QUALITY INSPECTION SUMMARY

We have made every effort to manufacture this instrument to the highest quality standards. All assemblies have been thoroughly tested and inspected at the factory as follows:

Initial Assembly Inspection	_____	☐
Initial QC Inspection/Calibration	_____	☐
24 Hour Burn-In	_____	☐
Final Performance Inspection	_____	☐

Packaging Inspection Initials: _____ Date: _____

Items included with any catalog number may be labeled and packaged separately in shipping carton.

Description	**Quantity**	**Checked**	
50-16-4-01 4 Motor Control Module (MCM-4)			
Containing:			
Controller Module		_____	☐
Accessory Kit		_____	☐
50-16-4-02 5 Motor Coupling Unit (MCU-5)		_____	☐
Containing:			
Coupling Unit		_____	☐
Accessory Kit		_____	☐
50-16-4-03 4 Motor Coupling Unit (MCU-4)		_____	☐
Containing:			
Coupling Unit		_____	☐
Accessory Kit		_____	☐

DECLARATION OF CONFORMITY

We, FHC, Inc., 1201 Main Street, Bowdoin, Maine 04287, telephone number 207-666-8190, fax number 207-666-8292, declare under sole responsibility that the product:

(check all that apply)

50-16-4-01 MCM-4	Serial #_____	☐
50-16-4-02 MCU-5	Serial #_____	☐
50-16-4-03 MCU-4	Serial #_____	☐

to which this declaration relates, is in conformity with the following standards:

EN292, Parts 1 & 2

Following the provision of the machinery (89/392/EEC) Directive:

EN60127-1, EN60320-1, EN60204-1

Following provisions of the Low Voltage (73/23/EEC) Directive.

The Technical Construction File is maintained at:

1201 Main Street
Bowdoin, ME 04287

DATE OF ISSUE: _____

PLACE OF ISSUE: Bowdoin, ME

SIGNED: _____
Frederick Haer

"Innovation through collaboration"

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

Multidrive Components

50-16-4-01 MCM-4 Controller Module
50-16-4-02 MCU-5 5 Motor Coupling Unit
50-16-4-03 MCU-4 4 Motor Coupling Unit

microTargeting™

neurocraft™

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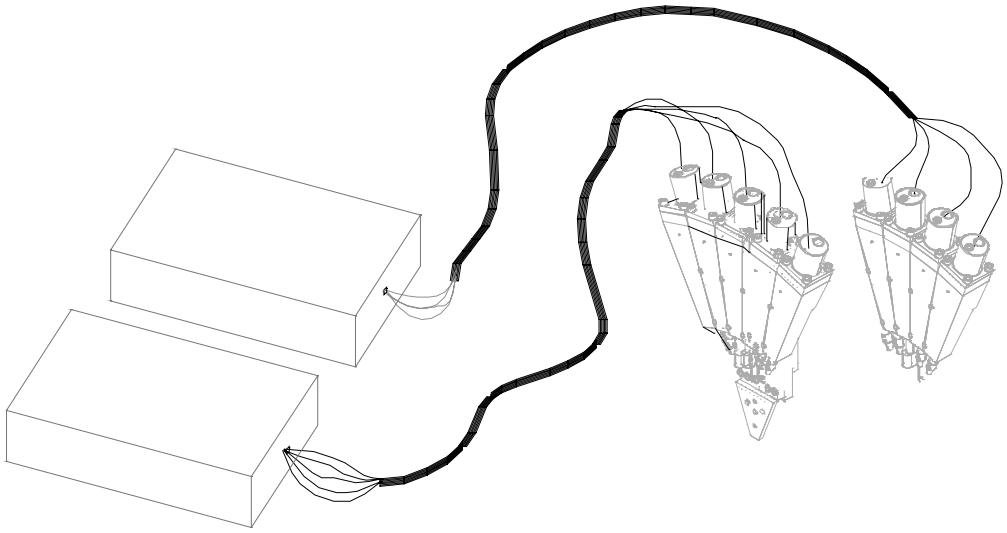
FHC Europe
(TERMOBIT PROD srl)
129 Barbu Vacarescu Str,
Sector 2
Bucharest 020272
Romania

L005-18B

50-16-4-02 and 50-16-4-03 Special Handling Instructions

The items contained under these catalog numbers are connected by hydraulic lines and couplings. Use caution not to pull or tangle the lines when removing and unwrapping the modules from their shipping material and carton.



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Manual A994: Multidrive Components
50-16-4-01 MCM-04
50-16-4-02 MCU-5
50-16-4-03 MCU-4

0 Declarations

0.1 *CONDITIONS FOR USE*

Intended Use

The Multidrive components described in this manual allow the neuroresearch investigator precision positioning capabilities for configurations of 4 or 8 electrodes (Larger configurations available as technology progresses.) It is not approved for use on human patients.

Warnings

The Multidrive components should not be disassembled beyond their major assemblies. Any disassembly beyond this may affect function and calibration. If repair is required please contact FHC at (207) 666-8190 for evaluation and to secure a return authorization number if necessary.

Storage Precautions

Store at normal room temperatures between -34°C (-29°F) and 57°C (135°F). Do not expose to temperatures below -39°C (-29°F) or greater than 70°C (158°F), or a relative humidity of less than 10% or more than 100%, including condensation, or an atmospheric pressure less than 500hPa or greater than 1060hPa for long-term storage.

Sterilization

None of the Multidrive components are designed for sterilization. Any attempt to sterilize them may result in malfunction or component failure.

Handling

While a high degree of durability has been designed into the components, care should be taken not to drop them. Do not force any of the connections. Place all cables and leads where they will not be inadvertently pulled or tangled.

0.2 *SYMBOLS USED*

↑

RETRACT: This symbol is used to indicate that the direction of travel is toward the rear limit (retracting from the target) on the DRC-01 and VRC-01.

↓

ADVANCE: This symbol is used to indicate that the direction of travel is toward the forward limit (advancing to the target) on the DRC-01 and VRC-01.

For additional explanations on the functionality of the DRC-01 and VRC-01, refer to sec. 1.6.2 of manual A992.

1 *OPERATIONAL MANUAL*

1.1 *FEATURES*

- Functions in conjunction with the MCM controller of the Motorized Microdrive (#50-16-1) to position up to 8 electrodes in synchronous or independently controlled combinations.
- Expandable modular design. Ability to expand to more than 8 electrodes as technology develops.
- Electrode stage separated from motor stage of the MCU-5 or MCU-4 by 2.5m (8') hydraulic line eliminating artifacts due to motor noise or vibration.
- Variable step length - In step mode, 1, 5, and 10 step lengths are available.
- In continuous mode, rates between 1 and 500 microns/sec. are available.
- Position is read from a precision magnetic encoder attached to the motor.
- Controlled via hand-held Push Button Remote (DRC-01), Knob Function Remote (ARC-01), or PC-controlled through Virtual Remote software (VRC-01), operated via a provided serial port and cable.
- Enabling/disabling the channels performed by remote or front panel switches. Front panel only when using the ARC-01 remote.
- MCM-4 module will stand alone on a desktop, or can be mounted in an optional frame for instrument rack use.
- Compact MCU-5 or MCU-4 Motor Coupling Unit is separated from MCM-4 via 3.1m (10') cable (other lengths can be specified) to allow for noise reduction and commutator applications.
- Power output for convenient "daisy-chaining" of other NeuroCraft stand-alone modules.

1.2 ***DESCRIPTION***

The MCM-4 motor controller module and MCU-5/MCU-4 motor coupling units are used to expand the 50-16-1-01 MCM of the Motorized Drive to position up to 8 electrodes in independent and synchronous combinations. Future expansions will be possible as technology develops.

The MCM-4 controller easily connects to the MCM with the provided communication cable through ports on the rear of the unit. The MCM-4 is used to control the four electrode positioning motors of the MCU-5, or an MCU-4 when more than four channels are used. A dedicated cable from the MCU-5 is connected to the motor port on the MCM to control a main drive channel for positioning all the electrodes and guide tube simultaneously.

The MCU-5 consists of a remote motor unit containing 5 encoder-read stepper motors that drive five hydraulic master cylinders. The master cylinders are connected to the 5 cylinders of the electrode positioning stage by 2.4 m (8') of hydraulic tubing. The MCU-5 is separated from the control module by 3.1m (10') of cabling. (Other lengths of cable and tubing may be specified.) The remote separation of the MCU-5 eliminates artifacts due to mechanical vibration and electrical noise from the motors. Another advantage of this setup is that the electronic cable can be connected through a commutator if the apparatus holding the preparation must be able to move, e.g. rotate.

The MCU-4 is identical to the MCU-5 except for an absence of the main drive channel. The MCU-4 is used to add an additional four drives directly to the MCU-5 setup. The electrode positioning stage of the MCU-4 directly attaches to the face of the MCU-5 electrode positioning stage. An additional MCM-4 controls these drive channels.

The components are operated using one of the three MCM hand-held remote controls. The DRC-01 remote can be used to control the mode, direction, and rate of travel, as well as setting the zero reference point utilizing membrane-type push buttons. The DRC-01 is also capable of enabling and disabling the drives on the remote in the Special Function mode. The ARC-01 Remote uses a spring-loaded knob to position the drive. Rotating the knob from its center position causes the drive to retract or advance. The distance from center determines the rate up to 500 microns/sec. The "Zero" button on the remote sets the reference position. Enabling and disabling the individual drives can be accomplished using switches on the front panel with either remote. Computer operated positioning and selecting can be accomplished via our VRC-01 virtual remote software kit. The VRC-01 performs all the functions of the DRC-01 through a PC (Windows 95, 98, 2000, NT compatible).

FHC offers as an accessory the SAF rack frame (cat # 55-11-0) for conveniently installing the Multidrive components into a standard instrument rack.

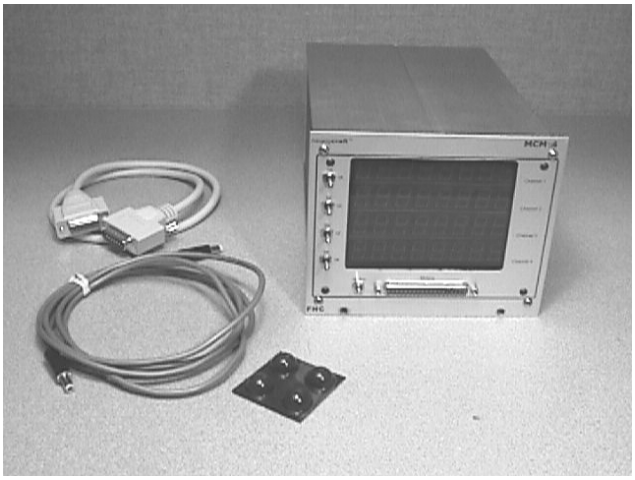
1.3 ***OPERATING ENVIRONMENT***

The Multidrive components have been designed to operate in a typical laboratory setup. They should be placed on a flat surface that is level and free from contaminants and vibration.

1.4 *INVENTORY*

1.4.1 *ITEMS DESCRIBED IN THIS MANUAL*

Systems are ordered from the following:



1 ea. (Additional required for more than 4 channels) 50-16-4-01 MCM-4: 4 Motor Controller Module

Includes: MCM-4 Motor Controller Module

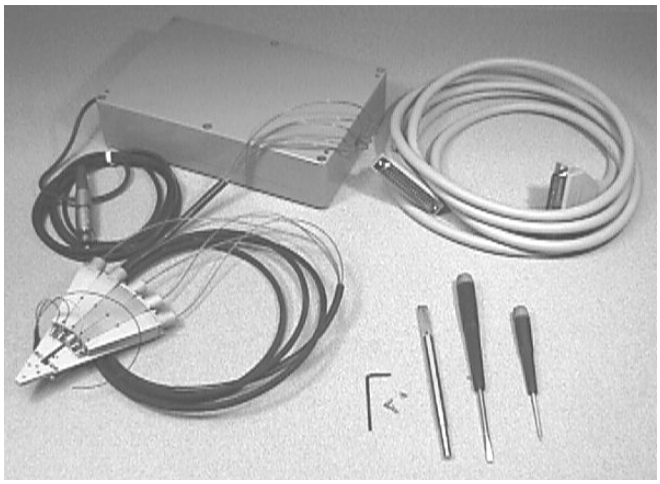
Accessory Kit Includes:

Power Transfer Cord

DB15 Communication Cable

A994B Manual (Not shown)

4 rubber feet (Use Optional)



1 ea. 50-16-4-02 MCU-5: 5 Motor Coupling Unit

Includes: MCU-5 Coupling Unit

Accessory Kit Includes:

DB37 Motor Cable

Flat Head Hex Handle Driver

5/64” Hex Key

.035” Hex Handle Driver

4-40X1/16” Set Screws (4ea.)

Stereotaxic Mounting Rod

2-56X1/8” Cap Screws (2 ea.)

.050” Male Omnetics Connector Strip (Not Shown)

1 ea. (For 8 channel systems only) 50-16-4-03 MCU-4: 4 Motor Coupling Unit

Includes: MCU-4 Coupling Unit

Accessory Kit Includes:

DB37 Motor Cable

Flat Head Hex Handle Driver

5/64” Hex Key

.035” Hex Handle Driver

4-40X1/16” Set Screws (4ea.)

2-56X1/2” cap screws (4 ea.)

2-56X5/8” cap screws (4 ea.)

.050” Male Omnetics Connector Strip (Not Shown)

1.4.2 *ADDITIONAL ITEMS REQUIRED FOR OPERATION*

The following additional items are ORDERED SEPERATELY:

1 ea. 50-16-1-01 MCM Motor Controller Module

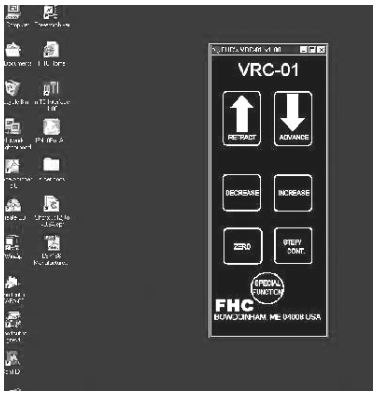
1 ea. (2 ea. for 8 channel systems) 55-00-1 12V Desktop Power Supply

1 ea. (2 ea. for 8 channel systems) 66-EL-LC-XXX Line Cord (Country specific see sec 2.1.4 of this manual for catalog number)

1ea. from the following remote options:

50-16-1-03 DRC-01 Remote Control

50-16-1-04 ARC-01 Remote Control



50-16-1-05 VRC-01 Virtual Remote Software

Includes:

55-00-4 Serial Cable (Not shown)

1 ea. from the following manifold configurations (Please contact Technical Services at (207) 666-8190 for specification information.

50-15-4 4 Electrode Manifold

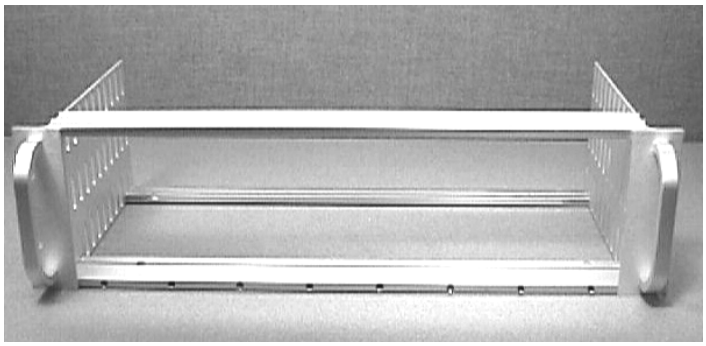
50-15-5 8 Electrode Manifold

1.4.3 *REPLACEMENT ITEMS*

50-16-4-10	MCM-4 Accessory Kit
50-16-4-20	MCU-5 Accessory Kit
50-16-4-30	MCU-4 Accessory Kit
55-00-1	12V Desktop Power Supply
55-00-2	Power Transfer Cord
66-EL-LC-XXX	Line Cord (Country specific see sec. 2.1.4 of this manual for catalog number)
55-00-5	DB15 Communication Cable
55-00-6	DB37 Motor Cable

1.4.4 *OPTIONAL ACCESSORIES*

The following accessories are available:



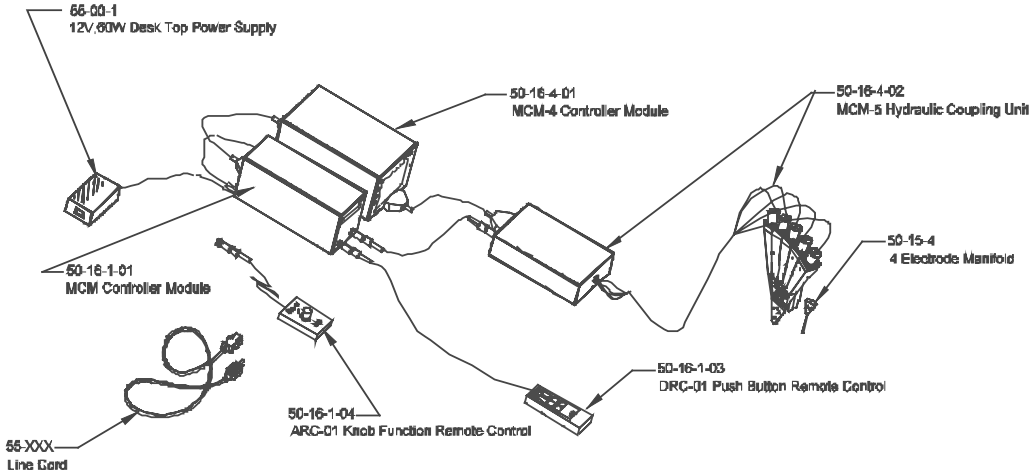
55-11-0 SAF Rack Frame for Stand-Alone Modules

Not Shown:

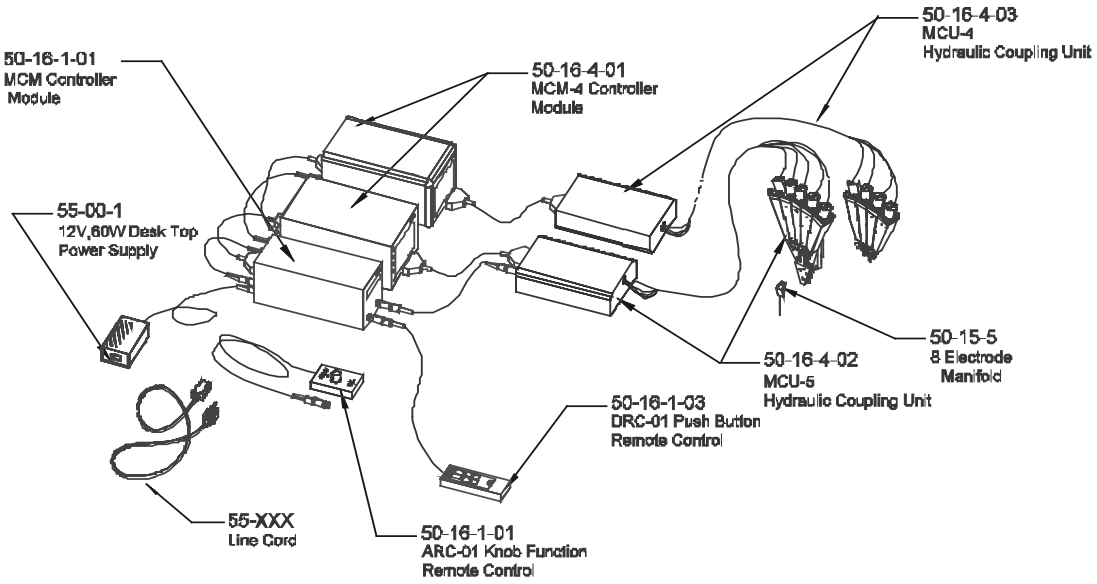
Micromanipulator System (ex. FHC 60 System Coarse Positioners)

1.4.5 ***SYSTEM CONFIGURATIONS***

4 electrode system:



8 electrode system:



1.5 *CONCEPTS*

1.5.1 *TERMINOLOGY*

There is no specialized product-specific terminology used in this manual.

1.5.2 *DESIGN DESCRIPTION*

The Multidrive components are used to expand the functionality of the Motorized Microdrive components to independently control up to 8 electrodes. An embedded microcontroller is used in the MCM-4 controller module to digitally control and display movement of the electrode. Each drive channel of the MCU coupling units contains a stepper motor that drives a diaphragm of the hydraulic system via a plunger. An encoder attached to the stepper motor is used to display the position based on actual movement of the motor shaft rather than calculated steps. The electrode stage comprises a hydraulically coupled diaphragm that drives a spring loaded shaft. Electrodes are attached in collets at the end of these shafts. Electrical connection is made to the electrode via leads soldered from the collets to an omnetics connector. One drive channel of the MCU-5 is used to position the entire electrode stage simultaneously for coarse positioning.

1.6 *TECHNICAL SUMMARY*

1.6.1 *SPECIFICATIONS*

MCM-4:

Display: 8 characters, 1cm height, red, 1 micron resolution

Power Requirements: 85-265 VAC

Dimensions:

Height: 13cm (5.22")

Width: 10cm (4.20")

Length: 25cm (9.75")

Weight: 1.48 Kg (3.26 lbs)

Mounting Options: Tabletop, 4 rubber feet prevent sliding.

Rack mountable with SAF-08 Frame (Cat. #55-11-0 Available separately)

Mode of Operation: Step or Continuous (Selectable)

Continuous only when using ARC-01 Remote

Software: Windows 95, 98, 2000, NT compatible

Cable: Noise shielded 9 pin female DIN (both ends), straight through, 3m (9.8')

MCU-5:

Dimensions:

Height: 2.5cm (1")

Width: 8cm (3")

Length: 15cm (6")

Weight: .57 Kg (1.26 lbs)

Cable Length/Diameter: 3m length (9.8') X .35cm O.D. (0.14")

Connector: 9 pin indexed, color coded Blue with strain relief

MCU-4:

Dimensions:

Height: 2.5cm (1")

Width: 8cm (3")

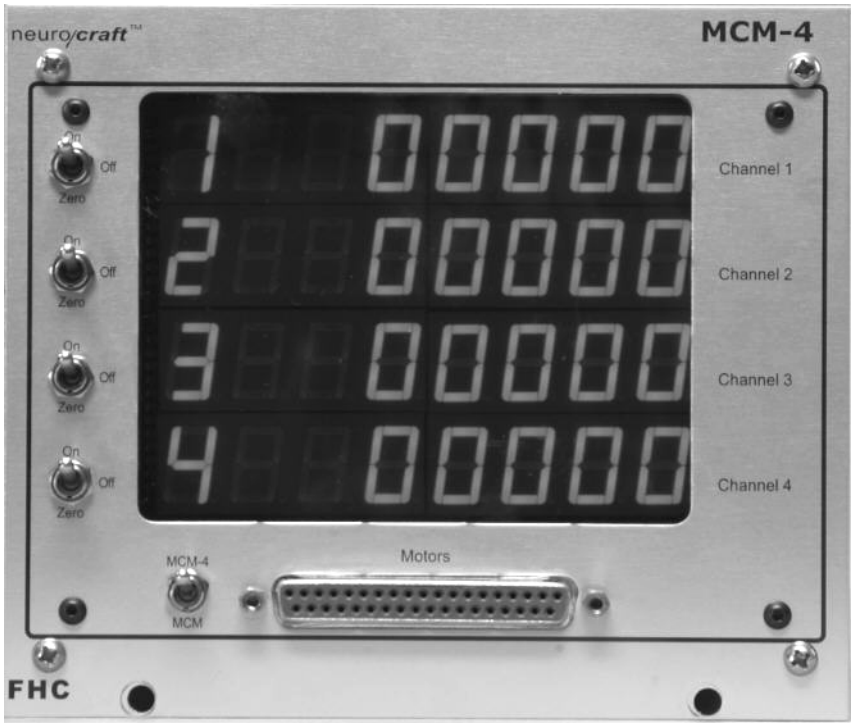
Length: 15cm (6")

Weight: .57 Kg (1.26 lbs)

Cable Length/Diameter: 3m length (9.8') X .35cm O.D. (0.14")

Connector: 9 pin indexed, color coded Blue with strain relief

1.6.2 ***CONTROLS/CONNECTORS***



Display –MCM-4 Front Panel:

Position Displays: 8 character display. The first two characters display the channel numbers (1-4 for Multidrive 4 configuration, 1-8 for Multidrive 8 configuration. Additional channels as technology develops.) The next character displays whether the position is negative or positive in relation to the user-referenced zero position. It displays a "-" when retracted past zero. The following five characters display the position in terms of the zero reference to a resolution of 1 micron.

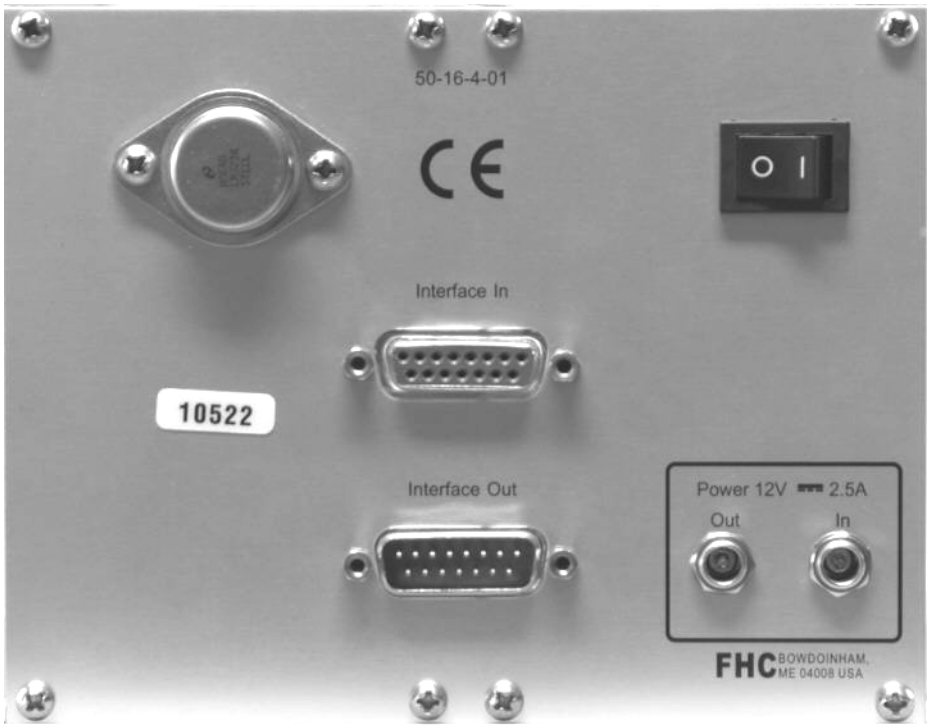
Controls – MCM-4 Front Panel:

On/Off/Zero: Three-position toggle switch used to enable, disable (On/Off), and set the zero reference position (Zero), of the individual drive channels from the front panel.

MCM-4/MCM: Two-position toggle switch used to switch between the main and individual drive channels from the front panel. All of the individual drive channels are simultaneously disabled if the switch is in the "MCM" position. If using more than one MCM-4, all are disabled by setting any one to "MCM".

Connections – MCM-4 Front Panel:

Motors: DB37 female connector for interfacing with the 4 individual drive channels.



Controls - MCM-4 Rear Panel:

0|I: Rocker switch used to activate power.

Connections - MCM-4 Rear Panel:

Power In: 2.1mm female socket. 12VDC 2A input.

Power Out: 2.1mm female socket. 12VDC pass-through outlet for daisy chaining of modules.

Interface In: DB15 female receptacle, for communications input from either MCM or additional MCM-4's

Interface Out: DB15 male receptacle, for communications output to additional MCM-4's

Connections - MCU-5:

Main Motor Cable: 3 meter (other lengths may be specified) 3/16" dia. Earth shielded, flexible cable with a 16 pin plug (color coded Blue).

Motors: DB37 female connector for interfacing with the 4 individual drive channels.

Connections - MCU-4

Motors: DB37 female connector for interfacing with the 4 individual drive channels.

1.6.3 *COMPATIBILITIES*

The Multidrive is provided with a mounting rod that is compatible for use with most commercially available stereotaxic mounting systems. (Kopf etc.) For questions on compatibility, contact the FHC Technical Services department at (207) 666-8190.

1.7 *ILLUSTRATIVE PROCEDURE*

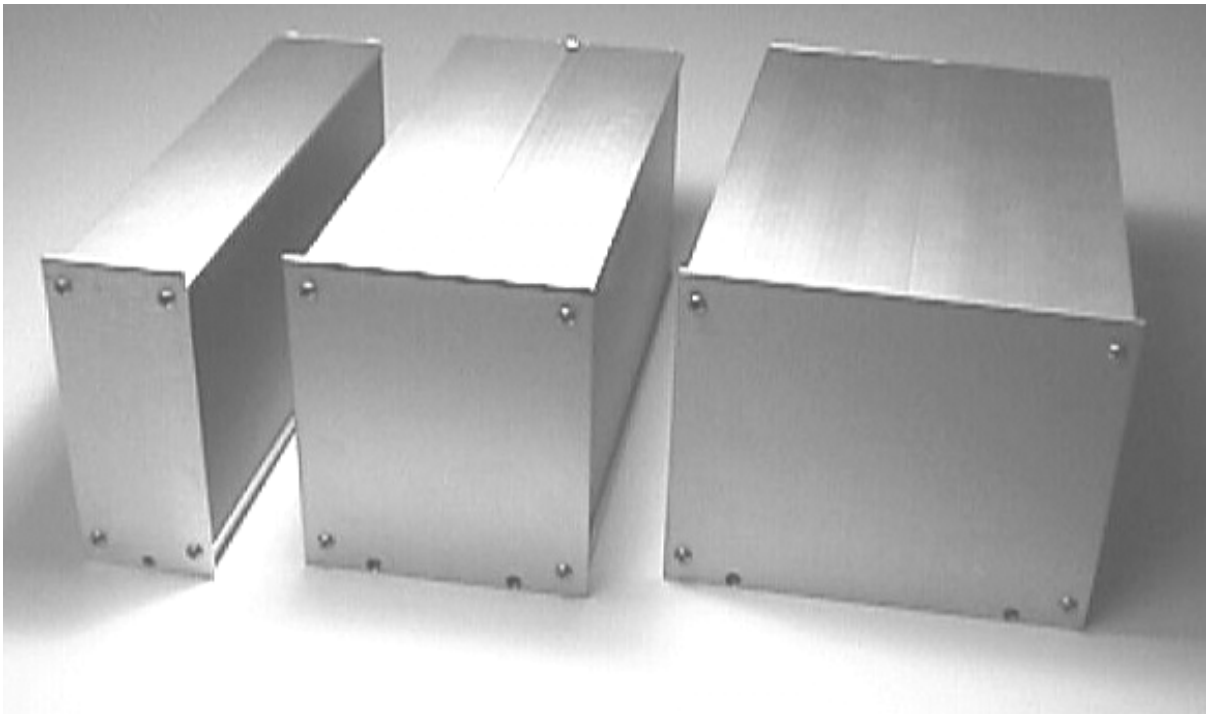
1. Set up the unit in a convenient manner, positioning all MCM-4's where displays can be easily seen. (see section 2.2 for complete installation instructions.)
2. Apply power to the MCM and all MCM-4's.
3. Install manifold per section 2.1.2 of manual A110
4. Enable the MCM-4 per section 2.3 of this manual.
5. Align the individual electrodes within the manifold and set to zero (See section 2.1.2 of manual A110 for detailed instructions.)
6. Attach the electrode stage of the MCU-5 to a stereotaxic or manipulator system.
7. Coarsely position the guide tube using the stereotaxic or manipulator system to a reference point. (Commonly just above the dura.) Zero the displays at this reference point.
8. If the target is within 15 mm, the individual channels can be positioned from this point. It is common practice to use the main drive channel to simultaneously position all electrodes to within 7-8mm, then use the individual drive channels to fine tune the target signal.
9. To position with the main drive channel, enable the MCM and set the zero reference per section 2.3 of this manual.
10. Position the main drive channel to within 7-8mm of target.
11. Enable the MCM-4.
12. Position the individual drive channels. It's common practice to use the continuous mode while searching for units, then using the step mode to fine-tune the signal. (See section 2.3 of manual A992 for detailed instructions on setting drive modes.)
13. At the end of the experiment, retract all drive channels back to their rear limit for storage. Remove from the stereotaxic or manipulator system.

2 *REFERENCE MANUAL*

2.1 *REFERENCE INFORMATION*

2.1.1 *PACKAGING*

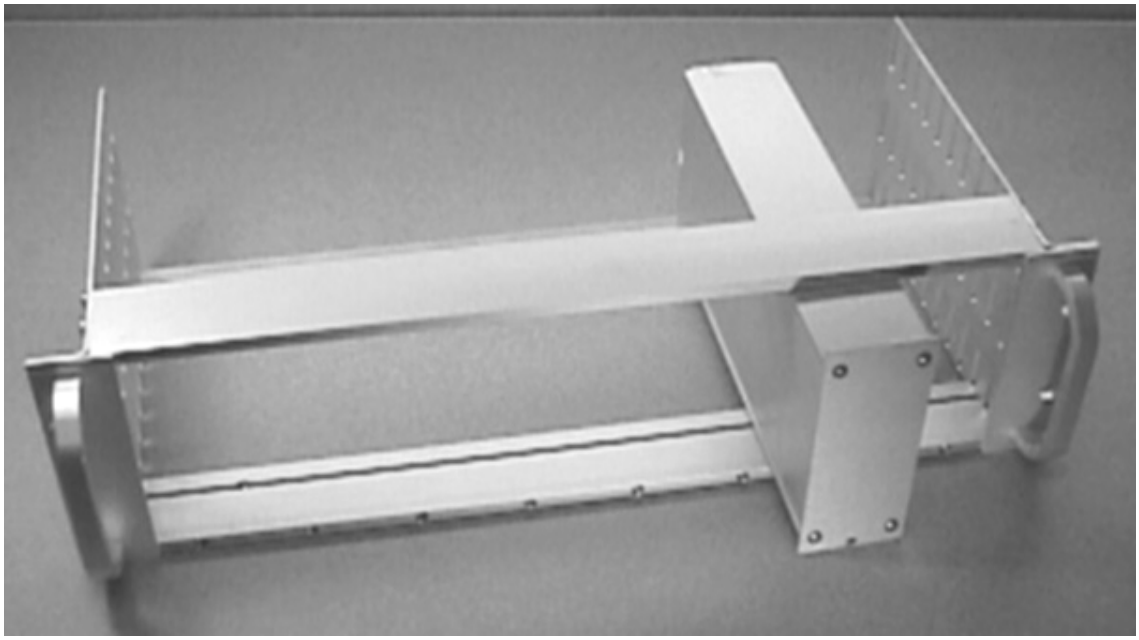
The stand-alone modules of the neuroCraft series instruments are packaged in metal cases, which consist of standard 5.25" high front panels. Front panel widths are specified as Type 2 modules (2.05" actual), Type 4 modules (4.15" actual), and Type 6 modules (6.25" actual) Front panels are mounted on extruded top and bottom panels. Flat side panels slide into slots in the extrusions, and are held in place when the back panel is secured into the extrusion. All modules are 9.75" in depth.



Type 2 Module Type 4 Module Type 6 Module

2.1.2 ***MOUNTING***

All stand-alone modules are completely encased and can be used without further mounting or hardware. Provided rubber feet may be used to protect surfaces from scratching. However, it may be suitable to group modules, and we have made provision for several configurations. The SAF Rack Frame for Stand-Alone Modules (cat #55-11-0) will hold up to eight Type 2 modules, four Type 4 modules, or two Type 6 modules and 2 ea. Type 2 Dress Panels (cat #55-11-1 use optional), while occupying only 3 rack units (5.25") vertically on a standard 19” instrument rack. Several combinations are available for all of the neuroCraft series stand-alone modules. For example an SAF frame could accommodate 3-Type 2, 1-Type 4, and 1-Type 6 within its 16" of horizontal rack space.



SAF Rack Frame For Stand-Alone Modules
(Shown with a neuroCraft Type 2 Module)

Dress Panels for SAF (Ordered Separately):

- 55-11-1 Type 2 Dress Panel

2.1.3 ***INSPECTION***

FHC Modules are factory checked and calibrated but should be carefully inspected upon receipt, before using, or activating power. If any exterior damage to the shipping carton is noted, the instrument(s) should be inspected for obvious physical damage. The contents of each package should be physically checked against the inventory list (sec. 1.3) to determine shortages or errors in inventory.

2.1.4 ***POWER CONNECTIONS***

All of the stand-alone modules in the NeuroCraft series are powered by a desktop 12V power supply. (input:100-240VAC, 50-60Hz, 1.7A output: +12VDC,5000mA) (Cat. # 55-00-1) An international pattern Line Cord (not shown) is ordered separately, and is specified by country per the catalog number. (See table below for catalog numbers.) Additionally, the power transfer cord (not shown) supplied with the NeuroCraft stand-alone modules can be used to "daisy-chain" the power between other instruments in the series from one power supply. The amount of modules powered from one supply is determined by the amount of current drawn by each module. Contact Technical Services at (207) 666-8190 for assistance.

66-EL-LC-AUS	Australia
66-EL-LC -CH	China
66-EL-LC -DAN	Denmark
66-EL-LC -EURO	Europe
66-EL-LC -ISR	Israel
66-EL-LC -ITA	Italy
66-EL-LC -JA	Japan
66-EL-LC -SAF	South Africa
66-EL-LC -SWI	Switzerland
66-EL-LC -UK	United Kingdom
66-EL-LC -USA	North America

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. Although 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***

1.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.TRADE-UP POLICY: It is our policy to offer customers trade-up ability as new and/or expanded capabilities for their instruments are announced. In many cases, full credit will be given. In general, we will allow 100% credit for two years and depreciate 20% per year thereafter. Please contact our Marketing Department for information relating to your particular situation.

2.1.7 ***SERVICE***

Should service be required, please contact our Service Department for a return authorization number and instructions (207-666-8190). Please have the model and serial number on hand (Both are located on the back panel). Carefully pack the instrument before returning.

Please include a note indicating:

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

If the instrument is not covered by the warranty, a quotation will be forwarded to the sender detailing the repairs necessary and charges, before repair is begun.

2.2 ***INSTALLATION***

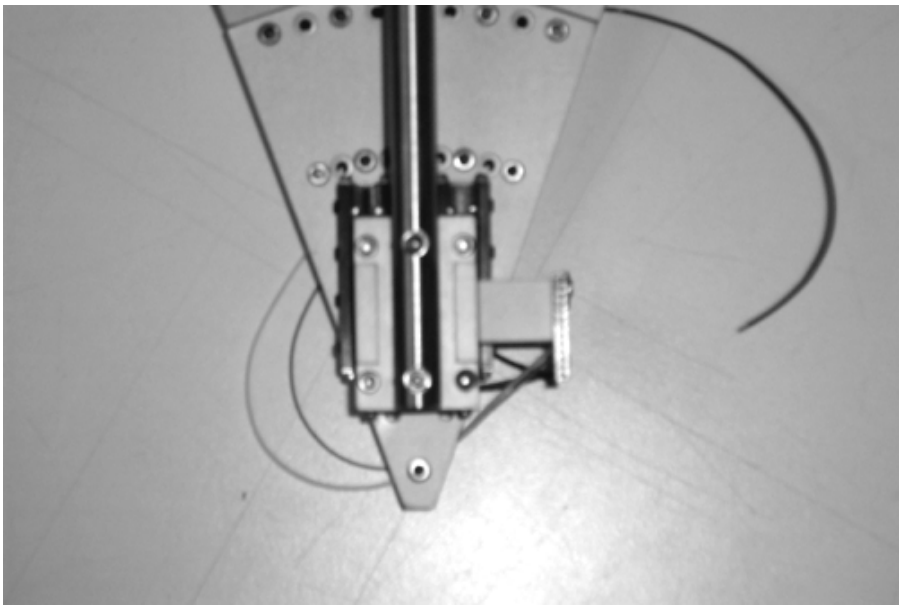
1. Reference section 2.2 of manual A992 for installing the MCM module and remote controls.
2. Ensure that all controller modules (MCM, MCM-4 etc.) are placed in a convenient spot for viewing the display.
3. Ensure that the motor stage of the MCU-5 (and MCU-4) is placed close enough to the preparation that the hydraulic line will not be stretched.
4. Route all wires as to prevent them from being pulled or tangled.
5. Ensure power switch on the back panel is in the "Off" position. (Indicated by the O side of the rocker switch pressed in.)
6. If powering from the desktop power supply:
    - Plug the power supply line cord into a properly grounded wall jack.
    - Install the 2.1mm plug from the power supply into the "Power In" jack on the back panel.

   If powering from another module:
    - Install the power transfer cord from the "Out" of the other module, to the "In" of this module.
7. Connect the communications cable from the "Interface In" socket to either the "MCM-4 Interface" socket on the back panel of the MCM, or the "Interface Out" socket on the back panel of another MCM-4. If the connection is made with the MCM, this module will drive the 1-4 drive channels. If the connection is made from the MCM-4 that controls the 1-4 drive channels, this module will drive the 5-8 drive channels and so on.
8. Connect the main motor cable from the MCU-5 to the MCM via the BLUE front panel socket labeled "Motor". Line up the red dot on the plug with the red dot on the socket. Plug will "snap" into the socket.
9. Connect the individual drive channel cable from the DB37 connector of the MCU-5 or MCU-4 to the appropriate MCM-4 DB37 front panel connector labeled "Motors". Orient the cable to fit into the connector, tighten the screws securely.

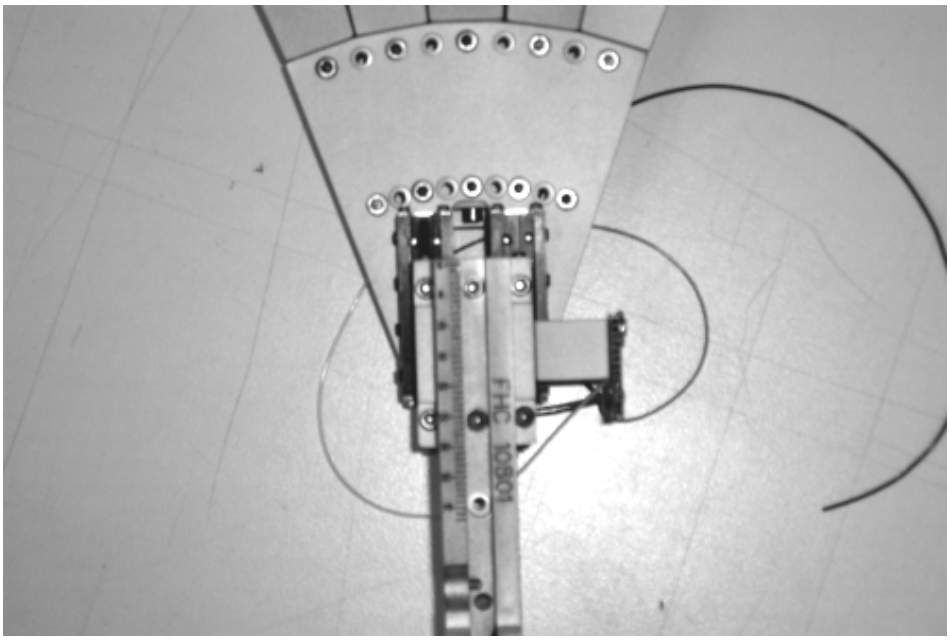
Mounting the electrode stage:

The electrode stage can be mounted to either the provided stereotaxic mounting rod, or an FHC 60-00-1 guide tube drive. See below for positioning.

View of Stereotaxic Mounting Rod:



View of 60-00-1 Guide Tube Drive:



Mounting the 50-16-4-03 MCU-4 electrode stage:

The MCU-4 electrode stage will need to be mounted to the 50-16-4-02 MCU-5 electrode stage if purchased separately as an add-on device. If purchased with an MCU-5, the stage will be factory installed.

1. Ensure that the main drive cylinder is at its retracted limit. Shaft will be fully extended at the electrode stage.
2. Insert the 2-56X1/2" cap screws (FHC #Z6-19) into the bottom row open holes in the back of the MCU-5 electrode stage. It may be necessary to loosen the adjacent screws slightly for them to fit.
3. Insert the 2-56X5/8" cap screws (FHC #Z6-19-02) into the top row of open holes in the back of the MCU-5 electrode stage. It may be necessary to loosen the adjacent screws slightly for them to fit.
4. Attach the MCU-4 cylinders to the front face of the MCU-5 using the above cap screws. The cylinders are arranged according to the color of the lead attached to the collet. L-R facing the front of the cylinders:
    1. Green
    2. Blue
    3. Violet
    4. Grey
5. Tighten all screws securely including any that were loosened to allow inserting the above cap screws.
6. Slide the provided piece of heatshrink over the exposed ends of the leads above.
7. Solder the leads to the omnetics connector in the same order as in #4 above starting with the pin next to the existing shrink-wrapped leads.
8. Push heatshrink down over the leads and pins. Heat to shrink.

2.3 ***FUNCTIONAL CHECKOUT***

1. Ensure the Multidrive components are installed correctly per section 2.2 of this manual.
2. Set the MCM-4/MCM switch on any MCM-4 front panel to "MCM".
3. Hold the RETRACT (↑) button down on the DRC-01 or VRC-01. Alternately, turn the knob of the ARC-01 counterclockwise.
4. If the main drive of the MCU-5 is currently at the rear limit, the display will read "↑R+00000" while the button is pushed. Reverse limit is indicated by an "R" second from the left when the RETRACT (↑) button is pressed
5. If the main drive was not previously set at it's rear limit, it will retract to it. (The MCM display will read in negative "-" numbers) When reached, the motor will stop, and the character second from the left will be an "R".
6. Press the ZERO button (for all remotes). Confirm that the display reads "→C+00000"
7. Hold the ADVANCE (↓) button down on the DRC-01 or VRC-01. Alternately, turn the knob of the ARC-01 clockwise.
8. Confirm that the display is counting forward, and that the main drive piston of the MCU-5 is moving back toward the top of the chamber.
9. Allow the drive to travel to the forward limit.
10. Confirm that the display reads "↓F+XXXXX" at the forward limit. Forward limit is indicated by an "F" second from the left when the ADVANCE (↓) button is pressed. The X's represent the total travel distance of the unit in microns.
11. Retract the main drive to the reverse limit.
12. Set the MCM-4/MCM switch on all MCM-4 front panels to "MCM-4".
13. Set all individual drive channel switches to "Off". Confirm that all the displays dim.
14. Set all individual drive channel switches to "On". Confirm that all displays are bright.
15. Hold the RETRACT (↑) button down on the DRC-01 or VRC-01. Alternately, turn the knob of the ARC-01 counterclockwise.
16. If the drives are at their reverse limit the displays will read "L 00000"

17. If any drive was not previously set at it's rear limit, it will retract to it. (The display will read in negative "-" numbers) When reached, the motor will stop, and the left character an "L".
18. Press the ZERO button (for all remotes). Confirm that all individual drive displays read "L 00000"
19. Hold the ADVANCE (↓) button down on the DRC-01 or VRC-01. Alternately, turn the knob of the ARC-01 clockwise.
20. Confirm that the displays are counting forward, and that the individual drive pistons are moving forward away from the top of the chambers.
21. Allow the drive to travel to the forward limit.
22. Confirm that the display reads "L XXXXX" at the forward limit. Forward limit is indicated by an "L" in the left character. The X's represent the total travel distance of the unit in microns.
23. Retract the drives to the reverse limit.
24. At a random location as the drives retract, stop movement and switch each individual drive switch to "Zero" then back to "On". Confirm that all displays are bright and that the counter's are reset to all 0's. Continue retracting to the limit.

For DRC-01 and VRC-01 use ONLY:

25. Press the "Special Function" button.
26. Confirm that the display of the MCM reads "Drive M"
27. Press the "Zero" button once. Confirm that all individual drive displays dim
28. Press the ADVANCE (↓) button once. Confirm that the display reads "Drive 1"
29. Press the "Zero" Button once. Confirm that the display changes from dim to bright.
30. Repeat steps 4 and 5 for all individual drives.
31. Press the "Special Function" button to return the display to drive mode.

2.4 *OPERATIONAL INFORMATION*

1. Reference manual A992 sec. 2.3 for detailed instructions on MCM and remote control functionality. The individual drives of the Multidrive function in the same manner as the Motorized Microdrive described in A992 when they are enabled.
2. Ensure that the components are installed correctly per section 2.2 of this manual.
3. Apply power to the MCM and all MCM-4's by pressing in the "I" side of the rocker switch located on the back panels of the modules. The position displays (the five right-most characters) will read "0".
4. The status (enabled/disabled) of the drive channels are initially determined by the front panel switches on power-up. The status is indicated by the display being bright (enabled) or dim (disabled).

Enabling/Disabling drives from the front panel:

1. To enable the main drive (MCM) using the front panel switches, toggle the MCM/MCM-4 switch to the "MCM" position. This will disable the individual drives (display will dim)
2. To disable the main drive and enable the individual drives (MCM-4), toggle the MCM/MCM-4 switch to the "MCM-4" position. (The main drive (MCM) display will dim when disabled.)
3. The drives can be enabled, disabled, and zeroed using the "On/Off/Zero" toggle switches to the left of the corresponding drive channels on the front panel of the MCM-4.

Enabling/Disabling drives through the "Special Function" (DRC-01, VRC-01 only)

NOTE: All MCM-4 modules need to be enabled (MCM-4/MCM switch in the "MCM-4" position) for this feature.

1. Select "Special Function". The display of the MCM will read "Drive M".

2. Use the "Advance" and "Retract" buttons to scroll through the channels. Display will read "Drive 1", "Drive 2" etc.
3. Press the "Zero" button to enable or disable the selected drive. The status is indicated by a bright display (enabled) or a dim display (disabled).
4. Enabling the main drive (display reads “Drive M”) will disable all individual drives regardless of switch settings. (All will dim.) Disabling the main drive returns the individual drives to the states they were in previous to enabling the main drive.

2.5 ***SCHEDULED MAINTENANCE***

The Multidrive components are not user repairable or serviceable. The functional checkout in section 2.3 of this manual should be performed on a yearly basis. If any discrepancies are found, please contact Technical Services at (207) 666-8190 to discuss.