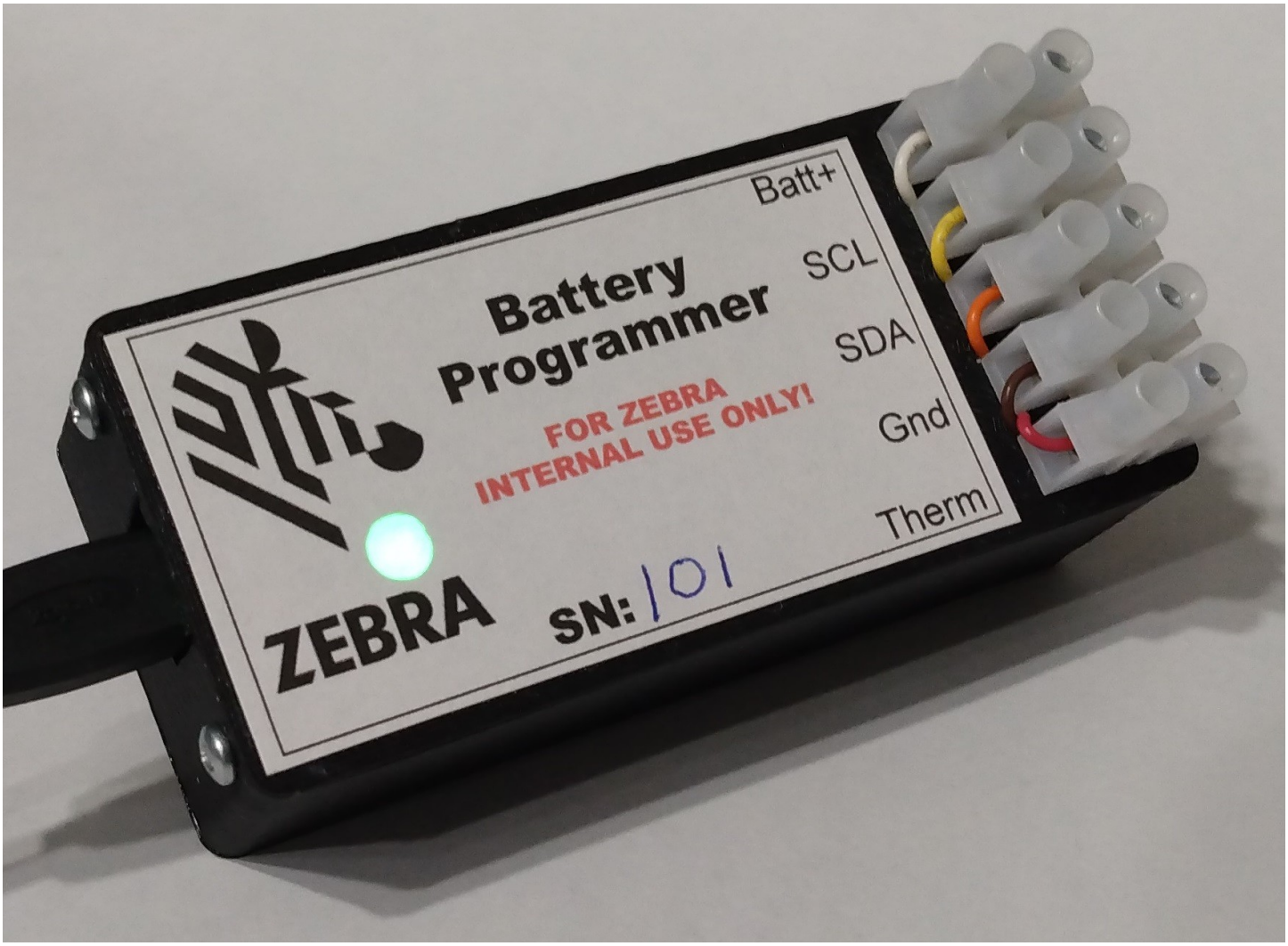
Zebra Battery Programmer Box
V2 Test Manual



This document is for Zebra internal use ONLY!

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Overview

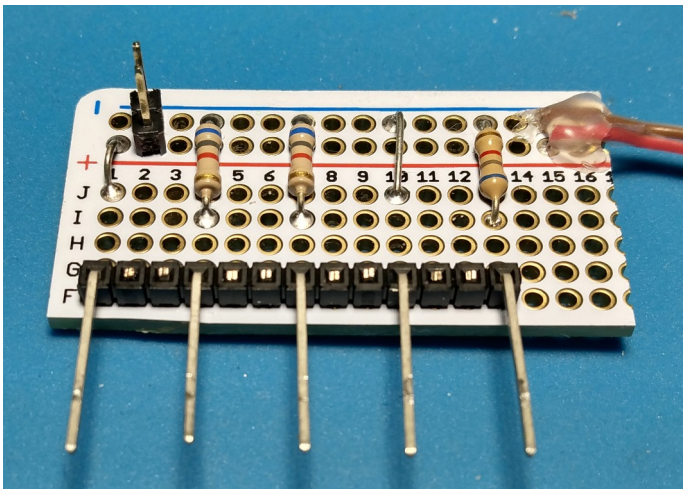
This manual covers the setup and testing of the Zebra Battery Programmer Box V2.

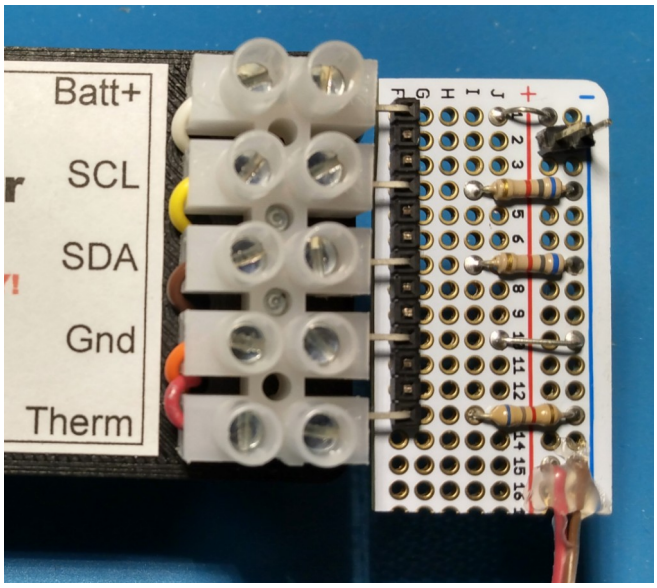
Test Equipment Needed

Windows PC with TeraTerm or equivalent serial terminal program installed
Test firmware files “code.py” and “V2Test.uf2”
Micro USB cable
Adjustable power supply capable of producing up to 10V
Voltmeter
3 6.8K 1% resistors

Sample Test Fixture

A simple test fixture can be created from a small section of proto-board, the 6.8K resistors and a 13 pin section of 90^{o} header, as shown on the left below. Clipping out every 2nd and 3rd pin as shown gives about the right spacing to be able just plug the board into the terminal strip, as seen on the right.





Software Installation

A serial communications program is required to run the test software. We recommend TeraTerm, but other serial terminal programs may work. TeraTerm can be found on the Battery Programmer SharePoint site:

https://zebra.sharepoint.com/sites/BatteryProgrammer

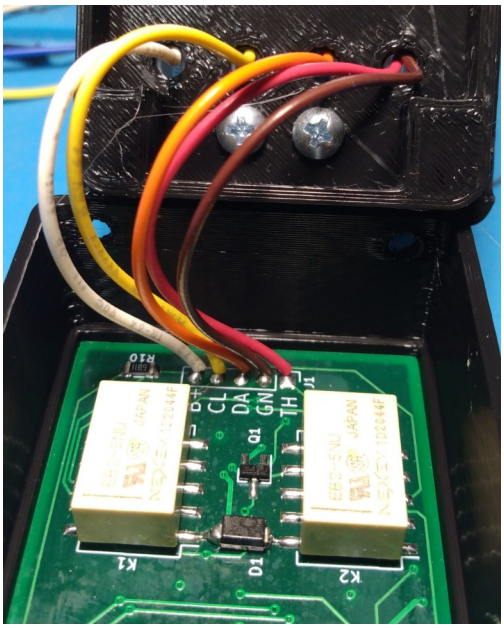
Download the installer and install it onto the PC used for doing the testing.

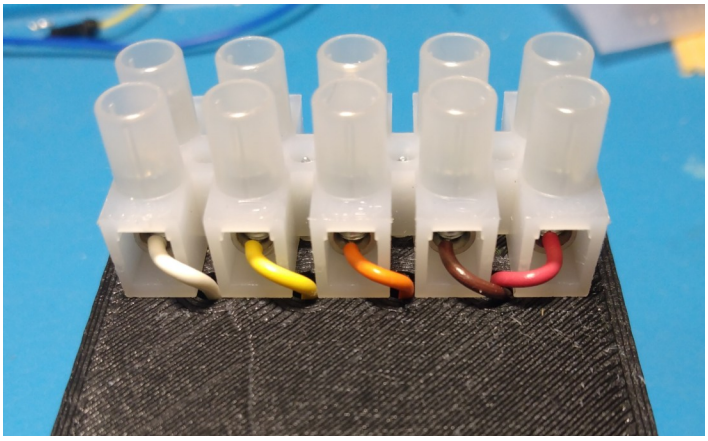
NOTE: The the box is NOT compatible with the Arduino IDE serial monitor

Test Procedure

Check the wiring

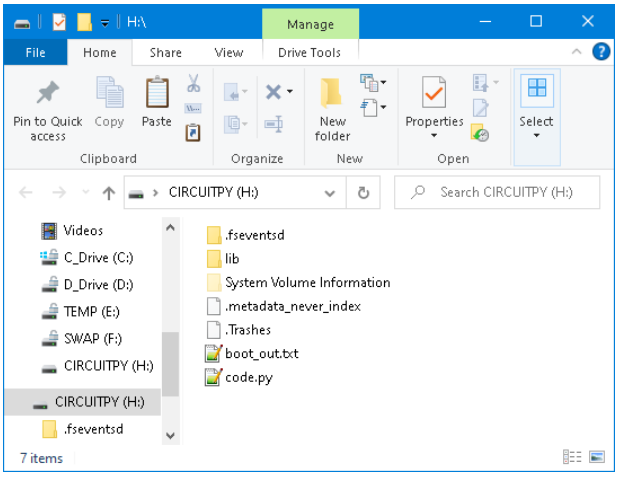
Check the wiring to insure the connections from the board to the terminal strip are correct. The connections are in the same order from left to right on both as seen below:



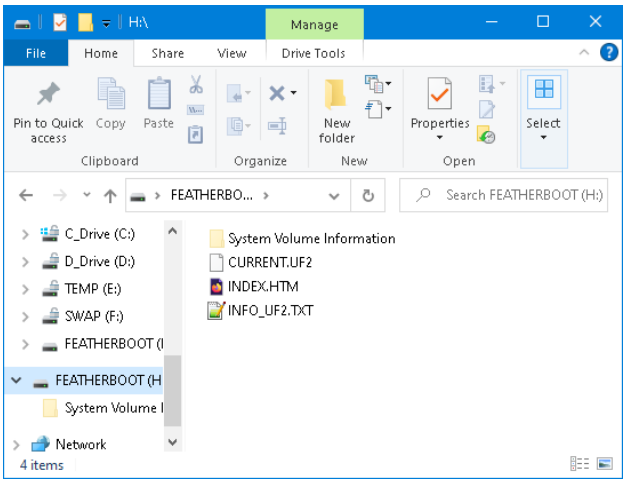


Load the test software

Use the USB cable to connect the box to the PC, the box will boot into it's preloaded CircuitPython application. A drive will appear on the PC that looks like the one below:



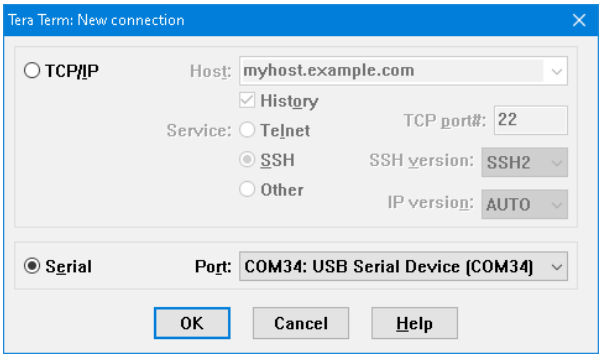
Drag and drop the "code.py" file onto the drive and overwrite the current one. The box will reboot into bootloader mode and you should see a drive appear as shown below:



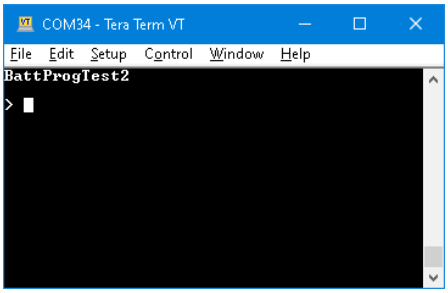
Drag and drop the “V2Test.uf2” file onto this drive. The box will load the test software and then reboot. When it starts up the LED should be yellow.

Connect to the box using TeraTerm

After starting TeraTerm you will see the following dialog, select “Serial” and then pick the port assigned to the box. It will probably be labeled “USB Serial Device”.



You should see the following text and the LED should change to blue.



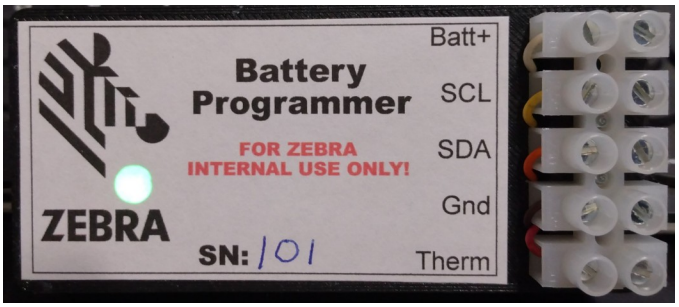
Unit test

Test Connections

To run the unit test the following connections are needed.

1. Variable power supply (Up to 10V) connected to the Batt+ terminal
2. 6.8K 1% resistor connected between SCL and Gnd
3. 6.8K 1% resistor connected between SDA and Gnd
4. 6.8K 1% resistor connected between Therm and Gnd

For reference the connections on the terminal strip are arranged as shown below:



Battery positive

SCL – I^2C clock signal

SDA – I^2C data signal

Ground (Battery negative)

Battery thermistor

Enter the “DAT” (Do All Tests) command and follow the instructions on the screen to go thru the tests detailed below:

Thermistor Test

This checks the measuring of the battery thermistor. It first checks that an open thermistor can be detected, and then checks the value of the test resistance. Problems could be related to the value of the thermistor pull up resistor R14.

Battery Input Test

This checks the circuitry for measuring the battery voltage at various input levels. Problems could be caused by the values of R10 or R11, or the 3.3V voltage from the Feather board, which should be within 1%.

Pullup Resistor and Voltage Selection Test

This checks the circuitry that muxes the pull up resistors and also selects the value of the pull up voltage. Problems with voltage selection can be cause by U3, U7,R15, or R16. Pull up resistor value issues could be caused by U1, U2, R4 thru R9. Active clock drive issues could be caused by U1, U2, or U3.

Status LED Test

This checks the RGB status LED on the Feather board. Any issues here are a problem with the Feather board itself.

Authentication IC Test

This checks the auth IC for proper operation and configuration. Problems could be caused by U6 or the internal I^2C pull ups R12 &R13.

Format Drive Test

This checks the internal storage device on the Feather board. Any issues here are a problem with the Feather board itself.

Test Command List

Cmd	Function	Notes
DAT	Do All Tests	Runs all the units tests sequentially.
TA	Test Auth chip	Tests and configures the authentication IC.
TPR	Test pull up Resistance	Tests the values of the pull up resistors and the active clock drive circuit.
TT	Test Thermistor	Checks the thermistor measurement circuit.
TPV	Test pull up voltage	Test the pull up voltage selection and the active clock drive.
TBV	Test Battery voltage	Checks the battery voltage measurement.
SBV	Show Battery Voltage	Displays the current battery voltage
ST	Show Thermistor	Displays the current thermistor resistance.
RC	Relay Close	Closes the relay contacts
RO	Relay Open	Opens the relay contacts.
AC	Active Clock	Enables the active clock drive.
PC	Passive Clock	Disables the active clock drive.
PBV	Pull up Battery Voltage	Sets the pull up resistor drive to the battery voltage.
P3V	Pull up 3.3 Volts	Sets the pull up resistor drive to 3.3V.
P10	Pull up 10K	Sets both clock and data pull ups to 10K ohms.
P6	Pull up 6.8K	Sets both clock and data pull ups to 6.8K ohms.
P5	Pull up 5.1K	Sets both clock and data pull ups to 5.1K ohms.
PN	Pull up None	Removes the pull up resistors from the clock and data lines.
DAC	Dump Auth Config	Dumps the auth chip config in hex out the serial port
FD	Format Disk	Formats the internal 2MB disk drive for FAT32
UF	Update Firmware	Reboots the box into bootloader mode to load new code.
?	Help	Displays the help menu

Detailed Command Descriptions

DAT – Do All Tests

This command runs all the needed tests to validate the unit is properly built. The following tests are run:

Thermistor test
Battery voltage test
Pull up test
Status LED test
Authentication IC test/configure
Format Drive

TA – Test Auth chip

Check the auth IC type installed (ATECC508A/ATECC608A) and then configure it if needed. The config is then verified.

TPR – Test Pull up Resistance

Tests the values of the internal pull up resistors by verifying the voltage drop with 6.8K external load resistors.

TT – Test Thermistor

Tests the thermistor measurement using an external 6.8K resistor

TPV – Test Pull up Voltage

Tests the selection of the pull up voltage between the battery voltage and a fixed 3.3V level. Also checks the active clock drive circuit.

TS – Test Status LED

Runs the status LED thru a pattern of Red-Green-Blue to check it’s operation

SBV – Show Battery Voltage

Displays the battery voltage measured on the Batt+ terminal.

ST – Show Thermistor

Displays the current resistance between the Therm and Gnd terminals.

RC – Relay Close

Closes the internal relays that switch the Batt+, SCL, SDA, and Therm terminals.

RC – Relay Open

Opens the internal relays that switch the Batt+, SCL, SDA, and Therm terminals.

AC – Active Clock

Enables the 3.3V active clock drive to the SCL terminal.

PC – Passive Clock

Enables the passive pull up resistor drive to the SCL terminal.

PBV – Pull up Battery Voltage

Sets the drive voltage for the internal pull up resistors to the voltage on the Batt+ terminal.
NOTE: The pull up voltage level is limited to a max of 5V regardless of the battery voltage.

P3V – Pull up 3.3 Volts

Sets the drive voltage for the internal pull up resistors to a fixed 3.3V level.

P10 – Pull up 10K

Sets both clock and data internal pull ups to 10K ohms.

P6 – Pull up 6.8K

Sets both clock and data internal pull ups to 6.8K ohms.

P5 – Pull up 5.1K

Sets both clock and data internal pull ups to 5.1K ohms.

PN – Pull up None

Disconnects both clock and data from all internal pull ups.
NOTE: There is a 20K pull up to 3.3V on the internal side of the I^2C level shifter that can effect what is seen on the SCL and SDA terminals.

DAC – Dump Auth Config

Displays the 128 byte configuration area of the authentication IC in hex.

FD – Format Disk

Formats the internal 2MB drive using FAT32.

UF – Update Firmware

Reboots the box into bootloader mode. This brings up the FEATHERBOOT drive so new code can be loaded onto the device.

? – Display help

Displays a list of the available commands.