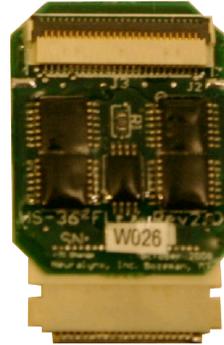
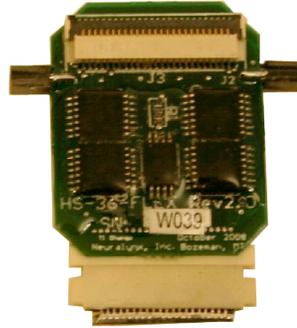




# Neuralynx

High Density Electrophysiology Recording Systems



## HS-36 Manual

Headstage 36 Unity Gain Pre-amplifier

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# 1 Overview

The Neuralynx Headstage 36 (HS-36) Amplifier provides 36 channels of unity gain amplification (buffering). It is designed for use with any of the EIB-36 family of electrode interface boards.

The following manual describes the functionality of the Headstage 36 with a Hirose connector for connection to the flex tether. The headstage can also be ordered with an Omnetics fine wire connector. This tether is made up of a series of fine wires that connect the headstage signals. For specific information on these connectors, please contact Neuralynx.

Low noise, low power, and low input bias op-amps have been used on this device instead of the traditional source-follower FET circuit used in the traditional headstage amplifier design. This allows the HS-36 to obtain exact unity gain, which greatly improves the common mode rejection ratio (CMRR) performance for the entire recording system. Better CMRR allows for better artifact and other common mode noise signal rejection. The lower output impedance of the HS-36 reduces noise susceptibility on the tether and other signal cabling.

The Neuralynx electrode referencing panels (ERP) or the Digital Lynx input cards contain power supplies, which properly sequence voltage application and monitor headstage currents.

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## 2 Headstage Amplifier Input Pins (EIB connection)

The HS-36 is designed to work with any of the EIB-36 family of electrode interface boards. There are two guideposts on the HS-36 that determine the orientation of the HS-36 when mounting to an EIB. Please see the manual for your EIB if you are unsure where the guidepost connection holes are located, as incorrect mounting may damage your EIB. The guideposts are shown here as black circles. The input mapping is as follows:

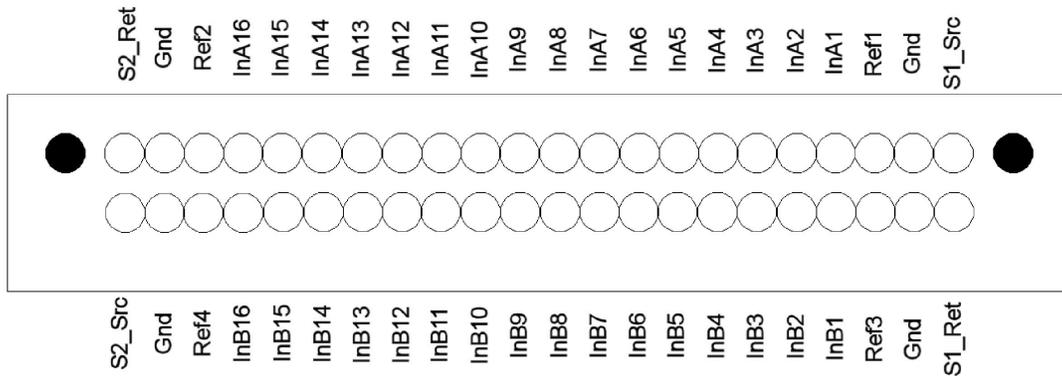


Figure 2-1 HS-36 input Pin Out

**Note:** Please note that S2\_Ret and S2\_Src were inadvertently reversed and do not match the print on the EIB. This reverse is on all HS-36 series of headstages.

A description of the pin labels:

| Pin Label   | Description  |
|-------------|--|
| InA1 - A16  | Signal input for A1-A16 electrode channels.                |
| InB1 - B16  | Signal input for B1-B16 electrode channels.                |
| S1_Src      | Source signal output for S1 differential stimulus channel. |
| S1_Ret      | Return signal input for S1 differential stimulus channel.  |
| S2_Src      | Source signal output for S2 differential stimulus channel. |
| S2_Ret      | Return signal input for S2 differential stimulus channel.  |
| Ref1 - Ref4 | Reference electrode channels 1-4.                          |

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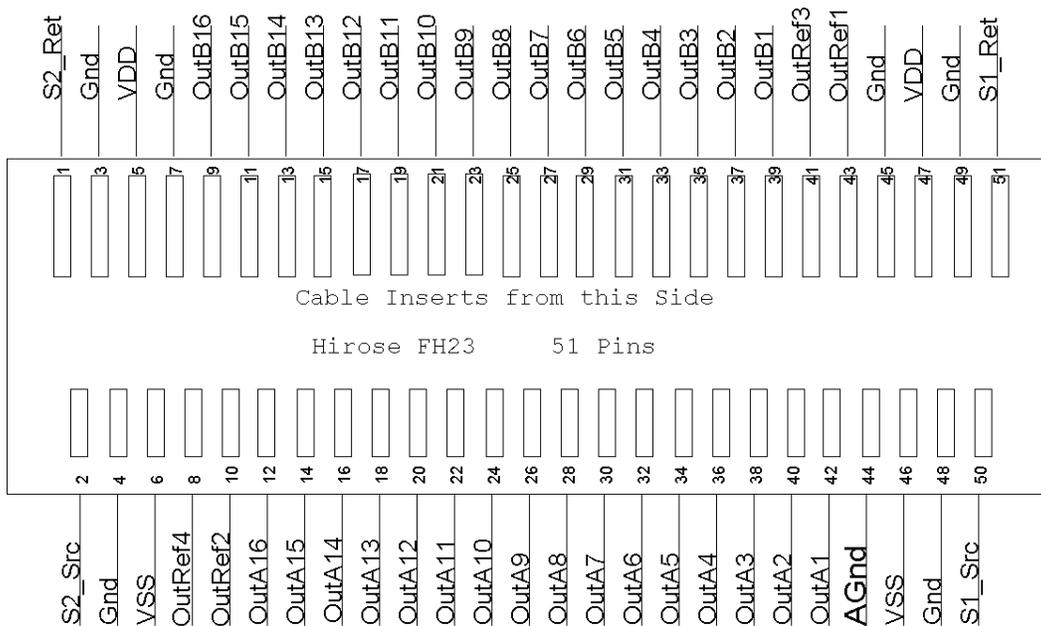
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|     |  |
|-----|--|
| Gnd | Electrical ground provided by headstage power supply. This is also connected to the ground on the EIB. See your EIB manual for proper grounding procedure. One of the Gnd connections is routed to the AGnd output and carries no current. |
|-----|--|

### 3 HS-36 Amplifier Output Pins

Although the HS-36 is sold with the flex tether attached to the amplifier board, a pin out of the 51 pin Hirose FH23 connector is shown below (orientation is as shown in the above image).



**Figure 3-2 Hirose Connector for Flex Tether**

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A description of the pin labels:

| <b>Pin Label</b> | <b>Description</b>                                    |
|------------------|---|
| OutA1 - A16      | Buffered signal output for A1-A16 electrode channels. |
| OutB1 - B16      | Buffered signal output for B1-B16 electrode channels. |
| S1_Src           | Source signal for S1 differential stimulus channel.   |
| S1_Ret           | Return signal for S1 differential stimulus channel.   |
| S2_Src           | Source signal for S2 differential stimulus channel.   |
| S2_Ret           | Return signal for S2 differential stimulus channel.   |
| OutRef1 - Ref4   | Buffered reference electrode channels 1-4.            |
| VSS              | -5V headstage power.                                  |
| VDD              | +5V headstage power.                                  |
| AGnd             | Animal ground. A non-current carrying Gnd connection. |
| Gnd              | Electrical ground provided by headstage power supply. |

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## 4 HS-36 Tether Adaptor Pins (ERP, DRS or Input Board Connection)

This adaptor is the same MDR-50 connection used for all of the other Neuralynx Headstages. This connection is usually made directly to an ERP (for analog or digital systems) or to a DRS or Input Board (for digital systems only). The following pin out is provided for reference purposes:

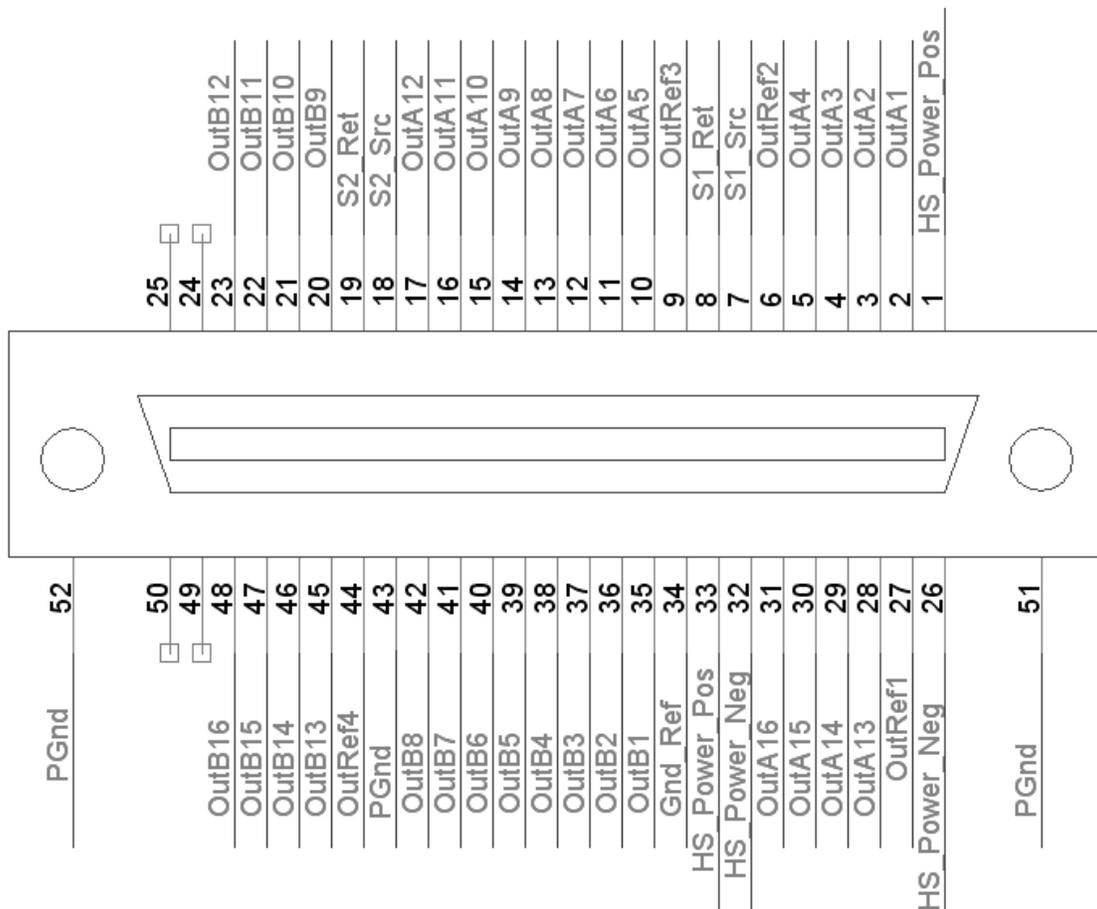


Figure 4-3 Tether Adaptor Pins

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## 5 Mounting the HS-36 to an EIB

All of the EIB-36 families of electrode interface boards mount with the HS-36 using an Omnetics 44 pin connector. This connector contains two guide post holes on one row. If you are unsure of the location of the guidepost holes on your EIB, consult your EIB's manual before attempting to connect the HS-36. **Improper guidepost alignment may damage your EIB and Headstage.**

## 6 Using the HS-36 with a DRS-36

The DRS-36 is a software controlled reference selector specifically designed for the HS-36. All 32 signal channels and 4 reference channels are available when using the HS-36 with a DRS-36. The HS-36 connects directly to the female MDR50 connection of the DRS-36.

## 7 Using the HS-36 with a Digital Lynx Input Board (AC or DC)

The HS-36's tether adaptor can be connected directly to a Digital Lynx input board. In doing this, you are limited to using only 3 of the references from the HS-36 (Ref4 is not available). Reference selection is then done using jumpers on the Input Board. See the Digital Lynx input board manual for more information. The HS-36 tether adaptor connects directly to the female MDR50 connection of the Digital Lynx input board.

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## 8 Using the HS-36 with an ERP-27

The HS-36 is designed to connect directly to the DRS-36, which takes full advantage of all signals available from the HS-36. However, the HS-36 can be used with the ERP-27 electrode reference panel. When using the ERP-27, you are limited to only 3 of the references from the HS-36 (Ref4 is not available). There are three ways analog system users can accomplish this task:

1. Existing ERP-27s can accept the MDR50 connection from the HS-36 directly. Using this method, the following mapping can be used:

| <b>HS-36</b> | <b>ERP-27</b>               |
|--------------|-----------------------------|
| OutA1 – A12  | A1 – A12                    |
| OutB1 – B12  | B1 – B12                    |
| S1_Src       | S1SRC (Stimulus Connection) |
| S1_Ret       | S1RET (Stimulus Connection) |
| S2_Src       | S2SRC (Stimulus Connection) |
| S2_Ret       | S2RET (Stimulus Connection) |
| Ref1         | Ref                         |
| Ref2         | E1                          |
| Ref3         | E2                          |
| OutA13 – A16 | Not Available               |
| OutB13 – B16 | Not Available               |
| Ref4         | Not Available               |
| AGnd         | AGnd                        |

2. An adapter can be purchased for existing ERP-27s that will allow users to utilize OutA13-A16 and OutB13-B16 via banana jacks. These banana jacks may be connected to the CSC1-CSC8 connections on the front of the ERP-27, or used for other purposes.

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3. The mapping is as follows:

| <b>HS-36</b> | <b>ERP-27</b>               |
|--------------|-----------------------------|
| OutA1 – A12  | A1 – A12                    |
| OutB1 – B12  | B1 – B12                    |
| S1_Src       | S1SRC (Stimulus Connection) |
| S1_Ret       | S1RET (Stimulus Connection) |
| S2_Src       | S2SRC (Stimulus Connection) |
| S2_Ret       | S2RET (Stimulus Connection) |
| Ref1         | Ref                         |
| Ref2         | E1                          |
| Ref3         | E2                          |
| OutA13 – A16 | Banana Jack                 |
| OutB13 – B16 | Banana Jack                 |
| Ref4         | Not Available               |
| AGnd         | Agnd                        |

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4. Beginning with revision 3 of the ERP-27, all of the recording channels from the HS-36 can be used without purchasing a special adapter. The CSC connections on the front of the ERP-27 will not be used as inputs when using a HS-36. The CSC channels will function as outputs, similar to the A1-A12, B1-B12 connections. The individual CSC references may be used as in previous versions of the ERP-27. The revision 3 and newer ERP-27s will allow the following mapping:

| <b>HS-36</b> | <b>ERP-27</b>               |
|--------------|-----------------------------|
| OutA1 – A16  | A1 – A12, B1-B8             |
| OutB1 – B16  | B9 – B12, CSC1-CSC8         |
| S1_Src       | S1SRC (Stimulus Connection) |
| S1_Ret       | S1RET (Stimulus Connection) |
| S2_Src       | S2SRC (Stimulus Connection) |
| S2_Ret       | S2RET (Stimulus Connection) |
| Ref1         | Ref                         |
| Ref2         | E1                          |
| Ref3         | E2                          |
| Ref4         | Not Available               |
| AGnd         | AGnd                        |

## 9 Storage and Maintenance

While not being used for recording, keep the HS-36 in the anti-static box it was shipped in. This will protect the circuitry from static damage, as well as physical damage when not in use.

From time to time it may be necessary to clean the HS-36. This should be done with both the MDR50 connector as well as the amplifier disconnected (as shown in the picture at the beginning of this manual). The amplifier's circuit board is coated with a conformal coating to keep dirt away from the circuitry. Wash the amplifier board with hot soapy water, followed by rinsing in a 50% alcohol and de-ionized water solution. The board should then be dried at about 40°C (104°F) for three hours.

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## 10 Antistatic Precautions

As with all electronics, static discharges cause damage to semiconductor devices and especially to high impedance inputs. The opamp inputs are protected against a 2000V discharge but care must still be used when handling and using the HS-36 amplifier. Please observe the following guidelines:

1. Always wear a grounding wrist strap when handling an animal which is connected for recording.
2. Always wear a grounding wrist strap when handling the HS-36 amplifier.
3. Store the complete HS-36 assembly (amplifier, tether, and MDR50) in the antistatic protective box in which it was shipped.
4. Static discharge damage will usually result in lower amplifier input impedance and noisier amplifier channel performance.

### 10.1 Other Products Used with the HS-36

- EIB-36 family of electrode interface boards
- Neuralynx Microdrives
- 44" tether extension for HS-36
- EIB-36 to ERP-27 adaptor
- Signal Mouse 36

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## Technical Specifications

| <b>HS-36 FWT w/o LED connectors</b> |   |
|-------------------------------------|---|
| Width                               | 0.82 inches   |
| Length                              | 1.00 inch   |
| Thickness                           | 0.16 inches (+-.01 inch depending on conformal coat protection) |
| Weight                              | 2.19g / 0.0772oz  |
| Input Connection                    | Omnetics 44pin  |
| Input Impedance                     | 1TΩ   |
| Output Connection                   | Omnetics 44pin  |
| Output Impedance                    | 1Ω - 10Ω depending on Frequency                                 |
| Gain                                | 1   |

| <b>HS-36 Tether Adaptor</b> |  |
|-----------------------------|--|
| Dimensions(LxWxH )          | (39.02 x 58.46 x 11.95) mm<br>(1.54 x 2.3 x 0.47) in |
| Weight                      | 21.86g / 0.77oz                                      |
| Input Connection            | Hirose 51pin   |
| Output Connection           | 3M MDR50   |

| <b>Flex Tether</b> |  |
|--------------------|--|
| Dimensions(LxWxH ) | (508 x 15.78 x 0.25) mm<br>(20.0 x 0.62 x 0.01) in |
| Weight             | 1.23g / 0.04oz                                     |

| <b>Tether Extension</b>          |  |
|----------------------------------|--|
| Dimensions (largest point LxWxH) | (1022.63 x 20.88 x 3.4) mm<br>(40.26 x 0.82 x 0.13) in |
| Weight                           | 3.32g / 0.12oz   |

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