

COMANCHE PEAK STEAM ELECTRIC STATION UNITS 1 AND 2

DOCKET NOS. 50-445 AND 50-446

TXU GENERATION COMPANY LP

FAX RECEIVED BY K. MORTENSEN (NRC STAFF)

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**3.1 Test # 1**

- 3.1.1 This test is for the ARD880UR relay. Set up the test circuit as shown in Figure 3.1. The voltage across Loads 1 thru 5 is 140 +0, -1Vdc and across Load 6 is  $120 \pm 2\text{Vac}$ . Adjust the DC/AC source to achieve the voltages.
- 3.1.2 The DC contact loads will be powered using power supplies, which maintain 139Vdc or more across their loads when peak current is drawn by the loads. The AC contact load will be  $120 \pm 2\text{Vac}$  from the AC relay coil.
- Verify power supply adequacy prior to commencement of testing by observing transient and steady state voltage across each load when energized.
- 3.1.3 For cycle 1, energize each load individually and measure the transient voltage across the load and current through the load and relay contact using an oscilloscope and store the data digitally. De-energize each load individually. Contact resistance will be recorded for each contact after the first cycle using the voltage and current values.
- 3.1.4 Turn on the switches for all loads for the remaining cycles except the 100<sup>th</sup>, 200<sup>th</sup>, 300<sup>th</sup>, 500<sup>th</sup> & 1000<sup>th</sup> cycles. See Step 3.1.7 on load switching and recording.
- 3.1.5 Connect the relay coil to a DC power supply via a switch. The switch will be used to energize and de-energize the coil. Apply a voltage of  $115 \pm 2\text{Vdc}$  to the coil.
- 3.1.6 Turn the switch for the DC coil on. Wait 1 second. Turn the switch off. Wait 90 seconds. Repeat for a total of 1000 cycles. A cycle is defined when the coil is energized and then de-energized. Record the voltage across the contact and transient current using an oscilloscope at the 100<sup>th</sup>, 200<sup>th</sup>, 300<sup>th</sup>, 500<sup>th</sup> and 1000<sup>th</sup> interval for each load.
- 3.1.7 To record the voltage across the relay contact and transient current for a given load, turn the switch for that load on and the switches for the other loads off. Repeat for all loads until readings are taken for each load at the 100<sup>th</sup>, 200<sup>th</sup>, 300<sup>th</sup>, 500<sup>th</sup> and 1000<sup>th</sup> interval. Using the voltage and current readings, calculate and record the contact resistance across the relay for the intervals identified above.
- 3.1.8 Readings will be recorded and stored digitally. Label each set of data appropriately for ease of retrieval. The test data will be transferred to a spreadsheet for tabulation.
- 3.1.9 If a contact fails prior to reaching the 1000<sup>th</sup> cycle, turn off the switch to that load. Remove the damaged/failed contact cartridge from the relay and continue with the remainder of the loads. Identify the relay contact, which failed and its load and record.

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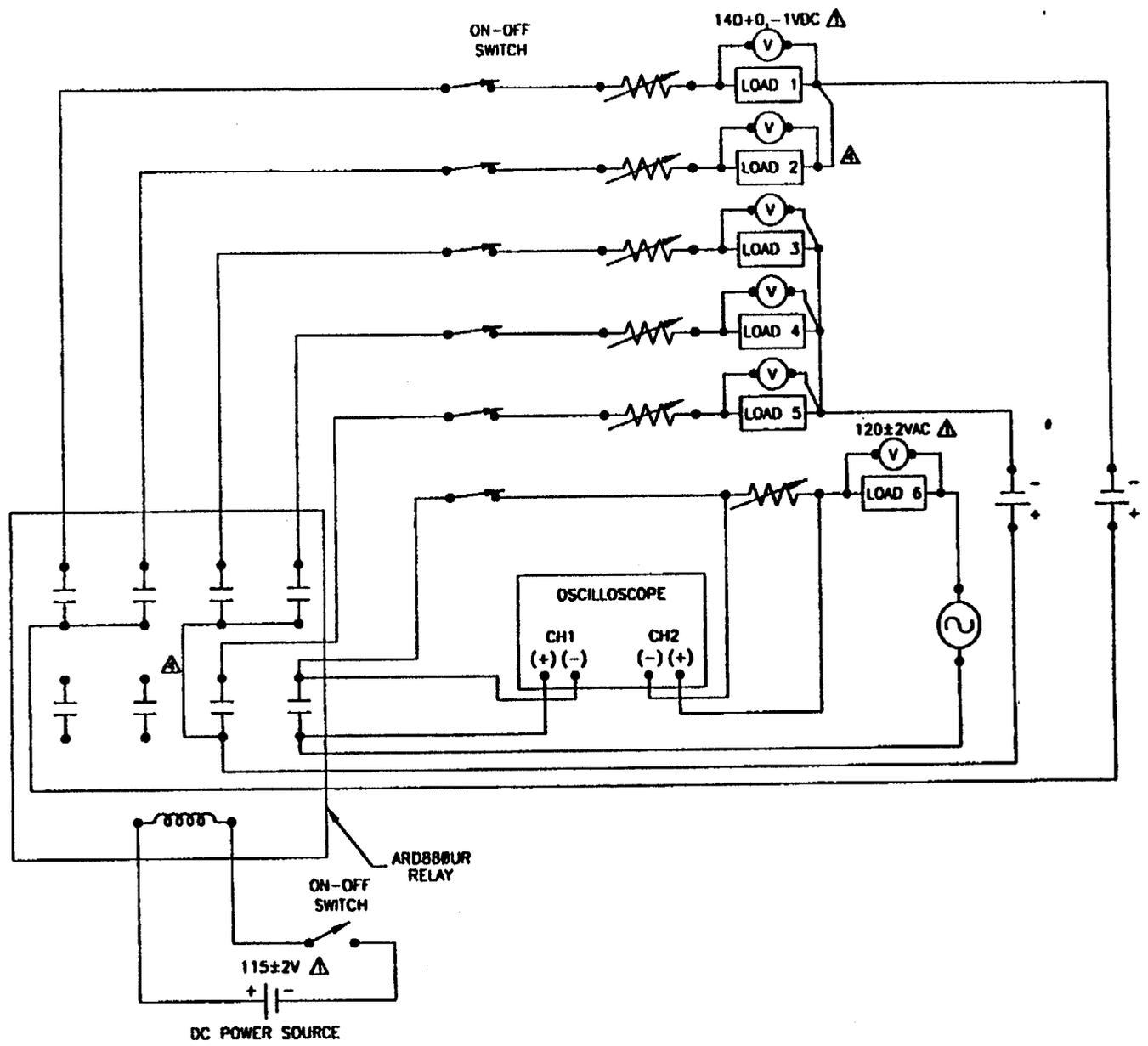


Figure 3.1 Test #1-ARD880UR DC Relay Cycling Test Circuit

**3.2 Test #2**

- 3.2.1 This test is for the AR880AR relay. Set up the test circuit as shown in Figure 3.2. The voltage across Loads 1 thru 5 is 140Vdc +0, -1Vdc. Adjust the DC source to achieve the voltage.
- 3.2.2 The DC contact loads will be powered using power supplies, which maintain 139V or more across their loads when peak current is drawn by the loads.
- Verify power supply adequacy prior to commencement of testing by observing transient and steady state voltage across each load when energized.
- 3.2.3 For cycle 1, energize each load individually and measure the transient voltage across the load and current through the load and relay contact using an oscilloscope and store the data digitally. De-energize each load individually. Contact resistance will be recorded for each contact after the first cycle using the voltage and current values.
- 3.2.4 Turn on the switches for all loads for the remaining cycles except the 100<sup>th</sup>, 200<sup>th</sup>, 300<sup>th</sup>, 500<sup>th</sup> and 1000<sup>th</sup> cycles. See Step 3.2.7 on load switching and recording.
- 3.2.5 Connect the relay coil to an AC power supply via a switch. The switch will be used to energize and de-energize the coil. Apply a voltage of  $115 \pm 2$ Vac to the coil.
- 3.2.6 Turn the switch for the AC coil on. Wait 1 second. Turn the switch off. Wait 90 seconds. Repeat for a total of 2000 cycles. A cycle is defined when the coil is energized and then de-energized. Record the voltage across the contact and transient current using an oscilloscope at the 100<sup>th</sup>, 200<sup>th</sup>, 300<sup>th</sup>, 500<sup>th</sup> and 1000<sup>th</sup> interval for each load.
- 3.2.7 To record the voltage across the relay contact and transient current for a given load, turn the switch for that load on and the switches for the other loads off. Repeat for all loads until readings are taken for each load at the 100<sup>th</sup>, 200<sup>th</sup>, 300<sup>th</sup>, 500<sup>th</sup> and 1000<sup>th</sup> interval. Using the voltage and current readings, calculate and record the contact resistance across the relay for the intervals identified above.
- 3.2.8 Readings will be recorded and stored in the oscilloscope. Label each set of data appropriately for ease of retrieval. The test data will be transferred to a spreadsheet for tabulation.
- 3.2.9 If a contact fails prior to reaching the 1000<sup>th</sup> cycle, turn off the switch to that load. Remove the damaged/failed contact cartridge from the relay and continue with the remainder of the loads. Identify the relay contact, which failed and its load and record.

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Use the test data sheets in Attachment I for recording all the required test data. Attach the spreadsheet and graphical print-outs to the test data sheets. A description of the test equipment used for measurement and tolerance of the instrument will be provided in the test data sheets.

Appropriate size resistors are used to achieve the required current and voltage in the load circuits. DC and AC power supplies are used as voltage sources.

Put all the relays and test loads into a box for return to the TXU CPSES.

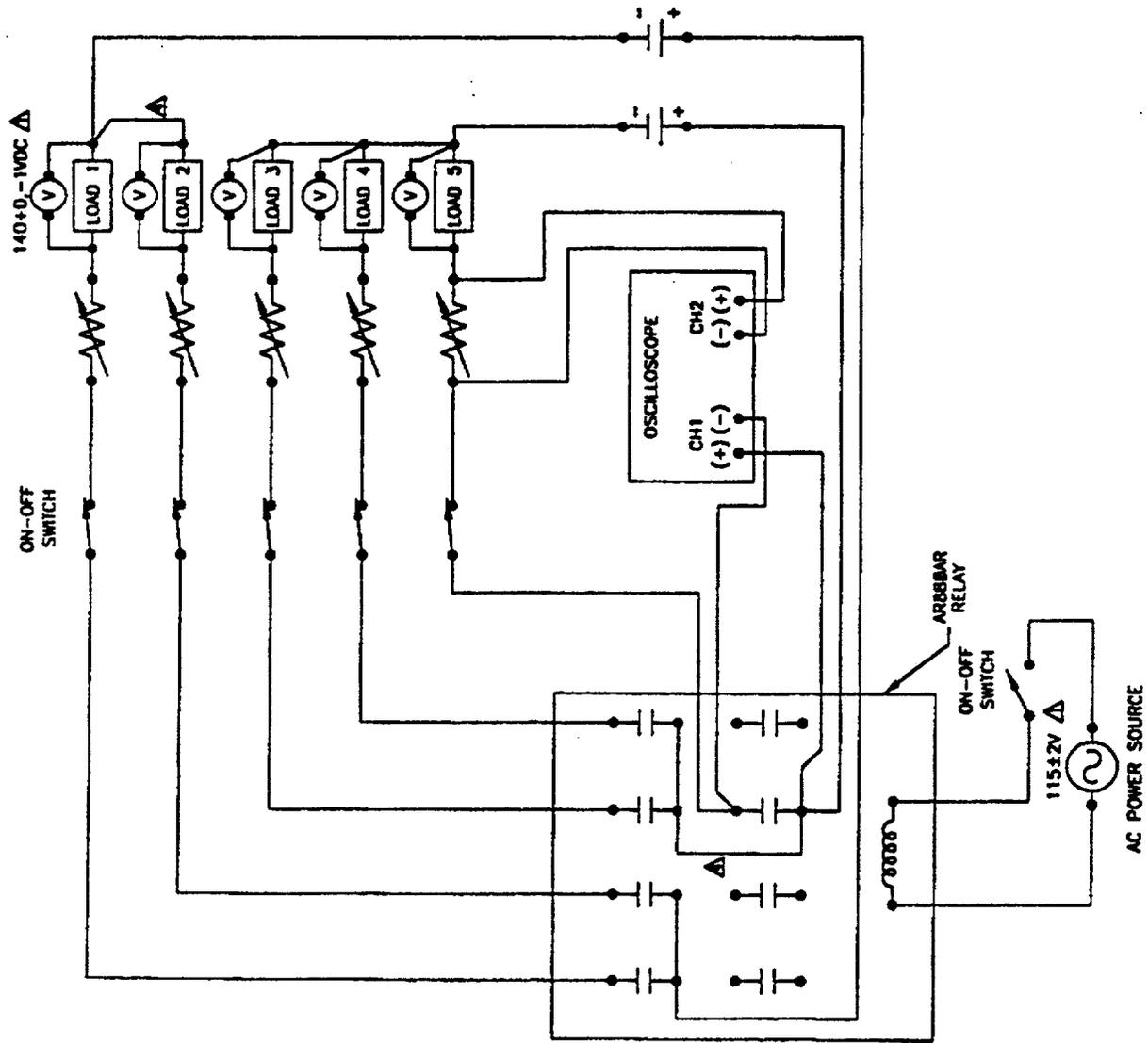


Figure 3.2 Test #2-AR88BAR AC Relay Cycling Test Circuit