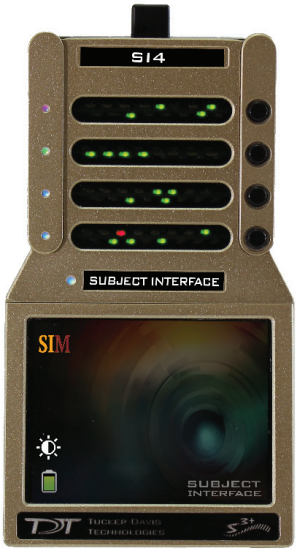
Tucker-Davis Technologies

The Subject Interface

System 3



Overview. TDT's Subject Interface (SI) is an exciting new hybrid device capable of both electrical stimulation and biological signal recording. The SI can be tailored to meet the unique needs of your research by combining different banks of electrical stimulation, analog recording and digital headstage inputs. The SI comes in different "sizes" that vary by the total number of banks. Choose between our 2, 4, 6 and 8 bank SI models, depending on the capacity your research requires.

Electrical Stimulation. The new stim circuitry designed for the SI builds on the previous generations of TDT MS & IZ2 stimulators. Each stimulation card can deliver stimuli to 16 output channels, with a maximum of 4 voices (current sources) active concurrently. The stimulator can run in either constant current or constant voltage mode with a user selectable compliance voltage up to 15 V. In current mode, the SI stimulator can deliver up to 5 mA of current per voice with a resolution/step size of 10 nA. In voltage mode, the stimulus output maxes at 15 V with a 100 µV resolution. Running at sampling rates up to 50 kHz, pulses can be delivered with a width as short as 20 µs. Add multiple stimulation banks to stimulate more channels or combine outputs to reach higher maximum currents and compliance voltages.

Analog Recording. The SI features the same great analog recording functionality built into the PZ5 product line. Each analog recording bank is capable of recording 16 channels of high impedance or low impedance biological signals up to ~50 kHz. Analog input boards oversample the input signals with very fast instrumentation grade converters. TDT's custom hybrid A/D circuit yields 28 bits of resolution and unparalleled dynamic range. Optional DC coupling offers zero phase distortion across the signal bandwidth. Sampling rate and down-sampling filters can be optimized on each logical amplifier for the intended input type to optimize signal fidelity. The +/-500 mV input range is large enough to accept any biological potential and most stimulus artifacts without saturating.

Multi-Modal Configuration. Analog recording on the SI is organized into 16-channel banks. Each bank is electrically isolated, so ground and reference channels are not inherently shared between banks. Multiple banks can be grouped into a single logical amplifier that shares the same settings and ground/reference among each bank in the logical amplifier. Each logical amplifier can use the ground as a reference, use a shared reference, use a unique reference on each bank, or implement full per-channel differential referencing.

Digital Headstage. The SI can also be equipped with digital headstage banks, each with one Omnetics connection to receive data from an Intan-based digitizing headstage. Compatible digitizing headstages (from TDT, Intan or other vendors) can be 32, 64, 96 or 128 channels. The SI will keep the digitized data time-locked with all other data on the system and the A/D characteristics will be defined by the headstage itself.

Power and Communication. Data from the SI can be streamed across the fast fiber optic connection to an RZDSP_M card in an RZ processor. Configuration information is also sent from the RZ to the SI across the fiber optic connection.
The SI is powered by an optically isolated 32 Amp-hour Lithium-ion battery pack. An external battery pack (PZ-BAT) is also available to provide longer battery life for extended experiment sessions.

SI Input Compatibility. The SI can accept inputs from a variety of electrode/headstage combinations via the back-panel mini-DB26 connectors on the stimulation and recording banks. Each connector inputs 16 recording channels (or eight differential channels) along with ground and reference. An external ground is also available.

Subject Interface (SI) Part Numbers:

SI**N**-S**XX**-A**YY**-D**Z**

- **N**: Total number of banks/slots in device
- **XX**: Number of stimulation channels (16 channels per bank)
- **YY**: Number of analog recording channels (16 channels per bank)
- **Z**: Number of digital recording banks (1 digital input per bank)

EXAMPLE: SI8-S32-A96-D2

Subject Interface with 8 banks
(32 stim channels, 96 analog channels, and 2 digital banks)

Have a question? contact us at sales@tdt.com
+1.386.462.9622

Technical Specifications for the Subject Interface

Electrical Stimulation	
Stimulus Output Channels:	16 per card
Stimulus Output Voices:	4 per card
Stimulus Output Voltage (max):	±15 V
Stimulus Output Voltage Resolution:	100 µV
Stimulus Output Current (max):	± 5 mA per voice, up to 3 kΩ load*
Stimulus Output Current Resolution:	10 nA
Stimulus Compliance Voltage:	User-selectable up to 15 V*
DC Offset Current:	active channel < 100 nA open channel < 1 nA
Sampling Rate:	Up to 50 kHz *Higher values can be attained by combining voices or cards

Analog Recording	
A/D:	16 channels per card, hybrid A/D
Maximum Voltage In:	+/- 500 mV
A/D Sample Rate:	Up to 50 kHz
Frequency Response:	DC coupled: 0 Hz – 0.45*Fs (Fs=sample rate) AC coupled: 0.4 Hz – 0.45*Fs (Fs=sample rate)
S/N (typical):	Single Ended: 104 dB, Fs = 25 kHz, 300-7000 Hz Differential: 116 dB, Fs = 750 Hz, 0.4-300 Hz
DC offset:	DC Coupled: < +/-10 µV
Input Referred Noise:	Single Ended: 3.0 µVrms, Fs = 25 kHz, 300-7000 Hz Differential: 0.75 µVrms, Fs = 750 Hz, 0.4-300 Hz
Distortion (typical):	< 1%
Input Impedance:	AC coupled: 100 kΩ DC coupled: 20 MΩ

Digital Recording	
Input	1 digital input from an Intan-based headstage per card
Maximum Voltage In:	+/- 5 mV
Frequency Response:	0.1 Hz - 10 kHz

General	
Battery Capacity:	32 Amp-hour
Battery:	8-10 hours to charge to 95% capacity, 14 hours to fully charge *Battery life between charges is dependent on # of active cards:* 2 active cards ~50 hrs 6 active cards ~27 hrs 4 active cards ~35 hrs 8 active cards ~22 hrs
Charger:	External 12 VDC, 2.5 A power supply, center negative
Fiber Optic Cable:	5 meters standard, cable lengths up to 20 meters *If longer cable lengths are required, contact TDT*
Ethernet Port:	100 Mbps