase the auxiliary ac voltage to the relay setting voltage. The relay should now be operating in a non-tripped condition.

Switch on the main output, and increase the output voltage to a value that will trip the relay. The voltage to the relay can now be switched between a value that will trip the relay and will not trip the relay by switching the main output on and off.

Switch off the main output.

Switch the timer to “internal start” mode, and reset the relay.

Switch the main output on. The timer will start, and will stop when the relay trips.

3.2.3 Testing under voltage relays

To test an under voltage relay, the voltage needs to drop rather than rise when the main output is switched on. To achieve this, the polarity of the main output is reversed as shown in figure 3.3.

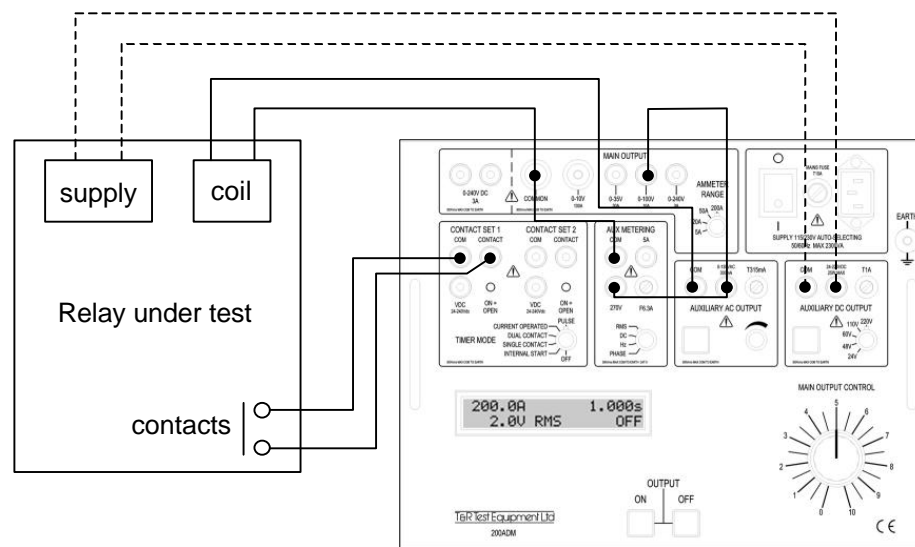


Figure 3.3 Connections for testing under voltage relays

3.3 Timing of Auto-Reset/Reclosing Devices

Auto-reclosing devices require that the timer is started when power is removed from the device, and the timer stops when the contacts change state. This may be achieved using the single contact timer mode.

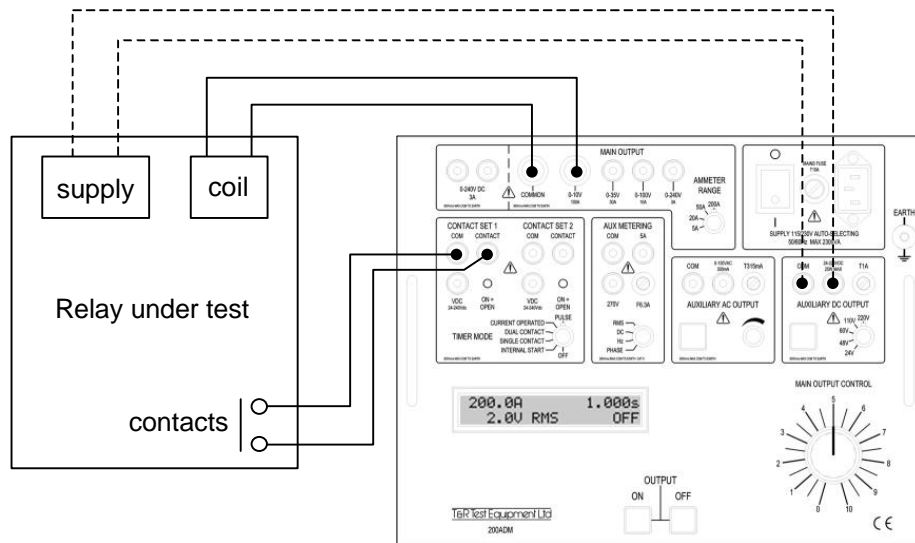


Figure 3.4 Connections for testing auto-reclose devices

3.3.1 Connections

Ensure that the outputs are switched off and that the relay is isolated before making any connections.

Connect the relay contacts to contact set 1.

If the relay requires an auxiliary supply, identify the auxiliary supply connections on the relay and the voltage required. Set the correct voltage, and connect the auxiliary DC supply to the relay.

Connect the main output as shown in figure 3.4, selecting the most appropriate output tap for the relay under test.

3.3.2 Test procedure

Set the main output control to zero (anti-clockwise) and the timer mode to "off".

Switch on the main output, and increase the output to the desired level.

Switch off the main output.

Switch the timer to "single contact" mode, and reset the relay.

Switch the main output on. The output will be switched off and the timer will start when the relay trips. The timer will stop when the relay auto-resets.

3.4 Timing Circuit Breakers

Testing CBE's MCB's and other devices with no auxiliary contacts is possible using the current operated timer mode on the 200ADM. This mode starts the timer when the output current exceeds 10% of the selected current range, and stops the timer when the current falls below 10% of range.

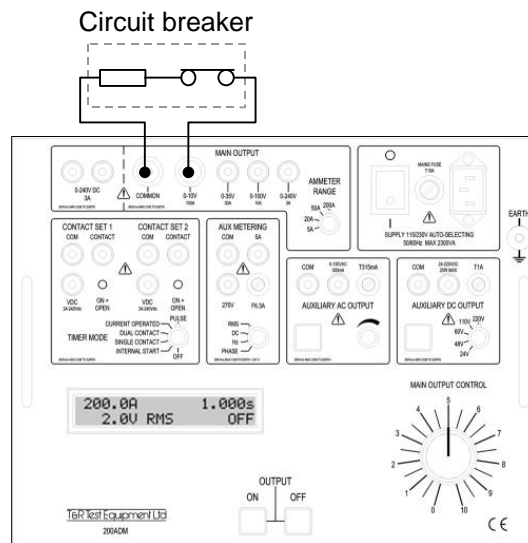


Figure 3.4 Connections for testing circuit breakers

3.4.1 Connections

Ensure that the outputs are switched off and that the device under test is isolated before making any connections.

Connect the main output as shown in figure 3.4, selecting the most appropriate tap for the device under test. For circuit breakers and other current trips, this will almost always be the 0-10V output.

Set the ammeter switch to the most suitable range.

3.4.2 Test procedure

Set the main output control to zero (anti-clockwise) and the timer mode to “off”.

Switch on the main output, and increase the output to the desired level.

Switch off the main output.

Switch the timer to “current operated” mode, and reset the breaker if it has tripped.

Switch the main output on. The timer will start when current starts flowing in the device under test, and will stop when the device trips.

3.4.3 Devices with short trip times

When testing devices with short trip times (such as thermal circuit breakers at high over-current factors), setting the current may cause the breaker to trip. In such circumstances, set the current using pulse mode. In this mode, current will be injected for 400ms and the current logged every time the “output on” button is pressed.

3.5 Connections for Relays Requiring Simultaneous Voltage and Current

Relays requiring simultaneous voltage and current may be connected to the main output for current supply and the auxiliary ac output for voltage supply.

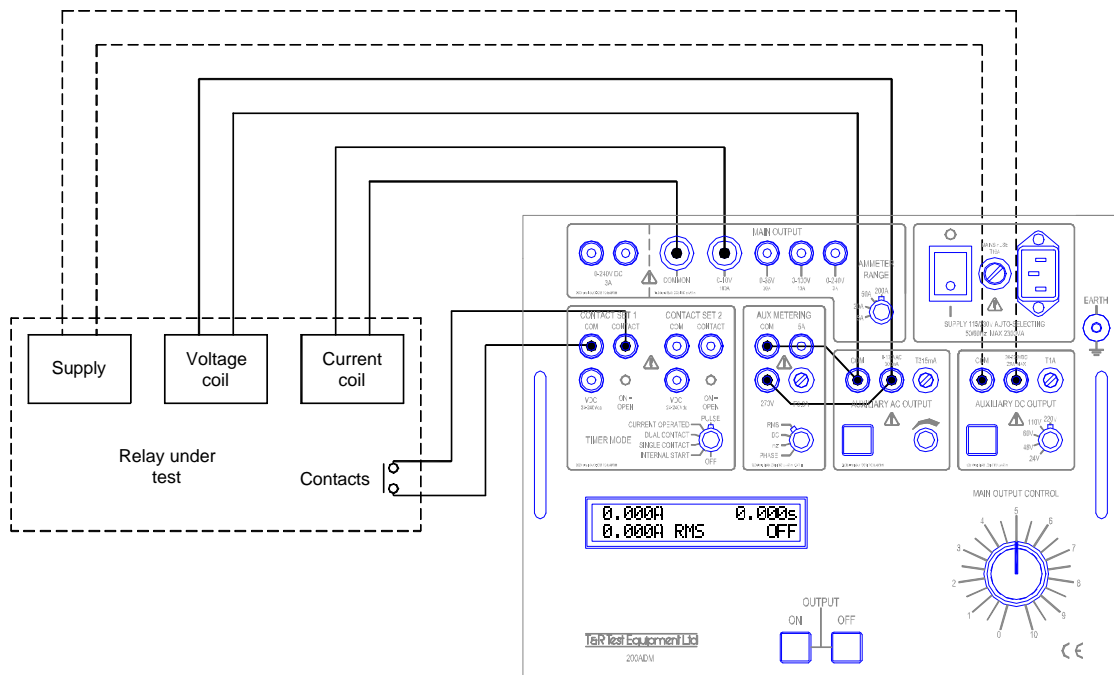


Figure 3.5 Connections for relays requiring current and voltage

3.5.1 Connections

Ensure that the outputs are switched off and that the device under test is isolated before making any connections.

Connect the main output as shown in figure 3.5, selecting the most appropriate tap for the device under test.

Connect the auxiliary ac output to the voltage coil of the relay, and also connect the auxiliary ac output to the auxiliary metering input.

Set the ammeter switch to the most suitable range, and the aux metering switch to "rms" mode.

3.5.2 Test procedure

Set the main output control to zero (anti-clockwise) and the timer mode to "off".

Switch on the main output, and increase the output to the desired level.

Switch on the auxiliary ac output and set to the required level. A phase shift of 180° may be obtained on the voltage by reversing the auxiliary ac supply connections. In some cases if the relay fails to operate this may be necessary.

The required tests may now be carried out on the relay.

3.6 Testing Bias Differential Relays using the optional 200ADM-DRE

The 200ADM-DRE is an optional accessory for the 200ADM that connects to the 0-130Vac auxiliary output and provides a 0-6.8V 5A or 0-3.4V 10A output. The two output ranges are selected by two links on the 200ADM-DRE.

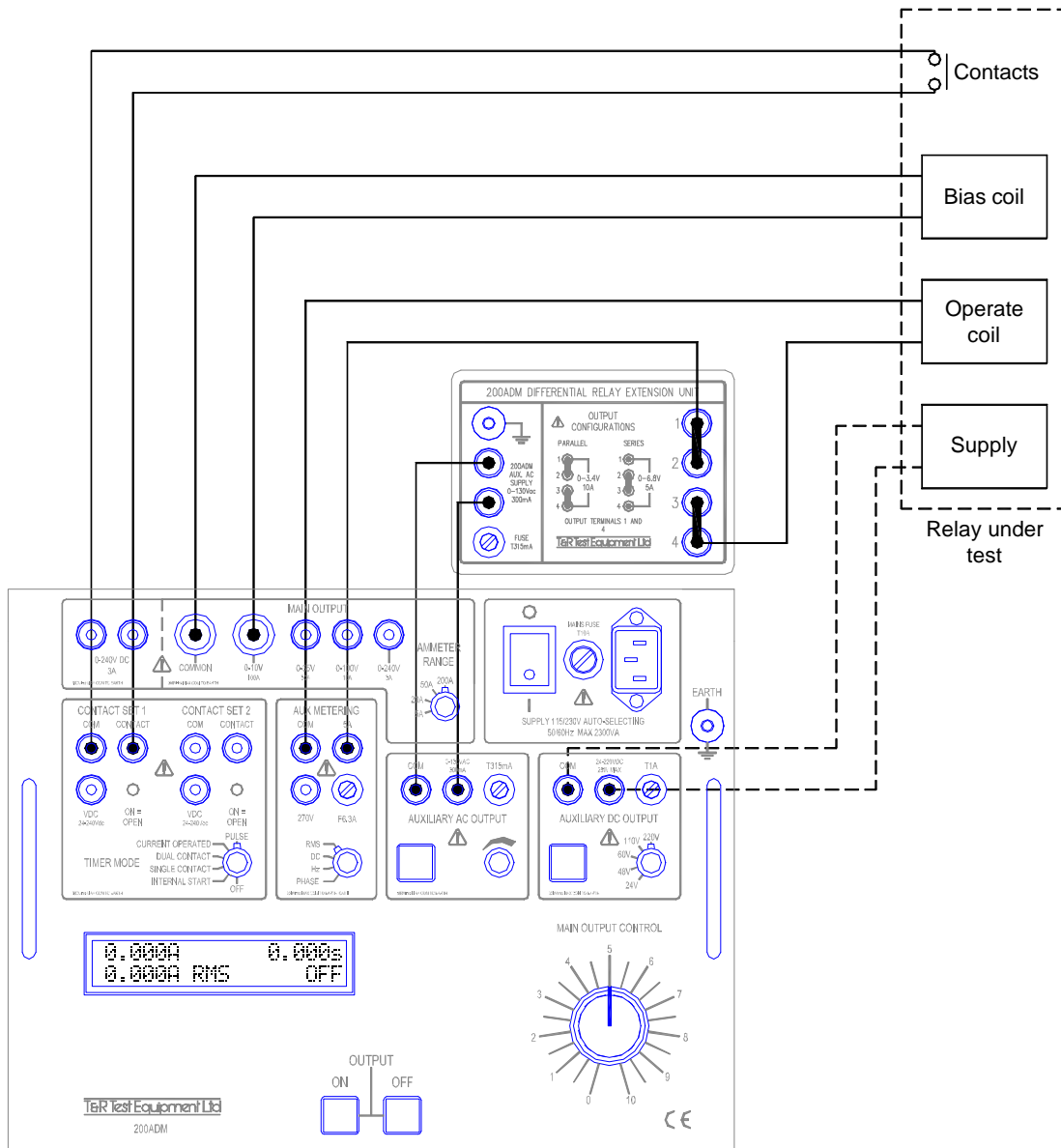


Figure 3.6 Connections for bias differential relays

3.5.1 Connections

Ensure that the main output is switched off and that the device under test is isolated before making any connections.

Connect the main output to the relay bias coil as shown in figure 3.6, selecting the most appropriate tap for the device under test.

Select the desired output range from the 200ADM-DRE using the links provided.

Connect the auxiliary ac output to 200ADM-DRE, and the output of the 200ADM-DRE to the operate coil of the relay via the auxiliary metering current input.

Set the ammeter switch to the most suitable range, and the aux metering switch to "rms" mode.

Connect the relay contacts to the contact set 1 input. The contact set 1 LED will then indicate the state of the contacts. Set the timer mode switch to the “off” position.

3.5.2 Test procedure

Set the main output and auxiliary ac controls to zero (anti-clockwise).

Switch on the main output and auxiliary outputs, and increase the currents to the desired level. The current through the bias coil is controlled using the main output control, and the current through the operate coil is controlled by the auxiliary output control.

The required tests may now be carried out on the relay.

3.7 Testing Inductive Disk Relays using the Optional Filter

When testing inductive disk type relays, the current waveform is distorted by the relay, and timing results will be inaccurate. In this situation it is necessary to use the T&R Test Equipment 100ADM-F filter unit to force the current to a sinusoid. This unit is an optional accessory.

For further details on using the filter unit, please refer to the 100ADM-F manual.

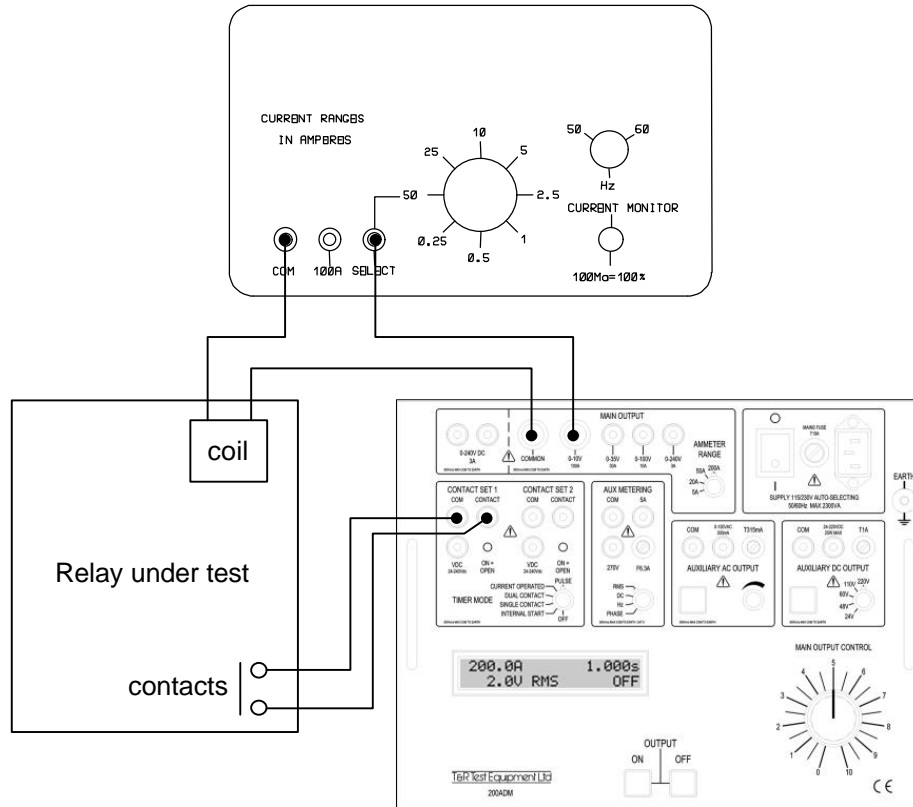


Figure 3.5 Connection of filter unit and inductive disc relay