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
2 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.

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>50-16-1-01 Motor Control Module (MCM)</td>
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<tr>
<td>Accessory Kit</td>
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<tr>
<td>50-16-1-02 Motor Coupling Unit (MCU)</td>
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<td>50-16-1-03 DRC-01 Remote Control</td>
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<td>50-16-1-04 ARC-01 Remote Control</td>
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<td>50-16-1-05 VRC-01 Remote Control Software</td>
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<tr>
<td>And Serial Cable</td>
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</tbody>
</table>
We: FHC, GmbH
of: Kassbergstr. 24
09112 Chemnitz
Germany

declare that:
Equipment: Motorized Microdrive
Model: Catalog No.s 50-16-1-01, 50-16-1-02, 50-16-1-03, 50-16-1-04, 50-16-1-05
Serial Number(s): __________________________________________________

in accordance with the following Directives:
73/23/EEC Low Voltage Directive
and its amending directives
89/336/EEC Electromagnetic Compatibility Directive
and its amending directives
98/37/EC Machinery Directive
and its amending directives

has been designed and manufactured to the following specifications:
EN61010-2001: Safety Requirements for electrical equipment for measurement, control, and laboratory use: Part 1 - General Requirements
EN292-1: 1991 Safety of machinery – Basic concepts, general principles for design Part 1: Basic terminology, methodology

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all essential requirements of the Directives.

Signed by: Frederick Haer
Position: President, FHC
Done at: FHC Inc., 1201 Main Street, Bowdoin, ME 04287 USA
Phone: 1207-666-8190, Fax: 207-666-8292
E-mail: fhcinc@fh-co.com, Website: http://www.fh-co.com

A992B
MOTORIZED MICRODRIVE COMPONENTS
Motorized Microdrive Components

50-16-1-01 Motor Control Module (MCM)
50-16-1-02 Motor Coupling Unit (MCU)
50-16-1-03 Push Button Remote Control (DRC-01)
50-16-1-04 Knob Function Remote Control (ARC-01)
50-16-1-05 Remote Control Software & Serial Cable (VRC-01)
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50-16-1-02 MCU
50-16-1-03 DRC-01
50-16-1-04 ARC-01
50-16-1-05 VRC-01

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0.1 CONDITIONS FOR USE

**Intended Use**
When used in conjunction with the Hydraulic Probe Drive (Cat # 50-12-1C), the Motorized Microdrive components give the investigator precision positioning capabilities for electrodes, microelectrodes, or pipettes. It is not approved for use on human patients.

**Warnings**
The Motorized Microdrive 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 Motorized Microdrive 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 Motorized Microdrive components, care should be taken not to drop them. Do not force the Hydraulic probe into the coupling of the MCU. Place all cables and leads where they will not be inadvertently pulled or tangled.

0.2 SYMBOLS USED

- Input/Output: This symbol is used to designate the RS232 serial port on the backpanel.

- 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.
1 OPERATIONAL MANUAL

1.1 FEATURES

- Bright, 1cm high display of current status and position of electrode to a resolution of 1 micron.
- Integrated magnetic encoder verifies positional accuracy of the motor shaft.
- Variable step size - In step mode, 1, 5, and 10 micron step sizes are available.
- In continuous mode, rates between 1 and 500 microns/sec. are available.
- Controlled via hand-held DRC-01 push button remote, ARC-01 knob function remote, or PC controlled through VRC-01 virtual remote software operated through a provided serial port and cable.
- MCM controller module will stand alone on a desktop, or can be mounted in an optional frame for instrument rack use.
- Compact MCU motor coupling unit is separated from the MCM by a 3meter (10') cable (other lengths can be specified), which allows noise reduction and commutator applications.
- Power output connector for convenient "daisy-chaining" of other NeuroCraft stand-alone modules.
- Additional Multidrive components available to expand MCM to 8 independently controlled electrode drive channels. Ability to expand even more as technology develops.
1.2 DESCRIPTION

The MCM motor controller module and MCU motor coupling unit are used to advance or retract our 50-12-1C Hydraulic Probe Drive (refer to FHC Cat. page #30) to precisely position metal microelectrodes or pipettes. In step mode one, five, or ten micron steps are available. During continuous mode, the electrode can be advanced or retracted at a continuous rate up to 500 microns/sec. Additionally, Multidrive components are available to expand the system to independently control up to 8 electrode channels. (More channels will be available as technology develops.)

The position of the tip of the microelectrode or pipette is shown relative to a user defined zero position to a one micron resolution. This eight-character alphanumeric display also shows the current mode (Step/Continuous), and direction (↑or↓) of travel.

The MCU is connected to the MCM by a 3 meter (10') cable (other lengths may be specified). A precision magnetic encoder is installed on each motor, which reads to a resolution of 1 micron. The remote MCU packaging permits the drive system to be separated from the MCM by large distances. 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.

We offer two intuitive, hand-held remote controls. The DRC-01 utilizes membrane push buttons to control the mode, direction, and rate of travel, as well as setting the zero reference point. The ARC-01 uses a spring-loaded knob to position the drive. Rotating the knob from its center position causes the drive to retract or advance. The rotated distance determines the rate. (up to 500 microns/sec.) The "Zero" button on the ARC-01 sets the reference position.

A serial port on the rear panel of the MCM allows the investigator to interface with any PC using our VRC-01 software (Windows 95/98/NT/2000 compatible) or simple ASCII commands.

The MCM can be placed as a stand-alone unit on a desktop, or mounted in our SAF rack frame (cat # 55-11-0) for convenient installation in a standard instrument rack.

Additional Multidrive components are available to expand the system for independent positioning of up to 8 electrodes. More electrode possibilities will be available as the technology expands.

1.3 OPERATING ENVIRONMENT

The Motorized Microdrive 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. 50-16-1-01 MCM Motor Controller Module
   Includes: MCM Motor Controller Module
   Accessory Kit Includes:
   Power Transfer Cord
   A992B Manual (Not shown)
   4 rubber feet (Use Optional)

1 ea. 50-16-1-02 MCU Motor Coupling Unit
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:
55-00-3 Serial Cable (Not shown)
1.4.2 ADDITIONAL ITEMS REQUIRED FOR OPERATION

The following additional items are ORDERED SEPARATELY:

1 ea. 55-00-1 12V Desktop Power Supply
1 ea. 66-EL-LC-XXX Line Cord (Country specific see sec 2.1.4 of this manual for catalog number)

Not Shown:
1 ea. 50-12-1C Hydraulic Probe Drive
Micromanipulator or Stereotaxic System (ex. FHC 60 System Coarse Positioners)
Electrodes, Microelectrodes, or Pipettes.

1.4.3 REPLACEMENT ITEMS

50-16-1-10 MCM Accessory Kit
55-00-1 12V Desktop Power Supply
55-00-2 Power Transfer Cord
55-00-3 Serial Cable
66-EL-LC-XXX Line Cord (Country specific see sec. 2.1.4 of this manual for catalog number)
1.4.4 **OPTIONAL ACCESSORIES**

The following accessories are available:

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

Multidrive Components for expanding system to 4 or 8 electrode drives (Contact Technical Services at (207) 666-8190, or visit our website (http://www.fh-co.com) for details)
1.5 CONCEPTS

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

1.5.2 DESIGN DESCRIPTION
The Motorized Microdrive components are used to precisely position a single electrode, microelectrode, or pipette. An embedded microcontroller is used in the MCM controller module to digitally control and display movement of the electrode. The drive channel of the MCU coupling units contains a stepper motor that drives a diaphragm of the FHC Hydraulic Probe drive 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.

1.6 TECHNICAL SUMMARY

1.6.1 SPECIFICATIONS

**MCM:**

- **Display:** 8 characters, 1cm height, red, 1 micron resolution
- **Power Requirements:** 12VDC, 2Amp
- **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
- **Serial Interface:**
  - **RS232 Settings:**
    - Baud Rate 19200, 1 stop bit, No Parity, No Handshake
    - Communications Protocol: ASCII
    - Commands Supported:
      - V: Version Report
      - S+: Increase Step Size
      - S-: Decrease Step Size
      - C+: Increase Continuous Rate
      - C-: Decrease Continuous Rate
      - M-C: Switch to Continuous Mode
      - M-S: Switch to Step Mode
      - *: Simulate Remote Advance
      - /: Simulate Remote Retract
      - ?: Simulate Remote Step/Cont
      - ZERO: Zero the Display
      - #: Advance # Microns
      - #: Retract # Microns
- **Software:** Windows 95, 98, 2000, NT compatible
- **Serial Cable:** Noise shielded 9 pin female D-SUB (both ends), straight through, 3m (9.8’)

**MCU:**

- **Range of Travel:** 15mm
- **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

**DRC-01 Remote:**
- **Step Rate:** 1, 5, and 10 micron rates available.
- **Continuous Rate:** 1 to 500 microns per second.

**Dimensions:**
- Height: 5cm (2")
- Width: 2cm (.75")
- Length: 14cm (5.5")

**Weight:** .23 Kg (.5 lbs)
**Cable Length/Diameter:** 3m length (9.8') X .35cm O.D. (.014'")
**Connector:** 8 pin indexed, color-coded White with strain relief

**ARC-01 Remote:**
- **Rate:** 1 to 500 microns per second.

**Dimensions:**
- Height: 4cm (1.7")
- Width: 7cm (2.16")
- Length: 9cm (3.7")

**Weight:** .19Kg (.44lbs)
**Cable Length/Diameter:** 3m length (9.8') X .35cm O.D. (.014'")
**Connector:** 8 pin indexed, color-coded White with strain relief
1.6.2 CONTROLS/CONNECTORS

Display – MCM Front Panel:

Referenced Position: 8 character display. The first character displays the direction the electrode is traveling (↓, or ↑), or → when at rest. It changes to R for rear limit or F for forward limit if the drive reaches these points. The second character displays the mode of travel, C for continuous, S for step. The third character displays + or - depending on the value compared to the referenced zero. The final five characters display the position of the electrode to a resolution of 1 micron.

Connections – MCM Front Panel:

Remote Control: 8 pin socket (color coded White) for DRC-01 Remote or ARC-01Remote.

Motor: 16 pin socket (color coded Blue) for MCU.
Controls - MCM Rear Panel:

0|1|: Rocker switch used to activate power.

Connections - MCM 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.

Serial Port (I/O/I/O): 9 pin male D-Sub receptacle, RS232 (serial port), uses noise shielded IBM-PC 9 pin female serial cable (straight through)

MCM-4 Interface: DB15 male receptacle, for communications output to MCM-4's
Display – MCU:

Direction LED: Indicates piston is in motion as displayed by controller. Measured movement is not performed using this indicator.

Connections - MCU

Hydraulic: Hydraulic Probe Coupling

Motor Cable: 3 meter (10’, other lengths may be specified) 3/16” dia. Earth shielded, flexible cable with a 16 pin plug (color coded Blue).
Controls - DRC-01 Remote

**Up Arrow/Retract:** Pressing this button retracts the drive up away from the brain if it's not currently at the rear limit. (Indicated by an R on the first character of the display.) In step mode this button is pressed once for each step. In continuous mode, this button is held down for continuous movement of the drive. All other buttons are disabled while this button is pressed.

**Down Arrow/Advance:** Pressing this button advances the drive down into the brain if it's not currently at the forward limit. (Indicated by an F on the first character of the display.) In step mode this button is pressed once for each step. In continuous mode, this button is held down for continuous movement of the drive. All other buttons are disabled while this button is pressed.

**Zero:** Pressing this button for one second, or longer, sets the position display to zero at any time.

**Step/Cont.:** Pressing this button toggles between "Step" and "Continuous" mode.

**Increase:** Pressing this button advances the "Step" size (1, 5, and 10 micron steps are available) or the "Continuous" rate (1 to 1000 microns per second are available), depending on the mode (Step/Cont) selected.

**Decrease:** Pressing this button decreases the "Step" size (1, 5, and 10 micron steps are available) or the "Continuous" rate (1 to 1000 microns per second are available), depending on the mode selected.

**Special Function:** In place for special customer requirements or additional functions. (Enabling/disabling drives on the expanded Multidrive system is an example) Contact Technical Services for more information (207) 666-8190

Connections - DRC-01 Remote

**Cable:** 3 meter (10’, other lengths may be specified) 3/16” dia. Earth shielded, flexible cable with a 8 pin plug (color coded White).
**Controls - ARC-01 Remote**

**Knob:** Positions the drive using a 1 to 500 microns per second sweepable control pot. Turning knob to the left of center advances the drive, turning to the left of center retracts the drive. The knob is spring-loaded and will return to the center position (no movement) when released.

**Zero:** Pressing this button sets the reference position display to zero.

**Connections - ARC-01 Remote**

**Cable:** 3 meter (10’, other lengths may be specified) 3/16” dia. Earth shielded, flexible cable with a 8 pin plug (color coded White).
**Controls - VRC-01**

**Up Arrow/Retract:** Left clicking on this button retracts the drive up away from the brain if it's not currently at the rear limit. (Indicated by an R on the first character of the display.) In step mode this button is clicked once for each step. In continuous mode, this button is held down for continuous movement of the drive. All other buttons are disabled while this button is pressed.

**Down Arrow/Advance:** Pressing this button advances the drive down into the brain if it's not currently at the forward limit. (Indicated by an F on the first character of the display.) In step mode this button is pressed once for each step. In continuous mode, this button is held down for continuous movement of the drive. All other buttons are disabled while this button is pressed.

**Zero:** Pressing this button sets the position display to zero at any time.

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**Special Function:** In place for special customer requirements or additional functions. Enabling/disabling drives on the expanded Multidrive system is an example. Contact Technical Services for more information (207) 666-8190

**Connections - VRC-01**

**Cable:** The serial cable is connected from the PC to the serial port located on the back panel of the MCM.
1.6.3 **COMPATIBILITIES**

The Motorized Microdrive is compatible with the FHC 50-12-1C Hydraulic Probe Drive.

1.7 **ILLUSTRATIVE PROCEDURE**

1. Set up the unit in a convenient manner, positioning the MCM where the display can be easily seen. (see section 2.2 for complete installation instructions.) If using the VRC-01 remote, install the software per instructions in section 2.2.
2. Apply power to the MCM. Retract the MCU to its rear limit.
3. Install Hydraulic Probe Drive into the MCU. (The piston of the MCU will just engage the Hydraulic Probe Drive) Attach the electrode stage of the Hydraulic Probe Drive to a stereotaxic or manipulator system.
4. Install microelectrode or pipette into platform of the Hydraulic Probe Drive.
5. Coarsely position the electrode using the stereotaxic or manipulator system to a reference point. (commonly just above the dura, or within 12mm of the target.)
6. Set the referenced position on the display of the MCM to zero.
7. From this point the electrode can be positioned. It's common practice to use the continuous mode while searching for units, then using the step mode to fine-tune the signal. When using the ARC-01 the unit is always in continuous mode. Discrete steps can be achieved through momentary movement of the knob.
8. At the end of the experiment, retract the MCU back to the rear limit for storage. Remove the Hydraulic Probe Drive from the stereotaxic or manipulator system.
9. Remove the Hydraulic Probe Drive from the MCU to prevent unnecessary pressure on the hydraulic 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.
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.

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</table>

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. Ensure that the MCM is placed in a convenient spot for viewing the display.
2. Ensure that the MCU is placed close enough to the preparation that the hydraulic line will not be stretched.
3. Route all wires as to prevent them from being pulled or tangled.
4. Ensure power switch on the back panel is in the "Off" position. (Indicated by the O side of the rocker switch pressed in.)
5. If powering from the desktop power supply:
   - Plug the power supply line cord into a properly grounded wall receptacle.
   - 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.
6. Connect the MCU cable 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.
7. Connect the DRC-01 or ARC-01 cable to the MCM via the WHITE front panel socket labeled "Remote Control". Line up the red dot on the plug with the red dot on the socket. Plug will "snap" into the socket.
8. If applicable, connect the VRC-01 serial cable to the MCM via the serial port located on the back panel. Connect the other end to an open serial port on a computer. (see section 1.4.1 of this manual for computer port requirements.)
Software Installation (for VRC-01 software only):

1. Insert disk into the disk drive of the computer.
2. Right-click once on the "Start" button on the lower left corner of the screen.
3. Right-click once on "Run"
4. Type in the path to the setup.exe file. The path will be the directory of the CD-ROM drive followed by "setup.exe" (ex. A:\setup.exe). Click "OK" to accept.
5. The next screen will ask you to close all applications before proceeding. Verify there are no programs running and click "OK". Click "Exit Setup" to cancel.
6. The next screen defines the drive and directory. The default is C:\Program Files\VRC01. To accept the default, click the large button. To change the drive and directory, click on the "Change Directory" button, select the new drive and directory, then click "OK".
7. The next screen defines the program group. The default is FHC Program Group. To accept the default, click "Continue". To change click on one of the "Existing Groups" then click "Continue".
8. The next screen will indicate successful installation. Click "OK".

2.3 FUNCTIONAL CHECKOUT

1. Ensure that the Motorized Microdrive components are installed correctly per section 2.2 of this manual.
2. Hold the RETRACT (↑) button down on the DRC-01 or VRC-01. Alternately, turn the knob of the ARC-01 counterclockwise.
3. If the MCU 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.
4. If the MCU 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".
5. Press the ZERO button (for all remotes). Confirm that the display reads "→C+00000"
6. Hold the ADVANCE (↓) button down on the DRC-01 or VRC-01. Alternately, turn the knob of the ARC-01 clockwise.
7. Confirm that the display is counting forward, and that the piston of the MCU is moving. The MCU can be checked by either watching the piston, or the LED in the top of the housing.
8. Allow the drive to travel to the forward limit.
9. 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.
10. Retract the unit to the reverse limit. At random intervals, change the drive modes and rates by stopping movement, and pressing the STEP/CONT button to toggle between modes, and the INCREASE/DECREASE buttons on the DRC-01 and VRC-01 to vary the rates. Alternately, vary the amount of rotation on the ARC-01. Ensure that changes in the modes and rates take effect on the display of the MCM, as well as the LED and piston of the MCU.
11. Once the reverse limit is reached, attach the master cylinder (Ref manual A901B-02) of the Hydraulic Probe Drive into the hydraulic coupling of the MCU. Secure using the thumbscrew, ensuring that the thumbscrew engages the groove in the master cylinder. Ensure that the electrode platform of the Hydraulic Probe Drive moves slightly as the master cylinder engages the piston of the MCU.
2.4 OPERATIONAL INFORMATION

Instructions for use with the DRC-01 Remote:

1. Ensure that the Motorized Microdrive components are installed correctly per section 2.2 of this manual.
2. Apply power by pressing in the "I" side of the rocker switch located on the back panel of the MCM. The display will read "→C+00000"
3. Ensure that the MCU is at its rear limit by holding down the RETRACT (↑) button.
4. If the MCU 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.
5. If the MCU 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. Route hydraulic line of the 50-12-1C Hydraulic Probe Drive as to prevent it from being pulled or tangled.
7. Attach the master cylinder (Ref manual A901B-02) of the Hydraulic Probe Drive into the hydraulic coupling of the MCU. Secure using the thumbscrew, ensuring that the thumbscrew engages the groove in the master cylinder.
8. It is standard practice to attach the electrode stage of the Hydraulic Probe Drive to a manipulator or stereotaxic system for coarse positioning of the Hydraulic Probe Drive.
9. Insert an electrode, microelectrode, or pipette into the clamp of the Hydraulic Probe Drive. (for detailed instructions see probe manual A901B-02 page 9.)
10. Using the manipulator or stereotaxic system, coarsely position the Hydraulic Probe Drive, to a reference start point. Keep in mind that the maximum travel distance is 15mm.
11. Once a reference point is reached, the display of the MCM should be set to zero by pressing the ZERO button on the remote. The five numbers of the display will all read "0"
12. The mode of travel can now be set for advancing the Hydraulic Probe Drive. It is common practice to advance the electrode in continuous mode while searching for units. When the target area is reached, step mode is used to precisely position the electrode using 1, 5, or 10 micron steps for greater control.
13. To change modes, press the STEP/CONT button once. The display will indicate the current mode and rate. (Ex. CONT 1000) To toggle between the two modes, press the STEP/CONT button again.
14. 3 seconds of inactivity will shift the display back to the position mode. The current mode is indicated by the second character. ("C" for continuous, "S" for step.)
15. To change the step or continuous rate, press the INCREASE or DECREASE button once. The display will indicate the current mode and rate. (Ex. STEP 5)
16. Press the INCREASE or DECREASE buttons again to change the step size or continuous rate. (Reading is in microns for step, microns/sec for continuous.)
17. 3 seconds of inactivity will shift the display back to the position mode.
18. The Hydraulic Probe Drive is advanced in step mode by pressing the ADVANCE (↓) button. In step mode, each single press of the button will advance the Probe Drive the defined step size. In continuous mode, holding down the ADVANCE (↓) button will advance the Probe Drive at the defined continuous rate.
19. The electrode can be moved in either direction during the experiment. Direction of travel is displayed on the MCM by an up arrow (↑) or a down arrow (↓) in the first (leftmost) character. When at rest, a right pointing arrow (→) is displayed. Confirmation of movement in the MCU can be performed at any time by the LED showing through the top of the case.
20. If the MCU reaches it's forward limit, the motor will stop, and the second character of the display will be an "F" while the ADVANCE (↓) button is pressed.
21. At the end of the experiment, the electrode can be retracted out of the preparation by holding down the RETRACT (↑) button in continuous mode.
22. It is a good practice to retract the motor unit to its rear limit when not in use. The hydraulic probe should be detached from the motor unit to prevent unwanted pressure on the hydraulic system.
Instructions for use with the ARC-01 Remote:

1. Ensure that the Motorized Microdrive components are installed correctly per section 2.2 of this manual.
2. Apply power by pressing in the "I" side of the rocker switch located on the back panel of the MCM. The display will read "--C+00000"
3. Ensure that the MCU is at its rear limit by turning the knob to the left.
4. If the MCU is currently at the rear limit the display will read "↑R+00000" while the knob is turned. Reverse limit is indicated by an "R" second from the left.
5. If the MCU 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. Route hydraulic line of the 50-12-1C Hydraulic Probe Drive as to prevent it from being pulled or tangled.
7. Attach the master cylinder (Ref manual A901B-02) of the Hydraulic Probe Drive into the hydraulic coupling of the MCU. Secure using the thumbscrew, ensuring that the thumbscrew engages the groove in the master cylinder.
8. It is standard practice to attach the electrode stage of the Hydraulic Probe Drive to a manipulator or stereotaxic system for coarse positioning of the Hydraulic Probe Drive.
9. Insert an electrode, microelectrode, or pipette into the clamp of the Hydraulic Probe Drive. (for detailed instructions see probe manual A901B-02 page 9.)
10. Using the manipulator or stereotaxic system, coarsely position the Hydraulic Probe Drive, to a reference start point. Keep in mind that the maximum travel distance is 15mm.
11. Once a reference point is reached, the display of the MCM should be set to zero by pressing the "Retract" button on the remote. The five numbers of the display will all read "0"
12. The ARC-01 Remote is always in continuous mode. Single steps can be achieved by turning the knob slightly, then allowing it to spring back to center.
13. The rate of travel can be changed at any time by turning the knob further from center.
14. The electrode can be moved in either direction during the experiment. Direction of travel is displayed on the MCM by an up arrow (↑) or a down arrow (↓) in the first (leftmost) character. When at rest, a right pointing arrow (→) is displayed. Confirmation of movement in the MCU can be performed at any time by the LED showing through the top of the case.
15. If the MCU reaches it's forward limit, the motor will stop, and the second character of the display will be an "F" while the ADVANCE (↓) button is pressed.
16. At the end of the experiment, the electrode can be retracted out of the preparation by turning the knob to the left of center.
17. It is a good practice to retract the motor unit to its rear limit when not in use. The hydraulic probe should be detached from the motor unit to prevent unwanted pressure on the hydraulic system.

Instructions for use with the VRC-01 Remote software:

1. Ensure the Motorized Microdrive is installed correctly per section 2.2 of this manual.
2. Install the VRC-01 Remote software per the instructions in section 2.2 of this manual.
3. Apply power to the Motorized Microdrive using the power switch located on the back panel of the Controller Module. The display on the Controller Module will read all "0"
4. Ensure that the Motor Unit is at it's rear limit by holding down the left mouse button over the "Retract" (↑) button on the display.
5. If the Motor Unit was not previously set at it's rear limit, it will retract to it. (The Controller Module display will read in negative "-" numbers) When reached, the motor will stop, and the leftmost character of the Controller Module display will read "R".
6. Route hydraulic line as to prevent it from being pulled or tangled.
7. Attach the master cylinder (Ref manual A901B-02) of the Hydraulic Probe Drive into the hydraulic coupling of the Motor Unit. Secure using the thumbscrew of the coupling ensuring that the thumbscrew engages the groove in the master cylinder.
8. It is standard practice to attach the electrode stage of the Hydraulic Probe Drive to a manipulator or stereotaxic system for coarse positioning of the Hydraulic Probe Drive.
9. Insert an electrode, microelectrode, or pipette into the clamp on the Hydraulic Probe Drive. (for detailed instructions see probe manual A901B-02 page 9.)
10. Using the manipulator or stereotaxic system, coarsely position the Hydraulic Probe Drive, to a reference start point. Keep in mind that the maximum travel distance is 15mm.
11. Once a reference point is reached, the display of the Controller Module should be set to zero by left clicking the "Zero" button.
12. The mode of travel can now be set for advancing the electrode. It is common practice to advance the electrode in "Continuous" mode while searching for units. When the unit is reached, "Step" mode is used to precisely position the electrode using 1, 5, or 10 micron steps for greater control.
13. To toggle between step mode and continuous mode press left click the "Step/Cont" button again.
14. The step or continuous rate can be changed at any time by left clicking the "Increase" or "Decrease" buttons.
15. The electrode is advanced in step mode by left clicking once on the "Advance" ( \( \downarrow \) ) button in step mode. Each single click will correspond to the step size defined by the user. Holding the left mouse button down over the "Advance" button ( \( \downarrow \) ) in continuous mode advances the electrode at the user defined rate.
16. The electrode can be moved in either direction during the experiment. Direction of travel is displayed on the Controller Module by an up arrow ( \( \uparrow \) ) or a down arrow ( \( \downarrow \) ) in the leftmost character. When at rest, a right pointing arrow ( \( \rightarrow \) ) is displayed. Confirmation of movement in the Motor Unit can be performed at any time through the window in the top of the Motor Unit case.
17. If the Motor Unit reaches it's forward limit, the motor will stop, and the leftmost character of the Controller Module display will read "F".
18. At the end of the experiment, the electrode can be retracted out of the preparation by holding the left mouse button down over the "Retract" ( \( \uparrow \) ) button in continuous mode.
19. It is a good practice to retract the motor unit to its rear limit when not in use. The hydraulic probe should be detached from the motor unit to prevent unwanted pressure on the hydraulic system.

2.5 SCHEDULED MAINTENANCE

The Motorized Microdrive 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.