

# Configuring LabJack T Series Analog Inputs (AIN) using MatDeck

In this document, we will illustrate two alternative ways of configuring the AIN channels for LabJack T7 and T4 devices.

- MatDeck provides LabJack functions, and configuration can be done directly in MatDeck's C++ style Script . Additionally, you can configure devices in Python.
- However, the most effective and intuitive way for configuring the devices is by using MatDeck GUI configuration.

This document is "alive" and simultaneously executes commands, which is one of MatDeck's unique advantages.

## Configuring Analog Input at the Selected Channel in MatDeck Script

In this example, the T7 is configured to measure the temperature by collecting the signal at the AIN2 channel. MatDeck supports LabJack functions which can be used directly inside MatDeck script to configure LabJack devices. To configure and use device, the LabJack T7 device should be opened in the document:

```
1 dev := ljdevice_open("any", "any", "any")
```

In this example, we presume that the low power linear active thermistor circuit MCP9701A is used as a temperature sensor. Here, the output is the voltage that depends on the ambient temperature, the voltage reading is converted to temperature by using a linear function given in the Microchip data-sheet. The sensor transfer function is:

$$V_{OUT} = T_C \cdot T_A + V_{0^\circ C}$$

Here,  $V_{OUT}$  is the sensor output voltage,  $T_A$  is the ambient temperature,  $T_C$  is the temperature coefficient, and  $V_{0^\circ C}$  is the sensor output voltage at  $0^\circ C$ . From the MCP9701A datasheet,  $T_C=19.5 \text{ mV}/^\circ C$  and  $V_{0^\circ C}=400\text{mV}$ . In order to determine the temperature from the voltage, we need to inverse the function.

$$T_A = V_{OUT} / T_C - V_{0^\circ C} / T_C$$

Slope and offset can be determined as follows:

```
2 Tc := 0.0100
3 V0 := 0.5
4 Slope := 1 / Tc
5 Offset := -V0 / Tc
```

AIN2 is configured to use the Offset and Slope extended feature, EF\_INDEX is 1, which automatically adds a slope and an offset to analog readings according to the linear function above.

```
6 ljdevice_write(dev, "AIN2_EF_INDEX", 1)
7 ljdevice_write(dev, "AIN2_EF_CONFIG_D", Slope)
8 ljdevice_write(dev, "AIN2_EF_CONFIG_E", Offset)
9 a := ljdevice_last_error("s") //Check for errors in configuration
```

```
a = "LJ_SUCCESS"
```

Finally, all extended features should be disabled and the device should be closed.

```
10 ljdevice_close(dev)
```

## Configuring Analog Input at the Selected Channel by using MatDeck GUI

All of the above parameters can be set by using `ljainT7_config_form` in a very intuitive manner. By using this way, all lines of script code are substituted by GUI settings. The same form can setup all the device pins.

```
form := ljainT7_config_form(0, "Form_2")
ljainT7_config_form_configure(form)
```

LabJack - AIN Configuration Form

Device Type: T7 | Connection Type: ANY | Device ID: ANY

AI(0:3) | AI(4:7) | AI(8:11) | AI(12:13) | Stream | All

AI0: [Dropdown]

AI1: [Dropdown]

AI2: Offset and Slope | Offset: -50.0 | Slope: 100.0

AI3: [Dropdown]

Configure

The tab `AI(0:3)` is used to select extended feature `Offset and Slope` which is appropriate for this type of temperature measurement. The GUI settings are used instead of script code above..

The written code below will be automatically executed after the GUI. Whatever method is used to configure the T7 device, the temperature is automatically read using:

```
11 dev1 := ljdevice_open("any", "any", "any")
12 Ta :=ljdevice_read(dev1, "AIN2_EF_READ_A")
```

`Ta = 29.625 C`

Before use, the device should be opened first, and once finished, it should be closed again.

```
13 ljdevice_close(dev1)
```