Fieldpiece

4 Port Wireless Manifold & Micron Gauge

OPERATOR'S MANUAL

Model SMAN460



Quick Start

1 Install six AA batteries into rear battery compartment. Batteries included in packaging.
2 Press the center blue button for 1 second to turn on your new manifold.
3 Connect hoses and pipe clamps to the manifold and the system.
4 See real-time pressure and temperature measurements all at once!

Certifications

FCC ID: VEARF915A

C-Tick (N22675)

CE

RoHS Compliant

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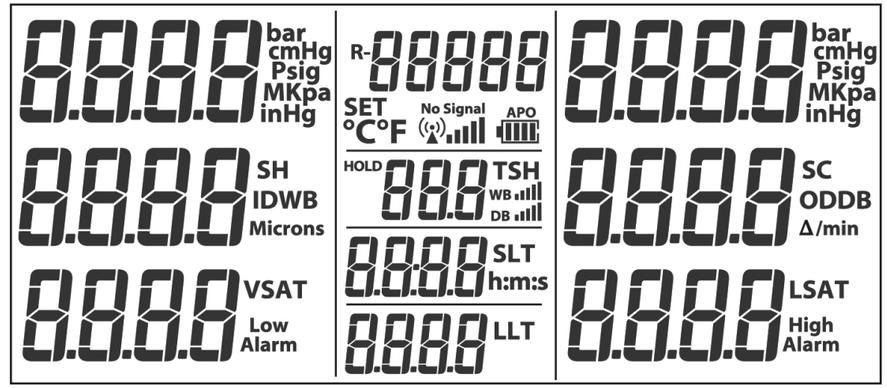
Description

Your SMAN460 is the top of the line Wireless 4 Port Manifold and Micron Gauge for HVACR professionals. See all your pressures and temperatures at the same time on the redesigned large display with bright blue backlight.

SMAN460 combines high precision, absolute pressure sensors, a superheat/subcooling calculator, true micron gauge for vacuum, and dual temperature measurements. Your SMAN460 calculates and displays target superheat and actual superheat to verify proper charge. SMAN460's large 3/8"VAC port and true 3/8"bore throughout the block allow for quicker recovery and evacuations.

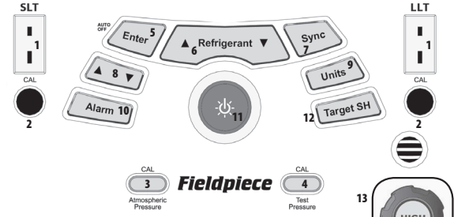
Your SMAN460 is designed to meet the demands of HVACR field service with a rugged rubber boot for durability, a strong metal hanger for easy storage and a form fitting, water resistant, padded nylon pouch.

Use additional wireless products like SDP2 Dual In-Duct Psychrometer to receive temperature measurements wirelessly for real-time target superheat calculations.



bar	Pressure (bar)	ODDB	Outdoor Dry Bulb
Psig	Pressure (pounds/in^2)	IDWB	Indoor Wet Bulb
MkPa	Pressure (kilopascals or Megapascals)	h:m:s	Hours:Minutes or Minutes:Seconds
inHg	Negative Pressure (inches of mercury)		Battery Life / Connection Strength
cmHg	Negative Pressure (cm of mercury)	APO	Auto Power Off Enabled
SH	Superheat	No Signal	Wireless Signal Lost
SC	Subcooling	R-	Selected Refrigerant of System
TSH	Target Superheat	Microns	Vacuum (Microns of Mercury)
SLT	Suction Line Temperature	Set	Set Mode / Δ/min Rate of change
LLT	Liquid Line Temperature	High Alarm	High Alarm / Low Alarm Low Alarm
VSAT	Vapor Saturation Temperature	HOLD	Static Target Superheat Calculation
LSAT	Liquid Saturation Temperature	WB	IDWB Connection Strength
		DB	ODDB Connection Strength

Controls



1 Insert Type K thermocouple plugs here.
2 Temperature calibration pots.
3 Press to zero atmospheric pressure.
4 Press to calibrate to refrigerant tank. (See Advanced Pressure Calibration section.)
5 Press to confirm selection.
6 Press/hold to cycle through refrigerants.
7 Hold 1 second to enable wireless functionality.
8 Press up or down arrow to adjust values.
9 Press to change units.
10 Press to turn on/off the Hi/Lo vacuum alarms and hold to change alarm settings.
11 Hold 1 second to power on or off. Press to toggle backlight.
12 Press to enter Target Superheat setup mode.
13 Turn clockwise to close High side port.
14 Turn clockwise to close Low side port.
15 Turn clockwise to close 3/8" Vacuum port.
16 Turn clockwise to close Refrigerant port.

Functions

Superheat and Subcooling

Your SMAN460 can calculate and display both superheat and subcooling simultaneously.

1 Select the appropriate refrigerant using the REFRIGERANT button.
2 Connect EPA approved refrigerant hoses to low and high side on SMAN460. Plug Type K thermocouple pipe clamps to SLT and LLT.
3 Connect your SMAN460 to the system:
Superheat: Hand tighten low side hose to suction line service port. Place the SLT pipe clamp thermocouple on the suction line between the evaporator and compressor, no closer than 6 inches to compressor.
Subcooling: Hand tighten high side hose to liquid line service port. Attach the LLT pipe clamp thermocouple on the liquid line between the condenser and expansion valve (TXV), as close to the service port as possible.
4 After turning the system on or making any adjustments to the system wait 15 minutes before charging by superheat or subcooling to ensure the system is stabilized.
5 To add or remove refrigerant connect a refrigerant or recovery cylinder to the REF port on SMAN460. Follow recommneded charging or recovery practices from equipment manufacturer. Use the low side, high side, and REF valves on SMAN460 to charge or recover refrigerant as needed. Let system stabilize for 15 minutes.

Note: When superheat and/or subcooling cannot be calculated an "OL" or "-OL" will be displayed. Please check the following:
1 The correct refrigerant is selected on the SMAN.
2 The pipe thermocouples are plugged into SLT/LLT ports and are in good working condition.
3 The pipe thermocouples are attached in the appropriate location on the system. See step 3 above for details.

Target Superheat

Target Superheat is useful for charging fixed orifice air conditioning systems. Your SMAN460 can receive real-time indoor wet bulb (IDWB) and outdoor dry bulb (ODDB) temperatures wirelessly to calculate real-time target superheat. The IDWB and ODDB values can also be entered both manually if measurements are taken by other instruments, or a combination of one wireless measurement with one manually inputted measurement.

Receive IDWB and ODDB temperatures wirelessly

1 Press Target SH button to enter Target SH setup mode. SMAN will search for last connected wireless instrument and automatically connect if found. Press ENTER to end search and sync to a new wireless instrument. IDWB will blink indicating it is ready for an input.
2 Hold SYNC until beep is heard to search for a Fieldpiece wireless instrument.
3 Set your Fieldpiece wireless instrument to connect with the SMAN460. Refer to your Fieldpiece wireless instrument's manual for more information.
4 Once SMAN460 is connected with Fieldpiece wireless instrument, the real-time wet bulb temperature measurement will display.
5 Ready the Fieldpiece wireless instrument to measure indoor wet bulb temperature and place the probe at the return side of the evaporator between the filter and the coil.
6 On your SMAN460 use the ARROWS to setup ODDB. When ready, ODDB will be blinking.
7 Repeat steps 2 -5 for outdoor dry bulb measurements (ODDB). For outdoor dry bulb measurement, place the dry bulb temperature probe onto the side of the condenser. For accurate results, keep it shaded from direct sunlight.
8 Target superheat (TSH) is calculated and updated in real-time and located in the center column of display.

Wireless Notes

1 For real-time target superheat calculations, both IDWB and ODDB measurements must be received wirelessly.
2 A blinking HOLD will appear to the left of the TSH calculation when one measurement is wirelessly received and the other manually input indicating a static TSH calculation.
3 If the indoor wet bulb or outdoor dry bulb measurements result in an uncalculable TSH, *"OL"* or *"-OL"* will display.
4 When the IDWB or ODDB is wirelessly connected with SMAN460, and the connection is lost, "nSG" (No Signal) will display. The SMAN460 will try to reconnect with Fieldpiece wireless instrument for 2 minutes while the unit is powered ON. During these 2 minutes IDWB or ODDB can be connected to a different Fieldpiece wireless instrument but manual entry will be disabled.

Manually Input Temperatures

1 Press Target SH button to enter Target SH mode. Press ENTER to end wireless search. IDWB will blink indicating it is ready for an input.
2 Press UP or DOWN ARROW to toggle between IDWB or ODDB input. Hold ENTER to select which temperature you want to input, either IDWB or ODDB. The far left digit of IDWB or ODDB will begin blinking indicating manual input mode is ready.
3 Press the ARROWS to change values and press ENTER to lock in each digit.
4 Repeat steps 2 and 3. The calculated target superheat will show in the center column of the display. A solid HOLD will display to the left of the TSH calculation indicating a static TSH calculation.

Note: If the inputted temperature is out of the calculable range for IDWB or ODDB an "Err" will flash once and a double beep will sound. IDWB range (40°F to 125°F, 4.4°C to 51.7°C) and ODDB range (50°F to 140°F, 10°C to 60°C). Re-input a temperature within these ranges to calculate target superheat.

Pulling a Vacuum

Follow all manufacturers' evacuation procedures over those in this manual.

1 Connect your SMAN460 to your vacuum pump and the system, then power on your SMAN460.
2 Set up vacuum alarms. These will notify you when you've reached your desired vacuum and stabilization levels. See Set Vacuum Alarm instructions below.
3 Pull a vacuum on the system. SMAN460 will automatically sense the negative pressure and begin to display in inHgV. Once the vacuum levels are low enough, the display will automatically change to show vacuum in microns. Once in micron mode the inHgV readings will no longer display.
4 The rate at which the vacuum levels are changing will be displayed in microns per minute. The smaller the rate of change, the closer you are to stabilization.

Set Vacuum Alarms

1 Hold ALARM for 1 second to enter Alarm Set Mode. The first digit of LO alarm will blink.
2 Use ARROWS to change the blinking number. Press ENTER to lock in a digit and move to the next one. Repeat for all LO alarm digits.
3 When LO alarm is complete, the first digit of HI alarm will blink. Use ARROWS to change the blinking number. Press ENTER to lock in a digit and move to the next one. Repeat for all HI alarm digits.
4 Hold ALARM until you hear a beep to save your alarm values and exit Alarm Set Mode.

Note: Anytime while in Alarm Set Mode, you can press ALARM to toggle between alarm HI set and alarm LO set. Hold ALARM to save values and exit Alarm Set Mode at any time.

Note: "Err" will show if you try to set the HI alarm lower than the LO alarm, or the LO alarm higher than the HI alarm.

Activate Vacuum Alarms When Pulling a Vacuum

1 Press ALARM to activate low alarm. Default is 500 microns. Stopwatch will start. When low alarm value is reached, SMAN460 will beep and the stopwatch will restart from zero. You can monitor how long the vacuum has been under your target value.
2 Press ALARM again to deactivate low alarm and activate high alarm. Default is 1000 microns. When high alarm value is reached, SMAN460 will beep and the stopwatch will pause. You can see how long it took to reach your target value.
3 Press ALARM again to deactivate high alarm.

Additional Evacuation Tips to Reach a Deeper Vacuum:

1 Use shortest vacuum rated hoses with largest diameter available.
2 Remove schrader cores and core depressors. Core removal tools like the "MegaFlow Valve Core Removal Tool" can be purchased from Appion, Inc. to help with this process.
3 Inspect the rubber seals at both ends of your hoses for damage that may result in leakage.
4 Do not use hoses with low loss fittings when evacuating or pulling a vacuum on a system.
5 When the vacuum pump is isolated from the system, a slow rise in micron levels may signify moisture is still present in the system but should eventually stablize. A continuous rise in microns levels to atmosphere may indicate a leak in the hoses, the vacuum pump connections or the system.

Changing Units

Your SMAN can display pressure and temperature measurements in English, Metric or combination of both units.

1 Press UNITS to enter unit selection screen.
2 Use ARROW to select your desired pressure units. Press ENTER.
3 Use ARROW to select your desired temperature units. Press ENTER to return to pressure units.
4 Press UNITS to return to normal SMAN display.

Wireless System Analyzers

Your SMAN460 can connect with the Fieldpiece HVAC Guide® HG3 for deeper diagnosis, data storage and reporting. Send all your line pressures and temperatures, vapor and liquid saturation temperatures, superheat and subcooling calculations and micron readings wirelessly to the Fieldpiece HVAC Guide® HG3.

1 Connect all hoses and pipe clamp thermocouples to the SMAN460 and the HVACR unit to be tested.
2 From main display, hold SYNC for 1 second until a beep is heard. SMAN460 will begin searching for a Fieldpiece Wireless System Analyzer.
3 Set your Fieldpiece HVAC Guide® HG3 to connect with the SMAN460. Refer to your Fieldpiece HVAC Guide® HG3 manual for more information on how to connect wirelessly.

Wireless Notes

1 The SMAN460 and Fieldpiece HVAC Guide® HG3 must be between 1 to 10 feet for initial sync to occur.
2 Be sure the Fieldpiece HVAC Guide® HG3 has been updated to the latest firmware version located on our website.

Firmware Updates

Your SMAN460 firmware can be updated in the field to ensure you always have the most up-to-date features for your manifold. Just go to www.fieldpiece.com to periodically check for the latest firmware version. If a newer version is available, follow the download link and installation instructions on the website. Connect your SMAN460 to the PC via a mini-USB to USB cable (not included) to install the update on your SMAN.

To check your current firmware version, power off your SMAN460. Press and hold the blue power button for about 6 seconds. The SMAN460 firmware version will show in the top right corner of the display (X.XX).

Specifications

Mini-USB port: For updating to newer versions of firmware
Display size: 5 inches (diagonal)
Backlight: Blue (On for 3 minute unless turned off manually)
Battery: 6 x AA (Battery life below based on alkaline type)
Battery life: 350 hours (without vacuum, backlight and wireless)
Low battery indication: ▭ is displayed when the battery voltage drops below the operating level
Auto shut off: 30 minutes of inactivity when APO is activated
Over range: "OL" or "-OL" is displayed
Operating environment: 32°F to 122°F (0°C to 50°C) at <75% RH
Temperature coefficient: 0.1 x (specified accuracy) per °C (0°C to 18°C, 28°C to 50°C), per 0.6°F (32°F to 64°F, 82°F to 122°F
Storage temperature: -4°F to 140°F (-20°C to 60°C), 0 to 80% RH (with battery removed)
Weight: 4.03 lbs (1.83 kg)

Pressure

Sensor type: Absolute pressure sensors
Connector type: Standard 1/4" and 3/8" NPT male flare fitting
Range: 29″HgV to 580psig (English), 74 cmHgV to 0 to 4000KPa (Metric), 4.000MPa (Metric), and 40.00bar (Metric)
Resolution: 0.1 psi/inHg; 1 kPa/cmHg; 0.001MPa; 0.01bar
Accuracy: 29″HgV to 0″HgV: ±0.2″HgV
74 cmHgV to 0 cmHgV: ±1 cmHgV
0 to 200 Psig: ±1 Psi; 0 to 1378 KPa: ±7 KPa; 0 to 1.378MPa: ±0.007MPa; 0 to 13.78 bar ±0.07 bar
200 to 580 Psig: ±(0.3% of reading+1 Psig); 1378 to 4000KPa: ±(0.3% of reading+7 Kpa); 1.378 to 4.000MPa: ±(0.3% of reading+0.007MPa); 13.78 to 40.00bar: ±(0.3% of reading +0.07bar)
Maximum overload pressure: 800 psig
Units: Psig, kPa, MPa, bar, inHg, and cmHg

Microns for Vacuum

Connector type: Standard 1/4" and 3/8" NPT male flare fitting
Range: 0 to 9999 microns of mercury
Resolution: 1 micron (0 to 2000 microns), 250 microns (2001 to 5000 microns), 500 microns (5001 to 8000 microns), 1000 microns (8001 to 9999 microns)
Accuracy: ±(5% of reading + 5 microns), 50 to 1000 microns
Maximum overload pressure: 580 psig
Units: Microns of mercury

Temperature

Sensor type: Type K thermocouple
Range: -95°F to 999.9°F (-70°C to 537.0°C)
Resolution: 0.1°F/°C
Accuracy: ±(1.0°F) -95°F to 199.9°F; ±(0.5°C) -70°C to 93°C ±(2.0°F) 200°F to 999.9°F; ±(1.0°C) 93°C to 537.0°C
Note: All accuracies are after a field calibration.

Wireless

Wireless range: 1 to 100 feet (30m)
Initial sync setup range: 1 to 10 feet
Wirelessly transmit to Fieldpiece HVAC Guide® HG3 System Analyzer
Wirelessly receive indoor wet bulb (IDWB) and outdoor dry bulb (ODDB) from Fieldpiece transmitters

Auto Power Off (APO)

To conserve battery life, your SMAN will power down after 30 minutes of inactivity. APO is activated by default and APO displays above the battery icon. To deactivate, press and hold ENTER while powering on the SMAN. When deactivated, APO will no longer show above the battery icon.

Maintenance

Clean the exterior with a dry cloth. Do not use liquid.

Battery Replacement

The battery must be replaced when the battery life indicator ▭ is empty. SMAN will display "lo batt" and power off. Remove rear battery cover and replace with 6 AA batteries.

Cleaning the Micron Sensor

Over time, the vacuum sensor of the SMAN460 may become contaminated with dirt, oil, and other contaminants from pulling vacuums.

1 ***Never*** use an object such as a cotton swab to clean the sensor, you may cause damage to the sensor.
2 Open all valves and cap all the ports except for the VAC port.
3 Drop enough Isopropyl (rubbing) alcohol into the VAC port using an eye dropper or funnel so that it can flush out contaminants.
4 Cap VAC port and gently shake your SMAN460 upside down to clean sensor.
5 Turn right side up. Open a port to pour out the rubbing alcohol and open all ports to allow sensors to dry out. Drying usually takes about an hour.

Using Different Refrigerants

You can use your manifold with different refrigerants. Be sure to purge your manifold and hoses before connecting to a system with a different refrigerant.

Calibration

Temperature

To calibrate your SMAN460 temperature thermocouples, adjust the pot on the front of the meter labeled SLT Cal or LLT Cal. The best way to calibrate is to match to a known temperature. Ice water is very close to 32°F and is readily available. Accuracies of one degree or better are obtained through field calibration.

1 Stabilize a large cup of ice water by stirring. Pure, distilled water will be the most accurate.
2 Immerse the temp probe in ice water from SLT and adjust the SLT Cal pot with a flat head screwdriver and let it stabilize, keep stirring.
3 Repeat Step 2 for temp probe in LLT.

Pressure Zeroing

To calibrate your SMAN460 pressure sensors to atmospheric pressure, ensure that your SMAN460 is disconnected from any pressure source and at equilibrium with the ambient pressure.

1 Press the CAL Atmospheric Pressure button and your SMAN460 will set the zero point of pressure to the ambient pressure.

Advanced Pressure Calibration

Your SMAN460 has the ability to perform a linear adjustment of the pressure sensors based on refrigerant type, temperature, and pressure.

Calibration setup: For best results, first perform both the Temperature and Pressure Zeroing procedures. See Calibration section for details. This will ensure pressure readings are zeroed and thermocouple is properly calibrated to the SLT port of the SMAN. Calibration to LLT port is not necessary for this calibration. The refrigerant cylinder should be stored in a stable ambient environment for at least 24 hours before calibration.

1 Plug in a Type K thermocouple into SLT. (A bead type thermocouple, like the ATB1, is recommended.)
2 Connect the SMAN460 to a refrigerant cylinder of a known, single refrigerant using an EPA approved service hose. Be sure to open both HIGH and LOW side valves on your manifold and cap the unused ports. (If caps are not available you can connect both ends of a refrigerant hose to the two unused caps. Note: Some refrigerant will remain in the hoses which will need to be recovered.)
3 Press the REFRIGERANT button to match the refrigerant of the cylinder you are using.
4 Attach bead-type thermocouple to the side of the cylinder using tape. It is recommended to attach in the middle of the cylinder. Important: Let the temperature of the thermocouple stabilize to the refrigerant temperature for 1 to 2 minutes or until stable.
5 Open the refrigerant cylinder. The pressure inside cylinder should now be displayed on both HIGH and LOW side pressure sensors.
6 Press the CAL Test Pressure button. If successful, "Good" will display for 3 seconds. If failed, "Err" will display for same time.

Your SMAN checks with its built-in P-T charts to compare the temperature of the refrigerant in the tank to the vapor saturation temperature based on the refrigerant you selected. If the measured pressures on your SMAN are within ±3psi of the P-T chart pressure corresponding to the vapor saturation temperature, the SMAN will adjust the pressure sensor linearity to match the P-T chart.

Possible causes of failed "Err" pressure calibration:

1. Refrigerant tank was not stored in stable ambient conditions for at least 24 hours.
2. Thermocouple attached to refrigerant tank was not properly calibrated to SLT port of SMAN.
3. Thermocouple was plugged into wrong port LLT instead of SLT.
4. Incorrect refrigerant was selected on the SMAN.

Refrigerants

The P-T charts of the following 45 refrigerants come pre-programmed into your SMAN. In your SMAN the refrigerants are listed in order of most commonly used. Here, they are listed in numerical order for easy reference.

R11, R113, R114, R12, R123, R1234YF, R124, R125, R13, R134A, R22, R23, R32, R401A(MP39), R401B, R402A, R402B, R404A, R406A, R407A, R407C, R407F, R408A, R409A, R410A, R414B (Hotshot), R416A, R417A, R417C (HOT SHOT 2), R420A, R421A, R421B, R422A, R422B(NU22B), R422C(Oneshot), R422D, R424A, R427A, R434A(RS-45), R438A(MO99), R500, R502, R503, R507A, R508B (Suva95)

⚠ WARNINGS

DO NOT APPLY MORE THAN 800 PSI TO ANY PORT ON THE MANIFOLD. FOLLOW ALL EQUIPMENT MANUFACTURER'S TESTING PROCEDURES ABOVE THOSE IN THIS MANUAL IN REGARDS TO PROPERLY SERVICING THEIR EQUIPMENT.

FCC Compliance and Advisory Statement

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, according to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try correct the interference by one or more of the following measures:

1.Reorient the receiving antenna.
2.Increase the separation between the equipment and receiver.
3.Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4.Consult the dealer or an experienced radio/TV technician for help.

Shielded interface cables must be used in order to comply with emission limits.

FCC Caution: To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Fieldpiece
Designed in USA
MADE IN TAIWAN

Limited Warranty

This meter is warranted against defects in material or workmanship for one year from date of purchase from an authorized Fieldpiece dealer. Fieldpiece will replace or repair the defective unit, at its option, subject to verification of the defect.

This warranty does not apply to defects resulting from abuse, neglect, accident, unauthorized repair, alteration, or unreasonable use of the instrument.

Any implied warranties arising from the sale of a Fieldpiece product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above. Fieldpiece shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim of such damage, expenses, or economic loss.

State laws vary. The above limitations or exclusions may not apply to you.

Obtaining Service

Email Fieldpiece warranty department at fpwarranty@fieldpiece.com for current fixed price repair service. Send check or money order made out to Fieldpiece Instruments for the amount quoted. If your meter is under warranty there will be no cost for the repair/replacement. Send your meter, freight prepaid, to Fieldpiece Instruments. Send proof of date and location of purchase for in-warranty service. The meter will be repaired or replaced, at the option of Fieldpiece, and returned via least cost transportation.

For international customers, warranty for products purchased outside of the U.S. should be handled through local distributors. Visit our website to find your local distributor.

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