



*Providing Instrumentation and
Apparatus for Cellular Research,
Intraoperative Recording, and
Microneurography; Micro-
electrodes, Micropipettes, and
Needles to the Neuroscience
Community for 30 years.*

Micro-Step Multi-Drive Manifolds

50-15-4(iin): 4 Electrode Manifold

50-15-5(iin): 8 Electrode Manifold



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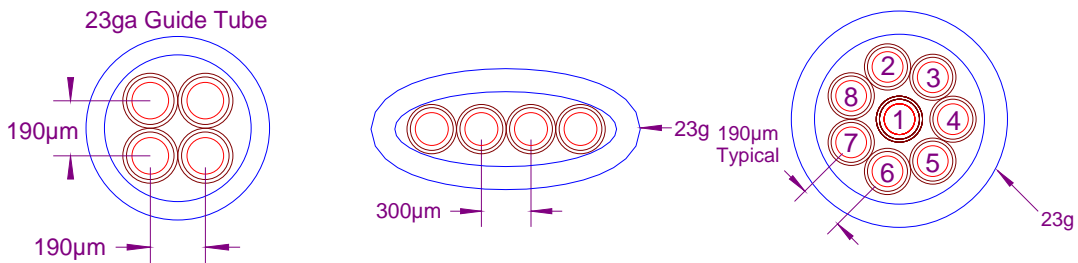
1 Operational Manual

1.1 Features

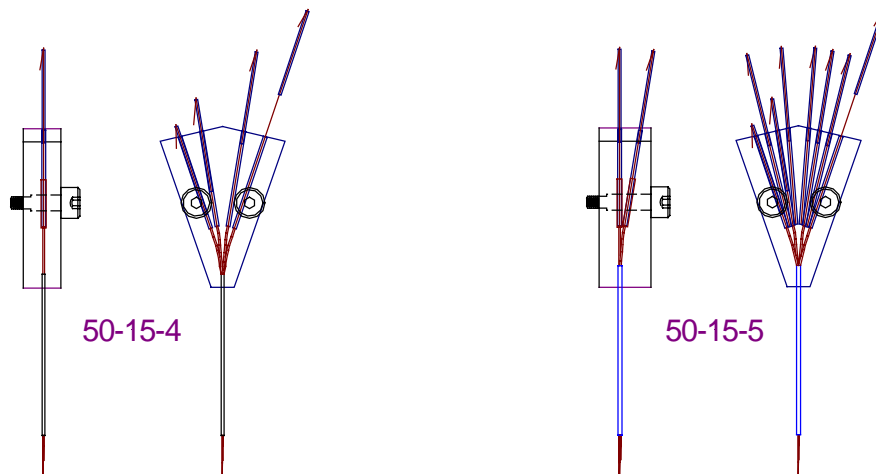
- All Manifolds are fully customized to suit the investigator's experimental needs
- Relatively low unit price allows the investigator to purchase multiple manifolds, each specially configured for specific experimental goals
- Allows the use of most standard FHC, and other, microelectrodes to keep operating costs to a minimum
- Manifolds can be configured to use almost any style microelectrode which has proven itself to work well for your experimental applications
- Microelectrode spacing as close as 190 microns
- Microelectrodes can be replaced individually by the investigator as they become worn or damaged
- Connector and pin-out arrangements can be fully specified
- Manifolds may be sent back to FHC for reloading and quick turn-around

1.2 Description

There is no stock or standard manifold. FHC will work with the investigator to settle on a manifold configuration which best suits his or her needs. All manifold catalog numbers end with the investigator's initials and a version / revision number. While there are some production related limitations, most conceivable tip configurations can be manufactured.



FHC manifolds come in two varieties, the four electrode **50-15-4(iin)** which is to be used with the 50-15-2 **micro-step Multi-Drive** and the eight electrode **50-15-5(iin)** to be used with the 50-15-2 and the 50-15-3 **micro-step Multi-Drive +4**. Either kind of manifold can be used, however, with either the four or the eight electrode system. All manifolds can be reloaded by the investigator to replace individual microelectrodes as they



become worn or damaged. For the larger configurations, reloading can be done quickly and easily, as the configurations get smaller (and smaller diameter microelectrodes are used) a

magnifying glass or stereo microscope may be necessary. See section 1.5 Illustrative Procedure for detailed instructions on loading and mounting manifolds.

1.3 Technical Summary

1.3.1 Specifications

Manifold Body: The body of the manifold consists of a molded Acrylic plastic resin

Electrode Tracks: Each electrode is completely contained in it's own path consisting of polyimide tubing. The tubing runs the entire length of the guide tube and is selected for a tight fit, for the type of electrodes to be used, to help reduce backlash.

Termination: The electrodes are terminated with a length of stainless steel tubing hereafter called an electrode guiding tube. The end of the electrode is sharply bent over the top of this tube to prevent any relative movement once the electrode depths have been set.

Expected duration: FHC Manifolds are delicate in nature, if treated with care, however, they should last indefinitely.

Mounting Hardware: FHC Manifolds are mounted using the two 4-40 shoulder cap screws provided. They bolt onto the base of the 50-15-2 positioner as detailed later in this manual and in the 50-15-2/3 instruction manual. Screw length varies from the four electrode manifold to the eight electrode manifold

Weight: 50-15-4 – About 3 grams (0.1 Oz.), 50-15-5 – About 6 grams (0.2 Oz.)

Cleaning: FHC Manifolds can be thoroughly cleaned in a mild detergent, Guide Tube may be dipped into Alcohol for sterilization purposes.

1.3.3 Components / Accessories

Components:

50-12-4(iin): The Four electrode manifold comes ready to use, with all the equipment needed to mount and use your manifold immediately.

- 1) Manifold Body and guide tube to specifications
- 2) 4 microelectrodes to specifications preloaded and terminated
- 3) 2 #4-40 shoulder cap screws for mounting your manifold P/N Z6-22-02
- 4) Allen wrench tool for mounting your manifold P/N Z6-28
- 5) Allen wrench tool for tightening the collets P/N Z6-25
- 6) Foam insulated packaging for storage of your manifold when not in use
- 7) This manual containing a production drawing showing dimensions and materials used in the construction of your specific manifold. The (iin) signifies the customers initials and the manifold version number and is used by FHC to reference this included drawing. See section #3.

50-12-5(iin): The Eight electrode manifold comes ready to use, with all the equipment needed to mount and use your manifold immediately.

- 1) Manifold Body and guide tube to specifications
- 2) 8 microelectrodes to specifications preloaded and terminated
- 3) 2 #4-40 shoulder cap screws for mounting your manifold P/N Z6-22-05
- 4) Allen wrench tool for mounting your manifold P/N Z6-28
- 5) Allen wrench tool for tightening the collets P/N Z6-25
- 6) Foam insulated packaging for storage of your manifold when not in use
- 7) This manual containing a production drawing showing dimensions and materials used in the construction of your specific manifold. The (iin) signifies the customers initials and the manifold version number and is

used by FHC to reference this included drawing. See section #3.

Accessories:

50-15-6-xx: Manifold Reload Guiding Tube kit, contains 12 Stainless Steel Guiding Tubes cut to the appropriate length (0.90"/23mm) and deburred. Note: Due to the large variety of manifold configurations available, various sizes of tubing will be required. For the complete catalog number for your manifold please refer to section #3.

UEXXXXXXXXXX: FHC Metal Microelectrodes,
See section #4 for ordering and pricing information regarding FHC microelectrodes. Microelectrodes are sold in boxes of 12 (you get 1 extra tube and pin when using the Reload kit above). In general only some kinds of electrodes will work with any given manifold. Information regarding what type of electrodes your manifold will accept is given in section #3. Any X's seen here indicate that you may choose any of the options available, if a character is not an x however this indicates that you must use an electrode with that feature.

Replacement parts:

Z6-28-02: 5/64" Hex Key Tools for mounting Manifolds
Z6-25-02: 0.035" Hex Key Tool for tightening collets
Z6-22-02: Mounting Screw, 1/8" Shoulder for 50-15-4 Manifolds
Z6-22-05: Mounting Screw, 3/8" Shoulder for 50-15-5 Manifolds

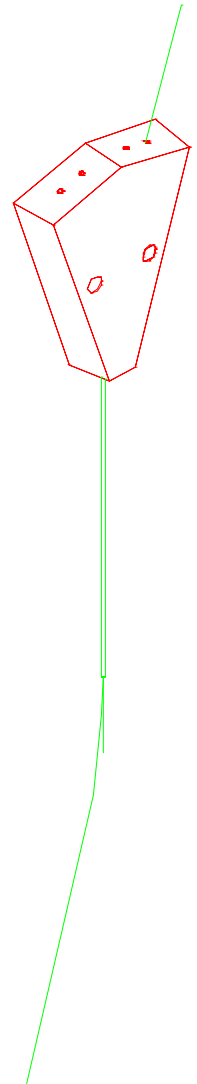
1.4 Illustrative Procedure

50-15-4/5 micro-Step Multi-Drive Manifold Loading Procedure

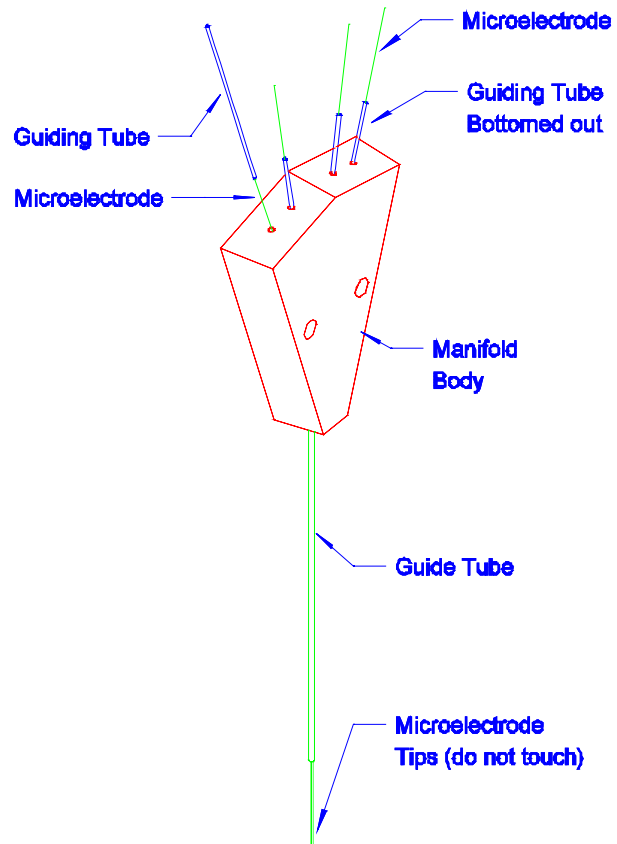
The following procedure assumes that you're loading a 50-15-4 four electrode manifold, the procedure for the 50-15-5 eight electrode manifold would be a straight forward extension of the procedure below.

Equipment Needed:

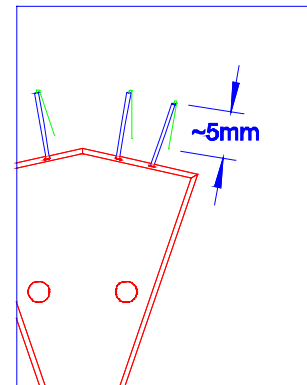
- a. Four Electrodes of the appropriate length and diameter, stripped of insulation for at least the last 2 cm.
 - b. Four Stainless Steel Tubes de-burred on both ends. The tubes should be 23mm (0.90") long. The correct tubing gauge varies with manifold configurations.
 - c. Stereo Microscope (recommended), or magnifying glass
 - d. Needle nose tweezers
 - e. A sharp pair of surgical scissors or diagonal wire cutters
-
1. Backfill the electrodes from the end of the guide tube back through the manifold until they emerge out of the top of the manifold. It is helpful at this stage to use a stereo microscope or magnifying glass, to aid in inserting the back end of the electrode in the appropriate tube. You may encounter some slight resistance in sliding the electrode through when the end of the electrode gets to the bend in the manifold, but slight force (use tweezers if necessary to grip the micro-electrode) will not damage the manifold. Be careful while doing this not to bend the electrode or touch the tip. If the electrode does become kinked it may still be good for other uses but it will not be usable in the multi-drive as it will be near impossible to backfill into the manifold.



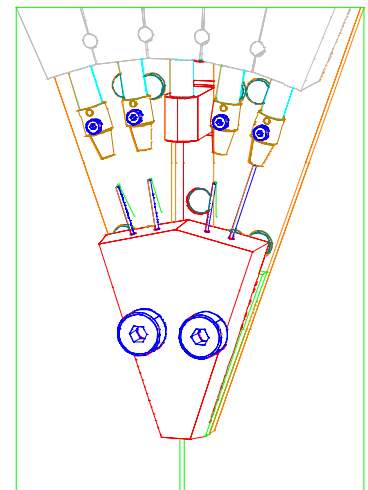
- Once the electrodes have been backfilled slide the stainless steel Guiding tubes over the back end of each microelectrode, down into the Manifold until they bottom out.
- Mount the manifold onto the multi-drive and retract all four drives until they hit the rear limits. Then advance all four drives the distance you want the electrodes to be recessed into the guide tube during insertion into the preparation. FHC recommends 1 to 2 mm to protect the electrode tips. Then advance all 4 drives another 6 mm to compensate for the depth of the holding collets.



- Using tweezers, position each electrode in turn so that the tip is even with the end of the guide tube. Eyeballing this is close enough at this stage, as final adjustments will be made later. The Back of the electrode can be bent out of the way of the collet.
- Slide each Guiding Tube out of the manifold in turn until it's just even with the bottom of the brass collet on the end of each piston. Be careful not to allow the electrode to move. Then sharply fold the stripped end of the electrode over the top of the Guiding Tube. Repeat this for all four electrodes.
- Using diagonal cutters or scissors cut off any excess length of electrode as shown in the diagram to the right, leaving about 5mm of electrode folded over at the top.



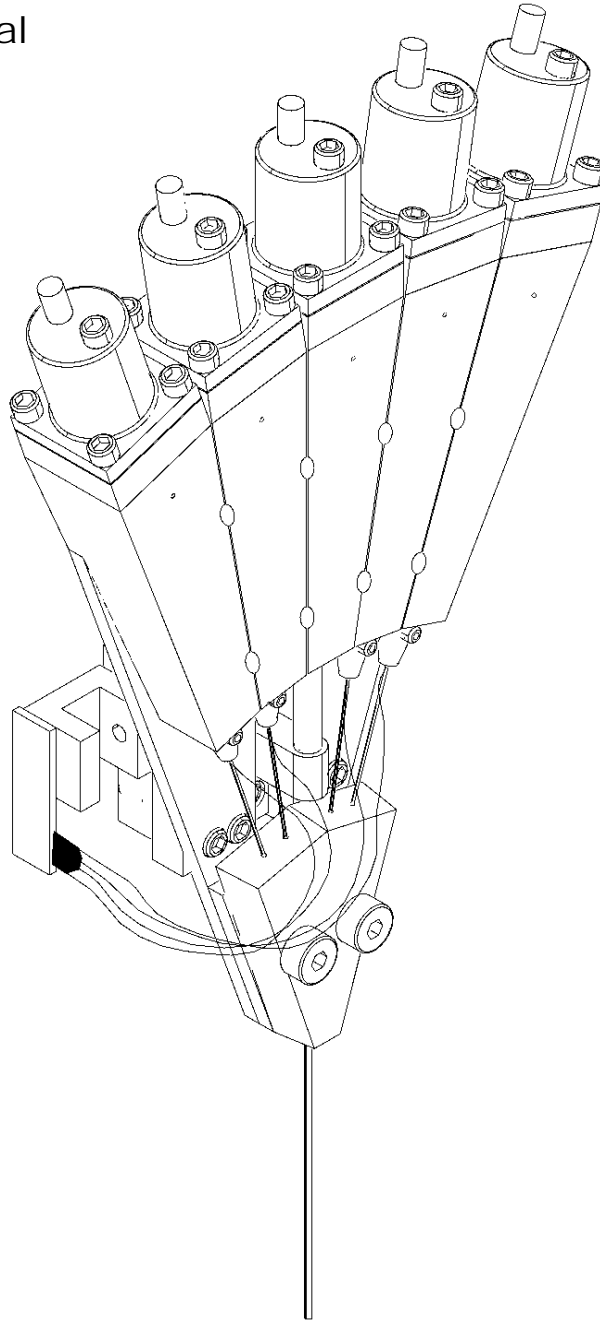
- The tips of the guide tube and all four electrodes should now be cleaned in alcohol, as any dust present on the electrodes prior to back-filling will have collected at the tip of the guide tube. It is recommended that you dip the end of the guide tube in alcohol and one by one manually extend each electrode in and out a few times by pushing and pulling on the guiding tubes. Allow the manifold to dry thoroughly.
- Mount the manifold and using tweezers if necessary, securely plug each of the male pins into the corresponding couplers and tighten the set screw



to hold it in place. As shown in the figure on the next page.

9. Using a stereo microscope focus in on the tip of the manifold guide tube. One at a time advance then retract each drive until the tip of the corresponding microelectrode is even with the end of the manifold guide tube. Be as exact as possible here, when the microelectrode is positioned correctly, push the zero button of the corresponding drive display.
10. Finally, retract all electrodes back into the guide tube until the rear limit switch is engaged.

2 Reference Manual



2.1 Reference Information

2.1.1 Packaging

FHC Manifolds are packaged and should be stored with the electrode tips retracted back into the guide tube. All Manifolds are shipped with electrodes pre-loaded. Replacement electrodes are shipped in boxes of one dozen. They will come pre-cut to the correct length. When ordering replacement electrodes FHC will need to know the catalog # of your manifold.

2.1.2 Mounting Instructions:

Instructions for mounting the manifold to the positioner can also be found in the manual provided with your 50-15-2/3 manual.

1. Load the Manifold with electrodes, as detailed above.
2. Plug the manifold into the **micro-Step Multi-Drive** (prior to mounting on preparation):
 - a. Fully retract all the pistons and bolt the manifold onto the platform using the two 4-40 shoulder cap screws and 5/64 hex key tool provided with your Manifold or the micro-Step Multi-Drive, these only need to be tight enough to prevent movement of the manifold during use.
 - b. One by one raise the Guiding Tubes away from the manifold and push them up into the collets. The smaller hex key tool provided with the manifold and the micro-Step Multi-Drive is for tightening the 2-56 set screws on the collets, which are used to secure the Guiding Tubes in the collets. These should be tightened only enough to solidly grab the tube and folded over electrode. If you have an eight channel system you will want to plug in the rear row of guiding tubes (1-4) first by retracting pistons 5-8 all the way and extending pistons 1-4 enough to gain access to the set screws.

Refer to the diagram at the heading of Section #2 for a view of a correctly mounted Manifold.

3. Align the electrodes (prior to mounting on preparation):
 - a. Using a magnifying glass or low power microscope (by eye is fine depending on accuracy needed for experiment) line up the tips of each of the electrodes in turn with the end of the manifold's guide tube. The electrodes can be lined up with one another if they have been left intentionally long.
 - b. Zero all the position readouts on the control module and then retract the electrodes about 1mm each into the guide tube. The displays will read about 9000 indicating -1mm.
 - c. Fully retract the main drive, or analogously fully extend the main drive piston.

2.1.3 Inspection

Carefully inspect the tips of the pre-loaded electrodes for any damage, they can be checked for impedance as well. When being stored the manifold should be returned to it's original packaging. Check that the guide tube(s) have not been bent and that the electrodes all slide smoothly.

2.1.5 Warranty

All FHC products are unconditionally guaranteed against defects in workmanship for one year from date of shipment as long as they have been exposed to normal and proper use. Even though the one year warranty may have expired, please contact our Service Department before attempting any repairs or alterations. Many of these repairs will still be performed at the factory at no charge to the customer.

2.1.6 Policies

TECHNICAL SUPPORT: It is our policy to provide our customers with the most comprehensive technical support in the industry. If any questions arise or problems occur, we encourage you to call or write and we promise to promptly and comprehensively respond to your requirements.

2.1.7 Service

Should repair or replacement be required, please contact our Service Department for return instructions (207-666-8190). Carefully pack the manifold before returning. Save any packing retainers for future use.

Please include a note indicating:

- 1.The catalog number and purchase date of the manifold.
- 2.The person to contact if questions arise.
- 3.The "symptoms" indicating that repair is necessary.

If the manifold is not covered by the warranty, a quotation will be forwarded to the sender detailing the repairs necessary and charges, before repair is begun. Due to the fragile nature of the manifolds, in many cases it will be necessary to replace the manifold rather than repair it. If the Manifold is determined to be beyond repair FHC will either replace it at no charge to you or inform you of the replacement price.

2.3 Operational Information

Eventually after having used a manifold you will need to replace one or more of the electrodes. The manifold must be removed from the positioner to do this. Pull the worn electrode out from the top of the manifold and cut the wire to the connector as close to the pin as possible. If the pin was soldered on, cutting the wire may not be necessary. Load in a new electrode by following the instructions under section **1.4 Illustrative Procedure**. Note that eventually as the electrodes continue to be changed the wiring to the connector will become too short. When this happens a new connector will need to be made. Contact our service department and FHC will provide you with one.