



## *Installation, Setup and Operating Instructions*

### STANDARD ACCESSORIES AND COMPONENTS

Check packaging to ensure the following items are included

- 1 ea. Bluetooth adaptor.
- 1 ea. Battery charger unit
- 1 ea. Nellcor V-Sat SpO2 sensor with two tongue clips
- 1 ea. IRMA gas sensor with 2 airway adaptors (Optional)
- 1 ea. Storage pouch containing:
  - 1 ea. VetGard+ in hanging pouch
  - 1 ea. ECG chest probe
  - 1 ea. Set of 3 low force ECG skin clips
  - 1 ea. ECG Yoke cable
  - 1 ea. Set of three disposable ECG electrode clips
  - 1 ea. Packet of 3 ECG disposable electrodes
  - 3 ea. Esophageal ECG and temperature probes
  - 1 ea. Rectal temperature probe
- 1 ea. inner box containing:
  - 1 ea. Instruction manual
  - 1 ea. Installation CD
  - 1 ea. Set of 5 blood pressure cuffs (Optional)
  - 1 ea. 8 ft. Blood pressure air hose (Optional)

- Quick Start instructions (**NOTE: COMPLETE MANUALS FOR VETGARD+ AND PC-DISPLAY SOFTWARE ARE AVAILABLE ON THE INSTALL CD, FROM THE HELP MENU AND CAN BE DOWNLOADED FROM [www.vmedtech.com/customers](http://www.vmedtech.com/customers).**)

### GENERAL PRECAUTIONS

- **CAUTION:** *Use only the patient isolated battery charger provided by Vmed.* Laptop charging plugs may appear identical but their use with the VetGard+ may damage electronics and voids the warranty. **WARNING:** Non-isolated chargers do not protect patient in the event of a ground fault.
- ECG noise may occur with some patients when operating VetGard+ with the battery charger plugged in. If noise is present, disconnect battery charger and operate on battery.

### GENERAL PRECAUTIONS

- Do not plug VetGard+ sensors into any other equipment or into AC line receptacles.
- Do not operate or mount the VetGard on its side. Vertical mounting is OK.
- VetGard+ is not registered with the FDA for human use.
- Do not use in the presence of flammable anesthetics.
- Do not immerse the VetGard+, sensors or cables in water or other fluids. Avoid spilling fluids on the VetGard+ connection plate or accessories.
- Do not autoclave the VetGard+ or sensors.
- Do not disassemble the VetGard+ enclosure. VetGard+ contains no operator serviceable components and opening enclosure voids the warranty (with the exception of the battery door).
- ECG electrical interference: The wireless connection used in the VetGard+ minimizes electromagnetic or radio frequency interference (RFI). Noise may occasionally occur when operating with the AC charger plugged in or from the strong RFI generated by electro-

cautery, diathermy and dental scaling equipment. Distortion of ECG signal may occur with the use of these devices.

- **CAUTION:** Before using a defibrillator, disconnect any ECG accessory of the VetGard+ from the patient.
- Ensure that electrodes are connected only to the patient and do not touch any other conductive part or equipment to prevent possible shock to patient from leakage current from other equipment.
- Avoid cable and connector damage by grasping the plug, not the cable, and pulling straight out and pushing straight in. Take care not to bend the pins in the plug.
- **WARNING:** *Do not use electro-surgery or electrocautery devices near metal ECG electrodes, especially esophageal probes.* Electric arcing may cause tissue burns.
- **CAUTION:** *Use only the patient isolated battery charger provided by Vmed.* Laptop charging plugs may appear identical but their use with the VetGard+ may damage electronics and voids the warranty. **WARNING:** Non-isolated chargers do not protect patient in the event of a ground fault.

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## Chapter

# 1

## Chapter 1 Monitor Description

### Hardware

The PC-VetGard+ is a battery operated, Bluetooth enabled, wireless, multi-parameter patient monitor providing, as a minimum, ECG, SpO<sub>2</sub>, respiration and temperature, and selectively, NIBP, and airway gas monitoring of CO<sub>2</sub>, CO<sub>2</sub>/O<sub>2</sub> and CO<sub>2</sub>/anesthesia agents. Digital information, real-time waveforms and trending are displayed through a wireless link to a Windows based computer. Each VetGard+ includes the following sensors:

### Basic unit with ECG, SpO<sub>2</sub>, Temperature, Respiration

- ❖ One ECG chest probe with three build-in metallic electrodes for ECG rhythm strips. When placed over the heart, accurate rate and rhythm information is derived.
- ❖ One SpO<sub>2</sub> lingual sensor with two clips.
- ❖ One set of low force clip electrodes that when attached to the legs of the patient as described provide ECG Lead II information.

*Note: Since it is not always possible to obtain an adequate signal using the chest probe, clip leads may be required when monitoring some patients. Clip leads can also be used to continuously monitor the ECG signal during surgery or for short term critical care monitoring.*

- ❖ Three trans-esophageal probes to monitor the ECG and temperature of anesthetized patients. Each probe has three electrodes affixed to the flexible plastic tube that is inserted into the esophagus and positioned over the heart with the distal electrode positioned behind the left ventricle and the second electrode behind the left atrium. The third electrode is reference. A temperature sensor is fitted inside the tip of each probe to measure and display core body temperature

- ❖ One cable yoke and set of 3 leads with spring clips for use with pre-gelled disposable electrodes.
- ❖ One 3 mm rectal temperature probe with 5 foot cable

#### VetGard+ Add-On Modalities

- ❖ Non-invasive blood pressure: SunTech motion reduction electronics provides excellent oscillometric blood pressure detection on large and small animals including cats and is validated for veterinary use. The NIBP module includes an 8 foot long 4mm diameter air hose with fittings and a set of 5 animal cuffs including size (L x W in cm), #2 (2.5 x 11), #3 (3 x 13), #4 (5 x 21), #7 (6 x 25) and #8 (7 x 30).
- ❖ Airway gas sensors: PhaseIn IRMA mainstream automatic gas sensors are self-contained, self-calibrating inline infrared sensors that detect inspired and expired CO<sub>2</sub>, O<sub>2</sub> and Anesthesia agent airway gases in any mixture.
  - CO<sub>2</sub> sensor includes 8 foot cable with connector and two semi-disposable airway adaptors. Airway adaptors should be changed after 20 patient uses when prompted on the computer display.
  - CO<sub>2</sub>/O<sub>2</sub> sensor includes 8 foot cable with connector, two semi-disposable airway adaptors with O<sub>2</sub> vent and a rapid response galvanic oxygen sensor. The O<sub>2</sub> sensor should be replaced every four months or whenever the oxygen readings are questionable.
  - CO<sub>2</sub>/Agents sensor includes 8 foot cable with connector and two airway adaptors. The O<sub>2</sub> sensor may also be fitted to this probe.

The VetGard+ is equipped with an internal wireless Bluetooth radio transmitter. Bluetooth enables the wireless transmission of real-time monitoring information between the VetGard+ and a Bluetooth enabled Windows based computer.

Bluetooth operates at approximately 2.4 GHz and steps up and down frequency constantly making the VetGard+ free of interference including the radio frequency interference common in hospital and clinic settings. Bluetooth transmissions are omnidirectional, operate at low power and travel through walls and around corners to a radius of up to 100 yards line of sight. It is not necessary to aim the VetGard+ at the computer or printer to initiate commands. The computer and/or printer can be in

another room if desired. The print report can be printed from any printer connected to the computer being used with the VetGard+ or on a wireless network.

All functions not requiring keyboard input can be controlled from the VetGard+ control panel or the Windows display toolbar. Commands are only active if a wireless connection between the VetGard+ and the computer is established. Power is supplied by a rechargeable lithium-ion battery or through the patient isolated power supply/charger provided. Power is always available from the A/C mains even with a missing, fully discharged or defective battery. When fully discharged, the battery can be fully recharged within 4 hours and provides up to 6 hours of use with all modalities operating.

#### VETGARD+ KEYPAD CONTROLS



**MASTER POWER:** Press and immediately release button to turn ON; press and hold down to turn OFF. VetGard+ will shut off automatically if a computer wireless connection is not established within three minutes and the power is not plugged in.



**BLOOD PRESSURE POWER SWITCH:** Press and release to turn ON the blood pressure measurement sequence; press and release again to turn OFF the blood pressure measurement sequence.



**RECORD STOP/START SWITCH:** Press to manually begin recording and saving the ECG to file. Press again to stop recording, completing the save function.



**OPEN ECG FOR REVIEW:** Provided an ECG trace has been completely recorded and saved, this switch opens the ECG Reviewer or Interpreter program in a second window while PC-Display continues to monitor the current trace. Analyses can be carried out only on the portion of the ECG that was recorded and saved to file.



**SILENCE ALARM(S):** Turns off the audio alarm tones during an alarm event.



**DISPLAY TREND GRAPH:** Manually displays trend graph of all parameters being monitored. Select the switch again to remove the trend graph. The trend graph will also display automatically at the desired interval and period set in the default configuration window. The trend graph is displayed in a second window super-imposed over the real time patient display.



**START/STOP TRACE:** Stops and starts moving sweep information for evaluation of waveforms (i.e. “freeze” or “unfreeze”). This will not affect the recording functionality.



**SELECT ECG GAIN:** Sequentially changes ECG gain (vertical scale factor) settings from 0.5 to 4.0.



**PRINT COMMAND:** Sends information on the screen to the printer that is connected to the computer and automatically saves up to a 30 second recording of the ECG trace as a patient episode file.



**SCROLL UP MENU:** Scroll through the various menus available with the SELECT switch. Press the SELECT after scrolling to the desired selection.



**OPEN MENU (SELECT):** Displays keypad menu selections and selects the highlighted option in this menu.



**SCROLL DOWN MENU:** Scroll through the various menus available with the SELECT switch. Press the SELECT after scrolling to the desired selection.

## Software

### PC-Display Software

The Vmed Windows application programs installed on your computer for the processing and display of real time patient information for all Vmed wireless monitors. PC-Display software can be installed on multiple computers without limit and simultaneous instances of the program can be run subject to computer capability. See the PC-Display User Manual for more details.

### Reviewer Software

The Vmed Reviewer program is used to open and review patient files saved from PC-Display. The Reviewer program is compatible with Vmed wireless monitors. Refer to the PC-Display Manual for a complete description of this program.

### Interpreter Software

The Vmed Interpreter is optional ECG interpretation software compatible with all Vmed wireless monitors. This program has restricted use and requires registration. All functions available in the Reviewer program are also available in the Interpreter program.

### Bluetooth Software

This software is only used if your computer is **NOT** operating with Windows XP Service Pack 2 or 3, Windows Vista or Windows 7 operating systems or is using a Bluetooth adapter different from what is supplied by Vmed Technology. Do not install this software unless you are using the Windows 2000 operating system or unless instructed to do so by a support representative. Windows XP (SP2 or SP3) computers use the included Microsoft “plug-n-play” Bluetooth drivers.

## Computer Display

The screen below shows a typical computer display from an operating VetGard+

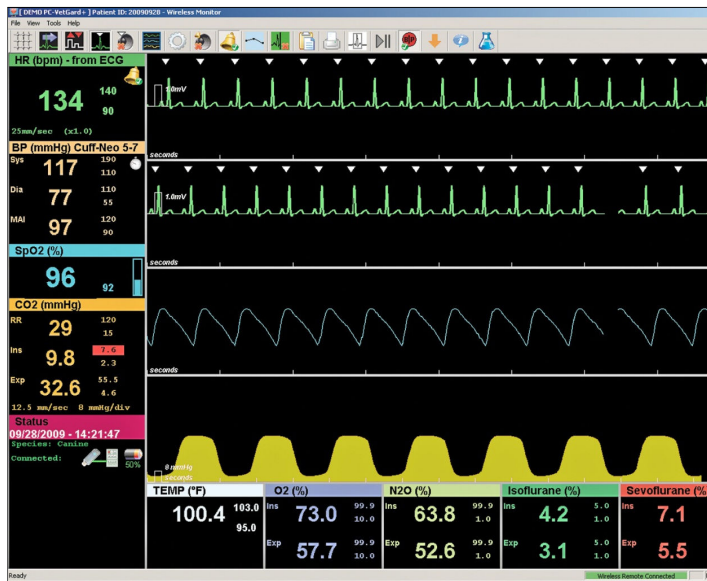


Figure 1 Computer display of VetGard+ information showing ECG Lead II, SpO<sub>2</sub>, and CO<sub>2</sub> waveforms. *NOTE: BP is not turned on.*

## PC-Display Toolbar (See PC-Display manual for details)

The PC-Display toolbar allows quick access to selections. Many of these icons are duplicated on the VetGard+ control panel.

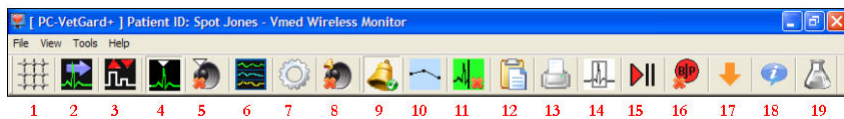
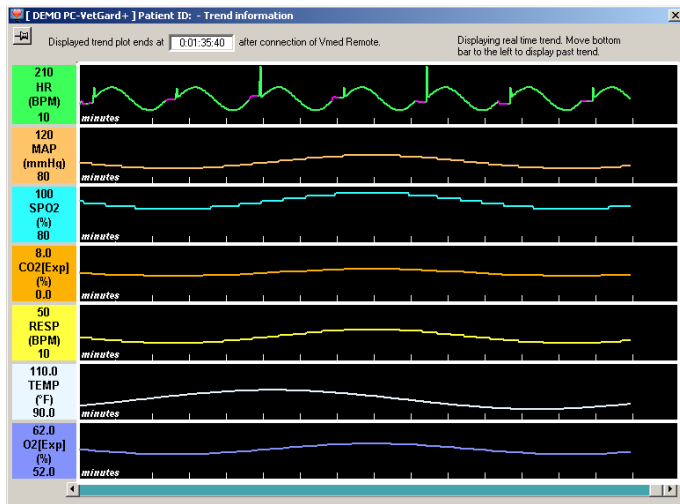


Figure 1. PC-Display toolbar

## Toolbar Icons

1. **Toggle waveform grid** - Click this once to turn on the grid behind the ECG and CO<sub>2</sub> waveforms. This is useful for a quick waveform measurement reference. Click it once more to turn it off.
2. **Sweep rate** - Click to toggle through 25, 50, 100 and 200 millimeters per second sweep speed for ECG and SpO<sub>2</sub> waveforms (CO<sub>2</sub> sweep rate may be different as controlled from the configuration window).
3. **ECG gain** - Click to toggle through 1, 2, 3, 4 and 0.5 times the gain (vertical scale factor) of the ECG waveform.
4. **Toggle R-wave markers** - Click to turn off or on the white triangular R-wave markers for each ECG beat.
5. **Toggle beat audio tone** - Click to turn off or on the beat tone that is sounded for each beat whether from ECG or from SpO<sub>2</sub>.
6. **Select waveforms** - Clicking on this button will open a small window where you may select which waveforms you wish to have displayed besides ECG (ECG will always be selected).
7. **Change current settings** - Clicking on this button will open the Current Configuration window where you may make configuration changes that will only affect the current session. These changes will revert to the default configuration upon disconnection of the wireless remote. See the *Setup PC-Display Defaults* section of Chapter 1 for more information.
8. **Toggle alarm audio** - Click to enable or disable the audio alarm tone that sounds when a vital sign parameter exceeds its preset limit. Video representation of alarm will remain.
9. **Toggle all alarms** - Click to enable or disable all the alarms for every displayed vital sign parameter.
10. **Display trend graph** - Click to display the trend graph window. Unless this window is "pinned" to the screen it will automatically disappear in 10 seconds. Refer to Figure 7 below:



**Figure 2 Trend graph screen.** Appears momentarily at preset time automatically or as selected on the upper tool bar icon. *NOTE: Select preference in the PC-Display default Settings window.*

- 11 Toggle ECG recording** - Click to begin recording of the ECG waveform into a patient episode file. This will be saved according to the Patient ID recorded within the patient information window prior to saving the episode. Click the button again to stop recording.
- 12 Enter patient information** - Click on this button to open the Patient Information window. Enter the patient's name or ID, the client's name, the patient's species, breed, age, sex and weight. These values will be included in the saved episode if a recording is made.
- 13 Print report** - Click on this button to print the last 24 seconds of the ECG tracing and vital signs values to the default printer of the computer in use. In addition to printing this report, an individual episode of the same seconds of ECG tracing will be saved automatically.
- 14 Open currently saved episodes** - Once at least one episode has been completely saved (toggling the record button on and then off) during the current connection of the wireless remote this button will become enabled (yellow in color) indicating that you may choose an episode to view using the default Vmed viewing application (either ECG Reviewer or ECG Interpreter).

**15 Start/stop sweep** - Click to freeze (pause) the display of all the waveforms. Click on it again to resume. Any recordings will continue regardless of whether the screen has paused using this feature.

**16 Toggle NIBP measurement** - Click on this button to begin the blood pressure measurement cycle. You will first be presented with a window asking you which size of blood pressure cuff you are using. Select the cuff being used from the list and then click OK to begin the measurement cycle. Click this button again to stop the measurement cycle.

**17 Mark event** - Click to mark on the point of the ECG waveform that you wish to review later. This will put an orange arrow on the immediate display as well as an event within a saved ECG episode that includes the vital signs at that moment.

**18 Software information** - Click on this button to open the information window that shows the version number of PC-Display as well as the various hardware and software components of the currently connected remote module.

**19 Select anesthetic agents** - Click on this button if you are using a gas probe that has the capability to measure anesthetic agents. This button will allow you to select which agent you want to be displayed as the primary agent and in some cases which to be displayed as the secondary agent.

### Remote Selection Menu

1. Turn on the VetGuard+ and establish connection to the computer.

2. Press the SELECT key  on the VetGuard+ keypad and the following menu appears on the computer screen:

REMOTE MENU
SPECIES...
NEW PATIENT...
GRID
SWEEP RATE
ECG GAIN
R-WAVE MARKER
R-WAVE TONE
SPO2 WAVEFORM
RR WAVEFORM
ALARMS
ALARM TONE
RECORD ECG
EXIT...



3. Use the UP/DOWN arrows on the VetGard+ keypad to select the desired function and then press the SELECT switch again to choose the option. Repeat the process for each function.

4. These functions may also be selected from the icons on the PC-Display toolbar.

*NOTE: Most of these functions may also be selected from the icons on the PC-Display toolbar and many are also available in iconic form on the VetGard+ keypad.*


SELECT	OPTIONS	DEFAULT
Silence Alarms	Press to silence audio alarm	Keypad & Toolbar
Species	Canine	Gain 1
	Feline	Gain 1
	Equine	Gain 1
	Other	Gain 1
Sweep Rate	25 mm/sec	25 mm/sec
	50 mm/sec	
	100 mm/sec	
	200 mm/sec	

Gain	0.5: 55 mm/mV	
	1.0: 10 mm/mV	1.0: 10 mm/mV
	2.0: 20 mm/mV	
	3.0: 30 mm/mV	
	4.0: 40 mm/mV	
R-Wave Marker	ON	ON
	OFF	OFF
Grid	ON	
	OFF	OFF
Beat Tone	ON	ON
	OFF	
Record ECG	Press for continuous recording	Keypad & Toolbar
Alarms	ON	ON
	OFF	
Blood Pressure	ON	
	OFF	OFF

Table 1: "Select" key options and factory default values




### Remote BP Measurement Selection


1. Turn on the VetGard+ and establish wireless connection to the computer.

2. Press the  key on the VetGard+ keypad and the following menu appears:




CUFF MENU
NEONATE 1
NEONATE 2
NEONATE 3
NEONATE 4
NEONATE 5-7
SMALL ADULT OR NEONATE 8
ADULT
EXIT...



3. Use the UP/DOWN arrows   on the VetGard+ keypad to select the appropriate cuff size and then press the SELECT  button again to accept this choice. The measurement will begin immediately.

4. This measurement functionality may also be selected from the  icon on the PC-Display toolbar.

## Accessories

			
ECG Leads and Adaptors,	ECG Loop Electrodes	ECG Needle Electrodes	ECG Long term monitoring leads
			
ECG Skin Clips	ECG Chest Probe	ECG and Temperature Esophageal Probes	Rectal and Esophageal Temperature Probe
			
Nellcor SpO <sub>2</sub> Sensor	Small Animal Cuff Set	Mainstream CO <sub>2</sub> Probes	CO <sub>2</sub> Airway Adaptors
			
Side Stream CO <sub>2</sub> Sensor	Side Stream CO <sub>2</sub> Airline (“NOMoline”)	Side Stream CO <sub>2</sub> Airway T-Adapter	Vmed Class 1 Bluetooth USB Adapter

Chapter  
2

## Chapter 2 Operating Instructions

### Battery Life between Battery Charges\*

FUNCTION	CHARGE LIFE
ECG; SpO <sub>2</sub>	12 HOURS
ECG; SpO <sub>2</sub> ; CO <sub>2</sub>	9 HOURS
ECG; SpO <sub>2</sub> ; BP*	7-8 HOURS
ECG; SpO <sub>2</sub> ; BP*; CO <sub>2</sub>	5 HOURS

\* BP measurement interval of every 5 minutes.

### Preparation

PROCEED ONLY AFTER YOU HAVE SUCCESSFULLY INSTALLED THE SOFTWARE AND HAVE COMPLETED THE BLUETOOTH DISCOVERY PROCESS (SEE PC-DISPLAY MANUAL).

1. The VetGard+ can be used in the hanging pouch or placed on a secure flat surface without the hanging pouch. The VetGard+ may be mounted horizontally or vertically. **CAUTION: Do not mount or operate the VetGard+ on its side since this position restricts lubrication to the blood pressure pump.**
2. Plug the sensor of choice into the appropriate VetGard+ receptacle.
3. Turn on the VetGard+ by briefly depressing and releasing the red power key on the keypad (Do not hold the power switch down). The “CONNECTION” light will turn red and then amber.

4. Double click the PC-Display icon on your desktop to start the program. This will open a window to select the particular device and initiate the search process.
5. Wait for the “CONNECTION” light to turn from amber to blinking green. The process may take as long as 30 seconds to complete the first time after initial discovery.

**NOTE:** When the VetGard+ connection status light blinks green, the notation in the STATUS box on the screen will change to “Connected” and the notation at the lower right corner of the screen will change to: “VetGard+ Remote Connected” on a green background. To preserve battery life, the VetGard+ will shut off automatically if connection to your computer is not established within 3 minutes and the remote module is not plugged into wall power. When connection is complete waveform sweeps appear on the display as flat lines moving left to right at the selected sweep speed. Upon acquisition of a satisfactory signal, the waveform will appear and the trace will change to a color corresponding to each sensor:

Trace or Digit Color	Modality
Green	ECG
Orange	NIBP
Blue	SpO <sub>2</sub>
Yellow	CO <sub>2</sub>
White	Temp (Digits Only)
Purple	O <sub>2</sub>
Dark Green	Primary Agent (Digits Only)
Red	Secondary Agent (Digits Only)

**NOTE:** A magenta ECG sweep represents a leads off condition and may occur even if a waveform is present, however, the computer will not recognize a valid ECG and the digital heart rate display will not appear. You should, in this case, reposition the sensor or clip leads and add alcohol to the clip locations until a green sweep appears.

### Important comments about ECG

The VetGard+ obtains two types of clinical ECG information (1) rate and rhythm and (2) PQRST waveform characteristics. For surgical and long term monitoring, generally rate and rhythm only is needed to monitor patient status since changes in heart rate or significant variation of the periodic interval of the beating heart may be indications of patient compromise. Accurate Rate and rhythm can be obtained by any of the available ECG sensors provided with the VetGard+, leg clips and the internal positioned esophageal probe being the most often used in surgery. For long term patient monitoring, leg clips or disposable chest electrodes should be used.

Accurate diagnostic lead II ECG, on the other hand, requires information on both the rate and rhythm of the heart and evaluation of the ECG complexes themselves. Conductive abnormalities, for example, are manifested by higher than normal R and S amplitudes. For routine ECG and pre-surgical screening, the chest sensor is most convenient and is recommended for this application, however the method may produce inaccuracies in amplitude if the chest probe is not positioned at the correct angle to the heart. For this reason, whenever a beat characteristic or signal amplitude seems abnormal when using the chest sensor a follow up trace should be taken using the leg clips to confirm the reading.

**NOTE:** *Alcohol, ECG electrolyte or ultrasound gel provide good contact medium. A magenta colored ECG trace, no valid ECG signal, no heart rate readout or double counting of heart rate are all indications of poor electrode placement. Use salt free electrolyte to reduce corrosion of metal clips.*

### Using the Chest Probe

1. Place the patient in the right lateral recumbent or standing position. Pull the front legs cranial if patient is on its side.
2. Liberally apply alcohol to the left lateral chest wall where the electrodes will make contact. Position the chest probe over the heart, cable toward the left rear leg and press firmly enough that all three electrodes make good contact with the chest wall.



Figure 3 Correct position of the chest probe over heart on left chest oriented Right Front to Left Rear legs. Apply alcohol liberally for good signal.

3. Rotate the probe until the “R” amplitude is at its highest and a good tracing appears on the screen. If a good tracing is not obtained, re-saturate the chest wall and reposition the chest probe. In some rare cases excess hair should be clipped.

**NOTE:** *Orientation of the chest probe is important to approximate Lead II information, however the chest probe is accurate for rate and rhythm only.*

4. Record the ECG until at least three good lines of tracing are obtained. **NOTE:** *The ECG sweep windows stacked vertically on the display represent a continuous Lead II sweep with the earliest information being replaced by the current sweep. At the default chart speed of 50 mm/sec, the three panels represent 12 seconds of data.*

- Depress the Start/Stop button on the chest probe to freeze the trace on the screen. Depress the “Print” button on the keypad to print the display (this automatically saves about 24 seconds of the waveform up to that point to a patient episode file). You may also print directly from the moving trace by pressing the Print switch on the keypad.

### Using Leg Clips

The three lead clips are color coded according to American Heart Association (AHA) standards. The following table provides the list of AHA color codes for Lead II connections modified to identify animal legs.

LEAD	BIPOLAR	LEAD & REFERENCE	COLOR
II	RF-Right Front	Negative Electrode	White
	RH-Right Hind*	Reference Electrode	Green
	LH-Left Hind	Positive Electrode	Red

**NOTE:** \* Reference electrode may also be attached left front (LF) leg. For an accurate Lead II reading, each pair of legs must be parallel to one another but not touching. Use standing or right lateral recumbent position.

- Plug the clip lead cable into the VetGard+ receptacle.
- Place animal in the right lateral recumbent or standing position.
- Saturate the area where clips attach with alcohol or electrolyte.
- Connect leg clips to the appropriate limb. Connect two clips to the hind legs, Red to left hind and Green to right hind, on the posterior aspect of the stifle just proximal to or distal to the point of the knee. Connect the remaining White clip to the right front leg on the anterior aspect of the leg just proximal to or distal to the elbow.

## Using Esophageal Probe

Vmed esophageal probes have sensors for monitoring ECG and temperature. Choose the appropriate probe for the size animal. If the baseline tends to wander or deviate from a straight line, the electrode spacing is too large and a probe with a shorter spacing should be used. If the ECG signal is intermittent, usually with respiration or double counting occurs the electrode diameter is too small for the animal and a probe with larger diameter electrodes should be used.

**NOTE: Do not try to evaluate ECG traces using the esophageal probe. Sweep is accurate for rate and rhythm only. Use the ECG clips for a Lead II ECG.**

1. Lay the probe on the animal simulating it being in the esophagus.
2. Place end of probe one finger width from the last rib.



Figure 4 Position of esophageal probe on and in patient

3. Note the distance marked on the probe in centimeters at the nose.
4. Lubricate probe with lubricating jelly and slide it into the esophagus until the distance marked at the animal's nose is at the mouth. Reference centimeter depth marks.
5. Move the probe cranial and caudal and rotate as necessary until the best ECG signal is obtained.

## Using Long-term Monitoring Electrodes

The clip leads provided with this optional sensor connect to the metal tabs on disposable infant pre-gelled electrodes. Disposable chest electrodes are best for long term, critical care situations when the animal is under or recovering from anesthesia. It may be necessary to shave excess hair.

1. Plug the three clip leads into the corresponding colored receptacle on the yoke cable.
2. Connect a plastic clip from each lead to each of three electrodes.
3. Prepare the electrode site by clipping excess hair.
4. Wet area with alcohol and wipe dry.
5. Remove electrode from the liner and place on the leg indicated by the color code on the cable preferably above the hock and elbow. Electrodes may also be placed on the chest, over the heart and oriented to the Lead II axis: **White on right chest toward right front leg, Green in the middle and Red on left chest toward the left hind leg.** **NOTE: It is suggested that a protective bandage be applied over the electrodes to prevent the animal from dislodging or chewing off the electrode or lead. Accurate Lead II information is only available if electrodes or clips are attached to the patients' legs.**
6. Smooth down the electrodes with a circular motion. Avoid pressing on center of electrode.

## Rectal Temperature Probe

Plug the rectal probe into the receptacle at the front of the VetGard+. Use a disposable thermometer sheath if available to minimize contamination. Insert the tip into the rectum to a safe depth. Wrap the Velcro strap around the base of the tail to stabilize and secure the rectal probe. **NOTE: The rectal probe is not needed if an esophageal probe is used since esophageal probes are fitted with a temperature sensor.**

## Pulse Oximetry (SpO<sub>2</sub>)

Each SpO<sub>2</sub> reusable sensor comes with two clips that are used to apply the sensor to different sized animals and to different sites. The sensor and clips are indicated for use when continuous non-invasive monitoring of arterial oxygen saturation is desired for canine, feline and equine animals. Reusable sensors may be used on the same site for a maximum of 4 hours provided that the site is inspected routinely to ensure skin integrity and correct positioning. Some patients may require moving the sensor more often.

### PRECAUTIONS

- ❖ Failure to apply sensor properly may cause incorrect measurements.
- ❖ Exposure of bright light at the point of sensor attachment may cause inaccurate measurements. Cover sensor with an opaque material to block ambient light.
- ❖ Move sensor to a new site at least every four hours. It may be necessary to move the sensor more often with some patients.
- ❖ Do not use supplemental tape or straps to secure sensor to the site since this may restrict blood flow and cause inaccurate readings.
- ❖ Use of Intravascular dyes may cause inaccurate measurements.
- ❖ Motion, particularly repetitive motion, may compromise performance. If readings cannot be obtained, change the site.
- ❖ Carefully route all monitoring cables to reduce the possibility of entanglement or strangulation.
- ❖ Do not use during MRI scanning.
- ❖ Do not alter or modify the sensor in any way since accuracy will be affected.
- ❖ Do not use any other brands of SpO<sub>2</sub> sensor with the VetGard+.
- ❖ Clean the sensor and clip separately before and after each use (Refer to cleaning instructions below).

## Application

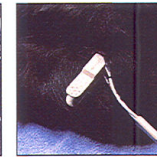
**NELLCOR'S VETSAT VETERINARY SENSOR** The sensor comes with two sizes of clips so it can be applied to various sites on the animal.



Lip



Tongue

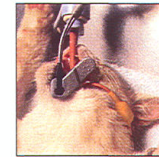


Vulva

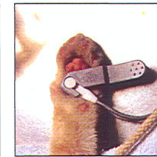
### CANINE

#### Other Sites:

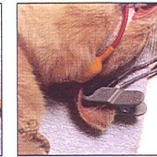
- Paw
- Ear
- Prepuce



Lip



Paw

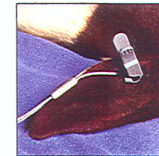


Ear

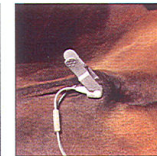
### FELINE

#### Other Sites:

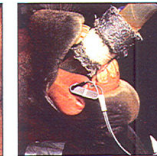
- Tongue
- Lower leg
- Tail



Ear



Prepuce



Tongue

### EQUINE

#### Other Sites:

- Lip
- Vulva
- Nostril



## Preparation

- ❖ Open the clip by pressing with the thumb and forefinger as shown (A)
- ❖ Slide one of the sensors alignment buttons along the clip slot until the sensor is fully engaged in the clip. (B)
- ❖ Slide the second sensor button along the slot in the other side of the clip until fully engaged as in step 3. (C) **NOTE: Be sure the optical components face each other.**

The sensor is now ready to be applied to the animal. The preferred application site for canine, feline and equine patients is on the tongue with the sensor positioned at the center of the tongue as shown (D). Alternatively, the sensor may be applied to the animals lip, toe, ear, prepuce or vulva.



**NOTE:** If the sensor does not track the pulse reliably, it may be incorrectly positioned—or the sensor site may be too thick, thin, or deeply pigmented to permit appropriate light transmission. If any of these situations occur, reposition the sensor or try another sensor site. If the sensor site is covered with fur or hair, try shaving the site and reapplying the sensor.

1. Attach the sensor as illustrated above. Ensure that the sensor cable is positioned along the side of the animal's face and body to avoid entanglement with the animal. (E)
2. Plug the sensor connector into the receptacle on the VetGard+ and verify proper operation.

**NOTE:** To verify correct placement of the sensor on the site, manually take a pulse rate reading at another site on the animal. If the sensor is placed correctly, the manual reading should correspond to the pulse rate reading displayed on the VetGard+ computer screen.

**CAUTION :** For the comfort of the animal and to avoid damaging the sensor, do not pull on the cable when removing the sensor and clip from the sensor site.

3. To remove the sensor and clip from the animal, press the clip open and remove.
4. To remove the sensor from the clip, grasp the end of each sensor pad and pull it through to the inside of the clip. The sensor should pop out of the clip easily. Do not pull on the cable.

**NOTE:** The source of the heart rate and beat tone within PC-Display will default to ECG as long as there is a "leads on" or green ECG tracing with noticeable beats.


Otherwise, PC-Display will take this information from SpO<sub>2</sub>. However, you may manually select SpO<sub>2</sub> as the source of the heart rate and beat tone even if a good ECG signal is present by clicking on the Tools menu and then on the item marked "HR from SPO2". Alternatively, you may use the shortcut key "Alt + H" to do the same. This feature may be toggled off by way of the same procedure.

#### **Cleaning**

Wipe inside of sensor with isopropyl or ethyl alcohol and dry. Clean cable and clips the same way. Hold the connector and rub toward sensor. **NOTE:** Do not pull cable while holding sensor.



## Non-Invasive Blood Pressure Monitoring

The blood pressure module must be turned on by depressing the red BP power switch  on the VetGard+ keypad or by clicking the BP icon on the PC-Display upper tool bar.

**NOTE:** *The BP function uses the most battery power so its measurement cycle must be enabled manually.*

### PRECAUTIONS

- Connect BP air hose to correct fittings
- Use only the tubing provided by Vmed
- Do not use the BP function if oscillometric pulses may be altered by other devices or techniques.
- Do not attach cuffs to limb being used for IV infusions as the cuff inflation can block the infusion with potential harm to the patient.
- Accuracy of any blood pressure measurement may be affected by the position of the patient, its physical condition and use not in accordance with operating instructions. Interpretation of blood pressure measurements should be made only by a veterinarian or trained medical staff.
- Extremely small or large cuffs may cause errors depending on the BP mode selection.
- Pulse Oximetry readings taken on the same extremity as the blood pressure cuff will be altered when the cuff is inflated due to artery occlusion.
- Cuffs of the wrong size or if placed incorrectly may result in incorrect or no readings.
- When cuff is positioned for an extended period of time the limb should be periodically checked for proper circulation.

## Connection

1. Connect airline to monitor. Note color coding on some monitors
2. Connect selected cuff to airline as shown below. **NOTE:** *Later monitors use a threaded connector*



**Figure 5** Press the male fitting at the end of the air line into the inside of cuff fitting. **NOTE:** *The threads on the outside of the cuff fitting are not used in the configuration shown. Some air hoses use a twist nut that engages the threads on the cuff. In this case twist nut to the right so it is snug.*

## Animal Modes

There are two animal modes that are needed to handle the large variety of animal sizes within the dog, cat and horse populations. These are Small and Large Animal modes.

The *Small Animal Mode* has been developed to perform on smaller animals including cats and small dogs. Cats typically have very low oscillometric signal strength and are difficult patients for non-invasive blood pressure measurement. The Small Animal



Mode in the veterinary BP algorithm was specifically designed for this patient population and cuff placement plays a key role in obtaining BP measurements. This mode is automatically selected when a #3 cuff or smaller is selected on the BP cuff size drop down window on the VetGard+ computer display. Dogs equal to or less than 8kg (~17.5 lb) should also have their blood pressures measured in this mode. Dogs or cats that require a #4 cuff or larger and when selected on the computer drop down window, will shift automatically to the Large Animal Mode.

The *Large Animal Mode* has been designed for animals requiring a #4 cuff or larger. This typically is dogs weighing more than 8kg (~17.5 lb) and horses. Equine blood pressure should be obtained from the base of the tail. If a patient is using a #3 cuff in this mode and problems arise, then try a larger cuff.

For cats and dogs, the preferred position for all NIBP measurements is either left or right lateral recumbence for both sedated and awake conditions. This will position the limbs fairly close to heart level and makes it easier to hold an awake-animal.

### **Cuff Selection & Placement**

It is important to select the cuff size that is appropriate to the diameter of the patient's limb or tail. Use the *Range Lines* on the outside of the cuff to determine the correct size cuff or insure that the cuff width is approximately 40% of the limb circumference. It is better to use a cuff that is slightly too large than one that is slightly too small. The cuff should never extend over a joint. Wrap the cuff around the limb making sure that the Artery Marker is directly above (or reasonably close) to the artery. It may become necessary to shave excess hair or fur if there is trouble obtaining BP measurements. The cuff should fit snug to the patient's limb for maximum oscillometric signal quality. Ensure that the air hose from the monitor to the cuff is not compressed, crimped or damaged.

The cuff should be at heart level for proper measurement accuracy. When the cuff is below heart level, measurement results may be higher and when the cuff is above heart level, measurement results may be lower than comparative results obtained at the level of the heart Please remember that using a cuff that is the wrong size may give false and misleading results.

### **Cuff Considerations on Cats & Dogs**

For the awake-animal, the cuff should be placed on a front limb instead of a hind limb. This is because when the cuff inflates, many animals instinctively retract their hind limbs which can alter the blood flow. For sedated cats and dogs, this is not a concern. It is important to choose a limb that does not have a med-line or pulse oximeter probe attached. For all applications, the artery marker should be over the artery regardless of which limb is chosen.

### **Cuff Considerations on Horses**

The preferred cuff location is at the base of the tail. The artery marker should be on the underside of the tail base.

### **Measurement Advice**

Animals are often anxious during medical examinations and procedures. Calm the animal down as much as possible before attempting to measure blood pressure on awake-animals. It is beneficial to have the owner help with the procedure. Several measurements should be taken and. It is common practice to eliminate the first reading because of elevated results or excessive motion artifact due to the anxiousness of the animal.

### **Default Values**

After power-up, the BP Module will default to the following settings:

- Initial Inflation Pressure: 160mmHg
- Large Animal Mode

***NOTE: After the first BP reading is performed, the next initial inflation pressure will be at least 30 mmHg above the previous systolic reading. This inflation pattern will continue until the module is turned off, an error occurs or the initial pressure is set by the SET\_INITIAL\_INFLATE command.***

## Blood Pressure Display

The blood pressure display on the computer screen includes symbols to denote the phase of each measurement cycle. This allows the operator to know if the BP module is off, taking a measurement or between measurements. Some symbols are dynamic and include audio tones. This functionality is only available on more recently shipped PC-VetGard+ remotes.

BP (mmHg)	Cuff-Neo 3
Sys	160
---	80
Dia	100
---	50
MAP	120
---	60

Figure 6 Blood pressure module is turned off.

BP (mmHg)	Cuff-Neo 4
Sys	160
---	80
Dia	100
---	50
MAP	120
---	60

Figure 7: An animated icon will play while blood pressure is being measured.

BP (mmHg)	Cuff-Neo 4
Sys	160
---	80
Dia	100
---	50
MAP	120
---	60

Figure 8: A single tone will sound indicating a new measurement is ready to read and a stopwatch icon will appear when the system is between measurements.

## Mainstream Airway Gas Monitoring

### PRECAUTIONS

- Do not submerge, autoclave or allow moisture on the gas sensor.
- Do not touch the window on the airway adaptor or expose adaptors to organic solvents.
- Dispose of depleted O<sub>2</sub> sensors in accordance with biohazard protocol.
- Do not place sensor between the ET tube and a line elbow since secretions may accumulate and block the adaptor window.
- Do not use the large airway adaptor on animals weighing less than 6 pounds since this adaptor adds 6 ml dead space the patient circuit.
- Do not use the small adaptor on animals weighing over 6 pounds since this will cause excessive flow resistance.
- Do not place the airway adaptor in a gravity dependent position in order to prevent moisture draining into the adaptor.
- Do not use the airway adaptor with nebulizer medications as this may affect light transmission through the blue window.
- Do not sterilize or submerge the disposable airway adaptor in fluids other than distilled water. Used airway adapters should be disposed of in accordance with local regulations for medical waste.
- Do not apply tension to the sensor cable.
- Do not operate at temperatures less than 50° F or over 95° F.
- The gas sensing IRMA probe is intended only as an adjunct in patient assessment. It must be used in conjunction with other assessments of clinical signs and symptoms.



## Set-up

Airway gas monitoring is accomplished by use of an infrared measuring apparatus (IRMA) mainstream airway sensor and a semi-disposable plastic airway adaptor. The clear window on the adaptor is very important for accurate gas measurements (the below images show a blue ring around this IR window).

**CAUTION:** Under most conditions, airway adaptors will remain reliable for 20 patients after which the adaptor should be replaced. Should gas readings become questionable at any time during the monitoring period try replacing the adaptor.

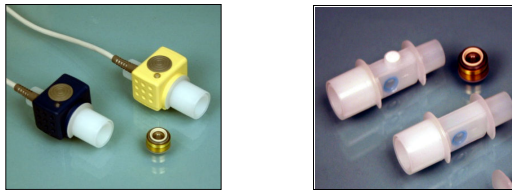


Figure 9 IRMA sensors with O<sub>2</sub> sensor cell; Airway adaptors and O<sub>2</sub> sensor cell

Use the standard airway adaptor for animals over 15 pounds and for animals 6–15 pounds if a rebreathing circuit is used. Use the small airway adaptor for all animals less than 6 pounds and for animals between 6 and 15 pounds if a non-rebreathing circuit is used. If inaccuracies are suspected with the standard adaptor, change to the small adaptor.

**CAUTION:** Do not use the small adaptor with rebreathing circuits due to the higher flow resistance of this adaptor.

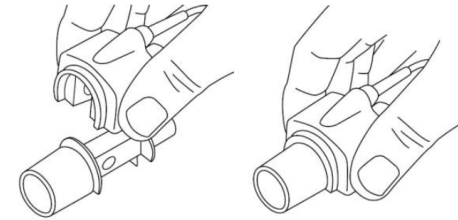


Figure 10 Standard and Small Animal Airway Adaptors

Standard airway adaptor for animals weighing >15 pounds. Re-breathing circuits OK. Order catalog C106221 without O<sub>2</sub> Catalog C106211 with O<sub>2</sub>

Small animal airway adaptor for animals weighing < 6 pounds and up to 15 pounds. Do not use with re-breathing circuits. Order catalog C106260 without O<sub>2</sub>

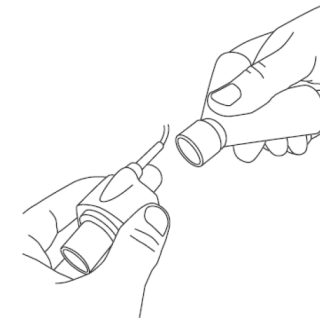
1. Plug the gas sensor into the VetGard+ receptacle marked “CO<sub>2</sub>/O<sub>2</sub>/GAS”
2. Snap the IRMA gas sensor head into the disposable airway adaptor. It will click into place when properly seated.



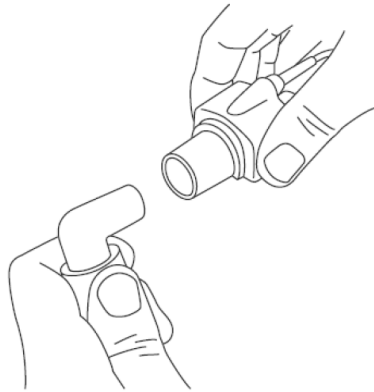
3. The green LED indicator lamp will light when ready for use.



4. Connect the airway adaptor 15 mm male end to the breathing circuit.



5. Connect the airway adaptor 15 mm female end to the patient's endotracheal tube.



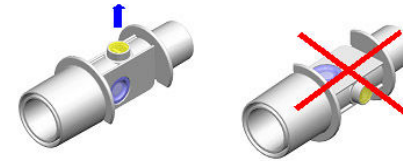
6. Always position the airway sensor with the O<sub>2</sub> cell facing up.



7. Do not place the IRMA gas sensor and airway adaptor between the ET tube and an elbow. This may allow patient secretions to block the adaptor IR windows.

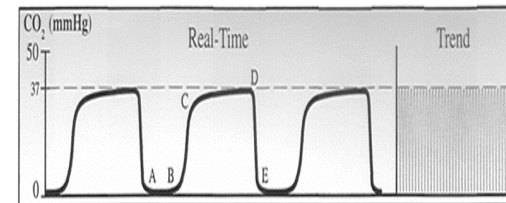


8. To keep patient secretions from pooling on the blue windows, position the airway adaptor with the IR windows in a vertical position only.



### Pre-Use Check

1. If you are using the O<sub>2</sub> feature, before connecting the airway adaptor to the breathing circuit, verify the O<sub>2</sub> calibration by checking that the O<sub>2</sub> reading on the monitor is correct at 21% (normal ambient reading). Refer to section below on how to perform room air calibration.
2. Perform the tightness check of the patient circuit with the sensor head snapped into the airway adaptor.
3. Verify that there has not been any accumulation of gas between the gas sensor head and the IR window on the adaptor by checking that the CO<sub>2</sub> and Agent readings on the monitor are correct before connecting the patient to the breathing circuit.
4. Check that the connections have been made correctly by verifying the actual patient CO<sub>2</sub> waveform on the computer display per Fig. 10 below.



The "normal" capnogram is a waveform which represents the varying CO<sub>2</sub> level throughout the breath cycle.

Waveform Characteristics:  
A-B Baseline  
B-C Expiratory Upstroke  
C-D Expiratory Plateau  
D End Tidal Concentration  
D-E Inspiration Begins

Figure 11 Normal CO<sub>2</sub> display

NOTE: See Monitoring Parameters in the HELP menu for CO2 waveform analysis.

### IRMA Sensor Operating Alarms and LED Indications

In addition to a descriptive alarm appearing on the VetGard+ computer display, the following LED indications will appear on the IRMA gas sensor itself:

Steady Green Light	System OK
Steady Blue Light	Anesthetic Agent Present
Steady Red Light	Sensor Error
Blinking Red Light	Check Adaptor*

\* Contamination of the light transmission window may have occurred. Remove contamination by rinsing with distilled water or replace the adaptor.

### IRMA Sensor Computer Display Pop-up Messages

The PC-Display program will advise or warn the user when certain conditions occur associated with the IRMA gas sensor.

#### Gas Probe Messages

PC-Display checks the status of the gas probe every five seconds after initial connection of the remote. When abnormal status is detected, a message box typical of the one below is shown.



There are many possible messages that can be shown in this box, including:

- Replace airway adapter (IR signal low) This message will appear when the airway adaptor is extremely worn or dirty. The adaptor should be replaced every 20 patient uses in any case.
- No airway adapter detected. Please connect adaptor (IR signal high).
- Airway adaptor O<sub>2</sub> port failure (clogged or plugged O<sub>2</sub> port).
- No airway adapter detected. Please connect adaptor (IR signal high)
- O<sub>2</sub> sensor has low sensitivity and will soon need to be replaced.
- Please replace O<sub>2</sub> sensor.
- Service required: At least one parameter is out of range. Accuracy of current gas readings can not be guaranteed.
- Room air calibration of O<sub>2</sub> measurement required
  1. Leave gas probe connected to VetGard+.
  2. Remove airway adapter from the gas probe.
  3. Wait for LED on gas probe to start blinking red.
  4. Put the airway adapter back in the gas probe.
  5. Wait for LED on gas probe to turn green.
  6. Exit PC-Display and reconnect to VetGard+ remote.

### Cleaning IRMA Sensor and Airway Adaptor

Clean the gas probe with a cloth moistened (*not wet*) with maximum of 70% isopropyl alcohol or ethanol. Remove the disposable airway adaptor prior to cleaning of the gas probe.

**NOTE:** Do not attempt to directly clean the airway adaptor as this may affect light transmission through the transmission window. If it is to be used more than once then it can be rinsed with distilled water and allowed to drip dry. DO NOT INSERT OBJECTS OF ANY KIND INTO THE ADAPTER.

**CAUTION:** It is important to keep the gas probe from getting wet since this may cause irreparable damage to the sensor. Such damage will void the warranty of the sensor.

**CAUTION:** To avoid damage to the IRMA gas sensor, aggressive Chlorine disinfectant and Chlorine cleaners should be avoided. Under no circumstances should Chlorine be used with the IRMA gas sensor. If Chlorine solutions/cleaners are used in the operating/procedure room the IRMA gas sensor should be removed during the cleaning process.

## Oxygen Monitoring

### Room Air Calibration for O<sub>2</sub> Sensor

If your sensor is equipped to monitor inspired and expired oxygen, remove the plastic cap on top of the IRMA sensor, open the sealed O<sub>2</sub> sensor package and insert and screw in the O<sub>2</sub> sensor into the IRMA sensor. Room air calibration of the O<sub>2</sub> sensor will be performed automatically at regular intervals whenever the sensor head is disconnected from the airway adaptor.

If the gas sensor is kept in operation for a long time without being disconnected from the airway adaptor or if the operating temperature for the O<sub>2</sub> sensor changes significantly, the gas sensor will indicate that a new room air calibration is required and a warning indication will appear on the VetGard+ computer display.

Use the following procedure to perform a room air calibration of the O<sub>2</sub> sensor:

1. Disconnect the disposable airway adapter from the IRMA gas sensor.
2. Wait for the LED on the sensor to blink red.
3. Snap the airway adapter back into the IRMA gas sensor.
4. Check that the LED light turns green.
5. Check that after a few seconds the O<sub>2</sub> reading on the VetGard+ computer display reads at or near 21%.

### Oxygen Sensor Replacement

Replace the O<sub>2</sub> sensor every four months, when indicated by the VetGard+ computer display or whenever O<sub>2</sub> readings are questionable.

### CO<sub>2</sub> Zero Reference Calibration

A zero reference calibration of the CO<sub>2</sub> (or agent) gas sensor measurements should be performed when:

- An offset in gas readings is discovered or if “GAS CONC. OUT OF RANGE” alarms appear when measuring room air.
- Whenever PC-Display message states “CO<sub>2</sub> outside specified accuracy range” or “Negative gas concentrations calculated. Zero reference calibration may be required”

- *[for IRMA OR+ and AX+ sensors only]* Every time that an airway adapter is changed.

The following procedure will guide you through the steps to perform a Zero Reference Calibration on the IRMA gas probe using your VetGard+ and PC-Display (version 2.5.0 or later). **Note: not following these instructions exactly may cause a miscalibrated CO<sub>2</sub> sensor which will result in incorrect measurements.**

1. Insure you have PC-Display version 2.5.0 or later installed. If not, go to “Help” > ”Check for Updates” to download latest update.
2. Insure your VetGard+ remote module is either plugged into AC power or has enough battery charge for this 15 minute procedure.
3. Insure the IRMA gas probe is plugged into your VetGard+ remote module and is not connected to a patient. (Open to still ambient air).
4. Make sure that a brand new airway adapter has been inserted into the IRMA gas probe.
5. Connect your VetGard+ remote module to computer via Bluetooth link.
6. After connecting via Bluetooth wait about 2 minutes (if the serial number of your IRMA gas probe is greater than 200000, otherwise wait 15 minutes). Then, click the Zero option from the Tools menu of PC-Display (“Tools” > “Zero CO2 Probe”).
7. If your IRMA gas probe has warmed up enough then you will be asked if you wish to proceed with the zeroing process. Click the OK button.
8. You should now see a message indicating that the zeroing command has been sent to your IRMA gas probe. Your IRMA gas probe will also, in most cases, blink a green light on the sensor end for a few seconds if the zeroing process is successful.

## Sidestream Airway Gas Monitoring

### INTENDED USE

The ISA product family consists of CO<sub>2</sub> only and the AX+ which monitors, CO<sub>2</sub>, N<sub>2</sub>O and anesthesia gas agents including Halothane, Isoflurane, Enflurane, Sevoflurane, and Desflurane. ISA devices are intended to be connected to a patient breathing circuit for monitoring patient inspired/expired gases during anesthesia, recovery and ICU.

The ISA product family is not intended to be used as the only means of monitoring a patient but must be used in conjunction with other vital signs monitoring modalities and/or professional human judgments of patient condition. Only trained and authorized personnel should use ISA devices and components.

### ALARMS

Indication	Status
Steady green light	System OK
Blinking green light	Zeroing in progress
Steady blue light	Anesthetic agent present
Steady red light	Sensor error
Blinking red light	Check sampling line connections

### CLEANING

Clean the ISA analyzer with a cloth moistened with ethanol or isopropyl alcohol.

**CAUTION:** Clean with the Nomoline connected to prevent liquid contamination.

**CAUTION:** Nomolines are non-sterile devices. Do not autoclave.

**CAUTION:** Do not sterilize or immerse the ISA gas analyzer in liquid.

**CAUTION:** Do not use Chlorine solutions/cleaners near the ISA gas analyzer

### WARNINGS

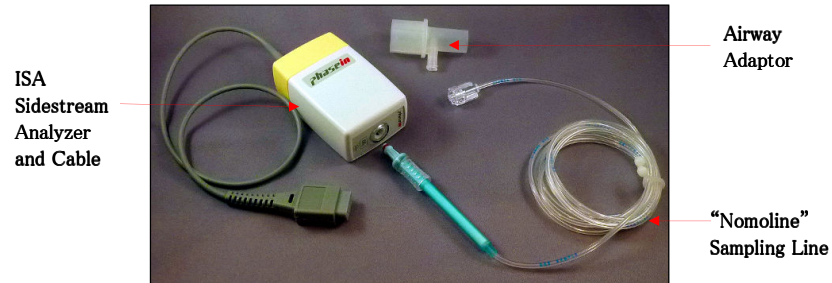
1. Use only sampling lines manufactured by PhaseIn.
2. Do not use in presence of flammable anesthetics
3. Do not use Nomolines on more than one patient unless accuracy is confirmed.
4. Use infant Nomoline configuration on animals weighing less than 6 pounds only. Use on heavier animals will cause flow resistance.
5. Use adult Nomoline configuration on animals weighing more than 10 pounds. Use on lighter animals may add dead space to the patient circuit.
6. Do not use the ISA device with metered flow-dose inhalers or nebulized medications as this may clog the bacterial filter.
7. Check that the gas sample flow is not too high for the patient size.
8. Replace the sampling line if the sampling line input connector flashes red or a Nomoline occlusion message is displayed on your computer.
9. Vmed monitors and the ISA device are not designed for MRI environments.
10. Operating high frequency electrosurgical equipment in the vicinity of the monitor or the ISA can produce interference and may cause inaccurate readings.
11. Too strong positive or negative pressure on the patient circuit may cause inaccurate readings and internal damage to the ASA.
12. Strong scavenging suction pressure might cause incorrect readings and internal damage.
13. Do not place the Vmed monitor or ISA device in any position that might cause it to fall on the patient.

### CAUTIONS

1. Do not autoclave any part of the sampling line.
2. Do not pull on the ISA cable or Nomoline.

3. Do not sterilize the ISA or immerse in liquid.
4. There is no need to manually zero the ISA gas analyzer since it will perform its own zeroing automatically.

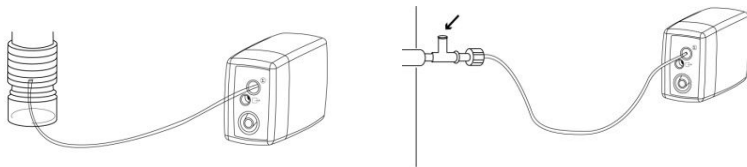
### SYSTEM SET-UP



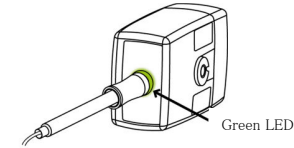
### PRE-USE CHECK

Before connecting the Nomoline sampling line to the breathing circuit, do the following:

1. Connect the ISA analyzer to the VetGard+ and connect via Bluetooth the VetGard+ to your computer.
2. Connect the sampling line to the ISA gas inlet connector.
3. Connect the gas sample exhaust port to a scavenging system or return the gas to the patient circuit to prevent pollution of the operation room when anesthetic agents are being used.



4. Check that the Nomoline connector of the ISA analyzer shows a steady green light (indicates that the system is OK)



5. Breathe into the sampling line and check that a valid CO<sub>2</sub> waveform and values are displayed on the computer.
6. Occlude the sampling line with a fingertip and wait 10 seconds.
7. Check that an occlusion alarm is displayed and that the Nomoline connector of the ISA analyzer shows a flashing red light.
8. If applicable, perform a tightness check on the patient circuit with the sampling line attached.

### ISA LEAKAGE CHECK

Whenever gas readings are questionable, perform a leakage check according to the following instructions.

1. Connect a new Nomoline sampling line with male Luer lock to the ISA gas inlet connector and check that the gas inlet connector shows a steady green light.
2. Connect a short segment of silicon tubing with an inner diameter of 3/32" (2.4 mm) to the Nomoline male Luer.
3. Exhale a long breath into the silicon tubing until the CO<sub>2</sub> concentration is greater than 4.5 vol% or 34 mmHg.
4. Quickly connect the silicon tubing tightly to the exhaust port.
5. Wait 1 minute until the CO<sub>2</sub> concentration has stabilized. Note the value.
6. Wait 1 minute and check that the CO<sub>2</sub> concentration has not decreased more than 0.4 vol% or 3 mmHg. If it has decreased more there is a major leakage in the ISA unit or in the Nomoline. Do not operate the ISA if there is a major leakage in the unit.



### Zeroing the ISA device

ISA sidestream gas analyzers perform zeroing automatically by switching the gas sampling from the respiratory circuit to ambient air. Automatic zeroing is performed every 24 hours and takes less than 3 seconds for ISA CO<sub>2</sub> gas analyzers and less than 10 seconds for ISA multi-gas analyzers.

**WARNING:**

Since a successful zeroing requires the presence of ambient air (21% O<sub>2</sub> and 0% CO<sub>2</sub>) in the gas analyzer, place the ISA in a well-ventilated area. Avoid breathing near the ISA before or during the zeroing procedure.

### Connection for Use

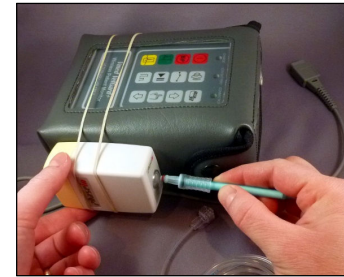
1. Place the ISA sensor in a convenient place. You might attach to the monitor with tape, Velcro or rubber bands as shown below.



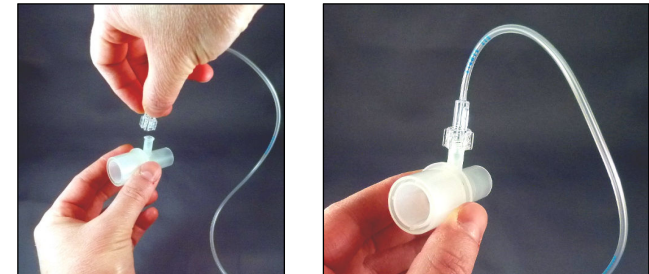
2. Position the airway adapter in the patient airway circuit with the port pointed up. The device will be used in this position.



3. Plug the Nomoline plug of the sampling line into the ISA module.



4. Twist the Luer lock connector onto the port of the airway adapter so that it is secure.



5. Plug the ISA module into the VetGuard+ CO<sub>2</sub> port.



6. Turn on the VetGuard+ monitor and connect to your Computer.

7. Confirm that the green light is displayed on the ISA device.

**WARNING:**

To ensure accuracy, replace the Nomline after each use. If accuracy can be confirmed, the Nomline can be used a maximum of 10 times and should be replaced after 10 uses in any case.

## Chapter 3 Service and Maintenance

### Service and Support

#### **If you purchased directly from Vmed:**

Phone: 800-926-9622  
FAX: 425-585-0231  
Email: info@vmedtech.com  
WEB: www.vmedtech.com

#### **If you purchased from DVM Solutions:**

Phone: 866-373-9627  
FAX: 830-438-7041  
WEB: www.dvmsolutions.com

### Cleaning and Maintenance

#### **Precautions**

- o Do not immerse or soak the monitor or cable connectors in any fluid
- o Do not use bleach, bleach solution or ketones on plastic parts
- o Do not steam autoclave or gas sterilize the VetGard+ or cable connectors
- o Do not use petroleum based solvents on any parts.
- o If moving or handling the VetGard+ is often required, use the monitor in its protective hanging pouch if possible.

## Cleaning

Except for the SpO<sub>2</sub> and IRMA gas sensors (Refer to using the SpO<sub>2</sub> and IRMA gas sensors in the appropriate sections of Chapter 3 of this manual), clean the VetGard+, sensors and cables by wiping surfaces with any of the following solutions:

- Soap and water
- Isopropyl or ethyl alcohol
- Peroxide solution

Salt based ECG gel or paste will corrode skin clips and loop electrodes over time. These sensors should be cleaned after each use if salt based electrolytes are used.

## Maintenance

There are no field serviceable components inside the VetGard+ other than the rechargeable battery (which should be replaced every 2 years). Opening the housing (other than the battery compartment) voids the warranty. Store the VetGard+ in the storage pouch when not in use.

### Changing Batteries

VetGard+ uses a rechargeable lithium-ion battery that has a useful life of approximately two years. When this battery no longer holds its charge or if battery power is suspected as a source of trouble, the battery should be replaced. **NOTE: Use only Vmed replacement batteries. Order Vmed part ETRS2-4000.**

### Removing battery



Figure 12 Remove cover from the back of the device and remove the battery from its compartment. Stretch the wires to their full length and pull the battery straight up to remove the battery plug.

### Replacing battery



Figure 13 Use tweezers or forceps to place the plug of the replacement battery over the battery socket and press into place by pressing down on top of the plug. Place the battery into the compartment ensuring that wires are not pinched and replace the cover.

### Cable Connectors

**CAUTION: TAKE CARE NOT TO BEND THE PINS IN THE PLUG OR FORCE PLUG INTO RECEPTACLE. PLUGS SHOULD BE INSERTED INTO THE VETGARD+ BY PUSHING THE PLUG STRAIGHT INTO THE RECEPTACLE. DO NOT FORCE. NOTE: The Vmed logo is on the top and the plug key is on the bottom.**

## Troubleshooting

Refer to the table below to trace common problem areas.

SITUATION	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Cannot make Bluetooth connection with computer.	<ul style="list-style-type: none"> <li>Weak battery on VetGard+.</li> <li>Improper Bluetooth discovery.</li> <li>Bluetooth not enabled.</li> <li>Bluetooth USB adapter not plugged in</li> <li>Wrong type of Bluetooth used.</li> </ul>	<ul style="list-style-type: none"> <li>Recharge the battery or use the module while plugged in to power.</li> <li>Re-initiate discovery procedure.</li> <li>Verify that USB Bluetooth adapter is plugged in to computer.</li> <li>Determine if the Windows XP Service Pack 2 method of Bluetooth should be used over Bluetooth drivers that came with Bluetooth adapter. (See Chapter 1)</li> </ul>
Bluetooth connection has range <50ft.	<ul style="list-style-type: none"> <li>Low Battery.</li> <li>Signal may pass through high attenuation barrier such as concrete floor/walls or heavy metal objects.</li> <li>Using computer's built-in Bluetooth</li> </ul>	<ul style="list-style-type: none"> <li>Recharge the battery or use the remote while plugged in to power.</li> <li>Clear signal path.</li> <li>Disable built-in Bluetooth and use the Bluetooth device provided by Vmed.</li> </ul>
Cannot acquire satisfactory ECG signal	<ul style="list-style-type: none"> <li>Not enough electrolyte fluid used.</li> <li>Not making adequate skin contact.</li> <li>Corroded electrodes.</li> <li>Broken or corroded lead wire, cable or plug.</li> <li>Bad cable connection.</li> </ul>	<ul style="list-style-type: none"> <li>Re-apply electrolyte.</li> <li>Re-position electrodes and trim excessive hair. Also, try again with clip leads connected to moist human fingers to verify equipment functionality.</li> <li>Wiggle the ECG lead wire at the connector to see if this makes a difference in the signal.</li> <li>Replace electrodes.</li> <li>Replace lead wire or cable.</li> <li>Remove and re-insert all plugs.</li> </ul>
Excessive noise in the ECG signal	<ul style="list-style-type: none"> <li>Inappropriate filter selected.</li> <li>Poor electrode-skin contact.</li> <li>Excessive motion.</li> <li>GAIN set too high.</li> <li>RFI or electromagnetic interference.</li> </ul>	<ul style="list-style-type: none"> <li>Change the filter selection in the "Tools" drop down menu.</li> <li>Re-apply electrolyte and re-position electrodes. Also, try again with clip leads connected to moist human fingers to verify equipment functionality.</li> <li>Reduce patient motion.</li> <li>Set GAIN to 1.</li> <li>Shut off electrical devices near the VetGard+.</li> </ul>
Lost wireless connection with computer	<ul style="list-style-type: none"> <li>VetGard+ out of range of computer or behind signal attenuator.</li> <li>VetGard+ lost power.</li> <li>Bluetooth device loose in USB port.</li> <li>Computer turned off or PC-Display closed.</li> </ul>	<ul style="list-style-type: none"> <li>Move toward computer or clear attenuating obstacle.</li> <li>Try VetGard+ power button.</li> <li>Plug in to power.</li> <li>Check Bluetooth device/USB connection.</li> <li>Re-start PC-Display.</li> </ul>

SITUATION	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Cannot turn VetGard+ unit back on.	<ul style="list-style-type: none"> <li>Battery is totally discharged and remote is disconnected from power.</li> <li>User is pressing and holding power button.</li> </ul>	<ul style="list-style-type: none"> <li>Plug power back in to remote unit.</li> <li>Press and <i>immediately</i> release the power button to turn on (holding down the Power button for a second or more will turn the remote off again).</li> </ul>
Blood Pressure measurement gives no readings	<ul style="list-style-type: none"> <li>Hose connector placement may be reversed (not a tight enough air seal)</li> <li>Incorrect cuff or placement</li> <li>Incorrect cuff selected within PC-Display</li> </ul>	<ul style="list-style-type: none"> <li>Refer to the Blood Pressure measurement section of Chapter 3 for appropriate setup procedures</li> </ul>

**Table 2 Trouble Shooting Guide**

## Appendix A

### Appendix A Computer Requirements and Specifications

#### Computer Minimum Requirements

- 1+ GHz. PC desktop, laptop or tablet computer
- Windows XP (Windows XP SP 3 Recommended), Windows Vista, Windows 7
- 1+ GB RAM for Windows XP, 2+ GB RAM for Windows Vista and Windows 7
- SVGA display, 256 colors, 800 x 600 resolution
- Spare 1.1 or 2.0 USB port
- CD Rom Drive
- 60 MB available hard disk space for PC-Display program, plus approximately 100k Bytes per patient stored
- Windows supported printer
- MAPI compliant E-Mail system such as Microsoft Outlook or Outlook Express (for direct email feature of ECG Reviewer software).
- Windows .NET Framework 2.0

#### Physical Specifications

TYPE: Multi-parameter patient monitor with integrated Bluetooth wireless module

CONSTRUCTION: High impact ABS-PC plastic.

DIMENSIONS OVERALL

LENGTH: 6.0"

WIDTH: 3.75"

THICKNESS: 1.1"

WEIGHT (WITH BATTERIES): 19 oz.

CONTROLS: FLAT PANEL KEYPAD SWITCHES, TACTILE PUSH TYPE:

MASTER ON/OFF

BP ON/OFF

RECORD ECG

OPEN INTERPRETER

SILENCE ALARMS

TREND SELECT

STOP/START SWEEP

SELECT GAIN

PRINT

SELECT

UP/DOWN ARROWS

INDICATORS:

CONNECTION STATUS LED Changes from red to yellow to blinking green

LOW BATTERY LED Turns steady red when battery needs recharging

CHARGE LED Yellow when charging, green when charge complete

CABLE CONNECTION: ECG: Circular mini-DIN, 6 pin; SpO<sub>2</sub>: RS-232, 9 pin; Rectal temperature:

2.5 mm phone plug; CO<sub>2</sub>: RS-232, 9 pin; NIBP: Female Luer twist lock

BATTERY:

TYPE: Lithium Ion Rechargeable, 3.7 V

BATTERY LIFE:

(ECG/Temp/SpO<sub>2</sub> only) - 8 hours continuous operation

(ECG/Temp/SpO<sub>2</sub>/CO<sub>2</sub> only) - 6 hours continuous operation

(ECG/Temp/SpO<sub>2</sub>/CO<sub>2</sub>/NIBP every 3 min) - 3 hours continuous operation

STANDARD PATIENT CABLES AND LEADS:

36" Interface cable with three lead receptacle yoke and connector

Three electrode chest probe with 32" cable and connector

Three wire 80" Zip cable with removable, low force skin clips.

Rectal temperature sensor with 5' cable

Esophageal probes with 36" cable

SpO<sub>2</sub> sensor with 36" cable.

#### System Specifications

ECG GAIN/SENSITIVITY: 5, 10, 20, 30 and 40 mm/mV

COMMON MODE REJECTION: -70dBV CMRL

SAFETY STANDARDS: IEC 601, AAMI EC-11

INPUT IMPEDANCE: 1 M Ohm

INPUT DYNAMIC RANGE: 15 mV

DC OFFSET CORRECTION: -0.5 Hz.

A/D SAMPLING RATE: 400 Hz.

SAMPLE RESOLUTION: 12 bit

ECG SWEEP SPEED, SELECTABLE: 25, 50, 100 mm/sec. (Default: 50 mm/sec.)

QRS DETECTION RANGE: >0.2 mV

FILTERS:

PERMANENT: Pass Band: High pass: 70 Hz

Low pass: 40 Hz

USER SELECTABLE: Notch (AC line noise rejection): 50/60 Hz

ALARMS: HEART RATE, SPO<sub>2</sub>, RESPIRATION, APNEA, CO<sub>2</sub>, O<sub>2</sub>, AGENT, TEMPERATURE, and

BLOOD PRESSURE (systolic, diastolic and MAP): High/Low, selectable limits

FEATURES:

ALARMS: ENABLE/DISABLE

tone: ON/OFF

GRID: ON/OFF

ALARM AUDIO: ON/OFF

R-WAVE DETECTOR: ON/OFF

SILENCE ALARMS: USER ACTIVATED

WIRELESS: Bluetooth Class I radio

RANGE: 100 meters line of sight

FREQUENCY: 2.4-2.4835 GHz WITH FREQUENCY HOPPING

OUTPUT POWER: 4 to 20 dBm

PHYSICAL INTERFERENCE: USB UHCI/OHCI 1.1 compliant

## IRMA GAS SENSORS

TYPE: Extremely fast, compact infrared mainstream multi-gas sensor with integrated ultra-fast galvanic oxygen sensor (When installed). Self-calibrating and self-compensating for atmospheric pressure, temperature and full spectral interference for any gas mixture.

DIMENSIONS (W x D x H): 1.45" x 1.1" x 0.9"

CABLE: 8.3'

WEIGHT: <30 g. without cable

OPERATING TEMPERATURE: 50° F-95° F

AIRWAY ADAPTORS: Semi-disposable small animal and exotic. (Dead: space 7 ml)

RESPIRATION RATE: 3-100 BPM

FLAGS: Apnea, O<sub>2</sub> low, Replace O<sub>2</sub> sensor, Check adaptor, Sensor over range, Hardware errors.

OXYGEN: Integrated ultra-fast response galvanic oxygen sensor >62,500 O<sub>2</sub> hours

CALIBRATION: No routine calibration required, room air calibration performed automatically when changing airway adaptor (time <5 sec).

WARM-UP TIME: 5 seconds, full accuracy within 1 minute.

SAFETY: Anesthesia monitors: EN ISO 11196:1997, ASTM-F 1452-92, Capnometers:

EN864:1996, ISO 9918, ASTM-F 1456-92, Oxygen monitors: EN12598:1999, ISO 7767,

ASTM-F 1462-93, Medical equipment safety: EN60601-1-2:2001

ACCURACY SPECIFICATION DURING ALL CONDITIONS:

GAS	RANGE*	INACCURACY
CO <sub>2</sub>	0-10	±0.5%ABS or ±10% REL
HAL <sub>2</sub> ISO	0-5	±0.15%ABS or ±10% REL
SEVO	0-8	±0.15%ABS or ±10% REL
O <sub>2</sub>	10-100	±3%ABS

**\* Accuracy specification is valid for all specified environmental conditions and includes effects from interfering gases.**

## BLOOD PRESSURE

METHOD OF MEASUREMENT: Oscillometric. Diastolic values correspond to Phase 5 Korotkoff sounds.

BLOOD PRESSURE RANGE:

Systolic: 40 - 265mmHg

MAP: 27 - 222mmHg

Diastolic: 20 - 200mmHg

PULSE RANGE: 25 to 300 Beats per Minute

CUFF DEFLATION RATE: Deflation step size varies with heart rate, cuff pressure and cuff volume.

INITIAL INFLATION PRESSURE:

Large Animal Mode: 160 mmHg (default). Variable from 120 - 280 mmHg

Small Animal Mode: 160 mmHg (default). Variable from 60 - 280 mmHg

CLINICAL ACCURACY: Animal algorithm is based upon the human algorithm that meets accuracy requirements of ANSI/AAMI SP10:1992 and 2002.

PRESSURE TRANSDUCER ACCURACY: ±3mmHg between 0 mmHg and 300 mmHg for operating conditions between 0°C and 50°C. Possible slight reduction in accuracy for temperatures above 50°C up to 60°C.

RECOMMENDED FREQUENCY OF TRANSDUCER CALIBRATION: Verify annually

OPERATING CONDITIONS: 0°C to 50°C, 15% to 95% non-condensing humidity

STORAGE CONDITIONS: -20°C to 65°C, 15% to 95% non-condensing humidity

ALTITUDE: Measurement accuracy is not affected by altitude

PATIENT SAFETY: Internal operating software ensures that: Maximum cuff inflation time limited to 75 seconds. Duration of blood pressure reading is limited to 130 seconds (non MT mode) 120 seconds (Motion Tolerant mode). Additional redundant safety circuitry oversees normal operation and will override to abort a reading if cuff pressure exceeds 300 mmHg at any time or if the cuff has been inflated for >180 seconds.

## Appendix B

### Appendix B Limited Warranty

All Vmed Technology products carry the limited warranties described below. All warranty claims must be received by Vmed Technology in written form within the warranty periods specified below or they will lapse.

**Limited Warranty:** Vmed Technology warrants: (i) the PC-Vet ECG monitor, VetGard+ monitor, and IRMA gas sensors to be free of defects in materials and workmanship for two years from date of purchase by the original end user customer; (ii) Vet-Dop Blood Pressure Monitor to be free of defects in materials and workmanship for one year from date of purchase by the original end user customer; (iii) Cables, lead wires and connectors, ECG sensors and clips, esophageal probes, temperature probes, blood pressure cuffs and blood pressure tubing sold with the VetGard+ Monitor, the PC-Vet Monitor, the Vet-Dop Monitor, or purchased as an optional accessory for such monitors, will be free of defects in materials and workmanship for six months from date of purchase by the original end user customer; and (iv) all other supplies or disposable or single use instruments or products, are warranted to be free of defects in materials and workmanship for the period that ends upon the earlier of initial use for their intended purpose or their expiration date.

Customers who feel an instrument is defective must return it to Vmed Technology for evaluation. Such return must be made in accordance with both the Vmed Technology RMA procedures described below and prior to expiration of the warranty period. Products found by Vmed Technology to be defective will either be repaired or replaced with the same or a comparable product, at the discretion of Vmed Technology. As described below, repair or replacement, at no charge for parts or labor, is the Customer's sole and exclusive remedy. The warranty on any Vmed Technology product is voided if the product is repaired by anyone other than Vmed Technology. Shipping charges are not covered by this warranty. Warranties do not cover general maintenance or cleaning needs that result from normal use. Damage to an instrument or product caused by accident, abuse, alteration, misuse, improper care, cleaning, chemicals, loss or theft are not covered by this warranty. **OPENING THE PC-VET OR VETGARD+ HOUSING OR THE HOUSING OF ANY OTHER VMED TECHNOLOGY PRODUCT WILL VOID THE WARRANTY.**

**Disclaimer of all other Warranties.** VMED TECHNOLOGY HEREBY DISCLAIMS ANY AND ALL OTHER WARRANTIES WHATSOEVER, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT OF THIRD PARTY RIGHTS. The agents and representatives of Vmed Technology are not authorized to make modifications to these warranties, or to make additional warranties. Any additional statements, whether oral or written, do not constitute warranties and should not be relied upon by the Customer.

**Exclusive Remedies of Customer; Limitation of Liability:** Vmed Technology's liability and Customer's remedy for damages incurred as a result of any breach of warranty or related to the goods and products provided to Customer or use of those products by Customer or others, is expressly limited to return of the non-conforming or defective goods to Vmed Technology and, at Vmed Technology's option, either the repair of non-conforming or defective goods or the replacement of non-conforming or defective goods with conforming or comparable goods.

**THE REMEDIES OF THE CUSTOMER SET FORTH IN THESE CONDITIONS OF SALE ARE EXCLUSIVE. VMED TECHNOLOGY SHALL NOT BE LIABLE FOR SPECIAL,**

**INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES ARISING FROM BREACH OF WARRANTY, BREACH OF CONTRACT, TORT, PERSONAL INJURY, PRODUCT LIABILITY, NEGLIGENCE, STRICT LIABILITY, INDEMNITY, OR ANY OTHER LEGAL THEORY, EVEN IF VMED TECHNOLOGY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR THE REMEDY PROVIDED HEREUNDER FAILS OF ITS ESSENTIAL PURPOSE. SUCH EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, LOSS OF PROFITS OR REVENUES, LOST INCOME, CANCELLED PATIENT FEES OR PROCEDURES STEMMING FROM ANY PRODUCT ON BACKORDER, LOSS OF USE OF THE GOODS OR INSTRUMENTS, COSTS OF CAPITAL, COST OF SUBSTITUTE GOODS, FACILITIES OR SERVICES, OR CLAIMS OF CUSTOMERS OR PATIENTS/CLIENTS OF THE CUSTOMER FOR SUCH DAMAGES.**

SOME STATES MAY NOT ALLOW EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES AND THEREFORE THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU IF SUCH STATE'S LAWS ARE FOUND TO BE APPLICABLE TO YOU.

#### WARRANTY RETURN POLICY

**Return of Product for Breach of Warranty:** In order to make a claim for breach of warranty or to return a product for warranty or non-warranty repair, Customer must obtain a Return Merchandise Authorization (RMA) number from Vmed Technology customer service at (800)-926-9622. An itemized list of returned products must accompany all returns. The RMA number and explanation of why the product is being returned must be included. Returned goods MUST be packaged in a shipping container equivalent to that in which it was received. Returned goods MUST be shipped pre-paid at Customer's expense by FedEx or UPS or other service that provides package tracking, and must be insured for the purchase price of the contents. Returned goods received by Vmed Technology in any form less than that described above will be refused by Vmed Technology and return shipped to the Customer. Vmed Technology will pay the return freight on products repaired or replaced under warranty.

**Appendix C Accessories and Replacement Parts**

SEE [www.vmedtech.com/accessories](http://www.vmedtech.com/accessories) FOR PHOTOS AND DESCRIPTION

<u>CATALOG</u>	<u>DESCRIPTION</u>
<u>SENSORS</u>	
ECGN18	Needle electrodes, 28 ga., set of 3, 18" lead
ECG 10	Loop electrodes, Set of 3, 18" lead
ECG 1.2	Loop electrode, exotic, set of 3, 18" lead
2070	Electrodes, Monitoring, 3M, large Animal (Box of 50)
2248-3	Electrodes, Monitoring, 3M, small animal (Box of 20, 3ea.)
CE1	Clip leads, 3 wires, low force clips with connector
CH1B	ECG Small animal chest probe with start/stop button
EQ1	ECG large animal chest probe
PET4	Esophageal ECG and temperature probe, kittens and exotics
PET6	Esophageal ECG and temperature probe, dogs and cats.
PET8	Esophageal ECG and temperature probe, large breeds
CY1	Cable yoke for 3 clip leads for disposable chest electrodes
CE2	Clip leads for disposable long-term electrodes, set of 3
DEC4	Extension cable, SpO <sub>2</sub> sensor, 4' with connector
XTN3	Extension cable, ECG, 3'
TR1B	Rectal temperature probe with 8' cable and connector
V-SAT	Nellcor SpO <sub>2</sub> lingual sensor with 2 clips
200101	IRMA mainstream CO <sub>2</sub> only sensor (8' cable)
200201	IRMA mainstream CO <sub>2</sub> and O <sub>2</sub> (8' cable)
200301	IRMA mainstream CO <sub>2</sub> , O <sub>2</sub> and primary agent (8' cable)
200401	IRMA mainstream CO <sub>2</sub> , O <sub>2</sub> , primary and secondary agent; agent ID
106211	IRMA semi-disposable airway adaptor with O <sub>2</sub> port (box of 12)
106221	IRMA semi-disposable airway adaptor without O <sub>2</sub> port (box of 12)
100230	IRMA oxygen sensor (box of 5)

<u>CATALOG</u>	<u>DESCRIPTION</u>
<u>BLOOD PRESSURE ACCESSORIES</u>	
C100	Small animal cuff set of 5
C101	Feline cuff set of 5
ETRS2-6000	Tubing, blood pressure, 8'
<u>OTHER</u>	
BT-USB	Class I Bluetooth adaptor kit with hardware and software
BT2-USB	Class 1 Bluetooth adaptor kit for Windows XP and Vista
ETRS2-4000	Battery, Rechargeable, lithium-ion 3.7 v.
HC-110	Battery Charger, Patient isolated, 110v/220v
HC-110B	A/C power cord for charger
P5	Storage pouch
P6	Hanging pouch, Protective
M3	Manual, VetGard+
W2	PC-Display installation CD, all monitors



*Installation, Setup and Operating  
Instructions*

***PC-VetGard+™ Wireless Patient Monitor***

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