Thank you for choosing the Thames Medical CAT+™ Doppler blood pressure determination system. We are confident that it will give you long and useful service.

The CAT+™ Doppler has been in use since 1999, designed and produced by our development team, including the top experts in the fields of Doppler Technology, Veterinary Medicine (specialising in Feline Hypertension) and Applied Physiology. Whilst today the CAT+ Doppler is probably the most sensitive and easiest to use Doppler in the world, we will continue our development and improvement program and may from time to time make changes to the advertised product.

Please take a moment to read through this manual as it will give you an insight into how to get the best from your CAT+.

If you have any doubts, concerns, questions or ideas as to how we may further improve our product, please contact us and we will do what we can to help you.

Once again, thank you.

Mike Brampton
Managing Director and inventor of the CAT+ Doppler BP system

CAT+™ is a registered trademark and does not signify species compatibility

Thames Medical Ltd,
Thames House,
8 A’Becket Gardens,
Worthing,
West Sussex,
BN13 2BW.

Website: www.thamesmedical.com
Phone: 01903 522911
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</table>
1. What’s in the CAT+ Doppler kit box?

- 1 x Cat+Doppler unit with Hypersense™ Flat probe
- 1 x Disytest Sphygmomanometer with hose and female tapered Luer connector
- 1 x White size 1 cuff
- 1 x White size 2 cuff
- 1 x White size 3 cuff
- 1 x White size 4 cuff
- 1 x White size 5 cuff
- 1 x JVC Headphones (HS160 Flats)
- 1 x Bottle of Ultrasound Gel
- 2 x PP3 Photocell Hi-Discharge Rechargeable Batteries
- 1 x Intelligent Battery recharger (either UK, EU, US or Aus)
- 1 x Operation and maintenance manual
What’s in The CAT+Doppler Mini-Kit box?

- 1 x Cat+ Doppler unit with Hypersense™ Flat probe
- 2 x PP3 Photocell Hi-Discharge Rechargeable Batteries
- 1 x Intelligent Battery recharger (either UK, EU, US or Aus)
- 1 x Operation and maintenance manual
2. Controls and indicators

The CAT+ is powered from a single 9 volt alkaline battery (type 6LR61/PP3). To insert or change the battery, slide off the battery cover and withdraw the battery and connector.

Carefully remove the battery from the connector and snap the new battery into position taking care to ensure correct orientation. Place the battery and connector back into the battery compartment and refit the battery cover.

- **On/Off switch** - To switch on the CAT+, press the centre of the membrane switch located on the front of the unit. The unit switches on when you remove your finger. In normal operation the LED will flash momentarily and then, if the battery is charged, it will go out, ie. in normal use with a good battery the yellow light will be off. The CAT+ will stay on until the on/off switch is pressed again.

- **Low battery warning light** - on front of unit. If the yellow light stays illuminated during operation, then the battery is dying or dead – it is NOT an indication that the unit is switched on. Use only high capacity batteries (See Care of the Cat+ on Page 6).

- **The FLAT probe** - detects the blood flow signals and transmits along the cable to the unit.

- **Headphone socket** - on top of the unit, see headphone symbol.

- **Built-in loudspeaker** - on the face of the unit.

- **Rotary volume control** - on the side of the unit.

- There is an option to print velocity signals using a printer cable (not included in kit) connected to a suitable printer or ECG with an analogue input. Contact supplier for further details.
headphones
volume control
low battery warning light
data output (special units)
speaker grill
cable and probe

CAT^+ Doppler

www.thamesmedical.com
3. Overview and Care of your CAT+

IMPORTANT: TOP TIPS on caring for and getting the best from the kit:

Technically the CAT+ is a small portable, low voltage, blood flow detector which uses ultrasonic radio waves and the Doppler effect to detect and “sound” pulses and blood flow in both veins but, more importantly, in the uses described here, arteries.

The probe

- Each probe is made up of a combination of complex electronics driving organically-grown matched pairs of ultrasonic crystals, mounted, back-filled with acoustically damped epoxy resin and cured in an oven for 48 hrs.

- The probe, whilst being very tough, is also very sensitive. Its matched pairs of organically-grown crystals are tuned by specialised technicians using oscilloscopes. It is designed to detect the faintest movement using echo-location. If the probe is moved around while searching for a pulse then sound will be generated and produced via the loudspeaker or headphones.

- For a long probe life: After each use, carefully wipe excess coupling gel from the transducer with a soft tissue. The transducer face is very delicate and may be damaged by being dropped. Always store the unit and transducer in carry case.

The Cable

- A shielded, multi-stranded cable connects the probe to the CAT+ unit.

- For a long cable life: Handle this cable with care. If it is tugged or wrapped around the CAT+ for storage or if it is twisted/pulled, the shielding will break down. Also keep it away from sharp teeth, blades and scissors.

- If the shielding is damaged, the unit will produce static noise and it will be very difficult to detect the patient’s pulse.
The Unit/Batteries

- **If the low battery warning light is on?** Remember the light on the front of the unit is the yellow LOW BATTERY warning light; if it stays on, the battery needs to be changed. **The CAT+ needs high capacity batteries so please use only Photo quality 9-volt cells, Duracell Ultra disposables or the Vapor rechargeables supplied.** Low quality batteries will not allow the Doppler to detect even the loudest, clearest pulse.

  And as with a mobile phone, the rechargeable Vapor batteries will degrade slowly over time and will need replacing every couple of years.

- **Caring for the unit casing:** If the Doppler unit itself becomes dirty, wipe with a damp cloth moistened with a mild detergent. Never use chlorhexidine products, alcohol or any other solvent to clean any part of the Doppler as these may cause damage.

- **Headphones:** these plug in at the top of the unit – see headphone symbol next to the socket.
4. Using the CAT+

Pulse Detection

The Cat+ can be used for pulse detection anywhere that a pulse quality indicator is needed, for example during anaesthesia.

It will give you a clear indication of the quality, rhythm and location of the patient’s pulse. The CAT+ will work on any species with a pulse, even goldfish.

TOP TIPS:

• DON’T CLIP but do use LOTS OF GEL. Ultrasound is best transmitted via fluid (gel); the more gel you use, the better the sound quality will be.

• NO PRESSURE. Seriously, we often get our patients to hold their probes on themselves. All you are doing, when hand-holding the probe, is keeping it gently in position, lightly touching the gel. If you have to touch the patient’s skin, then so be it. But if you have enough gel, it is not necessary.

• ONLY TURN UP VOLUME when the probe is still and in position on the patient.

Blood Pressure

Using a CAT+ Doppler, blood pressure cuffs and a Sphygmomanometer it is possible to detect the patient’s systolic and diastolic blood pressure. See page 10.
5. A note about cuffs

Male tapered luer to fit the Sphygmomanometer female luer

Please note the size scale which will mean you are always between 30 and 40% cuff width to limb circumference for accurate reading.

Artery marker – place this over the artery you are measuring from

For accurate deflation make sure there is a female luer connector in the end of the tube
The 3 phase Brampton sounds of blood pressure using the CAT+ doppler*

The sounds we hear from the doppler are often erroneously referred to as Karotkoff sounds. They are certainly similar but because the doppler can detect all flow, whether laminar or turbulent (as described by Karotkoff), it is inappropriate to label them as such.

For sake of clarification we will describe the sounds heard using the doppler technique as Brampton Sounds after Korotkoff.

Going from a total occlusion of the artery being listened to:

- **Phase 1 Single tap**: When the pressure in the cuff controlled by the sphygmomanometer is dropped to a level equal to that of the patient’s systolic blood pressure, the first sounds will be heard. As the pressure in the cuff is the same as the pressure produced by the heart, some blood will be able squish or spurt past the cuff when the pressure in the artery rises to maximum during systole. This blood flows in spurts as the pressure in the artery rises above the pressure in the cuff and then drops back down beyond the cuffed region, resulting in turbulence that produces the first staccato tapping or squishing sound. Take the reading from the sphygmomanometer. This will give you the systolic pressure.

- **Phase 2 Double tap**: Continuing to reduce the pressure in the cuff smoothly in a linear manner at the rate of about a second hand in reverse, the single staccato sound will become louder but will remain as a single staccato tap sound until the artery is able to expand and contract unhindered. At this point (diastole) the sounds become more of a double tap sound. With faster heartbeats the “tone” of the tap changes and becomes a rounder sound.

- **Phase 3 Venous swoosh**: finally, and at a significantly lower pressure, there will be a low whoosh sound added to the sound, often described as the sound of wind in the trees or the seashore. This whoosh sound is the sound of blood returning through the lower pressure venous system and is important as it shows that the blood in the distal limb is once again flowing freely and not still under a tourniquet.

A simple technique to train the ear to hear diastolic point can be practiced initially on a human finger. By listening to an uninterrupted pulse (cuff deflated) you will hear the traditional “lub dup” sound. As you increase the pressure in the cuff to below your systolic pressure the sound becomes sharpened and you lose the “dup” aspect; instead, you will hear a sharper “tap” sound. As you deflate the cuff and as the artery is able to open fully, you will hear the single tap (“lub” sound) revert to a double tap (“lub dup” sound). This is the diastolic as heard via doppler.

*The Brampton Sounds after Korotkoff (1905) and Riva-Rocci (1896)
7. How to take a cat’s blood pressure

The technique used is an identical one to a human manual technique, with the exception that instead of using a stethoscope to auscultate the sound of the blood in the arteries, we will use the FLAT probe CAT doppler. The pick-up comes from the white circle on the probe.

You may wish to isolate the animal in a quiet room for a while to reduce the animal’s stress but, in the author’s opinion, this isn’t always necessary. After preparing the site to be used (forelimb, hindlimb or underside of the tail) the probe is positioned distal to the cuff over an artery. One of the easiest reference sites to use is a medial position between the “stopper” pad and main pad on the underside of the animal’s limb. There is no need to keep the long axis of the probe in line with the limb. Little or no pressure is required, other than that needed to hold the probe in place. For long anaesthetic cases, the probe can be taped in place.

The pressure in the cuff is then smoothly increased using the sphygmomanometer, making note of the pressure gauge until such a time as the pulse sounds from the doppler are no longer heard. Continue on for another 10-20 mmHg pressure and then using the trigger on the back of the sphygmomanometer, smoothly and steadily deflate the cuff (like a second hand in reverse). At the point that blood sounds can be heard again, read off the pressure on the sphygmomanometer gauge. This is the systolic blood pressure.

The Diastolic pressure can also sometimes be determined by a change in tone as the cuff pressure continues to be released, but this is not always possible.

IMPORTANT: Remember always to totally deflate the cuff after every attempt – this allow venous draining.
8. Technique on cats (picture guide)

The CAT+ doppler BP Kit

It is important to take the cat’s blood pressure in as stress-free an environment as possible. Ideally, the owner should be present. Blood pressure should be measured after the animal has had a few minutes to settle and before any other procedure, such as clinical examination or rectal temperature taking.

The cuff should be placed snugly around the forelimb. Note that the width of the inflatable part of the cuff should be around 30 – 40% of the circumference of the limb it is being placed around. Use the size guide marked on the cuff.

The flow of blood is measured through the common digital artery located between the carpal and metacarpal pads. To get good contact with the doppler probe, the area should be damped down with spirit or soapy water to get the oil out of the fur.
Ultrasound coupling gel should also be applied to the area... lots and lots of gel, and work it in and even add some more...

... and to the doppler probe.

The probe is then gently held just below the carpal pad and the machine switched on. The position of the probe then needs to be gently altered until you can hear the flow of blood.

The less pressure applied and the more gel used, the louder the pulse signal will be.

Use the headphones to avoid startling the cat

Once a clear signal is heard, the cuff is gently inflated to around 20mm of mercury above the point where bloodflow can no longer be heard. The cuff is then slowly and steadily deflated. The point where blood-flow is first heard again is systolic pressure. The average of 3 to 5 readings is used, and ideally each reading should be about the same.
If you have an animal whose systolic blood pressure is, for example, 185 mmHg, it is important to rule out user error or other factors which may be artificially increasing the animal’s blood pressure (white coat hypertension, travel stress etc). Keep the animal in a quiet corner in the room you are going to do the determination in for an hour or so, to allow it to adjust to the surroundings. You may also want to take a blood sample to eliminate any other causes for this elevated reading; it could be primary or secondary hypertension.

### ACVIM/IRIS Guidelines

<table>
<thead>
<tr>
<th>Systolic BP (mm Hg)</th>
<th>Blood Pressure Sub-stage</th>
<th>Risk of Future Target Organ Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 90</td>
<td>Hypotensive</td>
<td></td>
</tr>
<tr>
<td>90-150</td>
<td>Normotensive</td>
<td>Minimal</td>
</tr>
<tr>
<td>150-159</td>
<td>Borderline Hypertensive</td>
<td>Low</td>
</tr>
<tr>
<td>160-179</td>
<td>Hypertensive</td>
<td>Moderate</td>
</tr>
<tr>
<td>&gt;180</td>
<td>Severely Hypertensive</td>
<td>High</td>
</tr>
</tbody>
</table>
10. How to take a dog’s blood pressure

The technique is the same as for cats with one major difference:

Where a cat’s forelimb is flexible with flexible bones, a dog’s is not, which means that it can be very difficult to occlude either the brachial or radial artery. This can produce artificially elevated readings.

The best site to place the cuff to determine a dog’s pressure is below the hock. Place the cuff on the metatarsals with the artery marker on the cuff on the dorsal/upper side. The artery to be compressed initially tracks down the back of the leg alongside the Achilles tendon to the hock, where it switches to the dorsal surface before continuing down to the pads. The probe is placed on the dorsal surface, distal to the cuff, on or around the level of the main pad. To avoid grossly elevated readings, always use the hind limb. The Great Dane in the picture had a BP of 165mmHg in the hind limb with a size 5 cuff placed below the hock. The readings were repeatedly over 230mmHg from the front leg.

What Constitutes Hypertension? - Dogs

<table>
<thead>
<tr>
<th>Systolic BP (mm Hg)</th>
<th>Blood Pressure Sub-stage</th>
<th>Risk of Future Target Organ Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 90</td>
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<tr>
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</tr>
<tr>
<td>&gt;180</td>
<td>Severely Hypertensive</td>
<td>High</td>
</tr>
</tbody>
</table>
Cuff position above the hock with the artery marker posterior to enable the cuff bladder to wrap the achilles and occlude the saphenous artery.

NOTE the position of the cuff/artery marker if used ABOVE the hock.

Note the artery marker is alongside the inflation tube.
11. Top tips for success

- Use alcohol or a soap solution to wet the fur down. Air and hair both interfere with Doppler ultrasound.
- If you use alcohol you shouldn’t need to clip; this keeps the animal calmer.
- Use lots of gel.
- Put the right sized cuff (they are all marked with size range) below the elbow; the limb is more tubular at this point so the cuff compression is more even, leading to improved results.
- Get the nurse to ‘present’ the limb as if for injection.
- If the cuff starts to slide down, reposition it and ask the nurse to steady it. (Don’t let the nurse squeeze it though!)
- Use lots of gel.
- Be calm and confident in your approach; it’s amazing what a difference this can make.
- Hold the probe gently on the patient to avoid occluding the artery being listened to.
- If the forelimb is a ‘no go’, try the hind limb or under the tail.
- When measuring dogs’ BP’s, lay them down, especially Greyhounds, Staffordshire Bull Terriers and other muscular dogs. If you don’t, you could be pumping up the cuff all day and still not occlude the artery.
- Use lots of gel.
- If the animal objects to the noise of the CAT+, use the headphones.
- Keep the volume down until the probe is in approximately the correct position and then turn up the volume.
- IMPORTANT: If the volume is quiet, use the headphones and check the yellow low battery warning light isn’t on.
- Minimise the amount of lateral movement when looking for the pulse, the probe will detect and sound/produce that movement and so it will be harder to identify the pulse.
- Keep a spare fresh battery in the case
- Keep a battery on charge when not in use
- IMPORTANT: Always record the cuff size, cuff position and limb used and any other notable things on the records so that next time you can replicate.
- If doubts persist or skills seem lacking, book a training session with us: call 01903 522911

IMPORTANT: Always record the cuff size, cuff position and limb used and any other notable things on the records so next time it can be duplicated.
12. Troubleshooting

In the unlikely event of instrument failure, the following simple checks may be made before contacting your supplier or Thames Medical +44 (0)1903 522911 for further advice.

- Turn the volume control to maximum.

- Turn the unit on and observe the Battery Low indicator. If it does not flash on briefly, replace the battery and try again.

- If the Battery Low indicator remains on, replace the battery and try again.

- If the Battery Low indicator illuminates and then goes out (normal operation) stroke the transducer/probe face.

- If no audio signal is heard in the loudspeaker, consult your supplier or Thames Medical.

- When contacting your supplier with a problem please have available the instrument type and serial number. The serial number can be found inside the battery compartment.

In the event of a failure we operate a rapid turn-round out-of-warranty fixed-price repair scheme to give you peace of mind.

Follow this link: http://www.thamesmedical.com and select Repairs Download the return form which includes instructions and return address label and send it in.

Please note that we may ask you to send us just the unit. If so, please keep your sphygmomanometer at your Practice and do not send the unit in the blue carry case as we have limited storage space.

By return we will tell you exactly what the problem is and give you a range of options with costs to solve the problem.

Or simply call +44 (0)1903 522911 for instructions on where and how to send it.
13. CAT+ urban myths

“You have to take the battery out after every use”
No you don’t, BUT battery life will be conserved if you turn the unit off after every use.

“The power light is on but there’s no sound”
There is no “power light” on the CAT+, only a Low Battery Warning light. If the light is on, a new high-capacity battery is needed.

“It takes a long time to get a reading”
With training and practice, it can take less than a minute to get a BP reading. See videos at thamesmedical.com.

“The noise scares the patient”
Not if you use the headphones; not only will you hear the pulse easier, no-one else including your patient will hear anything!

“I don’t like clipping the patient”
Neither do we, which is why we don’t do it. Alcohol or warm soapy water to strip the oil out of the fur, then lots and lots of gel.

“The firmer I squeeze the quieter the sound”
Yes, remember that we apply tourniquets to obstruct blood flow in exactly the same way. Use only light or no pressure on the probe and LOTS OF GEL.

“You have to measure the limb circumference”
All the CAT+ cuffs are pre-measured and marked. In short, if the CAT+ Cuff fits, that’s the right cuff width-to-limb circumference (30-40%)

“You can only measure the systolic”
No. With training and knowing what to listen for, you can also measure the diastolic (see www.thamesmedical.com/videos for more information).
14. Guidelines for identifying and resolving adverse EMC conditions

**Emissions**

Care has been taken through the design and manufacturing processes to minimise the EM emissions that may be produced by this equipment. However, in the unlikely event that the unit causes an EM disturbance to adjacent equipment, we suggest that the procedure is carried out ‘out of range’ of the affected equipment.

**Immunity**

If the user has any doubt regarding the unit’s EM immunity during routine operation, we suggest that the source of EM disturbance is identified and its emissions reduced. Mobile phones will interfere with the quality of pulse detection and sound, and will manifest as a rapid crack crack sound. Remove the phone from the immediate vicinity.

If the user has any doubt regarding the identification and resolution of adverse EM conditions, they may contact the following to seek advice:

Thames Medical, SERVICE DEPARTMENT, Thames House, 8 A’Becket Gardens, Worthing, West Sussex BN13 2BW

Tel: +44 (0)1903 522 911 Fax: +44 (0)1903 522 922 Email: info@thamesmedical.com
15. Parts and replacement ordering

We stock a full range of parts and accessories for your CAT+ dopplers, available online at www.thamesmedical.com or simply by calling us on 01903 522911.

Please note whilst we are happy to accept any order, we ask that all orders below £50 before VAT P&P are paid with a credit or debit card at the time.

### Blood pressure cuffs

<table>
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<tr>
<th>Item Code</th>
<th>Description</th>
<th>Effective Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>TML-S-BPC1</td>
<td>Blood Pressure Cuff Size 1</td>
<td>3cm to 6cm</td>
</tr>
<tr>
<td>TML-S-BPC2</td>
<td>Blood Pressure Cuff Size 2</td>
<td>4cm to 8cm</td>
</tr>
<tr>
<td>TML-S-BPC3</td>
<td>Blood Pressure Cuff Size 3</td>
<td>6cm to 11cm</td>
</tr>
<tr>
<td>TML-S-BPC4</td>
<td>Blood Pressure Cuff Size 4</td>
<td>7cm to 13cm</td>
</tr>
<tr>
<td>TML-S-BPC5</td>
<td>Blood Pressure Cuff Size 5</td>
<td>8cm to 15cm</td>
</tr>
<tr>
<td>TML-S-BPC6</td>
<td>Blood Pressure Cuff Size 6</td>
<td>12cm to 19cm</td>
</tr>
</tbody>
</table>

### Headphones

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TML-U-CAT4HPBL</td>
<td>Headphones - JVC Swivel cup – Black</td>
</tr>
</tbody>
</table>

### Gel

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TML-U-CAT4GEL</td>
<td>250ml Bottle Ultrasound gel</td>
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</tbody>
</table>

### Batteries and recharger

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TML-U-CAT4RB1</td>
<td>Rechargeable 9v High Power Battery (photo cell)</td>
</tr>
<tr>
<td>TML-U-CAT4RBC</td>
<td>9v Intelligent Rechargeable Battery Charger - UK Spec</td>
</tr>
<tr>
<td>TML-U-CAT4RBCEU</td>
<td>9v Intelligent Rechargeable Battery Charger (EU)</td>
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</tbody>
</table>