

MCerberus[®] Hardware Installation Guide

MCB-400 Series

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Use of the MCerberus® product is subject to our End Users License Agreement (EULA) which is located on our website at www.mHVACmonitor.com.

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Web: www.mHVACmonitor.com

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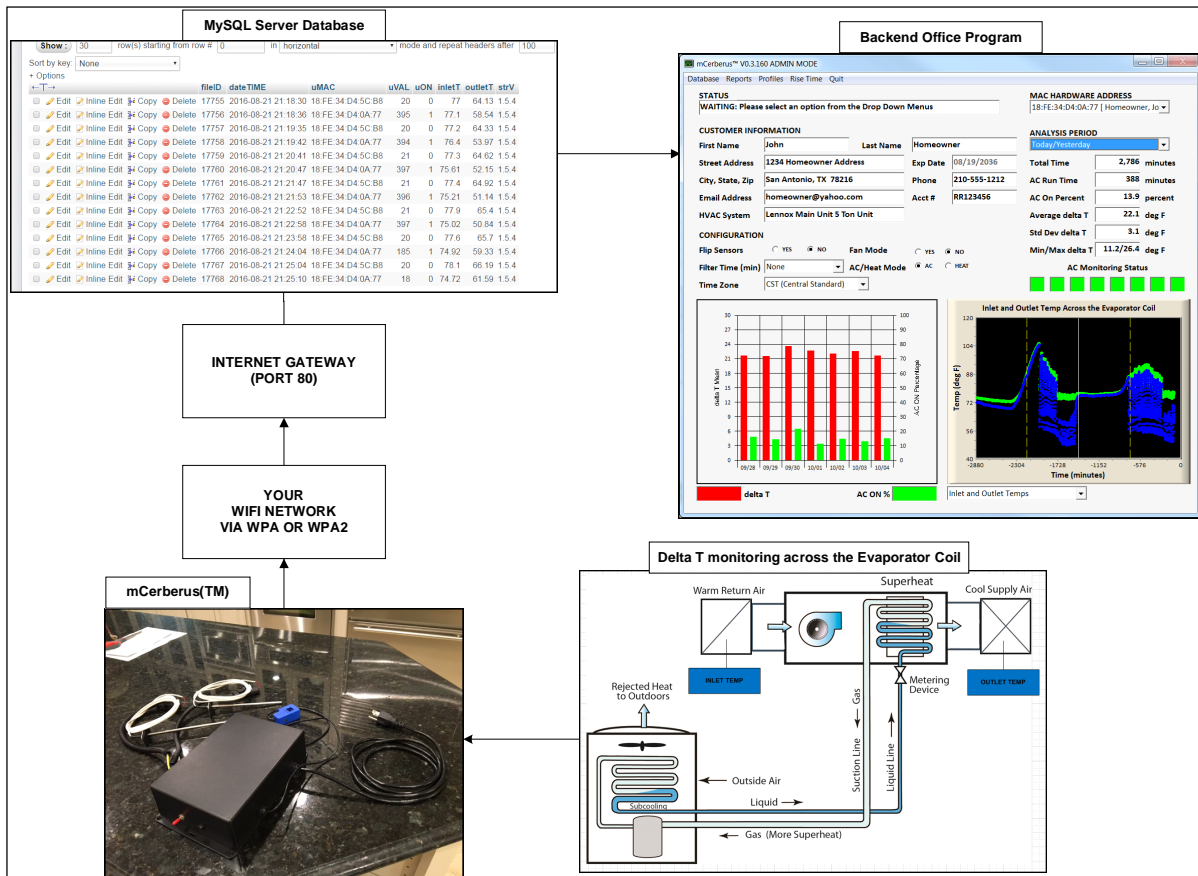
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I. Introduction

Welcome to the MCerberus® Hardware Installation Guide.

This guide will provide you basic instructions on how to implement and use the MCerberus® delta T AC Monitoring system (hereafter referred to as the SYSTEM). The following schematic illustrates the overall function of the MCerberus® product. The following are the major process steps of the SYSTEM:

- The SYSTEM includes a SCT-013 current probe is utilized to monitor and determine when the AC/Furnace is ON
- The SYSTEM includes two 10K Type II thermistors temperature sensor that are used to measure the Inlet and Outlet Temperatures.
- Every 60 seconds -- the SYSTEM measures the current draw and the Inlet and Outlet Temperatures. This data is written to a MySQL Database hosted on the Internet via a WiFi System. The WiFi System is provided by the End User.
- A Backend Office Software Application is used to analyze the stored data. We provide separate documentation for the installation and running of this software program.



II. Safety Summary

The following safety precautions apply to both operating and maintenance personnel and must be observed during all phases of operation, service, and installation of the SYSTEM. Before applying power, follow the installation instructions and become familiar with the operating instructions for this instrument. If this device is damaged or something is missing, contact US immediately. This manual contains information and warnings that must be followed to ensure safe operation as well as maintain the SYSTEM in a safe condition.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the SYSTEM in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a safety hazard.

KEEP AWAY FROM LIVE CIRCUITS

Monitored equipment covers must not be removed by operating personnel. Installation of the MCerberus® unit must be made by qualified maintenance/electrical personnel. Disconnect the power cord before removing the monitored equipment covers and installing the MCerberus® current probe. Under certain conditions, even with the power cable removed, dangerous voltages may exist. To avoid injuries, always disconnect power, and then discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

Do not attempt any internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY THE INSTRUMENT

Do not install substitute parts or perform any unauthorized modifications to the MCerberus® product. Return the instrument to RT Automation for service and repair to ensure that safety features are maintained.

WARNINGS AND CAUTIONS

WARNING and CAUTION statements, such as the following examples, denote a hazard and appear throughout this manual. Follow all instructions contained in these statements.

A WARNING statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.

A CAUTION statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of part or all of the product.

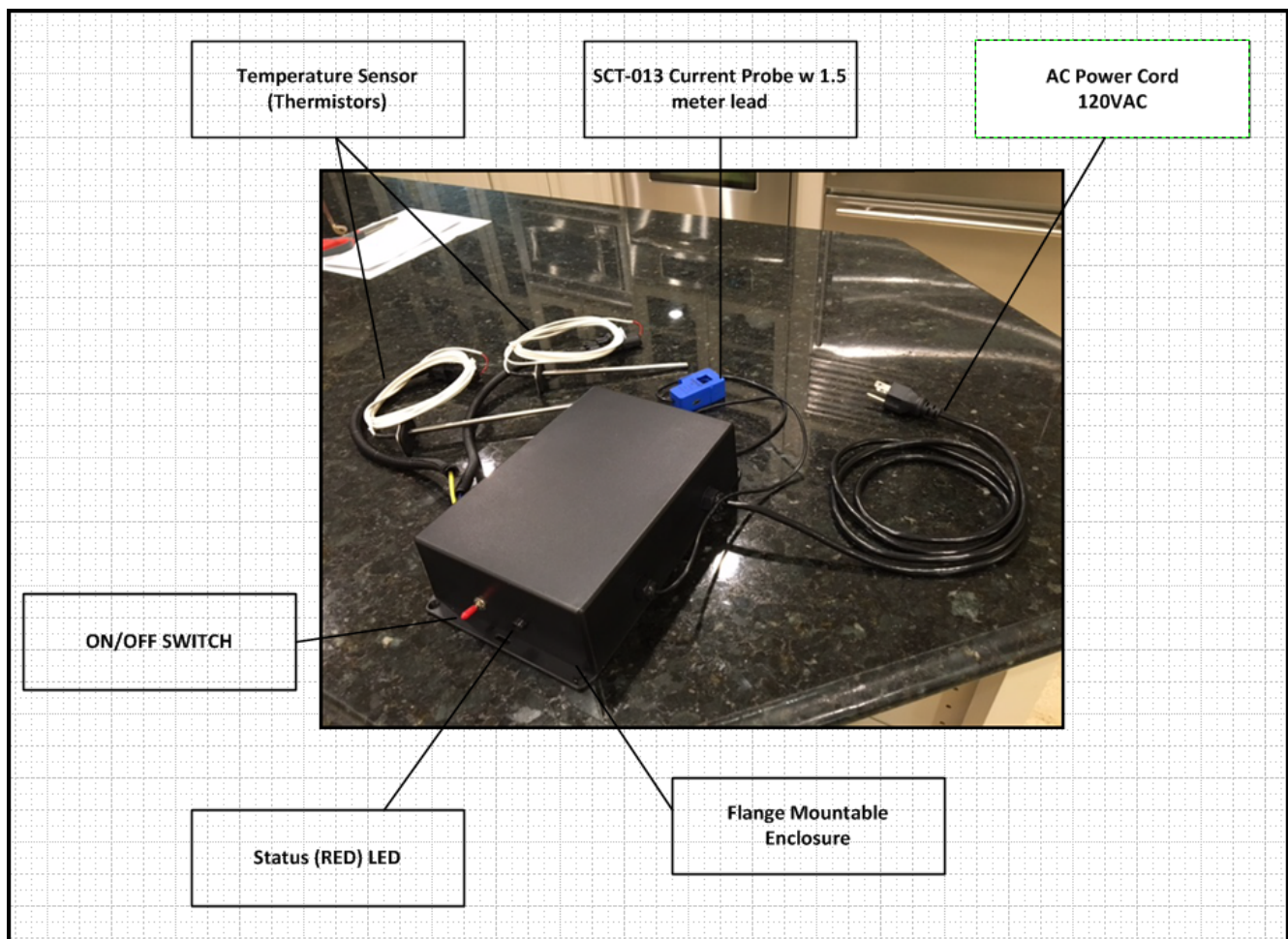
WARNING: Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock.

WARNING: To avoid electrical shock hazard, disconnect power cord before removing covers. Refer servicing to qualified personnel.

CAUTION: Before connecting the line cord to the AC mains, check the rear panel AC line voltage indicator. Applying a line voltage other than the indicated voltage can destroy the AC line fuses. For continued fire protection, replace fuses only with those of the specified voltage and current ratings.

III. Key Features of the MCerberus® Product

The following figure provides information with regards to key features of the MCerberus® supplied hardware. The ON/OFF switch on the Hardware may or may not exist on your unit. We have also migrated to a smaller enclosure (see the Appendix).



IV. Necessary Components

The following components are necessary in order to run the SYSTEM:

1. The MCerberus® Hardware unit (MCB-400) which includes a current probe and two temperature sensors.
2. Power: 120VAC, 60Hz power is required. The SYSTEM will consume no more than 1 Amps.
3. The SYSTEM requires access to your WiFi. If you do not have access to WiFi coverage where the SYSTEM is to be placed -- the SYSTEM will not operate. We do not provide this service.
4. Equipment or process: You must have access to the Air Handler of the Air Conditioner or Furnace. In order for the SYSTEM to monitor the process, you must be able to place (or clamp) the current probe around one (1) of the Equipment's power lines.
 - Note: Working with high voltage electrical service is potential hazardous. The installation of the current probe must be completed by qualified personal (see Section II Safety Summary).
 - The current probe (that we provide) must be sized properly to the equipment being monitored. Standard sizes provided at the time this document was written are 20A, 30A, and 50A. Using too small or large of a current probe can lead to the SYSTEM not operating correctly and/or the SYSTEM being permanently damaged.

V. Networking Requirements

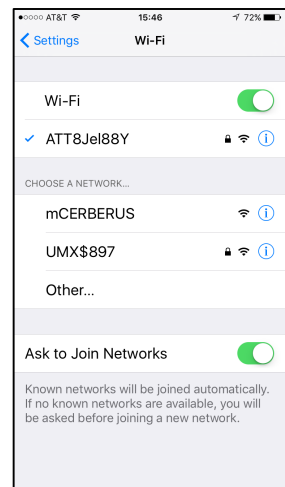
1. The SYSTEM requires access to your WiFi and also the Internet. We do NOT include these services with the SYSTEM.
 - If you do not have access to WiFi coverage where the SYSTEM is to be placed -- the SYSTEM will not operate.
 - If there is no WiFi coverage where the SYSTEM is to be placed -- the SYSTEM will not operate.
 - If the WiFi signal strength is less than -75 dB, then the SYSTEM reliability and performance in sending text messages may be derated significantly. If your WiFi strength is too low -- we recommend the purchase and implementation of a WiFi Range Extender (not provided).
 - SYSTEM supports 802.11 b/g/n, 2.4GHz, supports WPA and WPA2 encryption
2. Ports 80 and 2525 on your WIFI gateway must be open. These Ports are utilized by the SYSTEM in order to transmit data to our MySQL Server.
3. If you do NOT program the SYSTEM -- the system will not operate.

VI. Programming/Configuring

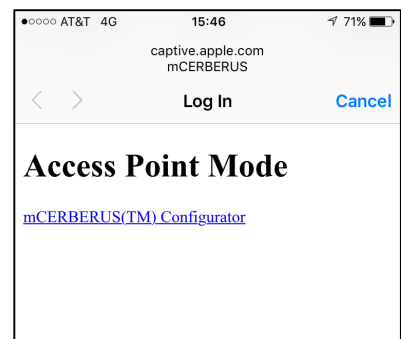
The MCerberus® product allows for "in the field" configuration which requires following a very specific "power-on" sequence of steps. This section provides this information so you can setup your MCerberus® for use in your facility.

1. **Make sure that the device is OFF** (i.e. power to the unit must be completely removed). The AC current probe does NOT have to be connected to the monitored equipment during programming.
2. **Disconnect BOTH temperature sensors from the Hardware Box.**
3. **Connect 120VAC power to the unit and WAIT.** After approximately five (5) seconds -- the LED will flash rapidly (ON/OFF/ON) for two seconds and then remain ON. This LED flashing is the SYSTEM acknowledgement that you wish to enter program mode.
4. User: Log into the SYSTEM using your Smart Phone. The Network name of the SYSTEM is called **MCerberus** (as illustrated).

- If you are using an iPhone -- simply click on this Network name to gain access to the unit. After you click on this Network name -- your web browser will automatically open up to the Access Point menu
- If you are using something other than an iPhone (like a laptop with WiFi capability) -- configure your laptop to gain access to the MCerberus WiFi Network. Then open a web browser on your laptop and type in "194.168.1.1" into the web browser address bar and press ENTER.



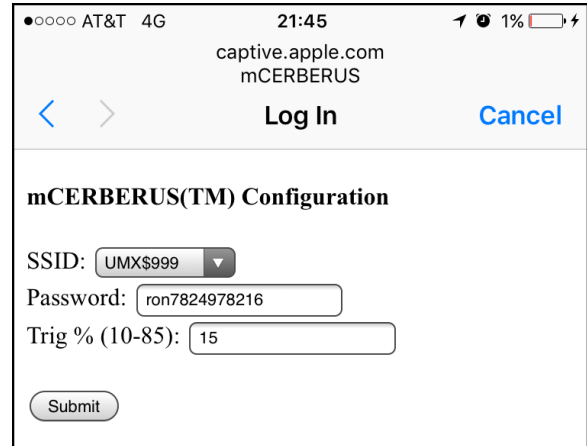
5. User: The following screen should appear on your browser screen. Select the **MCerberus® Configurator** link to enter the SYSTEM configuration screen.



6. User: The **Configuration** screen will appear.

SSID: Select the SSID from the drop down dialog box. The SYSTEM polls and records all current available WiFi Networks in the vicinity. The SYSTEM must be in the area where your designated WiFi Network is operating AND the WiFi Network must be actively broadcasting its name.

Password: Enter the WiFi Network Password. Note: If you enter the WiFi password into the system wrong -- the SYSTEM will NOT function correctly.



●○○○○ AT&T 4G 21:45 1%
captive.apple.com
mCERBERUS
< > Log In Cancel
mCERBERUS(TM) Configuration
SSID: UMX\$999
Password: ron7824978216
Trig % (10-85): 15
Submit

Trigger Level (percent): This the trigger level percentage of the current probe supplied with your unit. The max current draw of the monitored equipment should not exceed the current rating of the SCT-013 current probe. In most cases a value of 15 (i.e. 15% of the current rating of the SCT-013 current probe) should be adequate. In some special cases -- this value may need to be adjusted. Contact us at sales@MCerberus.com if you want help in setting this item. When you have configured the system -- select the **SUBMIT** button. Wait approximately ten (10) seconds for the information to be written to EEPROM.

7. User: **Cycle Power to the SYSTEM by unplugging the power cord.** Wait a minimum of five (5) seconds and then reconnect the 120VAC power to the unit. You are done!

NOTE: This step is VERY important if you happened or plan to have multiple units in the immediately vicinity. If you do not complete this step, the SYSTEM will/may continue to broadcast the MCerberus® as an available Network Access Point when in fact it is NOT available. The only way to remove this AP Name Broadcast is by completely removing power to the Unit after configuring it.

VII. Unit Installation

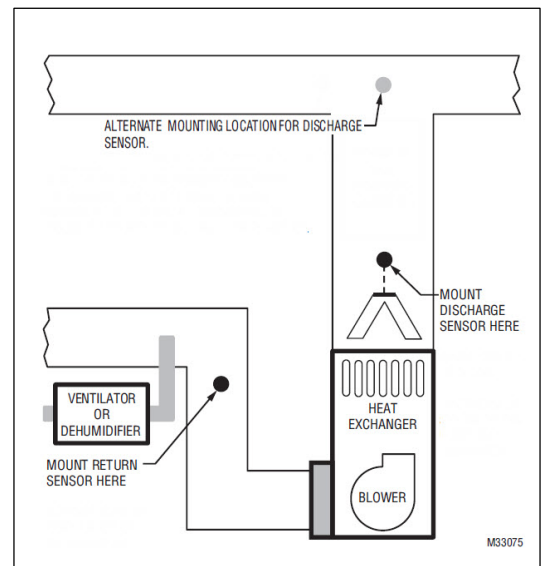
This section provides necessary instructions for proper installation of your MCerberus® unit. This installation should be completed AFTER you have configured the unit.

WARNING: The following steps should be completed by someone experienced with electrical systems. If these steps are not followed -- the installation may not be successful, the installer may be electrically shocked/harmed/killed, and the MCerberus® unit may be damaged.

WARNING: Do NOT clamp the SCT013 current probe onto circuits where voltages exceed 480 VAC. Personal injury or damage to the MCerberus® unit may result.

The following figures provide illustrations of the installation of the temperature sensors as well as the mounting point for the Main Unit.

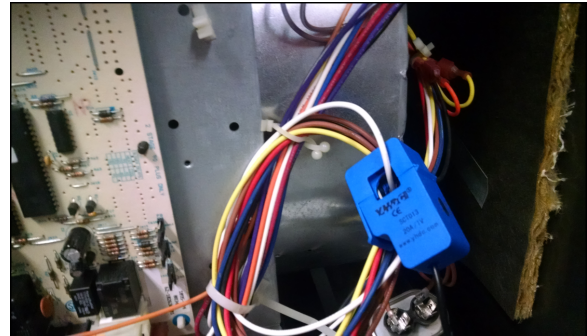
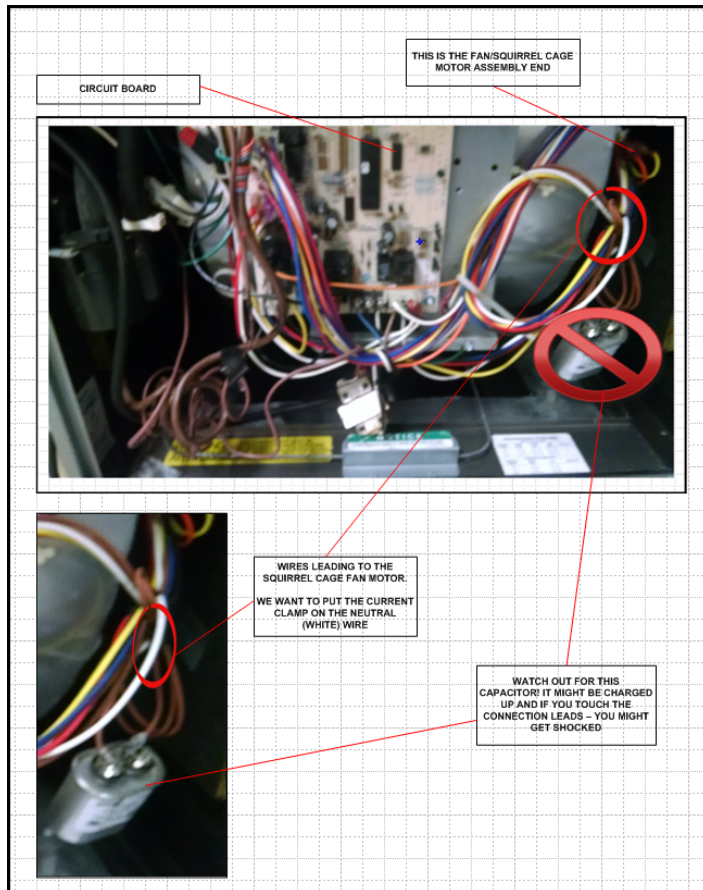
1. Mount the Main Unit. The flange mountable case allows for installation of the SYSTEM to a wall or on top of the air handler. NOTE: The SYSTEM is a sensitive piece of electrical equipment. Do not drop, shake, rattle, or roll it.



2. Turn OFF the power to the air handler that is to be monitored by the MCerberus® system.

NOTE: The MCerberus® system utilizes a SCT013 current probe to determine the machine state. A current clamp or current probe is an electrical device having two jaws which open to allow clamping around an electrical conductor. This allows properties of the electric current in the conductor to be measured, without having to make physical contact with it, or to disconnect it for insertion through the probe. The SYSTEM only works with detecting alternating currents (not DC).

3. Remove the main cover to the air handler and identify the Input Power to the Blower Fan Motor. Place the SCT013 current probe around the WHITE conductor. Ensure that the SCT013 jaws are completely CLOSED.



WARNING: If the SCT013 current probe jaws are not completely closed -- then the current measurement by the SYSTEM will be adversely affected. The SYSTEM will not operator and/or will operate inconsistently. Clamping the SCT013 current probe around both wires WILL give you a zero reading and the MCerberus® unit will not operate correctly.

4. Route the SCT013 cable (as necessary) so that it may be connected to the Main Unit. Then reinstall the main cover of the air handler back on.

5. Install the Inlet Temperature Sensor. This sensor should be placed approximately 18 to 24 inches before the heat exchanger in the air duct. The sensor may be installed horizontally or vertically BUT it should be centered in the middle of the duct as shown. We typically use metal foil duct tape to secure the sensor in place (not provided).



6. Install the Outlet Temperature Sensor. This sensor should be placed approximately 18 to 24 inches after the heat exchanger. The sensor may be installed horizontally or vertically BUT it should be centered in the middle of the duct as shown. Use metal foil duct tape to secure the sensor in place.

NOTE: In many cases -- there will be a temperature sensor port/opening that already exists in the duct that was used during the HVAC installation.

7. Connect the Inlet Temperature Sensor to the SYSTEM. The sensor connection has Yellow electrical tape wrapped on it. On an AC system -- the Inlet temperature is warm (like the Sun).



8. Connect the Outlet Temperature Sensor to the SYSTEM. The sensor connection has Blue Electrical tape wrapped on it. On an AC system -- the outlet temperature is cold (brrrr...)

9. Restore power to the piece of equipment to be monitored

10. Plug the 120VAC power cord from the SYSTEM to a nearby power outlet. At this point, the MCerberus® system is active.

11. You should verify proper operation (Installation Qualification/Operational Qualification) of the MCerberus® unit when first installing it. We provide a IQOQ Summary Sheet that may be used to complete the required steps. These steps are summarized here:

a. Confirm that the SYSTEM has connected to the programmed WiFi network. If the LED light is flashing ON/OFF very quickly -- this indicate that the SYSTEM has NOT logged into the WiFi system. See Section VI of this document.

b. Confirm that the SYSTEM is able to identify that the air handler is ON. This is indicated by the LED flashing light being mostly ON. The SYSTEM takes approximately 30 seconds to determine that the air handler is ON.

c. Confirm that the SYSTEM is able to indentify that the air handler is OFF. This is indicated by the LED flashing light being mostly OFF. The SYSTEM takes approximately 30 seconds to determine that the air handler is OFF.

d. After five minutes -- log in to the Delta T AC monitoring back end software application and confirm that the SYSTEM is writing to the database properly.

VIII. Run Mode

When the SYSTEM is first powered up (and assuming the User is not attempting to program or configure it via Section VI), the first operational step that the SYSTEM takes is to login to your WiFi system. The SYSTEM will indicate to the User that it is trying to log into the WiFi system by flashing the LED for a few seconds (typically 2 to 6 seconds) during the login process.

- If the LED flashes quickly for more than 15 seconds continuously, that is an indication that the SYSTEM was UNABLE to login to your WiFi system. Failure modes are the following:
 - Incorrect WiFi information entered (typically the password)
 - Your WiFi system does not support WPA or WPA2
 - The WiFi signal strength is too low

After completing the WiFi login process was successful the SYSTEM will enter one of two modes depending on the current air handler state:

- When the air handler is ON -- the Red LED light will be ON for 1.9 seconds and OFF for 0.1 seconds (i.e. mostly ON) and then repeats itself.

NOTE: When the Red LED light is "mostly" ON indicates that the MCerberus® believes that the piece of equipment is ON

- When the air handler is OFF -- the Red LED light will be ON for 0.1 seconds and OFF for 1.9 seconds and then repeat itself (i.e. mostly OFF).
- NOTE: When the Red LED light is "mostly" OFF indicates that the MCerberus® believes that the piece of equipment is OFF
- The GREEN LED gives an indication of WiFi Signal Strength
- At Power ON -- the SYSTEM assumes that the Air Handler is ON
- **Typically the SYSTEM will take thirty (30) seconds to recognize that the Air Handler has changed states.**

Every minute the SYSTEM will communicate with our MySQL server. This takes approximately 3 to 6 seconds. The Red LED will be constantly ON when data is being transmitted.

IX. Troubleshooting

FAULT CONDITION	CORRECTIVE ACTIONS
<p>The LED light just flashes rapidly</p>	<p>Your SYSTEM was unable to connect to the WiFi system.</p> <ul style="list-style-type: none"> . Ensure that the WiFi Network is ON . Ensure that the WiFi Signal Strength is at least -75 dBm <p>If these are proper -- you will then need to make sure that the system was configured properly. See Section VI of the User's Guide</p> <p>If the WiFi strength at the installation point is weak -- you may need to install a WiFi range extender. We recommend Netgear PN EX2700 which is priced at approximately \$30. We do NOT provide this range extender as part of the kit.</p>
<p>LED Light is not ON</p>	<p>Ensure AC Power Cord is plugged into Power (120VAC, 60Hz)</p>
<p>The LED light is on for one second and off for one second and repeats itself</p>	<p>The ON/OFF switch is set to OFF. System is in standby mode. Set the switch to ON to ENGAGE the system.</p>
<p>The SYSTEM never detects a machine state change (air handler)</p>	<ul style="list-style-type: none"> . Make sure the current clamp is properly installed . Make sure the SYSTEM is ON (engaged). . Make sure the current clamp is connected to the Hardware Box
<p>I am unable to configure the unit</p>	<p>See Section VI of the User's Guide</p>
<p>No information is being written to the MySQL database</p>	<p>Ensure that the System is connected to the WiFi network</p> <p>Ensure that Port 80 is open on your Network</p> <p>Ensure that the ON/OFF switch is set to ON</p> <p>Ensure that the System is powered (LED light is ON)</p>
<p>I installed the temperature sensors backwards and I do not want to go fix it</p>	<p>The back end office software application allows you to "flip" the sensors. Set this parameter and save it for the Installation and the problem is fixed.</p>

X. Product Summary

Main Unit Size:	4.7x4.7x2.5" (flange mountable)
IP Rating:	IP52 - we expect to "improve" this rating in the future
Weight:	approximately 0.5 lbs (excluding sensors)
Electrical Requirements:	120 VAC 60 Hz, less than 1 Amp recommended 85 ~ 305VAC input, 47-63 Hz, 5 Watts. Comply with EN55032 Class B without any additional components
WiFi	802.11 b/g/n, 2.4GHz, supports WPA and WPA2.
WiFi Network Signal Strength:	-75 dBm minimum
Network Requirements:	Ports 80 and 2525 must be open on your network
Current Detection	SYSTEM only works with detecting alternating current levels (not DC or direct current)
Operating Temperature:	-20 to 60 degrees C. We have three years of field tests at this environment
Humidity:	5 - 95% RH (non-condensing)
Vibration:	Not rated. Item is a sensitive piece of electrical equipment. Do not drop, shake, rattle, or roll it.
Temperature Sensors:	10K Type II Thermistors
Current Sensor:	SCT-013 alternating current sensor
State Change Time:	The MCerberus® product takes approximately fifteen (15) seconds to recognize a air handler state change (i.e. from OFF to ON or ON to OFF). This is a hardcoded value. If you need faster or slower response -- please contact us.
Modes:	System works with analyzing the delta T across the evaporator coil in air conditioning systems and/or heating systems
Warranty:	24 months from date of shipment. We retain the right to repair or replace failed units. See Section XIV.

XI. FCC Test Results

The following test reports provides the FCC Test Results Certification for the WiFi Modules used in the SYSTEM. This SYSTEM complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

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Report No.: NTEK-2017NT04142711F

1 TEST RESULT CERTIFICATION

Applicant's name	ShenZhen Doctors of Intelligence & Technology Co.,Ltd.
Address	4F, Building 2, Science & Technology Industrial Park, Pingshan Xili, Nanshan District, Shenzhen
Manufacturer's Name	ShenZhen Doctors of Intelligence & Technology Co.,Ltd.
Address	4F, Building 2, Science & Technology Industrial Park, Pingshan Xili, Nanshan District, Shenzhen
Product description	
Product name	ESP-F WiFi Module
Model and/or type reference	ESP-F
Serial Model	ESP

Measurement Procedure Used:

APPLICABLE STANDARDS	
APPLICABLE STANDARD/ TEST PROCEDURE	TEST RESULT
FCC 47 CFR Part 2, Subpart J:2016	Complied
FCC 47 CFR Part 15, Subpart C:2016	
KDB 174176 D01 Line Conducted FAQ v01r01	
ANSI C63.10-2013	
FCC KDB 558074 D01 DTS Meas Guidance v03r05	

This device described above has been tested by NTEK Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
 This report shall not be reproduced except in full, without the written approval of NTEK Testing Technology Co., Ltd., this document may be altered or revised by NTEK Testing Technology Co., Ltd., personnel only, and shall be noted in the revision of the document.
 The test results of this report relate only to the tested sample identified in this report.

Date of Test : 14 Apr. 2017 ~ 08 May, 2017

Testing Engineer : Lebron Wang
(Lebron Wang)

Technical Manager : Jason Chen
(Jason Chen)

Authorized Signatory : Sam. Chen
(Sam Chen)

N2004-11-05-1100 V.1.1

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Report No.: BCTC-141211251E

TEST RESULT CERTIFICATION

Applicant's name : Shenzhen Anxinke technology co., LTD

Address : 5A,B Building,Gushu WanLiHua Industrial,XOXiang Town, BaoAn District,ShenZhen,China

Manufacturer's Name : Shenzhen Anxinke technology co., LTD

Address : 5A,B Building,Gushu WanLiHua Industrial,XOXiang Town, BaoAn District,ShenZhen,China

Product description

Product name : WIFI Module

Model and/or type reference : ESP-12

Serial Model : ESP

Standards : FCC Part15.247

Test procedure : ANSI C63.4-2003

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
 This report shall not be reproduced except in full, without the written approval of BCTC, this document may be altered or revised by BCTC, personal only, and shall be noted in the revision of the document.

Test Result : **Pass**

Prepared by(Engineer): Eric Yang

Reviewer(Quality Manager): Sophie Lu

Approved & Authorized Signer(Manager): Casey Wang

XII. FCC Part 15 Compliance Test Results

FCC Compliance Our device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

FCC Part 15 This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Based on our testing, operation of this equipment in a residential area may cause interference ONLY at 400 MHz in which case the user will be required to correct the interference at his own expense.

	
CERTIFICATE OF TEST	
COMPANY:	Roth Technologies, LLC 14111 Bluff Grove Drive San Antonio, Texas 78216 USA
PRODUCT NAME:	mCerberus® Equipment Monitoring
MODEL NO(S):	MCB-400* <i>*Denotes actual model tested as worst-case representative of product family that includes models MCB-400, MCB-100, MCB-200, MCB-500, MCB-600 and MCB-800.</i>
TEST RESULTS:	In Compliance
REPORT NO(S):	F2LQ8729-01E
STANDARD(S)/RULE(S):	FCC CFR 47, Part 15, subpart B:2017, Class A
TEST LABORATORY:	F2 Labs 16740 Peters Road Middlefield, Ohio 44062 USA
TEST SITE:	Same as Above
Signature:	
Name:	Ken Littell
Title:	Director of EMC & Wireless Operations
Date:	April 5, 2018

XIII. Service Information

Warranty Service: Please contact us in order to obtain an RMA #. Clearly state on the RMA the performance problem and return any leads, probes, connectors and accessories that you are using with the device.

Non-Warranty Service: Please contact us to obtain an RMA #. Return the product in the original packaging to the address below. Clearly state on the RMA the performance problem and return any leads, probes, connectors and accessories that you are using with the device.

Our Non-Warranty Service does not include return shipping. Return shipping to locations in North America is included for Warranty Service.

RT Automation
14111 Bluff Grove Drive
San Antonio, TX 78216
Phone: 210-380-9890
Web: www.mHVACmonitor.com
Email: sales@MCerberus.com

Include with the returned instrument your complete return shipping address, contact name, phone number and description of problem.

XIV. Customization

We pride ourselves on customer service. If you want your SYSTEM customized -- please contact us. We typically do this at no charge (but we are not making any promises).

The latest version of the software application for this device is available on our website at www.mHVACmonitor.com. As a licensed User of this program -- you have availability to the latest version at no charge (including any and all updates to the application). Please see our End User License Agreement for more details.

XV. Warranty

RT Automation warrants to the original purchaser that its products and the component parts thereof, will be free from defects in workmanship and materials for a period of 24 months from the date of purchase. We will, without charge, repair or replace (at OUR option) defective product or component parts. Returned product must be accompanied by proof of the purchase date in the form of a sales receipt.

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. The warranty is void if the serial number is altered, defaced or removed. RT Automation shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. If this exclusion provision is not acceptable then we require that you return the unit to us for a full refund within the first 30 days of purchase.

This warranty gives you specific rights and you may have other rights, which vary from state-to-state.

XVI. Enclosure

