



## DaqPRO Calibration Procedure

This document outlines calibration procedure for fourtec – Fourier Technologies 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.

For technical support please contact [support@fourtec.com](mailto:support@fourtec.com)

**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.

- **A - Required Equipment**
- **B - Pulse Input Test**
- **C - Calibration Procedure**
- **C1 - NTC-10K Calibration**
- **C2 - NTC-100K Calibration**
- **C3 - 0-10 V Sensor QA & Calibration**
- **C4 - Current Sensor QA & Calibration**
- **C5 - 50 mV Sensor QA & Calibration**
- **C6 - PT 100 2-wire Sensor Calibration**
- **C7 - PT 100 3-wire Sensor Calibration**
- **C8 - TCJ, K, T Sensor Calibration**
- **Appendix A: DaqPRO Calibration Sheet**

### A - Required Equipment

- External power supply for [DaqPRO](#)
- [Martel MC-1000](#) calibrator (or suitable alternative calibration device)
- [Martel](#) model 2001 calibrator with plug-in for TC-calibration (or suitable alternative calibration device)
- PC with CalibratorProject.exe and [DaqLab](#) software installed
- 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  $\Omega$  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  $\Omega$ .
- USB cable for [DaqPRO](#)

## 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

### 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.
3. Open the [Calibrate Sensors](#) dialogue and select the [NTC-10K](#) sensor for calibration.
4. In the Calibration dialog, click [Restore default settings](#).
5. Click [Start](#).
6. Wait while the readings stabilize. The peak point is the chosen one.
7. Click [Get Zero > OK](#).
8. Select the [Martel MC-1000](#) calibrator. There is an option, which allows outputting the resistance signal in [V/Om/Hz](#) using the 680  $\Omega$  resistance.
9. Set the [DaqPRO](#) IN 1 to 680  $\Omega$  resistance using the connector with the banana cables connected so as to check the calibration results.
10. To run the test, click [Run](#) and make sure that all temperature readings are within the 1 °C range of 100 °C.
11. Stop logging.

### NTC-10K Input QA

1. Open [Setup](#) and select the [NTC-10K](#) sensor in all I/O entries.
2. Insert terminal blocks with 680  $\Omega$  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.
2. Short circuit the “+” and “-” of IN 1.
3. Open the [Calibrate Sensors](#) dialogue and select [NTC-100K](#) for calibration.
4. In the calibration dialog, click [Restore default settings](#).
5. Click [Start](#).
6. Wait while the readings stabilize. The peak point is the chosen one.
7. Click [Get Zero > OK](#).
8. Input 6.8K $\Omega$  into IN 1 of the DaqPRO using the calibrator.
9. To run the test, click [Run](#) and make sure that all temperature readings are within the 1 °C range of 100 °C.
10. Stop logging.

### 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 5V signal in the [V/Om/Hz](#) output.
3. Click [Start](#).
4. Input in sequential order a 5V signal into all IN entries. There is an option to do this using two [DVM](#) probes that are mounted on the [Martel MC-1000](#) calibrator outputs.
5. Check to see that all INs produce readings of 5V or within the immediate range of 5V.
6. In order to run the voltage test, select the [10V](#) sensor in the first IN in the [Setup](#) dialogue and press [Finish](#).
7. Click [Start](#).
8. In the [Martel MC-1000](#) calibrator select a 0V signal in the [V/Om/Hz](#) output and record the reading at IN 1.
9. In the [Martel MC-1000](#) calibrator select a 10V signal in the [V/Om/Hz](#) output and record the reading at IN 1.
10. Calibrate the input according to these results.
11. 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](#).
12. Check to see that calibration was successful by running the logger and verifying the values.
13. 0V and 10V must appear in the [V/Om/Hz](#) output.



#### **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.
3. Run logger and select a current of 15.38, 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 - 50mV Sensor QA & Calibration**

##### **THIS SENSOR MUST BE CALIBRATED IN ALL CASES**

1. Open Setup and select [50mV](#) in the first I/O entry.
2. Send a signal of up to 50mV to the Martel MC-100 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. Before calibrating sensor click [Restore Defaults](#) and wait until a [Ready](#) message appears on the screen.
7. Enter the resulting values in [Logger Value](#) and press [OK](#).
8. Run logger and feed 0 and 50 mV signals to IN 1. Stop logging.
9. 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, proceed to the calibration of PT-100 3-wire. Otherwise proceed with the calibration process.
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. Short circuit the “-”-s of IN1 and IN5. The “+” insert as in the rest of the sensors.
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

1. Turn on the Martel model 2001 calibrator and connect it to the PC using a 9 pin male-female cable (DT135).
2. Run the CalibratorProject.exe on the PC and select [External Off](#) to disable external temperature compensation.

**Note:** If using an alternative calibrator, ensure external temperature compensation is disabled.

3. Close CalibratorProject.exe.
4. Go to [Logger>Thermocouple compensation>Disable](#) to disable compensation on the DaqPRO.
5. Open [Setup](#) and select [TCJ](#) sensor in the first I/O entry. Click [Finish](#).
6. Run logger and feed 0 and 1000 °C signals using the plug connected to the Martel model 2001 calibrator TC output.
7. Record the resulting readings and in case they do not correspond to the input values 0 and 1000 °C, calibrate the thermocouple.
8. In order to calibrate this sensor go to [Logger>Calibrate Sensors>Sensor Temperature TCJ](#).
9. As Offset Value enter the difference between the 0 in reference value and 0 in logger value. Click [OK](#).
10. Run the logger and check to see that the results correspond to 0 and 1000 °C (within the acceptable tolerance).
11. To calibrate TCK sensor, repeat the procedure in steps 1-10 above but select the TCK input during logger Setup, and on the calibrator.
12. To calibrate TCT sensor, repeat the procedure in steps 1-10 above but select the TCT input during logger Setup, and on the calibrator. In addition, the reference point for TCT calibration are 0 and 350 °C.

### Input Test with TCJ Plugs

1. Open Setup and select Internal Temperature sensor in the first I/O entry and TCJ in INs 2 – 7.
2. Enable surrounding temperature compensation using [Logger>Thermocouple compensation>Enable](#).



3. Run logger and check to see that the readings in all INs entries do not deviate substantially from those in IN1.
4. Turn off device and disconnect from the power supply. Turn back on and check to see that the date and time were saved correctly.
5. Fill in the calibration form corresponding to the version of DaqPRO.



## 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)		±1 °C

### NTC-100K (Test after Get Zero process)

Calibrator	DaqPro	Pass/Fail
100 °C (6.8KΩ)		±1 °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: