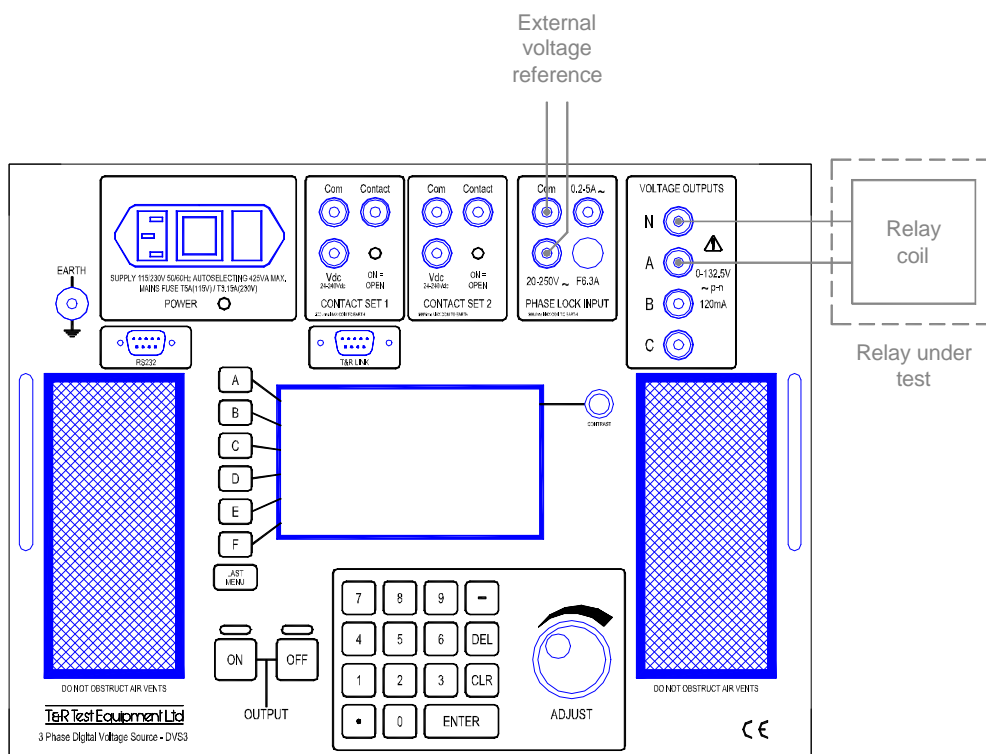


2.7.1 Fig 2a Automatic voltage regulating relays



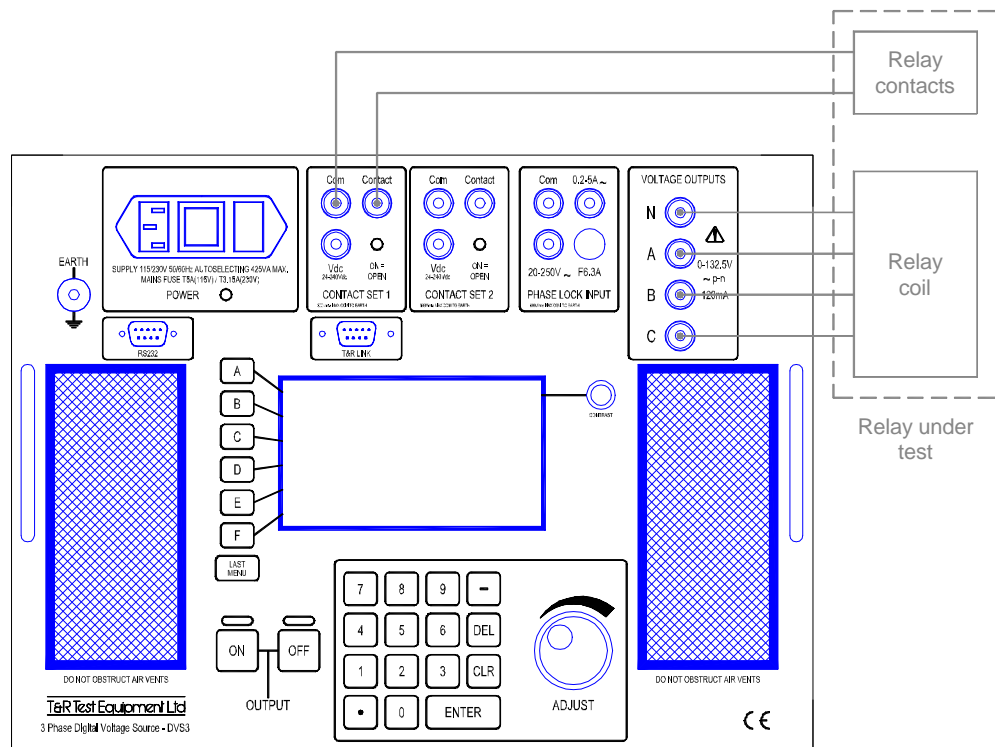
CONNECTIONS

1. AVR relay to the main output terminals **N** and either **A, B, or C**
2. To supply
3. To external voltage reference if required. (See **Note 6** below in **Test Procedures**)

TEST PROCEDURES

1. Switch on the main supply
2. Push **[B]** select **Mains lock** mode, **[E]** toggles Lock mode
3. Push **[A]** set output voltage to desired level
4. Switch on the main output by depressing the output on push-button
5. The output voltage can now be adjusted to check the relay operation
6. When testing AVR relays fitted with line drop compensation circuits the main output can be locked to the voltage transformer supply by using external supply lock input as shown above.

2.7.2 Fig 2b Under and over voltage relays



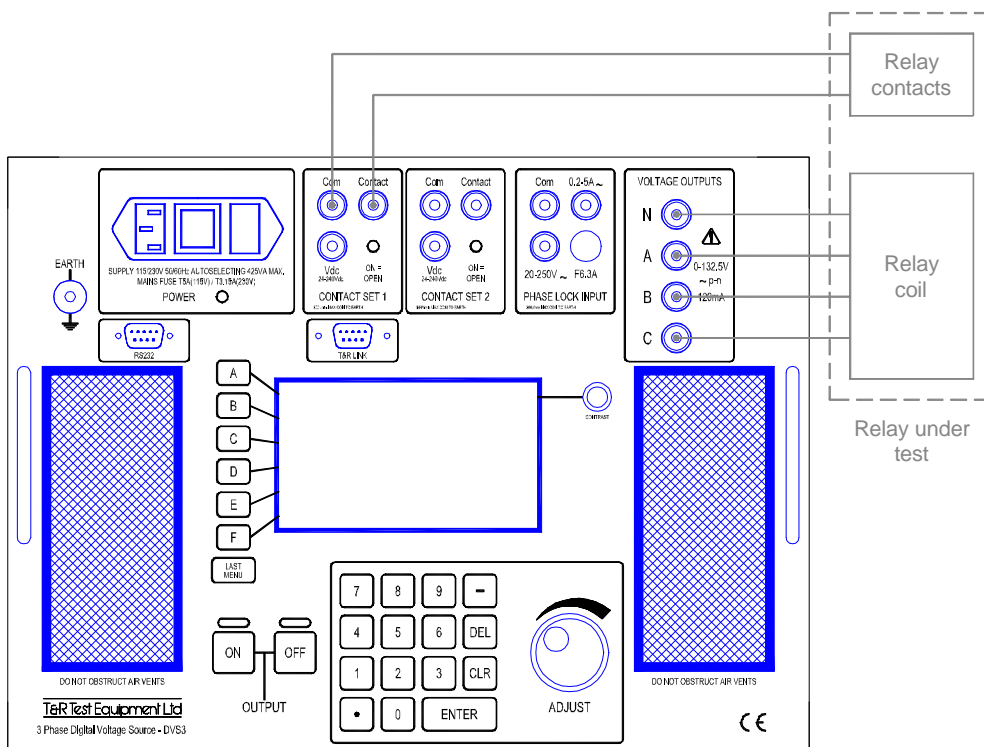
CONNECTIONS

1. Voltage relay to the main output terminals
2. Relay contacts to the **red** and **blue** contact sockets
3. To supply

TEST PROCEDURES

1. Switch on the main supply
2. Push **A** to select **variable frequency** mode
3. Set output voltage to desired level
4. Switch on the main output by depressing the output **ON** push-button
5. The output voltage can now be adjusted to check relay operation
6. The output voltage can now be adjusted and the trip voltage of the relay measured
7. Once the trip level has been ascertained the relay can now be timed by entering, via the keypad, a voltage higher for over voltage tripping, or lower for under voltage tripping, and pressing enter **Return**. The timer will then start and will be stopped by the action of the relay's contacts. The timer is reset by pressing key **D**

2.7.3 Fig 2c Under and over frequency relays



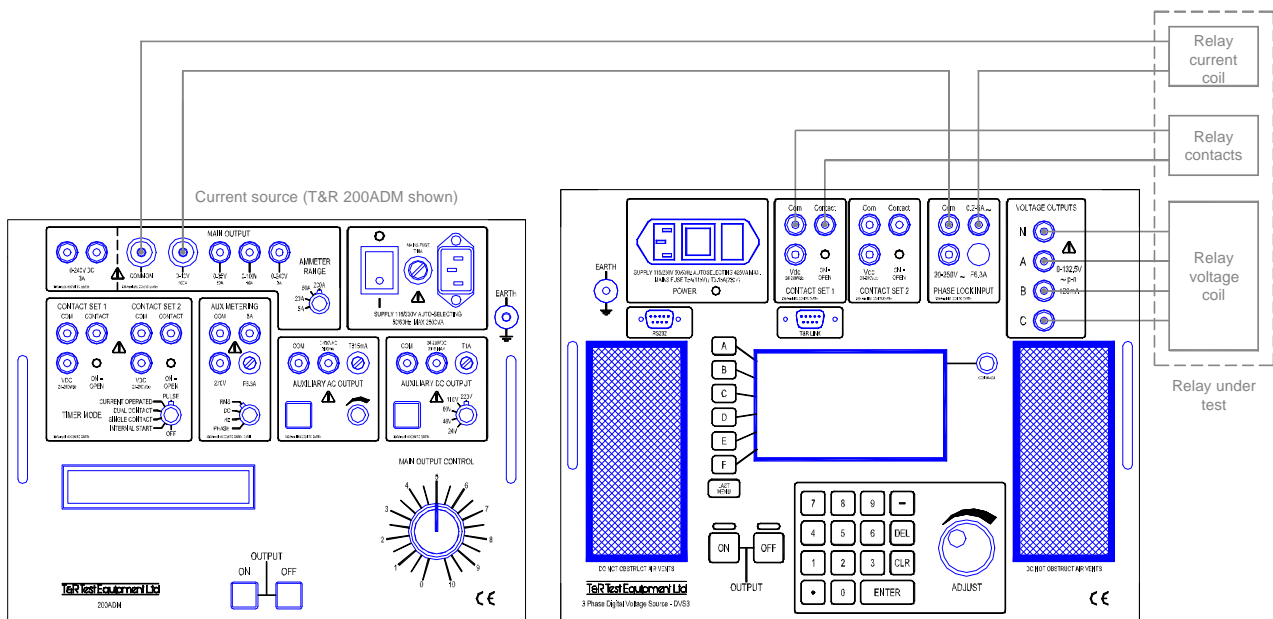
CONNECTIONS

1. Voltage relay to the main output terminals
2. Relay contacts to the **red** and **blue** contact sockets
3. To supply

TEST PROCEDURES

1. Switch on the main supply
2. Push **[A]** to select **variable frequency** mode
3. Set output voltage to desired level
4. Switch on the main output by depressing the output **ON** push-button
5. Push **[C]** the output frequency can now be adjusted to check relay operation
6. The output frequency can now be adjusted and the trip frequency of the relay measured
7. Once the trip level has been ascertained the relay can now be timed by entering, via the keypad, a frequency higher for over frequency tripping, or lower for under frequency tripping, and pressing the enter **[Return]**. The timer will then start and will be stopped by the action of the relay's contacts. The timer is reset by pressing key **[D]**.

2.7.4 Fig 2d Directional relays



CONNECTIONS

1. Directional relay voltage input to the main output terminals
2. Directional relay current input to the terminals as shown above, via the external current lock terminals on the DVS3-HP ensuring the correct polarity is observed.

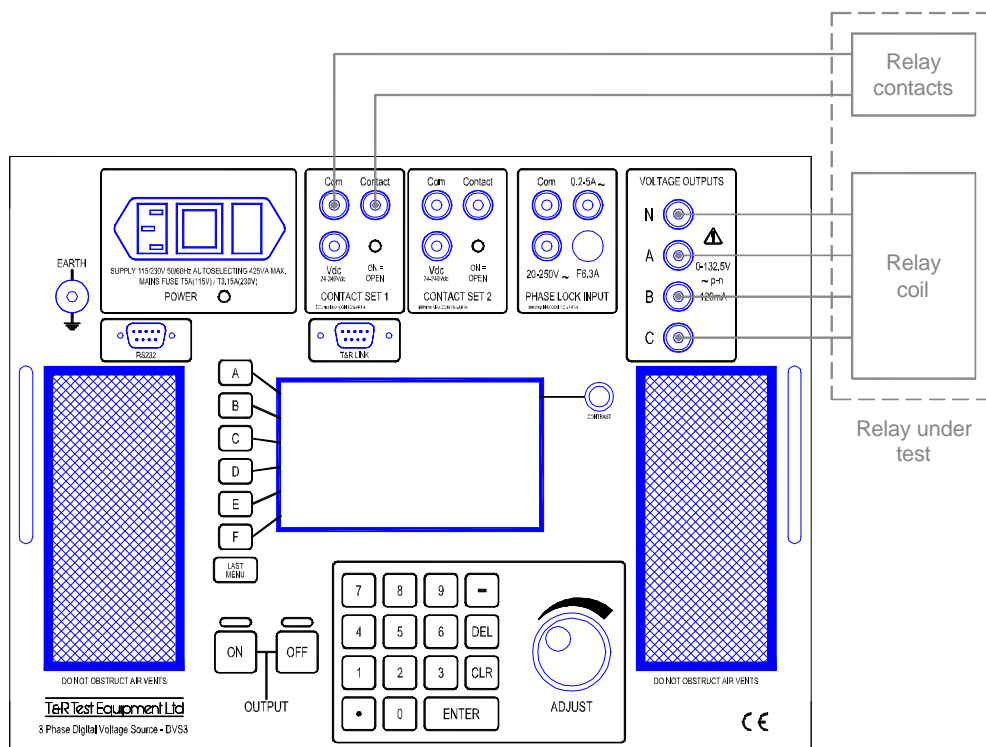
TEST PROCEDURES

1. Switch on the main supply
2. Push **B** to select **Phase lock** mode
3. Set output voltage to desired level
4. Switch on the main output by depressing the output **ON** push-button
5. Switch on the current source and press key **E**. The DVS3-HP will display **EXTERNAL LOCK**. If the reference signal is insufficient the DVS3-HP will revert back to **MAINS LOCK**.

In this case the external current signal must be increased above the minimum of 0.2A

6. Push **B** the output phase angle can now be adjusted to check the relay operation
7. The output phase angle can now be adjusted and the trip angle of the relay measured.

2.7.5 Fig 2e ROCOF relays



CONNECTIONS

1. ROCOF relay to the main output terminals
2. Relay contacts to the **red** and **blue** contact sockets
3. To supply

TEST PROCEDURES

1. Switch on the main supply
2. Select **ROCOF** mode by pressing key **[D]**
3. Set the minimum and maximum frequency for the sweep using options **[A]** and **[B]**. The values can be entered using the keypad or adjust knob.
4. Set the rate of change of frequency using option **[C]** and the keypad or adjust knob.
5. The voltage and phase angle of the individual outputs may be changed using key **[E]**
6. Key **[F]** is used to select the sweep type menu. The sweep type may be set to one of three options:
 - a) continuous sweep
 - b) single sweep from low to high frequency setting
 - c) single sweep from high to low frequency setting
7. The test is started by pressing the **ON** key.

TIMING ROCOF RELAYS

It is possible to time a ROCOF relay using the following sequence:

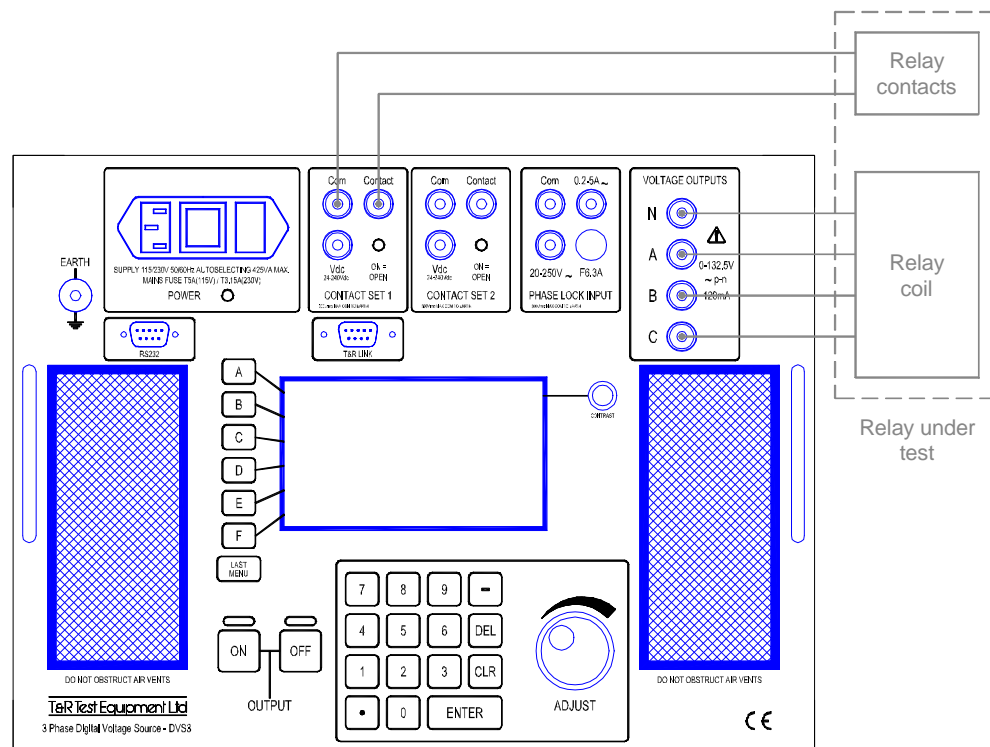
- a) Set a rate of change that will not trip the relay, and switch the output ON.
- b) Using the keypad, set a new rate of change of frequency that definitely will trip the relay. When the enter **[Return]** key is pressed, the timer starts and the new rate of change of frequency is applied to the relay. A change of state of the relay contacts will then stop the timer.

2.7.6 Fig 2f Vector Surge (Step change of phase) relays

The DVS3-HP can be used to test a vector surge relay by applying a series of increasing phase steps to the relay. The unit can also be used to time the response of the relay to a tripping condition.

A phase step is generated from the DVS3-HP by shifting the phase by a set amount using the keypad whilst in variable frequency mode. It is important to understand that phase angles are entered and shown on the DVS3-HP relative to a notional 0° phase reference. Therefore if the display is showing 5° for phase A, and a new phase of 7° is entered, a phase step of 2° is generated. The easiest way to carry out the tests is to enter a value for a phase shift, and set the phase back to zero before the next shift.

For example, start off with the DVS3-HP in variable frequency mode, and select phase adjustment by pressing button **[B]**. The display will currently be showing a phase of 0° for phase A. Type in 6 and press enter, and the DVS3-HP will generate a 6° phase step. Typing in 0 and pressing enter will set the phase shift back to 0° , generating a -6° phase step in doing so.



CONNECTIONS

1. Connect the relay to the main output terminals of the DVS3-HP
2. Connect the relay contacts to the “COM” and “CONTACT” contact set 1 sockets on the DVS3-HP
3. Connect mains supply to DVS3-HP

TEST PROCEDURES

1. Switch on the main supply
2. Push button **[A]** on the DVS3-HP to select **variable frequency** mode

3. Set the output voltage to desired level
4. Switch on the main output by depressing the output **ON** push-button
5. Push **[B]** to select phase adjustment mode.
6. Enter a phase step that should not trip the relay, for example 5° . Check to see if the relay has tripped, and then set the phase angle back to zero. If the relay has tripped, reset the relay and try again with a smaller phase step. If the relay has not tripped, apply gradually increasing steps to the relay until it does trip.
7. When the operate point of the relay has been ascertained using the procedure above, the relay response can then be timed. To do this, start with the phase angle set to zero. Type in a new phase value which is at least 2° greater than the trip value measured above. The timer will start when the phase step is applied to the relay, and will stop when contact set 1 on the DVS3-HP changes state.