info@biopac.com
support@biopac.com
www.biopac.com

FOTS200 — STAND-ALONE HIGH FIELD FIBER OPTIC SYSTEM

The FOTS200 Control Unit is a single-channel signal conditioner specifically designed for measuring physiological temperature. The system is designed to perform in stringent environments by offering the highest temperature accuracy and resolution in the industry. The unit interfaces with TSD380 and TSD381* high-accuracy MR Conditional temperature sensor transducers for high field strength MRI applications (see Fiber Optic Temperature Probes spec sheet for details). It should be used instead of the FOTS100 when customers want to measure temperature inside the scanner and the MRI field strength is greater than 3T.

This is a stand-alone system, but it can also be interfaced to BIOPAC MP Systems:

- MP160 or MP150 System via included Analog output cables: CBL102 + CBL106 (single channel)
    - Optional cable combination for AMI100D/HLT100C is CBL106 + CBL123 (not included).
- For the multiple channels for the COM/ground connection, users can "stack" the black common pins of multiple CBL106.
- If a user is using more than one temperature sensor, they will need one of those cable combinations per temperature channel being recorded.

IMPORTANT: If electrodes on to a human subject are connected to the same MP system as the FOTS200, the FOTS should be connected through an INISOA isolation adapter to maintain proper isolation for the subject.

The analog output parameters comprise the scale factor and the offset. The scale factor corresponds to the physical unit per Volt (unit/V) output by the system, while the offset corresponds to the physical value at which the user wants the analog output to be at zero volts. For example, with a scale factor set to 10° C / V and the offset set to 5° C, the temperature as a function of the analog output voltage is given by:

Temperature = [Voltage output] x 10° C / V + 5 °C

Default values: *Scale factor* 50° C / V (or its equivalent in ° F); *Offset* 0° C (or its equivalent in ° F).

FOTS200 includes: Single channel control unit with 20 Hz sampling rate, RS-232 output interface, ±5 V analog output, AC wall adapter. For more details, please see the complete FOTS200 User Manual.

FOTS200 Specifications

Number of Channels:	1 (4- or 8-channel modules are available—contact BIOPAC to discuss)
Compatibility:	TSD380, TSD381* temperature sensors
Accuracy:	±0.3° C (Total accuracy over the full range from 20° C to 45° C including both signal conditioner and sensor errors)
Resolution:	0.01° C
Sampling Rate:	20 Hz standard
Channel Rate Scan:	6.67 Hz (channel to channel measurement time = 150 ms)
Output Interface:	±5 V and RS-232 standard
No Signal Values:	*Analog* 0 Volt; *RS-232* 65 536.0
Input Power and Consumption:	12 to 30 VDC – 1.8 W (AC adapter included)
Dimensions:	95 mm (H) x 190 mm (W) x 239 mm (L)
Storage Temperature:	-40° C to 70° C
Operating Temperature:	10° C to 35° C
Humidity:	95% non-condensing
Light Source Life Span:	40,000 hours MTBF

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MAGNETIC SENSITIVITY

FOTS100

Pico-M signal conditioner – GaAs temperature sensing technology

When exposed to strong magnetic field, the GaAs sensor used with the FOTS100 will see an artificial shift in temperature:

Magnetic field	Shift in T° (approximately)
0 T	0 °C
1.5 T	< 0.2 °C
3 T	-0.4 °C
7 T	-2.5 °C
9.4 T	-4.5 °C

This shift does not depend on field orientation and is very reproducible in a given setup, hence it can be easily factored out by the user.

The values at field strength come from the following article: Buchenberg, W.B., Dadakova, T., Groebner, J., Bock, M. and Jung, B. (2015), Comparison of two fiber-optical temperature measurement systems in magnetic fields up to 9.4 Tesla. Magn. Reson. Med., 73: 2047-2051. doi:10.1002/mrm.25314

FOTS200

AccuSens signal conditioner—WLPI temperature sensing technology

- WLPI stands for “White-Light Polarimetric Interferometry”

The TSD380 series sensor probes associated with the FOTS200 readout unit have an optical sensing element that is insensitive to magnetic field, hence, there is no maximum magnetic field specification, which is a nice advantage in high-field MRI applications.

However, this technology has some disadvantages: it is more expensive; the probe cannot be made to a diameter smaller than 1.2 mmm O.D.