

ELECTRICAL

		<u>UNITS</u>	<u>VALUE</u>	
Channels			8	
Display:	LED (red) - Bias LED (yellow)		Open/Short Overload	
Sensor Excitation		V/mA	24 ±1/3-20	[12]
Fixed Gain:			x1 (unity)	
	Accuracy (at 500 Hz)	%	±1	
	Linearity (10-50 kHz)	%	±1	
Frequency Response (gain x 1) (-5%)		Hz	0.5-100,000	
Phase Accuracy (at 1 kHz)		°	±1	
Noise (spectral):	Typical	gain	x1	[19]
	1 Hz	µV√Hz	2.0	
	10 Hz	µV√Hz	0.2	
	100 Hz	µV√Hz	0.2	
	1 kHz	µV√Hz	0.15	
	10 kHz	µV√Hz	0.15	
Broadband Noise 1 Hz-10 kHz (typical)		µV	11.0	
Input Range		V	9.0 (Max.)	
Output Range (w/5 kΩ load minimum)		V/mA	10/2.0	
Overload Threshold		Vpk	+10 (±0.2)	
Output DC Offset (maximum)		mV	50	
Output Impedance		ohms	50 (maximum)	
Channel Isolation (minimum)		dB	72	
Power Requirements:		VAC	100-240	
	Maximum	A	0.6	
	Frequency	Hz	47-63	

ENVIRONMENTAL

Operating Temperature:		°F	32 to 120
		°C	0 to 50
Relative Humidity		%	85

PHYSICAL

Connectors - Signal:	Input (rear)	D-sub-50	1
	Output (rear)	D-sub-37	1
	Output (front)	BNC	8
Connector - Power			IEC 320
Size (H x W x D):		in	3.5 x 19.0 x 16.25
		mm	88,8 x 483 x 413
Weight (maximum)		lb [kg]	15.0 [6,82]

NOTES:

- [1] Limited by channel's frequency response.
 - [2] 055 - user defined filter cutoffs (-3 dB).
 - [3] Frequencies - 10 Hz, 100 Hz, 1,000 Hz and 10 kHz - tested at final calibration.
 - [4] 041 option required.
 - [5] "S" is defined as sensor sensitivity in mV/g times channel gain in V/V.
 - [6] Reference to sensor sensitivity of 100 mV/g (@ 61.4 Hz).
 - [7] Based on sinusoidal input.
 - [8] Reference specification sheets for 422M113, 422M116 and 422M117.
 - [9] Constant current adjusted/monitored in ICP® mode.
 - [10] RS-485 interface uses proprietary interconnect of PCB equipment only.
 - [11] Filter cutoffs 21.4k, 17.1k, 14.3k channel isolation 66 dB (minimum).
 - [12] Factory set at 4.0 mA ±1.0 mA.
 - [13] Gain x1 - Filter cutoff set to 995 Hz - 28.0, 16.0, 14.1, 16.8, 1.40, Broadband 525.
Gain x10 - Filter cutoff set to 995 Hz - 30.0, 9.60, 8.20, 7.10, 3.20, Broadband 540.
 - [14] Reference to sensor sensitivity of 10.2 mV/m/s² (100 mV/g)
 - [15] Filter enabled, accuracy -2%, disabled ±1%.
 - [16] Filter enabled, if disabled reference other options included, highest noise specification dominates.
 - [17] Tested with option 498-038 set to x1, channel output
 - [18] See PCB Declaration of Conformance PS024 for details.
 - [19] Noise test per AT-107-2, USING 401a05, or capacitor to ground in charge option. High noise value dominates.
- * Not Tested

SUPPLIED ACCESSORIES:

Model 017 Power Cable
 Ferrite Bead (part number 100-2973-30)
If Option 498-101 Also Supplied
 009N03
 EE-75 481A Control Software (1CD ROM)



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Drawn	LH	10/27/09	Spec No.	31556
Engineer	CPH	10/19/09		
Sales	JJM	10/15/09		
Approved	EB	10/22/09		Sheet 1 of 8

UNITSVALUE**012 - Calibration Signal: External Input or Internal Oscillator with Amplitude Control**

External Input Amplitude Range		V rms	1.0 (maximum)	
External Input Frequency Limits		Hz	0.5-100k	[1]
External Input Buffer Gain Accuracy		%	1	
Internal Oscillator Frequency		Hz	100 (±2%)	
Internal Oscillator Amplitude		V pk	1 (maximum)	
Internal Oscillator Amplitude Steps		V	0.01	
Internal Oscillator Amplitude Steps Front Panel (Option 103)		V	0.05	
Internal Oscillator Amplitude Accuracy		%	2	

013 - Selectable Time Constant

Time Constant		sec	2/10	
Frequency Response (-5%):	2 Seconds	Hz max	0.25	
	10 Seconds	Hz max	0.05	
with 037, 057 or both included	10 Seconds	Hz max	0.09	

014 - Calibration Signal: External Input

Input Amplitude Range		V	±10 (maximum)	
Input Impedance		M ohms	1 (minimum)	
Input Frequency Limits		kHz	0.5-100	[1]
Input Buffer Gain Accuracy		%	1	

020 - Programmable Overload Threshold Level

Threshold Maximum		V	10	
Steps		V	1	
Accuracy		%	2	

031 - Fixed Gain x5

Gain Accuracy		%	1	
Frequency Response (-5%)		Hz	0.5-80k	

032 - Fixed Gain x10

Gain Accuracy		%	1	
Frequency Response (-5%)		Hz	0.5-50k	

NOTES:

[1] Limited by channel's frequency response.

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UNITS

VALUE

035 - Programmable Gain

Gain Accuracy		%	1		
Linearity		%	1		
Gain			x1, x10, x100		
Noise (spectral):	Typical	gain	x1	x10	x100
	1 Hz	$\mu\text{V}/\sqrt{\text{Hz}}$	2.0	20.0	200.0
	10 Hz	$\mu\text{V}/\sqrt{\text{Hz}}$	0.2	0.6	6.0
	100 Hz	$\mu\text{V}/\sqrt{\text{Hz}}$	0.2	0.6	5.0
	1 kHz	$\mu\text{V}/\sqrt{\text{Hz}}$	0.15	0.6	5.0
	10 kHz	$\mu\text{V}/\sqrt{\text{Hz}}$	0.15	0.6	5.0
Broadband Noise 1 Hz-10 kHz (typical)		μV	11.0	50.0	500
Frequency Response (-5%)		kHz	65	65	40

037 - Programmable Fine Gain

Gain Accuracy		%	1		
Linearity		%	1		
Gain Limits:		minimum/maximum	0.1/200		
	Steps		0.1		
Frequency Response	(gain 0.1 – 99.9) (-2%/-5%/-10%)	kHz	20/65/90		
	(gain 100 - 200) (-2%/-5%/-10%)	kHz	20/60/80		
Noise (spectral):	Typical	gain	x1	x10	x100
	1 Hz	$\mu\text{V}/\sqrt{\text{Hz}}$	3.0	20.0	200
	10 Hz	$\mu\text{V}/\sqrt{\text{Hz}}$	1.5	1.5	10
	100 Hz	$\mu\text{V}/\sqrt{\text{Hz}}$	1.0	1.0	8.0
	1 kHz	$\mu\text{V}/\sqrt{\text{Hz}}$	1.0	1.0	6.0
	10 kHz	$\mu\text{V}/\sqrt{\text{Hz}}$	1.0	1.0	6.0
Broadband Noise 1 Hz-10 kHz (typical)		μV	100	125	650

038 - Expanded Programmable Fine Gain (Up to 200)

039 – Expanded Programmable Fine Gain (Up to 1000)

Gain Accuracy		%	1		
Linearity		%	1		
Gain Limits:		minimum/maximum	0.0025/200 or 1000		
	Steps	0.0025 - 9.9975	0.0025		
		10.00 - 99.975	0.025		
		100.0 – max.	0.25		
Frequency Response	(gain 0.0025 – 99.975) (-2%/-5%/-10%)	kHz	20/65/90		
	(gain 100 - 200) (-2%/-5%/-10%)	kHz	20/60/80		
Noise (spectral):	Typical	gain	x1	x10	x100
	1 Hz	$\mu\text{V}/\sqrt{\text{Hz}}$	3.0	20.0	200
	10 Hz	$\mu\text{V}/\sqrt{\text{Hz}}$	1.5	1.5	10
	100 Hz	$\mu\text{V}/\sqrt{\text{Hz}}$	1.0	1.0	8.0
	1 kHz	$\mu\text{V}/\sqrt{\text{Hz}}$	1.0	1.0	6.0
	10 kHz	$\mu\text{V}/\sqrt{\text{Hz}}$	1.0	1.0	6.0
Broadband Noise 1 Hz-10 kHz (typical)		μV	100	125	650

NOTES:

[19] Noise test per AT-107-2, USING 401a05, or capacitor to ground in charge option. High noise value dominates.

SUPPLIED ACCESSORIES:

Model 017 Power Cable

Ferrite Bead (part number 100-2973-30)

If Option 498-101 Also Supplied

009N03

EE-75 481A Control Software (1CD ROM)

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	<u>UNITS</u>	<u>VALUE</u>	
041 - Dual Independent 8 : 1 Switchable Output			
Number of Outputs		2	
Frequency Response (maximum)	kHz	100	[1]
Output Range (maximum/minimum)	V/mA	10.0/1.0	
Output Impedance (maximum)	ohms	400	
Connectors	BNC	2	
050-056 - Plug-In Fixed Filter Low Pass with Enable/Disable			
Cutoff Accuracy (-3 dB) Fx	Hz (%)	±5	
Order of Filter		4	
Roll Off	dB/oct & dB/dec	24/80	
Pass Band Accuracy	%	1	
Stop Band Attenuation (minimum)	dB	96	
List of Standard Cutoffs	Hz	2k, 10k, 20k, 100k	[2]
157 - Programmable Low Pass Filter (Elliptical) with Enable/Disable (sn > 353)			
Order of Filter		8	
Roll Off	dB	>65 at 1.5 times fc	
Pass Band Ripple	dB	1	
Pass Band Accuracy	%	2	[15]
Cutoff Frequency Accuracy	%	5	[3]
Stop Band Attenuation (minimum)	dB	70	
Spectral Noise (typical):	Gain x100	filter cutoff (-3dB) Hz	
		10	100
		995	10.7k
	1 Hz	μV√Hz	750 125 65.5 101
	10 Hz	μV√Hz	225 50.0 15.0 12.5
	100 Hz	μV√Hz	35.0 70.0 15.0 9.00
	1 kHz	μV√Hz	7.00 8.50 17.0 7.80
	10 kHz	μV√Hz	0.50 0.90 1.50 7.20
Broadband		μV rms	950 570 550 725
Broadband Noise (typical) 1-10 kHz		mV	4.00
List of Cutoff Frequencies (fc):	>5% apart	kHz	21.4 17.1 14.3
			12.2 10.7 9.51
			8.56 7.78 7.13
			6.58 6.11 5.71
			5.35 4.75 4.51
			4.28 4.08 3.89
	<5% apart	Hz	2 thru 3.72k

NOTES:

- [1] Limited by channel's frequency response.
 [2] 055 - user defined filter cutoffs (-3 dB).
 [3] Frequencies - 10 Hz, 100 Hz, 1,000 Hz and 10 kHz - tested at final calibration.
 [11] Filter cutoffs 21.4k, 17.1k, 14.3k channel isolation 66 dB (minimum).
 [13] Gain x1 - Filter cutoff set to 995 Hz - 28.0, 16.0, 14.1, 16.8, 1.40, Broadband 525.
 Gain x10 - Filter cutoff set to 995 Hz - 30.0, 9.60, 8.20, 7.10, 3.20, Broadband 540.
 [15] Filter enabled, accuracy -2%, disabled ±1%.
 [16] Filter enabled, if disabled reference other options included, highest noise specification dominates.
 [19] Noise test per AT-107-2, USING 401a05, or capacitor to ground in charge option. High noise value dominates.

SUPPLIED ACCESSORIES:

Model 017 Power Cable
 Ferrite Bead (part number 100-2973-30)
If Option 498-101 Also Supplied
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UNITS

VALUE

158 - Programmable Low Pass Filter (Butterworth) with Enable/Disable (sn > 353)

Order of Filter			8	
Roll Off		dB/oct	48	
Pass Band Accuracy		%	2	[15]
Cutoff Frequency Accuracy		%	5	[3]
Stop Band Attenuation (minimum)		dB	70	
Spectral Noise (typical):	Gain x100	filter cutoff (-3dB) Hz	10	100
	1 Hz	$\mu V/\sqrt{Hz}$	750	125
	10 Hz	$\mu V/\sqrt{Hz}$	225	50.0
	100 Hz	$\mu V/\sqrt{Hz}$	35.0	70.0
	1 kHz	$\mu V/\sqrt{Hz}$	7.00	8.50
	10 kHz	$\mu V/\sqrt{Hz}$	0.50	0.90
Broadband		μV rms	950	570
Broadband Noise (maximum) 1-10 kHz		μV	900	550
List of Cutoff Frequencies:	>5% apart	kHz	20.0	16.0
			11.4	10.0
			8.00	7.27
			6.15	5.71
			5.00	4.44
			4.00	3.81
	<5% apart	Hz	2 thru 3.4k	

061 - Dual Independent Single/Double Integrators Through Switched Output

Number of Outputs			2	
Output Range (minimum):		V/mA	5/1	
	Acceleration	%	2	
	Velocity	%	5	
	Displacement	%	5	
Integration Scale Factor:	Acceleration		S	[5]
	Velocity	mV/in/s	10 x S	
	Displacement	mV/mil	2 x S	
Low Frequency Corner (ref 100 Hz):	Velocity -5%	Hz (maximum)	8.0	
	Velocity -3 dB	Hz (maximum)	3.0	
	Disp -5%	Hz (maximum)	15.0	
	Disp -3 dB	Hz (maximum)	6.0	
High Frequency Response (ref 100 Hz):	Velocity -5%	kHz (minimum)	10	
	Disp -5%	kHz (minimum)	1	
Output Impedance		ohms (maximum)	400	
Connectors		BNC	2	

NOTES:

- [3] Frequencies - 10 Hz, 100 Hz, 1,000 Hz and 10 kHz - tested at final calibration.
- [4] 041 option required.
- [5] "S" is defined as sensor sensitivity in mV/g times channel gain in V/V.
- [15] Filter enabled, accuracy -2%, disabled $\pm 1\%$.
- [16] Filter enabled, if disabled reference other options included, highest noise specification dominates.
- [19] Noise test per AT-107-2, USING 401a05, or capacitor to ground in charge option. High noise value dominates.

SUPPLIED ACCESSORIES:

- Model 017 Power Cable
- Ferrite Bead (part number 100-2973-30)
- If Option 498-101 Also Supplied**
- 009N03
- EE-75 481A Control Software (1CD ROM)

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Drawn	LH	10/27/09	Spec No. 31556
Engineer	CPH	10/19/09	
Sales	JJM	10/15/09	
Approved	EB	10/22/09	Sheet 5 of 8

		<u>UNITS</u>	<u>VALUE</u>	
062 - Single Integration Per Channel with Enable/Disable (100 mV/in/s)				
063 - Single Integration Per Channel with Enable/Disable (1,000 mV/in/s)				
Output Range (minimum):		V/mA	5.0/1.0	
	Acceleration	%	2	
	Velocity	%	5	
Integration Scale Factor:		option number	062	063
	Velocity	mV/in/s	100	1,000
Low Frequency Corner (ref 100 Hz):				[6]
	Velocity -5%	Hz (maximum)	8.0	
	Velocity -3 dB	Hz (maximum)	3.0	
High Frequency Response:				
	Velocity -5%	kHz (minimum)	10	
064 - RMS to DC Conversion				
Accuracy		%	3	
Frequency Response		Hz	2-20,000	
Output Range (maximum)		VDC/mA	7.07/1.0	[7]
Output Impedance (maximum)		ohms	50	
Connectors (rear panel)		BNC	16	
065 - Single Integration Per Channel with Enable/Disable				
Output Range (minimum):		V/mA	5.0/1.0	
	Acceleration	%	2	
	Velocity	%	5	
Integration Scale Factor:				
	Velocity	mV/m/s	1000	[14]
Low Frequency Corner (ref 100 Hz):				
	Velocity -5%	Hz (maximum)	1.0	
	Velocity -3 dB	Hz (maximum)	0.5	
High Frequency Response:				
	Velocity -5%	kHz (minimum)	10	
070 - IEEE - 488 Parallel Bus Communication				
Byte Transfer Rate		byte/sec	10,000	
End of Line			EOI	
Interface Parameters (controller, serial poll, etc.):			SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, C0, E2	
Cable Length (maximum)		ft [m]	50 [20]	

NOTES:

- [6] Reference to sensor sensitivity of 100 mV/g (@ 61.4 Hz).
 [7] Based on sinusoidal input.
 [14] Reference to sensor sensitivity of 10.2 mV/m/s² (100 mV/g)

SUPPLIED ACCESSORIES:

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 Ferrite Bead (part number 100-2973-30)
If Option 498-101 Also Supplied
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	<u>UNITS</u>	<u>VALUE</u>			
080 - 8 BNC Inputs Rear Panel					
081 - 8 BNC Input and 16 BNC Outputs Rear Panel					
085 -8 BNC Outputs Rear Panel					
082/086/087 - Selectable ICP ® or Charge Mode Sensor Input					
282/286/287 – Programmable ICP ® or Charge Mode Sensor Input					
382/386/387 – Programmable ICP ® or Charge Mode Sensor Input – 0.5 Hz Low Frequency Response					
Switch Rear Panel (082/086/087 only)					
		Toggle			
		x82	x86	x87	
Input Charge Range (maximum) ±2%	± pC	25,000	2,500	250	
Input Time Constant	sec	0.1	0.1	0.1	
Charge Sensitivity (100 Hz) ±2%	mV/pC	0.1	1.0	10.0	
Amplitude Linearity (maximum)	%FS	1.0	1.0	1.0	
Low Frequency Response -5%	Hz	5.0	5.0	5.0	
Low Frequency Response -5% (382/ 386/ 387) Only	Hz	0.5	0.5	0.5	
High Frequency Response -5% (2/4/20 mA)	kHz	5/15/100	30/60/100	50/75/100	[9]
Broadband Noise	µV	400.0	20.0	20.0	[19]
Spectral Noise:					
1 Hz	µV√Hz	14.0	20.0	16.0	
10 Hz	µV√Hz	0.7	1.0	1.3	
100 Hz	µV√Hz	0.1	0.1	0.2	
486 – Programmable ICP or Charge (0.1, 1, or 10mV/pC) Mode Sensor Input					
		0.1	1.0	10	
Input Charge Range (maximum) ±2%	± pC	90,000	9,000	900	
Input Time Constant	sec	1.0	1.0	1.0	
Charge Sensitivity (100 Hz) ±2%	mV/pC	0.1	1.0	10.0	
Amplitude Linearity (maximum)	%FS	1.0	1.0	1.0	
Low Frequency Response -5%	Hz	0.5	0.5	0.5	
High Frequency Response -5%	kHz	100	100	100	[1]
Broadband Noise	µV	45.0	47.0	65.0	[18][19]
Spectral Noise:					
1 Hz	µV√Hz	2.5	4.2	13.0	
10 Hz	µV√Hz	1.0	1.0	1.5	
100 Hz	µV√Hz	0.5	0.5	0.7	
1 kHz	µV√Hz	0.42	0.5	0.5	
10 kHz	µV√Hz	0.42	0.43	0.5	
Connectors			16		
084 - Internally Jumper Selectable ICP® or Voltage Input Signal					
284 – Programmable ICP ® or Voltage Input Signal					
Input Range	V (maximum)	±10			
Input Impedance	k ohms	200			
Frequency Response (related to TC): Standard	Hz	0.5			[1]
Frequency Response: Standard	kHz	100			[1]

NOTES:

- [1] Limited by channel's frequency response.
- [8] Reference specification sheets for 422M113, 422M116, 422M117, 422M128, and 422M135.
- [9] Constant current adjusted/monitored in ICP mode.
- [18] Tested with option 481-038 set to x1, channel output.
- [19] Noise test per AT-107-2, USING 401a05, or capacitor to ground in charge option. High noise value dominates.

SUPPLIED ACCESSORIES:

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**686 – Programmable ICP or Charge (0.1, 1, or 10mV/pC)
Mode Sensor Input(sensors >500°F [260°C])**

	<u>UNITS</u>	<u>VALUE</u>		
Input Charge Range (maximum) ±2%	± pC	0.1	1.0	10
Input Time Constant	sec	90,000	9,000	900
Capacitance (Maximum allowable at input)	pF	0.1	0.1	0.1
Resistance (Minimum required at input)	ohm	20000	20000	2000
Charge Sensitivity (100 Hz) ±2%	mV/pC	10000	10000	10000
Amplitude Linearity (maximum)	%FS	0.1	1.0	10.0
Low Frequency Response -5%	Hz	1.0	1.0	1.0
High Frequency Response -5%	kHz	5.0	5.0	5.0
Broadband Noise	µV	100	100	100
Spectral Noise: 1 Hz	µV√Hz	60	62	85
10 Hz	µV√Hz	3.5	5.9	18.2
100 Hz	µV√Hz	1.4	1.4	2.1
1 kHz	µV√Hz	0.7	0.7	1.0
10 kHz	µV√Hz	0.42	0.5	0.5
Connectors	10-32	0.42	0.43	0.5
092 - External 12 VDC Power Invertor	Reference	16	488A05 or 488A06	
Input Voltage Range	VDC	10-15		
Efficiency	%	90		
Output Voltage	VAC rms	115 ±5%		
Output Frequency	Hz	60 ±0.1		
No Load Current Draw (maximum)	A	0.07		
Size (H x W x D):	in	1.5 x 4.53 x 4.85		
	[mm]	38 x 115 x 123		
Weight	lb [kg]	1.32 [0.60]		
Output Power	Watt	150		

101- Digital Control with RS-232/RS-485 Interface

Connectors	D-sub-9	2		
Baud Rate	bits/sec	9,600		
Start, Data, Stop, Parity		1, 8, 1, No		
Handshaking		RTS/CTS		
RS-485 Devices In System		16		[10]
Cable Length (maximum): RS-232	ft	50		
Cable Length (maximum): RS-485 *	ft	200		
Supplied Accessories	cable	009N03		

102 – Memory Default

103 - Front Panel Control/Display

Keypad		4		
Reset		1		
Display (dot matrix)	row/column	2/16		

NOTES:

[10] RS-485 interface uses proprietary interconnect of PCB equipment only.

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