

DOCUMENT TITLE:	PREVENTIVE MAINTENANCE PROCEDURE, TCM	
DOCUMENT TYPE:	☐ Calibration	☒ Preventive Maintenance
EQUIPMENT NAME:	TCM	
EQUIPMENT NUMBER:	TE82905	

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EQUIPMENT REQUIRED

Quantity	Part Number	Description
1		120VAC/60hz Power Source
1	TE82905	CHM simulator test fixture

DISPOSABLES REQUIRED

Quantity	Part Number	Description

REFERENCE DOCUMENTATION

Document Number	Description
WAT046538	Electrical Safety Test Procedure
WAT038170	Assembly, TCM Control
WAT038001	Performance Spec. TCM
WAT038004	Performance Spec. CHM
WAT038172	Test Spec. Column Heater Module

1. VISUAL INSPECTION

- 1.1. Visually inspect TCM unit for obvious defects.
- 1.2. Check the Pass or Fail Box on the TCM Preventive Maintenance Record.

2. TEST SETUP

- 2.1. Plug TCM into a 120 volt AC outlet.
- 2.2. Turn the TCM Power on.

3. FRONT PANEL LED ILLUMINATION

- 3.1. Press SELECT 99, ENTER. Press SELECT 1, ENTER. Make sure all the lights on the TCM turn on.
- 3.2. Turn the TCM power off.
- 3.3. Check the Pass or Fail box on the TCM Preventive Maintenance Record.

4. TEMPERATURE ACCURACY TEST

- 4.1. Connect the 3 connectors from TE82905 labeled CN1, 2 and 3 into the back of the TCM input/output connectors labeled 1, 2 and 3.
- 4.2. Set all the simulator toggle switches on TE82905 as follows: 1 DOWN, 2 UP and 3 UP
- 4.3. Turn the TCM power on.
- 4.4. All channels should read between 100° to 104°C. The led's above numbers 1, 2, and 3 light on the TCM to indicate which channel is displayed.
- 4.5. Record highest reading for each channel on the TCM Preventative Maintenance Record.
- 4.6. Check the Pass or Fail box on the TCM Preventative Maintenance Record based on the results.

5. TEMPERATURE VARIATION TEST

- 5.1. Enter the highest and lowest readings of the 3 channels in the space provided on the TCM Preventative Maintenance Record. Subtract the low reading from the high and enter the result. Result should be less than or equal to .5°C.
- 5.2. Check the Pass or Fail box based on the resulting answer.
- 5.3. Turn the TCM power off

6. OVER AND UNDER DEFAULT TEST

- 6.1. Set all the simulators toggle switches on TE82905 as follows: 1 DOWN, 2 and 3 UP.
- 6.2. Turn the TCM power on
- 6.3. Press SELECT 1 OVER (display should read 150.5+/-1). Press SELECT 1 UNDER (display should read 0). Repeat steps for 2 and 3 by pressing SELECT 2 or SELECT 3. Visually check that the TCM display alternates from Channel 1 to Channel 3. Also check that the 3 corresponding LEDS light while displaying the simulated temperatures for all 3 Channels.

- 6.4. Check the Pass or Fail box on the TCM Preventative Maintenance Record.
- 6.5. Turn the TCM power off.
- 6.6. Set all the simulators toggle switches on TE82905 as follows: 2 DOWN, 1 and 3 UP.
- 6.7. Turn the TCM power on.
- 6.8. Press SELECT 1 OVER (should read 75.0). Press SELECT 1 UNDER (should read 0).
- 6.9. Repeat steps for channels 2 and 3..
- 6.10. Check the Pass or Fail box on the TCM Preventative Maintenance Record.
- 6.11. Turn the TCM power off.
- 6.12. Set all the simulators toggle switches on TE82905 as follows: 3 DOWN, 1 and 2 UP.
- 6.13. Turn the TCM power on.
- 6.14. Press SELECT 1 OVER (should read 150.0). Press SELECT 1 UNDER (should read 0).
- 6.15. Repeat steps for channels 2 and 3.
- 6.16. Check the Pass or Fail box on the TCM Preventative Maintenance Record.
- 6.17. Turn the TCM power off

7. LIMIT TESTS

NOTE: COLUMN HEATER SIMULATOR SIMULATES 150°C.

- 7.1. Set all the simulator toggle switches on TE82905 as follows: 1 DOWN, 2 and 3 UP.
- 7.2. Turn the TCM power on
- 7.3. Set the temperature of all 3 channels to 150°C using the following sequences.

Press - SELECT 1 SET 1500 ENTER
LED ON SIMULATOR L1 SHOULD LIGHT.
Press - SELECT 2 SET 1500 ENTER
LED ON SIMULATOR L2 SHOULD LIGHT.
Press - SELECT 3 SET 1500 ENTER
LED ON SIMULATOR L3 SHOULD LIGHT.

OVER TEMPERATURE LIMIT TEST

- 7.4. Set the OVER TEMPERATURE LIMIT on all 3 channels to 98°C using the following sequences.
NOTE: Hold ENTER key long enough to hear alarm.

Press SELECT 1 OVER 980 ENTER
Press SELECT 2 OVER 980 ENTER
Press SELECT 3 OVER 980 ENTER

- 7.5. Verify that all 3 LEDs on the simulator go off and the alarm sounds for each channel. Verify that the OVER TEMPERATURE led indicator on TCM flashes.
- 7.6. Turn the TCM power off.

UNDER TEMPERATURE LIMIT TEST

- 7.7. Turn the TCM power on.
- 7.8. Set the temperature of all 3 channels to 150°C using the following sequences.

Press SELECT 1	SET 1500 ENTER
Press SELECT 2	SET 1500 ENTER
Press SELECT 3	SET 1500 ENTER

- 7.9. Verify that all 3 LEDs on simulator light.
- 7.10. Set the UNDER TEMPERATURE limit on all 3 channels to 105°C using the following sequences.

NOTE: Hold ENTER key long enough to hear alarm.

Press SELECT 1	UNDER 1050 ENTER
Press SELECT 2	UNDER 1050 ENTER
Press SELECT 3	UNDER 1050 ENTER

- 7.11. Verify that all 3 LEDs on the simulator stay on and the alarm sounds for all 3 channels. Verify that the UNDER TEMPERATURE led indicator on TCM flashes
- 7.12. Turn the TCM power off.
- 7.13. Disconnect TCM simulator box.
- 7.14. Check PASS or FAIL box on TCM Preventative Maintenance Record.

- 8.0 Place a Preventive Maintenance sticker on the unit.

END OF TEST

WATERS CORPORATION TCM PREVENTIVE MAINTENANCE

Part Number: _____

Tested By: _____

Serial Number: _____

Date: ____ / ____ / ____

Control Number: _____

1.0 Visual Inspection

PASS ☐ FAIL ☐ see note #____ PASS ☐

3.0 Front panel Illumination

PASS ☐ FAIL ☐ see note #____ PASS ☐

4.0 Temperature Accuracy

Chan1 (100°C - 104°C)Actual: _____

PASS ☐ FAIL ☐ see note #____ PASS ☐

Chan2 (100°C - 104°C)Actual: _____

PASS ☐ FAIL ☐ see note #____ PASS ☐

Chan3 (100°C - 104°C)Actual: _____

PASS ☐ FAIL ☐ see note #____ PASS ☐

5.0 Temperature Variation

High (104°C)Actual: _____

Low (100°C) Actual: _____

Variation ($\leq 5^\circ\text{C}$) Actual: _____

PASS ☐ FAIL ☐ see note #____ PASS ☐

WATERS CORPORATION TCM PREVENTIVE MAINTENANCE

Part Number: _____ Serial Number: _____

6.0 Over & Under Default Values (switch settings = 1 down, 2 and 3 up)

Chan1 (Over = 150.5+/-1°C) (Under = 0°C)	PASS ☐	FAIL ☐	see note #__	PASS ☐
Chan2 (Over = 150.5+/-1°C) (Under = 0°C)	PASS ☐	FAIL ☐	see note #__	PASS ☐
Chan3 (Over = 150.5+/-1°C) (Under = 0°C)	PASS ☐	FAIL ☐	see note #__	PASS ☐

Over & Under Default Values (switch settings = 2 down, 1 and 3 up)

Chan1 (Over = 75.0°C) (Under = 0°C)	PASS ☐	FAIL ☐	see note #__	PASS ☐
Chan2 (Over = 75.0°C) (Under = 0°C)	PASS ☐	FAIL ☐	see note #__	PASS ☐
Chan3 (Over = 75.0°C) (Under = 0°C)	PASS ☐	FAIL ☐	see note #__	PASS ☐

Over & Under Default Values (switch settings = 3 down, 1 and 2 up)

Chan1 (Over = 150.0°C) (Under = 0°C)	PASS ☐	FAIL ☐	see note #__	PASS ☐
Chan2 (Over = 150.0°C) (Under = 0°C)	PASS ☐	FAIL ☐	see note #__	PASS ☐
Chan3 (Over = 150.0°C) (Under = 0°C)	PASS ☐	FAIL ☐	see note #__	PASS ☐

7.0 Limit Tests

Over Temperature	PASS ☐	FAIL ☐	see note #__	PASS ☐
Under Temperature	PASS ☐	FAIL ☐	see note #__	PASS ☐

Notes: