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Operating Manual

LSS-8000 Inchworm Motor Positioning System

09258-M-00 (Rev A)



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1. INTRODUCTION

Overview

The Burleigh LSS-8000 Inchworm Motor System is a microelectrode positioning system with very high precision and acceleration. These performance characteristics are ideal for electrophysiology research such as intracellular and extracellular recording in slices and in-vivo.

The LSS-8000 Inchworm Motor Positioning System consists of a Model IW-811-L Inchworm Motor and a Model 8200-1-0 Inchworm Controller with a Model 8005 Handset. These components have their own separate manuals, which are provided with your system.

Theory of Operation

Positioning of microelectrodes for electrophysiology recording requires micrometer scale control of high velocity-high acceleration steps. These steps must be achieved with minimum vibration to prevent damage to cells, their processes and connections.

The IW-811-L Inchworm Motor integrates Burleigh's patented Inchworm motor with an optical position encoder. A microelectrode can be attached to the end of the moving Inchworm shaft using the IW-475 Kit. The Inchworm can be installed in a researcher's rig using the IW-450 or IW-460 Mounts.

The 8200-1-0 Controller receives position information from the optical encoder and position commands from the user via the front panel and from the 8005 Handset. This controller provides the high voltage signals required to move to the Inchworm shaft and microelectrode in a closed-loop manner to the desired position.

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IW-811-L Inchworm Motor

The Inchworm Motor is a patented solid-state design that directly creates linear motion by sequential activation of three piezoelectric (PZT) elements - two clamps and one extension. Piezoelectric ceramics change dimension when a voltage is applied. When the clamp elements are activated they grip the shaft. When the extension element is activated it changes the separation between the clamps. Each "clamp-extend-clamp-retract" cycle of the Inchworm motor produces approximately 2 micrometers of linear motion. This Inchworm cycle can be repeated any number of times to achieve a total travel limited by the length of the motor shaft. The IW-811-L has a maximum travel of 25 mm. Directly coupled to the Inchworm motor shaft is an optical glass scale encoder that provides direct position measurement with 0.5 micrometer resolution.

For more information, refer to the *IW-800 Inchworm Motor Operating Manual*.

8200-1-0 Inchworm Controller

The Model 8200-1-0 Inchworm Motor Controller provides a sophisticated means of controlling the Inchworm Motor. The power supplies and motor control circuitry of the 8200 Controller are specifically designed for the highest signal-to-noise ratio on the drive signals for maximum precision and stability. The controller suppresses radiated noise to minimize EMI interference with electrophysiology recordings.

The 8200 Controller offers a user-friendly front panel with which you can manipulate the Inchworm Motor direction and speed, as well as the start and stop motion.

For more information, refer to the *Model 8200 Inchworm Controller Operating Manual.*

Model 8005 Handset

A Model 8005 Handset is used to operate the Inchworm motor with the 8200 Controller. The Model 8005 uses push buttons and a potentiometer to control the direction, speed, starts and stops. Jog, Encoder Step, and Motor Step mode can be selected.

For more information, refer to the *Model 8200 Inchworm Controller Operating Manual.*

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Accessories

IW-450 Micromanipulator Mount

The IW-450 Micromanipulator Mount can be used to mount the cylindrical housing of the Inchworm Motor to any flat surface.

IW-460 Kopf Stereotaxic Mount

The IW-460 Kopf Stereotaxic Mount can be used to mount the cylindrical housing of the Inchworm Motor to Kopf stereotaxic instruments.

IW-475 Electrode Mounting Kit

The IW-475 Electrode Mounting Kit can be used to mount and connect electrodes to the Inchworm motor spindle.

Rack Mount Kit

The Rack Mount Kit can be used to mount the 8200-1-0 Inchworm Controller in a standard 19-inch electronics rack.

Extension Cables

Burleigh offers. motor and encoder extension cables in lengths of 3 m, 7.5 m, and 15 m.

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2. Installation

Visual Inspection

The Burleigh LSS-8000 Inchworm Motor Positioning System is packed in a special carton designed to give maximum protection during shipment. If the outside of the shipping carton is damaged, notify your shipping department immediately. The shipping department may wish to notify the carrier at this point.

If the shipping carton is undamaged externally, carefully remove and identify all of the components listed below.

The LSS-8000 System includes:

- IW-811-L Inchworm Motor
- Model 8200-1-1 Controller
- Model 8005 Handset
- Operating Manuals
- Accessories for the LSS-8000 include:
- IW-450 Micromanipulator Mounting Kit
- IW-460 Kopf Stereotaxic Mount
- IW-475 Electrode Mounting Kit
- Rack Mount and Extension Cables
- If any components are missing, contact Burleigh Instruments, Inc. or your local representative. Save the special carton for future storage or transportation of the system.

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Set Up

1. Place the Controller on a firm horizontal surface as described in the Location section of the Model 8200 Inchworm Controller Operating Manual.
2. Do the *Initial Test* described in the *8200 Inchworm Motor Controller Operating Manual*.
3. Mount the Inchworm Motor to your experimental rig using the IW-450 or IW-460 Mounts or using your own hardware design. Refer to the *Inchworm Motor Operating Manual* for mounting information and guidelines.
4. Connect the Inchworm Motor and the Handset to the Controller in accordance with the installation instructions in the *8200 Inchworm Controller Operating Manual*.
5. To install the optional IW-475 Electrode Mounting Kit, follow the instructions in the *Inchworm Motor Operating Manual*.

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3. Operation

The LSS-8000 Inchworm Motor Positioning System provides a generic positioning capability. This capability is achieved using the display on the 8200 Controller and the switches on the 8005 Handset. Refer to the *8200 Inchworm Motor Controller Operating Manual* for operating instructions.

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4. Maintenance and Service

The Burleigh LSS-8000 Inchworm Motor Positioning System has very few components that are serviceable by the user. Prior to contacting Burleigh's Service Department, check the troubleshooting sections in the component manuals.

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5. Specifications

Number of Axes	1
Travel	25 mm
Step Size	Programmable step sizes in 0.5 µm increments
Model IW-811-L, Inchworm Motor	See the *Inchworm Motor Operating Manual*.
Model 8200-1-0 Inchworm Controller	See the *8200 Inchworm Motor Controller Operating Manual*.
Model 8005 Handset	See the *8200 Inchworm Motor Controller Operating Manual*.

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6. WARRANTY

Burleigh LSS-8000 Inchworm Motor Positioning Systems are warranted against defects in material and workmanship for a period of one year after date of delivery and the return of Burleigh's warranty card. During the warranty period, Burleigh will repair or, at its option, replace parts, which prove defective when the instrument is returned prepaid to Burleigh Instruments, Inc.

Before return of an instrument, please call Burleigh for return authorization. The warranty will not apply if the instrument has been damaged by accident, misuse, or as a result of modification by persons other than Burleigh personnel.

The liability of Burleigh Instruments, (except as to title) arising out of supplying of said product, or its use, whether under the foregoing warranty, a claim of negligence, or otherwise, shall not in any case exceed the cost of correcting defects in the products as herein provided. Upon expiration of the warranty period specified herein, all liability shall terminate. The foregoing shall constitute the sole remedy of the buyer. In no event shall the seller be liable for consequential or special damages.

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Declaration of Conformity

Manufacturer's Name: Burleigh Instruments, Inc.

Manufacturer's Address: Burleigh Park
Fishers, NY 14453-0755
USA

declares this product:

Product Name: Inchworm Microdrive System

Model Number(s): LSS-8000

conforms to the following standards:

Safety: EN-61010 –1 : IEC-1010-1
61000-3-2: Harmonics
61000-3-3: Flicker

EMC: EN-50081-1: EN-55011; Group 1, Class A: Emissions
EN-50082-1: 61000-4-2: ESD Immunity; 2kV CD, 2kV AD
61000-4-3: RFI Immunity; 3V/m, 27-500 MHz, Class I
61000-4-4: Electrical Fast Transient Immunity; 0.5 kV
61000-4-5: High Voltage Surge Immunity; 0.5 kV
61000-4-6: Conducted Susceptibility; 0.5 kV

Supplementary Information: "The product complies with the requirements of the **Low Voltage Directive 73/23/EEC** and the **EMC Directive 89/336/EEC**."

European Sales Office: Burleigh Instruments (UK) Ltd.
9 Allied Business Center, Coldharbour Lane
Harpenden, Herts, AL5 4UT, UK

Date of Issue: ....., 2001

CE

signed:

David J. Farrell, President

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