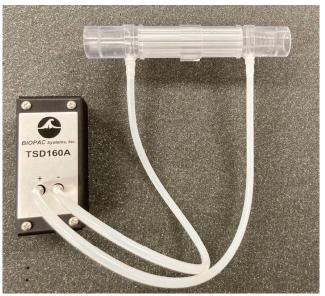


### TSD157B-MRI – LAMINAR FLOW TRANSDUCER ±120 LPM



The TSD157B-MRI laminar flow transducer ( $\pm$ 120 LPM) is suitable for precision ventilator bidirectional airflow measurements or resting airflow measures in fMRI. It consists of flow head RX157B + pressure transducer TSD160A + Tubing. Available with 20 m tubing for MRI use or 1 m tubing for non-MRI use (option TSD157B-MRI-01). Tubing presses over the barbs on the flow head and transducer and should be cut to fit for max separation, typically 10 m for MRI or 0.5 m for non-MRI.

- For ventilator flow measurements, the flow noise of TSD157B-MRI greatly outperforms earlier offering of TSD127 + TSD117B over the typical ventilator flow range of ±100 LPM.
- For MRI use, the TSD157B-MRI can go inside the bore; the tubing from the RX157B flow head goes through the waveguide to the TSD160A+DA100C in the Control Room and should be cut to fit. The TSD157B-MRI can also interface with the AFT35-MRI valve: AFT35-MRI to AFT7 tubing to AFT11E to RX157B. (This same setup also works with RX127, instead of RX157B, with an additional coupler AFT11B.)

BIOPAC supplied linearization polynomials are available on request as a template.

Additional or replacement flow heads available as RX157B. Ask about options for 60 LPM or below or 240 LPM and below.

### **OPTIONAL ACCESSORIES**

TSD157B-MRI can be used with the AFT35-MRI low-profile mouthpiece and non-rebreathing T-valve assembly and AFT7 tubing with AFT11B coupler:





#### **SPECIFICATIONS**

Components:	RX157B Flow head + TSD160A Differential Pressure Transducer + Tubing
Туре:	Bidirectional Flow Measurement
Range:	±120 Liter/Min
Noise:	Standard Deviation – 0.085 Liters/Min @ 25 LPM @ DC-10 Hz Bandwidth
Interchangeability Accuracy:	±5% (nominal)
Ports:	Single Barb accepts 3.5 mm ID Tubing Connects to Standard 22 mm ID Ventilator Tubing
Tubing—Length options:	1 m (non-MRI) or 20 m (MRI)
Temperature Range:	0 °C to 40 °C
Dimensions:	140 mm long x 22 mm OD x 15 mm ID
Mounting:	¼" x 20 standard female camera mount
MR Safe:	RX157B Flowhead
Sterilization:	Cold sterilization only (Cidex <sup>®</sup> OPA or equivalent)

Flow Rate (Liters/Min)	Pressure Delta (Inches H <sub>2</sub> O)	
20	0.02	
50	0.08	
100	0.26	
120	0.31	

Calibration, noise and accuracy data: download TSD157B to TSI4000 flow standard (xls and txt)

## TSD157B Amplifier and Calculation Channel Settings:

Table 1: Amplifier settings				
TSD157B An	nplifier Settings			
Parameter	Setting			
Channel	1			
Gain	1000			
10 Hz LPF	On			
LPF	300			
HP	DC			

# Table 2: Scaling

**Note:** The ideal range of CAL 1 – CAL 2 needs to be maintained. If after clicking CAL 2 to adjust for an offset of say, -0.12, then CAL 1 must be adjusted = 1 - 0.12 = 0.88

TSD157B Scaling				
	Input V	Map (volts)		
CAL 1	1	1		
CAL 2	0	0		



## Table 3: Polynomial equation curve fit

### Note: The reference voltage (vref+ and vref-) of DA100C should be +/-5v for the TSD157-MRI.

Calc	Polynomial Equation (C10 is the 10 Hz LPF raw signal from A1-pneumotach)	
Channel		
11	(-0.00473407 * C10^11) + (-0.14136 * C10^10) + (-1.84128 * C10^9) + (-13.7084 * C10^8) +	
	(-64.1117 * C10^7) + (-194.359 * C10^6)	
12	(-378.058 * C10^5) + (-443.201 * C10^4) + (-254.755 * C10^3) + (5.85431 * C10^2) +	
	(115.713 * C10)	
13	(-0.017143 * C10^11) + (0.485291 * C10^10) + (-5.96262 * C10^9) + (41.6528 * C10^8) + (-	
	181.939 * C10^7) + (514.133 * C10^6)	
14	(-936.911 * C10^5) + (1054.05 * C10^4) + (-644.382 * C10^3) + (119.216 * C10^2) +	
	(103.059 * C10)	
15	C11 + C12 LPM	
16	C13 + C14 LPM	
17	IF(LESS(C10, 0), C15, C16) LPM	
18	Math C17/60 LPM->lps	

### Table 4: Linear equation curve fit

Five segment piecewise-linear mapping of pneumotach flow to reference flow meter: (C10 is the 10 Hz LPF filtered raw signal from A1-pneumotach)

Segment 1 C11: (37.29935377 \* C10) - 21.8073737 Segment 2 C12: (23.26959 \* C10) - 29.25648 Segment 3 C13: (98.09533 \* C10) Segment 4 C14: (19.81710683 \* C10) + 33.84804951 Segment 5 C15: (39.20728782 \* C10) + 22.32275861

Decision Logic C16: IF(LESS(C10, -0.531), C11, IF(LESS(C10, -0.392), C12, IF(LESS(C10, 0.431), C13, IF(LESS(C10, 0.594), C14, C15))))