

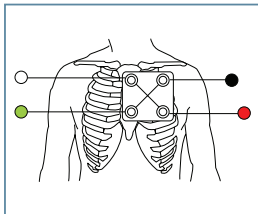


Precision Engineering

The PAM Module is an embedded instrumentation pack which provides an accurate gating trigger for use in an MRI environment. The PAM-200 is a complete solution consisting of ECG Acquisition, an Optical Plethysmograph for pulse acquisition, and a pneumatic respiration pad for respiration acquisition.

ECG Acquisition

The PAM utilizes a 4 lead ECG configuration. The Right Leg is the reference lead with Right Arm, Left Arm and Left Leg as the active leads. The PAM provides for two simultaneous orthogonal vectors which result in one vector less effected by magnetic gradients.

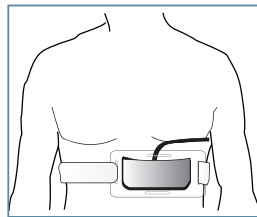


Respiratory Acquisition (RESP)

The PAM utilizes a pneumatic technique which responds to the expansion of the chest during respiration. A foam filled pillow is attached to the patient with a strap, and the air pressure in the pillow changes as the chest moves and compresses the pillow. The internal foam

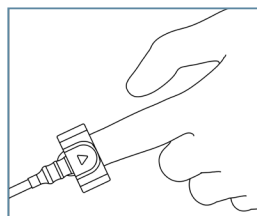
provides the spring action to return the pillow to the pre-compressed state.

The pillow has a stiff backing which aids in the compression action of the chest movement. The pillow is attached to the PAM Module by a flexible plastic tube - there is no electrical connection. The respiratory signal is transmitted in the digital stream to the console computer.



Peripheral Pulse Acquisition (PPG)

The PAM provides cardiac gating by way of an optical based peripheral pulse, which is acquired on the patient's finger. The optical emitter and detector are located within the PAM housing and the light energy is coupled to the patient through fiber optic cable. The peripheral pulse signal is transmitted in the digital stream to the console computer.



Accessories

ECG	
Name	Part No.
MRI ECG Cable Kit 6', AHA	3725-01-15
MRI ECG Cable Kit 6', IEC	3725-02-15
Electrodes	590494
NuPrep Gel	590291

RESP	
Name	Part No.
Pillow	2802-00-01
Strap, 42"	2842-00-10
Hose to Pillow	3215-00-01

PPG	
Name	Part No.
PPG Patient Cable w/ Finger Bands, 2.8m	3003-01-15

Module Operating Conditions

The PAM-200 MRI Gating Module, ECG Cable, Peripheral Pulse Cable and Pneumatic Respiration Pillow have been tested and verified to be MRI Conditional under the following operating conditions:

Max Static Field:	1.5T
Max Spatial Gradient:	1580 g/cm
Max Peak Gradient Strength:	33 mT/m
Max flux change /time (db/dt):	113.4 T/sec
Max Wholebody SAR (15min):	3.88 W/kg

Communications

Unidirectional fiber optic communication with console

Optical Transmitter:	Avago HFBR-1522
Optical Receiver:	Avago HFBR-2522
Maximum Distance:	45M
Transmission Rate:	115.2KBaud
Optical Frequency:	660nm
Serial Configuration:	8bit, 1 start bit, 1 stop bit, no parity

Communication Protocol

9 bytes once every 1ms, customized up to 1MB	
ECG1:	14 bit signed, 1ms sample, 136.7nV count
ECG2:	14 bit signed, 1ms sample, 136.7nV / count
Respiration:	12 bit signed, 5ms sample, amplitude auto-scaled
Peripheral Pulse:	12 bit signed, 5ms sample, amplitude auto-scaled

ECG Performance

Detection Amplitude Range:	0.3mV to 4.5mV
ECG Bandwidth:	5Hz to 20Hz
Digitization Rate:	10KHz
Digitization Resolution:	16 bits
Delay:	10ms
ECG Scaling at electrode:	7313 counts / mV or 136.7nV / count

ECG Electrical

Patient Leakage:	< 50uA @264Vac 60Hz
Patient Isolation:	4000V @60Hz for 1 minute

Respiratory Performance

Pressure Range:	0 to 1psi (760 mm Hg)
Digitization Rate:	1KHz
Waveform transmission rate:	200Hz
Digitization Resolution:	16 bit
Bandwidth:	3Hz
Baseline restoration :	20 seconds
AGC Range:	40dB
ACG lock:	60 seconds
AGC lock amplitude:	70% of full scale amplitude

Respiratory Patient Connection

Pneumatic connection:	Colder Products #PMC1602
Hose to pillow connection:	Lure Lock
Pillow strap:	2" wide Velcro Strap

Peripheral Pulse Performance

Peripheral Pulse Bandwidth:	10Hz
Peripheral Pulse Digitization Rate:	1KHz
Waveform transmission rate:	200Hz

Mechanical

The PAM is housed in a RF tight Cast Aluminum housing with a removable Aluminum top cover.

Length:	13.625" (34.6 cm)
Width:	3.5" (8.9 cm)
Height:	1.375" (3.5 cm)

Power Requirements

+8V to +15V ±5% of negative supply @1A;
Ripple < 50mV
-8V to -15V ±5% @500mA; Ripple < 50mV

Shipping Conditions

Temperature:	+41 to +131 °F (+5 to +55 °C)
Relative Humidity	90% max (non-condensing)

Environmental (Operating Conditions)

Ambient Temperature	41 to 104 °F (5 to 40 °C)
Ambient Temp Change	< 3 °C/hr (< 37 °F/hr)
Humidity (non-condensing)	30 to 75 %RH
Humidity Change (non-condensing)	< 5 %/hr
Altitude (above sea level)	-1300 to 10000 ft (-396 to 3048 m)
Atmospheric Pressure	1060 to 700 Hpa
Shock	Maximum 20G @ less than 3 rms half sine
Maz Continuous Magnetic Filed	0.6 Tesla (6000 Gauss)
Vibration	Maximum random 0.21G RMS

Regulatory

Unit meets or exceeds the specifications and regulations for:
 IEC 60601-1: 3rd edition
 IEC 60601-1-2: 4th edition (2014)
 CAN/CSA C22.2 No. 60601-1:2014
 MDD
 ISO 13485:2016
 RoHS 2011/65/EU
 WEEE 2012/19/EC
 FDA/CGMP
 MDSAP
 CE

Warranty

One Year (parts and labor)

(Specifications subject to change without notice)

 For additional specifications, refer to Operator Manual



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