



APPLICATION NOTE: The Balance function in TCS

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Summary

This application note describes the operation of the Balance function in TCS.

Background

The Titan System provides for two types of offset: Sensor offset and Balance offset. Sensor offset is handled in TCS, while Balance offset is handled in the Titan device hardware. Both are addressed briefly here.

Sensor offset is a user-specified value appearing in the sensor transform pane on the ‘Sensors’ page in TCS. Sensor offset is the ‘b’ term in the equation $y=mx+b$. On any given ‘Sensors’ definition page, the ‘Offset’ field allows you to enter an offset value in whatever Engineering units are specified. These offsets can be positive or negative. Offset values specified here show up in the exported data, but are not applied through a DAC (if connected).

The screenshot shows the 'B: Sensors' configuration page. The 'Name' field is 'Default Sensor'. The 'Description' field is empty. The 'Manufacturer', 'Model', 'Serial Number', and 'Cal Due Date' fields are empty. The 'Calibration Target Threshold' is set to 2%. The 'Eng Units' are set to 'Volts'. The 'Input Dividers' section has 'Input Dividers Enabled', 'Single Ended', and 'Differential' checked. The 'Sensitivity' section has '1000 mV Input /' and '1 V'. The 'Offset' field is set to 0. The 'Excitation' section has 'Internal' as the source and '2.048' as the value. A red circle highlights the 'Sensitivity' and 'Offset' fields.

Figure 1. If there are no PREV offset values, TCS will calculate and apply the offset when a Balance operation [F10] is performed

Balance offsets are stored on the Titan device hardware. Balance offsets are applied directly to the channel on the device and will show up in the exported data and on DAC outputs. The balance offset function is enabled on the ‘Tags and Channels’ page (described below), and is activated from the Runtime screen using the [F10] function key.

NOTE: Balance is a device specific operation –

1. *If you change devices during a test, Balance values will be incorrect & lost. To save Balance offsets with the test, see ‘Transferring Balance Offsets’, page 5.*
2. *Whenever you change the test, you should first UnBalance [F12] any connected device to remove any saved balance values.*

Balance

Balance operations are specified in the ‘Tags and Channels’ screen in TCS. A drop-down menu labeled “Bal Type” specifies the Balance function for the selected channel .

The screenshot shows the 'C: Tags and Channels' configuration window. At the top, the title is 'C: Tags and Channels'. Below it, there's a 'Name' field with 'Chan_01' and a 'Use Strict Naming' checkbox. There are two checked checkboxes: 'Channel Enabled' and 'Default Display'. The 'Sensor' is set to 'Default Sensor' with a 'Browse' button. 'Gain' is set to '1' and 'Cal Type' is 'VCAL'. The 'Bal Type' dropdown menu is open, showing 'NO' as the current selection, with 'YES' highlighted by a mouse cursor. To the right, there's a table of parameters: Eng Units (V), Range (± 32.767 V), Resolution (0.001 V), and Excitation (2.048 V). At the bottom left, it says 'Editing Channel 1'.

Figure 2. If there are no PREV offset values, TCS will calculate and apply the offset when a Balance operation [F10] is performed

The available BalType options are ‘YES’, ‘NO’, and ‘PREV’ (Previous). If ‘YES’ is selected, then Balance will be applied to that channel when the Balance operation [function key F10] is selected in the Runtime screen. If ‘NO’ is selected, then Balance will not be applied to the channel when the Balance operation is selected. If ‘PREV’ is selected, then the last stored Balance offset (or the offset that was loaded with the test) will be applied when the Balance function is selected. The ‘BalType’ selection affects the connected device as follows:

YES: Offsets are cleared when the device powers up. New offsets are calculated and applied when a balance operation is performed. Balance values will persist as long as the device is powered up.

NO: Offsets are cleared when the device powers up. No offsets are applied when a Balance operation is performed.

PREV: The last stored offsets are loaded at power up and applied when a scan is initiated. If no offsets are stored then new offsets are calculated and applied when a Balance operation is performed. Balance values will persist across power cycles as long as the channel is set to PREV *and* the offsets are stored.

BalType = YES

If running with BalType = YES, the channel will balance whenever a Balance operation is performed. If the device is power-cycled, then any balance offsets will be cleared.

For example, if Channel 1 has a steady 1V DC input, the Runtime screen will display 1 volt for that channel. If BalType = YES for Channel 1, selecting the Balance operation [F10] will balance the channel to zero volts. This means that the balance offset for this channel is -1 V. Selecting Un-Balance [F12] will remove the offset and restore the original value (1V).

BalType = NO

If running with BalType = NO, the channel value will not change when a Balance operation is performed and offsets will be cleared after a power cycle. This is the default Balance configuration for all channels.

BalType = PREV

Balance previous [PREV] should be selected if the device will be powered off at any time during the test and the Balance offsets need to be preserved for the acquisition.

Conditions

When operating with BalType = PREV the channel will Balance [F10] if no previous balance offset has been stored in the Titan device:

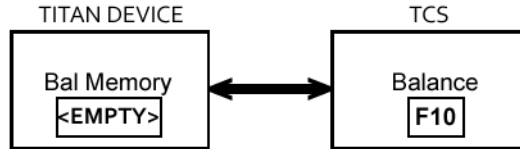


Figure 3. If there are no PREV offset values, TCS will calculate and apply the offset when a Balance operation [F10] is performed

If a balance offset is stored on the Titan device, performing a balance operation will simply re-apply that offset with recalculating:

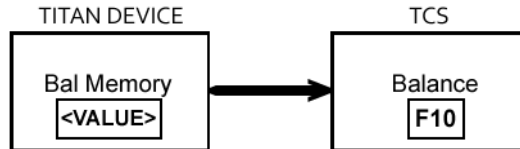


Figure 4. If PREV offset values exist, TCS will apply the offset when a Balance operation [F10] is performed.

Setting Balance Offset

Setting the balance offset involves two steps: selecting the ‘Balance’ function [F10] and responding ‘yes’ to the prompt, and then saving the balance offset to the Titan hardware by selecting ‘Save Offsets’ [F11] and responding ‘yes’ to the prompt. This action will write the Balance offset values to the memory on the Titan hardware so that they can be used in later tests, even after a power cycle (see note):

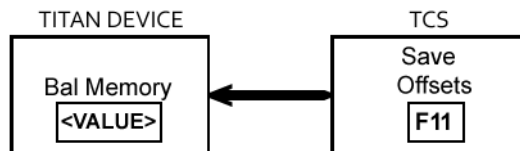


Figure 5. After offsets are calculated, selecting ‘Save Offsets’ [F11] stores the offset values on the Titan hardware

NOTE: Balance offsets will also be saved if you stop scanning and then re-scan.

Re-balancing

Once a channel is balanced using BalType =PREV it cannot be re-balanced simply by performing the Balance operation. There are two ways to re-balance a channel or group of channels:

1. If a single channel needs to be balanced while preserving the Balance offsets on other channels, stop the scan in TCS, switch to the Tags and Channels page and change the channel BalType to 'YES'. Switch to the Runtime screen and start scanning. Select 'Balance' [F10] and respond 'yes' to the prompt, then select 'Save Offsets' [F11] and respond 'yes' the prompt, and then stop scanning. Switch to the Tags and Channels screen and set the BalType on the channel back to 'PREV'. Switch to the Runtime screen and begin scanning again, select 'Balance' [F10] and respond "yes" to the prompt; the channel should balance using the newly calculated offset.
2. If the Balance offsets on all channels need to be reset, selecting 'Unbalance' [F12] will remove the offsets. All of the channels can then be re-balanced by selecting 'Balance' [F10] followed by 'Save Offsets' [F11].

When to use BalType=Yes or BalType=PREV

If running a remote test where the device will be power-cycled without a PC Connection, it is recommended to use the BalType=PREV setting. This is because BalType=PREV uses the Balance offsets that are saved in memory.

If your system configuration requires running with DACs that need to be offset, it is recommended to use the BalType=PREV setting. This is because you need to apply the Balance offsets instead of the Sensor offsets (Sensor offsets are only applied on the PC and not on the Titan device).

Transferring Balance Offsets

Balance offsets are device specific; if a different device needs to be used with the test and the balance offsets need to be preserved, then the offsets need to be transferred to the test. This process involves obtaining the Balance offset values from the memory of the original device and then applying those values to the test as a Sensor offset.

Obtain the Balance offsets by connecting to the original Titan device using the original TCS test. Switch to the Runtime screen, and then switch to the Single Pod Monitor Page. Begin scanning and then select 'Toggle Cal 0' [F9]. This will display the offset on each of the channels. Record the offset value for any channels that require balance. Stop the scan and go to the Configuration/Sensors tab. On the Sensors screen, select the sensor that corresponds to the channel that was previously balanced. Enter the balance value that was recorded in the 'Offset' field. After all entries are complete, save the test.

NOTE: When an offset is applied to a sensor that offset will be seen on each of the channels that the sensor is applied to.