



DaqPRO Calibration Procedure

This document outlines calibration procedure for Fourier's DaqPRO 5300. Calibration is performed on each of the DaqPRO's inputs. Use the calibration sheet at the end of the document to record the calibrated values, and also as a reference for the acceptable tolerance for each input.

Please refer to the *Calibration* chapter in the *DaqPRO User Guide* before proceeding with the Calibration procedure as outlined below.

Note: When calibrating DaqPRO of firmware version 2.0 the logger samples every 10 seconds so the calibration process will be slower. On DaqPRO firmware version 3.0a to 3.0h the logger will sample every second.

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A - Required Equipment

- DaqPRO and external power supply for **DaqPRO**
- USB cable for **DaqPRO**
- **Martel MC-1000** calibrator (or suitable alternative calibration device)
- **DaqLab 1.40.01** or higher installed on PC
- Two green terminal blocks connected to a black and red banana cable (+ is the red cable and - is the black cable)
- Seven terminal blocks with 680 Ω resistors
- Seven terminal blocks) with short TCJ sensors
- Seven terminal blocks with $\pm 349.5 \Omega$ resistors
- One terminal block with a resistor of precisely 6.8k Ω

B - Pulse Input Test

1. Turn on the **Martel MC-1000** calibrator.
2. Using the **V/mA/Hz** button choose **Out Hz**. Choose any frequency between 1 and 10 and press **Enter**.
 - a. **Rate = every second**
 - b. **Samples = 500**



3. Open the **Setup** dialogue and select **Pulse Meter** in the first I/O entry. Click **Finish**. Input a frequency signal.
4. Input a “**Pulse**” signal using the green connector and the black and red banana cables. As mentioned before, the red cable goes to the “+” and the black to the “-”.
5. Run the logger using **Logger>Run** and check whether the difference between the reading corresponds to the frequency displayed on the **Martel MC-100** calibrator.
6. Stop logging using **Logger>Stop** and disconnect the DaqPRO using **Logger>COM Setup>Work offline**
7. Turn off the device using the **Off** button situated on the front panel.

C - Calibration Procedure

For all tests and calibrations use the following Setup:

1. **Sample rate = Every second**
2. **Samples = 500**
3. **Average = 4 samples**

Restoring the calibration to factory defaults is a necessary step before beginning the calibration procedure. Connect the DaqPRO to the PC and go to **Logger > Calibration > Load Factory Calibration Defaults**. Enter the logger SN in the dialog that opens up.

Note: Password for Calibration dialog is 1234.

C1 - NTC-10K Calibration

1. Open **Setup** and select **NTC-10K** in the first I/O entry. Click **Finish**.
2. Short circuit the “+” and “-” of IN 1, using the green terminal block.
3. Open the **Calibrate Sensors** dialog and select the **NTC-10K** sensor for calibration.
4. Click **Start**.
5. Wait while the readings stabilize. When the peak point is reached, click **Get Zero > OK**.
6. Select the **Martel MC-1000** calibrator. There is an option, which allows outputting the resistance signal in **V/Om/Hz** using the 680 Ω resistance.
7. Connect the **DaqPRO** IN 1 to the calibrator, which is set to 680 Ω resistance.
8. To run the test, click **Run** and make sure that all temperature readings are within the 0.5 °C range of 100 °C.
9. Stop logging.
10. If recalibration is required, repeat steps 1 – 3. Before proceeding with step 4, in the Calibration tab press **Restore Defaults** to restore the NTC input to default calibration values. Then continue with steps 4 to 9.

NTC-10K Input QA

1. Open **Setup** and select the **NTC-10K** sensor in all I/O entries.
2. Insert terminal blocks with 680 Ω resistors into INs 2 – 8 and press **Run**.
3. Check to see that all readings resemble those of IN 1.
4. Stop logging.



C2 - NTC-100K Calibration

1. Open **Setup** and select **NTC-100K** in the first I/O entry. Click **Finish**.
2. Short circuit the “+” and “-” of IN 1, using the green terminal block.
3. Open the **Calibrate Sensors** dialog and select the **NTC-100K** sensor for calibration.
4. Click **Start**.
5. Wait while the readings stabilize. When the peak point is reached, click **Get Zero > OK**.
6. Select the **Martel MC-1000** calibrator. There is an option, which allows outputting the resistance signal in **V/Om/Hz** using the 6.8K Ω resistance.
7. Connect the **DaqPRO** IN 1 to the calibrator, which is set to 6.8K Ω resistance.
8. To run the test, click **Run** and make sure that all temperature readings are within the 0.5 °C range of 100 °C.
9. Stop logging.
10. If recalibration is required, repeat steps 1 – 3. Before proceeding with step 4, in the Calibration tab press **Restore Defaults** to restore the NTC input to default calibration values. Then continue with steps 4 to 9.

C3 - 0 to 10 Volt Input QA & Calibration

1. Open **Setup** and select **10 Volt** in all of the I/O entries. Click **Finish**.
2. In the **Martel MC-1000** calibrator select a 0V signal in the **V/Om/Hz** output and record the reading at IN 1.
3. In the **Martel MC-1000** calibrator select a 10V signal in the **V/Om/Hz** output and record the reading at IN 1.
4. Calibrate the input according to these results.
5. In order to calibrate this sensor perform the following:
 - a. Go to **Logger>Calibrate Sensors>Sensor 10V**
 - b. Enter the values for 0V and 10V in the suitable places and press **OK**.
6. Check to see that calibration was successful by running the logger and verifying the values.
7. In the **Martel MC-1000** calibrator select a 5V signal in the **V/Om/Hz** output.
8. In order to run the voltage test, select the **10V** sensor in the Setup dialog for all 8 inputs on the DaqPRO. Press **Finish**.
9. Input in sequential order a 5V signal into all IN entries.
10. Click **Start**.
11. Check to see that all INs produce readings of 5V or within the immediate range of 5V.

C4 - Current Sensor QA & Calibration

1. Open **Setup** and select **Current 4-20 mA** in the first I/O entry.
2. Using the **V/Om/Hz** button, select current signal output to the **mA** IN of the **Martel MC-1000** calibrator. Connect the DaqPRO to the calibrator. Remember to change the terminal connection of the banana plugs on the Martel calibrator.



3. Run logger and select a current of 15.38 mA, record the logger value and then enter 5.13 mA and record the logger value. Click **Stop**.
4. If results are not within the acceptable tolerance, calibrate the sensor.
5. In order to calibrate this sensor go to **Logger>Calibrate Sensors>Current 4-20 mA**.
6. Enter the values 15.38 and 5.13 mA as **Reference Values** and the actual results as **Logger Value**. Click **OK**.
7. Run logger and check to see that the readings correspond to 15.38 and 5.13 mA.
8. Stop logging.

C5 – 50 mV Sensor QA & Calibration

Note: This sensor must be calibrated before calibrating Thermocouple inputs

1. Open **Setup** and select **50mV** in the first I/O entry.
2. Send a signal of up to 50mV to the **Martel MC-1000** calibrator output.
3. Run logger and feed 0 and 50 mV signals to IN 1.
4. Record the resulting values.
5. In order to calibrate this sensor go to **Logger>Calibrate Sensors>Sensor 50 mV**.
6. Enter the resulting values in **Logger Value** and press **OK**.
7. Run logger and feed 0 and 50 mV signals to IN 1. Stop logging.
8. Check to see that the resulting readings after calibration correspond to 0 and 50 mV. If that fails, recalibrate sensor.

C6 - PT 100 2-wire Sensor Calibration

1. Open **Setup** and select **PT-100 2-wire** in the first I/O entry.
2. Select the PT-100 sensor in the Martel MC-1000 calibrator. To accomplish that use the **TC/RTD** and **Range** keys.
3. Run logger and feed 0 and 350 °C signals to IN 1.
4. Record the resulting readings. If these correspond to 0 and 350 °C.
5. In order to calibrate this sensor go to **Logger>Calibrate Sensors>Sensor PT 100 2-Wire**.
6. Enter the resulting readings (0 & 350 °C) in **Logger Value** and press **OK**.
7. Check to see that the resulting readings after calibration correspond to 0 and 350 °C. If that fails, recalibrate sensor.

C7 - PT 100 3 Wire Sensor Calibration

1. Connect the “-” of the calibrator to the “-” of IN 1 and IN 5 terminal block on the DaqPRO. Connect the “+” of the calibrator to the “+” of IN 1 terminal block on the DaqPRO.
2. Open **Setup** and select **PT-100 3-wire** in the first I/O entry.
3. Run logger and feed 0 and 350 °C signals to IN 1.
4. Record the resulting values. If these do not correspond to 0 and 350 °C proceed with the following calibration process.



5. In order to calibrate this sensor go to **Logger>Calibrate Sensors>Sensor PT 100 3-Wire**.
6. As Offset Value enter the difference between the 0 in reference value and 0 in logger value.
Click **OK**.
7. Run the logger and check to see that the results correspond to 0 and 350 °C.

C8 – TCJ, K and T Sensor Calibration

Note: Ensure the mV input is calibrated before calibrating Thermocouple inputs

1. Turn on the **Martel MC-1000** calibrator.
2. Press the **V/mA/Hz** button to bring it to V mode, and then press the **TC/RTD** button. Press **Range** to bring it to **mV**.
3. Go to **Logger>Thermocouple compensation>Disable** to disable compensation on the DaqPRO.
4. Open **Setup** and select **TCJ** sensor in the first I/O entry. Click **Finish**.
5. Use the respective voltage values in the table below to read 0 °C and 1000 °C on the **DaqPRO**.

	Point 1			Point 1		
	temp	tolerance	Voltage	temp	tolerance	Voltage
TCJ	0°C	±0.5°C	0mV	1000°C	±5°C	57.953mV

6. Record the value in the DaqPRO after 10 samples at both 0 and 1000 °C. In case they do not correspond to the input values 0 and 1000 °C, calibrate the thermocouple.
7. In order to calibrate this sensor go to **Logger>Calibrate Sensors>Sensor Temperature TCJ**.
8. As Offset Value enter the difference between the reference value of 0 °C and the relevant logger value. Click **OK**.
9. Run the logger and check to see that the results correspond to 0 and 1000 °C (within the acceptable tolerance).
10. To calibrate the **TCK** sensor, repeat the procedure in steps 1-9 above but use the values in the table below instead:

	Point 1			Point 1		
	temp	tolerance	Voltage	temp	tolerance	Voltage
TCK	0°C	±0.5°C	0mV	1000°C	±5°C	41.269mV

Select the **TCK** input during logger Setup.

11. To calibrate the **TCT** sensor, repeat the procedure in steps 1-9 above but use the values in the table below instead:

	Point 1			Point 1		
	temp	tolerance	Voltage	temp	tolerance	Voltage
TCT	0°C	±0.5°C	0mV	350°C	±2°C	17.819mV

Select the **TCT** input during logger Setup. Note that the reference points for the **TCT** calibration are 0 and 350 °C.



C9 – Thermocouple Compensation Tests across all Channels

1. Open **Setup** and select **Internal Temperature** sensor in the first I/O entry and **TCJ** in INs 2 – 8.
2. Enable Internal Compensation on the DaqPRO (either via the System Configuration menu on the logger, or via the DaqLab Setup wizard).
3. In DaqLab, enable ambient temperature compensation on the DaqPRO via **Logger>Thermocouple compensation>Enable**.
4. Select the TC-J option on the Calibrator.
5. Run the logger and check to see that the readings in all inputs do not deviate substantially from those on IN 1.



Appendix A: DaqPro Calibration Sheet

S/N: _____

Voltage

Calibrator	DaqPro	After calibration	Pass/Fail
0 V			±50 mV
10 V			±50 mV

0-50 mV

Calibrator	DaqPro	After calibration	Pass/Fail
0 mV			±250 µV
50 mV			±250 µV

PT100 2-wire

Calibrator	DaqPro	After calibration	Pass/Fail
0 °C			±0.5 °C
350 °C			±1.5 °C

PT100 3-wire

Calibrator	DaqPro	After calibration	Pass/Fail
0 °C			±0.5 °C
350 °C			±1.5 °C

TCJ

Calibrator	DaqPro	After calibration	Pass/Fail
0 °C			±0.5 °C
50 °C			±0.5 °C
1000 °C			±5 °C

TCK

Calibrator	DaqPro	After calibration	Pass/Fail
0 °C			±0.5 °C
50 °C			±0.5 °C
1000 °C			±5 °C

TCT

Calibrator	DaqPro	After calibration	Pass/Fail
0 °C			±0.5 °C
50 °C			±0.5 °C
350 °C			±2 °C

NTC-10K (Test after Get Zero process)

Calibrator	DaqPro	Pass/Fail
100 °C (680Ω)		±0.5 °C

NTC-100K (Test after Get Zero process)

Calibrator	DaqPro	Pass/Fail
100 °C (6.8KΩ)		±0.5 °C

Current 4-20 mA

Calibrator	DaqPro	After calibration	Pass/Fail
5.13 mA			±100 µA
15.38 mA			±100 µA

All inputs 0-10 V
 Pulse Counter
 NTC-10K (All inputs)

PASS/FAIL
 PASS/FAIL
 PASS/FAIL

Tester Name:
 Date: