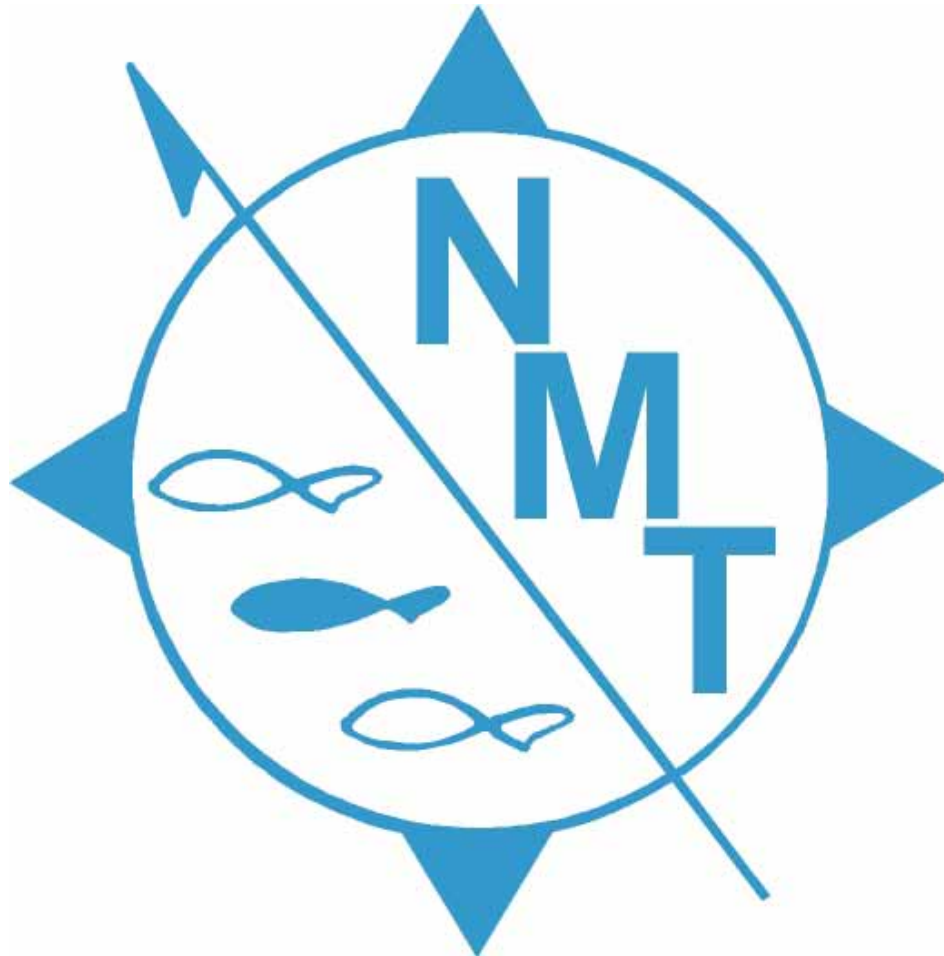


Multishot Instruction Manual

Handheld Coded Wire Tag Injector



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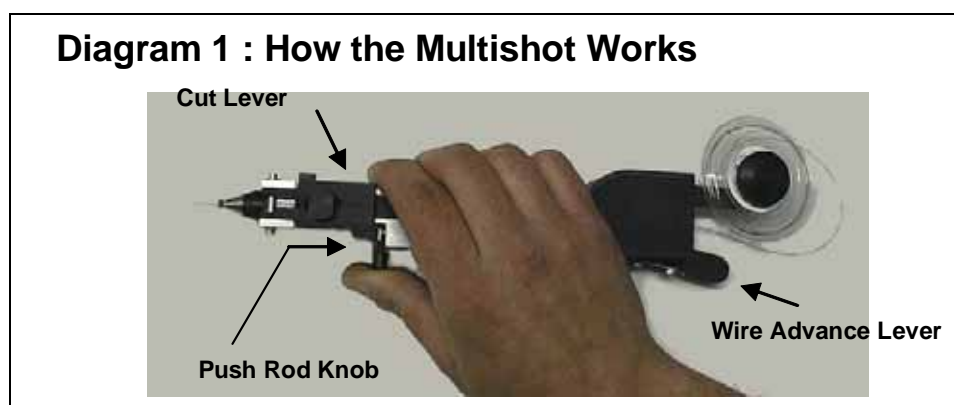
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Introduction

About the Multishot

Northwest Marine Technology (NMT) designed the Multishot to meet the demand for a small, portable, handheld “field” injector to mark small batches of fish or very large specimens (e.g., brood stock, endangered species, live trapped or smolts, and adult paddlefish). The Multishot is not intended to replace the MKIV Automatic Injector, which was developed to handle millions of cycles of tag injections. Typically used in conjunction with the Multishot is either an NMT Handheld “Wand” Detector or a Portable Sampling Detector. Either of these detectors will verify the presence of the tag in an animal.

How the Multishot Works



A complete injection cycle for the Multishot Injector has the following steps (see Diagram 1):

1. The coded wire is advanced by depressing the Wire Advance Lever. A ratcheting mechanism determines the tag length by moving the wire forward a fixed distance.
2. The tag is cut by depressing the Cut Lever.
3. The tag is magnetized and advanced to a point just short of the tip of the Needle by moving the Push Rod Knob forward until a slight resistance is felt (about 40 mm).
4. The Needle is inserted into the specimen.
5. The Push Rod is moved forward the remaining distance (about 8 mm) to inject the tag into the specimen. The Needle is removed from the specimen.

-
6. The Push Rod is retracted all the way which allows the Cut Lever to return to the “up” position, and the Multishot Injector is ready to repeat the cycle.

NOTE: When operating the machine always use brisk motion to properly engage the springs and levers.

Overview of CWT Tagging

An experiment using the Coded Wire Tag (CWT) consists first of implanting tags in the specimens, verifying implantation and releasing the specimens. The second stage involves recovering and screening the specimens for tags and reading the tags. Tag implantation sites will influence which verification and recovery procedures are used.

Tags are supplied in continuous form on a plastic spool. The Injector cuts a tag from the spool, magnetizes the tag and injects it into the specimen. The operator then verifies that the specimen contains a magnetic tag. Magnetically verifying the presence of a tag can be performed with any of the detectors made by NMT.

Upon recovery of the specimen, CWT's are located using one of the available detectors. CWT's are removed from the specimen and then read with conventional 10 to 30 power magnifiers.

A Few Things to be Considered Before Tagging

Tag Type: Tags are available in several formats. These include different tag sizes and a number of coding options. The tag type you choose will depend upon specimen size, data requirements and recovery methods.

Tag Implantation Site: The area or “target” where the tag will be implanted can vary for different applications. While salmon and trout have traditionally been tagged in the snout, other species are tagged in the cheek, adipose eyelid, jaw, scalp, nape, leg, etc. Choosing a suitable implantation site is critical to tag retention, specimen health and tag recovery.

Tag Insertion Technique: Some tagging is done with the aid of Head Molds to precisely position the specimen during tagging. When Molds are used it is very important to use a Mold of the proper size and shape for the particular specimen, otherwise poor tag retention can occur. NMT offers a variety of Head Molds for different species of fish ranging in size from 0.25 grams to 225 grams. If you are tagging a species for which a Head Mold is not available, or if you wish to make your own molds, contact NMT about the Head Mold fabrication kit and instructional video for this purpose. Tagging can also be done without the use of these fixtures if specimen size varies widely, the implantation site is large, or a suitable positioning fixture is not practical. A Needle Support Tube is available for this type of tagging.

Tag Recovery: How the tags will be recovered is important and must be considered during program design. Specimen size at the time of recovery, tag location, tag type, recovery site and detector technology can all influence the method and success of tag recovery.

2 Getting Started

Keep It Clean!

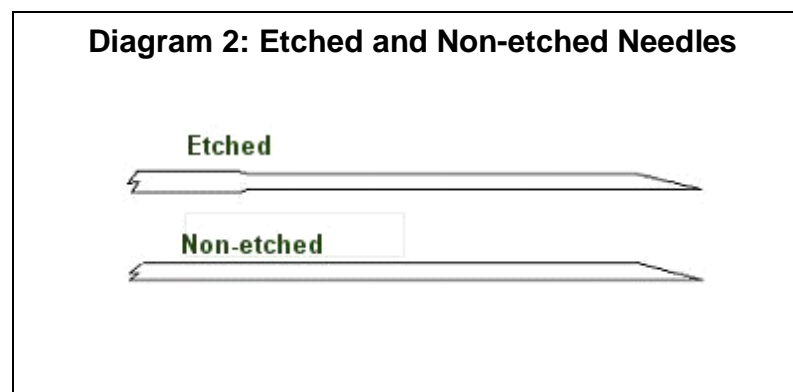
The Multishot **MUST BE CLEAN** to operate properly. The Multishot uses specially manufactured coded wire that is only 0.25 mm in diameter. This wire advances through a tiny hole in a cutter, the tag is cut, and then the tag is pushed through a needle with an inside diameter of 0.3 mm. The tag is pushed by the Push Wire, also only 0.25 mm diameter.

NOTE: This system will not work smoothly if fish slime builds up in the needle, in the Cutter, or on the Push Wire.

Regularly during use, the Multishot should be rinsed with fresh water to remove fish slime and other dirt. It is also advised that after each hour of use the following sequence should be followed: The unit should be submersed in a bucket of fresh water; the Cut Lever depressed and held down; and then the Push Rod advanced and retracted a dozen times (this sequence requires only a few seconds and is well worth the effort). This action works the push wire through the Cutter and the Needle causing a surging of fresh water through the system to dissolve any fish slime. A small amount of liquid detergent will help the cleaning. If you find during use that the Push Rod is not advancing smoothly it is likely one of two problems—either the Needle is not seated properly or the unit is not clean!

Needles

Types of Needles



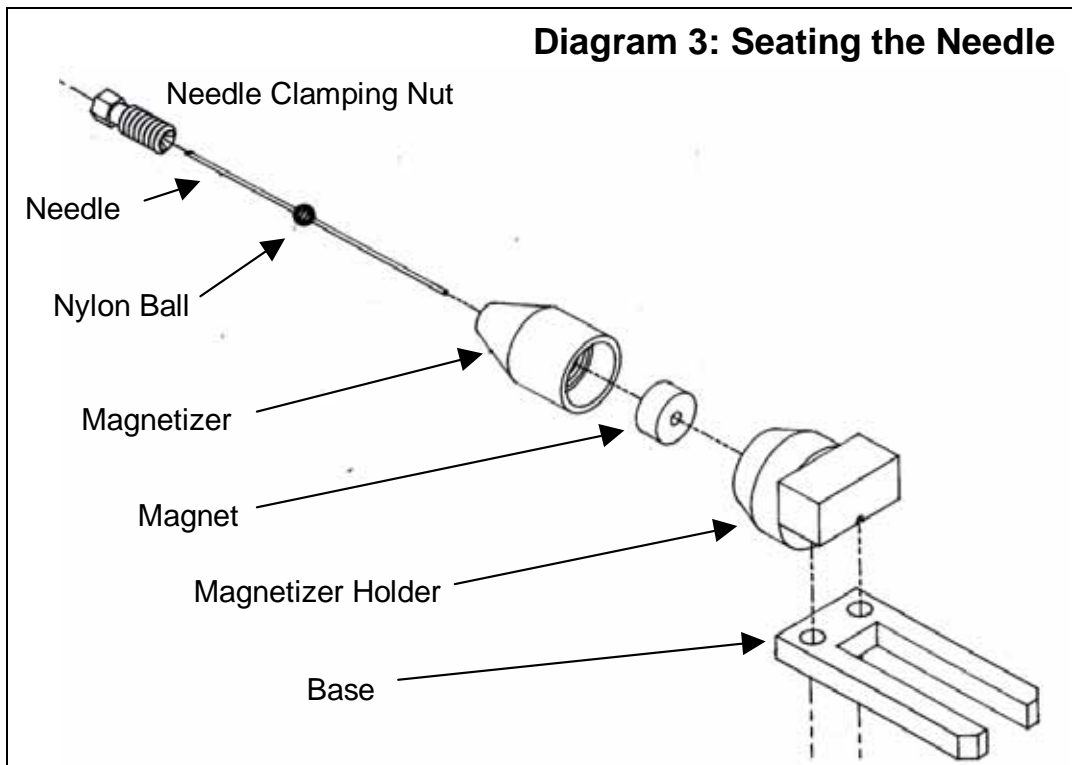
The Multishot uses a specifically designed 1.55 inch (3.94 cm) Needle. This 1.55 inch Needle will accommodate the use of Head Molds or a Needle Clamping Nut with

Support Tube (see Diagram 6: Needle Clamping nut with Support Tube, see also discussion of Head Molds).

The Multishot Needle is available as either “etched” or “non-etched” (see Diagram 2: Etched and Non-Etched Needles). Proper Needle selection is very important to the success of the tagging operation. The Non-Etched Needle has a constant outside diameter (0.0225 inch, 0.57 mm) from its base all the way to the beginning of the beveled tip. The Etched Needle, on the other hand, is necked down to a smaller outside diameter (0.0185 inch, 0.47 mm) beginning approximately 0.3 inches (0.76 cm) from the beginning of the bevel. The Etched Needle is designed to make a smaller injection hole in the fish and has been very successful with Head Molds for Pacific salmon. The Etched Needle will not work as well (i.e., it has a greater likelihood of bending) with fish of tougher tissue such as steelhead, nor will it work as well with most “body” tagging such as the cheeks of smallmouth bass, the scutes of sturgeon, or the rostrum of paddlefish. For this type of tagging, the Non-Etched Needle in a Needle Support Tube is often the better combination for penetration and tag placement.

Seating the Needle

The Needle **MUST** be properly seated in the cutter (see Diagram 3: Seating the Needle). An improperly seated Needle may be ejected from the tool when the Push Wire is advanced, or the Push Wire may become bent when trying to advance the Push Wire through the Needle. Either of these symptoms suggest that the Needle should be examined for proper seating.



To seat the Needle (assuming the Needle Clamping Nut and Needle are removed from the Injector):

1. Position the nylon ball approximately one third of the length down the Needle from the tip (the beveled end).
2. Slide the base of the Needle (the funnel shaped end) into the Magnetizer until it meets resistance; the Needle will come into contact with the Cutter.
3. While pushing gently, rotate the Needle until you feel the funnel end of the Needle slide into the Cutter.
4. Now slide the Needle Clamping Nut over the Needle and thread it into the Magnetizer; you may need to push the nylon ball into the Magnetizer a short distance with your fingernail to provide room for the initial thread of the Needle Clamping Nut.
5. Finger tighten the Needle Clamping Nut and then use the one-eighth inch Hex Wrench to tighten the Nut until it is snug - approximately a quarter turn.
6. Loosen the Needle Clamping Nut a quarter turn and then re-tighten one quarter turn. Repeat the loosen/re-tighten step a total of three to four times. This step ensures that the Needle is properly seated against the cutter (MSL3 PIN) without causing the cutter to bind.

Loading Tag Wire

Diagram 4 shows the Tag Supply Body, Wire Guide and Spool Arm. See Diagrams 19 and 20 for parts schematics.

To Load Tag Wire: The Tag Supply Body should be attached to the Injector Body (if it is not, refer to Reassembly Item 17, page 26).

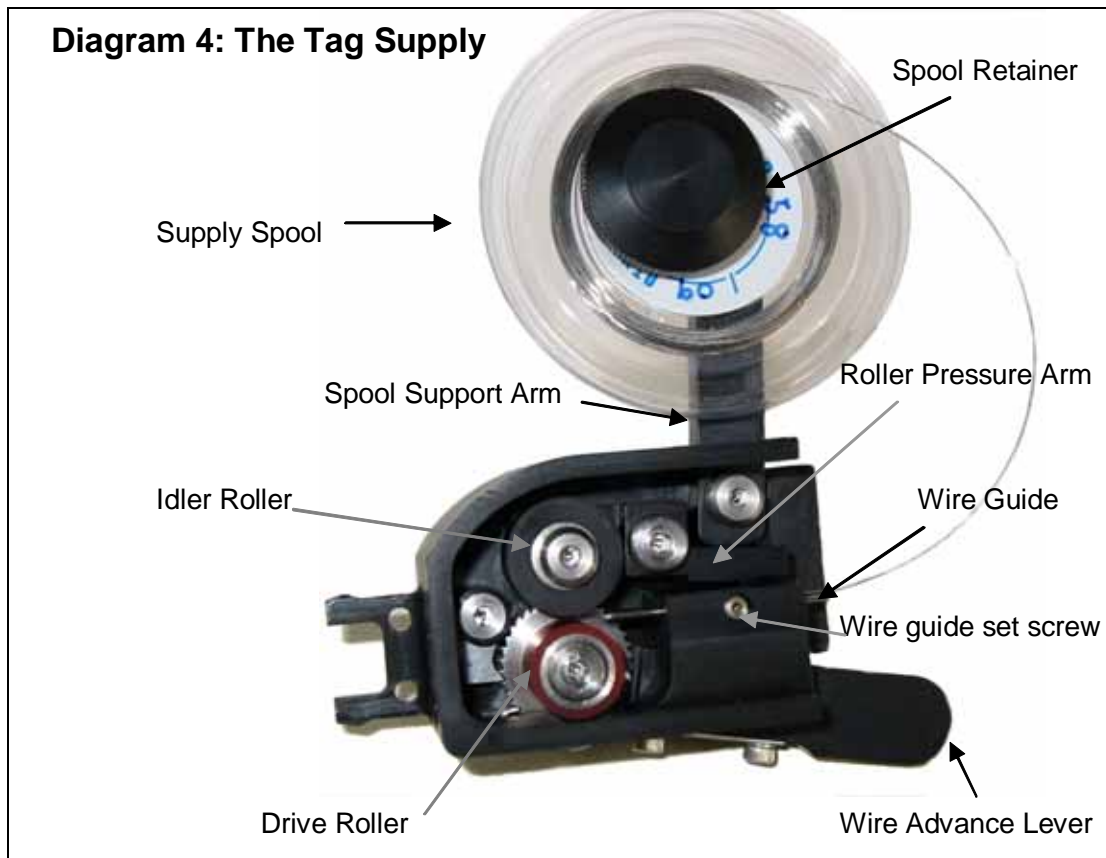
1. Remove the protective cover from the tag supply body by sliding it back. Unscrew the spool retainer, place the plastic tag supply spool onto the stud, and replace the spool retainer.
2. Rotate the spool support arm counter clockwise to place the roller pressure arm in the "off" position. This will separate the Drive and Idler Rollers.
3. Threading of the tag wire can be made easier if you straighten out any curl in the tag wire by running it between your thumb and forefinger. Thread the end of the tag wire into the Wire Guide, between the Drive and Idler Rollers and into the Feed Tube that protrudes from the injector body. Use the tweezers to guide the tag wire if necessary.
4. Feed the tag wire by hand into the Injector as far as it will go.

NOTE: The Cut Lever must be up when the tag wire is fed into the Injector.

5. The easiest way to determine if the tag wire has been fully inserted in the Cutter is to press down gently on the Cut Lever (diagram 1). A slight resistance will be felt if the tag wire is in the Cutter. Lower the Spool Support Arm to apply pressure to the two rollers. Replace the protective cover.
6. Cut the first tag (which will be a non-standard length and should be discarded) by depressing the Cut Lever, and then eject the tag by advancing the Push Rod all the way forward.

NOTE: Never advance the Push Rod if it is jammed!! See troubleshooting, page 15 if this occurs.

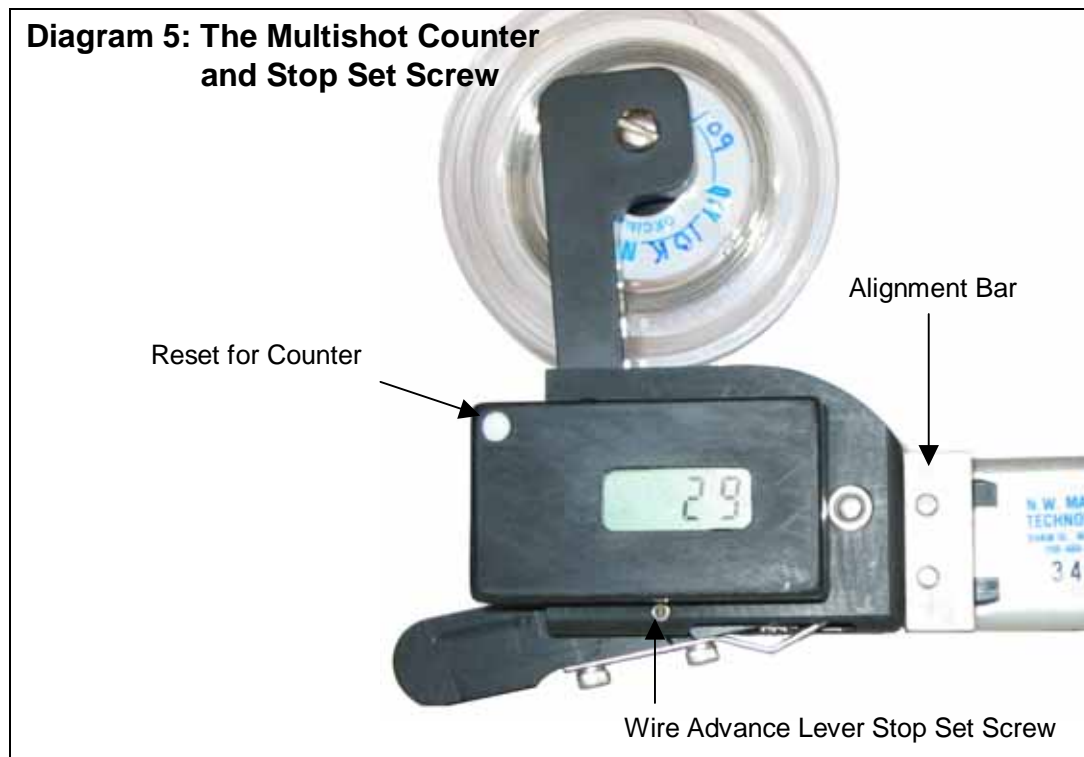
7. Retract the Push Rod all the way which will allow the Cut Lever to return to the up position. The Injector is now ready to start a new injection cycle.



Selecting the Tag Length

The Multishot can inject standard length (1.1 mm), one and a half length (1.65 mm) or double length (2.2 mm) tags (it will not inject the 0.5 mm half length tag). Standard and double length tags use the Standard Ratchet, and are selected by adjusting the Wire Advance Lever Stop Set Screw to control the throw (range) of the Wire Advance Lever (diagram 5). See Diagrams 19 and 20 for parts schematics.

Standard length tags are cut when the screw is in, and double length tags are cut when the screw is out. **Do not** take the screw all of the way out! If the screw is removed too far then the Wire Advance Lever will swing out of the bottom of the Wire Supply Body. One and a half length tags require insertion of the Special Ratchet in place of the Standard Ratchet. The Special Ratchet, which has fewer teeth than the Standard Ratchet, is optional.



NOTE: *If you want double length tags, the Stop Set Screw does not have to be removed, simply retract the standard length screw.*

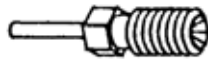
-or-

If an Injector is set to cut standard length tags and you wish to cut a double length tag without changing the Wire Advance Lever Stop Set Screw, this can be accomplished by pressing the Wire Advance Lever two times in succession before pressing the Cut Lever (note; however, if you are using a counter, that this approach will increment the counter by two). Similarly, if the Special Ratchet is installed to cut one and a half length tags then pressing the Wire Advance Lever two times in succession will generate a triple length tag.

Head Mold and Needle Clamping Nut with Support Tube

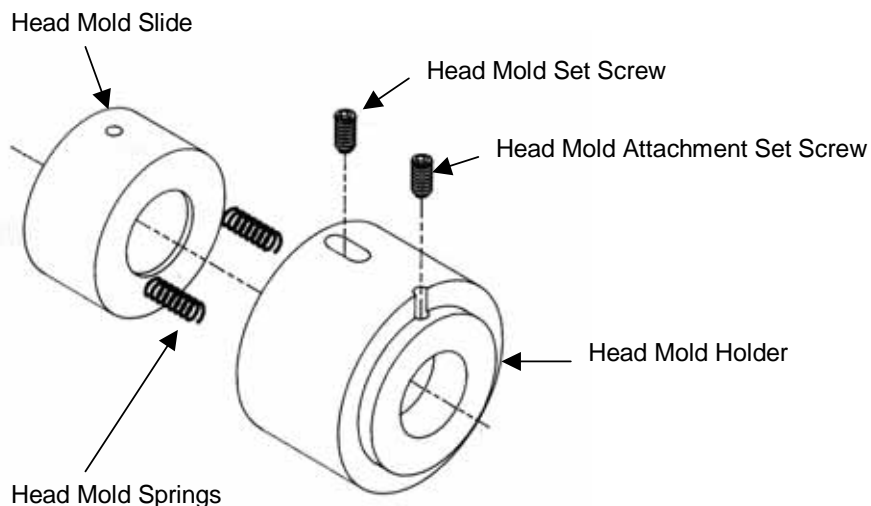
The Needle Clamping Nut with Support Tube is a modified Needle Clamping Nut that is supplied with the Injector (see Diagram 6). The Needle Clamping Nut with Support Tube is designed to stabilize the base of the Needle to prevent the Needle from bending when tagging. Use of the Needle Clamping Nut with Support Tube is encouraged when “body” tagging (e.g., the cheek, rostrum, base of fin, etc.). In fact, except when using a Head Mold there is little reason not to use the Needle Clamping Nut with Support Tube. The Needle Clamping Nut with Support Tube can also be used to gage the depth of needle penetration by applying a piece of tape around the base of the support, or slipping a piece of plastic tubing of the proper length over the support.

Diagram 6: Needle Clamping Nut with Support Tube



Head Molds are most often used for snout tagging. NMT supplies a variety of sizes and shapes. Custom Head Molds can also be constructed. A Head Mold Holder (supplied with the Injector) is slipped over the Needle and onto the front of the Magnetizer (see Diagram 7: Head Mold Holder). It is secured to the Injector by tightening the Set Screw at the base of the Head Mold Holder. A Head Mold is then inserted into the Head Mold Holder. The Head Mold is secured by tightening the Set Screw found at the front of the Head Mold Holder.

Diagram 7: Head Mold Holder



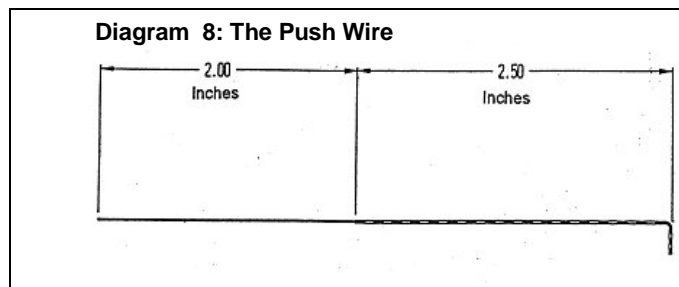
Depth of Needle Penetration

The depth to which the Needle penetrates the specimen is controlled in one of two ways.

1. With the freehand method (using the Injector without a Head Mold) the operator determines needle penetration by how far the Needle is pushed into the specimen. It is useful to mark the Needle with a depth stop of some type (tape, tubing, etc.) so you can tell how far the Needle has entered the specimen. A Needle Support Tube is also available for this type of tagging. The Needle Support Tube will help stabilize the Needle for better tag placement and will help prevent the Needle from bending.
2. When using the Head Mold Holder, needle penetration can be adjusted by setting the distance that the Needle protrudes in the Head Mold when the Head Mold Slide is fully depressed. The Head Mold is adjusted in or out by loosening the Head Mold Set Screw and moving the Head Mold to the desired position, then tightening the Set Screw.

Push Wire Function and Adjustment

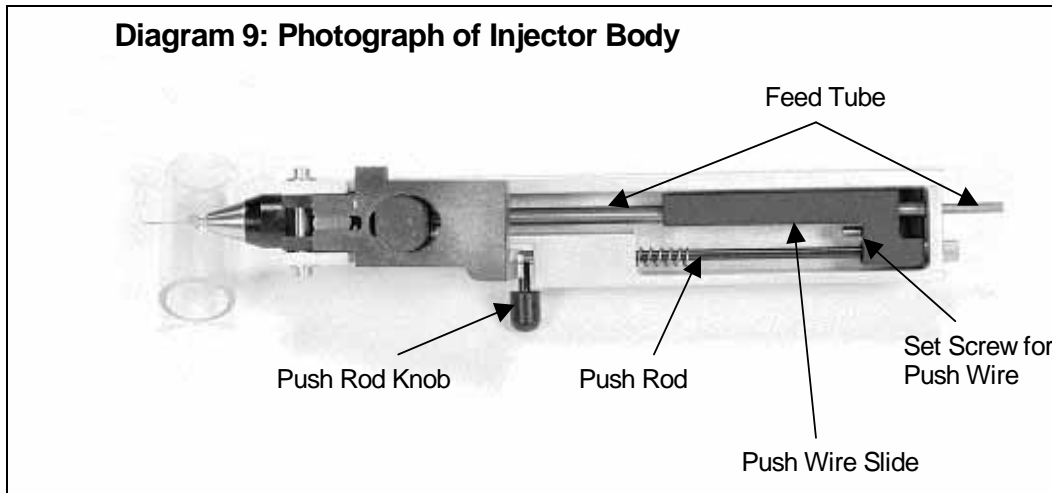
Tag placement depth refers to the position of the tag with respect to the tip of the needle. It is the **Push Wire** that advances the tag to the tip of the needle (see Diagram 8). The only way to adjust tag placement depth relative to the tip of the needle is to adjust the advancement of the Push Wire.



NOTE: The Push Wire assembly is manufactured to a fixed length. **DO NOT** attempt to change the length of the Push Wire (i.e., do not cut or file the Push Wire).

The advancement of the Push Wire can be adjusted with the Set Screw located at the center rear of the Push Wire Slide (see Diagram 9: Injector Body; and, Diagrams 19 and 20 for numbered parts schematics). To do this it is necessary to remove the Tag Supply Body and Body Cover; see Disassembly Instructions 2 and 5. Reach the adjusting Set Screw by pushing down the Cut Lever and moving the Push Rod all the way forward. Using the 0.050 inch Hex Ball-driver, rotate the Set Screw counter-clockwise if you want the cut tag to be injected further out the Needle; rotate the Set Screw clockwise if you want to have the tag further back into the Needle. The approximate

position of the cut tag can be determined by observing how the location of the Push Wire tip changes as the screw is rotated.

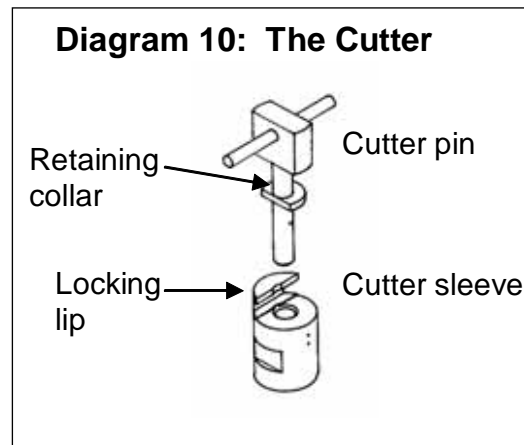


The Cutter

The Cutter is a precision device to cut the tags cleanly from the spool of tag wire. The Cutter is also the most expensive part of the Injector to replace. It should be cared for accordingly. With proper handling the Cutter should provide excellent service. It is not uncommon for a Cutter to yield in excess of 50,000 cuts.

Changing the Cutting Edge:

The Cutter pin has two cut edges available. To change the cut edge refer to Instruction 7, page 26, in the Reassembly Section.



NOTE: Keep it Clean! Clean the Cutter periodically during use, and after each use. Do not let the Cutter set for hours or overnight without proper cleaning. If you intend to leave the Injector laying around for several hours between uses, soak it in a bucket of fresh water to prevent fish slime from drying on the Cutter, in the Needle, and on the Push Wire.

The Counter

The Electronic counter is always on; there is no off switch. The estimated battery life is at least three years. Return the Counter to NMT if it no longer works.

Resetting the Counter: The Counter increments by one each time the Wire Advance Lever is depressed. Depress the white dot with a dull implement to reset the Counter (See Diagram 5). The Counter will not decrement.

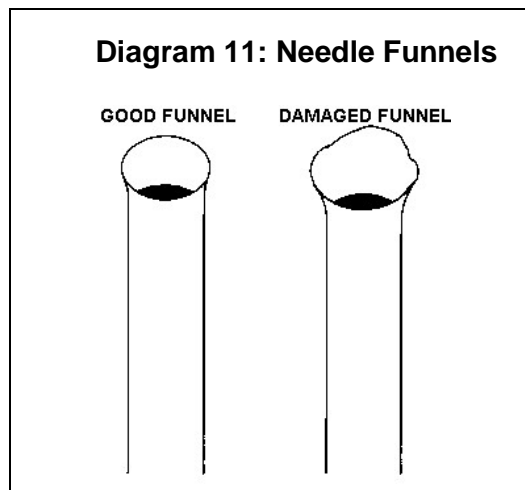
Troubleshooting

TROUBLESHOOTING SUMMARY TABLE		
PROBLEM	POSSIBLE CAUSES	SOLUTION
Needle pulls out of Injector	Improper seating of Needle	Tighten Needle Nut or reseal the Needle.
Needle breaks	Dull Needle into tough tissue; improper leverage from Injector	Use a sharp Needle in a Needle Support Tube, and do not pry up, down or sideways with Injector while the Needle is in the fish
Push Wire jams or sticky	Needle not seated properly; Needle not coned properly; Injector is dirty; burrs on the push wire	Reseat Needle; fix cone on Needle; clean Injector; use sharpening stone to remove burrs from end of Push Wire
Push Rod jammed or sticky	Push Rod improperly secured to Push Wire Slide; Injector dirty; Push Wire jammed	See Reassembly item 5 for securing Rod to Slide; clean Injector; see above for jammed Push Wire
Cutter not cutting smoothly	Injector dirty; Cutter dull or damaged; Push Wire too long; Cut Lever damaged; Cut Lever Spring or Cut Lever Alignment Pin Screws missing	Clean Injector; Replace Cutter; adjust Push Wire; replace Cut Lever, Cut Lever Spring, or Cut Lever Adjustment Screws
Cutting short tags	Drive Rollers worn	Replace worn Drive Rollers
Counter not working	Dead battery; Counter damaged	Return to NMT
Wire Advance Lever sticks	Dirty Injector; Advance Lever Pull Spring damaged	Clean Injector, particularly the Wire Supply Body; replace Advance Lever Pull Spring

Maintenance

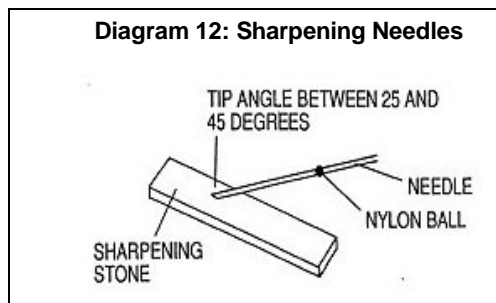
Care of Needles

Needle Inspection and Reaming: When inspecting or replacing a needle, examine the slight “funnel” at the back end of the Needle with the magnifying loupe. The funnel helps guide the tag into the Needle and can be damaged if the tag wire jams in the Injector. The funnel can be reshaped using the Needle reamer and the sharpening stone in the tool kit. To reshape the funnel insert the point of the reamer in the funnel and turn it a few times with light pressure to restore the proper shape. The rim of the funnel can be smoothed with the sharpening stone to remove the external flare caused by reaming and/or jams. Inspect the funnel end of the Needle to make certain that the last 5 mm is straight (see Diagram 11: Needle Funnels).



NOTE: A bent needle must be replaced.

Inspect the beveled end of the Needle to see that it is smooth and sharp. A dull needle makes penetration difficult and may tend to push the specimen away, causing shallow implantation of the tag. The angle of the Needle tip can be restored with the sharpening stone and light oil (see Diagram 12: Sharpening Needles).



After sharpening the Needle, be sure to clean it before reinstallation with chlorine solution and rinse with alcohol.

CLEANING PROTOCOL

The possibility of spreading fish diseases between culture facilities and watersheds is of concern to both our customers and Northwest Marine Technology. Although we are unaware of a case of coded wire tagging equipment moved between locations as having served as a "vector" in spreading a disease, the consequences of such occurrences call for stringent preventative measures. Disinfection procedures should also be implemented between groups of fish within a facility when signs of disease exist. Tagging should not be conducted during a severe outbreak of disease.

Chlorine solutions are recommended for use as disinfectants on tagging equipment. Commonly used source of chlorine are calcium hypochlorite ("*HTH*") and solutions of sodium hypochlorite ("bleach"). Household bleach comes in a concentration of about five percent so that to achieve the desired concentration one would dilute an ounce of bleach in each two gallons of water (a ratio of 1:250). Stronger solutions may be available at fish rearing facilities so that a lesser proportion of material would be required to achieve the desired concentration (200 ppm) of active ingredient. A promising alternative is a solution of chlorine dioxide (sold under various trade names including *Oxine* [CH₂O, International]). This material appears to be far less corrosive and less hazardous than the previously mentioned bleach and HTH. To reduce corrosion, alcohol (70 - 90%) is recommended as the disinfectant and cleaning agent for the interior mechanisms of NMT equipment.

Calcium hypochlorite and sodium hypochlorite solutions are highly toxic to fish but can be neutralized 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, they can be neutralized by adding an equal weight of either chemical. For example, one ounce of 5% bleach added to two gallons of water would be neutralized by one ounce (dry weight) of either sodium sulfite or sodium thiosulfate. If the chlorine solution is stronger, the weight of the neutralizing agent should proportionately increase. As an added precaution, "neutralized" disinfectant should not be poured directly into water containing fish. **Prior to the use of any disinfectant, read and understand the Material Safety Data Sheets (MSDS) for each product.**

Equipment and Supplies

In addition to the disinfectants indicated above, the following equipment and supplies are recommended:

- Two spray bottles for dispensing alcohol and chlorine solutions
- Tap (pathogen free) water
- 50 ml syringe with 20 gauge needle
- Wiping sponge/cloth
- Cotton tipped applicators made of wood (available from medical supply stores)
- Cotton balls
- A 2 - 3 inch length of blank/excess coded wire

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- Multishot tool kit
 - Multishot instruction manual
 - Paper towels
 - An open container for soaking parts
 - Material Safety Data Sheets
 - Rubber gloves
 - Eye protection
 - Particle masks or respirator

A note about cleaning: The Injector has many precision components which can become stuck or otherwise inoperable if not cleaned regularly during use and at the end of each day's tagging and before being stored. Careful cleaning will enhance performance and greatly extend the life of the unit so please take cleaning seriously.

Hourly cleaning: Each hour, or more often if necessary, the Injector should be submersed in a bucket of fresh water to remove fish slime and other dirt. It is best to hold the unit under water, depress the Cut Lever, and then slide the Push Rod back and forth a dozen times to surge water through the Needle and Cutter. This practice only takes a few seconds and clearly helps assure a smooth operation of the Injector.

Daily cleaning: This simplified cleaning procedure should be performed at the end of each day's tagging. Use a chlorine solution and rinse with alcohol. Use cotton swabs or other non-abrasive cleaning tools (see Diagrams 19 and 20 for parts schematics)

1. Disassemble the Injector following Disassembly steps 1, 2 and 4 thru 10.
2. Use the chlorine solution to clean the Needle, Cutter Pin, inside of the Cutter Sleeve and any exposed Injector surfaces that are dirty.
3. Use a piece of tag wire dipped in alcohol to clean the inside of the Needle, holes in Cutter Pin and holes in the Cutter Sleeve.
4. If you are using the Head Mold Holder, it can be cleaned without disassembly by removing it from the Injector and soaking it in the chlorine solution overnight (do not use alcohol on the Head Mold).
5. **Dry all surfaces before reassembling or storing, especially the Cutter Sleeve and Cutter Pin to prevent corrosion.**

Complete cleaning: This procedure should be performed if you wish to clean all Injector components. This procedure is recommended if disease is a concern, and should also be performed before the Injector is stored for an extended period of time. Again, use fresh water, a disinfectant, and non-abrasive cleaning tools (see Diagrams 19 and 20 for numbered parts schematics).

1. Disassemble the Injector following steps 1 thru 15 and clean all parts in chlorine solution.

-
2. Use a piece of tag wire dipped in alcohol to clean the inside of the Needle, holes in the Cutter Pin, holes in the Cutter Sleeve and the inside of the Feed Tube.
 3. Use a piece of tag wire to clean the inside of the Feed Tube and Nesting Needle in the groove on the bottom of the feed tube.
 4. Use alcohol and cotton swabs to clean the exterior of all other components.
 5. If you are using the Head Mold Holder it can be cleaned without disassembly by removing it from the Injector and soaking it in alcohol overnight. Soak the Head Mold in the chlorine solution NOT in alcohol.
 6. Dry all surfaces before reassembling or storing, especially the Cutter Sleeve and Cutter Pin to prevent corrosion. A thin film of silicone FEL-PRO LUBRI-SIL #51360 grease (or equivalent) is recommended on the following parts: Alignment Bar, Cut Lever Alignment Pin, Detent Assembly, and the Pull Spring screws.
 7. Keep the Needle Protector in place during storage and transit to protect the Needle and prevent injury.

Service

Although the Multishot Injector requires little maintenance if properly cleaned and cared for, certain components of the unit will need service with regular use.

The following is a recommended service schedule (which will vary with each unit depending on the cleaning, maintenance and handling by the owner):

After each **30,000** tag injections the Drive Roller, Idler Roller, Wire Advance Lever Spring, Pull Spring, Push Wire and Needle Clamping Nut should be inspected for wear, and likely replaced.

After **50,000** injections the Cutter, Push Rod Assembly, and Pull Spring should be inspected for wear and likely replaced. This service should be performed at NMT by one of our trained service technicians.

After three years the Counter's battery should be replaced. This service must be performed at NMT by one of our trained service technicians.

Disassembly

1. Remove the tag wire. Release the pressure on the Drive Roller by moving the Spool Support Arm up to the “off” position. Grasp the tag wire and pull it out the rear of the Injector. Remove the Tag Supply Spool from the Spool Retainer.
2. Remove the Tag Supply Body from the Injector Body. The Tag Supply Body clips in a slot at the rear of the Injector Body. To separate the two, remove the Alignment Bar, being careful to lift it straight out to avoid binding of the two pins (you may have to initially pry the alignment bar loose with a thin implement). Once the Alignment Bar is removed, hold the Tag Supply Body in one hand and the Injector Body in the other and pull them **straight apart**. The two pieces fit together fairly tight so some resistance will be felt.

NOTE: Make sure to pull the two pieces straight apart so you do not break the Feed Tube, which extends into the Tag Supply Body from the Injector Body.

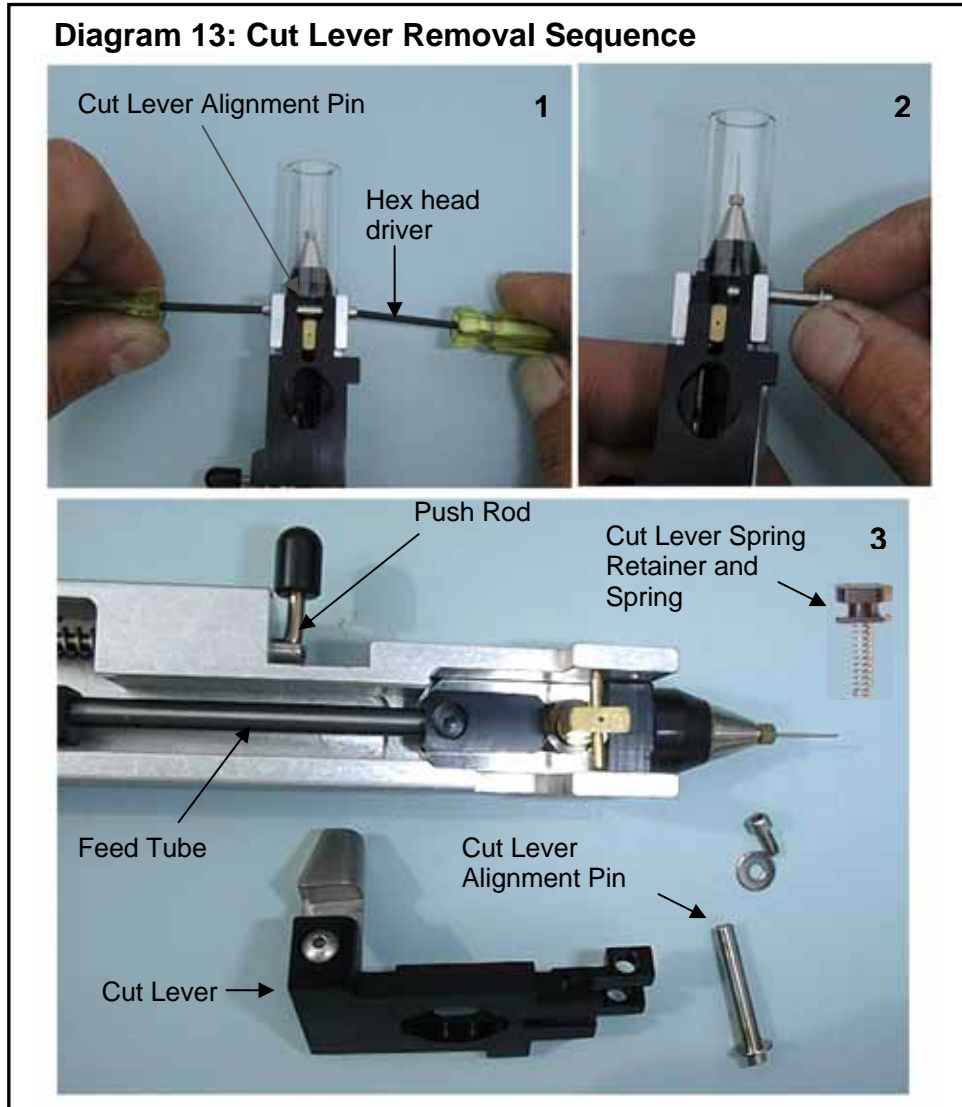
3. To remove the Drive Roller Assembly, first remove the Tag Supply Body Cover and relax the Idler Roller (off position of the Spool Support Arm). Next remove the Ratchet Pull Spring, which is attached with two screws to the bottom of the Wire Advance Lever. Back out the Wire Advance Lever Stop Set Screw and swing the Wire Advance Lever down (diagram 5). Loosen the Wire Guide Set Screw and slide the Wire Guide away from the Drive Roller Assembly. Remove Idler Shoulder Screw and Idler Roller. Remove the Drive Roller Shoulder Screw and the Drive Roller Assembly will lift out.
4. Remove the needle. Use the 1/8” wrench to remove the Needle Clamping Nut (diagram 3). Pull the Needle and its nylon ball out of the Magnetizer Assembly.

NOTE: If you are using the optional Head Mold Holder remove it first by loosening the Head Mold Attachment Set Screw (diagram 7) with the .050” wrench and slide it off the Magnetizer Assembly.

5. Remove Body Cover. The Body Cover is held in place by slots in the Injector Body. Remove it by sliding the Body Cover towards the rear.
6. Remove the Cut Lever Spring Retainer and Cut Lever Spring. Use your finger to apply slight upward pressure on the Cut Lever. Press down on Cut Lever Spring Retainer and turn it 90 degrees in either direction so it disengages from the Cut Lever, then lift out the Cut Lever Spring Retainer and Cut Lever Spring. The Spring and Retainer normally come out together.
7. Remove the Cut lever (diagram 13). Use your finger to apply slight upward pressure on the Cut Lever. It may be necessary to retract the Push Rod so that the Cut Lever can be moved to its “up” position. Using two 5/64” hex head drivers, remove the Cut Lever Alignment Pin.

NOTE: Only one side of the Alignment Pin Cap Screw will come free from the Injector. The other side is permanently secured to the Alignment Pin.

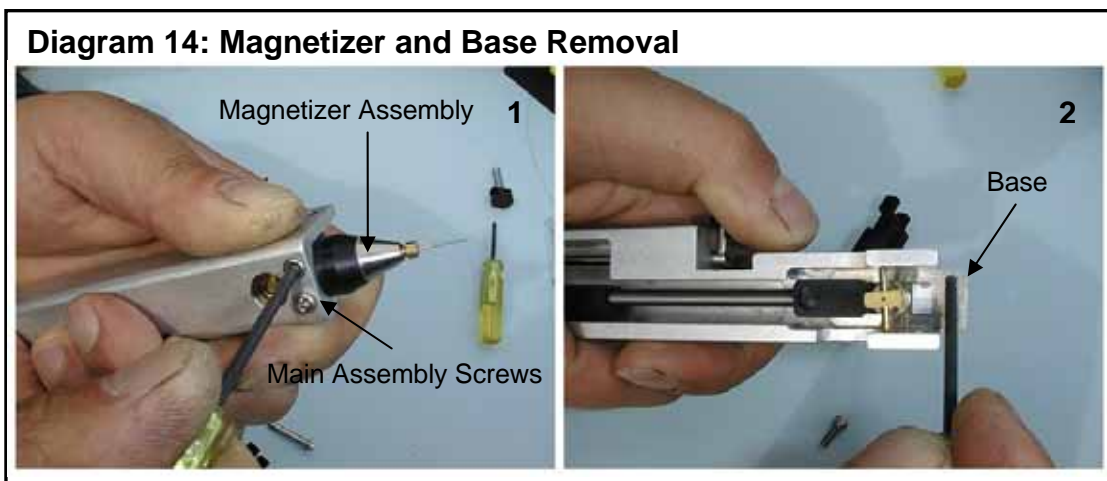
8. Remove the Cut Lever by lifting the rear end of it up so it clears the Injector Body, then pulling it back to slide it off the Dowel Pin.



9. Remove the Magnetizer Assembly. Use the 3/32" wrench to remove the two Main Assembly Screws from the bottom of the Injector Body (diagram 14). Pull the Magnetizer straight out away from the Injector.

NOTE: The Magnetizer Assembly is one piece. Do not try to separate the metal from the black plastic.

10. Remove the Push Rod from the Push Wire Slide (diagram 9). Pull the Push Rod back all the way and hold in place. Note the position of the groove in the forward end of the Detent (horizontal to the left). The Push Rod must fit into this groove when it retracts and is important on reassembly. Use the 3/16" nut wrench to remove the nut and split washer that secures the Push Rod. Hold Push Wire Slide in place and slide Push Rod forward so it is clear of the Push Wire Slide. The Push Rod is held in the Injector Body by the Push Rod Spring and E-Clip. Remove the E-clip and slide the Push Rod and spring out of the Injector Body.
11. With the Push Wire Slide fully retracted, use the 3/32" ball-driver to slide the Base forward, away from the Feed Support Tube. When the Base is fully disengaged from the Feed Support Tube, lift up, taking the Base and Cutter out together (diagram 14).

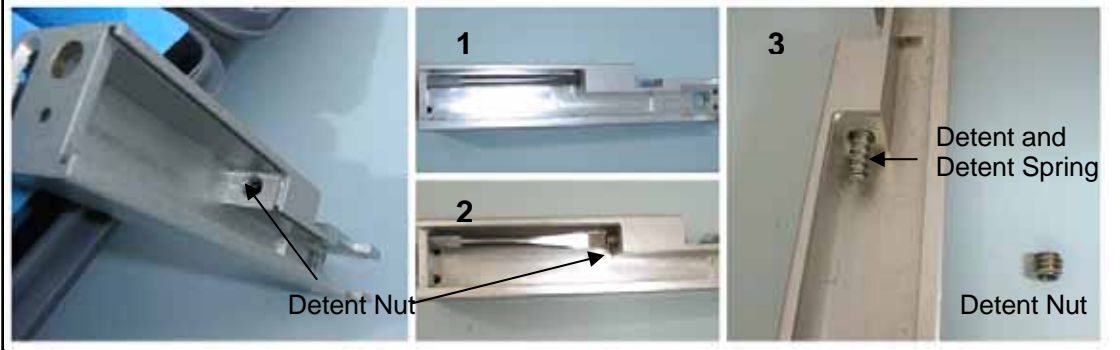


12. Separate the Cutter from the Base. Rotate the Cutter Pin 90 degrees, in the direction which allows the flat spot on the Cutter Pin retaining collar to clear the locking lip of the Cutter Sleeve (diagram 10). The Cutter Pin can then be pulled up and out of the Cutter Sleeve.
13. Remove the Feed Tube Support, Feed Tube and Push Wire slide. These parts are removed from the Injector Body at the same time by lifting up on Feed Tube Support and then pulling it forward so the rear end of the Feed Tube comes out of the hole in the back of the Injector Body.

NOTE: *The Feed Tube Support should not be separated from the Feed Tube.*

14. Remove pushrod detent and spring as shown in diagram 15.

Diagram 15: Push Rod Detent removal sequence

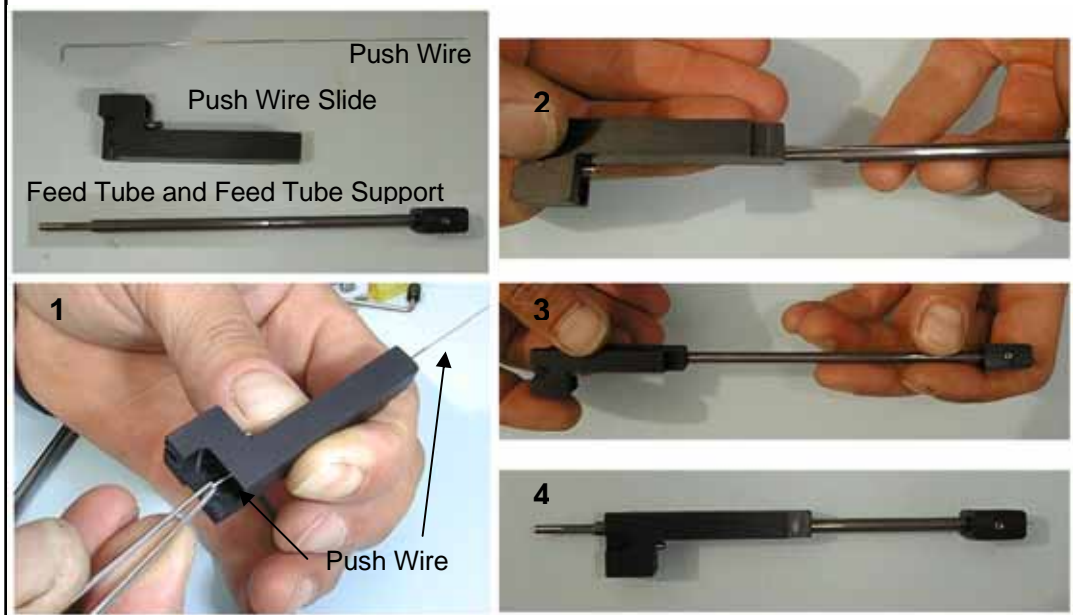


Disassembly is now complete.

Reassembly

1. Reinstall the Pushrod Detent and spring (diagram 15). The groove in the Pushrod Detent should be oriented to the left so that it will accept the Push Rod when it is pulled back.
2. Install the Push Wire and Push Wire Slide onto the Feed Tube (diagram 16). Note the Nesting Needle which is permanently installed in the groove on the bottom of the Feed Tube. Note the "L" in the rear end of the Push Wire which fits in the small retaining hole in the Push Wire Slide.

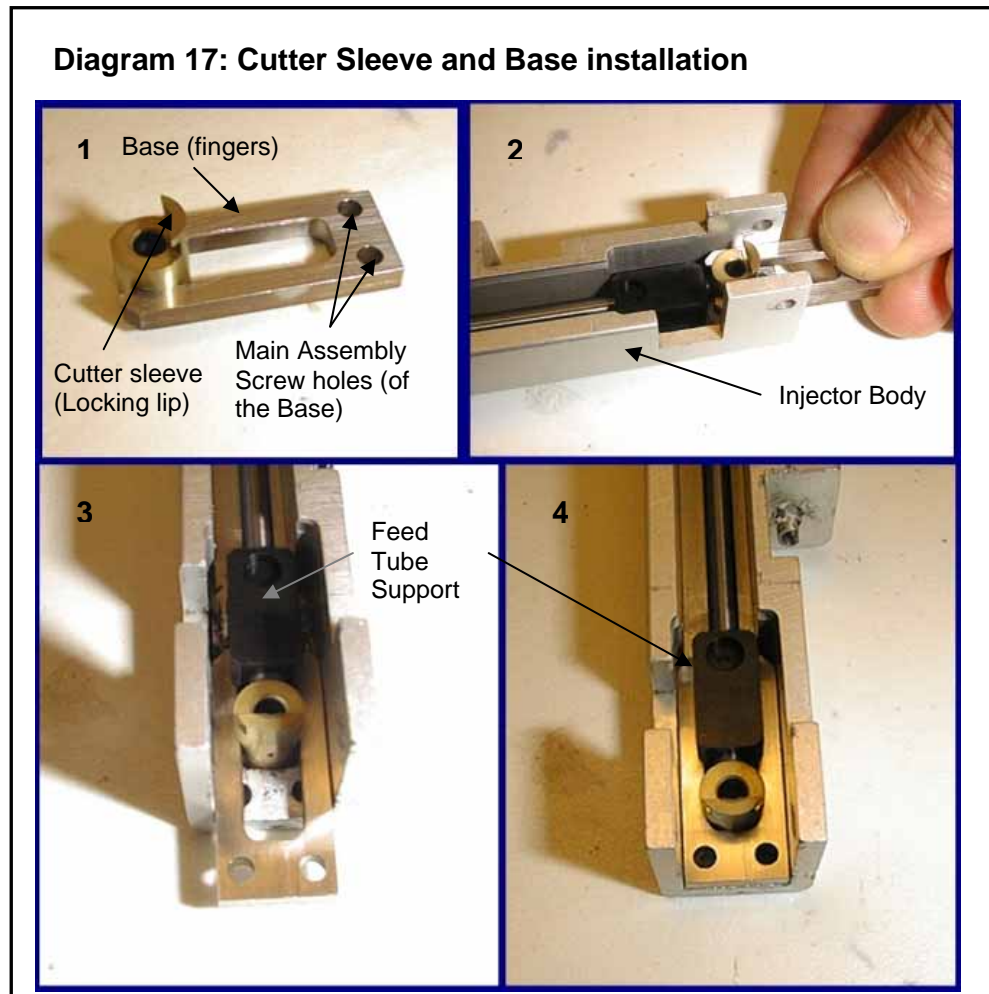
Diagram 16: Push Wire installation sequence



When installing the Push Wire and Push Wire Slide onto the Feed Tube it is necessary to thread the tip of the Push Wire in the end of the Nesting Needle at the same time as the Feed Tube enters the Push Wire Slide.

Hold the Feed Tube in one hand and the Push Wire Slide (with the Push Wire installed) in the other hand. Before inserting the Feed Tube in the Push Wire Slide, lay the Push Wire in the groove on the bottom of the Feed Tube. Use the tip of your finger on the hand holding the Feed Tube to guide the Push Wire into the Nesting Needle as the Feed Tube is inserted in the Push Wire Slide. Note that the groove on the bottom of the Feed Tube must be aligned with the "L" in the rear of the Push Wire so that the Feed Tube can go all the way through the Push Wire Slide.

3. Install the Feed Tube Support, Feed Tube and Push Wire Slide (assembled in step 2) into the injector body. With the Push Wire Slide forward (towards the feed tube support), the Feed Tube and Push Wire Slide are inserted in the injector body from the top. Using the Feed Tube Support as a handle for the assembly, slide the feed tube in the hole in the rear of the injector.

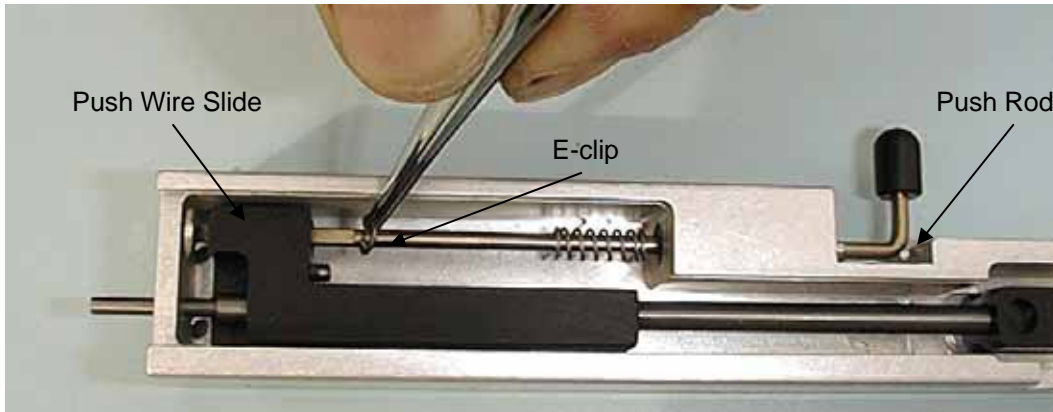


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- Slide the fingers of the Base over the grooves on the side of the Cutter Sleeve, until the Cutter sleeve is flush with the end of the fingers (diagram 17). The Cutter Sleeve's locking lip should be oriented towards the Main Assembly Screw holes of the Base. Holding the Cutter Sleeve with the Base, drop the sleeve into its hole on the Injector Body. Line the Base fingers up with the grooves on both sides of the Feed Tube Support and slide the Base in as far as it will go. The Main Assembly Screw holes of the Base and Injector Body should now be lined up.
 - Install the Push Rod. The handle end of the Push Rod must be horizontal so the threaded end can pass through the slot in the Push Wire Slide. Also check that the groove in the forward end of the Detent is horizontal, facing left, so that the Push Rod fits into the groove when fully retracted. Replace the spring on the Push Rod and secure it with the E-clip (diagram 18). With the handle end of the Push Rod Lever horizontal, insert the threaded end through the Push Wire Slide and out the hole in the rear of the Injector Body.

NOTE: The E-clip on the Push Rod must fit in the recess in the Push Wire Slide.

- Install and tighten (just snug, do not over-tighten) the nut and washer, which hold the Push Rod in place at the rear of the Injector Body.

Diagram 18: Push Rod installation



- Install the Cutter Pin. Make sure the Push Rod is fully retracted so that the Push Wire does not interfere with the insertion of the Cutter Pin. The Cutter Pin has a Retaining Collar with a flat spot. Align the flat spot on this Retaining Collar so that it clears the corresponding flat spot on the Cutter Sleeve. The Pin can now be inserted in the Sleeve. After the Pin has been inserted all the way, rotate it 90 degrees in either direction to lock it in the Sleeve. Note: The Cutter Pin has two available cutting edges. The Cut Edge (1 or 2) is selected depending upon the direction of rotation (clockwise or counterclockwise) after the Pin is inserted in the Sleeve.

The convention for identifying Cut Edges is that inserting the Pin and turning it 90 degrees clockwise (when viewed from the top) selects Cut Edge number 1.

NOTE: The Cutter Pin, which is installed in step 8 above, is the depth stop for the Needle once it has entered the Cutter Sleeve. The Cutter Pin must be installed before the Needle can be properly installed.

8. Install Magnetizer Assembly. The Push Wire will be used to help align the Magnetizer as it is installed. To extend the Push Wire out the front of the Injector apply slight forward pressure on the Push Rod while turning the Cutter Pin slightly until the holes in the Cutter Sleeve and Cutter Pin are aligned. (The holes will be aligned when the dowel pin, at the top of the Cutter Pin, is exactly perpendicular to the long axis of the Injector.) When the holes in the Cutter Pin and Sleeve align, the Push Wire will pass through the Cutter and extend out the front of the Injector.

Thread the Push Wire through the center hole of the Magnetizer and align the two mounting holes in the Magnetizer with the matching holes in the Injector Base. Insert the two Main Assembly Cap Screws from the bottom side and use the 3/32" wrench to tighten the Magnetizer in place. Keep the Push Wire extended.

9. Install the Needle with Nylon Ball and the Needle Clamping Nut (diagram 3). As in step 7 above, the Push Wire will be used to guide the Needle into the Cutter Sleeve. Slide the Nylon Ball on the Needle so it is about one third of the length down the Needle from the tip (the beveled end). This ensures that the Needle will seat against the Cutter before the Nylon Ball bottoms out in the Magnetizer. Use the Push Rod to keep the Push Wire extended out the end of the Magnetizer. Insert the end of the extended Push Wire into the funnel (or dull end) of the Needle. Insert the Needle into the Magnetizer and all the way back to the Cutter. Rotate the Needle as it is inserted so it will fit in the small recess in the Cutter.
10. Place the brass Needle Clamping Nut over the end of the Needle and use the 1/8" wrench to push the Needle Clamping Nut and Nylon Ball back until the threads of the Nut can engage the threads of the Magnetizer Assembly. Tighten the Nut until it is just snug (approximately a quarter turn). The Nut will compress the Nylon Ball around the Needle to hold the Needle in place. However, note that over-tightening the Needle Clamping Nut can damage the Magnetizer.
11. Loosen the Needle Clamping Nut a quarter turn and then re-tighten one quarter turn. Repeat the loosen/re-tighten step a total of three to four times. This step ensures that the Needle is properly seated against the cutter (MSL3PIN) without being so tight as to cause the cutter to bind.
12. Install the Cut Lever. Slide the Push Rod all the way back to make sure the Push Wire is out of the Cutter. Install Cut Lever by tilting the front end down so the slots in the front of the Cut Lever can be slipped on to the Cutter Dowel Pin. Make sure the Push Wire stays retracted. Position the Cut Lever so the Cut Lever Alignment Pin with two screws and washers can be installed. Tighten the

screws with the two 5/64" hex head driver. Only one of the screws is removable.

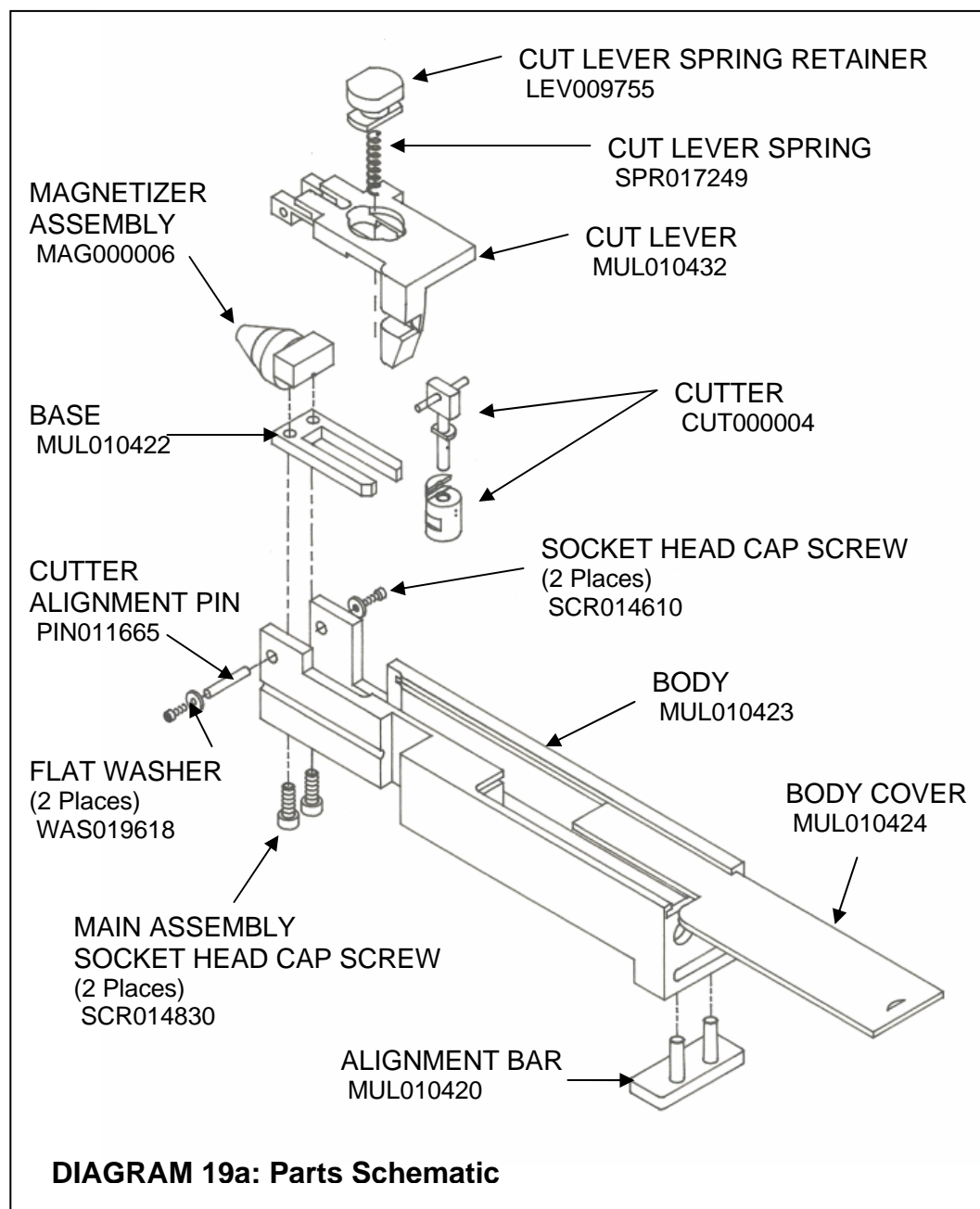
13. Install the Cut Lever Spring and Spring Retainer. If the Cut Lever Spring and Spring Retainer have separated, insert the Cut Lever Spring in the hole in the Cut Lever Spring Retainer. Retract the Push Rod and move the Cut Lever to its "up" position. Use your finger to apply slight upward pressure on the Cut Lever. Insert the Cut Lever Spring through the opening in the top of the Cut Lever and make sure the end of the spring goes in the recess in the top of the Feed Tube Support. Install the Cut Lever Spring Retainer by inserting it in the slot in the Cut Lever, and while pushing it down, turn it 90 degrees to lock it in place.
14. Install the Body Cover by sliding it into the slots in the Injector Body, from back to front.
15. Install Head Mold Holder. If you are using the optional Head Mold Holder install it at this time by loosening the Head Mold Attachment Set Screw with the .050" wrench and sliding the Head Mold Holder onto the Magnetizer Assembly as far as it will go. Tighten the Set Screw snug, but take care not to over-tighten or you may damage the Magnetizer.
16. To reinstall the Drive Roller Assembly, slide Wire Advance Lever into position (through side of Tag Supply Body) and place Drive Roller Assembly into position (through the hole in the Wire Advance Lever). Secure with the Drive Roller Shoulder Screw. Slide the Wire Guide in towards the Drive Roller Assembly and tighten the Wire Guide Set Screw. Position Idler Roller and secure with Idler Shoulder Screw. Position Wire Advance Lever Spring into the location hole on the Wire Advance Lever and compress this spring by pushing the Wire Advance Lever until it touches the Tag Supply Body. Holding this position, set the Wire Advance Lever Stop Set Screw to the position for a standard length tag and release the Wire Advance Lever. Place the Pull Spring over the two holes on the Wire Advance Lever and install the two pan head screws. Advance the Wire Advance Lever to ensure that it "clicks". Replace the Tag Supply Body cover by sliding it into the slots from the rear.
17. Install the Tag Supply Body. Attach the Tag Supply Body to the Injector Body by pressing the two together. The two prongs on the Tag Supply Body fit in the slot in the rear of the Injector Body. The two pieces fit together fairly tightly so some resistance will be felt.

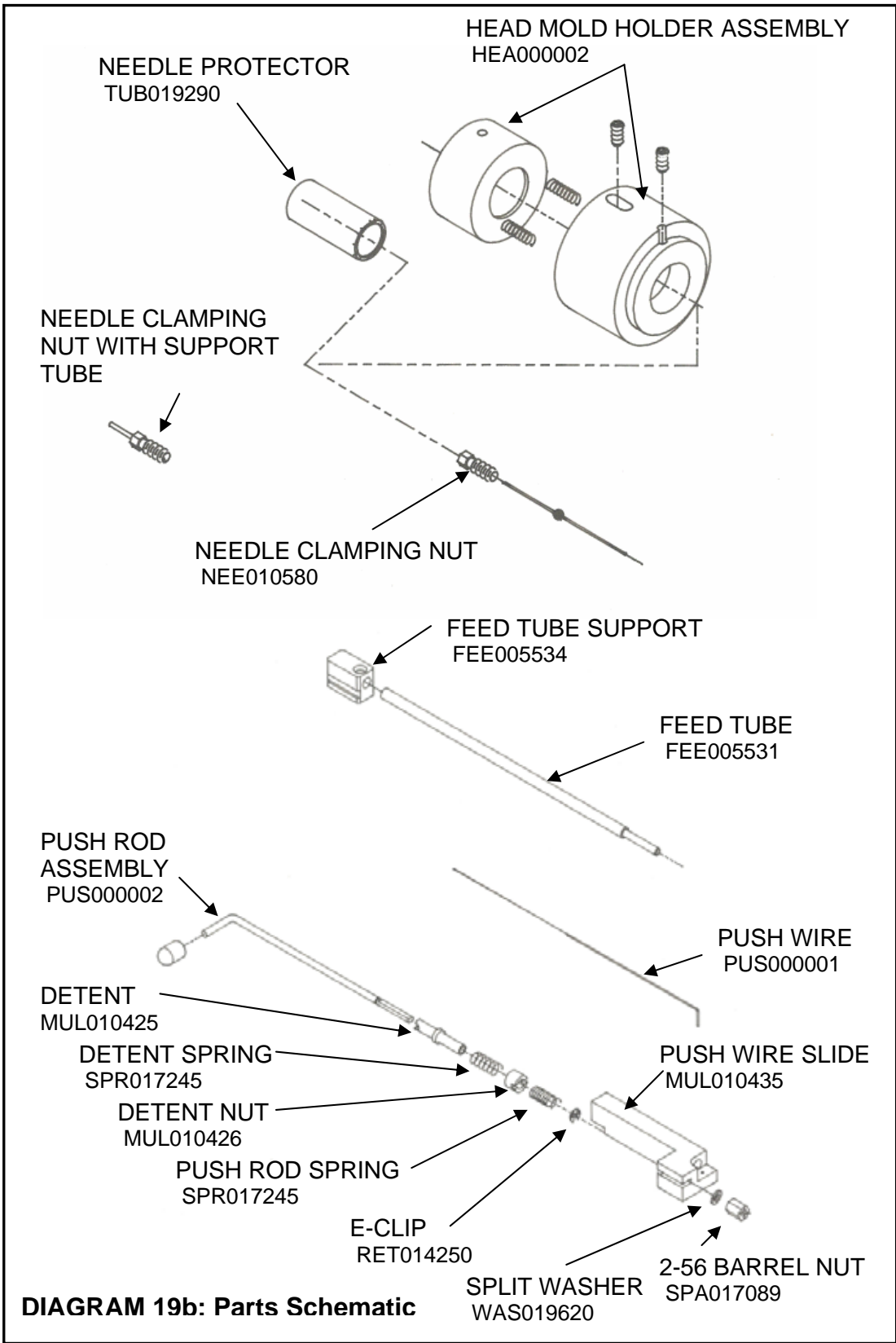
NOTE: Make sure the two pieces are aligned so you do not break the Feed Tube, which extends into the Tag Supply Body.

18. Insert the Alignment Bar to secure the Supply Body to the Main Body.
19. Test the now fully assembled injector by checking for smooth operation of Cut Lever through full range of motion. With Cut Lever depressed, test that the Push Rod slides forward and retracts smoothly.

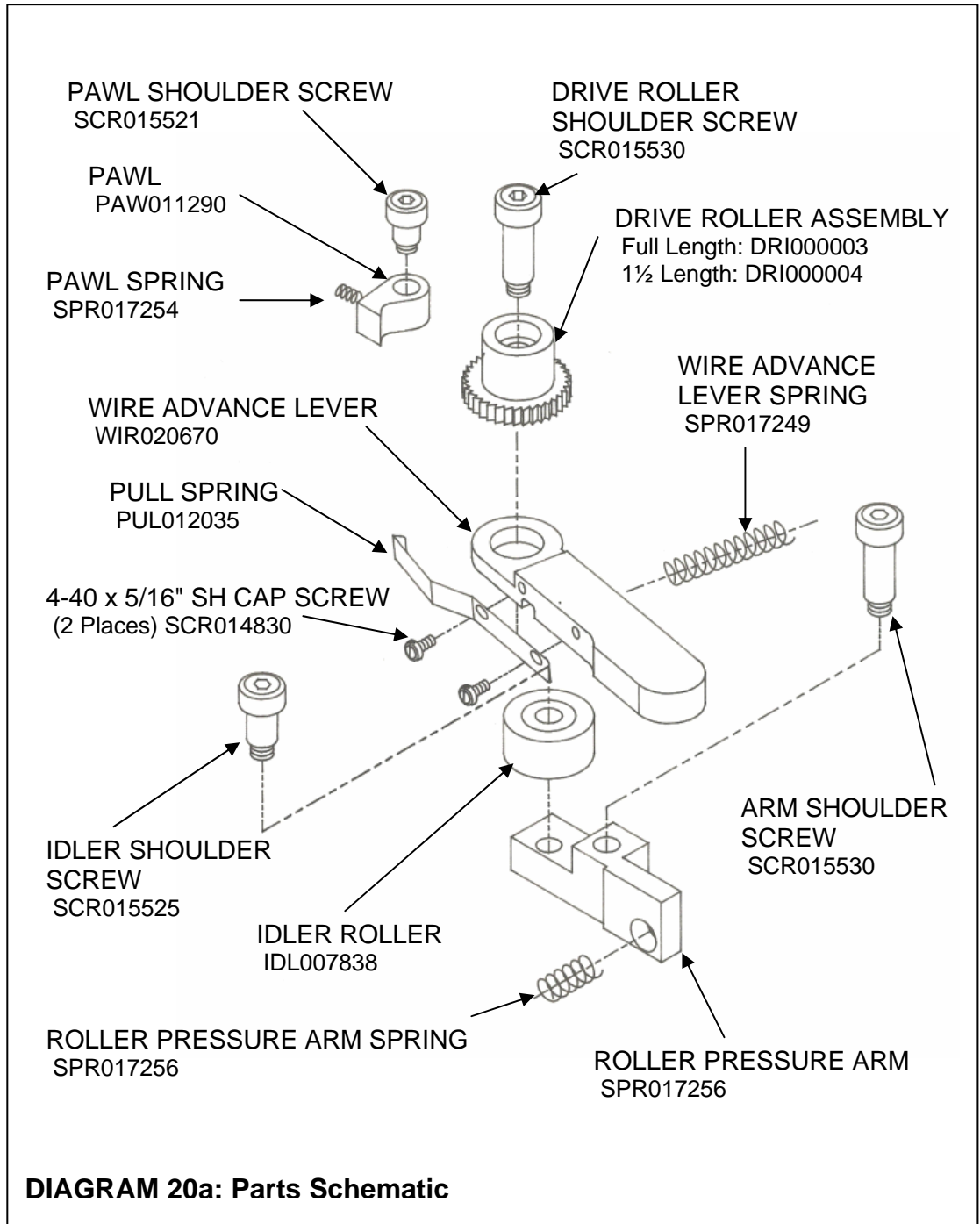
Parts Reference

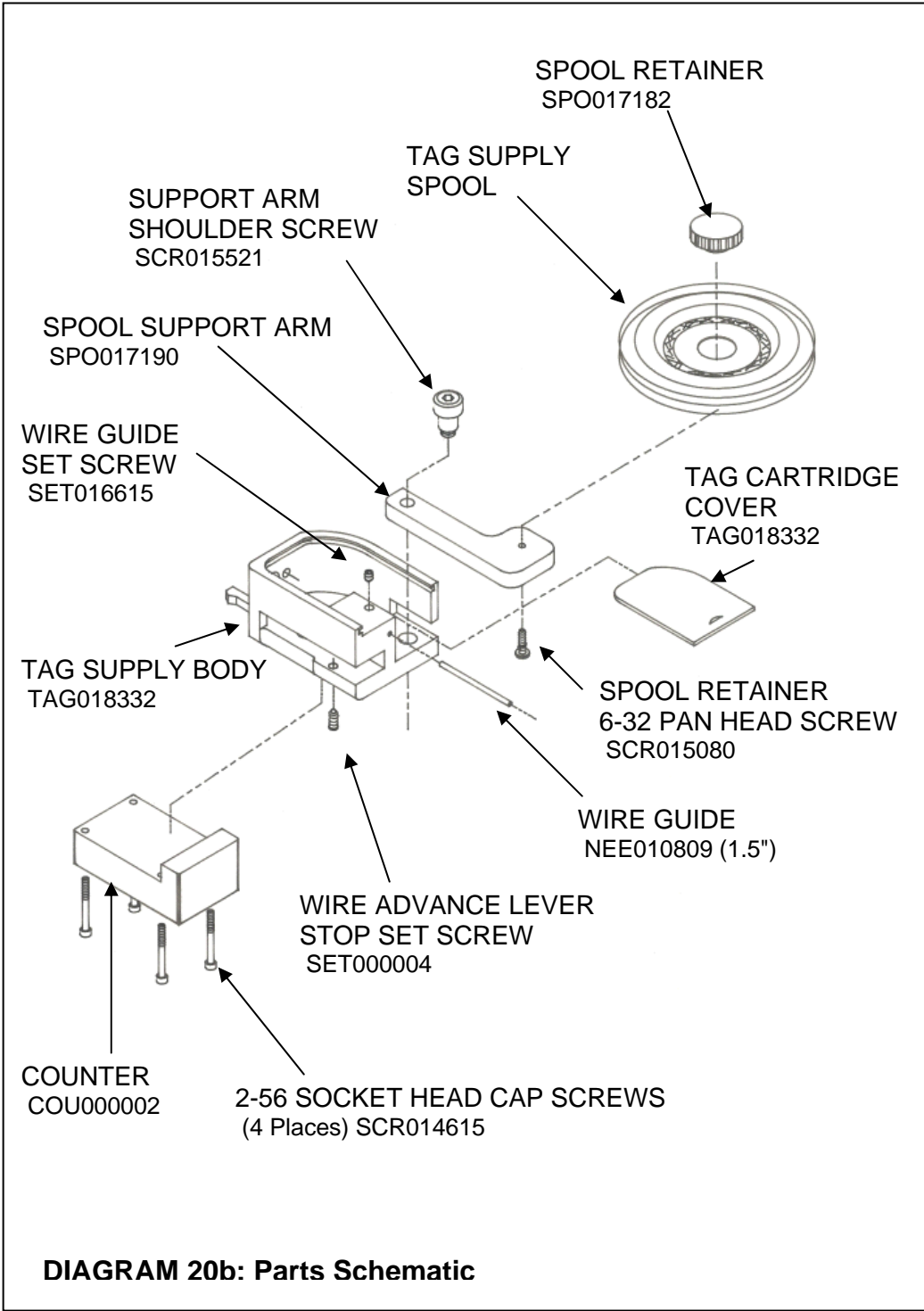
Injector Body





Supply Body





5

Tool Kit Contents

CWT Multishot Injector Tool Kit Materials List	
Item	Amount
Forceps (Stainless Steel 4 ½" Long)	1 each
Hard Wire Cutter	1 each
Hex Balldriver 3/32"	1 each
Hex Balldriver 5/64"	2 each
Hex Nutdriver 3/16"	1 each
Hex Balldriver 0.050"	1 each
Hex Wrench 1/8"	1 each
Loupe 5X	1 each
Needle with Ball, Non-Etched	1 package of 5 needles
Needle Nut with Support Tube	1 each
Parts Kit	1 each
Pin Vise with Reamer	1 each
Pushwire Assembly	1 each
Ratchet for producing 1.5 length tags	optional
Screwdriver Medium Blade	1 each
Sharpening Slipstone	1 each

Contacting NMT

NMT strives to provide the highest quality tagging systems for research and management. We offer free consultation on the suitability of available methods for specific purposes.

Corporate Office

For information on prices, delivery times, and for assistance on any questions or problems relating to our equipment for use in any location outside of Europe, Africa and Asia please contact our main office:

Northwest Marine Technology
Corporate Office
P.O. Box 427, Ben Nevis Loop Road
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E-mail: office@nmt.us
Support: techsupport@nmt.us
Web Site: <http://www.nmt.us>

Biological Services

For biological questions relating to the suitability of methods for various species and life stages, please contact our biological services office:

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Europe and Africa

For general inquiries, including those relating to biology and fisheries management, and orders for equipment and supplies to be used in Europe and Africa, please contact:

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