

DOCUMENT TITLE: **WATERS GTS PREVENTIVE MAINTENANCE and CALIBRATION PROCEDURE**

DOCUMENT TYPE: ☒ Calibration ☒ Preventive Maintenance

EQUIPMENT NAME: **WATERS GTS**

EQUIPMENT NUMBER: **TE82988**

AUTHOR(S): **RICHARD DAVIS**

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REVISED BY: **N/A**

DATE: **N/A**

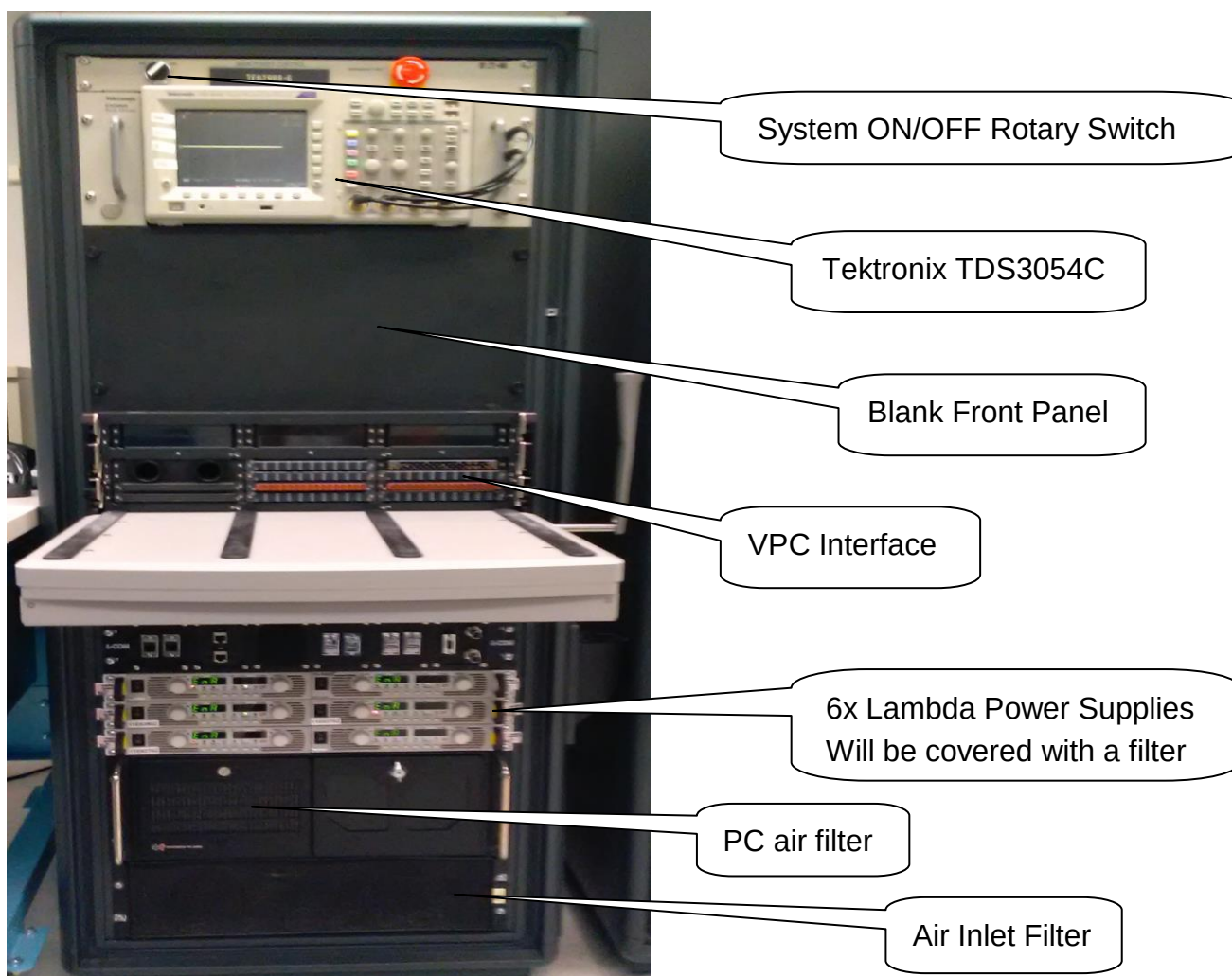


Figure 1  
GTS Front View

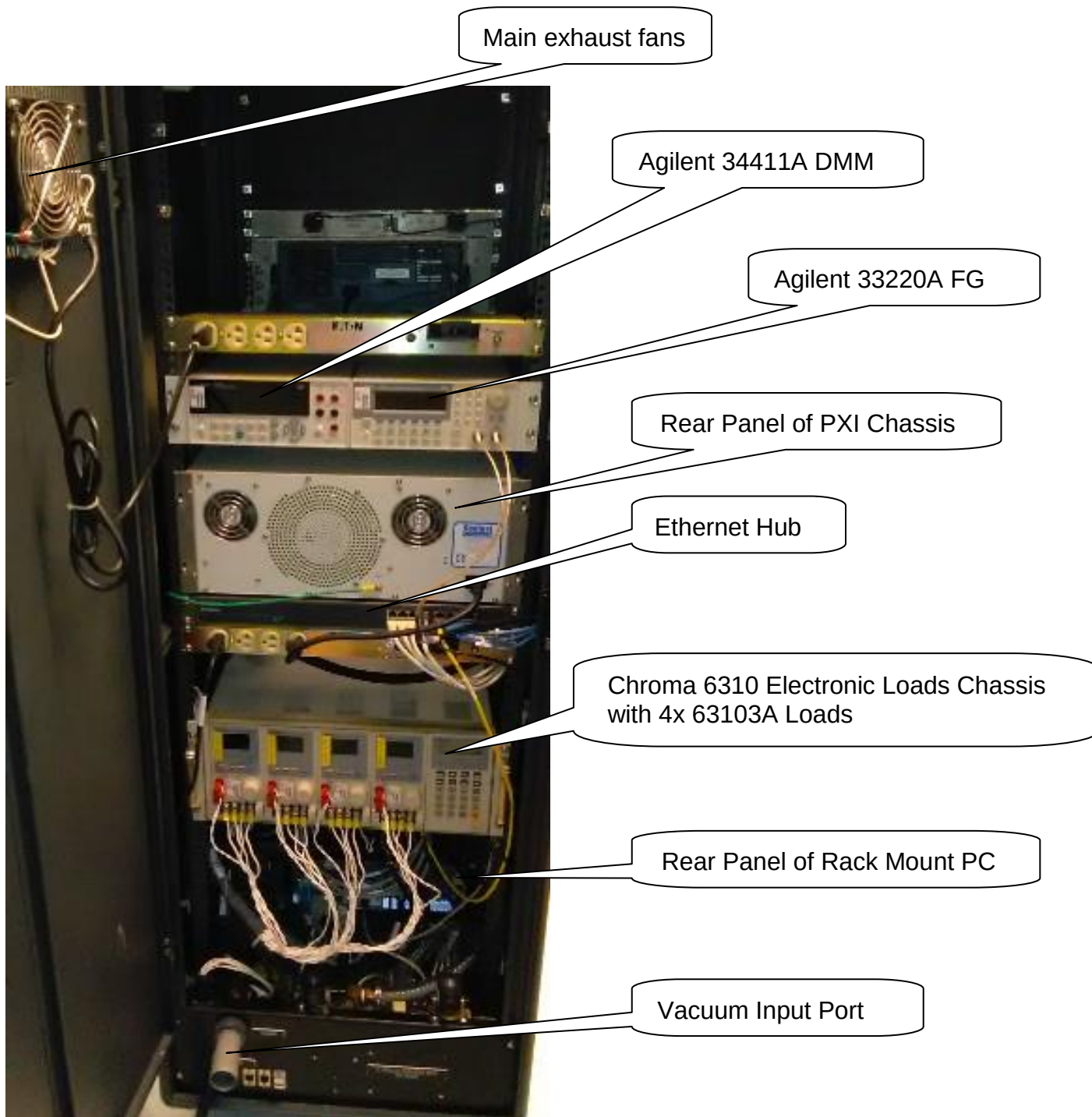


Figure 2  
GTS Rear View



Figure 3  
TE83063 Calibration Fixture



Figure 4  
TE83004 GTS Self Test Fixture

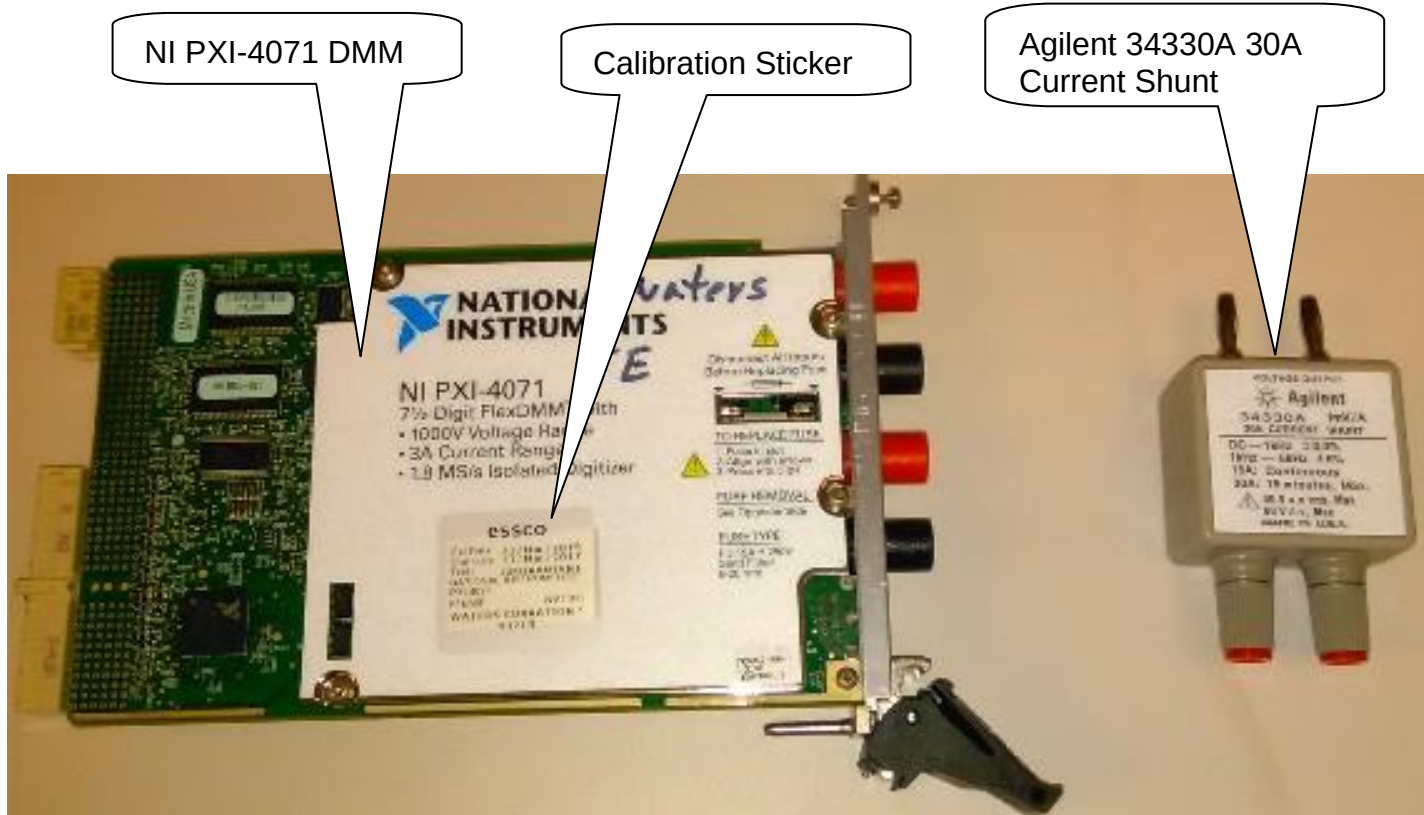


Figure 5  
PXI-4071 DMM and Agilent 34330A Current Shunt

## EQUIPMENT SUPPLIED

| Quantity | Part Number    | Description                                                            |
|----------|----------------|------------------------------------------------------------------------|
| N/A      | N/A            | Vacuum Cleaner w/soft brush attachment                                 |
| 1        | TE83004        | GTS Selftest Fixture (figure 4)                                        |
| 1        | TE83063        | GTS Calibration Fixture (figure 3)                                     |
| 1        | Agilent 34330A | 30A Current Shunt (1mV/A) supplied with Calibration Fixture (figure 5) |
| 1        | NI PXI-4071    | 7 ½ Digit PXI DMM supplied with Calibration Fixture (figure 5)         |

## REFERENCE DOCUMENTATION

| Document Number | Description                             |
|-----------------|-----------------------------------------|
| 730001799       | Operating Procedure, Calibration and PM |
| 730000295MP     | Quality System Document Control         |

## DEFINITIONS AND ABBREVIATIONS

| Term                   | Definition/Abbreviation                                                                                                                                                                                                                                                |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Calibration            | A process to ensure that equipment is capable of producing accurate results. This includes verifying measurements and/or making adjustment(s) to ensure measurement accuracy.                                                                                          |
| PM                     | Preventive Maintenance: The servicing, for the purpose of maintaining equipment in satisfactory working order, by performing systematic inspection, detection, and correction of potential failures. PM activities may include tests, cleaning, and parts replacement. |
| Calibration Laboratory | An accredited laboratory that performs ISO 17025 calibrations and can show traceability to US NIST standards or equivalent International standards.                                                                                                                    |
| Traceability           | The concept of traceability is important because it allows you to compare the results of measurements worldwide according to a standardized procedure for estimating measurement uncertainty.                                                                          |
| GTS                    | Global Test System                                                                                                                                                                                                                                                     |

## GTS INSTRUMENTS REQUIRING CALIBRATION

| Instrument                                               | Qty | Interval |
|----------------------------------------------------------|-----|----------|
| Agilent 34411A DMM                                       | 1   | 1 Yr.    |
| Agilent 33220A FG                                        | 1   | 1Yr.     |
| Tektronics TDS 3054C Oscilloscope                        | 1   | 1Yr.     |
| Lambda GEN60-12.5 Programmable DC Power Supply           | 4   | 1Yr.     |
| Lambda GEN30-25 Programmable DC Power Supply             | 2   | 1Yr.     |
| Chroma 63103 Electronic Load Modules                     | 4   | 1Yr.     |
| National Instruments PXI-6229 M-Series Multifunction DAQ | 2   | 1Yr.     |
| National Instruments PXI-4130 Source Measure Unit        | 1   | 1Yr.     |
| Geotest GX1164 Programmable Resistor PXI Module          | 1   | 2 Yr     |

## NOTES:

1. The calibration procedure in section 3 will be performed by an accredited Calibration Laboratory. The calibration will be performed on site using the GTS Calibration Fixture, TE83063. Instruments requiring calibration will not be removed from the GTS.
2. Other than the PXI-4071 DMM and the Agilent 34330A Current Shunt (called out in the Equipment List) the Calibration Laboratory is responsible for supplying all other calibration equipment. Equipment should be suitable with respect to accuracy and resolution, for its intended use.
3. The PXI-4071 DMM must be in current calibration to be used in conjunction with this calibration procedure. It should be sent to National instruments for calibration. It shall be on a 2 yr. calibration cycle.
4. The Agilent 34330A Current Shunt must be verified to be with specifications. It can be sent to any accredited Calibration Laboratory for verification. If found to be out of specification it must be replaced. It shall be on a 2 yr verification cycle.

## PROCEDURE

| 1. PC Maintenance                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.1. Log in as TE-1 (administrator) with credentials supplied by TE.                                                                                                                                                                                                                                                                                                       |
| 1.2. Open the Windows Disk Defragmenter utility. Run Analyze. If analysis says the volume needs to be defragmented then defragment now. If the analysis says you do not need to defragment this volume then exit the Disk Defragmenter.                                                                                                                                    |
| 1.3. Check fan operation of PC; ensure that vent is clear of dust. Clean the filter.                                                                                                                                                                                                                                                                                       |
| 1.4. Verify system date, time and time zone. Adjust if necessary.                                                                                                                                                                                                                                                                                                          |
| 1.5. Verify Symantec Antivirus service is running (you will see icon in system tray). Open Symantec Antivirus by double clicking on antivirus icon in system tray and verify dates on each type of protection. Ensure that definition files for each type of protection is <30 days old. If definition files cannot be updated, contact TE to upgrade anti-virus software. |
| 1.6. Login as tester, with credentials supplied by TE. If the screensaver tab is available, ensure that the time out is 240 minutes, with star field screensaver selected. Ensure that on resume, 'password protect' or 'display login screen' is selected.                                                                                                                |
| 1.7. Verify desktop wallpaper is Waters approved "The Science of what's possible" or none with a black background.                                                                                                                                                                                                                                                         |
| 1.8. Inspect all cabling to the rear panel of the PC (Ethernet, serial, monitor, keyboard, mouse, etc). Ensure they are secure and in good condition. Replace as needed.                                                                                                                                                                                                   |
| 1.9. Reboot the PC.                                                                                                                                                                                                                                                                                                                                                        |

## 2. GTS Maintenance

- 2.1. Power down the GTS. Note the PC stays powered on, this is OK.
- 2.2. Remove and clean the air inlet filter, located at the bottom front of the GTS.
- 2.3. Remove and clean the Lambda Power Supply filter.
- 2.4. Inspect the VPC Interface (Figure 1). Vacuum the connector blocks. Ensure rows 5 and 6 contain blank panels.
- 2.5. Remove GTS Blank Front Panel, located above the VPC Interface.
- 2.6. Vacuum the PXI Chassis front panel grill, below the PXI cards. Use a soft brush attachment to get behind/underneath the PXI cables. **Take care not to stress the cables.**

PXI Chassis front panel grill area to be vacuumed



- 2.7. Inspect the rear panel of the Agilent 34411A DMM and Agilent 33220A FG for debris and dust around the fan. Use vacuum to clean as required.

FG Fan



DMM Fan

- 2.8. Reinstall the GTS Blank Front Panel, removed in step 1.6.
- 2.9. Open door located in the rear of the GTS.
- 2.10. Vacuum the perforated grill area and fans located on the rear panel of the PXI Chassis.

Perforated Grill Area



2.11. Vacuum the perforated grill area located on the top of the Chroma Loads Chassis.

Chroma Chassis  
top perforated  
grill area



2.12. Vacuum the air inlet and fan areas on the rear panel of the oscilloscope.

Oscilloscope  
fan



Oscilloscope  
air grill

2.13. Power on the GTS. Restart the PC. Login as tester with credentials supplied by TE.

2.14. Install the Selftest Fixture. TE83004

2.15. Open Teststand from Start>Programs>National Instruments>TestStand 4.2.1>Sequence Editor. Login to TestStand by simply clicking on the OK button.

2.16. From Teststand load the Selftest program: File>Open Sequence File;  
browse to C:\GTS Selftest\;  
select file "TE82988 Selftest.seq"

2.17. Run Selftest: Click on the green Run Arrow in the toolbar. When prompted for a Serial Number use the GTS TE#



Run Arrow

Note: The following Calibration procedure utilizes the GTS Calibration Fixture, TE83063. If this fixture is not available for use it will be acceptable to remove the instruments requiring calibration from the GTS in order to have them calibrated.

| 3. Calibration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.1. Power down the GTS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 3.2. Install the NI PXI-4071 7-1/2 Digit DMM into PXI Chassis Slot 9.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 3.3. Install the Calibration Fixture, TE83063.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 3.4. Power on the GTS and restart the PC. Login as te-1 with credentials supplied by TE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 3.5. Calibrate the following instruments to the manufacturer's specifications:<br>Agilent 34411A DMM and Agilent 33220A Function Generator.<br>Use the connections on the Calibration Fixture to connect to the DMM and Function Generator.<br>Use the LXI Virtual Panels to setup and control the DMM and Function Generator.                                                                                                                                                                                                                                                                                                                                                                                   |
| 3.6. Calibrate the TDS3054B Oscilloscope to the manufacturer's specifications.<br>Connect calibration equipment directly to the oscilloscope's front panel inputs.<br>Setup and read back measurements from the oscilloscope's front panel display.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 3.7. Calibrate the PXI-4130 SMU to the manufacturer's specifications.<br>Use the jacks on the Calibration Fixture for connections to the SMU.<br>Use the NI-DCPower Soft Front Panel to control and read back from the SMU.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3.8. Calibrate the 2 PXI-6229 Multifunction DAQ modules to the manufacturer's specifications.<br>Use National Instruments Calibration Executive software. Configure the Calibration Executive software to use the National Instruments Calibration Hardware Adaptors, built in to the GTS Calibration Fixture, and the PXI-4071 DMM. When the Calibration Executive stops and prompts the operator to connect and swap cables, select the cable using the Cable Select Switch on the Calibration Fixture (see Figure 2).<br>An appropriate voltage source and frequency counter will have to be supplied by the Calibration Lab. These instruments should be compatible with the Calibration Executive software. |
| 3.9. Open the Calibration Suite program located at C:\GTS Calibration and fill out the Location, Performer, and Ambient Conditions fields. Then click on the Start button.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 3.10. From the Calibration Suite window select the Lambda Power Supplies. Complete the Calibration Equipment Information page, and then click on the DONE button. Follow on-screen instructions. Pick up the Calibration Data report and use the collected data to generate an official Certificate of Calibration. Repeat for all six Power Supplies. Select the Exit Button when finished with all the Power Supplies. Note: this verification uses the supplied PXI-4071 DMM and Agilent 34330A Current Shunt.                                                                                                                                                                                                |
| 3.11. From the Calibration Suite window select the Geotest PXI-GX1164. Complete the Calibration Equipment Information page, and then click on the DONE button. Follow on-screen instructions. Pick up the Calibration Data report and use the collected data to generate an official Certificate of Calibration. Note: This verification uses the supplied PXI-4071 DMM.                                                                                                                                                                                                                                                                                                                                         |

3.12. From the Calibration Suite window select the Chroma Electronic Loads. Calibrate the Chroma Electronic Loads to manufacturer's specifications.

This utility only provides the means to select the module, configure the module, and read back Voltage and Current from Electronic Load module.

The NI PXI-4071 DMM is configured for Voltage and can be used to read current shunt voltage and/or load input voltage.

3.13. Power down the GTS. Remove the NI PXI-4071 DMM.

3.14. Power on the GTS. Restart the PC. Login as tester with credentials supplied by TE.

3.15. Run the system Selftest. Refer to instructions in section 2.14 thru 2.17 above.

**WATERS CORPORATION**  
**Waters Global Test System**  
**CALIBRATION and PREVENTIVE MAINTENANCE RECORD**

|                                |                                |                             |
|--------------------------------|--------------------------------|-----------------------------|
| <b>Date:</b>                   | <b>Performed By:</b>           | <b>Procedure: 735004006</b> |
| <b>Equipment I.D. TE82988-</b> | <b>Location:</b>               |                             |
| <b>Due Date:</b>               | <b>Interval (Months): 1 Yr</b> | <b>Next Due Date:</b>       |

| SECTION                   | RESULT                                                      | NOTES                                                  |
|---------------------------|-------------------------------------------------------------|--------------------------------------------------------|
| Section 1 PC Maintenance  | PERFORMED <input type="checkbox"/>                          |                                                        |
| Section 2 GTS Maintenance | PERFORMED <input type="checkbox"/>                          |                                                        |
| Section 3 Calibration     | PASS <input type="checkbox"/> FAIL <input type="checkbox"/> | Attach Certificates of Calibration for each instrument |
| Section 3 Selftest        | PASS <input type="checkbox"/> FAIL <input type="checkbox"/> | Print and attach Selftest Report                       |

**NOTES**

Place Expired Label Here