OPERATING INSTRUCTIONS

SPARTAN SMART MANIFOLD

SPECIFICATIONS

- Gauge: Class 1.0
- Pressure Display: psi, bar, MPa, kg/cm^2, kPa
- Temperature Display: ˚F or ˚C
- Deep Vacuum Display: micron, mBar, kPa, Pa, Torr, mTorr, mmHg
- Sensing Resolution: 1 psi (.07 bar, .007 MPa, .07 kg/cm^2)
- Sensing Accuracy: ±1 psi or 1% of reading (whichever is greater)
- Working Pressure: 0 to 725 psi (50 bar, 5 MPa, 52 kg/cm^2)
- Proof Pressure: 1000 psi (70 bar, 7 MPa, 70 kg/cm^2)(Tolerable pressure without internal damage)
- Refrigerant Temperature Range: -40 to 200˚F (-40 to 93˚C)
- Operating Temperature: 32 to 122˚F (0 to 45˚C)
- Temperature Accuracy: ±1˚F (±0.5˚C) between 32 to 160˚F (0 to 71˚C)
- Storage Temperature: 10 to 120˚F (-12 to 49˚C)
- Vacuum Sensor: Range 20,000 to 1 micron
- Connections: 1/4" m-flare and 3/8" m-fl (vacuum hose connection (4 way only))
- Power: Li-Ion rechargeable battery (charge through supplied USB type C cable)
- Battery Life: 30-36 hours normal use (25-30 hours with Bluetooth® enabled)
- Auto-Off: after 30 minutes, sleep mode 4 minutes
- Data Logging: Up to 36 hours

WARNING!!

- **Wear Safety Glasses / Wear Gloves**
- **If eyes come in contact with refrigerant, immediately flush with plenty of water. Seek medical attention immediately.**
- **If the battery indicator is red, charge the manifold before use. The sensors will not give accurate readings if the battery level is in the red.**
- **Keep the manifold in a dry place. Do not allow moisture to enter the unit.**
- **Do not set manifold on top of an A/C system. This will result in incorrect temperature probe readings.**
- **Your digital manifold has been designed to eliminate the damaging effects of Electric Static Discharge ESD. If the unit is disrupted by ESD, it could affect the display and the unit may restart.**

USING THE MANIFOLD

Note: Charge overnight before first use

TURNING ON AND USING THE TOUCH SCREEN

To turn the unit on, press the on/off button. The screen will flash white, go black, then the unit will start up. If the unit flashes white, but does not turn on, you might need to press the button and hold it a little longer.

The manifold has a resistive touch screen. That means you can use any non-scratching item to press the buttons on the screen. Even a gloved finger.

Use a light touch on the screen to activate a button.
Note: You might have to keep the button pressed a little longer than you are used to.

The display will turn off (sleep) after four minutes. The manifold will keep running for 26 minutes after the screen turns off before turning off completely. To turn the display back on, touch anywhere on the screen or press the power button. To turn the manifold off, press the power button while the screen is on.

The left (your left when facing the screen), blue side of the manifold is for the HVAC unit's compressor suction or low-pressure side. The right, red side is for the compressor discharge or high-side of the unit.

CHECKING THE PRESSURES AND TEMPERATURES OF AN HVAC UNIT

Make sure the valves on the manifold are closed. Attach a blue hose to the left fitting (your left when facing the screen) and a red hose to the right fitting, using the opposite end of the hose from the hose's valve or check valve. Attach the valve end of the blue hose to the suction side of the HVAC unit and the valve end of the red hose to the compressor outlet side. The manifold should show the pressure inside the unit.

SATURATED PRESSURES, SUPERHEAT AND SUBCOOL

For the manifold to calculate the refrigerant's saturated pressure it has to be set to the refrigerant in the HVAC unit. To set the refrigerant, see "*Refrigerants Screen*" below.
The manifold will calculate superheat and subcool using the K type thermocouple clamps. Plug the clamp needed into the manifold. For superheat, use the left port. If you need subcool, plug the clamp into the right port. You can use both ports at the same time if needed. The actual temperature at the clamp and the appropriate subcool/superheat will be calculated and displayed.

RECOVERY, VACUUM AND CHARGING

TWO-WAY MANIFOLDS

Use the center port to recover, vacuum and charge HVAC units. Attach hoses the same way as above. To recover the refrigerant in the system, connect the recovery machine to the center port of the manifold using the recovery machine's instructions. When ready to recover, open both valves on the manifold.

To vacuum the system, connect a vacuum pump to the center port of the manifold. There should be no pressure in the system. Turn on the vacuum gauge in the manifold. See "*Vacuum/Micron Sensor Gauge Screen*" below. It is recommended to calibrate the vacuum sensor at atmospheric conditions before use. To do that, remove the cap or any hose on the center port. See *"Vacuum Sensor Calibration Screen"* for instructions. **DO NOT do a deep vacuum calibration** unless you have a highly accurate vacuum gauge for a reference. With the vacuum pump connected, turn on the vacuum pump and open the valves.

To charge a system, connect the center port of the manifold to a refrigerant cylinder on a scale. Purge the hose before charging the HVAC unit. Be sure to charge liquid refrigerant. Follow the HVAC unit's instructions and the scale's instructions to put a correct charge in the system.

4-WAY MANIFOLDS

4-way manifolds have the advantage of an extra fitting and two more valves than a 2-way manifold. This allows the system to be vacuumed and charged without changing any hose connections. Recovery can be done with the same setup as a 2-way manifold. Normally, the left-center fitting and black valve are used to connect to a recovery system and vacuum pump.

The black valve can be closed to isolate the manifold and a vacuum pump can be attached to the left-center fitting. This will prevent any loss of vacuum created by the recovery machine.

For vacuum and charging, a vacuum pump is connected to the left-center fitting and a source of refrigerant is connected to the right-center fitting. This way, the hose connected to the refrigerant source can be vacuumed so purging of the refrigerant hose is not necessary.

Make sure the valve to the refrigerant tank is closed and there is no pressure in the HVAC unit. Open all the valves on the manifold and vacuum the system. Turn on the vacuum gauge in the manifold. See *"Vacuum/Micron Sensor Gauge Screen"* below. It is recommended to calibrate the vacuum sensor at atmospheric conditions before use. To do that, make sure the manifold is at atmospheric pressure. See *"Vacuum Sensor Calibration Screen"* for instructions. **DO NOT do a deep vacuum calibration** unless you have a highly accurate vacuum gauge for a reference.

After the unit has been evacuated, close the black valve on the manifold. The unit is now ready for charging. With the refrigerant tank on a scale, follow the HVAC unit's instructions and the scale's instructions to put a correct charge in the system.

ADDITIONAL MANIFOLD FEATURES

PRESSURE/VACUUM LEAK TESTING

The manifold has the capability to do a pressure leak-down test or a vacuum leak-up test. A leak test is used to check for gross leaks after a system repair without having to charge the system with refrigerant. For either one, press MENU then press LEAK TEST.

To do a pressure leak test, pressurize the HVAC system with nitrogen or some other inert gas (never air) to the high-side running pressure. Select PRESSURE in the leak test screen. See *"Pressure/Vacuum Leak Test Screen"* for the specifics on setting the manifold to do the test. The manifold will show you the starting pressure, the final pressure and calculate the difference for you.

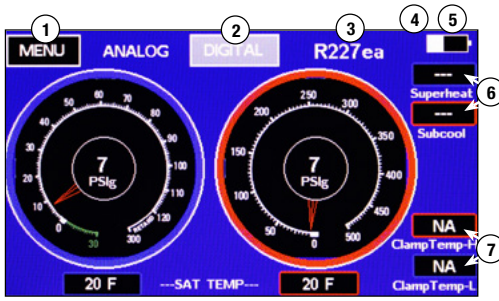
To do a vacuum leak test, pull a high vacuum on the system. Press VACUUM on the leak test screen. See "*Pressure/Vacuum Leak Test Screen*" for the specifics on setting the manifold to do the test. The manifold will show you the starting pressure, the final pressure and calculate the difference for you.

DATA LOGGING

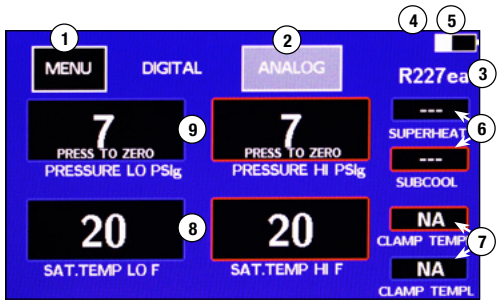
The manifold can record the values on the manifold's main screen then be downloaded to the Mastercool app. This is so you can see how the system is operating under normal usage for a long period of time. Go to MENU then DATA LOGGING to get to the datalogging screen. See "*Datalogging Screen*" below for instructions on how to set the recording time and sampling frequency. The manifold does not need to be monitored during this process. It will remain on while recording, even though the screen will be blank. Touch the screen to see the recording progress. The unit remains on after it is finished recording.

The data from the manifold can be downloaded using the Mastercool app. It will be in .csv format and can be imported to a spreadsheet program from there for analysis. Each data point will be numbered and time stamped.

MAIN SCREENS



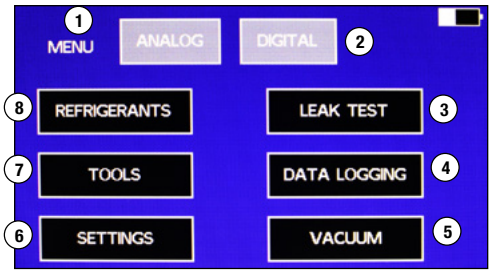
ANALOG SCREEN



DIGITAL SCREEN

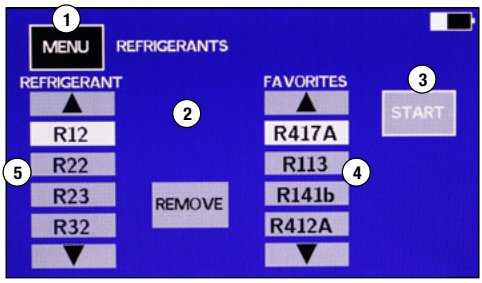
1. Menu: Goes to menu selections
2. Toggles between ANALOG and DIGITAL displays
3. Current refrigerant setting
4. ᛒ: Displayed when manifold is connected to the Mastercool app
5. ▬: White displays the battery level. If the symbol is green, the battery is charging. If the symbol is red, the battery needs charging. If the symbol is yellow, the battery is full. **CAUTION:** If the battery symbol is red, the sensor readings may not be accurate.
6. Superheat and subcool values: Displayed if the appropriate temperature sensor is plugged in and the pressure is in range for the refrigerant in use
7. Clamp temperature values: Displayed if the corresponding temperature sensor is plugged in
8. Saturated temperature values: Calculated from pressure and refrigerant setting.
9. Actual pressure values

MENU SCREEN



1. ANALOG: Goes to the analog main screen.
2. DIGITAL: Goes to the digital main screen.
3. LEAK TEST: Use this button to do leak testing for pressure and vacuum.
4. DATA LOGGING: Use this button to record the values on the analog and digital screens.
5. VACUUM: This goes to the vacuum screen and turns the vacuum on.
6. SETTINGS: Use this screen to change the units on all the screens.
7. TOOLS: This gives access to calibrate the gauges, turn the Bluetooth® on and off, update the firmware and an accessory timer.
8. REFRIGERANTS: Use this screen to change the list of favorite refrigerants and to change the refrigerant the manifold uses for calculations.

REFRIGERANTS SCREEN



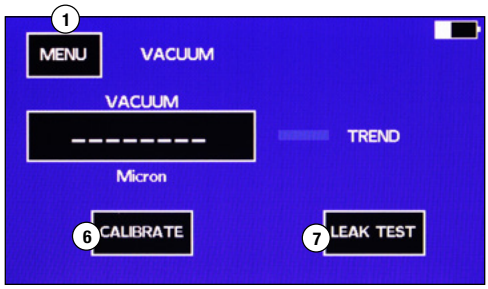
1. MENU: Press to return to the menu screen without saving any changes.
2. ADD and REMOVE: Press to add or remove refrigerants from the favorites list.
3. START: Press to set the manifold to the highlighted refrigerant under favorites and return to the main display.
4. List of favorite refrigerants: To highlight a refrigerant use the up and down arrows.
5. List of all refrigerants: To highlight a refrigerant use the up and down arrows.

TO ADD OR CHANGE A REFRIGERANT ON THE FAVORITES LIST

1. There is room for four favorite refrigerants (4).
   a. If all four refrigerant spaces are taken, The ADD button (2) will not be displayed. To display the ADD button, remove one of the refrigerants on the favorites list by using the arrows to highlight it, then press REMOVE.
2. To add a refrigerant to the favorites list, use the up and down arrows on the refrigerant list (5) to highlight the refrigerant needed, then press the ADD button.
3. To select which refrigerant the manifold will use for saturated temperature calculations, highlight the refrigerant on the favorites list, then press START.

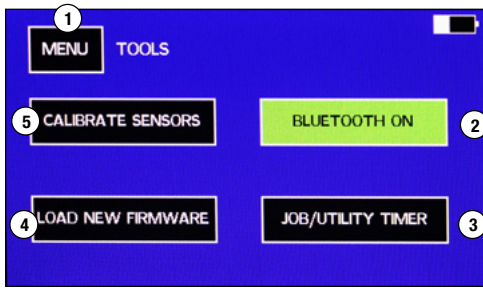
Note: To add a new refrigerant to the refrigerants list, see "*Updating the Manifold Firmware*"

VACUUM/MICRON SENSOR GAUGE SCREEN



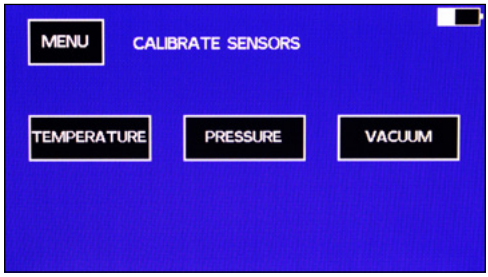
1. To use the high vacuum gauge, go to MENU then VACUUM.
2. It will have a short warm-up period, then the vacuum value will be displayed.
3. If the vacuum is over 20,000 microns, it will display dashes.
4. The TREND will show a green down arrow if the pressure is decreasing, a blue dash if the pressure is not changing and a red up arrow if the pressure is increasing.
5. MENU: Goes to the MENU screen
6. CALIBRATE: Goes to the vacuum calibration screen
7. LEAK TEST: Goes to the leak test screen.

TOOLS SCREEN



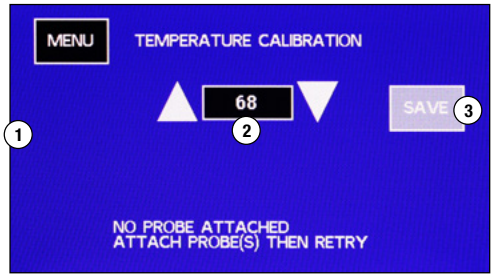
1. MENU: Returns to the MENU screen
2. BLUETOOTH®: Toggles the Bluetooth® on and off. To increase battery life, keep Bluetooth® turned off when not in use.
3. UTILITY TIMER: To go to built-in utility timer
4. LOAD NEW FIRMWARE: Use to load new firmware through the USB connector
5. CALIBRATE SENSORS: Use to calibrate sensors

CALIBRATE SENSORS SCREEN



1. Press the button for the sensor(s) you want to calibrate.
2. Press MENU to return to the menu screen.

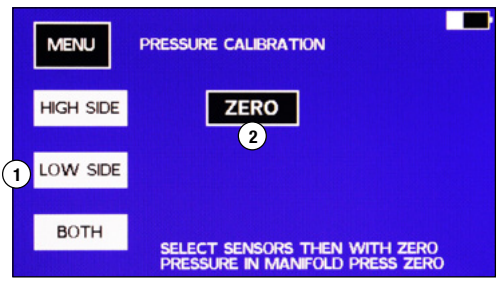
TEMPERATURE SENSOR CALIBRATION SCREEN



1. Plug in a K-type thermocouple that needs to be calibrated. HIGH SIDE and/or LOW SIDE will be displayed when a sensor is plugged into the manifold in those positions. The sensors need to be plugged in before going to this screen.
   Note: If no temperature sensors are listed and they are plugged in, there is an issue with the temperature sensor or the manifold. Try a "known-to-be-good" K type thermocouple. Press MENU to go out of the screen then go back into it. If it is not displayed on the screen, contact customer service.
2. Get the sensors to a known temperature. Use the up and down arrows to display the known temperature of the sensors.
3. Press SAVE to save the calibration and return to the main screen.

Note: Press MENU to return to the menu screen without changing the calibration setting(s).

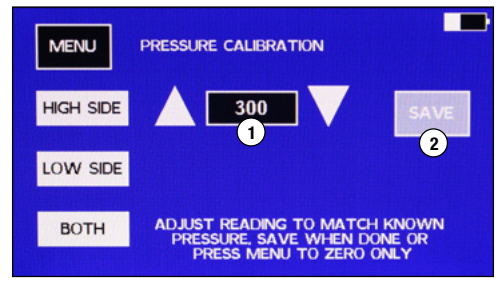
PRESSURE SENSOR CALIBRATION SCREEN - STEP 1



1. Select HIGH SIDE, LOW SIDE, or BOTH pressure sensors to be calibrated.
2. With the pressure sensor(s) selected and the manifold at atmospheric pressure, press ZERO.

Note: Pressing MENU will save the zero setting and return to the MENU screen. Pressing MENU before pressing ZERO will return to the MENU screen without changing the calibration settings.

PRESSURE CALIBRATION SCREEN - STEP 2



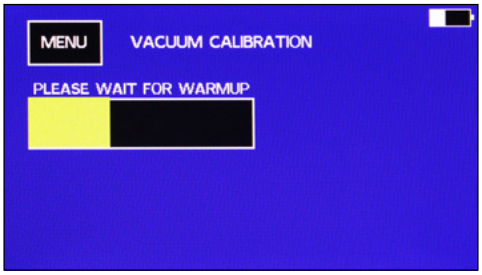
Note: Do not press SAVE if the pressure in the manifold does not match the pressure displayed. To exit without saving, press MENU.

Note: The pressure sensors read the pressure on the hose side of the valves.

TIP: To calibrate both sensors with one pressure source, pressurize one hose. Put a cap on the other side hose fitting and make sure both valves are open.

1. Put a known pressure into the manifold's hose(s).
2. Use the up and down arrows to adjust the value on the pressure calibration screen to the known pressure.
   Note: It is best to calibrate the sensors at close to 300 PSI
3. Press SAVE to calibrate the sensor(s) and return to the main screen.

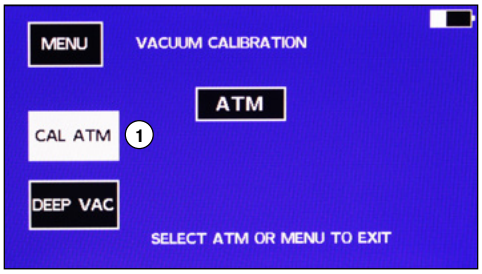
VACUUM SENSOR CALIBRATION SCREEN



Note: To exit without calibrating, press MENU at any time.
Note: A calibration at atmospheric pressure is recommended anytime conditions - temperature as well as atmospheric pressure - have changed from the last calibration. A deep vacuum calibration has been done at the factory and only needs to be done again if the deep vacuum values are off.

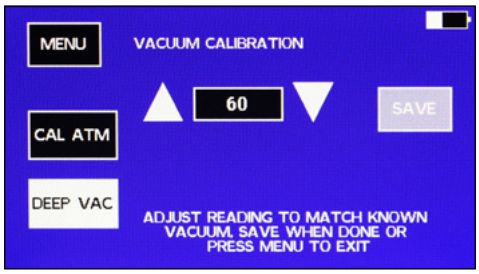
1. Press VACUUM in the calibration screen. The manifold will warm-up the sensor.

VACUUM SENSOR ATMOSPHERIC CALIBRATION SCREEN



1. After the sensor is warmed up, make sure the manifold is at atmospheric pressure. Press CAL ATM.
2. Press ATM to save the calibration and return to the main screen.

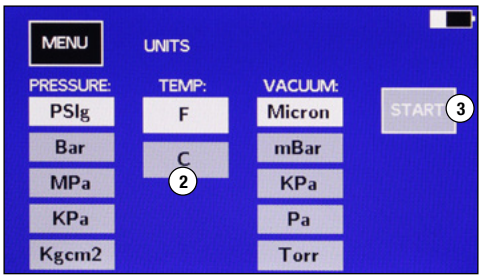
VACUUM SENSOR DEEP VACUUM CALIBRATION



Return to the MENU/CALIBRATION/VACUUM screen.

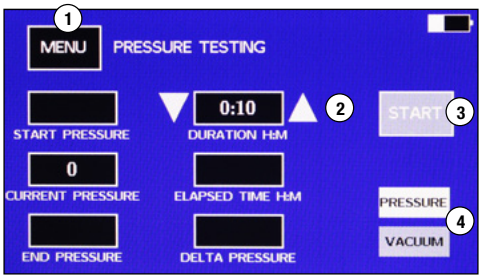
1. Attach an accurate vacuum gauge to the manifold.
2. Attach a vacuum pump to the manifold.
3. After the sensor has warmed up, press DEEP VAC.
4. Draw a vacuum until the accurate vacuum gauge reads under 100 microns.
5. Adjust the vacuum value on the screen using the up and down arrows to match the accurate vacuum gauge and press SAVE.

UNITS SETTING SCREEN



1. Press SETTINGS in the MENU screen
2. Press the desired units to highlight them.
3. Press START to set the manifold to the highlighted units and return to the MENU screen.

PRESSURE/VACUUM LEAK TEST SCREEN



Note: When doing a pressure leak-down test, the manifold uses the high-side pressure sensor. The manifold's high-side hose must be hooked up to the system under test for the test to work.

For vacuum leak-down tests with 4-way manifolds, the vacuum port needs to be connected to the system and the vacuum valve open.

F**or vacuum leak tests with 2-way manifolds**, if the high or low side hoses are attached to the system, the valve for the side attached to the system must be open. The center port can be connected to the system and both valves left closed.

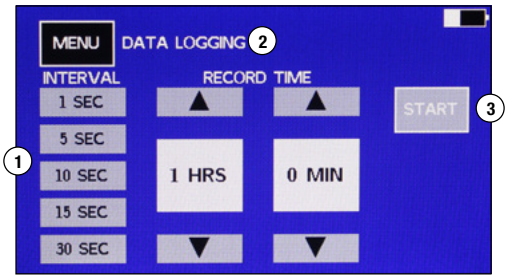
1. Install the manifold to the system undergoing the test.
2. Bring the system to the desired pressure or vacuum for the test.
3. Go to MENU - LEAK TEST to display the pressure test screen.
4. Select if a PRESSURE test or VACUUM test is being done (4).
5. Use the up and down arrows next to the duration time display (2) to set the desired test duration. The time is in Hours:Minutes.
6. Make sure the test pressure is in the CURRENT PRESSURE window and press START (3).
   a. The START button will become a STOP button.
   b. The Elapsed time will start. "Test Running" will blink below the STOP button.
   c. The CURRENT PRESSURE and START PRESSURE will be displayed.
   d. The DELTA PRESSURE will be calculated and displayed during the test.
7. When the test is done, END PRESSURE will be displayed.
8. To reset or restart the pressure test, leave the pressure test screen by pressing the MENU button, then select LEAK TEST again from the MENU screen.

Note: The CURRENT PRESSURE will continue to be displayed after the test is completed.

Note: The test will continue to run after the display goes to sleep. Touch the screen to turn the display back on.

Note: The unit will not automatically turn off in the PRESSURE TEST screen.

DATALOGGING SCREEN



1. Press on the interval that the data samples will be recorded to highlight it.
   Tip: Keep in mind that a longer interval will give fewer data points to process.
2. Use the up and down arrows to select the recording time.
3. Press START to start the recording data.
4. The unit will return to the DIGITAL screen and a red "R" will be displayed in the upper right corner.

Note: The manifold will continue to record after the display goes to sleep.
The manifold will not automatically turn off while it is datalogging.

UPDATING THE MANIFOLD FIRMWARE

To add new refrigerants or update the features on the manifold, it is necessary to update the manifold's firmware. This requires access to a computer running windows and a USB cable with a Type C connector. The new firmware and instructions for programming the manifold can be downloaded from the Mastercool website. If the manifold does not have a refrigerant you need, or you find a bug in the software, please contact customer service.

MASTERCOOL CONNECT APP

1. Press the ON/OFF key to power on the device
2. Download the Mastercool Connect app to a mobile device from the App Store or Google Play.
3. Launch the Mastercool Connect app on the mobile device.
4. Touch "SEARCH" on the Mastercool Connect app. From the list of available devices, pick the digital manifold.
5. Once the connection is made the Bluetooth® wireless technology symbol will be displayed on the upper right side of the digital manifold screen.

BATTERY CARE

For maximum battery life, do not fully discharge the battery. Avoid operating or charging the unit in extreme temperatures. If the battery life decreases by a significant amount, send the unit back to Mastercool to replace the batteries.

CLEANING THE VACUUM SENSOR

1. Disconnect the hoses from the manifold.
2. Being very careful not to spill on the manifold, fill it with system flush (Mastercool A/C Flush Solvent 91049-32 or other solvent into the manifold) through one of the fittings.
3. Close the valves and shake the manifold to distribute the solvent and let the manifold set for a few minutes.
4. Drain the solvent into a suitable container.
5. Hook the manifold up to a vacuum pump and draw a vacuum on the manifold to dry it out.
6. Repeat as necessary.

Note: If the vacuum sensor continues to not read correctly, return to Mastercool for repair.

PARTS AND ACCESSORY LIST

42010	Gasket for 1/4" FL
42014	Depressor
85511	3/8" Gasket for Black Hose

OPTIONAL ACCESSORIES

52234-BT	Digital Thermometer/Hygrometer with Bluetooth®
98210-A	Accu-Charge II Electronic Refrigerant Scale
99333	1/4 FL-M x 1/4 FL-M x 1/4 FL-F Tee

⚠ **WARNING:** This product can expose you to chemicals including Di (2-ethylhexyl) phthalate, lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov


Mastercool®
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"World Class Quality"