iD2 Digital Headstage Interface

Hardware Reference

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iD2 Overview

The iD2 is an interface to Intan-based digital headstages. It has two input connectors that can read up to 128 channels each, for a total of 256 channels. All raw data is streamed via USB 3 back to the computer running Synapse and recorded straight to disk.

- The iD2 includes impedance testing functionality for each headstage
- Onboard LEDs provide live feedback of the headstage connection and activity

iD2 Features

The iD2 has selectable sample rate options of ~750 Hz, ~1.5kHz, ~3 kHz, ~6 kHz, ~12 kHz, ~25 kHz or system rate (maximum ~25 kHz). Using the lowest practical rate for your application improves noise performance.

A plot-decimated (highly compressed) version of the raw signal is returned back to the processor and Synapse for visualization of all headstage channels. The plot decimated data consists of the max and min values of a short chunks of points. The rest of the chunk is thrown away. The data rate depends on the System rate and number of channels, but is usually ~300-1500 Hz. This is fine for monitoring the signal for activity and requires very low bandwidth, but is not useful for data analysis.

The plot decimated data can optionally be filtered on the iD2 itself. If the iD2 is running at ~6 kHz or above, you can enable a 100 Hz, 300 Hz, or 500 Hz filter on the device. At lower sampling rates, there is no filter available. At runtime, you can use the filter cutoff frequency as a highpass, as a lowpass, or disable it.

Up to 16 user-selectable channels are returned to the processor and Synapse at the full data rate for real-time processing and visualization.

All raw data is streamed back through the USB to the computer running Synapse.

For information on software control of the iD2 and all of its available features, see the Synapse Manual.

> **Important**
>
> The iD2 USB Streaming capability is not compatible with the iPac and SynCon software.

Clip Warnings and Activity Display

The status LEDs above each port on the iD2 indicate headstage connectivity (green) and clip warning (red).

Clip Warning

Clipping occurs when the input signal is too large. When the voltage input to any channel is within ~0.5 dB of the iD2's maximum voltage input range, the LED for the corresponding port is lit red to indicate that clipping may occur. This is ~±4.7 mV.

Activity

The activity LED is lit whenever a headstage is detected on that port.

USB indicators

The USB status LEDs indicate connectivity and error status.

Error

The red Error LED is normally off. It starts blinking if the internal memory buffer gets to 75% full, indicating that there are possible issues transferring data. The LED turns solid red when the buffer is 90% full.

Active

The green LED comes on to indicate a valid USB connection. During preview/record the LED blinks slowly to indicate that data is streaming.

Headstage Connectors

Plug the Intan-based headstage directly into the 12-pin Omnetics connector. Each port supports up to 128 channels.

Impedance Checking

The impedance checker on the iD2 provides a simple check of the channel impedance relative to ground. The impedance check is controlled in Synapse software.

The available probe frequencies are 24 Hz, 48 Hz, 95 Hz, 191 Hz, 381 Hz, 763 Hz, 1526 Hz, or 3052 Hz.

The impedance check continuously loops through the banks of channels and updates the LEDs in Synapse.

iD2 Technical Specifications

RHD2000 series amplifier boards and SPI interface cables are used in TDT's ZD and OD Intan-based digitizing headstages. They are available from Intan Technologies.

> **Important**
>
> The specifications below are dependent on the amplifier board. See Intan RHD2000 series website for latest, full performance specifications.

Digital Headstage Inputs	2 (256 channels)
Sampling Rate	Up to ~25 kHz
Frequency Response	0.1 Hz - 10 kHz
Input Range	±5 mV with ZD, OD, and other Intan-based digitizing headstages
Allowable DC Offset	±0.4 V
Focus Sample Delay	9 samples
USB Transfer Speed	>25 MB/sec (256 channels at ~25 kHz)
USB Sample Delay	0 samples

Digital Connectors

The digital input connector is a self-aligning 12-pin Omnetics PZN-12 polarized nano connector that mates directly to an Intan RHD2000 SPI interface cable.