Using shunting processes in Ethernet systems

TEC/NOT/077

This paper discusses the following topics:

48.1 Overview

Shunting is a calibration process for strain gauges. During this process, a simulated load is introduced to one arm of a balanced bridge by driving current into, or drawing current from, one bridge of the arm. This simulated load can then be used to calibrate the accuracy of the bridge.

48.2 Shunting in Ethernet systems

The following three types of shunting can be run on Ethernet systems:

- System-driven shunting
- Time-driven shunting
- External shunting

48.3 System-driven shunting

When a controller module in an Acra KAM-500 system is designated shunt master, this master controller module initiates shunting in other chassis by transmitting an Ethernet shunt packet that instructs other chassis to switch to a particular shunt format. The master controller module identifies the shunt format to switch to by reading the value of a user-defined shunt source parameter that you have associated with a shunt process.

48.3.1 Using DAS Studio 3 to configure system-driven shunting

As stated, master controller modules read the value of the shunt source parameter associated with a shunt process. You can use DAS Studio 3 to associate a user-defined shunt source parameter with a shunt process. DAS Studio 3 is used to create a configuration file which contains the various elements which make up your data acquisition system. You then use this configuration file to manage and program these elements. To see how hardware is represented in the DAS Studio 3 graphical user interface, see Figure 1 in the *DAS Studio 3 User Manual*.

To configure system-driven shunting using DAS Studio 3, do the following:

- Associate a shunt source parameter with a shunt process
- Enable Shunt Mode
- Set the shunting current

48.3.1.1 Associating a shunt source parameter with a shunt process

In the DAS Studio 3 GUI, the information displayed on the Processes tab relates to the node selected in the Navigator. When the overview node in the Navigator is selected, process registers for all the nodes in the Navigator are displayed. If another node is selected in the Navigator, only the process registers for that node are displayed.

In this section, a discrete low parameter from a KAD/DSI/102/B is the parameter used as an example of associating a shunt source parameter with a shunt process.

TIP! The KAD/DSI/102/B's discrete low parameter is ideal as you can easily reflect any 16-bit value by tying input pins to reference voltages.

To create a new shunt process and associate it with a shunt source parameter, do the following:

1. In the shunt master chassis, select the designated master controller module and go to the **Processes** tab.

2. Create a new process by clicking the ⊞ icon in the **Source Name** column.
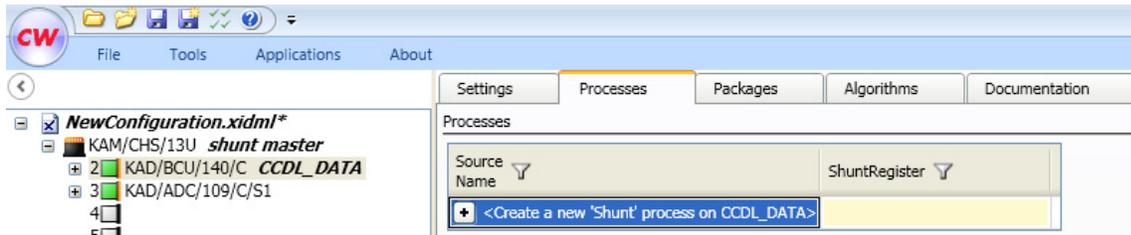
3. In the Navigator, select the **KAD/DSI/102/B** module and go to the **Settings** tab.
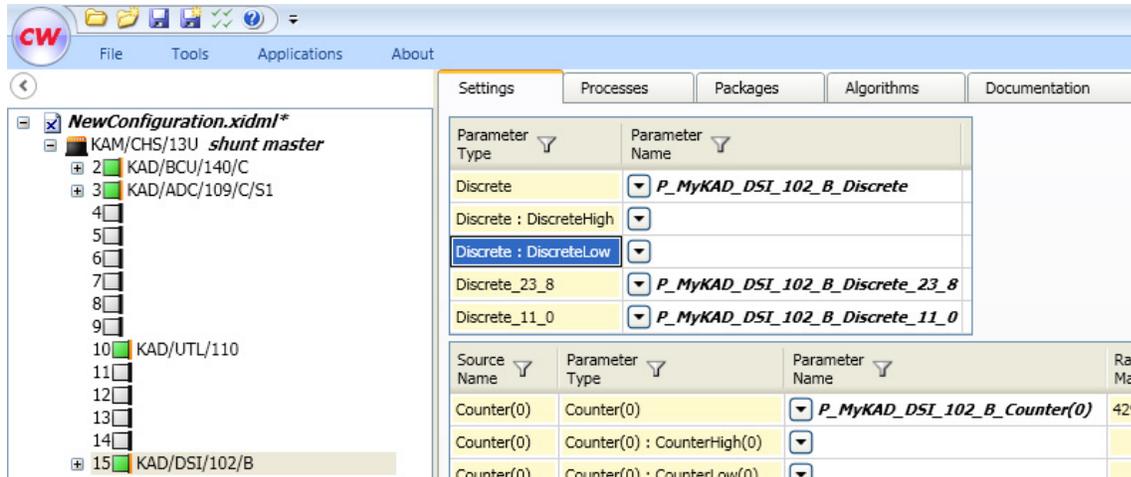
A discrete low parameter is displayed on the **Settings** tab.

4. In the **Parameter Name** column, type a name for the discrete low parameter.
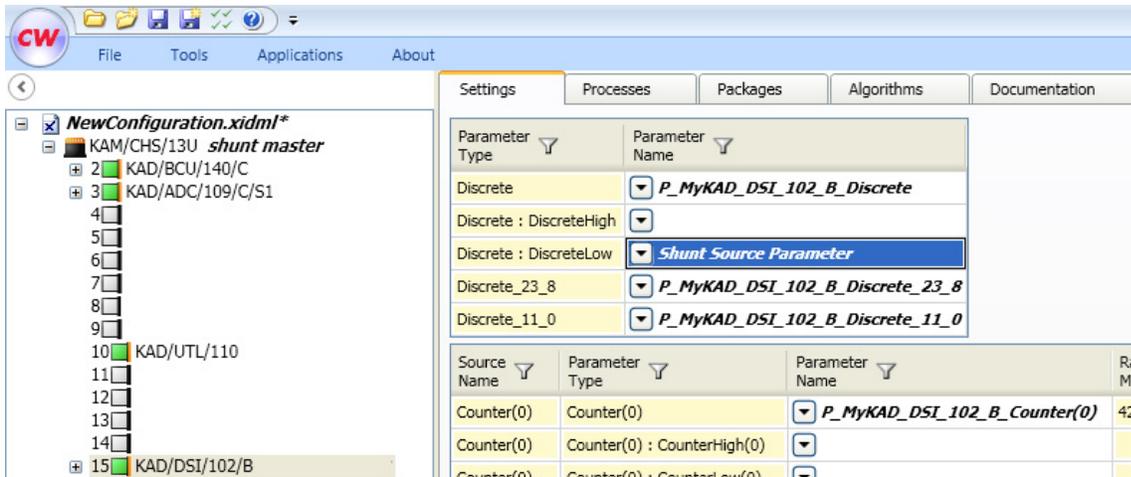
After naming this parameter, it is available in the **This File** library of the **Parameters Palette**.

5. In the Navigator pane, select the master controller module and go to the **Processes** tab. In the **ShuntRegister** column, click the drop-down arrow and select **Add parameter from palette**.
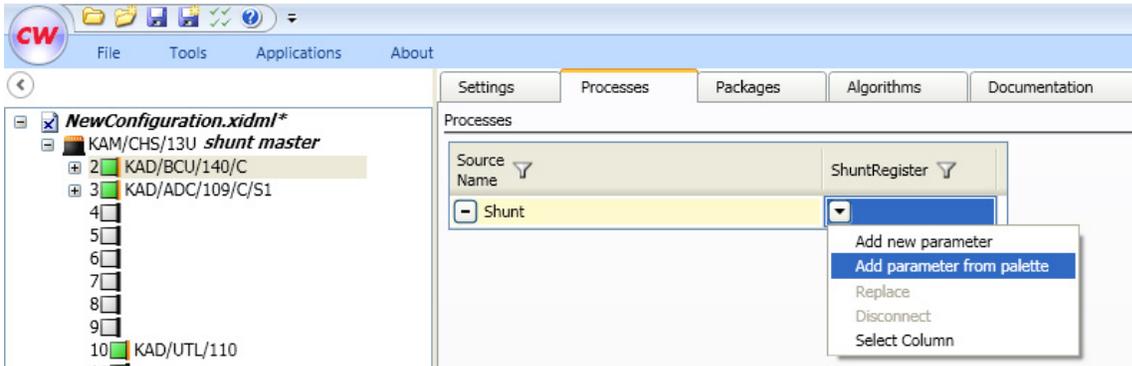
6. On the **Parameters Palette**, select the **This File** library to view the shunt source parameter.
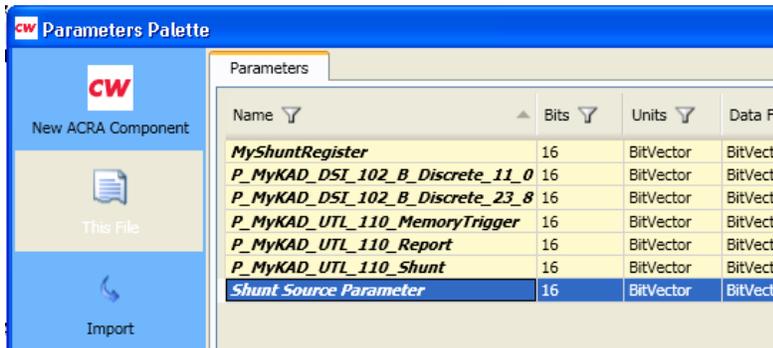
> **TIP!** On the left of the **Parameters Palette** are libraries which group parameters. The default library is **New ACRA Component**. By clicking on each library, you can display all parameters available.

7. Select the shunt source parameter and click **Add Reference**.
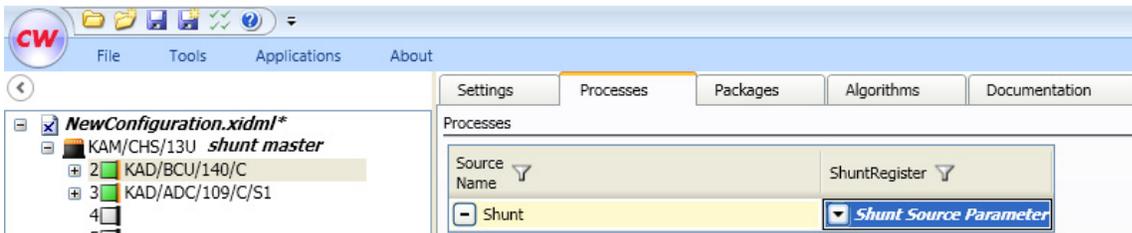
The shunt source parameter is now associated with the shunt process.

> **NOTE:** Valid shunt format values are 0, 4, and 8. At this point, you are able to force shunting by setting discrete inputs 0 to 15 of the KAD/DSI/102/B to read 0, 4, or 8. For example, to set the KAD/DSI/102/B to read shunt format value 4, tie inputs 15 to 3 to GND, tie input 2 to +5V, and tie inputs 1 and 0 to GND (0x0004).

48.3.1.2 Enabling Shunt Mode

On any shunt slave chassis, the Shunt Mode setting must be enabled so that controller modules in a shunt slave chassis react to the Ethernet shunt packet transmitted from the shunt master controller.

> **NOTE:** For successful shunting, enable Shunt Mode only in a chassis that contains shuntable user-modules such as the KAD/ADC/109/C/S1, modules from the KAD/ADC/118 family, and all other full-bridge modules.

To enable Shunt Mode, do the following:

1. Select a shunt slave chassis in the Navigator pane, then click the **Settings** tab.

2. On the **Settings** tab, select the **Shunt Mode** checkbox.

To locate the **Shunt Mode** checkbox, scroll down

48.3.1.3 Setting shunt current

To set a shunt current on a shuntable user-module, go to the **Settings** tab and insert a value in the **ShuntCurrent.Applied** field.

To locate the **ShuntCurrent.Applied** field, scroll to end of screen

NOTE: Insert the required current in amps, in the range -0.000071 to 0.000071 amps.

48.3.2 Summary

On the next acquisition cycle, when the master controller module identifies a defined value (for example, 4) in the parameter associated with shunting, it switches to using a shunt value of 4. At this time, the master controller module transmits an Ethernet shunt packet which instructs all shunt slave controller modules to also switch to using 4. When a shunt slave controller receives this packet, the balance adjust output of the KAD/ADC/109/C/S1 outputs 71µA while 4 is enabled. (Up to 71µA is available for use in both the ShuntCurrent.Applied field or the Balance.Applied field. Therefore, if Balance.Applied is set to output, for example, 20µA constantly, an additional 71µA cannot be shunted.)

When 8 is transmitted by the shunt master chassis, the inverse shunt current is output from the KAD/ADC/109/C/S1.

When 0 is transmitted by the shunt master chassis, the shunt current is removed from the balance adjust output, returning the channel to normal operation.

Shunt or Classic Shunt can be enabled for newer modules such as the KAD/ADC/134, KAD/ADC/135, and KAD/AC/136. When Classic Shunt is enabled (see far-right column), it is not required to set a ShuntCurrent.Applied value.

In shunt format 4 and shunt format 8, the resistor for Classic Shunt is added; in shunt format 0 it is removed.

48.3.3 Considerations when working with system-driven shunting

- Enable Shunt Mode only on a chassis that contains shuntable modules, for example full-bridge modules.
- Ethernet shunt packets are only transmitted when a change is identified in the value of the parameter associated with a shunt process.
- Ethernet shunt packets are iNET-X packets with a stream ID of 0; using this stream ID for any other packets is not recommended.
- In system-driven shunting, Shunt Mode remains active until another Ethernet shunt packet is received from the shunt master controller module.
- Ensure there is a path across the network from the shunt master controller module to all shunt slave controller modules. Ensure also that this path is not swamped by other traffic as this may cause shunt packets to be missed by shunt slave controller modules.

48.4 Time-driven shunting

Time-driven shunting works in the same way as system-driven shunting, with the exception that the shunt source parameter is derived from a KAD/UTL/110 and it is this parameter which must be associated with a shunt process on the master controller module.

The KAD/UTL/110 goes through a sequence of user-defined shunt formats and durations at power-up, giving you the option to automatically check bridges at power-up. The following figure displays the Settings tab for a KAD/UTL/110 module. This is where you locate the settings used to configure time-driven shunting.
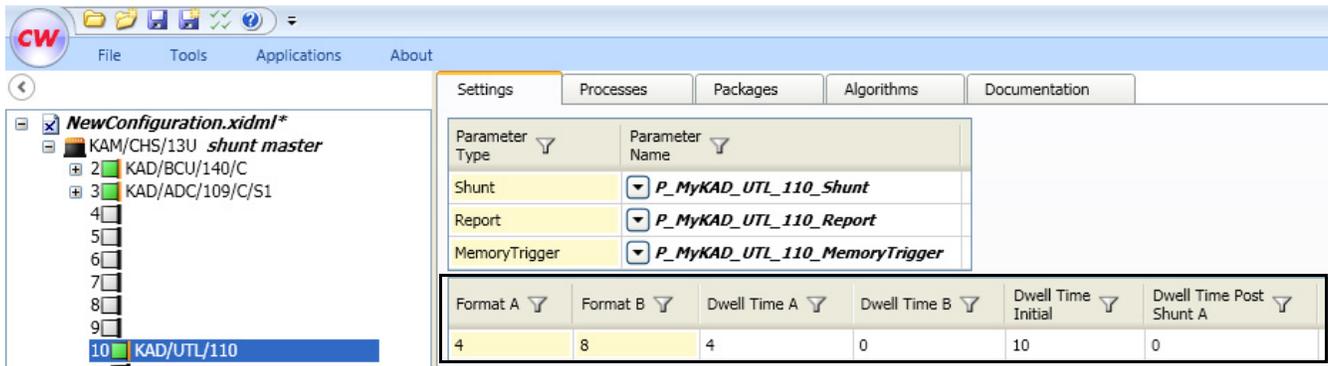
Figure 48-1: Time-driven shunting settings

The following table describes the fields required to configure time-driven shunting.

Setting	Description
Format A	After power-up, this is the first format the KAD/UTL/110 initiates. The default value is 4.
Format B	This is the format the KAD/UTL/110 initiates after the time set in Dwell Time B has elapsed. The default value is 8.
Dwell Time A	This is the number of seconds the system remains in Format A once it has been initiated. To skip Format A, set this field to 0 seconds.
Dwell Time B	This is the number of seconds the system remains in Format B once it has been initiated. To skip format B, set this field to 0 seconds.
Dwell Time Initial	This is the number of seconds the KAD/UTL/110 waits after power-up before initiating the first format switch.
Dwell Time Post Shunt A	This is the gap between Format A and Format B. To switch from Format A to Format B instantly, set this field to 0. Any other setting switches to 0 for the defined time before switching to Format B.

NOTE: The maximum value for dwell time allowable, for either format, is 3,600 seconds (one hour).

48.5 External shunting

External shunting refers to the process of using a PC or a laptop to initiate the shunting. In the example given below, there is no shunt master controller module. All controller modules that have shunting enabled respond to the shunt command from a PC.

The shunt command is an iNET-X packet with the following requirements for the destination MAC address, destination IP address, source and destination ports:

Destination MAC address = 01-00-5E-00-00-FA

Destination IP address = 224.0.0.250

Source port = 10220

Destination port = 10250

Example iNET-X packet header and payload

iNET-X versions = 0x11000000

iNET-X stream ID = 0x00000000

iNET-X sequence = 0x00000000

iNET-X length = 0x00000028

iNET-X seconds = 0x4EFFA3E6

iNET-X nano-seconds = 0x2470620A

iNET-X flags = 0x00000000

Event code (0x0310) and parameter (16 bits), that is, 0x0310nnnn where nnnn is the format number.

Optional description up to 16 bytes, null terminated. The default value is FORMAT, for example, FORMAT4 0x464F524D41543400.

The destination address of the iNET-X packet must be the multicast address 224.0.0.250, UDP source port 10220 and destination port 10250.

NOTE: Shunt initiated by this method times out and the system reverts to 0 after 12 seconds. You must ensure that there is a communication path between all controller modules with shunting enabled and the PC or laptop.

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