

# FAQ

*Question not answered here? Send an email to [support@ee-quipment.com](mailto:support@ee-quipment.com)*

## **ee-203 Real-Time Current Monitor with USB**

Q: What is the recommended method for calibrating the unit?

A: Disconnect any load from the DUT terminal. Apply a voltage to the SUPPLY terminal that is within the operating limits of the unit (1.5V – 5.5V). For best accuracy, calibrate at the voltage that will be applied to your DUT when taking measurements. Enter the [C]alibrate command at the CMD> prompt. When the unit completes calibration it will print out a table of calibration parameters and how much they have changed since the last time the unit was calibrated. With the exception of the Temp value, which is for informational purposes only, the parameters should change no more than 1%. If any of the parameters has changed more than 1%, calibrate the device again until the changes are less than 1%. During calibration the ee203 will draw 100 mA from SUPPLY. If you are calibrating from a battery or any high-impedance source be sure it can supply 100 mA without a voltage drop. If your battery can't supply 100 mA without a voltage drop then calibrate using a power supply set to the nominal battery voltage.

Q: How often should I run self-calibration?

A: You must calibrate the unit whenever you update the application firmware. When absolute accuracy is important, calibrate the unit at the supply voltage that will be used during measurement immediately before starting the measurement. The worst-case accuracy is specified in the ee203 Product Overview Document.

Q: I'm seeing some funny readings. How can I be confident the unit is operating correctly?

A: First calibrate the unit (see FAQ "What is the recommended method for calibrating the unit?"). Enter the [M]onitor Change command at the CMD> prompt. The debug monitor will allow access to the internal current sources used to calibrate the device. Ensure that there is no load on the DUT terminal and that there is a voltage applied to the SUPPLY terminal. Enter the [C]ur Src command with an 'H', 'M', or 'L' parameter. The H, M, L parameters turn on the 100 mA, 1 mA, and 10 uA current sources. The output data stream and the SCOPE terminal should give readings of 5.00, 3.00, and 1.00 Volts (+/- 0.1V) for the three current sources. If this is the case then the unit is operating properly. Remember to turn off the current sources with the command "C O" or else you will get erroneous results in normal operation.

Q: Can I float the supply to the RTCM to measure current at higher voltages?

A: The power supply to the RTCM is provided by the USB port, which is connected to chassis ground through the USB host (i.e. your computer). You can float this supply by connecting to a laptop running off a battery, or a USB charger that is battery powered. Use caution connecting the ground terminal to a scope as it is most likely returned to chassis ground. This type of floating configuration has not been tested and caution is advised as the USB host and/or the RTCM may be damaged.

Q: I can see two the virtual serial ports, one for command and the other for data, but there is no data received on the data console and I cannot type a command into the command port.

A: You are in bootloader mode. In bootloader mode the ports exist but they are inactive. The ports work only in application mode. When you boot up the unit by plugging in the USB cable, bootloader mode is entered if the SUPPLY terminal is connected to the GND terminal, or sometimes if the SUPPLY terminal is unconnected. To boot up in application mode make sure there is a voltage >1V applied to the SUPPLY terminal.

## **ee-201 Real-Time Current Monitor**

Q: What is the relationship between the SCOPE output voltage and the measured current?

A: The SCOPE voltage is the negative of the LOG<sub>10</sub> of the measured current. For example, when Vscope = 3, the current is 10<sup>-3</sup> = 1 mA.

$$V_{scope} = -\text{LOG}_{10}(i)$$
$$i = 10^{-V_{scope}}$$

Q: Why do transitions to low power states sometimes appear to take a very long time?

A: The internal log amp has very high gain at low currents which reduces its bandwidth, making the response time slower. The output is also noisier at low current inputs due to the high gain of the amplifier.

Q: How can I measure current with more accuracy?

A: Use the Current Monitor to view overall behavior. For critical power measurements, put the DUT into a static state and measure using more accurate (expensive) equipment.

Q: Why should I invert the scope trace?

A: The Current Monitor output is 0 → 6V. However, the scope display will be more intuitive if it shows the output as ranging between 0 → -6V (up on the scope is higher current).

Q: Can I put the Current Monitor in the ground return rather than the supply?

A: No, the internal circuitry operates from a single positive supply and will not operate properly when the input is near ground.

Q: At low currents why is the display noisy?

A: The internal log amp has very high gain at low currents. This amplifies any noise in the system and also reduces the bandwidth, making the response time slower.

Q: If I measure the voltage on the DUT pin with nothing connected to the DUT and SUPPLY pins, why do I see a voltage of as much as 8V?

A: If there is no load on either the SUPPLY or the DUT terminals you may see a voltage from an internal calibration circuit that offsets small ( $\mu\text{V}$ ) errors in the instrument at low currents. This circuit can only supply up to 5  $\mu\text{A}$  of current, so it will not damage any load connected to the DUT terminal.

## **ee-1201 Demo Board**

Q: What is the useable voltage range?

A: Current Sink: 1.8 – 5.5V, although the 100 mA sink starts to lose accuracy below 2.2V.

MPU: 1.8 - 3.6V. **DO NOT enable the MPU if the supplied voltage is greater than 3.6V.**

Q: How accurate is the current sink?

A: Within +/-1  $\mu\text{A}$  at 10  $\mu\text{A}$ , and within 2% at all other ranges.

Q: Why does the demo board sometimes power up drawing 20-30 mA and the current sinks don't work?

A: There is a voltage reference on the board that sometimes powers up in an illegal state, drawing current and supplying an improper voltage reference. Remove and re-apply power to the board with all jumpers removed and the condition should resolve itself.

Q: During STOP3 MODE, the quick start guide shows that the voltage should be -6.1V, why am I seeing around -9V?

A: Depending upon process, voltage and temperature, the current draw in STOP3 MODE can be as low as 0.4  $\mu\text{V}$ . The RTCM cannot reliably measure less than 1  $\mu\text{A}$  and the output when the current is less than that is undefined and will tend toward the internal supply voltage of 9V.