ROTOR RSO REFLECTOMETERS

TYPE TDR100/200

APPLICATION NOTE 1

SETTING THE RSO MEASUREMENT PARAMETERS.

Issue 2. February 2017

SUMMARY

In normal use, it is almost impossible to incorrectly set the **TDR100/200 Rotor Reflectometer hardware and software controls** so that **two non-identical RSO waveforms** are generated for a **fault-free rotor winding**. However, it is preferable to set these controls in a standard way, as this allows measurements carried out on similar rotor windings at different times to be easily compared. Users should first read the full set-up instructions in the **TDR 100/200 Instruction manuals** and then follow the instructions given here to optimise the settings of these measurement controls and parameters.

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1. OVERVIEW

When carrying out **RSO measurements** on an unknown rotor winding, it is important to measure the **characteristic impedance** of the **rotor winding** and also the **single-pass transit time** (**SPT**). Once these values are known, the **RSO waveforms** can be displayed and viewed in a standardised format which facilitates comparison with results obtained for other similar rotors. This note describes how this is done.
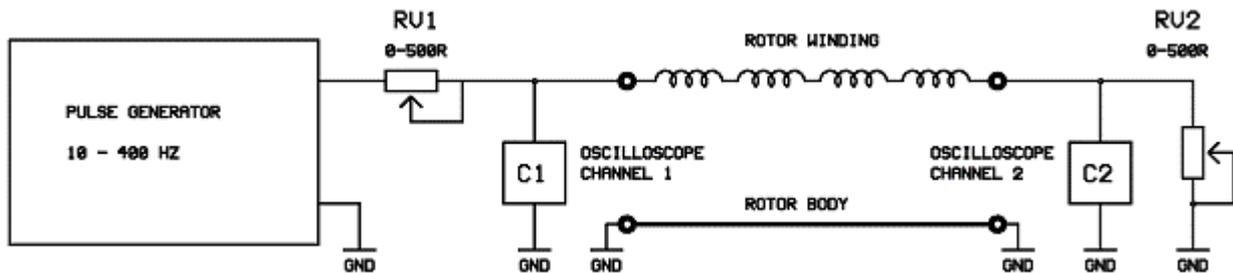

Figure 1.1 Basic RSO measurement circuit

2. MEASURING THE ROTOR CHARACTERISTIC IMPEDANCE

The approximate **rotor characteristic impedance** value can be measured as follows:

On the **PC screen**, set the **Control window Measurement Channel** to monitor the **Input ends** of the winding.

With the **Vertical scaling factor** in the **Control window** set to a value of **1.6**, adjust the **R1** (input impedance) control on the **TDR200 front panel** so that the pulse displayed in the **Plot window** is approximately 80% of the **Plot window height**, as shown in figure 2.1. **This value of R1** is the approximate **characteristic impedance of the rotor winding** in Ohms.
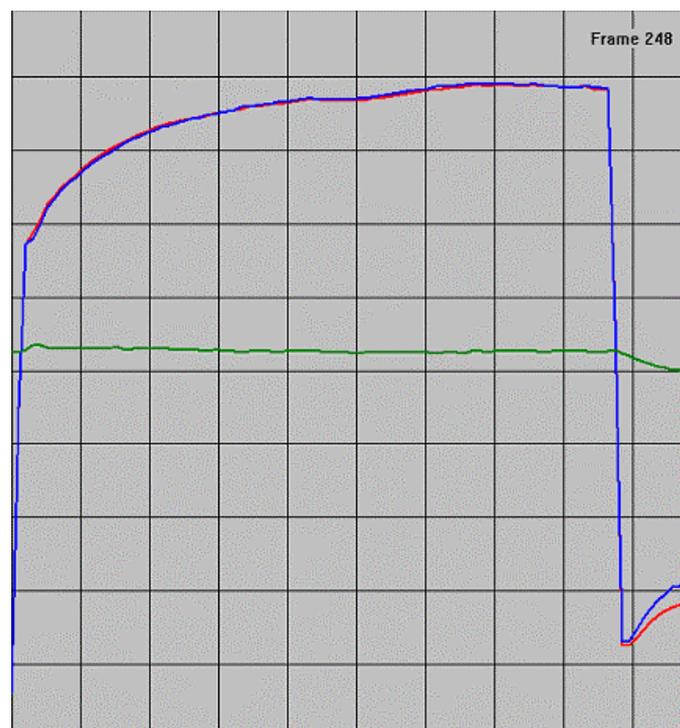

Figure 2.1 Plot window showing Input end waveforms with R1 adjusted correctly

3. MEASURING THE SINGLE-PASS TRANSIT TIME.

On the PC, set the **Control window Measurement Channel** to monitor the **Output ends** of the winding.

Adjust the **Control panel Plot window width** and also the **Pulse width controls** on the front panel of the **TDR200** unit until a waveform similar to that shown in figure 3.1 is obtained.
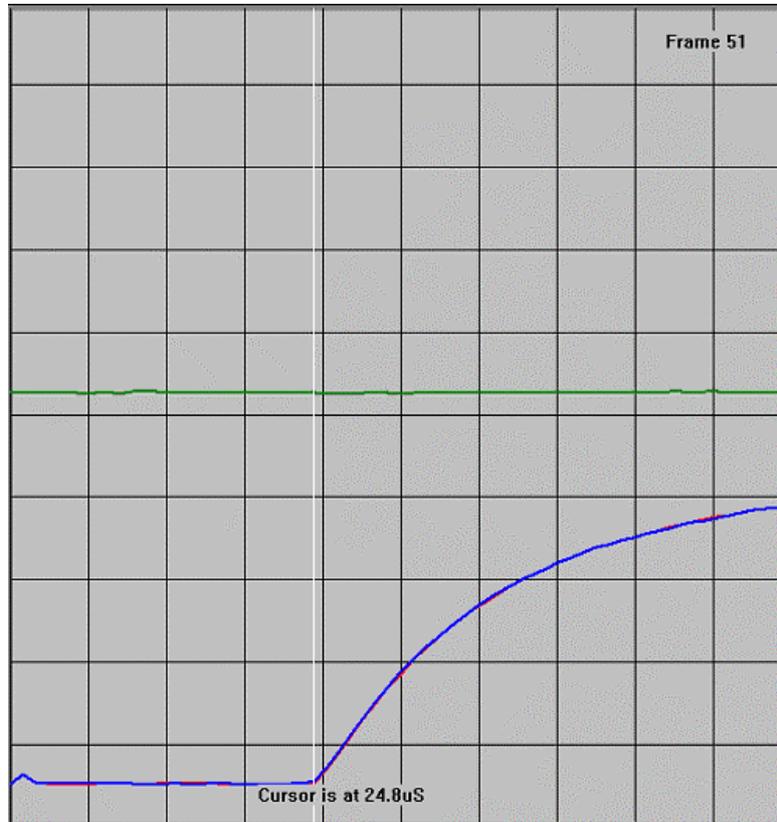

Figure 3.1 Plot window (output ends)

Click on the **Pause button** in the **Plot window**, which will stop the scanning. Now click the **mouse pointer** at the point near the start of the output waveforms (where the waveform starts to increase). This will generate a white time cursor line as shown in figure 3.1 and the **time at the cursor position** will be is displayed.

Note the time displayed for the cursor (in this case, 24.8uS). This is the time in microseconds for the pulse to pass through the rotor winding from one end to the other and is known as the **Single-pass transit time** (**SPT**).

4. SETTING THE VALUE OF R2.

The next step is to measure and set the correct value for the terminating impedance **R2**. This should be similar to that of the input impedance, **R1**. However, it is possible to measure it accurately as described next.

Reset the **Control window Measurement Channel** to monitor the **Input ends** of the winding.

Set the **Display width** in the **Plot window** to be approximately 2 x **SPT** + 16 uS. So in the above case, where SPT is 24.8uS, this figure becomes 65.6 uS. The nearest settable value to this figure is 64 uS, so this value should be used.

On the **TDR200 front panel**, set the value of **R2 = 0.5 * R1** and set the **PC** to display the input end waveforms. (Note that **R1 and R2** are shown as **RV1** and **RV2** in figure 1.1.)

If necessary, adjust the **pulse width controls** on the **TDR200** unit until the waveforms are similar to those shown in figure 4.1(a) below.

Next reset the value **of R2 = 2 * R1** and display the input end waveforms. These should be similar to those shown in figure 4.1(b) below.
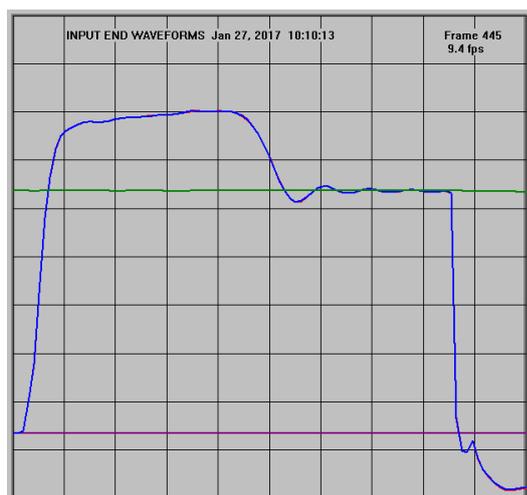
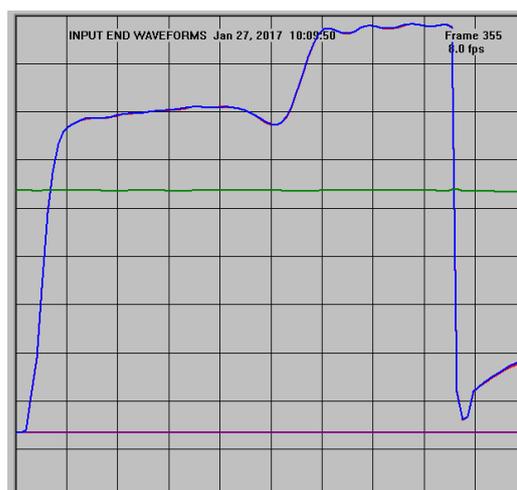**Figure 4.1 (a) Typical input end waveforms with R2 set to half R1 value.**

Figure 4.1(b) Typical input end waveforms with R2 set to 2 x R1 value.

Notice that there is now a **reflected signal** which occurs approximately **2 x SPT** after the start of the input pulse.

If **R2 is set to be > R1**, the reflected signal is **positive** and adds to the input waveform.

If **R2 is set to be < R1**, the reflected signal is **negative** and subtracts from the input waveform.

Now adjust **R2** so that there is no reflected signal after **2 x SPT**. This is the correct setting for **R2**. The waveforms should now resemble those shown in figure 5.1.
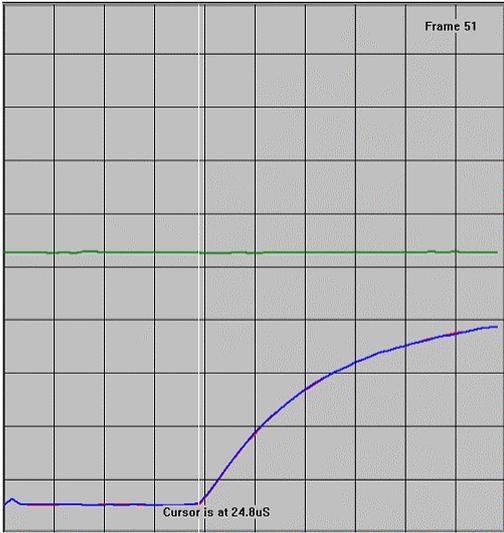
Finally, adjust the setting of **R1** so that it is the same as **R2** if necessary to finish the measurement set-up.

5. SUMMARY

If the **Control window** and **TDR200** controls have been set correctly, the waveforms at the input and output ends of the rotor winding should now be similar to those shown in figure 5.1 below.
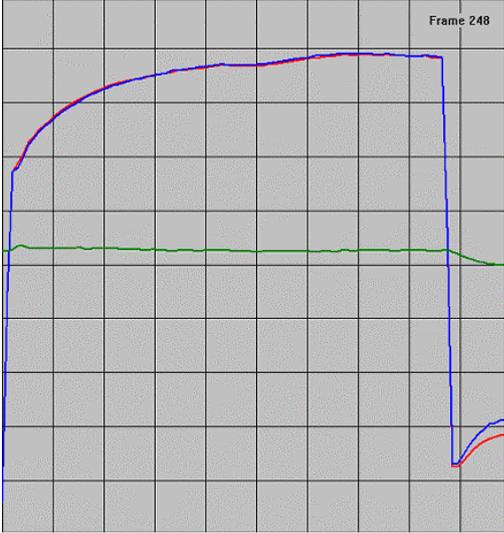
(a) Input end waveforms

(b) Output end waveforms

Figure 5.1 Correct RSO waveforms for a fault-free rotor winding.