# Fusion Digital Power Designer GUI 7.0 for the UCD90xxx Sequencer

# **User's Guide**



Literature Number: SLVUB51 May 2017



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# Introduction

### 1.1 Overview

The UCD90xxx family of digital power-supply sequencers from TI, also known as *system health monitors*, are flexible and powerful enough to meet user's sequencing, monitoring, margining, and other needs. The TI Fusion Digital Power Designer is a dedicated graphical user interface (GUI), tool which helps users configure and monitor UCD90xxx sequencers/health monitors without coding knowledge. This document is targeted for Fusion Digital Power Designer 7.0 or newer. It can be a useful reference for the older 2.0.xxx Fusion GUI, but the layout and interface may not be the same as described in this document.

The TI Fusion Digital Power Designer has the following features:

- Windows<sup>®</sup>-based application, supports Windows 7
- Design, configure, and monitor TI digital-power controllers and sequencers/health monitors using a TI USB adapter
- Supports multiple devices in the same bus in online (connected to live devices), offline (file-base virtual devices), and hybrid mode (combination of online and offline mode)
- Exports the configuration of the device to different file formats for third-party programming
- Supports command line tools for scripting and automation

The entire family of devices is designed to have similar behavior, with different numbers of rails or some minor features. Users need only to learn how to use the device once, and then they can seamlessly switch to other devices within the family that best fit future designs. This document is a reference guide to give users a jump start, and applies for all UCD90xxx devices (except UCD9080 and UCD9081).

Windows is a registered trademark of Microsoft Corporation.

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# Installation

### 2.1 Fusion Digital Power Designer

Click here for the latest Fusion Digital Power Designer software. Perform the following steps to install the software (see Figure 2-1).

- 1. Double-click TI-Fusion-Digital-Power-Designer-7.0.x.exe to run the install.
- 2. Accept the License Agreement and click the Next button.
  - **NOTE:** By default, the software is installed in C:\Program Files (x86)\Texas Instruments\Fusion Digital Power Designer. However, you can relocate it to a different folder so that each version of the fusion digital power designer is separately installed.
- 3. Select the option to create a shortcut on Start Menu.
- Select the option to create more shortcuts for other tools and add the Fusion GUI directory in the system PATH. TI recommends checking both the SAA Debug Tool and UCD3xxx UCD9xxx Device GUI.





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If this is your first time using the Fusion GUI, a pop-up introduction window will appear (see Figure 2-2). Click OK to proceed to using the Fusion GUI.

| Fusion Digital Power Des  | ligner   |
|---|--|
| Version 7.0.11 [2017-05-01]   |  |
| Fusion Digital Power Designer is a Graphical User<br>controllers.   | Interface (GUI) used to configure and monitor Texas Instruments digital power  |
| If this is your first time using the GUI, please review th<br>also launch the help center from the Help menu or Fusi  | e documentation available in the GUI's <u>Documentation &amp; Help Center</u> . You can<br>on Digital Power Designer's Windows Start Menu.                                     |
| The GUI can run in one of two modes:  |  |
| <ul> <li>Online. The GUI configures one or more devic<br/>adapter found, the GUI automatically detects<br/>you expect to configure, however. This will be</li> </ul>      | es connected to one or more USB-based serial bus adapters. For each USB devices on the serial bus. The GUI needs to be instructed what type of device done on the next screen. |
| <ul> <li>Offline. The GUI can store a device's configur<br/>parameters, in a project file. This lets you con<br/>a new file based on a canned, EVM default cor</li> </ul> | ation, along with GUI-centric configuration data such as design input<br>figure your device offline. You can either open an existing project file or create<br>nfiguration.    |
| Every time the GUI starts up, it will look for the USB ac<br>could be found, you can switch to offline mode by click  | lapter and scan for devices. If the USB adapter is not present or no devices<br>ing the "Offline Mode" button.   |
| very time the GUI starts up, it will look for the USB ac<br>ould be found, you can switch to offline mode by click  | apter and scan for devices. If the USB adapter is not present or no devices<br>ing the "Offline Mode" button.  |

Figure 2-2. GUI Mode Options

### 2.2 USB Adapter Firmware

Currently, the Fusion GUI supports the TI USB-to-GPIO adapter. The adapter can be added as an individual dongle (see Figure 2-3) or built into some of the EVM boards, shown in the following images.

For the USB adapter as a dongle, the USB cable is connected on one end to the PC on the USB port, and on the other end it is connected to the dongle. The 10-pin ribbon is connected to the dongle and to the EVM 10-pin header. For some UCD90xxx EVMs, the USB adapter is built in with the EVM. Remove the dongle, then connect the USB cable directly to the USB connector on the EVM board.



Figure 2-3. USB-to-GPIO Adapter

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#### USB Adapter Firmware

www.ti.com

The Fusion GUI supports the TI USB-to-GPIO adapter, firmware version 1.0.x. If however, the firmware version on the USB adapter is not 1.0.x, you can download the USB adapter firmware by launching the USB Adapter Firmware Download Tool and selecting Start Menu  $\rightarrow$  All Programs  $\rightarrow$  Texas Instruments  $\rightarrow$  Fusion Digital Power Designer  $\rightarrow$  Tools  $\rightarrow$  USB Adapter Firmware Download Tool (see Figure 2-4). TI recommends using version 1.0.13 because it supports up to 58 bytes of data package, which is required by UCD90320 devices (see Figure 2-5).



Figure 2-4. Adapter Firmware Download Tool (1/2)

| Select |
|--------|
|        |
|        |
|        |
|        |
|        |
|        |

Figure 2-5. Adapter Firmware Download Tool (2/2)



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# Fusion GUI Mode

The Fusion GUI supports online, offline, and hybrid mode for various applications (see Figure 3-1). As the term suggests, a live device is required for online mode and hybrid mode.



Figure 3-1. Typical GUI Application

# 3.1 Fusion GUI Offline Mode

The Fusion GUI can store the configuration of a device, along with GUI-centric configuration data, such as design input parameters, in a project file (see Figure 3-2). This lets users design the power system without real devices. Users can launch offline mode by selecting Start menu  $\rightarrow$  Texas Instruments  $\rightarrow$  Texas Instruments Fusion Digital Designer  $\rightarrow$  Fusion Digital Power Designer Offline Mode.



Figure 3-2. Fusion Digital Power Designer Offline Mode

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When the offline GUI is launched, you can choose one of two options to start the design (see Figure 3-3).

| 🕴 Define System   | _ □ 🛛                                    |
|---|--|
| O Create new Offline system from start  |  |
| You will be able to design a new system with multiple devices selected from either a list of supported devices or previous created proje<br>to a file with ".tifsp" extension | ct files (.xml), The system can be saved |
| Create new Offline system by opening existing system file   |  |
| You have previously defined the system (.tifsp) and would like to open it in Offline mode   |  |
|   |  |
|   |  |
| Cancel  | us Next                                  |

Figure 3-3. GUI Offline Project Start Options



### 3.2 Fusion GUI Online Mode

The Fusion GUI online mode can be launched by selecting Start menu  $\rightarrow$  Texas Instruments  $\rightarrow$  Texas Instruments Fusion Digital Power Designer  $\rightarrow$  Fusion Digital Power Designer. The GUI will discover one or more devices connected to one or more USB-to-GPIO adapters.

#### 3.2.1 No Adapter Found

If no USB adapter is connected to the PC, the screen in Figure 3-4 appears. Either connect the USB adapter and try again or go to Offline mode.

| Texas Instruments  |  |
|--|--|
| Fusion Digital Power Designer<br>Version 7.0.11 [2017-05-01]   |  |
| No USB Adapter Found!         A Texas Instruments USB serial bus adapter does not appear to be connected to your PC. Please check your connection. You should see a green light on the adapter when it is attached to the PC.         Retry       Adapter Mode       Offline Mode       Exit Program |  |

Figure 3-4. No Adapter Found Message

#### 3.2.2 No Device Found

If a USB adapter is connected to the PC but no device is found (see Figure 3-5), it may be due to one of the following reasons:

• No devices are connected to the other end of the adapter.

| Fusion Di<br>Version 7.0.:                                     | gital Power E<br>11 [2017-05-01]                   | )əsig.       | nər                |                         |                              |  |  |  |  |
|--|--|--------------|--------------------|-------------------------|------------------------------|--|--|--|--|
| No Devices Fo<br>No compatible PMBus<br>power is supplied to y | und!<br>devices were found. Please<br>your device. | check tha    | t the serial cable | end of your USB adapter | is attached to your device a |  |  |  |  |
| Scanning Mode:   | DeviceIDAndCode/                                   | AndICDe      | viceID             |                         |                              |  |  |  |  |
| USB Adapter Firmware Version: 1.0.10                           |  |              |                    |                         |                              |  |  |  |  |
| Bus Speed:   | Packet Error Checkin                               | g:           |                    | ALERT Pullup:           | 2.2 kΩ 🗸                     |  |  |  |  |
| ○ 100 kHz  | <ul> <li>Enabled</li> </ul>                        |              | • Serial           | CLOCK Pullup:           | 2.2 kΩ 🔍                     |  |  |  |  |
| <ul> <li>400 kHz</li> </ul>                                    | O Disabled   |              |                    | DATA Pullup:            | 2.2 kΩ 🗸                     |  |  |  |  |
| Signals  |  |              |                    |                         |                              |  |  |  |  |
| SMBALERT#:   | ACK: High  | Refresh      | P. )               |                         |                              |  |  |  |  |
| Control Lines:<br>(click to set)                               | #1 #2<br>OHigh OHigh                               | #3<br>) High | #4<br>◯ High       | #5<br>〇 High            | Refresh All                  |  |  |  |  |
|  | Low     Low  | Low          | Low                | Low                     |                              |  |  |  |  |

Figure 3-5. No Device Found Message



To detect the presence of supported TI devices on the PMBus, the Fusion GUI sends a list of known PMBus commands (supported by the devices) to address 1 to 127 (skip 12). The Fusion GUI sets the IDs of the devices based on the response from the devices. These known PMBus commands are called Device Scan Mode in GUI. Users can select to scan for a specified address (or addresses) by skipping all other addresses using the Device Scan Mode setting. Users can also select which command (or commands) to send to the address to scan for devices (see Figure 3-6).

Different device scan modes are used to discover devices on the bus, as follows:

- DEVICE\_ID (0xFD): Most UCD92XX and UCD90XX devices use this mode.
- DEVICE\_CODE (0xFC): Most TPSxxxx devices use this mode.
- IC\_DEVICE\_ID (0xAD): Devices supporting PMBus 1.2 use this mode.
- Custom scan mode: some devices use PMBUS\_REVISION (ReadByte 0x98) or MFR\_MODEL (ReadBlock 0x9A) as a way to identify themselves on the bus. Click the Scan for Device button to customize the scan mode (see Figure 3-7).



Figure 3-6. Device Scan Editor



| (i) | Device Scan Help  |   |
|-----|---|---|
| 4   | During device scan, Fusion Digital Power Designer">12C bus by issuing a series of command requests on addresses 1-<br>11 and 13-127 decimal. Address 12, the SMBus Alert Response Address, is skipped. One or more of the following<br><u>SMBus</u> / <u>PMBus</u> commands will be read during the scan:   | Î |
|     | <ul> <li>DEVICE_ID (0xFD)         This is a Texas Instruments proprietary command. It is implemented as a read block command in the MFR_SPECIFIC_45 slot, command code 0xFD. Devices that implement DEVICE_ID return an ASCII encoded string defining the part, optional revision, and optional date representing code build/etc. An example is "UCD9240-64[3.24.0.8204[080918".         UCD92XX, UCD90XX (UCD Controllers and Sequencers) response to this command.     </li> </ul>  | m |
|     | <ul> <li>DEVICE_CODE (0xFC)         This is also a Texas Instruments proprietary command. It is implemented as a read word command in the PMBus MFR_SPECIFIC_44 slot, command code 0xFC. Devices that implement DEVICE_CODE return a 12 bit code identifying the device and a 4 bit revision code. Each Texas Instruments part will normally have its own device identifier. This command is oriented at non-firmware devices that do not have the resources to implement DEVICE_ID.     </li> <li>TPS5404xx, TP553819, TP553915, TP553913, TP5549A20, TP5549C20, TP553640, TP553661, TP553667, TP5544x20, TP5544x22, TP565400, etc. response to this command.</li> </ul> |   |
|     | • IC DEVICE ID (0xAD)<br>Standard PMBus 1.2 read block command, command code 0xAD. Devices that implement IC_DEVICE_ID<br>return bytes data identified device on the bus.<br><i>TPS53622, TPS5365x, TPS5367x, TPS5368x, TPS544x24, TPS544x25, TPS546xxx, etc. response to this</i><br><i>command.</i>   |   |
|     | <ul> <li>PMBUS_REVISION (0x98).</li> <li>A standard PMBus command, a read byte at command code 0x98. A small number of devices do not support DEVICE_ID, DEVICE_CODE, or IC_DEVICE_ID. For these devices, you must manually select the device. The GUI then looks for devices that ACK PMBUS_REVISION and return a valid byte.</li> <li>TPS53951 responses to this command.</li> </ul>  | Ŧ |
|     | OK Copy Message to Clipboard  |   |

Figure 3-7. Device Scan Help

- Bus speed: the device may not support the bus speed setting, try a different speed (100 kHz and 400 kHz).
- Packet error checking (PEC): the device may not support PEC. Try enabling and disabling PEC.
- Pullup resistor needs adjusting
- Check the resistor on the PMBUS\_ADDR1 and PMBUS\_ADDR2 pin to ensure they are compliant with the data sheet requirement.



# **Fusion GUI Layout**

Figure 4-1 shows the Fusion GUI work flow.

- Build system: define your system in either online or offline mode. If active devices are connected to the PC, you can begin monitoring and debugging your system.
- Configure system: configure each device in your system.
- Monitor and debug system: view the system responses.
- Save system: save the system configuration to a single system file (.tifsp), or save each device configuration as individual configuration files (.xml, .csv, and .hex) for later use. If devices are online, you can save the configuration of the device to its nonvolatile memory.
- Production: import the system file (.tifsp) or the configuration file of the device saved in the previous bullet to devices using the Fusion MFR GUI, Fusion command line tools, or third-party programming.



### Figure 4-1. Fusion GUI Work Flow

Figure 4-2 shows the system view.



Figure 4-2. Fusion GUI – System View



### 4.1 Build System

Figure 4-3 shows the build mode selection. Here, you can perform the following:

- Create new Offline system from start: design a new system in off-line mode by adding one or more offline devices at a time. Select from an existing file (.xml or . tifsp), or a list of supported devices embedded in the GUI. All devices in your system will be offline.
- Create new Offline system by opening existing system file: you have previously defined the system and saved it in the system file (.tifsp) or a single project file (.xml). All devices in your system will be off-line
- Modify existing system: add one or more off-line devices at a time by selecting from an existing file (.xml or .tifsp), or selecting from a list of supported devices embedded in the GUI. This option can be a hybrid mode, combining on-line devices from existing systems and newly added off-line devices.

| 🕴 Define System  |
|--|
| O Create new Offline system from start   |
| You will be able to design a new system with multiple devices selected from either a list of supported devices or previous created project files (.xml). The system can be saved to a file with ".tifsp" extension |
| Create new Offline system by opening existing system file  |
| You have previously defined the system (.tifsp) and would like to open it in Offline mode  |
| O Modify existing system   |
| Modify your current system   |
|  |
|  |
|  |
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|  |
|  |
|  |
|  |
|  |
|  |
| Cancel   |
|  |

### Figure 4-3. Build System Mode Selection

Build System



#### 4.2 Debug System

System monitors provide an overview of the system (see Figure 4-4).

- Control panels: apply to all the devices and rails on the bus. If the setting is invalid for a rail or a device, or it is nonwritable, the operation is skipped for that rail or device.
- Chart views: select a rail in the system to view the response data.
- Status view: LED on the device level indicates if the device status is OK or not. The LED in the rail level indicates the status of the rail: fault, warning, or OK.
  - The green LED indicates that the device has no fault and no warning at all.
  - The red LED indicates that the device has a fault and warnings at either the rail or device level.
  - The orange LED indicates that the device has warnings at either the rail level or device level.
- PMBus Logging: log the PMBus communication.

The system monitor has another important use, which is to single-step, turns on and turn off power rails. Users can configure the On/Off Config of the rail, and toggle the Turn On and Immediate Off option to turn on or off rails individually, so that all the rails are changed manually to discover any design issues (see Figure 4-4).



Figure 4-4. Debug System Monitor



### 4.3 Configure System

Figure 4-5 shows the configure system view.

| Ļ | Texas Instruments - Fusion Digital Power Designer [System View]   |                          |      |      |     |      |     |  |  |  |  |  |  |  |
|---|---|--------------------------|------|------|-----|------|-----|--|--|--|--|--|--|--|
|   | File Tools Debug Help   |                          |      |      |     |      |     |  |  |  |  |  |  |  |
| ( | 🔍 Scan for Device (Device_ID   Device_Code   IC_Device_ID)   🛞 Build System   System Monitor   🔚 Save   🗸 Auto Write   👄 Stop Polling |                          |      |      |     |      |     |  |  |  |  |  |  |  |
| ſ | Power Rails Tree  |                          |      |      |     |      |     |  |  |  |  |  |  |  |
|   | # △     Rail # △     Rail Name     Vout     On Delay     Rise     Off Delay     Fall     Dependencies (Direct Only)                   |                          |      |      |     |      |     |  |  |  |  |  |  |  |
|   | Device: UCD909  | 90A @ PMBus Address 1010 | 1    |      |     |      |     | \varTheta 🛷 💰 <u>Click to configure device</u> |  |  |  |  |  |  |
|   | 1 1   | Rail #1                  | 0.00 | 0.00 | N/A | 0.00 | N/A | Vin On/Off                                     |  |  |  |  |  |  |
|   |   |                          |      |      |     |      |     |  |  |  |  |  |  |  |
|   |   |                          |      |      |     |      |     |  |  |  |  |  |  |  |
|   |   |                          |      |      |     |      |     |  |  |  |  |  |  |  |
|   |   |                          |      |      |     |      |     |  |  |  |  |  |  |  |
|   |   |                          |      |      |     |      |     |  |  |  |  |  |  |  |
|   | <[  |                          |      |      |     |      |     | 11   |  |  |  |  |  |  |

Figure 4-5. Configure System View

- 1. Click the *Click to configure device* link to modify the configuration of the device. Different devices have different views and tabs. See the device specification document for how to configure devices.
- 2. Navigate between rails (outputs): If the device supports multiple outputs, use the top-right-corner combo box to navigate between rails.
  - Online or Offline LED: device is connected (online) or device is not connected (offline)
  - Write Pending to hardware: no pending write to hardware (RAM). You made changes in the GUI but have not written to the hardware yet.
  - Write Pending to NVM: no pending write to NVM (flash). Pending write to NVM. Since launching the GUI, you made changes in the hardware (RAM) but have not stored the configuration to the nonvolatile memory yet. The changes you make will be lost if the device is power cycled.



#### 4.3.1 Configure Task

The Configure Task provides the settings to configure the UCD90XXX device to function as designed (see Figure 4-6). The task has Hardware Configuration, Rail Configuration, and Global Configuration tabs, which are described in the following sections. Before starting the configuration, it is important to follow the design flow. Consider the following:

- Rail setup: Number of rails to monitor and type of monitoring (voltage, current, temperature)
- Rail monitoring setup: Voltage, current, and temperature set points
- Rail control setup: Rails control (how are rails turned on and turned off)
- Rail margining setup: Number of rails requiring margining as well as the frequency and duty cycle
- GPI configuration: Are there digital signals (GPI) which must be monitored?
- Rail sequencing configuration: Start-up sequence; which rails come first, and which rails depend on other rails for sequencing?
- Fault response configuration: How should the device act if a fault is detected (ignore the fault or act on the fault)? If the device should act on the fault, how (shut down fault rail and other slave rails, resequence, log the fault, and so on)?
- Logic GPO configuration: Are there output signals (LGPO) that must notify the external system?
- Other configurations: System watchdog and system reset

| levice Tools   |  |  |                 |                    |                                 |                                 |                                 | UCD9090A @ 101d - Ra            | I #1 - PMON_10R8_A |  |
|----------------|--|--|-----------------|--------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|--------------------|--|
| e to Hardware  | 🔀 Discard Changes   Store RAM to Flash   🔓   💑 Error Chec  | king   |                 |                    |                                 |                                 |                                 |                                 |                    |  |
| ure            | Hardware Configuration Rail Configuration Global Config  | uration  |                 |                    |                                 |                                 |                                 |                                 |                    |  |
|                | Hardware Configuration   | Rails - M  | lonitors & Enab | lles               |                                 |                                 |                                 |                                 |                    |  |
| by/Clone Rails | Monitors & GPIO pins assignment: Configure pins to perform<br>specific functions   |  | Rail Name       | Voltage            | Femperature                     | Current                         | Enable                          | Trim/Margin PWM                 | Actions            |  |
|                | Device Information; Device information such as Device Part   | Rail #1  | Ral #1          | Pin 1 MON1         | <click assign="" to=""></click> | < <u>Click to Assign&gt;</u>    | <click assign="" to=""></click> | < <u>Click to Assign&gt;</u>    | Delete Configure   |  |
|                | ID, firmware version, IC package, PMBus Revsion,<br>Manufacturing Info (MFR ID, MFR MODEL, etc.), data flash                           | Rail #2  | Rail #2         | Pin 2 MON2         | <click assign="" to=""></click> | <click assign="" to=""></click> | <click assign="" to=""></click> | <click assign="" to=""></click> | Delete Configure   |  |
|                | checksum, etc.   | Rail #3  | Rail #3         | Pin 40 MON5        | <click assign="" to=""></click> | < <u>Click to Assign&gt;</u>    | Pin 10 FPWM1 GPIO5              | < <u>Click to Assign&gt;</u>    | Delete Configure   |  |
|                |  | Rail #4  | Rail #4         | Pin 41 MON6        | <click assign="" to=""></click> | < <u>Click to Assign&gt;</u>    | Pin 11 FPWM2 GPIO6              | <click assign="" to=""></click> | Delete Configure   |  |
|                |  | Rail #5  | Rail #5         | Pin 42 MON7        | <click assign="" to=""></click> | <click assign="" to=""></click> | Pin 12 FPWM3 GPIO7              | <click assign="" to=""></click> | Delete Configure   |  |
|                |  | Rail #6  | Rail #6         | Pin 45 MON8        | <click assign="" to=""></click> | < <u>Click to Assign&gt;</u>    | Pin 13 FPWM4 GPIO8              | < <u>Click to Assign&gt;</u>    | Delete Configure   |  |
|                |  | Rail #7  | Rail #7         | Pin 38 MON3        | <click assign="" to=""></click> | <click assign="" to=""></click> | <click assign="" to=""></click> | <click assign="" to=""></click> | Delete Configure   |  |
|                |  | Add Rai  | 1               |                    |                                 |                                 |                                 |                                 |                    |  |
|                |  | GPIs - General Purpose Inputs  |                 |                    |                                 |                                 |                                 |                                 |                    |  |
|                |  | GPI Nar  | ne              | Pin                | Polarity                        | Special Behavi                  | or                              |                                 | Actions            |  |
|                |  |  |                 | Pin 4 GPIO 1       | Active High                     | GPI Fault Enable;               | Fault Shutdown rails            |                                 | Delete Configure   |  |
|                |  | GPI #2   |                 | Pin 5 GPIO2        | Active High                     |                                 |                                 |                                 | Delete Configure   |  |
|                |  | GPI #3   |                 | Pin 6 GPIO3        | Active High                     |                                 |                                 |                                 | Delete Configure   |  |
|                |  | GPI #4   |                 | Pin 7 GPIO4        | Active High                     |                                 |                                 |                                 | Delete Configure   |  |
|                |  | GPI #5   |                 | Pin 21 GPIO14      | Active High                     |                                 |                                 |                                 | Delete Configure   |  |
|                |  | GPI #6   |                 | Pin 16 FPWM7 GPIO1 | 1 Active High                   |                                 |                                 |                                 | Delete Configure   |  |
|                |  | GPI #7   |                 | Pin 24 GPIO 15     | Active High                     | GPI Fault Enable;               | Fault Pin                       |                                 | Delete Configure   |  |
|                |  | Add GP   | l .             |                    |                                 |                                 |                                 |                                 |                    |  |
|                |  | Logic Controlled GPOs - General Purpose Outputs with Programmble State Logic |                 |                    |                                 |                                 |                                 |                                 |                    |  |
|                |  | GPO  | Name            | Pin                | Polarity                        | Mode                            | Configuration Summa             | iry                             | Actions            |  |
| onfigure       |  |  |                 |                    |                                 | 110                             |                                 |                                 |                    |  |
| onitor         | 12:07:48.863: USB-SAA #1: CONTROL1 now Low   |  |                 |                    |                                 |                                 |                                 |                                 |                    |  |
| atus           | 12:22:17.678: USB-SAA #1: CONTROL3 now Low<br>12:22:17.678: USB-SAA #1: CONTROL3 now Low<br>12:22:17.678: USB-SAA #1: CONTROL4 now Low |  |                 |                    |                                 |                                 |                                 |                                 |                    |  |
|                | 12:37:00.700: USB-SAA #1: CONTROLS NOW LOW   |  |                 |                    |                                 |                                 |                                 |                                 |                    |  |

Figure 4-6. Hardware Configuration Task View

After making changes, do the following steps or the changes will be lost after the device is reset or power cycled.

1. Click the Write to Hardware button to save changes into the RAM.

Write to Hardware

2. Click the Store RAM To Flash button to save changes into the Flash.



#### 4.3.1.1 Hardware Configuration

The UCD90xxx family supports various I/O capabilities (see Figure 4-7). The GUI lists the capacities at the top-right corner of each I/O function (X of Y assigned), and Y is the capacity of the particular I/O function. The Hardware Configuration tab lets users configure the I/Os as desired functions, such as monitoring, GPI, logic GPO (LGPO), margining, and more. Users must perform the hardware configuration first.

|   | Rails - Mon  | nitors & Enable  | 5  |                                    |                                 |                                 |                                 |                   |            | 6 of 10 Assigne |  |  |
|---|--|--|--|------------------------------------|---------------------------------|---------------------------------|---------------------------------|-------------------|------------|-----------------|--|--|
| tors & GPIO pins assignment: Configure pins to perform<br>fic functions                           | R  | ail Name   | Voltage Te   | mperature                          | Current                         | Enable                          | Trim/Margin PWM                 | Actions           |            |                 |  |  |
| e Information: Device information such as Device Part   | Rail #1 P  | ·1V2   | Pin 1 MON1 <c< td=""><td>lick to Assign&gt;</td><td><click assign="" to=""></click></td><td>Pin 4 GPIO1</td><td><click assign="" to=""></click></td><td>Delete Configure</td><td></td><td></td></c<>       | lick to Assign>                    | <click assign="" to=""></click> | Pin 4 GPIO1                     | <click assign="" to=""></click> | Delete Configure  |            |                 |  |  |
| mware version, IC package, PMBus Revsion,<br>facturing Info (MFR ID, MFR MODEL, etc.), data flash | Rail #2 P  | 1V35   | Pin 2 MON2 <c< td=""><td>lick to Assign&gt;</td><td><click assign="" to=""></click></td><td>Pin 5 GPIO2</td><td><click assign="" to=""></click></td><td>Delete Configure</td><td></td><td></td></c<>       | lick to Assign>                    | <click assign="" to=""></click> | Pin 5 GPIO2                     | <click assign="" to=""></click> | Delete Configure  |            |                 |  |  |
| sum, etc.   | Rail #3 P  | '1V8   | Pin 38 MON3 <c< td=""><td>lick to Assign&gt;</td><td><click assign="" to=""></click></td><td>Pin 6 GPIO3</td><td><click assign="" to=""></click></td><td>Delete Configure</td><td>Rails</td><td></td></c<> | lick to Assign>                    | <click assign="" to=""></click> | Pin 6 GPIO3                     | <click assign="" to=""></click> | Delete Configure  | Rails      |                 |  |  |
|   | Rail #4 P  | 3V3  | Pin 39 MON4 <c< td=""><td>lick to Assign&gt;</td><td><click assign="" to=""></click></td><td>Pin 7 GPIO4</td><td><click assign="" to=""></click></td><td>Delete Configure</td><td>rtuns</td><td></td></c<> | lick to Assign>                    | <click assign="" to=""></click> | Pin 7 GPIO4                     | <click assign="" to=""></click> | Delete Configure  | rtuns      |                 |  |  |
|   | Rail #5 P  | ·5V3   | Pin 40 MON5 <0   | lick to Assign>                    | <click assign="" to=""></click> | <click assign="" to=""></click> | <click assign="" to=""></click> | Delete Configure  |            |                 |  |  |
|   | Rail #6 P  | VOV85 AVS  | Pin 41 MON6 <0   | lick to Assign>                    | <click assign="" to=""></click> | Pin 21 GPIO 14                  | <click assign="" to=""></click> | Delete Configure  |            |                 |  |  |
|   | Add Rail   | Add Rail   |  |                                    |                                 |                                 |                                 |                   |            |                 |  |  |
|   | GPIs - Gene  | eral Purpose I   | inputs   |                                    |                                 |                                 |                                 |                   |            | 3 of 8 Assign   |  |  |
|   | GPI Name   |  | Pin  | Polarity                           | Special Behavi                  | or                              |                                 | Actions           |            |                 |  |  |
|   | PGOOD_VT   | T_DDR4   | Pin 25 GPIO 16   | Active High                        |                                 |                                 |                                 | Delete Configure  |            |                 |  |  |
|   | Thermostat   | t  | Pin 26 GPIO17  | Active High                        | GPI Fault Enable                |                                 |                                 | Delete Configure  | GPIs       |                 |  |  |
|   | RST_REQUE  | EST  | Pin 17 FPWM8 GPIO12  | Active High                        | GPI Fault Enable                |                                 |                                 | Delete Configure  |            |                 |  |  |
|   | Add GPI  | Add GP1  |  |                                    |                                 |                                 |                                 |                   |            |                 |  |  |
|   | Logic Controlled GPOs - General Purpose Outputs with Programmble State Logic |  |  |                                    |                                 |                                 |                                 |                   |            | 2 of 10 Assign  |  |  |
|   | GPO Na   | me   | Pin  | Polarity                           | Mode                            | Configuration Summ              | nary                            | Actions           |            |                 |  |  |
|   | DDR4_V   | TT_ENABLE  | Pin 24 GPIO 15   | Active High                        | Actively Driven                 | Delay=5 ms * GPI1               |                                 | Delete Configure  | LGPOs      |                 |  |  |
|   | LGPO #2  | 2  | Pin 10 FPWM1 GPIO5   | Active High                        | Actively Driven                 | Delay=5 ms * GPO1               |                                 | Delete Configure  |            |                 |  |  |
|   | Add Logic Controlled GPD Move Selected Pins Up Move Selected Pins Down       |  |  |                                    |                                 |                                 |                                 |                   |            |                 |  |  |
|   | Territoria and the second  | Command Controlled GPOs - General Purpose Outputs with Fixed State |  |                                    |                                 |                                 |                                 |                   |            | 1 of 21 Assign  |  |  |
|   | Command  | Controlled GP  | os ocician arpose ou   |                                    |                                 |                                 |                                 |                   |            |                 |  |  |
|   | GPO Name   | Controlled GP  | Pin  | State                              |                                 |                                 |                                 | Actions           | CRO        |                 |  |  |
|   | GPO Name<br>Command G  | PO #1  | Pin           Pin 28 TDO GPI019  | State                              | () High (1) () ⊨                | 1i-Z                            |                                 | Actions<br>Delete | GPO        |                 |  |  |
|   | GPO Name<br>Command G<br>Add Comm  | SPO #1   | Pin           Pin 28 TDO GPIO 19           ed GPO  | State                              | ⊕ High (1)      ○ H             | i-Z                             |                                 | Actions Delete    | GPO        |                 |  |  |
|   | Command G<br>GPO Name<br>Command G<br>Add Comm                               | e<br>3PO #1<br>nand Controlle                                      | Pin Pin Pin 28 TDO GPI019 Pin 28 TDO GPI019 Pulse-Width Modulation   | State                              | ⊕ High (1)      ○ H             | i-Z                             |                                 | Actions<br>Delete | GPO        | 0 of 10 Assign  |  |  |
|   | Command G<br>GPO Name<br>Command G<br>Add Comm<br>PWMs - Gen<br>You have no  | SPO #1<br>nand Controlle<br>neral Purpose                          | Pin Pin 28 TDO GPIO19 ed GPO Pulse-Width Modulation y PWMs; click the Add link be  | State C Low (0) Outputs Now to add | . e High (1) C H                | ñ-2                             |                                 | Actions<br>Delete | GPO<br>PWM | 0 of 10 Assign  |  |  |

Figure 4-7. Hardware Configuration

### 4.3.1.1.1 Configuring Rails – Monitoring, Enabling, and Margining

Each rail can have up to five pins: voltage, temperature, current, enable, and trim/margin (see Figure 4-8). The voltage, temperature, and current pin assigns a monitor pin to perform voltage, temperature, and current monitoring, respectively. The enable pin is an output signal to enable and disable the downstream power supply. The trip/margin pin is the PWM output signal to margin the desired voltage rail. The user can also configure a rail with the enable pin only. A rail without any pins is forbidden.

| Rails - M | onitors & Enable | 5          |                                 |                              |                                 |                                 |                  | 1 of 10 Assigned |
|-----------|------------------|------------|---------------------------------|------------------------------|---------------------------------|---------------------------------|------------------|------------------|
|           | Rail Name        | Voltage    | Temperature                     | Current                      | Enable                          | Trim/Margin PWM                 | Actions          |                  |
| Rail #1   | PMON_10R8_A      | Pin 1 MON1 | <click assign="" to=""></click> | < <u>Click to Assign&gt;</u> | <click assign="" to=""></click> | <click assign="" to=""></click> | Delete Configure |                  |
| Add Rai   | I                |            |                                 |                              |                                 |                                 |                  |                  |

Figure 4-8. Configure Rails



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Users must click Add Rail to add a new rail, then click the Configure button, to configure the monitor type and polarity of the enable signal and margining settings (duty cycle, frequency, mode, and so on) as shown in Figure 4-9.

| Rail #1 Voltage  | Monitor Type  |
|--|---|
| Voltage monitor type   | e:  |
| () Standard  |   |
| Hardware con<br>The response<br>with the hard<br>option is only<br>There is no gl                            | nparator<br>time to an over/under voltage fault is faster<br>ware comparator. The hardware comparator<br>available with up to six monitored voltages.<br>litch filtering when using the hardware        |
| comparator.<br>You can not u<br>"retries"of vo<br>Fault respons<br>monitor.<br>The function<br>reaches the p | ise either of the "continue to operate" or<br>(tage fault responses (OVF, UVF, Ton Max<br>es) with a hardware comparator Voltage<br>is not enabled until the rail is turned on and<br>power-good state. |
| - Rail #1 Enable P   | in Configuration  |
| Polarity:  | Outout Mode:  |
| O Active Low   | Actively Driven   |
| (  Active High   | O Onen-Drain  |
| - <b>Rail #1 Trim/M</b> a<br>PWM Config:   | argining  |
| Duty Cyde:   | 0 💎 %   |
| Frequency:   | 15.275 💭 kHz 🖂  |
| Fre<br>Margin Mode:  | equency can be 15.275 kHz to 125 MHz  |
| Tri-State<br>When not m  | argining, the PWM pin is tri-stated.  |
| <ul> <li>Active Trim</li> <li>When not m<br/>adjusted to</li> </ul>  | argining, the PWM duty-cycle is continuously<br>keep the voltage at VOUT_COMMAND.   |
| <ul> <li>Active Duty<br/>When not m<br/>duty-cycle.</li> </ul>   | Cycle<br>argining, the PWM duty-cycle is set to a fixed   |
| Ignore faults<br>When margining<br>(over-voltage ar  | is enabled with a pin, this determines if faults<br>nd under-voltage) are ignored or not.   |
| Increase Duty C<br>When margining<br>increase or decr  | yde increases Voltage<br>,, this determines if increasing duty cycle will<br>ease voltage   |

Figure 4-9. Configure New Rails

#### 4.3.1.1.2 Configuring General-Purpose Inputs (GPIs)

GPIs are mainly used to receive signals from the external system. Click the Add GPI button to add a GPI, then click the Configure button to set the polarity and other GPI functions (see Figure 4-10). GPI functions vary by device (see Figure 4-12, Figure 4-13, and Figure 4-11). See the data sheet for function details. Moreover, the GUI provides a description next to each function to help customers understand the feature.

| GPIs - General Pur | pose Inputs |             |                  |                  | 1 of 8 Assigned |
|--------------------|-------------|-------------|------------------|------------------|-----------------|
| GPI Name           | Pin         | Polarity    | Special Behavior | Actions          |                 |
| GPI #1             | Pin 4 GPIO1 | Active High |                  | Delete Configure |                 |
| Add GPI            |             |             |                  |                  |                 |

# Figure 4-10. Configure GPIs

| GPI Polarity:         Note: Polarity defines output voltage level when the logic evaluation result is TRUE(active). In open-drain mode, High-level output means the output pix is in Hi-2 take; a pull-up resistor is required to make the output level High. <ul></ul>  | → Pin Polarity  |
|--|---|
| ☑ GPI Fault Enable<br>When this bit is set, the de-assertion of the GPI is treated as fault and can<br>shutdown rails if together either "Fault Shutdown Rails" or "Fault Pin" bit is also<br>set.   | Must Be Set To Enable GPI Logging,<br>Fault Shutdown And Fault Pin Functions. |
| Latched Statuses Clear Source<br>When a GPO uses a latched status type (LATCH), you can configure a GPI that<br>will dear the latched status.  |   |
| The Section of Augustation of Augustation of Augustation of Augustation of Augustation of Augustation of August Au | → GPI For Margin  |
| Input Source for Margin Low/Not-High   | , j   |
| When this pin is asserted, all rails with margining enabled will be put in a margined<br>state (low or high).  |   |
| Fault Shutdown rails   |   |
| When this bit and the GPI Fault Enable bit are set, the de-assertion of the GPI is<br>treated as fault and can be used to shutdown rails according to the below Fault<br>Responses setting   |   |
| How device responses to GPI fault  | GPI Fault Response  |
| Max glitch time: 0,5 🐳 ms  | · ·   |
| Resequence: Enabled; Gitch filter: Disabled; Response: Shut down immediately; Fdit   | Response Actions  |
| Restarts Do not restart  | · · · · · · · · · · · · · · · · · · ·   |
| When pin has fault, will shut down these rafis:         Rel 01       Ral 02       Rail 03       Rail 04       Rail 05         Rail 06       Rail 07       Rail 08       Rail 09       Rail 10         Configured as Sequencing Debug Pin       Input pin can be used to put device in Debug Mode. If pin is selected and is assert PMBus Alert pin for any faults/warnings, not  |   |
| response to any faults, and not log any faults (excluding fault reported in<br>STATUS_CML register such as Invalid Command, PEC Fault, etc.). This function is<br>mainly used for debugging purpose only. It is not recommended in the final<br>production   |   |
| Configured as Fault Pin  |   |
| Configure this input pin as fault-influenced outputs. The state of the output is<br>determined by any faults occured on selected rails   |   |
| When these rais have fault, will output signal on pins   |   |
| Rail 01 V Rail 02 V Rail 03 V Rail 04  |   |
| Kanus     Kanus     Kanus     Kanus     Kanus     Kanus  |   |
| How device responses to Input pulled low:  | Fault Pin Configuration   |
| Max glitch time: 0.0 💭 ms  |   |
| Resequence: Disabled) Gitch filter: Disabled; Response: Ignore: Restart: N/A   |   |
| When pin has fault will shuldown these rails:  |   |
| 🖂 Rail 01 🔄 Rail 02 🔄 Rail 03 🔄 Rail 04 🖂 Rail 05  |   |
| 🗹 Rail 06 🔲 Rail 07 📄 Rail 08 📄 Rail 09 📄 Rail 10  |   |
| Enable Cold Boot Mode  |   |
| Cold Boot Mode Timeout:  | ← Cold Boot Settings  |
| Normal Boot Start Delay:   |   |
|  |   |

### Figure 4-11. GPI Configuration for Rest UCD9090A and UCD90160A



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#### Figure 4-12. GPI Configuration for UCD90240 and UCD90320



#### Figure 4-13. GPI Configuration for Rest UCD90xxx



#### 4.3.1.1.3 Configuring Boolean Logic-Controlled GPOs (LGPO)

UC90xxx devices can output signals based on the combined results of Boolean logic from the GPIs state, Rails state, and other LGPOs state (see Figure 4-14). Users can also configure a LGPO without a physical output pin, a virtual LGPO. The virtual LGPO is typically used as an input for other LGPO to save a physical pin.

| Logic Controlled GPOs |                                 | 1 of 10 Assigned 😃 |                 |                                 |                  |  |
|-----------------------|---------------------------------|--------------------|-----------------|---------------------------------|------------------|--|
| GPO Name              | Pin                             | Polarity           | Mode            | Configuration Summary           | Actions          |  |
| LGPO #1               | <click assign="" to=""></click> | Active High        | Actively Driven | Delay=0 ms * <no logic=""></no> | Delete Configure |  |
| Add Logic Controlled  | GPO Move Selected Pins Up M     | love Selected Pins | Down            |                                 |                  |  |

Figure 4-14. Configure Boolean Logic-Controlled LGPOs

Click the Add Logic Controlled GPO button to add a LGPO, then click the Configure button (see Figure 4-14). Each LGPO has two AND paths and one final OR gate with an inverter on each (see Figure 4-15).

| ID Path #1  | Configure                |   |
|---|--------------------------|---|
| GPIs, rails, or fans have been added to<br>infigure link to edit. | this AND path. Click the | Click to<br>change gate A+B   |
| ID Path #2  | Configure                |   |
| OPIs, rails, or fans have been added to onfigure link to edit.    | this AND path. Click the | LGPO #1 (Pin 200)   |
|   |                          | Enable State Machine Mode   |
|   |                          | Delay Time: 0.0 💭 msec<br>Delay when Asserting<br>Delay when De-asserting<br>Ignore Inputs during delay   |
|   |                          | Polarity: Output Mode:  |
|   |                          | Active Low O Actively Driven     Active High O Open-Drain   |
|   |                          | Note: Polarity defines output voltage level<br>when the logic evaluation result is<br>TRUE(active). In open-drain mode,<br>High-level output means the output pin is<br>in Hi-Z state; a pull-up resistor is required<br>to make the output level High. |

Figure 4-15. Add Logic-Controlled GPO



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Users can select the combination of GPI, GPO, and Rail inputs (see Figure 4-16).

| PI State                        | Enabled?                |                              |
|---------------------------------|-------------------------|------------------------------|
| NOT GPI #1 (4 GPI01)            |                         |                              |
| GPO State                       | Enabled?                |                              |
| NOT JFC_RESET_L (GP01 (No Pin)) |                         |                              |
| Check All                       | Check All               | Click to change to NAND gate |
| Uncheck All                     | Uncheck All             |                              |
| Rail/Fan Status: POWER_GOOD     | $\overline{\mathbf{v}}$ |                              |
|                                 | Enabled?                |                              |
| NOT PMON_10R8_A (Rail #1)       |                         |                              |

Figure 4-16. Logic GPO Input Selection

#### 4.3.1.1.4 Configuring Command Controlled GPOs

Command Controlled GPOs are the output with a fixed state unless users issue a PMBus command to change it (see Figure 4-17).

| Command Controlled | GPOs - General Purpose O | utputs with Fixed State     |         | 1 of 21 Assigned |
|--------------------|--------------------------|-----------------------------|---------|------------------|
| GPO Name           | Pin                      | State                       | Actions |                  |
| Command GPO #1     | Pin 28 TDO GPIO19        | ● Low (0) ○ High (1) ○ Hi-Z | Delete  |                  |
| Add Command Contr  | olled GPO                |                             |         |                  |

Figure 4-17. Configure Command Controlled GPOs

### 4.3.1.1.5 Configuration Fans

Some UCD90xxx sequencers have a built-in fan controller, enabled by combining Tach monitor inputs, PWM output, and temperature measurements (see Figure 4-18). For the details on fan control, see the data sheet.

| Fans    |          |                         |  |                  | 3 of 10 Assigned |
|---------|----------|-------------------------|--|------------------|------------------|
|         | Fan Name | Pins                    | Configuration Summary  | Actions          |                  |
| Fan #1  | Fan #1   | PWM: Pin 17 FPWM1_GPIO5 | Installed: yes; Tach Pules Per Rev: 2; PWM Mode: VariablePWM; Auto Calibration Off;  | Delete Configure |                  |
|         |          | Tach: Pin 31 GPI1_PWM1  | 200.00 RPM; Fan Speed Auto Adjusted via Rail #9; 5% < 15°C; 40% < 25°C; 60% < 35°C; 100% < 45°C; 100% < 55°C; 100% : Speed Change: 4.000%; Fault Increase  |                  |                  |
| Fan #2  | Fan #2   | PWM: Pin 18 FPWM2_GPIO6 | Installed: yes; Tach Pules Per Rev: 2; PWM Mode: VariablePWM; Auto Calibration Off;  | Delete Configure |                  |
|         |          | Tach: Pin 42 GPI3_PWM3  | Duty On/Off/Max: 90/10/100%; Speed Type: PctOperatingSpeed; Speed Fault Limit<br>200.00 RPM; Fan Speed Auto Adjusted via Rail #9; 10% < 15°C; 40% < 25°C; 60% <<br>35°C; 80% < 45°C; 100% < 55°C; 100%; Speed Change: 4.000%; Fault Increase     |                  |                  |
| Fan #3  | Fan #3   | PWM: Pin 19 FPWM3_GPIO7 | Installed: yes; Tach Pules Per Rev: 2; PWM Mode: VariablePWM; Auto Calibration Off;  | Delete Configure |                  |
|         |          | Tach: Pin 37 TDO_GPIO20 | Duty On/Offf/Max: 90/10/100%; Speed Type: PctOperatingSpeed; Speed Fault Limit:<br>200.00 RPM; Fan Speed Auto Adjusted via Rail #9; 10% < 15°C; 40% < 25°C; 60% <<br>35°C: 80% < 45°C: 100% < 55°C: 100% is Speed Change: 4.000%; Fault Increase |                  |                  |
| Add Fai | n        |                         |  |                  |                  |





First click the Add Fan button and then click the Configure button, as shown in Figure 4-18. On the pop-up window (see Figure 4-19), customers can configure the following settings for the fan functions:

- PWM
- Speed
- Speed Type
- Duty Cycle
- Tach input
- Auto Adjust Fan Speed to Temperature
- Fault Response

| 🜵 Fan Config - UCD90910 @ PMBus Address 101d   |   |  |
|--|---|--|
| Fan Installation   |   |  |
| PWM Configuration  | - Fan Tach Configuration  |  |
| Control Pin Mode:  | Tach: Pin 31 GPI1 PWM1  | Tach pulses per revolution: 2 💭  |
| Simple Enable/Disable     Variable PM/M Signal     Towart PM/M   | - Auto Adjust Fan Speed to Temp   | erature  |
| Fan PWM Pin: Pin 17 FPWM1 GPI05  | Enable fan speed auto adjust  |  |
|  | Temperature Monitor: Rail #9  | automatically be adjusted as a temperatre reading changes.   |
| Frequency: 25.000 🔆 kHz 🖂  | Select the rail that has a monitor asso<br>adjust to.   | ciated with the temperature sensor you want the fan to   |
| Frequency can be 15.275 kHz to 125 MHz   | Auto Adjust Configuration:  | Fan Speed  |
| - Speed Configuration  | Temp  | 100 😴 %  |
| Manual Fan Speed Setting: 0 🐨 %  | Tomo 4  | 100 😌 %  |
| Speed Change: 4.000 🔆 % The change in speed per second.  | Temp 3: 35 🕀  | °C%  |
| Apply new speed change immediately   | Temp 2: 25 💭  | °C%  |
| Speed Type   | Lowest Temp: Temp 1: 15   | 40 🐳 %   |
| The commanded speed determines the percent duty-cycle for the PWM.   |   | 5 💮 %  |
| <ul> <li>Percent Operating Speed<br/>The "Speed" parameter sets the percent operating speed to the fan. At 100%,<br/>the fan runs at its fastest speed ("Duty-cycle max").</li> </ul>  | - Fault Reporting & System Shute  | down   |
| Duty Cycle Values for Percent Operating Speed Mode   | Speed fault limit: 200.00 $\stackrel{\wedge}{\searrow}$ R<br>If the fan speed is below the limit speed<br>the DMRus ALEDT clears, and est the f | UPM<br>cified above for 5 consecutive seconds, the device will assert  |
| Duty Cycle On: 90 + % The percent duty-cycle where the fan turns on,   | STATUS_WORD registers.  | ault bits in the STATUS_FAINS_T_2 or STATUS_FAINS_3_4 and  |
| When auto calibration mode is enabled, set to a<br>value dose to or just below the duty-cycle<br>where the fan starts. This will speed up the<br>calibration process. This is ontional | Enable system shutdown when thi   | is fan and 🛛 🕞 additional fans have also failed.   |
| Duty Cycle Off: 10 + % The percent duty-cycle where the fan turns off.<br>This will be used as the lowest duty-cycle that will<br>ever be applied to the fan.                          | Fault increase speed: 0   | eeds will be incremented by this amount (0-100%). Speeds<br>ed. A ceiling of 100% is placed on the result of the speed                   |
| Duty Cycle Max: 95 💮 % The duty-cycle where the fan is at its max RPM.   | increase. When this value is non-zero<br>the other fan speeds are increased. The<br>fan comes back on and then fails again                      | and the fan fails, the 'Fault increase speed'' is set to 0 after<br>his prevents this function from occurring a second time if the<br>n. |
|  | ОК  |  |

Figure 4-19. Fan Configurations



#### 4.3.1.1.6 Configuring General-Purpose Pulse-Width Modulation (PWM)

General-purpose pulse-width modulation are the PWM output with a fixed duty cycle, frequency, and phase until users make changes with commands (see Figure 4-20).

| PWMs - General Pu | rpose Pulse-Width Modulation Ou | tputs      |           |       |                  | 1 of 10 Assigned |
|-------------------|---------------------------------|------------|-----------|-------|------------------|------------------|
| PWM Name          | PWM Pin Name                    | Duty Cycle | Frequency | Phase | Actions          |                  |
| PWM #1            | Pin 10 FPWM1 GPIO5              | 0.0 %      | 15.28 kHz | 0.0 ° | Delete Configure |                  |
| Add PWM           |                                 |            |           |       |                  |                  |



#### 4.3.1.1.7 Configuring Manufacturing Information

The device information includes the following:

- Device part ID
- Firmware version
- IC package
- PMBus Revision and Manufacturing Information

Among these, users can customize manufacturing information to suit their needs, such as configuration version control (see Figure 4-21).

| ardware Configuration  | Device Information  |             | Manufacturing Infe  | þ  |  |
|--|---|-------------|---|--|--|
| on <u>for &amp; SefO pins assignment</u> : Configure pins to perform<br>sector functions<br>excel functions<br>), firmmate version, IC package (MBBus Revision,<br>andischuring Info (MIR_ID, MIR_MODEL, etc.), data flash<br>hedrarm atc. | Device ID:         UCD9090A]2.4.3.0811[160922           Capability:         Max Bus: 400 Khz; PEC: Yes; SMBALERT: Yes           PMBus Revision:         1.1,1.1 - Part I: 1.1, Part II: 1.1           Vout Mode:         EXP           IC Package:         QFN-48           DFlash checksum (onlime):         0x00000AFB5 | :<br>Update | Manuf Date:<br>Manuf ID:<br>Manuf Location:<br>Manuf Model:<br>Manuf Serial:<br>These fields can be or<br>runtime by the device | YYMMDD<br>MFR_JD<br>MFR_LOCATION<br>MFR_MODEL<br>MFR_REVISION<br>000000<br>uustomized to suit your needs | (max 6 chars)<br>(max 18 chars)<br>(max 12 chars)<br>(max 12 chars)<br>(max 12 chars)<br>(max 12 chars)<br>(max 12 chars)<br>and are not used at |
|  | Device Constants  |             |   |  |  |
|  | Maximum Number of Digital Comparators:  | i.          |   |  |  |
|  | Maximum Number of General Purpose Outputs (GPOs):   | 10          |   |  |  |
|  | Maximum Number of General Purpose Inputs (GPIs):  |             |   |  |  |
|  | Maximum Number of Pages:  | 10          |   |  |  |
|  | Maximum Number of Fans:   | )           |   |  |  |
|  | Maximum Number of Monitors:   | 11          |   |  |  |
|  | Maximum Number of Entries in the Logged Fault Detail :  | 26          |   |  |  |
|  | Maximum Number of PWM Outputs   | 0           |   |  |  |

Figure 4-21. Configure Manufacturing Information

#### 4.3.1.2 Rail Configuration

The Rail Configuration tab (see Figure 4-23) includes all the settings related to the rails including: thresholds, sequencing conditions, fault responses, and scaling. Based on the user's inputs, the GUI plots rail sequences on and off timing in real time. Moreover the GUI also provides a snapshot of rail settings; users can double click the target rail to modify it.

#### 4.3.1.2.1 Voltage, Current, Temperature Limits, and Scaling Settings

Figure 4-22 shows how the rail jumps among different states with the settings.



Figure 4-22. State Machine



#### Figure 4-23 shows the Rail Configuration screen.

|                  | (a.1c. b  | <u></u>               |  |                    |   |
|------------------|---|-----------------------|--|--------------------|---|
| Copy/Clone Rails | Rail Configuration  | Voltage setpoints for | Rail #1 (PWR_12V0)                               | Scaling            | and the second se |
|                  | Voltage, Current, Temperature limits and<br>scaling setting:                            | Over Fault:           | 13.800 🕀 V 15.0 🕀 %                              | Vout Scale Mon:    | 0.250 😌   |
|                  | Sequencing: SEQ_CONFIG (0xF6): configure  | Over Warn:            | 13.200 令 V 10.0 令 %                              | Vout Cal Mon:      | 0.000 🐳 V   |
|                  | sequence timeout, actions when sequence<br>timeout occurs, sequencing dependencies on   | Margin High:          | 12 200 A V 2 0 A W                               | Iout Cal Gain:     | 11.0000 🕀 mΩ  |
|                  | rails, and GPIO pins; how to turn rail on/off   | Martingen             |  | Iout Cal Offset:   | 0.000000 🚭 A  |
|                  | rail is commanded on (TON_DELAY, 0x60)  | vouc                  | 12.000 V V Synchronize margins/imits/ PG to vout | Temp Cal Gain:     | 92.3 🕀 *C/V   |
|                  | and off (TOFF_DELAY, 0x64);   | Margin Low:           | 11.640 ⊕ V -3.0 ⊕ %                              | Temp Cal Offset:   | 0.00 🕀 °C   |
|                  | page fault condition (FAULT_RESPONSES,  | Under Warn:           | 10.800 🗘 V -10.0 💭 %                             |                    |   |
|                  | 0xE9), and to GPI Fault<br>(GPI_FAULT_RESPONSES, 0xF4)                                  | Under Fault:          | 10.200 (축) V -15.0 (축) %                         | IOUT & Temp Limits |   |
|                  | SMBAlert Mask: Set used to block a status bit   | Power Good On:        | 10 200 AV -15.0 A %                              | Iout OC Fault:     | 0.000 🚭 A   |
|                  | (s) from causing hte SMBALERT# signal to be<br>asserted (SMBALERT_MASK, 0x1B). Refer to | Power Good Off        |  | Iout OC Warn:      | 0.000 🕀 A   |
|                  | PMBus Specification document for format<br>detail.                                      |                       | 9.800 (v) V -18.3 (v) %                          | Iout UC Fault:     | 0.000 🗇 A   |
|                  |   | Vout Exponent:        | -10 🐨 Max: 4.000 V 🔽 Set for me                  | OT Fault:          | 255 🕀 +C  |
|                  |   | Configured as VIN     | Monitor Fixed percentage voltages                | OT Warn:           | 255 💮 °C  |
|                  |   |                       |  |                    |   |

Figure 4-23. Rail Configuration Tab

#### 4.3.1.2.1.1 Setting Voltage Setpoint, Margin, and Limits

Each rail can have up to nine different thresholds for each voltage rail, as follows:

- OVER\_VOLTAGE\_FAULT
- OVER\_VOLTAGE\_WARNING
- UNDER\_VOLTAGE\_FAULT
- UNDER\_VOLTAGE\_WARNING
- MARGIN\_HIGH
- MARGIN\_LOW
- POWER\_GOOD\_ON
- POWER\_GOOD\_OFF
- VOUT



The GUI can help to synchronize the margins, limits, and PG to the VOUT, to save the user's inputs (see Figure 4-24). The Vout Exponent defines the maximum value the device can detect. When the *Set for me* checkbox is selected, the GUI automatically adjusts the Vout Exponent based on the user's inputs to achieve the best resolution. If the thresholds are larger than the maximum value allowed by the Vout Exponent, 0 V is returned by the device. All of these thresholds are the results after the scaling factor and offset defined in Section 4.3.1.2.1.2.

| 13.800 ↔ V     15.0 ↔ %       13.200 ↔ V     10.0 ↔ % |
|---|
| 13.200 🗇 V 10.0 🕆 %                                   |
|   |
| 12.360 🐳 V 3.0 🐳 %                                    |
| 12.000 💭 V 🗸 Synchronize margins/limits/ PG to Vout   |
| 11.640 ↔ V -3.0 ↔ %                                   |
| 10.800 🗘 V -10.0 🗘 %                                  |
| 10.200 🗘 V -15.0 😴 %                                  |
| 10.200 🗘 V -15.0 💭 %                                  |
| 9.800 (m) V -18.3 (m) %                               |
| -10 🚔 Max: 4.000 V 🗸 Set for me                       |
| or Fixed percentage voltages                          |
|   |

Figure 4-24. Voltage Setpoint, Margin, and Limit Setting for Rest UCD90xxx

The UCD90320 device supports up to 4 profiles (each profile has 9 thresholds) per rail, to support different CPU skews. Users can click the Edit Rail Profile link to add, delete, or modify existing profiles (see Figure 4-25).

| 😓 UCD90320 @ PH4Bus Address 17d - Rail #20   |
|--|
| Profile #1         Over Fault         1.320 **         V         10.0 **         %           Over Fault         1.320 **         V         10.0 **         %           Over Warn         1.260 **         V         5.0 **         %           Margin High         1.224 **         V         2.0 **         %           Vout         1.300 **         V         2.0 **         %           Under Warn         1.140 **         V         -5.0 **         %           Under Fault         1.000 **         V         -10.0 **         %           Power Good Off         1.000 **         V         -10.0 **         %           Power Good Off         1.000 **         V         -10.0 **         %           Vout Exponent:         -14 **         Max:         2.0 V         \$           Select for me         Diss *         Diss *         Profile           Configured as VIN Monitor         Select for 1         0         0         0           Fibred percentage voltages setpoint         GP12         GP11         Profile Index Used         Selection           Block out period:         0.000 **         mec         Block out period:         0.0000 ** |
|  |

Figure 4-25. Voltage Setpoint, Margin, and Limit Setting for UCD90320



#### 4.3.1.2.1.2 Setting Scaling Factors

Each rail has its own scaling factor and offset for voltage, current, and temperature. Set the scaling factors based on the hardware design. The thresholds set in Section 4.3.1.2.1.1 are after scaling factor and offset. The Vout Scale Mon is normally the ratio of the external voltage divider if applicable. For example, a 12-V rail is down-scaled to 2 V using a divider connected on the Mon pin. The Vout Scale Mon must be set to 2/12 (1/6) and all the thresholds set in Section 4.3.1.2.1.1 shall be based on the 12 V instead of the 2 V.

| Scaling          |              |
|------------------|--------------|
| Vout Scale Mon:  | 0.250 💭      |
| Vout Cal Mon:    | 0.000 🔨 V    |
| Iout Cal Gain:   | 11.0000 📩 mΩ |
| Iout Cal Offset: | 0.000000 💭 A |
| Temp Cal Gain:   | 92.3 🔷 °C/V  |
| Temp Cal Offset: | 0.00 ♠ ℃     |

Figure 4-26. Scaling Factors Setting

#### 4.3.1.2.1.3 Setting Current and Temperature Limits

When rails are configured to monitor current and temperature, limits can also be set (see Figure 4-27).

| IOUT & Temp Limits |           |  |  |
|--------------------|-----------|--|--|
| Iout OC Fault:     | 0.000 🚔 A |  |  |
| Iout OC Warn:      | A         |  |  |
| Iout UC Fault:     | A         |  |  |
| OT Fault:          | 255 ♠ °C  |  |  |
| OT Warn:           | 255 💭 °C  |  |  |
|                    |           |  |  |
|                    |           |  |  |
|                    |           |  |  |

Figure 4-27. Current and Temperature Limits Setting



#### 4.3.1.2.2 Sequencing

#### 4.3.1.2.2.1 Turning Rails On and Off

Each rail has an On/Off Config setting, the Turn On/Off Delay and the Max Turn On/Off, to meet different power-up requirements (see Figure 4-28). The Turn On/Off Delay is the delay time to assert or deassert the enable signal after the On/Off condition is met. Max Turn On sets an upper limit, in ms, on how long the power supply can try to power up the output without reaching the POWER\_GOOD\_ON voltage level. Max Turn Off sets an upper limit, in ms, on how long the power supply can try to power down the output without reaching 12.5% of the output voltage programmed.

| How to turn rail On/Off 🛛 🗹 |            |                 |              |  |  |
|-----------------------------|------------|-----------------|--------------|--|--|
| On/Off Config:              | 0x00 🗸 (Au | ito Enable)     |              |  |  |
| Turn On Timi                | ng         | Turn Off Tim    | ing          |  |  |
| Turn On Delay:              | 0.0 🔶 ms   | Turn Off Delay: | 0.0 🔶 ms     |  |  |
| Max Turn On:                | ∞ Â<br>▼   | Max Turn Off:   | ∞ 🔶 ms       |  |  |
|                             | Vo limit - |                 | V No limit - |  |  |

Figure 4-28. Rail On/Off Config Setting (1/2)

Configure System

Figure 4-29 shows the Rail On/Off Config options.

| On / Off Control            |                                |
|-----------------------------|--------------------------------|
| <ol> <li>None</li> </ol>    |                                |
| The enable pin is asse      | r ted after the                |
| Sequence-on depende         | encies are met plus Turn       |
| On Delay                    |                                |
| CONTROL Pin Only            |                                |
| The enable pin is asse      | r ted when the                 |
| CONTROL pin is active       | and the Sequence-on            |
| dependencies are met        | plus Turn On Delay.            |
| CONTROL oin is not a        | serted when the                |
| Delay.                      | ave position on                |
| O OPERATION Only            |                                |
| The apphie pip is page      | ted when the en left           |
| portion of the OPERAT       | TON command is set to          |
| ON and the Sequence         | -on dependencies are           |
| met plus Turn On Dela       | y. The enable pin is           |
| deasserted IMMEDIAT         | ELY or with SOFT STOP          |
| when the on/off portion     | on of the OPERATION            |
| Command is set to OFF       | 5• ·                           |
| Both CONTROL Pin &          | OPERATION                      |
| The enable pin is asse      | rted when the                  |
| CONTROL pin is active       | , the on/off portion of        |
| the Sequence-on depr        | and is set to ON and           |
| Turn On Delay. The e        | nable pin is deasserted        |
| when the CONTROL p          | in is not active or when       |
| the on/off portion of t     | he OPERATION                   |
| command is set to OFF       |                                |
| - Control Pin Polarity -    |                                |
| Active low (Pull pin low)   | r to start the unit)           |
| C Arthur high (Dill birth t | n start the unit               |
|                             | and a state of the state study |
| - Control Pin Turn Off      | Configuration ———              |
| ( Soft Off (With Sequer     | rcing).                        |
|                             |                                |
|                             |                                |
| C Immediately Off No.9      | equendoo).                     |

- (1) None (auto enable): the rail automatically tries to turn on when the UCD90xxx device is out of reset. In auto mode, the rail does not tries to turn off.
- (2) CONTROL Pin Only: the rail tries to turn on or off when the CONTROL pin state is toggled.
- (3) OPERATION Only: the rail tries to turn on or off when it receives an OPERATION command. If the PIN SELECTED RAIL STATE (PSRS) feature is used, the rail must be configured as OPERATION.

Figure 4-29. Rail On/Off Config Setting (2/2)

#### 4.3.1.2.3 Setting Sequencing Time-Outs and Dependencies

Sequencing is very critical for the modern power system. Which rails should be on first? Are there any dependencies? Which rail should be off last? UCD sequencers provide very flexible configuration for the sequencing (see Figure 4-30). A rail can have dependencies on other rails, GPIs, and logical GPOs, to meet various sequencing conditions (see Table 4-1). To prevent the dead loop case, users can set a proper time-out value to decide what action to take: wait forever, turn on, or resequencing when the time-out expires.

| Table 4-1. | Sequencing | Dependencies | <b>Events</b> |
|------------|------------|--------------|---------------|
|            |            |              |               |

| Event                      | Rail   | GPI                       | LGPO <sup>(1)</sup>        |
|----------------------------|--|---------------------------|----------------------------|
| Sequence On condition met  | Voltage monitoring: Above<br>POWER_GOOD threshold<br>Other monitoring: EN signal is asserted.          | Asserted <sup>(2)</sup>   | The logic output is TRUE.  |
| Sequence Off condition met | Voltage monitoring: Below<br>POWER_GOOD_OFF threshold<br>Other monitoring: EN signal is<br>deasserted. | Deasserted <sup>(2)</sup> | The logic output is FALSE. |

<sup>(1)</sup> LGPO dependencies are available only on UCD90320, UCD90160A, and UCD9090A devices.

<sup>(2)</sup> The input signal is asserted if it matches the defined polarity, otherwise it is deasserted.



Figure 4-30. Sequencing Time-Out and Dependencies Setting

### 4.3.1.2.3.1 Using Fault Shutdown Slaves

Fault shutdown slaves are the slave rails of the faulted rail. Each rail can have its own fault slave rails (as shown in Figure 4-31). When a fault occurs on the master rail, if its response is to shut down, all slave rails are also shut down. If retries are specified for the master rail, the slave rail (or rails) remain running until all retries are exhausted. For the UCD90120 and UCD90124 devices, the slave pages are shut down in the same way as the master page. For devices other than the UCD90120 and UCD90124, the slave pages are shut down using sequence off dependencies and TOFF\_DELAY. The slave pages do not perform any retries during the fault slave shutdown. After being shut down, slave rails are latched off as if they had experienced the fault. A status bit is set in their MFR\_STATUS word indicating the reason they are latched off. If a resequence is enabled on the fault response of the master rail, the fault shutdown slaves are resequenced along with master rail.

If the fault response of master rail is set to ignore and continue operation, the fault shutdown slaves are meaningless.



Figure 4-31. Fault Shutdown Slaves

#### 4.3.1.2.4 Setting Fault Responses

This section describes how to set up fault responses to protect the system when faults are detected. The GUI provides a convenient way to configure the fault response. Figure 4-32 and Figure 4-33 show a snapshot of the fault responses. By clicking the *Edit in larger window* link, the user can configure each fault individually.

| Council Transmission India and   | raun Responses  |   |  |              |  |  |   |
|--|---|---|--|--------------|--|--|---|
| setting:   | Time between restarts:  |   | 0 💮 msec   |              |  |  |   |
| Sequencing: SEQ_CONFIG (0xF6): configure                               | Voltage fault max glitch ti   | me:   | 0.0 🔅 msec   |              |  |  |   |
| d GPIO pins; how to turn rail on/off                                   | Non-voltage fault max glit  | tch time:   | 0 📩 msec   |              |  |  |   |
| promised on (TON_DELAY, 0x60)  | Fault Git   | ch Filter Re-Sequen   | ce   |              | Response   | Restart  | Click To Soo  |
| (TOFF_DELAY, 0x64);  | Vout Over Voltage   | Disabled  | No   |              | Ignore   | N/A Edit   |   |
| sponses: Set the response for each<br>ult condition (FAULT RESPONSES,  | Vout Under Voltage  | Disabled  | No   |              | Ignore   | N/A Edit   | Action  |
| and to GPI Fault   | Iout Over Current   | Disabled  | No   |              | Ignore   | N/A Edit   |   |
| ULT_RESPONSES, 0xF4)   | Iout Under Current  | Disabled  | No   |              | Ignore   | N/A Edit   |   |
| t Mask: Set used to block a status bit                                 | Over Temp   | Disabled  | No   |              | Ignore   | N/A Edit   |   |
| I (SMBALERT MASK, 0x18). Refer to<br>Specification document for format | Time On Max   | Disabled  | No   |              | Ignore   | N/A Edit   | Non-GPI Fault<br>Response   |
|  | GPI Fault Responses   |   |  |              |  |  |   |
|  | GPIs used to GPI a<br>select profile Disa.  | # 2         GPI # 1           ♥         Disa ♥           3         2         1  | Max glitch time:<br>Block out period:  | 0.0 (*) msec |  |  |   |
|  | de-assert de-assert 0   | 0 0 0   |  |              |  | +  | GPI Profile Selection   |
|  | GP12 GP11<br>de-assert de-assert 0<br>de-assert assert 1<br>assert de-assert 2<br>assert assert 3   | Profile Index Used           0         0         0           1         1         0           2         0         0           2         1         0  |  |              |  |  | —   |
|  | GP12 GP11<br>de-assert de-assert 0<br>de-assert 1<br>assert de-assert 2<br>assert assert 3<br>Fault   | Protile Index Used           0         0         0           1         1         0           2         0         0           2         1         0           2         1         0  | equence  |              | Response   | Restart  | GPI Profile Selection   |
|  | GP12 GP1<br>de-assert de-assert 0<br>de-assert assert 1<br>assert de-assert 2<br>assert assert 3<br>Fault<br>GP1#01   | Index Used           0         0         0           1         1         0           2         0         0           2         1         0           Glitch Filter         Res           Disabled         Disabled  | equence No   |              | Response<br>Ignore   | Restart<br>NA <u>Edit</u>  | → GPI Profile Selection → Clock to See Action                         |
|  | GP12 GP1<br>de-assert de-assert 0<br>de-assert cle-assert 2<br>assert de-assert 3<br>Foult<br>GP1#01<br>GP1#02<br>GP1#02  | Brothile Index Used           0         0         0           1         1         0           2         0         0           Image: Constraint of the state of th | equence No No  |              | Response<br>Ignore<br>Ignore   | Restart<br>N/A <u>Edit</u><br>N/A <u>Edit</u>  | → GPI Profile Selection → Clock to See Action                         |
|  | GP12 GP1<br>de-assert de-assert 1<br>assert de-assert 2<br>assert assert 3<br>Fault<br>GP1#01<br>GP1#02<br>GP1#03<br>GP1#03   | Brothile Index Used           0         0         0           1         1         0           2         0         0           2         1         0           Glitch Filter         Res         Disabled           Disabled         Disabled         Disabled   | equence No No No   |              | Response<br>Ignore<br>Ignore<br>Ignore   | Restart<br>N/A Edit<br>N/A Edit  | → GPI Profile Selection → Clock to See Action                         |
|  | GP12         GP11           de-asser         de-asser           de-asser         asser           asser         de-asser           asser         de-asser           asser         asser           asser         asser           asser         de-asser           fault         de-asser           GP1 #02         de-asser           GP1 #04         de-asser   | Brothile Index Used         Index Used           0         0         0           1         1         0           2         0         0           2         1         0           Glitch Filter         Res           Disabled         Disabled           Disabled         Disabled  | equence<br>No<br>No<br>No  |              | Response<br>Ignore<br>Ignore<br>Shut down immediately  | Restart<br>NA Edit<br>NA Edit<br>NA Edit<br>Do not restart Edit  | → GPI Profile Selection → Clock to See Action                         |
|  | GP12         GP11           de-asset         de-asset           de-asset         asset           asset         de-asset           asset         asset           GP1 asset         3           Fact         GP1           GP1 a01         GP1 a03           GP1 a04         GP1 a04           GP1 a05         GP1 a05  | Profile Index Used         0         0         0         0         0         0         1         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         0         2         1         1         0         2         1 <th1< th=""> <th1< th=""> <th1< th=""></th1<></th1<></th1<>  | equence No No No No No No No   |              | Response<br>Ignore<br>Ignore<br>Shut down immediately<br>Ignore  | Restart YA Edit<br>N/A Edit<br>N/A Edit<br>Do not restart Edit<br>N/A Edit :   | → GPI Profile Selection → Clock to See Action                         |
|  | GP12         GP11           de-same         desame           asser         asser           asser         desame           asser         desame           asser         asser           asser         asser           asser         asser           asser         asser           GP1801         GP1801           GP1802         GP1803           GP1804         GP1804           GP1805         GP1805           GP1806         ser   | Device         Index Used           0         0         0           1         1         1           2         0         0           2         1         0           Ghtch Filter         Ress         Disabled           Disabled         Disabled         Disabled           Disabled         Disabled         Disabled  | equence No<br>No<br>No<br>No<br>No<br>No                                     |              | Response<br>Ignore<br>Ignore<br>Shut down inmediately<br>Ignore<br>Ignore  | Restart V/A Edit<br>N/A Edit<br>N/A Edit<br>Do not restart Edit<br>N/A Edit<br>N/A Edit  | → GPI Profile Selection → Clock to See Action GPI Fault               |
|  | GP12         GP11           de-asser         de-asser           asser         asser           asser         de-asser           asser         de-asser           asser         de-asser           asser         de-asser           asser         de-asser           asser         asser           asser         de-asser           asser         de-asser           asser         de-asser           asser         de-asser           asser         de-asser           asser         de-asser           asser         asser           Fault         GPI #02           GPI #03         GPI #05           GPI #05         GPI #07  | Description         Description           0         0         0         0           1         1         0         0         0           2         0         0         0         0           2         1         0         0         0           Glitch Filter         Res         Disabled         Disabled           Disabled         Disabled         Disabled         Disabled   | equence<br>No<br>No<br>No<br>No<br>No<br>No<br>No                            |              | Response<br>Ignore<br>Ignore<br>Shut down immediately<br>Ignore<br>Ignore<br>Ignore<br>Ignore  | Restart<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit  | → GPI Profile Selection → Clock to See Action → GPI Fault → Response  |
|  | GP12         GP11           de-samet         de-samet           assert         de-samet           assert         de-samet           assert         de-samet           assert         assert           generation         assert           generation         assert           GP1 #00         GP1           GP1 #01         GP1 #03           GP1 #03         GP1 #04           GP1 #05         GP1 #07           GP1 #07         GP1 #08   | Devilia Devilia         Devilia         Devilia           0         0         0         0           1         1         0         0           2         0         0         0           3         1         1         0         0           2         0         0         0         0           3         0         1         0         0           0         0         1         0         0           0         0         1         0         0           0         0         0         0         0         0           0         0         0         0         0         0         0           0   | équence No<br>No<br>No<br>No<br>No<br>No<br>No<br>No                         |              | Response<br>Ignore<br>Ignore<br>Shut down immediately<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore  | Restart /<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit  | → GPI Profile Selection → Clock to See Action GPI Fault<br>Response   |
|  | GP12         GP11           de-samet         de-samet         0           de-samet         samet         1           assert         de-samet         2           assert         assert         3           Fault         GP1 #01         GP1 #02           GP1 #04         GP1 #03         GP1 #04           GP1 #05         GP1 #05         GP1 #06           GP1 #09         GP1 #09         GP1 #09  | Destiliates         Used           0         0         0         0           1         1         0         0         0           2         0         0         0         0           Glitch Filter         Disabled         Disabled         Disabled           Disabled         Disabled         Disabled         Disabled           Disabled         Disabled         Disabled         Disabled   | équence No<br>No<br>No<br>No<br>No<br>No<br>No<br>No<br>No                   |              | Response<br>Ignore<br>Ignore<br>Shut down immediately<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore  | Restart / / Edi<br>N/A Edi<br>N/A Edi<br>N/A Edi<br>N/A Edi<br>N/A Edi<br>N/A Edi<br>N/A Edi   | → GPI Profile Selection → Clock to See Action → GPI Fault<br>Response |
|  | GP12         GP11           de-asset         de-asset         0           asset         asset         1           asset         de-asset         0           asset         de-asset         2           asset         de-asset         2           asset         asset         3           Fault         GP1 #01         GP1 #02           GP1 #02         GP1 #02         GP1 #03           GP1 #05         GP1 #05         GP1 #06           GP1 #07         GP1 #08         GP1 #09           GP1 #10         GP1 #10         GP1 #03  | Descrite         Use           0         0         0         0           1         1         0         0         0           2         0         0         0         0           2         1         0         0         0           3         1         1         0         0         0           2         0         0         0         0         0           3         1         1         0         0         0           5         Disabled         Disabled         Disabled         Disabled           5         Disabled         Disabled         Disabled         Disabled           5         Disabled         Disabled         Disabled         Disabled  | equence<br>No<br>No<br>No<br>No<br>No<br>No<br>No<br>No<br>No<br>No          |              | Response<br>Ignore<br>Ignore<br>Shut down immediately<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore  | Restart<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit                                  | → GPI Profile Selection → Clock to See Action GPI Fault Response      |
|  | GP12         GP11           de-same         de-same           asser         de-same           asser         de-same           asser         de-same           asser         de-same           asser         asser           de-same         asser           asser         asser           de-same         asser           de-same         asser           asser         asser           de-same         asser           de-same | Devilia Devilia         0   | No N                                     |              | Response<br>I gonore<br>I gonore<br>Shut down immedately<br>I gonore<br>I gonore<br>I gonore<br>I gonore<br>I gonore<br>I gonore<br>I gonore<br>I gonore<br>I gonore<br>I gonore | Restart V/A Edit<br>N/A Edit<br>N/A Edit<br>Do not restart Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit<br>N/A Edit              | → GPI Profile Selection → Clock to See Action GPI Fault Response      |
|  | GP12         GP11           de-samet         de-samet         0           de-samet         assert         1           assert         de-samet         2           assert         de-samet         2           assert         assert         assert           assert         assert         3           Fault         GP1 #01         GP1 #02           GP1 #03         GP1 #03         GP1 #04           GP1 #04         GP1 #05         GP1 #05           GP1 #07         GP1 #00         GP1 #09           GP1 #09         GP1 #10         GP1 #11           GP1 #11         GP1 #12         GP1 #12  | Destilatest Used           0         0         0         0           1         1         0         0         0           2         0         0         0         0           Glitch Filter         Disabled         Disabled         Disabled           Disabled         Disabled         Disabled         Disabled           Disabled         Disabled         Disabled         Disabled           Disabled         Disabled         Disabled         Disabled   | équence No<br>No<br>No<br>No<br>No<br>No<br>No<br>No<br>No<br>No<br>No<br>No |              | Response<br>Ignore<br>Ignore<br>Shut down immediately<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore<br>Ignore                                  | Restart N/A Edit<br>N/A Edit | → GPI Profile Selection → Clock to See Action → GPI Fault<br>Response |

Figure 4-32. Fault Response Setting For UCD90240 and UCD90320

| Fault Responses        |                |             |          |         |      |
|------------------------|----------------|-------------|----------|---------|------|
| Time between restar    | ts:            | 0 🕆 msec    |          |         |      |
| Voltage fault max glit | ch time:       | 0.0 🖶 msec  |          |         |      |
| Non-voltage fault ma   | x glitch time: | 0 (A) msec  |          |         |      |
| Fault                  | Glitch Filter  | Re-Sequence | Response | Restart |      |
| Vout Over Voltage      | Disabled       | No          | Ignore   | N/A     | Edif |
| Vout Under Voltage     | Disabled       | No          | Ignore   | N/A     | Edir |
| Iout Over Current      | Disabled       | No          | Ignore   | N/A     | Edit |
| Iout Under Current     | Disabled       | No          | Ignore   | N/A     | Edit |
| Over Temp              | Disabled       | No          | Ignore   | N/A     | Edit |
|                        | Dicabled       | No          | Ionore   | N/A     | Edi  |

### Figure 4-33. Fault Responses Setting For Rest UCD90xxx



For each fault, there are different actions (see Figure 4-34).

|     | ptions   |
|-----|--|
|     | Enable glitch filter<br>If checked, when the fault is first detected the device<br>continues operation for the per-rail voltage max glitch time,<br>0.0 msec. If the fault is still present after this time, the<br>response configured below is taken.          |
|     | Enable re-sequencing<br>If checked, when the retries have been exhausted the<br>associated rail and any Fault Slaves will be shutdown in a<br>manner based on the Response selected. There will be a<br>delay, and then all of those rails will be re-sequenced. |
| R   | esponse  |
| 0   | Ignore fault and continue operation  |
| 0   | Shut down immediately  |
| 0   | Shut Down with delay configured using TOFF_DELAY   |
| - R | estart   |
| 0   | Do not restart   |
|     | The unit does not attempt to restart. The output remains<br>disabled until the fault is cleared.   |
| 0   | Restart up to 1 🗧 times  |
|     | The device attempts to restart up to the specified number of times, with a maximum of 14 restarts permitted.   |
|     | If the device fails to restart in the allowed number of retries,<br>it disables the output and remains off until the fault is cleared.   |
|     | The time between each restart attempt is configured globally for the rail, and is currently set to 0 ms.   |
| 0   | Restart continuously   |
|     | The device attempts to restart continuously, without<br>limitation, until it is commanded OFF (by the CONTROL pin or<br>OPERATION command or both), bias power is removed, or<br>another fault condition causes the unit to shut down.                           |

#### (1) Options:

- The glitch filter is used to filter out expected noise so that the response is taken on the real fault. The fault is still logged regardless of the filter.
- Resequence the faulted rail and its fault shutdown slaves after a programmable delay when the retry is exhausted. Resequence starts after the retry is exhausted.

(2) Response:

- If ignore is selected, the reset settings are ignored.
- The faulted rail is turned off immediately.
- The fault rail is turned off based on its sequencing.

(3) Restart:

• Retry settings. The retry count is reset whenever the rail stays above POWER\_GOOD for a TON\_MAX\_FAULT\_LIMIT amount of time without having a glitch. If TON\_MAX\_FAULT\_LIMIT is set to 0, 4 seconds are used for the time. There is only one retry for the UV fault because the retry is not considered completed until the rail reaches the POWER\_GOOD threshold again.

#### Figure 4-34. Fault Response Actions



The settings related to the resequence are detailed under the Global Configuration tab (see Figure 4-35).

| Rail Config Hardware Configuration Global Configuration  | All Config   |
|--|--|
| Global Configuration   | Re-Sequencing, Brownout, and Fault Log Options   |
| Enable Fault Log: Select which faults will get written to the<br>detail fault log in non-volatile flash memory. Because there is           | Re-Sequencing Options  |
| a limit to the total number of faults that can be logged in<br>detail, use this setting to log the most critical faults in your<br>system. | Enable Re-Sequence Abort     If a rail fails to turn off during re-sequencing, stop the re-sequencing operation. |
| Misc Config: Resequence options, enable Brownout, set Fault  | Max Re-Sequences: 1 time 🗸   |
| Log FIFO Scheme, manually set temperature.   | Time Between Re-Sequences: 0 💭 msec  |
| System Reset: allows device to provide an external reset<br>signal to the system. This signal can be based on time, the                    | From 0 to 32,256 milliseconds.   |

Figure 4-35. Resequence Settings

#### 4.3.1.2.5 SMBAlert Mask

This feature prevents the SMBALERT# signal being asserted, based on the selected status bit (see Figure 4-36). Only UCD90240 and UCD90320 devices have this feature.



Figure 4-36. SMBAlert Mask



# 4.3.1.3 Global Configuration

Global Configuration is meant to configure the rest of the functions of the devices including: Enable Fault Log, Misc Config, System Reset, System Watchdog, Pin Selected Rail States, Fault Pin Config, and Run Time Clock (see Figure 4-37).

| Hardware Configuration Rail Configuration   | Global Configuration  |
|---|---|
| Global Configuration  |   |
| Enable Fault Log: Select which faults will get wr<br>detail rauit log in non-volatile flash memory. Bec<br>a limit to the total number of faults that can be l<br>detail, use this setting to log the most critical fau<br>system.  | itten to the<br>ause there is<br>logged in<br>ults in your                  |
| Misc Config: Resequence options, enable Brown<br>Log FIFO Scheme, manually set temperature, en<br>Clock between devices, and set ADC Reference.   | out, set Fault<br>able Sync   |
| System Reset: allows device to provide an extern<br>signal to the system. This signal can be based of<br>power-good state of selected rails, the state of s<br>pins, or a combination of these things This ensi<br>devices are held in reset until other dependent of<br>peripherails) are fully powered. | nal reset<br>on time, the<br>selected GPI<br>sures that key<br>devices (ex: |
| System Watchdog: keeps a timeout counter run<br>counter is reset when the watchdog input (WDI)<br>toggled or when the SYSTEM_WATCHDOG_RES<br>is written.  | ning, That<br>pin is<br>ET command  |
| Pin Selected Rail States:<br>use up to 3 GPI pins to<br>the state or the rails if rails' ON_OFF_CONFIG ar<br>using OPERATION command.   | e determine<br>re configured  |
| Fault Pin Config: allows pins to be configured as<br>influenced outputs. The state of the output pin i<br>by a selection of GPI pins and any faults of a sec<br>rails.  | i fault-<br>is determined<br>lection of                                     |
| Run Time Clock the time kept by this clock is us<br>data flash-based fault logging to note the time t<br>occured. You can sync the device clock to PC, m<br>techniques your host microcontroller might use.   | sed within<br>hat a fault<br>iimicing                                       |

Figure 4-37. Global Configuration



#### 4.3.1.3.1 Enabling the Fault Log

Users can configure which faults get written to the detail fault log in the nonvolatile flash memory. The checkboxes select the fault to be written (see Figure 4-38). This only affects detail fault logging. Faults are always written to the logged fault summary in the flash memory. A limited number of faults can be logged in the details; this number varies by devices.

| Logged Fa                                   | ult Detail Enable - Ove  | erview  |  |   |   |  |  |                                 |                     |
|---|--|---|--|---|---|--|--|---------------------------------|---------------------|
| This is an edi<br>LOGGED_FA<br>Because then | tor for the LOGGED_FAULT_<br>ULT_DETAIL command. This is a limit to the total number | DETAIL ENABLES comma<br>s only affects detail fault log<br>r of faults that can be logged | nd. The checkbox<br>ging. Faults will a<br>in detail – 26 on | es select which faults v<br>always be written to the<br>this device you can | vill get written to the de<br>e logged fault summary<br>use these settings to lin | tail fault log in non-volat<br>in flash memory via the<br>it detail fault logging to t | ile flash memory via t<br>LOGGED_FAULTS o<br>he most critical faults i | he<br>ommand.<br>n your system. |                     |
| Common I                                    | Detail Fault Log Enable  | 25  |  |   |   |  |  |                                 |                     |
| Common:                                     | System Watchdog T  | Timeout 🔽 Watchdog  | Timeout 🔽  | All Common Fault  | 5   |  |  |                                 |                     |
| GPI Faults:                                 |  | ≠2  | 2I #4 🔽 GP   | I #5 🕼 GPI #6   | ☑ GPI #7 ☑ G  | PI #8 2 All GPI  | Faults   |                                 |                     |
| Rail Specif                                 | ic Detail Fault Log Ena  | ables   |  |   |   |  |  |                                 |                     |
| Rail #1:                                    | SEQ_OFF_TIMEOUT  |   | OT Fault   | IOUT UC Fault   | 10UT OC Fault   | TON_MAX Fault  | Vout UV Fault  | Vout OV Fault                   | All Rail #1 Faults  |
| Rail #2:                                    | SEQ_OFF_TIMEOUT  | SEQ_ON_TIMEOUT  | OT Fault   | IOUT UC Fault   | tour oc Fault   | TON_MAX Fault  | Vout UV Fault  | Vout OV Fault                   | All Rail #2 Faults  |
| Rail #3:                                    | SEQ_OFF_TIMEOUT  | SEQ_ON_TIMEOUT  | OT Fault   | IOUT UC Fault   | IOUT OC Fault   | TON_MAX Fault  | Vout UV Fault  | Vout OV Fault                   | 🔳 All Rail #3 Fault |
| Rail #4:                                    | SEQ_OFF_TIMEOUT  | SEQ_ON_TIMEOUT  | OT Fault   | IOUT UC Fault   | IOUT OC Fault   | TON_MAX Fault  | Vout UV Fault  | Vout OV Fault                   | All Rail #4 Fault   |
| Rail #5:                                    | SEQ_OFF_TIMEOUT  | SEQ_ON_TIMEOUT  | OT Fault   | IOUT UC Fault   | IOUT OC Fault   | TON_MAX Fault  | Vout UV Fault  | Vout OV Fault                   | All Rail #5 Fault   |
| Rail #6:                                    | SEQ_OFF_TIMEOUT  | SEQ_ON_TIMEOUT  | OT Fault   | IOUT UC Fault   | IOUT OC Fault   | TON_MAX Fault  | Vout UV Fault  | Vout OV Fault                   | All Rail #6 Faults  |
| Rail #7:                                    | SEQ_OFF_TIMEOUT  | SEQ_ON_TIMEOUT  | OT Fault   | IOUT UC Fault   | IOUT OC Fault   | TON_MAX Fault  | Vout UV Fault  | Vout OV Fault                   | All Rail #7 Fault   |
| Rail #8:                                    |  | SEQ_ON_TIMEOUT  | OT Fault   | 100T UC Fault   | IOUT OC Fault   | TON_MAX Fault  | Vout UV Fault  | Vout OV Fault                   | All Rail #8 Faults  |
| Rail #9:                                    | SEQ_OFF_TIMEOUT  | SEQ_ON_TIMEOUT  | OT Fault   | IOUT UC Fault   | IOUT OC Fault   | TON_MAX Fault  | Vout UV Fault  | Vout OV Fault                   | All Rail #9 Faults  |
|   | All Rails  | All Rails   | All Rails  | All Rails   | All Rails   | All Rails  | All Rails  | All Rails                       |                     |

Figure 4-38. Enable Fault Log



# 4.3.1.3.2 MISC\_CONFIG

The MISC\_CONFIG function lets users configure the following features (see Figure 4-39). Features vary by device (see individual UCD90xxx data sheets for supported features).

- Resequencing
- Fault log FIFO mode
- Brownout logging
- Disable flash logging
- Fan control
- External ADC reference
- Manual temperature settings

| Global Configuration  | Re-Sequencing, Brownout, and Fault Log Options  |   |
|---|---|---|
| Enable Fault Log: Select which faults will get written to the<br>detail fault log in non-volatile flash memory. Because there is  | Re-Sequencing Options   | Fault Log First-In, First-Out (FIFO) Mode   |
| I into the scal number of faults that can be logged in<br>setting uses the strength to big the next critical faults in your<br>hystem.<br>With Central Resequence options, anable Brownood; set fault<br>00 72707-0000000000000000000000000000000 | Frable Re-Sequence Abort     If a rail fails to burn of during re-sequencing, stop the re-sequencing operation.     Max Re-Sequences:         1 time          1 time          Time Between Re-Sequencing:         0 € mec         From 0 to 32,256 millioconds.     Re-Sequence Rails Masks:         If set, device will not check rail off status (rails voltage below POWER GOOD OFF, and TOFF_MAX_WARN status         b) when performing resequences         Real #00   Rail #02   Rail #03   Rail #04   Rail #05   Rail #06         Mindex Add         Horwordt Options         Then on the status (rails voltage below POWER GOOD OFF, and TOFF_MAX_WARN status         b) when performing resequence         Real #01   Rail #02   Rail #03   Rail #05   Rail #06         Mindex Add         Horwordt Options         Then the status (rails regarding actions is enabled. This allows information (faults, peaks, Run-Time dock, etc) to be         avait to faults information in fault.         Refore the baits frequence actions action action is enabled. This allows information (faults, peaks, Run-Time dock, etc) to be         avait of tables frequence actions in enabled. This allows information (faults, peaks, Run-Time dock, etc) to be         avait of tables frequence actions action action is enabled. The faults is feature.         Deable Flash Logging         Monable Flash Logging boffeath is deable. Derive at Blogg findles, peaks, RTC to RAM but nothing will be saved to Flash.         Ment ends. Derive at Blogg findles, peaks, RTC to RAM but nothing will be saved to Flash.         Avait actions a the final document of the state for action action performed actions peaks. | Cleable log FERO model     The first 56 factors will be logged, it is additional factors will be logged until     Cleable log FERO for all of LOGGED_FALIT_SETAIL.     The most recent 35 multiple will be logged. Once 35 multiple entry to be lost     Cleable log FERO will be logged. The most recent 13 factors are logged, any     methods and the logged factors are recent 13 factors and be lost     cleable log FERO will be logged. The most recent 13 factors are logged, any     distribution factors will be logged. The most recent 13 factors are logged, any     distribution factors will be logged.     The first 13 factors are be object fault log entry to be lost. 26 faults     n total will be logged. |
|   | UCD9090A does not support fan controls  | Set Temperature Reading Manually  |
|   | Fan 1:         0 ÷         Fan 6:         0 ÷           Fan 2:         0 ÷         Fan 7:         0 ÷           Fan 3:         0 ÷         Fan 8:         0 ÷           Fan 4:         0 ÷         Fan 9:         0 ÷           Fan 5:         0 ÷         Fan 9:         0 ÷   | A host can set the temperature reported by the CEAD_TEMPERATURE_2 common by writings.<br>UREAPA-encode temperature DRXATU_TEMPERATURE_2 (writem word commode ORGE).<br>When a monitor pro associated with the temperature and READ_TEMPERATURE_2 are written by<br>constrol pro be ground with the part is reset. When the en to monitor pro takeground with the more read.<br>The more area to associated with the sense starts and READ_TEMPERATURE_2 written by<br>READ_TEMPERATURE_2 command written.<br>Tempe2 Reading: 0.0 🛞 Write to Hardware  |

Figure 4-39. MISC\_CONFIG Function

Configure System



#### 4.3.1.3.3 Configuring System Reset Output

The system reset function lets the device provide an external reset signal to the system. The signal can be based on time, the power-good state of selected rails, the state of selected GPIs, or a combination of these. This ensures that key devices (such as the CPU and FPGA) are held in reset until other dependent devices are fully powered (see Figure 4-40).

Users must select an I/O as a reset output, the polarity and mode are configurable. Select the rails or GPIs which impact the system reset signal. A reset can also be generated as a result of a system watchdog time-out if the checkbox is selected.

The GPI tracking function lets the system reset pin be more precisely influenced by a specific GPI pin. (The GPI pin may be a reset signal from another device or a pushbutton.) Whenever the GPI deasserts, the system reset immediately asserts. When the GPI asserts, the system reset is held asserted for the GPI Tracking Release Delay time. After this delay time, the system reset is deasserted.

| System Reset Overview & Enable   |  |
|--|--|
| The system reset function allows the device to provide an external reset signal to<br>the state of selected GPI pins, or a combination of these things. This ensures th<br>peripherals) are fully powered. A reset pulse can also be generated as a result of<br>Selected System reset | o the system. This signal can be based on time, the power-good state of selected rails,<br>at key devices (ex: a CPU) are held in reset until other dependent devices (ex:<br>of a System Watchdog Timeout.  |
| Pin Selection & Configuration  | Conditions   |
| Reset Pin:         Pin 16 FPWM7_GPI           Pin Polarity:         Pin Mode: <ul></ul>  | ✓ De-assert when Power-Good and GPIs Asserted         A reset signal will be de-asserted after the selected rails reach the power-good state, selected GPIs are asserted, and then the Delay Time passes.         ✓ Assert when NOT Power-Good and GPIs De-Asserted         When set, the reset pin is immediately asserted whenever any of the selected rails leaves the power-good state or any of the GPI pins are de-asserted.         Whenever the reset pin is asserted because of the "Assert when NOT Power-Good" function, the device will attempt to de-asserted the reset pin based on the Delay Time or a combination of the power-good state of selected rails and the asserted state of the selected GPIs, and the Delay Time.         ✓ Assert when Watchdog Timeout       When set, a System Watchdog timeout causes the reset pin to be asserted for the time identified by the         ④ Delay Time       ● Delay Time         ● Delay Time       ● Delay Time         < |
| GPIs Check All Uncheck All   | GPI Tracking   |
| 1. 25 GPIO 16 2. 26 GPIO 17 3. 17 FPWM8_GPIC   | □ Enable       Release Delay Time:     200.0 ⊕ msec       GPI Number;     GPI ≠ 1 (25 G ♥  |

Figure 4-40. Configure System Reset Output

#### 4.3.1.3.4 Configuring the System Watchdog

The system watchdog function keeps a time-out counter running. That counter is reset when the watchdog input (WDI) is toggled or when the SYSTEM\_WATCHDOG\_RESET command is written. If the counter is not periodically reset within the amount of time configured in the following reset period, the watchdog output (WDO) pin is asserted. The WDO pin stays asserted until the WDI pin is toggled or until the SYSTEM\_WATCHDOG\_RESET command is written. The WDI and WDO pins are optional, except for UCD90120 and UCD90124 devices (see Figure 4-41).

The start time is the time to delay before monitoring the WDI pin or command. The Watch Reset Pin and the Disable until System Reset Release options can be used to disable or enable the system watchdog function based on the system reset signal.

| System Wat                                   | chdog Overview & Enable   |  |
|--|---|--|
| The system was<br>SYSTEM_WAT<br>output (WDO) | atchdog function keeps a timeout counter running. That counter i<br>CHDOG_RESET command is written. If the counter is not periodic<br>pin is asserted. The output pin stays asserted until the watchdog | s reset when the watchdog input (WDI) pin is toggled or when the<br>ally reset within the amount of time configured in the Reset Period below, the watchdog<br>g input pin is toggled or until the SYSTEM_WATCHDOG_RESET command is written.   |
| Enable sys                                   | item watchdog   |  |
| Pin Selection                                | a & Configuration   | Options  |
| Input Pin (WD<br>Output Pin (W               | I): <u><click assign="" to=""></click></u><br>DO): <u><click assign="" to=""></click></u><br>WDO Polarity: WDO Mode:<br>(a) Active Low (b) Actively Driven<br>(c) Active High (c) Open-Drain            | <ul> <li>Watch reset pin</li> <li>When checked, the System Reset pin will influence the system watchdog timeout behavior. When the system reset pin is asserted, a watchdog timeout will on longer occur until the reset is de-asserted. Once it is de-asserted, the system watchdog function will wait the Start Time before monitoring the Input Pin again.</li> <li>Disable until System Reset release</li> <li>When checked, the System Watchdog Reset function will be temporarily disabled until the System Reset pin is de-asserted. The temporarily disable state only applies when the device comes out of reset or when the System Watchdog Reset command is written</li> </ul>  |
| Timing                                       |   | Watchdog Reset Test  |
| Start Time:<br>Reset Period:                 | 0.0   | MFR_STATUS System Watchdog Timeout:       Asserted       Clear Faults         GUI writes SYSTEM_WATCHDOG_RESET periodically:       Write every 480 msec (80% of reset period configured, minimum 10 msec)         Write every       10,000 ÷       msec         Time Watchdog Timer Was Last Reset by GUI: 2017-02-13 16:25:50.959         Use this tool to mimic how your microcontroller could write to         SYSTEM_WATCHDOG_RESET command periodically. Writes will be performed in the background regardless of what tab you are currently working on in the GUI. Once you exit the GUI, SYSTEM_WATCHDOG_RESET writes will stop occurring.         Note: an interval smaller than 20 msec may impact the performance of polling and monitoring functions of the GUI. There may be times when the GUI executes a long running operation that locks out this feature and causes the Watchdog timer to |

Figure 4-41. Configure System Watchdog



#### 4.3.1.3.5 Pin Selected Rail States (PSRS)

PSRS use up to three GPI inputs to determine the state of the rails (system state) to support the ACPI (advanced configuration and power interface). With each system state, up to eight rails can be set to on or off to meet system requirements (see Figure 4-42). Only the first three GPIs are used to determine the states. The rails that are set as on or off must be configured using the OPERATION command to use PSRS.

| Global Configuration  | Pin Selected R  | tail States Ove   | rview  |   |   |  |                                      |                                       |                                |                        |                          |                             |   |
|---|---|---|--|---|---|--|--------------------------------------|---------------------------------------|--------------------------------|------------------------|--------------------------|-----------------------------|---|
| <u>Enable Fault Log:</u> Select which faults will get written to the<br>detail fault log in non-volate fault memory. Because there is<br>a limit to the total number of faults that can be logged in<br>detail, use this setting to log the most critical faults in your<br>system. | This feature allo<br>example. With e<br>with regard to it<br>Your first three | ws an encoding<br>each system sta<br>s startup or shu<br>GPIs are used to | on 3 input pins to<br>te, you define wh<br>tdown dependenc<br>determine the st | determ<br>ich rails<br>ies – al<br>ate, lat | ine the st<br>are on ar<br>changes<br>ieled GPI | ate of all of the rails<br>ad which rails are off<br>are done with full se<br>0 - GPI 2 below. | (the syste<br>If a new<br>quencing f | m state).<br>state is p<br>unctionali | The input<br>resented i<br>ry. | pins can<br>on the inp | then be u<br>ut pins, ar | ed to put<br>id a rail is r | the system in a low power mode, for<br>equired to change state, it will do so |
| Misc Config: Resequence options, enable Brownout, set Fault<br>Log FIFO Scheme, manually set temperature.   | Pin Selected F  | Rail States Co  | nfig   |   |   |  |                                      |                                       |                                |                        |                          |                             |   |
| System Reset: allows device to provide an external reset<br>signal to the system. This signal can be based on time, the<br>power-good state of selected rails, the state of selected GPI  | FPWM8_GPIO1<br>2<br>RST_REQUEST   | GPI 1<br>GPIO 17<br>Thermostat  | GPIO 16<br>PGOOD_VTT_D<br>DR4  | State                                       | Enabled   | Turn Off Mode  | Rail #1                              | Rail #2                               | Rail #3                        | Rail #4                | Rail #5                  | Rail #6                     |   |
| pins, or a combination of these things This ensures that key<br>devices are held in reset until other dependent devices (ex:<br>peripherails) are fully powered.  | De-Asserted   | De-Asserted   | De-Asserted  | 0   |   | Immediate Off  | Off 🗸                                | off 🗸                                 | Off 🖓                          | Off 🖂                  | Off 🖂                    | Off 🖂                       | All On All Off  |
| System Watchdog: keeps a timeout counter running. That  | De-Asserted   | De-Asserted   | Asserted   | 1   | $\checkmark$                                    | Soft Off 🗸 🗸   | On 🗸                                 | Off 🖂                                 | On 🗸                           | Off 🗸                  | On 🖂                     | Off 🖂                       | All On All Off  |
| counter is reset when the watchdog input (WDI) pin is<br>toggled or when the SYSTEM_WATCHDOG_RESET command<br>is written.   | De-Asserted   | Asserted  | De-Asserted  | 2   |   | Immediate Off 😔  | off 🗸                                | Off 🖂                                 |                                |                        | Off 🖂                    |                             | All On All Off  |
| Pin Selected Rail States: use up to 3 GPI pins to determine   | De-Asserted   | Asserted  | Asserted   | 3   |   | Immediate Off 🔽  | off 🗸                                |                                       | Off 🗸                          |                        |                          |                             | All On All Off  |
| the state of the rails if rails' ON_OFF_CONFIG are configured<br>using OPERATION command.   | Asserted  | De-Asserted   | De-Asserted  | 4   |   | Immediate Off  |                                      |                                       |                                |                        |                          |                             | All On All Off  |
| Run Time Clock: the time kept by this clock is used within<br>data flash-based fault logging to note the time that a fault  | Asserted  | De-Asserted   | Asserted   | 5   |   | Immediate Off 🗸  |                                      | Off 🗸                                 |                                |                        |                          |                             | All On All Off  |
| occured. You can sync the device clock to PC, mimicing<br>techniques your host microcontroller might use.   | Asserted  | Asserted  | De-Asserted  | 6   |   | Immediate Off  |                                      |                                       | Off 🗸                          |                        |                          |                             | All On All Off  |
|   | Asserted  | Asserted  | Asserted   | 7   |   | Immediate Off 🔽  | Off 🗸                                |                                       |                                |                        |                          | Off 🖂                       | All On All Off  |

Figure 4-42. Pin Selected Rail States

When the number of GPIs used for PSRS is less than the number of configured GPIs, enable all supported states based on the number of configured GPI and configure the state based on the number of GPI for PSRS. For example, three GPIs are configured, but only the first GPI is used for PSRS. Users must enable all eight states; configure all even states the same as state 0 and configure all odd states the same as state 1. Therefore the changes on the second and third GPI do not affect the desired function.

#### 4.3.1.3.6 Fault Pins Config

Fault Pin Config is valid only on UCD90240 and UCD90320 devices. For the UCD90240 device, users can select which pin is the Fault pin (highlighted by the black square); on the UCD90320, the fault pin selection is part of GPI pin configuration, therefore the black square is grayed-out on the UCD90320 device (see Figure 4-43). From the fault pin configure, users can configure which pages have impact on the fault pin output.

| Insbl. Fault Loss: Select which fulls will get written is the deal fault big in nonvalide fault heaven is nonvertice (see provide an external on provide) (NOC) provide is active fault fault fault (NOC) provide is active fault fault fault (NOC) provide is active fault fault fault fault fault (NOC) provide is active fault fault fault (NOC) provide is active fault fau  | Global Configuration   | Fault P  | ins Config |  |  |                                   |  |
|--|--|----------|------------|--|--|-----------------------------------|--|
| deal. use this setting to log the most critical faultis in your system.  | Enable Fault Log: Select which faults will get written to the<br>detail fault log in non-volatile flash memory. Because there is<br>a limit to the total number of faults that can be logged in  | Pin #    | Enable     | Pin Selection                          | Pin Polarity                           | System Watchdog Timeout           | Resequence Error   |
| Image: Config: Resequence options, enable Brownout, set Figure       1         Digr FDO Schem, manualy as thergoenaux, enable Sync       1         Cock to besen devices and set ADC Reference.       10         Statem Rescip allow device to provide an external rest.       10         Space The Statem Rescip allow device to provide an external rest.       10         Statem Rescip allow device to provide an external rest.       10         Space The Statem Rescip allow device to provide an external rest.       10         Statem Rescip allow device to provide an external rest.       10         Statem Rescip allow device to provide an external rest.       10         Statem Rescip allow device to provide an external rest.       10         Statem Rescip allow device to provide an external rest.       10         Statem Rescip allow device to provide an external rest.       10         Statem Rescip allow device to provide an external rest.       10         Statem Rescip allow device to provide an external rest.       10         Statem Rescip allow device to provide an external rest.       10         Statem Rescip allow device to provide an external rest.       10         Statem Rest rest.       10       10         Statem Rest rest.       10       10         Statem Rest rest.       10       10       10   | detail, use this setting to log the most critical faults in your system.   |          |            | Pin N2 GPIO 04                         | Active Low 🛩                           |                                   |  |
| Sature Bases: Jakon device to provide an external reset<br>sponter goal to the system.       Sature Bases: Jakon device to provide an external reset<br>sponter goal to the system.       Image: Sature Bases and the state of selected GPL<br>provide Sature State Sature State of Sature State of Sature State<br>States Watchdog: Seep a Sature State of Sature State<br>States Watchdog: Seep a Sature State of Sature States<br>States Watchdog: Seep a Sature State State States<br>States Watchdog: Seep a Sature State States<br>States Watchdog: Seep a Sature States<br>States Watchdog: States<br>States States<br>States States<br>States States<br>States<br>States States<br>States States<br>States<br>States States<br>States States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>States<br>St | <u>Misc Config:</u> Resequence options, enable Brownout, set Fault<br>Log FIFO Scheme, manually set temperature, enable Sync<br>Clock between devices, and set ADC Reference.  | 1        |            | Pages                                  |  |                                   | 11 10 9 8 7 6 5 4 3 2 1 0<br>0 0 0 0 0 0 0 0 0 1 <b>1</b> 0 0 0  |
| Ancles are shell in used until dependent devices (cr)<br>perpherals) are fully powerd.<br>South Withdow Leeps a timod counter running. That<br>Counter is read: while the watchdog input (NOD) pin is<br>gogled or when the SYSTEM WICHOOD (SEST command<br>a writen.<br>South Dis 1 States: use up to 3 GPT pins to determine<br>the state of the rails f rail (n) GPT, CONFIG are configured<br>a writen.<br>South Dis 1 States: use up to 3 GPT pins to determine<br>the state of the rails f rail (n) GPT, CONFIG are configured<br>a writen.<br>South Dis 1 States: use up to 3 GPT pins to determine<br>the state of the rails f rail (n) GPT, CONFIG are configured<br>a writen.<br>South Dis 1 States: use up to 3 GPT pins to determine<br>the state of the rails f rail (n) GPT, CONFIG are configured<br>a writen.<br>South Dis 1 States: use up to 3 GPT pins to determine<br>the state of the rails of the rails of the configured as fault:<br>South Dis 1 States: use up to 3 GPT pins to determine<br>the state of the rails of the configured as fault:<br>South Dis 1 States: use up to 3 GPT pins to determine<br>the state of the rails of the configured as fault:<br>South Dis 1 States: use up to 3 GPT pins to determine<br>the state of the rails of the configured as fault:<br>South Dis 1 States: use up to 3 GPT pins to determine<br>the state of the rails of the configured as fault:<br>South Dis 1 States: use up to 3 GPT pins to determine<br>the state of the rails of the configured as fault:<br>South Dis 1 States: use up to 3 GPT pins to be configured as fault:<br>South Dis 1 States: use up to 3 GPT pins to be configured as fault:<br>South Dis 1 States: use up to 3 GPT pins to be configured as fault:<br>South Dis 1 States: use up to 3 GPT pins to be configured as fault:<br>South Dis 1 States: use up to 3 GPT pins to be configured as fault:<br>States Dis 1 States: use up to 3 GPT pins to be configured as fault:<br>States Dis 1 States: use up to 3 GPT pins to be configured as as faults on the states of the states   | System Reset: allows device to provide an external reset<br>signal to the system. This signal can be based on time, the<br>power good state of selected rails, the state of selected GPI   |          |            | <click assign="" to=""></click>        | Active Low 💌                           |                                   |  |
| Sutter Witchdog: News & News to under running. Thet could be added by any state of or of be add by pland or pland by  | devices are held in reset until other dependent devices (ex:<br>peripherails) are fully powered.   | 2        |            | Pages                                  |  |                                   | 11 10 9 8 7 6 5 4 3 2 1 0<br>0 0 0 0 0 0 0 0 0 0 0 0 0 0         |
| An Selected Ball States: use up to 3 GP1 pins to determine<br>the state of the rails if rails' ONLOFF_CONFIG are configured<br>using OPERATION command.     3     11 10 9 8 7 6 5 4 3 2 1<br>0 10 10 10 10 10 10 10 10<br>10 0 10 10 0 10 10 0<br>10 0 10 0 10 0 10 0<br>10 0 10 0 10 0 10 0<br>10 0 10 0 0 10 0<br>10 0 10 0 0 10 0<br>10 0 0 10 0 0 0<br>10 0 0 10 0 0 0   | System Watchdog: keeps a timeout counter running. That<br>counter is reset when the watchdog input (WDI) pin is<br>toggled or when the SYSTEM_WATCHDOG_RESET command<br>is written.  |          |            | < <u>Click to Assign&gt;</u>           | Active Low 😒                           |                                   | D  |
| Carlot In Confo.     allows pins to be configured as fault       Industrial couples. The state of the adjust pin is determined     Image: Carlot Assign: Carlot  | Pin Selected Rail States: use up to 3 GPI pins to determine<br>the state of the rails if rails' ON_OFF_CONFIG are configured<br>using OPERATION compand.   | 3        |            | Pages                                  |  |                                   | 11 10 9 8 7 6 5 4 3 2 1 0<br>0 0 0 1 0 0 0 1 0 0 0 0             |
| by a selection of GPI pins and any faults of a selection of  | Fault Pin Config. allows pins to be configured as fault-   |          |            | <click assign="" to=""></click>        | Active Low 😒                           |                                   |  |
|  | by a selection of GPI pins and any faults of a selection of<br>rails.  | 4        |            | Pages                                  |  |                                   |  |
| Pages C C C C C C C C C C C C C C C C C C C  | Internets copular. The state of the output of an is obtained<br>by a selection of GPI pinsate of the output of an is obtained<br>rail.<br><u>Run Time Clocks</u> the time kept by this clock is used within<br>data flash-based fault togging to note the time that a fault<br>occurred. You can sync the device clock to PC, mining | 4<br>The | s Read/Wri | Pages<br>te block command configures t | he function of a given fault pin. This | command allows pins to be configu | 11 10 9 8 7 6 5 4 3 2 1 0<br>0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |



#### 4.3.1.3.7 Run-Time Clock

The run-time clock is the time used within data flash-based fault logging to note the time that a fault occurred. The run-time clock starts from 0, but an external processor sets the run-time clock to real-word time. See the UCD90XXX PMBus Command Reference Guide for the details.

### 4.3.2 Monitor Task

The Monitor task provides a real-time status of the rails and I/Os. Using the checkboxes in the upper-left corner, users can choose which property plot (voltage, current, temperature, and GPIO) should be visible for the given rail (see Figure 4-44). Changes to Control Line, Operation, and Margining take effect immediate without clicking the Write to Hardware button. Users can choose either target rail or device from the drop-down menu at the top-right corner.



Figure 4-44. Monitor Task Screen



#### 4.3.2.1 Device (Rail) Dashboard

The rail dashboard provides an overview of the selected rail (see Figure 4-45). The dashboard lists property values of all rails, the current rail status, and the control pin/operation command (including margining).

| Readings   |   |               |      |          |
|--|---|---------------|------|----------|
| veaunitys  | 32.50   |               |      |          |
| -  | 32 0  |               |      |          |
|  | Vout  | Iout          | Temp |          |
| 1. P1V2  | 0.000 V   | N/A           | N/A  | RAMP_UP  |
| 2. P1V35   | 0.001 V   | N/A           | N/A  | RAMP_UP  |
| 3. P1V8  | 0.002 V   | N/A           | N/A  | RAMP_UP  |
| 4. P3V3  | 0.015 V   | N/A           | N/A  | RAMP_UP  |
| 5. P5V3  | 0.002 V   | N/A           | N/A  | RAMP_UP  |
| 6. P0V85 AV5   | 0.000 V   | N/A           | N/A  | RAMP_UP  |
| 7. P1V7_RF1  | 0.000 V   | N/A           | N/A  | RAMP_UP  |
| 8. P1V7_TX_D   | 0.002 V   | N/A           | N/A  | RAMP_UP  |
| 9. P1V7 TX D   | 0.001 V   | N/A           | N/A  | RAMP_UP  |
| Vout #1: OK<br>lout #1: OK<br>lemp #1: OK<br>DML: OK   |   |               |      | <u> </u> |
| Vout#1: OK<br>lout#1: OK<br>Emp#1: OK<br>CML: OK<br>Miso: POWE<br>Mfr#1: OK<br>SMEALERT# Not A   | R_GOOD#   |               |      |          |
| Vout#1: OK<br>lout#1: OK<br>Temp#1: OK<br>CML: OK<br>Miso: POWE<br>Mir#1: OK<br>SMBALERT# Not A  | R_GOOD#<br>sserted<br>Clear Fa  | ults          |      |          |
| Vout #1: OK<br>Iout #1: OK<br>Temp #1: OK<br>CML: OK<br>Miso: POWE<br>Miso: POWE<br>Miso: Not A<br>SMBALERT# Not A<br>Control Line (USE<br>O High<br>O Low   | Sserted<br>Clear Fa   | <u>ults</u> ) |      |          |
| Vout#1: OK<br>Iout#1: OK<br>Temp#1: OK<br>CML: OK<br>Miso: POWE<br>Miso: SMBALERT# Not A<br>Control Line (USE<br>High<br>() Low<br>Dperation - Rail  | R_GOOD#<br>sserted<br>Clear Fa<br>3)<br>#1 - P1V2                     | ults          |      |          |
| Vout #1: OK<br>Iout #1: OK<br>Temp #1: OK<br>CML: OK<br>Miso: POWE<br>Miso: POWE<br>SMBALERT# Not A<br>Control Line (USE<br>O High<br>O Low<br>Dperation - Rail  | ER_GOOD#<br>sserted<br>Clear Fa<br>3)<br>#1 - P1V2                    |               |      |          |
| Vout#1: OK<br>out#1: OK<br>Femp#1: OK<br>Misc: POWE<br>Misc: POWE<br>Misc: SMBALERT# Not A<br>Control Line (USE<br>OHigh<br>Operation - Rail =<br>On<br>On<br>Immediate Off  | R_GOOD#<br>sserted<br>Clear Fa<br>3)<br>#1 - P1V2<br>(No Sequencing)  | ults)         |      |          |
| /out#1:         OK           out#1:         OK           femp#1:         OK           CML:         OK           Viso:         POWE           Vitr#1:         OK           SMBALERT#         Not A             Control Line (USE           High         Low      Operation - Rail           On         On           Soft Off (With 1) | Clear Fa Clear Fa B) #1 - P1V2 (No Sequencing) Sequencing)            | ults          |      |          |
| Vout#1: OK<br>Iout#1: OK<br>Temp#1: OK<br>CML: OK<br>Mise: POWE<br>Mise: POWE<br>Mise: POWE<br>Mise: POWE<br>OK<br>SMBALERT# Not A<br>Control Line (USI<br>OHigh<br>© Low<br>Deration - Rail a<br>On<br>© Immediate Off<br>Margining - Rail a  | GOOD#      Sequencing)      #1 - P1V2  (No Sequencing)      #1 - P1V2 |               |      |          |
| Vout #1: OK<br>lout #1: OK<br>Temp #1: OK<br>CML: OK<br>Miso: POWE<br>Miso: POWE<br>SMBALERT# Not A<br>Control Line (USI<br>OHigh<br>© Low<br>Operation - Rail<br>© On<br>© Immediate Off<br>On<br>© Soft Off (With 1<br>Margining - Rail<br>Margin: © None  |   |               |      |          |
| Vout #1: OK<br>Iout #1: OK<br>Temp #1: OK<br>CML: OK<br>Mise: POWE<br>SMBALERT# Not A<br>Control Line (USE<br>OHigh<br>© Low<br>Operation - Rail<br>© On<br>© Immediate Off<br>© Soft Off (With 1<br>Margining - Rail<br>vlargin: © None<br>Fault Action: O A  |   |               |      |          |

Figure 4-45. Rail Dashboard



# 4.3.3 Status Task

The status task shows the current status registers, fault log, peak log, misc status, and blackbox log (see Figure 4-46). Users can clear faults, logged faults, logged peaks, and blackbox using different buttons on the left-side panel. Users can read the status of different rails from the pulldown menu at the top-right corner of the status task.

- The Status Registers tab shows the status of the rail and system, where STATUS\_WORD, STATUS\_CML, and MFR\_STTATUS are global instead of page-based.
- The Logged Faults tab shows all faults logged since the last clearing.
- The Peak Readings tab shows all peak values of all monitor rails since the last clearing.
- The Misc Status tab shows device reset tracking
- The Blackbox Info tab shows a snapshot of the system from when the first fault is detected to the last clearing (this feature is available only for UCD90240 and UCD90320 products).

| 👆 Fusion Digital Power    | Designer - UCD90320 @ PMBus Address 119d (77h) - Rail #1 - +3.3V - Texas Instruments   | _ = 🛛                  |
|---------------------------|--|------------------------|
| File Device Tools         | Help UCD90320 @ 119d (77h) - Rai #1  | - +3.3V 🔽              |
| Status                    | Status Registers Logged Faults Peak Readings Misc Status Blackbox Info   |                        |
| Stop Polling              | - Fault Info   |                        |
| Launch Dashboard          | Fault ID:     GPI Fault on GPI # 1     Fault Value:     N/A       Time Stamp:     Saturday, December 24, 2016 2:46:34 AM   |                        |
| Clear Faults              | GPI Statuses   |                        |
| Clear Logged Faults       |  |                        |
| Clear Logged Peaks        | GPO Statuses<br>GPO #: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16  |                        |
| Clear Blackbox Log        |  |                        |
| Refresh Blackbox Log      |  |                        |
| ARA                       | Rail #         OV WARN         OC WARN         OC WARN         TOFF WARN         OT WARN         Voltage         Current         Temperature                               | Â                      |
| None                      | 1 1.1538 V N/A N/A   |                        |
|                           | 2 0.6130 V N/A N/A   | E                      |
|                           | 3 0.5100 V N/A N/A   |                        |
|                           | 4 0.4126 V N/A N/A   |                        |
|                           | 5 0.3110 V N/A N/A   |                        |
|                           | 6 0.2795 V N/A N/A   |                        |
|                           | 7 0.2249 V N/A N/A   |                        |
|                           | 8 0.1973 V N/A N/A   |                        |
|                           | 9 0.6575 V N/A N/A   |                        |
|                           | 10 0.5010 V N/A N/A  |                        |
| Onfigure                  |  | -                      |
| 🛷 Monitor                 |  |                        |
| 🚸 Status                  |  |                        |
| 🤣 Security                | 1 PMBus Log Messages Show PMBus Log  | us, and Security 📮     |
| Fusion Digital Power Desi | noner v2 0.179 (2016-10-12) UIC D00320 Erromate v3 0.0 3023 @ DMBut Address 119d (77b) UISB Adapter v1 0.13 INo PEC: 400 kHz: Alert: Onen Drain: Clock: 🚽 Truce bermanerer | I fusion digital nowar |

Figure 4-46. Status Task Screen

Configure System



#### 4.3.4 Security Task

The Security Task lets users prevent certain commands from being modified without authorization (see Figure 4-47). For the devices that do not support SECURITY\_BIT\_MASK, the protected commands are fixed. See the UCD90XXX PMBUS Command Reference Guide for details.

In the GUI, the user must input 6-character (not byte) passwords; for example, if the user enters 123456, the GUI sends the 0x313233343536 password to the device using MFR\_SPECIFIC\_33 (0xF1) to enable the feature. When security is enabled, the feature can be temporarily disabled by writing the password to this command. The feature can be permanently disabled by first disabling security, then setting the password to [0xFFFFFFFFFFFFF], and clicking Store RAM to Flash. For security reasons, the password cannot be read back.

| Security             | NOTE: The list of commands that are write protected | when security is a | enabled is not editable. It is shown below for reference only.   | _ |
|----------------------|---|--------------------|--|---|
| ecurity Is Off       | Security Protection Bitmask                         |                    |  |   |
| Turn On Security     | Command   | ∆ Code             | Description  | 1 |
|                      | Category: Operations                                |                    |  |   |
| Save Config to Flash | ENABLE_ROM_MODE [MFR 09]                            | 0xD9               | Sends system into ROM mode. Issue this command before attempting to download new firmware to the controller.   |   |
|                      | SOFT_RESET [MFR 11]                                 | 0xDB               | Resets the device.   |   |
|                      | Category: Parameters                                |                    |  |   |
|                      | BLACK_BOX_FAULT_INFO                                | 0x85               | The block read-write command returns detail information of the first fault. Writing all zeros will clear the log                                     |   |
|                      | FAULT_PINS_CONFIG [MFR 00]                          | 0xD0               | This Read/Write block command configures the function of a given fault pin. This command allows pins to be configured as fault-influenced outputs    |   |
|                      | FAULT_RESPONSES [MFR 25]                            | 0xE9               | Responses for each fault condition: Vout OV/UV, Iout OC/UC, OT, and TON_MAX.   | 1 |
|                      | GPI_CONFIG [MFR 41]                                 | 0xF9               | Configures the functionality of the several of the IC's General Purpose Input Output (GPIO) pins.  |   |
|                      | GPI_FAULT_RESPONSES [MFR 36]                        | 0xF4               | Responses for each GPI fault condition.  |   |
|                      | GPIO_CONFIG [MFR 43]                                | 0xFB               | Configures the GPIO identified by the GPIO_SELECT command.   |   |
|                      | GPO_CONFIG [MFR 40]                                 | 0xF8               | Configures the functionality of the rail status output pins.   |   |
|                      | IOUT_CAL_GAIN                                       | 0x38               | Ratio of the voltage at the current sense pins to the sensed current.  |   |
|                      | IOUT_CAL_OFFSET                                     | 0x39               | Most often used in conjunction with the IOUT_CAL_GAIN command to minimize the error of the current sensing circuit.                                  |   |
|                      | IOUT_OC_FAULT_LIMIT                                 | 0x46               | Sets the value of the output current, in amperes, that causes the overcurrent detector to indicate an overcurrent fault condition.                   | L |
|                      | IOUT_OC_WARN_LIMIT                                  | 0x4A               | Sets the value of the output current that causes an output overcurrent warning.  | L |
|                      | IOUT_UC_FAULT_LIMIT                                 | 0x48               | Sets the maximum output current, in amperes, that is allowed before action is taken. Note that the IOUT_UC_FAULT_LIMIT value is generally negati     |   |
|                      | LOGGED_COMMON_PEAKS [MFR 30]                        | 0xEE               | Maximum internal IC temperature on the device and logged into non-volatile memory.   |   |
|                      | LOGGED_FAULT_DETAIL_ENABLES [MFR 31]                | 0xEF               | Selects what fault detail (see LOGGED_FAULT_DETAIL) is logging by rail and by fault type. Also used to select fault detail to log for common (not-PA | 1 |
|                      | LOGGED_FAULTS [MFR 26]                              | 0xEA               | A history of all faults that have ever been reported and logged into non-volatile memory.  |   |
|                      | LOGGED_PAGE_PEAKS [MFR 29]                          | 0xED               | Maximum temperature, voltage, and currents seen during operation and logged into non-volatile memory. Specific to a rail.                            | 1 |
|                      | MARGIN_CONFIG [MFR 37]                              | 0xF5               | Configures margining for a specific rail.  | L |
|                      | MFR_DATE  | 0x9D               | Unit's date of manufacture as ASCII text.  |   |
| 11110                | MFR_ID  | 0x99               | Manufacturer's ID as ASCII text (name, abbreviation or symbol that identifies the unit's manufacturer).  | L |
| Configure            | MFR_LOCATION  | 0x9C               | ASCII text identifying the fadiity that manufactured the unit.   | 1 |
|                      | MFR_MODEL   | 0x9A               | Manufacturer's model number as ASCII text.   | 1 |
| Monitor              | MFR_REVISION  | 0x98               | Manufacturer's revision number as ASCII text.  | I |
| 🖖 Status             | MFR_SERIAL  | 0x9E               | Optional unique identifier of the unit, such as a serial number or batch number.   |   |
| Security             | 51 PMBus Log Messages Show PMBus Log                |                    | ✓ Unique open/dose settings for Configure, Monitor, Status, and Security   | 1 |

Figure 4-47. Security Task Screen



# Import and Export Configurations

The Fusion GUI can import and export configurations from various formats. These configurations are done from the File Menu. The format for importing and exporting configurations differs depending on online or offline mode and also the devices. The configuration of an individual device can be saved in the project file or saved as a single system file (.tifsp). Users can choose whether to store all settings to the data flash and/or to clear the flash logs before exporting the data flash, as shown in Figure 5-1 (see the Global Options tab).

| Export Multiple Formats  | Global Options  | Device Report  | Text File   | Project File                                     | Data Flash File                                     |
|--|---|--|---|--|---|
| Execute STORE_DEFAULT,<br>If checked, a STORE_DEF/<br>are selected in "Export Mu<br>debug purposes and do no             | ALL on source device befine<br>AULT_ALL command will be<br>tiple Formats' mode, only<br>t want the flash to be mode   | ore exporting data flash<br>sent to the device before readin<br>a single STORE_DEFAULT_ALL is<br>lifted before it is extracted, unch | g the device's configue<br>performed. If you water this checkbox.     | ration EEPROM. If mul<br>int to inspect your dev | tiple data flash formats<br>ice's flash image for   |
| The STORE_DEFAULT_ALL<br>tabs, the flash mage will b   | is only performed once fo<br>e the same.  | r the duration of your export ses  | sion. This ensures the  | it if you perform multip                         | le exports from different                           |
| Clear flash logs on source of<br>If checked, any data flash-<br>formats are selected in "Ex-<br>debug permases and do no | device before exporting da<br>based logs the device sup<br>port Multiple Formats" more<br>t want the flash to be more | ata flash<br>ports will be cleared/reset befor<br>e, only a single flash log clear/re<br>lified before it is extracted, unch         | reading the device's<br>iset is performed. If y<br>eck this checkbox. | data flash EEPROM. If<br>ou want to inspect you  | fmultiple data flash<br>ur device's flash image for |
| actually has beared on the second  |   |  |   |  |   |

Figure 5-1. Configuration Storage Setting

# 5.1 File Formats

The Fusion GUI supports the following file formats (see Figure 5-2):

- Project file (.xml): used by the Fusion GUI; stores the configuration of a single device, and nondevice's definition such as rail names. Project file can be saved in device's configuration window, File menu → Save Project As
- System file (.tifsp): used by the Fusion GUI; stores configurations of multiple devices. System file can be saved in the system configuration window, using the save button or File menu.
- Flash file (on-line device and device has flash): contain raw binary flash data. Flash file is a single device's configuration, and can be saved in the configuration window of the device, File menu → Export. TI recommends using the data flash (.hex) format to import into the new device.
  - Data Flash: text (.txt), Intel Hex (.hex), or S-Record (.srec)
  - Program Flash: Intel Hex (.hex), S-Record (.srec), and Tektronix Extended Format (.x0). The S-Record and Intel Hex file can be used by both EEPROM/JTAG programmers and the Fusion GUI. The Tektronix format is only for the Fusion GUI.
- Script file: Sequence of I<sup>2</sup>C, SMBus, and PMBus commands used to configure the device. File formats are text (.txt), and Excel (.csv), and can be used by both third-party programmers and the Fusion GUI.
  - PMBus Write Script File: writes to RAM and takes effect immediately
  - Data Flash Script File: writes to Data Flash and takes effect until reset
- JTAG file(.svf): used by the external JTAG programmer; the configuration of a device from either the active device or a hex file is saved in serial vector format (SVF).

| Export Multiple  | Formats  | Global Options  | Device Repo   | rt   | Text File  | Project File   | Data Flash File  |
|--|--|---|---|--|--|--|--|
|  |  |   |   |  |  |  |  |
| se this tab to o<br>ormats" button<br>Device Reg<br>An Excel o<br>supported<br><u>Text File</u><br>Tab or com<br>readings. | export multiple f<br>n. Click the links<br><u>sort</u><br>r HTML report or<br>for UCD92xx an<br>ma separated lis         | ormats with a single click.<br>below or tabs above to re<br>basic device configuratic<br>d UCD90xxx device famil<br>of OFPMBus parameter se | All formats you che<br>eview options for ea<br>on. Only<br>es.<br>ttings and/or | ck below will<br>ch export for<br>PMBus<br>Defines<br>configu<br>host mi<br>Data Fi<br>Defines<br>current<br>dones | be exported when you<br>mat or export just as a<br>Configuration Write Sr<br>swrites that must be p<br>ration through PMBus<br>crocontroller develope<br><u>ash Write Script</u><br>swrites that must be p<br>configuration via data<br>the device's data flash<br><u>ash longed</u> c Scipt | i click the "Export All G<br>ingle format.<br><u>rist</u><br>erformed to write the<br>(command-by-comma<br>rs who want to develo<br>erformed to download<br>if dash. Similar to the f<br>completely. | necked<br>nd). Useful for<br>ng a full or partial<br>d this device's<br>MBus script, but |
| XML file de<br>Project."   | scribing configur  | ation. Generally equivale   | nt to "Save as  | Defines  | s writes that must be p<br>ing firmware on the de  | erformed by a microci<br>vice.   | ontroller when   |
| Data Flash<br>Hex file us<br>some dedir  | Hex File<br>ed to write entire<br>tated EEPROM p   | e configuration via the Fu<br>rogrammers.   | sion tools and  |  |  |  |  |
| Serial Vect  | SVF / JTAG File  | file used to program a de   | vice's  |  |  |  |  |
| <u>Data Flash</u><br>Serial Vect<br>configurati  | (SVF / JTAG File<br>or Format (SVF)<br>on (data flash) v   | file used to program a de<br>ia JTAG.   | vice's  |  |  |  |  |
| <u>Data Hash</u><br>Serial Vect<br>configurat  | ISVF / JTAG File<br>or Format (SVF)<br>on (data flash) \   | file used to program a de<br>ia JTAG.   | vice's  |  |  |  |  |
| Data Hash<br>Serial Vect<br>configurat   | INF / JTAG File<br>or Format (SVF)<br>on (data flash) v<br>ination<br>C:\digitalpower                                    | file used to program a de<br>na JTAG.   | vice's  |  |  |  | Select ) (Browse   |
| Data Hash<br>Serial Vect<br>configurati<br>Output Dest<br>utput Folder:<br>lename:   | ination<br>C:\digitalpower<br>{PN} {DV} Add  | file used to program a de<br>ia JTAG.<br>\<br>\<br>ress (DA) {EF}.(EXT)   | vice's  |  |  | Reset to De  | Select Browse  |
| Data Flash<br>Serial Vect<br>configurati<br>Dutput Dest<br>utput Folder:<br>lename:<br>eview:                              | INTE / JTAG File<br>or Format (SVF)<br>on (data flash) v<br>ination<br>C:\digitalpower<br>{PN} (DV) Add<br>UCD9090A 2.4. | file used to program a de<br>ia JTAG.<br>\<br>ess {DA} {EF}.(EXT}<br>3.811 Address 101 Data f   | vice's  |  |  | Reset to De  | Select ) Browse<br>fault Filename Token He   |
| Data Flash<br>Serial Vect<br>configurati<br>Output Dest<br>utput Folder:<br>lename:<br>review:<br>Log                      | Ination<br>C:\dgitalpower<br>(PV) \DV Add<br>UCD9090A 2.4.   | file used to program a de<br>ia JTAG.<br>\<br>\<br>ress {DA} {EF}.{EXT}<br>3.811 Address 101 Data I   | vice's<br>=lash.svf   |  |  | Reset to De  | Select ) (Browse<br>Ifault Eilename Token He   |
| Output Dest Output Dest Utput Folder: Ilename: review: Log   | Ination<br>ination<br>C:\digitalpower<br>(PN) (DV) Add<br>UCD9090A 2.4.<br>Stopped backgr                                | file used to program a de<br>la JTAG.   | vice's  |  |  | Reset to De  | Select ) (Browse .<br>fault Filename Token He  |

Figure 5-2. Supported File Formats



# 5.2 Device Report

The Fusion GUI can generate a file (Excel or HTML format) to report the basic configuration of the device. The report file can be generated using the Device Report tab (see Figure 5-3).

| generate this report via the File->Report menu. | 1 |
|---|---|
| generate this report via the File->Report menu. |   |
|   |   |
|   |   |
|   | - |
|   |   |
|   |   |
|   |   |
|   |   |

Figure 5-3. Device Report (1/2)

The file gives users a complete view of the entire configuration of the rail (PINs, threshold/limits, dependencies, timing, and fault response). Currently, the file does not include other settings, such as GPI, LGPO, and global configurations (see Figure 5-4).

| 5        | с       | D        | 3        | 4       | G     | H     |         | -0    | - K   | 1      | M       | N        | 0      | P    | Q      | 8      | 5    | (T)         | 9       | V.      | W     | X       | Y     | Z        | AA                    | AB   | AC    | AD     | AE    | AF      | AG       | AH       |
|----------|---------|----------|----------|---------|-------|-------|---------|-------|-------|--------|---------|----------|--------|------|--------|--------|------|-------------|---------|---------|-------|---------|-------|----------|-----------------------|------|-------|--------|-------|---------|----------|----------|
|          | -       | <u> </u> | -        | Samlard |       | Over  | Voltage | 1     |       | Under  | Voltage |          |        | Mary | gining | -      | 1    |             | Vout E  | ponent  | 1     | _       |       |          |                       | Lora |       | Low    |       | Turn On | Max Turn | Turn Off |
| Device   | Address |          | Rail     | Voltage | ov    | Warn  | ov      | Fault | 071   | Varo   | UV      | Facult : | Margin | High | Marei  | in Low | On   | /Off Config | EXP     | Max (V) | Power | Good On | Power | iood Off | Fault Shutdown Slaves | -    | cpena | - On O | cheno | Delay   | On       | Delay    |
|          | 1 m D   |          |          |         |       |       |         |       |       |        | 1       |          |        |      |        |        |      |             |         |         | 0     |         |       | _        |                       | Rail | GPI   | Rail   | GPI   | (ms)    | (ms)     | (ms)     |
|          |         | 1        | P1V2     | 1.200   | 1.320 | 10.05 | 1.380   | 15.0% | 1.080 | -10.0% | 1.020   | -15.0%   | 1.260  | 5.0% | 1.140  | -5.0%  | 0x00 | Auto Enable | EXP -14 | 2.000   | 1.080 | -10.0%  | 1.020 | -15.0%   | Rail #2,3,4,5,6,7,8,9 | None | None  | None   | None  | 6.0     | No Limit | 2.0      |
|          |         | 2        | P1V35    | 1.350   | 1.48  | 10.0  | 4 1.553 | 15.0% | 1,215 | -10.0% | 1.148   | -15.0%   | 1.418  | 5.0% | 1,283  | -5.0%  | 0x00 | Auto Enable | EXP-14  | 2.000   | 1.215 | -10.0%  | 1.148 | -15.0%   | Rail#2,3,4,5,6,7,8,9  | None | None  | None   | None  | 7.0     | No Limit | 1.0      |
|          |         | 3        | P1V8     | 1.800   | 1.980 | 10.0  | 6 2.070 | 15.0% | 1.620 | -10.0% | 1.530   | -15.0%   | 1.890  | 5.0% | 1.710  | -5.0%  | 0x00 | Auto Enable | EXP-13  | 4.000   | 1.620 | -10.0%  | 1.530 | -15.0%   | Rail#1,2,4,5,6,7,8,9  | None | None  | None   | None  | 4.0     | Notimit  | 4.0      |
|          |         | 4        | P3V3     | 3.300   | 3.630 | 10.0  | 5 3.795 | 15.0% | 2.970 | -10.0% | 2.805   | -15.0%   | 3.465  | 5.0% | 3.135  | -5.0%  | 0x00 | Auto Enable | EXP -12 | 8.000   | 2.970 | -10.0%  | 2.805 | -15.0%   | Rail #1,2,3,5,6,7,8,9 | None | None  | None   | None  | 2.0     | No Limit | 5.0      |
| UCD9090A | 1010    | \$       | P5V3     | 5.300   | 5,830 | 10.0  | 6 6.095 | 15.0% | 4,700 | -11.3% | 4.500   | -15.1%   | 5.565  | 5.0% | 5.035  | -5.0%  | 0x00 | Auto Enable | EXP -12 | 8.000   | 4.770 | -10.0%  | 4.505 | -15.0%   | Rail #1,2,3,4,6,7,8,9 | None | None  | None   | None  | 0.0     | No Limit | 0.0      |
|          | 0x05    | 6        | POV85 AV | 0.850   | 0.935 | 10.0  | 6 0.977 | 14.9% | 0.765 | -10.0% | 0.722   | -15.1%   | 0.893  | 5.1% | 0.808  | -4.9%  | 0x00 | Auto Enable | EXP -14 | 2,000   | 0.765 | -10.0%  | 0.722 | -15.1%   | Rail#1,2,3,4,5,7,8,9  | None | None  | None   | None  | 8.0     | No Limit | 0.0      |
|          |         | 7        | P1V7_RE  | 1 1.600 | 1.750 | 10.0  | 6 1.840 | 15.0% | 1,440 | -10.0% | 1.360   | -15.0%   | 1.680  | 5.0% | 1.520  | -5.0%  | 0x00 | Auto Enable | EXP -13 | 4,000   | 1.440 | -10.0%  | 1,360 | +15.0%   | Rail #1,2,3,4,5,6,8,9 | None | None  | None   | None  | 0.0     | No Limit | 6.0      |
|          |         | 8        | 1V7_TK_D | 1.600   | 1.760 | 10.0  | 5 1.840 | 15.0% | 1.440 | -10.0% | 1.360   | -15.0%   | 1.680  | 5.0% | 1.520  | -5.0%  | 0x00 | Auto Enable | EXP-15  | 4.000   | 1.440 | -10.0%  | 1,360 | -15.0%   | Ral) #1,2,3,4,5,6,7,9 | None | None  | None   | None  | 0.0     | No Limit | 6.0      |
|          |         | 9        | EV7 TX D | 1.600   | 1.750 | 10.0  | 1.840   | 15.0% | 1,440 | -10.0% | 1360    | -15.0%   | 1.680  | 5.0% | 1.520  | -5.0%  | 0x00 | Auto Enable | EXP-13  | 4,000   | 1.440 | -10.0%  | 1.360 | -15.0%   | Rail#12345678         | None | None  | None   | None  | 0.0     | No Limit | 6.0      |

Figure 5-4. Device Report (2/2)



# Fusion GUI Useful Tools

### 6.1 Preferences

Go to File menu  $\rightarrow$  Preferences... (see Figure 6-1).

- Show or hide the All Config tab.
- Enable or disable the protected feature (need password to show the protected feature).
- Delete all application preferences.
- Show warnings or confirmation dialog messages: some warnings and confirmation dialog pop-ups from the GUI are discarded and not shown again by the users selection. Clicking this button enables these pop-up dialog boxes again.
- Configure Device Scan Mode and Address.
- Delete all application preferences when the Fusion GUI closes. The GUI does not keep the user preferences each time it is launched. The GUI treats each as first-time users.
- Delete rail names and pin names when the GUI closes (only rail names and pin names are deleted).

| - Pre   | ferencer  |
|---|---|
| M   | icrences.   |
| 0   | ove device dashboard window when main window is mov<br>resized  |
|   | se PAGE_PLUS_READ and PAGE_PLUS_WRITE to<br>ad/write PAGEd commands on PMBus 1.2 capable device                               |
| Since | ow advanced editors and features that are normally<br>dden (e.g. "Advanced Config" on UCD92xx and "All<br>onfig" on UCD90xxx) |
| D   | elete all application preferences when GUI doses  |
| D   | elete rail names, pin names, etc when GUI closes  |
| ΠE  | hable GUI protected features (e.g. pflash export):  |
|   |   |
| C   | Configure Device Scan Mode and Addresses  |
| C   | Enable all Standard Warnings/Confirmations  |
| (   | Delete All Application Preferences  |
|   |   |

Figure 6-1. Preferences



### 6.2 Background Polling

By default, the GUI polls various information from devices, and updates this information in the GUI (for example, plots). This feature can be seen turned on and off, as shown in Figure 6-2.

| P Texas Instruments - Fusion Digital Power Designer [System View]  |                |
|--|----------------|
| File Tools Debug Help  |                |
| 🔍 Scan for Device (Device_ID   Device_Code   IC_Device_ID)   🚓 Build System   System Monitor   🔚 Save   🗸 Auto Write | G Stop Polling |
| Power Rails Tree   |                |

Figure 6-2. Background Polling [System View]

Or the feature can be turned on and off using the system monitor toolbar (see Figure 6-3).

| 🜵 System Monitor  |                            |                     |                            |                       |                     |
|-------------------|----------------------------|---------------------|----------------------------|-----------------------|---------------------|
| On/Off Config     | OPERATION                  | Control Lines (USB) | SMBAlert                   | Polling               | Fault Management    |
| Always Converting | Margining                  | #1 High #2 High     | ARA None                   | Stop Polling 500 💭 ms | Clear Faults        |
| Write Setting     | Turn On Immed Off Soft Off | Low                 | Refresh SMBAlert# Asserted | Polling Status        | Clear Logged Faults |

Figure 6-3. Background Polling [System Monitor]

**NOTE:** Background polling should be disabled if other hosts have access to the device.



# 6.3 Polling Status

Figure 6-4 and Figure 6-5 show on-screen displays of the polling status for the system and for each device.

| n/Off Confi          | ig                    |           | OPERATION                                   | Control Lines (USB)   | SMBAlert   |                    | Polling        |             |              | Fault Management   |
|----------------------|-----------------------|-----------|---|---|--|--------------------|----------------|-------------|--------------|--------------------|
| ONTROL P             | in Only               | $\sim$    | Margining                                   | #1 O High #2 O High   | ARA None   |                    | Stop Po        | ling        | 500 💭 ms     | Clear Faults       |
| Writ                 | te Setting            |           | Turn On Immed Off Soft Off                  | ● Low   | Refresh SMB/   | Not Asserted       | Polling Sta    | tus         |              | Clear Logged Fault |
| CD9090A              | N @ PM                | 🬵 Fusio   | n Digital Power Designer - Parameters Being | ) Polled  |  |                    |                |             |              |                    |
| elect Dev            | vice                  | Order     | Parameter                                   | Last Value  |  |                    | Last Read Time | Last Status | New Value Re | ad                 |
|                      |                       | Dev       | rice: UCD9090A @ PMBus Address 101d         |   |  |                    |                |             |              |                    |
|                      |                       |           | 1 READ_VOUT [0x88,Rail #1]                  | 0.089 V   |  | 0x00B6             | 2:56:01 PM     | ACK         | 2:56:01 PM   |                    |
| ut - Rail            | 1#1                   |           | 2 READ_VOUT [0x88,Rail #2]                  | 0.000 V Polling   | status for the   | 0x0000             | 2:56:01 PM     | ACK         | 2:56:00 PM   |                    |
| 1.00                 |                       |           | 3 READ_VOUT [0x88,Rail #3]                  | 0.000 V   | vstem  | 0x0000             | 2:56:01 PM     | ACK         | 2:56:00 PM   |                    |
| 100                  |                       |           | 4 READ_VOUT [0x88,Rail #4]                  | 0.000 V   | ystern   | 0x0000             | 2:56:01 PM     | ACK         | 2:56:00 PM   |                    |
| 0.80                 |                       |           | 5 READ_VOUT [0x88,Rail #5]                  | 0.000 V   |  | 0x0000             | 2:56:01 PM     | ACK         | 2:56:00 PM   |                    |
| 0.60                 |                       |           | 6 READ_VOUT [0x88,Rail #6]                  | 0.002 V   |  | 0x0010             | 2:56:01 PM     | ACK         | 2:56:01 PM   |                    |
|                      |                       |           | 7 READ_VOUT [0x88,Rail #7]                  | 0.005 V   |  | 0x0014             | 2:56:01 PM     | ACK         | 2:56:01 PM   |                    |
| 0.40                 |                       |           | 8 LOGGED_COMMON_PEAKS [MFR 30,0xEE]         | Temp: 33 °C   |  | 0x21               | 2:56:00 PM     | ACK         | 12:58:27 PM  |                    |
| 0.20                 |                       |           | 9 LOGGED_FAULTS [MFR 26,0xEA]               | Common: <empty>; GPI: <em< td=""><td>pty&gt;; Rail #1: <empty< td=""><td>0x0000000000000</td><td>2:56:00 PM</td><td>ACK</td><td>12:44:17 PM</td><td></td></empty<></td></em<></empty> | pty>; Rail #1: <empty< td=""><td>0x0000000000000</td><td>2:56:00 PM</td><td>ACK</td><td>12:44:17 PM</td><td></td></empty<> | 0x0000000000000    | 2:56:00 PM     | ACK         | 12:44:17 PM  |                    |
| 0.00                 |                       |           | 10 READ_TEMPERATURE_1 [0x8D]                | 32 °C   |  | 0xDBFA             | 2:56:00 PM     | ACK         | 2:56:00 PM   |                    |
| 0.00 -               |                       |           | 11 RUN_TIME_CLOCK [MFR 07,0xD7]             | 0 Days, 02:55:33.905  |  | 0x00A0BC1100000000 | 2:56:00 PM     | ACK         | 2:56:00 PM   |                    |
|                      |                       |           | 12 STATUS_BYTE [0x78]                       | NONE_OF_ABOVE,OFF   |  | 0x41               | 2:56:00 PM     | ACK         | 12:45:08 PM  |                    |
| A Rai                | #                     |           | 13 STATUS_CML [0x7E]                        | <empty></empty>   |  | 0x00               | 2:56:00 PM     | ACK         | 11:59:52 AM  |                    |
| JCD909               | IOA @ F               |           | 14 STATUS_WORD [0x79]                       | NONE_OF_ABOVE,OFF,POWE  | R_GOOD   | 0x0841             | 2:56:00 PM     | ACK         | 12:45:08 PM  |                    |
| 1                    | 1 6                   |           | 15 USER_RAM_00 [MFR 10,0xDA]                | 1   |  | 0x01               | 2:56:00 PM     | ACK         |              |                    |
| 2                    | 2 1                   |           | 16 LOGGED_PAGE_PEAKS [MFR 29,0xED,Rail #    | 1] Voltage: 0.159 V, Current: 0.0   | 0 A, Temp: 0 °C  | 0x0045010080       | 2:56:00 PM     | ACK         | 2:55:53 PM   |                    |
| 3                    | 3 1                   |           | 17 MFR_STATUS [MFR 35,0xF3,Rail #1]         | <empty></empty>   |  | 0x00000000         | 2:56:00 PM     | ACK         | 12:45:08 PM  |                    |
| 4                    | 4 1                   |           | 18 READ_IOUT [0x8C,Rail #1]                 | 0.00 A  |  | 0x8000             | 2:56:01 PM     | ACK         | 11:59:52 AM  |                    |
| 5                    | 5 6                   |           | 19 READ RAIL STATE [0x89,Rail #1]           | IDLE  |  | 0x01               | 2:56:01 PM     | ACK         | 12:45:08 PM  |                    |
| 6<br>7<br>2:22:17.67 | 6 F<br>7 F<br>78: USB | Last Poli | ng Cycle Completed On: 5/8/2017 2:56:01 PM  | A9 64   | ОК   |                    |                |             |              |                    |

Figure 6-4. System Polling Status

| File   | Device       | Tools                      |                                |                      |              |                |             |                |   |
|--------|--------------|----------------------------|--------------------------------|----------------------|--------------|----------------|-------------|----------------|---|
| 1<br>W | R            | ail Dashboard              |                                | o Flash 🛛 🔓          | Error (      | Checking       |             |                |   |
| Mon    | St           | ore Configuration          | to Flash Memory                |                      |              |                |             |                |   |
| Show   | Se           | oft Reset Device           |                                |                      |              |                |             |                |   |
| √ Vc   | P            | olling Status              |                                |                      |              |                |             |                |   |
| Fusion | Digital Powe | r Designer - UCD9090A @    | PMBus Address 101d part        | Vout<br>being polled | Iout         |                |             |                | 1 |
|        | 1            |                            |                                |                      | 8            | 1              | T           | 1              |   |
| Order  | Paramet      | er                         | Last Value                     |                      | Last Raw     | Last Read Time | Last Status | New Value Read |   |
| 🖯 Devi | ce: UCD9090  | A @ PMBus Address 101d     |                                |                      |              |                | 10.000      |                |   |
|        | 1 READ_VO    | OUT [0x88,Rail #1]         | 0.000 V                        |                      |              | 3:00:42 PM     | ACK         | 3:00:42 PM     |   |
|        | 2 READ_VO    | OUT [0x88,Rail #2]         | 0.047 V                        | P                    | olling statu | s for the      | TX.         | 3:00:42 PM     |   |
|        | 3 READ_VO    | OUT [0x88,Rail #3]         | 0.000 V                        |                      | devic        | 0              | ĸ           | 3:00:42 PM     |   |
|        | 4 READ_VO    | OUT [0x88,Rail #4]         | 0.000 V                        |                      | uevic        | C              | LK.         | 3:00:42 PM     |   |
|        | 5 READ_VO    | OUT [0x88,Rail #5]         | 0.005 V                        |                      | 0x0050       | 3:00:42 PM     | ACK         | 3:00:42 PM     |   |
|        | 6 READ_VO    | OUT [0x88,Rail #6]         | 0.000 V                        |                      | 0x0000       | 3:00:42 PM     | ACK         | 3:00:42 PM     |   |
|        | 7 READ_W     | OUT [0x88,Rail #7]         | 0.009 V                        |                      | 0x0024       | 3:00:42 PM     | ACK         | 3:00:42 PM     |   |
|        | 8 READ_TE    | MPERATURE_1 [0x8D]         | 32 °C                          |                      | 0xDBF8       | 3:00:42 PM     | ACK         | 3:00:42 PM     |   |
|        | 9 STATUS     | WORD [0x79]                | NONE_OF_ABOVE, OFF, POWER_GOOD | )                    | 0x0841       | 3:00:42 PM     | ACK         | 12:45:08 PM    |   |
|        | 10 USER_RA   | MM_00 [MFR 10,0xDA]        | 1                              |                      | 0x01         | 3:00:42 PM     | ACK         |                |   |
|        | 11 MFR_STA   | ATUS [MFR 35,0xF3,Rail #1] | <empty></empty>                |                      | 0x00000000   | 3:00:42 PM     | ACK         | 12:45:08 PM    |   |
|        | 12 READ_IC   | OUT [0x8C,Rail #1]         | 0.00 A                         |                      | 0x8000       | 3:00:43 PM     | ACK         | 11:59:52 AM    |   |
|        | 13 READ_R    | AIL_STATE [0x89,Rail #1]   | IDLE                           |                      | 0x01         | 3:00:42 PM     | ACK         | 12:45:08 PM    |   |
|        | 14 READ_TE   | MPERATURE_2 [0x8E,Rail #1] | 32 °C                          |                      | 0xDBF8       | 3:00:42 PM     | ACK         | 3:00:42 PM     |   |
|        | 15 READ_R    | AIL_STATE [0x89,Rail #2]   | IDLE                           |                      | 0x01         | 3:00:42 PM     | ACK         | 12:45:08 PM    |   |
|        | 16 READ_R    | AIL_STATE [0x89,Rail #3]   | IDLE                           |                      | 0x01         | 3:00:42 PM     | ACK         | 12:45:09 PM    |   |
|        | 17 READ_R    | AIL_STATE [0x89,Rail #4]   | IDLE                           |                      | 0x01         | 3:00:42 PM     | ACK         | 12:45:09 PM    |   |
|        | 18 READ_R    | AIL_STATE [0x89,Rail #5]   | IDLE                           |                      | 0x01         | 3:00:42 PM     | ACK         | 12:45:09 PM    |   |
|        | 10 DEAD D    | ATI STATE (0v80 Pal #6]    | IDI F                          |                      | 0v01         | 3:00:42 PM     | ACK         | 12:45:09 PM    |   |

Figure 6-5. Device Polling Status



#### 6.4 Copy or Clone Rails

The Clone and Copy features (select File  $\rightarrow$  Tools  $\rightarrow$  Copy/Clone Rails ...) help users copy the following settings of a sourcing rail: Voltage Parameters, Fault Responses, Turn On and Turn Off Timing, Sequence ON and OFF Timing, Sequence ON and OFF GPI pin, Enable Pin Setup, Margining Pin Setup, On Off Config, Fault Logging, as well as Current and Temperature Parameters (see Figure 6-6).

| - Copy Source and Desti  | nation  | Select What to Copy  |
|--|---|--|
| Copy Source and Desti<br>Copy From:<br>P1V2 Source Vout: 1.2 V<br>If a destination rail does no<br>only had rail #1 defined and<br>the 'Range' option and sele<br>Enter the Yout for each des<br>based on the percentages of<br>Destination Yout: 1.2<br>Note: Rail Sequence On<br>dependencies, and Fau | Copy To:         All rails         Single Rail         P1V35         Range From         P1V35         To Rail #10         vaniet do create new rails(b). For example, if you         dwanted to create three new rails based on it, you could dick set Rail #2 through Rail #4.         station rail. All warning and fault thresholds will be copied of the source rail         20 ÷         adependencies, Rail Sequence Off         It Shutdown Slaves will NOT be copied. | Select What to Copy         Voltage Parameters         Included voltage set points, margins, limits, Vout scale monitor, and Vout Cal Monitor         Fault Responses         Turn On Timing (Turn On delay and Max Turn On time)         Turn Off Timing (Turn Off delay and Max Turn Off time)         Sequence ON GPI pin dependencies         Sequence ON FGPI pin dependencies         Sequence ON Timing (Timeout period, timeout action)         Sequence OFF Timing (Timeout period, timeout action)         Bable Pin Setup (Pin Polarity and Pin Mode)         Margining Pin Setup (Margin Mode, PWM frequency, duty cycle and phase)         On Off Config (On/Off Control, Control Pin polarity, and Control Pin turn of         Fault Logging (Rail Detail Fault Log Enables)         Current Parameters (Current limits, Iout Cal Gain, and Iout Cal Offset)         Temperature Parameters (Temperature limits, Gain, and Offset)         Check All |
| Log  |   |  |
| Timestamp Message  |   |  |
|  |   |  |

Figure 6-6. Copy or Clone Rails Screen

# 6.5 PMBus Logging

The Fusion GUI can save all the PMBus commands from the USB adapter host to a local file if these are required for debugging purposes (see Figure 6-7). This feature is only available in online mode.

| File To | ols. Debug Help                  |    |               |          |                   |           |                    |          |         |        |                           |
|---------|----------------------------------|----|---------------|----------|-------------------|-----------|--------------------|----------|---------|--------|---------------------------|
| Q, se   | Data Logging                     | D) | 🛞 Build S     | ystem    | System Monit      | or 🛛 🔛 Sa | ive 🗸 🗸 Auto Write |          | Stop Po | olling |                           |
| Pow     | PMBus Logging                    | F  |               |          |                   |           |                    |          |         |        |                           |
| #       | Refresh all parameters           |    | On Delay      | Rise     | Off Delay         | Fall      | Dependencies (Dir  | rect Onl | v)      |        |                           |
| 01      | SMBus_I2C_SAA tool               | 1  | 1 server week | Internet | Distantion of the | 10000     |                    | •        | •       | æ      | Click to configure device |
|         | USB Adapter setting              |    | 0.00          | N/A      | 0.00              | N/A       | Vin On/Off         |          |         |        |                           |
|         | Download USB Adapter Firmware    |    |               |          |                   |           |                    |          |         |        |                           |
|         | PEC_SMBus-> I2C Translation Tool |    |               |          |                   |           |                    |          |         |        |                           |
|         | ASCII Tool                       |    |               |          |                   |           |                    |          |         |        |                           |





# 6.6 Data Logging

Data logging is used to turn on the poll for a selected command, and the values are logged to one or more text files (see Figure 6-8). Unlike the PMBus logging utility, this feature enables polling of selected commands always, even if the monitor task has never been selected.

|  | File Device Tools  | Debug Help    |          | 🐙 Likelat Data Lagrang   |
|--|--------------------|---------------|----------|--|
| PMBus Commands   | -                  |               |          | Overview   |
| Device   | PMBus Commands     | Page<br>Index | Select   | Use this form to enable or disable data logging for all devices the GUI has detected.<br>When data logging has been turned on, commands you select will always be polled in<br>the background and the values longed to one or more text files.   |
| UCD9090A @ PMBus Address 101d  | READ_VOUT          | 0             | Ø.       | U.H. al. parts the states legged to one of more exertical  |
| UCD9090A @ PMBus Address 101d  | READ_VOUT          | 1             | V        | commands "always", even if the Monitor task has never been selected.   |
| UCD9090A @ PMBus Address 101d  | READ_VOUT          | 2             |          |  |
| UCD9090A @ PMBus Address 101d  | READ_VOUT          | 3             | 1        |  |
| UCD9090A @ PMBus Address 101d  | READ_VOUT          | 4             |          | Coloris - Coloris - Coloris de Statute de St |
| JCD9090A @ PMBus Address 101d  | READ_VOUT          | 5             | <b>V</b> | generated for each log file.   |
| JCD9090A @ PMBus Address 101d  | READ_VOUT          | 6             |          | Directory:   |
| JCD9090A @ PMBus Address 101d  | READ_VOUT          | 7             | 1        | Subtree m  |
| JCD9090A @ PMBus Address 101d  | READ_VOUT          | 8             | 1        | Open Folder  |
| JCD9090A @ PMBus Address 101d  | READ_IOUT          | 0             | 1        | File Format:   |
| JCD9090A @ PMBus Address 101d  | READ_IOUT          | 1             | 1        | <ul> <li>Tab Separated</li> </ul>  |
| JCD9090A @ PMBus Address 101d  | READ_IOUT          | 2             | 1        | Comma Separated Value (CSV)  |
| ICD9090A @ PMBus Address 101d  | READ_IOUT          | 3             | 7        |  |
| JCD9090A @ PMBus Address 101d  | READ_IOUT          | 4             | 1        | Log Mode:  |
| JCD9090A @ PMBus Address 101d  | READ_IOUT          | 5             | 1        | Modal     All other backers and data polling is purposed on while this data  |
| ICD9090A @ PMBus Address 101d  | READ_IOUT          | 6             | 7        | logging is active. Charts, statuses, etc., might not be updated if   |
| JCD9090A @ PMBus Address 101d  | READ_IOUT          | 7             |          | commands are not included in Data Logging  |
| ICD9090A @ PMBus Address 101d  | READ_IOUT          | 8             | V        | Run in background together with all other data polling.  |
| ICD9090A @ PMBus Address 101d  | READ_TEMPERATURE_1 | N/A           | 1        |  |
| ICD9090A @ PMBus Address 101d  | READ_TEMPERATURE_2 | 0             | V        | Select Commands to Log   |
| ICD9090A @ PMBus Address 101d  | READ_TEMPERATURE_2 | 1             | 7        |  |
| ICD9090A @ PMBus Address 101d  | READ_TEMPERATURE_2 | 2             | V        | Not data logging   |
| JCD9090A @ PMBus Address 101d  | READ_TEMPERATURE_2 | 3             | V        |  |
| JCD9090A @ PMBus Address 101d  | READ_TEMPERATURE_2 | 4             |          |  |
| JCD9090A @ PMBus Address 101d  | READ_TEMPERATURE_2 | 5             | 1        | Start Data Logging OK  |
| JCD9090A @ PMBus Address 101d  | READ_TEMPERATURE_2 | 6             | 1        | IWate V2.4-3.611 @ PIVIOUS AUGIESS 1010 (0.30) 036 Adapter V1.0.10 [PEC; 400 Km  |
| JCD9090A @ PMBus Address 101d  | READ_TEMPERATURE_2 | 7             | V        |  |
| UCD9090A @ PMBus Address 101d  | READ_TEMPERATURE_2 | 8             | 1        |  |
| Check All Uncheck All  |                    | (             | OK       |  |
| Service Servic |                    |               |          |  |

Figure 6-8. Data Logging

### 6.7 Device and Project Configuration Comparison

Users can compare the configuration stored in the project file (.xml) and the current configuration loaded on the device (online or offline), or compare the configurations between project files (see Figure 6-9).

| File Device   | Tools | Debug Help                          |     |
|---------------|-------|-------------------------------------|-----|
| Configure     | D     | evice/Project Configuration Compare | loł |
|               | G     | PIO Pins Peek/Poke                  | -   |
| Write to Hard | C     | Copy/Clone Rails                    |     |

Figure 6-9. Device and Project Configuration Comparison

The tool is highly flexible when providing the combinations to compare and results to display (see Figure 6-10).

| Devices / Project Files     UCD9090A@101[1]       UCD9090A@101[2]       Add project file(s) - Add attacher | Project: UC<br>Device: UCI<br>I devices (of | D9090A @<br>D9090A @ I<br>ffline or onli | PMBus issues 101d Project.xml in Z:\DigitalPower\Gui Project\UCD9090<br>MBus Address 101d (65h)<br>ne) • <u>ClearList</u> • <u>Force Report Refresh</u>  | A Modify<br>Modify  |
|--|---|--|--|---|
| - Options  | Shown [77                                   | lower                                    | Fill Card Cade Show Hay Values: O Taline w/F   | Decoded O Sensrate Column (@ Den't Show   |
| Only show differences (differences)  | nt values or                                | missing corr                             | mands) Auto size cells to fit text Show Only: Read-Only  | y Commands O Writable Commands O Both   |
|  | L.  | Esta                                     |  |   |
| Command  | Code  | Rail                                     | UCD9090A@101[1]  | UCD9090A@101[2]   |
| コ Category: Calibration  | 1   |  |  |   |
| FAULT_KESPONSES  | UXES  | Kan ≠1                                   | Ketty Time: Umsec[Vi0X/Vi0K datch time: U.Umsec] Max Other<br>Gitch Time: 0 msec] VOUT_V: Resequence: Disabled; fichth filter:<br>Disabled; Rich filter: Disabled; Gitch filter: Disabled; Rich filter:<br>Disabled; Rich filter: Disabled; Gitch filter: Disabled; Response:<br>Ignore; Restart: N/A  IOUT_UC: Resequence: Disabled; Gitch filter:<br>Disabled; Rich filter: Disabled; Gitch filter: Disabled; Rich filter:<br>Disabled; Rich filter: Disabled; Gitch filter: Disabled; Rich filter:<br>Disabled; Rich filter: Disabled; Response: Ignore; Restart: N/A<br>TON_MAX: Resequence: Disabled; Gitch filter: Disabled; Response:<br>Ignore; Restart: N/A   | Reary Time: 960 misec   Max Volt Glack Time: 1.2 misec   Max Votter<br>Glich Time: 0 misec   VOLT_V/R seequence: Enabled; Glich Time:<br>Disabled; Response: Shut down with delay; Restart: Do not restart]<br>VOLT_UV: Resequence: Enabled; Glich Titler: Disabled; Response:<br>Shut down with delay; Restart: Do not restart] TOUT_OC:<br>Resequence: Disabled; Glich Titler: Disabled; Response: Ignore;<br>Restart: N/A] TOUT_UC: Resequence: Disabled; Glich Titler:<br>Disabled; Seponse: Ignore; Restart: N/A] TOT Resequence:<br>Disabled; Glich Titler: Disabled; Glich Titler: Disabled; Response:<br>TON_MAX: Resequence: Disabled; Glich Titler: Disabled; Response:<br>Ignore; Restart: N/A                         |
| FAULT_RESPONSES  | 0xE9  | Rail #2                                  | Retry Time: 0 msec  VoUT_OV: Resequence: Disabled; Gitch Time: 0.0 msec  VoUT_OV: Resequence: Disabled; Gitch Time: Disabled; Gitch Time: Disabled; Gitch Time: Disabled; Gitch Time: Disabled; Resequence: Disabled; Gitch Time: Disabled; Resequence: Disabled; Gitch Time: Disabled; Gitch Time: Disabled; Gitch Time: Disabled; Response: Ignore; Restart: N/A  IOUT_UC: Resequence: Disabled; Gitch Time: Disabled; Gitch Tim | Retry Time: 960 msec] Max Volt Gitch Time: 1.2 msec] Max Other<br>Gitch Time: 0 msec] VOUT_OV: Resequence: Enabled; Gitch filter:<br>Disabled; Response: Shut down with delay; Restart: Do not restart]<br>VOUT_UV: Resequence: Enabled; Gitch filter: Disabled; Response:<br>Shut down with delay; Restart: Do not restart] IOUT_OC:<br>Resequence: Disabled; Gitch filter: Disabled; Response:<br>Ignore;<br>Restart: NAI IOUT_UC: Resequence: Disabled; Riter<br>Disabled; Ritch filter: Disabled; Response: Ignore;<br>Disabled; Ritch filter: Disabled; Response: Ignore;<br>Disabled; Ritch filter: Disabled; Response: Ignore;<br>Tomer: Restart: N/AI<br>TON_MAX: Resequence: Disabled; Gitch filter: Disabled; Response: |
| IOUT_CAL_GAIN  | 0x38  | Rail #2                                  | 1,000.0000 mΩ  | 10.0000 mΩ  |
| FAULT_RESPONSES  | 0xE9  | Rail #3                                  | Retry Time: 0 msec  Max Volt Glitch Time: 0.0 msec  Max Other<br>Glitch Time: 0 msec  VOLT_OV: Resequence: Disabled; Glitch filter:<br>Disabled; Response: Ignore; Restart: N/A  VOLT_UV: Resequence:<br>Disabled; Glitch filter: Disabled; Response: Ignore: Restart: N/A   | Retry Time: 960 msec  Max Volt Gitch Time: 1.2 msec  Max Other<br>Gitch Time: 0 msec  VOUT_OV: Resequence: Enabled; Gitch filter:<br>Disabled; Response: Shut down with delay; Restart: Do not restart <br>VOUT_UV: Resequence: Enabled; Gitch filter: Disabled; Response:  |

The differences in Category: Status can be ignored because the I/O status can be different.

Figure 6-10. Comparison Tool Results

# 6.8 UCD3xxx and UCD90xxx Device GUI

The Fusion GUI also provides a low-level GUI debug tool, which includes links to many different tools together (see Figure 6-11). This GUI cannot coexist with the Fusion GUI.



Figure 6-11. UCD3xxx and UCD90XXX Device GUI



#### SMBUS, I2C, and SAA Tool

The Device GUI can help users scan the device on the same I2C bus, download Firmware, as well as dump, export, and compare flash files and other uses (see Figure 6-12).

| atus   | Tools  |
|--|--|
| ttached: Unknown ast ROM Found: IC Info: ROM Info: Package ID: ast Program Found: Address: DEVICE_ID: MFR_MODEL: MFR_REVISION: | Scan Device in ROM Mode         Scan Device in Program Mode:         Set Device in Program Mode:         Pilesh File         Displays the contents of a flash file         Dump Flash File         Displays the contents of a flash file         Export Flash         Reads program and/or data flash from the device to a file         Compare Flash Files         Compare Flash Files         Device Flash         Device Tope         Point Tope         Point Tope         Device Tope |
| g<br>Timestamp Message   | Flash Test Tool         Erases, writes a pattern, and then verifies that the pattern is present.           X0 to Hex Tool         Converts a Tektronix Extended x0 to Intel Hex or S-Record  |
| 2:55:19.390 Click one of the scan buttons to find a c  | evice in ROM or program mode   |
| Copy Log Clear Log   | Display all SMBus/12C activity in I  |

Figure 6-12. Device GUI Settings

# 6.9 SMBUS, I2C, and SAA Tool

The SMBUS, I2C, and SAA tool provides a very low-level  $I^2C$  utility, which can be used for any  $I^2C$  devices in addition to the UCD90xxx (see Figure 6-13). There any different ways to launch this utility. Be sure to stop the polling from the Fusion GUI if the tool is launched from there.

| Q Sc | Data Logging<br>PMBus Logging    | D) | 🛞 Build S | ystem | System Monit | tor   🔛 Sa  | we   🗸 A  | uto Write    | 🔴 Sto   | p Pol | ling |                 |
|------|----------------------------------|----|-----------|-------|--------------|-------------|-----------|--------------|---------|-------|------|-----------------|
| #    | Refresh all parameters           |    | On Delay  | Rise  | Off Delay    | Fal         | Depende   | ncies (Direc | t Only) |       |      |                 |
| 01   | SMBus_I2C_SAA tool               |    | 10000000  | 1     | 1            |             | 1         |              | 0       | *     | 6    | Click to config |
|      | USB Adapter setting              |    | 0.00      | N/A   | 0.00         | N/A         | Vin On/Of | ff           |         |       |      |                 |
|      | Download USB Adapter Firmware    |    |           | -     |              | _           |           |              |         |       |      |                 |
|      | PEC_SMBus-> I2C Translation Tool |    |           |       | SMBUS/I2C Lo | w Level Too |           |              |         |       |      |                 |
|      | ASCII Tool                       |    |           | -     |              | 1010        |           |              |         |       |      |                 |

Figure 6-13. SMBUS, I2C, and SAA Toolbar Launch



The SMBUS, I2C, and SAA tool can also be launched from the Device GUI described in Section 6.8 (see Figure 6-14).

| 💀 UCD3XXX / UCD9X  | XXX Device GUI |  | _ 🗆 🔀 |
|--|----------------|--|-------|
| Settings   |                |  |       |
| Status   |                | Tools  |       |
| Attached: Unknown  |                | Scan Device in ROM Mode  |       |
| Last ROM Found:<br>IC Info:<br>ROM Info:<br>Package ID:                      |                | Scan for Device in Program Mode: <u>DEVICE ID</u> <u>DEVICE CODE IC DEVICE ID</u> <u>PMBUS REVISION</u> When a device is found, dump additional PMBus commands  Command ROM to execute its program (SendByte 0xF0 to Address 11) Command Program to jump to ROM (SendByte 0xD9)  |       |
| Last Program Found:<br>Address:<br>DEVICE_ID:<br>MFR_MODEL:<br>MFR_REVISION: |                | Flash       Checksums       SMBus/I2C       Debug       Utilities       Trim       Multi-Image         SAA Adapter Settings       Configure SAA Adapter settings         SMBus Debug       Read/Write data and send commands         ROM API       Make calls to ROM functions for UCD30xx         PEC 8 SMBus -> 12C Translation Tool         PEC byte calculator + Converts SMBus requests into I2C transactions |       |

Figure 6-14. SMBUS, I2C, and SAA Tool GUI Launch

The last method to launch this tool is using the Start menu (see Figure 6-15).







SMBUS, I2C, and SAA Tool

Users must enter the PMBus address of the device in the Device Address box before advancing further (see Figure 6-16). See the SMBus Specification, PMBus Specification, and UCD90XXX PMBus Command Reference GUI to understand the protocol and commands.

| vice Address: 11 d 08 h   |        | putcorr                              | ect addr   | ess                 |               | Group Prot       | ocol )   | SAA Settings . |
|---|--------|--------------------------------------|--|---------------------|---------------|------------------|--|----------------|
| ead Data  |        | - Write Data-                        | -  |                     |               |                  |  |                |
| Cond Data   | Status |                                      | Cmd  | Data                |               |                  |  | Status         |
|   | nya    | () Send Byte                         | oo h   |                     |               |                  |  | n/a            |
| Keed Byte   | n/a    | O Write Byte                         | 00 h   | 00 h                |               |                  |  | n/a            |
| Read Word h   | n/a    | O Witte Word                         | 00 6   | 0000                | ь             |                  |  | n/a            |
| Read Block 00 h   | n/a    |                                      | 00 1   | 00                  | ~             |                  |  |                |
|   | 0/2    | O more book                          | 1  |                     |               |                  |  | 5              |
|   | , yo   |                                      |  |                     |               |                  |  |                |
| Read Block 96   |        |                                      |  | Length: 1           | Note: do i    | not include coun | t/length byte in   | data           |
|   |        | 0.000                                | (An )a   | 100                 |               |                  |  |                |
| (max length is 62)  | 100    | O 12C WING                           | in the second se | 100                 |               |                  |  | 0.4            |
| - Len 1   | n/a    |                                      |  |                     |               |                  |  | h              |
|   |        |                                      |  | (max 60 by          | tes can be in | 12C data)        |  |                |
| Send Keep Serding   |        | Send [                               | Keep Sendi   | w                   |               |                  |  |                |
|   |        |                                      |  | 2.)                 |               |                  |  |                |
| Cmd Data  | Status | SMBALERT#1                           | tow  | Refresh             |               |                  |  |                |
| Process Call 00 h 0000 h  | n/a    | Controllino                          |  | *2                  | 47            |                  |  |                |
| (Word write, word read)   |        | (dicking sets)                       | O High   | OHah                | OHigh         | OHah             | OHigh  | Defect all     |
| Block Process Call 00 h 00  | n/a    | 40.0004.00040                        | (e) Low  | () Low              | () Low        | () LOW           | ● Low  | Neresci Al     |
| (Block write, block read)   |        | S 2                                  |  |                     |               |                  | and the second |                |
| (Block write, block read)   |        | - GPIO Peek/I                        | oke  |                     |               |                  |  |                |
| (Block write, block read)   | h      | GPIO Peek/f                          | Poke   | b5 b4               | b3            | b2 b1            | 60   |                |
| (Block write, block read)<br>Write Length: 1<br>Read Length:  | h      | GPIO Peek/I                          | Poke   | ы ы                 | ыз<br>[]      | 62 b1            | 80   | Read/Write     |
| (Block write, block read)<br>Write Length: 1<br>Read Length: - Read:<br>Send  | h      | GPIO Peek/I                          | Poke   |                     | ыз<br>П       |                  | 8  | ReadjWrite     |
| (Block write, block read)<br>Write Length: 1<br>Read Length: - Read:<br>Send  | h      | GPIO Peek/I                          | oke  |                     | <b>53</b>     |                  | 8  | Read/Write     |
| (Block write, block read)<br>Write Length: 1<br>Read Length: - Read:<br>Send<br>9<br>2000 270: 54.4 ±1: Bullinebus Sizeral Loss: ACV COUTE C =1 = 1 = 1   | h      | GPIO Peek/i                          | oke<br>≫<br>□ [<br>□ [   | 8 ¥                 | ы<br>П        |                  | 8  | Read/Write     |
| (Block write, block read)<br>Write Length: 1<br>Read Length: — Read:<br>Send<br>9<br>9<br>37:00, 770: SAA #1: PollPmbusSignalLines: ACK CONTROL #1 is Low<br>37:00, 770: SAA #1: PollPmbusSignalLines: ACK CONTROL #2 is Low  | h      | GPIO Peek/i                          | oke  | ы ы<br>] []<br>] [] | 63<br>[]      |                  | 88   | Read/Wros      |
| (Block write, block read)           Write Length:           Read Length:           Send           9           37:00.770: SAA #1: PollPmbusSignalLines: ACK CONTROL #1 is Low           37:00.770: SAA #1: PollPmbusSignalLines: ACK CONTROL #2 is Low           37:00.770: SAA #1: PollPmbusSignalLines: ACK CONTROL #3 is Low           37:00.770: SAA #1: PollPmbusSignalLines: ACK CONTROL #3 is Low | h      | GPIO Peek/i                          | >oke   | 85 94<br>           | 63<br>  <br>  |                  | 8  | Read/Write     |
| (Block write, block read)<br>Write Length: 1<br>Read Length: — Read:<br>Send<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9   | h      | GPIO Peek/i<br>b7<br>Read:<br>Write: | 20ke   |                     | 53<br>  <br>  | 62 61            | 8  | Read/Write     |
| (Block write, block read)<br>Write Length: 1<br>Read Length: — Read:<br>Send<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9<br>9   | h      | GPIO Peek/i<br>b7<br>Read:<br>Write: | 20ke56[<br>56[<br>□ [  |                     | 53            | 62 61            | 8  | Read/Write     |

Figure 6-16. Device PMBus Address



### 6.10 SAA Settings

Users can configure the TI USB-to-GPIO adapter to disable or enable PEC as well as change the  $I^2C$  speed and pullup resistors values. This utility can be launched from the SMBUs, I2C, SAA tool, in the top-right corner or the Tool menu (see Figure 6-17 and Figure 6-18).

| File To | ols D | ebug Help                   |                |      |  |  |  |  |
|---------|-------|-----------------------------|----------------|------|--|--|--|--|
| Q s     | Dat   | ta Logging                  |                | D)   |  |  |  |  |
| Powe    | PM    | Bus Logging                 |                |      |  |  |  |  |
| # 1     | SM    | Bus _I2C _SAA too           |                | Dela |  |  |  |  |
| Θε      | USI   | USB Adapter setting         |                |      |  |  |  |  |
| -       | Do    | vnload USB Adapter Firmware |                |      |  |  |  |  |
|         | PEC   | _SMBus-> I2C Tra            | anslation Tool | )    |  |  |  |  |
|         | AS    | CII Tool                    | 1              | ,    |  |  |  |  |
| 33      | 6     | ixun #9                     | 1,20           | 0.00 |  |  |  |  |
| 6 6     | ij.   | Rail #6                     | 1.80           | 5.00 |  |  |  |  |
| 77      | 8     | Rail #7                     | 2.50           | 5.00 |  |  |  |  |
| 8.8     | 6     | Rail #8                     | 1.00           | 5.00 |  |  |  |  |

Figure 6-17. SAA Settings (1/2)

| 🤚 USB Adapter Settings/Preferences 📃 🗖 🔀  |                                   |              |  |  |  |  |  |  |  |
|---|-----------------------------------|--------------|--|--|--|--|--|--|--|
| - Texas Instruments USB Adapter   |                                   |              |  |  |  |  |  |  |  |
| USB Adapter Firmware Version: 1.0.13  |                                   |              |  |  |  |  |  |  |  |
| Bus Speed:  | Bus Speed: Packet Error Checking: |              |  |  |  |  |  |  |  |
| 🔾 100 kHz   | ◯ 100 kHz ◯ Enabled               |              |  |  |  |  |  |  |  |
| 400 kHz   | z 💿 Disabled                      |              |  |  |  |  |  |  |  |
| Bus Mode:   | ALERT Pullup:                     | Open Drain 🖂 |  |  |  |  |  |  |  |
| <ul> <li>Serial</li> </ul>  | CLOCK Pullup: 2.2 kΩ 🗸            |              |  |  |  |  |  |  |  |
| O Parallel  | DATA Pullup:                      | 2.2 kΩ 🗸     |  |  |  |  |  |  |  |
|   |                                   |              |  |  |  |  |  |  |  |
| - Note  |                                   |              |  |  |  |  |  |  |  |
| This tool adjusts current USB adapter settings and<br>configures defaults for future launches of select Fusion<br>tools such as Fusion Digital Power Designer.<br>While these settings are unique for each individual user<br>of the PC, they are shared across all TI Fusion tools. If<br>you have multiple copies of Fusion Digital Power Designer<br>or other Fusion tools installed, they will share these<br>settings. |                                   |              |  |  |  |  |  |  |  |
| Οκ  |                                   |              |  |  |  |  |  |  |  |

Figure 6-18. SAA Settings (2/2)



# **Configuration Examples**

The following provides example considerations for configuring UCD90xxx devices.

### 7.1 Design Flow

- Rail setup:
  - How many rails must be monitored?
  - What type of monitoring (voltage, current, temperature)?
- Rail monitoring setup:
  - What are the voltage, current, and temperature set points?
- Rail control setup:
  - How are the rails controlled (turned on and turned off)?
- Rail margining setup:
  - How many rails require margining?
  - What is the frequency and duty cycle?
- GPI configuration:
  - Are there digital signals (GPI) that must be monitored?
- Rail sequencing configuration:
  - What is the start-up sequence?
  - Which rails come first?
  - Which rails depend on other rails for sequencing?
- Fault response configuration:
  - How should the device act if a fault is detected?
  - Should the device Ignore the Fault or Act on Fault?
  - If the device should Act on Fault, and which action to take (shut down fault rail and other slave rails, resequence, log the fault, and so on)?
- Logic GPO configuration:
  - Are there output signals (LGPO) that must notify external system?
  - Other configurations:
    - System watchdog
    - System reset
    - Faults to log
    - Fan control
    - FIFO log mode
    - Resequencing settings



### 7.2 Hardware Configuration

When the previous questions are answered, go to Configure  $\rightarrow$  Hardware Configuration to perform the following steps:

- 1. Create rails to monitor either voltage, current, temperature, or all.
- 2. Assign GPIO pins to be used as the enable pin, monitoring rail status such as: rail is on, rail is off.
- 3. Assign PWM pins for margining.
- 4. Assign GPI pins to monitor the external event.
- 5. Assign LGPOs to output the status.
- 6. Configure the device information.

# 7.3 Rail Configuration

When all the hardware pins are assigned, go to Configure  $\rightarrow$  Rail Config to perform the following steps:

- 1. Configure the voltage, current, temperature limit, and scaling.
- 2. Set the proper turnon or turnoff delay.
- 3. Configure sequencing (how are rails turned on and off? Which rails should turn on first? Are there any dependencies.)
- 4. Go to Global Configuration  $\rightarrow$  PIN SELECTED RAIL STATES, if needed.
- 5. Configure Fault Responses (rails response to faults).

# 7.4 Global Configuration

When all the rails are configured properly, the last step is to go to Config  $\rightarrow$  Global Configuration to see whether the following features are required.

- Enable Fault Logging: See which faults must be logged to save more important logs.
- Misc Config: Set the resequence option, brownout option, Fault logging scheme (FIFO mode, fan control and external ADC) when they are applicable and required.
- · System Reset: Set the proper system reset if this feature is required.
- System Watchdog: Configure the system watchdog if this feature is required.

Hardware Configuration

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