



SOLAR STIK®

**OPERATOR AND MAINTENANCE
MANUAL FOR
PRO-VERTER REMOTE
MONITORING KIT LAN**

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Contents

GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

Introduction4

Installing the RMK4

Connecting a PC Directly to the RMK6

OPERATOR INSTRUCTIONS

Viewing the System Data7

 Current Settings Page7

 Current Conditions Page (left side of screen)8

 Current Conditions Page (right side of screen)9

 Historical Data Page.10

 Fault Codes and Inverter Status Codes.11

Setting a PC Static IP Address12

Connecting the RMK to a Network via a Router15

Files on the USB Drive Included with the System.15

 Editing the Interfaces File16

Updating the Interfaces File in the RMK.17

TROUBLESHOOTING PROCEDURES

Using the LED Indicators to Determine the RMK's Status18

Common Problems During Startup19

Operating the PRO-Verter without the RMK19

RMK LAN Troubleshooting and Repair20

ABOUT SOLAR STIK, INC.

Contact27

List of Tables

Table 1. Inverter Fault and Status Codes 11

Table 2. RMK LED Indicator Guide..... 18

Table 3. Link and Activity LED Meanings 18

List of Figures

Figure 1. Solar Stik PRO-Verter RMK	4
Figure 2. The RMK installed on the PRO-Verter Faceplate	4
Figure 4. Correct (left) and incorrect (right) routing and securing of cables	5
Figure 3. The RMK Ports	5
Figure 6. RMK connected to PC.....	6
Figure 5. Connecting an Expander Pak and the PRO-Verter	6
Figure 7. Home Screen and Current Settings of the RMK graphical user interface.....	7
Figure 8. Current Conditions Page (left side).....	8
Figure 9. Current Conditions Page (right side)	9
Figure 10. Historical Data Page.....	10
Figure 11. “Control panel” search	12
Figure 12. Control Panel window.....	13
Figure 13. Network and Internet window	13
Figure 14. Network and Sharing Center window.....	13
Figure 15. Ethernet Status and Ethernet Properties windows	14
Figure 16. Internet Protocol Version 4 Properties window	14
Figure 17. List of files on the USB drive	15
Figure 18. Interfaces file	16
Figure 19. Updating the RMK’s interfaces file.....	17
Figure 20. Functions of LEDs below the Ethernet port	18
Figure 21. RJ11 Crossover wire connecting the REMOTE and INVERTER ports	19
Figure 22. RMK on PRO-Verter Faceplate.....	20
Figure 23. Fastener and status LED locations.....	20
Figure 24. Removing RMK fasteners.....	20
Figure 25. Removing control board	21
Figure 26. Locations of coin cell battery and fuse on control board	21
Figure 27. Removing coin cell battery	21
Figure 28. Testing coin cell battery voltages	21
Figure 29. Two-amp blade fuse	22
Figure 30. Fuse removal/replacement	22
Figure 31. Testing good fuse with a multimeter.....	22
Figure 32. Reading for a blown fuse.....	22
Figure 33. Removing the microSD card from the control board.....	23
Figure 34. Disk imager user interface.....	23
Figure 35. Creating the target image	24
Figure 36. Read results for a damaged microSD card	24
Figure 37. Read results for an undamaged microSD card	24
Figure 38. Reinstalling control board.....	25
Figure 39. Reinstalling fasteners	25

Revision History

Section	Page(s)	Description	Date
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GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

Introduction

The Remote Monitoring Kit (RMK) provides remote access to vital operating data of a Hybrid Power System (HPS) via the user interface on the PRO-Verter Faceplate. The RMK also records and stores all of the data from the PRO-Verter and provides tabular and graphical reports of these data in a browser-based user interface.



Figure 1. Solar Stik PRO-Verter RMK

Installing the RMK

1. Install the RMK to the PRO-Verter Faceplate in the designated space using the four (4) fasteners provided. The RMK can be installed in two different orientations. Installing it with the USB ports facing the front of the case and the power port toward the back makes access to the USB ports easier. See subsequent steps.



Figure 2. The RMK installed on the PRO-Verter Faceplate

2. Connect RMK to the PRO-Verter: Two RJ11 **crossover** wires are included with the RMK: one connects the “Inverter” ports, and the other connects the “Remote” ports (Figure 2). The red or black 3’ Cat5 straight-through cable connects the “Ethernet” ports. The power cable plugs into the “Power” port on the back side of the RMK, and the other end of this wire is connected to the 24 V, 5 A DC terminals on the front left-hand corner of the Faceplate. **Note:** Red to red, black to black.



Figure 3. The RMK Ports

NOTICE

The cables connecting the RMK to the PRO-Verter must be bundled together and secured to the Faceplate to prevent them from slipping between the lid and the body of the PRO-Verter and causing damage to the cables and/or the PRO-Verter case hinges. If the cables are not already secure as shown (Figure 4), a zip tie with ring on the end may be used to bundle the cables, which should then be secured to the Faceplate using one of the nearby Faceplate screws.

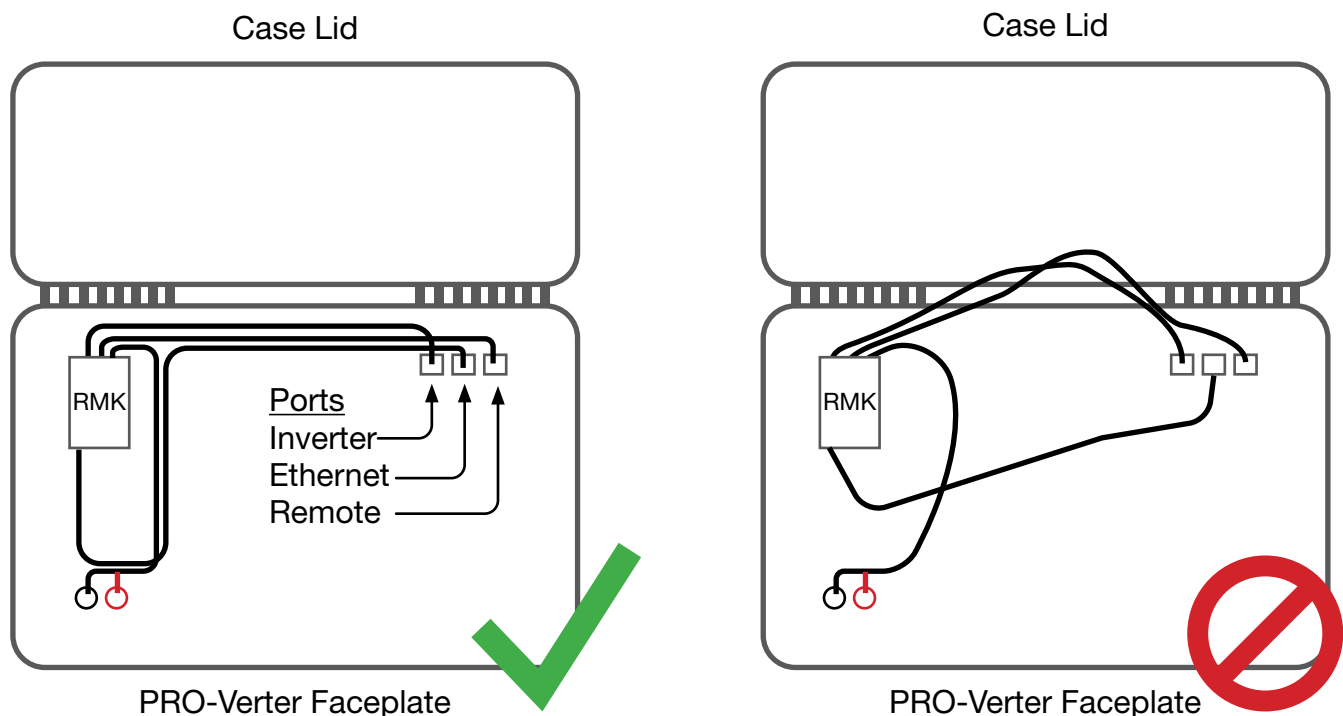


Figure 4. Correct (left) and incorrect (right) routing and securing of cables

3. Connect the PRO-Verter to a 24VDC Expander Pak(s) using a 24VDC Inter-Connect Cable.



Figure 5. Connecting an Expander Pak and the PRO-Verter

Connecting a PC Directly to the RMK

1. Connect the PRO-Verter to a PC with a straight-through CAT5 Ethernet cable between the external MODEM or TECH port and an Ethernet port on a PC (lower right box in Figure 6). Green lights on both ends of the cable indicate a good connection. (If the connection is not good, use a crossover cable to connect the PC to the PRO-Verter.)
2. Configure the PC to communicate via a static IP address. See “**Setting a PC Static IP Address**” section for instructions.

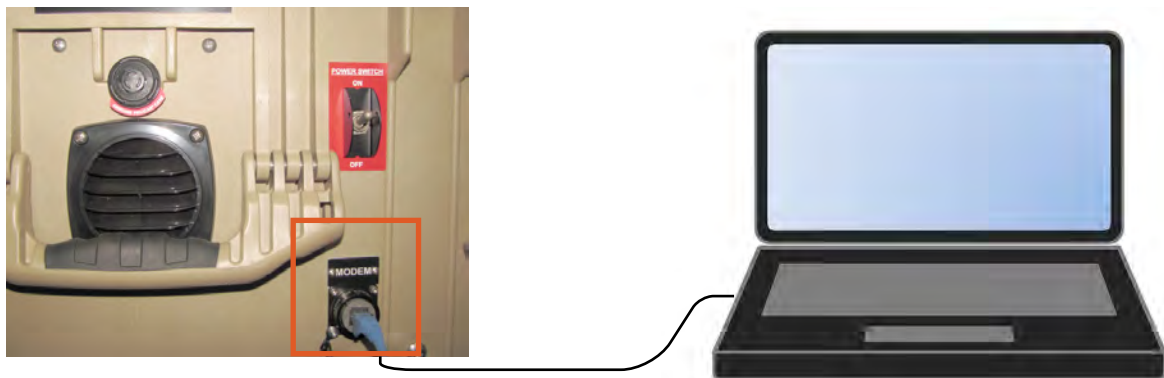


Figure 6. RMK connected to PC

3. Turn on the PRO-Verter main power switch. **Note:** Connecting all cables and components with the power on may result in a failure of the RMK to communicate. Turn on the power only after all connections have been made.

Note: The time it takes for the RMK to “boot up” and begin to communicate with the PC may vary significantly, from seconds to many minutes.

OPERATOR INSTRUCTIONS

Viewing the System Data

Current Settings Page

The default IP address for the RMK is 192.168.1.200. Type “192.168.1.200” into the address bar of a web browser. The “Current Settings” page of the RMK graphical user interface (GUI) should appear after a moment or two (Figure 7).

The System data collected by the RMK is displayed in the RMK GUI. The GUI menu bar provides options for three (3) windows:

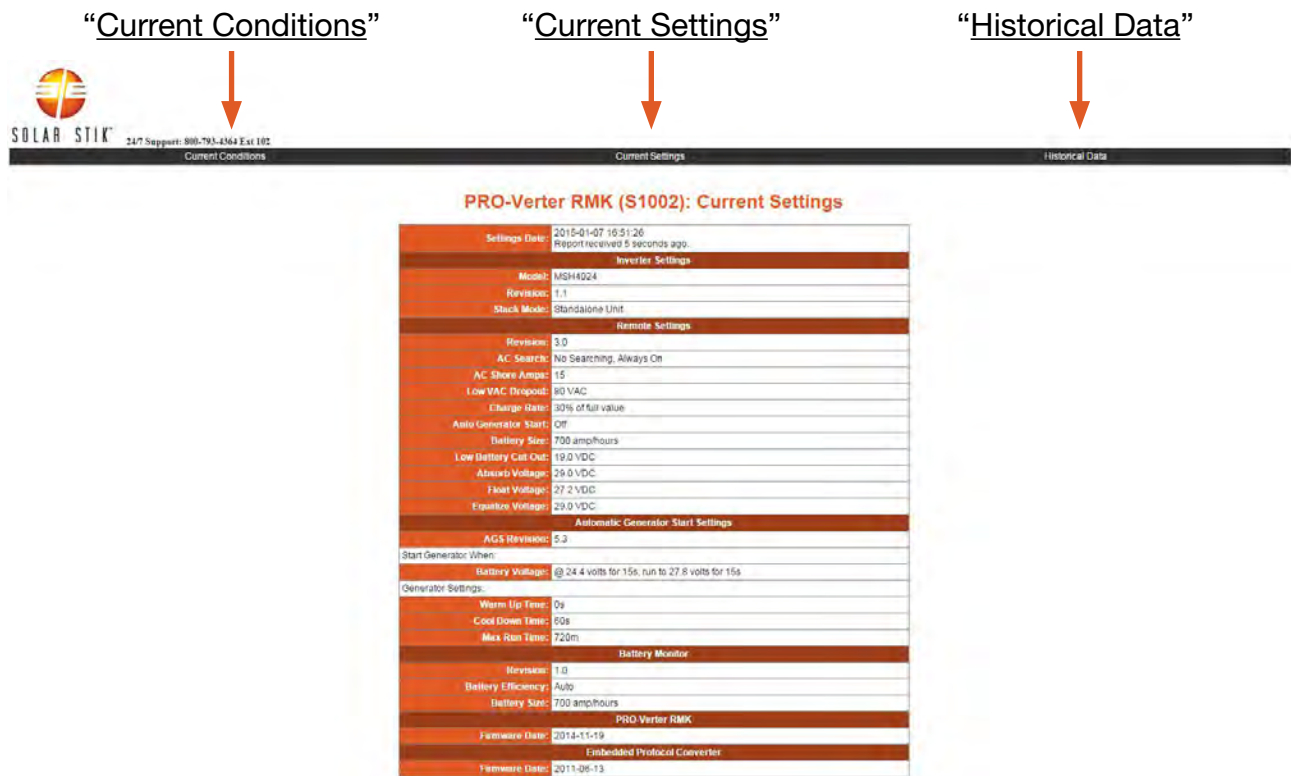


Figure 7. Home Screen and Current Settings of the RMK graphical user interface

The “PRO-Verter RMK (S1XXX)*: Current Settings” window is the first window displayed. This page reports the current settings for the PRO-Verter including the Inverter Settings, Remote Settings, Auto Generator Start Settings, and the Battery Monitor. These values were set at the factory and few can or should be changed.

*Each RMK is serialized S1XXX. The serial number unique to that RMK will be displayed automatically in the “Current Settings” title.

All windows and values reported by the GUI are read only.

Current Conditions Page (left side of screen)

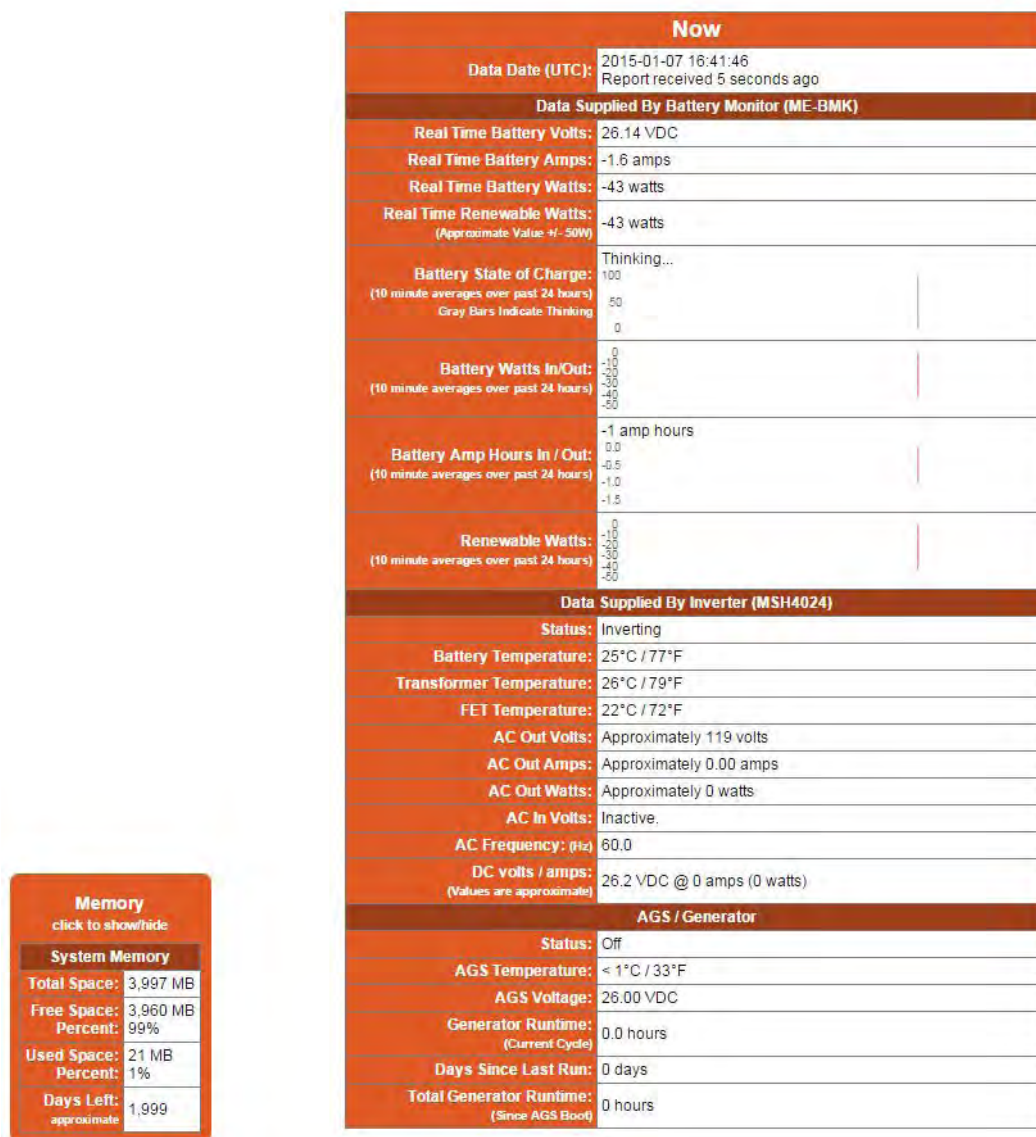


Figure 8. Current Conditions Page (left side)

PRO-Verter Current Conditions (real-time)

This (and the facing) page is updated every 10 seconds and gives an overall view of the system. The left-hand side of the screen displays the conditions as they are in real time.

- **Data Supplied By Battery Monitor**

This is both real time and average data from the last 24 hours. The volts, amps and watts are DC values.

- **Data Supplied By Inverter**

This is real time data from the inverter. Most of the data supplied are critical component temperatures, AC output and battery status.

- **AGS/Generator**

This section provides data regarding the generator auto start/stop system if it has been used.

- **Memory**

At the lower left corner of the page is a small window showing how much storage space is being used, and how much is left on the internal drive.

Current Conditions Page (right side of screen)

24 Hour Data			
Data Supplied By Battery Monitor (ME-BMK)			
	Minimum	Maximum	Average
Battery State of Charge:	Was Disconnected...		
Battery Volts:	26.13	26.14	26.14
Battery Amps:	-1.7	-1.6	-1.6
Battery Watts:	-45	-42	-43
Renewable Watts:	-45	-42	-43
Data Supplied By Inverter (MSH4024)			
	Minimum	Maximum	Average
AC volts Out: (when volts > 80)	119	119	119
AC amps Out: (when not charging)	0	0	0
AC amps In:	0.00	0.00	0.00
AC Frequency: (Hz)	60.0	60.1	60.0
Battery Temperature:	25°C / 77°F	25°C / 77°F	25°C / 77°F
Transformer Temperature:	26°C / 79°F	26°C / 79°F	26°C / 79°F
FET Temperature:	22°C / 72°F	22°C / 72°F	22°C / 72°F
AGS			
	Minimum	Maximum	Average
AGS Temperature:	Was Disconnected...		
AGS Voltage: (volts DC)	26.00	26.00	26.00

Alarm Controls
 click to show/hide
 Silenced: false

Silence Alarm
 Unsilence Alarm
 Dismiss
 Test Alarm

Figure 9. Current Conditions Page (right side)

24-hour Data

The right-hand side of the “Current Conditions” screen displays a 24-hour rolling minimum, maximum, and average (statistical mean) for:

- **Data Supplied by Battery Monitor (BMK)**
- **Data Supplied by Inverter/Charger**
- **Auto Generator Start Circuit Conditions**
- **Alarm Controls: Alarm will sound with any System Fault**

The RMK notifies the user of fault conditions when they arise. Faults include but are not limited to: generator start failure, inverter overtemperature, charger overtemperature, low battery, and lost Ethernet connection.

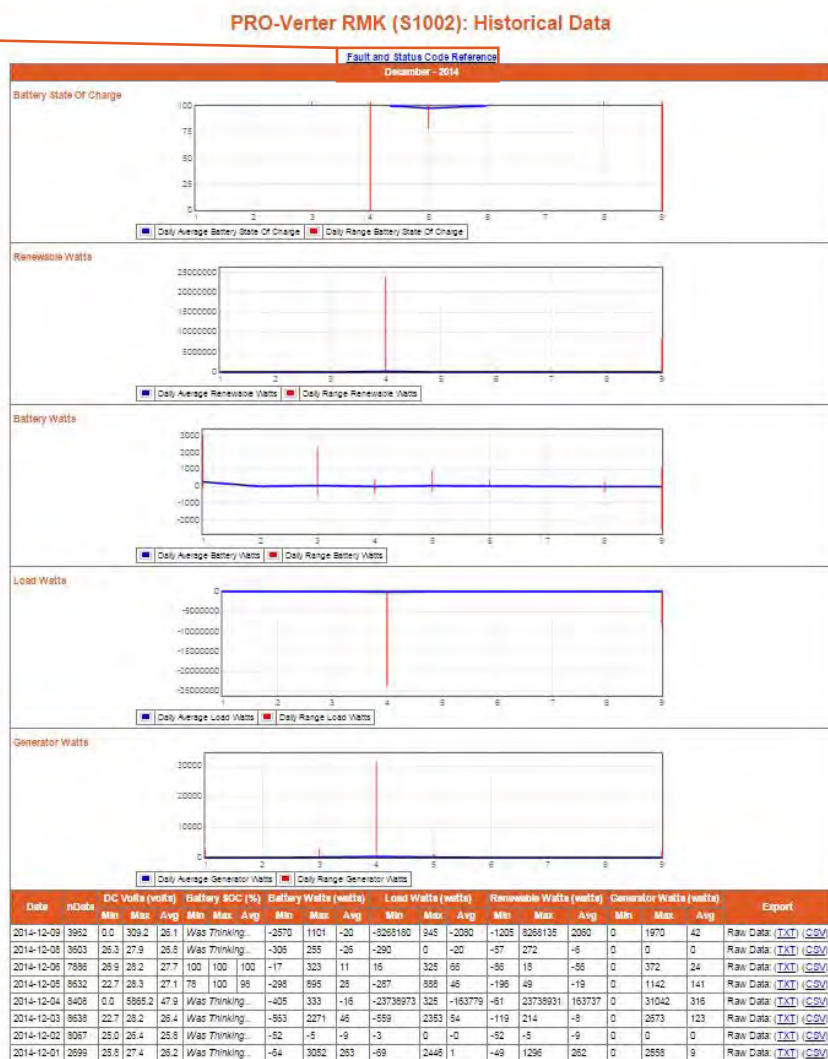
A list of inverter faults with codes can be found on the Historical Data Page. Fault codes are recorded in the data files and reported in the table of Fault and Status Codes.

Historical Data Page



The RMK user interface provides multiple ways to access, view, and report the historical data that are collected. Clicking the box next to a month will call up a sub-page that displays the information for that month in graphical form (see Figure 10). **Note:** The graphs shown here contain no real data. They are shown only for the purpose of illustrating what graphs will be present. In addition to the graphs, the files that contain the graphed data can be downloaded as .txt or .csv files.

Fault and Status Code References can also be found by clicking this link. See the next page.



Access to historical data files

Figure 10. Historical Data Page

Fault Codes and Inverter Status Codes

Data files contain Inverter Fault and Status Codes along with all of the other parameters from the RMK. The table below is the key for the Fault and Status Codes. **Note:** The “FAULT” column (Column T) in log files extracted from the RMK include fault codes not listed below. If fault codes other than those shown below are reported by the RMK User Interface or encountered when searching the log files, please contact Solar Stik Technical Support.

Table 1. Inverter Fault and Status Codes

Fault Code	Fault Message	Inverter Status Code	Status Message
0	No Fault on Inverter	0	Charger Standby AC in, charging disabled.
1	Stuck Relay	1	Equalize Mode Equalizing with AC.
2	DC Bridge Overload	2	Float Mode Floating with AC.
3	AC Output Overload	4	Absorb Mode Absorbing with AC.
4	Charging a Dead Battery	8	Bulk Mode Bulk Charging with AC.
5	AC Backfeed	9	Battery Saver Mode Battery full. No charging current.
8	Low Battery Cutout	16	Charge Mode, no AC Unit is in charger mode, but no AC applied.
9	High Battery Cutout	32	Off Inverter off. Charger waiting for user input. No AC pass through.
10	High AC Output Voltage	64	Inverting
16	Bad FET Bridge	80	Inverter Standby
18	FETs too Hot	128	Search Mode Searching for a load. Charger may be on or off.
19	FETs too Hot too Fast		
20	Internal Fault 4		
22	Stacker Fault, both units not in same mode, problem with *other* inverter		
24	Stacker sync clocks are not in phase		
23	Stacker does not detect other stackers sync clock		
25	Stacker AC output voltage is not properly phased		
32	Over Temperature Shutdown		
33	Transfer Relay is not Closed in Charge Mode		
128	Bridge Fault in Charge Mode. Max PWM, no AC amps, Vbat < FloatV		
129	High Battery Temperature		
144	Open Transformer TCO Temperature Cutout		
145	Open Input 30 amp AC Breaker CB3		

Note: Fault codes ranging from 250-255 may indicate that the RMK has been connected incorrectly. Check/ensure that all of the connections and cable types are correct.

Setting a PC Static IP Address

Use the following steps to configure the network settings on the PC that is connected directly to the RMK.

The following screen capture images show how the process appears on a Windows 10 laptop. Please note that the names of the settings windows will vary based on the user's hardware, installed driver for that hardware, and the version of Windows.

1. Click the Start button, type "control panel" into the search window, then click "Control Panel" in the search results.

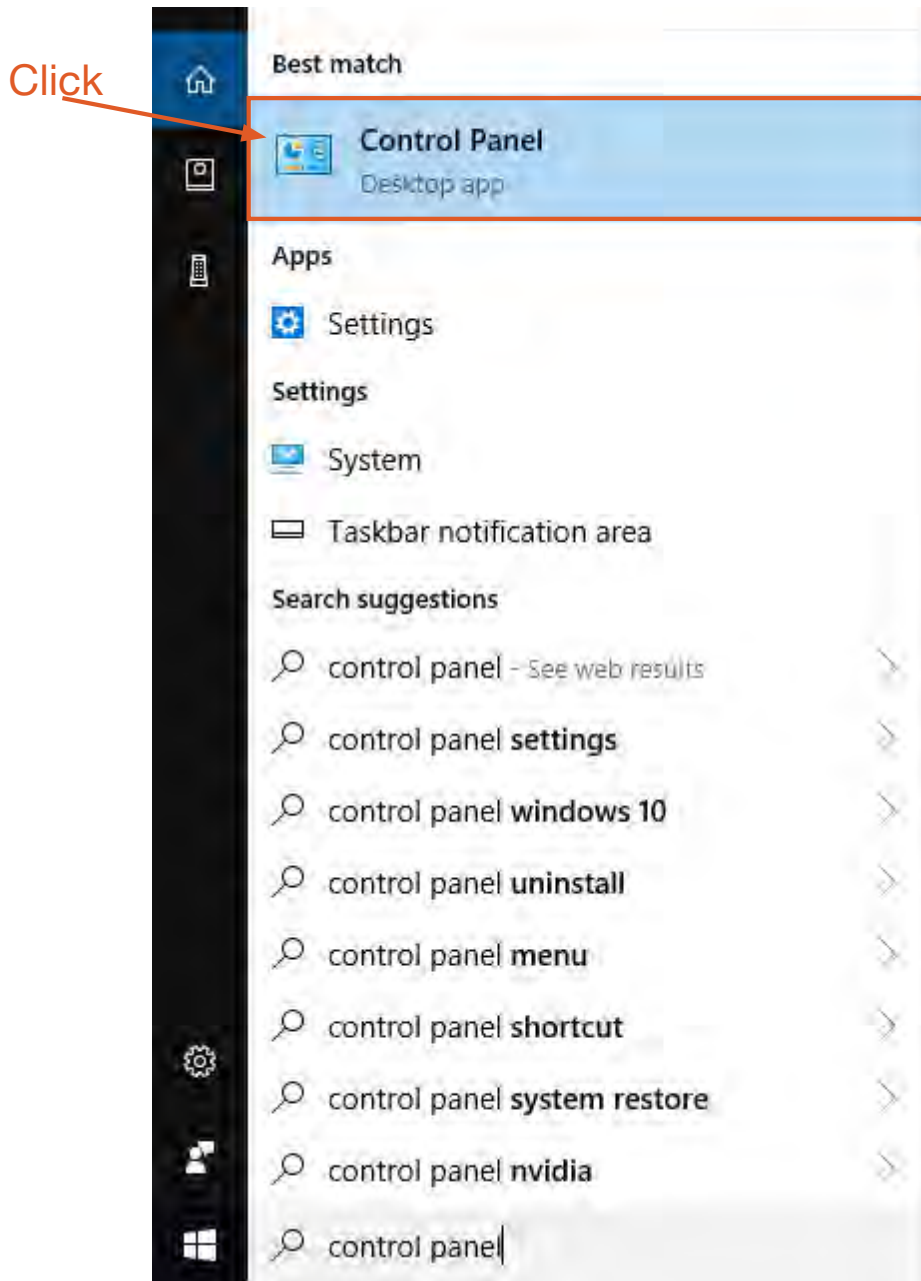


Figure 11. "Control panel" search

2. Click “Network and Internet”.

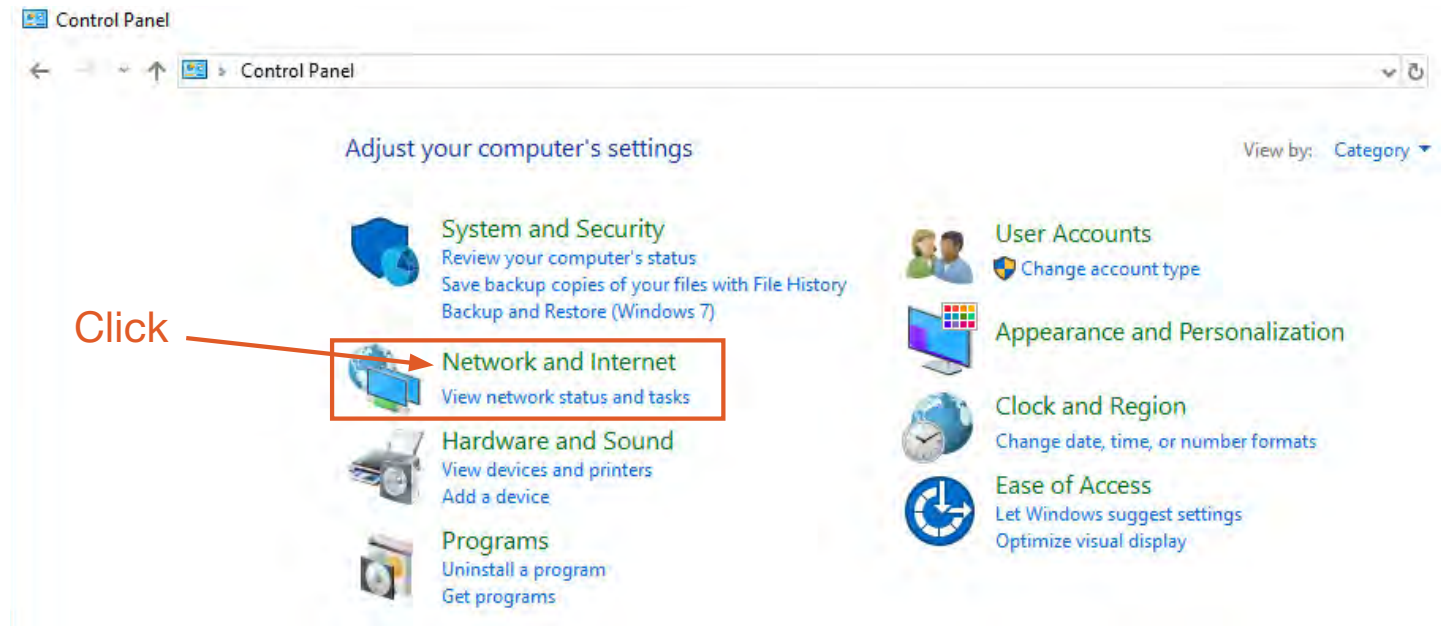


Figure 12. Control Panel window

3. Click “Network and Sharing Center”.

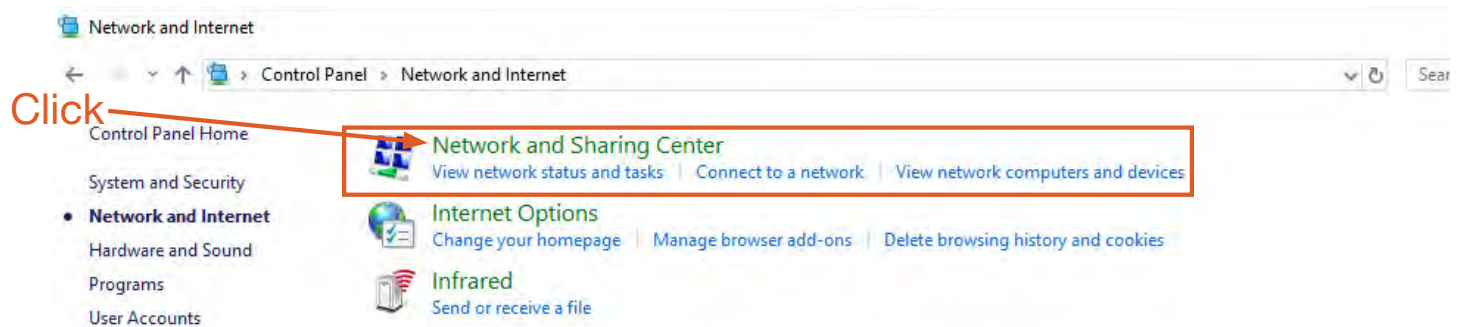


Figure 13. Network and Internet window

4. The various active networks will appear in the window. Click “Ethernet”.

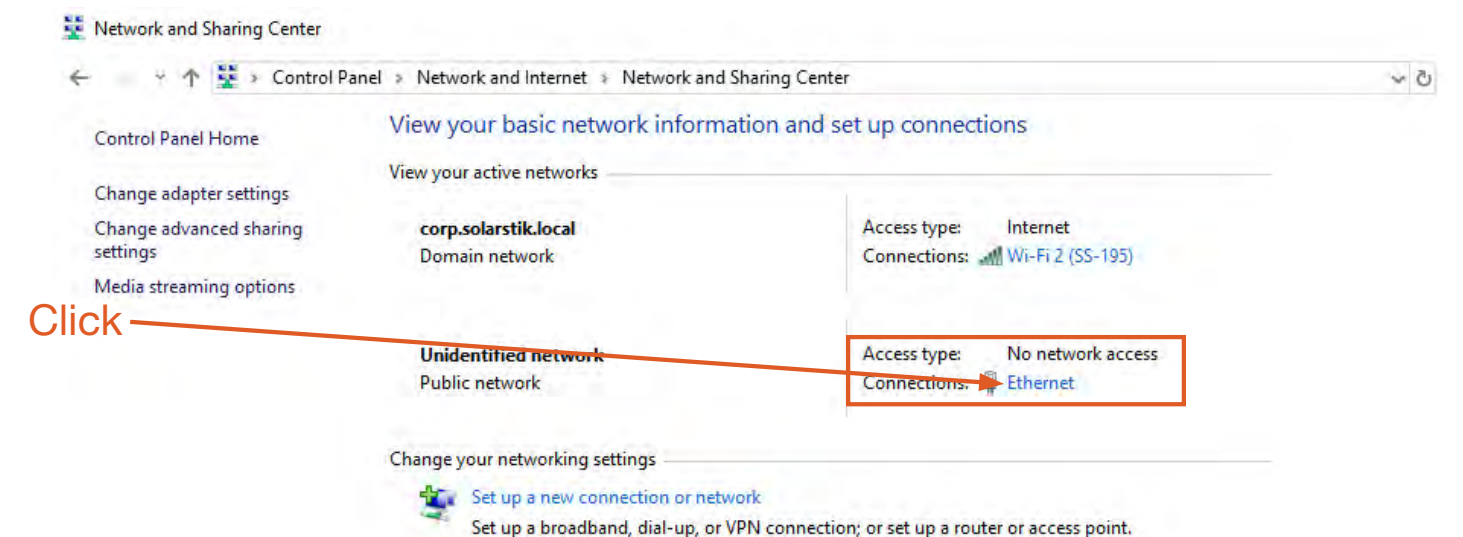


Figure 14. Network and Sharing Center window

5. In the Ethernet Status window, click the Properties button. In the Ethernet Properties window, click the “Internet Protocol Version 4 (TCP/IPv4)” box. If the box was already checked, click to uncheck the box and then click again to check the box so the Properties button becomes active. Then click the Properties button.

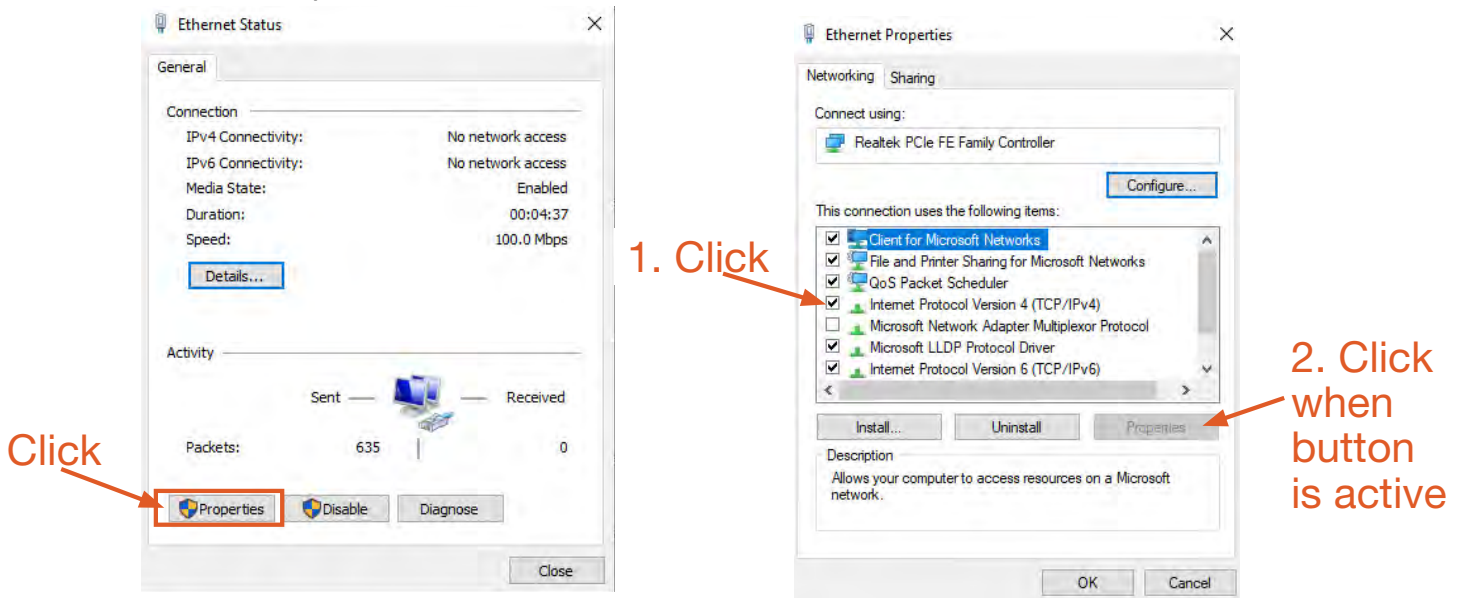


Figure 15. Ethernet Status and Ethernet Properties windows

6. Click the radio button in front of “Use the following IP address:” if it is not already selected. If using the default IP address for the RMK, which is 192.168.1.200, set the PC IP address to 192.168.1.xxx. **Note:** The last 3 digits can be any number between 1 and 254, with the exception of numbers already associated with other devices (including the RMK) on the network. The one in Figure 16 is set to 240.

Set the other address per Figure 16. When finished, click OK or Close in the three (3) windows for the changes to take effect.

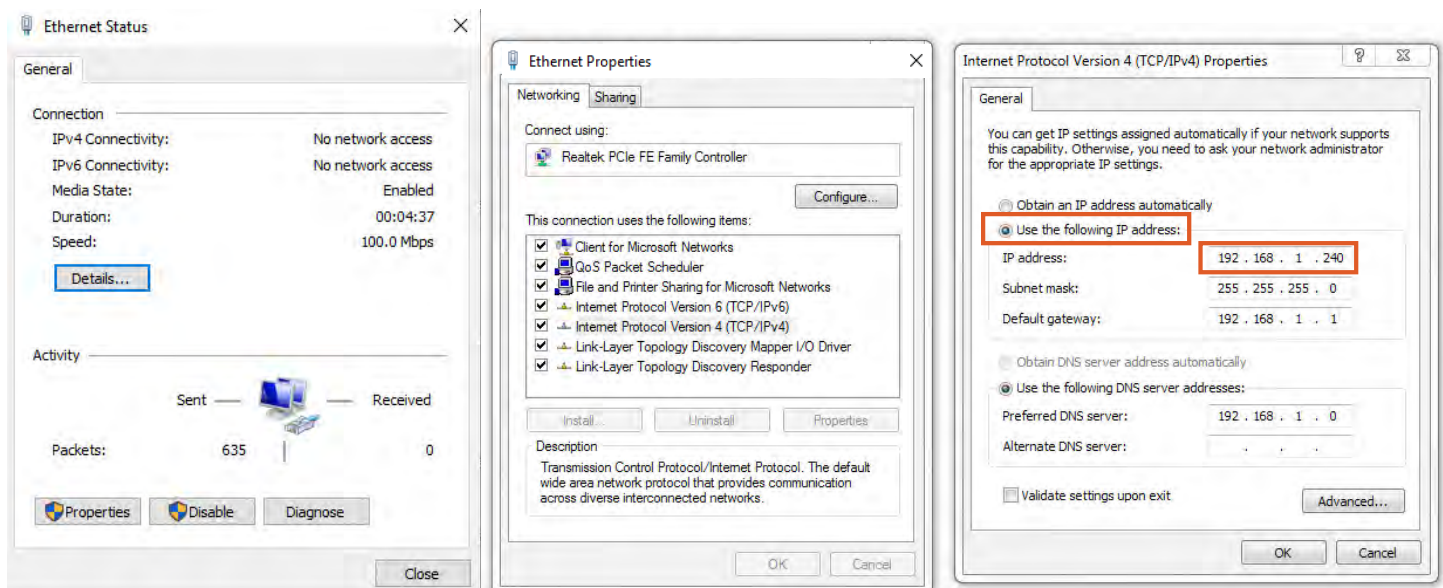


Figure 16. Internet Protocol Version 4 Properties window

Connecting the RMK to a Network via a Router

The RMK is configured to connect to a DHCP network by default.

Connect the RMK to a router using a straight-through Cat5 Ethernet cable.

Open a command prompt window and type in “ipconfig/all” to find the IP address that the DHCP router assigned to the RMK. Type this IP address into the address bar of a web browser to view the system data.

If a DHCP network is not available or desired, the RMK settings can be reprogrammed (see instructions “**Editing the Interfaces File**” section).

Files on the USB Drive Included with the System

A USB drive included with the system will contain the files listed as shown in Figure 17. The files are in a folder with the same name as the RMK Serial Number (S1002 in the figure below).

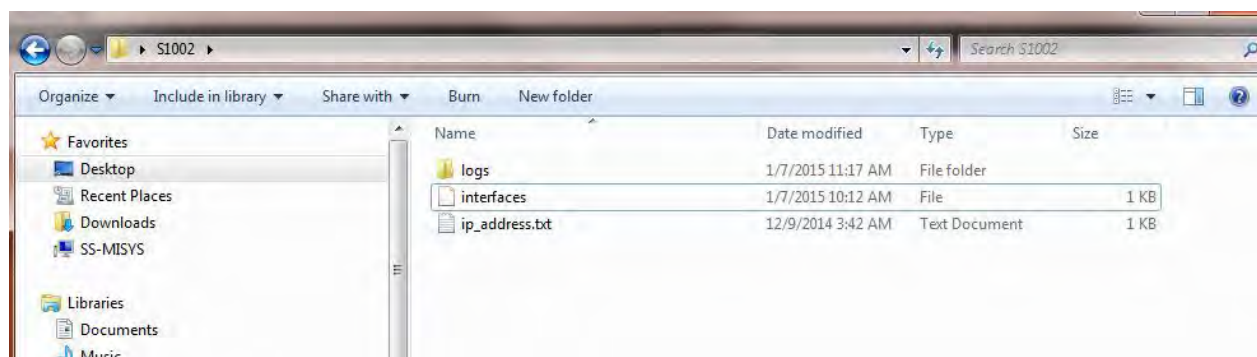
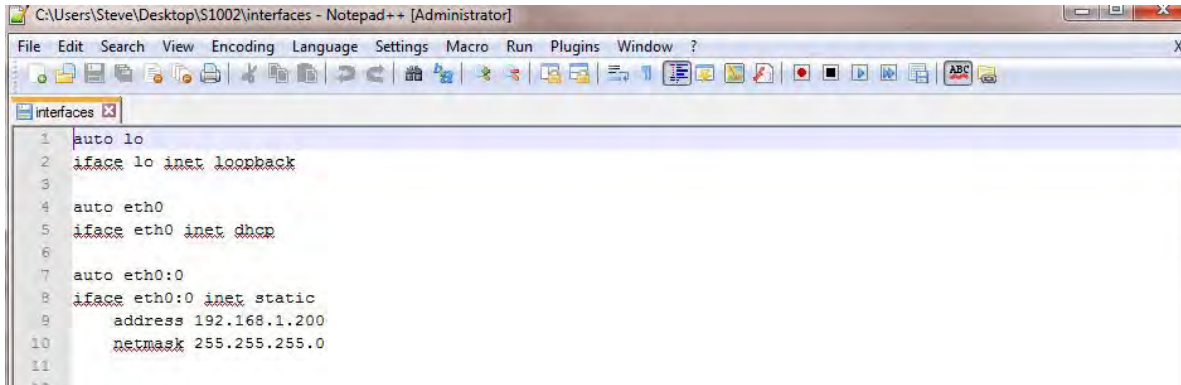


Figure 17. List of files on the USB drive

- The **logs folder** contains historical records of all data from the RMK since the last time it was uploaded from the RMK by plugging in the USB drive. The historical records are both .txt and .csv files created daily and consist of data captured every 10 seconds. The data in these files are the same as the data displayed in the user interface.
- The **interfaces file** is used to configure networking. This file is not created by the RMK.
- The **ipaddress.txt file** is a log file that shows the current IP address of the RMK. When using DHCP, the router-assigned IP address can be discovered by reading this file. **Note:** IP addresses may change after a reboot if the IP address in the interfaces file is different from the current IP address.
- The **interfaces.bak file** is the interfaces file that was used previously to configure the RMK.

Editing the Interfaces File

“Interfaces” is a simple Unix script text file that can be opened and edited with the text editor **Notepad++**. Do not edit using word processing programs like MS Word. **Note:** The interfaces file does not have a file extension.

A screenshot of the Notepad++ text editor window. The title bar shows the file path: C:\Users\Steve\Desktop\S1002\interfaces - Notepad++ [Administrator]. The menu bar includes File, Edit, Search, View, Encoding, Language, Settings, Macro, Run, Plugins, Window, and ?. The toolbar contains various icons for file operations and editing. The text area shows the following configuration for the 'interfaces' file:

```
1 auto lo
2 iface lo inet loopback
3
4 auto eth0
5 iface eth0 inet dhcp
6
7 auto eth0:0
8 iface eth0:0 inet static
9     address 192.168.1.200
10     netmask 255.255.255.0
11
```

Figure 18. Interfaces file

- Lines 1 and 2 are for the loopback interface and should not be changed.
- Lines 4 and 5 configure the Ethernet port to use DHCP. If a DHCP server is available, this will be the default address and will be assigned by the router. If DHCP is not desired, comment out lines 4 and 5. (To comment a line out, place a “#” character at the beginning of the line.)
- Lines 7–10 are used to configure an alias on the Ethernet port so that a static IP address can be used. The default address as shipped is 192.168.1.200 and the netmask is 255.255.255.0. The static IP address can be changed to match the user’s network.

Updating the Interfaces File in the RMK

When a USB drive is inserted into the RMK, the RMK looks for a folder with the RMK serial number. If one does not exist, one is created. The folder will be populated with log data and a few other files (see Figure 17). If the USB already contains the serial number folder, the files in this folder will be updated.

1. Plug the USB drive into any of the four (4) USB ports; they are all equal. The **green** LED (circled in orange) on the lower right corner of the RMK will turn off temporarily.
2. The LED will turn to **orange** while the RMK reads the interfaces file and writes any system data that have been logged by the RMK to the USB drive. This process may take several minutes.
3. When the process is finished, the LED will return to **green**.

For the interface file changes to take effect, the RMK must be rebooted. This is accomplished by cycling the power.

4. With the USB drive in the RMK and the LED **green**, remove the **NEGATIVE** lead from the 5A 24VDC post.
5. Reconnect the lead. The LED will turn **red**. Wait for the LED to turn **green**. This may take several minutes.
6. Remove the USB drive.

The RMK is now accessible to a network at the reprogrammed IP address. Enter the new IP address into a web browser to access the interface.

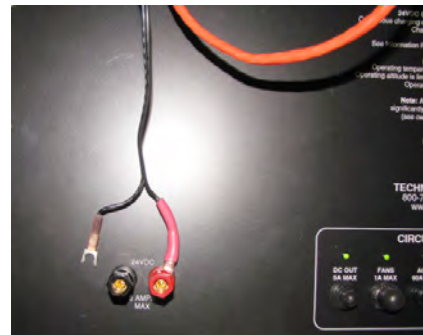
Note: The log files are extracted from the RMK onto the USB storage device during this process. If the data log files are large and numerous (Figure 8 lower left), this process may take a long time (up to and over an hour). The long wait can appear like the RMK is frozen. Be patient. Do not dismount the USB storage device before sufficient time has been given for the transfer.



RMK recognizing the USB drive



Uploading info from the USB drive (removed)



Cycling the power to the RMK



Waiting for changes to take effect in the RMK



Setup complete

Figure 19. Updating the RMK's interfaces file

TROUBLESHOOTING PROCEDURES

Using the LED Indicators to Determine the RMK's Status

There is a bi-color LED indicator on the side of the RMK (next to the Ethernet port) to indicate the RMK's status. When the device is first powered up, the LED blinks red and green while going through a self-test. Once the self-test is complete, use the table below and the LED indicator to determine the RMK's operating status.

If the RMK device does not function correctly, use the tables below to help find a solution.

Table 2. RMK LED Indicator Guide

LED Status	Meaning
OFF	Ensure the inverter has power and the cables are correctly seated into the RMK.
Red ON,	Power-up sequence. The RMK is performing a self-test – this occurs when first connected to power. <1 Minute
Green ON	Normal operation: the RMK is correctly transmitting and receiving with network devices.

Table 3. Link and Activity LED Meanings

Link LED		Activity LED	
Color	Meaning	Color	Meaning
Off	No Link	Off	No Activity
Amber	10 Mbps	Amber	Half Duplex
Green	100 Mbps	Green	Full Duplex

Normal operation is amber or green for the Link LED and periodic flashing of the Activity LED.

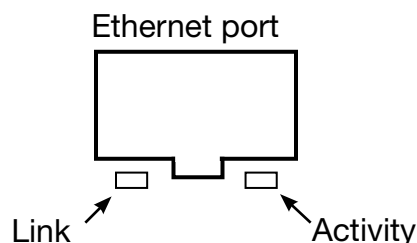


Figure 20. Functions of LEDs below the Ethernet port

Common Problems During Startup

Before using the information below to troubleshoot, review the LED indicator guides in Table 2 and Table 3.

Most issues arise when minor connection problems exist.

- Is the RMK connected to an “always on” internet connection?
- Is the RMK attached to a DHCP network to assign the address?
- Is the PRO-Verter powered up and properly connected to the RMK? Consult Connection Diagram

Operating the PRO-Verter without the RMK

It may be necessary to use the PRO-Verter without the RMK. If this is the case, use an RJ11 Crossover cable to connect the REMOTE and INVERTER ports on the upper right-hand corner of the PRO-Verter AGS Faceplate. **Note:** This cable **MUST BE** a “crossover” RJ11 cable for proper function. A “straight” RJ11 cord will not work.



Figure 21. RJ11 Crossover wire connecting the REMOTE and INVERTER ports

RMK LAN Troubleshooting and Repair

If the RMK LAN does not power up and the status LED does not emit light, the fault could be a tripped PRO-Verter breaker, the coin cell battery, the fuse, or the microSD card in the microcontroller. To determine which is the problem and how to resolve it, use the procedures in this section.

I. Check the DC OUT 5 A Breaker

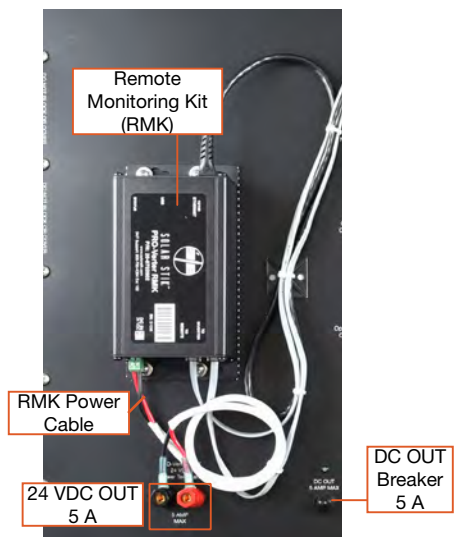


Figure 22. RMK on PRO-Verter Faceplate

1. The circuit supplying power to the RMK has a 5-amp breaker. The LED above the breaker reset button will emit green light if not tripped. The LED will be unlit if the breaker has been tripped. If the breaker is tripped, press the reset button. The LED will emit green light.

If the LED for the 5 A breaker is green but the RMK does not power up, remove the RMK from the PRO-Verter and proceed to step 2.

II. Check the Coin Cell Battery

2. Remove the four (4) fasteners from the end of the RMK housing using a #2 cross-tip screwdriver.



Figure 23. Fastener and status LED locations



Figure 24. Removing RMK fasteners

- Slide out the control board, noting which grooves in the interior of the housing are used. The coin cell battery and fuse (see section III) are on the underside of the circuit board.

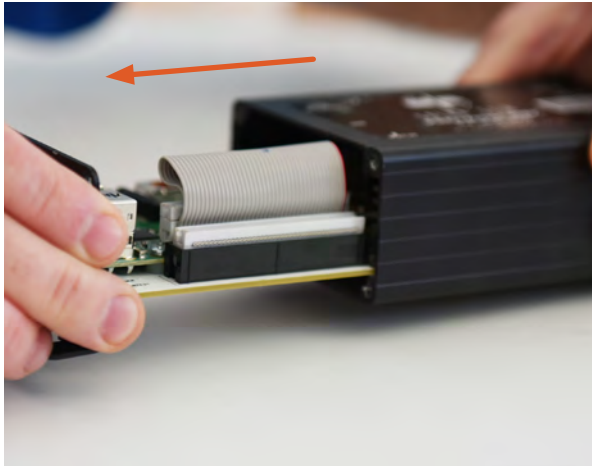


Figure 25. Removing control board

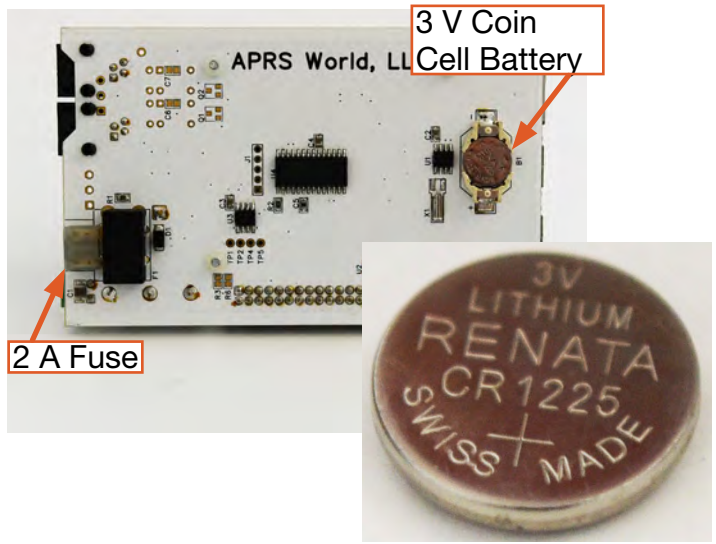


Figure 26. Locations of coin cell battery and fuse on control board

- Remove the coin cell battery and test the voltage. A fully charged coin cell battery will provide ~3.2 VDC. If the voltage is 2.75 VDC or less, it is fully discharged; replace the battery and proceed to step 10. If the voltage is higher than 2.75 VDC, reinstall the battery and proceed to the next step.

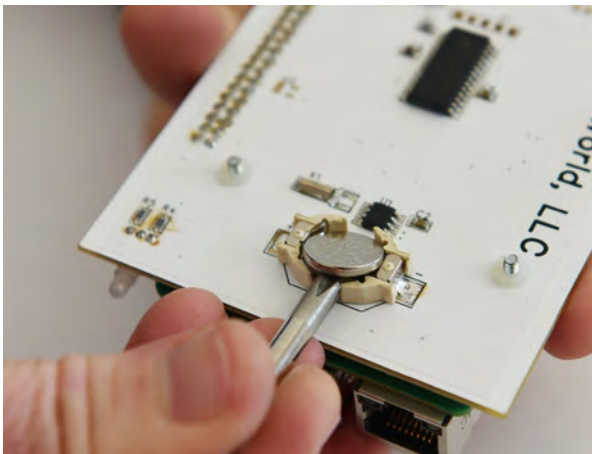


Figure 27. Removing coin cell battery



Figure 28. Testing coin cell battery voltages

III. Check the Fuse

5. Determine the status of the fuse visually or by using a multimeter (Figure 31). If using a multimeter, set it to Ohms. Place one lead on each of the two fuse contacts. The reading will waver but remain very low ($m\Omega$ range); a bad fuse will result in overload (OL). If the fuse is blown, replace it and go to step 10. Pliers may be required to remove the fuse from the socket. If the fuse is good, go to the next step.

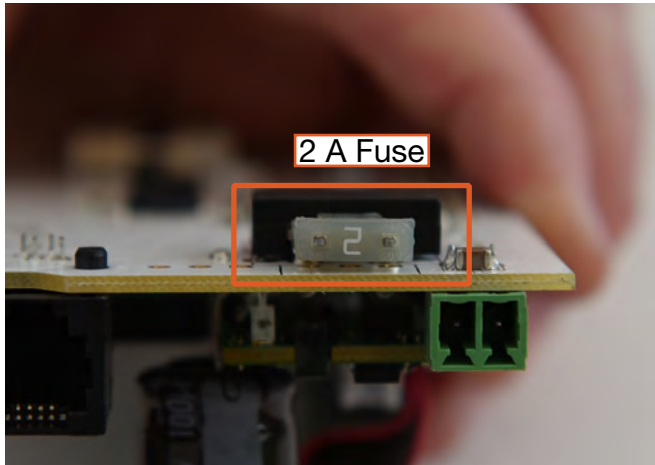


Figure 29. Two-amp blade fuse

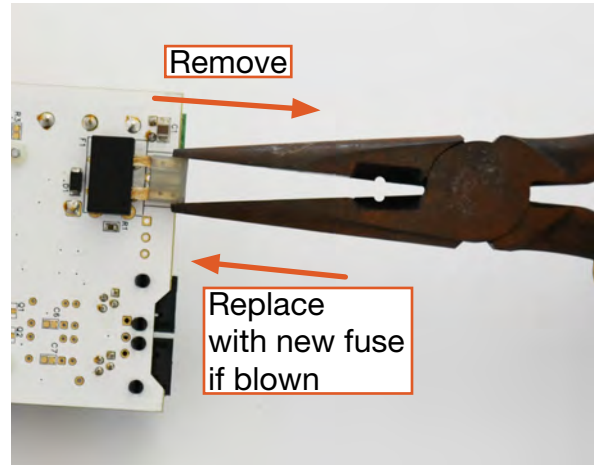


Figure 30. Fuse removal/replacement



Figure 31. Testing good fuse with a multimeter

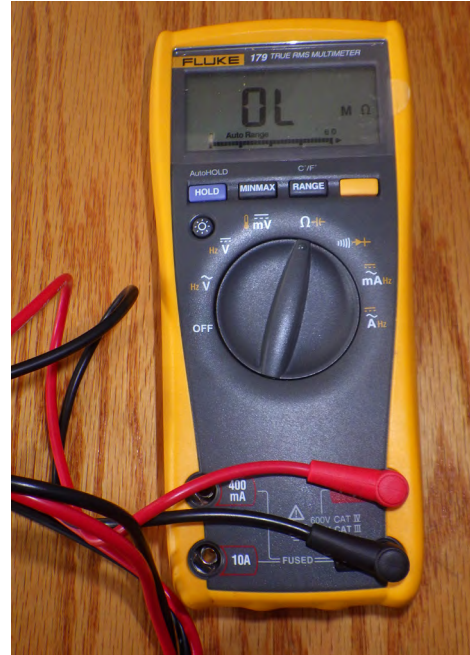


Figure 32. Reading for a blown fuse

IV. Test the MicroSD Card

Testing the microSD card during troubleshooting should be done only after the coin cell battery and blade fuse have been eliminated as the source of the malfunction.

The most efficient and simple method to test the function of the microSD card independently from the RMK is to use a disk imager utility to try to verify that the entire card is free of media errors. The program is free online and is one of many that are available (see step 7 below).

6. Remove the microSD card from its port on the underside of the control board by depressing it to unlock the card (Figure 33A). The card/port assembly has an internal spring and makes a click when it has been unlocked. **Note:** Use insulated or nonconductive tools if possible to prevent shorting the capacitor (Figure 33B).

Use tweezers or small needle-nose pliers to slide the microSD card from the port (Figure 33C). **Note:** The copper contacts face upward (Figure 33D).

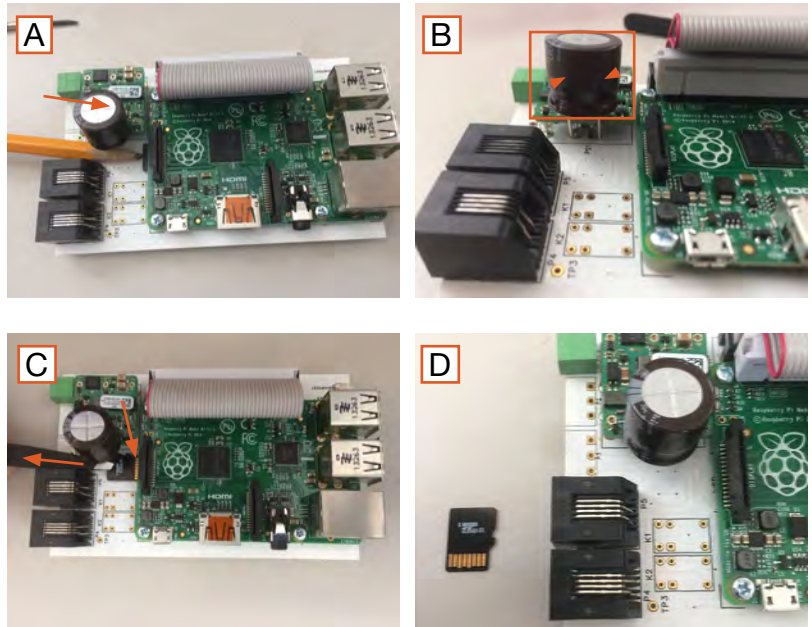


Figure 33. Removing the microSD card from the control board

7. Download and install win32diskimager from <http://sourceforge.net/projects/win32diskimager>.

Insert the microSD card into a card reader attached to your computer. **Note:** Connecting a microSD card to your computer may require an adapter. Open the utility. The user interface will appear. Choose the “device”/drive (Figure 34A) on your computer where the microSD card has been inserted. Click the folder button (Figure 34B) to begin creating the target image file.

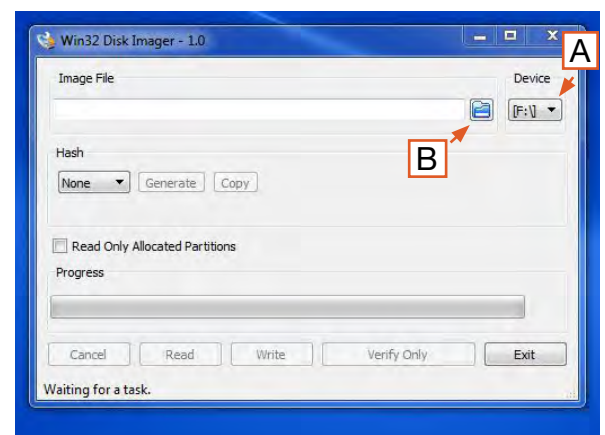


Figure 34. Disk imager user interface

8. Create a target image file on the desktop. In this example, we used the serial number of the RMK as part of the file name (Figure 35A). The file path for this image will appear in the image file field and the “Read” option (Figure 35B) will appear as the only selectable option. Click **Read** to begin the process of reading the boot up information on the microSD card.

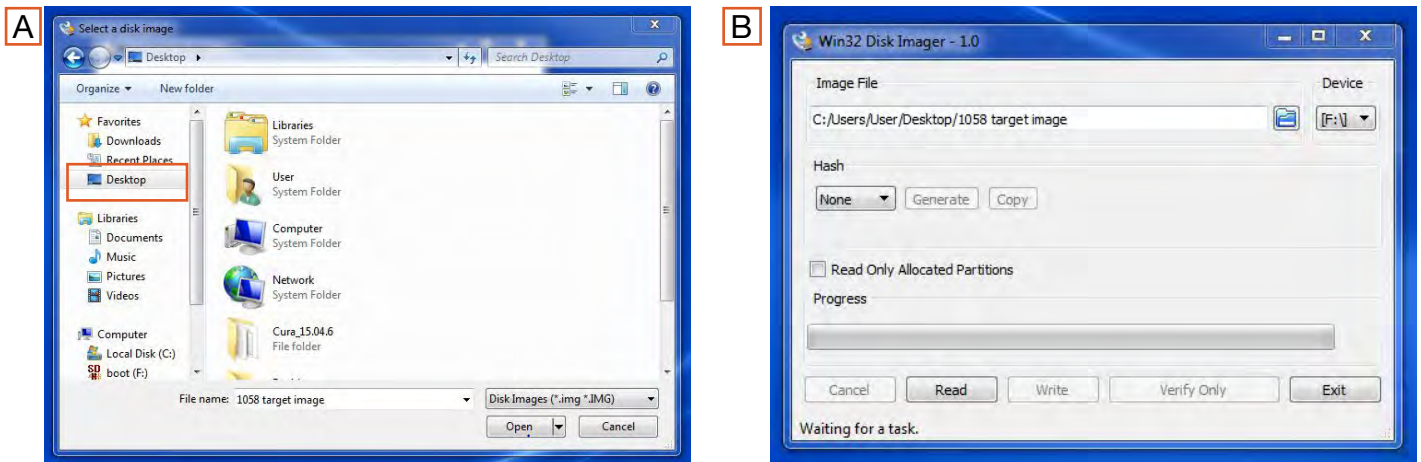


Figure 35. Creating the target image

9. Interpret the results from reading the microSD card.
- For a damaged microSD card, the read process stalls indefinitely at 1% (Figure 36). You may see an error message, depending on the cause of the card failure. If so, the RMK is non-mission capable (NMC). Contact Solar Stik Technical Support (800-793-4364, Ext. 102).
 - For an undamaged, functional microSD card, a success message appears (Figure 37). Reinstall the microSD card into the port and proceed to the next step.

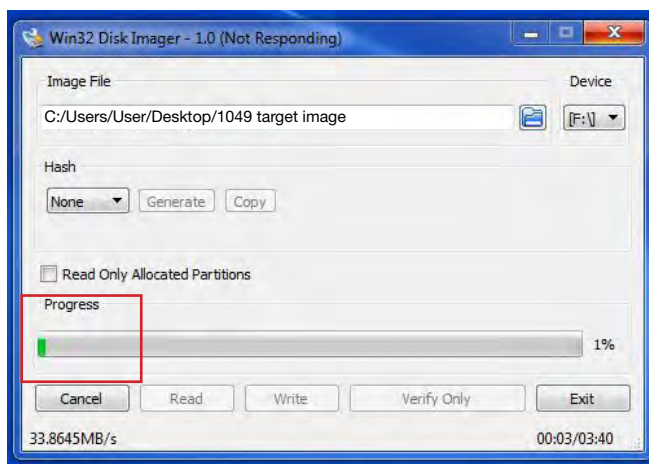


Figure 36. Read results for a damaged microSD card



Figure 37. Read results for an undamaged microSD card

V. RMK Testing

10. Plug the RMK power cord from the PRO-Verter into the RMK power port to determine whether the problem is solved. If solved, go to the next step. If not, go to step 13.

VI. RMK Reassembly and Reinstallation

11. Reinstall the control board by sliding it back into the housing. Depress the ribbon cable during reinstallation to prevent damage. Reinstall the four (4) fasteners.



Figure 38. Reinstalling control board



Figure 39. Reinstalling fasteners

12. Reinstall the RMK onto the PRO-Verter.
13. If all tests are passed and the RMK still fails to boot when properly installed on the PRO-Verter, the RMK is NMC. Contact Solar Stik Technical Support (800-793-4364, Ext. 102).

ABOUT SOLAR STIK, INC.



Mission Statement

Using American-made components and constant innovation, Solar Stik creates portable power solutions that enable self-sufficiency for the soldier, the sailor, and beyond. In doing so, we save lives, change lives, and help revive American manufacturing.

STIKopedia

[STIKopedia](#) is a compilation of everything you would ever want to know about portable Hybrid Power Systems, including the philosophy and mechanics of high-efficiency circuits, and the individual technologies used to create them.

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