YELLOW JACKET
P51-860 TITAN™ User Manual
UPC# 40860

Note: These instructions do not cover the manifold attached to the instrument. For instructions on use of the TITAN™ 4-Valve manifold, please visit: http://yellowjacket.com/wp-content/uploads/2015/01/500716_Rev.F-1.pdf

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Chapter 1:
Before You Start

Contacting Ritchie Engineering:
To order accessories, receive assistance, or locate the nearest YELLOW JACKET distributor.

Corporate Office and Mailing Address:
Ritchie Engineering Co, Inc. YELLOW JACKET Products Division 10950 Hampshire Avenue South
Bloomington, MN 55438-2623 U.S.A.
Phone: (952) 943-1300 or (800) 769-8370
Fax: (800) 769-8370
E-mail: custserv@yellowjacket.com www.yellowjacket.com

Safety Information:
Use the instrument only as specified in this manual. Otherwise, the protection provided by the instrument may be impaired. Refer to safety information in Table 1-1.

A Warning identifies conditions and actions that pose hazards to the user. A Caution identifies conditions and actions that may damage the instrument or the equipment under test.

Table 1-1. Safety Information

⚠ **Warning**

To avoid personal injury or death, follow these guidelines: • Most governments and legal authorities require that HVAC technicians be trained and certified in the safe and proper operation of HVAC tools, such as this instrument. Since this tool may be connected to many types of equipment through a limitless combination of hoses and fittings, proper training is the most important element of using this tool safely. • Read the entire User Manual before using the instrument. • Use the instrument only as described in the User Manual, otherwise the protection provided by the equipment may be impaired.	• Do not use the instrument if it is damaged. Before you use the instrument, inspect the case. Look for cracks or loose components • The instrument contains no internal user-serviceable parts; Do not open the instrument. Have the instrument serviced only by Ritchie Engineering Co. or authorized service centers. • Do not use the instrument if it operates abnormally. Protection may be impaired. When in doubt, have the instrument serviced.

- Do not operate the instrument around explosive gas, vapor, or dust.
- Various refrigerants have been intentionally excluded for very significant safety reasons. Never use refrigerants in this instrument that are not listed in the Set-up menu.
- The refrigerant database in this unit may include refrigerants classified as flammable. If such refrigerants are selected, the operator may need additional certifications and/or training. Consult your government and legal authority and comply fully with all requirements.
- Always wear eye and skin protection when working with refrigerants. Escaping refrigerant vapors will present a freezing danger. Do not direct refrigerant vapors venting from hoses towards the skin.
- Maximum Working Pressure: 700 psia (4.83 MPa)
- Because this instrument allows for various inputs including electrical and mechanical, care must be taken to observe any ways that an electrical shock hazard could develop. Example: Wet or humid conditions, along with a damaged thermocouple or vacuum sensor, could allow an electrical path across the instrument and over wet hoses. Keep all interconnected equipment clean, organized, and in proper condition. Do not use the instrument if you are not qualified to recognize potential electrical faults.

To avoid damage to equipment, follow these guidelines:

- Do not allow pressures beyond the specifications listed in this manual.
- Be aware that internal pressures can change unintentionally when equipment is stored with pressure in the system during temperature changes. If sub-cooled liquid refrigerant is trapped in a hose or manifold with no room for expansion, it may result in dramatic pressure variations with seemingly small temperature changes. Pressures can reach high enough levels to cause damage to the instrument's internal pressure transducers. Release liquid refrigerant from the hoses and manifold when disconnecting from a system.
- Do not attempt to introduce liquid or samples heavily laden with oil into the instrument.
- Do not use this instrument on systems containing leak sealing chemicals. These leak sealants can collect and harden in the instrument, causing permanent damage.

Chapter 2:
Getting Started

Getting to Know Your P51-860 TITAN™:

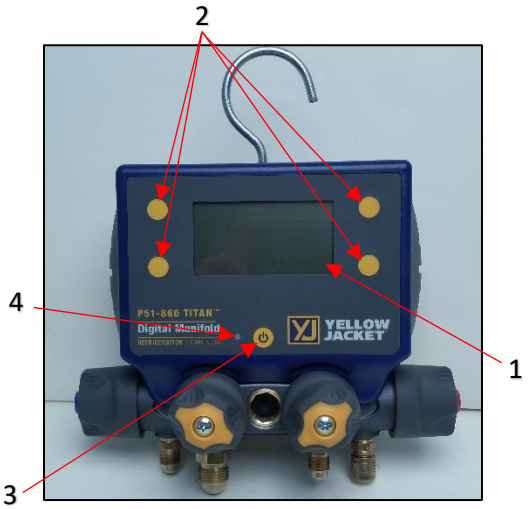

Figure 1: P51-860 Front View

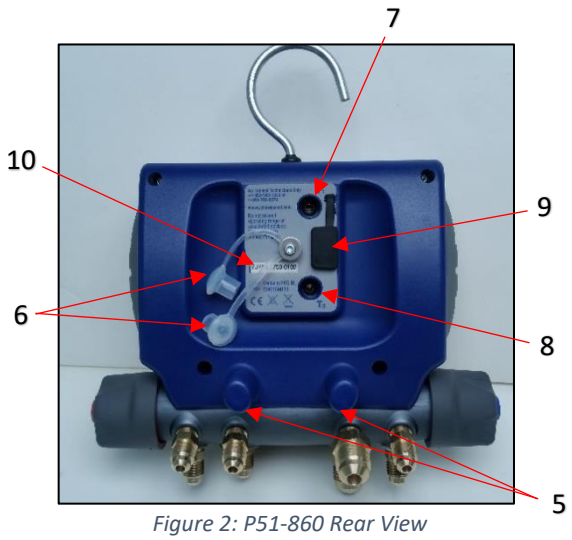

Figure 2: P51-860 Rear View

1. Monochrome Display
2. Interactive Buttons
3. Power/Backlight Button
4. RGB LED
5. Temperature Clamp Mounting Pegs
6. Silicone Plugs
7. T1 Connector
8. T2 Connector
9. Micro-USB Connector
10. Serial Number/Bluetooth ID

Turning the instrument On and Off:

Press and release the power button, located at bottom center of the display. The YJ logo will appear briefly on startup. The current firmware version and Serial Number are displayed at the bottom left and right corners of the display respectively on power up. The instrument will then proceed to the pressure/temperature mode of operation as seen in Figure 3.

Figure 3: Powering on the Device

At any time during operation, press and hold the power button for 3 seconds to turn off the instrument.

Interacting with the device:

The P51-860 TITAN™ features a temporary button webbing system, shown in Figure 4, that allows the user to display and interact with the buttons when desired. While on any mode of operation screen, a single button press of any of the four buttons adjacent to the display will bring up a button webbing around the corners of the display. The button webbing will disappear after four seconds with no user input.

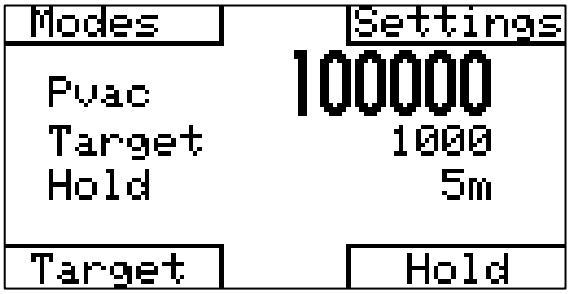

Figure 4: Interactive Button Webbing

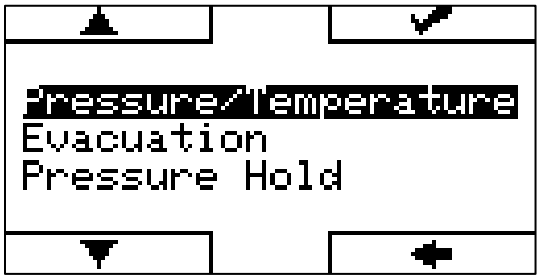

Figure 5: Permanent Button Webbing

All menus feature a permanent button webbing, shown in Figure 5, which allows the user to easily navigate and make selections through the menu system. The up and down arrows to the left of the display allow the user to scroll through the currently selected list. The select button displayed as a check mark in the top right corner of the display allows the user to select the currently highlighted option. The back button displayed as a left pointing arrow in the bottom right corner allows the user to return to the previous menu or screen.

Connecting and Using the Temperature Clamps:

Two (67010) temperature clamps, pictured in Figure 6, are supplied with the P51-860 TITAN™ and can be used to monitor system temperature, superheat and subcooling. To connect the sensors to the device, remove the clear silicone plugs from the back of the device covering connectors T1 and T2. Insert the male temperature clamp connectors into either the T1 or T2 connectors (shown in Figure 7). Attach the clamps to the point on the system where it is desired to measure temperature. Ensure that both jaws of the clamp are well secured and the metal temperature probe on the upper jaw is flush with the surface to be measured.

Figure 6: 67010 Included Temp Probes

Figure 7: Connecting the Temp Probes

When not in use, the temperature clamps can be conveniently stored by attaching to the two mounting pegs located on the back of the device.

Connecting and Using a Vacuum Sensor:

An optional YJ vacuum sensor (67030), shown in Figure 8, may be purchased and used with this unit to measure the current depth of vacuum within a system. To connect the vacuum probe to the device, remove either of the two clear silicone plugs on the back of the device covering the T1 and T2 connectors.

Figure 8: 67030 Vacuum Sensor

Figure 9: Connecting the Vacuum Sensor

Insert the vacuum probe connector into either the T1 or T2 audio connectors as shown in Figure 9. The P51-860 TITAN™ will prioritize the T1 connector but can measure through the T2 connector. Connect the vacuum probe to a system during evacuation to monitor the system pump down. Ensure that the vacuum probe is tight to the system and at a significant distance from the vacuum pump such that it does not disturb the vacuum measurements.

Interpreting the Battery Life Indicator:

This instrument utilizes a 850mAhr rechargeable lithium ion battery. It is equipped with a battery level indicator displayed in the top left corner of all mode screens as seen in Figure 10. At full charge, the battery will appear with no white space (solid black). As the charge is drained, the black bar will decrease in width. No black bar remaining indicates the device has less than 15% charge remaining and should be immediately connected to a power source.

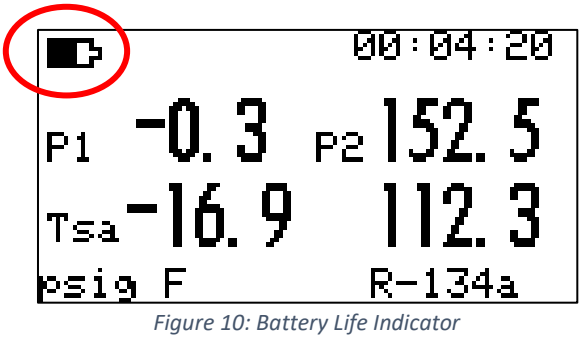

Figure 10: Battery Life Indicator

This device is rated for 5 hours of battery life with full backlight brightness and 80 hours with no backlight. To properly maximize battery life, make use of both auto off and auto dimming features accessible in the device settings menu (See page 18). The most influencing factor on

battery life is the backlight intensity, be sure to adjust the backlight level accordingly depending on your current viewing conditions (See page 18).

Charging the Battery:

To ensure maximum battery life, make sure the P51-860 TITAN™ is charged before and after each job session. To charge the device, remove the micro-usb cover and connect the manifold to a power source via the provided data transfer cable as pictured in Figure 11. When connected to a power source, the LED will turn a solid green. It takes approximately 2.5 – 3hrs to reach full charge from dead battery. Once the device has reached full charge, the green LED will shut off indicating the charge is complete.

Figure 11: Charging the Battery

Operating the Backlight:

This instrument is equipped with a backlit transmissive LCD display to improve readability in all lighting conditions. While the device is powered on, the backlight can be toggled on and off by quickly pressing and releasing the power button. The backlight level can be adjusted from 10 to 100% within the device settings menu (seen in Figure 12).

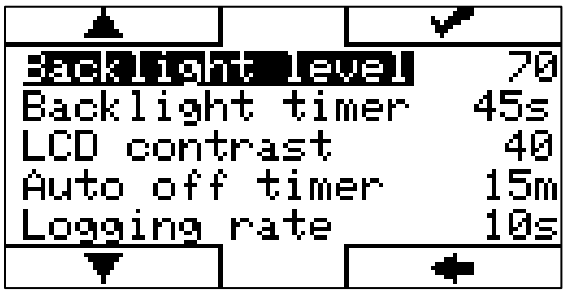

Figure 12: Device Settings - Backlight Settings

To help conserve battery life, this device is equipped with an auto-dimming feature. This feature allows the user to set intervals for how long the backlight should remain on after the last button press. The backlight timer can be adjusted from 5 seconds to 15 min. See pages 17-18 for instructions on adjusting the backlight level and timer.

Datalogging:

The P51-860 TITAN™ digital manifold can be used to gather and record live system readings for later analysis. From the moment the device is powered on, it begins to record all current data inputs including Pressure, Temperature, and Vacuum. The logging rate can be adjusted anytime through the device settings menu (See page 18).

After completing a job, the datalog files can be accessed by connecting the instrument to a PC. To connect the P51-860 TITAN™ to a PC, connect the provided data transfer cable to the micro-usb port on the back of device shown in Figures 13 and 14. Plug the opposite end into the usb port on a PC. Ensure that the device is powered on, the PC will attempt to open the device as a flash drive.

Figure 13: Micro-USB Location

Figure 14: Connecting to the Micro-USB

Datalog files are stored as .csv files and are named with the following date/time convention: last number of year, work week, last three digits of serial number, letter convention preventing duplicates. See Figure 15 for example of stored datalog files.

Ex. 50th week of 2017 with device serial number ending in 127, 4th datalog file; 750127AD

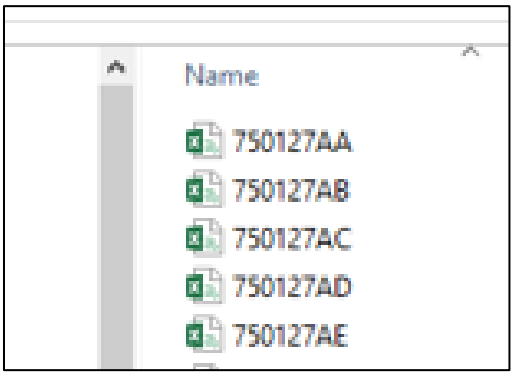

Figure 15: P51-860 TITAN™ as Removeable Drive

These files cannot be modified while stored on the device but can be copied from the drive to the PC and modified using any application compatible with .csv files (Microsoft Excel, notepad, etc.).

When the device is nearing full storage capacity, the device will prompt the user on startup with remaining datalog time at current sampling rate. Selecting “Yes” will clear all datalog files stored

on the device. If selecting “NO”, the device will proceed to normal startup and retain all stored datalog files. If the device reaches Max storage and has not been cleared, it will cease to log data until all files have been cleared from the device. Be sure to select the proper logging rate based on the intended length of the datalog session. As the P51 has limited internal memory, exceeding maximum memory capacity will result in loss of data and may cause corruption of the current datalog session file. To avoid this, ensure to select the appropriate logging rate for your current datalog session. Table 2-1, details the maximum logging duration for several logging rates assuming the internal memory has just been cleared, or is 0% capacity

Table 2-1: Sampling Rates and Time to Maximum Memory Capacity

Selected Sampling Rate (s)	Estimated Datalog Length (hrs)
1s	13.5
5s	67.5
10s	135
30s	405
60s (1 min)	810
300s (5 min)	4054
600s (10 min)	8108 (339 days)

Interpreting the RGB LED:

The LED on the front face of the device can display a variety of colors during normal operation. Below is a list of various colors and flashing schemes encountered during normal use.

- Flashing Blue: The P51-860 TITAN™ flashes blue every time it stores a datalog sample. If the logging rate is set to a larger time increment, the LED will not flash blue as often.

- Flashing Red: When the device reaches low charge, or falls below 10% battery charge, the LED will flash red every time a datalog sample is taken (at the same rate as flashing blue).

- Flashing Violet: The instrument will flash a violet color every 1 second when connected and transmitting data via Bluetooth to a device.

- Solid Red/Blue: The LED will turn a solid red or blue when the power button is pressed and held (usually when powering on/off). Powering on the device will display a solid blue LED, powering off will display a solid red LED.

- Solid Green: The LED will remain a solid green color when connected to a power source and charging. When the device reaches full charge, the solid green light will shut off regardless if it remains connected to a power source.

- Solid Violet: If the instrument is placed into updater mode, the LED will turn a solid violet color and the display will shut off (if the device is powered on). This mode is not intended for normal use; to exit updater mode, hold the power button for 3 seconds or until the LED powers off.

Chapter 3:
Modes of Operation

Modes Menu

The P51-860 TITAN™ defaults to pressure/temperature mode on startup. To access the modes menu (shown in Figure 16), press the mode button in the upper left corner of any modes screen. Use the up, down, and select buttons to navigate to and confirm the desired mode of operation. The back button will return the user to the previous modes screen.

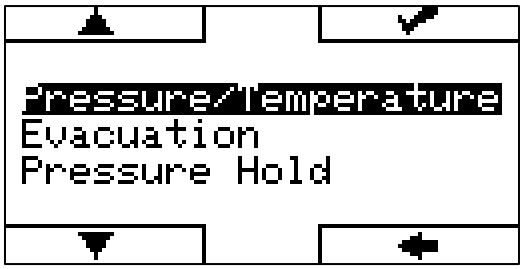

Figure 16: Modes Menu

Pressure/Temperature Mode

Overview:

The P51-860 TITAN™ defaults to pressure/temperature mode on power up. Pressure/Temperature mode can be used to monitor system high and low side pressure, system temperature, vapor saturation and liquid saturation temperature, calculated system superheat and subcooling.

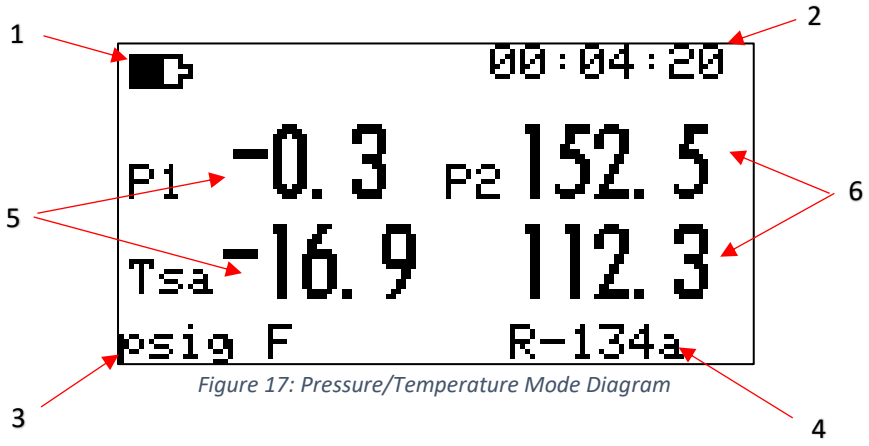

Figure 17: Pressure/Temperature Mode Diagram

1. Battery Level Indicator
2. Session Timer
3. Currently Selected Pressure & Temperature Units
4. Currently Selected System Refrigerant
5. Low Side Pressure & Temperature Measurement
6. High Side Pressure & Temperature Measurement

High and low side system pressures are displayed at the top left and right-hand side of the display as P1 and P2 respectively and the corresponding temperature measurement displayed directly below.

Operating the Pressure/Temperature Mode:

While in pressure/temperature mode, use the bottom two buttons to easily switch between system temperature, saturation temperature, superheat and subcooling. The Tsa button will display saturation temperature (Figure 19), Tsy will display the current system temperature as measured by the connected temperature clamps (Figure 18), and SH/SC will display the measured system superheat and subcooling (Figure 20).

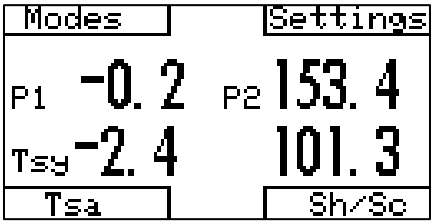

Figure 18: Pressure/System Temperature

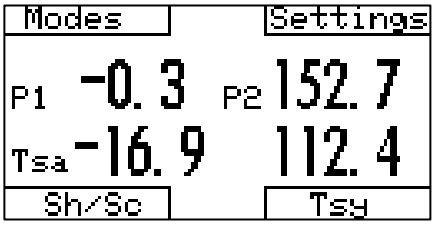

Figure 19: Pressure/Saturation Temperature

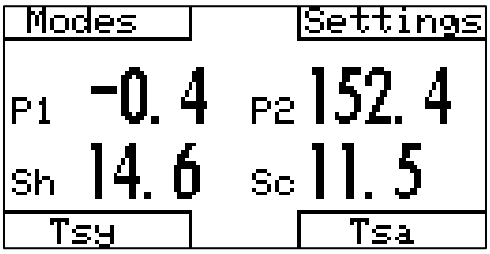

Figure 20: Pressure/Superheat & Subcool

When the temporary button webbing is active, the top left and right corners of the display contain the modes and settings menu buttons respectively. Selecting “Modes” will bring the user to the modes menu, allowing the selection of another mode of operation. Selecting the “Settings” button will advance to the settings menu allowing for a variety of quick settings adjustments.

NOTE: Before connecting to the system, make sure to zero the pressure transducers at ambient pressure to ensure accurate pressure readings. To read about the transducer zeroing process, see page 16.

Evacuation Mode

Overview:

Once the refrigerant has been recovered from the system, the P51-860 TITAN™ can be used to accurately monitor the system evacuation. Evacuation mode displays the current system vacuum level as determined by an optional YJ vacuum gauge (67030), the target vacuum level, and the vacuum hold timer.

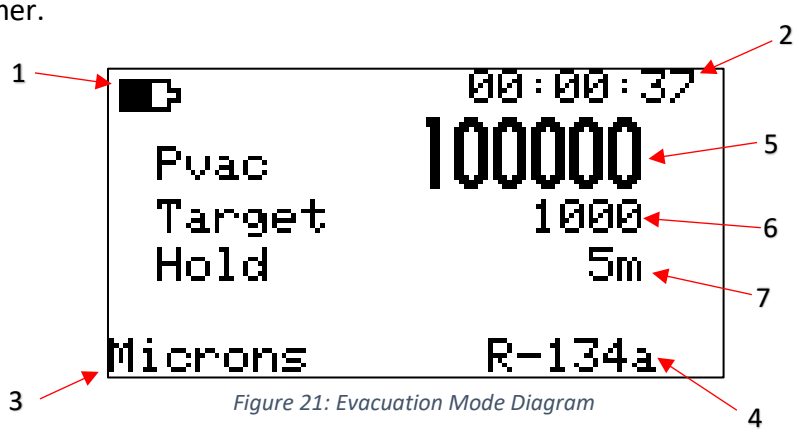

Figure 21: Evacuation Mode Diagram

1. Battery Level
2. Session Timer
3. Currently Selected Vacuum Unit
4. Currently Selected Refrigerant
5. System Vacuum Pressure
6. Target Vacuum Level
7. Vacuum Hold Timer

System vacuum pressure is displayed in real time and is denoted by Pvac. While evacuating the system, the P51-860 TITAN™ will display 100000microns from atmosphere down to the 100000micron vacuum level after which it will accurately measure and display down to 5 microns.

Operating the Evacuation Mode:

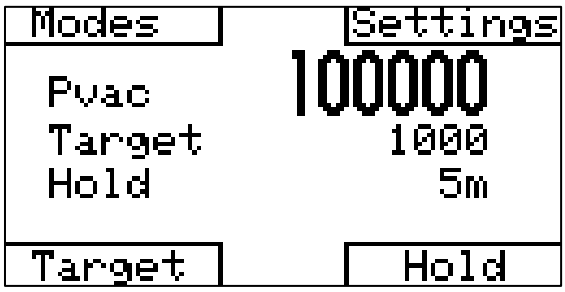

Figure 22: Evacuation Mode

Before beginning an evacuation, connect the YJ vacuum probe (67030) to either the T1 or T2 connectors on the back of the device. Connect the vacuum probe to the system at a sufficient distance from the vacuum pump such that it will not disturb the vacuum reading. Use the bottom two buttons adjacent to the display to set the desired target vacuum level and vacuum hold timer as seen in Figure 22. Pressing each of these buttons will cycle between a range of available values, with the last value selected being automatically saved. Target vacuum level can be adjusted in 6 increments: 200, 300, 400, 500, 750, 1000microns. Vacuum hold timer can be adjusted in 7 increments: 1m, 3m, 5m, 10m, 15m, 30m, None.

NOTE: Using the vacuum hold timer can help to ensure that all refrigerant has been evacuated from the system and the system is free of non-condensables. Refrigerant and non-condensables can cause the vacuum level to rise in a system giving a false positive during a leak test when no leak is present.

Once the target vacuum level has been reached, the vacuum hold timer will start to deplete. When the vacuum hold timer has depleted (or target vacuum has been reached in the event vacuum hold timer is set to NONE), an alarm will sound and the device will prompt a pressure hold test (as seen in Figure 23) to verify there are no leaks within the system. Selecting "Yes" will advance to the pressure hold setup menu, selecting "No" will return to the evacuation screen and silence the alarm.

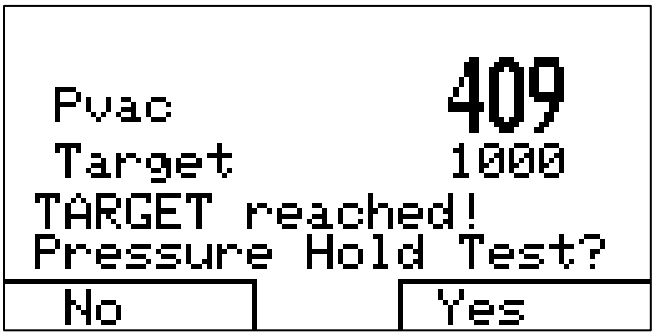

Figure 23: Evacuation - Pressure Rise Test

Pressure Hold Mode

Overview:

The P51-860 TITAN™ can be used to monitor a leak through both a rise in vacuum pressure or a drop in positive pressure. Pressure Hold mode displays the current system pressure (Pc), the initial pressure (Pi), the change in pressure (deltaP), the Limit Pressure (Lim), and the Rate of Change (P/s).

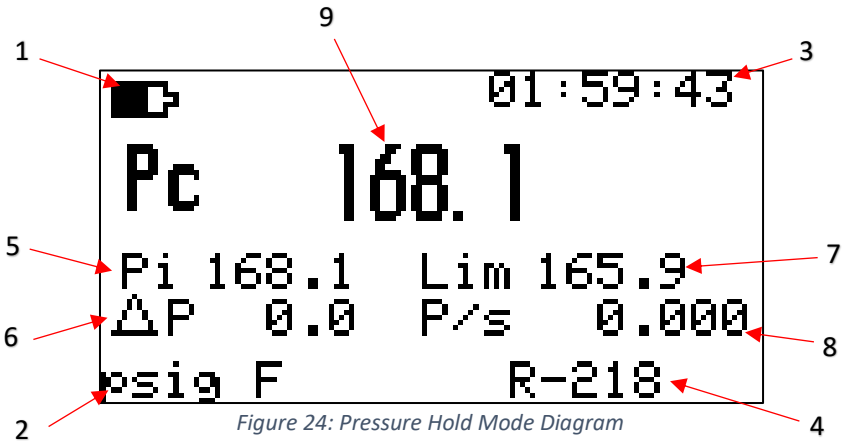

Figure 24: Pressure Hold Mode Diagram

1. Battery Indicator
2. Currently Selected Units
3. Hold Timer
4. Currently Selected Refrigerant
5. Initial Pressure (Pi)
6. Change in Pressure (deltaP)
7. Pressure Limit (Lim)
8. Rate of Change (P/s)
9. Current System Pressure (Pc)

Current system pressure is displayed top center of the display and is denoted by Pc. While monitoring for a system leak, the device will watch for a change in pressure and notify the user if the pressure has fallen below or risen above the pressure limit (Depending on the pressure hold mode selected).

Operating the Pressure Hold Mode:

To begin a pressure hold test, select pressure hold from the Modes Menu. The device will advance to the pressure hold setup menu as seen in Figures 25 and 26. Use the arrow buttons to navigate to the setting to be adjusted and the select button to confirm the desired selection.

Session Type option allows the user to switch between the two pressure hold modes, pressure decay and pressure rise.

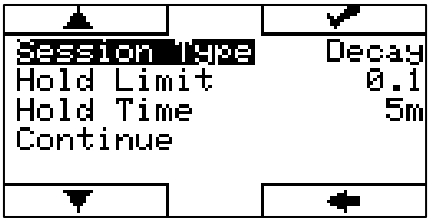

Figure 25: Pressure Hold Mode Setup Menu

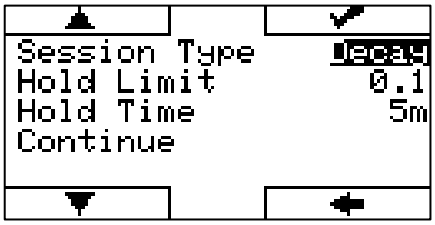

Figure 26: Pressure Hold - Session Type Selection

Pressure Rise session type allows the user to monitor a rise in vacuum pressure through an optional YJ vacuum probe (67030) after the system has been evacuated. In this instance, the hold limit value will be adjusted to an increment of the current vacuum level with ranges from 1000 to 2500 microns. This is the maximum allowable vacuum pressure, above which the P51-860 TITAN™ will indicate a leak in the system (as denoted by a Fail).

Pressure Decay session type allows the user to monitor a drop in system pressure as measured through the low side transducer after the system has been charged to a positive pressure with nitrogen. During a pressure decay test, the hold limit becomes a percentage decrease in the initial system pressure, below which the P51-860 TITAN™ will indicate a system leak (as denoted by a Fail). Hold time sets the total length of time the pressure hold test will be conducted.

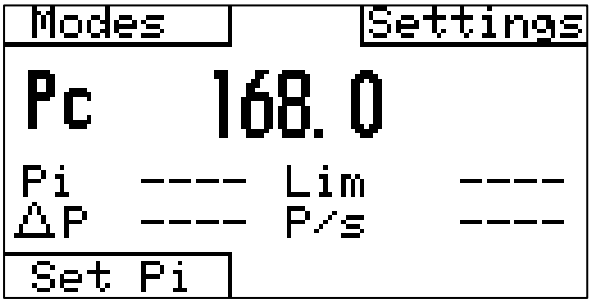

Figure 27: Pressure Hold Test - Setting Initial Pressure

Once all session settings have been confirmed, select the continue option to advance to the pressure hold test. Note that the pressure hold test will not begin until the Set Pi button has been pressed (seen in Figure 27). This allows the user to make any last adjustments before beginning the test. Once the Set Pi button has been pressed, the device will then set current pressure as Pi and begin to monitor for a change between Pc and Pi (shown as deltaP – only available in Pressure Decay Mode). Lim will display the pressure limit above or below which the test will fail (depending on the session type). P/s displays the current rate of change in system pressure per second.

While conducting a pressure hold test, if the system pressure falls below or rises above the set limit pressure (depending on session type), the P51-860 TITAN™ will notify the user that the test has failed as seen in Figure 28. If, at the end of the test, the pressure has not changed enough to indicate a failure, the device will notify the user that the system has passed as seen in Figure 29. At any time throughout the test, Set Pi can be used to reset the test at the current system pressure if the user so desires.

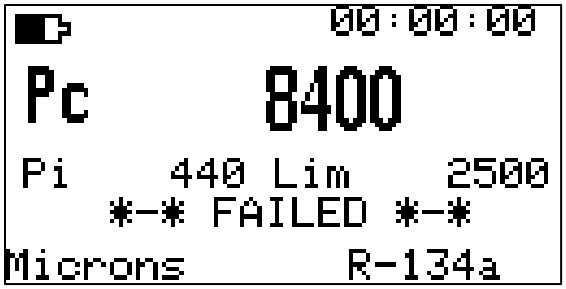

Figure 28: Pressure Hold Mode - Failure

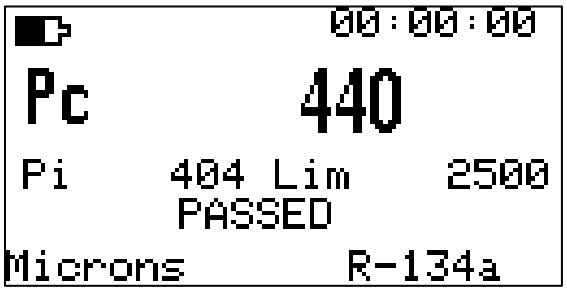

Figure 29: Pressure Hold Mode - Pass

Chapter 4:
Settings

Settings Menus Overview

The P51-860 TITAN™ settings menus are separated into three menus: unit settings, device settings, and general settings. While on any modes screen, the general settings menu can be quickly accessed by bringing up the button webbing then tapping the settings button in the upper right-hand corner as shown in Figure 30.

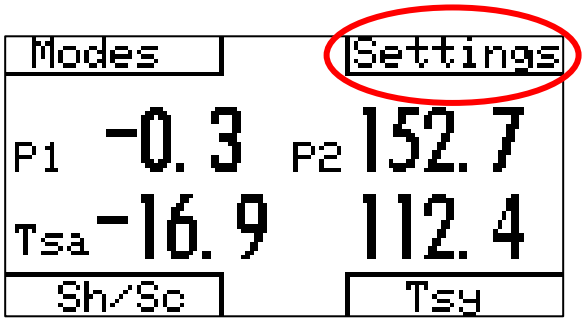

Figure 30: Accessing the General Settings Menu

General Settings Menu

The general settings menu, shown in Figure 31, allows the user to adjust system refrigerant, access the unit and device settings menus, and zero the pressure transducers. To access either the unit or device settings menus, use the up, down, and select buttons to navigate to and confirm the appropriate selection. The back button in the bottom right corner may be used to return to the modes screen at any time.

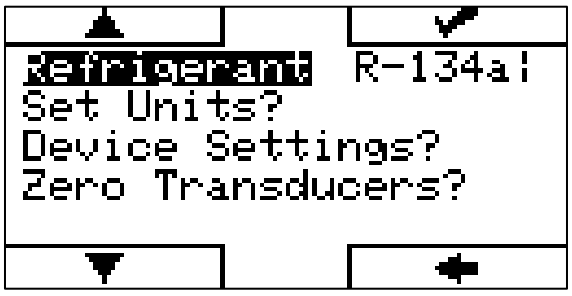

Figure 31: General Settings Menu

Changing Refrigerant:

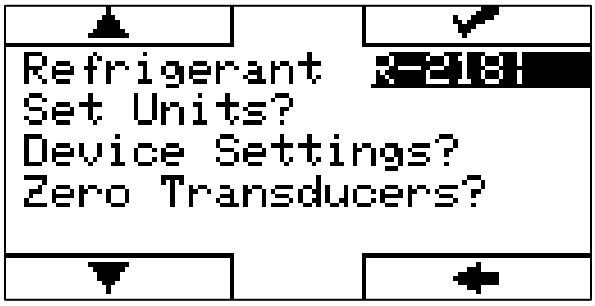

Figure 32: General Settings Menu - Refrigerant Selection

All refrigerants contained within the P51-860 TITAN™ are identified with their official ASHRAE number. It is necessary to select the correct refrigerant when in pressure/temperature mode to display accurate saturation temperature, superheat, and subcooling measurements. To change the currently selected refrigerant, use the up, down, and select buttons to navigate to the refrigerant option and confirm selection as shown in Figure 32. Next, use the up and down arrows to navigate through the list of 126 available refrigerants. Holding the up or down arrow button will allow the user to quickly cycle through the available refrigerants When the desired refrigerant appears on the screen, use the select button to confirm the refrigerant and return to the general settings menu. The back button can be used to return to the general settings menu without selecting a new refrigerant.

Zeroing the Pressure Transducers:

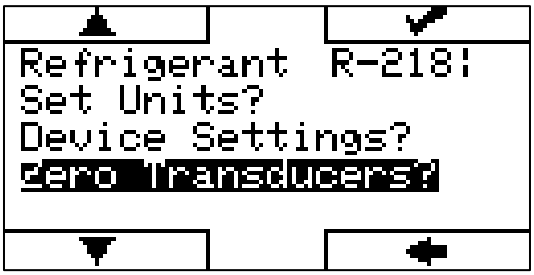

Figure 33: Zeroing the Pressure Transducers

To ensure accurate pressure readings, the pressure transducers should be re-zeroed before every job. To correctly zero the pressure transducers, first remove any pressure from the manifold and ensure all knobs are open such that the manifold is at current atmospheric pressure. Next, use the button webbing to navigate to and select the “Zero Transducers?” option as shown in Figure 33. To confirm the selection, press select an additional time as shown in Figure 34. To return without zeroing the transducers, use the return button in the bottom right corner.

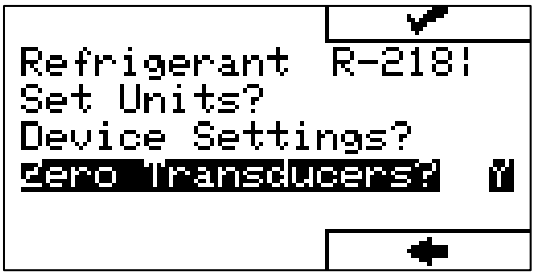

Figure 34: Confirming the Zeroing Selection

If the zeroing was successful you will be returned to the general settings menu. If the zeroing was unsuccessful an error message will be displayed indicating which of the transducers failed the zeroing process. A common issue when zeroing transducers is residual positive pressure within the manifold. If the device senses excessive pressure when prompted to zero the transducers, it will display an error message.

Unit Settings Menu

The unit settings menu can be used to quickly change currently selected units. To access the units settings menu, while in the general settings menu, use the button webbing to navigate to and select “Set Units?.” While in the unit settings menu, simply use the up, down, and select buttons to navigate to and confirm the type of unit to be adjusted as shown in Figure 35. Once the type of unit has been selected, again use the button webbing to adjust until the desired unit of measure is displayed (shown in Figure 36). Use either the select button to confirm the selection or the back button to return to the unit settings menu without saving the new selection. While in the unit settings menu, use the back button to return to the general settings menu.

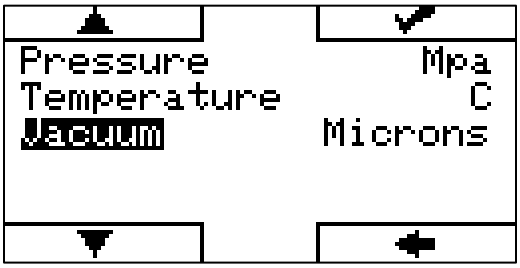

Figure 35: Unit Settings Menu

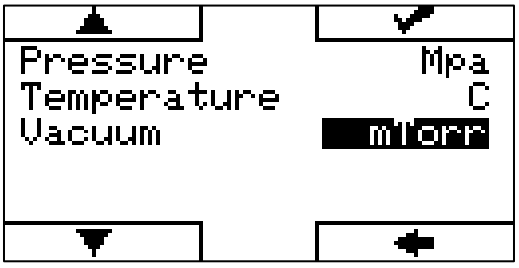

Figure 36: Confirming the Unit Selection

Pressure Units:

Pressure units are used to display pressure measurements while in pressure/temperature and pressure decay mode. This unit can be adjusted to one of six pressure units: psig, psia, bar, kg/cm^2, MPa, and kPa.

Temperature Units:

Temperature units are used to display temperature measurements while in pressure/temperature mode. This unit can be adjusted to one of two temperature units: °F, and °C.

Vacuum Units:

Vacuum units are used to display vacuum measurements while in evacuation mode. This unit can be adjusted to one of seven vacuum units: Microns, Pa, kPa, mmHg, mTorr, Torr, and mBar.

Device Settings Menu

The device settings menu, shown in Figure 37, can be accessed through the general settings menu and can be used to adjust a variety of settings. To access the device settings menu, while in the general settings menu, use the button webbing to navigate to and select “Device Settings.” While in the device settings menu, simply use the up, down, and select buttons to navigate to and confirm the device settings to be adjusted. Once the specific

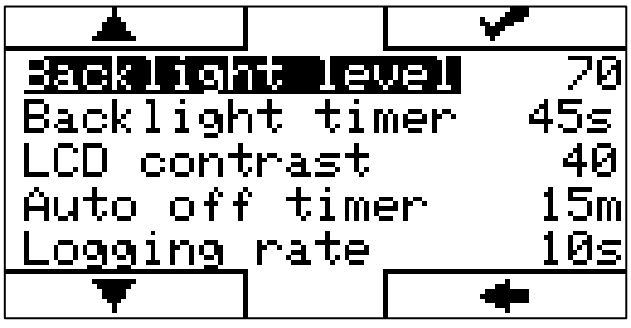

Figure 37: Device Settings Menu

device setting has been selected, again use the button webbing to adjust until the desired value is displayed. Use either the select button to confirm the selection or the back button to return to the device settings menu without saving the new selection. While in the device settings menu, use the back button to return to the general settings menu.

Backlight Level:
Backlight level can be used to adjust the intensity of the LCD backlight in a range of values from 10 to 100%. Increasing the backlight intensity may help viewability in different lighting but will also decrease the battery life.

Backlight Timer:
The backlight timer sets the duration the backlight will remain active since last button press. If the backlight timer is set to a higher value, the backlight will remain on for a longer period but at the cost of decreased battery life. After the backlight turns off, it can be toggled on at any time with a quick press of the power button. The backlight timer can be adjusted in eight increments: 5s, 15s, 30s, 45s, 60s, 5m, 10m, and 15m.

LCD Contrast:
LCD contrast allows the user to adjust the contrast of the display granting increased viewability in various lighting conditions. Depending on temperature conditions, the display may appear darker or washed out. Adjust the LCD contrast option to help account for any changes in contrast due to ambient conditions. LCD contrast can be adjusted from 30 to 60% in 1% increments.

Auto Off Timer:
The auto off timer will automatically power the unit down if there has been no user input for the selected duration of time. This feature can be used to significantly increase the battery life of the manifold. The auto off timer can be set to four increments: 15m, 30m, 1hr, and None. Selecting “None” will prevent the unit from auto powering off.

NOTE: If attempting to capture datalogs for an extended period, ensure that the auto off timer is set to none. If the auto off timer is not set to none, the device will power off after the set time interval and any additional datalogging information will be lost.

Logging Rate:
Logging rate sets the time interval for how often a data sample is stored. It may be tempting to set the logging rate to the lowest possible time interval (1s) but this may result in extremely large datalog files making it difficult to analyze the information. Be sure to set the logging rate to an appropriate interval for the conditions being tested. The logging rate can be set to thirteen different time intervals: 1s, 5s, 10s, 30s, 1m, 5m, 10m, 30m, 1hr, 2hr, 6hr, 12hr, and 24hr.

Be sure to select the proper logging rate based on the intended length of the datalog session. As the P51 has limited internal memory, exceeding maximum memory capacity will result in loss of data and may cause corruption of the current datalog session file. To avoid this, ensure to select the appropriate logging rate for your current datalog session. Table 4-1, details the maximum

logging duration for several logging rates assuming the internal memory has just been cleared, or is 0% capacity.

Table 4-2: Sampling Rates and Time to Maximum Memory Capacity

Selected Sampling Rate (s)	Estimated Datalog Length (hrs)
1s	13.5
5s	67.5
10s	135
30s	405
60s (1 min)	810
300s (5 min)	4054
600s (10 min)	8108 (339 days)

Chapter 5:
Mantooth App Integration

Overview:

The P51-860 TITAN™ features a Bluetooth low energy radio and is fully compatible with both the iOS and Android Mantooth™ Apps V3.0 or later. The Mantooth app in conjunction with the P51-860 TITAN™ can be used to remotely monitor system pressure, temperature, vacuum, and perform target superheat and subcool calculations. Additionally, the Mantooth app can generate its own datalog files and job reports.

Operation of the Mantooth App with the P51-860 TITAN™:

Before the P51-860 TITAN™ can be used with the Mantooth App, the Mantooth App must be installed and updated to version 3.0 or newer on the desired mobile device. Before using the Mantooth App, ensure that the manifold is paired to the desired mobile device.

For Android devices, navigate to the Bluetooth utility and make sure the manifold is powered on. The P51-860 TITAN™ should appear in the available devices menu as the name of the device followed by the serial number (Ex. YJP51-1801-0103) as seen in Figure 38. Select the appropriate device and it should appear in the paired devices menu.

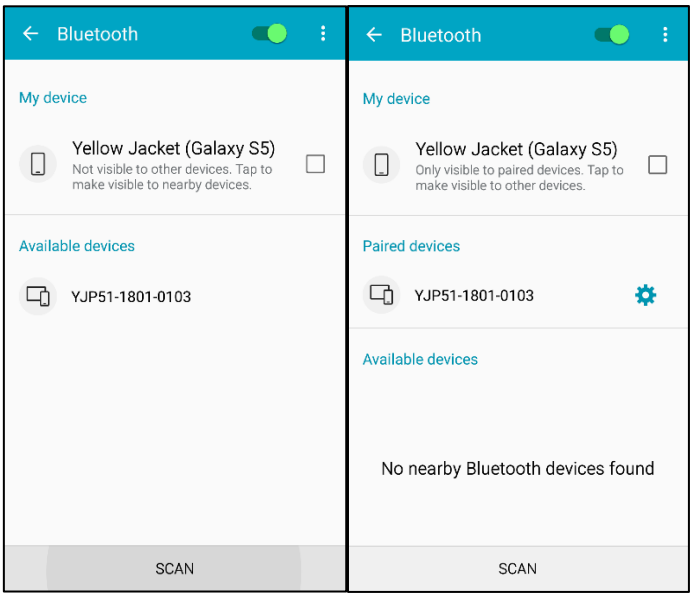

Figure 38: Android - Pairing a P51-860 TITAN™

For iOS devices, the manifold does not need to be paired through the Bluetooth utility. The P51-860 TITAN™ will be available to connect through the Mantooth App if the device is powered on and the Mantooth App is updated to version 3.0 or newer.

For instructions on operating the Mantooth App, selecting or adjusting settings, retrieving datalog files, generating job reports, and all other features of the Mantooth App, please see the Mantooth User Guide by following the hyperlink below.

http://yellowjacket.com/wp-content/uploads/2016/02/ManTooth-PTV-Operating-Guide.pdf

When the P51-860 TITAN™ is connected to a mobile device via Bluetooth, the LED will flash violet every second.

Chapter 6:
Maintenance

Overview:
Basic operator maintenance is covered in this chapter. For more extensive maintenance and for repair, contact Ritchie Customer Service. See Chapter 1 for contact information.

General Maintenance:
Since this instrument may be used in the presence of a wide range of chemical liquids and vapors, it is recommended that the case be cleaned often with a damp cloth and mild detergent such as dish soap.

Although the display is protected by a tough scratch resistant lens, take care when cleaning the lens as clarity is a critical component of this instrument:

- Normally, the lens can be cleaned as one would clean plastic eyeglass lenses: Use a soft, 100% cotton or microfiber cloth and water or eyeglass lens cleaning solution. Do not use paper products.
- If the lens is very dirty, generously soak a soft cloth with warm, soapy (dish soap) water and place the cloth for a couple of minutes over the lens to loosen any stubborn dirt. Wipe off excess water with a clean, less dampened, 100% cotton or microfiber cloth, and complete the cleaning using the normal lens cleaning method described above.
- DO NOT place the device under running water, always use a dampened cloth to transport liquid to and from the device.

Replacement Parts:
If parts are damaged please see Table 6-1 for replacement part numbers.

Table 6-1: Replacement Parts

UPC#	Description
67030	Vacuum Sensor
67010	Temperature Probe
21990	(3) 60” RYB (standard Fittings); (1) 60” Y (3/8” str x 3/8” 45° Quick Coupler)
67012	USB Cable

Software Updates:
Details related to software updates are available online at www.yellowjacket.com or by contacting Ritchie Engineering. See Chapter 1 for contact information.

Chapter 7:
Device Specifications

Table 7-1: Physical Specifications	
Maximum Pressure	700 psia (48.3 bar)
Operating Temperature	140 to -4°F (60 to -20°C)
Storage Temperature	140 to -4°F (60 to -20°C)
Battery Life	5 hrs continuous Backlight
	80 hrs no Backlight
Size	Approx. 7.5" x 8.5" x 4.25"
Weight	2.53 lbs

Table 7-2: Instrument Specifications	
Working Pressure	0 – 700 psia (48.3 bar)
Pressure Sensing Resolution	0.1 psi, 0.1 bar, 1 kPa
	0.001 MPa, 0.01 kg/cm^2
Pressure Sensing Accuracy	0.5% of full scale at 77°F (25°C)
	1% of full scale 55 to 130°F (13 to 54°C)
	2% of full scale -40 to 248°F (-40 to 120°C)
Temperature Sensing Range	Sensing element: -40 to 266°F (-40 to 130°C)
	Max Cord temp: 176°F (80°C)
	Max Clamp Temp: 203°F (95°C)
Temperature Sensing Resolution	0.1°F or °C
Temperature Sensing Accuracy	±0.36°F (±0.2°C)
(Optional) Vacuum Sensing Range	5 to 100000 microns
(Optional) Vacuum Sensing Resolution	1 micron

Chapter 8:
Troubleshooting Guide

Table 8-1: P51 Troubleshooting			
Model(s)	**Problem**	**Possible Cause(s)**	**Possible Solution(s)**
40860/ 40870	Screen does not display anything	Screen is auto-dimming, backlight is off	Check backlight auto-dimming timer (40870 only)
			Tap power button or anywhere on display to power on backlight (40870 only)
		Device is not powering on	Make sure manifold is sufficiently charged
		Screen is damaged	Contact technical support
40860	Screen has dimmed	Backlight has turned off	Tap power button to power on backlight
			Check backlight auto-dimming timer in device settings
		Screen is damaged	Contact technical support
40870	Screen not responding to touch	Display not calibrated properly	Recalibrate display (see User Manual/Quick Start Guide)
		Display is damaged	Contact technical support
		Device is connected to PC	Disconnect from PC
40860/ 40870	Device not responding to button press	Buttons/overlay damaged	Contact technical support (40860 only)
		Device is connected to PC	Disconnect from PC
40860/ 40870	Pressure Transducers won't zero	Manifold is under pressure	Make sure manifold is vented to atmosphere
		Pressure transducers damaged	Contact technical support
40860/ 40870	Temperature reading incorrect/not displaying	Temperature clamp barrel connector not fully seated in back of manifold	Check temperature clamp connections on back of manifold
		Temperature clamp/cable damaged	Call technical support
		Temperature clamp jacks damaged	Call technical support
		Clamp not properly attached to system	Check clamp connections to system
		Low-Side and High-Side readings reversed	Make sure T1 is attached to system low-side, T2 to system high-side
		Wrong PT readings mode selected	Make sure Tsy mode is selected (40860 only)
40860/ 40870	Vacuum reading incorrect/not displaying	Vacuum probe barrel connector not fully seated in back of manifold	Check vacuum probe connections on back of manifold
		Vacuum probe/cable damaged	Call technical support
		Vacuum probe jacks damaged	Call technical support
		Probe not properly attached to system	Check vacuum probe connections to system
		Vacuum probe plugged into wrong jack	Make sure vacuum probe is plugged into A1 or A2 jacks (40870 only)

40860/ 40870	Pressure readings incorrect	Pressure transducers not zeroed properly	Make sure pressure transducers are zeroed before use
		Pressure transducers damaged	Call technical support
40860/ 40870	Manifold not holding pressure/vacuum	Knobs are open	Check position of knobs
		Manifold damaged/leaking	Call technical support
		Hose connections not tightened properly	Check hose connections
40860/ 40870	Device not recognized when connected to PC	USB cable not connected properly	Check USB connection to P51 manifold and PC
		Device not powered on	Power on P51 manifold for data transfer
		USB cable damaged	Use alternate USB cable
		Manifold damaged	Call technical support
40860/ 40870	Unable to save new data logs	Device memory full	Upload existing datalogs and clear system memory (upon next power up)
		Manifold damaged	Call technical support
40860/ 40870	Manifold not charging, LED not solid green	USB cable not connected properly	Check USB connection to P51 manifold and power source
		USB cable damaged	Use alternate USB cable
		Device fully charged	No action
		Manifold damaged	Call technical support
40860/ 40870	Unable to establish Bluetooth connection	Device is not powered on	Make sure P51 manifold is powered on
		Bluetooth not enabled on mobile device	Enable Bluetooth on the mobile device
		ManTooth App old version	ManTooth app must be version 3.0 or newer
		Manifold not paired to mobile device	Pair manifold with mobile device using Bluetooth settings utility (Android only)
		Manifold not within range of mobile device	Ensure manifold and mobile device are within range (~400 ft)
40860/ 40870	Bluetooth connection lost	Manifold has been powered off	Adjust auto-off timer
			Make sure manifold is sufficiently charged
		Mobile device has moved out of range	Move mobile device back into range of manifold
40860/ 40870	LED is flashing red and device is powering off immediately	Battery charge is critically low	Charge manifold battery
40860/ 40870	LED is solid purple and screen does not display anything	User has entered updater mode	Hold power button for 3 seconds until LED powers off