BLACKMAX®
Digital Manifold Series

cps®

DIGITAL SERIES

US Patent No. 9,043,161

OWNER'S MANUAL (English)

Français, Español, Deutsch: www.cpsproducts.com

(Software Version 3.2 or Higher)

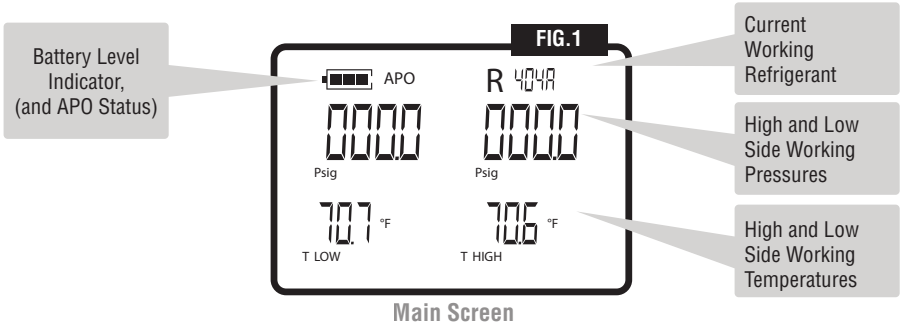
2 Valve Series: MD50, MD50HE, MD50VHE

4 Valve Series: MD100, MD100HE, MD100VHE

CONTENTS

QUICK START INSTRUCTIONS

1. Install 4 AA Alkaline (included) or rechargeable batteries into back of manifold.
2. Press and hold **[ON/OFF]** ⏻ (green button) to turn manifold ON.
3. **WELCOME SCREEN** appears briefly (displays software version 3.2).
4. "**LOC**" and "**SEL**" will appear on the display.
5. Intermittently press **[CLR]** to scroll among regions:
   - AUSTRALIA (Australia, Asian Pacific)
   - EUROPE (All of continental Europe, plus Great Britain, Russia)
   - USA (Includes USA, Canada, Caribbean, Central or South America)
6. Press **[SET]** to select desired region.
7. ***To change the region selected:***
   A. Press and hold **[SET]**, then **[ON/OFF]** ⏻ until display appears, then release **BOTH** keys.
   B. This will take you back to step 5 above. Select another region.
8. The next screen will be the "**MAIN**" screen [**FIG.1**] showing default status for the following:
   - Battery charge status/APO (On or Off)
   - High and low side working pressures
   - High and low side temperatures
   - Current working refrigerant



Main Screen

9. Review and adhere to all safety instructions.
10. Connect MD50 or MD100 series to an AC system.
11. You are now ready to work.

GENERAL SAFETY INSTRUCTIONS

Please read, follow and understand the contents of this entire manual, with special attention given to Danger, Warning and Caution statements.

FOR USE BY PROFESSIONALLY TRAINED AND CERTIFIED OPERATORS ONLY. MOST STATES, COUNTRIES, ETC., MAY REQUIRE THE USER TO BE LICENSED. PLEASE CHECK WITH YOUR LOCAL GOVERNMENT AGENCY.

DANGER: **EXPLOSION/RUPTURE RISK!!!** Use extreme caution when working with flammable refrigerants. **DO NOT** use manifold with unregulated nitrogen, carbon dioxide or other very high pressure gasses. **NEVER USE MANIFOLD WITH OXYGEN.** Unregulated gasses can cause components in a refrigeration system to rupture. Severe Injury or Death can occur.

DANGER: **ELECTRICAL SHOCK HAZARD:** Always disconnect power source when servicing equipment.

WARNING: **DO NOT APPLY MORE THAN 900 PSI TO ANY PORT ON MANIFOLD. FOLLOW ALL EQUIPMENT MANUFACTURER'S TEST PROCEDURES WHEN SERVICING THOSE SPECIFIC TYPES OF EQUIPMENT.**

WARNING: Remove all hoses with care as they may contain liquid refrigerant under pressure. Contact with refrigerant may cause frostbite or other related injuries. Wear proper personal protective equipment such as safety goggles and gloves. When disconnecting any hose, please use extreme caution.

WARNING: Avoid breathing refrigerant vapors and lubricant vapor or mist. Breathing high concentration levels may cause heart arrhythmia, loss of consciousness, or even cause suffocation. Exposure may irritate eyes, nose, throat and skin. Please read manufacturer's Material Safety Data Sheet for further safety information on refrigerants and lubricants.

NOTE: **It may be unlawful to discharge or exhaust refrigerants into the atmosphere. CPS strongly recommends the practice of recovery or recycling. Check your local government agencies for refrigerant handling regulations.**

OVERVIEW

BLACKMAX digital manifolds from CPS Products, Inc. combine the latest manifold design and electronic measurement features into one easy-to-use, accurate and water resistant product in a rugged nylon plastic housing, incorporating a durable elastomeric keypad and large backlighted LCD display.

For safety, specially designed pressure sensor cavities eliminate the possibility of user damage even in severe pressure misapplications.

The MD50 and MD100 Series provide many functions such as pressure, vacuum leak and hold tests. The optional CPS vacuum accessory MDXVG turns the digital manifold into an accurate Vacrometer.

CONTROLS AND FEATURES

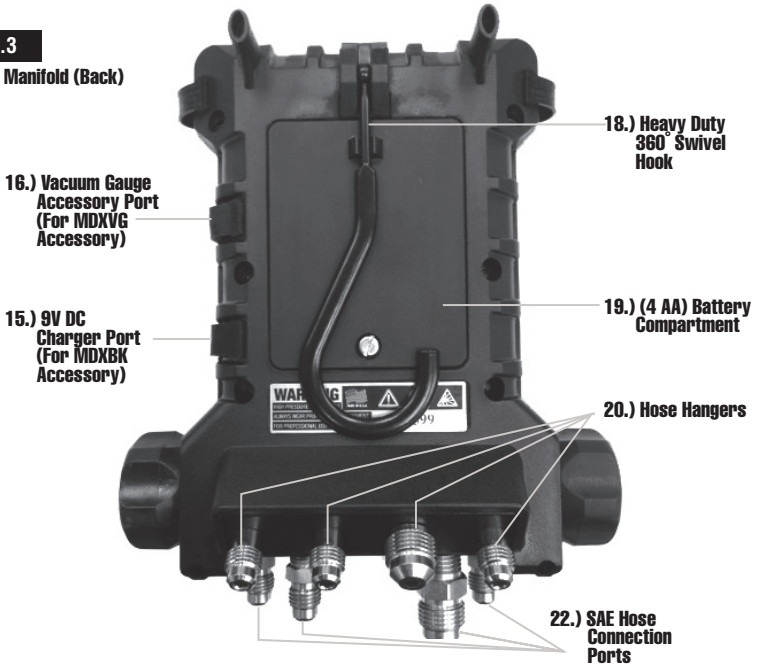
1. **[ON/OFF]** - Press and hold to turn On or Off
2. **[SET]** - For entering programed values
3. **[REF]** (Refrigerant) - Scrolls through 5 pre-selected “favorite” or commonly used refrigerants
4. **[MODE]** - Programming (change English vs. Metric units; Turn Auto-Power OFF)
5. **[SH/SC] (Superheat, Subcool)**- Controls display of Superheat/ Subcool, Saturation temperatures, and Delta T.
6. **[TEST]** - Press to obtain either “Pressure Hold” or “Vacuum Hold” tests.
7. **[CLR]** (Clear)- Sets pressure to zero point . Also ends any test in process.
8. **[BACKLIGHT]** - Press once to turn light On or Off
9. **HIGH SIDE VALVE**- Controls flow to right side ¼” SAE male port.
10. **REFRIGERANT VALVE (MD100 Series Only)**- Controls flow through RIGHT MIDDLE ¼” SAE Male Port.
11. **SIGHTGLASS**- Monitor refrigerant flow.
12. **VACUUM VALVE (MD100 Series Only**)- Controls flow through LEFT MIDDLE 3/8” SAE PORT.
13. **LOW SIDE VALVE**- Controls flow to LEFT SIDE ¼” SAE Port.
14. **CENTER PORT (MD50 Series Only)**- A ¼” SAE Male “T” port used as common connection to vacuum pump, recovery unit or refrigerant supply tank. The addition of a ¼” SAE Male “T” fitting with valve core allows for a dual hook up between vacuum pump and refrigerant supply tank.
15. **9V DC Charger Port** - Connection for Accessory MDXBK
16. **Vacuum Gauge Accessory Port** - Connection for accessory MDXVG
17. **Thermistor Sensors** - Ideal for taking Superheat and Subcool true temperatures on round pipes, at any angle
18. **Heavy Duty 360° Swivel Hook**
19. **Battery Compartment** - Uses 4 AA batteries
20. **Hose Hangers** - For securing ends of unused hoses
21. **Connection Points-** For (2) thermistor sensors
22. **SAE Connection Ports** - For SAE Hoses

FIG.2

4 Valve Manifold (Front)

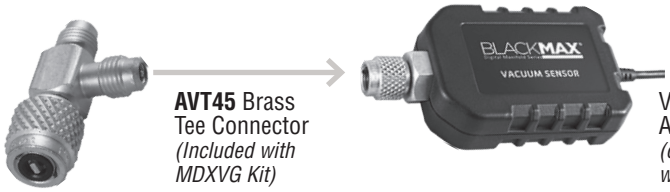
FIG.3

4 Valve Manifold (Back)



OPTIONAL ACCESSORIES

Optional Vacuum Gauge Accessory Kit **MDXVG** **FIG.4**

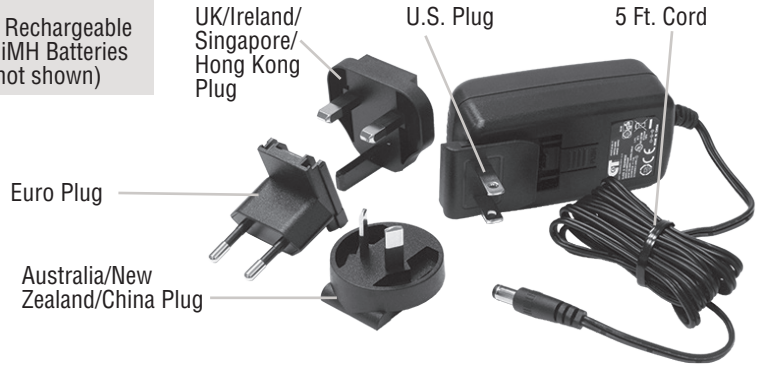


AVT45 Brass Tee Connector *(Included with MDXVG Kit)*

Vacuum Gauge Accessory *(only available with MDXVG Kit)*

Optional Universal Charger **MDXBX**

4 Rechargeable NiMH Batteries (not shown)

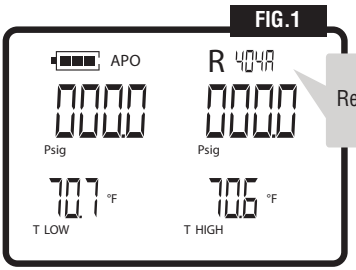


MDXCP Thermistor Sensor with 6 Ft. Lead for taking Superheat and Subcool true temperatures on pipes

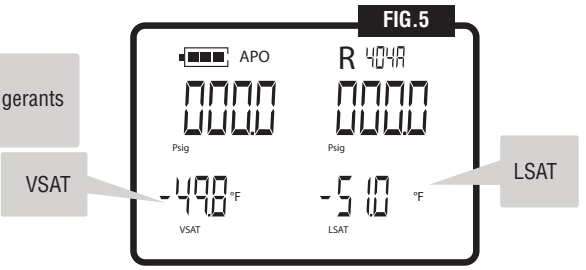
MDXSC Soft Case
- Padded Sides
- Rear Storage Pocket with Zipper
- Protective Skirt with Drawstring

INITIAL OPERATION

1. To Select A Refrigerant Other Than the One Shown- From Main Screen [**FIG.1**], press **[REF]** to scroll through a list of 5 common factory programmed refrigerants.
   Note: To change default refrigerants, go to page 12.
   Note: Thermistor sensors must be connected to get a T Low and / or T High temperature reading.
2. To View Vapor (**VSAT**) and Liquid (**LSAT**) Saturation Temperatures, press **[SH/SC]**

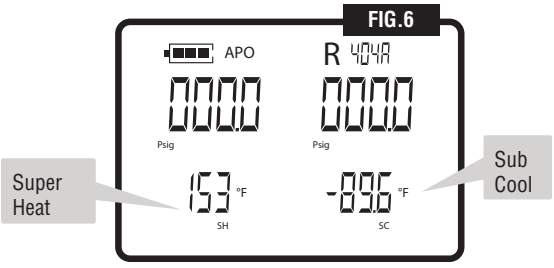


Main Screen



Saturation Temperature Screen

3. Note: In this mode, and to prevent errors, refrigerant cannot be changed using **[REF]** key. Press **[CLR]** to return to the **Main Screen** [**FIG.1**] from this view.
4. To View Superheat (**SH**) and Sub-cool (**SC**) Temperatures- Press **[SH/SC]** again.
5. Note: In this mode, and to prevent errors, refrigerant cannot be changed using the **[REF]** key. Press **[CLR]** to return to **Main Screen** [**FIG.1**] from this view.



Super Heat, Sub Cool Screen

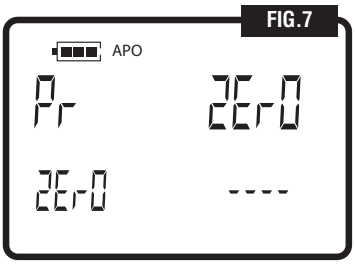
Thermistor Sensors - The enclosed clamps can be used to take temperatures of pipes or other round surfaces within its jaw range (1/8" to 1-1/8"). This greatly improves the calculation of Superheat and Subcool temperatures, as the sensor is virtually isolated from ambient conditions, allowing sensors to read true pipe temperatures while attached.

Operation - Plug one lead into the **LEFT** (Blue) socket and one lead into the **RIGHT** (Red) socket. Apply Thermistor Sensors to system tubing and read the resulting display temperatures.

6. To Display Difference Between High and Low Side Temperatures- Press **[SH/SC]** again. Press **[CLR]** to return to **Main Screen [FIG.1]**.
7. To turn manifold OFF, press and hold the **[ON/OFF]** ⏻ until the screen shows "**OFF**".

SETTING TO ZERO PRESSURE

1. It is recommended the manifold be opened to the atmosphere before every working session. If display reads other than zero in the selected pressure units, zero can be re-set by pressing and holding **[CLR]** at main screen. The Pressure Zero Screen [**FIG.7**] appears and will then return user to Main Screen [**FIG.1**], where both Pressure Displays should now read zero. This operation should be performed especially if manifold has been dropped or pressurized beyond 800 PSIG (55 bar) full scale.



Pressure Zero Screen

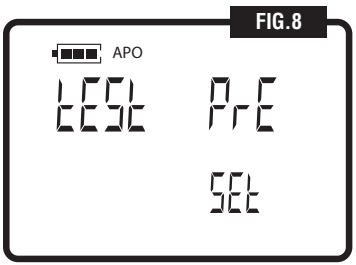
PRESSURE HOLD OR VACUUM HOLD TESTING

The BLACKMAX MD100 and MD50 series manifold can perform **Pressure Hold and Vacuum Hold tests**. Test pressures and durations are fully settable by the user. Any test can be aborted at any time by pressing **[CLR]**.

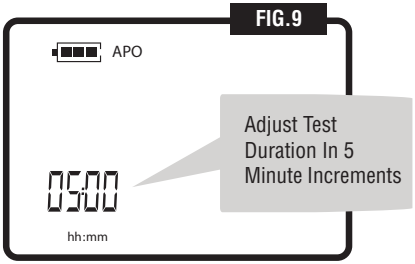
PRESSURE HOLD TEST

A pressure hold test should be used to determine if a **large** leak exists (not to determine if no leak or small leaks exist). Electronic Leak Detectors are the only instrument to determine leak rates less than 1 oz./year. In practice there should be no pressure hold detected if the system is deemed leak proof enough to add refrigerant. Large leaks should be found before adding refrigerant. Low cost tracer gas mixtures such as 95% N2 and 5% H2 are popular and can be sensed by a CPS E_MOS leak detector.

1. At **Main Screen [FIG.1]** press **[TEST]**. The **Test Pressure Set** Screen will appear **[FIG.8]**. [**Note**: The **MDXVG** Vacuum Gauge accessory **should not be plugged in at this time**].
2. Press **[SET]** to advance to Test Time (Pressure) Set Screen [**FIG.9**].



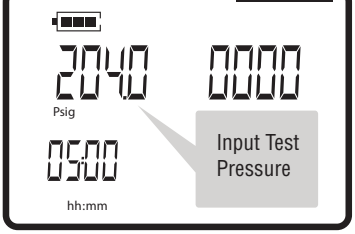
Test Pressure Set Screen



Test Time Pressure Set Screen

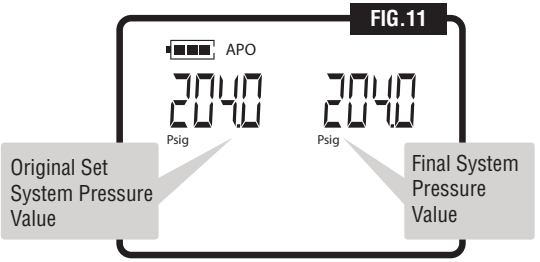
3. Use **[UP/DOWN ARROWS]** to adjust test duration in 5 minute increments to desired setting (Note: Minimum time is pre-set at 5 minutes. Maximum time is 95 minutes).
4. Press **[SET]** to store **Test Duration**. Display will advance to **Pressure Set Screen [FIG.10]**.

FIG.10



Pressure Set Screen

FIG.11



Start Vs. Final Pressures

5. Connect manifold Low and High Side Service hoses to the system to be tested. Pressurize the system. **Regulated** Nitrogen or Nitrogen/Hydrogen trace gas is recommended.
6. The pressure in the system will be displayed in the UPPER LEFT.
7. Press **[SET]** to start test. Starting test pressure is indicated in upper left display [**FIG.10**]. Current system pressure is shown in upper right display. Timer (lower left display) decrements and when at zero, a bell will sound indicating test completion and **Start Vs. Final Pressures** will be displayed [**FIG.11**] to determine if system leaks.

VACUUM HOLD TEST

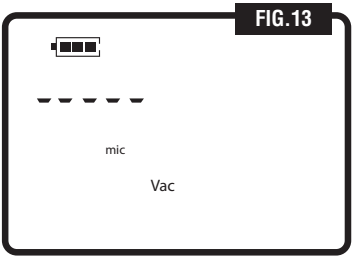
Normally, systems with vacuum levels within 250-500 microns are deemed as having a good seal and are ready for charging. As with any recharged system, a good electronic leak detector should be used to test for leaks after the charge has been completed. MD50 or MD100 manifold series will function as accurate vacrometers when used with the **MDXVG Remote Vacuum Accessory [FIG.4]**.

1. Plug the MDXVG Vacuum Accessory into the upper right side of the manifold [**FIG.12**].
2. The **Vacuum Display Screen** [**FIG.13**] appears.

FIG.12

MDXVG Vacuum Gauge Accessory Connection

FIG.13

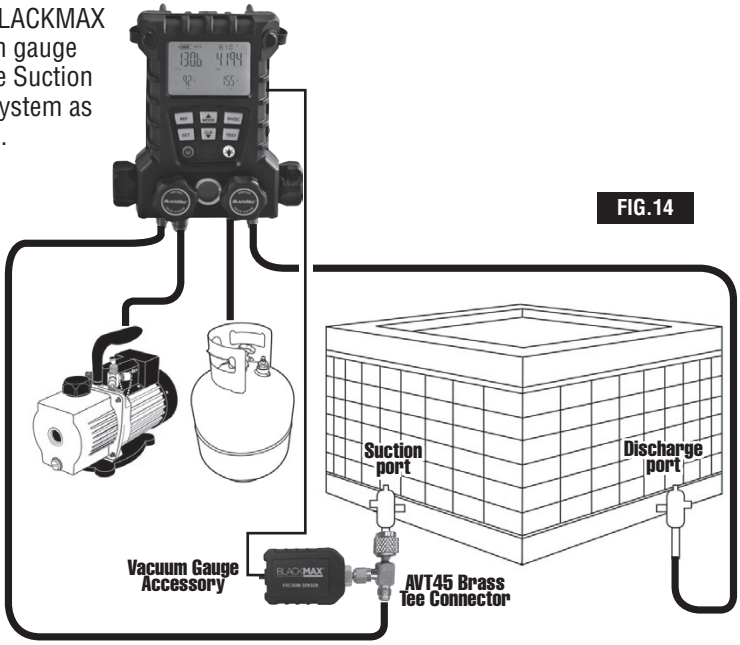


Vacuum Display Screen

VACUUM HOLD TEST

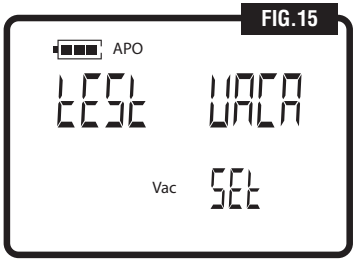
3. Assemble the BLACKMAX MDXVG vacuum gauge accessory to the Suction Port on an AC system as shown [**FIG.14**].

FIG.14



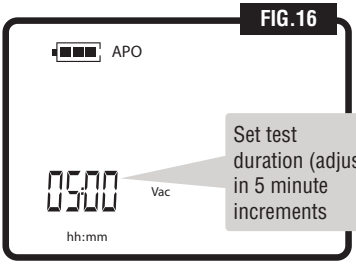
4. In this mode, the manifold will show current vacuum in the system. The display begins to show vacuum levels at 25000 microns or less and is accurate to +/- 10 microns. Continue to run vacuum pump until the desired vacuum level is reached. Once reached, proceed to Vacuum Hold Test.
5. **Vacuum Hold Test** - To perform this test, press **[CLR]** to go to the **Main Screen** [**FIG.1**] Vacuum Gauge Accessory should still be plugged into manifold.
6. At **Main Screen** [**FIG.1**] press **[TEST]**. The **Test Vacuum Set Screen** appears [**FIG.15**]
7. Press **[SET]** to advance to Vacuum Hold Test – Time Set Screen [**FIG.16**].
8. Use **[UP/DOWN ARROWS]** to adjust test duration in 5 minutes increments (minimum time is pre-programmed at 5 minutes).
   A) Press **[SET]** to store Vacuum Test duration time. **Vacuum Hold Test Screen** [**FIG.17**] will now be displayed.

FIG.15



Test Vacuum Set Screen

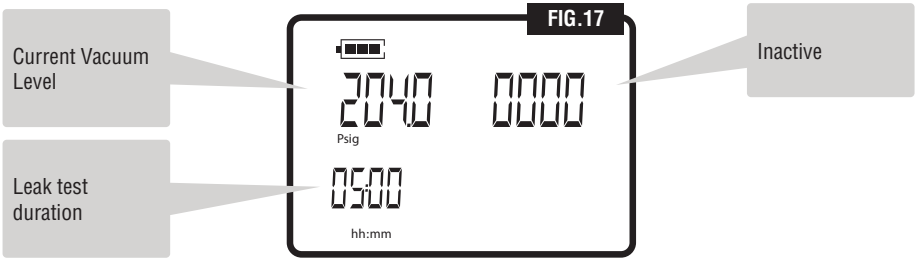
FIG.16



Vacuum Hold Test Time Set Screen

NOTE: The Vacuum Reading in the upper Left display is still active. The Reading in the upper Right display is not active unit steps 2 and 3 are completed.

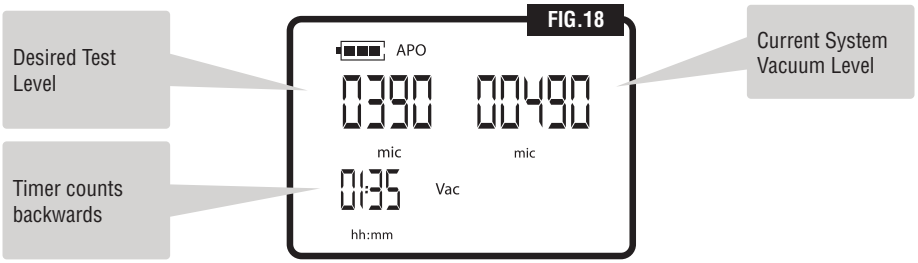
VACUUM HOLD TEST



Vacuum Display Screen

B) Continue to Evacuate the system to the desired level which is indicated in the upper left display once the desired vacuum level is reached:
   a. On the MD100, close the vacuum valve
   b. On the MD50, close the High and Low side valves.

C) Press **[SET]** to start test. Starting test vacuum level is indicated in upper left display **[FIG.18]**. Current system vacuum level is shown in upper right of display and timer is shown in lower left. The timer decrements and when zero, a bells sounds and test ends. At end of test, Start vs. Final Vacuum levels will be displayed to enable determination of any vacuum loss over a set period of time.



Vacuum Display Screen

D) Press **[CLR]** to return to **Main Screen** [**FIG.1**].

NOTE: If it is required to rerun the vacuum pump after STEP 3, disconnect and reconnect the MDXVG to reset it in the vacrometer mode.

PROGRAMMING/SETTING UNITS

According to your geographic location, MD50 and MD100 manifold series are factory programmed with 5 common refrigerants in those regions (see chart below), and units of measure (Temperature, Pressure and Vacuum) for specific regions. See chart below for details. **Any of these units can be changed via the Program Mode.**

PROGRAMMING/SETTING UNITS

There are 2 major options. In each, a blinking symbol represents a choice the user can make by pressing **[SET]**.

1. **PrO** (Programming)
   a. **Change Refrigerants:** Change any or all of 5 common refrigerants accessible at Main Screen.
   b. **Change Temperature Units:** Change °F or °C.
   c. **Change Pressure Units:** Change Psig, kPa, Mpa, bar and KgCm2 pressure units.
   d. **Change Vacuum Units:** Change Microns vs. Hg vacuum units.
2. **APO (Set Automatic Power OFF)** - Manifolds come factory pre-set to ON.

Pre-Programmed Refrigerants
The following 5 common refrigerants have been programmed for easy access from the **Main Screen** using the **[REF]** key:

PRE-PROGRAMMED REFRIGERANTS and UNITS OF MEASURE		
USA	**AUSTRALIA**	**EUROPE**
R-134a	R-134a	R-134a
R-22	R-22	R-404A
R-404A	R-404A	R-744 (CO2)
R-407A	R-744 (CO2)	R-410A
R-410A	R-410A	R-407c
PSIG, F, Micron	**kPA, C, Micron**	**Bar, C, Micron**

PROGRAMMING/SETTING REFRIGERANTS

The recommended way to change refrigerants involves making a *new* list of 5 refrigerants, and change all five of them in the same session. Example: If only R-22 needs to be changed to R-1234yf (and if using USA defaults), program the following items: R-410A, R-1234yf, R-404A, R-134a and R-407A.

1. At **Main Screen** [**FIG.1**] press and hold **[MODE]** until "**PrO**" (**Program**) **Screen** [**FIG.18**] appears. "**PrO**" will blink.
2. Press and hold **[SET]** to enter the Refrigerant Selection Screen [**FIG.19**].

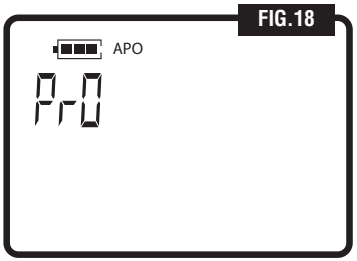


FIG.18
Program Screen

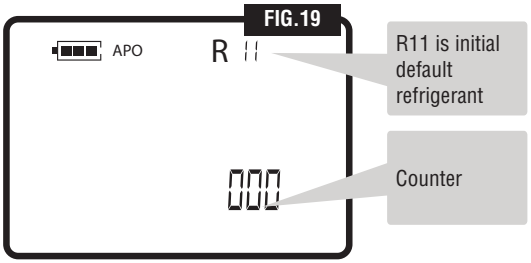


FIG.19
Refrigerant Selection Screen

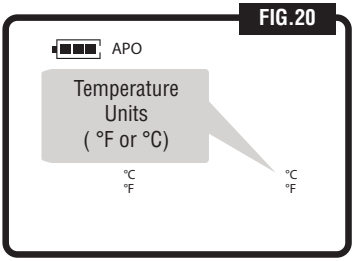
3. The **Initial Refrigerant** (blinking in upper right) should be R-11 and Counter (Lower Right) should start at 000.
4. Use **[UP/DOWN ARROWS]** to scroll through 93 refrigerants. Press and hold either arrow to scroll through refrigerants progressively faster. Release to stop scrolling. Last refrigerant displayed will blink.

PROGRAMMING/SETTING REFRIGERANTS

5. To select refrigerant displayed, press **[REF]**. A tone will sound and counter will increment by one indicating that the first refrigerant in the sequence of 5 favorites has been replaced with one selected.
6. To select another refrigerant, repeat steps 3 and 4.
7. To exit this menu and go to the next (Temperature Units Screen), press **[SET]**, or
8. To return to **Main Screen** [**FIG.1**], press and hold **[CLR]** after step 6.
9. If all 5 refrigerants are changed, manifold automatically advances to next menu without having to press **[SET]**. Main Screen [**FIG.1**] can then be accessed by pressing and holding **[CLR]**.

PROGRAMMING/SETTING TEMPERATURE UNITS (°F VS. °C)

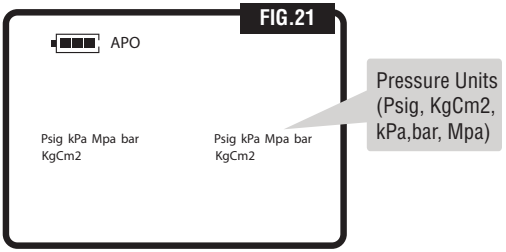
1. At Main Screen [**FIG.1**] press and hold **[MODE]** until "**PrO**" screen [**FIG.18**] appears. "**PrO**" will blink.
2. Press **[SET]** to enter "**PrO**" menu. The Refrigerant Selection Screen appears [**FIG.19**].
3. Press **[SET]**. The Temperature Units Screen [**FIG.20**] will appear (blinking).
4. Press **[SET]** to select this menu. The symbol for the current units blinks.
5. Use **[UP/DOWN ARROWS]** to toggle between °F /°C
6. Press **[SET]** to select °F vs. °C and go to next menu (Pressure Units), or
7. To return to **Main Screen** [**FIG.1**], press and hold **[CLR]**.



Temperature Units Screen

PROGRAMMING/SETTING PRESSURE UNITS (PSIG, KGCM2, KPA,BAR, MPA)

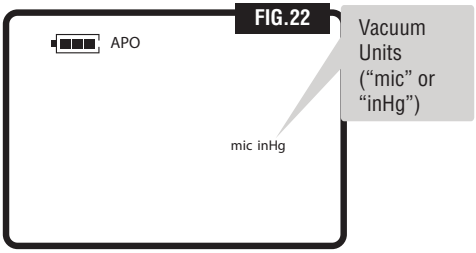
1. At **Main Screen** [**FIG.1**] press and hold **[MODE]** until "**PrO**" **Screen** appears **FIG.17**]. "**PrO**" will blink.
2. Press **[SET]**. The **Refrigerant Selection Screen** appears [**FIG.19**].
3. Press **[SET]**. The **Temperature Units Screen** (blinking) appears [**FIG.20**].
4. Press **UP ARROW** to advance to **Pressure Units Screen** [**FIG.21**]. See blinking symbols.
5. Press **[SET]** to select this menu. Current units blink.
6. Use **[UP/DOWN ARROWS]** to scroll through units (Psig, KgCm2, kPa,bar, Mpa)
7. Press **[SET]** to select pressure units desired and go to next menu (Vacuum Units), or
8. To return to **Main Screen** [**FIG.1**], press and hold **[CLR]**.



Pressure Units Screen

PROGRAMMING/SETTING VACUUM UNITS (MIC VS. INHG)

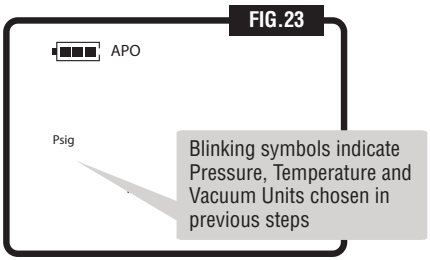
1. At main screen [**FIG.1**] press and hold **[MODE]** until "**PrO**" screen [**FIG.17**] appears. "**PrO**" blinks.
2. Press **[SET]** to enter " **PrO**" Screen. The **Refrigerant Selection Screen** appears [**FIG.19**].
3. Press **[SET]** to bypass Refrigerants Screen. The Temperature Units Screen (blinking) appears [**FIG.20**].
4. Press **[MODE]** to advance to **the Pressure Units Screen** [**FIG.21**].
5. Press **[SET]** to advance to **Vacuum Units Screen** (blinking) [**FIG.22**].
6. Press **[SET]** to select this menu. Current units will blink.
7. Use **[UP/DOWN ARROWS]** to select either microns (mic) or inches of mercury (inHg).
8. Press **[SET]** to select desired units and go to next menu (Units Summary Screen), or
9. To return to the **Main Screen** [**FIG.1**] press and hold **[CLR]**.



Vacuum Units Screen

ENTER PROGRAMMING CHANGES (MAKE CHANGES CURRENT)

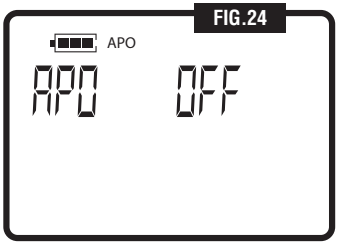
1. The next menu item after selecting Vacuum Units is the **Units Summary Screen** [**FIG.23**]. Blinking symbols represents units chosen in previous steps.
2. Press **[SET]** to select units shown on this screen-making them the current working units.
3. Or after pressing **[SET]**, use **[UP/DOWN ARROWS]** to display previous units. These can be restored by pressing **SET** Menu. In either case, units become current units and manifold returns to **Main Screen [FIG.1]**



Units Summary Screen

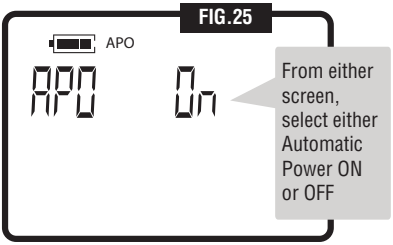
SETTING APO (AUTOMATIC POWER) ON OR OFF

When **APO** is **ON** and there has been no user activity (usually 10-15 minutes), manifolds turn **OFF** to conserve battery power. About 1 minute before turning **OFF**, an alarm will sound to signify that override is possible by pressing any key, except the **[ON/OFF]** key. This will re-start the **APO** timer. **APO** is suspended when performing either the vacuum or pressure hold test or when the unit is used as a vacuum gauge.
When **APO** is **OFF**, the user must turn a manifold off manually.



Set APO Screen

1. From **Main Screen** [**FIG.1**], press and hold **[MODE]**. The **PrO** icon will blink [**FIG.18**].
2. Press **DOWN ARROW** to go to (blinking) **Set APO** screen. [**FIG.24**].
3. At **SET APO** Screen briefly press **[SET]**. "**APO On**" will appear and blink [**FIG.25**].
4. Use **[UP/DOWN ARROW]** to change display from **APO** On [**FIG.25**] to **APO OFF** as desired.
5. Press **[SET]** to select desired **APO** state and return to **Main Screen** [**FIG.1**]



CONNECTING TO AN A/C SYSTEM

Various service and test procedures below can be performed after your manifold has been properly connected to an AC system as shown:

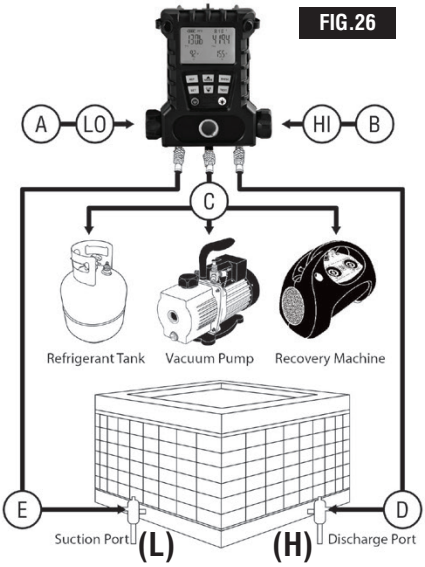


FIG.26

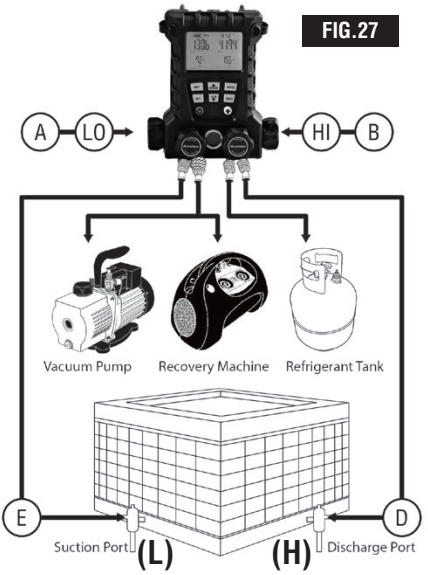


FIG.27

RECOVERING REFRIGERANT

Reference [Fig.26] and [Fig.27]

MD50 2 Valve Manifold [FIG.26]	MD100 4 Valve Manifold [FIG.27]
1.) Connect Low (A) and High (B) Service hoses to service ports (E) and (D)	**1.)** Connect Low (1) and High (2) Side Service hoses to equipment's service ports (L) and (H)
2.) Connect hose from to open port on the tee(C) to Refrigerant Recovery Unit inlet port	**2.)** Connect hose from port (4) to Refrigerant Recovery unit inlet port
3.) Start Recovery Unit	**3.)** Open low side valve (A)
4.) Open low side valve (A)	**4.)** Open high side valve (B)
5.) Open high side valve (B)	**5.)** Start Recovery Unit
6.) Complete refrigerant recovery process.	**6.)** Open valve (D)
7.) Disconnect manifold from system.	**7.)** Complete refrigerant recovery process. Disconnect manifold from system.
8.) Proceed to the repair system, then go to Evacuation Procedure	**8.)** Proceed to the repair system, then go to Evacuation Procedure

EVACUATING PROCEDURES

MD50 2 Valve Manifold [FIG.26]	MD100 4 Valve Manifold [FIG.27]
1.) Connect Low (A) and High (B) Service hoses to service ports (E) and (D)	**1.)** Connect Low (1) and High (2) Service hoses to service ports (L) and (H)
2.) Connect hose from tee (C) to Inlet port of Vacuum Pump. Use the fitting on the tee with the valve core.	**2.)** Connect 3/8" hose from port (4) to Vacuum pump inlet port
3.) Connect another hose from the open port of tee (C) to the valve of a refrigerant supply tank. Supply tank valve must be off.	**3.)** Connect another hose from port (3) to refrigerant supply tank's valve. Supply tank valve must remain off.
4.) Check Low and High Side pressure readings, if zero PSIG or lower continue. If pressure reads higher than 0 PSIG, run Refrigerant RECOVERY	
5.) Once it is determine no refrigerant is present in system, start vacuum pump.	
6.) Open low side valve (A)	**6.)** Open low side valve (A) Open high side valve (B)
7.) Open high side valve (B)	**7.)** Open valve (D). Open valve (C), but do not open supply tank valve.
8.) Note: A Vacuum Gauge (VG200) can be connected via service tee to equipment to monitor vacuum pump's progress.	**8.)** Note: Optional Vacuum Gauge Accessory (MDXVG) can be connected via service tee to the equipment to monitor vacuum pump's progress.
9.) Evacuate system according to manufacturer's specifications; close high and low side hand knobs.	
10.) Disconnect Vacuum Pump hose from valved port on Tee (C). The valve core will seal when hose is removed, thus preserving the vacuum.	**10.)** Close valve (D) once the required vacuum level is reached. Turn off vacuum pump.

The unit is now ready for Vacuum Leak test or High Side Charging Procedure.

CHARGING PROCEDURE - LOW SIDE

MD50 2 Valve Manifold [FIG.26]	MD100 4 Valve Manifold [FIG.27]
1.) The following instructions are to add charge to a pressurized system, known as "topping off".	
2.) Connect Low (A) and High (B) Service hoses to service ports (E) and (D). All valves should be closed.	**2.)** Connect Low (1) and High (2) Service hoses to service ports (L) and (H)
3.) Connect a hose from the open port on tee (C) to valve fitting on supply tank.	**3.)** Connect a hose from port (3) to refrigerant supply tank's valve.
4.) Open supply tank valve. For blends, turn tank upside down or make sure liquid refrigerant is being charged.	
5.) Push valve core on tee (C) until refrigerant comes out. This will purge the hose from the supply tank.	**5.)** Open valve (C). With hose disconnect from port (4), slightly open valve (D) until refrigerant comes out. This will purge the hose from the supply tank.
6.) Turn refrigerant system on. Monitor pressure gauges. Use superheat and subcooling features to help determine when charge amount is optimal.	
7.) Slightly open Low Side Valve (A) to allow liquid refrigerant to flow into low side of equipment. Caution should be used when charging liquid refrigerant into low side of a refrigeration system.	
8.) Close Low Side valve (A) when desired amount of refrigerant has been added. Note the use of a scale is required.	
9.) Let equipment temperatures and pressures stabilize. Check superheat and/or subcooling levels. Repeat charge if necessary.	
10.) Once done, close off supply tank valve and disconnect all hoses. Use Caution as all hose connections are under pressure.	

Once charge is complete, an electronic refrigerant leak detector should be used to confirm leaks do not exist.

CHARGING PROCEDURE - HIGH SIDE

High Side Charging should be done on a completely evacuated system.

	MD50 2 Valve Manifold [FIG.26]	MD100 4 Valve Manifold [FIG.27]
1.) A scale should be used to weigh in the charge. Place tank on scale so liquid refrigerant is supplied.		
2.) Open Supply tank valve to fill manifold with liquid refrigerant.		
3.) Set scale to record charge amount.		
4.) Open High Side Valve (B). Monitor weight reading.		
5.) Once desired charge amount has been reached, close High Side Valve (B) and supply tank valve.		
6.) Start refrigeration system. Open Low Side valve (A) to allow all remaining refrigerant in manifold and service hoses to charge into system.		
7.) Close Low Side Valve (A).		**7.)** Close Low Side Valve (A) and Valve (C).
8.) Monitor Low and High Side pressures. Superheat and subcooling features of manifold can be used at this time.		
9.) Disconnect service hoses from equipment. Use Caution as all hoses are under pressure.		

Once charge is complete, an electronic refrigerant leak detector should be used to confirm leaks do not exist.

APPENDIX A (MANIFOLD SPECIFICATIONS)

High side pressure range		-14.7 to 800.0 PSIG (-1.0 to 55 bar)
Low side pressure range		-14.7 to 800.0 PSIG (-1.0 to 55 bar)
Pressure reading accuracy		+/- 1% of reading or +/- 0.5 PSIG (+/- 0.05 bar)
Pressure reading resolution		0.5 PSIG (0.05 bar)
High and low side burst pressure		1500.0 PSIG (103.4 bar)
High side temperature range		-58.0 °F to 302 °F (-50 °C to 150°C)
Low side temperature range		-58.0 °F to 302 °F (-50 °C to 150°C)
Temperature reading accuracy		+/- 0.36 °F (+/- 0.2°C)
Vacuum indication accuracy		+/- 10 microns (requires MDXVG accessory)
SH, SC and saturation temperature accuracy		+/- 0.5°F (+/- 0.3°C)
Instrument working temperature		-4.0 °F to 122°F (-20°C to 50°C)
Instrument working RH range		0% to 100% non-condensing
Total number of stored refrigerants		93
APO (Automatic Power Off)		10 minutes. Can be disabled by user.
MD100 size (L x H x W)		8.1" x 3.5" x 7.0" (20.5 cm x 8.9 cm x 17.8cm)
MD50 size (L x H x W)		8.1" x 2.5" x 7.0" (20.5 cm x 6.4 cm x 17.8cm)
MD100 weight		3.3 lb. (1.5 kg)
MD50 weight		3.0 lb. (1.4 kg)
Display Life (Using 4 industrial alkaline AA batteries (included)	Backlight full ON:	25+ hrs. continuous duty
	Backlight full OFF:	60+ hrs. continuous duty
Display Life Using 4 Rechargeable NiMH AA batteries (not included):	Backlight full ON:	20+ hrs. continuous duty from full charge
	Backlight full OFF:	50+ hrs. continuous duty from full charge

APPENDIX B (MDXVG VACUUM GAUGE ACCESSORY SPECIFICATIONS)

Sensor Type	Self - heated thermistor bridge with integral temperature compensation from 0 to 50 °C (32 to 122 °F).	
Display Pressure Range	AUTO-RANGING SCALES:	
	0 to 99 microns	1 micron resolution
	100 to 990 microns	10 micron resolution
	1000 to 9900 microns	20 micron resolution
	10000 to 25000 microns	50 micron resolution
	above 25000 microns	Will display low side pressure reading, in selected unit.
Accuracy	+/- 10% of reading or +/- 10 microns, whichever is greater	
Operating Temperature Range	Compensated (accuracy as stated): 0°C TO 50°C (32°F TO 122°F)	
	Non-compensated (add +/- 0.5% of reading error for every °C outside compensated range): -10 to 0°C (14 to 32°F)	
Operating and Storage Humidity	0 to 95%, non-condensing	
Storage Temperature	-40 to 85°C (-40 to 185°F)	

APPENDIX C (MDXBK CHARGER ACCESSORY SPECIFICATIONS)

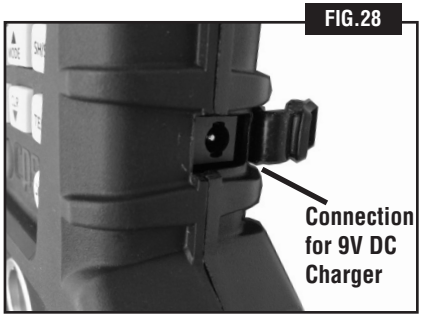
Operating Temperature Range	32°F to 122°F (0°C to 50°C)
Operating and Storage Humidity	0-95%
Storage Temperature	-40°F to 185°F (-40 to 85°C)
Power Source	100-240VAC input, 9VDC 2.0 amp maximum output
Battery Type	AA size, NiMH rechargeable, approximate battery life is 20,000 to 50,000 hours*
Rechargeable Battery Cycle Life	1000 recharges *based on usage with or without the LCD backlight energized.

APPENDIX D (BATTERY SELECTION AND REPLACEMENT)

For optimum life and economic value, CPS Products, Inc. recommends that MD50 and MD100 manifold series be powered by rechargeable NiMH (nickel metal hydride) batteries. CPS Products offers an optional "Charger Kit" (model **MDXBK**) that comes with a power adapter and 4 NiMH batteries. Do not connect the battery charger if there are no rechargeable batteries in the manifolds. ***NOTE: Alkaline batteries should not, and cannot be charged in the BLACKMAX MD50 or MD100 Series.*** Battery charge status is shown by the battery indicator symbol in the upper left [**FIG.1**] **Main Screen** and all other screens. ***NOTE: A slight increase in temperature near the charging socket is normal.*** Remove battery door and install 4 AA size batteries, observing battery polarity.

When using rechargeable batteries for the first time, turn manifold off and connect one end of charger to Manifold 9V DC plug [**FIG.28**] and the other end to an appropriate wall outlet socket. Charge NiMH batteries for 2 hours. The Battery Symbol on the display will blink during charging. MD50 and MD100 manifold series can be used while charging the batteries, but charging time will be considerably extended. The preferred way to use the Rapid Charging Feature is to charge while the manifold is OFF.

FIG.28



APPENDIX E (CLEANING SENSOR IN MDXVG)

Sensor may become contaminated with dust, oil, etc. from pulling vacuums.

1. **Never use a cotton swab or similar object to clean the sensor. This may damage the sensor.**
2. Open all knobs, valves, and cap all the ports except for the VAC port.
3. Invert the MDXVG and add about 1 tablespoon of 100% denatured alcohol into the **VAC port (see FIG 2)** so as to flush out contaminants.
4. Gently shake the unit to produce a swirling effect of the alcohol inside the housing.
5. Turn right side up, open a port to pour out the rubbing alcohol.
6. Repeat the above procedure until the alcohol appears to be clean and clear of contaminants.
7. Check the gasket located inside the VAC port. If worn or deformed, replace with a new CPS gasket (PN: HXG)
8. Open all ports to allow sensors to air dry (usually about 1 hour). **DO NOT BLOW DRY.**

APPENDIX F (LIMITED WARRANTY)

BLACKMAX digital manifolds are covered by a CPS Products, Inc. LIMITED WARRANTY.
CPS Products, Inc. warrants, to the original purchaser, that its BLACKMAX line of digital manifolds and accessories are free from defects in assembly, materials and workmanship for **1 year** from the date of purchase, or **15 months** from the date of manufacture, whichever is sooner. If any BLACKMAX product is believed to be defective it must be returned to CPS Products. If the product is found to be defective, CPS will repair or replace the item(s), at our option, at no charge.

This warranty does not apply to products or accessories that have been altered, misused, submerged, exposed to extreme heat or cold, lightning strikes, or electrical voltage exceeding published product specifications. This warranty also does not apply to products that are simply in need of routine field service maintenance.

To assure your BLACKMAX purchase is on file with CPS Products, please fill in a Product Registration form and mail to CPS within 15 days from the date of purchase, along with a copy of the original sales receipt. Return of the registration form is not required to be covered by the Limited Product Warranty.

To process a warranty claim, please contact CPS USA at 1-800-277-3808 or CPS Products N.V. (Belgium) at (32) 3 281 30 40; or CPS Australia at 08 8340 7055, within 15 days of discovering defects in assembly, materials, or workmanship. CPS will provide a return authorization number (RGA #). Do not attempt to repair BLACKMAX products. CPS has the sole right to determine if a claim is valid and if compensation is justified.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER EXPRESS WARRANTIES. TO THE EXTENT ALLOWED BY LAW, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED TO THE DURATION OF THE LIMITED PRODUCT WARRANTY. IN NO CASE SHALL CPS PRODUCTS INC. HAVE ANY LIABILITY FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, INCLUDING BUT NOT LIMITED TO: THE LOSS OF THE USE OF THE PRODUCT OR ANY ASSOCIATED EQUIPMENT, COST OF ANY SUBSTITUTED EQUIPMENT, FACILITIES OR SERVICES, DOWNTIME, THE CLAIMS OF THIRD PARTIES, DAMAGE TO PROPERTY OR PERSONAL INJURY. SOME JURISDICTIONS DO NOT ALLOW LIMITS ON WARRANTIES OR ON REMEDIES FOR BREACH IN CERTAIN TRANSACTIONS. IN SUCH JURISDICTIONS, THE LIMITS IN THIS PARAGRAPH MAY NOT APPLY.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION.

APPENDIX G (REFRIGERANTS STORED IN MEMORY)

MD50 and MD100 manifold series are pre-loaded with 93 of the most common refrigerants.

<table>
<tr><td>R11</td><td>R13B1</td><td>R290</td><td>R407D</td><td>R416A</td><td>R424A</td><td>R504</td></tr>
<tr><td>R113</td><td>R141B</td><td>R32</td><td>R407F</td><td rowspan="2">R417A / M059</td><td>R425A</td><td>R507A</td></tr>
<tr><td>R114</td><td>R142B</td><td>R401A</td><td>R408A</td><td>R426A</td><td>R508A</td></tr>
<tr><td>R115</td><td>R143</td><td>R401B</td><td>R409A</td><td>R418A</td><td rowspan="3">R427A / M089 / FX100</td><td>R508B</td></tr>
<tr><td>R116</td><td>R143A</td><td>R401C</td><td>R41</td><td>R419A</td><td rowspan="2">R509A</td></tr>
<tr><td>R12</td><td>R152A</td><td>R402A</td><td>R410A</td><td>R420A</td></tr>
<tr><td>R123</td><td>R176</td><td>R402B</td><td>R410B</td><td>R421A</td><td>R428A</td><td>R600</td></tr>
<tr><td>R123A</td><td>R21</td><td>R403A</td><td>R411A</td><td>R421B</td><td>R434A</td><td>R600A</td></tr>
<tr><td>R1234YF</td><td>R218</td><td>R403B</td><td>R411B</td><td rowspan="2">R422A / M079</td><td rowspan="2">R437A / M049PLUS</td><td>R601</td></tr>
<tr><td>R124</td><td>R22</td><td>R404A</td><td>R412A</td><td>R601A</td></tr>
<tr><td>R125</td><td>R23</td><td>R405A</td><td>R413A / M049</td><td>R422B</td><td>R438A / M099</td><td rowspan="6">R744 (Sub-critical range only)</td></tr>
<tr><td>R1270</td><td>R236ea</td><td>R406A</td><td></td><td>R422C</td><td>R500</td></tr>
<tr><td>R13</td><td>R236FA</td><td>R407A</td><td>R414A</td><td rowspan="2">R422D / M029</td><td>R501</td></tr>
<tr><td>R134</td><td>R245ca</td><td>R407B</td><td>R414B</td><td>R502</td></tr>
<tr><td>R134A</td><td>R245fa</td><td>R407C</td><td>R415A</td><td>R423A / 39TC</td><td>R503</td></tr>
</table>

APPENDIX H (ERROR INDICATOR SCREENS)

If certain malfunctions occur, MD50 and MD100 series will display error messages:

oP -Appears in display areas reserved for temperature readings when thermistor sensor connected to that port is open circuited or not connected. Replace sensor with CPS model number TMX3C.

SP –Appears in display areas reserved for temperature readings when thermistor sensor connected to that port is short circuited. Replace sensor with CPS model number TMX3C.

Err (Upper Left Display) - Appears in upper left display when T function is selected and one or both thermistor sensors are defective as indicated by oP or SP indicators mentioned above.

Err (Lower Left Display) -Appears in display areas reserved for temperature readings when user tries to read saturation temperatures and calibration of pressure channels is invalid. This defect requires manifold be returned to factory.

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