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Specifications

Shimmer3/3R
Bridge Amplifier+ Unit



Key Features

Interfaces with strain gauge or load cell sensors to measure load, weight, force, torque, or pressure

Measures skin-surface temperature with the Shimmer skin temperature probe, recorded in °C by Consensys, alongside force if required; also interfaces with other variable resistance sensors

Contains an excitation source for strain gauge or load cell, so no external voltage source is required

Optimises power consumption via software controlled excitation source & amplifier

2 channels of output from bridge amplifier, providing both low and high gain; low gain is ideal for bipolar inputs; high gain provides additional 3x gain for unipolar load cells

EEPROM for board identification, with 2032 of its 2048 bytes free for user data

Introduction

The Shimmer Bridge Amplifier+ unit allows for strain and load cell data acquisition for force and resistance measurements free from wired constraints, allowing for natural range of motion and measurement outside of a dedicated lab setting.

The Bridge Amplifier+ unit also has integrated inertial sensing via accelerometers, gyroscope, magnetometer and altimeter.

Product Overview

The Bridge Amplifier+ unit contains a bridge amplifier, excitation source, and connector enabling force measurement with Shimmer, as well as a buffered resistance divider amplifier to enable resistance measurements.

The bridge amplifier is ideal for all load, weight, force, torque, and pressure measurements through the connection of a user-supplied strain gauge based bridge sensor or load cell. The resistance divider input is suitable for variable resistance sensors, such as the Shimmer skin surface temperature probe, whose readings Consensys records in °C.

Applications

Musculoskeletal Clinical Research

Strength Capacity and Force Measurement

Skin Temperature Monitoring

Resistance Measurement

Environmental Monitoring

Rehabilitation

Fall Risk Assessment (Grip Strength)

Sports Training

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Wearable Wireless Sensing

Small, lightweight wearable design provides full mobility, unrestricted movement and comfort for wearer.

Highly flexible and adaptable sensor platform can convert captured data to digital format, and provide real-time physiological data collection and streaming.

Highly accurate and scientifically reliable raw, calibrated or uncalibrated data to allow complete control over capture and interpretation of sensed data in real-time.

Supporting Software

- Shimmer ConsensysPRO & ConsensysBASIC
- Shimmer LabVIEW Instrument Driver
- Shimmer MATLAB Instrument Driver
- Shimmer Java / Android API
- Shimmer C# API

Supporting Hardware & Accessories

- Skin Surface Temperature Probe
- TRRS Cable
- Shimmer3 Calibration Stand
- Straps, Documents, Charging Dock/Base, Case

Technical Specifications

Bridge Amplifier	
Gain[1]	183.7 ± 1% (Normal Channel), 551 (3x Normal) ± 1% (High Gain Channel)
Frequency Range[1]	DC..1kHz (Normal Channel), DC..50Hz (High Gain Channel)
Common Mode Rejection[1]	higher than 110dB
Input Impedance[1]	50MOhm
Input Signal Range	±7mV, ±2.5mV/V (Normal Channel), 0-4mV, 0-1.43mV/V (High Gain Channel)
Zero-load Noise	12mV RMS both outputs, < 1% full-scale (Normal Channel), < 0.5% full-scale (High Gain Channel)
Excitation Voltage[2]	2.8V ± 5%
Input Protection	Current limiting, EMI/RF suppression
Resistance Amplifier	
Gain[1]	10.1 +/-2%
Pull-up/Input Impedance	200kOhms to +3.0V
Frequency Range[1]	DC..408Hz (2nd Order)
Signal Range	280mV or 20kOhms (1kΩ-20kΩ measurement range recommended)
Zero-load Noise	0.1 mV RMS at output
Connections	Two 3.5mm jacks (headphone type) for 4 conductor shielded cable for Bridge Amplifier and Resistance Amplifier,
Current Consumption	< 100µA (Excitation disabled), 17mA (Excitation enabled[3])
EEPROM memory	2048 bytes

[1] Calculated specification, exact value subject to environmental and component variation.

[2] The Excitation source is software controlled.

[3] This value is load-cell dependant, to estimate use the formula I = 1 + 2.8/(RSGin || RSGout); RSG data is available from the load-cell manufacturer.

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Shimmer3/3R Specifications

	Shimmer3R	Shimmer3
Processor	ST STM32U5A5 (32-bit Arm Cortex-M33), runs at 48 MHz 2.5 MB RAM, 4 MB flash	TI MSP430F5437A (16-bit), up to 24 MHz 16 KB RAM, 256 KB flash
Radio	Bluetooth Classic and Bluetooth Low Energy: Ezurio Vela IF820 module (453-00171C), integrated chip antenna	Class 2 Bluetooth: Roving Networks RN-42 (Classic), or Microchip RN4678 (Classic and Bluetooth Low Energy) on later units
Storage	microSD slot: microSDHC and microSDXC cards, FAT32 or exFAT Read by a PC through a *Shimmer Dock* or *Consensys Base*, or over USB-C as a removable drive Files can be listed, read and deleted over Bluetooth	microSD slot: microSD and microSDHC cards up to 32 GB, not microSDXC; an 8 GB SanDisk card is supplied Full-speed transfer to a PC through a *Shimmer Dock* or *Consensys Base*
Battery and power	3.7 V rechargeable lithium battery, 400 mAh, with a safety circuit Battery voltage monitoring, on a converter of its own Soft power control of the Bluetooth radio and the sensor supplies	3.7 V rechargeable lithium battery: 450 mAh, or 400 mAh on current units, with a safety circuit Battery voltage monitoring Soft power control of the Bluetooth radio and the microSD card Designed for EN 60601-1 compliance
Integrated sensors	3-axis low-noise accelerometer and 3-axis gyroscope (ST LSM6DSV) 3-axis wide-range accelerometer (ST LIS2DW12) 3-axis magnetometer (ST LIS2MDL) Pressure and temperature sensor (Bosch BMP390, or BMP581 on later units)	3-axis low-noise accelerometer 3-axis wide-range accelerometer 3-axis gyroscope 3-axis magnetometer Pressure and temperature sensor

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