Introduction

This user's manual provides instructions on using the *CondUIt software* to program and communicate with the FS140X/FS160X/FS160XA/FS100X/FS1412/FS1525 chip through the TDK-PMBus-I2C dongle. The manual uses FS1525 as an example.

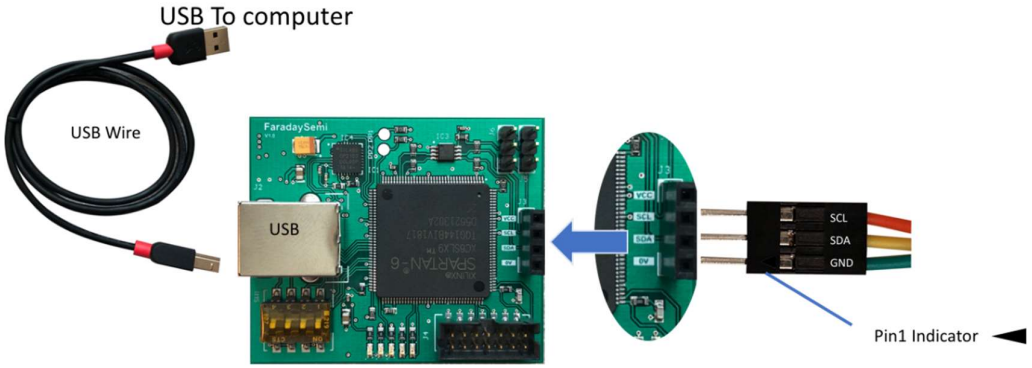
The software and complementary hardware, read and write directly to the circuit's registers using I2C/PMBus.

System Requirements

- Computer installed with Windows 7 or higher.
- 2GB Of RAM
- USB Port Access
- TDK-PMBus-I2C dongle kit

Software and Hardware Setup

1. Download and install Silicon Labs CP210x USB to UART Bridge VCP Driver.
2. Extract the given GUI zip file – CondUIt.zip.
3. Connect the TDK-PMBus-I2C dongle to the evaluation board by using jumper cables as shown in Fig 1.
4. Connect TDK-PMBus-I2C dongle to computer using USB Cable as shown in Fig 1.
5. The setup uses **VCC as bus voltage**, if there are no pullups on the target board, jumpers are provided on the dongle by default.



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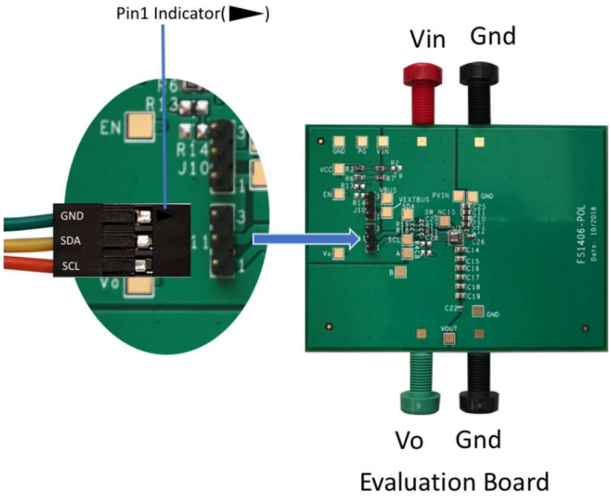

Fig 1. TDK-PMBus-I2C dongle connections

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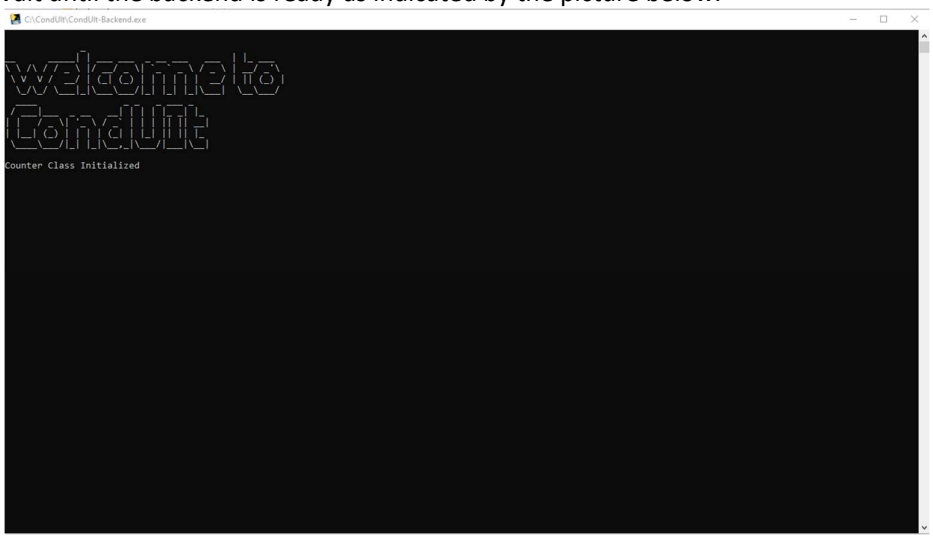
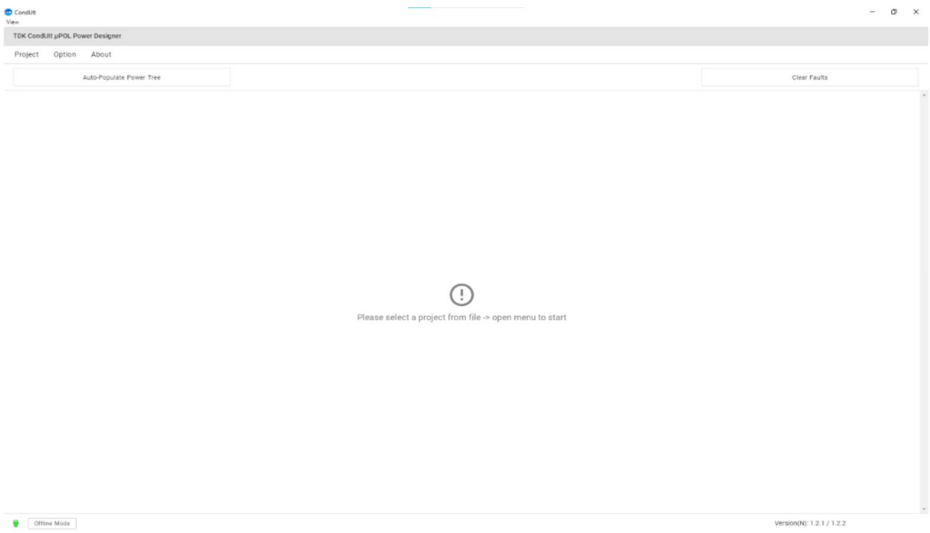
Launching the GUI

1. Go to C:\Conduit (the default installation folder) and double-click CondUIt-Backend.exe to launch the backend. Wait until the backend is ready as indicated by the picture below.



2. From C:\Conduit, double click the CondUIt application to launch the GUI. The GUI will launch in "offline" mode as shown in the highlighted area below, which means that it can be used without connecting the dongle to a FS1525 device/demo board. The green symbol indicates that the dongle status is good.



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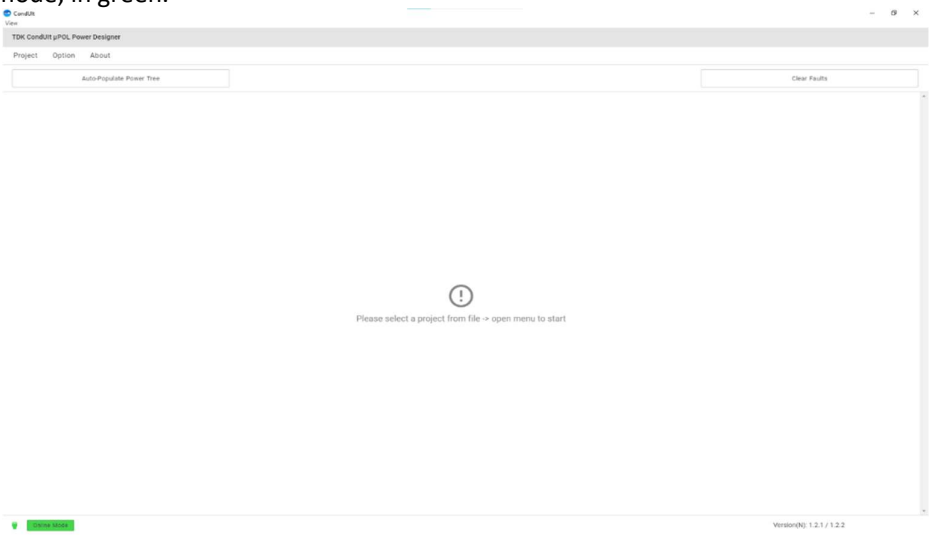
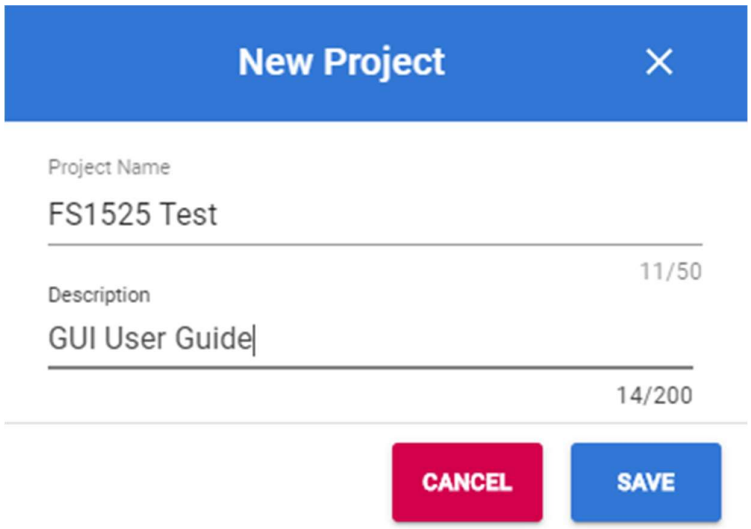
3. At this stage a project can be built in "Offline" mode. "Online" mode is when a demo board is connected to the dongle and powered up. To switch to Online mode, click on Offline mode and it will toggle to Online mode, in green.



Creating and working with a Project

1. Go to Project>Create to create a new project. After filling out Project Name and Description, click the SAVE button to continue.



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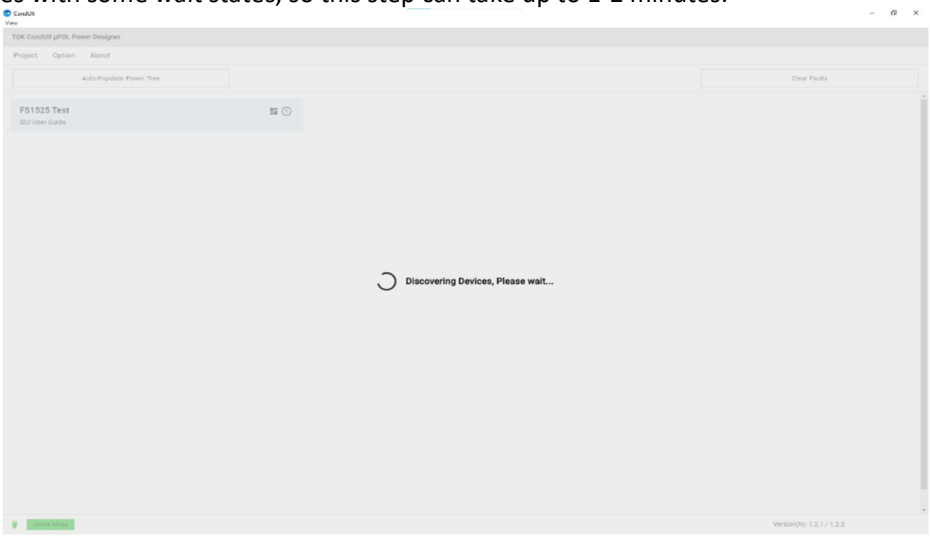
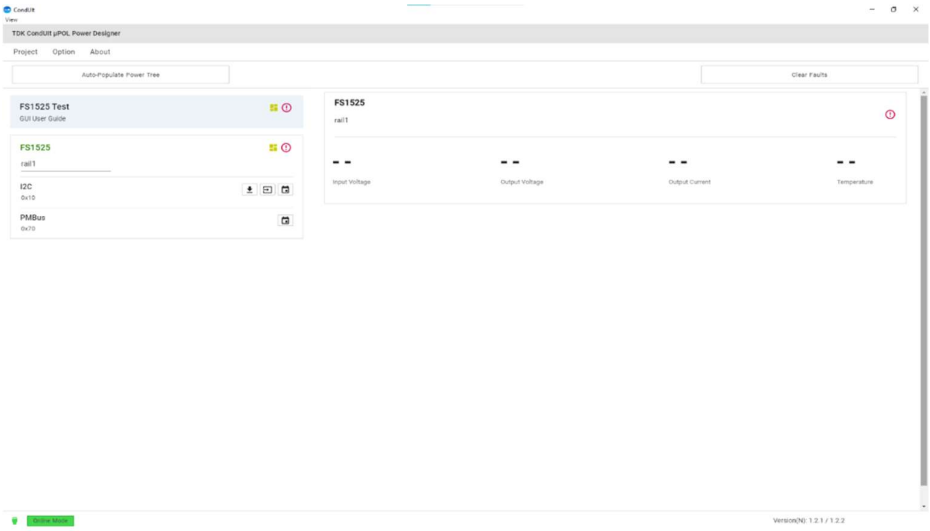
2. Click on the Auto-populate Power Tree button to scan the bus for all I2C/PMBus devices. When a device is found, it will automatically populate in the project power tree. Device discovery scans for nearly 127 addresses with some wait states, so this step can take up to 1-2 minutes.



3. After the Auto-populate process is complete, the display will show the power tree enumerated with all the devices that responded to the scan, including their I2C and PMBus addresses.



At this stage, the Telemetry display dashboard is not populated and fault indicator is red. Clicking on Project Dashboard brings up the system values and clicking on Fault status gives the current status of Faults of the device.

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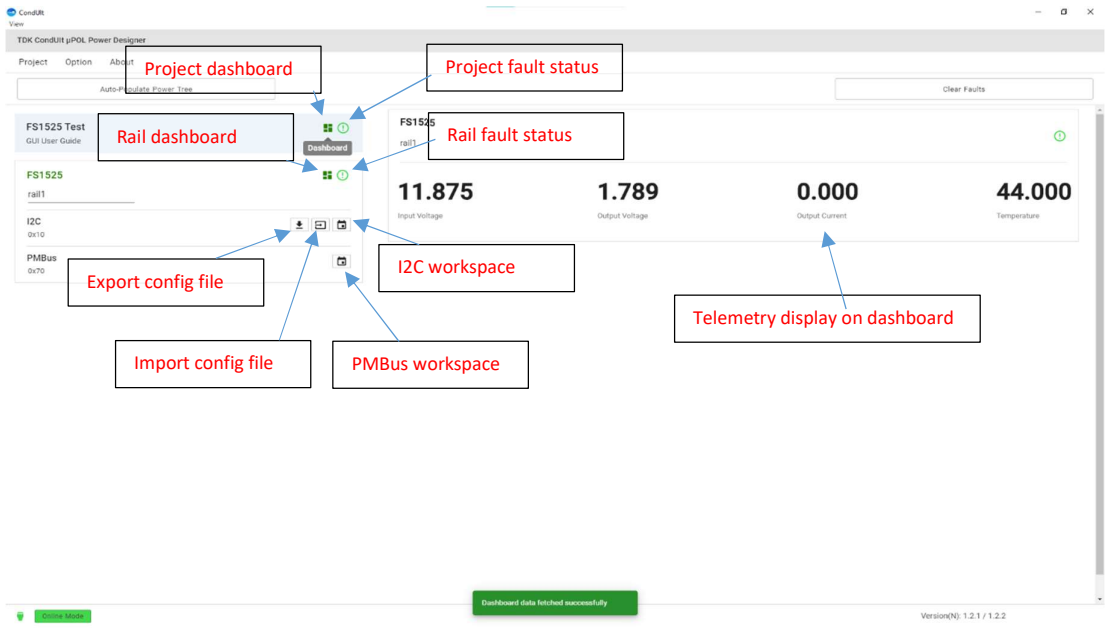
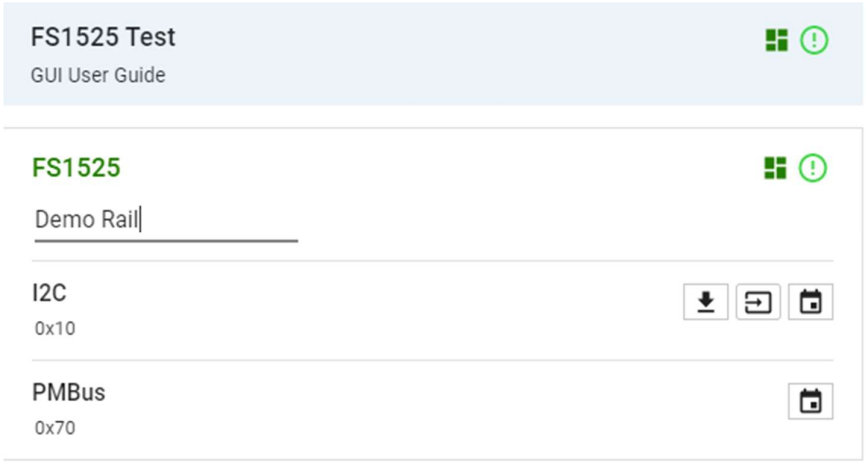


NOTE – For FS160XA/FS160X/FS100X, Dashboard values are invalid when the device is not switching. PVIN reporting is invalid for values >15.875V

4. It is recommended to provide meaningful names for the rail (s). This is particularly useful for a multi-rail project and is done simply by clicking and typing over the default Rail name.



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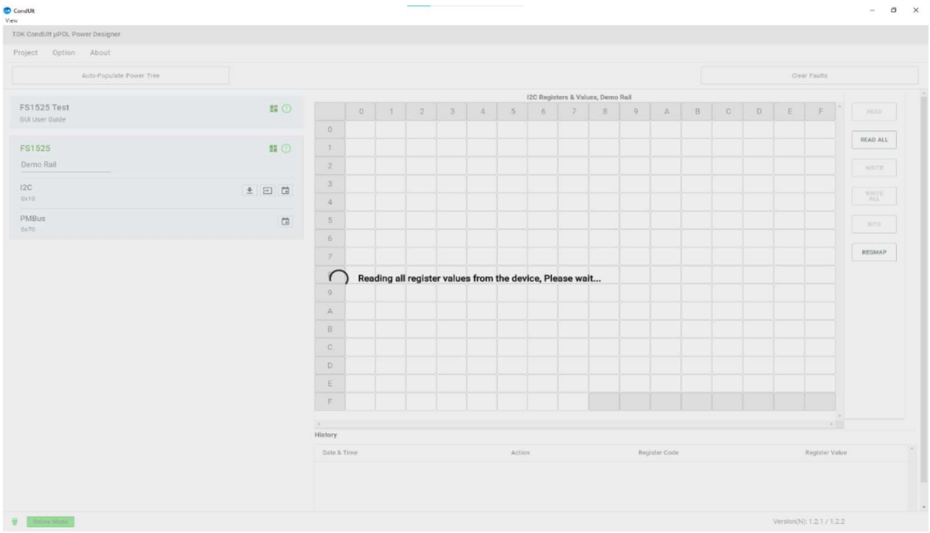
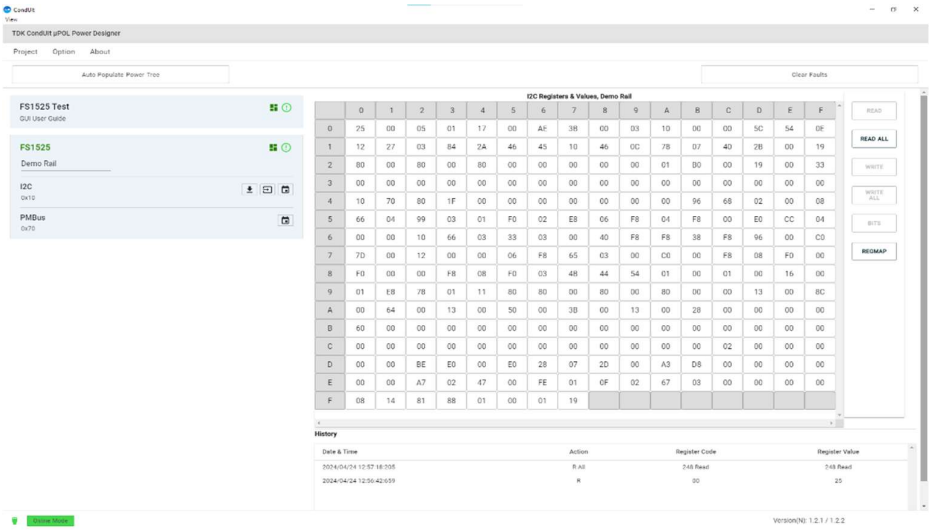
5. At this stage, the user can read all the I2C registers using the Read All Registers button.





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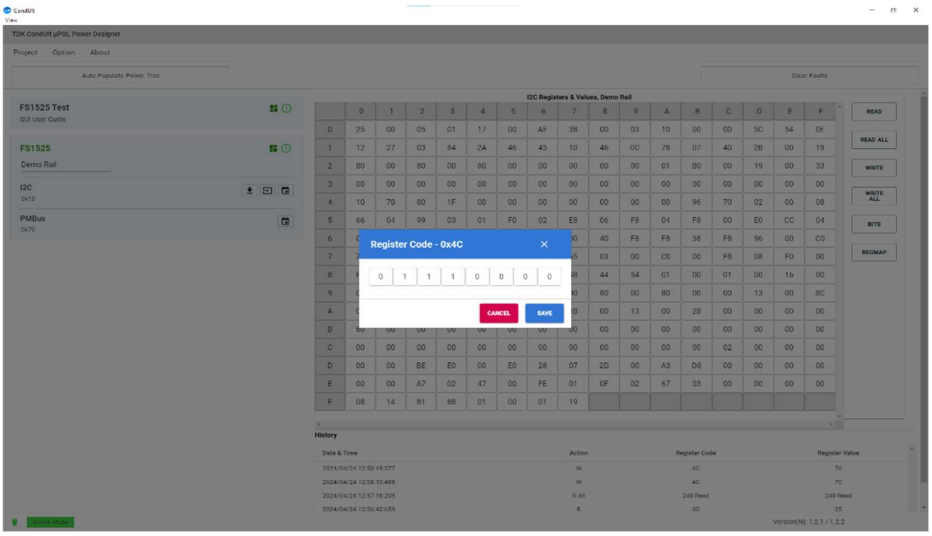
6. **Exporting a configuration file:**
   This step illustrates the export/save of a register configuration file in text format once any changes have been made to any of the registers. In this illustration, to keep it simple, only registers 4C and 4D are written using the WRITE ALL button. Reg 0x4D is written with a value of 0x02 and Reg 0x4C is written with a value of 0x70. Note that single registers may be written using the WRITE button. The BITs button is useful to change individual bit values within a register when different bits or groups of bits in each 8-bit register serve different functions.



Before clicking on Export Symbol, Go to Options>Expert Mode, enter password: expertgui. Click on Export and all the values will be saved as a configuration file.

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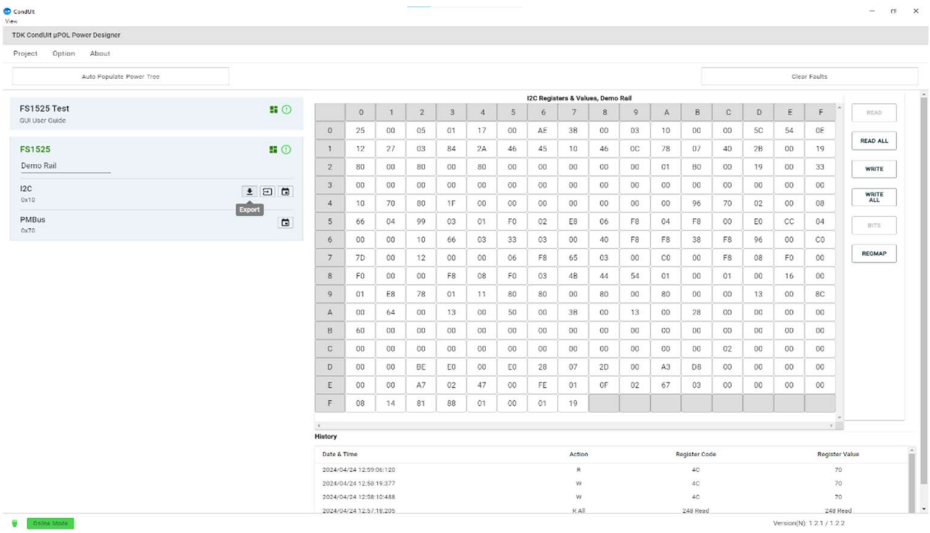

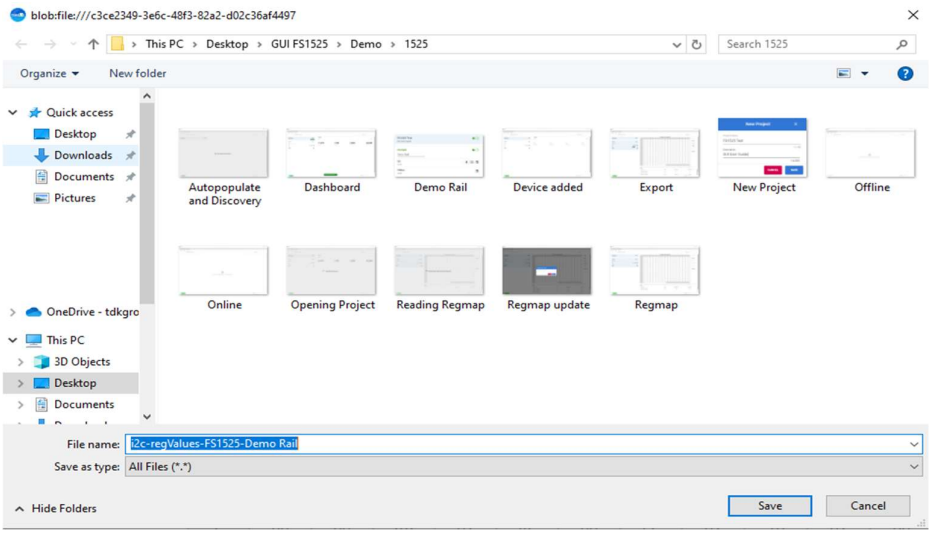

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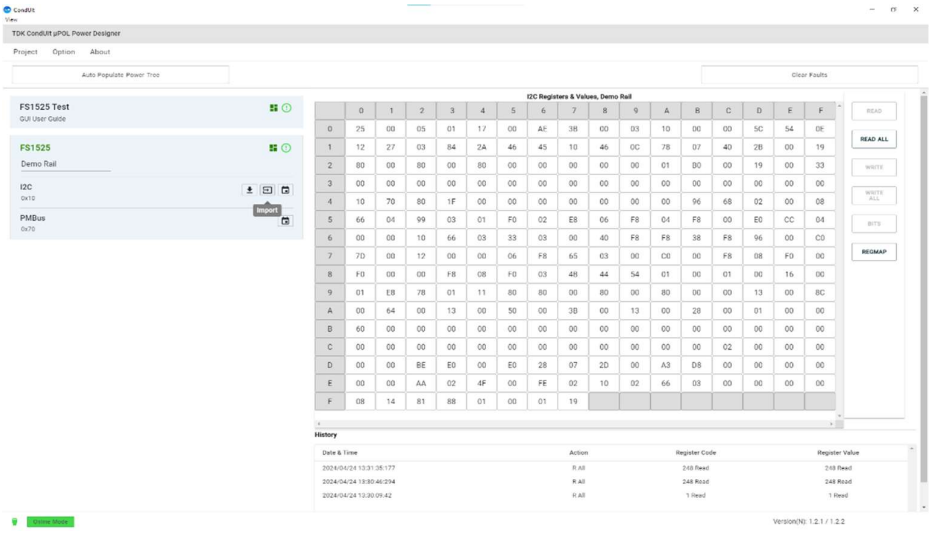
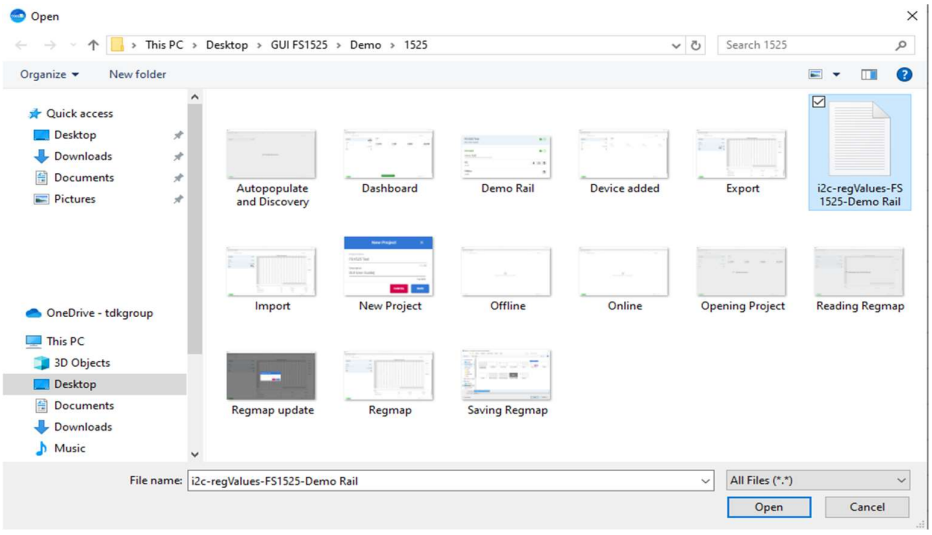
7. **Importing a text configuration file into the registers:**
   By clicking the import button, the user can browse and select the configuration file they wish to import into the design/project.





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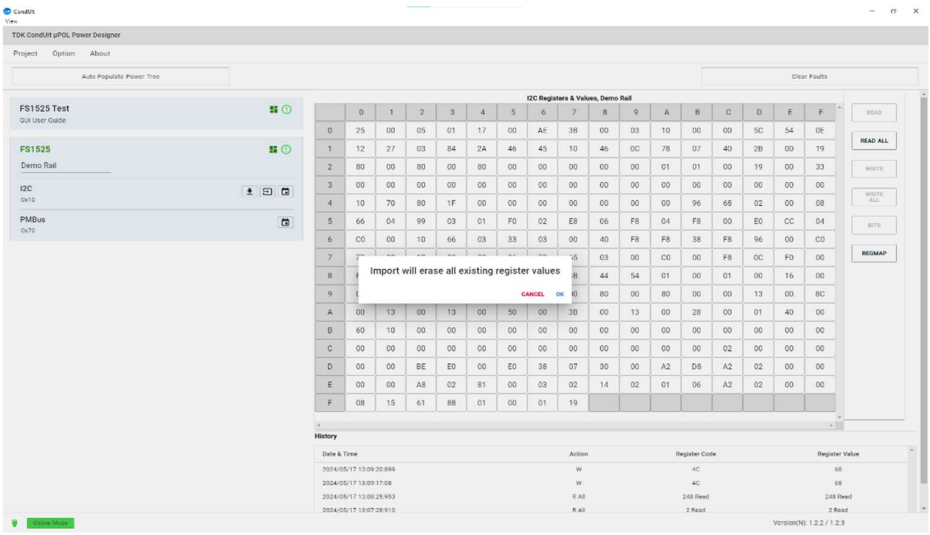
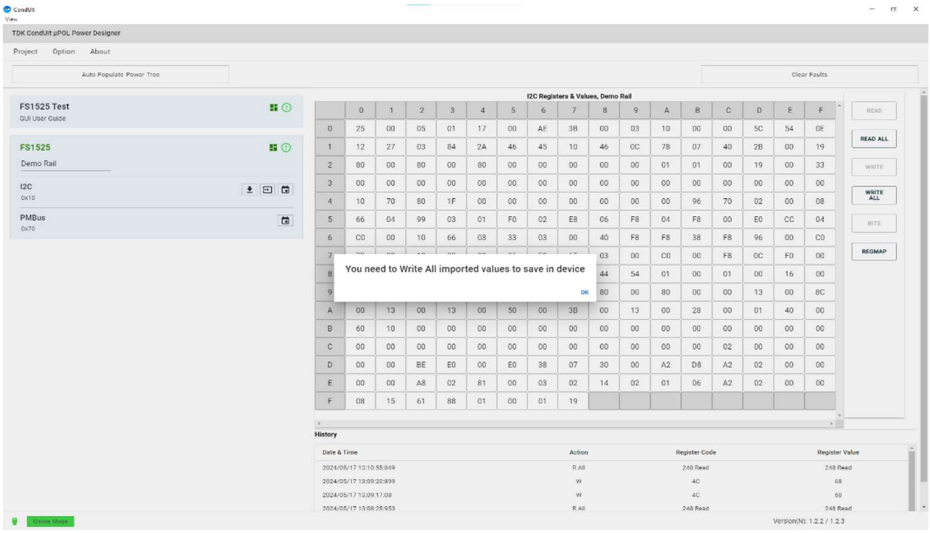


Click OK



Click OK. Note that at this point the configuration values are part of the project but have not yet been written to the device registers. To do so, click WRITE ALL.

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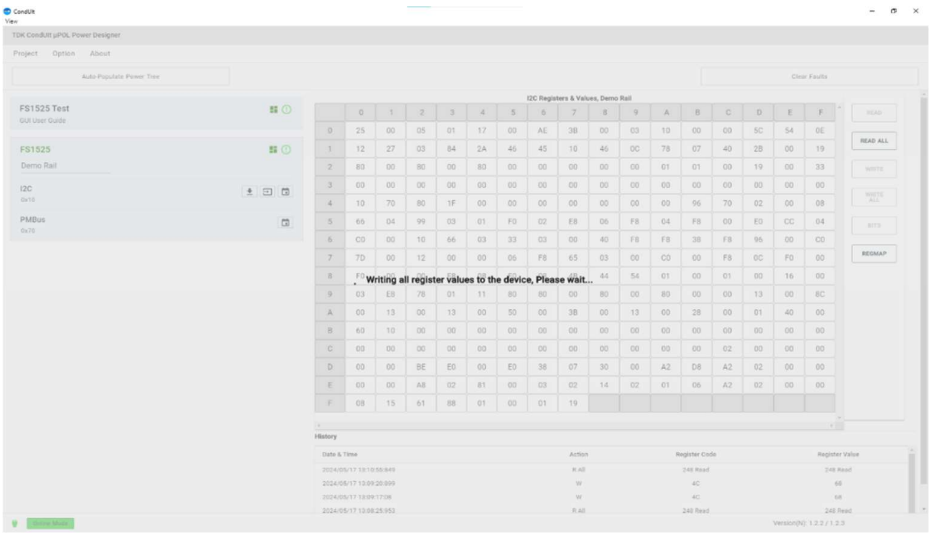

NOTE:

Any changes so far are still volatile and the device will revert to its default values if Vin/Vcc are cycled. To permanently store the values to the programmable non volatile memory, please follow the steps in the appendix.

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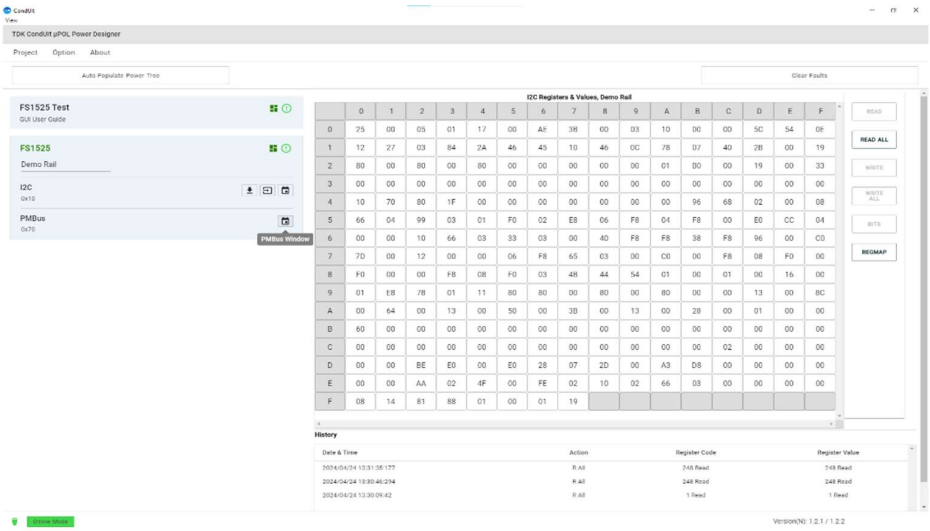
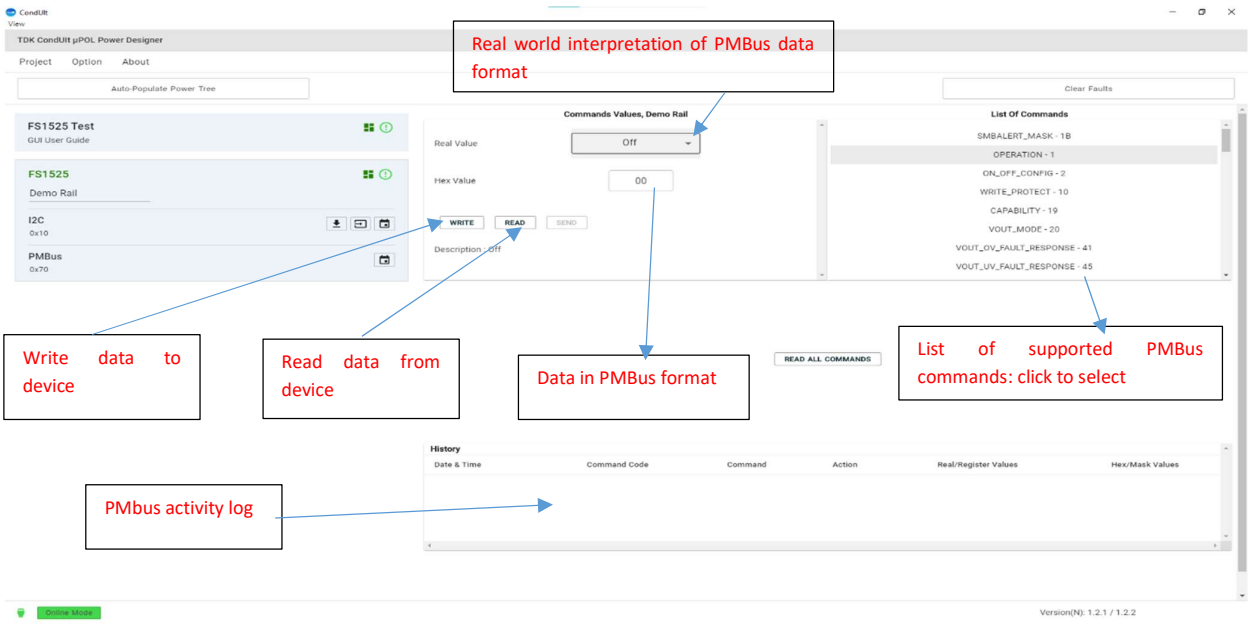
8. **PMBus work area**: Click the PMBus workspace button to bring up the PMBus work area.





See an illustration of command history below:

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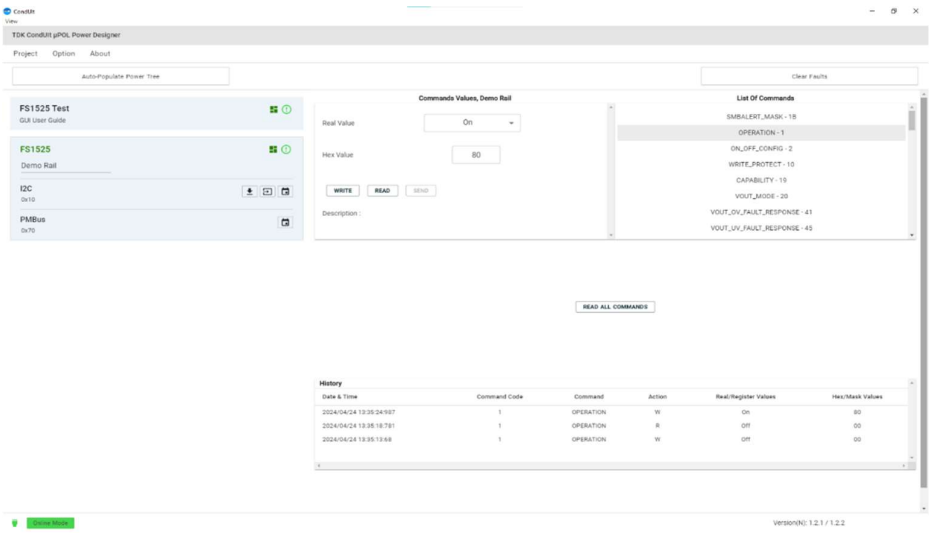
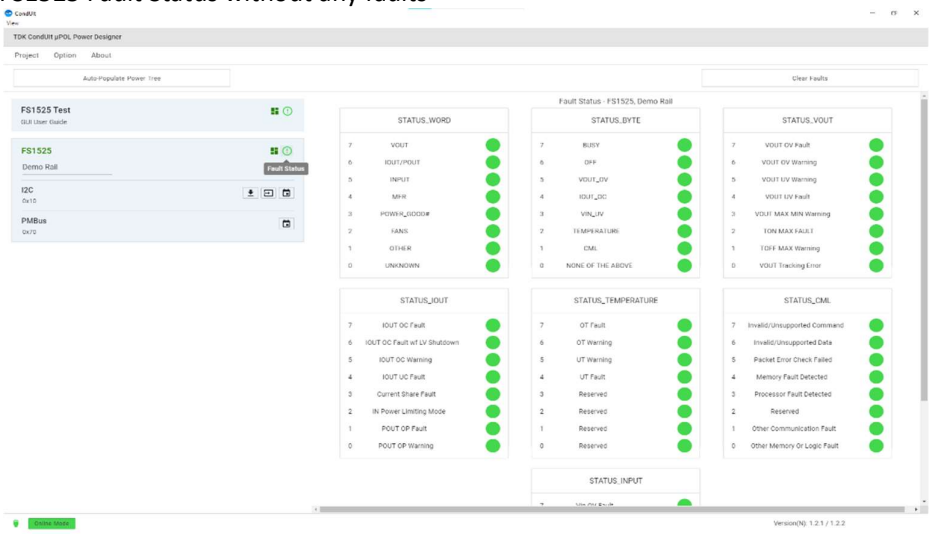


9. **Device FAULT Status** :
   There is a dedicated area in GUI indicating any Faults that happen during the device operation. This is an example of FS1525 Fault Status without any faults –



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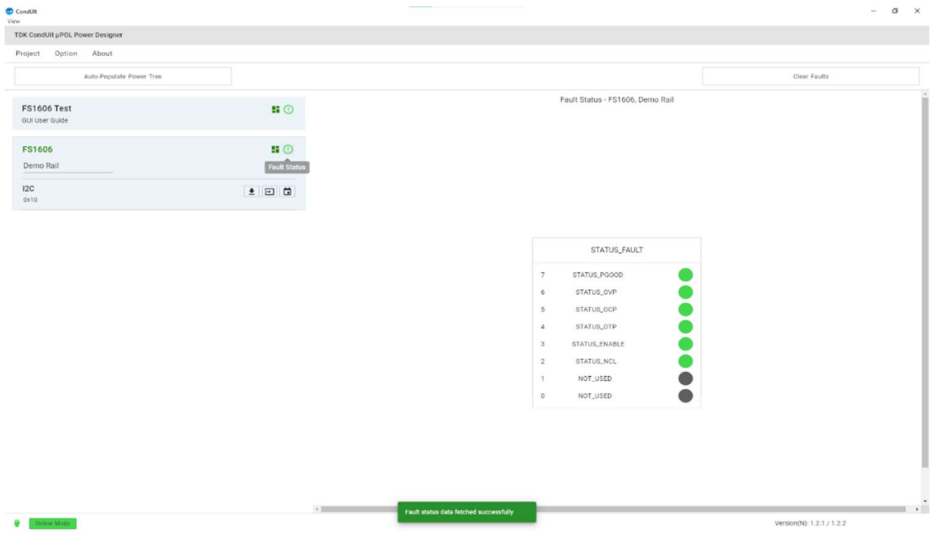
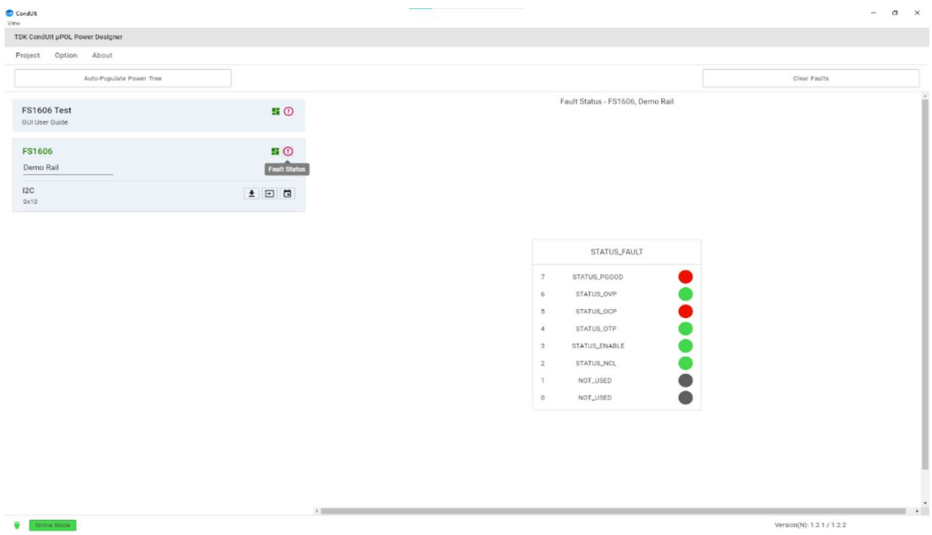
For FS160XA/FS160X/FS100X/FS140X, there is no PMBUS functionality, and the fault status page is much simpler –



This is an example of FS1606 in OCP –



NOTE – The fault bits for FS160XA/FS160X/FS100X/FS140X are stickied, and removing the Fault won't change the flag from Red to Green. Also, the Clear Faults tab on top right is tied to PMBUS and thus only works for FS1525/FS1412. As such, to reset the bit, En Cycling needs to be done. (NCL needs Power Cycling)

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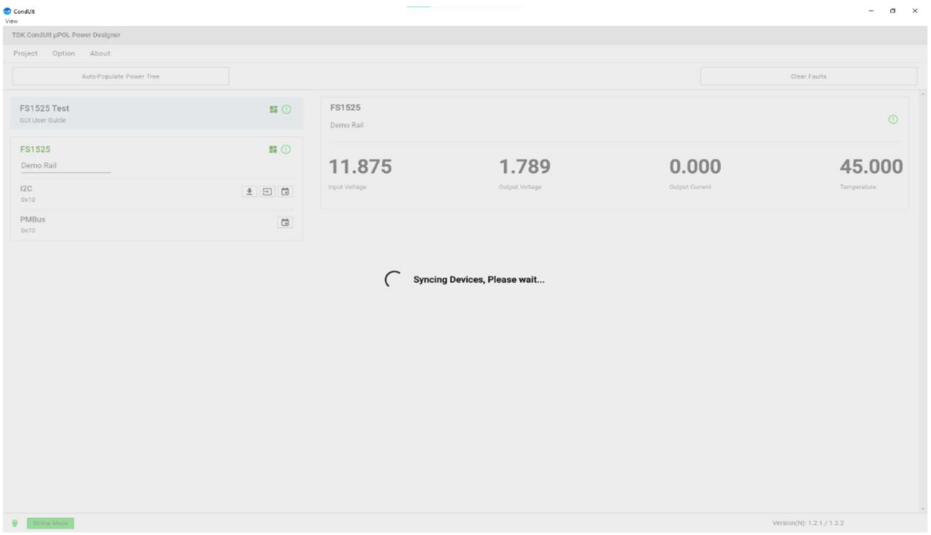
10. **Opening an already created Project.**
    Go to Project>Open and select the project that needs to be accessed. Once selected, the following screen pops up –



After Syncing is complete, the project will be ready for use.

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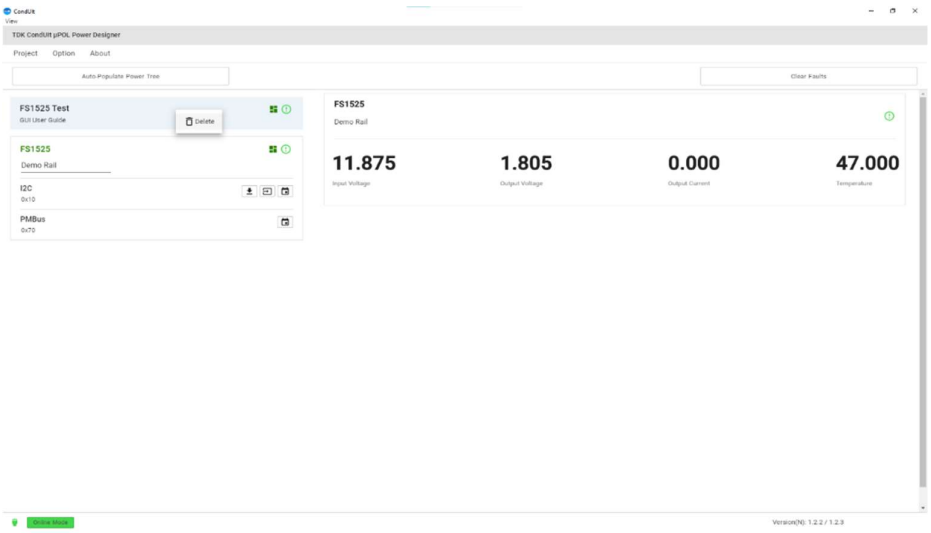
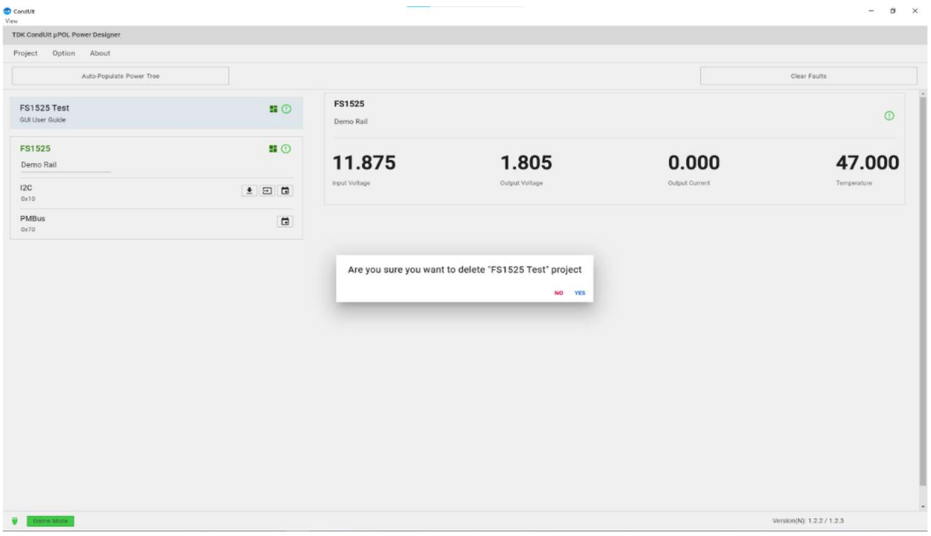
11. **Deleting a Project**
    Right Click on the Dashboard Panel and Delete icon will come up.





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APPENDIX:

INSTRUCTIONS to burn OTP for FS1412

1) Once all registers are written to desired values, read all the values into a configuration file as (register, data) pairs

2) Read Reg 0x92 to check number of available user banks

Reg 0x92[7:4]	Number of writes left
0001	9
0010	8
0011	7
0100	6
0101	5
0110	4
0111	3
1000	2
1001	1
1010	0

3) Apply 7.5V+/-0.25V to Vin pin

4) If number of writes left > 0, write 0x02 to reg 0x89

5) Read reg 0x93. If bit [1] is 1, the write to OTP succeeded. If this bit is 0, the write failed.

6) If successful, cycle Vin.

7) Verify step:
Read all regs, compare with the values in configuration file, and verify that they Match

8) If steps 5 or 7 fail, retry steps 1 to 4.

9) If steps 5 or 7 fail again, debug.

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INSTRUCTIONS to burn OTP for FS160XA/FS160X/FS100X

1) Once all registers are written to desired values, read all the values into a configuration file as (register, data) pairs

2) Read Reg 0x20 to check number of available banks

Reg 0x20[5:0]	Number of writes left
001001	3
010010	2
011011	1
100100	0

3) Apply 7.5V+/-0.25V to Vin pin

4) If number of writes left > 0, write 0x15 to reg 0x2B, make sure bit[1] of reg 0x1D is 1 (turn on OTP clock)

5) Read reg 0x21. If bit [0] is 1, the write to OTP succeeded. If this bit is 0, the write failed.

6) If successful, cycle Vin.

7) Verify step:
   Read all regs, compare with the values in configuration file, and verify that they Match

10) If steps 5 or 7 fail, retry steps 1 to 4.

11) If steps 5 or 7 fail again, debug.

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INSTRUCTIONS to burn OTP for FS1525

1) Once all registers are written to desired values, read all the values into a configuration file as (register, data) pairs

2) Read Reg 0xF2 to check number of available user banks

Reg 0xF2[7:4]	Number of writes left
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A(10)

3) Apply 7.5V+/-0.25V to Vin pin

4) If number of writes left > 0, write 0x02 to reg 0xC9

5) Read reg 0xF3. If bit [1] is 1, the write to OTP succeeded. If this bit is 0, the write failed.

6) If successful, cycle Vin.

7) Verify step:
Read all regs, compare with the values in configuration file, and verify that they Match

8) If steps 5 or 7 fail, retry steps 1 to 4.

9) If steps 5 or 7 fail again, debug.

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INSTRUCTIONS to burn OTP for FS140X

1) Once all registers are written to desired values, read all the values into a configuration file as (register, data) pairs

2) Read Reg 0x20 to check number of available banks

Reg 0x20[5:0]	Number of writes left
001001	3
010010	2
011011	1
100100	0

3) Apply 7.5V+/-0.25V to Vin pin

4) If number of writes left > 0, write 0x02 to reg 0x1D, make sure bit[1] of reg 0x1D is 1 (turn on OTP clock)

5) Read reg 0x21. If bit [1] is 1, the write to OTP succeeded. If this bit is 0, the write failed.

6) If successful, cycle Vin.

7) Verify step:
   Read all regs, compare with the values in configuration file, and verify that they Match

8) If steps 5 or 7 fail, retry steps 1 to 4.

9) If steps 5 or 7 fail again, debug.

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