



Extension Cable Use

Effects on Probe Received Signal

Received Signal Normalization

The Received Signal Amplitude of Transonic Systems' flowprobes and flowsensors used with the 400-series flow modules and previous models T106 and T206 are normalized to read 1 volt in Test mode on standard use extension cables. Standardizing the test signal voltage for probes helps the user to identify poor acoustic conditions and to track signal quality and the functional status of the probe. Low received signal may affect measurement quality with increases in noise and zero offset.

Signal Level Thresholds

Transonic flowmeters present signal quality through various indicators: the LED displays signal quality ("Good", "Low", "No Signal" or "Acoustic Error") in Test mode and the analog meter (models TS420, T106, T206) measures the voltage. 400-Series flowmeters continuously display a light bar indicator of signal level.

SIGNAL STRENGTH	SIGNAL QUALITY	BAR DISPLAY	ANALOG DISPLAY	REC AMP VOLTAGE
Over 80%	Good	5 bars lit	----	Over 0.8V ----
60% - 80%	Good	4 bars lit		
30% - 60%	Good	3 bars lit	Proportional	
20% - 30%	Low	2 bars lit	Readings	
10% - 20%	Low	1 bar lit		
Under 10%	No Signal	No bars lit	----	Under 0.1V ----

Conditions that Degrade Signal Level

- Acoustic Conditions**
Air in probe, fatty tissue deposits on the vessel, untreated artificial graft materials with imbedded air, using sensors on inappropriate tubing and fluids with atypical acoustic properties all decrease the signal amplitude.
- Use of Inappropriate Extension Cable**
Probes are normalized for typical extension cable use unless specified by the user. Deviations may effect received signal strength and renormalization on the desired extension cable may be recommended.
- NonStandard Electrical Configurations**
These include using electrical swivels and switch boxes
- Electrical Connection**
Break in probe wire, corrosion in pins or wire connection.

Special Application Considerations Cables longer than 3 meter length

Long cables are often requested for MRI applications where it is important to keep the flowmeter electronics away from the magnet or for monitoring tethered animals from an observation room. Flowprobes with high received signal may be used with cables as long as 7 -10 meters, but must be tested and normalized to operate on this length. In addition, transmission of the probe digital eeprom data over long cables is not reliable. Use of separate eeprom keys with long extension cables is recommended to locate the eeprom at the flowmeter where it the digital information can be reliably read.

Super Keys Extending Chronic Implant Life

Conditions in chronically implanted flowprobes (such as fatty tissue infiltration) can cause the probe signal to degrade over time. A probe with normalized signal that has become low may be boosted by increasing the transmit signal with specially programmed eeprom "Super Keys". Super Keys may extend the functional life of an implanted probe so that data may continue to be collected. Researchers should evaluate new data with previous data to ensure that baseline has not shifted significantly and zero offset increased.

Using Electrical Swivels

Multiple electrical connections and impedance mismatch in the cable may also compound received signal loss. Super Keys may be used in these applications to overcome low signal conditions which cannot be resolved.

Prosthetic Graft Materials

Artificial graft conduits are woven or knitted of various materials which generally trap air in the graft wall and impede ultrasonic signal transmission. Grafts may be pretreated by vacuum or preclotted to absorb air prior to implant to allow flow measurement with Transonic flowprobes during surgery. Normalizing and calibrating flowprobes for specific use on a graft accelerates the signal transmission to achieve a measurement sooner on chronically implanted grafts.

Conclusions

- Flowprobe receive signal should be tested periodically for adequate signal levels.
- Flowprobes should be used with recommended extension cable lengths.
- Flowprobes with low signal should be serviced and renormalized at Transonic Systems.
- Flowprobes for chronic implant should have a minimum signal level of 0.7 volts prior to implant.



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400-Series Perivascular Flowprobes

EXTENSION CABLE WITH 10-PIN PROBE CONNECTOR				
PROBES WITH CRA10 CONNECTOR	STANDARD 1.25 METER LENGTH	2 METER LENGTH	3 METER LENGTH	CUSTOM: > 3 METERS
0.5 MM, 0.7 MM NANOPROBES	Standard Normalization = 1V	<i>Not recommended</i> Significant signal decrease and zero offset increase		<i>Not available</i>
1 MM, 1.5 MM PROBES	Standard Normalization = 1V	Normalize on 2 meter cable; signal may decrease	Normalize on 3 meter cable; signal may decrease	<i>Not recommended</i>
2 MM & LARGER PROBES	Standard Normalization = 1V	Normalize on 2 meter cable suggested	Normalize on 3 meter cable suggested	Normalize on custom length; Use separate Eprom Key

EXTENSION CABLE WITH 4-PIN OR 12-PIN PROBE CONNECTOR				
PROBES WITH CHRONIC CONNECTOR	STANDARD 1.25 METER LENGTH	STANDARD 1.8 METER LENGTH	3 METER LENGTH	CUSTOM: > 3 METERS
0.5 MM, 0.7 MM NANOPROBES	Not available	Standard Normalization = 1V	<i>Not recommended</i> Significant signal decrease and zero offset increase	
1 MM, 1.5 MM PROBES	Not available	Standard Normalization = 1V	Normalize on 2 meter cable; signal may decrease	<i>Not recommended</i>
2 MM & LARGER PROBES	Not available	Standard Normalization = 1V	Normalize on 3 meter cable; suggested	Normalize on custom length; Use separate Eprom Key

400-Series Tubing Sensors

EXTENSION CABLE			
SENSOR SIZE	NO EXTENSION CABLE	1 METER LENGTH	CUSTOM: > 1 METERS
1 PXN, 2PXN, 3PXN	Standard Normalization = 1V	<i>Not recommended</i> Significant signal decrease and zero offset increase	<i>Not recommended</i>
PXL SENSORS 4 PXN & LARGER	Standard Normalization = 1V	Normalize on 1 meter cable; signal may decrease	Normalize on custom length; Contact Transonic for specification.

• Fluid temperature and tubing type also significantly affect tubing flowsensor received signal. Normalization should be performed at conditions of actual use.

T106 / T206 -Series Perivascular Flowprobes

EXTENSION CABLE LENGTH				
PROBES SIZE & CONNECTOR TYPE	1 METER LENGTH	2 METER LENGTH	3 METER LENGTH	CUSTOM: > 3 METERS
10-PIN CONNECTOR				
0.5V - 1.5 MM PROBES	Standard Normalization = 1V	<i>Not recommended</i> Significant signal decrease and zero offset increase		<i>Not available</i>
2 MM & LARGER PROBES	Standard Normalization = 1V	Normalize on 2 meter cable suggested	Normalize on 3 meter cable; signal may decrease	Normalize on custom length; Use separate Eprom Key
4-PIN CONNECTOR				
1 MM, 1.5 MM PROBES	Standard Normalization = 1V	Normalize on 2 meter cable; signal may decrease & zero offset may increase	<i>Not recommended</i> Significant signal decrease and zero offset increase	<i>Not available</i>
2 MM & LARGER PROBES		Standard Normalization = 1V	Normalize on 3 meter cable; signal may decrease	Normalize on custom length; Use separate Eprom Key



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