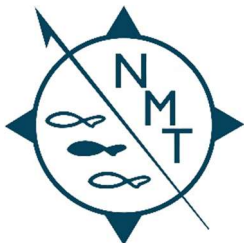


R-SERIES TUNNEL DETECTOR USER MANUAL

*Includes Detectors, Diverter Gates,
Counters, and Sub-Sampling Controller*



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2 INTRODUCTION

R-Series Tunnel Detectors detect Coded Wire Tags in fish passing through the central tunnel. You can slide fish through the tunnel by hand, or with a conveyor belt. Whenever a fish has a Coded Wire Tag, the detector responds with an audio alarm and indicator lights.

You can choose to attach an optional *Diverter Gate* to the detector, which diverts tagged fish to one side and untagged fish to the other as they exit the tunnel. To operate the detector without a gate, you would manually sort the exiting fish according to the presence or absence of the tag. You may also use a *Counter* with the gate to tally fish exiting from each side, with or without or a *Subsampling Controller* to automatically divert a subsample of tagged fish in situations where you encounter more tags than need to be recovered.

NMT offers two models of R-Series Tunnel Detectors, the R8000 and the R9500. The R9500 is larger than the R8000, but operation of both models is the same. This manual describes the setup and operation of the Detector, Diverter Gate, Counter, and Subsampling Controller.



Need help? If you have questions, problems or comments about setting up and using your detector and accessories, please call +1 (360) 764-8850 or email office@nmt.us. Visit www.nmt.us for more detailed information about Coded Wire Tags.

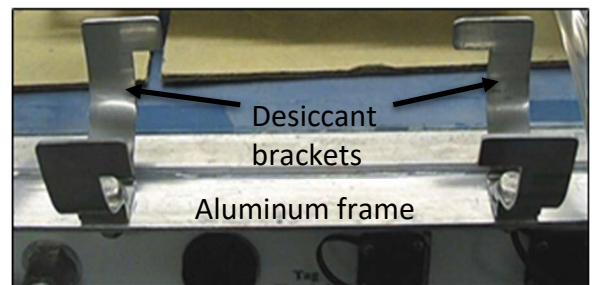
3 SETUP

3.1 R-DETECTOR SETUP

Step 1. Unpack your detector and accessories from the cases. We recommend storing the cases for future shipping.

Step 2. Install the desiccant cartridge. Desiccant protects the internal electronics from corrosion. Active desiccant is blue. Pink desiccant must be replaced or regenerated with heat. Stainless steel brackets hold the cartridge on the back of the detector. Complete the installation as follows:

1. There are two brackets, two bolts, 4 washers, 2 nuts, a 6" and an 8" piece of clear hose, and a white hose clamp with the cartridge.
2. Attach the brackets to the detector through the holes in the aluminum frame on the back of the detector. Orient the brackets so that the tabs face each other as shown, right. Use a washer between the screw and the bracket and one between the bracket and the nut.
3. Remove the desiccant cartridge from the tunnel and set it in the brackets. The end of the desiccant with the screw-on cap should be over the Electronics Connector. Slide the hose clamps that are around the cartridge over both of the tabs on each bracket. Rotate the hose clamp screws so they will be out of the way and tighten them around the brackets. Remove the yellow plugs on the cartridge barbs.
4. Attach the 8" piece of tubing from the air vent on the detector to the lower barb on the desiccant cartridge. Clip the white hose clamp around the end of the 8" tubing and brass barb on the back of the detector.
5. Attach the 6" piece of hose to the upper barb on the cartridge. Leave the other end open to allow air to circulate.
6. For the R8000, rebend the back handle to fit over the desiccant cartridge.
7. Store and transport the detector with the desiccant attached.



Step 3. Provide a sturdy platform for the detector.

1. The front of the detector has the control switches and LED display. Fish must go quickly through the tunnel for tags to be detected. Mount the front of the detector higher than the back, at an angle between 10 and 30 degrees.
2. Support the detector by resting the bottom on a sturdy angled platform or by fastening supports to the 1/8" x 1" aluminum side frame on the front and back panels (see sidebar).
3. Secure the detector to the platform so that it won't slide off if it is bumped during sampling.

Step 4. Stabilize the detector to prevent wobbling as fish pass through the tunnel. Severe wobbling causes the alarm to go off even if a tag is not present. If necessary, fasten the gate to a tote or some other stable object, or set the end of the detector on the tote. Use chock blocks under gurneys and make sure all bolts are tight.

Step 5. Provide water to the tunnel. Attach a hose so that a gentle stream of water covers the bottom of the tunnel to help the fish slide quickly through. You could use clamps or rope to attach the hose to the front handle. If running water is not available, periodically rinse the tunnel to keep fish moving smoothly.

Step 6. Provide power to the detector.

1. If you are using a gate with your detector, skip this step and go on to "Diverter Gate Setup" on page 8.
2. R Detectors come with a 12 V rechargeable battery, an NMT power cable, a battery box, a battery charger with cables, and an NMT power supply.
3. To use the 12 V battery, connect the NMT power cable to the battery, then to the connector labelled "*Power Connector*" on the back of the detector. Attach the red battery cable end to the positive terminal, and the black cable end to the negative terminal.
4. To use AC power, connect the NMT power supply to the connector labelled "*Power Connector*" on the back panel of the detector. Plug the other end into an extension cord or an appropriate 120 V 60Hz AC electrical outlet.
5. Use the battery box to protect the 12 V battery and the power supply from getting wet or disconnected.



To avoid draining the battery, detach the battery cable from the power connector when the detector is not in use.

Detector Set Ups

The on-site set up for a detector is customized by the user. A modified gurney (as shown below) or a sturdy aluminum table make good stands for the detector. Fiberglass or aluminum funnels can be mounted flush with the tunnel entrance to provide a smooth path for fish and a convenient way to supply water to the tunnel.



3.2 DIVERTER GATE SETUP

You can attach a Diverter Gate to the back of the R-Series detector to sort tagged and untagged fish into separate containers. It's main components are two latching gate doors, and an electronics box.

The latch allows only one door to open at a time. As a fish slides out of the tunnel, it pushes open the unlatched door and is diverted to that side. Untagged fish will go through the door that remains unlatched when you set up the detector. When a tag is detected, the latch will toggle so that the tagged fish is diverted to the other side.

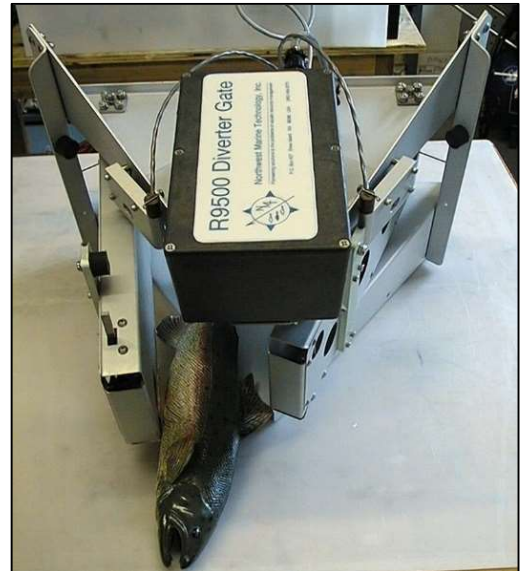
Step 1. Bolt the gate to the aluminum frame on the back of the detector using the four 1/4-20 X 3/4" bolts and 1/4-20 nylon insert nuts. Two of these bolts are used in common with the back handle.

Step 2. Connect the grey cable from the gate labelled "*Cable to R Detector*" to the connector on the back of the detector labelled "*Cable to Gate*".

Step 3. Provide power. When you are using a gate, power for both the gate and the detector is through the power input connector on the gate. If you mistakenly connect the power supply to the detector instead of the gate, the detector will look like it is working (but it won't be) and the gate will not work.

Step 4. R Detectors come with a 12 V rechargeable battery, an NMT power cable, a battery box, a battery charger with cables, and an NMT power supply.

1. To use the 12 V battery, connect the NMT power cable to the battery, then to the connector labelled "*Power Input Connector*" on the gate electronics box. Attach the red battery cable end to the positive terminal, and the black cable end to the negative terminal.
2. To use AC power, connect the NMT power supply to the connector labelled "*Power Input Connector*" on the gate electronics box. Plug the other end into an extension cord or an appropriate 120 V 60Hz AC electrical outlet.
3. Use the battery box to protect the 12 V battery and the power supply from getting wet or disconnected.



Above: R9500 Diverter Gate with fish pushing open the unlatched door and being diverted to the left.
Below: Gate electronics box.



To avoid draining the battery, detach the battery cable from the power connector when the detector is not in use.



Caution!

Use only an NMT power supply with a label on the front stating it is for use with R-Detectors. Other power supplies may damage the electronics. Contact NMT if your power supply does not have this label.

3.3 COMBINED QUAD COUNTER SETUP

If you are using a gate, you can also use a Combined Quad Counter to tally the number of fish that are tagged or untagged in two different groups.

- Step 1.** Use the four bolts and nuts provided to attach the counter onto the front handle of the detector.
- Step 2.** Connect the cable with the probes to the connector in the center back of the counter.
- Step 3.** Put one wooden switch probe into the slot on the top of each door of the gate, and secure it with the spring. If the spring is missing, you can wrap an elastic band around the probe and the holder to keep it in place.



- Step 4.** Press the A or B button to turn on the counter. Fully open and close the unlatched gate a few times to ensure the counts are on the corresponding side. Counts from the left door should

register on the left panel of the counter (and vice versa for the right). If counts register on the wrong side, reverse the probes. Press the A and B buttons together to turn off the power.

Step 5. If you are using the A/B foot switch, plug it into the connector in the lower left corner of the back of the counter.

3.4 SUBSAMPLING CONTROLLER SETUP

Use the Sub-Sampling Controller when you recover more tagged fish than you need to collect tags from. The Sub-Sampling Controller automatically diverts tagged fish according to the percentage of the group you wish to sample.

Step 1. Bolt the Sub-Sampling controller to the front handle of the detector using the bolts and brackets provided. If you are also using a counter, you will need an additional bracket for the subsampling controller. Mount it below the counter as shown.

Step 2. Connect the cable from the electronics connector on the back of the R-Detector to the connector labelled "*Electronics Connector from R-Detector*" on the back of the Sub-Sampling Controller.

Step 3. Connect the cable labelled "*Cable to R-Detector*" on the gate electronics box to the connector labelled "*Electronics Cable to Gate*" on the back of the Sub-Sampling Controller so that the Sub-Sampling Controller is between the gate and the detector.

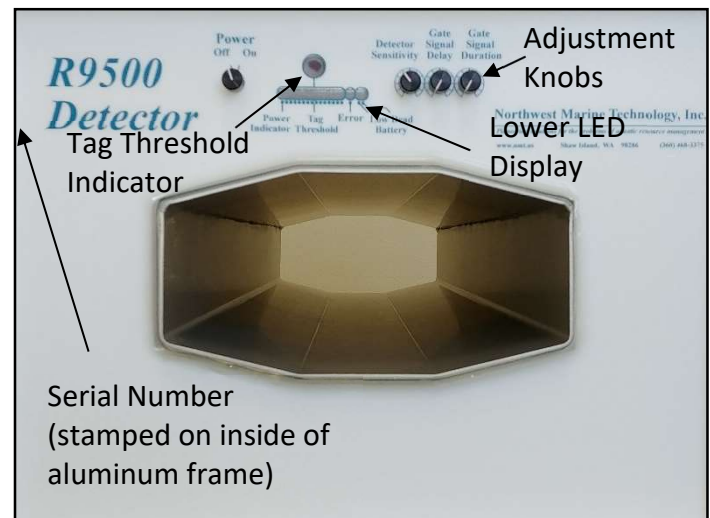
4 DETAILED OPERATING PROCEDURES

4.1 R-DETECTOR OPERATION

The front of an R-Detector is shown here.

4.1.1 LED DISPLAYS

1. The Tag Threshold Indicator will light up only when a tag (or other magnetic object in the tunnel) is detected.
2. Eighteen LEDs make up the lower LED display. When you turn on the detector, the LED bar graph to the right of “Tag Threshold” indicates the battery charge, with one LED indicating very low charge and full scale indicating a fully charged battery. These LEDs stay lit for 10 to 20 seconds after you turn the detector on.
3. When you use the NMT Power Supply, all of the LEDs to the right of “Tag Threshold” will come on for 20 seconds after you turn the detector on.
4. After the initial battery condition display, the LEDs to the right of “Tag threshold” turn off indicating that the detector is ready to use.
5. Once the detector is ready for use, the lower LED display indicates the following:



LED #	Indicates:
1	The first LED is a power-on indicator that is lit whenever the detector is turned on.
2-15	Tunnel detectors find tags by measuring the magnetic disturbance inside the tunnel. These LEDs show how big the disturbance is. When it gets to the level marked “Tag Threshold”, the detector recognizes the presence of a tag, sounds the alarm, and all of these LEDs will be lit.
16	An error in conveyor belt timing (you can ignore this unless you are using a conveyor belt to move fish through the tunnel).
17	Low Batteries – this LED indicates when the 12 V battery connected directly to the detector (not to the gate) needs recharging. The detector will still function for up to 10 hours after this light turns on if you are not using a gate.
18	Dead Batteries – this LED indicates that the 12 V battery is so low that the detector will not function correctly, you must recharge the battery.

4.1.2 ADJUSTMENT KNOBS

There are three adjustments knobs:

1. *Detector Sensitivity* controls the strength of a signal that you need for tag detection. See how to adjust it below.
2. *Gate Signal Delay* is used to coordinate the gate and the detector. See Gate Signals (page 18) for details. Ignore this knob if you are not using a gate.
3. *Gate Signal Duration* is also used to coordinate the gate and the detector. See Gate Signals (page 18) for details. Ignore this knob if you are not using a gate.

4.1.3 ADJUSTING DETECTOR SENSITIVITY



Adjusting the detector settings can be difficult. If you have questions, problems or comments about setting up your detector, we can help. Please call +1 (360) 764-8850 or email office@nmt.us.

If you turn the Detector Sensitivity knob all the way counterclockwise, a very strong signal will be needed to detect a tag. In this instance, you will miss most tags that go through the detector. If you turn the sensitivity knob all the way clockwise, a very weak signal will trigger a tag detection. In this instance, the detector is likely to beep nearly constantly as it will be sensitive to random magnetic fields and slight movements.

4.1.3.1 INITIAL SENSITIVITY SETTING

Start with the detector sensitivity knob set to about 11 o'clock. Pass the tag detection standard on the long stick quickly back and forth through the tunnel a few time to make sure the tag is detected every time. This will be suitable for most situations, but sometimes further adjustment is needed.

4.1.3.2 HOW TO REDUCE SENSITIVITY

Stray magnetic fields around the detector (e.g. from heavy equipment), flexing of the central tube, magnetic sand clinging to the fish, and vibrations or wobbling can all cause false positives and affect the ability of the detector to function properly. If your detector is constantly sounding the tag detection alarm when no tag is present, you may need to reduce the sensitivity. Before you do this, try to remove the source of the false detections:

- Stray magnetic fields can interfere with the detector and cause false positives. To reduce this problem, move the detector away from other electrical equipment, forklifts, and machinery. If possible, reroute electrical cables that cause interfering signals.
- Vibrations and jostling can cause false positive detections. Reduce this problem by building a

sturdier platform for the detector and moving away from other busy sampling activities.

- If fish hit inside of the tube hard enough to cause false positives, change how fish are fed into the tunnel. Live fish may need to be anesthetized, or sampled with a different type of detector.
- Optimize the speed of fish traveling through the tube to maximize the signal strength. They should move quickly through at about 3 meters per second.
- Remove fish hooks, and as much magnetic sand or dirt from the fish as possible before placing them into the detector.

If none of these measures reduce the false positives, you can reduce the sensitivity as follows:

- Turn the detector sensitivity knob slightly counterclockwise (try about 10 o'clock).
- Pass the end of the tag detection standard on the long stick quickly back and forth through the tunnel a few times to make sure the tag is detected every time. If the tag is not detected, you will need to increase the sensitivity again. If the tag is consistently detected, you can sample with this setting to see if the problem is solved, or try a slightly lower setting.



Each time you reduce the sensitivity setting, confirm tags will still be detected by testing with the tag standard.

4.1.3.3 HOW TO INCREASE SENSITIVITY

You may need to increase the sensitivity if you are sampling for ½ length tags.

- Turn the knob slightly clockwise (try about 12 o'clock). Pass the end of the tag detection standard with the 0.6 mm tag on the long stick quickly through the tunnel a few times to make sure the tag is detected every time. If it is not consistently detected, turn the knob clockwise in small increments until you detect the tag every time it moves through the tunnel. Set it only as high as needed to avoid continually detecting interfering magnetic fields.
- When you increase the sensitivity, the detector will also become more responsive to movement from fish passing through the tunnel. Each time you increase the sensitivity, jostle the detector in a similar way as fish passing through will cause it to move. This movement will cause additional LEDs to light but as long as the detector doesn't falsely signal a tag, the setting is acceptable.

The back panel of a detector is shown here.

- The **Alarm** sounds whenever a tag is detected. Though the audio alarm has a fixed volume, you can dampen the volume by placing a foam ear plug in the hole.
- The **“Cable from GATE” Connector** is used to connect the detector electronics to a Diverter Gate.
- The **Power Connector** on the back panel is used when there is no gate.
- The **Tag Threshold LED** is a duplicate of the Tag Threshold LED on the front panel. It turns on when a tag is detected.
- The upper **Vent** is used for attaching the dessicant cartridge.



4.1.4 TURNING ON POWER

If you are not using a gate:

1. Turn on the detector using the power switch on the front panel.

If you are using a gate:

1. Turn on the gate using the power switch on the gate electronics box.
2. Turn on the detector using the power switch on the front panel.
3. Toggle the direction switch on the gate electronics box a few times to initialize the electronics.
4. Verify that the gate latch mechanism is working properly, and leave the direction switch set to the desired direction. The unlatched door should be on the side to which untagged fish will be diverted.

4.2 DIVERTER GATE OPERATION

The gate electronics box controls the gate functions:

- The **Power Switch** toggles up for on and down for off.
- The **Direction Switch** toggles to the left or right and latches the gate on that side. Set the switch so the unlatched door is on the side where you want untagged fish to go.
- During normal operation, the latch could be accidentally bumped to the opposite side and fish would be diverted the wrong way. If this happens, you will hear the **Error Alarm** ring. To shut it off, just push the latch back to the correct position, or toggle the direction switch a couple of times.
- The **Power On LED** indicates that the gate is turned on and has power.
- The **Low Bat LED** turns on when the gate is being powered by the 12V battery and the battery voltage is low. The gate may operate correctly for only a few hours after this light turns on; the battery should be replaced or recharged as soon as this light goes on.



Before removing the gate from the detector, always remove the counter cable sensors if you are using a counter, and disconnect the cable from the detector.

4.2.1 GATE SIGNALS

The detector sends signals to the gate telling it when to switch sides to divert a tagged fish. You must match the gate timing with your sampling speed so that the fish are diverted correctly.

Use two adjustments to do this:

1. **Gate Signal Delay:** Coded Wire Tags are detected in the center of the tunnel. When a tag is detected, a signal is sent to the gate telling it when to switch the door latch to divert the fish. The gate signal delay is the time between the actual tag detection in the center of the tunnel and when the door latch switches. When this knob is set to the minimum (shortest delay), the latch will switch immediately after the tag is detected. When the knob is set to the maximum (longest delay), there will be a delay before the latch switches.
2. **Gate Signal Duration:** This indicates how long the gate will stay switched to the tagged side before it automatically reverts to the untagged side. When this knob is set to the minimum (shortest duration), the latch will revert quickly after it is switched. When this knob is set to the maximum (longest duration), there will be a delay before the latch reverts.

4.2.2 INITIAL GATE SETTINGS

Start with the gate signal delay set to the minimum (the knob turned all the way counterclockwise) and the gate signal duration set at the maximum (the knob turned all the way clockwise). With this setup, the gate will switch as soon as a tag is detected, and will remain open for the maximum time. With these settings, if a tagged fish is not correctly diverted, it is most likely not moving through the tunnel quickly enough. Increase the flow of water and send the fish with a little more speed.

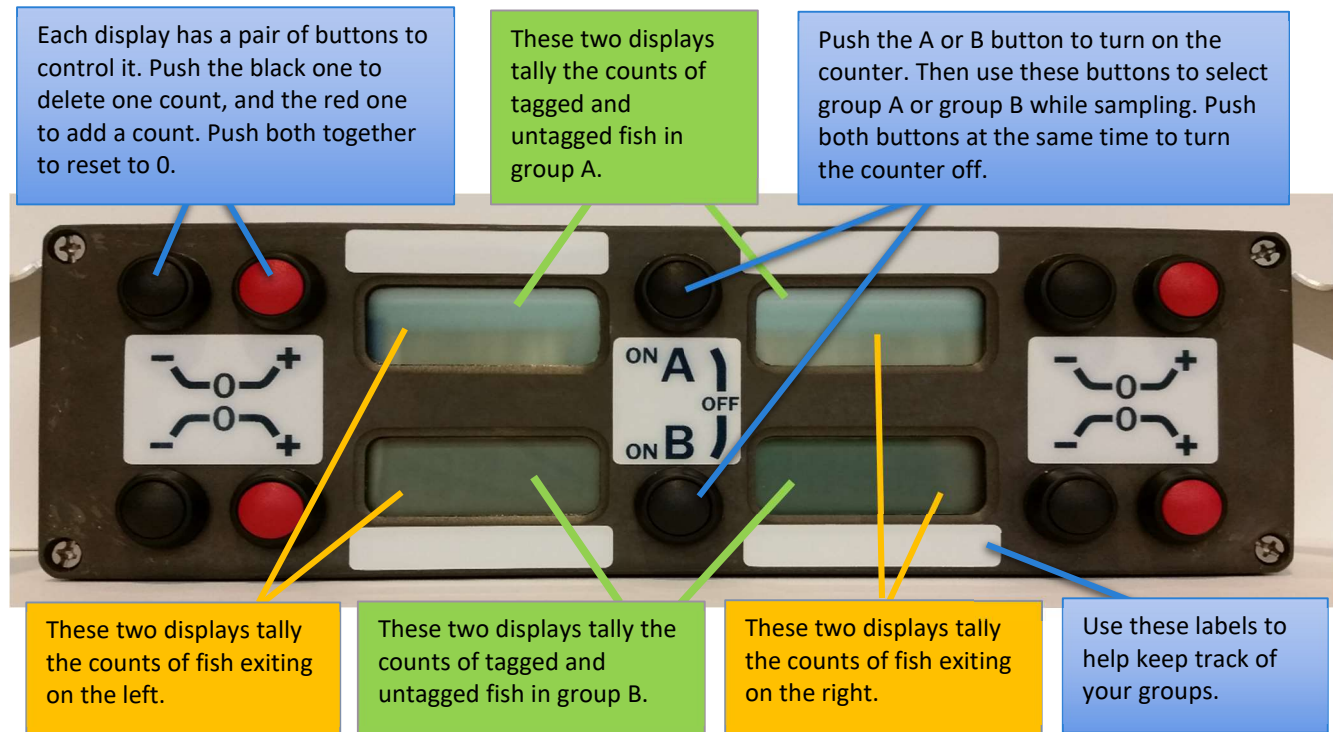
4.2.3 ADJUSTING GATE SETTINGS

The gate can divert fish moving through the tunnel at speeds up to 1 fish per second. Faster operation requires greater care by the operator to avoid errors caused by fish that are too close together, especially with two or more people feeding fish. If you are sampling quickly enough that there is more than one fish in the tunnel at a time, you will likely need to adjust the gate signals.

- Step 1.** Adjust the gate signal delay. This is an iterative process that will require some trial and error. Use a tagged fish moving through the tunnel at your sampling speed. Increase the gate signal delay slightly each time you feed the fish through the tunnel until the gate switches just before that fish reaches the gate doors.
- Step 2.** Adjust the gate signal duration. This is also an iterative process that will require some trial and error. Use a tagged fish moving through the tunnel at your sampling speed as before. Shorten the gate signal duration until the fish is at least partially through the door when the latch reverts to the default position.
- Step 3.** Confirm your settings. Once you are satisfied with the adjustments, have a partner watch the diverted fish for a few minutes while you sample to make sure they are all correctly diverted. If not, continue to evaluate and adjust the settings and your sampling speed.

4.3 COMBINED QUAD COUNTER OPERATION

Use the Combined Quad Counter with a gate to tally up to four groups of fish.



Press either the A or B button to turn the counter on. To turn it off, press both of these buttons simultaneously. Any accumulated counts will be saved while the unit is off, so long as battery power remains.

The left displays count fish exiting through the left door of the gate. The right displays count exits from the right door. If your fish exit to the side opposite the display, switch the probes in the gate doors.

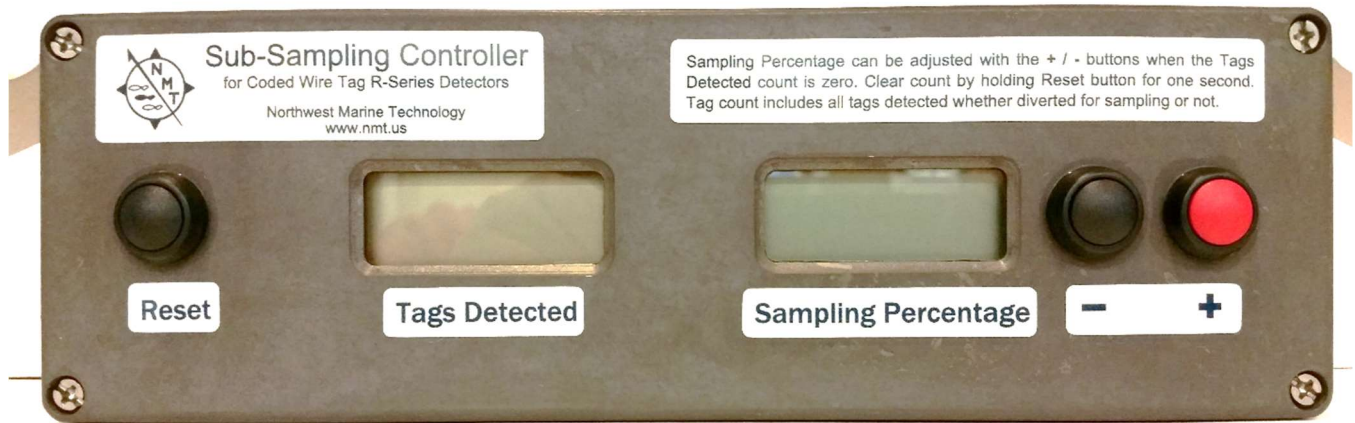
Each display has a pair of buttons labelled + and – for manual corrections to the accumulated counts. Pressing the + and – buttons of a pair simultaneously for 1 second will reset the count to zero. Continuing to hold down a pair of + and - buttons after the counter has cleared may cause the counter window to show a test pattern. If this occurs, restore the normal display by pressing any button.

Use the A and B buttons to activate the upper (A) or lower (B) pair. Exiting fish will only be tallied on the selected pair. The inactive pair will be blank, but the counts will be saved, and will be shown again the next time you select that pair. A foot switch can also be used to toggle between the groups.

You can write which groups are being sampled on the labels using a Sharpie. Use rubbing alcohol to clean it off.

4.4 SUB-SAMPLING CONTROLLER OPERATION

The front of the Sub-Sampling Controller is shown below. The + and – buttons adjust the sampling percentage, which is shown on the right display. The sampling percentage is the percentage of tagged fish that will be diverted for tag recovery. The remaining fish will sound the alarm signaling a tag was detected, but will sort to the side with the untagged fish. The left display counts all tag detections, including those fish that are diverted with the untagged fish.



Clear the counter by pressing and holding the RESET button for at least one second. Reset the number of tags detected before changing the sampling percentage. If you press the – and + buttons when the tags detected does not read zero, you will get an error message “Clear”. Reset the counter, then resume changing the percentage.

The unit derives its power from the gate. If the power is interrupted, the display will go black. Your information will be stored and when power is restored, the numbers will be displayed again.

5 QUICK START GUIDE

5.1 SAMPLING WITHOUT A GATE

Once your detector is set up on a sturdy table, use this quick guide each time you sample.

- Step 1.** Take everything off of the top of the detector (tools, battery pack, coffee cups, etc.).
- Step 2.** Check your desiccant. Blue is fresh. If it is pink, you need to replace it as soon as possible.
- Step 3.** If available, turn on the water so that a gentle stream keeps most of the bottom of the tunnel wet. Tip: If you are using running water, pay attention to where it is draining so that you don't accidentally fill up your sampling containers.
- Step 4.** Turn on the detector with the knob on the front panel. The LED bar graph first shows the charge in the battery pack. Wait another 15 to 20 seconds, and then it will start showing the strength of detected magnetic signals. Now it is ready for tag detection.
- Step 5.** If the "Low Battery" or "Dead Battery" LED is on, recharge the external battery or plug into an outlet.
- Step 6.** Pass the detection standard (the tag on a long stick) through the detector at about 10 feet/second (3 meters/second) to confirm the tag is detected. If not, adjust the sensitivity (see page 10).
- Step 7.** Start sampling!

5.2 SAMPLING WITH A GATE

Once your detector is assembled and set up on a sturdy table, use this guide each time you sample.

- Step 1.** Take everything off of the top of the detector (tools, battery pack, coffee cups, etc.).
- Step 2.** Check your dessicant. Blue is fresh. If it is pink, you need to replace it as soon as possible.
- Step 3.** Check that all of the cables between the gate, counter (if using), subsampler (if using) and detector are properly connected.
- Step 4.** Confirm that the gate doors open freely. If not, gently peel the rubber bumper loose from the gate. Bumpers keep the gate doors aligned for proper diversion. Replace missing bumpers before using the gate.
- Step 5.** Connect power to the gate and turn it on. Toggle the "Direction" switch several times to initialize the gate. Choose which side you want tagged fish to go. Set the direction switch so the unlatched door is on the side to which untagged fish are to be diverted.
- Step 6.** If you are using a counter, open each gate door fully and confirm that the counts appear on the correct display. Switch sensors to the opposite side if necessary. Confirm that counts go to the appropriate upper or lower display on the combined quad counter. Zero the counts.
- Step 7.** If you are using a subsampler, set the percentage and clear the counter.
- Step 8.** If available, turn on the water so that a gentle stream keeps most of the bottom of the tunnel wet. Tip: If you are using running water, pay attention to where it is draining so that you don't accidentally fill up your sampling containers.
- Step 9.** Turn on the detector with the knob on the front panel. The LED bar graph first shows the charge in the battery pack. Wait another 15 to 20 seconds, and then it will start showing the strength of detected magnetic signals. Now it is ready for tag detection.
- Step 10.** If the Low or Dead Battery LED is on, recharge the battery or plug into an outlet.
- Step 11.** Set the "Delay" to the minimum (fully counterclockwise) and the "Duration" to the maximum (fully clockwise). Adjust for faster sampling if needed.
- Step 12.** Pass the detection standard (the tag on a long stick) through the detector at about 10 feet/second (3 meters/second) to confirm the tag is detected. If not, see page 10 for details about adjusting the sensitivity.
- Step 13.** Start sampling! As you sample the first several fish, check that the counts are incrementing on the correct displays and that the fish are being diverted to the correct side.

6 CARE AND MAINTENANCE

6.1 GENERAL MAINTENANCE

To minimize weight, the detector is made of lightweight aluminum honeycomb. Protect the sides, top, and bottom from sharp objects. Rough handling, dropping, or applying a large weight or force could cause damage to the detector. Always support the detector on its side, top, or bottom in order to avoid damage to the controls and to the waterproof seal at the ends of the tunnel.

Do not allow magnets near the R-Series Detectors (within approximately 1 foot), and never in the central tunnel.

R-Series Detectors are designed to be as rugged as possible while still being lightweight and performing as a precision electronic instrument. **Do not cut the seals and open the detector for any reason.** There are no parts inside that can be repaired on site, and opening the detector will result in further damage and costs. All repairs must be made by NMT. If you have any problems with the detector, please call for assistance.

6.2 DESICCANT REPLACEMENT

Change the desiccant cartridge or desiccant material before it is completely exhausted. Neglecting to change the desiccant can result in irreversible damage to the electronics. The “Drierite” cartridge contains indicating CaSO_4 . When the desiccant is dry and active it is blue; when exhausted it turns pink. If the desiccant is all or mostly pink, replace or regenerate it with heat.

6.3 CLEANING

The detector, gate, and counter are mostly corrosion-resistant aluminum. Remove saltwater and organic material after each use to reduce corrosion. Use water, soap and water, or 91% isopropyl alcohol, with a gentle spray, sponge, cloth or soft brush. Iodine based disinfectants are also acceptable, provided they are mixed to the proper dilution, though they may stain the equipment.

Strong solvents may damage the paint or waterproof seals, as may pressure washing. Use a garden hose with a gentle spray.

6.4 DISINFECTING

For information on disinfecting equipment, see “Disinfection of Coded Wire Tagging Equipment”, found on our web site www.nmt.us.

We recommend using a chlorine solution to disinfect detection equipment. Common sources of chlorine are calcium hypochlorite ("HTH") and solutions of sodium hypochlorite ("bleach"). Household bleach comes in a concentration of about 5%, so to achieve the desired solution of 200 ppm, dilute one ounce (2 tablespoons, 1/8 cup, or 32 ml) of bleach in 2 gallons (8 liters) of water (a ratio of 1:250).

Calcium hypochlorite and sodium hypochlorite ("bleach") are both highly toxic to fish but excess solution can be neutralized for disposal by adding sodium thiosulfate or sodium sulfite to the solution. As a "rule of thumb," if a five percent solution of these chlorine compounds is used as a disinfectant, adding an equal weight of either sodium thiosulfate or sodium sulfite can neutralize them.

The front panel of the detector is water resistant with no exposed electrical contacts, and rinsing should be carried out as described above. Avoid using anything that could scratch the clear splashguard.

The alarm for the detector is water-resistant,, but after exposure to salt water, make sure to rinse with fresh water and dry. To minimize the risk of corrosion of the external electronics connector and power connector, carefully rinse the connectors with fresh water after exposure to salt water. Do not allow water to enter the vent or desiccant tubes.

The gate should be thoroughly rinsed, paying special attention to the hollow doors and the bottom, which can accumulate a considerable amount of fish slime. The bumpers on the gate doors may glue shut with fish slime or after storage. Carefully peel the bumpers free before you use the gate.

The counters with square + and – switches are water resistant, but avoid high-pressure streams that can force water past the seals. The counters have round black and red switches have drain holes in the bottom, but do not use high-pressure streams or direct spray that will force water into the drain holes. Also, avoid hitting the bezels of the displays and keys of the counter with the backs of heavy scrub brushes. Disconnect the counter cable from the counter when it is not in use.

6.5 BATTERIES

6.5.1 12V BATTERY

The R-Series Detector and gate are shipped with a 12-volt DC sealed lead acid battery and a battery charger. Recharge your 12-volt battery as needed (instructions are with the battery charger). Disconnect the battery from the detector or gate when not in use or when charging.

6.5.2 COMBINED QUAD COUNTER BATTERY

The Combined Quad Counter is powered by an internal lithium battery, which has an expected lifetime of 5 or more years. When the battery is low, a “lobat” message will appear in the two inactive displays. The unit will continue to operate for a short time before the battery is completely exhausted. When it is time to replace the battery, NMT supplies replacement CR2/3A lithium batteries. You could also use a more common CR123 lithium battery, though it may have a shorter lifetime.

Before you replace the battery, record any counts you need from the display, since all stored information will be lost when you remove the battery. Loosen the four screws in the corners of the front panel and pull the panel forward away from the case. The battery is in a black plastic holder on the circuit board behind the right-hand side of the front panel. Gently pry up one end of the old battery, then pull it out. Replace it with the new battery oriented in the same direction as the old one, return the panel to its original position, making certain the o-ring is in its groove, and tighten the screws just snug.

7 TROUBLESHOOTING



Need help? If you have questions, problems or comments about setting up and using your detector and accessories, please call +1 (360) 764-8850 or email office@nmt.us.

7.1 ALARMS AND SIGNALS

7.1.1 POWER LOSS TO GATE

If the detector is attached to a gate, it will sound a continuous audio alarm if the gate's power is interrupted or disconnected. To stop the alarm, simply reset the detector by turning it off and back on again. Restore power to the gate and check that the gate power indicator light is on before resuming operation.

7.1.2 ERROR ALARM

If the gate latch hook is manually moved out of position during sampling, an alarm will continuously sound to warn that fish will be diverted to the wrong side. Either toggle the direction switch or move the latch hook back to its proper position to fix the problem and silence the alarm.

7.2 GATE LATCH BAR STOP ADJUSTMENT

When the Latch Hook is toggled to the latched position on one side, it should move the Latch Bar off the stop screw about $\frac{1}{32}$ " or $\frac{1}{16}$ ". Move the latch hook back and forth to see the amount of play. If the play is more than $\frac{1}{16}$ " or less than $\frac{1}{32}$ ", then the stop screw needs adjusting. The stop screw is adjusted by loosening the stop nut with a $\frac{5}{16}$ " socket wrench and turning the screw either in or out with a $\frac{7}{64}$ " hex key. One revolution of the hex key will move the latch bar approximately $\frac{1}{16}$ " off of the latch hook. Retighten the lock nut, preferably with Loctite or some other anti-vibration solution.