

LiveWire Mantis™

MONITORING SYSTEM

USER MANUAL

(Windows PC Interface Version)

Live diagnostic module that monitors energized cable runs and electrical circuits around the clock



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Table of Contents

Revision History	iii
About the Mantis	4
Terms and Descriptions	2
Part Numbers and Accessories	2
Additional Equipment Required	3
Safety Information	4
Mantis Description	5
Testing Descriptions	6
Windows PC User Interface	11
General Settings Menu	15
General Operations	18
Physical Setup	18
Turning the Unit On/Off	19
Resetting the Mantis to factory default settings	19
Connecting Mantis To Mantis Application	21
Install the Mantis Application on a Windows PC	21
Initial Mantis Unit Setup and Use	22
Setup Local Computer for Wired Host Mode	22
Initial Mantis Log-in using Wired Host Mode	26
Select the proper Time Zone	27
Mantis Switching to Wired Network Mode	28
Mantis Switching to Access Point Mode (AP Host)	30

Mantis Switching Wi-Fi Client Mode	33
Mantis Switching to Cellular Network Mode.....	35
Fault Location, Live IFD, and Live Sweep Test	37
Fault Location Test.....	37
Live Intermittent Fault Detection Testing.....	44
Live Sweep Testing	47
View Test	50
Cable Types and VOP	53
File Management	56
Interpreting Test Results	58
Fault Location Test.....	59
Waveform Analysis	60
User Settings	62
Mantis Application (Log-in Page).....	62
Settings menu	62
Device menu	65
Email Settings Menu	66
Modbus Settings	67
Email List menu.....	67
Mantis Software/Firmware Updates.....	69
Maintenance	71
Specifications	72
Appendix A	74
Customer Service	75
Warranty	76
Patents/Intellectual Property.....	76

Revision History

Revision	Date	Author(s)	Description
01-2016	1/13/2016	WHM	Updated document with changes from Version 1.8.1 of the application: <ol style="list-style-type: none">1. Added a discussion for Fault Location testing about the Minimum/Maximum Fault Distance functionality.

About the Mantis

The Mantis is the first live cable tester module that monitors energized and un-energized cable runs and electrical circuits around-the-clock. It detects, locates, and characterizes faults, either static/persistent or intermittent to show where and when they occur. This information can then be transmitted either wirelessly or over data cables for alerts and instant response to the events.

NOTE: For **Android tablet interface** features, please consult LiveWire Mantis User Manual (Android tablet Interface version) available at <http://www.livewireinnovation.com/downloads>

Feature (Windows PC Interface)	Function
Works on both energized and un-energized cables	Locate and isolate persistent faults or intermittent faults that can occur during operations including Date, Time, Location, and Type
Monitors cable for intermittent faults	Records a complete history of intermittent faults
Windows PC user interface	Easy to use interface for controlling and reading info from the Mantis
Electrical connector interface	Easy-to-use terminal block for electrical connections
Saves reports transferrable to PCs for storage and printing	Maintain test result history
Cable fault finding or end point discovery and associated locations	Easily verify quality of entire cable length and report faults
No calibration needed	No metrology calibration required
English or metric measurements	International applications
1000V Category II	Meets international requirements for working on energized cables

Terms and Descriptions

The table below defines the terms used throughout the manual and provides information to assist you with proper operation and understanding of the unit and its functions.

Term	Description
Spread Spectrum Time Domain Reflectometry (SSTDR)	SSTDR is a patented technology that allows for diagnostic testing on cables without interference from voltage.
Open Fault	Typically an unterminated wire, broken wire or bad connection.
Short Fault	Two wires making contact or connected together (closed circuit).
Fault Location Testing	Test for faults that are persistent, (either a hard short or open which do not change with time).
Live IFD Testing	Intermittent Fault Detection (IFD) continuously test for a fault on live or un-energized cables that can occur randomly and not persistent.
Live Sweep Testing	An intermittent fault detection function that is used to locate intermittent fault conditions on extremely long energized cables (≤ 6 kilometers), but also retains the ability to detect short and medium distance faults.
VOP	Velocity of Propagation (VOP) is the speed at which a signal travels through a cable, measured relative to the speed of light. For most cables, this is about 66% the speed of light.

Part Numbers and Accessories

The Mantis can be used with a variety of accessories and in conjunction with an application on an Android tablet or on a Windows PC operating system. This manual applies to use of the Windows PC interface application. For reference on the Android tablet interface application, please see LiveWire Mantis User Manual (Android tablet Interface Version). Below is a list of accessories included with the Mantis.

Part Number	Description
LW-MM200	<ul style="list-style-type: none">• Mantis main unit• Power Supply 12VDC

Additional Equipment Required

In order to use the LiveWire Mantis from the Windows PC interface application, you must have a Windows PC (Windows 7 or greater). An Android tablet option is also available. See LiveWire Mantis User Manual (Android Interface Version) located at livewireinnovation.com/downloads.

To utilize the 3G/4G functionality, the user will be required to use a Cellular dongle.

To utilize the WIFI functionality, the user will be required to use a WIFI dongle.

Below are the requirements for Windows PC compatibility with the Mantis unit and applications.

- Windows Platform (Windows 7 or greater)
- Minimum 4 GB memory
- 500 GB hard drive recommended

Safety Information

To ensure safe operation of the Mantis, follow the instructions carefully and observe the warning and caution messages in this manual. Failure to observe warnings can result in severe injury or death and can damage the equipment.

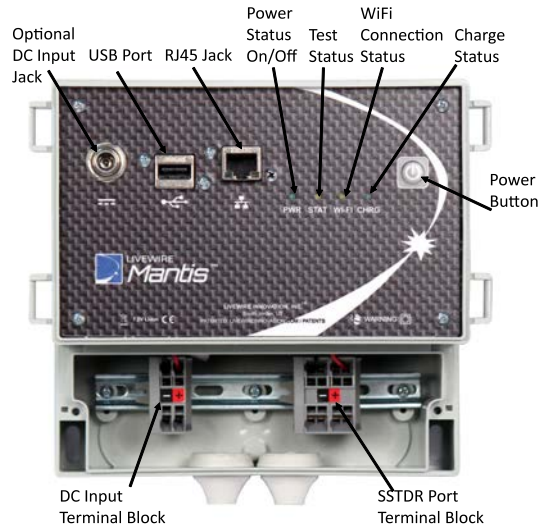
Warning/Caution:

- Do not use the Mantis or Mantis accessories if they appear damaged or if the Mantis is not working properly.
- Do not use with voltages higher than the Mantis' rated voltage (1000V).
- Use caution when connecting to live voltage, particularly any voltage greater than 30V. All safety guidelines and rules for the particular application should be followed.
- Do not use around explosive or flammable gas.
- Always wear personal protective equipment when working with the Mantis in live power environments.

Disposal Warning

Do not place equipment and accessories in the trash. Items must be properly disposed of in accordance with local regulations.

Mantis Description



A/C Charger DC IN Terminal Block

The accepted input voltage is 10 to 28 VDC. Use the provided A/C to D/C Power Adapter (charger) to connect to the Mantis DC power input. It charges the battery and provides power for the Mantis. The power supply must be 24 Watt or greater. Using an improper power supply can cause serious damage to the Mantis and may pose a serious safety hazard.

USB Port

The USB port will be used for expansion capabilities, e.g. Cellular and WIFI.

Indicator Lights

PWR

- **On** – Unit is ON
- **Off** – Unit is OFF

STAT

- **Solid On** – Test is running
- **Blinking** – There is a fault in the log

Wi-Fi/Cellular

- **Solid** – Waiting for a client to connect through wireless or cellular

connection

- **Blinking** – A client is logged into the Mantis unit
- **Off** – Waiting for a client to connect through wired connection

CHRG

- **On** – A/C to D/C Power Adapter is plugged into the unit
- **Off** – Unit is running on battery power
- **Blinking** – Mantis has a missing or bad battery

(On/Off) Power Button

Use this button to power up and power down the Mantis or if there is a power outage beyond the battery life.

Terminal Block

Connect the cables to the terminal block for testing.

RJ45 Jack

Ethernet connector for the Mantis.

Testing Descriptions

Cable Testing

The Mantis offers three test modes.

- **Fault Location:** The Fault Location test is a good test to start with. It will scan the wire under test to find either a persistent open or short fault. Operating in this mode is recommended for non-powered cables only.
- **Live Intermittent Fault Detection:** Live IFD scans the wire continuously to identify faults that may not be detected by the Fault Location test if the fault condition changes with time. Live IFD should be used when intermittent fault conditions occur very rapidly (less than 5 seconds).

- **Live Sweep Fault Detection:** Live Sweep mode is similar to Live IFD mode, but uses multi-frequency scanning in order to provide better distance to fault accuracy over the entire length of an extremely long cable. Live Sweep mode should be used for cable lengths between 1000 feet and 19685 feet.

Cable Types and VOP

The Mantis has the ability to save new cable types and VOP values.

Mantis Alerts

The Mantis is equipped with an email alert system for 24/7 monitoring. In order to send an email alert, the Mantis must be connected to the internet by wired Ethernet cable, WIFI dongle or Cellular dongle. The Mantis must also have a sender configured, see **Email Settings** Menu. The sender can be any valid email account (e.g., gmail) which permits third-party emails and may require that account to be setup to permit less secure applications to sign in.

NOTE: While there is no restrictions on the recipient, there have been occurrences when the email alert arrives in the recipient's junk email box.

There are two types of email alerts: System Email Alerts, and Fault Email Alerts:

- Fault Email Alerts
 - A fault occurs during intermittent testing (IFD).
 - A fault occurs during Live Sweep Fault Detection.
- System Alerts
 - The battery reaches low battery power (10%).
 - The battery reaches critical battery power (5%).
 - The power supply to the Mantis is disconnected.
 - The power supply to the Mantis is re-connected.

NOTE: The System Email Alert text for the power supply is disconnected or

re-connected may use “AC Power” but this actually refers to any external power, DC or AC. The wording has been changed with Mantis Server Version 1.6.0.

The subject of each of these email alerts include the hostname (the name assigned to the device by the customer/installer, using **Device menu**) and each line of text in the email contains the time stamp of the actual alert.

Example full email alert:

From: Mantis Monitoring System <billhmoore@gmail.com>
Sent: Wednesday, November 04, 2015 9:26 AM
To: Bill Moore; billhmoore; whm3977
Subject: Mantis63: Status Message

<04.11.2015 09:02 US/Mountain> Fault Found: Short Circuit Fault Found at 880 feet

<04.11.2015 09:04 US/Mountain> Fault Found: Open Circuit Fault Found at 880 feet

<04.11.2015 09:05 US/Mountain> Fault Found: Short Circuit Fault Found at 880 feet

Fault Email Alerts are sent only for a short circuit or open circuit fault types.

Example Fault Alerts:

<22.10.2014 18:59 US/Eastern> Fault Found: Short Circuit Fault Found at 4 feet

<22.10.2014 18:59 US/Eastern> Fault Found: Open Circuit Fault Found at 4 feet

Example System Alerts:

<04.11.2015 09:05 US/Mountain> EXTERNAL POWER LOSS: EXTERNAL Power has been disconnected

<04.11.2015 09:05 US/Mountain> External Power Restored

<14.08.2014 06:03 UTC> LOW BATTERY ALERT

<14.08.2014 11:31 UTC> Battery level is critical. Mantis unit is powering down

Email recipients can be assigned to receive email alerts of one specific type of email alert or both. The email recipients must be added to the Email List, see **Email List menu**.

Modbus Interface

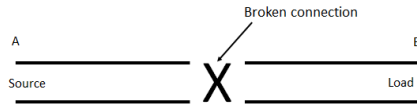
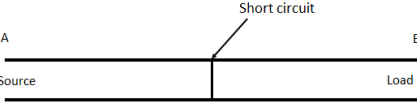
Type	Function Codes	Function Name
System Alerts	"00"	Keep Alive
	"01"	A/C Power Loss
	"02"	A/C Power Restored
	"03"	Low Battery Warning
	"04"	Critical Battery Warning
Fault Alerts	16	Short Fault
	17	Open Fault
Output Queries	32	Fault Location Test Running
	33	Live IFD Test Running
	34	Live Sweep Test Running
	35	No Test Running
Input Queries	48	Is Test Running Query
	49	Stop Test Query
	50	Start Fault Location Test Query
	51	Start Live Sweep Test Query
	52	Start Live IFD Test Query
Other	254	Connection Test
	255	General Error

The Mantis provides Modbus TCP/IP interface which allows the Mantis to send data and respond to queries.

Cable Faults

The Mantis is capable of scanning a cable in three modes; Fault Location, Live

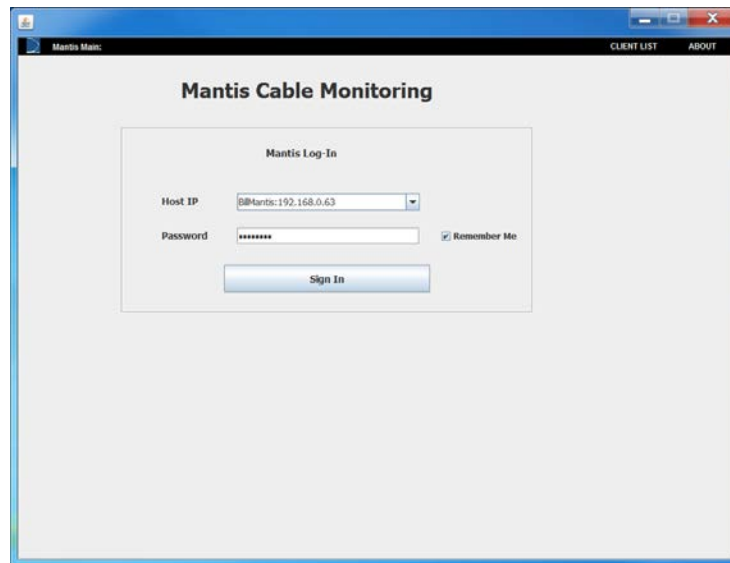
IFD, and Live Sweep, all enabling the user to identify if an open or short circuit condition exists on the cable. The table below describes open and short circuit fault conditions.

Cable Faults	Description
Open	<p>An "Open" fault appears when a wire that should be connected from point A to point B has no electrical connection between those points.</p> 
Short	<p>The "Short" fault appears when the two wires within a cable are electrically connected. This is also known as a short circuit.</p> 

Windows PC User

This section of the manual provides a preview of the Mantis Windows PC application interface and shows screenshots of some available screens used. There is a separate section (Connecting to the Mantis) that provides details for installing the Mantis Application on your Windows PC, then connecting through a network to the Mantis.

The first screen you see when you open the application is the Log-in screen:



After successfully logging in to the Mantis unit (for additional detail on login user name and password, see Connecting to the Mantis section), the Windows PC application brings you to the Main menu page:

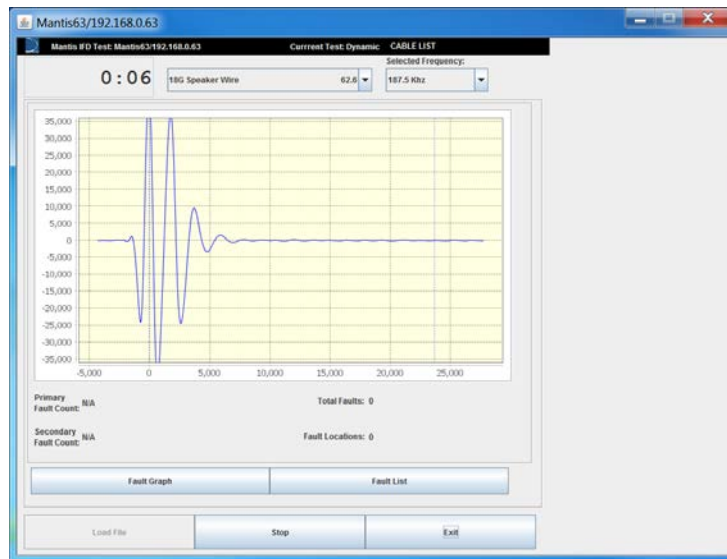


Fault Location: This mode of testing indicates where the closest reflection is located. This can either be the end of the cable or the location of a hard fault, whichever is closest to the point where the Mantis is connected.

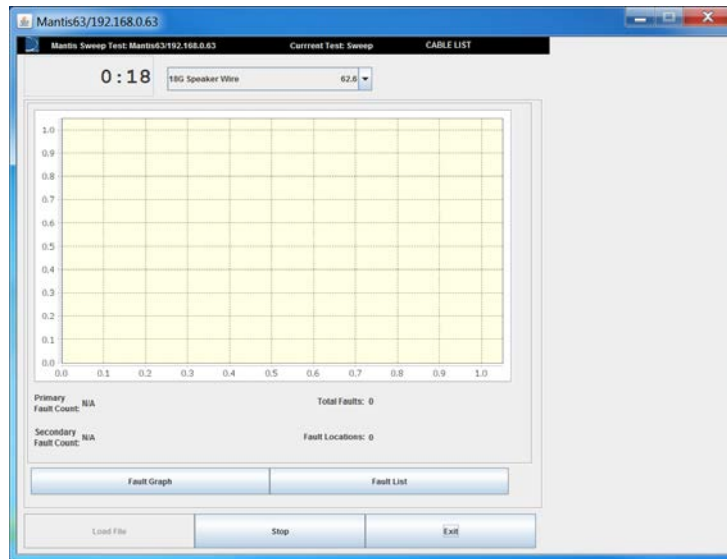


Live Intermittent Fault Detection: Cable and wiring systems can have fault conditions that come and go intermittently, which means that the fault can disappear and reappear at any time. Live IFD enables a technician to find such a fault condition. A significant change in the condition of the wire or cable under test (short, open, etc.) that is different than the initial condition of the wire will be reported as a fault.

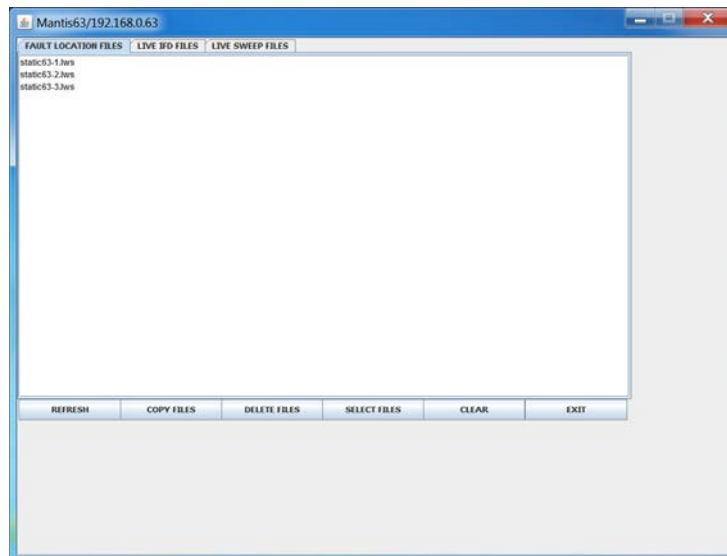
The following screen shows an IFD test while it is running:



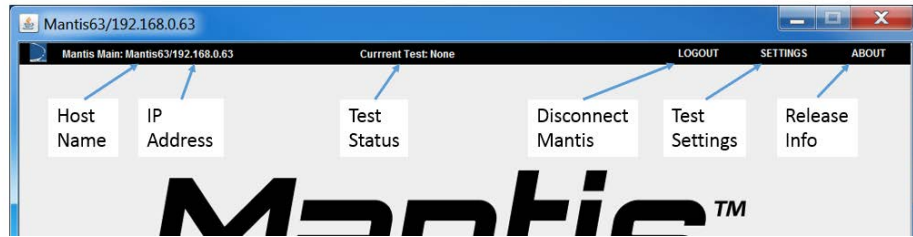
Live Sweep: Cable and wiring systems can have fault conditions that come and go intermittently, which means that the fault condition can disappear and reappear at any time. Live Sweep enables a technician to find intermittent fault conditions on extremely long cables (≤ 6 kilometers), but also retains the ability to detect short and medium distance faults. Multiple operating frequencies are utilized to obtain the most accurate distance to fault results over the entire length of a long cable.



File Browser: You can view previously saved data that provides detail for reporting or analysis. Files are saved to the Mantis and must be transferred to the Windows PC by selecting a file and clicking on the Copy button.



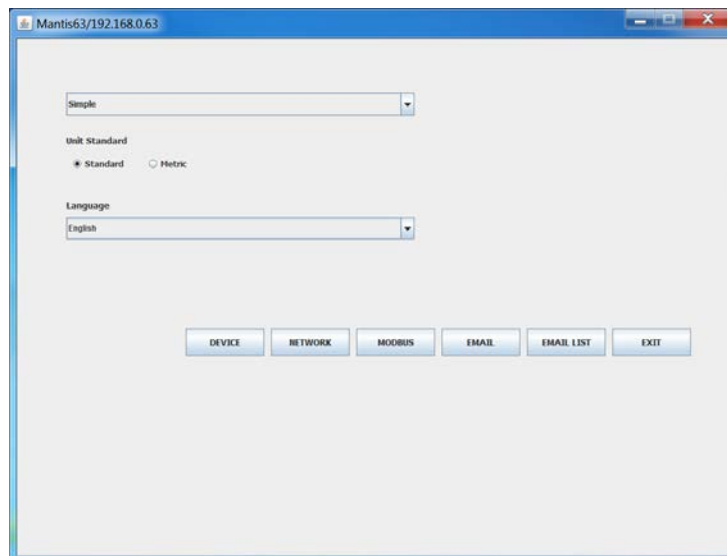
LOGOUT: Logout of the Mantis from the Main page using the **LOGOUT** option at the top. If there is a Live IFD test or Live Sweep test running, the Window's PC software will take you automatically to the test mode associated with the currently running test.



General Settings Menu

- Live IFD tests to use Advanced Intermittent Test settings by checking the box. The unchecked box (default) means the Mantis is configured to use “Simple Mode” which loads all the default settings for cable scans at any frequency chosen.
- Unit of Measure either Standard or Metric. This configures the waveform graphs and distance to fault for all detection modes.
- Email Alert Language is set to English (default) or Italian (Additional language support will be added as needs arise at no additional charge).

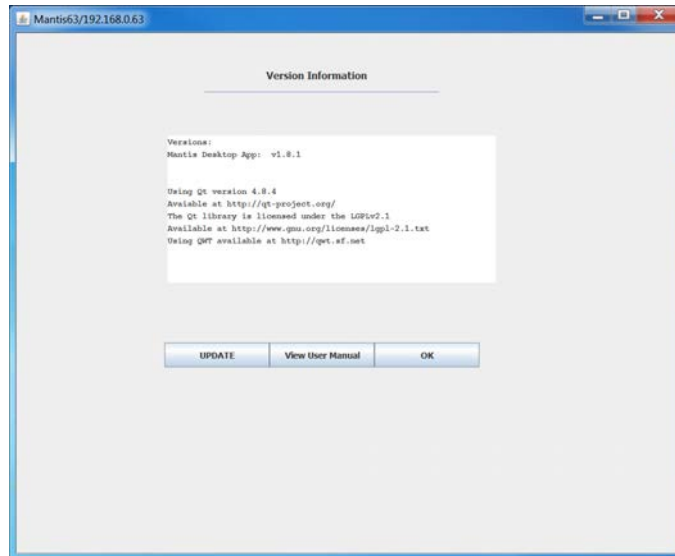
The menus at the top right allow you to change Mantis **Device** settings, **Network** settings, **ModBus** settings, **Email** settings, and **Email List**. More specific details about these menus are discussed in the User Settings section.



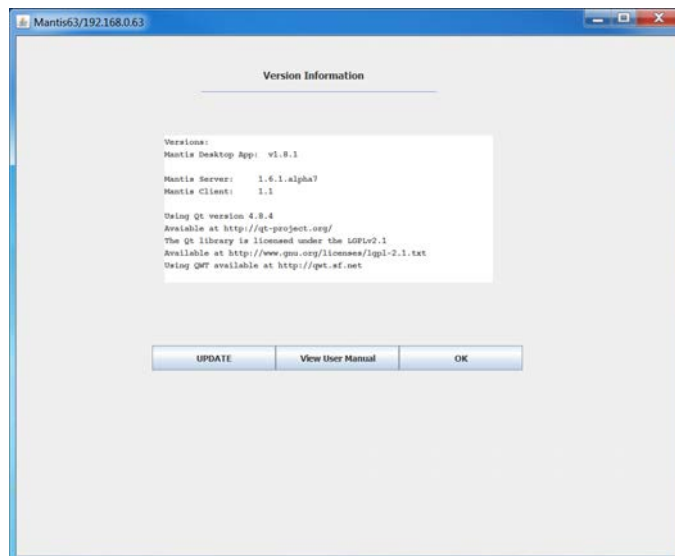
ABOUT menu: Provides information about the software/hardware

versions active on the current platform. There are two versions of the About screen, one before signing in and the other after signing in.

About menu before signing in provides information about the Windows PC application interface and QT with other library packages which are used.



About menu after signing in provides information about the Windows PC application interface, Mantis Server, Mantis Client and QT with other library packages, which are used.



Battery Status: The battery charge status bar is located at the bottom

of the Mantis application. The battery status bar turns green when there is no DC power source charging the battery. The battery status bar changes to red when the battery charge falls below 10%.

General Operations

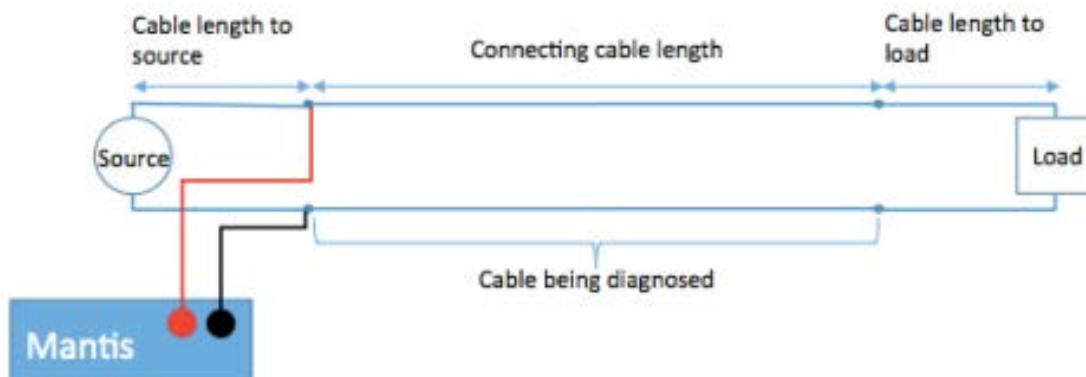
The Mantis is operated via menu-driven software. It is simple to use and connects to wires, cables, or harness wiring via a terminal block inside the Mantis unit. To ensure safe operation of the Mantis, follow the instructions carefully and pay attention to the warning and caution symbols. Failure to observe warnings can result in severe injury or death and can damage the unit.

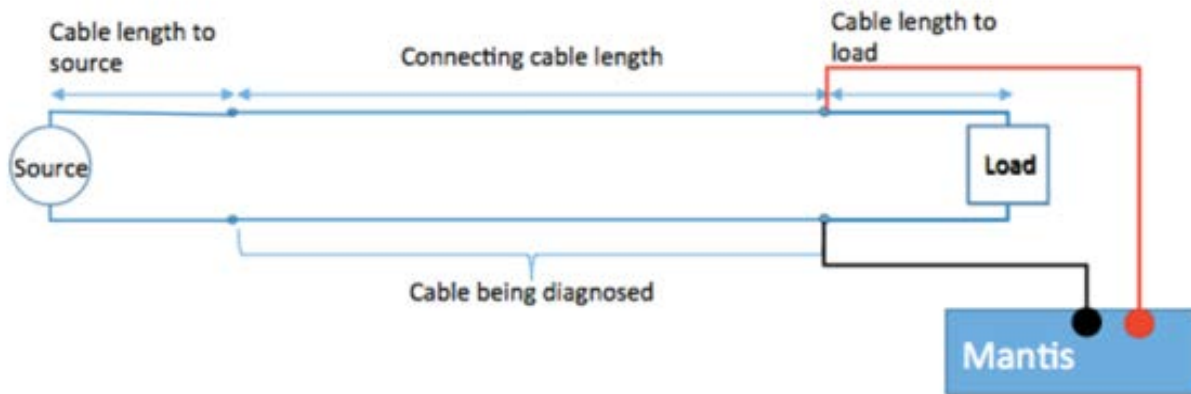
Physical Setup

- Mount the Mantis in the desired location.
- Connect the included A/C to D/C power adapter to the Mantis.

Connecting to a Cable/Wires

Connect the cable or wires to the terminal block of the Mantis to perform a test. The connection method is similar for all test methods but the differences are described below. Figure 2 and Figure 1 illustrate connections with the Mantis near the source or near the circuit load. The connection method is similar for all test methods but the differences are described below.





Fault Location Testing

The Mantis Fault Location test is not meant to be used on powered cables. Connect the cable or wires to the terminal block of the Mantis to perform a test.


Live IFD (Intermittent) Test:

To monitor the cable length, Mantis can be connected either near the source or near the load. The images on the next page illustrate connections with the Mantis near the source or near the circuit load.



Live Sweep (Intermittent) Test:

The Live Sweep test maximizes accuracy on very long length cables (> 1000 feet). Mantis can be connected either near the source or near the load. The images on the next page illustrate connections with the Mantis near the source or near the circuit load.

Turning the Unit On/Off

- Press the  power (On/Off) button to turn the unit on.
- Press the Power button momentarily to turn the unit off. The unit performs a 6 second power down sequence.

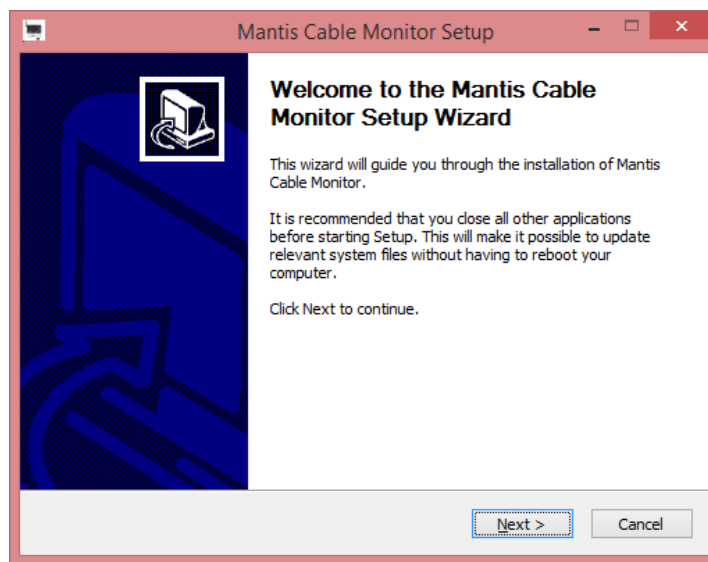
Resetting the Mantis to factory default settings

- If the unit is on, power down by pressing the power button  momentarily and wait approximately 6 seconds.
- To **reset** the Mantis to factory defaults, press and hold down the power button  until the WiFi and Status LEDs illuminate, approximately **15 seconds**.
- The Wi-Fi and Status LED's will cycle: Wi-Fi, Status, Status, Wi-Fi.
- The reset is now complete, and the Mantis will continue the boot process. When properly reset, its default connection mode is wired host mode.

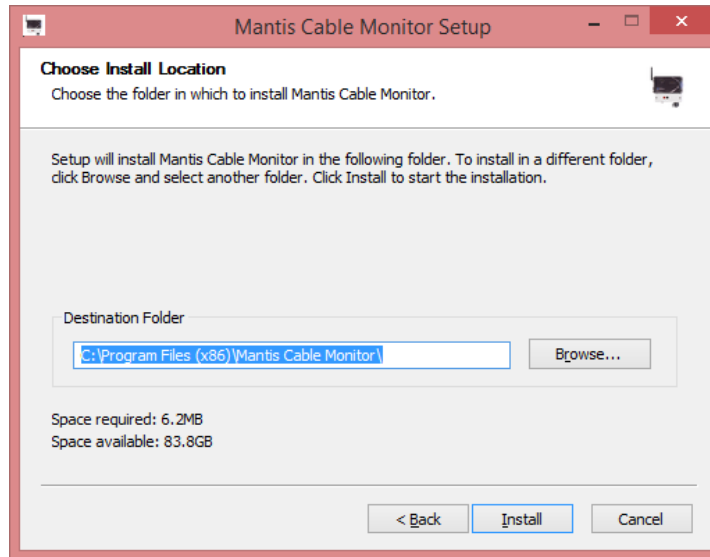
Connecting Mantis To Mantis Application

Install the Mantis Application on a Windows PC

- On the Windows PC, navigate to <http://www.livewireinnovation.com/download> and select the **Mantis Cable Monitor** link.
- Navigate to the location on your hard drive where the file was saved (~\downloads for example).
- Right mouse click on the executable file and select **Run as Administrator**.



Click **Next** to continue the setup.



Click the **Install** button to install the application in the default location. After the application is installed, it will appear in the Start menu. To run the Mantis Cable Monitor, click on the **Start** menu entry.

Initial Mantis Unit Setup and Use

The Mantis ships from the factory in Wired Host mode. This means that the Mantis is the network AP and requires an Ethernet cable to be connected to the to the RJ45 interface on the Mantis Unit and your PC.

Setup Local Computer for Wired Host Mode

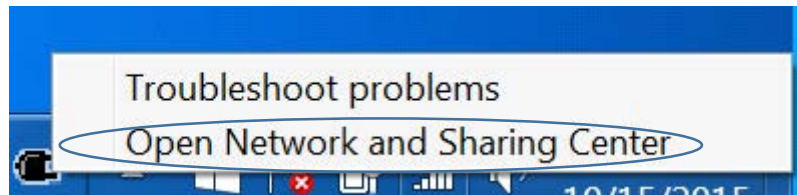
Ensure an Ethernet cable has been connected from the local computer and the Mantis Unit.

The following instructions describe how to setup the IP address on the local computer.

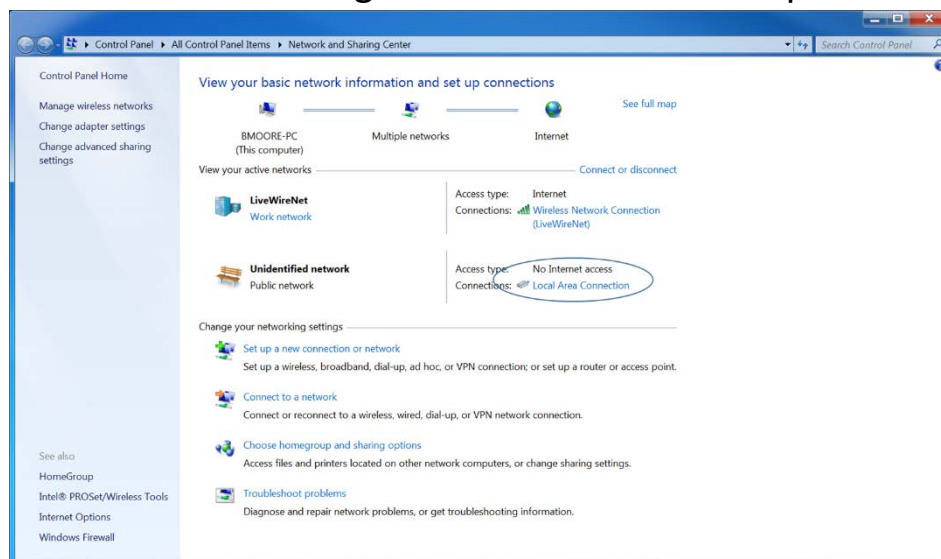
1. Check the current IP Address of the Local Area Connection of your local computer.
 - a. Right-Click on the Network Icon:



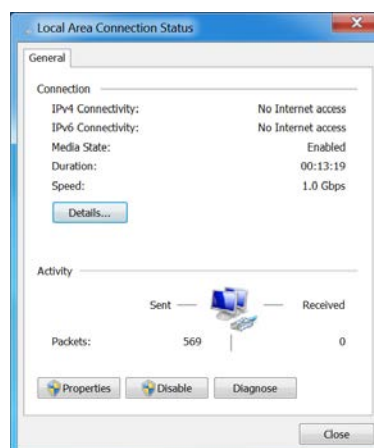
b. Select the “Open Network and Sharing Center”



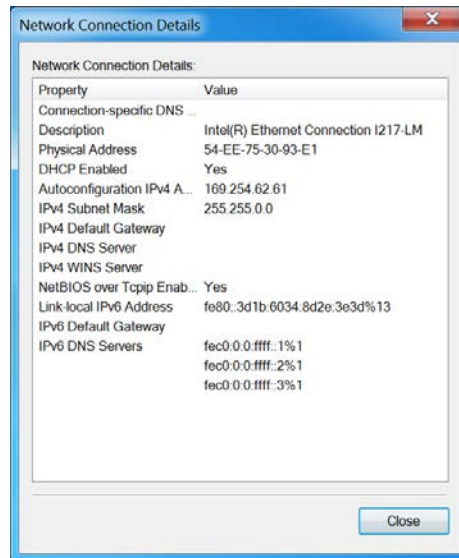
c. Network and Sharing Center Screen should open



d. Select the “Local Area Connection”



e. Select “Details”

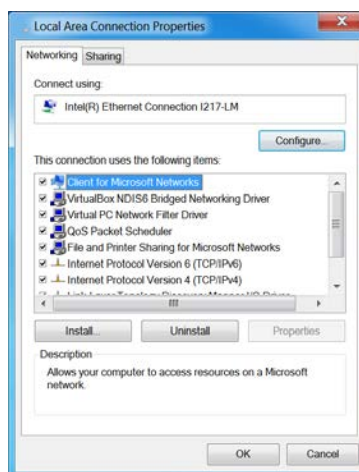


f. Verify the IPv4 Address is 10.254.254.2

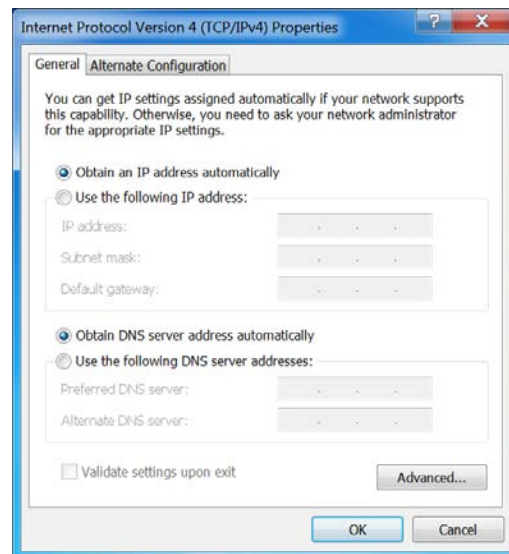
g. If the IPv4 Address is 10.254.254.2, your local computer is setup and should communicate with the Mantis Unit in wired host mode. Proceed to the next step only if the address needs to be changed.

2. Change the current IP Address of the Local Area Connection of your local computer.

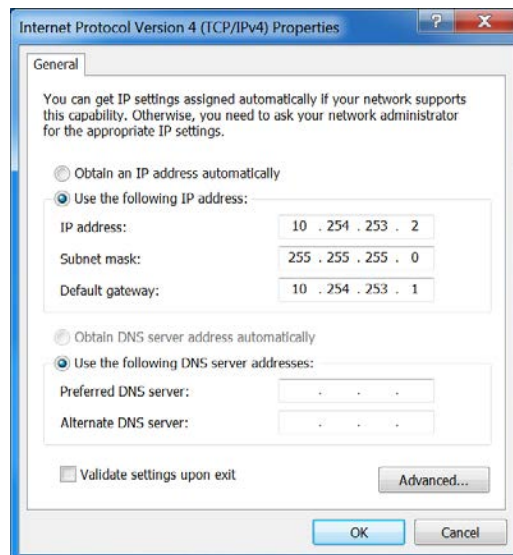
a. On the “Local Area Connection Properties” screen, press the “Properties” button.



- b. Select the “Internet Protocol Version 4 (TCP/IPv4) and then “Properties” button should be enabled.
- c. Press the “Properties” button.



- d. Select the “Use the following IP Address” and enter the following data:




- e. Press the “OK” button.

- f. Press the “Close” button on the “Local Area Connection Properties” screen.
- g. Press the “Close” button on the “Local Area Connection Status” screen.
- h. Using a program, like putty, attempt to connect to the Mantis Unit. If you are successful in connecting, then proceed to the next section. Otherwise, contact Livewire Technical Support.

Initial Mantis Log-in using Wired Host Mode

After the IP Address is correct, 10.254.253.2, the Windows PC application can connect **directly** to the Mantis Unit.

- Power on the unit by pressing the  power button and wait approximately 40 seconds until the Mantis.
- Ensure there is an Ethernet cable connected from the Mantis directly to your Windows PC and check the properties of the wired network adapter, typically name Local Area Connection, to ensure an address, like 10.254.253.x, has been assigned.
- With the Mantis application running on the Windows PC, you will see the following screen:

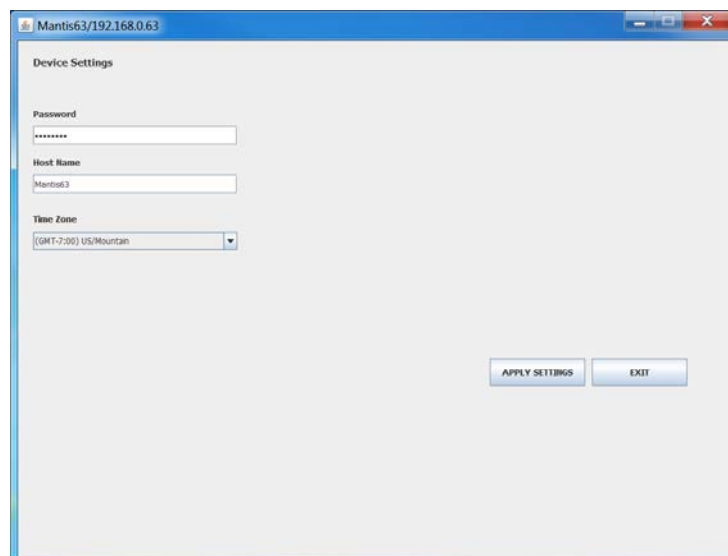


- Mantis units are shipped by default in Wired Host mode. The IP address is 10.254.253.1 and the default password is cdma2000. Click on the Sign In button and connect to the Mantis.
- The user must now change the network mode to a mode other than Wired Host or AP Host by clicking on Settings in the upper right of the main page (shown above).



Select the proper Time Zone


- From the Mantis main screen select **Settings** and then the **Device** button.

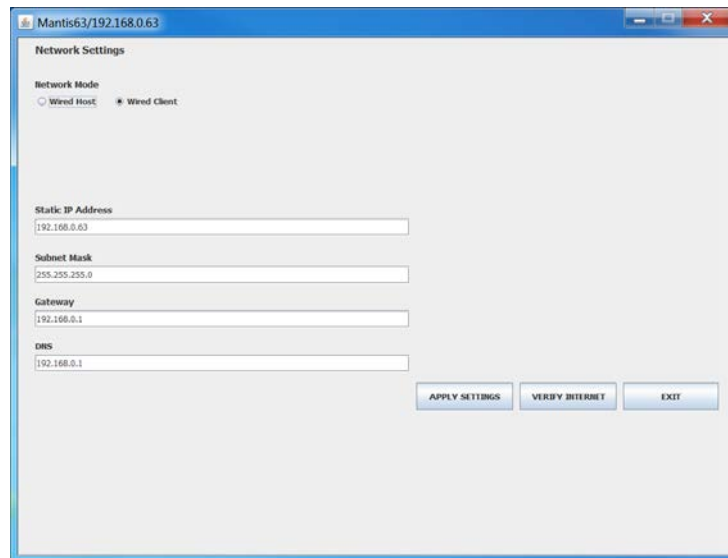


- Select Time Zone and select the correct time zone from the drop-down box.
- If you make any changes to password or host name. The user should change the host name to be a unique name for the company's network. After making any changes, click on Apply **Settings**.

NOTE: The time displayed on the tablet is different than the time displayed in the Mantis program because the default is Coordinated Universal Time (UTC). The Mantis time zone must be correctly set for time and date data to be correct in emails that are sent from the Mantis.

Mantis Switching to Wired Network Mode

- Power on the unit by pressing the  power button and wait approximately 40 seconds for the Mantis to boot up. If the Mantis is currently setup in any wireless mode, the Wi-Fi LED will light. If it is set up in wired mode, the Wi-Fi LED will not be lit.
- **Open** the Mantis application on the PC from the Start menu.
- Log in to the Mantis in its current mode (either Wireless AP mode, Wireless Client mode, Wired Host mode, Wired Client mode, or Cellular mode).
- From the Main screen, select **Settings**.



- Click on the Network at button.
- Select Network Mode.
- Under Network Mode, select Wired Client from the options shown.
- Type in the Static IP Address.
- Type in a valid and available IP address to assign to the Mantis for a wired connection.
- Select Subnet Mask.
- Type in the subnet mask. Example: 255.255.255.0.
- Type in a valid Gateway IP address. Example: 192.168.0.1.
- Type in IP address of the DNS server.
- Recheck settings on this page to be sure they are valid and correct.
- Click on “Apply Settings” button.

NOTE: This will log the Windows PC application out of the Mantis and bring you back to the Mantis App log-in screen.


- If the correct network is not shown, select **Network Selection**, then select and enter the SSID of the network the Mantis was assigned to. If it has not been done before, the network will need to be selected/configured with the correct password on the PC application.
- Select **Client List** at the top right, then **New** to enter the Mantis’

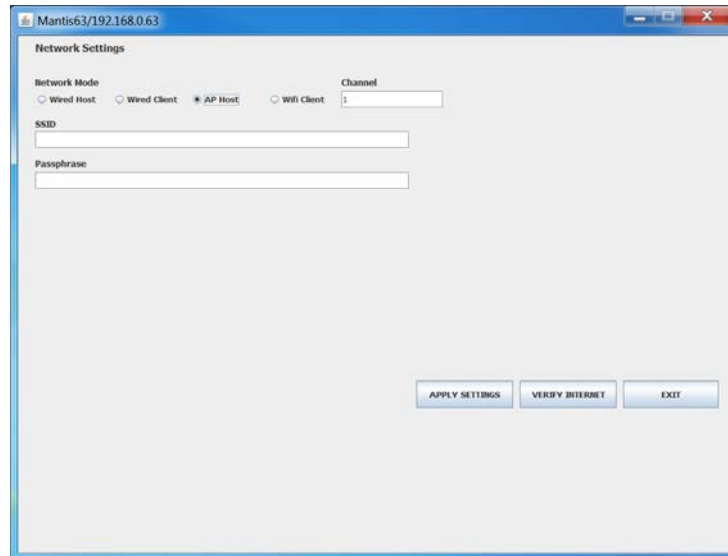
new name (if desired) and IP address. Here, you can also edit or delete a Mantis connection that was previously stored in the PC application.

- Select the Name and IP address of the Mantis you are connecting to.
- Under Mantis Log-in, enter the Mantis device password (Default: cdma2000). If this was previously done and the Remember Me box was checked, the tablet will remember the Mantis' device (root) password. Reminder: This is **not** the Network password.
- When all settings on this screen are correct click on the Sign In button at the bottom. The windows PC software then logs in to the Mantis and brings you to the Main screen.

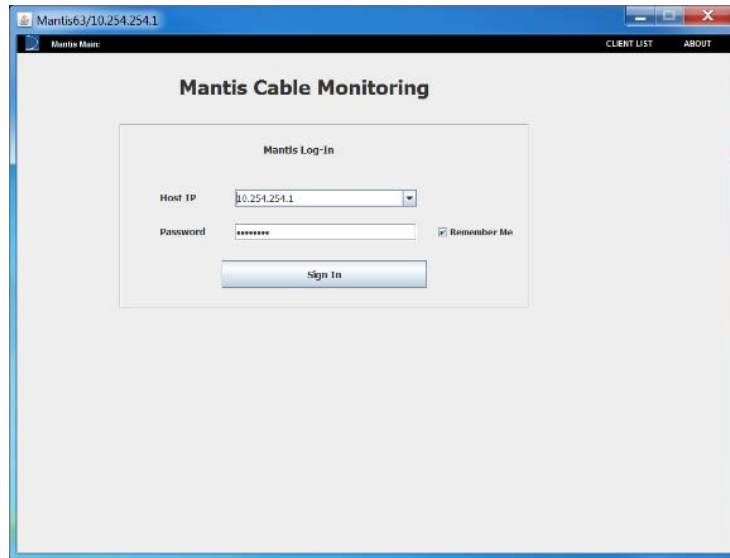
Mantis Switching to Access Point Mode (AP Host)

If a WIFI dongle has been installed in the USB Port, then Access Point mode (AP Host) is available. This means that the Mantis is the network AP and the Windows PC application must first connect **directly** to its Wi-Fi interface.

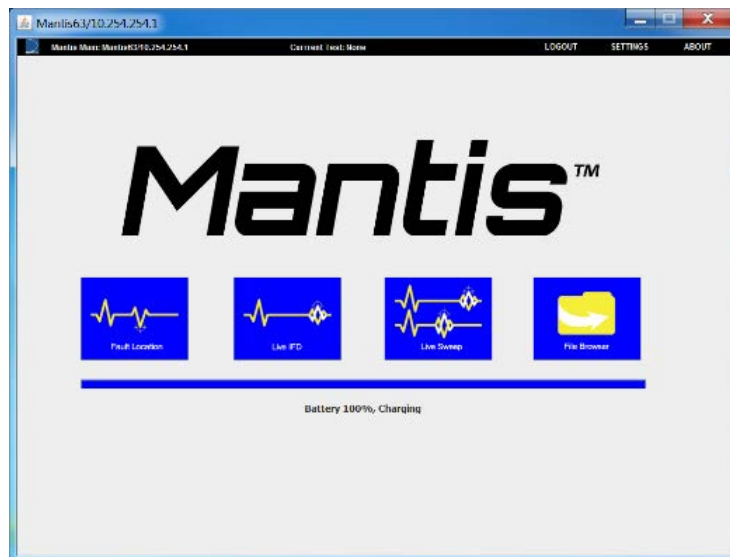
- Power on the unit by pressing the  power button and wait approximately 40 seconds until the Mantis boots.
- From the Mantis Main screen select **Settings**.
- Select the **Network** button
- Select **AP Host** at the top of the window.



- Enter the SSID and Passphrase that the Mantis will use as the Access Point. After making any changes, click on **Apply Settings**.
- Connect your Windows PC's wireless adapter to the SSID which was specified when the Mantis was set to AP host mode and use the passphrase. Wait for your wireless adapter to connect and obtain an IP address from the Mantis. The IP address should be like 10.254.254.x.
- With the Mantis application running on the Windows PC, you will see the following screen:



- When a Mantis units is in Access Point mode (AP), the IP address is **10.254.254.1** and the default password is **cdma2000**.
- Click on the **Sign In** button and connect to the Mantis.
- To change the SSID or password of AP mode, click on **Settings** in the upper right of the main page (shown above) and between LOGOUT and ABOUT.

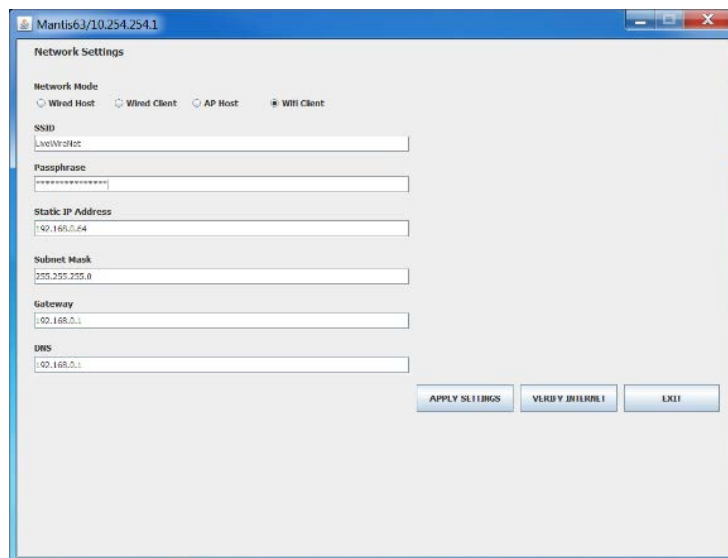


Mantis Switching Wi-Fi Client Mode

In order to switch the Mantis into Wi-Fi Client Mode, a Wi-Fi dongle must be installed in the USB port. Wi-Fi Client mode is used when you want to connect the Mantis unit to a wireless network. The Mantis will need to be connected wirelessly to your company's wireless Access Point.

Log-in to the Mantis using the Mantis' current network mode as shown above.

- From the Mantis Main screen select **Settings**.
- Select the **Network** button
- Select **Wi-Fi Client** at the top of the window.



The screenshot shows a web-based interface for 'Mantis63/10.254.254.1'. The title of the window is 'Network Settings'. Under 'Network Mode', four radio buttons are present: 'Wired Host', 'Wired Client', 'AP Host', and 'Wi-Fi Client'. The 'Wi-Fi Client' option is selected, indicated by a small asterisk. Below the mode selection, there are several input fields: 'SSID' (containing 'LiveWireNet'), 'Passphrase' (containing a series of asterisks), 'Static IP Address' (containing '192.168.0.64'), 'Subnet Mask' (containing '255.255.255.0'), 'Gateway' (containing '192.168.0.1'), and 'DNS' (containing '192.168.0.1'). At the bottom right of the form, there are three buttons: 'APPLY SETTINGS', 'VERIFY INTERNET', and 'EXIT'.

- Type the name of your network's ID into the **SSID** field (case sensitive).
- Type in the **Passphrase** (case sensitive).
- Type the **Static IP** address you would like the Mantis to access (verify this address is correct and that it is not being used by another device). Example: 192.168.0.64.
- Type in a valid Subnet Mask. Example: 255.255.255.0

- Type in a valid Gateway IP address. Example: 192.168.0.1.
- Type IP address of the DNS server.

Important! Double check all settings on this page! If you click on the **Apply Settings** button and your settings are incorrect (especially network SSID/password), you may not be able to log in to the Mantis and a factory reset would need to be done.

- When all settings are correct, click on Verify Internet. A pop-up windows will appear as notification that all network settings are correct.


NOTE: When you click on the **Apply Settings** button, the Mantis immediately reconfigures its own network settings. This will disconnect the Mantis from the Windows PC software which will revert back to the log-in screen.

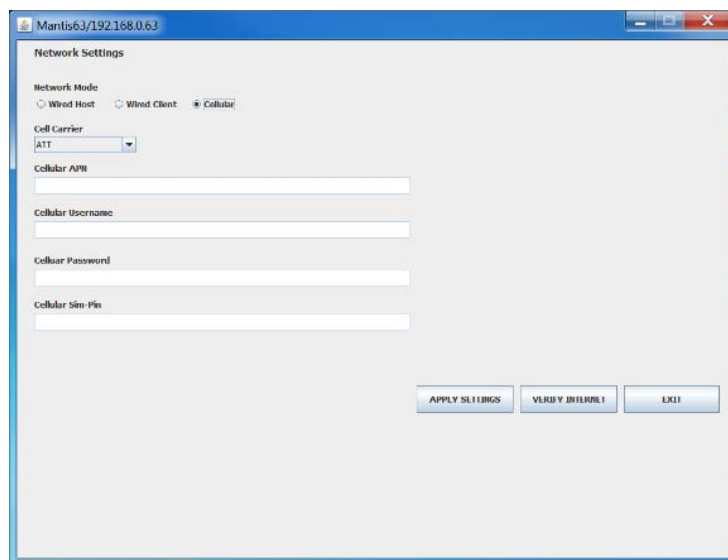
- If you desire to use the wireless adapter on your Windows PC, the ensure the wireless adapter is connected to the same wireless Access Point which was setup on the Mantis.
- Select **Client List** at the top right, click **New** to enter the Mantis' new name (if desired) and IP address. Here, you can also edit or delete a Mantis connection that was previously stored on the Windows PC application.
- Select the Name and IP address of the Mantis you are connecting to.
- Under Mantis Log-In, enter the Mantis device password (Default: cdma2000). If this was previously done and the Remember Me box was checked, the Windows PC application will remember the Mantis' device (root) password. Reminder: This is **not** the Network password.
- When all settings on this screen are correct, click on the **Sign In** button. The Windows PC application will log into the Mantis, and

brings you to the Main screen.

Mantis Switching to Cellular Network Mode

The Mantis unit supports plugging an approved Cellular dongle into the USB Port. The instructions here describe how to use a Cellular dongle.

- Power on the unit by pressing the  power button and wait approximately 40 seconds for the Mantis to boot up.
- **Open** the Mantis application on the PC from the Start menu.
- Log in to the Mantis in its current mode (either Wireless AP mode, Wireless Client mode, Wired Host mode, Wired Client mode, or Cellular mode).
- From the Main screen, select **Settings**.
- Click on the **Network** at button.
- Select **Cellular** Network Mode.



Select a Cell Carrier from the drop-down box. The drop-down box contains the name of three cellular providers which have been tested and approved. If your cellular provider is not listed then use Custom. If **Custom** is selected then the remaining text fields will be enabled and data must be provided. Otherwise, skip the steps for entering the data.

Select Cellular APN.

Type in a valid **Cellular APN**.

Select Cellular Username.

Type a valid username for the Cellular account.

Select Cellular Password.

Type in a valid password for the Cellular account.

Select Cellular Sim-Pin.

Type in a valid pin for the SIM Card, if one has been set.

Recheck settings on this page to be sure they are valid and correct.

Click on **Apply Settings**. Note: This will log the Windows PC application out of the Mantis and bring you back to the Mantis App log-in screen. Wait 1 or 2 minutes for the Mantis to complete the setup of the cellular dongle.

Select **Client List** at the top right, then **New** to enter the Mantis' new name (if desired) and IP address. Here, you can also edit or delete a Mantis connection that was previously stored in the PC application.

Select the Name and IP address of the Mantis you are connecting to.

Under Mantis Log-in, enter the Mantis device password (Default: cdma2000).

If this was previously done and the Remember Me box was checked, the tablet will remember the Mantis' device (root) password. Reminder: This is **not** the Network password.

When all settings on this screen are correct click on the **Sign In** button at the bottom. The Windows PC software then logs in to the Mantis and brings you to the Main screen.

Fault Location, Live IFD, and Live Sweep Test

The Mantis offers three test modes to measure and identify faults on a cable. The Fault Location test is a good test to start with. It will scan the wire being tested to find either an open or a short fault. It is not meant to be used on powered cables. The Live IFD test scans the wire continuously looking for intermittent faults that may not be detected using the Fault Location mode and is intended for cables < 1000 feet. The Live Sweep test uses the same scan characteristics as in a Live IFD test, but separately steps through multiple operating frequencies and scan operations. Live Sweep mode is able to monitor extremely long cables, but retains the ability to detect short and medium range faults. Live Sweep mode should be used for cable lengths between 1000 feet and 19685 feet.


Fault Location Test

The Mantis can conduct tests for Fault Location faults to test for an existing open or short circuit. Fault Location mode is not used for testing intermittent faults. Fault Location is not meant to be used on A/C powered cables and may not provide accurate results in this mode.

Set Up

- Connect the cable to be tested to the Mantis terminal block.
- Connect the DC power source to the Mantis terminal block.

Use additional adapters if needed.

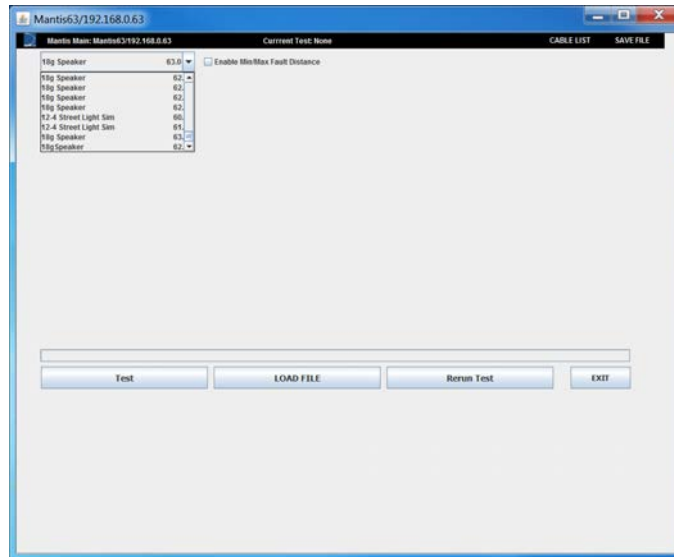
- From the Main page of the Mantis Application, select the Fault Location  icon. This brings up the Fault Location Test page.

Select your Cable Type

Select CABLE LIST in the upper right corner of the test screen.

In the drop down menu that appears, select the appropriate cable type being tested. This step ensures accuracy of the test by using the correct VOP that is

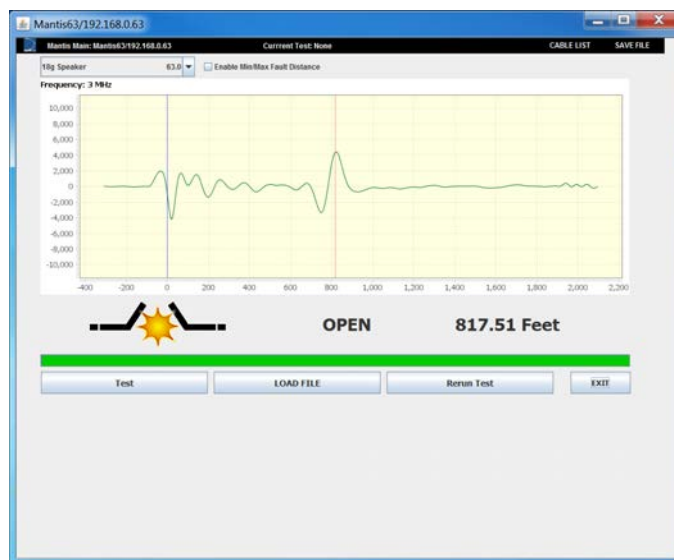
associated with the cable type.



To add or edit a cable type, refer to Cable Types and VOP section.

Fault Location Testing and Results

- Select the **Test** button.
- The result displays the fault type, distance to fault, and a graph of the waveform from the test. The fault is displayed in the graph with a vertical line at the reported fault location. An example is shown below.



NOTE: If the distance to fault shown is at or near zero, it is likely that the

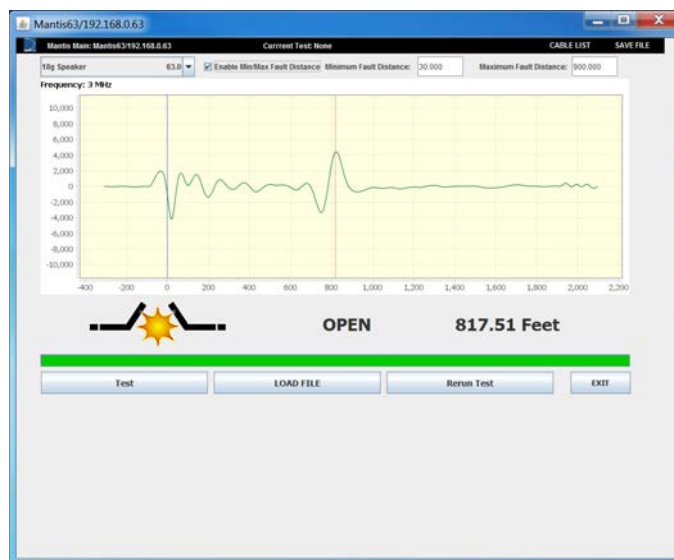
terminal block connections needs to be checked and/or adjusted. Additionally, if the test result shows 'No Fault', the distance to fault may be too far away for the Mantis to detect the fault with certainty.

For a more detailed explanation of test results, refer to the **Interpreting Test Results** section of this manual.

- To save the Fault Location test, click **Save File** in the upper right corner of the window.

Fault Location with Min/Max Fault Distance Settings

If there is a need to limit the minimum or maximum distance where a fault will be detected, the use the Min/Max Fault Settings. First, enable the Min/Max Fault Distance by checking the check box. After enabling the Min/Max Fault Distance, two additional items are displayed, one for the Minimum Fault Distance and the other for Maximum Fault Distance, as shown below:



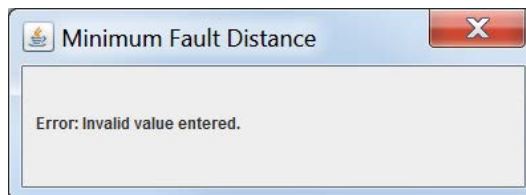
Upon checking the “Enable Min/Max Fault Distance”, the Mantis unit is queried for the current values which are then displayed. If the current values are 0, then a dash, “-”, character is displayed. The dash, “-”, character is used

to disable the specific fault distance limit. If no limit for the minimum fault distance is wanted but a limit for the maximum fault distance is wanted, then



the following is an example:

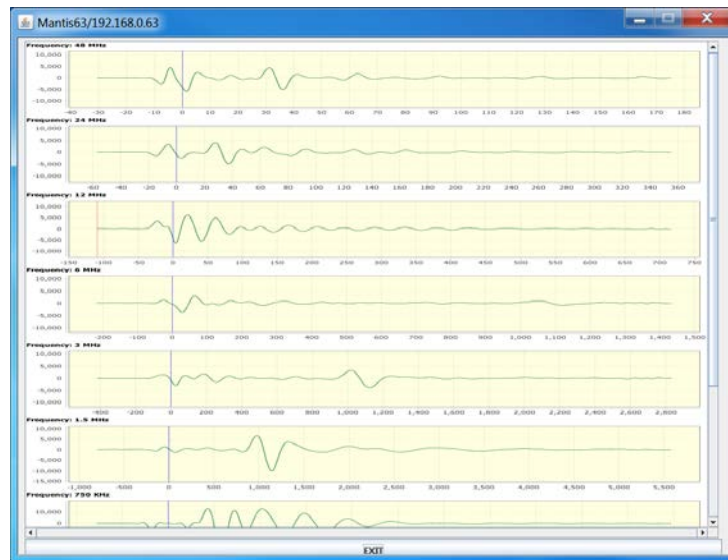
Valid values for both fault distance are “-” or any value greater or equal to 1. If the user enters an invalid value, a popup is presented to inform the user.



Any changes to these values are not sent to the Mantis unit until the “Test” button is pressed. If the user unchecks the checkbox and then checks it again, the values from the Mantis unit are display and any changes are lost.

Fault Location Test Result Details

After the Fault Location test is complete and the results are displayed, the user can drill down to get more detail graphs. The user presses the “left click” with the mouse and the Multiple Frequency page is displayed:



The user can now “left click” with the mouse and the Frequency Detail page is displayed:



The Frequency Detail page contains the graph of the three line series. Using the “Difference”, “Reference”, and “Focus” buttons will hide or show the associated line series. The color of the button label is the same as the color

of the line series on the graph.

If the user want the value, i.e., of a peak, the user can “control left click” on the peak and a crosshair is added to the graph, as shown below:



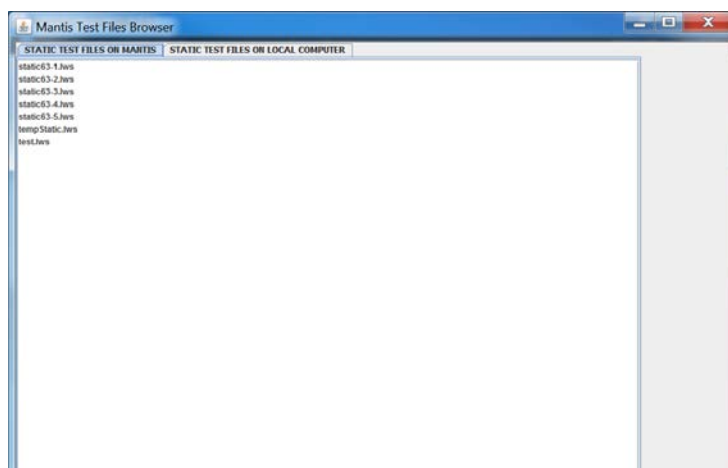
To the left, on the horizontal crosshair, is the value of the x and y. The x value is the distance and the y value is the amplitude.

The user can remove the crosshair by pressing “control shift left click”.

This crosshair function is available on all graphs.

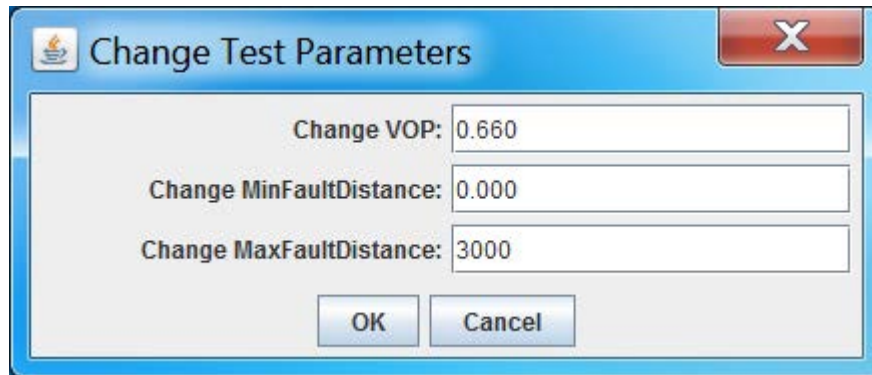
Fault Location ReRun Testing and Results

The Fault Location Test page has a “Rerun Test” button. The “Rerun Test”



button allows the user to choose a Fault Location Test file.

The user can choose a file from the Mantis device or from the local



computer. After selecting a file, the user presses "Rerun Test" and the user is then allowed to change any of the three values, VOP, Minimum Fault Distance and Maximum Fault Distance, as shown below:

After all desired changes, the user presses the "OK" button.

The selected test file is updated with any changes and sent to the Mantis device, where the data in the file is processed through the appropriate algorithms and new test result is generated, as shown below:



Live Intermittent Fault Detection Testing

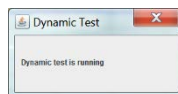
Test Frequency

Before running a Live Intermittent Fault Detection test, select the correct frequency for the cable. The table below illustrates test frequencies that work best for the length of cable being tested.

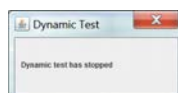
Test Frequency	Recommendations
48 MHz	Recommended for short impedance controlled cables up to 100 ft. in length
24 MHz	Recommended for impedance controlled cables up to 150 ft. in length
12 MHz	Recommended for cables up to 300 ft. in length
6 MHz	Use on cables up to 800 ft. in length
3 MHz	Use on cables up to 1,200 ft. in length
1.5 MHz	Use on cables up to 2,000 ft. in length
750 kHz	Use on cables up to 4,000 ft. in length
375 kHz	Use on cables up to 8,000 ft. in length
187.5 kHz	Use on cables up to 16,000 ft. in length

Run an Intermittent Test (Live IFD)

- Connect the Mantis as described in **General Operations – Connecting to Cable/Wire** on page 11.
- Click on the **Live IFD** test button from the Mantis Main screen.
- Open the test frequency menu by clicking the current selected frequency value and a drop down menu will appear.
- Select the **desired test frequency** from the drop down menu.
- Select the cable type from **Cable List** drop down menu.

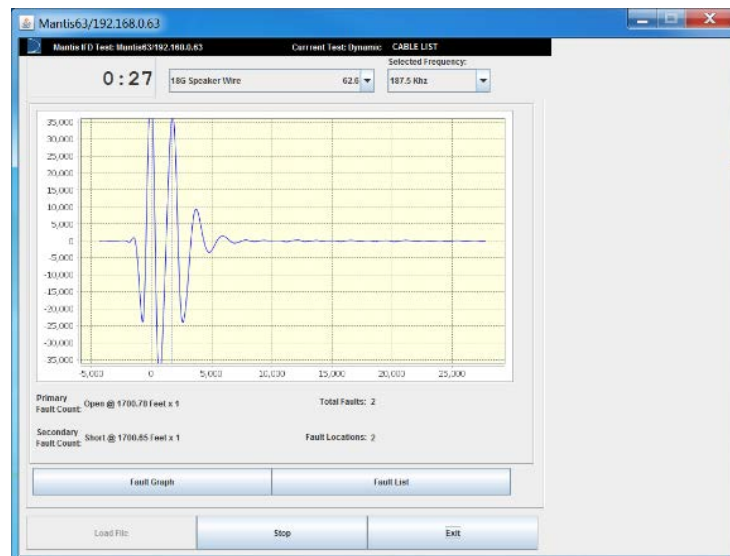


- Click the **Test** button, which starts the test that continuously scans the wire for faults. A confirmation dialog box will appear.
- Click on the **STOP** button to stop the test. A confirmation dialog box will appear. Select **Cancel** or **OK** to stop the test.

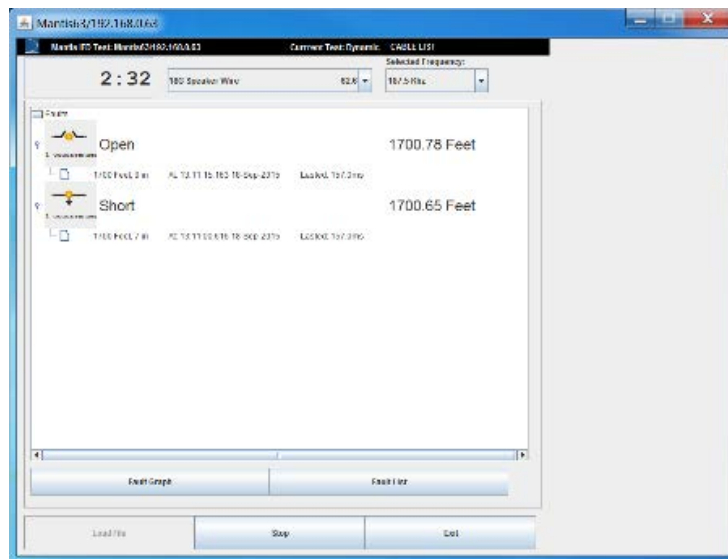


Intermittent Test Results

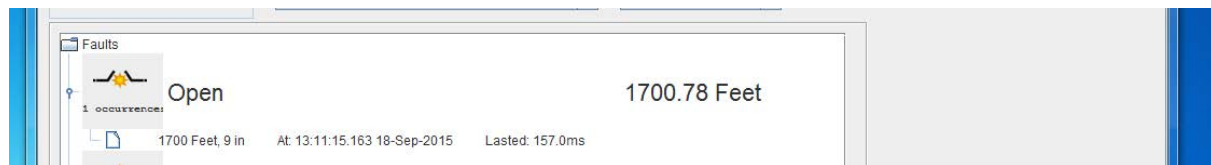
- Test time elapsed is displayed in the upper left hand side of the screen.
- The waveform that represents current state of the wire under test is displayed in the graph view waveform. The reference state is shown in blue and the fault state in red.
- Intermittent faults will appear on the graph (and also in text form) as they occur. The most recent fault (primary fault) will be displayed at the top of the list along with the total number of faults at that location. The secondary fault appears beneath the primary, and shows the most prominent fault that is at a different location than the primary fault. An example of a running intermittent test is shown below.



- To view a full list of all faults and their specific results, click on the Fault List button.
- This will display total number of recorded occurrences and distance to where the fault occurred. An example of the Fault List is shown below.



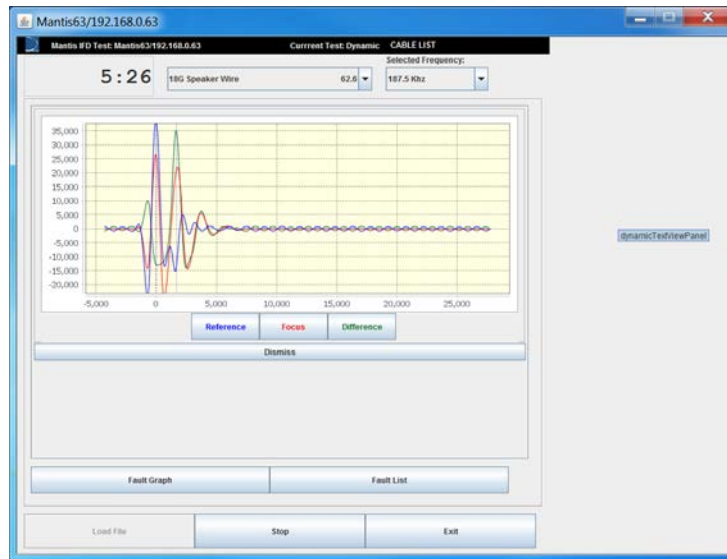
- To view detailed information and detailed fault waveforms, select a single fault **location or occurrence**. Double click the fault you're interested in which will show time stamped entry. Left click on this entry in the list and the graphs will be displayed. To minimize this information, click on the **Dismiss** button.



- To view detailed waveforms of the fault, click on the additional information displayed under the short, example shown below:

1700 Feet, 9 in At: 13:11:15.163 18-Sep-2015 Lasted: 157.0ms

- This will open the graph window shown on the next page. The window consists of a single graph displaying the reference, focus, and difference reflectometry.




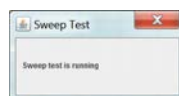
Live IFD Waveform Graph

- For further information on this graph and interpreting data, see **Interpreting Test Results** on page 37.
- Click on the **Exit** button to return to the Live IFD Test page or Mantis main page.
- To save a Live IFD test, refer to **File Management – Save File(s)** on page 26.

Live Sweep Testing

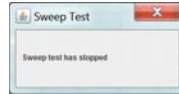
Running a Live Sweep Test

- Connect the Mantis as described in General Operations – Connecting to Cable/Wire.
- Click on the Live Sweep test icon  from the Mantis home screen.
- Select the cable type from Cable List drop down menu.
- Click Test. This starts the test that continuously scans the wire for faults at multiple frequencies. A confirmation dialog box will appear. If a fault is detected it will be displayed.



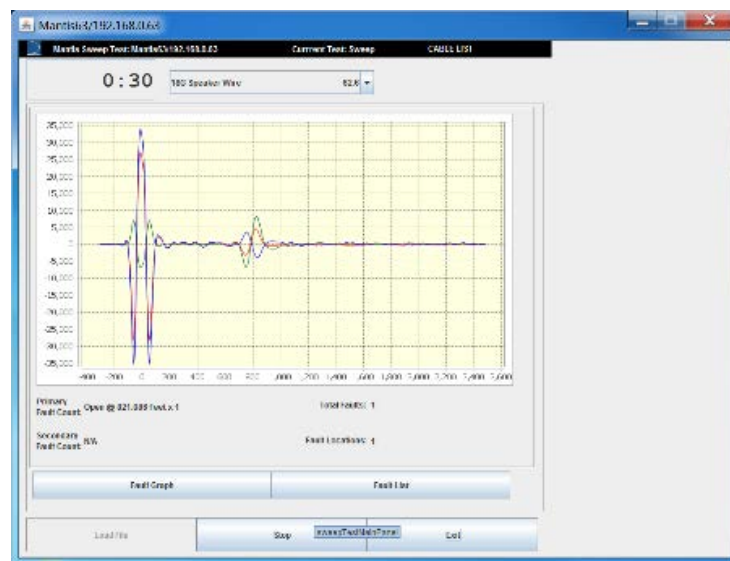
Note: Since the reference waveform changes every time the Sweep test cycles to a new frequency scan, the graph /waveform will not appear until a fault occurs. Then the fault state waveform appears and remains until another fault is detected.

- Select **STOP** to stop the test. A confirmation dialog box will appear.



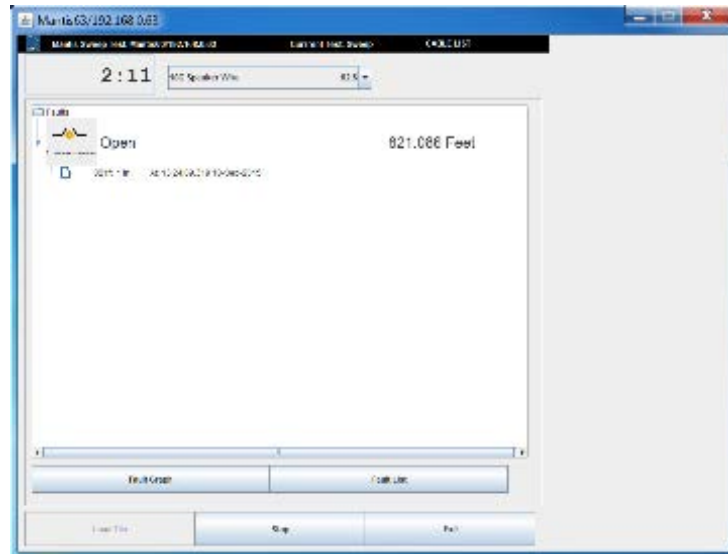
Sweep Test Results

- Test time elapsed is displayed in the upper left hand side of the screen.
- The current state of the wire under test is displayed in the graph view waveform.
- Sweep mode faults will begin to appear as they occur. The fault with the most occurrences and most recent will be displayed at the top of the list. The total faults will also be displayed. An example of a running a sweep test is shown below.



- To view specific results, click on the Fault List button.
- This will display all of the occurrences and length at which a fault occurred. An example of the Fault List is shown on the next page.

- To view detailed information and detailed fault waveforms, select a single fault occurrence by double clicking it, which will additionally display the time and the duration of the fault.



- To view detailed waveforms of the fault, left click on the additional information displayed under the **Short**.

This will open the graph window shown on the next page. This screen displays multiple selectable graphs - one for each frequency in the sweep. In the diagram, the 750 KHz test was utilized to best identify the fault location.



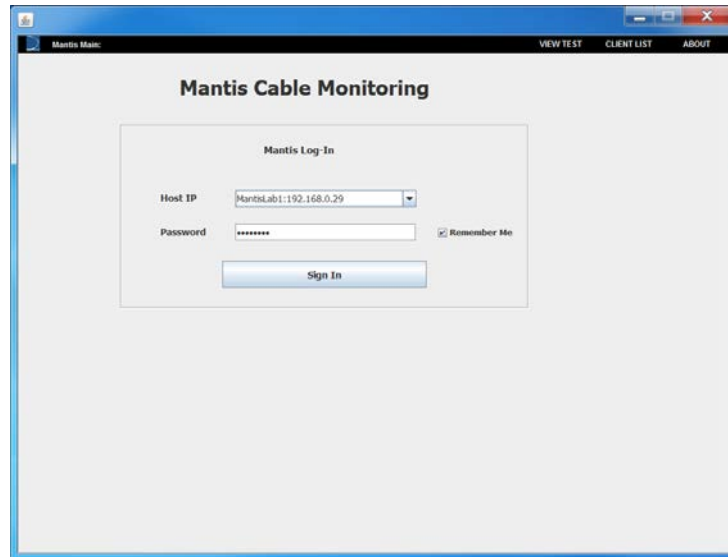
Selecting the second waveform (3 MHz) we get the following screen:



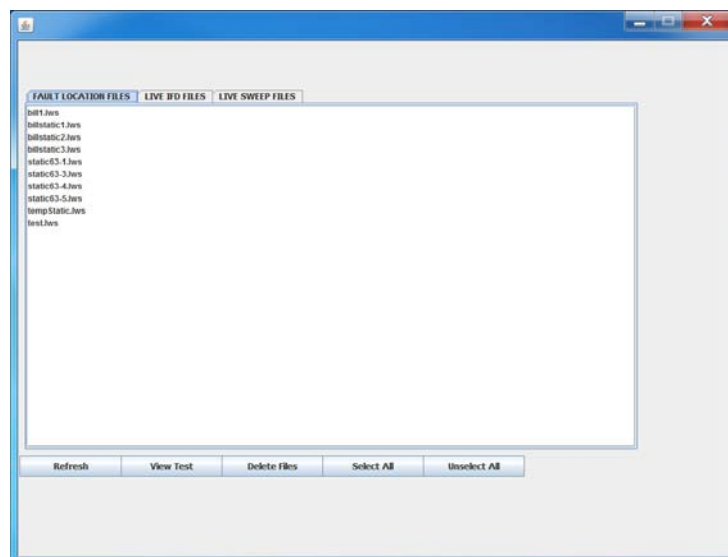
From this screen you can analyze the waveforms of the cable fault that was detected.

View Test

The "View Test" on the "Sign In" screen is used by the user to load files containing the test results of any test type; Fault Location, Live IFD or Live Sweep, without having to sign in to a Mantis device. The files, which can be loaded must be on the local computer.



After pressing the “View Test”, the following screen will appear, from which the user will select a test file to be viewed.

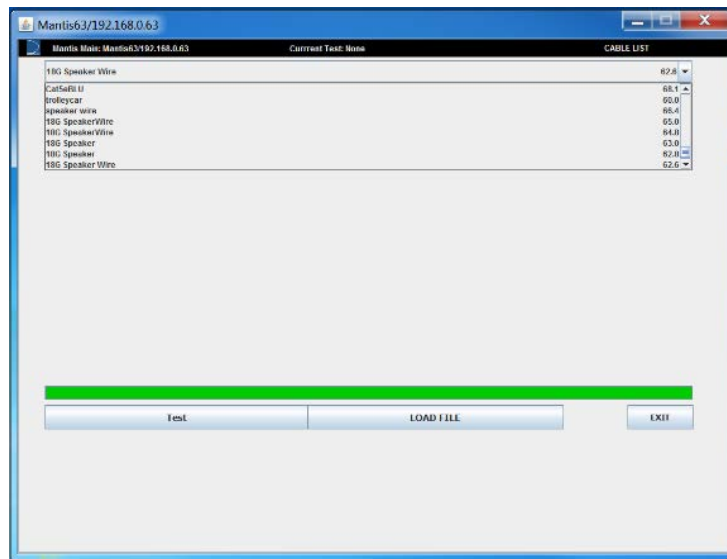


The user selects one of the tabs to view a listing of the files, which are on the local computer. The user selects a file, i.e, static63-5.lws, and then presses the “View Test” button. The test results from the file is loaded, as shown below.



Cable Types and VOP

To edit an existing cable or create a new cable, select the **CABLE LIST** button. This will display a cable list window as shown in the following screen.



Add New Cable Type

- To create a new cable type select NEW.
- To change the name of the new cable select the text box and enter the name of the cable being created.
- Change the VOP to the correct VOP of the cable being tested. Appendix A of this manual contains typical cable types and VOP values.

NOTE: If the VOP is unknown see Calculate Unknown VOP section. The range for VOP is 0% - 99%.


Edit Cable Properties

- To edit a current cable type, select EDIT.
- Select the cable to be edited from the library of cables.
- The details of the cable will be displayed in the window.
- Edit the cable name or VOP value as needed by selecting each field

- and changing them to fit proper cable properties.
- Click OK to save changes.

Calculate Unknown VOP

If a cable is not found in the pre-populated list and the VOP is unknown or if the VOP of an existing cable is not accurate, calibration of the VOP may be necessary. A cable of known length 25ft – 200 ft. is needed to calculate the VOP. Longer lengths (up to 500 ft.) will result in a more accurate VOP.

- Connect the known length of cable to the Mantis.
- From the main Mantis Application, select the  Fault Location icon.
- Select TEST to perform a Fault Location test.
- If the result of the Fault Location test is greater than the known cable length, the VOP is set too high.
- If the length of the Fault Location test is less than the known cable length, the VOP is set too low.

Use the calculation below as an example of how to determine the VOP for an unknown cable:

VOP estimate = 84.6%

Actual cable length = 30 feet

Reported fault location = 38.5 feet


$$\begin{aligned}\text{VOP Actual} &= \text{VOP Estimate} * (\text{Cable Length} / \text{Reported Fault Location}) \\ &= 0.846 (30/38.5) \\ &= 64.58\%\end{aligned}$$

- To create a new cable type with another VOP, select CABLE LIST then select NEW. To edit an existing cable, select a cable from the cable list then select EDIT.
- Enter a new or edit the cable name and VOP, then select OK.

- Run the Fault Location test with the new VOP and readjust until the length of the known cable is displayed or is very close. It may also be helpful and more accurate to use longer cables where possible, but a different test frequency will be necessary depending on the length of the cable and distance to fault.

File Management

Save File(s)


- From each test screen, click on Save File in the upper right corner of the page.
- Enter a filename and select OK.
- This file will be saved to the Mantis unit, however the file is not viewable until it is transferred from the Mantis unit to the Windows PC.
- To transfer the file to the PC, click on the Copy button and return to the main page or log back in to the Mantis Application.
- Select File Browser  from the home screen.
- All files copied to the Windows PC are organized in three categories (Fault Location, Live IFD, or Live Sweep).
- Select Refresh at the top. Previously saved files will appear on a new page.
- Select any available file(s) to transfer to the PC or check Select All.
- Click on Copy Files option to begin the file transfer process.
- When finished, a message appears Done Transferring Files at the bottom of the screen.

Load File(s)

- From the Fault Location test screen, select Load File in the bottom left corner of the test page.
- Select the desired file from the available files on the PC.
- Results will load immediately.

Email File(s)

In order to email a file, choose your favorite email client on the PC and attach the files you wish to email.



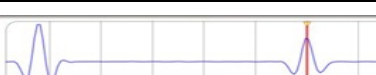
- Open the email program.
- Select paper clip  to add an attachment.
- Navigate the windows explorer pop-up to the root

folder where the files are stored “c:\users\”your user ID”\livewire”

- All Fault Location test files are located in the fault_location folder.
- All Live Intermittent Fault Detection test files are located in the live_ifd folder.
- All Live Sweep test files are located in the live_sweep folder.
- Select the proper folder and the file to be emailed.
- The email client will appear with an attachment in the email.
- Input the Sender, Subject Line, and text as desired and select Send.

Interpreting Test

The Mantis evaluates cable faults using SSTDR which is capable of detecting/locating/reporting both intermittent and hard cable faults. The Mantis transmits a small but recognizable signal along a pair of wires or cable which will reflect off impedance changes. When the reflection of this signal reaches the launch point, the distance to the impedance change is determined by the velocity of propagation (VOP), which is a characteristic of every cable. The table below displays the reflections that would be seen for both a short and open circuit fault.

Type	Waveform
Launch Waveform with no detectable fault	
Short Circuit Fault	
Open Circuit Fault	

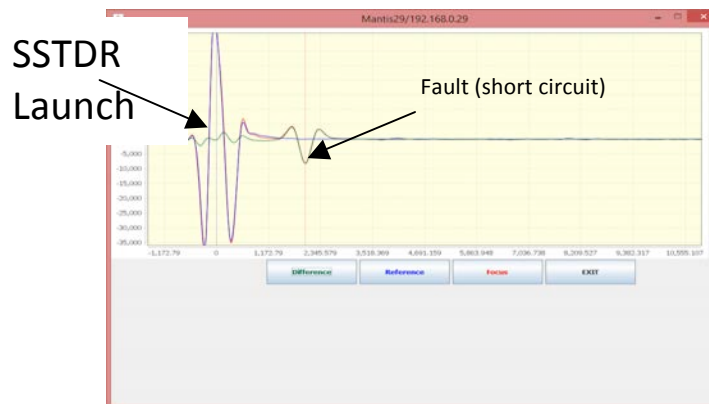
The waveform shape on the left is the initial start of the waveform, or location “zero”. The waveform shapes shown to the right correspond to fault reflections. The behavior of ‘up-down-up’ vs. ‘down-up-down’ indicates a short or an open circuit, respectively.

The time delay between the initial reflection (location = 0, where the Mantis is connected to the wire) and the reflection from the fault or end of the wire indicates the location of the fault. The time delay is converted to distance using VOP, which is why using the correct VOP for the type of cable is necessary an accurate measurement.

The Mantis uses this information to display the distance and type of fault. For the Fault Location test mode, several different scans are sent down the cable and the optimum scan chosen. For Live Intermittent Fault Detection, continuous scans (single frequency) are used to monitor the cable for faults in real-time.

Fault Location Test

The Fault Location test shown below displays a short at the point where fault is indicated. The SSTDR signature can be seen at the beginning of the test and the short appears as an 'up-down-up' reflection at some point during the scanning process.



To compare various frequencies tested, click on the Exit button to view all of the simplified waveforms for each frequency used during the test. Scroll up or down to view waveforms at the top or bottom of the list shown then click on the waveform you wish to select for a full screen view of only that waveform by itself.

NOTE: Any waveforms (among the full list) may be viewed, but the frequency that was chosen for final result during this test is the same waveform that was shown on the main Fault Location Test screen (and matches the distance to fault reading shown in text).



Waveform Analysis

The following waveform is an example of an Intermittent (IFD) test result, but the analysis can also be applied to the Fault Location waveforms.



- The buttons displayed at the bottom of the screen provide a legend for the graph and can be selected to provide a single graph or selection of graphs.
- The Reference graph displays the waveform of the transmitted signal and its reflections that are used as a reference for the wire scan with cables connected (known good state of the cable) before a fault is determined.
- The Focus graph displays the waveform (detected change; impedance signature) of the wire during a fault condition.
- The Difference graph displays the magnitude difference between the reference and focus graph (difference between the before/after states of the cable). The difference is used to determine the type of fault and its magnitude.

- In the above waveform, the fault and reference appear at the same place in this graph, because the fault (short) has occurred at the end of the cable. The reference is displaying at the end of the cable, and the fault is also displayed at the same place.

User Settings

Mantis Application (Log-in Page)

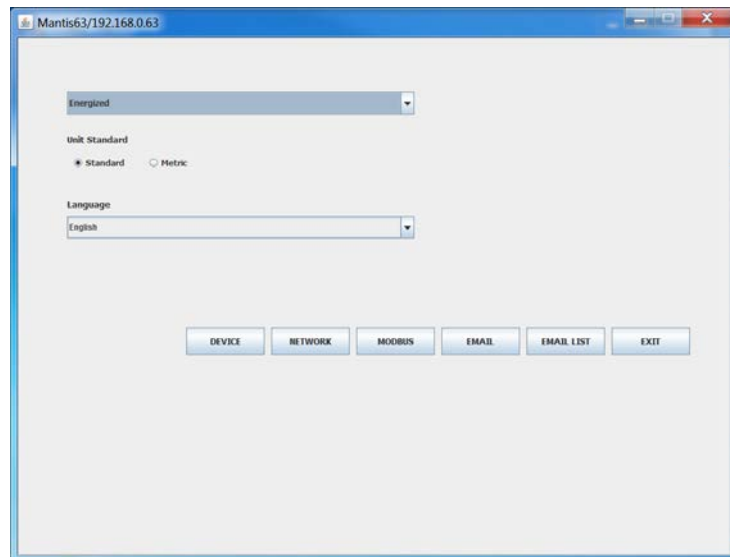
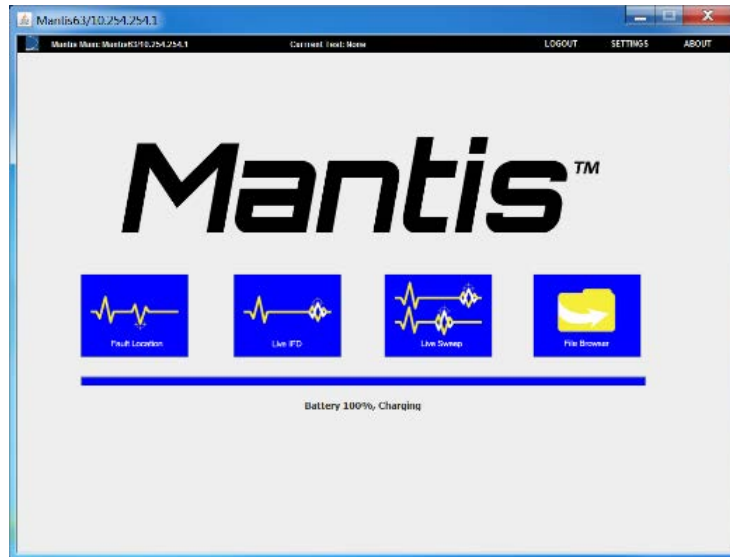
The Mantis client list is accessed from the Mantis log-in menu and by selecting CLIENT LIST. This list is only for use in Wi-Fi Client or Wired Client modes.

NOTE: Manual connection mode must be selected for the Client List to appear.

- It may be necessary to delete, edit, or create new clients at times depending on network configuration needs.
- The Device Client List displays Mantis clients on the same network as the Windows PC. If only one Mantis is being used, there should only be one Mantis in the client list.
- To add a new client select NEW from the client list.
- Input the new client name and IP address information.
- To delete a client from the list, select DELETE in the menu and click on the client to be deleted. The client will immediately be deleted from the list.
- To edit a client in the list, select EDIT from the client list. The name of each Client on the list can be anything that helps identify each Mantis unit that will be connected to from Windows PC.
- Input the new name and IP address information.

Settings menu

To check or change the Mantis' main configuration settings, first log in to the Mantis and from the Main menu page click on **SETTINGS** at the top.



Intermittent Test Settings

The initial screen for the '**Settings**' contains a drop-down box at the top which permits the user to set what mode of dynamic test should be used whenever a Live IFD test is started. The drop-down box contains the following values:

- Simple – Live IFD test will use the simple test mode.
- Advanced – Live IFD test will use Advanced Intermittent Test Settings, see below.

- Energized – Live IFD test will use Energized Intermittent Test Settings, see below.

Advanced Intermittent Test Settings

Under most test conditions, the default settings, Simple, will work very well and it is not recommended to use Advanced Intermittent Test settings unless the user/technician has a solid understanding of changing these settings. Select 'Advanced' in the drop-down box to enable Advanced Intermittent Test settings. This enables three sets of optional (advanced) settings: Custom, Short, and Long, referring to cable length.

Energized Intermittent Test Settings

The Energized Intermittent Test Settings are used on energized cables where known conditions will create faults and these faults should not be reported. Energized Intermittent Test Settings consists of two parameters:

- Noise Level – This parameter is used by the Mantis to handle very noisy cables.
- Minimum Fault Time – This parameter is used by the Mantis to ignore all detected faults whose duration is less than the Minimum Fault Time.

Unit of Measure

- From the main Mantis Application menu, select SETTINGS.
- Select Unit of Measure.
- Select standard or metric units.

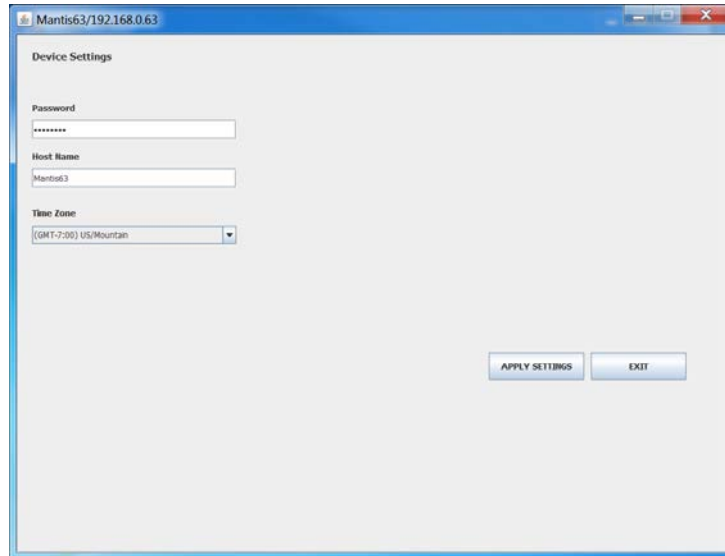
Email Alert Language

- Select Email Alert Language (Default: English)
- Select English or Italian (Additional language support will be added as the need arises at no additional charge)

NOTE: This only affects the language used for email alerts generated by the Mantis and not any other screens, settings, or functions.

Device menu

This menu is for changing the Host Name, Password, and Time Zone.



Host Name and Password

- The Host Name is the name that Mantis uses to identify itself (Default: Mantis) and the password is the password used to log-in to the Mantis (Default: cdma2000). The Host Name may be changed to help identify one or more Mantis units and is contained in the Email notifications.
- Select Host Name to change the host name.
- Select password to change the password. Changing this will also increase security and help guard against unauthorized use of your Mantis unit.
- Be sure to make note of these changes correctly before you apply the settings.
- Select APPLY SETTINGS.

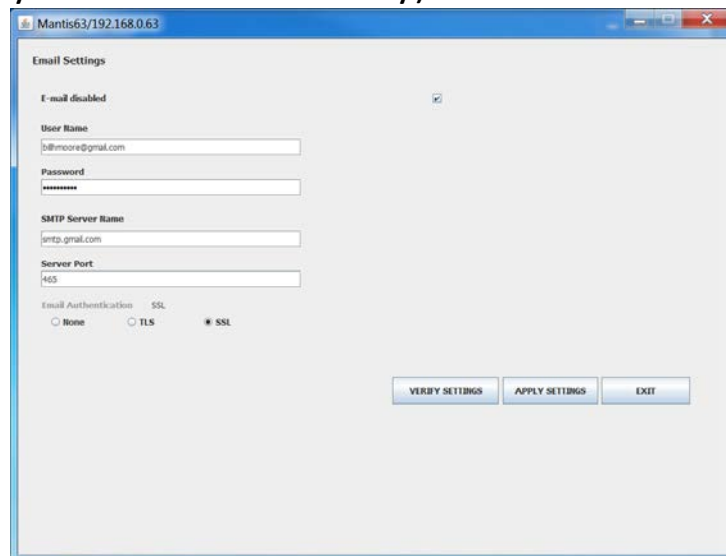
Mantis Time Zone

- Go to Device Settings.
- Select Time Zone.
- Scroll to the desired time zone and select it.

- Select APPLY SETTINGS.

Email Settings Menu

- Select **EMAIL**.
- Note that email alerts are disabled by default and that most of the fields are grayed out.
- To enable email alerts, check the empty box to the right of Email Disabled at the top. It changes to Email Enabled which enables the fields below it.
- Input User name, Password, SMTP Server Name, SMTP Port, and Email Authentication. These settings are for the email account from which the Mantis sends all email alerts. The example shown in the following screen shows valid settings for a Gmail account (except the username and password, which will need to be created by each user individually):

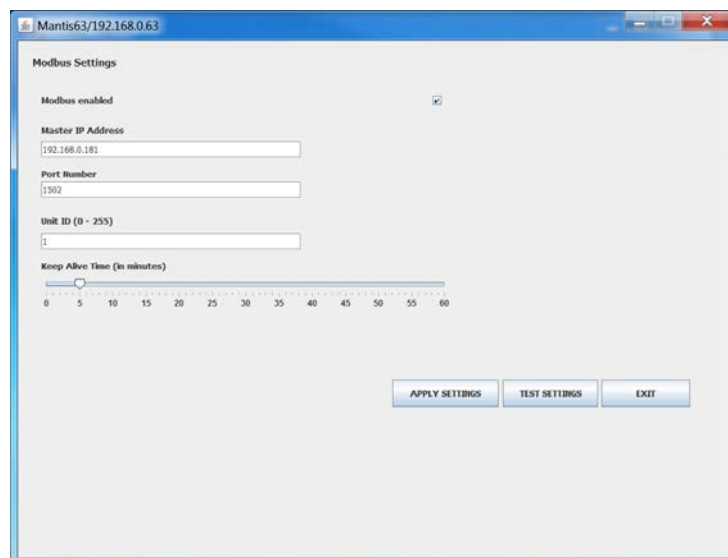


The screenshot shows a window titled "Mantis63/192.168.0.63" with a sub-header "Email Settings". Below this, there is a section "E-mail disabled" with a checkbox that is currently checked. Underneath, there are several input fields: "User Name" (containing "johnmoore@gmail.com"), "Password" (containing "*****"), "SMTP Server Name" (containing "smtp.gmail.com"), and "Server Port" (containing "465"). At the bottom, there is a section "Email Authentication" with three radio buttons: "None", "TLS", and "SSL" (which is selected). At the very bottom of the window, there are three buttons: "VERIFY SETTINGS", "APPLY SETTINGS", and "EXIT".

- When all fields are valid and correct, click the APPLY SETTINGS button.
- Click the VERIFY SETTINGS button. This will authenticate all of the email settings with the applicable email server (in this case Google's Gmail server). Of course, this also requires the Mantis to have a valid connection to the internet.

Modbus Settings

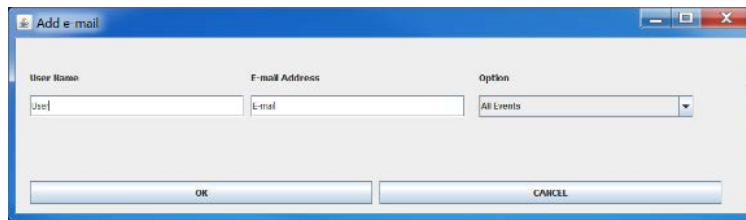
- Select MODBUS.
- Note that the Modbus interface is disabled by default and that most of the fields are grayed out.
- To enable the Modbus interface, check the empty box to the right of Modbus disabled at the top. It changes to Modbus Enabled which enables the fields below it.
- Input Master IP Address, Port Number, Unit ID, and Keep Alive Time. These settings are for the Master Modbus Server which the Mantis will interface with.
- When all fields are valid and correct, click the APPLY SETTINGS button.
- Click the TEST SETTINGS button. This will test that the Mantis can interface with the Master Modbus Server. Of course, this also requires the Mantis to have a valid connection to the internet.



Email List menu

- An email list can be added to send email alerts to multiple members.

- Select NEW to create a new email recipient to receive email alerts and input a valid email address. The same dialog is used for

A screenshot of a Windows-style dialog box titled "Add e-mail". The dialog has a light gray background and a blue border. It contains three input fields: "User Name" with the text "User", "E-mail Address" with the text "E-mail", and an "Option" dropdown menu currently showing "All Events". At the bottom of the dialog are two buttons: "OK" and "CANCEL".

NEW and EDIT functions.

- Select EDIT to edit an email.
- Select DELETE to delete an email.
- Select APPLY.

Mantis Software/Firmware Updates

The Mantis software can be updated using the Mantis Windows PC application. Be sure that the Mantis has sufficient battery power (>20%) or connect the Mantis to the A/C to D/C power adapter.

- From the Mantis Session Log-in screen, select ABOUT. This dialog box shows the current Windows PC application version if you are not logged in to a Mantis unit. It shows all applicable software/firmware only if you are logged in to the Mantis. Close this window.
- Sign In to the Mantis.
- From the Main menu page select ABOUT in the top right corner of the page. Note the current Mantis Server version.
- Select Check Online (for this choice, the Mantis must be connected to a network with internet access).
- A confirmation dialog box opens: Okay to update?
- Select OK.
- A message pops up: Unit is updating, then the Windows PC Mantis software will log out.
- Wait for at least 2 minutes for the Mantis to update its firmware and reboot.
- Select the Sign In button to log back into the Mantis.
- Check software versions to ensure the Mantis has the latest Server App version.

Alternate method (Update from file):

- From the Main menu page or the Log-in page, select ABOUT.
- Ensure the Windows PC has a valid internet connection. Select the Update button from the About screen.
- The Windows PC Mantis software downloads the latest Mantis Server App as indicated by the down arrow in the upper right

corner of the screen.

- Once the download completes, the Download Information dialog box appears, saying Please use the 'Update from file' button in the about section.
- Log-in to the Mantis from the log-in page.
- From the Main menu page select ABOUT.
- Note the current Mantis Server version.
- From the Version Information dialog box, select the Update button.
- Select the Update from file button. This does not require the Mantis or the Windows PC application to be connected to the internet, but requires that the Update file has been previously downloaded from the internet.
- The mantis_update.tar.gz file should appear under the Windows PC application's download directory. Click on the file.
- A message pops up: Unit is updating, then Windows PC application logs out.
- Wait for at least 2 minutes for the Mantis to update its firmware and reboot.
- Select the Sign In button to log back into the Mantis.
- Check software versions to ensure correctness.

Maintenance

WARNING! Disconnect all cables from the Mantis prior to cleaning. Failing to do so can damage the unit and result in personal injury.

* Do not use abrasive, harsh cleaners, or solvents to clean the Mantis.

Battery

- The Mantis contains a rechargeable Lithium-ion battery.
- To charge the battery, plug the charger into the bottom port then plug the charger into the power source.
- Mantis battery is not user serviceable.

NOTE: Lithium-ion batteries are hazardous waste and should be disposed of in compliance with local, state, and federal hazardous waste regulations.

Cleaning

- Use a clean, damp cloth to clean the Mantis.
- Before cleaning, disconnect all cables from the Mantis. Failing to disconnect cables can damage the device and cause personal injury.
- Do not use harsh cleaners, abrasives, or solvents.

Storage

- When not in use, store the Mantis in a temperature controlled area.
- Do not expose the Mantis to high temperatures or humidity. See the specifications section for Operating Environment limitations.

Specifications

Specifications	Description
Physical Dimensions	Size: 5.25" x 8.5" x 10.0" (with antenna) 5.25" x 7.5" x 7.25" (without antenna) Weight: 2.25 lbs. (1.02 kg)
Power Supply	Wall Adapter Voltage Input Range 10 to 28 VDC (12 V Nominal), 20W During power failure, the battery will keep the Mantis alive
Battery	3100 mAh Totes Li-ion rechargeable. 8-10 hours typical, 4 hour typical charge cycle
Voltage Warning	The Mantis is designed for use on cabling systems with voltage ratings: Output terminal block rated CAT II 1000V/CAT III 600 V
Measurement Method	Spread Spectrum Time Domain Reflectometry (SSTDR)
VOP Range	3-digit precision ranging from 20.0% to 99.9%
VOP Accuracy Range	+/- 2% accuracy for cables > 100 feet +/- 2 feet for cables < 100 feet Note: Accuracy Range applies with known VOP and consistent cable parameters
Maximum Length	Up to 20,000 ft. (6 km.) maximum testable cable length Note: Maximum testable cable length varies with VOP and cable type. Contact LiveWire Innovation for cables beyond this length
Battery	8-10 Hours Typical
Battery Charge	4 Hours Typical
Operating Environment	Operating temperature: -20 to 70 °C (-4 to 158 °F)

Specifications	Description
	Storage temperature: -30 to 85 °C (-22 to 185 °F) Humidity: 10% to 90%, non-condensing Altitude: 6,500 ft. (2,000m) operating
Designed to Meet	ANSI/ISA 82.02.01 (61010-1) 2004 CAN/CSA-C22.2 No 61010-1-04 UL 6101B (2003) IEC/EN 61010-1 2 nd Edition for measurement Category II, 1000 V EMC EN61326-1 WEEE Compliant

Appendix A

VOP Values by Cable Type		
Cable Type	VOP	Range
Coaxial Cables		
RG58	65.4	64.5 - 66.4
RG59	83.9	83.0 - 85.0
RG6U	84.6	83.5 - 85.5
RG6 Quad Shield	84.9	84.0 - 86.0
Phone Cables		
CAT3 4 Pair	67.3	65.5 - 68.0
CAT3 3 Pair CMX	67.5	66.5 - 68.1
24/25 Pair CAT3	64	63.0 - 65.0
Data Cables		
CAT5e (Orange/Orange White)	65.9	65.0 - 67.0
CAT5E STP	65.2	64.2 - 66.2
CAT5E FTP	73.1	72.1 - 74.1
24/25 Pair CAT5e	71	70.0 - 72.0
CAT6	68.8	67.5 - 69.5
Electrical Cables		
10/2 Romex Coiled	68.8	68.0 - 70.0
10/2 Romex Uncoiled	71.2	70.2 - 72.2
12/2 Romex Coiled	67.1	66.0 - 68.0
12/2 Romex Uncoiled	73.2	72.0 - 74.0
12/3 Romex Coiled	63.7	63.0 - 64.5
12/3 Romex Uncoiled	70.6	69.5 - 71.5
12/3 Romex Twisted Coiled	68.4	67.8 - 69.4
12/3 Romex Twisted Uncoiled	68.4	67.8 - 69.0
14/2 Romex Coiled	66.4	65.0 - 68.6
14/2 Romex Uncoiled	71.9	71.0 - 73.0
14/3 Romex Coiled	64.8	64.0 - 65.5
14/3 Romex Uncoiled	68.6	67.5 - 69.5
Security Cables		
12/2 Fire PLN	59.9	59.0 - 60.9
18/4 Fire PLN	60.4	59.5 - 61.5
16/2 Fire PVC	65.9	65.0 - 67.0
18/6 Fire PLN	61.6	60.5 - 62.5
14/2 Audio Cable	71	70.0 - 72.0
Discrete Wire Cable		
Discrete Wire 22-26 AWG	74	73 - 75
Discrete Bundle (3-20 Wires)	65	60 - 71
2-Wire Shielded(Wire-Wire)	58.5	57 - 60
2-Wire Twisted Shielded (Wire-Wire)	68	67 - 68

Customer Service

Contacting LiveWire Innovation, Inc.

For technical information and customer support, please visit www.livewireinnovation.com or send an email to support@livewireinnovation.com.

Contact Information:

Phone: Toll Free: 1-855-346-3358

Local: 801-293-8300

Email: support@livewireinnovation.com

Address: LiveWire Innovation, Inc.

10288 South Jordan Gateway, Suite A

South Jordan, UT 84095

USA

General Terms/ Software and End User License Agreement

The sales of all LiveWire Innovation products shall be subject to LiveWire's General Terms and Software and End User License Agreement located at www.livewireinnovation.com/terms.

Returns

Prior to returning any product to LiveWire Innovation, Inc., you must first request a Return Merchandise Authorization Number by contacting the Customer Service Department at 1(855)346-3358.

NOTE: Shipments will not be accepted without an RMA number which must be clearly marked on the shipping label.


Warranty

LiveWire Mantis is covered by the Limited Product Warranty set forth in and subject to the terms, conditions, limitations and disclaimers set forth in LiveWire's General Terms, <http://livewireinnovation.com/terms/>. No further warranties either implied or express will apply, nor will responsibility for operation of this device be assumed by LiveWire Innovation.

Product Registration

Registering your Mantis allows you to access support information and receive product updates. Register your products on the LiveWire Innovation website: www.LiveWireInnovation.com/warranty.

Disposal

 Compliant: Prior to disposal of this product, please contact LiveWire Innovation for proper disposal options.

Patents/Intellectual Property

LiveWire Mantis is the trademark of LiveWire Innovation, Inc. and is covered by one or more patents as described at <http://livewireinnovation.com/about/patents-trademarks/>.

LiveWire MantisTM User Manual

(Windows PC Interface Version)

For technical information and customer support, please visit
www.livewireinnovation.com or send an email to support@livewireinnovation.com

Contact Numbers: Toll Free: 1-855-346-3358

Local: 801-293-8300

Address: LiveWire Innovation, Inc.

10288 South Jordan Gateway, Suite A

South Jordan, UT 84095

USA



www.LiveWireInnovation.com