



# Field Trouble-Shooting Manual for SolTrex Data Loggers

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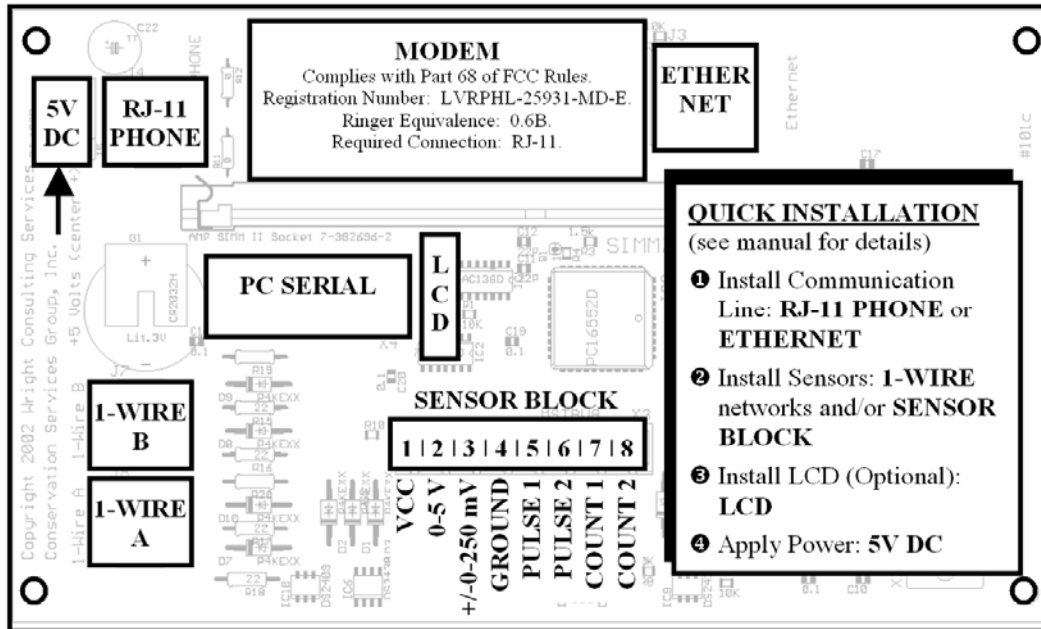


Figure 1. Logger Schematic

## Level 1 Troubleshooting Procedures

This section describes troubleshooting procedures that can be done with no special testing equipment.

### **Tools required**

- Digital volt meter (DVM)
- Jumper wire (single strand copper #12, at least 6" long recommended)
- Analog telephone

### **1. Verify 5V DC power present**

- a. Use DC voltage tester, probe VCC to GROUND on logger terminal block (should be 5V DC).
- b. Check for lights on TINI board during startup.

### **2. Verify analog phone line connected and live with dial tone**

- a. Unplug incoming phone line from the logger, plug it into a phone and check for dial tone.

### **3. Verify incoming pulses from kWh meter**

- a. If meter leads are connected to PULSE 1, use DVM continuity tester from PULSE 1 to GROUND, hold for several minutes to determine whether the state is changing (see Note).
- b. If meter leads are connected to COUNT 1 or 2, use continuity tester from COUNT 1 or 2 to GROUND, hold to determine whether the state is changing (see Note).

*Note: The PULSE 1 channel records state changes on a simple open/closed circuit with a minimum duration of 1 minute. This channel is commonly used on PV systems with a capacity of 10 kW or less and equipped with a switch closure pulse device that records 1 pulse per kWh. A 10 kW system would produce a maximum of one pulse cycle per 6 minutes, so you might need to wait several minutes before observing the switch closing or opening, particularly if the PV system is not running at full capacity.*

*The COUNT channels record pulses at a much faster rate – up to several thousand times per second. These are typically used with KYZ-output meters that pulse several times each minute.*

*To determine the expected pulse rate from your meter, make an estimate of the AC power the system should be producing (i.e., a 5 kW dc system on an overcast day at noon might be expected to be producing about 2 kW).*

### **4. Reboot the logger**

- a. Reboot the logger by unplugging its power supply and plugging it back in again.

## **5. Force data upload upon restart**

- a. Disconnect logger from power supply.
- b. Connect jumper wire from the VCC to 0-5V terminal on the logger terminal block.
- c. Reboot the logger. A new upload attempt should begin within 3-5 minutes.

*Note: The Force Upload function is present only on loggers with firmware versions 0.60 or later.*

## Level 2 Troubleshooting Procedures

### **Tools required**

- Installer's LCD
- Jumper wire

### **6. Install the LCD screen**

- a. Plug the installer's LCD into the orange LCD port onto the logger.
- b. Observe and record the status messages displayed on the LCD. Note any unusual messages or error loops.

### **7. Reboot the logger and view/record status messages**

- a. Reboot the logger by unplugging its power supply and plugging it back in again. Observe and record the messages displayed on the LCD. Note any unusual messages or error loops.

### **8. Determine logger identification and other information**

- a. Upon startup, the logger displays basic information regarding its configuration. This information includes:
  - The logger's unique serial number.
  - The firmware version installed.
  - Whether the logger detects an Ethernet connection ("Ethernet" or "No Ethernet"). Logger communications default to the PHONE port unless an Ethernet connection is detected.
  - The logger's IP address (on firmware version 0.74 and above) and MAC address (on firmware version 0.93 and above). These are useful for loggers connected to a high-speed Ethernet connection.

### **9. Test sensor channels**

During the startup sequence, the logger provides an opportunity to test various sensor channels to ensure they are working.

- a. **+/- 0-250 mV sensor channel.** During the logger's startup sequence, the logger will display the voltage detected on the 0-250 mV channel for 10 seconds. When nothing is connected to this channel, the number displayed will be very low. A known voltage within this range can be applied across the +/- 0-250 mV and GROUND terminals on the logger sensor block to test the channel during this time. The number displayed is in Volts, not mV.
- b. **PULSE 1 sensor channel.** During the logger's startup sequence, the logger will display the state of the PULSE 1 channel for 10 seconds, refreshing each second. By jumpering PULSE 1 to GROUND on the logger sensor block during this process and holding the connection for at least a second, you can change the state and verify this sensor channel is working. The LCD displays either a 1 or a 0, with 1 meaning a contact is detected and 0 meaning no contact is detected.

- c. **COUNT 1 and COUNT 2 channels.** During the logger's startup sequence, the logger will display the state of the COUNT 1 and COUNT 2 channels for 10 seconds each, refreshing each second. These channels work like an odometer, increasing their value by one each time a pulse is detected. By jumpering COUNT 1 or COUNT 2 to GROUND on the logger sensor block repeatedly during this process, you can change the state and verify this sensor channel is working.

### **10. View the number of messages awaiting upload**

- a. After the startup sequence, the logger will display the amount of data stored in its status and data queues. The display should look something like this:

**S: 1 0 Q: 156 6 T: 4**

Figure 2. LCD display of status and data queues.

- **S** refers to the logger's status queue. This is the string of recent status messages saved by the logger. The first number after the **S** shows the number of status messages ready to be uploaded during the next upload attempt. The second number shows the number status messages collected but that won't be uploaded on the next upload attempt.
- **Q** refers to the logger's data queue. This is the string of data samples awaiting upload. The first number after the **Q** shows the number of data records ready to be uploaded during the next upload attempt. The second shows the number of records collected but that won't be uploaded on the next upload attempt.
- The first numbers should decrease after a successful upload.
- Large numbers are indicative of a problem uploading data. Under normal operation with daily uploads, the status and data queues should not exceed a few hundred or so. As an example, if the logger is monitoring 4 sensors at 15 minute intervals and uploading daily, its data queue would be expected to hold 384 new records (4 sensors x 4 samples per hour x 24 hours per day) prior to the next daily upload.
- **T** appears only in firmware versions 0.99 and later. It refers to the number of active threads running on the logger. Under normal operations, it should say 4. The number should increase to 7 during a telephone dialup connection and to 5 during an Ethernet upload. After either upload the number should return to 4.

### **11. Force data upload upon restart**

- a. Disconnect logger from power supply.
- b. Connect jumper wire from VCC to 0-5V channel on logger terminal block.
- c. Reconnect power supply to start the logger.
- d. Verify "Force Upload" message appears during startup sequence. The "Force Upload" message should appear within a few seconds after startup, after the logger has displayed its serial number, determined whether it is connected to

Ethernet or not, discovered devices connected to it. The message appears immediately before the logger enters its testing sequence (Testing Pulse 1, etc.). Once the Force Upload has been detected, the logger will initiate an upload sequence within one minute after the testing sequences have completed.

- e. **Phone connection.** When transferring data via a phone connection, the LCD will display status messages unique to the dial-up operation. These include messages related to:
  - **The logger's communication with its internal modem.** These consist of a number "AT" commands sent to the modem and the "OK" responses received from the modem.
  - **The job of establishing an Internet connection.** These consist of messages reporting the status of dialing up the 800 number, negotiating for a PPP connection, and concluding with "Connected" and showing the baud rate of the connection.
- f. **Phone or Ethernet connection.** Once an Internet connection is established, either by a phone connection or Ethernet, the LCD will display status messages related to:
  - **The job of checking for and implementing configuration changes directed by the server.** A system administrator can change logger and sensor settings, such as call-up and sensor schedules and sensor policies. When these changes are made on the server, they are adopted by the logger the next time the logger establishes contact with the server.
  - **The job of uploading status messages to the server.** Upon successful uploads, the server responds to the logger with an "OK" message visible on the LCD (see Note).
  - **The job of uploading the data queue to the server.** Upon successfully uploads, the server responds to the logger with an "OK" message visible on the LCD (see Note).

*Note: When uploading the status and data queues to the server, the logger breaks the upload queue into smaller groups which are uploaded individually. Therefore, the upload process for a large status or data queue may produce repeated loops of "Uploading" and "OK" messages. Typically, you will be able to see the status and data queues being reduced during this process.*

## Level 3 Troubleshooting Procedures

Tools required:

- Laptop configured with Logger Support tools
- Serial cable (DB9 male to DB9 female, at least 6 foot recommended)
- Logger connected to Ethernet network or phone
- Jumper wire

### 12. Configure field laptop with Logger Support tools

- a. Copy the contents of the CD-ROM that came with the logger to c:\loggersupport\ on a Windows-based PC or laptop.
- b. Find the file javakit.bat in c:\loggersupport\. In Windows, right-click on the file and choose “Send To,” “Desktop (create shortcut).”

### 13. Start JavaKit and connect to the logger.

- a. Connect DB9 male to DB9 female serial cable between PC serial port and Logger serial port.
- b. Plug in the logger.
- c. Double-click on the javakit.bat desktop shortcut (a DOS window and JavaKit will open, see Figure 3).
- d. Under Port Name at the bottom left, select a COM port (normally COM 1 unless it is being used by another application).
- e. Hit the “Open Port” button.
- f. Hit the “Reset” button.
- g. The logger should respond with a command prompt:

```
TINI loader 05-15-00 17:45
Copyright (C) 2000 Dallas Semiconductor. All rights
reserved.
>
```

### 14. Use JavaKit to initiate a “hard” or “soft” reboot

- a. Open JavaKit and establish a connection to the logger.
- b. **Soft reboot.** For a soft reboot, press “E” then [Enter]. JavaKit will then display the status messages associated with the reboot operation. A soft reboot is equivalent to unplugging the logger and plugging it back in again, all previously-collected data is retained).
- c. **Hard reboot.** For a hard reboot, press:
  - i. B18 [Enter]
  - ii. F0 [Enter]
  - iii. E [Enter]

**Warning! A hard reboot permanently erases previously collected data and reformats the logger’s memory structures.**

## 15. Use JavaKit to load a new Operating System or Firmware

- a. Open JavaKit and establish a connection to the logger.
- b. **Operating System.** The logger runs on a version of the TINI Operating System (OS). To reload or update the OS, go to the JavaKit menu, choose “File,” “Load,” and select the OS file to load. OS files are located in the /firmware/ subdirectory of c:/loggersupport, and are named something like this: tini.1.02f.tbin.
- c. **Firmware.** The process for uploading firmware to the logger is the same as that for uploading the OS. On the JavaKit menu, choose “File,” “Load,” and select the firmware file to upload. Choose the firmware file from the loggersupport/firmware directory on your hard drive. Firmware files are named something like this: tinilogger.r1\_00.1.02f.csg.tbin, with larger numbers indicating later versions.

*Note: Check for the latest versions of the OS and firmware in the support area at [www.SolTrex.com](http://www.SolTrex.com).*

## 16. Use JavaKit to load Slush

- a. Slush replaces the logger firmware and is useful in setting up and debugging loggers. When loaded on the logger, it replaces the firmware file, so you need to remember to reload the firmware after completing your work with Slush.
- b. To load Slush, choose “File,” “Load,” and select the latest Slush version from the loggersupport/firmware directory.
- c. Once loaded, press “E” then [Enter] to reboot the logger running Slush.
- d. When Slush initialization is complete, it will ask you to “Hit any key to login.” Hit any key. It will then ask for a login and password. Use the following:

```
TINI login: root
TINI password: tini
```

After successfully logging in, Slush will display a command prompt.

```
TINI />
```

- e. A number of commands are available with Slush. To see a list of available commands, type the command “help” and press Enter.
- f. Some useful commands are as follows:  
**ls -l:** Lists the files and file sizes on the logger. Can be used to determine whether the file structures are valid. The file loggerdata should always be 65,536 bytes, regardless of how much data is being stored. The file statlog should always be 8,192 bytes, regardless of the number of status messages in the queue (see below).

```
TINI /> ls -l
total 7
drwxr-x   1 root    admin      6 Aug 02 16:57 .
drwxr-x   1 root    admin      3 Sep 03 18:04 etc
-rwxr--   1 root    admin     149 Sep 03 17:59 lasttimes
-rwxr--   1 root    admin    1493 Sep 03 17:59 loggerconfig
-rwxr--   1 root    admin     110 Sep 03 18:03 lastvals
-rwxr--   1 root    admin   65536 Sep 03 18:03 loggerdata
-rwxr--   1 root    admin    8192 Sep 03 18:03 statlog
```

## 17. Configure the logger to use static IP addresses with Slush

Bring up the logger running Slush and using JavaKit. Use the Slush command “ipconfig” to view and set IP addresses.

**ipconfig:** Configures or displays network settings. Can be used to set static IP parameters for Ethernet-connected loggers when DHCP (default) is not available or desired. Context is as follows:

```
TINI /> ipconfig /h
ipconfig [options]
```

Configure or display the network settings.

```
[-a xx.xx.xx.xx]   Set IP address. Must be used with the -m option.
[-n domainname]   Set domain name
[-m xx.xx.xx.xx]   Set subnet mask. Must be used with -a option.
[-g xx.xx.xx.xx]   Set gateway address
[-p xx.xx.xx.xx]   Set primary DNS address
[-s xx.xx.xx.xx]   Set secondary DNS address
[-t dnstimeout ]   Set DNS timeout (set to 0 for backoff/retry)
[-d]               Use DHCP to lease an IP address
[-r]               Release currently held DHCP IP address
[-x]               Show all Interface data
[-h xx.xx.xx.xx]   Set mailhost
[-C]               Commit current network configuration to flash
[-D]               Disable restoration of configuration from flash
[-f]               Don't prompt for confirmation
```

- g. After setting IP parameters, it’s best to commit them to flash using `ipconfig -C`.
- h. After using Slush, remember to reload the firmware back onto the logger and restart the logger with a soft reboot (either by cycling the power or with an “E” in JavaKit).

## 18. Use the “java findloggers” utility

This utility works on loggers running firmware 0.86 and above connected to an Ethernet network. The utility allows any network-attached computer to find all the loggers that are attached to the network. The syntax is:

```
java findloggers
```

The command returns list of all of the loggers on the LAN by their MAC address. You may need to try it a couple of times, due to the fact that it is based on UDP, a protocol without error checking.

```
java findloggers <MAC>
```

in which <MAC> is the MAC address for the logger. Returns logger config for this logger. Also, on 0.93 and later, returns status queue.

```
java findloggers <MAC> <query string>
```

Executes the query string on the <MAC> logger. The query string is as defined for the built in HTTP server. Also, can be used for soft or hard reboot of a logger:

```
java findloggers <MAC> TOOBER=yes  
java findloggers <MAC> TOOBER=heap  
java findloggers <MAC> TOOBER=all
```

Beware: if you use this to reboot a dialup machine, you need to immediately unplug the Ethernet cable so the machine will not try to reboot in Ethernet mode!!

### **19. Use the logger's built-in HTTP server**

Loggers running firmware version 0.84 or later have a built in http server that runs regardless of whether the logger is connected by phone or Ethernet. The server can be used as an aid in debug and configuration. The server can be accessed from a computer on the same LAN as the logger. To access, follow these steps:

- a. Connect an Ethernet cable from the network to the logger.
- b. Restart the logger and determine its IP address (section 6, 7, & 8, or with JavaKit)
- c. Open a web browser and type the following address (syntax described below):

```
http://<ip addr>/0 (or 1, 2, 3, 4, 5, 6)
```

```
0 - return config XML (Logger AND Device)  
1 - (same)  
2 - return data queue status XML  
3 - return data queue XML  
4 - return status queue status XML  
5 - return status queue XML  
6 - return network parameters as XML
```

## 20. Use the LoggerConfig utility

The LoggerConfig utility can be used to identify, configure, and troubleshoot any loggers on a local network from another computer also connected to the network. To use the utility from a network-connected PC or laptop configured with the c:/loggersupport/tools, launch c:/loggersupport/logrcfg.bat. A window will open that looks like this:

The screenshot shows the CWC Datalogger Configuration Utility window. The top yellow band displays status messages. Below it, a 'Rescan' button is on the left, and a section titled 'Found the following loggers:' shows the MAC address '00:60:35:00:dd:a6' and IP address '10.15.1.79', with a 'Get Configuration' button. The 'Logger Information' section provides details for ID: A25E7000C238FC89, OS version: TINI OS 1.02f, Firmware Version: 1\_05.1.02f.csg, Last reset time: 17 Feb 2005 20:44:38 GMT, and Internal clock: 16 Feb 2005 15:06:48 GMT. Below this are 'Reset', 'Reset - blast heap', and 'Reset - blast all' buttons. The 'Upload Configuration' section includes fields for Config URL, Data URL, and three upload schedules. The 'Network Configuration' section contains fields for IP Address, Gateway IP, Primary DNS Server, Proxy Server, Subnet Mask, DHCP Server, Secondary DNS Server, and Proxy Port. The 'Dialup Configuration' section includes fields for Phone Number, Password, Primary DNS, User ID, and Primary DNS. At the bottom, there is an 'Attached Devices' section with a list of MAC addresses and a 'Schedule' field set to '0\*\*\*\*' and a 'Policy' dropdown set to 'CHANGE'.

The top yellow band is used to display status messages. Upon startup, the utility will scan the network for any loggers and will display the MAC address and IP address of any loggers it finds. You can direct the utility to search again by clicking on the Rescan button on the left.

Once you have identified one or more loggers on the network, you can obtain configuration parameters by clicking on the Get Configuration button. The remaining screen is divided into three areas.

**Logger Information:** Provides basic information about the logger, including its unique ID, OS and firmware versions, etc. Allows three levels of resets to be selected.

**Upload Configuration:** Provides information about the upload configuration, including defining the destination URLs for configuration and data, the upload

schedule, and network and dialup configuration. Most of these parameters are settable from within the interface.

***Please Note: Configuration parameters on the logger can be overridden with the LoggerConfig utility and by the server defined in the Config URL. If a logger submits configuration to the Config URL, any recent changes made using the LoggerConfig utility may be overridden by the Config URL server!***

**Device Configuration:** Provides information about the configuration of each device recognized by the logger, including its sampling schedule and policy.