



General Users Guide to Completing Project Workflows

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Getting Started

Downloading & Installing measureQuick HVAC

Apple Devices (iOS)

Download and install from the iOS App Store: search **measureQuick HVAC**

Android Devices (OS)

Download and install from Google Play: search **measureQuick HVAC**

Logging-In & Setup

Enter the information on the login screen. This will give you access to the appropriate projects. Accept the User License agreement by scrolling to the end and tapping “accept.”

After logging in the first time, look for the icon in Figure 1.2. Tap “Check Permissions”

If you are not enrolled in any utility programs you will simply have standard permissions.

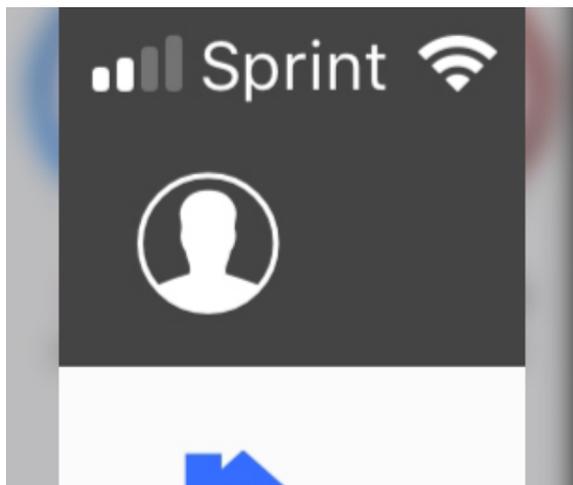


Figure 1.2



measureQuick HVAC Application

The purpose of this manual is to show instructions on how to use the measureQuick HVAC Application (mQ HVAC) to complete A/C, Heat Pump, and Gas Heating projects.



mQ HVAC and Smart Tools

This instruction manual shows how to navigate measureQuick (mQ) to perform testing, and access data from Bluetooth tools without interference. Then, once the testing is complete, the test data can be sent to an authorized Data Registry or emailed to your customer.

mQ HVAC Application

The mQ HVAC Application is a measurement aggregation validation software application that leads the user (using a smart device) through a step-by-step process to perform tests.

The measurements are sent to the mQ HVAC Application using Smart Tools with Bluetooth technologies, QR codes, IoT (Internet of Things) protocols or other digital means of data transmission, then saved, ensuring the accuracy and integrity of the test data.

Testing Results and Correction

mQ HVAC leads the user through the project process and shows the user if the results are in the correct range for compliance. If the project is non-compliant, mQ HVAC will diagnose faults and provide Just-In-Time Education so the technician can correct the issue and retest.

Navigating mQ HVAC

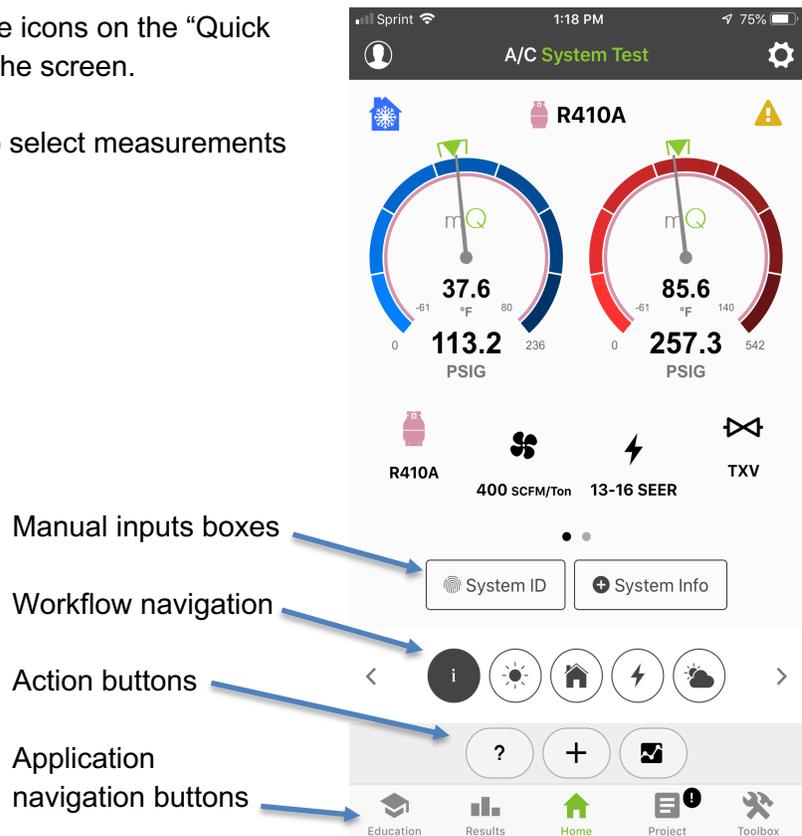
This instruction manual focuses on how to use the mQ HVAC application and how to upload data from the field.

Home Screen Navigation

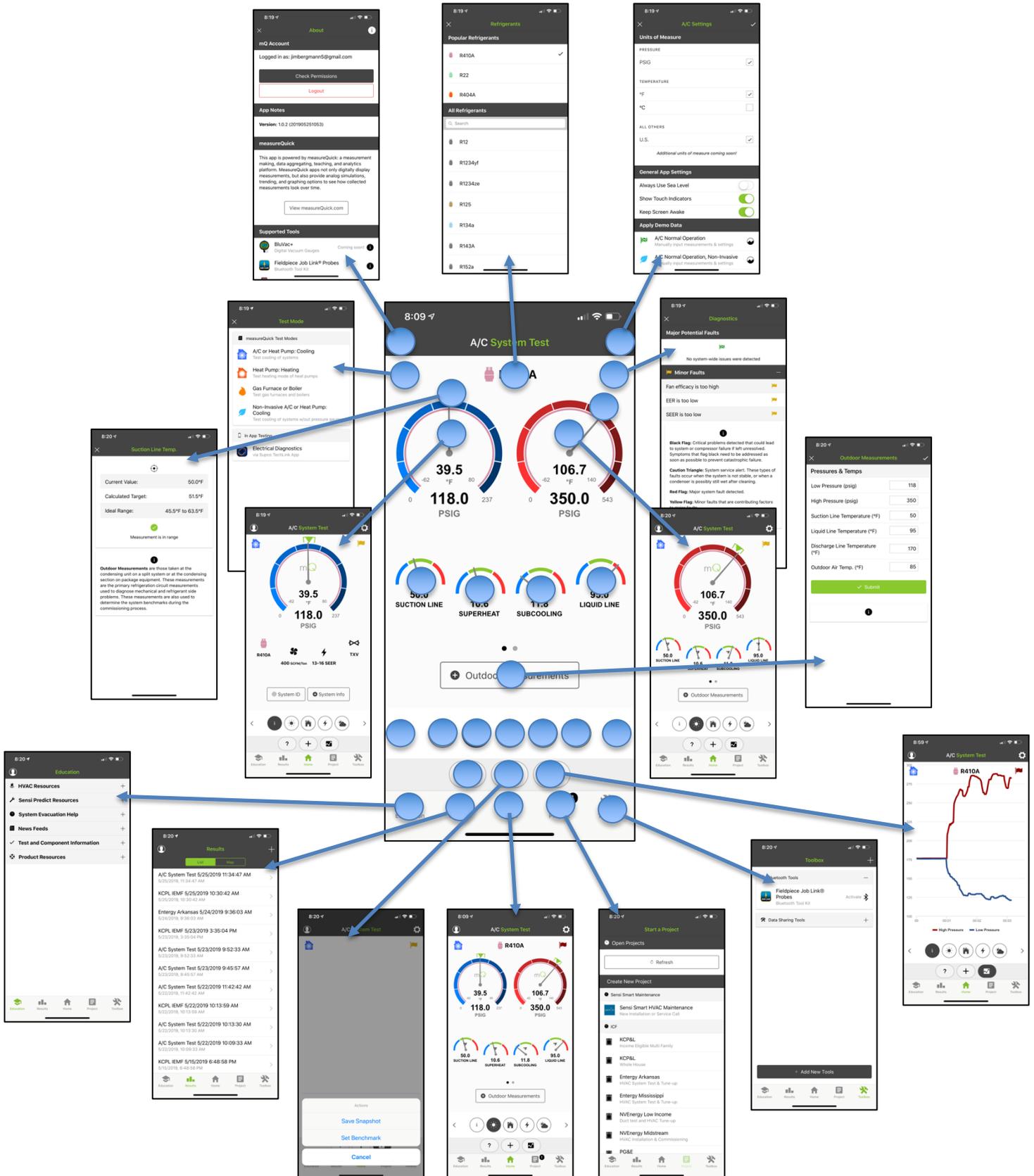
When the app is opened, the Home screen icon will be highlighted in green. It shows the “A/C System Test.” screen.

Navigate the workflow by using the icons on the “Quick Access Toolbar” at the bottom of the screen.

The icons represented here are to select measurements from the Home Screen Menu.



Typical Touch Points



General Project Information

Each project workflow is designed to complete specific project requirements in a specific order and should not be deviated from and or added to. For example, if the project does not require a “noninvasive test” the noninvasive test should not be performed from within the project.

DO NOT START NEW PROJECTS FROM THE RESULTS TAB. Each project has a unique project identifier assigned to the project when it is started. Attempting to duplicate projects by re-activating them in the results tab will result in duplicate projects that may not be accounted for as individual projects. Always start new projects from the “Project” tabs.

Installing Minor and Major App Updates:

App updates are a regular part of application maintenance, security updates and/or the addition or modification of project workflows. Whenever an update is available, **INSTALL THE UPDATE**. Minor updates will prompt installation at application startup. Major updates will be prompted through Google Play or the Apple App store

Troubleshooting Unexpected Operation

1) Problem: Unexpected operation or “crash” occurs.

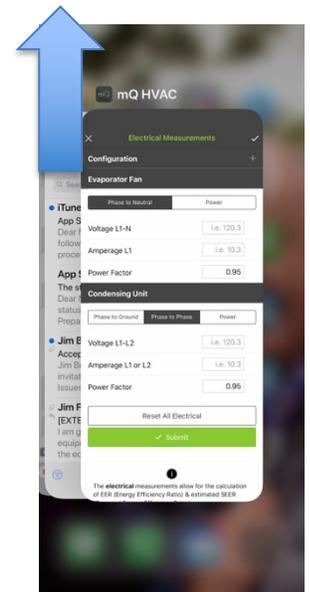
Solution: Restart the application. Apps are complex pieces of software and do need to be restarted periodically to clean up temporary files.

iOS, Older iOS devices, Double tap the home button to display all open apps and swipe the app (mQ) up to close the application. Newer iOS devices, from the home screen, swipe up from the bottom to show all open applications and swipe up MQ

To restart, Tap mQ from your home screen to restart.

2) Problem: I cannot see the project workflow I need for my projects.

Solution: Tap the “About” button, then check “Check Permissions” to see the permissions that are enabled for you account. If you do not see the program you need, contact the system administrator to have it added to your permissions.



Open process manager and swipe up to close the app.

3) Problem: I cannot check permissions for my account.
Solution: Connect to the internet via cellular or WiFi. If needed to verify you are connected to the internet, open a browser and go to a web page.

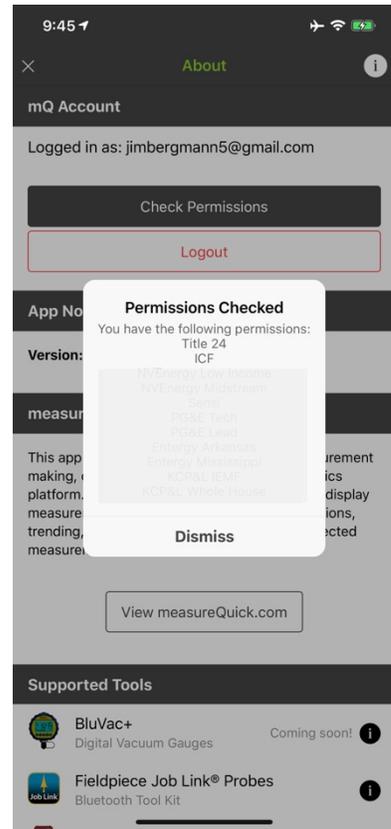
4) Problem: Workflow does not look as expected.
Solution: Tap the project button in the bottom tool bar and verify the correct project type. If you are not in the correct project type, exit the project and restart in the correct project type.

5) Problem: Checkmark in a workflow will not turn green.
Solution: Open the section and complete all bold black sections or bold red sections of the project. After completing this step, tap “Submit” and the section should go green. Note on some projects photos are required for document verification like that of low income.

6) Problem: I can see the probes in the toolbox, but the gauges on the home screen are not working.
Solution: From the toolbox, activate the probe set, tap the probe manager, then tap each probe to map its specific function. See section “The Tool Box” for more detailed information.

7) Problem: Everything is working correctly, but I am still getting red/yellow flags on the home screen.
Solution: Flags indicate “symptoms” of improper operation and do not definitively mean that the system operation is improper. Profiles are “educated guesses” on system operation and typically very reflective or consistent with the equipment selected. The technician should look at the symptoms and evaluate each one to verify if a problem exists. Minor faults contribute together to make major faults. If there are more than 4 minor faults contributing to a major fault, the fault cannot be cleared by the user. A green checkered flag is an indication of proper operation.

8) Problem: The pin on the report is not located on my job site.
Solution: The pin was not dragged to the site location in the “Equipment Information” Section. There are independent pins for the “Job Site” and Equipment Sections.



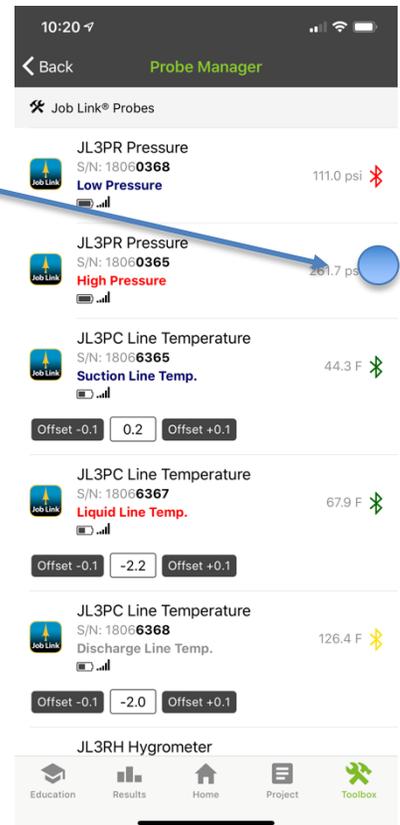
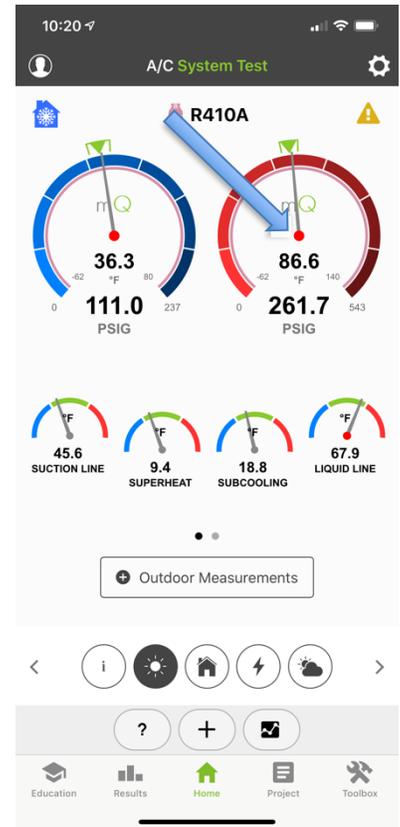
9) Problem: I have red dots displaying on the centers of the gauge needles.

Solution: Red dots are an indication that the probe has lost connection with measureQuick. The last reading will be held for a short period of time so calculations can continue to be made with the last data that was available. After a number of seconds or minutes (depending on the variable being measured) the gauge needle will go to zero, and the reading will repopulate once the smart device is in range of the probe.

Note: With Testo probes, if you are out of range for more than 10 minutes the probe may power off and need to be powered back on before readings can commence.

Note: With JobLink® Probes the probe will auto power off after 2 hours of continuous operation. The power off can be overridden with a long press and hold of the switch during the power up cycle.

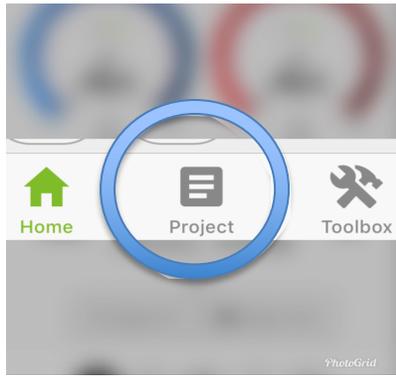
- Green indicates new data.
- Yellow indicates waiting for data
- Orange indicates still waiting for data (you may be in the threshold for range)
- Red indicates no data has arrived. The probe is either out of range or off.



Starting a Project

A new project will be added by the contractor in the field. From the main screen, tap "Project"

Figure 2.1



The user will see a project workflow for the program they are testing in. In this example, we will use the Entergy Arkansas workflow.

Click on the "Entergy Arkansas" project workflow
User will see the something similar to Figure 2.2
Click "Continue"

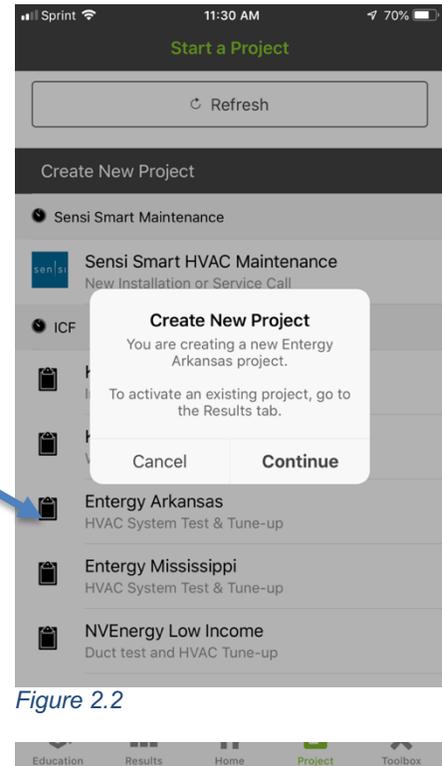
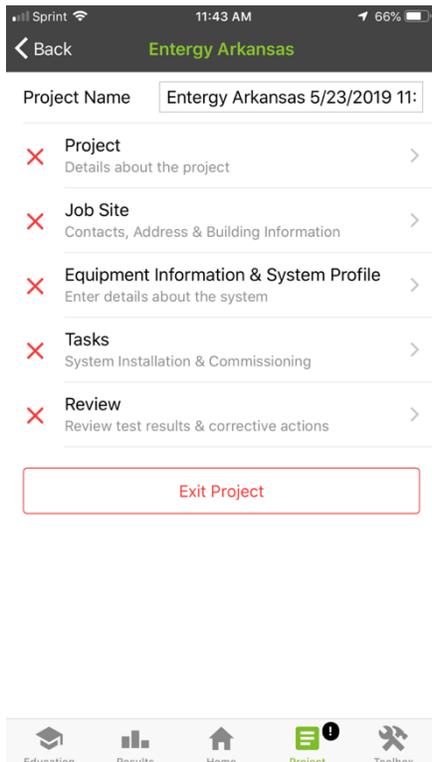


Figure 2.2



Project Name:

In this example, the project name will default to {Entergy Arkansas [date] [time]}. This can be edited if required or desired.

Project Workflow

Projects workflows are unique to each utility program and contain a series of steps to gather information or collect measurements about the HVAC system or performance of the HVAC system

The red "X" indicates the information in this section is incomplete or has not been completed.

Project Information (workflow specific)

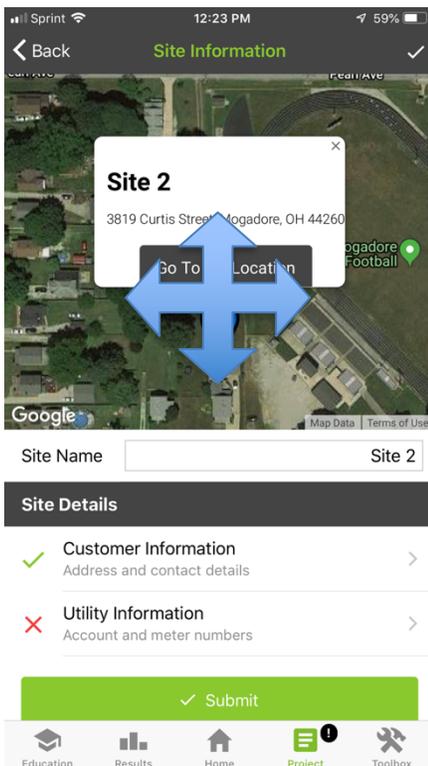
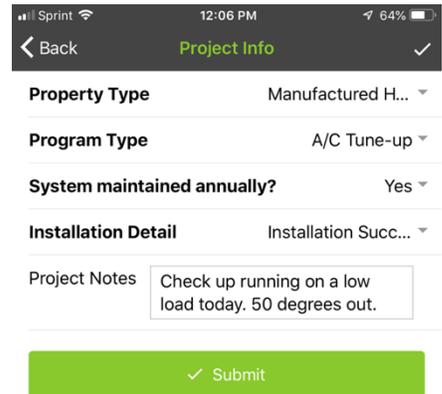
Tap “Project” to add or see specific details about the project.

Adding Project Information:

Using the dropdown menu, fill out the project information. Add project notes if there are any and either tap “Submit” or tap the check mark in the upper right corner.

After submitting, a green  check mark indicates the project information is complete and has been entered successfully.

A red “X” indicates that the information in the associated category is incomplete. Missing information may be added or revised at a later time.



Adding Job Site Information:

Adding Building Location Information

mQ finds the general location of the building or site and the user **must drag the blue pin** to the exact address. The geolocation is then recorded.

Tap “Customer Information” and continue to fill out the form. **All the fields in bold MUST be filled out.** mQ automatically populates the address to the customer information and records the coordinates.

After filling out each section, a green check mark indicates the customer information is complete and that all the required building information has been added.

If the user doesn't see the green check, go back and complete the information now highlighted in red.

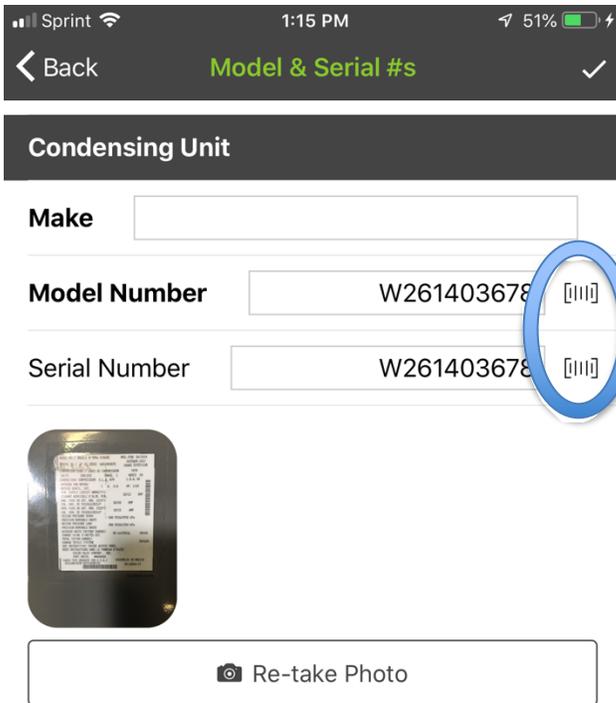
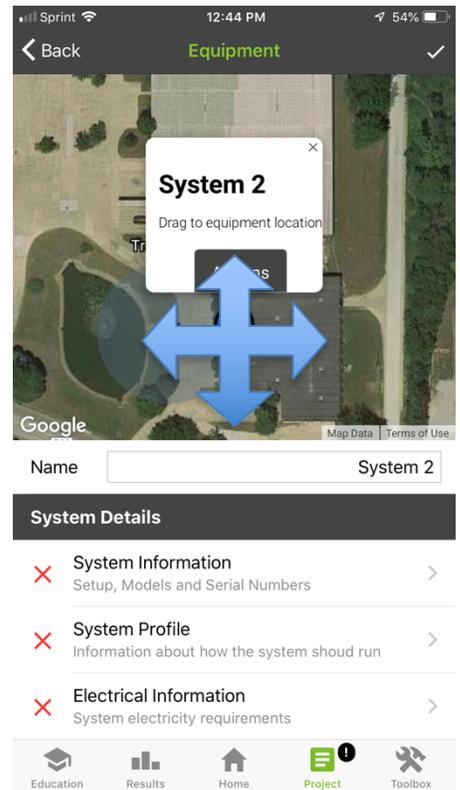
User can acquire the utility account number from home owner and/or scan the barcode of the meter when required.



Equipment Information & System Profile

mQ will prompt the user to **drag the blue pin to the exact location of the equipment** that will be tested. The equipment geolocation is then verified and recorded.

- The blue circle may not move with the pin depending on if the user is connected to Wi-Fi or not. Do not be alarmed if the circle does not move. mQ uses the pin location as the equipment location. A phone GPS at best has a repeatable accuracy of 50'



System Information

User will fill in the information.

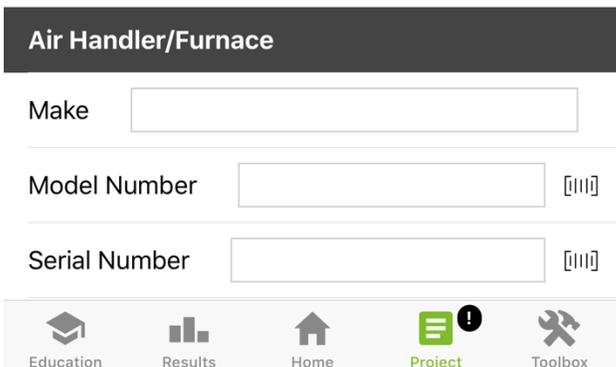
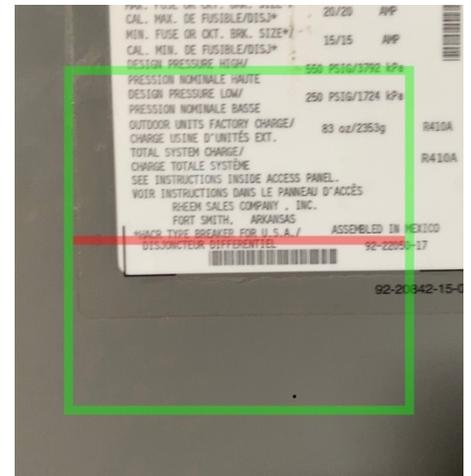
Adding System Details Using the Barcode Scanning Camera

Select the Barcode Scanning Camera Icon to the right of the field you are entering to scan model and serial numbers.

Scan Using the Barcode Camera Reader

Hold up the barcode to the camera.

The Barcode Scanning Camera will pop-up with a dialog box to access the camera. Press "OK"



Manually Entering the Model Number

If the barcode scanner worked, then great, but always double check. Barcode information is set up by the equipment manufacturer.

Barcode reading is “hit-or-miss”; based on the manufacturer. You must double check your number, correct any mistakes or enter the model number by hand.

The screenshot shows a mobile application interface for a 'Condensing Unit'. The title 'Condensing Unit' is at the top. Below it are three input fields: 'Make' with the value 'RHEEM', 'Model Number' with the value '018JAZ', and 'Serial Number' with the value 'W261403678'. Each field has a small icon to its right. The bottom right corner of the screen displays the 'PhotoGrid' logo.

Add Equipment Tag Photo

mQ makes it easy so that photos don't have to be uploaded from another device.

Take a photo by tapping “Take Photo”

User should have a clear photo showing the product and model number. If not, re-take.

Photos of verifications are stored on the smart device as well as in the project for export with PDF reports.

The screenshot shows the mobile application interface. At the top, there is a blurred header. Below it is a 'Serial Number' input field containing 'W261403678'. Underneath the input field is a photo of a metal equipment tag with technical specifications. Below the photo is a button with a camera icon and the text 'Re-take Photo'. The bottom right corner of the screen displays the 'PhotoGrid' logo.

Entering the System Profile & Electrical Information

When System Profile and Electrical Information forms are completed, user will tap “Submit.”

Tasks

System Profile

The system profile is one of if not the most important element of completing a project. Information entered here will drive all of the performance and diagnostic tools in the measureQuick application.

Nominal tons will be used to calculate capacity and airflow, the refrigerant type is used for coil temperatures as well as superheat and subcooling calculations.

Nominal airflow or “design airflow” will be used to determine suction pressure targets.

SEER will be used to determine the head pressure targets.

The **metering device** type is used to determine the target superheat and subcooling as well as the charging process.

The **high efficiency evaporator** switch is used for evaporator targets.

Superheat and subcooling targets are drivers for correct charge indication

Total External Static Pressure is the driver for allowable duct pressures.

Extended Performance Ratings drive performance targets when more precise information about the system operation is known.

Electrical Information is used for electrical diagnostics. The **Heating Profile** uses a set of similar drivers

The screenshot shows the 'System Profile' form in the measureQuick application. The form is titled 'System Profile' and has a 'Back' button and a checkmark icon. The form is divided into two sections: 'General Information' and 'Cooling Profile'. The 'General Information' section includes the following fields: 'Home All Electric' (No), 'Cooling System' (Central AC), 'Rated Capacity (Btu/hr)' (4000), 'Primary Heating System' (Heat Pump), 'Primary Heating Fuel Type' (Gas (Natural)), 'Supplemental Heating Fuel Type' (Gas (Natural)), and 'Domestic Water Heater Fuel Type' (Gas (Natural)). The 'System Configuration' is set to 'Split'. The 'Cooling Profile' section includes the following fields: 'Nominal Tonnage (Tons)' (1.5), 'Refrigerant' (R410A), and 'Nominal Airflow' (400 SCFM/ton). The bottom navigation bar shows 'Education', 'Results', 'Home', 'Project', and 'Toolbox'.

The screenshot shows the 'Electrical Information' form in the measureQuick application. The form is titled 'Electrical Information' and has a 'Back' button and a checkmark icon. The form includes the following fields: 'Condensing Unit Phase' (Single), 'Condensing Unit Nom. Voltage' (200/208), 'Evaporator Fan Phase' (Single), 'Evaporator Fan Nom. Voltage' (230/240), and 'Evaporator Fan Type' (X13). A green 'Submit' button is located at the bottom of the form. The bottom navigation bar shows 'Education', 'Results', 'Home', 'Project', and 'Toolbox'.

Project Tasks

A/C System Test In & A/C System Test Out

At this point in the project or at any time before this point, the user must hook up their wireless probes/gauges to the unit. Data can be viewed graphically or in a list.

Tapping “View on mQ Home” will bring up the gauge representation.

Tapping “View” on the right of the workflow navigation buttons will bring up a list view of the data in each section.

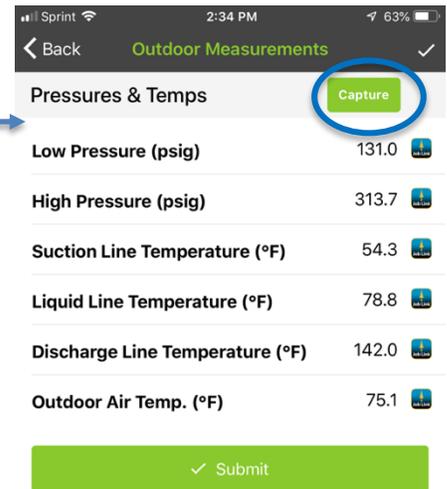
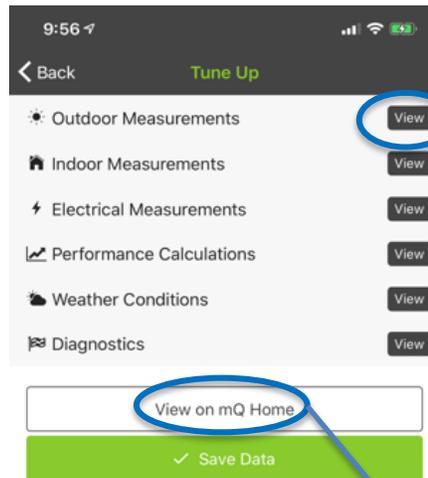
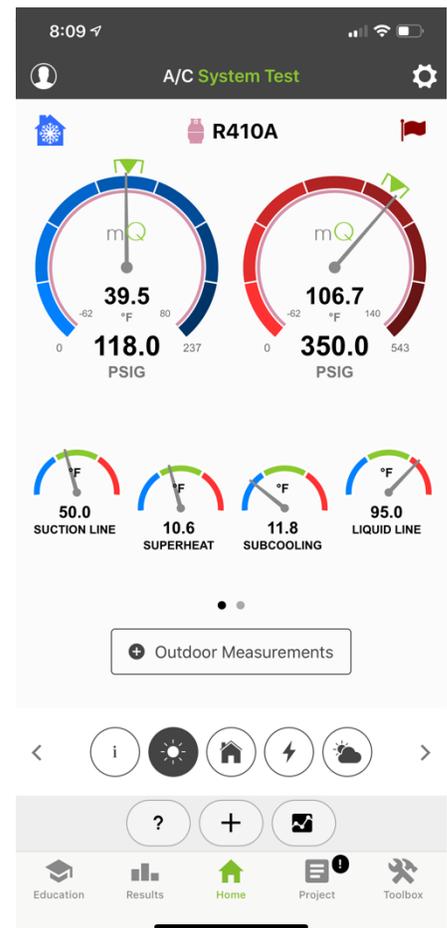


Figure 2.14



Outdoor Measurements

Tap “View” to display the measurements that would typically be made outside at the system condenser.

Any wireless probes that are hooked up to the unit will auto populate in the associated fields.

If there are no probes hooked up to an associated field, a grey input box will be there for the user to enter the data manually. When all fields are filled in, tap “Capture” (see Figure 2.14). Capturing the data will freeze-frame the data and upload it into the form. Tap “Submit” and return to the Tune Up screen.

Indoor Measurements & Electrical Measurements

Electrical measurements are used for determination of the SEER and EER calculations, fan efficacy as well as the capacitor health of the system.

Measurements can be entered the following ways:

- Phase to Ground
- Phases to Phase
- Power directly

Using a Redfish iDVM550 Single Phase Power Meter is the fastest and most precise way to measure electrical. The iDVM550 measures power and power factor directly. Otherwise the power factor is assumed.

10:21

Back Electrical Measurements

Configuration

Evaporator Fan

Phase to Ground Phase to Phase Power

Voltage L1-GND i.e. 120.3

Voltage L2-GND i.e. 120.3

Amperage L1 i.e. 10.3

Amperage L2 i.e. 10.3

Power Factor 0.95

Condensing Unit

Phase to Ground Phase to Phase Power

Voltage L1-L2 220

Amperage L1 or L2 7

Power Factor 0.95

Reset All Electrical

Education Results Home Project Toolbox

Capacity Calculations

Tapping the Performance Calculations will show the actual as well as the normalized capacity. Capacity is normalized (corrected) for the following:

- Outdoor air temperature
- Indoor dry bulb and wet bulb
- Airflow
- Voltage
- Line set length

System airflow is calculated using a mass flow equation and determines the CFM/Ton of cooling. The rated capacity used in the system profile multiplies the CFM/Ton by the nominal tonnage to determine the total system airflow. If the nominal capacity is not entered mQ will default to 1-ton (12,000 BTUh)

10:18

Back Performance Calculations

Results

Capacity Calculations

Rated:	2.0 Tons / 24,000 Btu/hr
Normalized:	1.9 Tons / 22,232 Btu/hr
Actual:	0.7 Tons / 7,928 Btu/hr (35.7% Normalized)
Sensible:	0.7 Tons / 7,928 Btu/hr (97.6% Normalized)
Latent:	0.0 Tons / 0 Btu/hr (0.0% Normalized)

Sensible Heat Ratio: 1.00

Air-side Performance

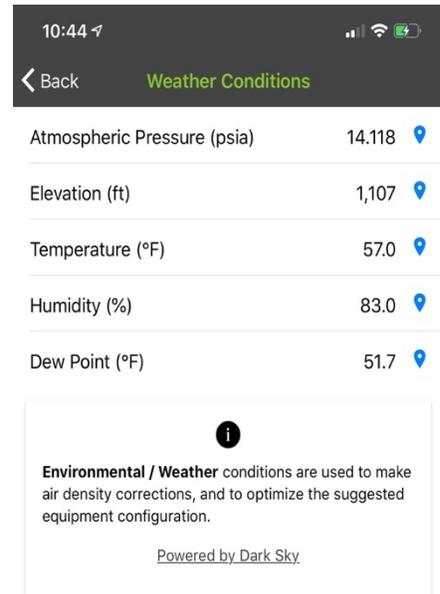
Airflow (nominal):	400 SCFM
Airflow (estimated):	379 SCFM
Airflow (estimated):	401 ACFM

Airflow (measured): --

Education Results Home Project Toolbox

Weather Conditions

Weather conditions are used to correct the temperature pressure charts for elevation, and to assure that the test conditions are within the guidelines of the program requirements. Weather information is pulled from nearby weather stations.



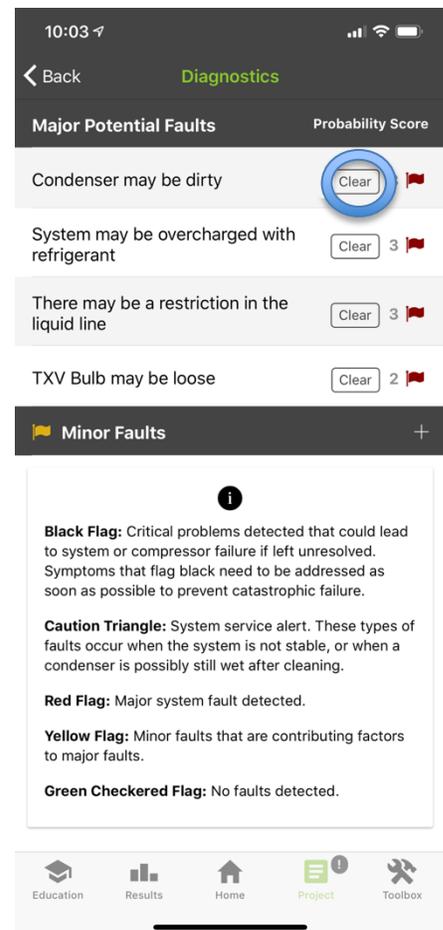
Diagnostics

The diagnostics show what may be wrong with the unit you are analyzing. Flags can be cleared by the user after a determination is made that the issue does or does not exist.

The number next to the flag is a “symptom of” the fault being shown. In this case there are three symptoms of a dirty condenser, and over charge of refrigerant and a liquid line restriction as well as two symptoms of a loose TXV bulb. The symptoms are derived from the minor faults that can be viewed by tapping the (+) sign. The technician is to perform a visual inspection and other tests to determine what the fault actually is. In this case, cleaning the condenser coil may clear all of the faults listed below.

When Diagnostics are done being troubleshoot, the user can return to the Tune Up screen and tap “Save Data.”

Return to Task screen and continue through A/C System Test Out. When done with that section, tap “Submit” under the Task screen



Review

Under the Review tab, take pictures as requested that are required by the program.

Return to the Project Main sheet and tap “Complete.”

A prompt will appear informing the user that the project was submitted successfully.

The project can now be exited.

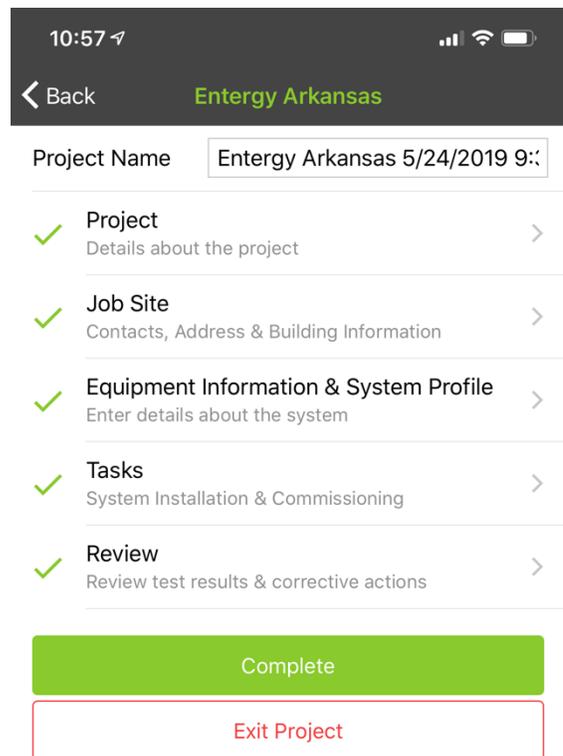
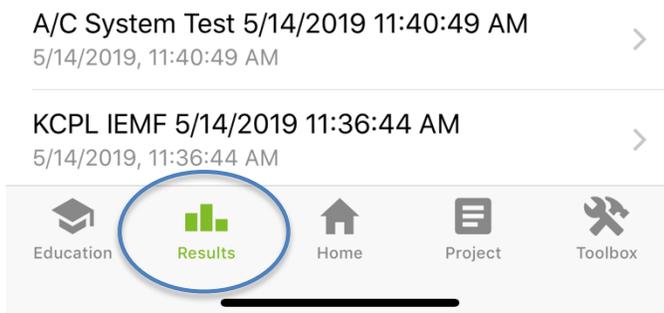
Results

Previous projects or exited projects can always be reopened by tapping “Results.” (Figure 3.1)

The user can tap the project they want to reopen and then tap “set as active.”

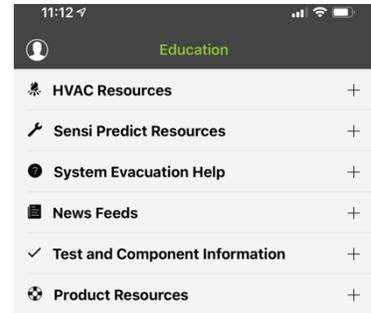
That project is now the active project and can be edited.

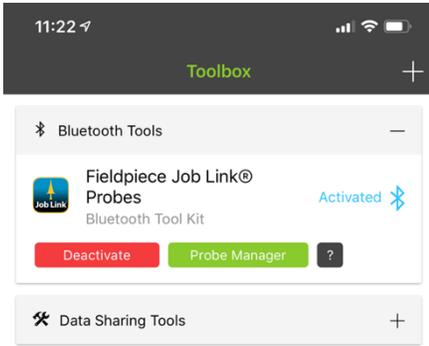
Figure 3.1



Education

The Education tab is a resource available to the user to look up information about measureQuick and products that are used with the app.





The Toolbox

In the toolbox you can either add your Bluetooth gauges or you can connect through another app.

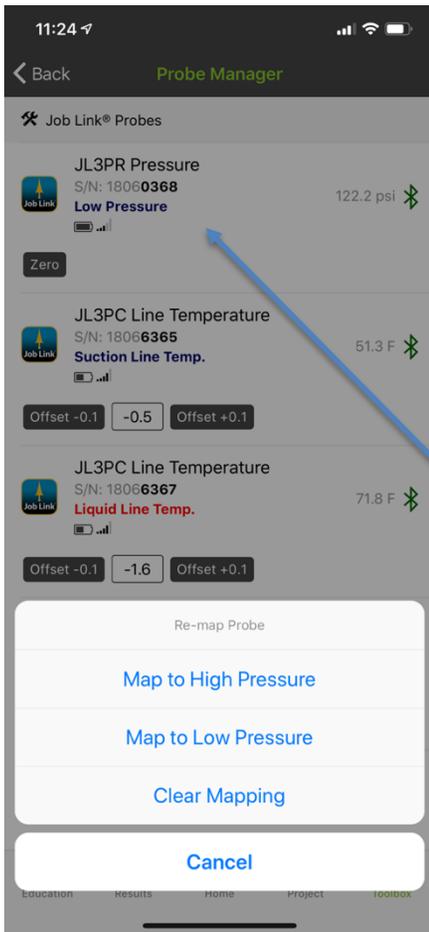
Connecting Bluetooth Tools

Make sure the tools/gauges that are being used are turned on.

Under the toolbox tab, tap “+ Add new tools”

mQ will scan the local area for any Bluetooth tools

The probes will start to populate, and the user will be able to see them.



To connect the probes, tap on “Probe Manager”

The first time the user uses the probes, the user will have to map them to the appropriate gauge they are measuring. If the probes are not mapped, they will not operate the “gauge” view.

Tap on the probe

A menu will appear like the one in Figure 4.2

Select which option is linked to the probe you want to map.

For instance- I selected the JL3PR pressure gauge (0368) and I want it to measure my low pressure, so I tap on it and select “map to low pressure.”

That gauge is now linked to low pressure and will remain like that until the user changes it.

An un-activated tool can be deleted by tapping and holding the tool icon until it turns grey and swiping left. A delete option will appear and the user can tap “Delete.”

The tool must be de-active before it can be deleted. User can tap “Deactivate” to do that.

Figure 4.2

Trending:

Trending allows the user to see a visual representation of the system operation over time to verify system stability or trends like TXV hunting that could indicate other system wide issues. The user can trend the following by tapping the trending icon and scrolling through the workflow navigation buttons.

- High and Low pressure
- Superheat and Subcooling
- Suction Line and Liquid Line Temperature
- Return and Supply Air
- Temperature split and enthalpy
- Total and Sensible Capacity
- EER and SEER
- Outdoor Air Temp and Atmospheric Pressure

