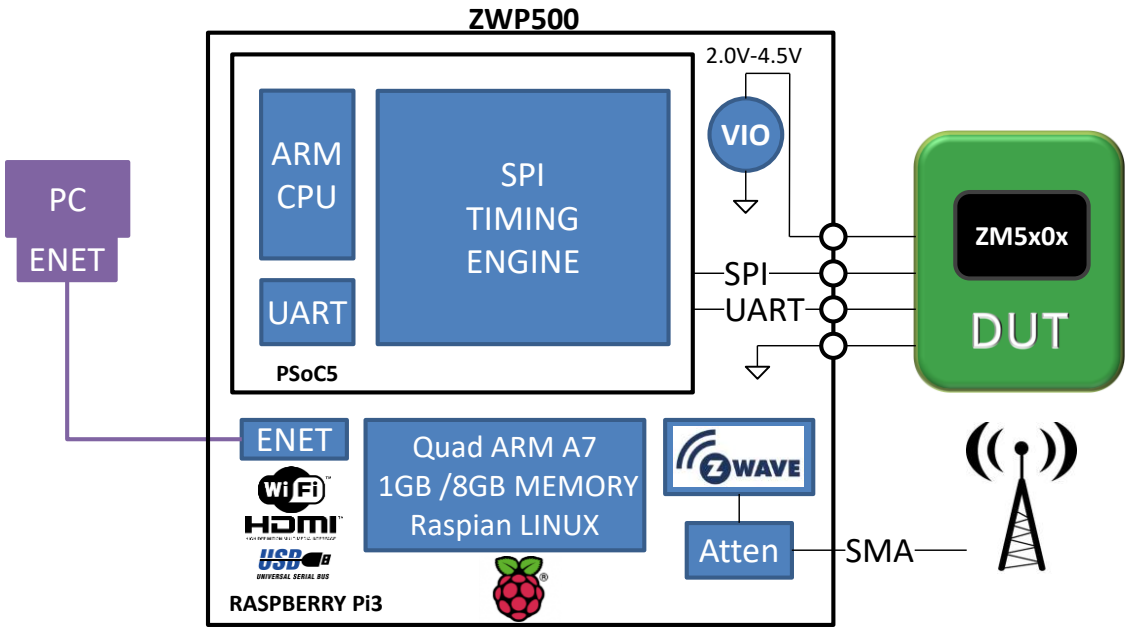


ZWP500™

Z-Wave Production Programmer & Test Platform

- Sigma Designs Z-Wave SoCs/Module Programmer
- FLASH & NVM Programmer
- Production Test Platform
- Firmware Validation Platform
- Programmable in Python or C
- SmartStart enabled with QRCode label printing
- Fully Customizable
- Validation Services Available

Overview

The ZWP500 is a robust and reliable programmer for the Sigma Designs 500 series of Z-Wave modules. A high-speed SPI bus interface programs the Z-Wave module in seconds. The ZWP500 is designed to operate on the factory production floor with a fanless design and push-button operation. The Raspberry Pi Linux computer is augmented with a PSoC5 microcontroller to provide the most accurate and fastest programming times possible.

A Z-Wave module with a programmable RF attenuator allows the ZWP500 to fully test the RF parameters of the target DUT. A 1ppm accurate crystal calibrates every device for optimal RF performance.

The Python API enables customizable production programming and testing. Program each NVR with a unique AES-128 Security S2 DSK pin code or other custom fields. Set the LOCK bits to prevent unauthorized access to the firmware. Have your team develop the test code or let the experts at Express Controls do it for you.

Features

Sigma Designs 500 Series FLASH Programmer
- Standard Sigma 12 pin programming header
  - SPI interface for programming
  - UART interface for debug
- NVR and external NVM programming & test
- 1ppm Crystal RF Calibration
- SmartStart QRCode generation & printing
- Fanless protective enclosure

Production Test Platform
- Customizable Python interface
- Scanner interface for serial number or DSK
- Label printer interface for DSK
- Camera interface for LCD screen testing

Z-Wave ZM5202 Module onboard
- Programmable RF Attenuator with SMA

Python API
- Customizable Programming API or GUI
- Sample test scripts for production testing

Programmable Power Supply
- +2.0V to +4.5V 300mA
- Resolution 100uV, 100 uAmps

Raspberry Pi based controller
- 1.2GHz Quad ARM CPU running Linux
- 1GB RAM - 8GB FLASH microSD
- Ethernet, WiFi, HDMI and USB connectivity
- Control locally or remotely via VNC

Ordering information:

ZWP500-AU – Programmer/Tester (908Mhz US)
ZWP500-AE – Programmer/Tester (868Mhz EU)
ZWP500-AH – Programmer/Tester (921Mhz ANZ)
ZWP500-DV – DevKit Interface Board
ZWP500-SVC - ZWP500 Services & Customization

Table of Contents

Overview

The ZWP500 is a **production programmer** for Z-Wave 500 series wireless RF modules. The ZWP500 programs Z-Wave modules at their maximum programming speed bringing the typical programming time down under four seconds compared to nearly 30 seconds with competing products. RF calibration is performed using the high accuracy 1ppm on-board crystal. A fanless enclosure means the ZWP500 can be deployed on the factory floor without special packaging or custom enclosures. The ZWP500 is a complete, high speed, robust production platform that can be customized to exactly meet your requirements. Customization services are available from Express Controls team of experts.

In addition to being a fast production programmer, the ZWP500 is an ideal platform for **testing Z-Wave devices**. Product testing on the factory floor to ensure every device is free of manufacturing defects requires an accurate, fast and robust system. The ZWP500 utilizes the Linux based Raspberry Pi model 3 Quad Arm A7 processor which is then augmented with the precise timing generators of a Cypress PSoC microcontroller and the RF capabilities of the on-board Z-Wave module. A programmable power supply with current measurement capabilities enables rapid testing that the Device-Under-Test (DUT) is free from gross production failures like power to ground shorts or missing power components. Either Python or C programming languages can be used to develop a customized test program to fully verify every electronic component of the DUT. Express Controls can write the test program for you or your team can develop it using the sample code provided with the ZWP500 as a guide.

The ZWP500 is can be used for **software validation** to verify there are no bugs in each release of firmware. The full power of high level programming languages like Python or C can be used to test every button press and Z-Wave command class with each firmware revision. Push buttons can be activated with millisecond precision, DACs can generate specific voltages or waveforms to trigger specific conditions, the power supply voltage can be varied to trigger low-battery conditions as well as measure current to ensure the DUT battery lifetime will meet your specification. LCD screens can be checked against reference images to verify every screen reacts properly to every button press. The power of the RPi3 is completely at your disposal using the most advanced programming languages to fully test every aspect of your product with every release.

Quick Start Guide

Unpack the ZWP500 which consists of the following items:

1. ZWP500
2. Power Supply

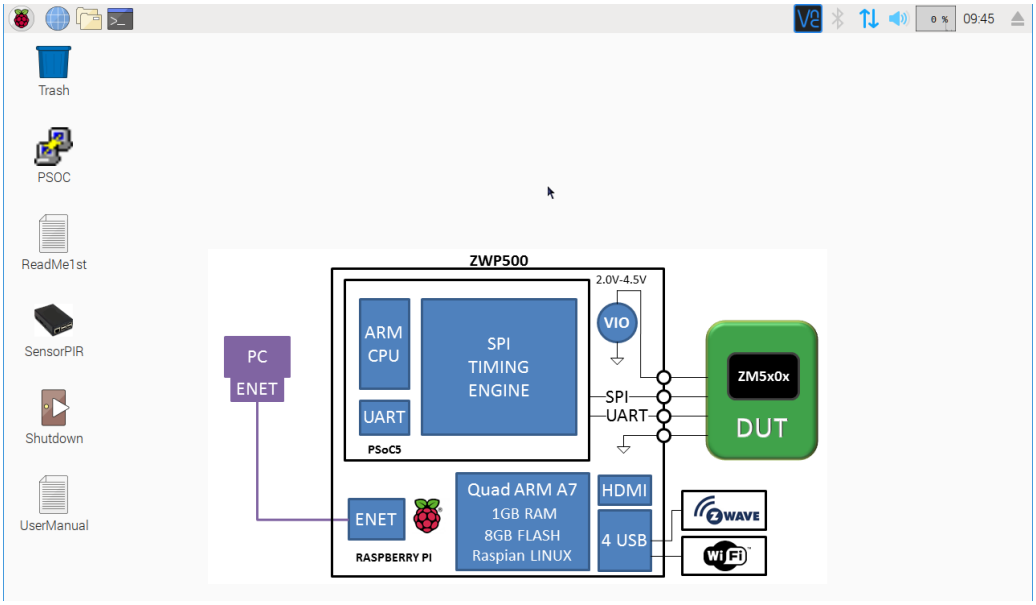
The optional ZWP500-DV DevKit interface board (shown here) is recommended for initial debug and project development.

The following item must be supplied by you to make a complete system:

1. Generic USB keyboard and mouse
2. Monitor with at least 1280x1024 resolution and HDMI cable
3. Optional but recommended:
    a. Sigma Designs Developers Board ACC-ZDB5202-U2 (choose the one for your region)

Connect the ZWP500 to the keyboard, mouse and monitor. Connect the ribbon cable to the ZWP500-DV sample developer kit interface board and plug the developer kit board into the interface board as shown. The developers kit board is optional but is a good learning tool on how to use the ZWP500.

Connect the power supply into the ZWP500 and plug the power supply in. The ZWP500 should go thru the normal Linux boot sequence and finally arrive at the ZWP500 desktop.



The icons on the left side of the screen may be different.

Double click on the UserManual icon to open the ZWP500 user manual.

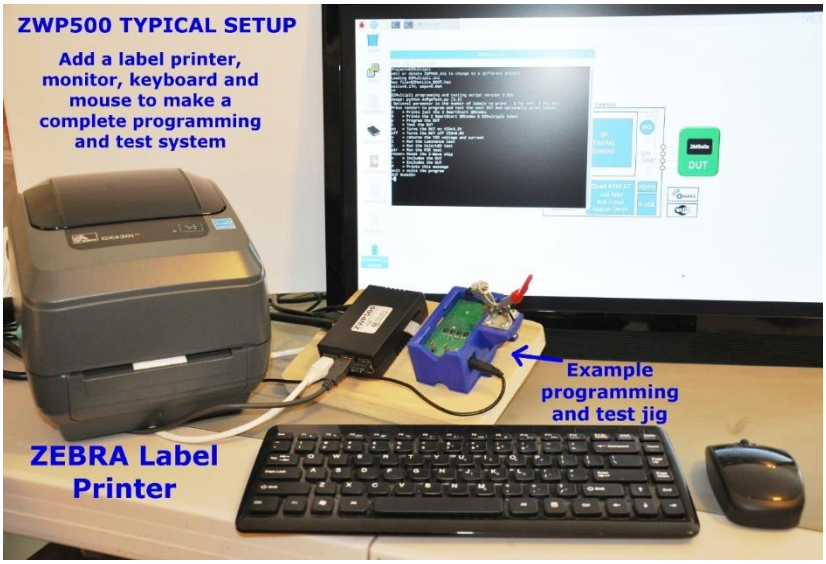
It is recommended to ALWAYS double click on the SHUTDOWN icon BEFORE powering the ZWP500 off. This will cleanly shut the file system down and avoid corrupting the SD card of the Raspberry Pi.

The PSOC icon opens a PuTTY terminal window to communicate directly with the PSoC. This can be used to debug your own test programs but is not used in normal operating modes.

Connect a Sigma Designs Development Board (not included) to the included DevKit interface board on J1. Click on the SensorPIR icon and then press "?<enter>" to get a list of commands that can be run. See the Sigma DevKit Interface section for more details.

Typical ZWP500 Setup

The ZWP500 does not come with all the items required to build a complete programming and test station. The ZWP500 is a complete Linux based computer with a graphical user interface. Thus, a keyboard, mouse and monitor are needed. The RPi3 has an HDMI connector which is typically connected to an inexpensive HDMI capable monitor with at least 1280x800 resolution. 1910x1080p resolution is recommended. Any generic keyboard and mouse will typically work. They can be either wired for maximum reliability or wireless for maximum flexibility.



A custom designed test jig is typically used to connect to the ZWP500 and provide reliable and easy connection to the DUT. Spring loaded pogo posts are typically used to connect the 500 series SPI bus to the ZWP500. Additional pins can provide other capabilities to push button or measure voltages. A 3D printed jig and clamp holds the DUT securely during programming and test.

SmartStart QRCode Label Printer

The ZWP500 has the ability to generate the required SmartStart QR Code labels for both the device and the package. The QRCode requires customization to fit on the desired label but the sample SensorPIR project can be used as a guide. Since each label is unique, the label MUST be immediately applied to the DUT to ensure the label matches values stored within the DUT. Many types of printers are supported by the RPi including the popular Zebra printers. The Zebra GX430t

is recommended as it provides 300dpi resolution and yields a good quality image in permanent ink. The printer is plugged into the USB port of the RPi and can be configured by using the browser to connect to the URL: `localhost:631`. More information on working with printers can found on the Raspberry Pi or Linux web sites.

Hardware Connections

The ZWP500 uses the standard 12 pin Sigma Designs programming header. The Sigma ZDP03A has only a 10 pin header and excludes the two UART pins but is otherwise pin compatible. Pins 2 and 5 are usually a no-connect on other programmers but the ZWP500 uses these pins to connect to a DUT board with I2C GPIO expanders or other I2C devices to enable complete control and measurement of the DUT. The cable should be less than 6 inches in length to ensure reliable signal quality.

Z-Wave Programming Cable

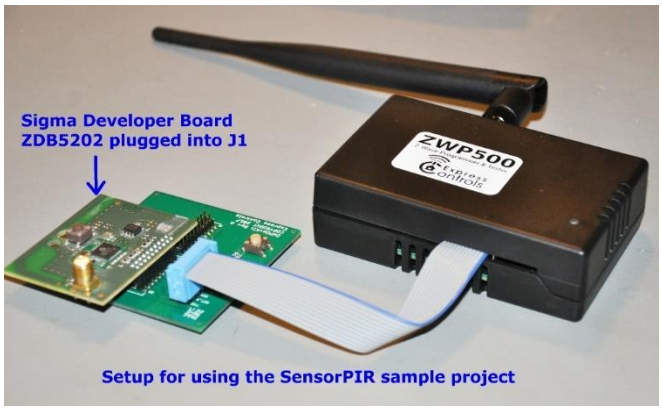
Z-Wave Programming Cable - TOP view				
VIO		1	2	I2C_SCL
NVM_CS_N		3	4	MOSI
I2C_SDA		5	6	MISO
GND		7	8	SCK
GND		9	10	RESET_N
RXD		11	12	TXD

Pin #	Signal Name	Description
1	VIO	Power for the DUT - programmable voltage from 2.0 to 4.5V at up to 300mA
2	I2C_SCL	Optional I2C SCL signal for controlling GPIO expanders/ADC/DACs on DUT test board
3	NVM_CS_N	Optional Chip Select signal to the Z-Wave module external NVM
4	MOSI	SPI MOSI signal
5	I2C_SDA	Optional I2C SDA signal
6	MISO	SPI MISO signal
7	GND	Ground (Vss) 0.0V
8	SCK	SPI Clock signal
9	GND	Ground (Vss) 0.0V
10	RESET_N	RESET_N pin of the Z-Wave module
11	RXD	Optional UART Receive Data (connect to the TXD of the Z-Wave module)
12	TXD	Optional UART Transmit Data (connect to RXD)

Z-Wave Antenna

An SMA connector on the side of the ZWP500 is typically connected to a 900MHz antenna to communicate with the DUT over the Z-Wave radio. The SMA connector may be cabled to an RF shielded enclosure to limit the RF interference with adjacent test stations or other Z-Wave networks.

Sigma DevKit Interface Board – ZWP500-DV

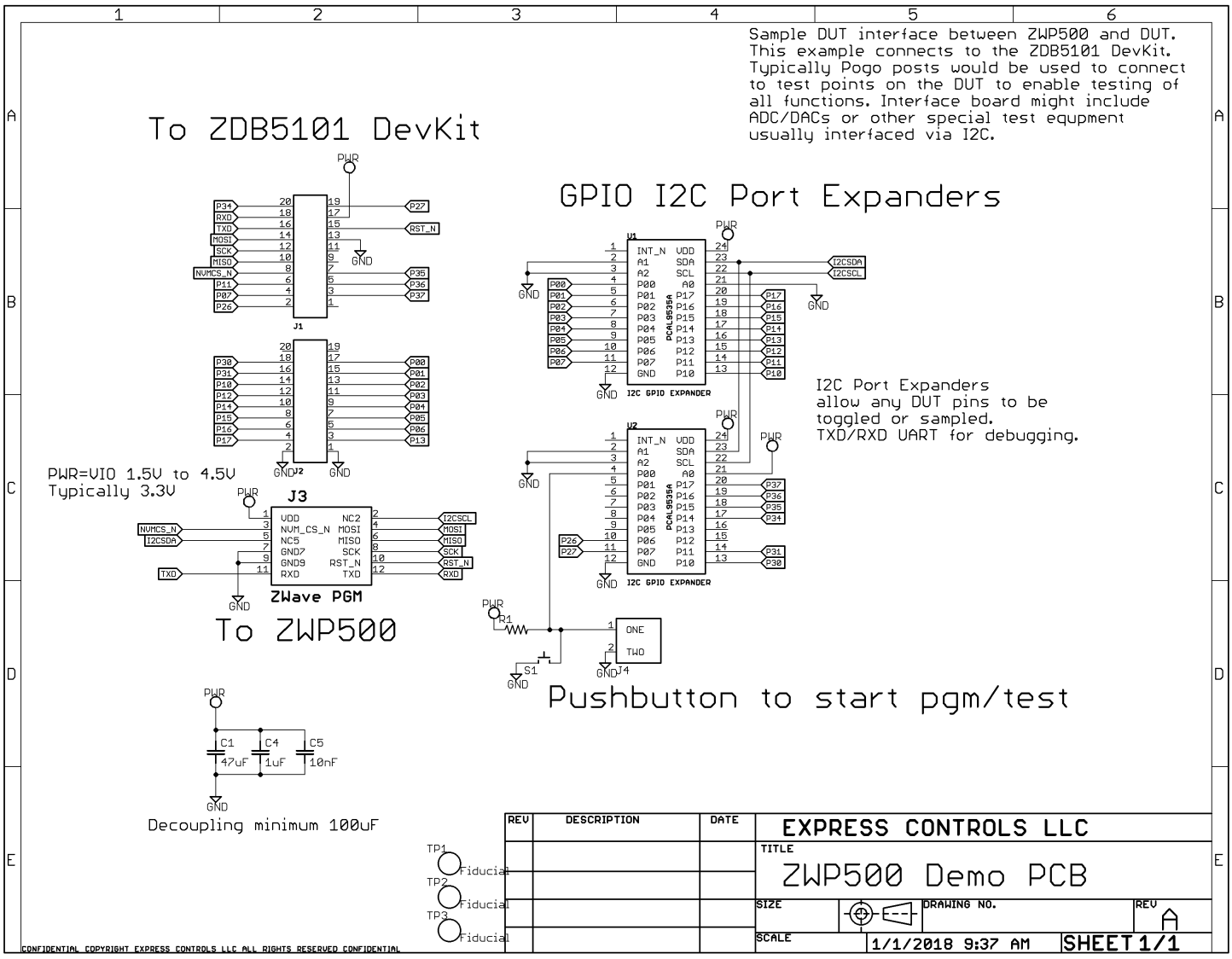


Setup for using the SensorPIR sample project

An interface board (ZWP500-DV DevKit) from the ZWP500 to the Sigma ZDB5202 Developer Board is optional but highly recommended for initial project development. Note that the Sigma Developer Board is NOT included and must be purchased separately (click on the links to purchase from Digikey). The ZWP500-DV can be used to prototype the programming and test environment of your product before the hardware exists. The board can also be used as an example of how to program and test a Z-Wave 500 series product using the ZWP500. The SensorPIR project from the Sigma SDK is pre-loaded on the ZWP500 and an icon to program and test it is on the Desktop. Double click on the SensorPIR icon and a terminal window comes up. Press "?<enter>" to get a list of commands available by the programming and test program. The program is written in Python and is in the /home/pi/examples/SensorPIR_test.py. Use the sample program to develop a customized program/test suite or contract Express Controls to do it for you.

TBD – NOTE: Rev A ONLY supports the ZDB5202 Sigma Developer Board!!! The board is being updated to also support the ZDB5101 and will be available soon.

Schematics for the ZWP500-DV DevKit board:



The DevKit board has two I2C GPIO expanders (PCAL9535A) at I2C address 20 and 21. These can be controlled using the ZWP500 commands I2CSend and I2CGet. See the sample SensorPIR.py Python code for an example.

The PCAL chip command structure is the I2C Slave address, then a command byte which is a register address, then optionally another data byte or two or perform an I2C read. See the PCAL9535A data sheet for more details.

- Command Byte definition:
- 0x00 read port 0
- 0x01 read port 1
- 0x02 set the output value for port 0
- 0x03 set the output value for port 1
- 0x06 set the configuration for port 0, a 1 sets the pin to an input, 0 is an output
- 0x07 set the configuration for port 1, a 1 sets the pin to an input, 0 is an output

Raspberry Pi

The brains of the ZWP500 are provided using the popular Raspberry Pi (RPi) embedded Linux computer. A plug-in board is added to the RPi to provide high speed programming and measurement of the DUT. The RPi is a complete Linux computer running the Raspian branch of the open source Linux operating system. A monitor and keyboard are typically

connected to the ZWP500 for full computer access (not included with the ZWP500). Most generic monitors with an HDMI connection will work. Most generic wired or wireless USB keyboard and mouse will work with the RPi.

PSoC PlugIn Board

The RPi is augmented with a plug-in board that contains a Cypress PSoC System-On-Chip microprocessor. This dedicated processor and its programmable hardware resources are used to program the DUT at the maximum speeds. The PlugIn board also contains a ZM5202 Z-Wave chip and RF attenuators to enable complete testing of the DUT for both functionality and RF performance. This board is integrated within the ZWP500 enclosure and should not be removed or otherwise modified.

Serial Port

The PSoC PlugIn board is connected to the RPi via the 40 pin header on the RPi. The serial port on the header is the primary communication method. The serial port /dev/ttyAMA0 operates at 921600 baud with 8 bits of data and 1 stop bit. The UART connection is via the RPi expansion header on pins 8 and 10. The Raspberry Pi3 default has the “mini UART” connected to the GPIOs and /dev/ttyAMA0 is connected to the on-board Bluetooth chip. The RPi has been configured to swap the UARTs so that the /dev/ttyAMA0 UART is connected to the GPIOs (and thus the PSoC) and the mini UART is connected to the Bluetooth chip which is normally not used but is still available.

USB Ports

Four USB 2.0 Type A connectors are present on the ZWP500. These USB ports support most generic USB devices like keyboards, mouse, and memory sticks. The bar-code scanner and the label printer can be connected directly to these USB ports.

HDMI Port

An HDMI port on the ZWP500 should be connected to a monitor to enable the user to interface with the software on the ZWP500. The recommended resolution is 1280x1024 which is the default setting. The RPi supports many other resolutions and most monitors will work. See the Raspberrypi.org site for details on configuring other resolutions.

Ethernet Port

An Ethernet RJ45 jack on the ZWP500 should be connected to a LAN which has access to the Internet. The ZWP500 requires a network connection to the internet to set the local time and date. Either a wired network connection or WiFi can be used.

WiFi Access

The RPi3 has WiFi integrated onto the RPi3 board. WiFi can be configured using the network icon in the upper right corner of the screen. See the Raspberrypi.org site for more details on configuring WiFi.

Desktop Sharing with VNC

The ZWP500 is configured with VNC for remote desktop access. Most VNC desktop applications will connect to the ZWP500. The recommended application is TightVNC available from tightnvc.com. A password is required to log into the ZWP500 with is “ExpressControls” (note the capitalization).

Source Code Control of Scripts

A common request is how and where to store the project specific custom coded scripts and how to deploy them across multiple ZWP500 systems. The solution is to use `git` which is pre-installed on the RPi3. While any git server will work, Express Controls recommends using BitBucket which provides a simple and free repository for small projects. Once the account and a repository are created on BitBucket, you “clone” the repository onto the ZWP500. The table below gives a few of the most commonly use git commands. See the online documentation of git for more details. Open a terminal

window and enter these commands. Do NOT put files in the `examples`, `Desktop`, or `ZWP500` directory as these may be overwritten when the ZWP500 code is updated.

Command	Description
`git clone "https://<username>@bitbucket.org/<acct>/<project>.git" <local_directory_name>`	Create a local repository on the ZWP500
`git status`	Prints out which files in your local directory have changed or need to be checked in
`git pull`	Updates local directory/repository with the main branch
`git commit -a -m "comment"`	Commits changed files TO YOUR LOCAL REPOSITORY but not to BitBucket!
`git push`	Pushes your commits up to BitBucket - always do a GIT PULL before committing/pushing

Sigma 500 Series RF Calibration

Each Sigma Designs chip or module must be calibrated to ensure optimal RF performance. See Sigma document INS12524 for details on RF calibration. The ZM5202 and ZM5304 modules are both TX and Crystal calibrated at the Sigma factory and do not need to be calibrated unless the NVR has been accidentally erased. The other Z-Wave modules and chips all need some level of calibration. The ZWP500 contains a 1ppm accurate crystal and the necessary firmware to perform both levels of RF calibration. The calibration is performed automatically and only if the NVR values are not already programmed. After the calibration values are calculated, the NVR is updated with the new values and the CRC is recalculated. The calibration process involves downloading a special calibration program into the DUT, then applying a 1ppm accurate 1MHz/256 clock onto the MISO pin. The calibration process takes 1.2 seconds plus the time to program the DUT with the calibration program. Total time is about 3 seconds. Note that if performing crystal calibration it is strongly recommended that the ZWP500 operate in a temperature and humidity controlled environment with an ambient temperature of approximately 72F.

Tx Calibration

There are two TX calibration values stored in the NVR - TXCAL1 and TXCAL2. If CCAL is already calibrated this calibration does not need as accurate of a clock but since the ZWP500 already has the 1ppm accurate clock, the calibration is highly accurate.

Crystal Calibration

The crystal calibration value CCAL is also stored in NVR. Most of the modules have this value already programmed and just need TxCal. Crystal calibration requires the 1ppm crystal which is part of the ZWP500.

Programming

Programming of Sigma Designs 500 series Z-Wave chips is described in the document INS11681. The ZWP500 implements the required algorithms for programming Z-Wave chips as quickly as possible using the dedicated PSoC microprocessor. Firmware on the PSoC automatically identifies the DUT chip type, captures the NVR data, erases, restores the NVR, programs flash and finally sets the Lock bits.

Non-Volatile Register (NVR) Fields

The values stored in the NVR are programmed using the ZWP500 and cannot be changed by the firmware on the DUT itself. The NVR contains a number of fields required for Z-Wave operation including the calibration values, the module type and the S2 security keys. Half of the NVR is available for user values and can be programmed with a variety of values as described below. The NVR fields are described in Sigma document SDS12467. Typically, these values are programmed with manufacturing data or with application specific data.

The values to be programmed in the NVR are defined in the <project>.ini file in the [nvr] section. All of the defined fields in the Sigma NVR document SDS12467 are supported. The defined fields allow for fields that are more than one byte to be programmed. The value to be programmed is a string with special characters on the end to perform specialized functions as described in the following sections. Any byte in the NVR can be supported by editing the Python code. The PSoC firmware supports all 256 bytes of the NVR. The PSoC treats the NVR as 256 bytes of memory. The Python code performs all of the calculations for what values in the NVR need to be reprogrammed. By default, an NVR value defined in the .ini file will be written to the NVR IF and ONLY IF the value in the DUT is 0xFF indicating the value has not been previously programmed. The project.ini file is updated with the latest values for the NVR (primarily the next incremented value) when the Python program exits.

Override Value !

If an exclamation point (!) is appended to the value then even if the NVR already contains a value other than 0xFF, the value is programmed with the desired value. If there is no punctuation character at all for the NVR value, then if the currently programmed value is all ones (0xFF) then the value in the .ini file will be written in. If the NVR already contains a value it is not overwritten. The ! will override the current value and always write the NVR register with the desired value.

When a device is reprogrammed a second time, typically after being reworked to fix a manufacturing defect, typically the settings in the NVR do NOT want to be overwritten. In some cases the values do want to be overridden and thus should have the ! appended in the .ini file.

Incrementing Value +

Any NVR value can be an incrementing number by adding a + to the end of it. Each unit PROGRAMMED is assigned the next value. If the NVR already has a value for this field (other than 0xFF), the value is not altered. The .ini file is updated with the final valued used when the program is exited. This is most commonly used for UUID to program a serial number for the unit. The value to be incremented is a 32 bit integer.

Check Value ?

If a question mark (?) is appended to the value then the NVR value is checked that it is already programmed with this value. If the value is not already programmed with this value, then programming is halted and the operator is informed of the failure. The most common NVR values to check is the REV field which is typically programmed by Sigma at the factory. The value is either 0x01 or 0x02. If the value is 0xFF that would imply the module has not been properly initialized and calibrated at the factory or that the NVR contents of this DUT has been lost. Either the module should be returned to Sigma or it must be fully initialized and calibrated.

Random Value

If a # is appended to a value then a fully random value is chosen for the next value. Most often this is used with the S2 security keys. Hardware is used to generate a truly random value and this is not a pseudo-random algorithm. The method for computing a random value involves both hardware and software and a significant amount of communication and computation. It is recommended to limit the use of the # to only the Security S2 keys to avoid processing delays during programming.

Scanner Value $

If a $ is appended to a value then the attached bar code scanner is used to input the value. This is most commonly used to match the value to a pre-printed bar code label on the device. There can be only one NVR value with this attribute in the .ini file.

Sigma Security S2 DSK

The Security S2 keys are supported as required by REV=0x02 of the NVR. The Public key PUK and the private key PRK. The PUK is required to be printed on the device and is used during the security negotiation immediately after inclusion. The PRK is the matching private key. The PRK must be unique for every device and is typically generated using the random value #. The PUK is computed based on the matching PRK. The PUK should be left blank in the .ini file.

Lock Bits

The lock bits can be set or cleared as desired using the EPx and RBAP identifiers. The lock bits EPx prevent the MCU from erasing or writing to flash space. If using an external NVM then these bits should normally be cleared to 0 which will lock the respective sector. If external NVM is not used, then parts of the FLASH are used by the application to store non-volatile values and thus must not be locked. The MCU can always read FLASH, the lock bits only prevent it from accidentally writing it in the event of a failure. The RBAP field is recommended to be set to 0xFE which enables the Read-back protection which prevents hackers from reading the contents of FLASH via the SPI interface.

Example [nvr] Section

```
                        COMMENT - not included in the file
[NVR]                   Start of the NVR section
rev = 02!               Force NVR rev to 02 since SmartStart is supported
pins = 01               ZM5202 swaps the pins, ZM5101 or others should be 0
nvmcs = 04              NVM Chip select pin – EX:P04=04
nvmt = 02               NVM Type
nvms = 0100
nvmp = 0100
sawc = xxxx?
sawb = xxxx?


nvr85 = 12
rbap = FE               Recommend RBAP = 0xFE which prevents reading the FLASH via SPI
ep = 0000000000000000   FLASH lock bits prevent the MCU from writing to FLASH
```

Non-volatile Memory (NVM)

Typically an external serial Non-Volatile Memory (NVM) is connected to the Z-Wave module to provide storage for the Z-Wave network routing tables. The ZWP500 is able to inspect, erase and set values in the NVM using the NVMSet/Get commands.

VIO Voltage & Current

The DUT is typically powered from the VIO pin of the ZWP500 cable. The voltage of VIO is programmable from +2.0V to 4.5V using the VIOSet command. The VIOGet command returns the instantaneous voltage at the VIO pin of the cable. The current is also measured and returned with the VIOGet command. The programmable voltage allows the testing of the battery level for devices that measure their battery level via the incoming power supply. The current measurement allows the power to be profiled to ensure battery powered devices achieve the proper low-current sleeping state.

FLASH File Preparation

The file to be programmed into the DUT is the file directly from the Keil C51 compiler and passed thru the Sigma scripts to add the CRC32. No additional processing is usually required. The RF Transmit Power (TXPOW) levels are typically compiled into the source code or they can be modified in the hex file if necessary. The ZWP500 does not currently allow overriding of the TXPOW values in the hex file.

The hex file is downloaded once into the ZWP500. Once it has been loaded it is stored internally and does not need to be downloaded with each DUT making the programming process fast.

CRC32 Calculation

The hex file to be programmed into the DUT MUST have a CRC32 added to it. The Sigma SDK utilizes a program called fixboot.exe to calculate the CRC. The CRC must already be present in the file and is checked with each DUT to ensure programming is 100% accurate.

Programmer Example Python Application

The ZWP500 is primary a tool for programming the firmware into each 500 series DUT during production. The firmware hex file is downloaded into the ZWP500 and then a simple short command is used to apply the proper VIO voltage for programming, enter programming mode on the DUT, save the NVR values, erase FLASH, restore the NVR and update with the desired values, transfer the firmware to the DUT and finally check the CRC of the firmware to verify the process is 100% accurate. If the NVR is identified as being uncalibrated, a calibration step can be performed using the 1ppm accurate crystal of the ZWP500. See the SensorPIR example for more details.

Product Validation

Product Validation Example Python Application

TBD

Production Testing

Product testing is a short, focused test that identifies manufacturing defects in each DUT. Time is money on the production floor so the test is usually a few tens of seconds long. The goal is to ensure any opens, shorts, missing or defective components are identified so the DUT can be reworked. Ideally each customer receives a fully functional DUT with a minimal number of returns.

Production Testing Example Python Application

The SensorPIR example code contains a short example of a test program where the VIO current to the DUT is measured and several pins are toggled to verify it is defect free.

Manufacturing Data Logging

The SensorPIR example also logs a number of metrics into a comma separated value (.csv) file. Each DUT tested is recorded in the file for later analysis and identification of areas of yield improvement.

ZWP500 Interface

The RPi communicates to the ZWP500 PSoC5 board via a UART which runs at 921600 baud. The following sections detail the commands that can be sent to the PSoC5 and their responses. It is recommended to use the sample application as a guide for the typical usage the low-level PSoC5 commands. The sample applications are in Python but any programming language such as C can be used. All communication is in ASCII making it easier to debug.

PSoC Commands

The PSoC processor receives commands from the RPi over the UART. Each command is typically an ASCII string and some optional data followed by a <CR>. See the section “Terminal Window Settings with PuTTY” for more details on how to setup a terminal window to interact with the PSoC directly. Normally a Python or C program is used to communicate with the PSoC. While the commands can be entered manually this is mostly just for debug purposes. The full command name must be sent and the capitalization must exactly match as shown. The end of line character <LF> is ignored as are spaces and the TAB character. Every command is echoed allowing the program to check that the command has been properly received.
Every command responds with one of the following acknowledgements:
* = Command accepted
? = Command not understood - usually caused by an invalid command or corrupted data
= Command discarded - usually because some other process is currently running
! = Command failed - additional data is typically provided with the reason for the failure
Many commands return additional data after the acknowledgement.

After a command is sent, the program **must wait** for the acknowledge and any expected return data. The PSoC may drop commands if multiple commands are sent without waiting for the acknowledge.

AcquireDUT

The AcquireDUT command attempts to put the DUT into Z-Wave programming mode. If successful, the last four bytes of signature of the chip is returned. The DUT must already be powered (VIOSet). The VIO will be measured and will return an error if the voltage is below 2.0V.

Example: AcquireDUT
Returns:

*<cr>Signature= 7F1F0401<cr>	if successful and the target device is a 500 series
!<cr>FAIL - VIO below 2.0V<cr>	or other message indicating the failure. A signature of all FFs is a failure.

Calibrate

An RF calibration cycle is run on the DUT. This operation takes about 2 seconds to complete as the calibration program has to be downloaded and then executed. The calibration values are NOT written to the NVR. The assumption is that a programming cycle will immediately follow the calibration cycle and the new calibration values will be written to the NVR at that time. The NVR is ERASED during the calibration process. It is REQUIRED to read the NVR prior to running a calibration and to restore the NVR afterward. Do NOT run a calibration alone. The ZWP500 has a high precision crystal and is able to accurately measure and set the CCAL value.

Example: Calibrate
Returns:
…..*<cr>CCAL=xx TXCAL1=yy TXCAL2=zz<cr>
Where xx, yy and zz are the hexadecimal values for the respective calibration values. The periods (.) indicate the calibration program is being downloaded. The acknowledge (*) takes about 2 seconds before it is returned. An ! is returned if there is a failure.

FirmwareUpdate

Download and update the PSoC firmware with the Intel hex file that is sent immediately after the command. Care must be taken with this command as it is possible to “brick” the PSoC if there is a power failure during the process or if the data is corrupted. When the PSoC is ready for each line of the hex file it will send an ACK (the character ‘$’). If the line of code fails the checksum, then a NAK (‘~’) is sent and the line must be resent. The program sending the firmware MUST wait for the ACK before sending the next line as the PSoC only has temporary storage for 1 line at a time. Every few lines there will be a pause while the PSoC writes the data into FLASH. Note that the data is written directly into FLASH so if a failure occurs it is likely unrecoverable and the unit will have to be reprogrammed at the factory.

Example:
FirmwareUpdate<cr>
<wait for the $ to arrive>
:400000000080002011000000A5490000A549000080B500AF024A034B1B68136004F0F6FCBC760040FA46004010B50
54C237833B9044B13B10448AFF300800123237010BD45
<wait for the $ to arrive then send each line of the intel hex file>
Repeat the two lines above for each line of the hex file. If a NAK is received, resend the line.
…
:00000001FF
The last line of the hex file is shown above and indicates that the download is complete.
*<cr>
Is the final indicator that the firmware download is complete and the PSoC will complete writing the data to FLASH and then reboot. The normal boot messages will then be sent if the firmware is good.

FlashDownload

The FlashXXX commands are not normally needed by most users who can rely on the Python code included with the ZWP500. The FlashXXX commands are documented here for users who want to fully customize the platform for their own needs. Typically the sample Python code is used to provide higher level functions for programming.

Download the intel hex format file to be programmed into the DUT. The PSoC will send an ACK ($) character when it is ready for each line of the hex file. The program sending the hex file MUST wait for the ACK before sending each line of the file. If the checksum fails or there was a data corruption, a NAK (~) character is returned. The program should resend the line if a NAK is received. The PSoC will pause every few lines while it writes the data to FLASH. Note that only Intel Hex record type 04 is supported to set the upper address bits of the 128K byte image. The tools used to develop Z-Wave code only use this record type.

Example:

#	Host	PSOC	Comment
1	FlashDownload<cr>		Initiate the command
2		FlashDownload<cr>	PSOC echoes the command
3		*<cr>	PSOC ACKs the command
4			WAIT up to 5s for the PSOC to setup the flash area
5		$<cr>	PSOC is ready for a line from the HEX file A ~<cr> will be sent if the previous line checksum failed
6	send one line of HEX file		Host sends a line from the HEX file
7			WAIT up to 2s for the PSOC to process the line
8			Repeat steps 5 thru 7 for each line of the hex file
9	:00000001FF<cr>		Last line of HEX file
10			Wait up to 10s final check sum calculation
11		*<cr>	ACK download is complete and CRC is good. !<cr> indicates a failure
12			Typically send a FlashCRC at this point to read the calculated CRC value of the HEX file.

FlashErase

Erase the DUT FLASH. The NVR settings are retained but the rest of the DUT FLASH is reset to all ones. This command is not normally needed as the FLASH is automatically erased during programming but is provided for completeness.

FlashWrite

Writes the downloaded Intel Hex file into the DUT. The DUT NVR must be read PRIOR to executing this command using the NVRGet command. The DUT FLASH is erased, the NVR values are written, then the hex file is programmed into the DUT. The CRC within the DUT is computed to ensure the hex file was programmed without error. If the CRC fails to match then a NAK (!) is returned. This process takes several seconds to complete.

NOTE! It is REQUIRED to execute an NVRGet BEFORE issuing a FlashWrite! Each DUT typically has data in the NVR pre-programmed by Sigma in the NVR and these values must be read before being erased and then restored. The NVR values for TXCAL1 and TXCAL2 must be checked and if they are 0xFF then a calibration cycle must be run prior to programming FLASH. Note that the TXCAL1/2 values must be written using NVRSet before programming FLASH.

Example:
NVRGet<cr> fetch the contents of the DUT NVR
Check the TXCAL1/2 NVR values, if 0xFF, then run Calibrate and update the TXCAL1/2 values
NVRSet …<cr> Adjust any NVR values required (this may require multiple NVRSet commands)
FlashWrite<cr> Erase FLASH, Write NVR, write the hex file to FLASH, check the CRC
Returns:
*<cr> If the hex file was programmed into the DUT without error
!<cr> if the programming failed. An error code may also be included in the message.

FlashRead 0xxxxx:0yyyyy

Read the DUT FLASH contents from address xxxxx to address yyyyy and return the data. This command is typically used to debug a failure to program FLASH. Note that the xxxxx and yyyyy addresses must be exactly 5 hexadecimal characters and be preceded with a 0.

Example: Read the entire contents of the DUT FLASH (128K bytes)
FlashRead 000000:01FFFF<cr>
@00000=000102030405060708090a0b0c0d0e0f000102030405060708090a0b0c0d0e0f<cr>
…
*<cr>
Thirty Two (32) bytes are returned on each line.

FlashVerify

Verify the contents of the DUT FLASH match the downloaded hex file. The first 100 mismatching bytes are returned if any. Typically the FlashCRC command can be used to verify the contents of FLASH much more quickly than using this command. This command is typically used to debug a failure of some kind and is not used in normal programming of the DUT due to the several seconds this command takes to run.

Example:
FlashVerify<cr>
Returns:
*<cr> If the DUT FLASH matches the downloaded hex file
@xxxxx=yy!=zz If the DUT FLASH does NOT match the hex file, up to 100 lines like this are returned
The DUT FLASH at address xxxxx is yy but the expected value is zz.

FlashCRC

Returns the four byte CRC in the downloaded hex file, the computed CRC and the DUT CRC if the DUT is acquired. Typically this command is used to ensure the proper hex file is downloaded into the ZWP500.

Example:
FlashCRC<cr>
Returns:
!<cr>FlashCRC=xxxxxxxx CalcCRC=yyyyyyyy DUTCRC=zzzzzzzz<cr>
Where xxxxxxxx is the CRC in the downloaded hex file if one has been downloaded, yyyyyyyy is the calculated CRC based on the downloaded hex file which should be the same as the FlashCRC. If a DUT is connected, powered and acquired, then zzzzzzzz is returned which is the CRC programmed into the DUT flash.

GPIOGet

Returns the binary voltage state of all 12 pins of the programming cable. The value is either 1 or 0 as the voltage is either positive or ground. The tristate state cannot be detected and the pin is either 0 or 1 depending on the voltage.

Example:
GPIOGet<cr>
Returns:
*<cr>GPIO=1 2 3 4 5 6 7 8 9 A B C
Where the value of the respective pin is printed as either 0 or 1. Note that pins 7 and 9 are always 0 since these pins are GROUND. Note that there is an extra space between pins 4 and 5 and 8 and 9 to make the pin state more readable.

GPIOSet PS

Set the desired pin (P) of the Z-Wave programming cable to the desired state (S). The variable P is one of the following [2-6,8,A,B,C] where A is pin 10, B is pin 11 and C is pin 12 (hexadecimal). Pin 1 is the VIO pin and is controlled using the VIOSet command. Pins 7 and 9 are GROUND. Valid values for the state S are [0,1, Z] where Z is tristate. Most of the pins

of the programming cable are dedicated to the SPI bus used for programming the DUT and accessing the external NVM. Pins 2, 5, 11 and 12 however are generally available for use and can be used to sense or drive test points on the DUT. If more than 4 pins are needed, an I2C bus GPIO expander can be placed on the DUT test board. Digital to analog converters, ADCs, temperature sensors and any I2C device can be placed on the DUT test board and pins 2 and 5 can be used to communicate with those devices. See the I2CSend and I2CGet commands for more details. Be aware that the DUT has to be powered for the GPIO pins to be driven to the proper voltage. The programming cable pins are powered with the VIO power supply. Use the GPIOGet command to verify the pin is set to the desired level.

Example: Set pin 2 to tristate
GPIOSet 2Z<cr>
Returns:
*<cr>
?<cr> is returned if an invalid pin number or value is sent

Help

The Help command returns a brief description of the most commonly used commands. The firmware version is returned as part of the data. A ? will also return the list of commands.

I2CGet AA LL

Send an I2C read command to I2C slave address AA (bits [7:1]) and read LL bytes of data. LL must be greater than 0. If the command completes properly, the data is returned as !<cr>I2CGet= 01 02 03 …<cr>. If the address or length fields are not hexadecimal then a ? is returned. If the slave NAKs the address byte then a ! is returned. An I2C STOP condition is always performed at the end of the command.

Example:
I2CGet 21 03
Returns:
!<cr>
I2CGet= 01 02 03
This example sends an I2C read command to slave address 0x21 (the first byte of the command is 0x43). If the slave ACKs the write, then the three data bytes are read from the device and returned. All values are hexadecimal.

I2CProbe

Configures pins 2 and 5 of the Z-Wave programming cable for I2C and then tests all 127 I2C addresses [1-127] and returns the address of any I2C devices that acknowledge the address byte. This command is used to find the I2C addresses of devices on the DUT test board. The address returned are bits [7:1] of the I2C address byte. If no I2C devices acknowledge, then a NAK (!) is returned. If one of the I2C pins is stuck either high or low a NAK is returned along with a message indicating which pin is stuck.

Example:
I2CProbe<cr>
Returns:
*<cr>
ACK@ 21 22<cr> If there is an I2C device at 0x21 (0100_001Rb) and 0x22 (0100_010Rb).
Address 0x21 maps to a slave address write byte of 0x42. The address is in bits [7:1] and bit 0 is the READ/WRITE bit.

I2CSend AA DD…[p]

Send an I2C write command to I2C slave address AA (bits [7:1]) with the data DD and optionally NOT send an I2C STOP if the character ‘p’ is at the end of the command. All values are in hexadecimal. The data is optional and may contain up to 32 bytes of data. If the I2C bus is in the idle state, then the command is initiated with an I2C START. If the previous command was not completed with an I2C STOP, then an I2C ReSTART initiates this command. The character ‘p’ at the end of the command allows commands to be linked together. Typically this is used to set the address pointer within the

I2C device which is then followed by an I2CGet. The I2C data to be sent is dependent on the capabilities of the I2C device. The data rate is just under 100Kbps which ensures that virtually any I2C device can be supported. If the address or data fields are not hexadecimal a '?' is returned. If the slave NAKs any byte of the command, a '!' is returned. If the command completed without error a '*' is returned.

Example:
I2CSend 21 01 02 03 p
Returns:
*<cr>
This command will send to I2C slave address 0x21 (the first byte is 0x42), the data 0x01, 0x02, 0x03 and then will NOT issue a STOP at the end of the command.

LEDSet RGB

Set the color of the LED on the ZWP500 enclosure to one of the eight possible colors. Each of the three LEDs (Red, Green, Blue) can be turned ON with a 1 or off with a 0. The RGB value must be three digits of either 0 or 1. Invalid values will return a ?. The LED on the ZWP500 can be used to indicate to the operator that the DUT is passed (green) or failed (red) or that the programming/testing is underway (any of the other colors).
000=OFF
001=BLUE
010=GREEN
100=RED
111=WHITE

Example:
LEDSet 100 Turns on only the RED LED
Returns:
*<cr>

NVMGet SSSSSS:EEEEEE

Most Z-Wave devices utilize an external Non-Volatile Memory to store the Z-Wave routing tables, application specific variables and an Over-The-Air firmware image. The NVM is most often an Adesto AT25PExx which is fully supported by the ZWP500. The NVM chip select signal must be connected to the Z-Wave programming cable pin 3 to enable access by the ZWP500. The NVMGet command reads the NVM starting at address SSSSSS and ending at address EEEEEE. Both fields must be six hexadecimal characters long and separated by a colon (:) character. The data is returned 16 bytes per line with the address at the beginning of the line. The NVM manufacturer strings can be returned with the command NVMGet M. Getting the manufacturing strings is a quick command to verify the NVM is functional. If S or E are not hexadecimal a ? is returned. If there is an error then a ! is returned.

Example:
NVMGet M<cr>
Returns:
*<cr>
NVM MFG=20 80 12 This is the manufacturing string for the Micron M25PE20.

Example: Get the first 16 bytes of the NVM
NVMGet 000000:00000F
Returns:
*<cr>
@000000= 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F<cr>

NVMSet AAAAAA=DD

The NVMSet command programs the NVM address AAAAAA with the value DD. The address and data fields are in hexadecimal. All six characters of the address field must be present. If the fields are not hexadecimal a ? is returned. After

setting the NVM to a new value it is recommended to do an NVMGet to verify the data was properly set. The entire NVM can be reset to all ones with the command “NVMSet R”.

Example:
NVMSet R The entire NVM is bulk erased to all ones
Returns:
*<cr>

Example:
NVMSet 000008=29 Set address 0x000008 to 0x29
Returns:
*<cr>

NVRGet

The Non-Volatile Registers (NVR) flash page of the Z-Wave module is not the same as the NVM. The NVR data is programmed at the factory and contains data specific to the hardware. The data cannot be changed by the MCU or by a firmware download over the air (OTA). Details of the fields in the NVR are specified in Sigma document SDS12467 “500 Series Z-Wave Chip NVR Flash Page Contents”. The NVR version 2 is supported which contains the DSK for Security S2. The upper half of the NVR is available for the application.

The NVRGet command returns all 256 bytes of the NVR. If the NVR was returned by the DUT then a *<cr> is returned. If the NVR failed to be read (typically because it is not powered) then a !<cr> is returned. The data is returned in 16 rows of 16 bytes using the format <cr>@AA= 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F where AA is the address for the row. Execute the command AcquireDUT before sending the NVRGet.

Example:
NVRGet<cr>
Returns:

```
*<cr>
@00= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@10= 01 09 01 FF 0D E8 8C 1B 00 FF FF FF FF FF FF FF
@20= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@30= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@40= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@50= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@60= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@70= FF FF FF FF FF FF FF FF FF FF FF FF FF FF 34 E3
@80= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@90= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@A0= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@B0= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@C0= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@D0= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@E0= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
@F0= FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

NVRSet AA=DD

Set the NVR address AA to the value DD. This command sets the NVR value of the DUT to be programmed to this value. The NVR is not written immediately. The NVR of the DUT is written as part of programming flash. The CRC16 field of the NVR (address 0x7E and 0x7F) is automatically calculated when the NVR is written to the DUT.

ALWAYS execute an NVRGet BEFORE issuing any NVRSet commands! NVR values are unique to each DUT and are pre-programmed by Sigma Designs at the factory. The pre-programmed data must be restored prior to programming flash.

Example:
NVRGet<cr> ALWAYS Read the NVR to capture the data pre-programmed by Sigma

NVRSet 12=04<cr> Set PINS to P04
NVRSet 18=02<cr> Set NVMT to 0x02 which is the serial FLASH value
NVRSet 19=01<cr> Set NVMS=0x0100 for a 2Mb serial flash
NVRSet 1A=00<cr>
Returns:
*<cr> For each command that was executed
?<cr> If the command was not properly formatted

ResetDUT [0]

Pulse the RESET_N signal to the DUT to exit programming mode and leave the RESET_N signal at the desired state. If the optional parameter 0 is appended to the end of the command then the RESET_N signal is left at 0 (reset asserted), otherwise RESET_N is asserted high and then tristated. RESET_N is driven low, then high, then low then optionally driven high and then tristated to ensure programming mode has been exited. If reset is stuck either high or low an ! is returned with a message indicating the stuck condition.

Example:
ResetDUT0 Pulse reset low, then high then low again and leave the chip in reset with RESET_N driven low
Returns:
*<cr> If reset has tracks the desired levels
!RST_N Stuck HIGH<cr> if reset is stuck high (or low)

RFAttenuatorSet DD

Set the RF attenuation to the hexadecimal value DD in the range from 0x00 (minimum) to 0x7F (maximum attenuation). The ZWP500 contains a pair of Digital Step Attenuators (DSA) on the RF path from the Z-Wave chip to the antenna SMA connector. The RF signal can be to be attenuated by up to 60db. Attenuating the RF signal enables the RF signal quality to be measured without needing to physically move the DUT a long distance from the ZWP500.

Example:
RFAttenuatorSet 3F Set the RF attenuation to be approximately 30db
Returns:
*<cr> if the command executed properly
?<cr> If the values DD is invalid or not a hexadecimal number

UARTGet

Return any characters received from the DUT UART pins. The Z-Wave programming cable contains two pins which are typically connected to the UART of the DUT Z-Wave chip. The UART pins can be used to send debug or telemetry data to aid in production testing. The pins are optional and can be used as generic GPIOs instead. The UART buffer is 64 bytes so messages must fit within the buffer between UARTGet commands. Typically the command is a short response to a UARTSend command. The baud rate is 115200, 8 data bits, 1 stop bit, no parity.

Example:
UARTGet<cr>
Returns:
*<cr> 56 33 2E 30 31<cr> The DUT UART send the ASCII characters “V3.01”

UARTInit BB

Initialize the DUT UART interface to BB baud rate. Valid values are 09(9.6K), 14(14.4K), 19(19.2K), 38(38.4K), 57(57.6K), 11(115.2K). A value of 0 disables the UART and returns the UART pins to general purpose IOs. The UART always operates with 8 data bits and 1 stop bit.

Example:
UARTInit 11<cr> Sets the UART to 115.2K baud, 8 data bits, 1 stop bit.

UARTSend DD…

Send the hexadecimal characters DD out the UART to the DUT. If the characters are not hexadecimal a ? is returned.

Example:
UARTSend 53 65 6E 64 30 31<cr> Sends the ASCII string “Send01” to the DUT UART

VIOSet

Set the current voltage of the VIO pin in milliVolts. A voltage value of 0 turns off the VIO power supply. If the desired voltage is not achieved or the current exceeds 300mA a command failed (!) is returned. The VIO voltage is stepped up over several milliseconds to allow the RPi power supply time to adjust to the increased load. Use VIOGet to check the voltage and current being provided to the DUT.

Example: VIOSet 3300<cr>
Returns: *<cr>

VIOGet

Get the voltage and current of the VIO power supply.
Example: VIOGet<cr>
Returns: *<cr>VIO x.xxV yy.yymA
Where x.xxV is the voltage in volts of the VIO pin and yy.yymA is the current in milliAmps.

ZWaveGet [TT]

Data from the Z-Wave chip SerialAPI is returned. The optional parameter TT specifies the number of seconds (in hexadecimal) to wait before returning. The default for TT is 1 second (0x01). If a complete SerialAPI frame has been received from the Z-Wave chip and the checksum is good, the frame will be acknowledged to the Z-Wave chip so that it won’t continue to retry sending the frame. Note that if the time between the ZWaveSend and the ZWaveGet is more than a few milliseconds, the Z-Wave chip may send the frame multiple times expecting an immediate acknowledge. The recommendation is to immediately follow a ZWaveSend with at least one ZWaveGet and typically several. An unsolicited frame may also arrive which may also have multiple retries in it which is why the receive buffer is purged when a ZWaveSend command is sent. During production testing the optional parameter TT is typically set to 01 or even 00 to shorten the timeout because there should be no routing or other delays.

See ZWaveSend for an example. The Python sample application also has a number of examples of how to send Z-Wave commands.

ZWaveSend DD…

The Sigma SerialAPI command DD is sent to the ZWP500 Z-Wave chip. This command can be any SerialAPI command and the data required with it. The SerialAPI frame is automatically built around the SerialAPI command. The SOF, length and checksum are wrapped around the command. The Z-Wave receive buffer is purged of any received commands. The receive buffer is purged as the expectation is that only the response to this command is desired.

The data portion of the command DD is as follows:

Byte #	Name	Description
1	FUNC_ID	SerialAPI Function ID as described in the Sigma SerialAPI documentation
2	DEST_NODEID	Destination NodeID (optional)
3-n	DATA	Data for the FUNC_ID depends on the command being sent.

If the SerialAPI SendData command is sent, a non-zero callback function ID (the last byte of the command) should be supplied to receive the callback indicating if the command was delivered to the desired NodeID or not. The function ID will be returned with the status of the delivery (ACK or NAK) which can take up to 10 seconds to deliver over the radio. Many SerialAPI commands return a large amount of data or a series of frames so multiple calls to ZWaveGet may be required to return all the data from a single ZWaveSend command.

Example:
ZWaveSend 13 77 02 20 02 25 44<cr>
Send a SerialAPI SendData command (13) to node 77 with a 2 byte command of a BASIC GET (20 02) with TXOPTIONS=25 and a callback function id of 44.
Returns:
*<cr> If the command was accepted by the Z-Wave chip for transmission.
!<cr> If the Z-Wave chip is busy and the command was ignored
Immediately after receipt of the acknowledge, send a:
ZWaveGet<cr>
Returns:
*<cr>13 01 <cr> The ACK from the ZW_SendData function indicating that the Z-Wave frame has been queued
A second ZWaveGet must then be sent which will return after up to 10 seconds
*<cr>13 44 00<cr> Callback indicating that the frame was delivered over the radio
If the NodeID did not acknowledge the frame, the 00 would be 01 or another error code.
The second ZWaveGet command may take up to 10 seconds before it returns due to routing delays over the Z-Wave radio.

A few of the more important SerialAPI commands are listed in the table below. Complete details are found in the Sigma documentation for the SerialAPI and the command class documents.

Name	Hex	Description
FUNC_ID_SENDDATA	0x13	Send a command over the Z-Wave radio
FUNC_ID_SETDEFAULT	0x42	Reset to factory new
FUNC_ID_ADD_NODE_TO_NETWORK	0x4A	Enter Inclusion mode
FUNC_ID_REMOVE_NODE_FROM_NETWORK	0x4B	Enter Exclusion mode
FUNC_ID_SET_LEARN_MODE	0x50	Enter Learn mode to join an existing Z-Wave network

Troubleshooting

TBD

Firmware Update

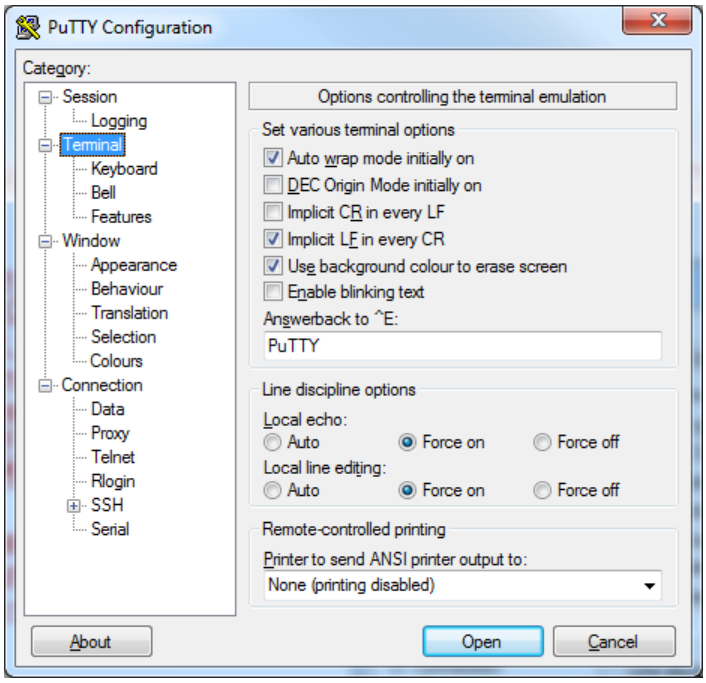
The ZWP500 utilizes the standard Debian software release mechanism. The latest firmware can be downloaded by opening a terminal window and entering: `sudo apt-get update` and then `sudo apt-get upgrade`. The upgrade will typically ask if it is OK to update because the Express Controls ZWP500 build is not on a “verified” server which is OK. If the ZWP500 release is updated, the PSoC firmware may also be updated which will happen automatically the first time the ZWP500 python code is executed. The firmware update process takes a minute or so and it is critical that power remain on during the process. The entire operating system and all installed applications will be updated to the latest release.

Terminal Window Settings with PuTTY

A terminal emulator program like PuTTY or minicom can be used to interact with the PSoC directly for debug and testing purposes. Note that this mode is meant only for debugging purposes and is not meant to be the normal method of communication. Python, C or other programming languages are expected to manage the communication.

Setup the PuTTY session as shown here:
Make sure the “Implicit LF in every CR” is checked. Since the PSoC ONLY sends CR, the LF is implicit. If this option is not checked then all communication will overwrite on the first line of the terminal emulator.
The “Local echo” should be set to “Force on” which makes it easier to see what you have typed.
The “Local line editing” should be set to “Force on” to make it possible to use the backspace character to correct typos before pressing <ENTER>.

Type “?<ENTER>” to print a brief menu of available commands and the current version of the PSoC firmware.



Python sample application

The ZWP500 has a sample application written in Python in the examples directory – see the SensorPIR.py file for more details.

TBD

References

Sigma document SDS12467 - NVR Flash Page contents

Warrantee & Copyright

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Document History

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1.1.00	2/18/2018	Initial Beta Version