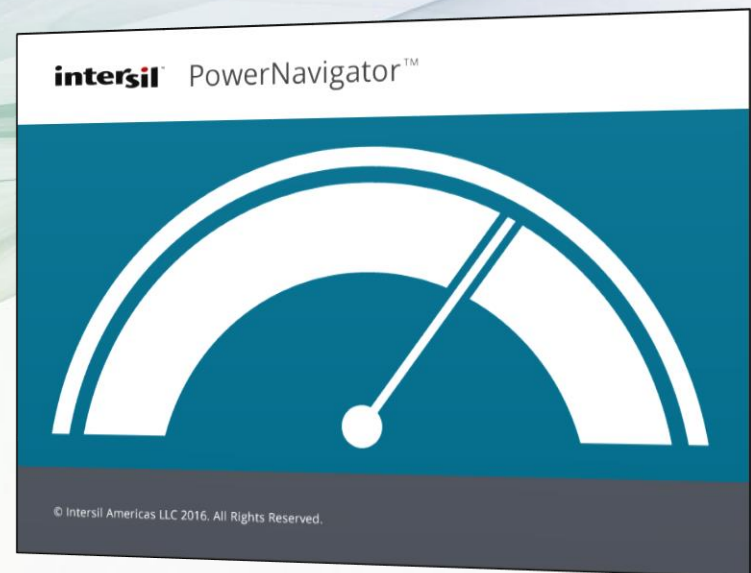


PowerNavigator

User Guide

February 2016



Overview

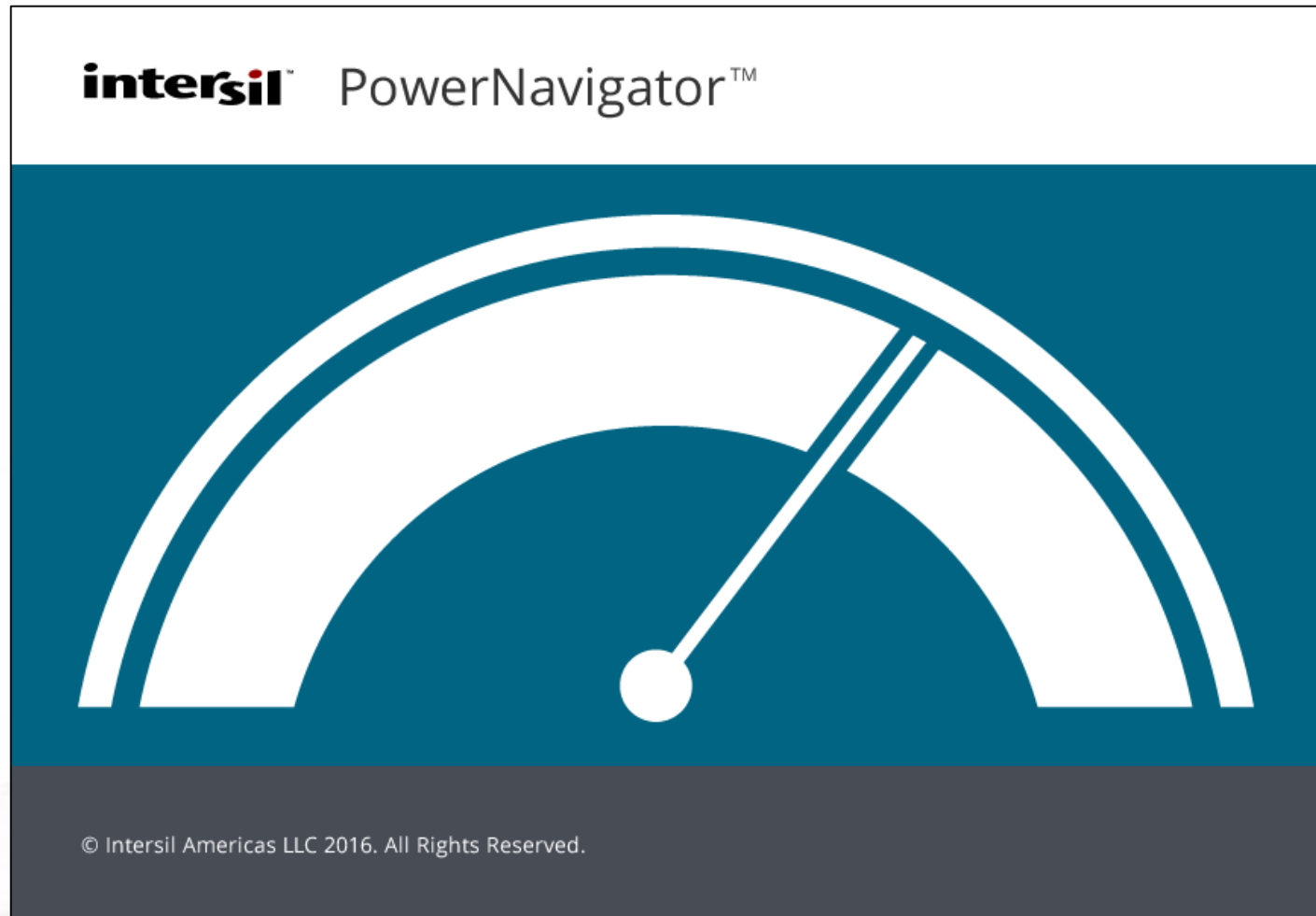
- **This guide walks a user through the steps to setup and configure a digital power device using Intersil's PowerNavigator GUI.**
- **This guide assumes the user has followed the instructions on the website for downloading and installing PowerNavigator and is able to launch the program successfully.**

Overview

- **The following sections are shown in this guide:**

- Hardware free mode
 - Selection of devices
 - Power architecture setup
 - Current sharing
- Connecting to hardware
 - Auto scan of devices
- Device setup with Rail Inspector
 - Changing device parameters
 - Configuration file load and save
- Sequencing
 - Time based sequencing
 - Event based sequencing
- RailScope
 - Adding/monitoring devices
 - Logging
- Production File Hex Creation

Offline Mode (Hardware Free Mode)



PowerNavigator Launch Screen – Offline Mode

Connected Devices

Offline Mode

Project Load

intersil™

PowerNavigator™

Choose an option and click start:

☐ SCAN ATTACHED DEVICES
Intersil products present on the bus:

☒ BUILD AN OFFLINE SYSTEM

☐ OPEN EXISTING PROJECT
Choose project:

5.1.64_HEX_File_Test
5.1.64_HEX_File_Test_r3
5.2.144_HEX_File_Test
5.2.159_HEX_File_Test
5.2.160r2_HEX_File_Test
5.2.160_HEX_File_Test
5.2.160_HEX_File_Test_r4
5.2.164_6105_HEX_Test
5.2.164_HEX

PMBus Address: 10 to 7f

Scan Again

Design your power system from scratch using Intersil parts. Once your system is designed, bring up the system by connecting to hardware.

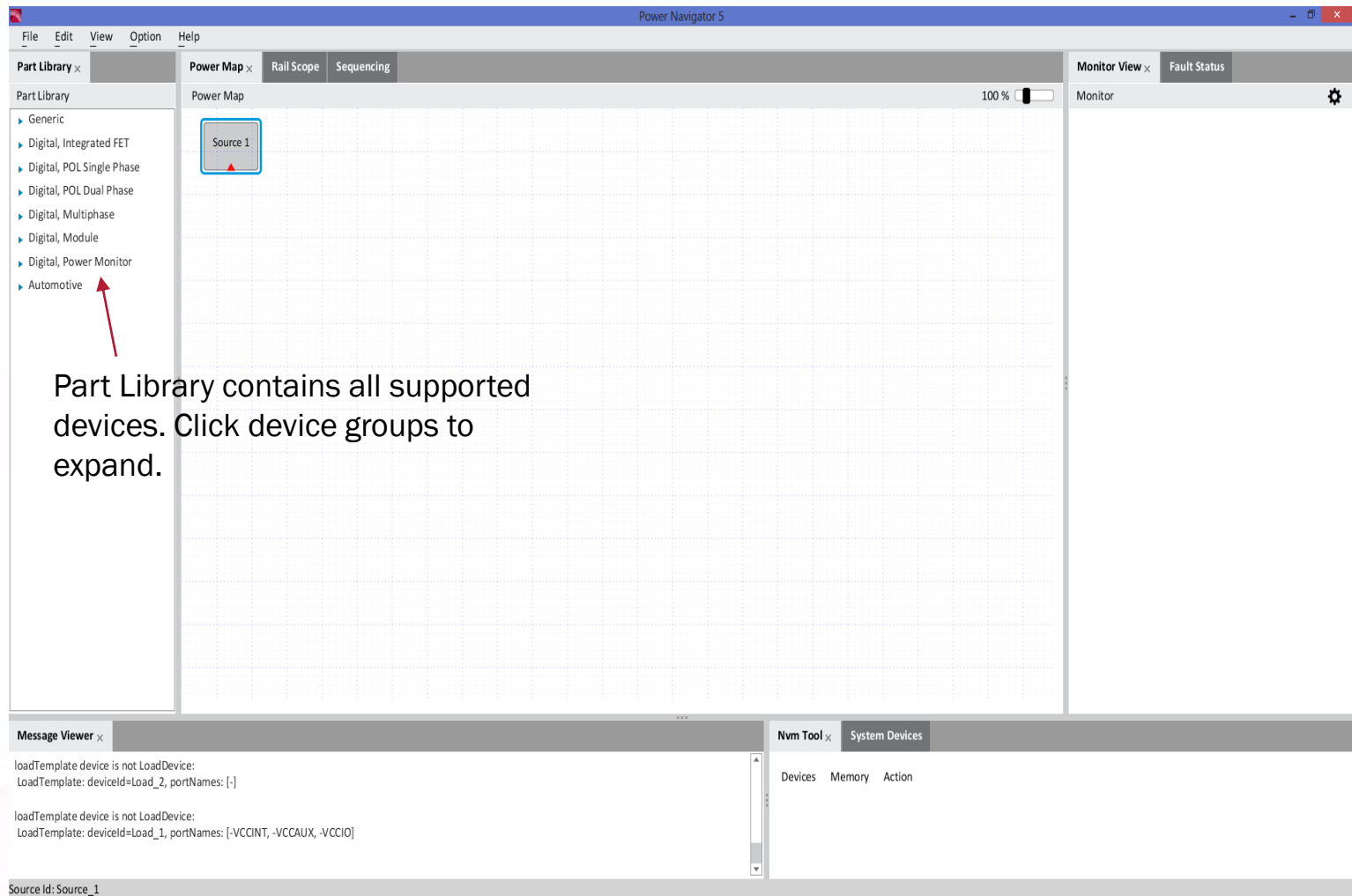
Start Cancel

PowerNavigator v5.3.6

Click on “Build New System” and then “Start”

The PowerNavigator launch screen allows you to select online (hardware connected) or offline modes of operation.

PowerNavigator – System Screen Offline Mode



PowerNavigator – System Screen Offline Mode

Power Navigator 5

File Edit View Option Help

Part Library x Power Map x Rail Scope Sequencing

Part Library

- Generic
- Digital, Integrated FET
- Digital, POL Single Phase
- Digital, POL Dual Phase
 - ZL8800
 - ZL8801
 - ZL8802
- Dig
- Dig
- Dig
- Aut

Expand device groups to see supported devices

Source 1

ZL8802 specs:
Dual Channel/Dual Phase PMBus™ ChargeMode™ Control DC/DC Digital Controller
Vout min = 0.54V
Vout max = 5.5V
Vin min = 4.5V
Vin max = 14V
Iout max = >40A

Hover over part with mouse to bring up part description and important specs

Monitor View x Fault Status

Monitor

Message Viewer x

loadTemplate device is not LoadDevice:
LoadTemplate: deviceId=Load_2, portNames: [-]

loadTemplate device is not LoadDevice:
LoadTemplate: deviceId=Load_1, portNames: [-VCCINT, -VCCAUX, -VCCIO]

Nvm Tool x System Devices

Devices Memory Action

Source Id: Source_1

PowerNavigator – System Screen Offline Mode

Part Library

- Generic
- Digital, Integrated FET
- Digital, POL Single Phase
- Digital, POL Dual Phase
 - ZL8800
 - ZL8801
 - ZL8802
 - ZL8802
- Digital, Multiphase
- Digital, Module
- Digital, Power Monitor
- Automotive

Power Map

Source 1

Comparison Window

ZL8802 specs:

Device Type: Digital, POL Dual Phase
Dual Channel/Dual Phase PMBus™ ChargeMode™ Control
DC/DC Digital Controller
Vout min = 0.54V
Vout max = 5.5V
Vin min = 4.5V
Vin max = 14V
Iout max = >40A
Key Features:
-Unique compensation-free design – always stable
-ChargeMode Control:
-achieves fast transient response
-reduced output capacitance
-provides output stability without compensation
-Proprietary single wire DDC (Digital-DC) serial bus

Visit the ZL8802 product information page:

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Vin max = 14V
Iout max = >40A
Key Features:
-Unique compensation-free design – always stable
-ChargeMode Control:
-achieves fast transient response
-reduced output capacitance
-provides output stability without compensation
-Proprietary single wire DDC (Digital-DC) serial bus
-2-channel output, 2-, 4-, 6- or 8-phase output

Visit the ZL8802 product information page:

Right click on part to add to compare window.

Compare window shows device description, key specs and link to datasheet

Message Viewer

Power Navigator version 5.3.6

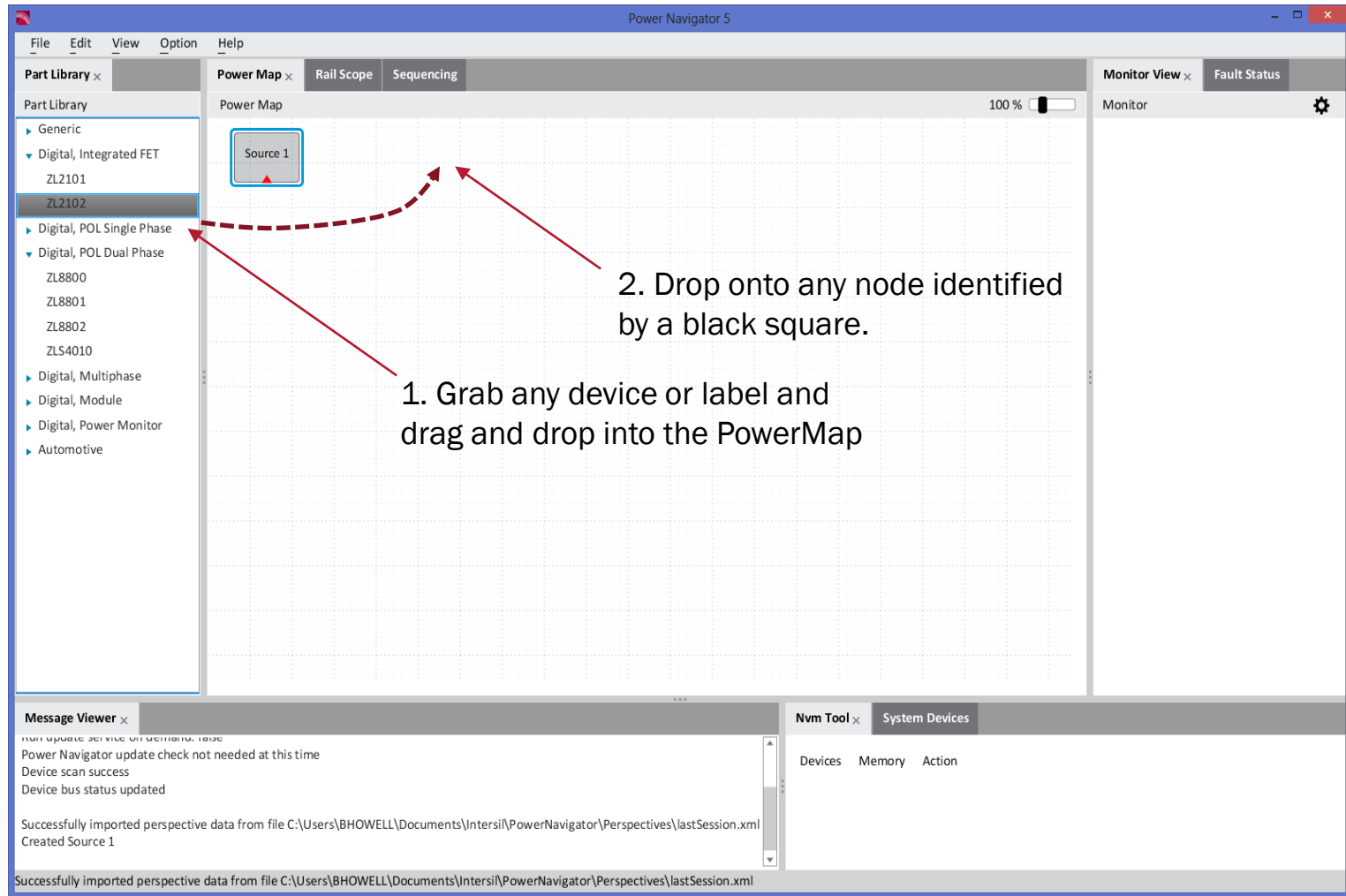
Source Id: Source_1

Nvm Tool

System Devices

Devices Memory Action

PowerNavigator – System Screen



PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 System Screen. The interface is divided into several sections:

- Part Library:** A sidebar on the left containing a tree view of components. The 'Digital, POL Dual Phase' category is expanded, showing parts like ZL2101, ZL2102, ZL8800, ZL8801, ZL8802 (highlighted), ZLS4010, and others.
- Power Map:** The central workspace showing a power rail configuration. A 'Source 1' block is connected to 'Rail 0'. 'Rail 0' is a ZL2102 1 φ converter with a 'PG' (Power Good) pin and an 'Offline' status. A red dashed arrow points to a connection point on the rail, with the text 'Additional rails can be added'. A red solid arrow points to the 'Offline' status, with the text 'Drop parts on this node to cascade rails'.
- Monitor View:** A panel on the right showing real-time monitoring data for 'Rail 0'. It includes a 'Power Good' indicator, 'Vout' (3.3 V), 'Pin Enable' dropdown, 'Immediate Off' button, 'Margin' dropdown, and graphs for 'Output Voltage' (0.00 V), 'Output Current' (0.00 A), 'Input Voltage' (0.00 V), and 'Internal Temperature' (0.00 C).
- Message Viewer:** A panel at the bottom left showing system messages. It includes a 'Device bus status updated' message and a 'Created Rail 0: ZL2102-0 0x20' message.
- Nvm Tool:** A panel at the bottom right showing 'System Devices'. It lists 'ZL2102 0x20' with a 'User' dropdown and 'Store' and 'Restore' buttons.

PowerNavigator – System Screen

The screenshot displays the PowerNavigator 5 software interface. The main window is titled "Power Navigator 5" and features a menu bar (File, Edit, View, Option, Help) and a toolbar. The interface is divided into several panes:

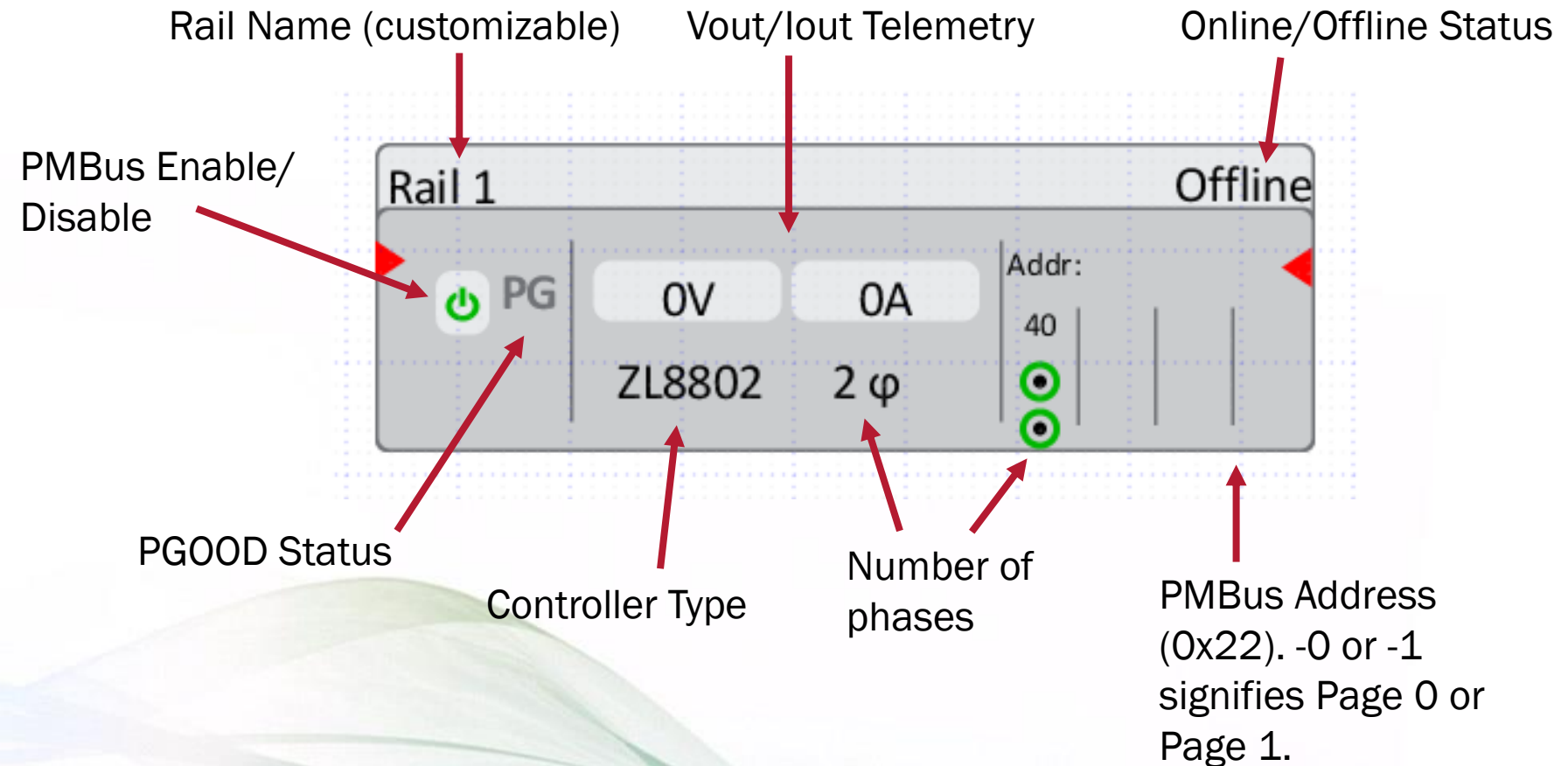
- Part Library:** A list of components including Generic, Digital, Integrated FET (ZL2101, ZL2102), Digital, POL Single Phase (ZL8800, ZL8801, ZL8802, ZLS4010), Digital, Multiphase, Digital, Module, Digital, Power Monitor, and Automotive.
- Power Map:** A central workspace showing a system-level view of power rails. It includes a "Source 1" block and four rail blocks (Rail 0, Rail 1, Rail 2, Rail 3). Each rail block displays its name, status (Offline), voltage (0V), current (0A), address, and the component it represents (e.g., ZL2102, ZL8802, ISL68200, ISL8272M). Red arrows point to these rail blocks with the text "Individual Rail Block for each device".
- Monitor View:** A panel on the right showing real-time monitoring data for "Rail 0". It includes a "Monitor" button, a "Power Good" indicator, a "Vout" field (3.3 V), a "Pin Enable" dropdown, an "Immediate Off" button, a "Margin" dropdown (Nominal), and four graphs: Output Voltage (0.00 V), Output Current (0.00 A), Input Voltage (0.00 V), and Internal Temperature (0.00 C).
- Message Viewer:** A panel at the bottom left showing device bus status updates, including "Created Rail 2: ISL68200-0 0x21" and "Created Rail 3: ISL8272M-0 0x22".
- Nvm Tool / System Devices:** A panel at the bottom right showing a table of devices and their memory addresses, with "Store" and "Restore" buttons for each.

Devices	Memory	Action
ZL2102 0x20	User	Store Restore
ZL8802 0x40	User	Store Restore
ISL68200 0x21		Store Restore

Multiple parts can be added to PowerMap, representing system level view.

PowerMap RailBlock Overview

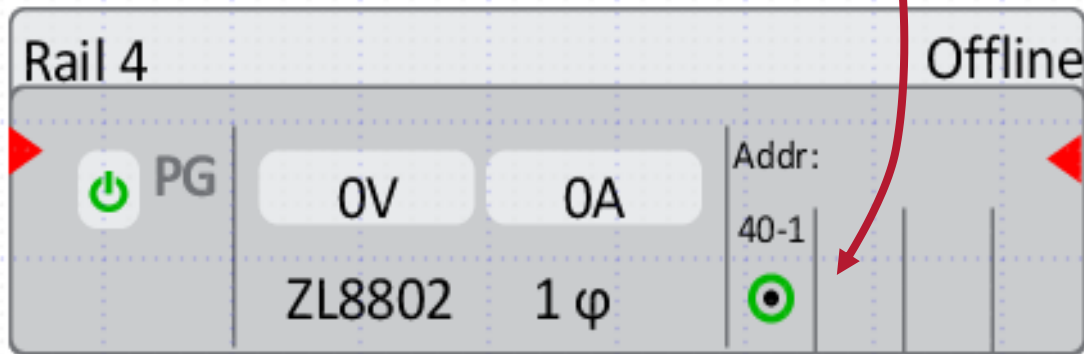
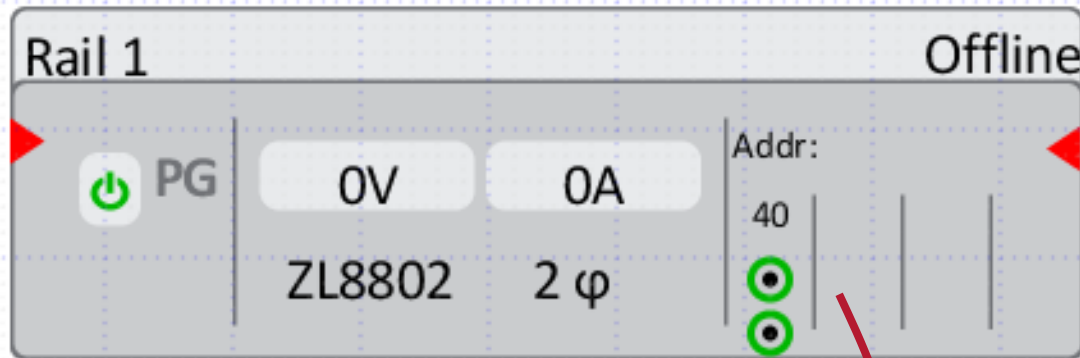
Example ZL8802 RailBlock (2-PH operation):



PowerMap RailBlock Overview

Example ZL8802 RailBlock (2-CH operation):

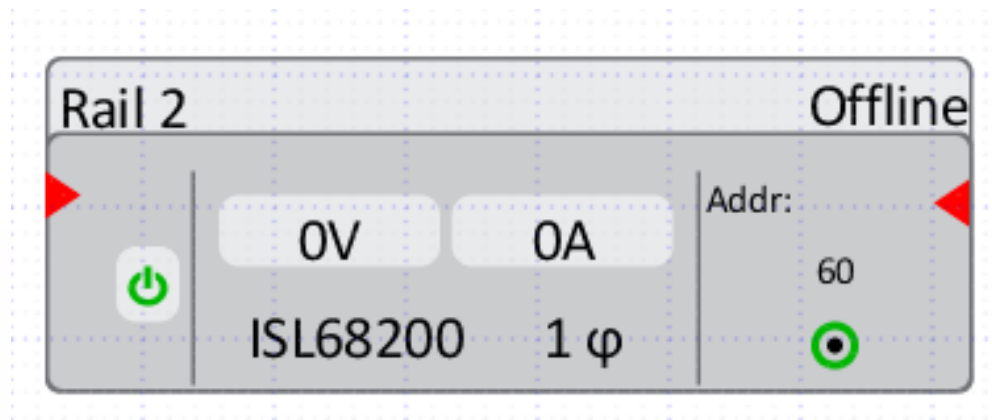
Drag and drop interface for configuration of a rail from 2-phase to dual output.



Drag "Phase Dot" to change from 2-phase to 2-Channel operation

PowerMap RailBlock Overview

Example ISL68200 RailBlock:



- Controllers which do not support current share will only have one “slot”.
- In this case, we have a single phase ISL68200 controller at PMBus address 0x60.

PowerNavigator – System Screen

The screenshot displays the PowerNavigator 5 software interface. The main window is titled "Power Navigator 5" and features a menu bar (File, Edit, View, Option, Help) and a toolbar. The interface is divided into several panes:

- Part Library:** A tree view on the left showing components like "Generic", "Load", "Rail", and various digital power modules (ZL2101, ZL2102, ZL8800, etc.).
- Power Map:** The central workspace showing a diagram of the power system. It includes a "Source 1" block, several "Rail" blocks (Rail 0, Rail 1, Rail 4, Rail 2, Rail 3), and a "Load 1" block. A red dashed line connects "Source 1" to "Load 1". A red arrow points to the "Load 1" block, which is labeled "Load block".
- Monitor View:** A panel on the right showing real-time monitoring data for "Rail 2". It includes a "Monitor" section with a power button, "Vout" (1.0 V), "PMBus & Pin Enab", and three output meters: "Output Voltage" (0.00 V), "Output Current" (0.00 A), and "Input Voltage" (0.00 V).
- Message Viewer:** A panel at the bottom left showing system messages, including "Set connectable name success", "ISL68200-0 request address change from 0x21 to 0x60", "Update System Success", "Device bus status updated", "Created Load 1", and "ZL2102-0 0x20".
- System Devices:** A panel at the bottom right showing a table of connected devices.

Device	Address	Connected	Send All	Read All
ZL2102	0x20	Offline	Send All	Read All
ZL8802	0x40	Offline	Send All	Read All
ISL68200	0x60	Offline	Send All	Read All

Load Blocks represent system load and can be added to the PowerMap from the Part Library. Double Click to add additional inputs.

Multi-input Load Boxes

1

Double Click Load to bring up Load Inspector dialog box

FPGA (Modal Dialog)

Load Name:

Input Name:

Input Name:

Input Name:

2

Hit "+" button to add additional inputs

Load 2

FPGA

VCCINT

VCCAUX

VCCIO

3

Additional inputs are now added to load box

PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 System Screen. The interface includes a menu bar (File, Edit, View, Option, Help) and a toolbar. The main workspace is divided into several panes:

- Part Library:** A tree view on the left showing categories like Generic, Load, Rail, Digital, Integrated FET, Digital, POL Single Phase, Digital, POL Dual Phase, Digital, Multiphase, Digital, Module, Digital, Power Monitor, and Automotive.
- Power Map:** The central workspace showing a power map with four rails (Rail 0, Rail 1, Rail 4, Rail 2) and two loads (FPGA, 3v3AUX). Each rail is configured with a voltage (0V), current (0A), and address (20, 40-0, 40-1, 60). The rails are currently Offline. A red arrow points from the text "Multi-input Load Box" to the FPGA load.
- Monitor View:** A panel on the right showing real-time monitoring for Rail 1. It includes a Power Good indicator, Vout (3.3 V), Pin Enable, Immediate Off, Margin (Nominal), Output Voltage (0.00 V), Output Current (0.00 A), Input Voltage (0.00 V), and Input Current (0.00 A).
- Message Viewer:** A panel at the bottom left showing system messages such as "Created Load 2", "Append Connectable Success", "Device bus status updated", "Set connectable name success", and "Set connectable name success".
- Nvm Tool / System Devices:** A panel at the bottom right showing a table of devices and their addresses.

Device	Address	Connected	Send All	Read All
ZL2102	0x20	Offline	Send All	Read All
ZL8802	0x40	Offline	Send All	Read All
ISL68200	0x60	Offline	Send All	Read All

Source Id: Source_1

After configuring system, all sources, rails and loads can be wired together.

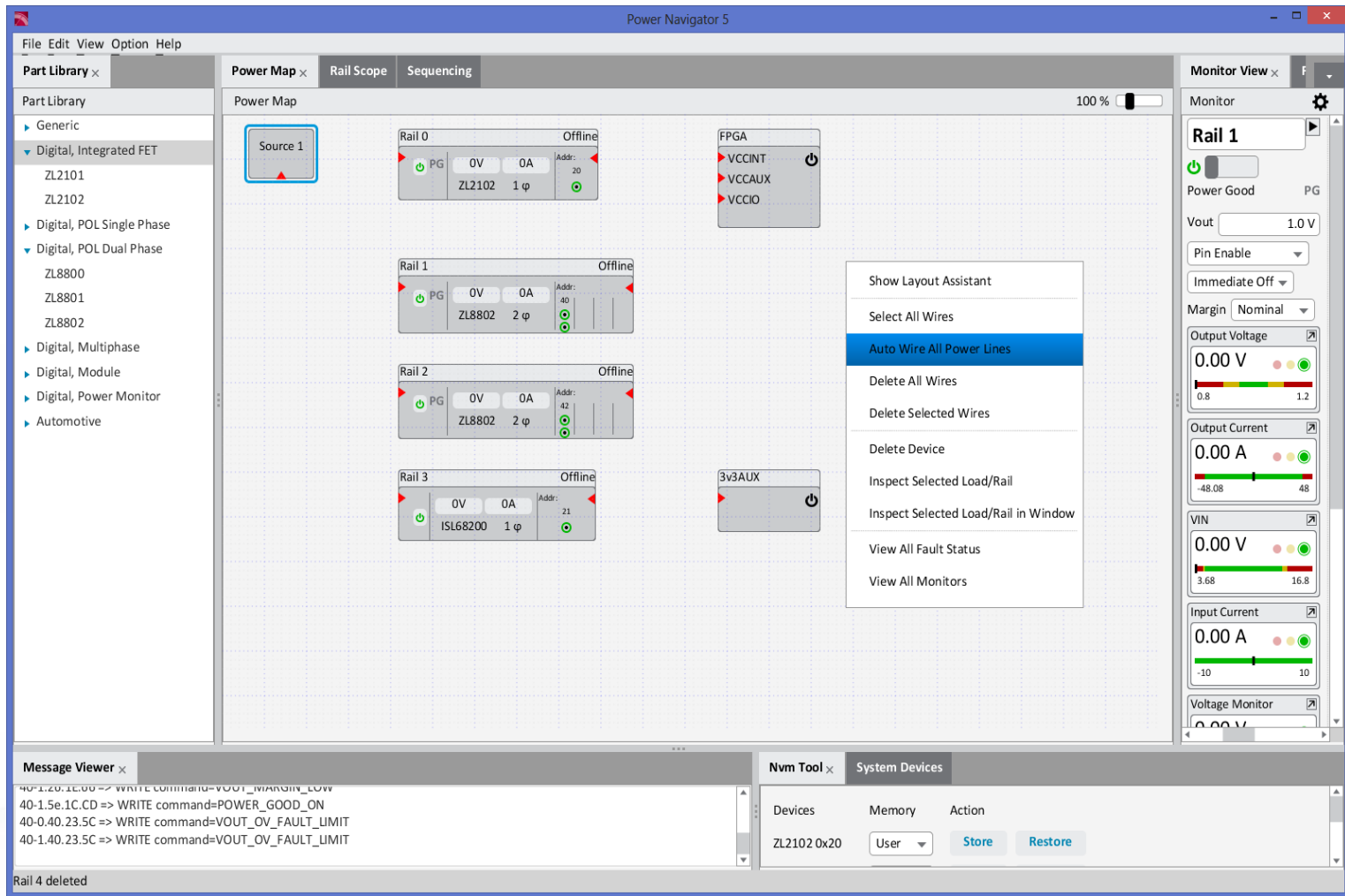
PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 System Screen, which is used for configuring and monitoring power systems. The interface is divided into several sections:

- Part Library:** A sidebar on the left containing a tree view of components. The 'Digital, Integrated FET' section is expanded, showing components like ZL2101, ZL2102, ZL8800, ZL8801, ZL8802, Digital, Multiphase, Digital, Module, Digital, Power Monitor, and Automotive.
- Power Map:** The central workspace showing a diagram of the power system. It includes a 'Source 1' block, four rail blocks (Rail 0, Rail 1, Rail 2, Rail 3), and two load blocks (FPGA and 3v3AUX). Rail 0 is connected to Source 1. The rail blocks show their status (Offline), voltage (0V), current (0A), and address. The load blocks show their power requirements (VCCINT, VCCAUX, VCCIO for FPGA; 3v3AUX for the load).
- Monitor View:** A panel on the right showing real-time monitoring data for Rail 1. It includes a 'Power Good' indicator, 'Vout' (1.0 V), 'Pin Enable' dropdown, 'Immediate Off' button, 'Margin' (Nominal), 'Output Voltage' (0.00 V), 'Output Current' (0.00 A), 'VIN' (0.00 V), 'Input Current' (0.00 A), and 'Voltage Monitor'.
- Message Viewer:** A panel at the bottom left showing a log of messages. The messages are: '40-1.20.1E.00 => WRITE command=VOUT_MARGIN_LOW', '40-1.5e.1C.CD => WRITE command=POWER_GOOD_ON', '40-0.40.23.5C => WRITE command=VOUT_OV_FAULT_LIMIT', and '40-1.40.23.5C => WRITE command=VOUT_OV_FAULT_LIMIT'.
- Nvm Tool:** A panel at the bottom right showing a table of devices and their memory. The table has columns for 'Devices', 'Memory', and 'Action'. The data row shows 'ZL2102 0x20' with 'User' memory and 'Store' and 'Restore' actions.

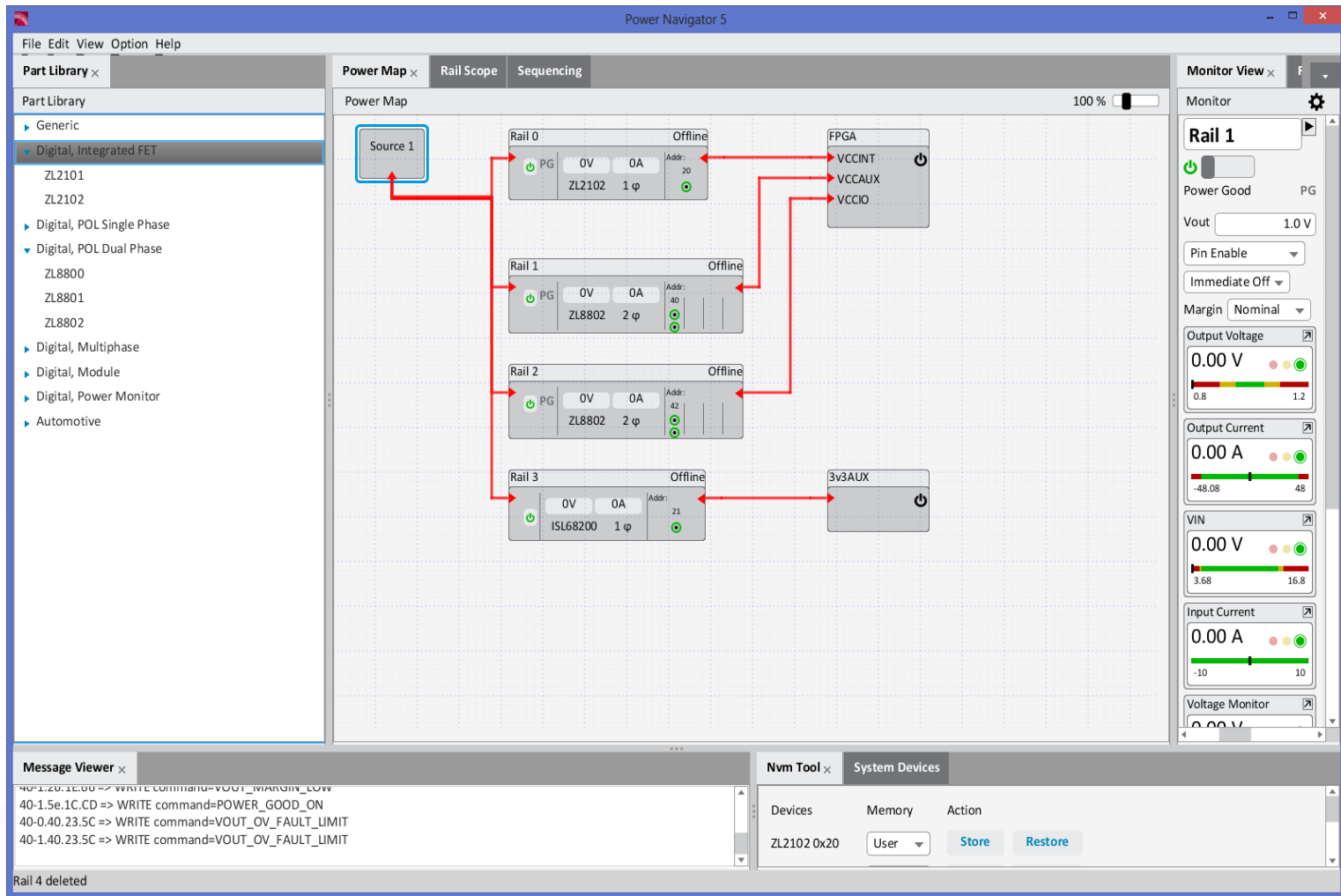
A red arrow points from the text 'Source to Rail Wiring' to the connection between Source 1 and Rail 0.

PowerNavigator 5.3 – System Screen



Right-click on PowerMap to bring up contextual menu. Select "Auto Wire All Power Lines" to auto wire PowerMap.

PowerNavigator 5.3 – System Screen



Fully wired PowerMap with multi-input loads.

PowerNavigator 5.3 – System Screen

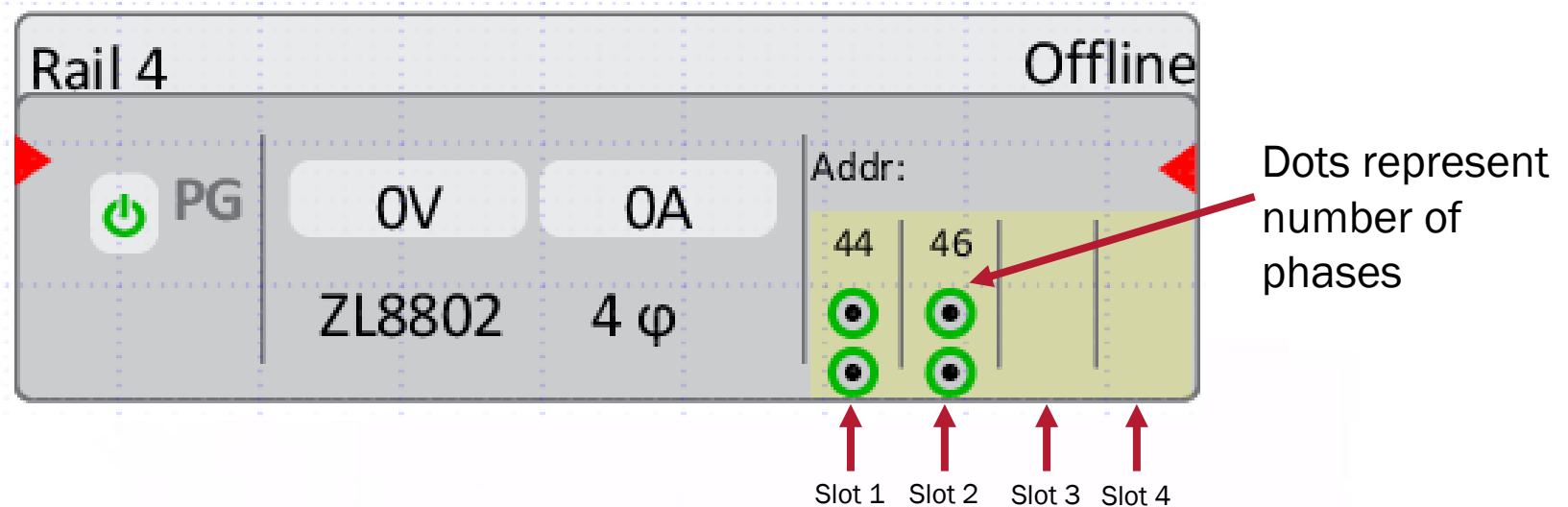
The screenshot displays the PowerNavigator 5.3 System Screen. The interface includes a menu bar (File, Edit, View, Option, Help) and a toolbar. The main workspace is divided into several panels:

- Part Library:** Located on the left, it lists various power components categorized by type (Generic, Digital, Integrated FET, Digital, POL Single Phase, Digital, POL Dual Phase, Digital, Multiphase, Digital, Module, Digital, Power Monitor, Automotive). A dashed red arrow points from the 'Digital, Multiphase' category to an open slot in Rail 2.
- Power Map:** The central workspace showing four rails (Rail 0, Rail 1, Rail 2, Rail 3) and their connections. Each rail is represented by a block with a power button icon, a 'PG' (Power Good) indicator, and a 'Vout' (Output Voltage) field. Rail 0 is connected to an FPGA block (VCCINT, VCCAUX, VCCIO). Rail 1 is connected to a 3v3AUX block. Rail 2 is connected to a 3v3AUX block. Rail 3 is connected to a 3v3AUX block. A 'Source 1' block is connected to Rail 0. A dashed red arrow points from the 'Digital, Multiphase' category in the Part Library to an open slot in Rail 2.
- Monitor View:** Located on the right, it displays real-time monitoring data for the selected rail (Rail 0). It includes a 'Monitor' button, a 'Power Good' indicator, a 'Vout' field (3.3 V), a 'Pin Enable' dropdown, an 'Immediate Off' button, a 'Margin' dropdown (Nominal), and two output voltage/current meters (Output Voltage: 0.00 V, Output Current: 0.00 A).
- Message Viewer:** Located at the bottom left, it displays system messages. The current message is: 'register is null for parameter: Over temperature fault: false', 'register is null for parameter: Power Good: false', 'register is null for parameter: None of the above: false', 'register is null for parameter: Vin UV Warning: false'. Below this, it says 'Rail 4 deleted'.
- Nvm Tool:** Located at the bottom right, it displays a table of system devices. The table has columns for 'Devices', 'Memory', and 'Action'. The current device is 'ZL2102 0x20', with 'User' in the Memory column and 'Store' and 'Restore' buttons in the Action column.

To implement a current sharing rail, drag a part from the part library onto an open RailBlock “slot”.

PowerMap RailBlock Overview

Example ZL8802 RailBlock (4-PH operation):



- The ZL8802 allows for 2-PH, 4-PH, 6-PH or 8-PH operation via current share.
- Each “slot” in the RailBlock represents shows how many controllers can be paralleled in a current share group.
- To create a current share group, a controller can be dragged from the part library into a “slot”, creating a current share rail.
- In this case, we have a 4-phase design, with two ZL8802 controllers – one at PMBus address 0x44 and another at 0x46.

PowerNavigator 5.3 – System Screen

The screenshot displays the PowerNavigator 5.3 System Screen. The main window shows a Power Map with four rails (Rail 0, Rail 1, Rail 2, Rail 3) and their connections to various components. The components include an FPGA, 3v3AUX, and ISL68200. The rails are configured with different voltage levels and current limits. The Monitor View on the right shows the status of the rails, including output voltage and current. The Message Viewer at the bottom shows system messages.

Power Map Details:

- Rail 0:** 0V, 0A, ZL2102 1 ϕ , Addr: 20. Connected to FPGA (VCCINT, VCCAUX, VCCIO).
- Rail 1:** 0V, 0A, ZL8802 2 ϕ , Addr: 40.
- Rail 2:** 0V, 0A, ZL8802 4 ϕ , Addr: 42, 44. Labeled "ZL8802 4PH Current Share".
- Rail 3:** 0V, 0A, ISL68200 1 ϕ , Addr: 21. Connected to 3v3AUX.

Monitor View Details:

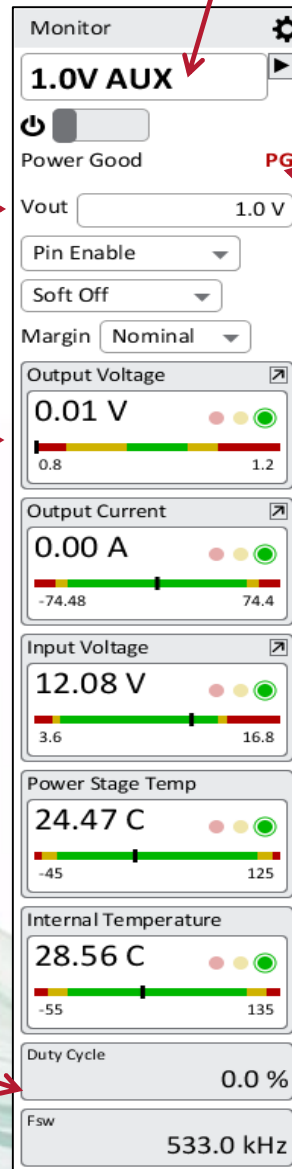
- Rail 0:** Power Good, PG, Vout: 3.3 V, Pin Enable, Immediate Off, Margin: Nominal.
- Output Voltage:** 0.00 V, Range: 2.64 to 3.96.
- Output Current:** 0.00 A, Range: -10.8 to 10.8.
- VIN:** 0.00 V, Range: 6 to 16.8.

Message Viewer:

- Created Rail 2: ZL8802-2 0x42 ϕ 0
- Created Rail 3: ISL68200-0 0x21
- Successfully set user data

Source Id: Source_1

Monitoring View



Device rail name

View configuration options

Adjustment on output voltage

PGOOD indicator

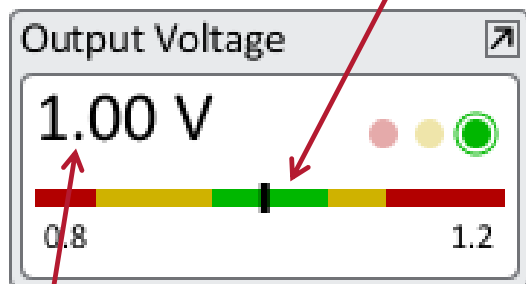
Monitoring readouts for Vin, Vout, Iout, Iin

Temperature monitors for both internal (controller junction) and external (power stage FETs)

Duty cycle and switching frequency

Readouts

Analog sliding meter with color indicators.
Green is within normal limits, yellow in PMBus
warning limits, red for exceeding OVP/UVF
settings



Clicking this button will open the window
below allowing adjustment of limits

Operation and fault lights

Digital readout of
output voltage

The 'Vout Margins & Limits' window allows configuration of output voltage limits and margins. It includes a 'Set to Defaults' button and a 'Vout Command' field.

Parameter	Value	Percentage
Vout Max	1.15 V	
Vout OV Fault Limit	1.1 V	10.0 %
Vout Margin High	1.05 V	5.0 %
Vout Margin Low	0.95 V	-5.0 %
Power Good Threshold	0.9 V	-10.0 %
Vout UV Fault Limit	0.85 V	-15.0 %

Margin/Limits Track Vout ☒

Display Limit High 1.2 V 20.0 %

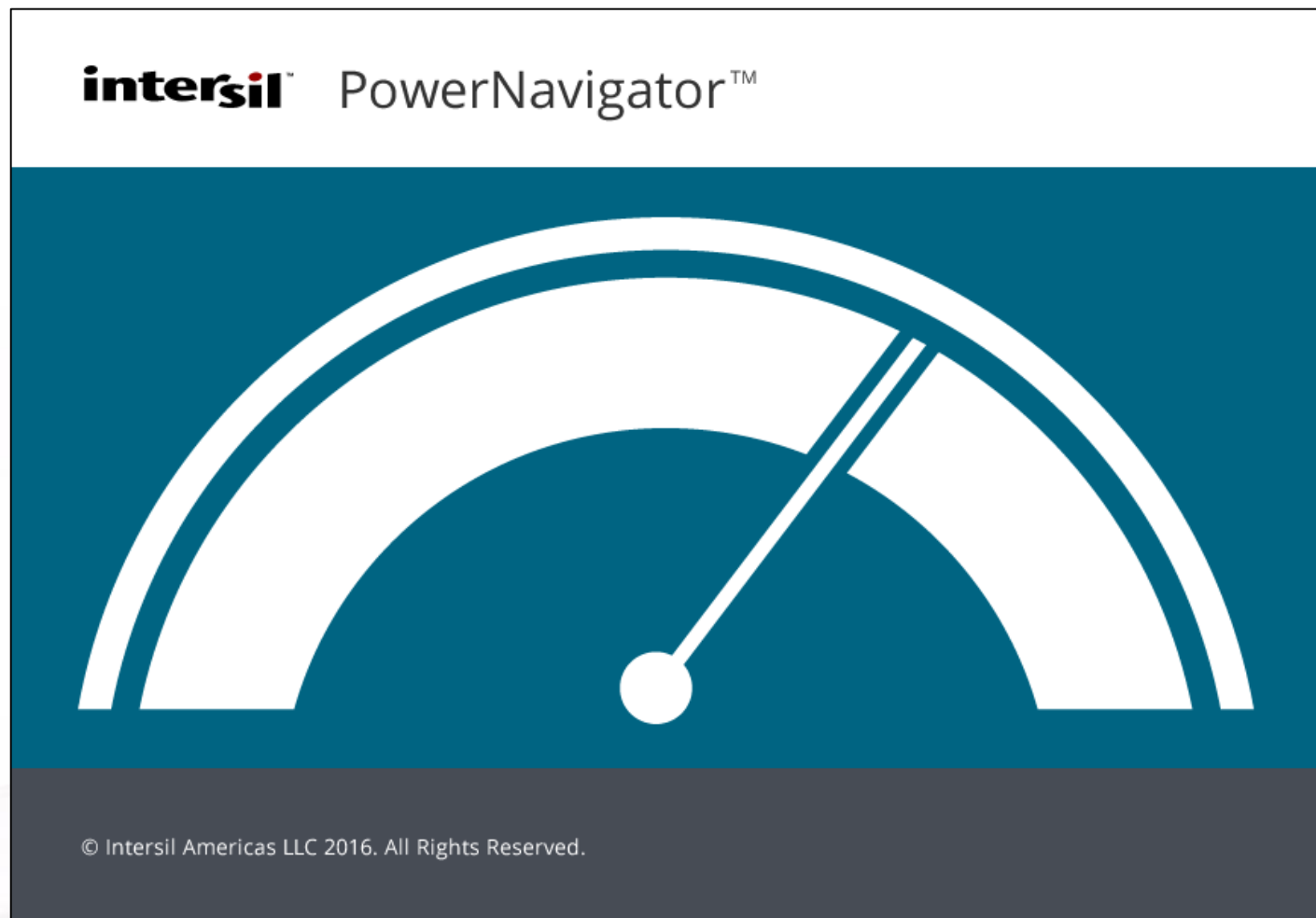
Display Limit Low 0.8 V -20.0 %

Display Limits Track Vout ☒

Vout Command 1.0 V

The window also contains a smaller 'Output Voltage' readout window in the bottom right corner, which is identical to the one shown in the top left.

Connecting to Hardware



Connect to Hardware...

- **To connect to hardware, a USB to PMBus adapter (ZLUSBEVAL3Z, included with all demo kits) is required.**
- **STEP 1: Connect USB cable from PC to USB adapter**
- **STEP 2: Connect USB to PMBus adapter to demo board hardware**
- **STEP 3: Power demo board**
- **STEP 4: Launch PowerNavigator software**

Connect to Hardware...

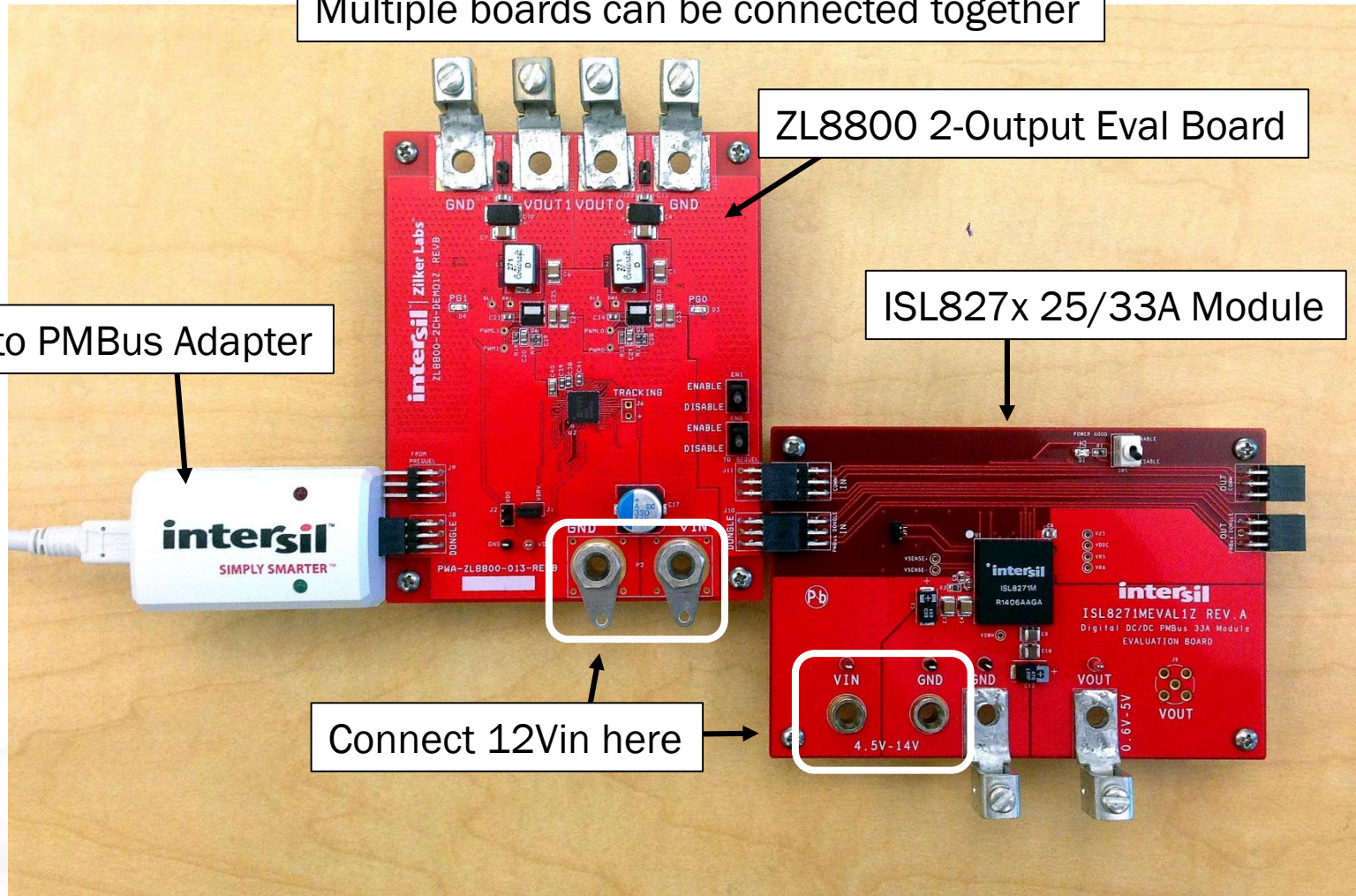
Multiple boards can be connected together

ZL8800 2-Output Eval Board

ISL827x 25/33A Module

USB to PMBus Adapter

Connect 12Vin here

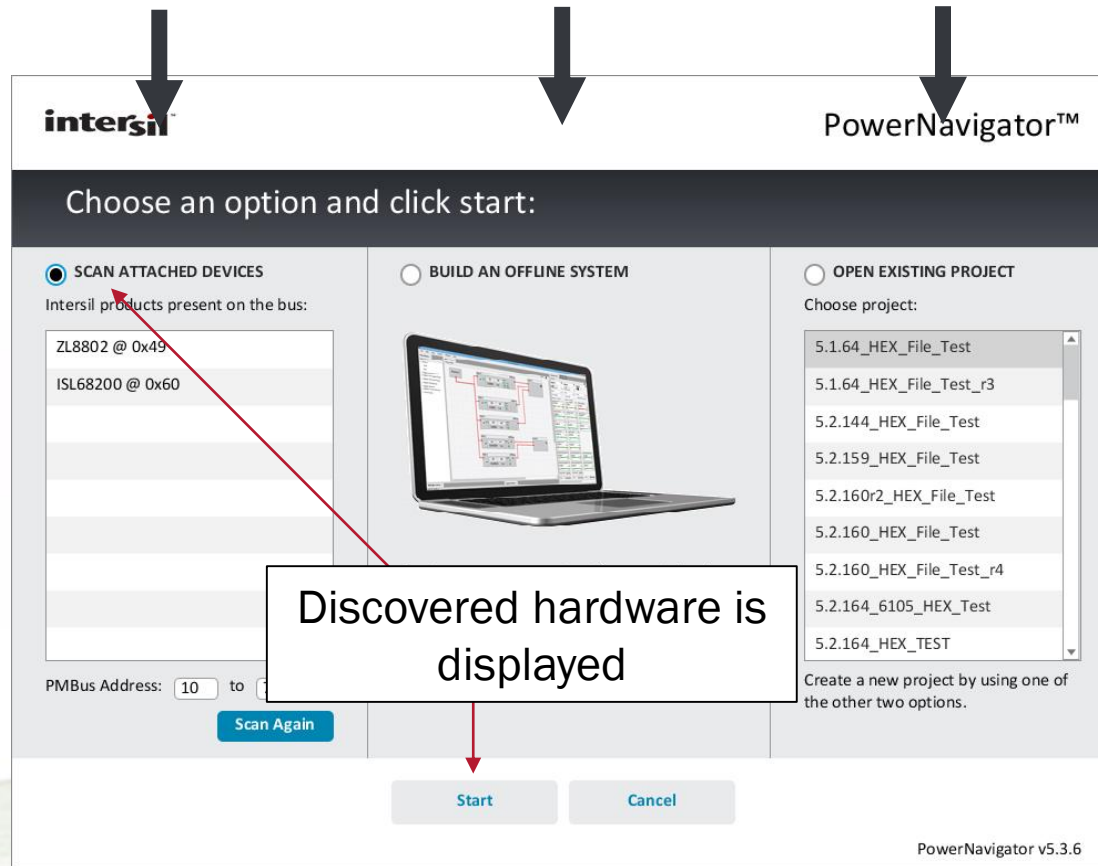


PowerNavigator Launch Screen

Connected Devices

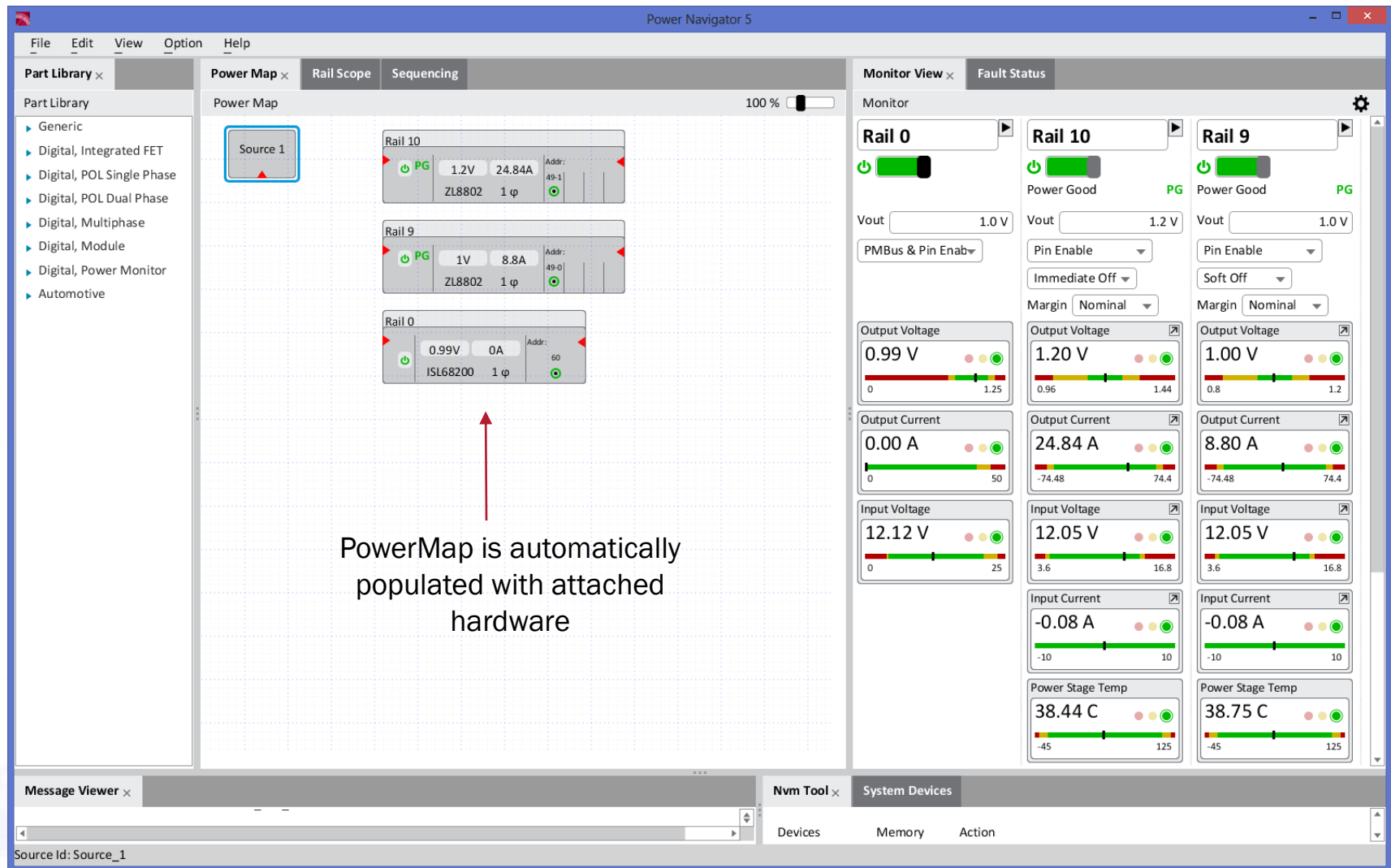
Offline Mode

Project Load

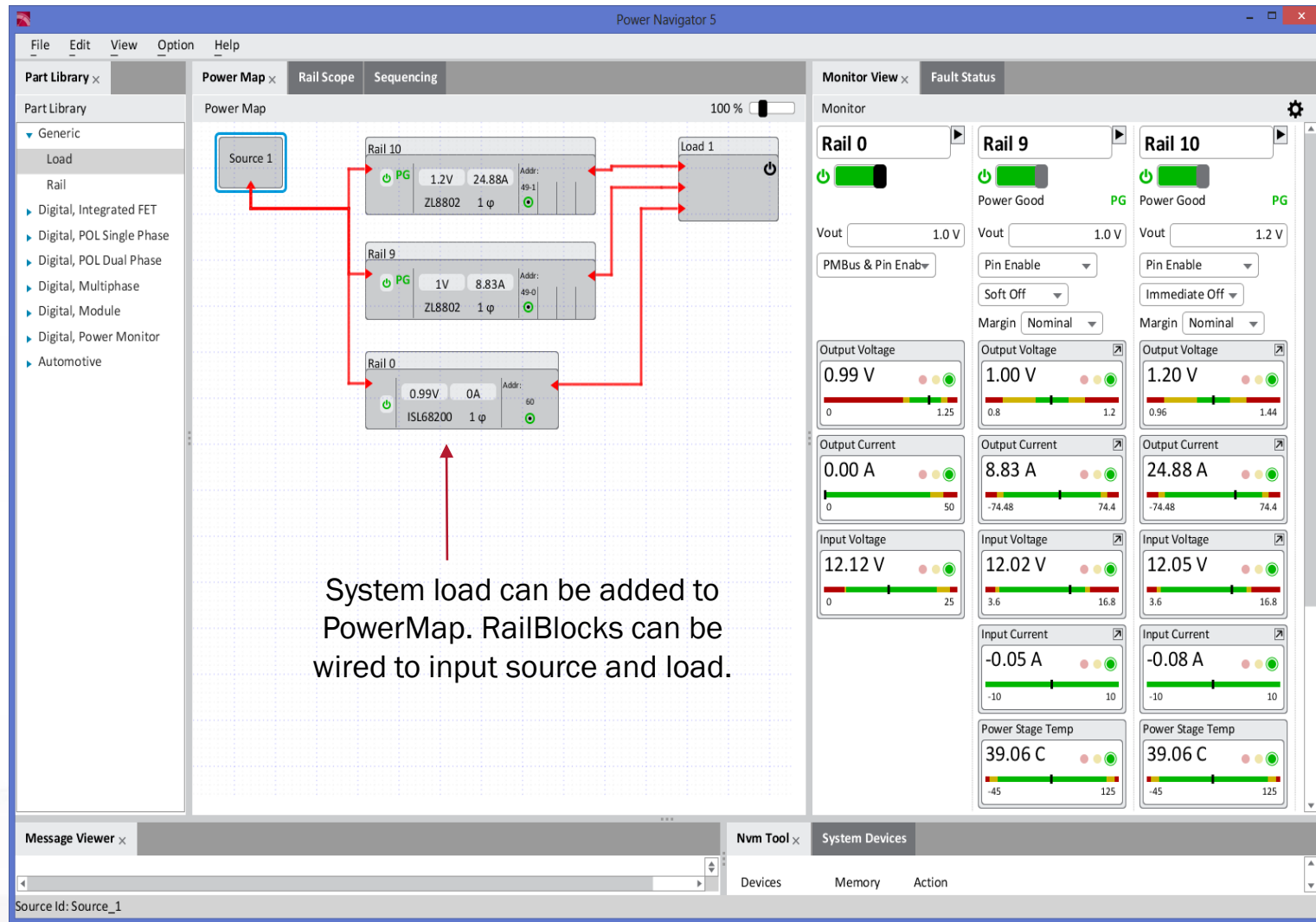


All discovered hardware is displayed in the “Scan Devices” window. The PMBus scan range can be adjust – default range is 0x10 to 0x7F.

PowerNavigator 5.3 – Connect to HW



PowerNavigator 5.3 – Connect to HW



PowerNavigator 5.3 – Project Save

The screenshot displays the PowerNavigator 5.3 software interface. The 'File' menu is open, with the 'Save' option highlighted. A red box encloses the 'File' menu and a text box that reads: 'To save a project, go to File -> Save'. Another red box encloses the 'Save Project' dialog box and a text box that reads: 'Saving a project will save any device configuration files, PowerMap setup, and PowerNavigator perspective settings.' The 'Save Project' dialog box is open, showing 'Project Name' as 'new' and a list of examples. The background interface shows a 'Power Map' with various rails (Rail 0, Rail 9, Rail 10) and a 'Monitor View' with various parameters (Output Voltage, Output Current, Input Voltage, Input Current, Power Stage Temp).

File Edit View Option Help

New Save Ctrl+S Open Ctrl+O Perspective Setting Export Production Hex Exit

Power Map Rail Scope Sequencing

Power Map 100 %

Source 1

Rail 10 1.2V 24.91A ZL8802 1 φ

Load 1

Monitor View Fault Status

Monitor

Rail 0 Rail 9 Rail 10

Power Good PG

Vout 1.2 V

Pin Enable Immediate Off Margin Nominal

Output Voltage 1.20 V

Output Current 24.91 A

Input Voltage 12.02 V

Input Current -0.08 A

Power Stage Temp 39.38 C

Project Name

new

example

☐ Do not save perspective

Please disable devices before save project.

Save Cancel

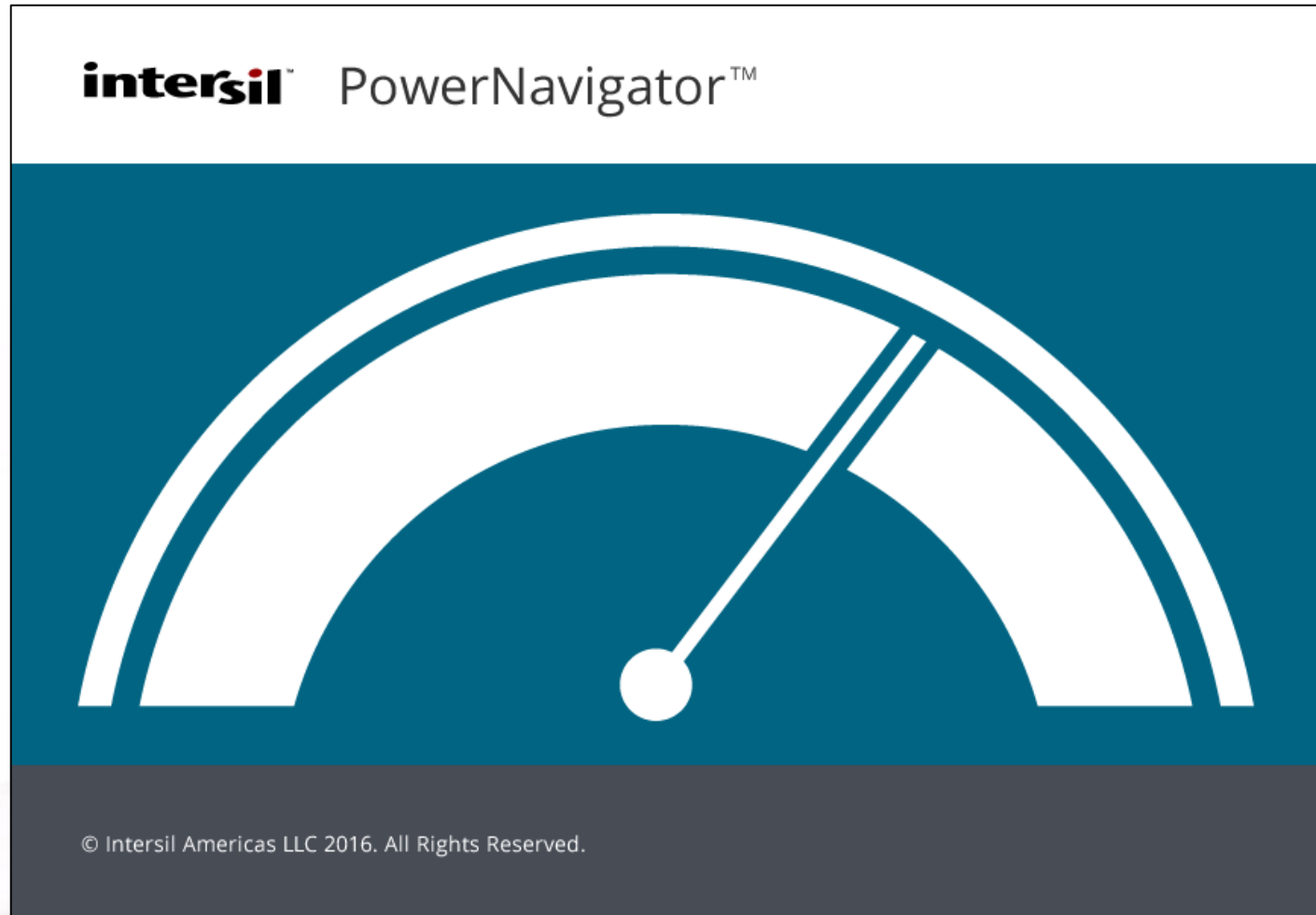
Message Viewer

Nvm Tool System Devices

Devices Memory Action

Source Id: Source_1

PowerNavigator – Rail Inspector



PowerNavigator 5.3 – Rail Inspector

- **Rail Inspector tool eases device configuration**
 - Double click on RailBlocks to bring up individual Rail Inspector for each device.
 - Each device in PowerNavigator can have its own, customized Rail Inspector.
- **Rail Inspector tool can be used to:**
 - Quickly see rail summary, including PMBus addresses, controller type, PMBus status, device options, fault status, etc.
 - Save/Load Configuration Files
 - Configure device using command tool
- **Allows for future expandability**
 - Future releases of PowerNavigator will expand Rail Inspector features

PowerNavigator 5.3 – Rail Inspector

1 Double Click RailBlock to bring up Load Inspector window

2 Rail Inspector Window will appear

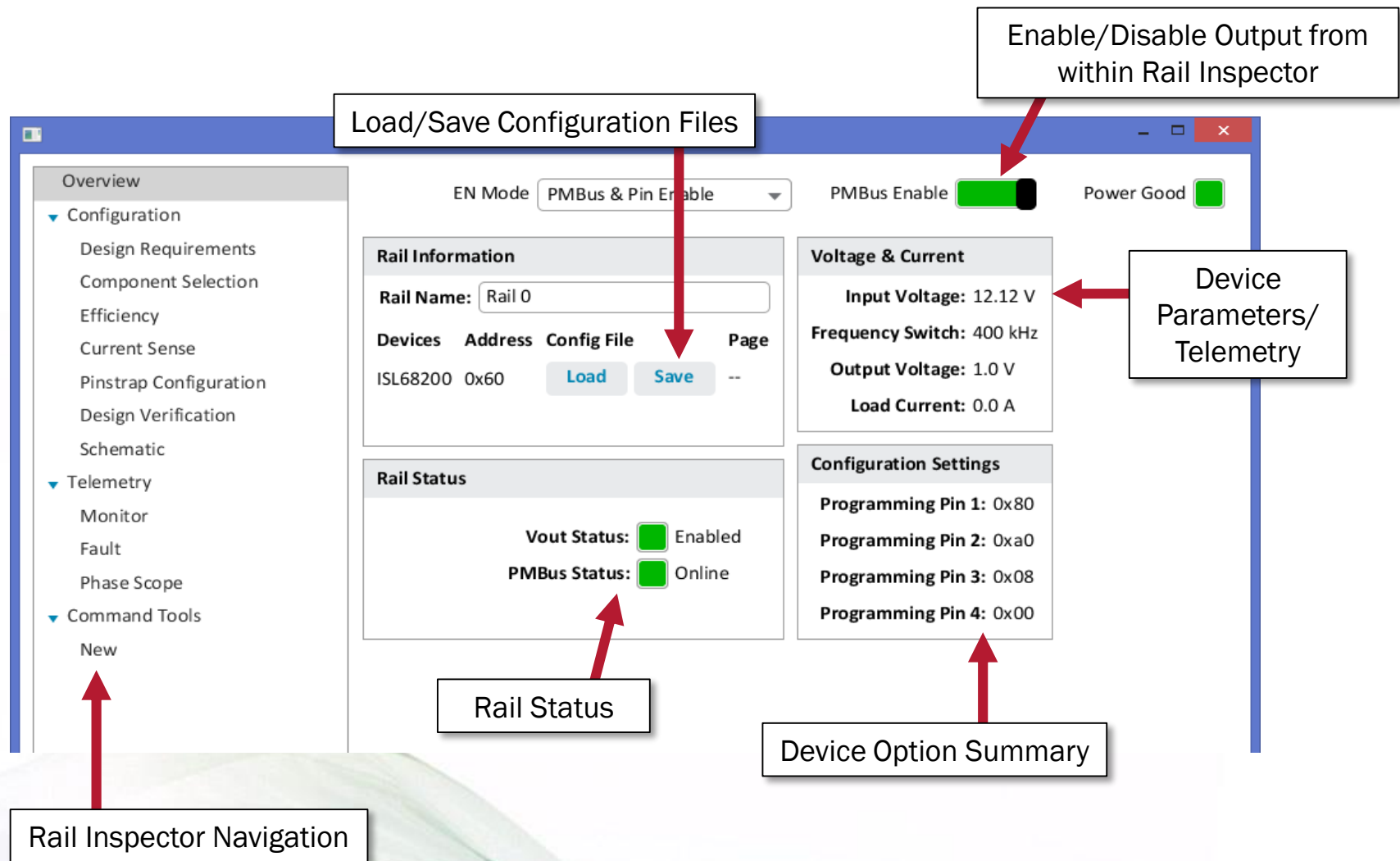
The screenshot displays the PowerNavigator 5.3 interface. The main window shows a Power Map with three rails: Rail 10 (1.2V, 24.88A), Rail 9 (1V, 8.86A), and Rail 0 (0.99V, 0A). A red arrow points from the Rail 0 block to the Rail Inspector window. The Rail Inspector window is open, showing the Overview tab with a list of configuration options. The Rail Information section shows the Rail Name as Rail 0 and the device as ISL68200. The Voltage & Current section shows the Input Voltage as 12.12 V, Frequency Switch as 400 kHz, Output Voltage as 1.0 V, and Load Current as 0.0 A. The Rail Status section shows the Vout Status as Enabled and the PMBus Status as Online. The Configuration Settings section shows the Programming Pin 1 as 0x80, Programming Pin 2 as 0xa0, Programming Pin 3 as 0x08, and Programming Pin 4 as 0x00.

Message Viewer x

ISL68200-00x60

intelsil

Example Rail Inspector – ISL68200



Example Rail Inspector – ISL68200

Rail 0

EN Mode PMBus & Pin Enable PMBus Enable ON Power Good ON

Design Requirements

Input Voltage

Max Input Voltage	13.2 V	10.0 %
Typ Input Voltage	12.0 V	
Min Input Voltage	10.8 V	-10.0 %

☒ Track by Percent

Output Voltage

Output Voltage	1.0 V	
Vout Tolerance	5.0 %	
Vout Ripple	10.0 mV	1.0 %

☒ Track by Percent

Load

Max Load Current	30.0 A	
Max Load Step	15.0 A	50.0 %
Over Current Trip Point	37.5 A	125.0 %

☒ Track by Percent

Design Requirements – Enter Vin, Vout and Iout requirements

Example Rail Inspector – ISL68200

Overview

- Configuration
 - Design Requirements
 - Component Selection
 - Efficiency
 - Current Sense
 - Pinstrap Configuration
 - Design Verification
 - Schematic
- Telemetry
 - Monitor
 - Fault
 - Phase Scope
- Command Tools
 - New

EN Mode: PMBus & Pin Enable

PMBus Enable: ☒

Power Good: ☒

Click on components in the schematic to configure them.

FSW: 400 kHz

VIN = 12.0 V

Q1: Rds(on) = 5.0 mΩ, Quantity = 1

L = 0.22 μH, DCR = 0.29 mΩ

VOUT = 1.0 V

Q2: Rds(on) = 1.2 mΩ, Quantity = 1

Qty = 4, C = 220.0 μF, ESR = 4.0 mΩ, ESL = 1.0 nH

Qty = 2, C = 47.0 μF, ESR = 4.0 mΩ, ESL = 0.6 nH

UFET

Manufacturer Part No:

Quantity:

Rds(on) at 5V:

Qg:

Coss:

Ton_Switch:

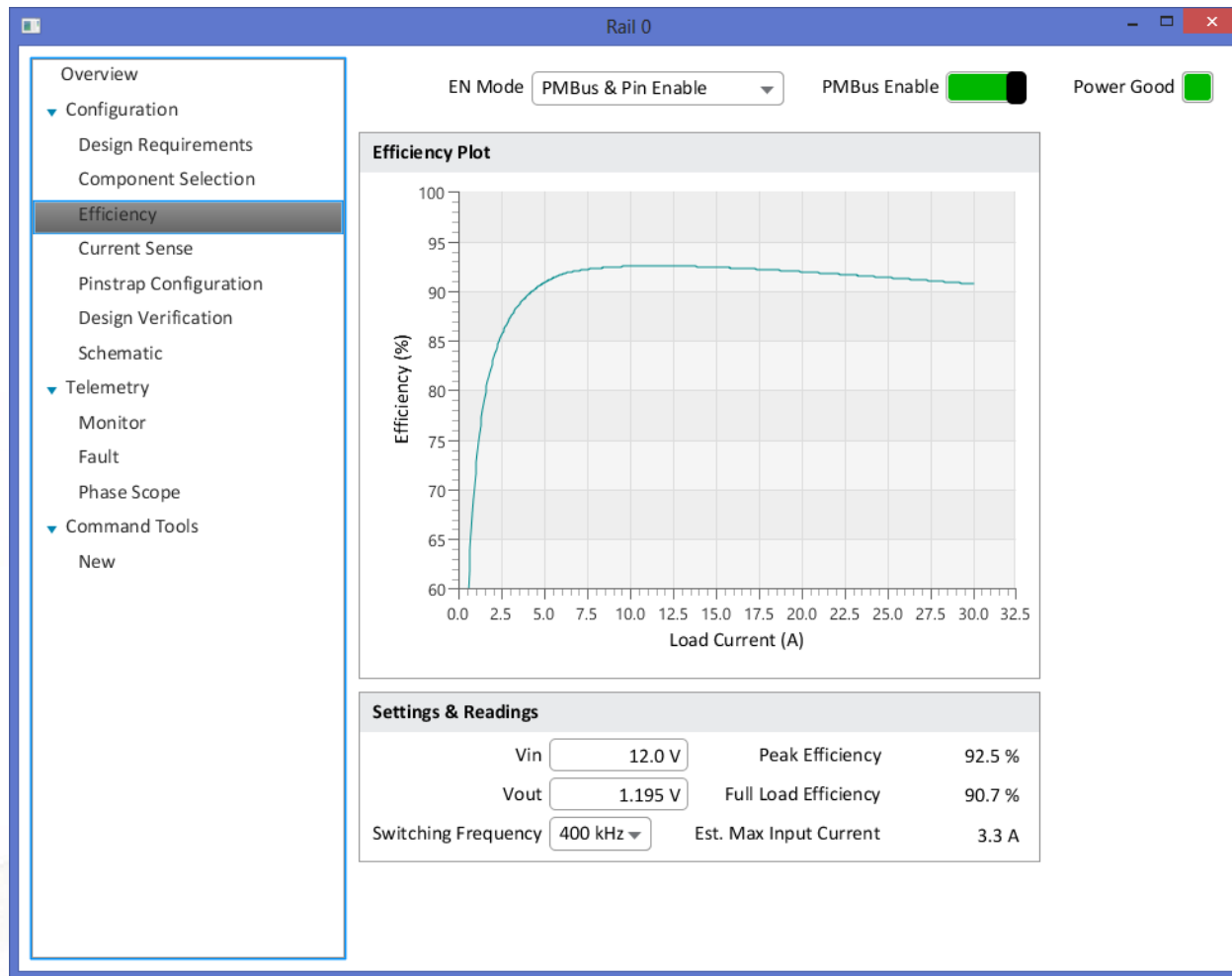
Toff_Switch:

Current	
Inductor Peak-Peak Ripple	10.417 A
Peak Current at Full Load	35.208 A

DCR Match	
RDCR	9.53 kΩ
CDCR	1.0 μF

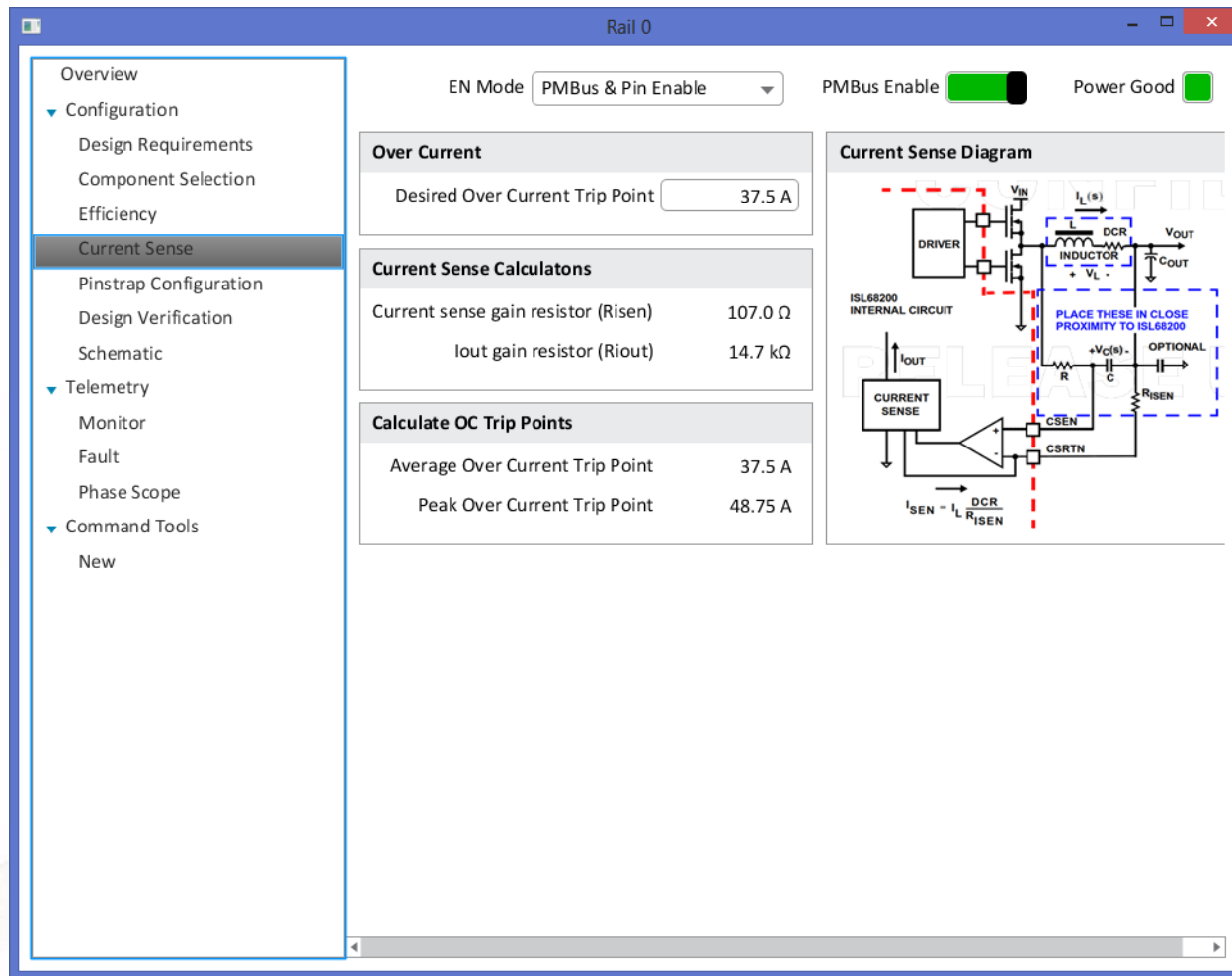
Component Selection – Enter FET, Inductor and Output Cap information

Example Rail Inspector – ISL68200



Efficiency – Real time plot of efficiency with selected components and switching frequency.

Example Rail Inspector – ISL68200



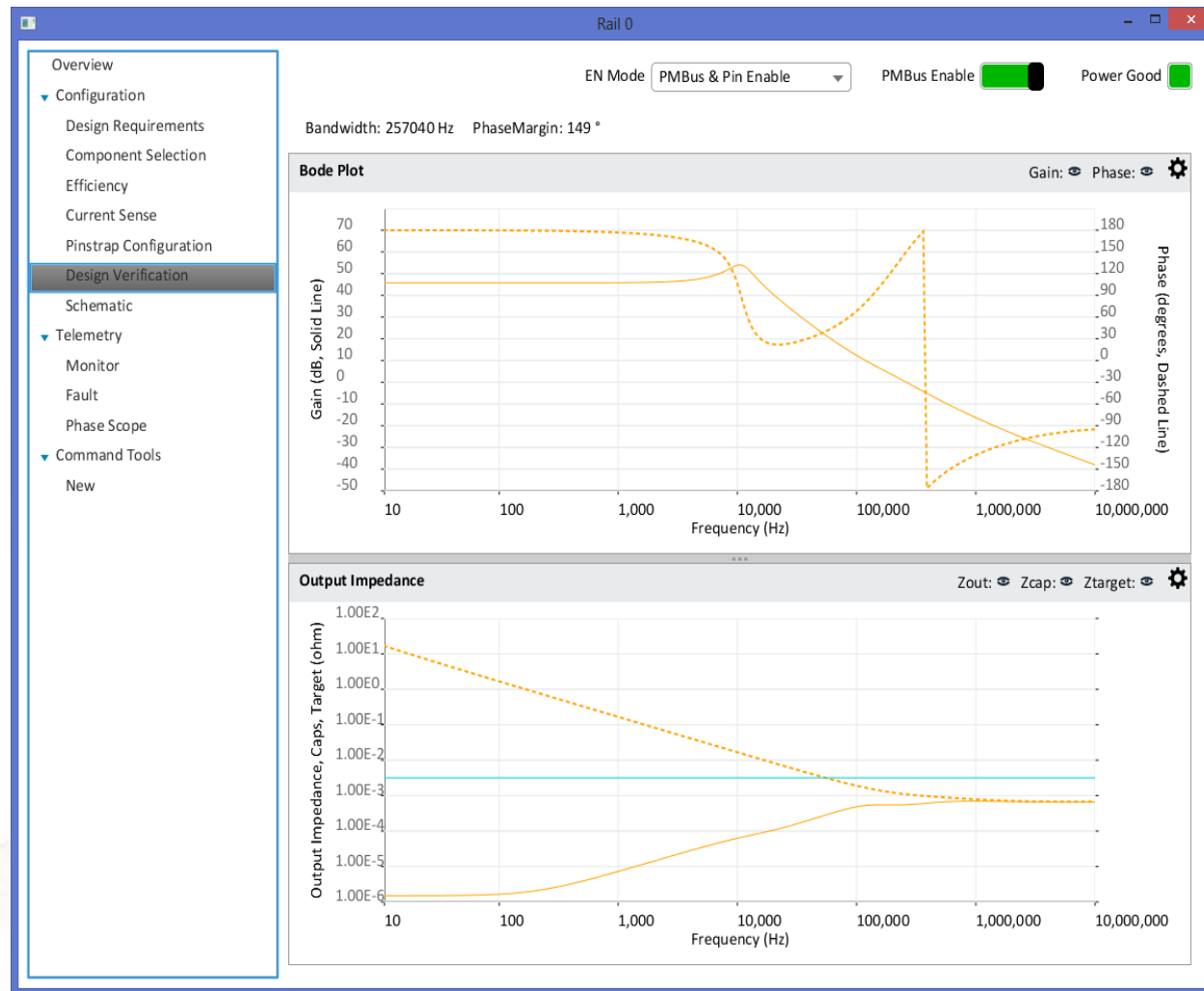
Current Sense – Automatic calculation of current sense resistor settings based on desired OC trip point.

Example Rail Inspector – ISL68200

The screenshot displays the 'Rail 0' software interface. On the left is a navigation menu with the following items: Overview, Configuration (expanded), Design Requirements, Component Selection, Efficiency, Current Sense, Pinstrap Configuration (selected), Design Verification, Schematic, Telemetry (expanded), Monitor, Fault, Phase Scope, Command Tools (expanded), and New. The main area is titled 'Rail 0' and contains several controls: 'EN Mode' set to 'PMBus & Pin Enable', 'PMBus Enable' toggle (on), and 'Power Good' indicator (on). Below these are four pin configuration panels: 'PROG1 Pin' (Output Voltage: 1.195 V, Register Value 0x5E, Rup 45.3 kΩ, Rdown 150 kΩ), 'PROG2 Pin' (Disable PFM toggle (on), TCOMP: +15 °C, PMBus Address: 0x60, Register Value 0xA0, Rup OPEN, Rdown 105 kΩ), 'PROG3 Pin' (OCP/OTP: Retry, FSW: 400 kHz, AV Gain: 42, 25 kHz Clamp toggle (on), Register Value 0x08, Rup 29.4 kΩ, Rdown 15 kΩ), and 'PROG4 Pin' (SS dv/dt: 1.25 mV/us, R4 RR: 200 kΩ, AV Multiplier: x1, Register Value 0x00, Rup OPEN, Rdown 10 kΩ). Each panel has 'Reset' and 'Send' buttons. At the bottom, a note states: '*Settings other than those selected by PROGx To finalize changes, resistor values on hardware'.

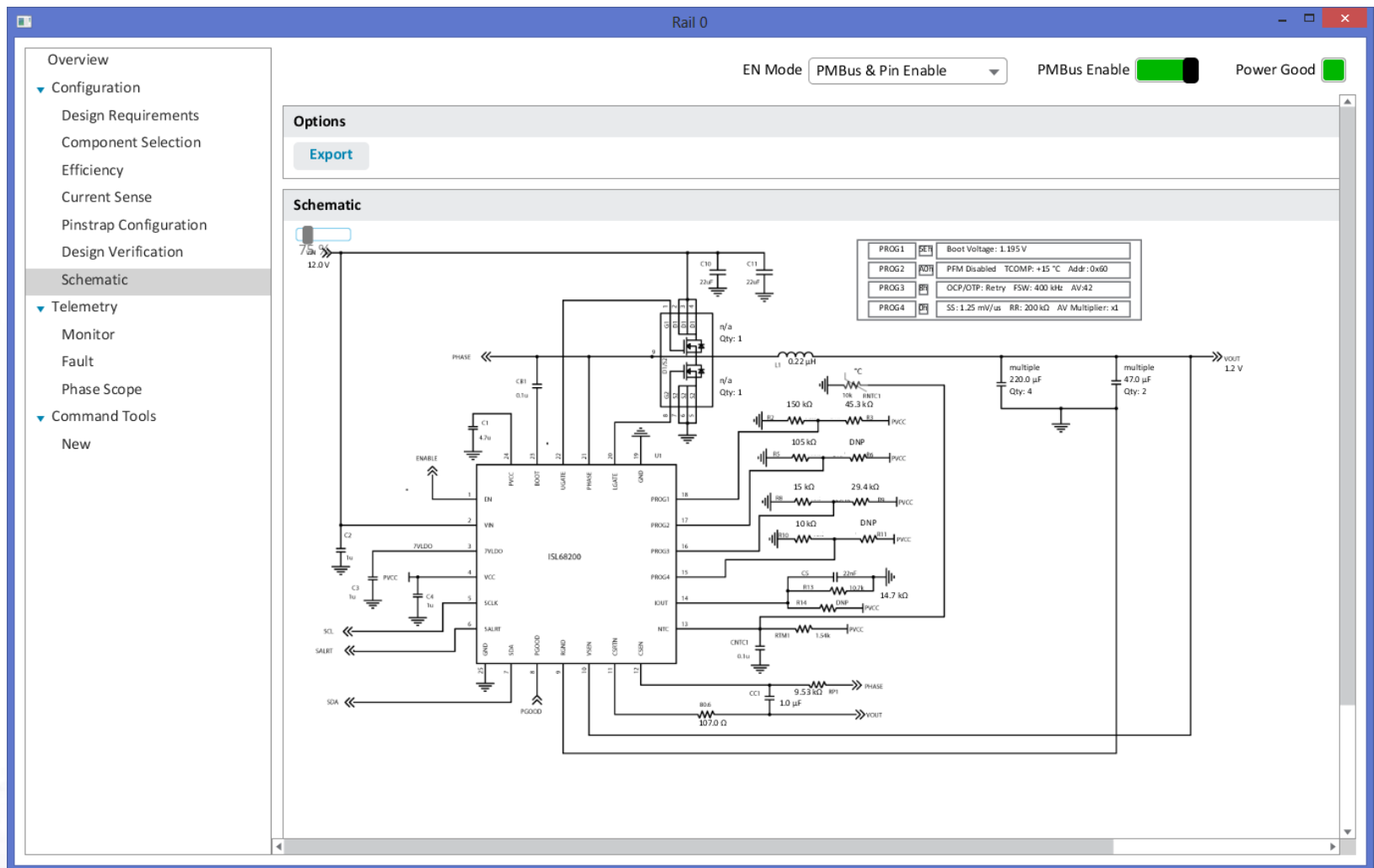
Pinstrap Configuration – Select pinstrap resistors to setup device default settings.

Example Rail Inspector – ISL68200



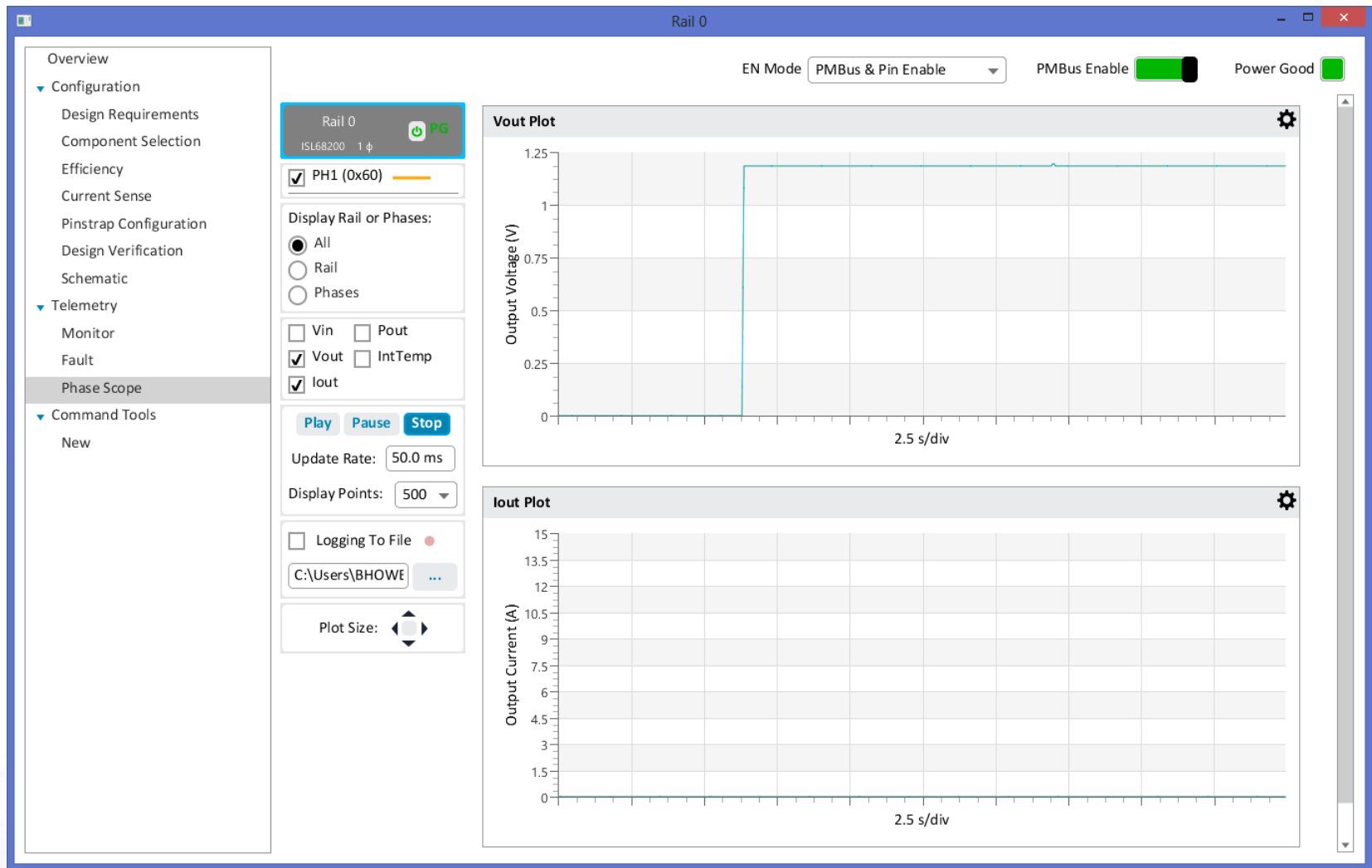
Design Verification – Bode and Output Impedance plots of design.

Example Rail Inspector – ISL68200



Schematic Generation – Final schematic, with customized components, generated automatically.

Example Rail Inspector – ISL68200



Phase Scope – Real time plotting of all telemetry parameters.

Example Rail Inspector – ISL68200

The screenshot displays the Rail Inspector application window for a target device labeled "Rail 0". The interface includes a left-hand navigation pane with sections like Overview, Configuration, Telemetry, and Command Tools. The main area shows configuration for the "ISL68200-0 0x60" device, including EN Mode (PMBus & Pin Enable), PMBus Enable status, and Power Good status. A command configuration section allows setting a command (e.g., VOUT_COMMAND) and its parameters (e.g., Hex 0099, 1.195 V). Below this, a table lists various monitoring parameters with checkboxes and dropdown menus. Red arrows and callout boxes highlight key features: selecting a command tool, entering a PMBus command, sending or reading commands to the target device, and adding/removing command lines in the command tool.

Overview

- Configuration
 - Design Requirements
 - Component Selection
 - Efficiency
 - Current Sense
 - Pinstrap Configuration
 - Design Verification
 - Schematic
- Telemetry
 - Monitor
 - Fault
 - Phase Scope
- Command Tools
 - New
 - Command Tool 1

Rail 0

EN Mode: PMBus & Pin Enable

PMBus Enable: ☒ Power Good: ☒

ISL68200-0 0x60

File Command Sets Targets

Cmd: VOUT_COMMAND

Hex: 0099 X 1.195 V

Search Send Read

Cmd: READ_IOUT

Search Read

Command Line to select PMBus command

Send/Read commands to target device

Add/Remove command lines in command tool

Select Command Tool in Rail Inspector

X	false	Busy			
X	false	Off			
X	false	Vout O			
X	false	Iout O			
X	false	Vin UV			
X	false	Temperature			
X	true	Comm/Logic			
X	false	None of the above			

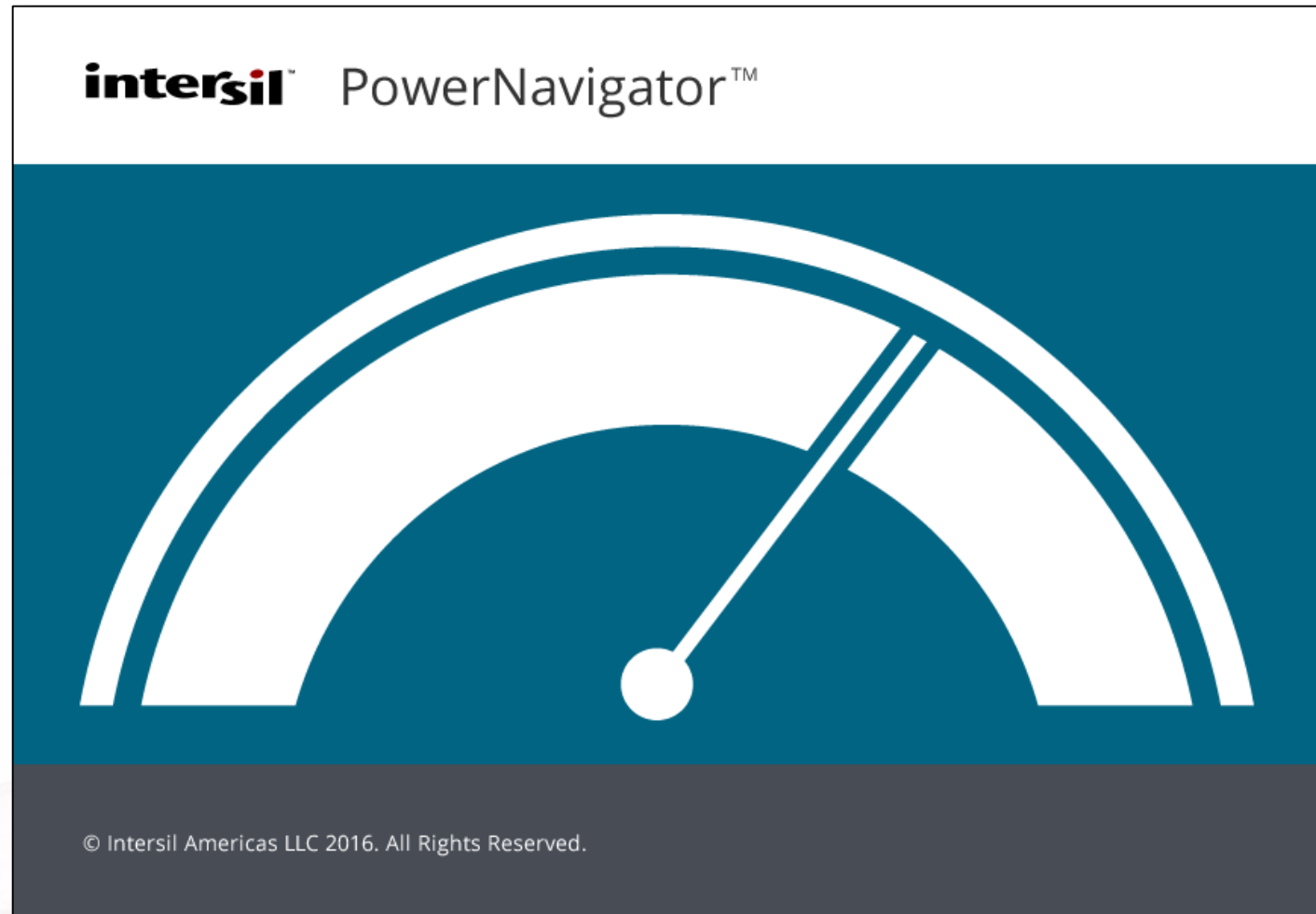
Example Rail Inspector – ISL68200

Clicking “Search” allows the user to quickly find any PMBus command the device supports

Command Search

Command Code	Command Description
d4h: AV_GAIN	d1h: TEMP_COMP
03h: CLEAR_FAULTS	d2h: ULTRASONIC_PFM_ENABLE
d0h: ENABLE_PFM	21h: VOUT_COMMAND
d3h: FAULT_BEHAVIOR	24h: VOUT_MAX
33h: FREQUENCY_SWITCH	20h: VOUT_MODE
adh: IC_DEVICE_ID	
aeh: IC_DEVICE_REVISION	
02h: ON_OFF_CONFIG	
01h: OPERATION	
98h: PMBUS_REVISION	
8ch: READ_IOUT	
dch: READ_PROG1	
ddh: READ_PROG2	
deh: READ_PROG3	
dfh: READ_PROG4	
8dh: READ_TEMP	
88h: READ_VIN	
8bh: READ_VOUT	
d6h: SET_RR	
d5h: SS_DVID_RATE	
78h: STATUS_BYTE	

Sequencing



PowerNavigator – Sequencing

- **All Intersil Digital Power Controllers and modules with a DDC bus support autonomous sequencing between rails.**
- **Sequencing is configured using the PowerNavigator sequencing tool.**
- **Once configured, all sequencing events are handled automatically using Intersil's proprietary DDC bus.**
 - Controllers and/or modules will automatically communicate via DDC bus, synchronizing sequencing events.

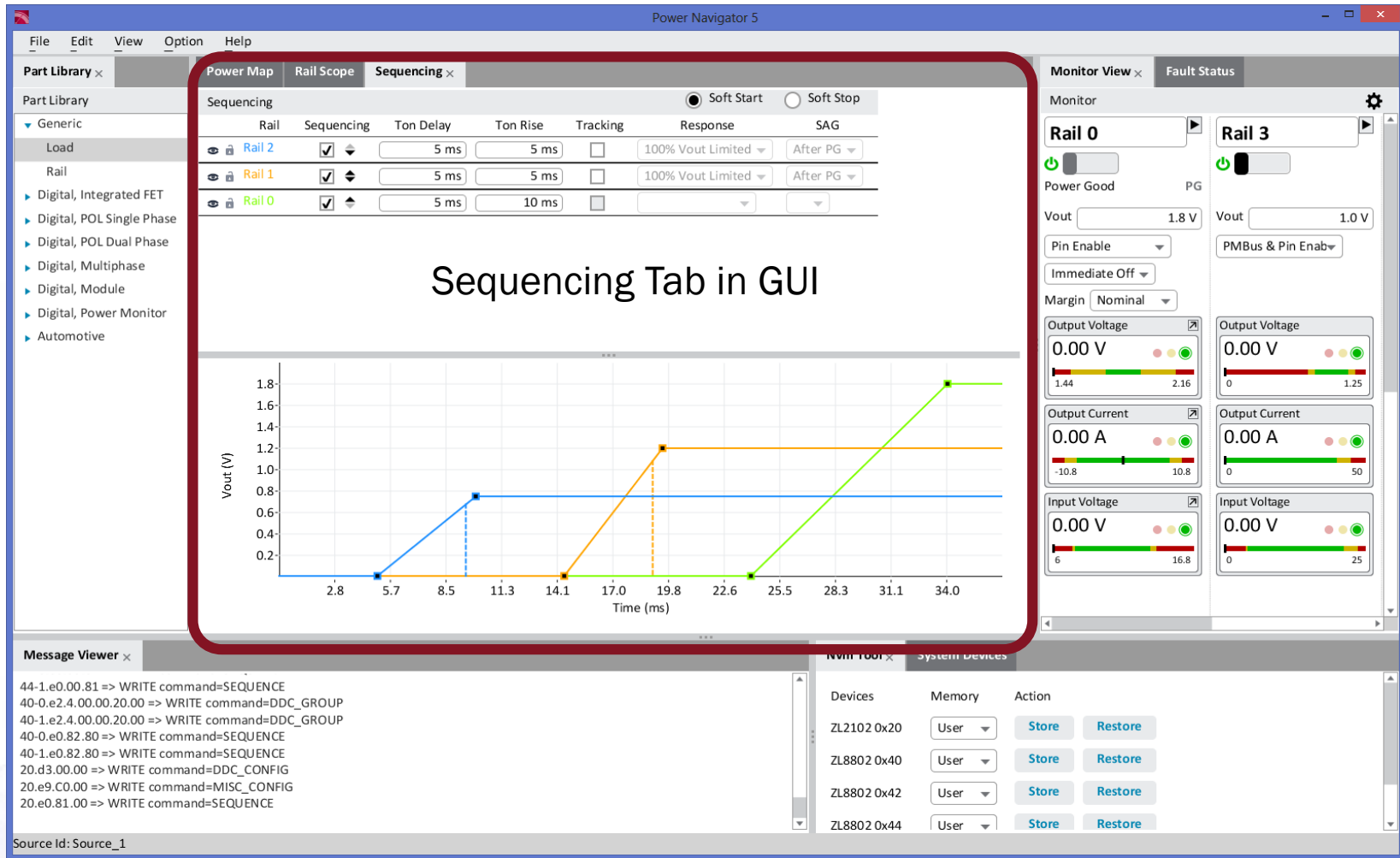
PowerNavigator – System Screen

The screenshot displays the PowerNavigator 5 software interface. The 'Sequencing' tab is selected and highlighted with a red box and a label 'Sequencing Tab'. The main workspace shows a 'Power Map' with four rails (Rail 0, Rail 1, Rail 2, Rail 3) and their associated components. Rail 0 is connected to an FPGA (VCCINT, VCCAUX, VCCIO) and a ZL2102 converter. Rail 1 is connected to a ZL8802 converter. Rail 2 is connected to a ZL8802 converter. Rail 3 is connected to an ISL68200 converter and a 3v3AUX component. The 'Monitor View' on the right shows real-time data for Rail 0: Vout = 1.195 V, Output Voltage = 1.19 V, Output Current = 0.00 A, Input Voltage = 12.12 V, External Temperature = 30.39 C, and Fsw = 400 kHz. The 'Message Viewer' at the bottom left shows a log of actions: Created Source 1, Created Rail 0: ZL2102-0 0x20, Created FPGA, Created Rail 1: ZL8802-0 0x40 φ 0, ZL8802-0 0x40 φ 1, Created Rail 2: ZL8802-1 0x42 φ 0, ZL8802-1 0x42 φ 1, ZL8802-2 0x44 φ 0, ZL8802-2 0x44 φ 1, Created Rail 3: ISL68200-0 0x21, Created 3v3AUX, and Successfully set user data. The 'Nvm Tool' at the bottom right shows a table of devices and their memory addresses.

Devices	Memory	Action
ZL2102 0x20	User	Store Restore
ZL8802 0x40	User	Store Restore
ZL8802 0x42	User	Store Restore
ZL8802 0x44	User	Store Restore

The sequencing tab allows for power up and power down sequencing of devices in the PowerMap.

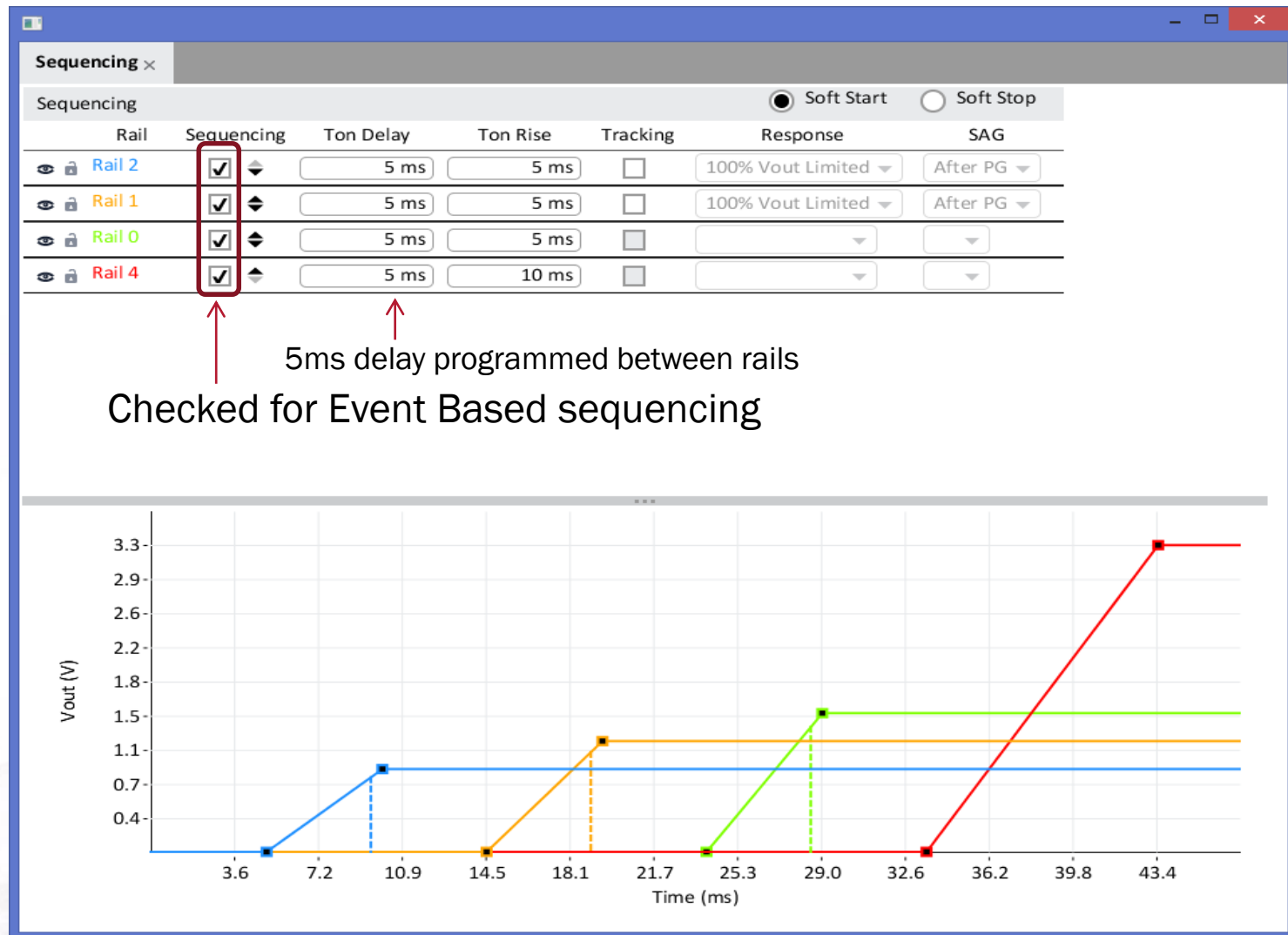
PowerNavigator GUI – Sequencing



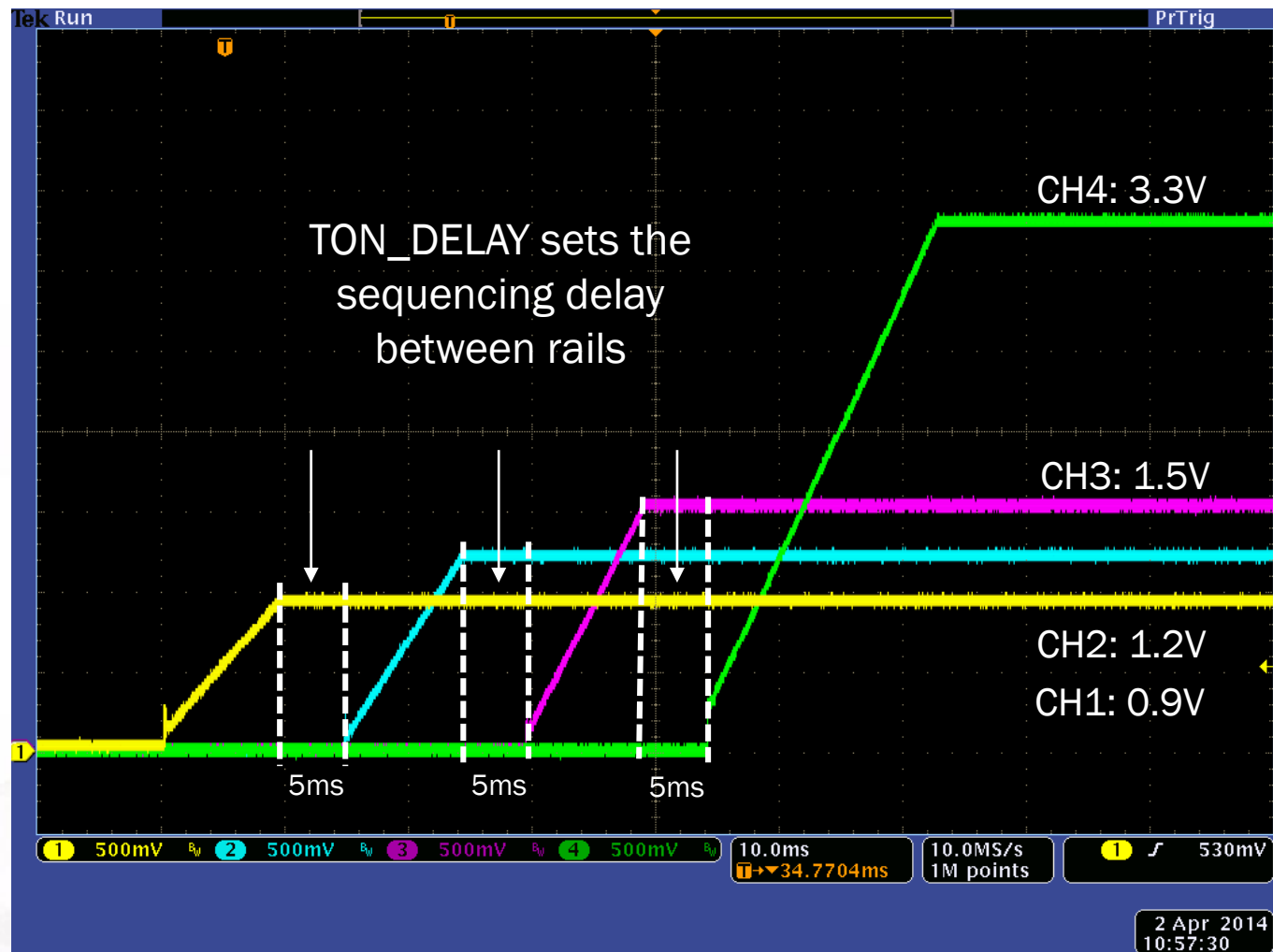
PowerNavigator – Sequencing

- **Event based sequencing waits for the device PGOOD to transition high (the event) before sequential rails start-up**
 - Sequence order is set by Prequel/Sequel using the SEQUENCE PMBus command
 - TON_DELAY is used to set the time delay between sequenced rails
- **Timed based sequencing uses a timer from a global enable to sequence rails at start-up.**
 - TON_DELAY sets the sequence order on the way up. TOFF_DELAY sets the order on the way down.

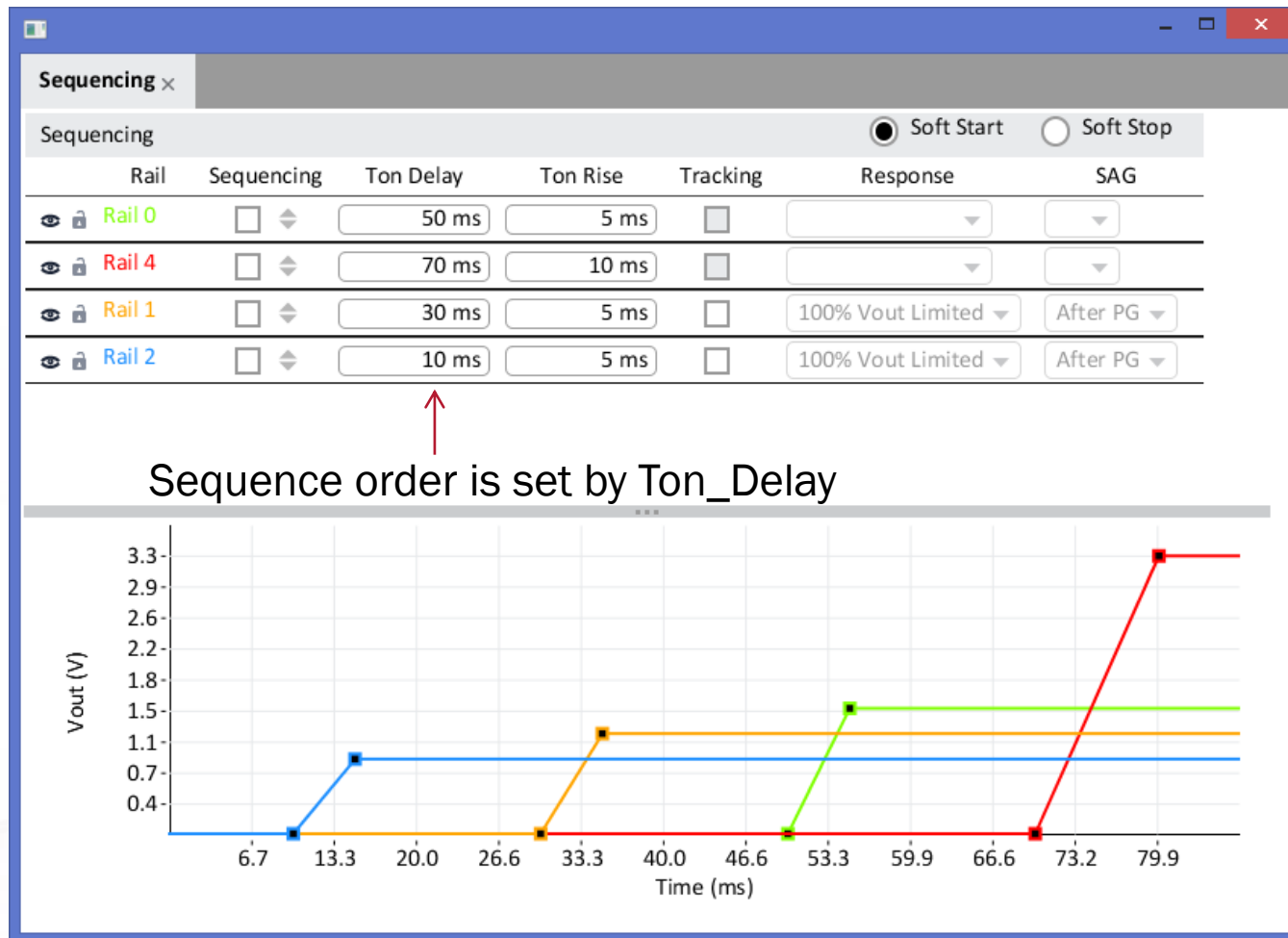
Event Based Sequence Example



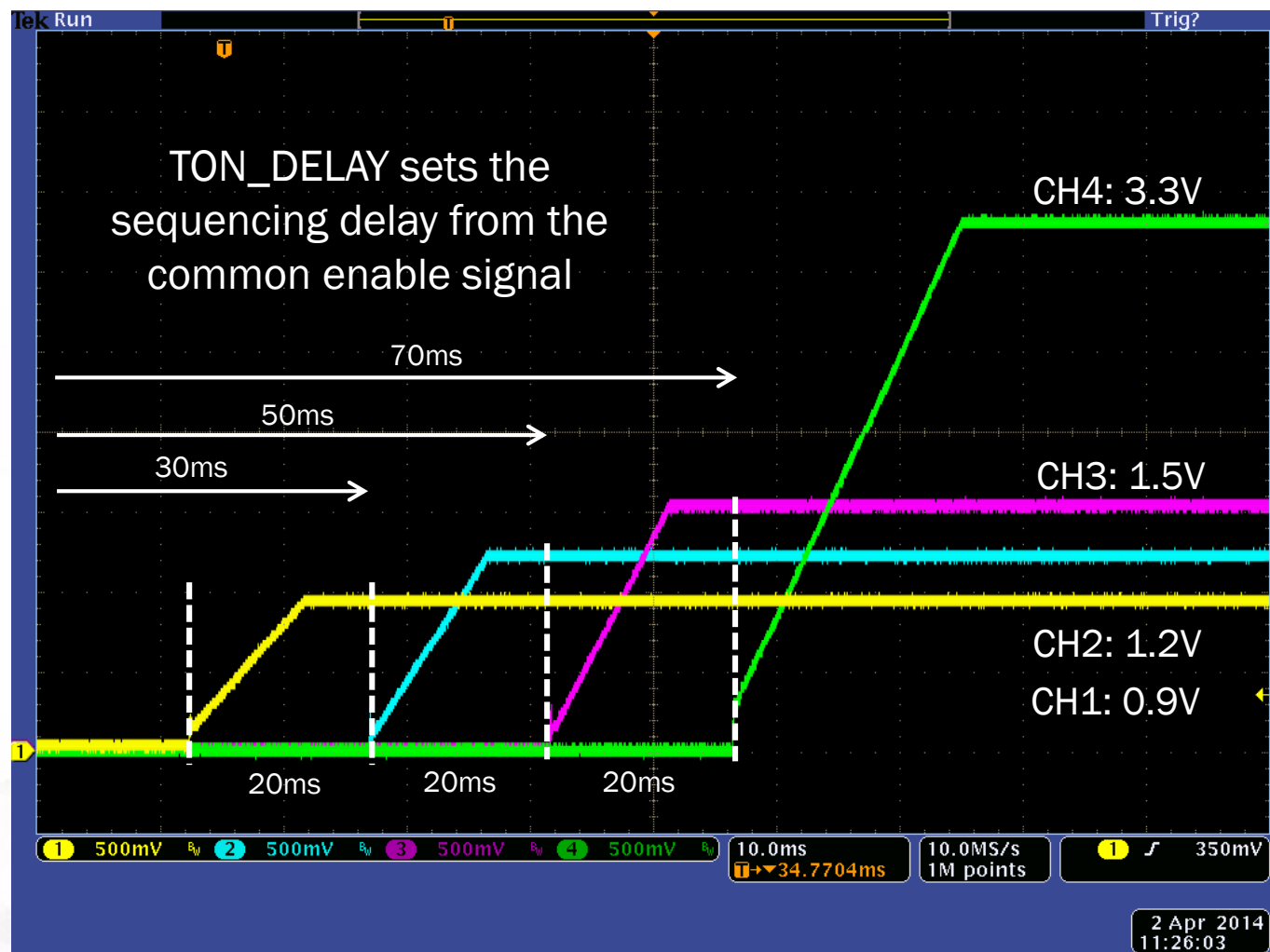
Event Based Sequence Example



Time Based Sequence Example



Time Based Sequence Example



RailScope

intersil™ PowerNavigator™



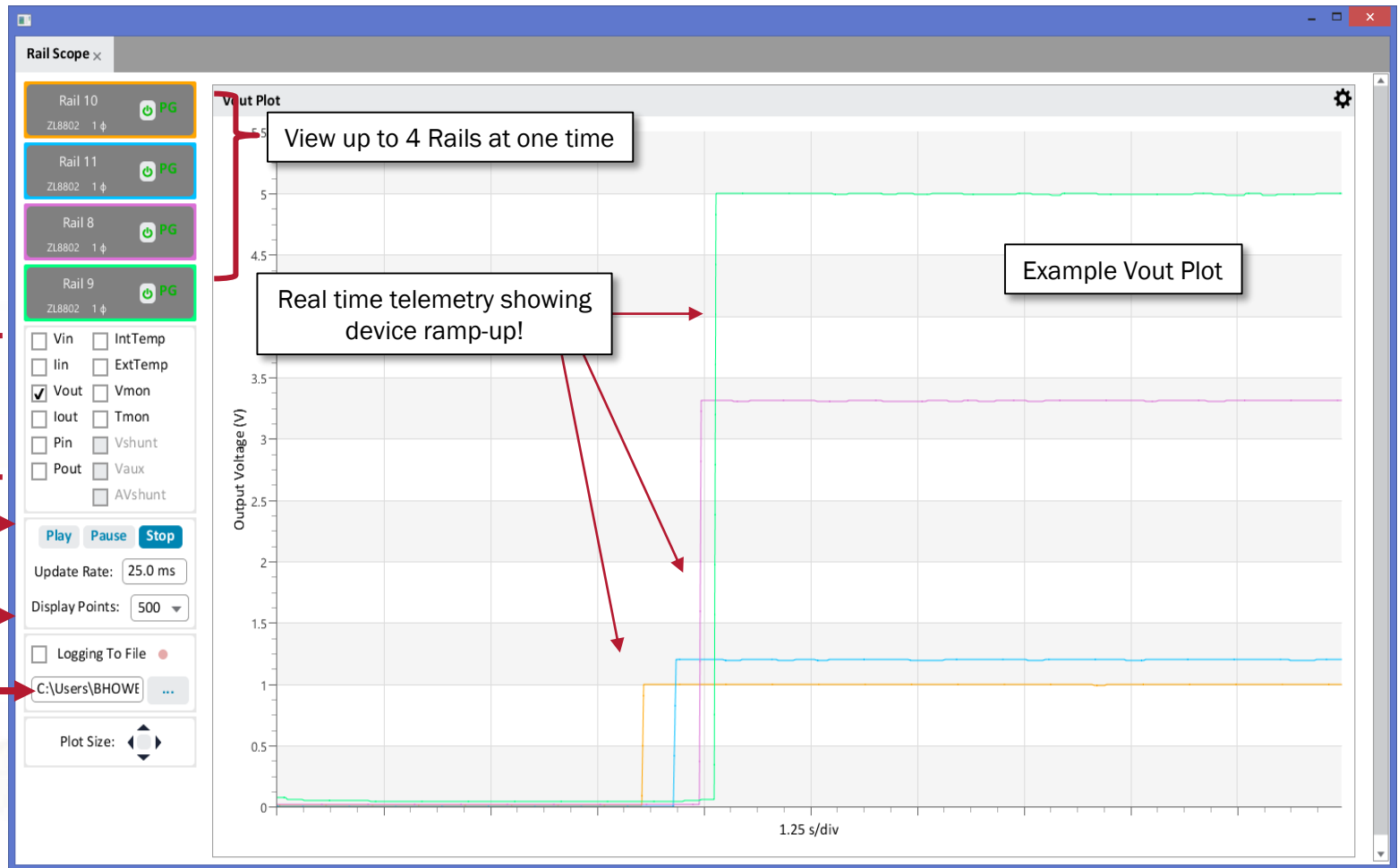
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intersil™

PowerNavigator 5.3 – RailScope

- **New RailScope allows the user to plot telemetry parameters from up to 4 devices.**
 - Similar to a Low Bandwidth Oscilloscope integrated into PowerNavigator.
 - Allows user to plot multiple telemetry values at a time.
- **Logging capability is also built-in.**
 - All telemetry values can be logged to a .csv file for later viewing.
 - Status registers are also logged.
- **Adjustable update rate allows users to control how much data they collect.**
 - Data can be updated as fast as 1ms and as slow as 1000ms.
 - Displayed points can be as few as 50 to as many as 500.

PowerNavigator - RailScope



RailScope: Initial Setup

1

If RailScope is not visible, go to View->RailScope

Power Navigator 5

File Edit **View** Option Help

Part Library x Power Map Rail Scope x

Part Library

- Generic
- Digital, Integrated FET
- Digital, POL Single Phase
- Digital, POL Dual Phase
- Digital, Multiphase
- Digital, Module
- Digital, Power Monitor
- Automotive

SLOT 1 (Double Click to Add)

SLOT 2 (Double Click to Add)

SLOT 3 (Double Click to Add)

SLOT 4 (Double Click to Add)

☐ Vin ☐ IntTemp ☐ Iin ☐ ExtTemp ☒ Vout ☐ Vmon ☐ Iout ☐ Tmon ☐ Pin ☐ Vshunt ☐ Pout ☐ Vaux ☐ AVshunt

Play Pause Stop

Update Rate: 25.0 ms

Display Points: 500

☐ Logging To File

C:\Users\BHOWE

Plot Size: [Zoom Icon]

Output Voltage (V)

5.5 5 4.5 4 3.5 3 2.5 2 1.5 1 0.5 0

Double Click on the "Slots" to add rails to RailScope

3

In "Load Rail" window, select rail to add to each slot.

Load Rail

Please select a rail:

No Selection

Rail 10 : ZL8802

Rail 11 : ZL8802

Rail 8 : ZL8802

Rail 9 : ZL8802

Please Choose Chart Style:

☒ Solid ☐ Dashed ☐ Dotted

ORANGE

Reset Color

Ok Cancel

4

Click "Ok" when done

Monitor View x Fau

Monitor

Rail 9

Power Good PG

Vout 5.0 V

PMBus Enable

Soft Off

Margin Nominal

Output Voltage 0.04 V

Output Current 0.00 A

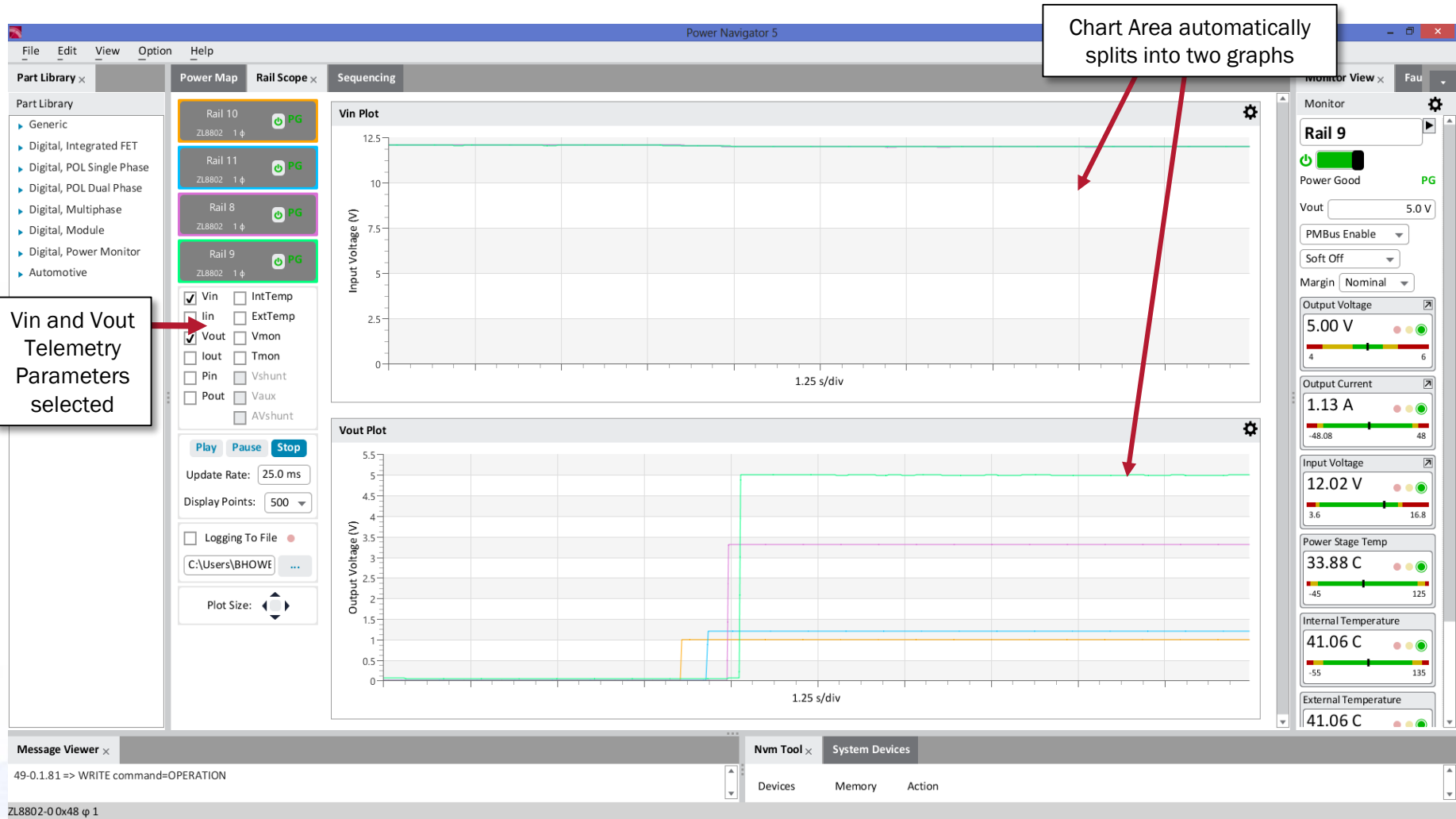
Input Voltage 12.08 V

Power Stage Temp 33.88 C

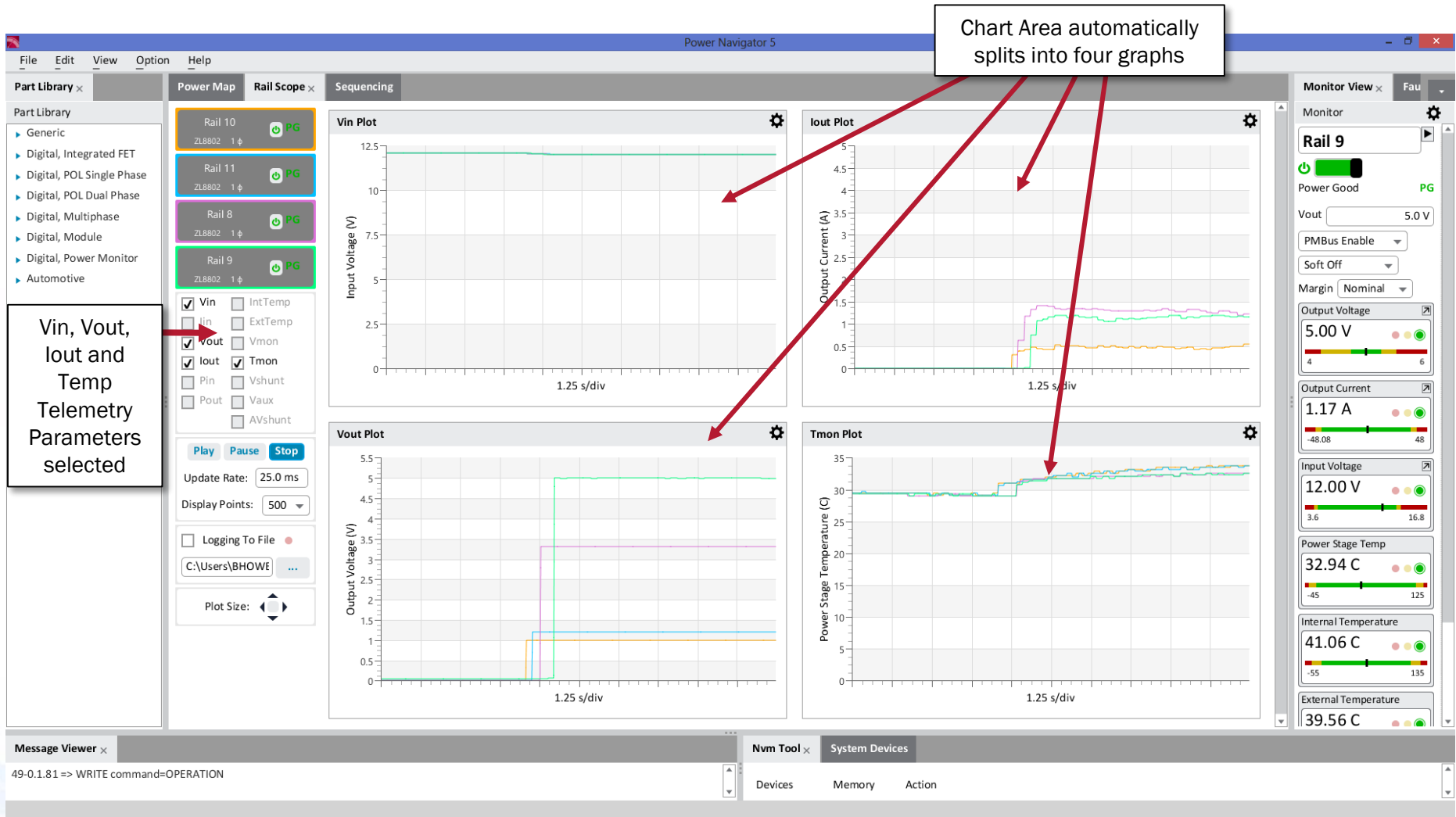
Internal Temperature 39.56 C

External Temperature 39.06 C

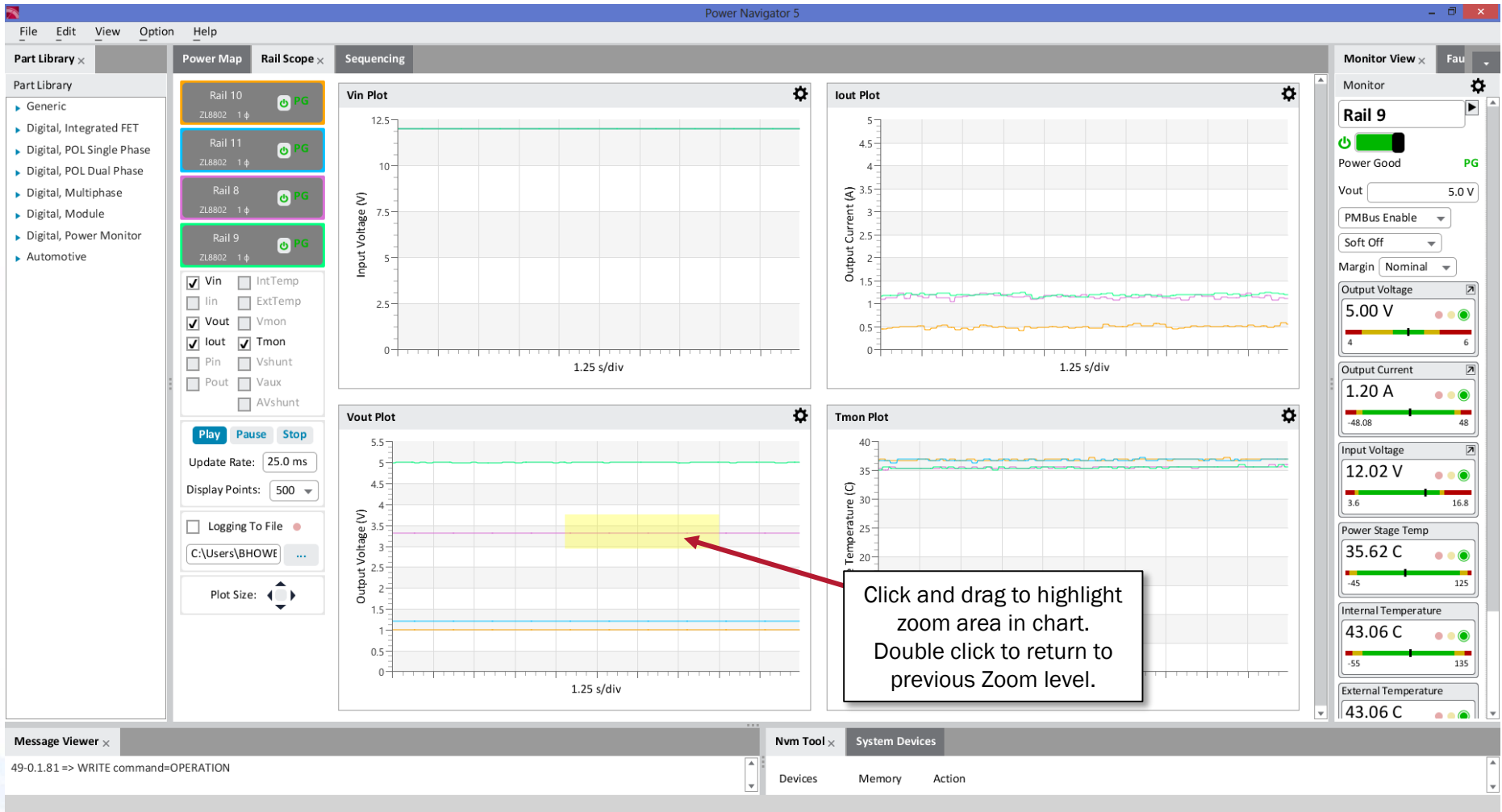
RailScope: Example View with 2 Telemetry Parameters



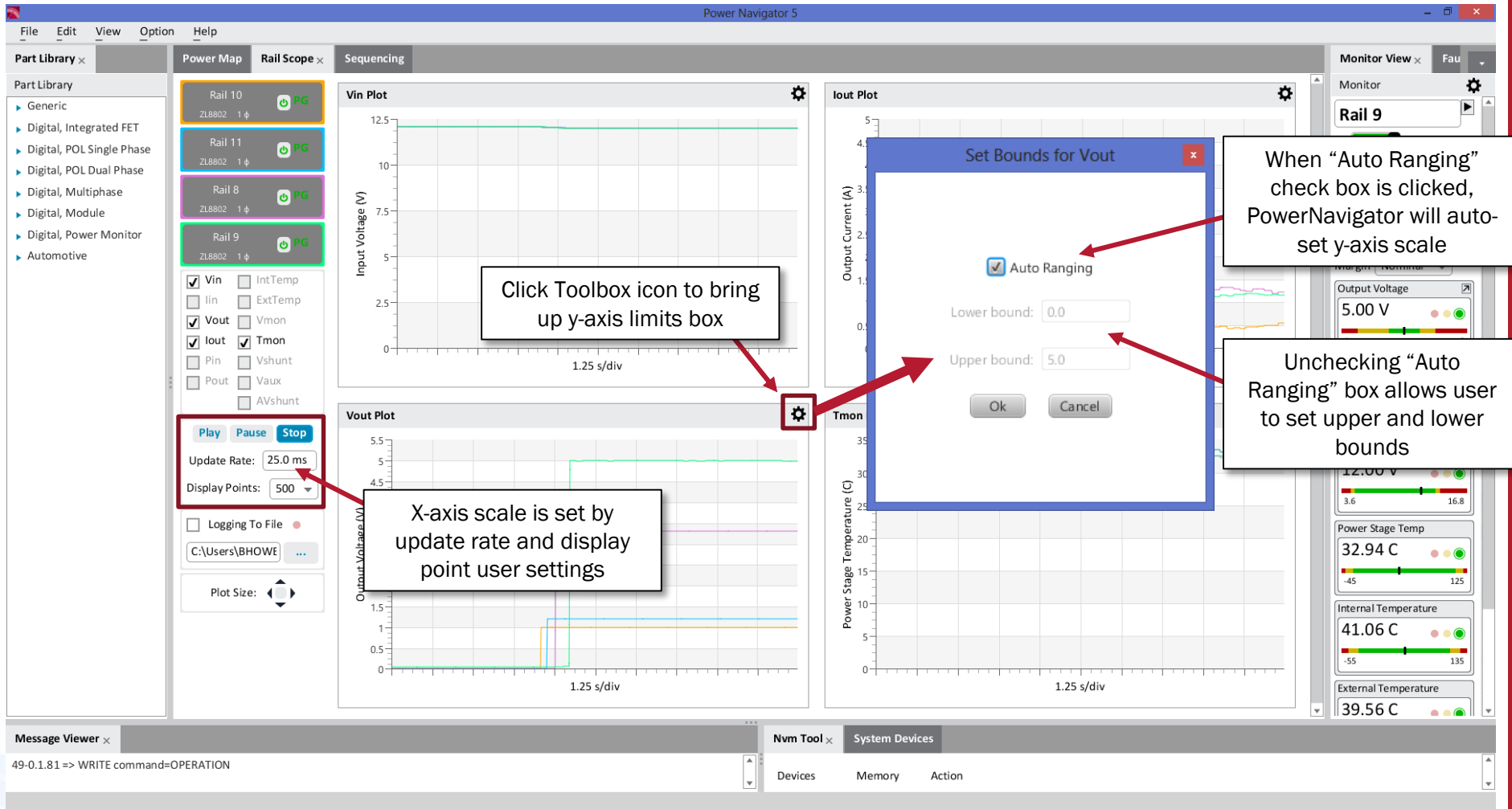
RailScope: Example View with 4 Telemetry Parameters



RailScope: Example Zoom-in



RailScope: Example X- & Y-axis Scale Options



RailScope: Logging Feature

- Once enabled, logging feature will automatically log all selected telemetry parameters and the STATUS_WORD register for each device.
- All data is saved to a .csv file, which can be opened in Excel for later data analysis.
 - Once the .csv file size exceeds 50MB, a new file will automatically be created.
 - There is no limit on how long logging can run for.
- The log file name and path can be changed by the end user.

The screenshot displays the RailScope software interface. At the top, four rail units are listed: Rail 0 (ZL6105), Rail 10 (ZL8801), Rail 17 (ZL8800), and Rail 18 (ZL8800). Each unit has a power icon and a 'PG' status indicator. Below the rail list, a grid of checkboxes allows selection of telemetry parameters: Vin, IntTemp, Iin, ExtTemp, Vout, Vmon, Iout, Vshunt, Pin, Vaux, Pout, and AVshunt. The 'Play', 'Pause', and 'Stop' buttons are visible, along with 'Update Rate' (100.0 ms) and 'Display Points' (500). A red rectangular box highlights the 'ENABLE LOGGING' checkbox (which is checked) and the 'Log File' field, which shows the path 'C:\Users\BHOWELL\Doc' and a file explorer icon. At the bottom, there is a 'Plot Size' control with directional arrows.

RailScope: Example Log File

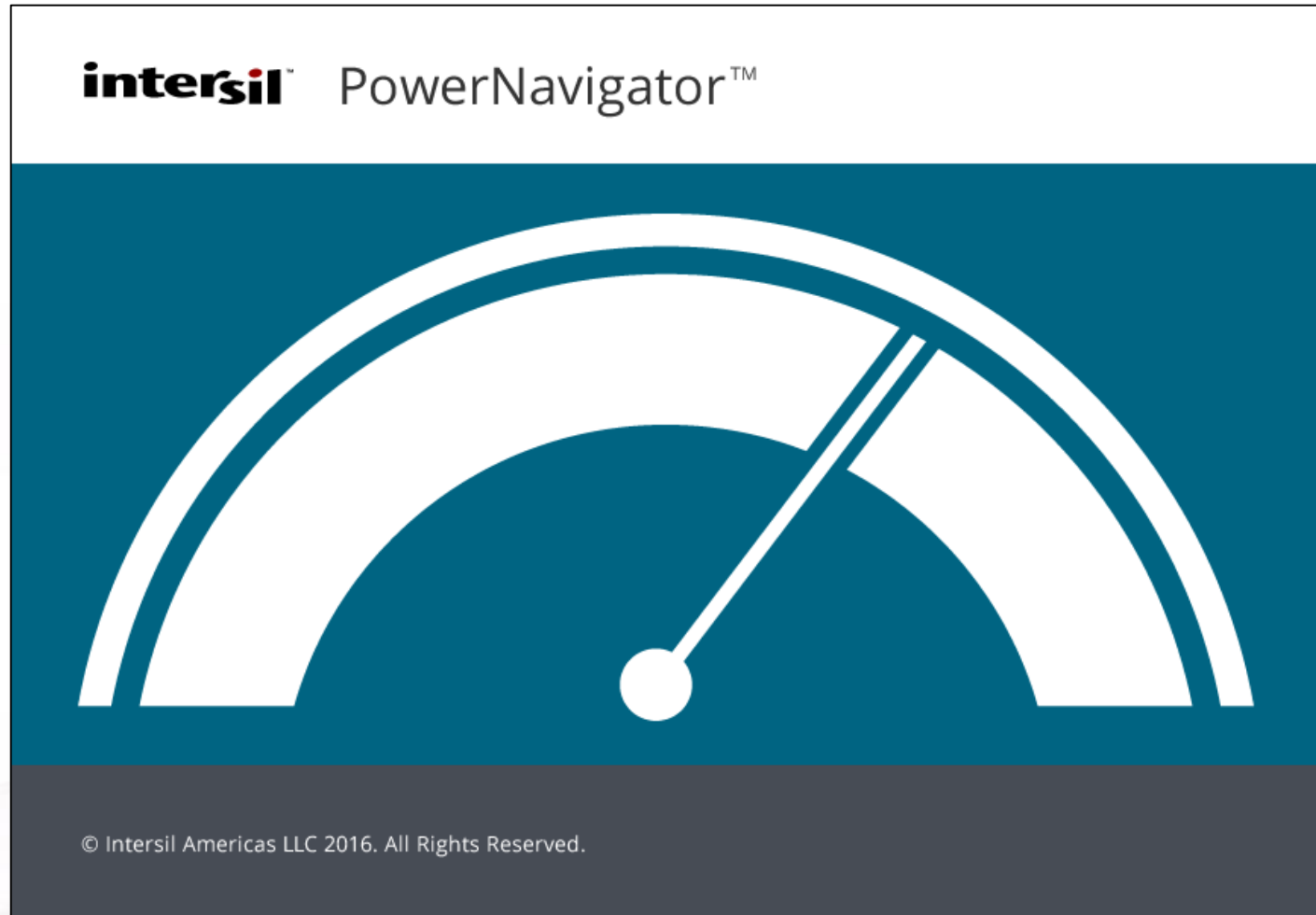
PN5p2_TelemetryLog.0.0.csv [Read-Only] - Excel

Telemetry parameters for "VCCIO" rail						Telemetry parameters for "AUX" rail					
Timestamp	VCCIO_STATUS	VCCIO_Vin	VCCIO_Vout	VCCIO_Iout	VCCIO_IntTemp	AUX_STATUS	AUX_Vin	AUX_Vout	AUX_Iout	AUX_IntTemp	CORE_STATUS
23/04/2015 10:58:04.0225	0x0000	11.921875	0.800292969	-0.048583984	32.1875	0x0000	11.890625	1.001953125	0.373046875	51.125	0x0000
23/04/2015 10:58:04.0265	0x0000	11.921875	0.799682617	-0.047790527	31.71875	0x0000	11.875	1.001953125	0.387695313	51.625	0x0000
23/04/2015 10:58:04.0467	0x0000	11.921875	0.799682617	-0.047363281	31.84375	0x0000	11.890625	1.003540039	0.320800781	51.625	0x0000
23/04/2015 10:58:04.0667	0x0000	11.9375	0.800292969	-0.047485352	32.125	0x0000	11.890625	1.003540039	0.334472656	51.125	0x0000
23/04/2015 10:58:04.0867	0x0000	11.9375	0.800048828	-0.04876709	31.90625	0x0000	11.890625	1.005249023	0.386230469	51.625	0x0000
23/04/2015 10:58:05.0067	0x0000	11.921875	0.800292969	-0.047485352	31.9375	0x0000	11.890625	1.003540039	0.357421875	51.625	0x0000
23/04/2015 10:58:05.0268	0x0000	11.921875	0.801513672	-0.049682617	32.0625	0x0000	11.890625	1.003540039	0.37890625	51.625	0x0000
23/04/2015 10:58:05.0468	0x0000	11.921875	0.800048828	-0.047790527	31.71875	0x0000	11.890625	1.005249023	0.374023438	51.125	0x0000
23/04/2015 10:58:05.0669	0x0000	11.921875	0.800048828	-0.047790527	31.71875	0x0000	11.890625	1.001953125	0.358886719	51.125	0x0000
23/04/2015 10:58:05.0869	0x0000	11.9375	0.800048828	-0.047485352	31.71875	0x0000	11.890625	1.001953125	0.358886719	51.125	0x0000
23/04/2015 10:58:06.0069	0x0000	11.9375	0.799682617	-0.048400879	31.9375	0x0000	11.890625	1.003540039	0.329101563	51.625	0x0000
23/04/2015 10:58:06.0269	0x0000	11.96875	0.800048828	-0.04510498	31.625	0x0000	11.890625	1.003540039	0.37890625	51.125	0x0000
23/04/2015 10:58:06.0471	0x0000	11.953125	0.800048828	-0.046142578	31.9375	0x0000	11.890625	1.003540039	0.427246094	51.125	0x0000
23/04/2015 10:58:06.0671	0x0000	11.921875	0.80065918	-0.048156738	31.78125	0x0000	11.890625	1.003540039	0.387695313	51.625	0x0000
23/04/2015 10:58:06.0871	0x0000	11.9375	0.800048828	-0.047363281	31.84375	0x0000	11.890625	1.003540039	0.368164063	51.125	0x0000

Each telemetry entry is time stamped

Rail name can be set by user (taken from PowerMap)

Hex File Creation



Configuration File Overview

- **Intersil Digital Power controllers use configuration files to program important device parameters.**
 - Configuration files are basically a list of PMBus commands defining device operation. i.e. Vout_Command = 1.0V, Iout_Cal_Gain = 0.5mV/A, etc...
- **Device configuration only needs to be done one time – programmed parameters are stored inside non-volatile memory for future use. NVM supports multiple writes and is re-programmable.**
- **Several Options are available for programming devices in a production environment.**

Programming Devices in Manufacturing Environment

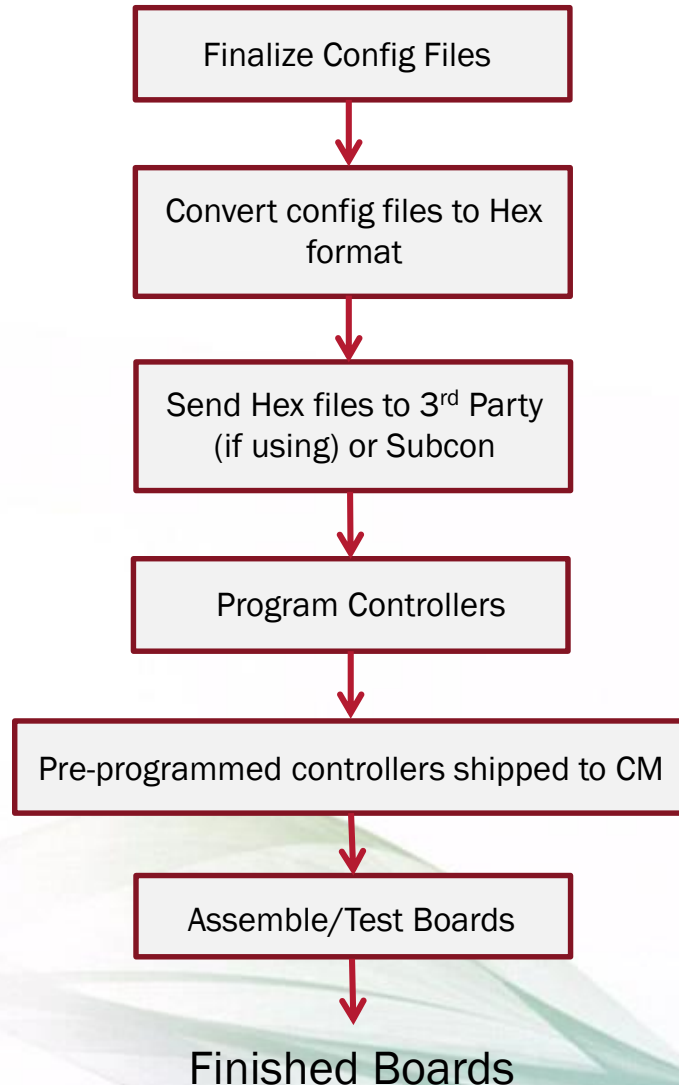
- **Option 1: Program controllers pre-board assembly**

- Devices are programmed on a high speed production programmer before being assembled on a board.
- Can use a supported 3rd party programming house OR offline programmer at sub-contractor.

- **Option 2: Program controllers after board assembly**

- Devices are programmed on PCB post board assembly
- Can be done at ICT (using a bed of nails approach or onboard microcontroller) OR using Intersil dongle and Production Configuration Tool (PCT).
- Requires board to be powered up with all controllers DISABLED until they are fully programmed.

Typical Flow – Pre-Programmed Devices



- Controllers are programmed prior to PCB manufacture.

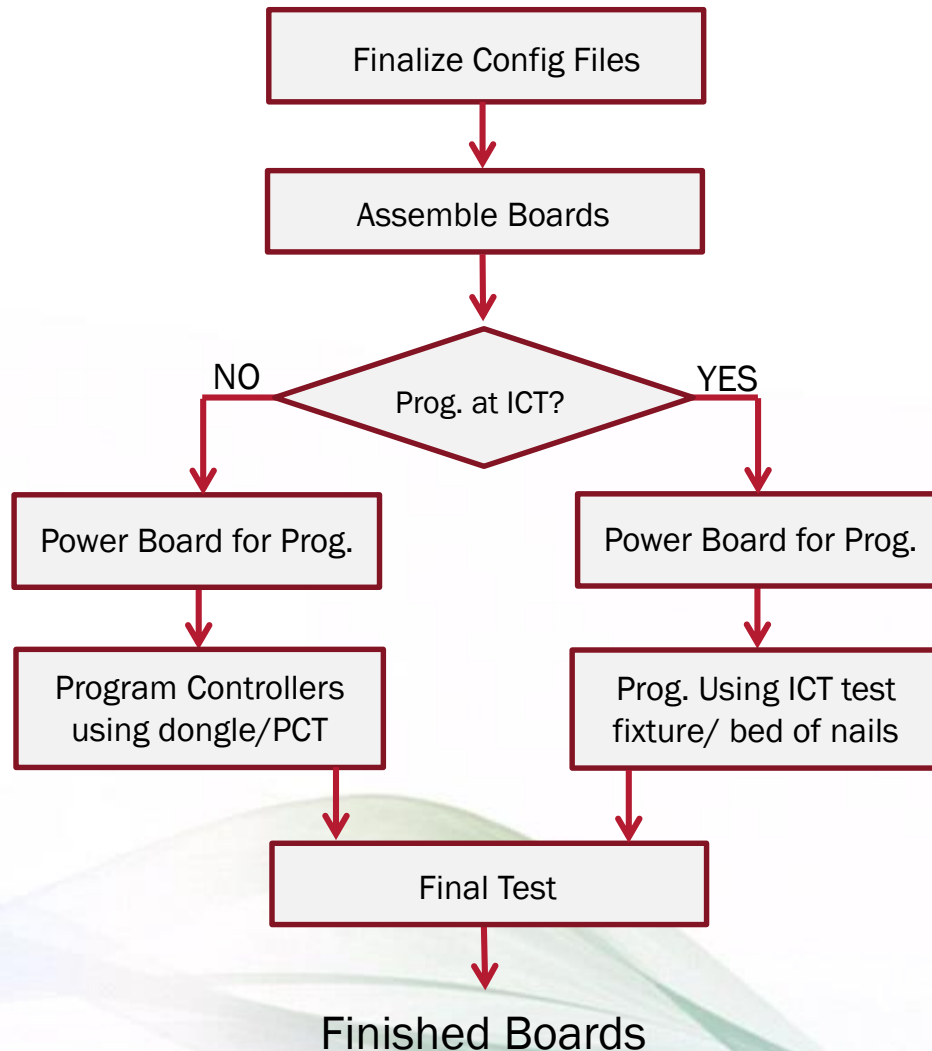
- Hex files are created using PowerNavigator software (File->Export Production Hex).

- Programming is done either with a 3rd party or using offline programmer at subcon.

- Typical programming time: 4-7 seconds per device.

- Individual part numbers are assigned to each device after programming to make sure boards are assembled correctly.

Typical Flow – Programming Parts on Board



- Controllers are programmed after board assembly.
- Typical Programming time: 5-10s per device.
- Simplified inventory and configuration file management.
- Controllers must be powered to program, but output must remain disabled until part is fully programmed.
- Special attention to sequencing must be made when using self-enabled parts.

HEX File Creation – Step 1, Project Save

Step 1: To create a production HEX file, first save your project

NOTE: Before saving a project, the HW enable pin on all controllers must be held low.

NOTE: All Project files are stored in the directory:
C:\Users\USERNAME\Documents\Intersil\PowerNavigator\Projects

Power Navigator 5

File Edit View Option Help

New
Save Ctrl+S
Open Ctrl+O
Perspective Setting
Export Production Hex
Exit

Power Map x Rail Scope Sequencing

Power Map

Source 1

VCCINT PG 0V 0A Addr: 20
ZL8802 1 φ

VCCAUX PG 0V 0A Addr: 40
ZL8802 2 φ

VCCIO PG 0V 0A Addr: 42
ZL8802 4 φ

3v3Aux PG 0V 0A Addr: 21
ISL68200 1 φ

Save Project

Project Name

new

☐ Do not save perspective

Please disable devices before save project.

Save Cancel

Monitor View x Fault Status

Monitor

VCCIO VCCAUX

Power Good PG Power Good PG

Vout 3.3 V Vout 3.3 V

Pin Enable Pin Enable

Immediate Off Immediate Off

Margin Nominal Margin Nominal

Output Voltage 0.00 V 0.00 V

Output Current 0.00 A 0.00 A

Input Voltage 0.00 V 0.00 V

Voltage Monitor 0.00 V 0.00 V

Internal Temperature 0.00 C 0.00 C

External Temperature

Nvm Tool x System Devices

Devices Memory Action

Source Id: Source_1

HEX File Creation – Step 2, Export HEX Files

Step 2: Go to File -> Export Production Hex

Click "Export"

NOTE: All Production HEX files are stored in the saved project folder, located in the directory:
C:\Users\USERNAME\Documents\Intersil\PowerNavigator\Projects

Export Production Hex

This utility converts configuration data saved in human-readable format into the proper hex format used for production programming.

What is the programming address? The PMBus address during production programming can differ from the in-system address. A programming socket might use address 0x20 while final in-system address is 0x36. Ask your programming house which address is needed.

Project location: C:\Users\BHOWELL\Documents\Intersil\PowerNavigator\Projects\example

Select	Device	Rail(s)	Programming Address (for programming house only)	Output Hex Filename (.hex)
☒	ZL2102-0 0x20	VCCINT	0x20	ZL2102-0
☒	ZL8802-0 0x40	VCCAUX	0x20	ZL8802-0
☒	ZL8802-1 0x42	VCCIO	0x20	ZL8802-1
☒	ZL8802-2 0x44	VCCIO	0x20	ZL8802-2

Source Id: Source_1

Example Hex File Creation

Export Production Hex

This utility converts configuration data saved in human-readable format into the proper hex format used for production programming.

What is the programming address? The PMBus address during production programming can differ from the in-system address. A programming socket might use address 0x20 while final in-system address is 0x36. Ask your programming house which address is needed.

Project location: C:\Users\BHOWELL\Documents\Intersil\PowerNavigator\Projects\example

Select	Device	Rail(s)	Programming Address (for programming house only)	Output Hex Filename (.hex)
☒	ZL2102-0 0x20	VCCINT	0x20	ZL2102-0
☒	ZL8802-0 0x40	VCCAUX	0x20	ZL8802-0
☒	ZL8802-1 0x42	VCCIO	0x20	ZL8802-1
☒	ZL8802-2 0x44	VCCIO	0x20	ZL8802-2

Devices from PowerMap
automatically populated

Programming address is
address used on High
Speed programmer socket

HEX file name can
be set by user

Export

Example Configuration File

```
# ZL8800-0 0x28
# connected: true
# DEVICE_ID
# IC_DEVICE_ID
# IC_DEVICE_REV

# 2014/01/16 17:55:45000
RESTORE_FACTORY
STORE_DEFAULT_ALL
STORE_USER_ALL

### Begin User Store
RESTORE_USER_ALL

# Global commands
FREQUENCY_SWITCH          0xfa50          # 296 kHz
VIN_OV_FAULT_LIMIT        0xd380          # 14 V
VIN_OV_FAULT_RESPONSE     0x80
VIN_OV_WARN_LIMIT         0xd360          # 13.5 V
VIN_UV_WARN_LIMIT         0xca5e          # 4.734 V
VIN_UV_FAULT_LIMIT        0xca4c          # 4.594 V
VIN_UV_FAULT_RESPONSE     0x80
IIN_CAL_GAIN              0xba00          # 1 mV/A
USER_GLOBAL_CONFIG        0x80
VMON_OV_FAULT_RESPONSE    0x80
VMON_UV_FAULT_RESPONSE    0x80
PRIVATE_PASSWORD
PUBLIC_PASSWORD
```

Header information with device type, FW version, creation date, etc.

This sequence of commands used to clear contents of NVM.

Programmed device parameters

Example HEX File

```
000340F499
000440F10087
0003401530
000440F10087
000340112C
000440F10087
00054046C0DB82
0005404B80D562
000540E720DBE2
000540E800D628
000440D80193
00054038E9C295
0005403924C4E8
000540D0C0AB01
000440DCAC8D
000D40D50940CC7BF0AEFC60997B74
000540D750A2C9
000340112C
000440F10087
0003401225
000440F10087
```

Configuration file translated into machine readable hex format.

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