petMAP™ XM

BPM

Blood Pressure Module

Xpand your petMAPXM with our BPM:

- NIBP (includes 7 cuffs)
- 2 IP channels

Developed by:
RAMSEY MEDICAL INC

Manufactured, Sold & Serviced by:
cardio COMMAND

petMAP™ BPM

MODEL	DESCRIPTION
9050	petMAP BPM (Blood Pressure Module)

This manual applies to the above device and its accessories. **Read this manual completely before using the equipment**.

petMAP BPM and its host device, petMAP XM, are to be operated by qualified personnel only. Before use, familiarize yourself with the devices and read both manuals, including all warnings and cautions. The user should check that petMAP BPM, along with its accessories, is functioning both safely and effectively prior to use.

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petMAP™ BPM OPERATOR'S MANUAL

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INTRODUCTION

Device Description

petMAP™ BPM (Blood Pressure Module) is a module designed to plug into the petMAP XM. It is capable of measuring both NIBP (Non-Invasive Blood Pressure, including systolic, diastolic and mean arterial pressures), heart rate and two channels of IP (Invasive Pressure). The measured values are displayed and trended on the petMAP XM, which also supports the user interface to the BPM. Data trended on the petMAP XM can optionally be saved on an SD memory card via the XM's integrated SD memory card slot. BPM is designed for veterinary use only.

A user interacts with petMAP BPM using the petMAP XM's touch screen, just like many smart phones. The device has two primary modes of operation: "Clinic Mode" (where NIBP automatic cycling is disabled and BP determinations are triggered by the user directly) and "OR Mode" (where NIBP automatic cycling is enabled and BP determinations automatically repeat at the user selected time cycle). In Clinic Mode, BP measurements are made under operator control and in OR Mode vital signs are automatically determined at user-selected time intervals. Both modes allow the user to set alarms for systolic blood pressure.

By sliding a switch from NIBP to IP, petMAP BPM can be used to measure one or two channels of invasive pressure. Similar to NIBP, the user interface for IP measurement resides on the XM; IP waveforms and values are also displayed there.

Intended Uses

petMAP BPM is intended to be used on veterinary patients when the user already has a petMAP XM and desires to measure or monitor NIBP, heart rate and/or IP. It can be used on a wide variety of veterinary patients, but is primarily designed for companion animals. petMAP XM with BPM can be used on both awake and anesthetized patients; its applications include use for surgical, ICU and trauma monitoring as well as use in the exam room and during procedures (imaging, dentals, etc.).

Features of petMAP BPM

- One Device | Dual Purpose: As mentioned above, petMAP BPM is capable of measuring and monitoring both NIBP and IP in a single device.
- Accuracy: petMAP's proprietary BP features include **PPO** (**P**etMAP **P**roprietary **O**ptimizations) and **NSV** (**N**ominal **S**ession **V**alue). petMAP BPM utilizes the oscillometric method which simplifies the measurement of blood pressure over traditional Doppler techniques. BPM also provides all of the BP parameters (systolic, diastolic, mean arterial pressure (MAP) and heart rate), enabling accurate diagnosis and management of hypertension and useful monitoring during surgical anesthesia and other procedures.
- Modularity: The petMAP BPM is capable of moving from XM to XM allowing any XM it is plugged into to measure BP.
- Sensitivity: petMAP's great sensitivity permits BP measurement even in small cats and dogs, as well as in larger animals, including horses, when set in the non-optimized mode setting. Additionally, for companion animals, PPO enhances the accuracy achieved by allowing the user to select the species (dog or cat) and the cuff placement site (forearm, tail or hind foot). PPO is unique to petMAP devices and when used, improves the correlation of the readings to direct, intra-arterial pressure measurements.
- Session BP values: Like all petMAPs, petMAP BPM/XM provides another unique and proprietary feature, the BP "Nominal Session Value" or NSV. The NSV is not a straight average of the BP readings; rather, it is a substantially more robust statistical measure of the animal's nominal BP during the BP session since it eliminates high and low outliers and gives more weight to the session values that are in the middle of the measured BP range. The NSV enhances the veterinarian's ability to accurately diagnose, trend and manage hypertension in awake animals in the exam room.
- Two modes of use: OR Mode and Clinic Mode. Described in more detail later in the manual, petMAP BPM when attached to XM has two different display formats, one designed primarily for longer term trending in OR Mode for surgery and ICU and the other, Clinic Mode,

designed for shorter term measurement periods when in the exam room. In Clinic Mode, the default display format shows three useful representations of the data: a short graphic trend line of the last 10 BP readings, a tabular list of the last 10 BP readings and the current NSV. Regardless of the current mode the user is in, either display format may be viewed by simply touching the displayed "graphic" area of the screen to toggle between the two display modes at anytime.

- Ease of use: petMAP's portability, data presentation options and intuitive user interface (no menus are required for normal use) make it one of the easiest devices to use. The touch screen controls, and no menus for normal use, make in-service a snap, particularly since it functions much like a smart phone or tablet…touch driven and very intuitive.

Measuring Vital Signs on Animals / General Information & Helpful Tips for BP Measurement.

Measuring blood pressure in companion animals requires:

1. A cooperative animal that is not moving
2. A patient, well trained veterinarian or technician
3. Accurate measuring equipment
4. The right size cuff properly applied to the appropriate limb. The forearm or tail is usually best for cats; the tail and forearm for dogs. The hindfoot is the least desirable, but usable if the preferred sites are not available.

Veterinarians who teach BP seminars point out the most important requirements are the skill, training and patience of the person taking BP. Also, a calm animal is essential. petMAP BPM is specifically designed to allow the user to get good determinations on calm, awake animals. Even so, many animals will require extra time for calming and lots of user patience. If an animal is restless, giving them 8 to 10 minutes to calm down often helps and should restore their BP closer to their usual level. Accurate BP readings, even on a relaxed animal, require the proper cuff size and a "snug-tight" fit, which completely compresses the fur; this snug fit is exceptionally important and

essential to accurate readings. Use the “OPTIMUM zone” lines to select the proper size cuff (see CritterCuff information, later in the manual).

If you have trouble getting good determinations, try:

1. Calming the animal so that it is truly relaxed and not moving. Sometimes having the owner hold the animal will make it much more comfortable and relaxed.

2. Checking cuff size for “OPTIMUM” fit and a truly snug cuff application.

3. Gathering more operator patience. BP measurements on awake animals are sometimes difficult and a calm and collected measurement person is always a big plus in getting reliable BP readings. It cannot be rushed.

Cold Animals**:** If the animal is noticeably cold, it may require 5 to 6 attempts in order to achieve any successful BP reading and clearly this is not an acceptable situation for reliable and accurate BP readings. Warm the patient with a blanket or other means before again attempting to measure BP.

Trembling Animals**:** It will be very difficult, or even impossible, to get accurate BP readings on a trembling animal since the rhythmic motion of the cuff can, and often does, mimic the rhythmic beat of the heart, which can result in inaccurate readings.

Unit Configurations & Accessories

The following table summarizes the standard accessories and optional accessories available for the
petMAP™ BPM:

	Product Code	Description
Standard Accessories (included with the Device)	**9050** petMAP BPM	➢ CritterCuff Kit. Includes 1 each of 2.0cm, 2.5cm, 3.0cm, 3.5cm, 4.0cm, 4.5cm and 5.5cm cuff ➢ BP Extension Hose (2.0 – 5.5cm cuffs) ➢ BP Extension Hose (6.5 – 13.0cm cuffs) ➢ BPM Connection Cable ➢ Operator's Manual
Optional Accessories	**9089**	IP Extension Cable
	9090	IP Transducer Transtar MX950SCNT
	8067	5.0cm CritterCuff
	8057	6.5cm CritterCuff
	8058	8.0cm CritterCuff
	8059	10.0cm RamseyCuff
	8060	13.0cm RamseyCuff
Replacement Items	**9009**	BP Extension Hose for CritterCuff sizes 2.0 – 5.5cm
	9010	BP Extension Hose for CritterCuff sizes 6.5 – 13.0cm
	R316002	BPM Connection Cable
	8050	2.0cm CritterCuff
	8051	2.5cm CritterCuff
	8055	3.0cm CritterCuff
	8052	3.5cm CritterCuff
	8056	4.0cm CritterCuff
	8053	4.5cm CritterCuff
	8054	5.5cm CritterCuff

SYMBOLS

Caution Symbol **Consult Manual Symbol**

Complies with the requirements of Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast) and Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast).

United Kingdom Conformity Assessed - Complies with the requirements of Great Britain Legislation, The Product Safety and Metrology etc. (Amendment etc.) (EU Exit) Regulations 2019

WARNINGS & CAUTIONS

Cuff Only. This cuff port is solely intended for connection of a CritterCuff, a CritterCuff Extension Hose or a RamseyCuff. Do not connect anything else to this port, especially, never connect an IV tube or arterial line to the cuff port on the petMAP since that would likely result in air being pumped into the patient with potentially fatal results! Also, fluid ingress through this port into the unit will result in severe damage to the unit.

IMPORTANT: For accurate BP readings with petMAP BPM, only Ramsey Medical, Inc. CritterCuffs and RamseyCuffs should be used. Improper cuff size and improper cuff fit will result in inaccurate (or no) BP readings. petMAP requires a cuff whose width is approximately 42 - 50% of the circumference of the forearm, the hind foot or the tail of the animal. The index line on the cuff should fall within the “OPTIMUM zone” shown by the dotted lines on the cuff, but NEVER outside of the solid boundary lines. For proper fit, the cuff must be truly snug, but not painfully tight (see CritterCuff information).

⚠ The petMAP BPM is intended for VETERINARY USE ONLY. Do not use on a human patient.

⚠ Do not apply the blood pressure cuff on an extremity being used for an IV solution.

⚠ Do not immerse the device in water or any liquid. If the unit is accidentally wetted, it should be thoroughly dried before use.

⚠ To ensure that the unit remains in calibration, verify calibration on a yearly basis or at any time there is user suspicion that proper calibration may have been lost.

⚠ If the petMAP BPM has been dropped or damaged in any way, it should be checked by qualified service personnel to ensure proper operation prior to use.

⚠ Use only Pressure Transducers specified by Ramsey Medical in this manual.

⚠ Never reuse disposable pressure transducers.

⚠ When using IP Transducers, read all included Instructions for use included with the BPM and the also the transducer.

⚠ High Frequency Electro Surgical Units (ESUs) can cause interference and Burn hazards. To reduce hazards ensure that all cables and transducers never come into contact with ESUs or ESU connections.

⚠ Use of accessories other than those specified by Ramsey Medical may result in increased electro-magnetic (EM) emissions or decreased EM immunity of the device.

⚠ Follow local governing ordinances and recycling instructions regarding disposal and recycling of device components and packaging.

⚠ The petMAP BPM is designed to conform to Electromagnetic Compatibility (EMC) standard EN 61326-1:2013, and will operate accurately in conjunction with other equipment which also meets this requirement. To avoid interference problems affecting the Monitor, do not use the Monitor in the presence of equipment which does not conform to these specifications.

POTENTIAL FOR RADIO/TELEVISION INTERFERENCE

This product has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. The product generates, uses and can radiate radiofrequency 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 the product does cause harmful interference to radio or television reception, which can be determined by turning the product on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the product and receiver.
- Consult the dealer or an experienced radio/TV technician for help.

⚠ The petMAP BPM is not intended for use on patients being imaged with an MRI device since the petMAP device contains magnetically active materials and could result in injury if used too close to an operating MRI.

⚠ Inaccurate readings may result when an electrosurgical unit (ESU) is used while monitoring with
the petMAP BPM. If this is suspected, discontinue use of the BPM while the (ESU) is in use.

⚠ Do not gas sterilize or autoclave the device.

EMC Declaration and Guidance

Precautions regarding Electromagnetic Compatibility (EMC) are required when using Medical Equipment. The petMAP BPM should be put into service according to the EMC information provided in this manual.

Portable and mobile RF communications equipment can affect Monitoring Equipment.

The measurement accuracy and user control functions as specified in this manual are determined to be the petMAP BPM essential performance.

The petMAP BPM combined with the petMAP XM is designed to conform to Electromagnetic Compatibility (EMC) standard EN 61326-1:2013, and will operate accurately in conjunction with other equipment which also meets applicable regulatory EMC requirements.

The petMAP XM and BPM use RF energy only for its internal function. Therefore, its RF emissions are very low and not likely to cause any interference in nearby equipment. (Bluetooth radios may affect nearby electronic equipment.)

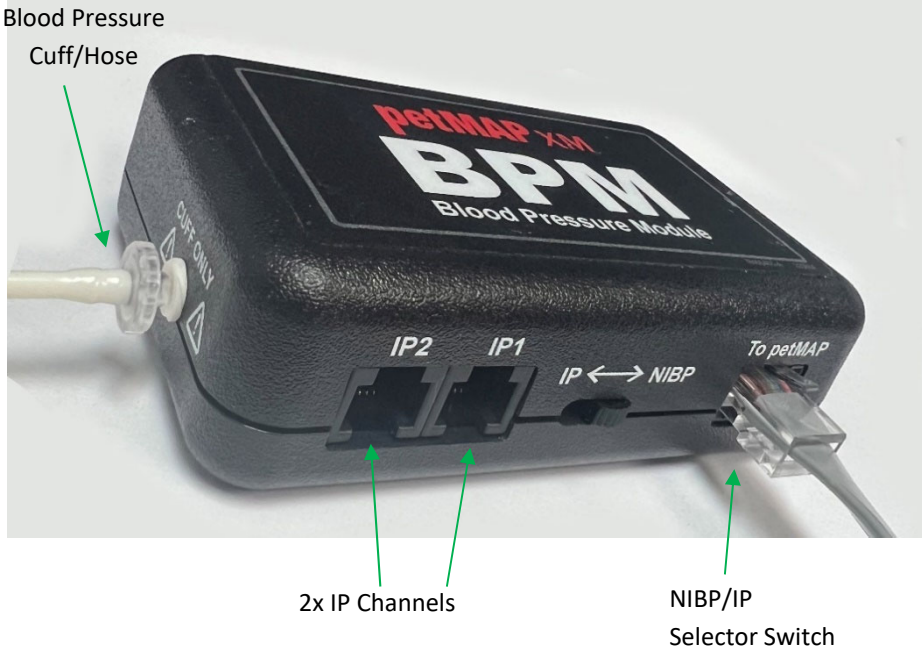
The petMAP XM and BPM are suitable for use in all commercial, industrial and business environments.

Electromagnetic Emissions		
The petMAP g3 is intended for use in the electromagnetic environment specified below. The customer or user of the petMAP g3 should assure that it is used in such an environment		
Emissions test	**Compliance Level**	**Electromagnetic environment guidance**
RF emissions CISPR 11	Group 1	The petMAP g3 uses RF energy only for its internal function. Therefore, its RF emissions are very low and not likely to cause any interference in nearby equipment. (Unit equipped with Bluetooth radios may affect nearby electronic equipment.)
RF emissions CISPR 11	Class B	The petMAP g3 is suitable for use in all establishments, including domestic establishments and those directly connected to the public low- voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC61000-3-2	Class B	
Voltage Fluctuations/flicker emissions IEC 610000-3-3	Complies	

DEVICE OVERVIEW

Controls & Connections. Note the diagram for petMAP BPM controls and connections.

Blood Pressure Module #9050 Connections



Connection to petMAP XM- Connect the 10 conductor RJ50 cable between the BPM and the petMAP XM BPM connector (bottom connector on right side of the petMAP XM).

Cuff Connector. When measuring Non-Invasive Blood Pressure, firmly push (with a slight twist) the male Luer connector of either a CritterCuff or the BP Extension Hose into this slot. When using a BP Extension Hose, be sure that the hose is the proper one for the size of the cuff, as marked, and it should be of the same diameter as the cuff hose. Do not attach anything other than the extension hose or a cuff to this connection (see **WARNINGS**) as doing so will result in a hazardous condition, since air under pressure is pumped through this connector to inflate the BP cuff!

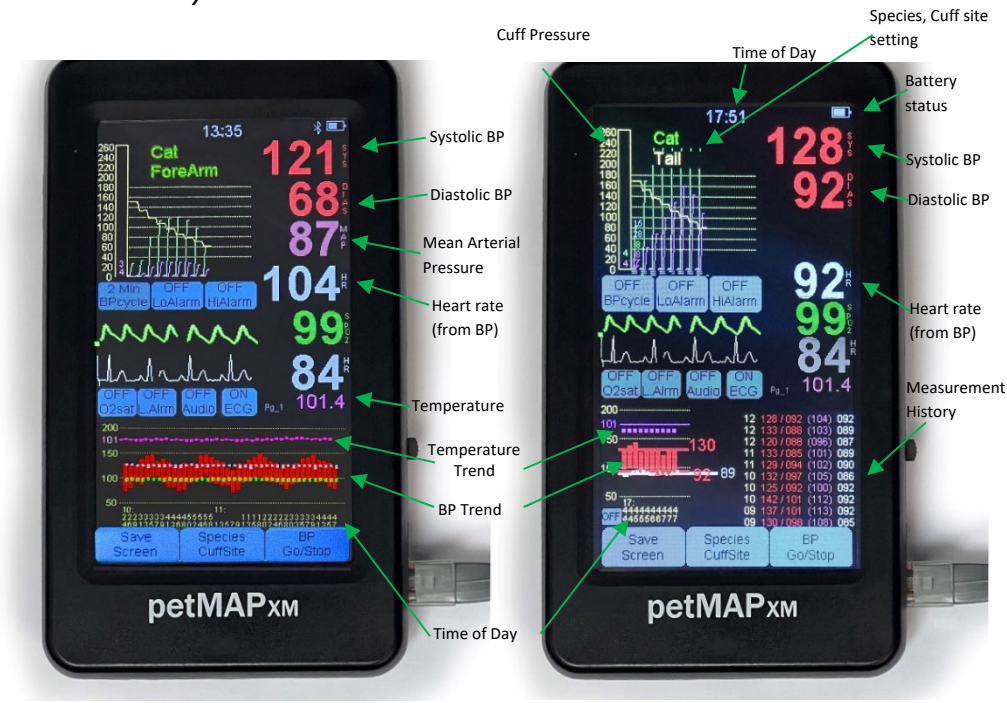
NIBP/IP Selector Switch. This switch sets the mode of the BPM. For Non Invasive Blood Pressure monitoring, slide the switch to the right (towards the gray petMAP interface cable). For Invasive Blood Pressure monitoring, slide the switch to the left towards the IP transducer connectors.

Operating Modes & Displays. Note the diagram for a description of petMAP XM display content when BPM is connected and active.

OR MODE

BP cycle set

CLINIC MODE



The OR Mode is activated by selecting a measurement frequency using the "BPcycle" button. The default mode is Clinic Mode (BPcycle is OFF) in which each BP reading must be started using the "BP Go/Stop" button.

Touch Screen. The touch screen is the primary method for the user to interact with petMAP XM/BPM. The display has several active areas (buttons) for the user to make selections, but some functions (alarm cancelation, trend display and selection of Fahrenheit or Celsius temperature display) are invoked by simply touching the screen in areas without buttons or by touching the temperature display directly. Generally, selections are made by using a momentary *press and release* technique. A press and hold technique on buttons will restore some controls to their OFF position. Some operators find using both their fingertip and their fingernail at the same time easier than just using the pad of their finger tip since this fingernail technique allows better visibility of the text displayed on the button. However, any technique is acceptable as long as nothing sharp is used to press the buttons on the screen.

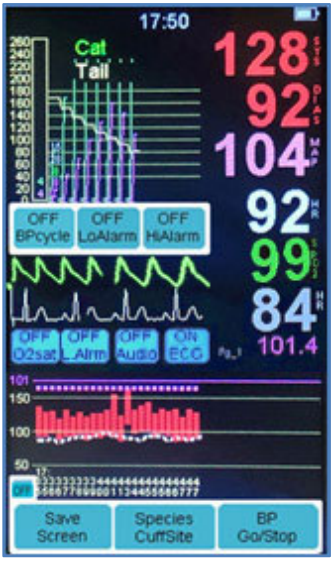
Time of Day. Time of Day is displayed below the graphical trend in three lines where the top line is the hour of day and the next two lines are minutes.

BP Trend. The BP trend is displayed as a bar where the top of the bar is the systolic pressure and the bottom of the bar is the diastolic pressure. Heart rate is displayed in white.

Measurement History. The format for the measurement history is minute of measurement, systolic value, diastolic value, MAP value (in parenthesis) and heart rate. The top value is the most recent.

User Selections. Note the diagram for petMAP XM user selections when BPM is connected and active. The available user selections are light blue with black text.

Non Invasive Blood Pressure Measurement & Related Commands



OFF BPcycle

Press and release to set the BP measurement frequency which, when set, places the device into OR mode in which BP reading are automatically repeated at the selected interval. The available BPcycle options are STAT (BP cycles rapidly for three minutes then reverts automatically to a 2 min cycle time), 1 Min, 2Min, 3 Min, 4 Min, 5 Min, 10 Min, 15 Min, 20 Min, 25 Min and 30 Min. Once the desired frequency is selected, the user must press the BP Go/Stop button to begin the measurements. Press and hold the BP cycle button to turn the cycle mode OFF.

OFF LoAlarm

Press and release to set the low limit alarm for systolic pressure. The available settings are 60, 80, 100, 120, 140, 160 and OFF.
Press and hold to turn the alarm OFF.

OFF HiAlarm

Press and release to set the high limit alarm for systolic pressure. The available settings are 150, 175, 200, 225, 250 and OFF.
Press and hold to turn the alarm OFF.

Species CuffSite

Press and release to set the species and cuff site which is displayed at the top. The seven available settings are DOG (forearm, hindfoot and tail), CAT (forearm, hindfoot and tail) and Optimize…None. The non-optimized mode should be used on any species other than dog or cat or when comparing petMAP to Doppler or other oscillometric BP devices.

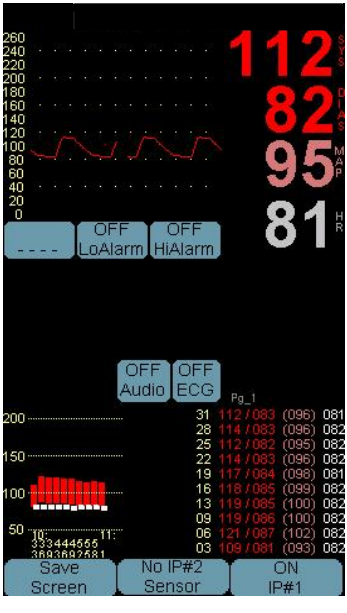
BP Go/Stop

Press and release to initiate a BP reading in Clinic Mode, or to initiate a series of automatically cycled BP readings in the OR Mode.

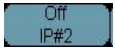
OFF
Save Screen

If an SD card is in use, press to capture an image of the screen in a file on the SD card. Similarly, the unit will prompt the user at power off for the same feature. (See Operator's Manual for the function of the small button, above left.)

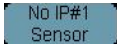
Invasive Blood Pressure Measurement Commands



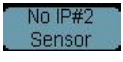
Press and release to turn Invasive measurement channel IP#1 ON



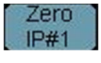
Press and release to turn Invasive measurement channel IP#2 ON

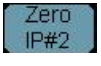


This is displayed when No Invasive Pressure Transducer is connected to invasive measurement channel IP#1



This is displayed when No Invasive Pressure Transducer is connected to invasive measurement





Press and release to ZERO the indicated invasive Pressure Channel. This message will Display on the button for 15 seconds after the desired invasive Pressure Channel is Turned ON The Button Text will Change to - - - - once zeroing is complete. Refer to the Transducer Instructions for Use for additional information on zeroing.

Press and release to set the low limit alarm for systolic pressure. The available settings are 60, 80, 100, 120, 140, 160 and OFF.
Press and hold to turn the alarm OFF.

Press and release to set the high limit alarm for systolic pressure. The available settings are 150, 175, 200, 225, 250 and OFF.
Press and hold to turn the alarm OFF.

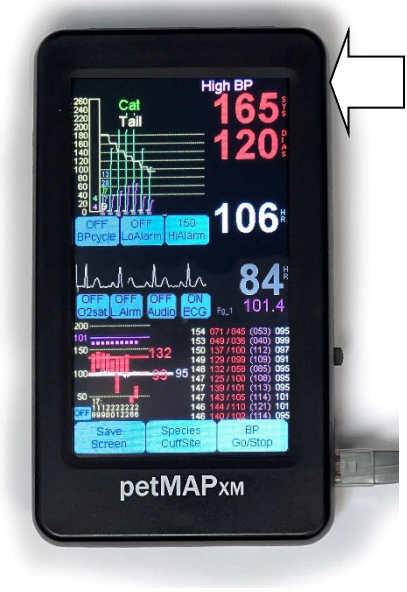
Alarms. petMAP BPM has both User-selectable Alarms and System Alarms.

User-selectable Alarms

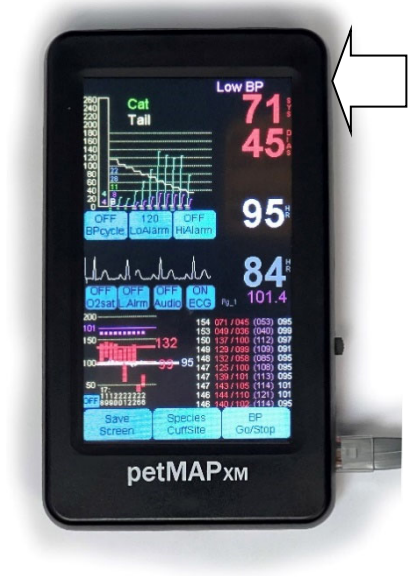
As mentioned above, the user may set alarms for systolic pressure (both hi and low). The default setting for all user selectable Alarms is OFF.

When activated by the user, the petMAP XM will audibly alarm when the selected alarm settings are exceeded.

The alarms begin as a subtle chirping sound and progress to a louder continuous tone after about 20 seconds. All alarms are canceled by the user by touching the screen anyplace, but make sure to only touch a button when it is desired to make a change in that button's function.



High BP Alarm



Low BP Alarm

System Alarms

petMAP has built in System Alarms which may sound when the device detects conditions that need attention. System Alarms are not user selectable and are always enabled.

The System Alarms include:

BP measurement not achieved -The message displayed on Screen – "Patient? Motion? Cuff?" is to let the user know that adequate BP signals were not properly detected, because the patient is not producing adequate signals for whatever reason, or the signals were substantially adversely affected by patient or operator induced motion artifact, and that a blood pressure measurement could not be made. The user should check the patient for adequate cardiovascular function, cuff or limb motion, and always check that the cuff is sized correctly and snugly applied to the limb, and is connected securely to the unit. Review the section: "Measuring Vital Signs in Animals" in this manual for proper BP measurement technique information.

The system alarms may also be silenced by touching anywhere on the screen, but take care not to touch a button unintentionally when canceling an alarm condition.

BP measurement not achieved

OPERATING INSTRUCTIONS

Measuring Non-Invasive Blood Pressure

petMAP BPM can operate in either “Clinic Mode”, where blood pressure measurement frequency is under user control, or in “OR Mode”, where measurement frequency is determined by the user by setting the BP cycle time for automatically repeated BP measurements at the set cycle time.

Cuff placement. In either mode, the first step for accurate NIBP determinations is to select the proper sized cuff and to apply it, snug tight, to the best limb available. The available cuff sites include the forearm, tail or hind foot. To achieve the most accurate and consistent readings, it is recommended that the forearm or base of the tail be used on cats (either works well). For dogs, the base of the tail if the preferred site, followed by the forearm. The hind foot is the least accurate and should only be used if the forearm and/or tail cannot be used. Generally, there is no need to shave or clip the hair or fur; however, it is critical to apply the cuff snug tight. In the case of BP measurements on long haired animals, wetting the fur to allow better compression by the cuff may be beneficial in terms of ease of cuff placement and potentially better accuracy.

For species other than cats and dogs, follow the BP basics with respect to cuff sizing and placement: 1) place the cuff as close to heart level as possible, since there is an offset of +/- 2 mmHg for every inch of vertical difference between the heart and the cuff, 2) use the correct sized cuff, and 3) there should be no pressure on the cuff, nor any movement of the limb or the animal during a BP measurement. Movement of the patient by the surgeon or staff during surgery or clinic exams can produce motion artifacts which can adversely affect BP accuracy.

BP extension hoses: petMAP BPM is supplied with two BP extension hoses, which can be used to increase the distance between the BPM and the cuff. The extension hoses are approximately four feet long and come in two different sizes. One size is used with the smaller cuffs (2.0 – 5.5cm) and has a smaller diameter which is the same size as the smaller cuff hoses; the other extension hose is used with larger cuffs (6.5 – 13.0cm) and has a larger diameter as do the larger cuffs. It is extremely important that the proper extension be paired with the cuff being used. However, in exceptional cases of very difficult patient positioning, it may be necessary to join the two different diameter extensions together to reach a remotely placed patient, but degradation in accuracy and performance should be expected if this is done.

petMAP settings: Using the Species Cuff Site button at the bottom of the screen, press and release to set the species and cuff site appropriate for the patient being measured. There are three settings for dogs (forearm, hind foot and tail) and the same three for cats. The settings are displayed at the top center. Using these settings, which are referred to as "optimizations", will improve the correlation of the reading results to intra-arterial pressures based on petMAP's unique algorithms. If the species being measured is not a dog or a cat, the seventh setting, the "non-optimized mode", should be used. The non-optimized setting should also be selected if attempting to compare readings from other BP devices to the petMAP.

Taking NIBP in Clinic Mode

Clinic Mode is the mode used when the user wants to be in control of the timing and frequency of BP measurements. When used in Clinic Mode, the user must leave the BPcycle setting OFF (by definition, the OFF setting puts the unit into Clinic Mode). For each desired reading, touch the BP Go/Stop button to initiate (or stop) a BP reading. The cuff will inflate automatically after the BP determination is started. During cuff pressure deflation, petMAP XM will display the cuff pressure and the oscillometric waveform. Using the graph of the oscillometric envelope, the user can discern the quality of the determination. See examples of good, bad and ugly readings later in this section. If a determination is developing a bad or ugly waveform, stop the determination, calm the patient, and then try again.

OR MODE

BP cycle set

CLINIC MODE

If the MAP value is desired while in Clinic Mode, simply touch the screen area below diastolic BP for it to be displayed. By default, in Clinic Mode the bottom area of the display contains both a graphical and a tabular display of measured data. In addition to the measured data in this Clinic Mode data display, the petMAP XM displays the NSV in the graphical display area. NSV stands for **N**ominal **S**ession **V**alue, a unique and proprietary petMAP feature. After the second reading, NSV is automatically calculated after each subsequent reading in the BP measurement session. NSV is not a straight average of the previous readings—all of the BP session readings are analyzed to result in a robust statistical measure of the patient's nominal BP. Outliers are eliminated and more averaging weight is given to the readings that are more similar to each other and near the median BP value measured. The OR Mode trend display (shown below) can be selected at anytime by touching the graphical data display area, and another touch returns to the Clinic Mode display.

Taking BP in OR Mode

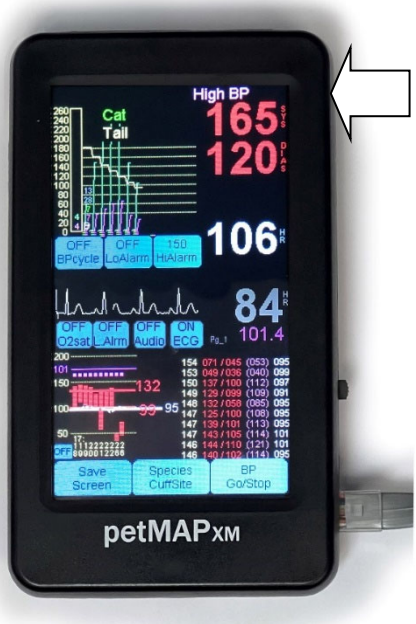
OR mode is the mode used when multiple BP readings are desired to be automatically measured at a specific user selected frequency of BP measurement. The BP cycle time is set by touching the BPcycle button repeatedly until you arrive at the desired time interval. The interval settings available are STAT (rapid readings for 3 minutes and then it will automatically switch to the 2 min cycle time), 1Min, 2Min, 3Min, 4Min, 5Min, 10Min, 15Min, 20Min, 25Min and 30Min. Returning to OFF can be accomplished by either cycling through all of the settings or by pressing and holding the BPcycle button until OFF appears. Once the BP cycle time is set, the BP Go/Stop button initiates the readings and must be pressed to start the automatic cycling of BP readings. To discontinue the cycle, set the BP cycle to OFF.

The STAT mode is used when rapidly repeating BP readings are desired. The STAT mode will re-inflate the cuff almost immediately after the previous reading has completed and this sequence will continue for 3 minutes at which time it automatically switches to the 2Min cycle time. After each new BP

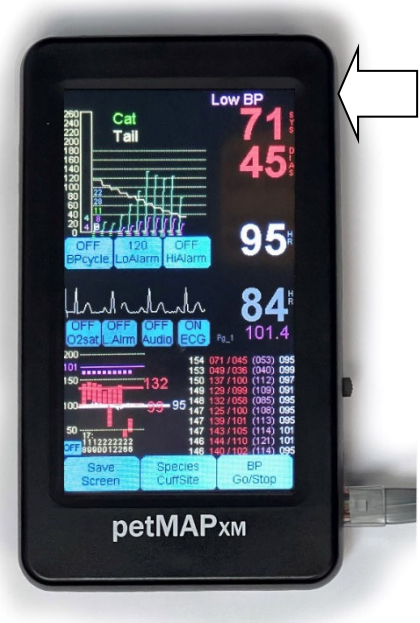
determination completes, a short beep will audibly sound to alert the user that a new BP value is available.

High and low alarms can be set for systolic pressure. To set alarms, repeatedly touch the BP Hi Alarm and/or Lo Alarm buttons until the desired alarm limit is set. If the measured value exceeds (higher or lower) the alarm limit set, the unit will both alarm and display a message at the top of the display. Silencing alarms is done by touching the display anyplace, but take care not to touch a button unintentionally.

High BP Alarm

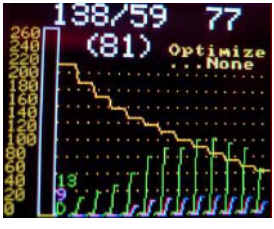
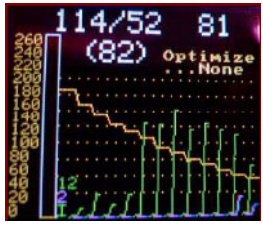
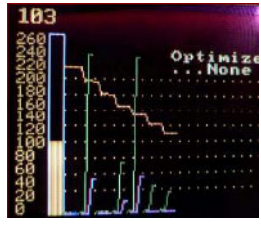
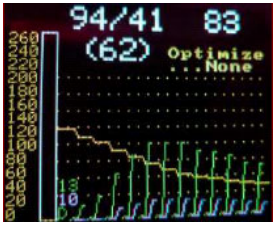
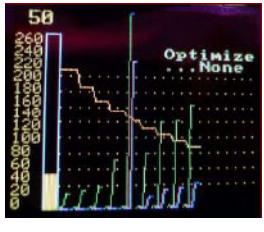
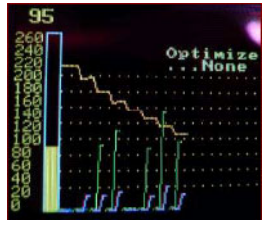
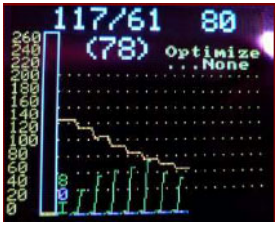
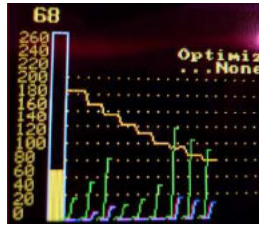
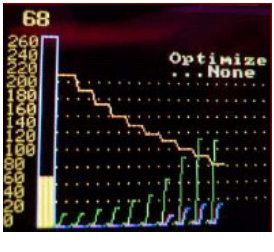
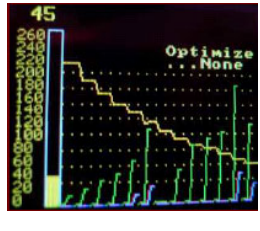


Low BP Alarm



The GOOD, the BAD, and the UGLY . . .

BP determinations that are showing ragged oscillometric envelopes like the BAD and the UGLY examples below should be terminated while in process by pressing the BP Go/Stop button, and appropriate corrective action taken such as checking the fit and snugness of the cuff and calming the patient to reduce motion before a new determination is started.

GOOD	BAD	UGLY
		
		
		
		

Monitoring Invasive Blood Pressure

The BPM support two channels of Invasive Pressure (IP) monitoring labeled IP1 and IP2 on the BPM.

Both Channels accept Industry standard IP transducers. Transducers are available from CardioCommand Inc. (REF 9090, MX950SCNT TranStar Disposable Pressure Transducers) and from other medical equipment suppliers.

Of the two IP monitoring channels, IP1 is the primary Invasive Pressure channel interface and the measurements from this channel are displayed on the screen with a red waveform and red text with results saved at 3 minute intervals in the trend display at the bottom of the Display, the SD card archive files and written to the USB output.

IP2 is a secondary Invasive Pressure channel, its measurement data is displayed on-screen with a green waveform and green text. Trends are not saved for the secondary IP channel.

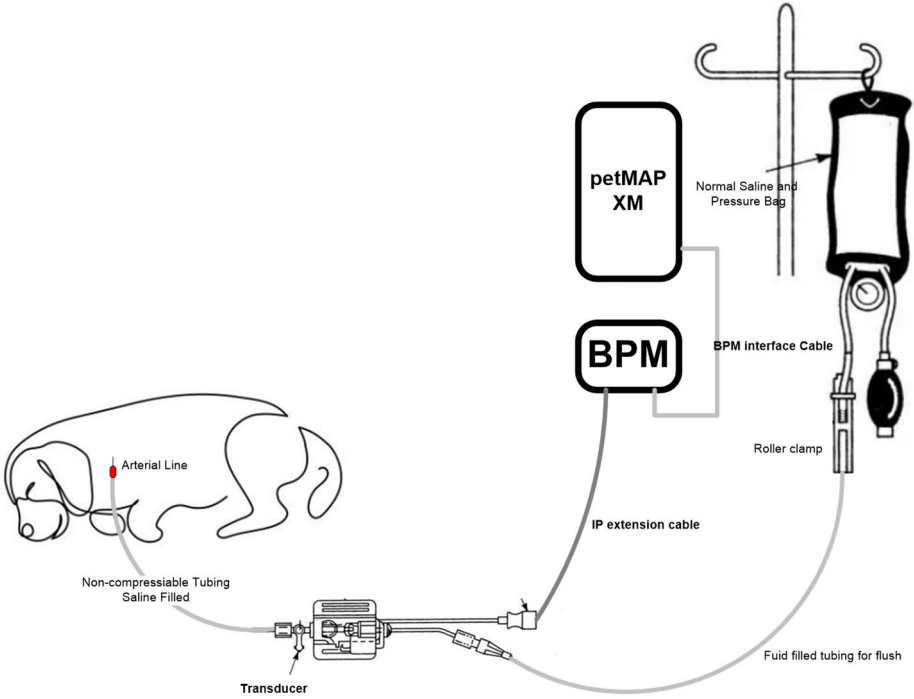
Invasive Pressure Set-Up

The following items are the typical required items for setting up an invasive pressure channel for monitoring with the petMAP XM/BPM, they include:

1. 500ml Normal Saline
2. Pressure Bag
3. Pressure Transducer (REF 9090)
4. Transducer Holder (attaches to IV pole)
5. Non compressible Transducer Pressure Line to patient
6. IP Extension Cable (REF 9089) which connects to a petMAP BPM IP receptacle and to the electrical connection of the Transducer.

Follow conventional arterial line protocols and the Instructions For Use included with the Transducer for flushing and making the necessary connections.

To set up an IP channel (refer to the Figures):



1. Plug the gray IP extension cable into one of the IP channel receptacles (IP1 or IP2) on the BPM
2. Prepare the Transducer connections and Pressure Bag Set-up
   Note: the Transducer should be positioned at heart level.
3. Flush the system to **remove all air bubbles** from IV tubing, stopcocks, and transducer.
4. Connect the pressure line to the patient arterial line.

Note: The complete pressure set-up can be completed and ready to go before arterial line insertion.

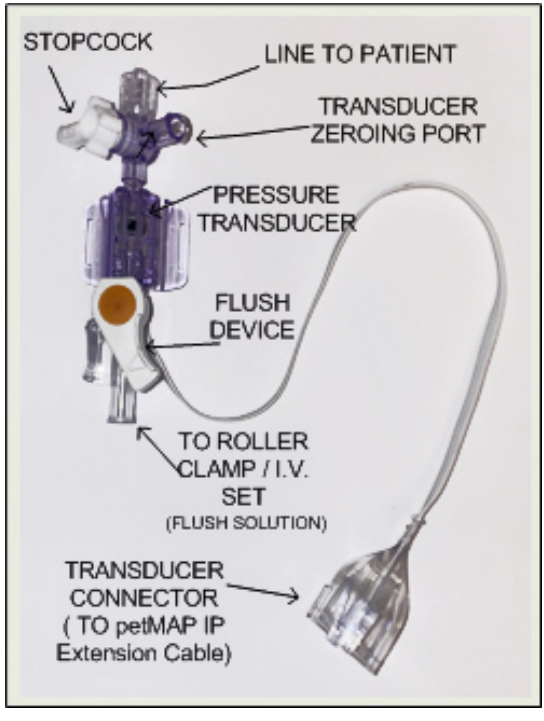


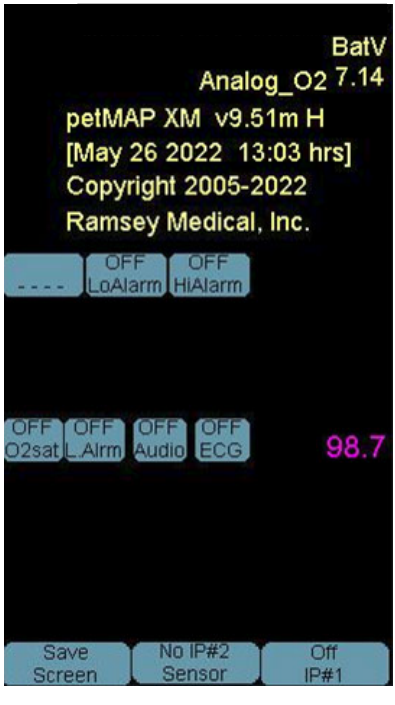
Figure 1 – Transtar IAP Transducer with Flush Device

Connect the IAP Transducer connector to the desired petMAP BPM IP receptacle or to the receptacle on a petMAP IP extension cable (REF # 9089). It is suggested to use channel IP1 if using only one transducer to take advantage of the trend history being logged.

IAP Operation

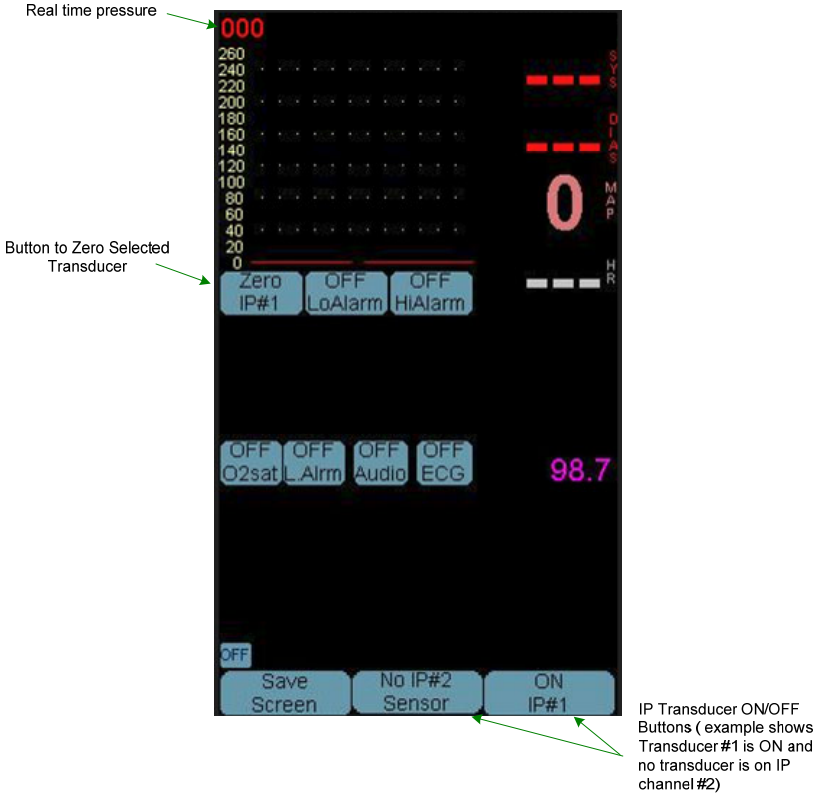
Once the setup and connections to the patient are completed, the Transducer(s) must be “ZEROED” and IP monitoring may begin.

- Connect the petMAP Blood Pressure Module (BPM) to the petMAP XM with the 10 conductor flat modular cable.
- Ensure the Slide Switch on the BPM is in the IP Position toward the IP connectors, ensuring the BPM is in the IP Measurement configuration.
- Power ON the petMAP XM. The display will look similar to that shown here indicating IP mode and the status of any detected IP Transducers.



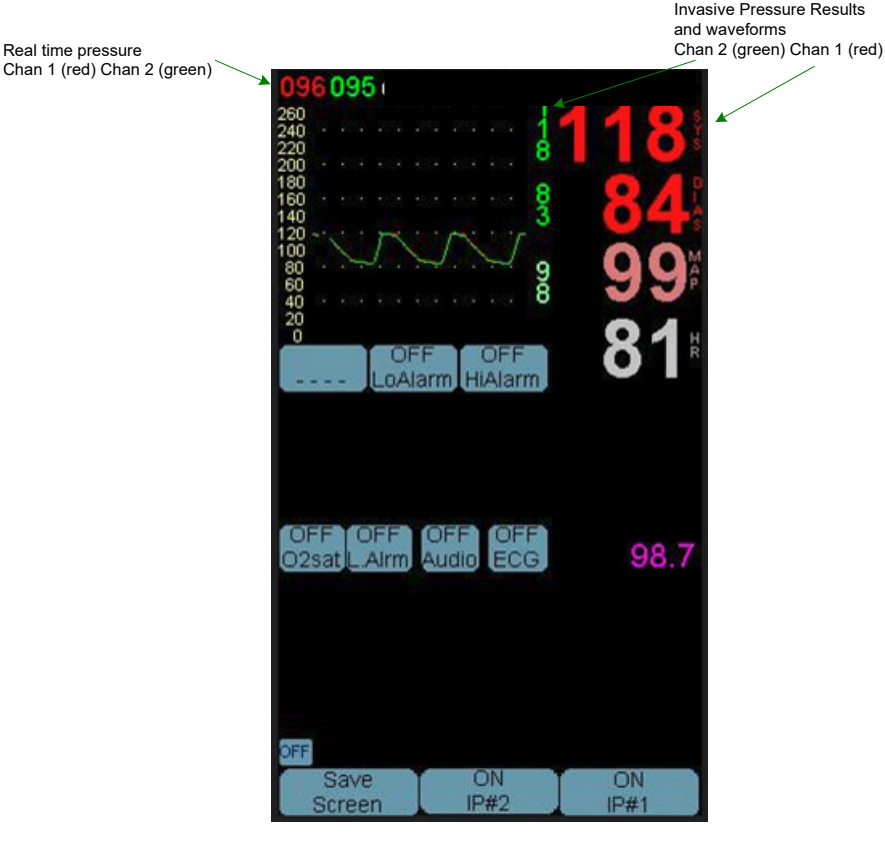
- After connecting the desired IP Transducer (s) to the petMAP BPM receptacle (s), the transducer(s) will be detected and the Button Displays will update to show which IP channel(s) have a transducer connected. (the screenshot below shows that a transducer is detected on IP channel 1 but not yet turned ON (Off IP#1) .

- Pressing the “Off IP#1” button will turn ON the IP monitoring function for IP Channel 1. The IP waveform will display as well as the zeroing button.
- Rotate the stopcock on the transducer to atmosphere and press the **Zero** Button to perform the zero. Note: The zeroing button will be displayed for 15 seconds.



- After the Zeroing, the Button text will change to --- indicating the completion of zeroing function.

- Once zeroing is completed rotate the stopcock from atmosphere back to the patient to begin IP monitoring. The image below shows 2 channels of invasive pressure in use.



Blood Pressure Values in Cats and Dogs

Blood pressure (BP) is most accurately measured directly using an intra-arterial catheter. Knowing an animal's BP is often required for diagnosis and treatment. However, since intra-arterial pressures are often impossible or impractical to measure, a variety of indirect measurement devices (Doppler and oscillometric) have been developed to permit estimation of an animal's BP. It is important to note that the different methods and different brands of indirect BP devices will likely produce different BP values in the same animal, as each estimates blood pressure in a somewhat different way. Further, all indirect methods are dependent on the state of the animal and, to some extent, the experience and skill of the user.

petMAPs have been designed to better correlate with intra-arterial pressure readings through optimizations for species and cuff site. The result of this better correlation with intra-arterial readings is that petMAP's readings will almost always be 10-20% higher than Doppler or other oscillometric devices. If correlation of petMAP BP readings with other BP devices (other than direct intra-arterial readings) is desired by the user, petMAP should be used in the non-optimized mode.

"Normal" BP in companion animals varies with the species, age of the animal, method used for BP determination, and the emotional state of the animal as a result of animal handling and other circumstances. "Normal" systolic values can range from 110 to 160 mmHg and most diastolic values range from 55 to 100 mmHg, if the animal is undisturbed and at rest. Normal BP is different for cats and dogs and can also vary by breed within species.

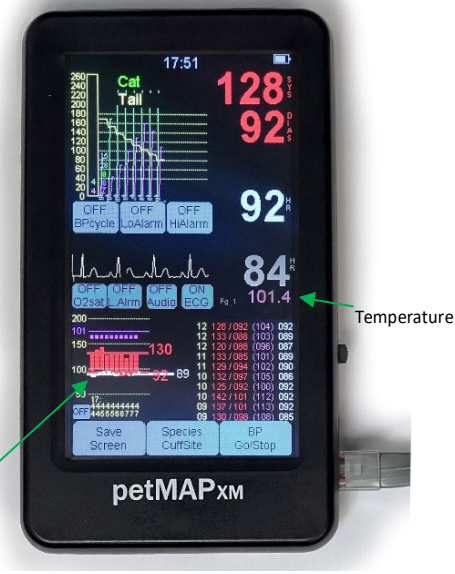
Hypertension is generally characterized as pressure >170/110 mmHg in relaxed animals; hypotension is pressure <90/50 mmHg in the awake animal. However, much of the BP data that has been used to establish these ranges has been measured with indirect devices and, as previously mentioned, most of these devices (Doppler and oscillometric) underestimate the intra-arterial systolic pressure by 10-20%.

The study of hypertension and its treatment is an evolving subject in veterinary medicine. It is suggested that veterinarians refer to the literature, including the ACVIM Consensus Statements, published on this topic.

OR MODE

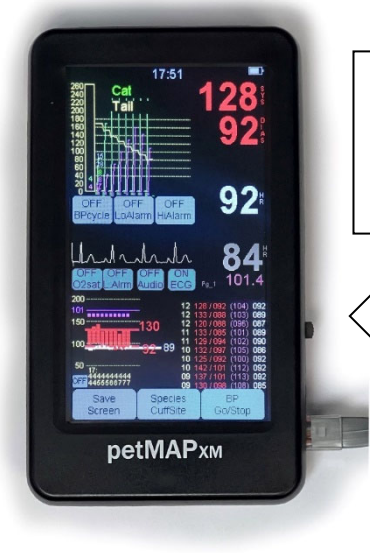
BP cycle set

CLINIC MODE



As previously mentioned, there are two different data display formats depending on the user's selection.

The display formats are shown below and can be changed from one to the other by simply touching the graphic trend area of the display at any time.



Touch the graphic area to change trend display format.

CritterCuff™/RamseyCuff™ Information

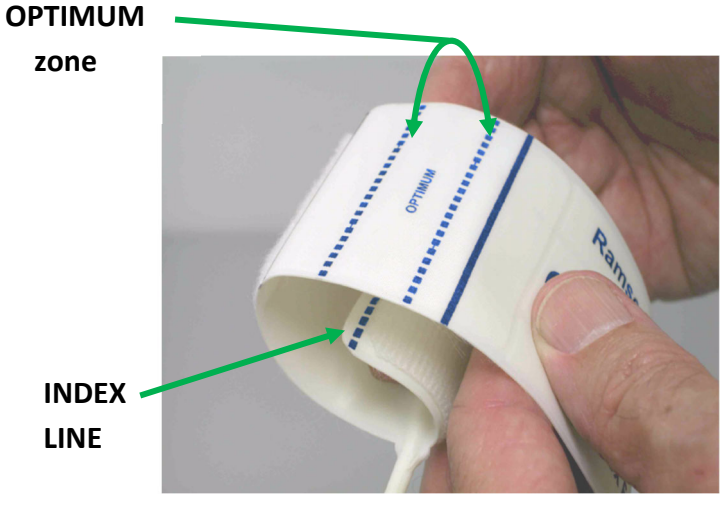
The Ramsey Medical, Inc. CritterCuffs and the larger sized RamseyCuffs are designed specifically to be used with petMAP devices. Using any other brand of cuffs may result in inaccurate BP readings, or even a failure to function, and is strongly discouraged for these reasons.

It is important to have the proper size cuff and the proper snug fit. Improper size and a loose cuff application on the limb will result in inaccurate BP readings or even a failure to determine the BP.

CUFF SIZE
Choose a cuff whose width is approximately 42-50% of the circumference of the leg or tail of the animal. Best results and accuracy will be achieved by using a cuff size where the cuff's index line is in the "OPTIMUM zone" marked on the cuff by dotted lines. If this is not possible, NEVER exceed the solid boundary lines!

CUFF FIT
The cuff should fit "snug tight", i.e., tight enough to get all of the air out of the cuff (attach cuff to animal BEFORE attaching the cuff hose to the petMAP BPM), and tight enough so that it will not slip around or off of the limb. However, the cuff should not be so tight that it hurts the animal or is so tight it functions as a tourniquet when not inflated. *The proper size cuff for the limb chosen and its "snug tight" application are absolutely essential if good results are to be achieved! Remember also to set petMAP for species and cuff site before use, but always before recording readings on the animal's chart.*

When wrapping the cuff around the animal's limb, the index line should fall between the two "OPTIMUM zone" dotted lines, as shown, but NEVER out of the solid boundary lines.



There are various sizes of CritterCuffs available to cover the range of limb sizes commonly encountered in companion animals. For accuracy of the reading, it is essential that the proper cuff be selected and applied snugly to the limb. Only CritterCuffs/RamseyCuffs should be used with the petMAP since the cuff and unit form a system specifically designed for sensitive and accurate blood pressure measurement in companion animals. The "OPTIMUM zone" is petMAP specific.

Seven CritterCuffs are packaged with each petMAP. Their sizes are: 2.0 cm, 2.5 cm, 3.0 cm, 3.5 cm, 4.0 cm, 4.5 cm, 5.5 cm. Larger cuff sizes (6.5 cm, 8.0 cm, 10.0 cm and 13.0 cm) and a 5.0 cm cuff are available at extra charge. Call Customer Service for more information (800-231-6370 or 813-289-5555).

CUFF SIZE IS IMPORTANT!!

The CritterCuffs may be used for dogs and cats on any of the three recommended positions: forearm, hind foot or tail. For best accuracy and reliability, the size of cuff should be chosen so that the cuff's index line falls within the "OPTIMUM zone" of the cuff indicated by the dotted lines when the cuff is snuggly applied to the selected limb. In no circumstance should the cuff index line be outside the solid boundary lines.

MAINTENANCE

Device

Cleaning petMAP BPM and cables :

Disconnect the BPM from the petMAP XM

As needed, *clean* the device and cables with a soft cloth dampened with warm water and a mild detergent solution. Gently rub the soiled area until clean. Use a soft cloth to dry the device. Do not use abrasive cleaners, alcohol or cleaning solutions which contain alcohol. Do not immerse in water or other liquids. Care should be taken to prevent water or cleaning solution from running into or onto the screen, connector openings or crevices. As needed, clean the display window using a soft, lint free cloth sprayed with an alcohol free glass cleaner. Do not use paper towels as they may scratch the surface.

To *disinfect* the device, use 0.1% bleach (generally prepared by mixing 1 part household bleach with 9 parts water) followed by a wipe with regular water. If it is necessary to remove blood or body fluid, use a more concentrated bleach solution.

The ratio of bleach to water is dependent on the concentration of bleach purchased. The following chart provides guidance and the dilution ratio should be adjusted, as necessary, for the strength of the bleach.

Original strength of bleach (% sodium hypochlorite)	Bleach (ml)	Water (ml)	Total (ml)	Dilution ratio (bleach:water)
1%	100	900	1000	1:10
2%	50	950	1000	1:20
3%	33	967	1000	1:30
4%	25	975	1000	1:40
5%	20	980	1000	1:50
6%	17	983	1000	1:60

Cuffs

Cleaning: *Clean* cuffs with a damp cloth or hand wash in warm water with mild detergent or soap; do not allow water to get into the cuff tube. Pat cuff dry initially on a towel, and air dry until fully dry and ready for use.

To *disinfect* cuffs, use 0.1% bleach (see above) followed by a wipe with regular water. If it is necessary to remove blood, body fluid or other contaminants, use a more concentrated bleach solution.

After covering the ends, the cuff extension hoses may be cleaned with a soft cloth dampened with germicidal solution, but do not allow any fluid into the lumen of the tubes since fluid in the tube could damage the petMAP severely!

TROUBLESHOOTING

Unit will not turn ON, or shuts OFF, after attempting a power ON .

1. If the unit is new, make sure the battery insulator strip has been removed.
2. The batteries are likely low or defective. Plug the AC/DC adapter in and confirm that the AC/DC adapter indicator is yellow (indicating it is charging, or green, indicating that the batteries are fully charged) by looking through the “peephole” on the left side of the unit just above the SD card slot.
3. Hard power OFF reset: Hold the power switch down for 10 seconds, then release it, and then press it once again to turn the device ON. This is like rebooting a computer and should be done anytime there is a problem with the operation of the unit.
4. Test with different batteries. Use other, known good AA batteries, NiMH, Alkaline or lithium to determine if the existing batteries are possibly defective. However, do not attempt to charge any battery type except for NiMH type batteries or a dangerous condition may be created.
5. If charging the unit and then doing a hard power OFF reset (hold off button for 10 secs) does not fix problem, contact Customer Service.

Difficulty obtaining consistent BP readings (greater than +/- 15 mmHg from reading to reading).

1. Animal or cuff is moving. Calm animal until they are relaxed so determinations can be made during periods of non-movement.
2. Wrong size cuff used; use a cuff sized so that the index line is in the "OPTIMUM zone" when snugly fitted to the limb.
3. Cuff not properly snug, i.e., not tight enough on initial placement. Tighten cuff on the limb, but not constricting tight.
4. Cuff is not in correct location on forearm, hind foot, or tail. Reposition cuff or move to another approved site and set petMAP using Species/Cuff Site button.
5. Determine if the cuff, hose or connector is leaking air. Observe the deflation steps on the screen during a BP determination to confirm that each step is about 10-15% of the cuff pressure before the deflation step. Test the cuff on your finger to observe the deflation steps to determine whether the cuff or hose is leaking. Try another cuff if in doubt to confirm proper operation. Discard any leaking cuff, as using a leaking cuff will result in inaccurate readings.

Cuff will not inflate.

1. Check cuff connections, both at the cuff port of the device and any connections between the cuff and the extension hose. Check cuff and extension hose for leaks or damage.
2. Verify that the pump is actuating when BP Start/Stop is pressed. If not, contact Customer Service.

Screen buttons don't respond in the expected way to touch.

It's possible that the touchscreen needs recalibration. To do so:

1. Turn the unit OFF.
2. To enter the setup mode, press your thumb or finger gently on the screen and then turn the unit ON while continuing said pressure on the screen. When the counter in the upper left reaches exactly 8, release your thumb or finger from the screen and follow the screen instruction (See Figure 1).

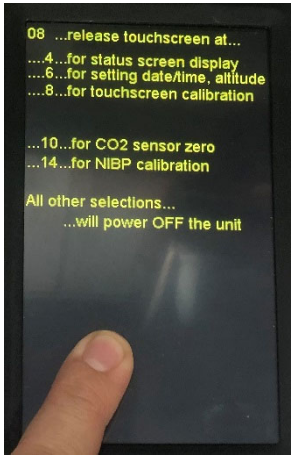


Figure 1

Figure 2

3. Follow the prompts on the screen by touching the arrows with a pointed object like a stylus or pencil. Do not use a sharp pointed object in order to avoid damage to the display (See Figure 2).

4. The unit will acknowledge each successful touch by beeping and counting down before moving to a different screen location.
5. Once all three locations have each been touched three times, touch the screen anywhere to exit the screen calibration function.
6. When the unit exits the setup mode and returns to its normal operating mode, verify that the touch buttons work as expected.

WARRANTY/SERVICE

Warranty

Ramsey Medical, Inc. warrants that the **petMAP BPM** device, when new, is covered by a one year warranty against defects in materials and workmanship. All warranties begin at the date of original purchase from CardioCommand, Inc. or its authorized distributors.

petMAP BPM accessories, including blood pressure cuffs and temperature accessories are warranted to be free from defects in materials and workmanship for 90 days.

Our obligation under this warranty is limited to repairing or, at our option, replacing defective parts or entire units without charge, if such defects occur as a result of normal use with prompt notification.

Damage resulting from inappropriate use or physical abuse is not covered by the warranty.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THOSE EXPRESSLY LISTED ABOVE. IN ADDITION, THERE ARE NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Customer Service & Repairs

All units returned for service and/or repairs (warranty and non-warranty) must have a RMA obtained by calling Customer Service at CardioCommand, Inc. The RMA number obtained should be written on the outside of the shipping container and the device should be sent to:

CardioCommand, Inc.
4920 W. Cypress St., Ste. 110
Tampa, FL 33607

Phone:	800-231-6370
	813-289-5555
Fax:	813-289-5454

Please include a complete description of the difficulty with all units returned for service.

SPECIFICATIONS

For Veterinary Use Only

Method of BP Measurement: Oscillometric. Accuracy optimized for species (dog/cat) and blood pressure cuff site (forearm, tail, hind foot).

Parameters Measured:

BP: Systolic, Diastolic, Mean Arterial Pressure (MAP)

Heart Rate by BP cuff

Temperature. Esophageal or rectal probes are available

Non Invasive Blood Pressure Ranges:

Systolic: 40 – 265 mmHg

Diastolic: 25 – 195 mmHg

MAP: 30 –180 mmHg

Invasive Blood Pressure Ranges:

Systolic: 40 – 265 mmHg

Diastolic: 25 – 195 mmHg

MAP: 30 – 180 mmHg

Heart Rate Range from BP: 40 – 240 BPM, +/- 5% or 3 BPM, whichever is greater.

Operating Environment:

Temperature: 10°C – 40°C (50°F – 104°F)

Humidity: 15% - 85%, non-condensing

Altitude: -500 feet (152 meters) below sea level to +8000 feet (2438 meters) above sea level

Storage Temperature: -20°C to 55°C (-4°F to 131°F)

Dimensions: 4.25” x 1.26” x 2.62”

Weight: .4 lbs

HISTORY OF REVISIONS

Document #/ Revision	Date	Comments
R400428-A	03/09/23	Manual Released ECO 230302

petMAP BPM is developed by:

RAMSEY MEDICAL INC

Tampa, FL 33607
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