Stand Alone | RATURN™

Instruction Manual

BASi

WELCOME!

Congratulations on the purchase of your new Stand-Alone Raturn™ from BASi, and welcome to the family. BASi has been dedicated to getting better data from fewer animals for more than 40 years. We are constantly in search of better ways to collect samples from low-stress animals, and the Raturn™ system was designed for just that.

BASi's Raturn™ is a movement response caging system that is designed for tether-based applications in awake animals. Used as an alternative to a liquid swivel or a commutator, the Raturn™ interactively responds to the animal movement to keep wires, tubing, fluid lines and cables from twisting. This system makes it easy to collect multiple types of data from a single animal, so that it is possible to reduce animal numbers while simultaneously improving study results.

To learn more about all of BASi's products and services, please visit our website www.basinc.com.

Contact us with any questions, comments or concerns at:

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Fax: (765) 497-1102

E-mail: invivo@basinc.com

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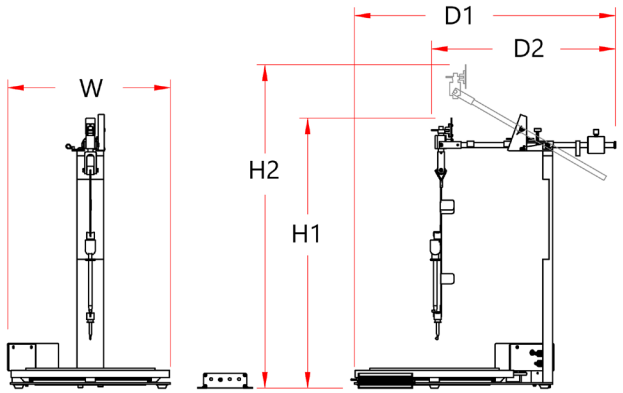
1. INTRODUCTION:

The Raturn™ consists of a turntable and drive mechanism connected to a control box. The rat or mouse is placed into a cage (sold separately) and tethered to a counterbalance arm. The animal can move up to 280° before activating the optical sensor, causing the cage to counter rotate to prevent twisting.

SPECIFICATIONS:

W= 12.2”/31.0 cm,
+ width of cage (see page 12 for caging options)
H1= 20.2”/51.3 cm
H2= 24.2”/61.5 cm
D1= 19.6”/49.8 cm
D2= 13.8”/35.1 cm



FEATURES:

- Eliminate swivels and commutators maintaining direct connections to your instruments
- Tethers and caging options available for multiple species and protocols
- Reduce stress with less animal handling
- Combine multiple fluid or electrical lines in a single animal
- Easy set-up and breakdown
- Optional add-ons include
  - o Raturn™ Activity Monitoring System for animal activity analysis
  - o Metabolic stand for urine and feces collection
  - o Integration with Culex® Automated Blood Sampling System.

COMPONENTS:

The StandAlone Raturn™ system is shipped in a single box, and includes:

- Raturn™ Controller
- Raturn™ Platter
- Raturn™ Turntable
- Raturn™ Motor
- Upright arm with socket screws
- Balance arm and tether
- Power Cord
- Communication Cables
- Spare O-rings
- Replacement animal collars
- Mounting Hardware
- 2 Hex screw drivers

Raturn™ compatible cage must be purchased separately. See page 12.

2. SAFETY PRECAUTIONS

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific **WARNINGS, CAUTIONS,** or **NOTES** elsewhere in this manual may impair the protection provided by the equipment. Such noncompliance would also violate safety standards of design, manufacture, and intended use of the instrument.

Bioanalytical Systems, Inc. assumes no liability for the customer's failure to comply with these requirements.

- For indoor use only.
- Ground the instrument. To avoid electric shock, the instrument must be grounded with the supplied power cable's grounding prong.
- Do NOT exceed the operating input power, voltage, current level and signal type appropriate for the instrument. Refer to the installation section for further information.
- Electrostatic discharge (ESD) can damage the highly sensitive microcircuits in your instrument. ESD damage is most likely to occur as the instruments are being connected or disconnected. Ground yourself to discharge any static charge built-up by touching the outer shell of any grounded instrument chassis before the I/O connectors are connected or disconnected.
- Do NOT place the instrument in fluid or expose the internal elements or back panel to fluid.
- Do NOT operate the instrument in an explosive atmosphere or in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment clearly constitutes a safety hazard.
- Keep away from live circuits. Operators must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltage levels may exist even with the power cable removed. To avoid injuries, always disconnect the power and discharge circuits before touching them.
- Do NOT substitute parts or modify the instrument. To avoid the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the instrument. Return the instrument to the Bioanalytical Systems, Inc. service department for service and repair to ensure that safety features are maintained in operational condition.

If you notice any unusual conditions as listed below, immediately terminate operation and disconnect the power cable. Contact the Bioanalytical Systems, Inc. service department for repair of the instrument. If you continue to operate without repairing the instrument, there is a potential for hazard or damage to both the equipment and the operator.

- Instrument operates abnormally
- Instrument emits abnormal noise, smell, smoke or a sparks during operation
- Instrument generates high temperatures or electrical shock during operation
- Power cable, plug or receptacle on instrument is damaged
- Foreign substance or liquid has penetrated the outer cover of the instrument

IMPORTANT INFORMATION:

Throughout the course of this manual, the following words and symbols will be used to designate important information:

WARNING – This signifies extreme hazard. Not following the instructions may result in serious injury or death.
CAUTION – Following information relates to a hazard. If instructions are not followed properly, it can result in irrevocable damage to the instrument.
NOTE – This implies that the following instructions are essential for the user to understand in order to operate the equipment effectively.

SYMBOLS


Caution: Risk of danger. User's manual must be consulted in all cases where this symbol is marked.


Alternating current


Fuse

On (supply)


Off (supply)


Complies with European Union directives


The European Waste Electrical and Electronic Equipment (WEEE) Directive

ENVIRONMENTAL REQUIREMENTS

The Raturn™ is designed to operate under the following environmental conditions:

- Temperature: 10°C to 35°C
- Humidity: 15% to 50% (relative humidity)
- Pressure: 75 KPA – 106 KPA
- Altitude: < 2,000 meters
- Pollution Degree 2

CAUTION - The Raturn™ must be protected from temperature extremes that could cause condensation within the instrument.

3. INSTALLATION

3.1. POWER REQUIREMENTS

The Raturn™ requires a power source that meets the following specifications:

- Voltage: 100-240 VAC (auto select)
- Frequency: 50-60 Hz
- Power Consumption: 20VA (max)
- Connections: The power cable uses a three-wire system in accordance with international safety standards.

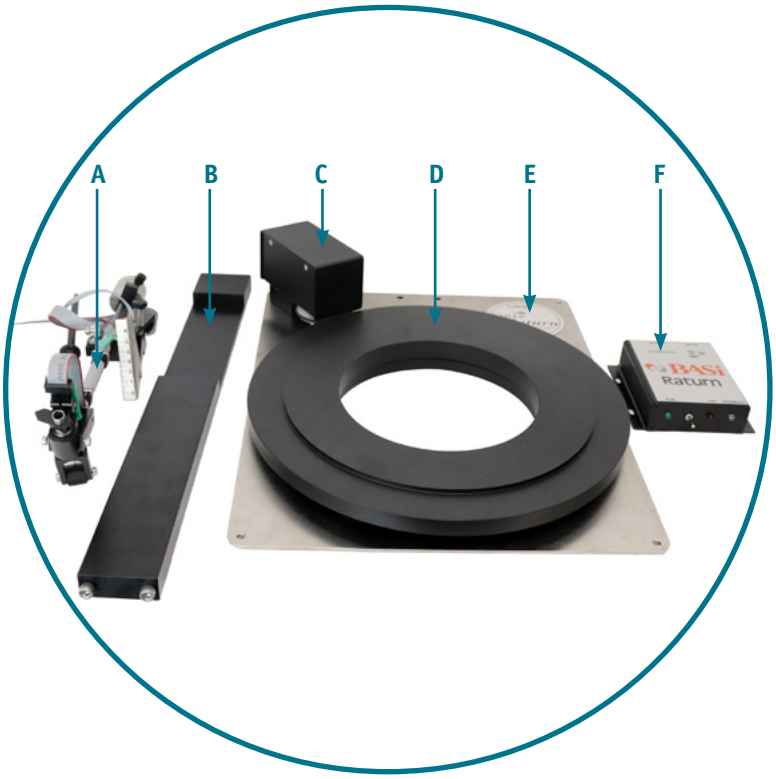
WARNING - To protect against electrical shock, the power cable grounding prong must NOT be removed. Failure to comply with these requirements may result in injury to both the user and the equipment.

3.2. COMPUTER

No computer is required for the Stand Alone Raturn™. However, BASi offers a Raturn™ Animal Activity Monitoring System which can be connected to the Raturn™ and downloaded to most Windows computers. More information is available in the Raturn™ Animal Activity Monitor Instruction Manual.

3.3 RATURN™ COMPONENTS

A: Balance arm and tether
B: Upright arm (vertical support)
C: Raturn™ motor
D: Raturn™ turntable
E: Raturn™ platter
F: Raturn™ controller



RATURN™ CONTROLLER COMPONENTS

Front Panel:
1: Green flashing indicator light for Raturn™ RUN (ON)
2: ON/OFF switch for Raturn™ turntable activation
3: Red indicator light for Raturn™ OFF
4: Red flashing indicator light for Raturn™ DISABLE

Back Panel:
5: Connection Port for Raturn™ motor
6: Connection Port for activity collection (optional). Can be connected to Culex controller Raturn™ Animal Activity Monitor.

RATURN™ MOTOR COMPONENTS

A. Connection Port for Balance Arm
B. Connection Port for Raturn™ Controller
C. Speed Setting Adjustment

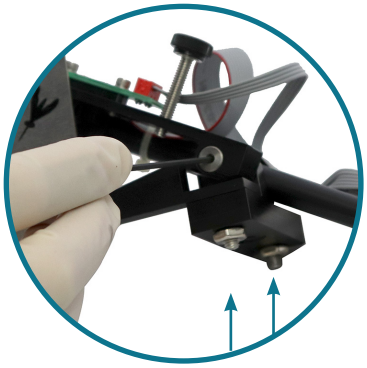
NOTE: All Raturn™ systems are shipped with a factory standard speed setting We strongly encourage all clients to keep the setting at this level. If a modification is needed, setting 2 = 75% setting 3 = 50% of factory recommended speed.

3.4 ASSEMBLY INSTRUCTIONS

The Raturn™ system should always be placed on a stable, level surface to ensure proper functioning. To install the Raturn™, follow the instructions below:

1. Attach the upright arm (part B) to the base plate (part E) using the two included socket head screws. Orient vertical support bar so that the smooth side is facing away from the platter and the notched side is facing to the inside, towards the base plate.

2. First, remove the two nuts holding the screws on the underside of the balance arm **(see arrows)**. These nuts can be discarded.



3. Use the included hex key tool to remove the hex screw on the pivot point of the balance arm (part A). This will allow you to remove the rearing sensor assembly (green component) and expose the two screws underneath.

CAUTION: The balance arm will disengage from the mount. Be careful not to drop the arm.

4. Mount the balance arm to the top of the upright arm (part B) by aligning the screws to the holes in the upright arm. The arm should be aligned so that the metal weight is to the outside of the base plate and the tether is centered over the base plate. The screws will look slightly different from one another; the flathead screw should go under the rearing assembly (on the right when the tether is toward you)

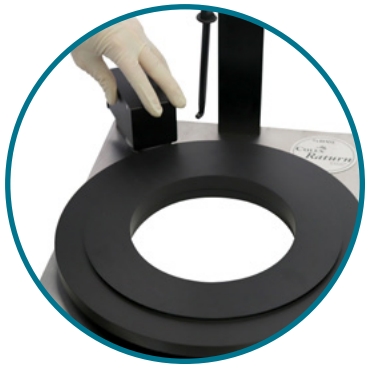
5. Replace the rearing assembly and secure it with the hex screw. Support the balance arm so that it stays in place during this procedure. The rearing tab (green component) on the balance arm must be aligned as shown, otherwise rearing will not be detected.

NOTE: Make sure the balance arm is properly secured with the hex screw and that the arm has free movement up and down. If it is stiff, then the hex key should be loosened.

CAUTION: The area around the balance arm should always be kept free of cables or wires. Never run anything behind, under, or around the arm where it could catch and interfere with the motion of the balance arm.

6. Slide the Raturn™ motor (part C) completely over the two shoulder screws located in the corner of the Raturn™ platter (part E).

7. While pushing back on the Raturn™ motor (part C), set the Raturn™ platter (part D) into place so that the lip of the platter bearing rests on the base plate (part E). You should hear or feel the platter slot into place. Release the motor and check to make sure that the O-ring is sitting against the side of the platter.



CAUTION: Failure to ensure proper placement of the Raturn™ platter against the drive motor can result in improper turning of the platter.

8. Place the Raturn™ controller (part F) on a stable, level surface near the Raturn™ platter (part E). Make sure that the ON/OFF switch of the Raturn™ controller is set to OFF. These controls are referenced on page 7 of this manual.

9. Connect the Raturn™ controller (part F) into the Raturn™ motor (part C), using Cable 1, shown to the right.

10. **(Optional):** Connect the Raturn™ controller (part F) into the Culex controller or Raturn™ Animal Activity System, using Cable 2, shown to the right.

11. Connect the sensor cable (Cable 3, below) from the balance arm (part A) into the Raturn™ motor (part C).

12. Connect the power cable (Cable 4, above) into the Raturn™ motor (part C).

13. Plug the Raturn™ Motor (part C) into a properly grounded outlet.

14. Turn the ON/OFF switch of the Raturn™ controller (p 7, front panel 2) to ON (light will be green).

15. To check for proper functioning of the Raturn™, adjust the black flag on the tether arm so that it is pointing directly forward and not contacting the sensor. Manually rotate the tether arm so that the flag contacts the sensor both clockwise and counterclockwise. The motor should activate and the turntable should rotate in the opposite direction from the tether arm.

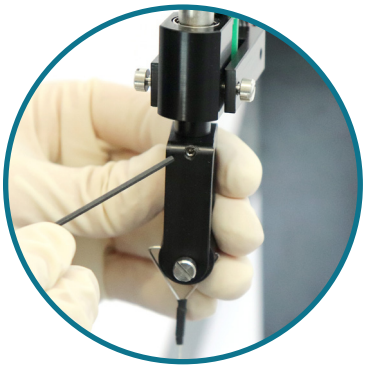
NOTE: If the turntable fails to rotate properly, please see the Troubleshooting section of this manual.

CAUTION: When working with an animal which is already connected to the tether, always turn the Raturn™ controller to OFF or DISABLE during handling. When finished, securely close the cage door and then turn the Raturn™ controller (front panel) to ON and observe to make sure animal can move freely.

3.5 CHANGING THE TETHER

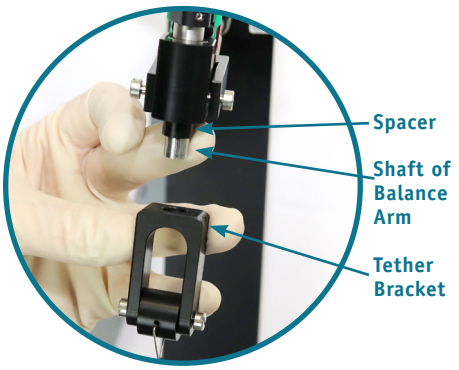
Use these instructions if you need to change or replace the tether (i.e., when switching from a rat tether to a mouse tether).

1. Use the provided hex screw (small) to loosen the set screw in the side of the tether bracket.



2. Slide the old tether bracket off of the metal tubing shaft, being careful not to lose the plastic spacer just above the tether bracket.

3. Slide the replacement tether bracket on to the metal tubing shaft and compress slightly using downward pressure on the shaft and upward pressure on the tether bracket.



4. Use the small hex screwdriver to tighten the set screw.

5. Test to make sure the tether is able to move completely to the left and right, and that the flag enters the sensor on both sides. If the tether is not moving freely, loosen the set screw slightly and/or repeat the above steps to achieve proper alignment.

4. USING THE RATURN™

4.1 INSTALLING THE CAGE

1. There are several Raturn™ Cage options available. Please refer to the individual cages and manuals listed below for your cage.

UNIVERSAL CAGE KIT

Benefits:

- Most flexible caging
- Rats, mice and other rodents

Details:

Add-on accessories for Rat Solid Floor, Mouse Solid Floor, or Rat Metabolic Floor. Find the manual here.

STACKABLE CAGE

Benefits:

- Cagewash safe, Polycarbonate
- Rats, mice and other rodents
- Lower Cost than Universal Cage

Details:

Best for studies with head mount (Microdialysis, cOFM and others).

BOWL CAGE

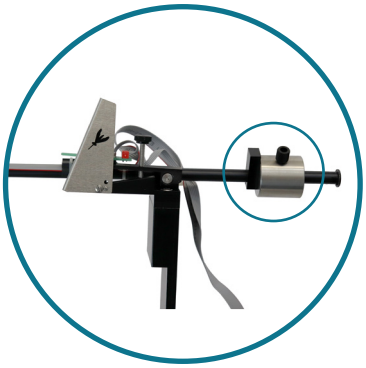
Benefits:

- Rats, mice and other rodents
- Lower Cost than Universal Cage

Details:

Good for studies with head mount (Microdialysis, cOFM and others). Water bottle must be placed on inside of cage when used with the StandAlone or Box style Raturn™. MUST BE HANDWASHED.

2. Make sure that the cage is seated on the ring of the black Raturn™ Platter and that it can turn freely with no obstructions (wires, water bottle, etc).

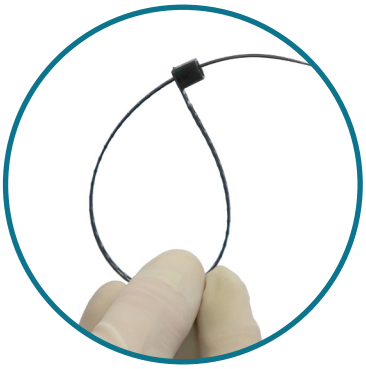


3. The tether should be appropriate for the species type and able to move freely when turned from left to right.

4. Make sure that the balance arm isn't locked (the black block is pushed away from the pivot point. Note the block and the counter weight circled in blue to the right).

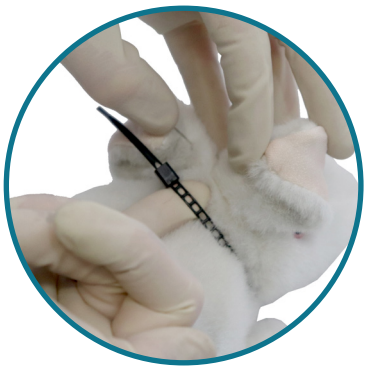
5. Adjust the weight on the balance arm so that the end of the tether rests at the level where the tether and collar connect (approximately at the height of the animal's head). If the arm is resting too high, loosen the set screw and move the weight forward. If it is too low, move the weight backwards.

4.2 COLLARING AN AWAKE ANIMAL



1. Form a loop with the collar and tighten it a few notches.

CAUTION: Make sure that the collar is looped so that the lock is facing toward the outside of the collar.



2. Slide the collar over the animal's head. Tighten until the collar is snug against the smallest (pinky) finger or a similarly sized object such as a marker.

3. Clip the excess length of collar with a pair of small wire clippers or scissors. Leave only a few links so that you have a place to grip if it becomes necessary to tighten the collar later.

CAUTION: Leaving the collar too long is a safety hazard for the animal and can result in animal interference.

4. The animal is now ready to be connected to the Raturn™.

4.3 CONNECTING AN ANIMAL TO THE RATURN™

1. Prepare the cage by adding food and water- it is easiest to perform this task before connecting the animal.

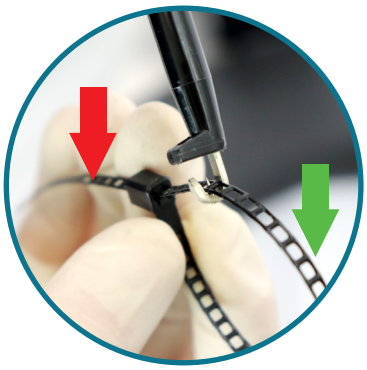
2. Advance any tubing, cables, or other connecting lines down the center hole of the Raturn™ balance arm, preparing them for animal connection.

3. Press down on the top of the black tether to extend the metal hook.

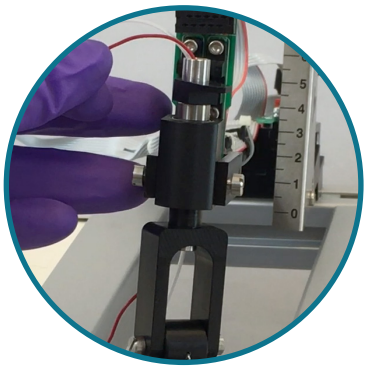
4. For rats, slide the hook around the collar at the back of the neck. A central "tooth" in the metal hook should slide into one of the openings of the collar to properly secure it.

5. For mice, you will only need to slide the single hook around the collar at the back of the neck as there is no central tooth for the mouse tether. Release the tether to retract the hook and secure the animal, making sure not to pinch the skin upon release.

CAUTION: The tether should NEVER be hooked to the part of the collar that extends beyond the collar lock (red arrow). This can cause the collar to tighten resulting in health issues. Always attach the tether to the looped section of the collar (green arrow).



6. Once the collar is attached, connect the tubing, wires or cables to the animal. Secure the lines with lab tape to ensure that they don't interfere with movement of the balance arm.



CAUTION: Do not release the animal until ready to close the cage door and turn the Raturn™ ON.

NOTE: It is helpful to orient the collar so that the collar lock rests behind the head. This will prevent animal interference while improving animal comfort.

4.4 RUNNING THE RATURN™

1. Once an animal is properly secured, immediately close the cage door and set the switch on the front of the Raturn™ controller to the ON position. When the controller is on, the green indicator light will be lit, and the Raturn™ platter will rotate in response to the animal's movement.

2. Always place the cage lid on the cage before leaving the room.

CAUTION: Always leave the Raturn™ on when an animal is collared and unsupervised. Failure to power on the Raturn™ controller can cause an animal to become injured.

3. There are two types of "OFF" settings for the Raturn™ controller – OFF and DISABLE. Both settings will turn the Raturn™ platter off.
   a. When set to OFF, the red indicator light will be lit. This setting is appropriate while the system is not in use.
   b. When set to DISABLE, the two red indicator lights on the left and right of the controller will flash. This is designed as a reminder to the user to turn the Raturn™ controller back on before leaving a tethered animal on the system. This setting is appropriate when an animal is connected, but you need to temporarily access or restrain the animal (such as for dosing).

4.5 COMPLETION OF THE STUDY

1. Remove the cage lid and set aside.

2. Turn the Raturn™ Controller to the OFF position.

3. Open the cage door and disconnect the collar as well as any connecting lines.

NOTE: When connecting and disconnecting the animal, always watch the tether arm flags and the animal to ensure that there is no pressure on the collar. If needed, adjust the animal's position to keep it comfortable until the Raturn™ can be turned on.

5. MAINTENANCE

5.1 CLEANING AND CARE

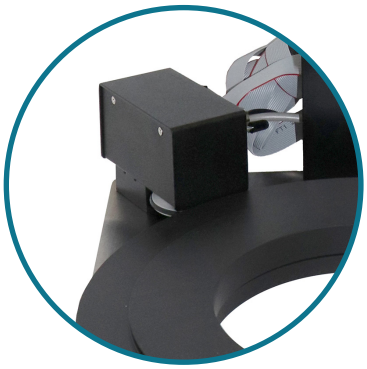
Proper care and cleaning are essential to the longevity of the Raturn™ system. Keeping the Raturn™ clean will circumvent most problems that the user may experience.

AFTER EACH USE:

- Disassemble the platter and motor.
- The platter may be washed in a standard laboratory washer, or by hand.
- The motor, Raturn™ controller, base plate, upright arm and tether should be wiped down with a standard laboratory disinfectant.
  - o When cleaning the tether, depress the top to extend the metal hook. Wipe the hook and tether with a cotton swab or lint-free towel.
- Clean the cage according the cage instruction manual.

WARNING: Do not submerge the Raturn™ motor, controller, or balance arm/tether. Do not allow liquid to enter the back panel of the Raturn™ controller. This can pose an electrocution hazard.

MAINTENANCE:



O-rings: Every three months, check the O-ring on the motor. If the O-ring is cracked, dry, or worn, replace it. To replace the O-ring, simply remove the old ring off of the wheel on the motor by hand. A rolling or peeling motion typically has the best results. The new ring may then be slipped into place.

NOTE: O-rings may need to be replaced more or less frequently depending on laboratory conditions and instrument use. Regular checking and maintenance will prevent problems.

Tether: Depending on use, the tether assembly may occasionally need to be replaced. Typically this is due to either a bent wire, or damage to the spring mechanism. Maintain the tether in good condition during the interim by making sure to clean inside of the tether hook area, and straightening the wire as much as possible when it has been bent. It is also a good idea to keep one or more replacement tethers nearby for emergencies.

Balance Arm: Perform regular checks to ensure that the balance arm is able to move through the full range of motion: up and down with no interference, as well as the tether moving side to side without tension. If salty fluids are spilled on the arm or the flag sensors, clean the residue as well as possible.

Maintenance Plans: BASi offers a variety of maintenance plans, repair services and extended warranties. Contact us if you would like to learn more.

5.2 REPLACEMENT PARTS FROM BASI:

MD-1455: Rat tether line with mounting bracket
CX-1214: Mouse tether for use with dual-species cage (short)
MD-1460R: Mouse tether line for use with Universal or Stackable Cage (long)
MF-5371: Replacement rat collars
MD-1365: Replacement mouse collars
MF-2050: Ozone resistant O-rings

For any other component, please contact BASi directly.

6. TROUBLESHOOTING GUIDE

If the motor runs, but the turntable is not turning, or turning slowly.

1. Check the position of the turntable. Make sure that it is seated properly, and the wheel of the motor is fully contacting the side of the turntable.
2. Check the condition of the O-ring. If it is cracked or worn down, replace it.
3. Clean the turntable. Remove the turntable from the platter and turn it sideways. Place it under a steady stream of water. Dry with lint-free cloth.
4. It is possible to change the speed of the Raturn™. See page 7, section 3.3 for details.

If the turntable does not turn at all when the flag contacts the sensor

1. Check to make sure that the Raturn™ controller is on (green light)
2. Check that the cable from the balance arm to the controller is fully plugged in, and that none of the pins are bent.
3. Observe the sensor for obstructions- this can include a physical barrier, such as a wire or tube, or it can be an optical barrier, such as salty fluid built up on the sensors.
4. If these things are okay, please contact BASi service.

If the cage does not turn at all when the flag contacts the sensor (but the turntable does)

1. Check to make sure that the cage is properly seated on the platter.
2. Check that there are no obstructions of the cage.
3. If both of these things are okay, please contact BASi service.

If the turntable only turns in one direction

1. Make sure the cable from the balance arm to the controller is fully plugged in, and that none of the pins are bent.
2. If the cable is properly secured, please call BASi service.

If the balance arm does not have full range of movement Up and Down:

1. Check for obstructions around the back of the arm, such as wires, cables, etc.
2. Make sure the lock on the balance arm is disengaged. Refer to page 13, section 4.1 for more details.
3. Check that the balance arm is properly secured into the mount with the hex screw, and pivots on the screw. Refer to page 8, section 3.4 for more details.

If the balance arm does not have full range of movement side to side:

1. Check for obstructions around the cage or the tubing
2. Make sure that the tether mount is not secured too tightly, and is not cracked.
3. Observe the ball-bearings at the top of the tether (where it meets the balance arm) for rust. If rust is observed, the arm will need to be replaced.

If the animal cannot be easily tethered:

1. If possible, give the animal several minutes to acclimate to the system and then return and try again.
2. If time is limited:
   a. And assistance is available, ask a team member to secure the animal while you make the connections. In some cases, this is the preferred method, such as with delicate microdialysis probes.
   b. And no assistance is available, hold the animal by the base of the tail with one hand, and then grab ahold of the end of the collar where it has been cut to steady the animal. While holding the end of the collar, remove hand from tail and gently attach the collar at the back of the neck being careful not to pinch the skin or hair.

If there was damage during shipping

Document the damage with photos, if possible. Contact BASi or your sales representative immediately and provide your order information. Claims must be made within 30 days of the ship date.

6.2 CONTACT BASI

Contact Details

Bioanalytical Systems, Inc. (BASi)
2701 Kent Ave
West Lafayette, IN 47906
TEL: (800) 845-4246
FAX: (765) 497-1102
General Inquiries: https://www.basinc.com/ask
Technical Inquiries: https://www.basinc.com/contact
Service, Repair or Warranty Inquiries: invivo@basinc.com

6.3 LIMITED WARRANTY

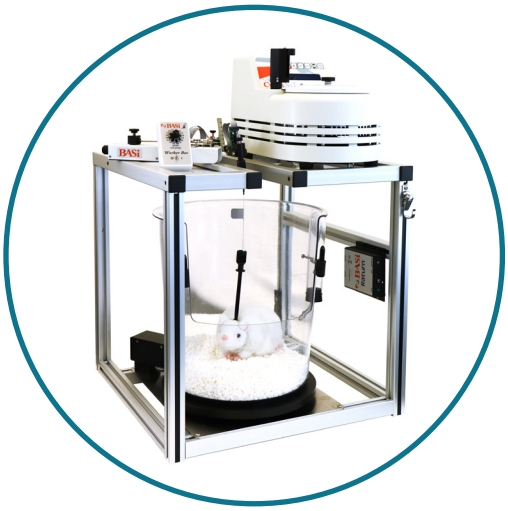
BASi warrants equipment manufactured by the company to be free of defects in material and workmanship as outlined in our terms of sale. For the most up to date details, please visit our website: https://www.basinc.com/products/terms

6.4 INSTRUMENT ASSISTANCE

BASi Instruments are built to last- some of our equipment has been in use in labs for more than 30 years! But when something doesn't go quite right, we're here to help. Check out this link to learn more about repairs, returns, issue reporting, maintenance plans and lifetime instrument support: https://www.basinc.com/instrument-service-and-repairs

ALTERNATIVE OPTIONS AND CONFIGURATIONS

AMD-R SYSTEM



The flexibility of the aluminum frame means you can modify to fit your needs. Add on side shelves, wheeled carts, or extend the length or width.

Best for:

- Keeping instruments close to the animal
- Protecting the Cage from external interference
- Available metabolic option

RATURN™ WITH METABOLIC COLLECTIONS

Available for the StandAlone or the AMD model of Raturn™, this addition, along with the appropriate cage, enable urine and feces collection. Yet another way to collect more data from fewer animals.

Best for:

- Bile Collection studies and metabolic profiling
- Maintaining urine at a consistent, chilled temperature

SHARE AND SHARE ALIKE

The Raturn™ system is used for a variety of exciting applications including Open Flow Microperfusion, Automated Blood Sampling, Optogenetics and more. What are you using it for? Let us know or send us your publication and we'll add it to our Bibliography Page.