Installation Data Sheet

128-Channel Motorized Commutator

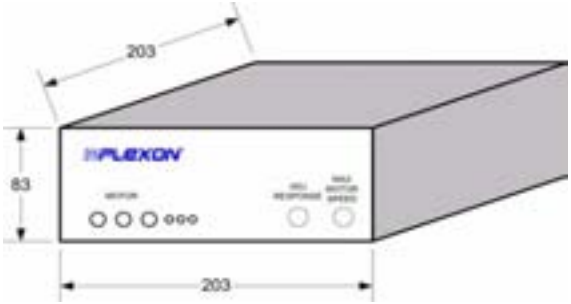
Features

- 128 signal channels, 16 reference channels, and +V, -V, and GND
- Maximum rotation speed is one revolution per second (RPS)
- Three speed ranges with variable speed and adjustable response
- Extremely-low actuation force: 1000 µNm
- Contactless actuation for motion sensor that is electrically and acoustically noiseless
- 120V or 220V operation

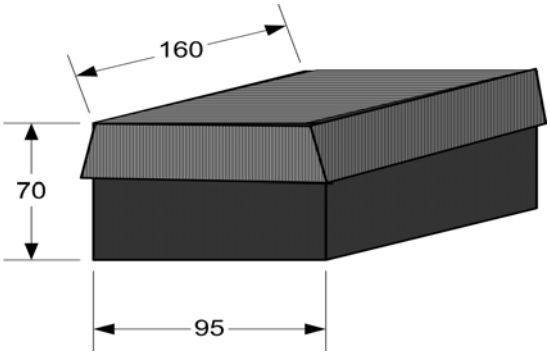
Installation Schematic

Dimensions are in millimeters (mm)

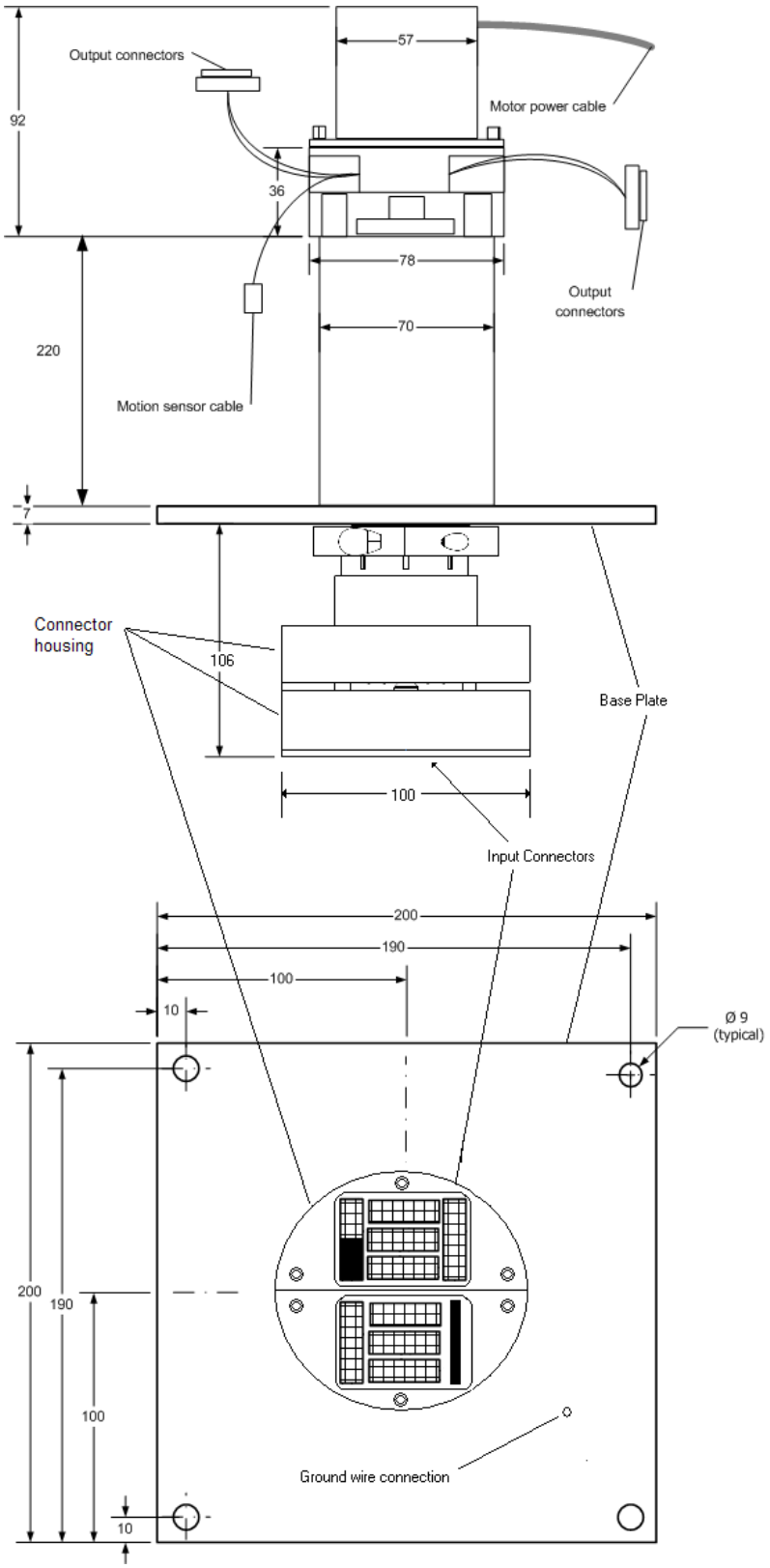
Note: All dimensions are correct at the time of publication. Specifications are subject to change without notice. For planning pre-installation work, please contact Plexon to obtain the latest specifications.



Electronic Drive Unit (EDU)



EDU Power Supply



Connector Pin Specifications for Harwin Connectors

Male Connectorts (Headstage Connector Housing – input):

GND = ground
NC = not connected
Ref = reference channel

Channel numbers shown are for example purposes only – color matching between top and bottom connectors is of primary importance

Brown (1-16)

A1 – Channel 1	A2 – Channel 2
A3 – Channel 3	A4 – Channel 4
A5 – Channel 5	A6 – Channel 6
A7 – Channel 7	A8 – Channel 8
A9 – (-V)	A10 – (+V)
A11 – GND	A12 – Ref A1
A13 – NC	A14 – NC
A15 – Channel 9	A16 – Channel 10
A17 – Channel 11	A18 – Channel 12
A19 – Channel 13	A20 – Channel 14
A21 – Channel 15	A22 – Channel 16
A23 – (-V)	A24 – (+V)
A25 – GND	A26 – Ref A2

Green (65-80)

E1 – Channel 65	E2 – Channel 66
E3 – Channel 67	E4 – Channel 68
E5 – Channel 69	E6 – Channel 70
E7 – Channel 71	E8 – Channel 72
E9 – (-V)	E10 – (+V)
E11 – GND	E12 – Ref E1
E13 – NC	E14 – NC
E15 – Channel 73	E16 – Channel 74
E17 – Channel 75	E18 – Channel 76
E19 – Channel 77	E20 – Channel 78
E21 – Channel 79	E22 – Channel 80
E23 – (-V)	E24 – (+V)
E25 – GND	E26 – Ref E2

Red (16-32)

B1 – Channel 17	B2 – Channel 18
B3 – Channel 19	B4 – Channel 20
B5 – Channel 21	B6 – Channel 22
B7 – Channel 23	B8 – Channel 24
B9 – (-V)	B10 – (+V)
B11 – GND	B12 – Ref B1
B13 – NC	B14 – NC
B15 – Channel 25	B16 – Channel 26
B17 – Channel 27	B18 – Channel 28
B19 – Channel 29	B20 – Channel 30
B21 – Channel 31	B22 – Channel 32
B23 – (-V)	B24 – (+V)
B25 – GND	B26 – Ref B2

Blue (81-96)

F1 – Channel 81	F2 – Channel 82
F3 – Channel 83	F4 – Channel 84
F5 – Channel 85	F6 – Channel 86
F7 – Channel 87	F8 – Channel 88
F9 – (-V)	F10 – (+V)
F11 – GND	F12 – Ref F1
F13 – NC	F14 – NC
F15 – Channel 89	F16 – Channel 90
F17 – Channel 91	F18 – Channel 92
F19 – Channel 93	F20 – Channel 94
F21 – Channel 95	F22 – Channel 96
F23 – (-V)	F24 – (+V)
F25 – GND	F26 – Ref F2

Orange (33-48)

C1 – Channel 33	C2 – Channel 34
C3 – Channel 35	C4 – Channel 36
C5 – Channel 37	C6 – Channel 38
C7 – Channel 39	C8 – Channel 40
C9 – (-V)	C10 – (+V)
C11 – GND	C12 – Ref C1
C13 – NC	C14 – NC
C15 – Channel 41	C16 – Channel 42
C17 – Channel 43	C18 – Channel 44
C19 – Channel 45	C20 – Channel 46
C21 – Channel 47	C22 – Channel 48
C23 – (-V)	C24 – (+V)
C25 – GND	C26 – Ref C2

Violet (97-112)

G1 – Channel 97	G2 – Channel 98
G3 – Channel 99	G4 – Channel 100
G5 – Channel 101	G6 – Channel 102
G7 – Channel 103	G8 – Channel 104
G9 – (-V)	G10 – (+V)
G11 – GND	G12 – Ref G1
G13 – NC	G14 – NC
G15 – Channel 105	G16 – Channel 106
G17 – Channel 107	G18 – Channel 108
G19 – Channel 109	G20 – Channel 110
G21 – Channel 111	G22 – Channel 112
G23 – (-V)	G24 – (+V)
G25 – GND	G26 – Ref G2

Yellow (49-64)

D1 – Channel 49	D2 – Channel 50
D3 – Channel 51	D4 – Channel 52
D5 – Channel 53	D6 – Channel 54
D7 – Channel 55	D8 – Channel 56
D9 – (-V)	D10 – (+V)
D11 – GND	D12 – Ref D1
D13 – NC	D14 – NC
D15 – Channel 57	D16 – Channel 58
D17 – Channel 59	D18 – Channel 60
D19 – Channel 61	D20 – Channel 62
D21 – Channel 63	D22 – Channel 64
D23 – (-V)	D24 – (+V)
D25 – GND	D26 – Ref D2

Gray (113-128)

H1 – Channel 113	H2 – Channel 114
H3 – Channel 115	H4 – Channel 116
H5 – Channel 117	H6 – Channel 118
H7 – Channel 119	H8 – Channel 120
H9 – (-V)	H10 – (+V)
H11 – GND	H12 – Ref H1
H13 – NC	H14 – NC
H15 – Channel 121	H16 – Channel 122
H17 – Channel 123	H18 – Channel 124
H19 – Channel 125	H20 – Channel 126
H21 – Channel 127	H22 – Channel 128
H23 – (-V)	H24 – (+V)
H25 – GND	H26 – Ref H2

Female Connectors (Preamp Cables -- output):

GND = ground
NC = not connected
Ref = reference channel

Brown (1-16)

A2 – Channel 2	A1 – Channel 1
A4 – Channel 4	A3 – Channel 3
A6 – Channel 6	A5 – Channel 5
A8 – Channel 8	A7 – Channel 7
A10 – NC	A9 – NC
A12 – Ref A1	A11 – NC
A14 – NC	A13 – NC
A16 – Channel 10	A15 – Channel 9
A18 – Channel 12	A17 – Channel 11
A20 – Channel 14	A19 – Channel 13
A22 – Channel 16	A21 – Channel 15
A24 – (+V)	A23 – (–V)
A26 – Ref A2	A25 – GND

Green (65-80)

E2 – Channel 66	E1 – Channel 65
E4 – Channel 68	E3 – Channel 67
E6 – Channel 70	E5 – Channel 69
E8 – Channel 72	E7 – Channel 71
E10 – NC	E9 – NC
E12 – Ref E1	E11 – NC
E14 – NC	E13 – NC
E16 – Channel 74	E15 – Channel 73
E18 – Channel 76	E17 – Channel 75
E20 – Channel 78	E19 – Channel 77
E22 – Channel 80	E21 – Channel 79
E24 – (+V)	E23 – (–V)
E26 – Ref E2	E25 – GND

Red (16-32)

B2 – Channel 18	B1 – Channel 17
B4 – Channel 20	B3 – Channel 19
B6 – Channel 22	B5 – Channel 21
B8 – Channel 24	B7 – Channel 23
B10 – NC	B9 – NC
B12 – Ref B1	B11 – NC
B14 – NC	B13 – NC
B16 – Channel 26	B15 – Channel 25
B18 – Channel 28	B17 – Channel 27
B20 – Channel 30	B19 – Channel 29
B22 – Channel 32	B21 – Channel 31
B24 – (+V)	B23 – (–V)
B26 – Ref B2	B25 – GND

Blue (81-96)

F2 – Channel 82	F1 – Channel 81
F4 – Channel 84	F3 – Channel 83
F6 – Channel 86	F5 – Channel 85
F8 – Channel 88	F7 – Channel 87
F10 – NC	F9 – NC
F12 – Ref F1	F11 – NC
F14 – NC	F13 – NC
F16 – Channel 90	F15 – Channel 89
F18 – Channel 92	F17 – Channel 91
F20 – Channel 94	F19 – Channel 93
F22 – Channel 96	F21 – Channel 95
F24 – (+V)	F23 – (–V)
F26 – Ref F2	F25 – GND

Orange (33-48)

C2 – Channel 34	C1 – Channel 33
C4 – Channel 36	C3 – Channel 35
C6 – Channel 38	C5 – Channel 37
C8 – Channel 40	C7 – Channel 39
C10 – NC	C9 – NC
C12 – Ref C1	C11 – NC
C14 – NC	C13 – NC
C16 – Channel 42	C15 – Channel 41
C18 – Channel 44	C17 – Channel 43
C20 – Channel 46	C19 – Channel 45
C22 – Channel 48	C21 – Channel 47
C24 – (+V)	C23 – (–V)
C26 – Ref C2	C25 – GND

Violet (97-112)

G2 – Channel 98	G1 – Channel 97
G4 – Channel 100	G3 – Channel 99
G6 – Channel 102	G5 – Channel 101
G8 – Channel 104	G7 – Channel 103
G10 – NC	G9 – NC
G12 – Ref G1	G11 – NC
G14 – NC	G13 – NC
G16 – Channel 106	G15 – Channel 105
G18 – Channel 108	G17 – Channel 107
G20 – Channel 110	G19 – Channel 109
G22 – Channel 112	G21 – Channel 111
G24 – (+V)	G23 – (-V)
G26 – Ref G2	G25 – GND

Yellow (49-64)

D2 – Channel 50	D1 – Channel 49
D4 – Channel 52	D3 – Channel 51
D6 – Channel 54	D5 – Channel 53
D8 – Channel 56	D7 – Channel 55
D10 – NC	D9 – NC
D12 – Ref D1	D11 – NC
D14 – NC	D13 – NC
D16 – Channel 58	D15 – Channel 57
D18 – Channel 60	D17 – Channel 59
D20 – Channel 62	D19 – Channel 61
D22 – Channel 64	D21 – Channel 63
D24 – (+V)	D23 – (–V)
D26 – Ref D2	D25 – GND

Gray (113-128)

H2 – Channel 114	H1 – Channel 113
H4 – Channel 116	H3 – Channel 115
H6 – Channel 118	H5 – Channel 117
H8 – Channel 120	H7 – Channel 119
H10 – NC	H9 – NC
H12 – Ref H1	H11 – NC
H14 – NC	H13 – NC
H16 – Channel 122	H15 – Channel 121
H18 – Channel 124	H17 – Channel 123
H20 – Channel 126	H19 – Channel 125
H22 – Channel 128	H21 – Channel 127
H24 – (+V)	H23 – (-V)
H26 – Ref H2	H25 – GND

Installation

Installation of the Plexon 128-Channel Motorized Commutator consists of three major steps:

1. Mounting the commutator to the enclosure or experimental arena
2. Connecting the components
3. Adjusting the settings and testing the installation

1) Mounting the commutator plate

1. Carefully review the installation schematic on Page 1 to make sure there is adequate clearance for the commutator body, the wire bundles, and the torque-arm rotation. To minimize interference, ensure adequate clearance for the motor power cable and route it as far as practical from the signal cables.
2. In the experimental enclosure, provide an opening and mounting holes that match the dimensions in the installation schematic. Choose a mounting location that, when combined with the length of the headset cable, provides the animal with adequate range of movement for the requirements of the experiment.
3. Secure the commutator to the surface of the enclosure with suitable fasteners.

   Note: The commutator uses a stepper motor to provide incremental movement. The vibration from the stepper motor can eventually loosen normal fasteners. To secure the commutator, consider the use of prevailing-torque fasteners (nylon-insert lock nuts, stover nuts, etc.) or a thread-locking compound such as Loctite®.

4. When mounting the commutator is completed, proceed with connecting the components.

HINT

Avoiding electrical noise on signal channels

To avoid picking up unwanted ambient noise from the lab environment, the commutator must be properly grounded. Make sure to connect the green ground wire specified in Step 1 on page 4 (in **2 Connecting the components** below) and use the terminating ground plugs for all unused channels as specified in Step 6 on page 7.

2) Connecting the components

1. Attach the green ground wire between the ground screw on the commutator mounting base and the ground screw at the rear of the commutator control box. Make sure to use the

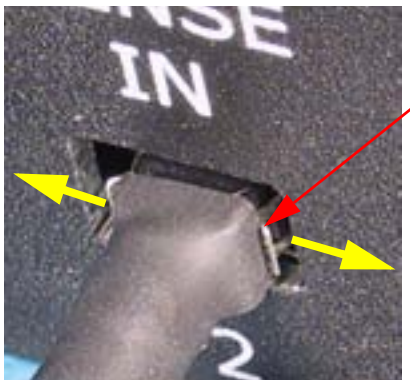
ground screw at the left rear corner of the box, which has the paint removed around it to provide a good ground.

2 Attach the AC cord to the power supply. At the **POWER** connector, make sure the power switch is **OFF**. Plug in the power supply. Connect the power supply output cable to the **POWER** connector on the rear panel of the EDU.

CAUTION

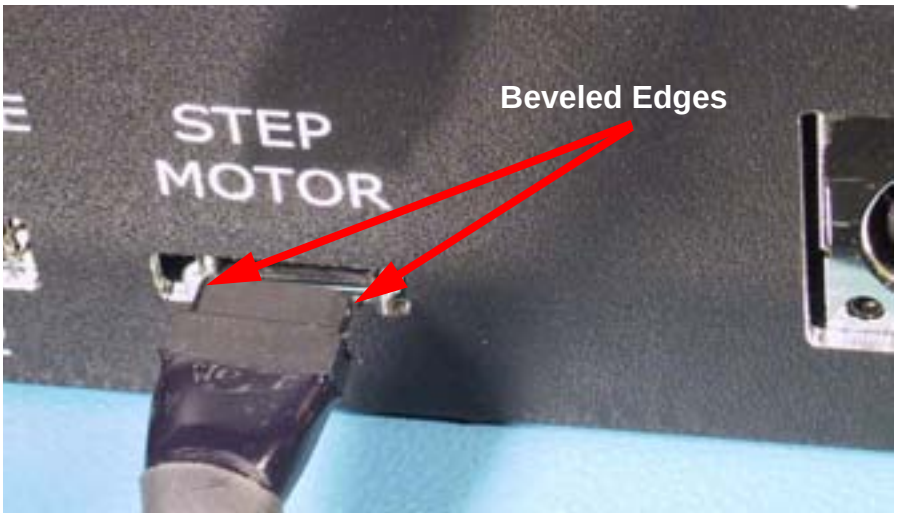
Connector Lock Release

The control box connectors for the SENSE IN and STEP MOTOR cables feature spring-loaded locks on each side. These locks secure the cable by grasping a raised tab on the cable connector. Before removing these cables from the control box, use a small blunt instrument such as a blade screwdriver to release the locks. Avoid damage to the connectors. Before removing the cables, always release the locking tabs.

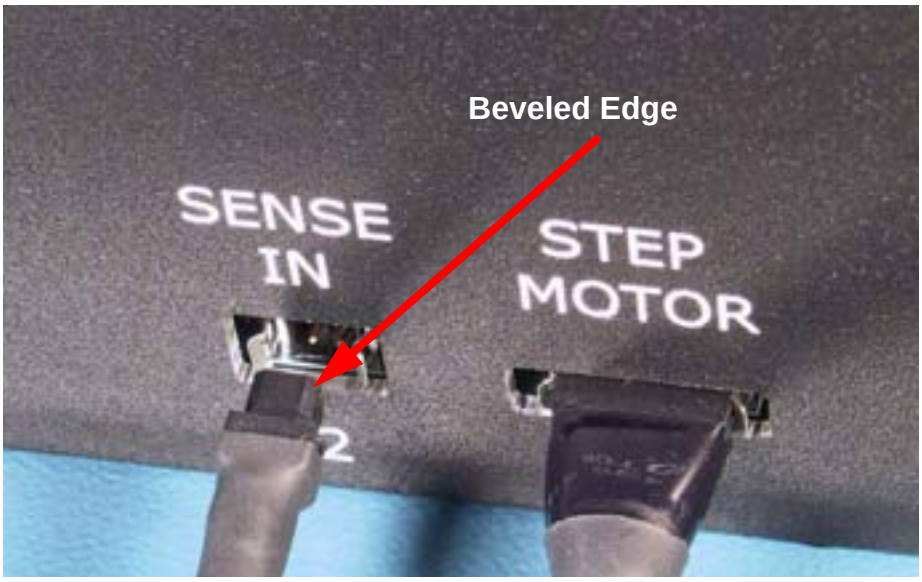


Connector lock release tab. Push out on each side to release cable.

3 Ten external (outside) cables connect the commutator to the control box and the preamp: eight signal cables, a motor power cable, and a motion-sensor cable. At the back panel of the control box, make sure the beveled edges on the connector face up, then connect the motor power cable to the **STEP MOTOR P1** connector.



4 Make sure the beveled edges on the connector faces up and to the right, then connect the motion sensor cable to the **SENSE IN P2** connector.



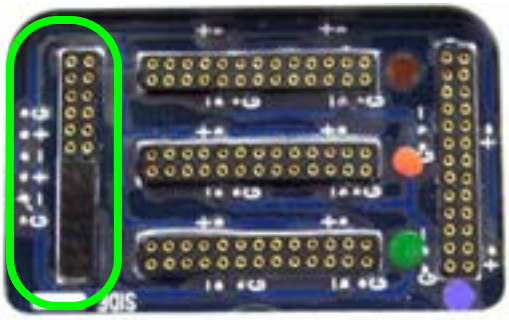
5 Connect each color-coded data cable to its mating board in the preamp. The following table lists the cable colors for each channel range:

Color	Channel Range
Brown	1 to 16
Red	17 to 32
Orange	33 to 48
Yellow	49 to 64
Green	65 to 80
Blue	81 to 96
Violet	97 to 112
Gray	113 to 128

Note: When routing the cables, keep the data cables as far as possible from the motor power cable.

6 Eight internal (input) signal cables connect the headstages to the commutator. Inside the experimental enclosure, plug the headstage cables into the matching colored connectors on the commutator connector housing; see “Connector Pin Specifications” on page 2 The

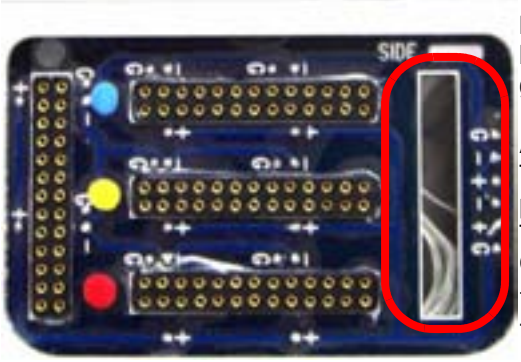
following illustration shows the connector housing. (The connectors shown are female connectors, but the product “as shipped” has the connector gender changed to male.)



NOTE: The area within the red oval is not used in this commutator and is not described in this document.

The connectors are color-coded to match the previously described connectors/cables.

Top Connectors
brown, orange, green (top to bottom)
violet (right side)



Bottom Connectors
blue, yellow, red (top to bottom)
gray (left side)

Area Within Green Oval
The connector is the stimulation pass-through connector
The white identifiers at the left are:
G = ground
+ = +V
- = -V

If all the cables are not connected to the connector housing, attach a terminating ground plug to each open connector. The terminating ground plug completes a path to ground for the “open” channels, which is essential to reduce noise on all signal channels.

7 Connect the other ends of the cables to the headstages.

Connection testing

8 Connect the headstages to Plexon headstage tester units. Connect the headstage tester units to the computer and provide a signal to the headstages.

Note: For information on the Plexon headstage tester unit, refer to the Plexon *RASPUTIN User’s Guide*.

9 Turn the computer on and set up RASPUTIN Sort Client or Recorder to receive signals. On the MAP unit, turn on the preamp power switch. Verify that Sort Client or Recorder receives the test signals from the headstage tester unit. If Sort Client or Recorder do not show the signals, connect a headset cable directly to the preamp to verify that signals are being transmitted. Reconnect the headset cable to the commutator. If the signals still do not appear in Sort Client or Recorder, contact Plexon customer service for assistance.

10 Disconnect the headstage tester units.

End of connection testing

11 Turn the preamp power off.

3) Adjusting settings and testing the installation

1 On the EDU front panel, set the motor function switch to **DISABLE**.

2 At the **POWER** connector, turn the power **ON**.

3 On the front panel, set both the **MOTOR STEP SIZE** switches **MS1** and **MS2** to **1**.

4 Set **MAX MOTOR SPEED** fully counter-clockwise to the slowest setting. Set **ADJ RESPONSE** fully counter-clockwise to the lowest setting.

CAUTION

Possible Cable Damage

If the SENSOR cable is unplugged, the commutator turns independently and it can quickly twist the headset cables. Before setting the **MOTOR** switch to **ENABLE**, *always* make sure the headset cables are visible. If the commutator begins to twist the cables, immediately set the **MOTOR** switch to **DISABLE** and check the cable connections.

5 Set the **MOTOR** switch to **ENABLE**. Turn **ADJ RESPONSE** clockwise to increase the response at the connector housing. Gently rotate the housing back and forth to gauge the

response. Set the **ADJ RESPONSE** control to allow some connector housing movement in each direction without engaging the motor.

6 Turn the **MAX MOTOR SPEED** clockwise to increase the rotation speed. Gently rotate the connector housing toward its full travel in one direction to gauge the rotation speed. Set the **MAX MOTOR SPEED** to the desired setting for the experiment.

7 The rotation speed may also be changed by changing the step size. The various positions of the two **MOTOR STEP SIZE** switches provide three settings. Set both switches to **1** for the smallest step size, and hence the slowest and smoothest rotation. Set both switches to **0** for the largest step size, and hence the fastest rotation speed. Use **MAX MOTOR SPEED** to fine tune the speed in each range. See the following chart for the motor speed settings:

Speed Range Switch Positions MS1 - MS2	Approximate Max Rotation Speed (rps)*
1 - 1 (1/8 step)	1/4 rps
0 - 1 (1/4 step)	1/2 rps
1 - 0 (1/2 step)	1 rps
0 - 0 (1/2 step)	1 rps

The optimum motor speed can:

- Reduce acoustical noise produced by the motor shaking the experimental enclosure (i.e., metal cages)
- Reduce electrical noise produced by mechanical vibration of components
- More closely match animal behavior

* varies somewhat depending on ADJ RESPONSE setting

8 To test the response and the rotation speed, attach the headstages to the experimental animal and observe the performance of the commutator. Adjust the response and rotation speed to provide the lowest level of interference for the animal.

Note: Slower speed ranges use smaller steps, which reduce electrical noise and mechanical vibration. In general, use the slowest speed range that is adequate for the experiment, then do a fine speed adjustment with the MAX MOTOR SPEED control.