Model 421A25

Product Name

Installation and Operating Manual

**For assistance with the operation of this product,
contact PCB Piezotronics, Inc.**

Toll-free: 800-828-8840
24-hour SensorLine: 716-684-0001
Fax: 716-684-0987
E-mail: info@pcb.com
Web: www.pcb.com

Repair and Maintenance

PCB guarantees Total Customer Satisfaction through its "Lifetime Warranty Plus" on all Platinum Stock Products sold by PCB and through its limited warranties on all other PCB Stock, Standard and Special products. Due to the sophisticated nature of our sensors and associated instrumentation, **field servicing and repair is not recommended and, if attempted, will void the factory warranty**.

Beyond routine calibration and battery replacements where applicable, our products require no user maintenance. Clean electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the material of construction. Observe caution when using liquids near devices that are not hermetically sealed. Such devices should only be wiped with a dampened cloth—never saturated or submerged.

In the event that equipment becomes damaged or ceases to operate, our Application Engineers are here to support your troubleshooting efforts 24 hours a day, 7 days a week. Call or email with model and serial number as well as a brief description of the problem.

Calibration

Routine calibration of sensors and associated instrumentation is necessary to maintain measurement accuracy. We recommend calibrating on an annual basis, after exposure to any extreme environmental influence, or prior to any critical test.

PCB Piezotronics is an ISO-9001 certified company whose calibration services are accredited by A2LA to ISO/IEC 17025, with full traceability to SI through N.I.S.T. In addition to our standard calibration services, we also offer specialized tests, including: sensitivity at elevated or cryogenic temperatures, phase response, extended high or low frequency response, extended range, leak testing, hydrostatic pressure testing, and others. For more information, contact your local PCB Piezotronics distributor, sales representative, or factory customer service representative.

Returning Equipment

If factory repair is required, our representatives will provide you with a Return Material Authorization (RMA) number, which we use to reference any information you have already provided and expedite the repair process. This number should be clearly marked on the outside of all returned package(s) and on any packing list(s) accompanying the shipment.

Contact Information

PCB Piezotronics, Inc.
3425 Walden Ave.
Depew, NY14043 USA
Toll-free: (800) 828-8840
24-hour SensorLine: (716) 684-0001
General inquiries: info@pcb.com
Repair inquiries: rma@pcb.com

For a complete list of distributors, global offices and sales representatives, visit our website, www.pcb.com.

Safety Considerations

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the precautions required to avoid injury. While our equipment is designed with user safety in mind, the protection provided by the equipment may be impaired if equipment is used in a manner not specified by this manual.

Discontinue use and contact our 24-Hour Sensorline if:

- Assistance is needed to safely operate equipment
- Damage is visible or suspected
- Equipment fails or malfunctions

For complete equipment ratings, refer to the enclosed specification sheet for your product.

Definition of Terms and Symbols

The following symbols may be used in this manual:

DANGER
Indicates an immediate hazardous situation, which, if not avoided, may result in death or serious injury.

CAUTION
Refers to hazards that could damage the instrument.

NOTE
Indicates tips, recommendations and important information. The notes simplify processes and contain additional information on particular operating steps.

The following symbols may be found on the equipment described in this manual:

This symbol on the unit indicates that high voltage may be present. Use standard safety precautions to avoid personal contact with this voltage.

This symbol on the unit indicates that the user should refer to the operating instructions located in the manual.

This symbol indicates safety, earth ground.

PCB工业监视和测量设备 - 中国RoHS2公布表

PCB Industrial Monitoring and Measuring Equipment - China RoHS 2 Disclosure Table

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
住房	O	O	O	O	O	O
PCB板	X	O	O	O	O	O
电气连接器	O	O	O	O	O	O
压电晶体	X	O	O	O	O	O
环氧	O	O	O	O	O	O
铁氟龙	O	O	O	O	O	O
电子	O	O	O	O	O	O
厚膜基板	O	O	X	O	O	O
电线	O	O	O	O	O	O
电缆	X	O	O	O	O	O
塑料	O	O	O	O	O	O
焊接	X	O	O	O	O	O
铜合金/黄铜	X	O	O	O	O	O

本表格依据 SJ/T 11364 的规定编制。

O： 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

X： 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

铅是欧洲RoHS指令2011/65/ EU附件三和附件四目前由于允许的豁免。

CHINA RoHS COMPLIANCE

Component Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Chromium VI Compounds (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Housing	O	O	O	O	O	O
PCB Board	X	O	O	O	O	O
Electrical Connectors	O	O	O	O	O	O
Piezoelectric Crystals	X	O	O	O	O	O
Epoxy	O	O	O	O	O	O
Teflon	O	O	O	O	O	O
Electronics	O	O	O	O	O	O
Thick Film Substrate	O	O	X	O	O	O
Wires	O	O	O	O	O	O
Cables	X	O	O	O	O	O
Plastic	O	O	O	O	O	O
Solder	X	O	O	O	O	O
Copper Alloy/Brass	X	O	O	O	O	O

This table is prepared in accordance with the provisions of SJ/T 11364.

O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

X: Indicates that said hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement of GB/T 26572.
Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.

Section Page

1.0 DESCRIPTION

PCB Model 421A25 is a multi-range charge amplifier designed for industrial use. It converts the output charge of a piezoelectric sensor, measured in units of picocoulombs (pC), into a proportional voltage signal. Because of its extremely wide charge range of 100pC to 1,000,000pC, the Model 421A25 is suitable for almost all piezoelectric measurement tasks.

Features of the Model 421A25 include:

- Minimal measurement drift due to compensated input offset voltage
- A robust die cast aluminum housing
- 13 fixed measurement ranges
- 3 adjustable measurement ranges
- An internal test function
- A peak value memory
- 2 adjustable alarms with switching outputs
- An RS232 interface

2.0 SAFETY CONSIDERATIONS

Installation of the charge amplifier must be performed by qualified service personnel only. Ensure all service personnel thoroughly read and understand the information contained in this manual.

Operating the charge amplifier in a manner not specified by PCB Piezotronics, Inc. may result in equipment damage. Refer to the product specification sheet supplied with this manual for further information on the product's performance capabilities.

Warning: Failure to observe these safety notes may result in serious personal injury and/or equipment damage!

3.0 TRANSPORTATION AND STORAGE

Transport and store the charge amplifier in original packaging. Protect the charge amplifier from impact forces and vigorous shaking.

4.0 INSTALLATION

Warning: All electrical wiring must be performed with the power turned off.

Caution: If the charge amplifier is not mounted and/or installed properly, improper instrument performance or failure may result.

Mounting

The charge amplifier is supplied with two M4 stainless steel mounting screws. The housing does not have to be opened for mounting, because the screws are already inserted. The dimensions of the mounting holes are 86mm x 36mm, with a minimum thread depth of 8mm.

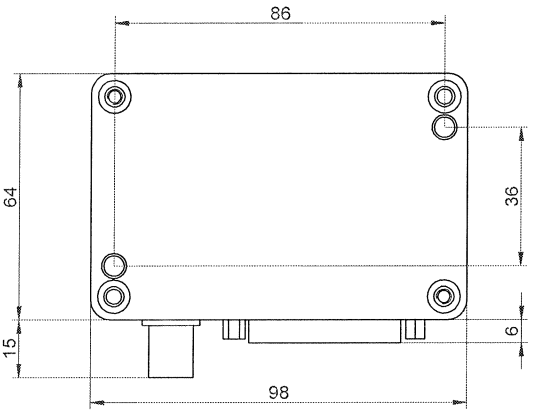

Figure 1 - Mounting Hole Dimensions

The screws can be tightened through the holes in the lid using a 3mm hex wrench. Secure with a thread-locking adhesive such as Loctite® 242, if necessary. If longer screws are required, the lid must be unscrewed. Insert new screws with lock washers.

Note: For EMC reasons, connecting the mounting plate to earth (mounting position) is recommended. The charge amplifier can be fitted in any position, but if it is arranged vertically, mounting with the plugs pointing downward is preferred.

5.0 FUNCTION

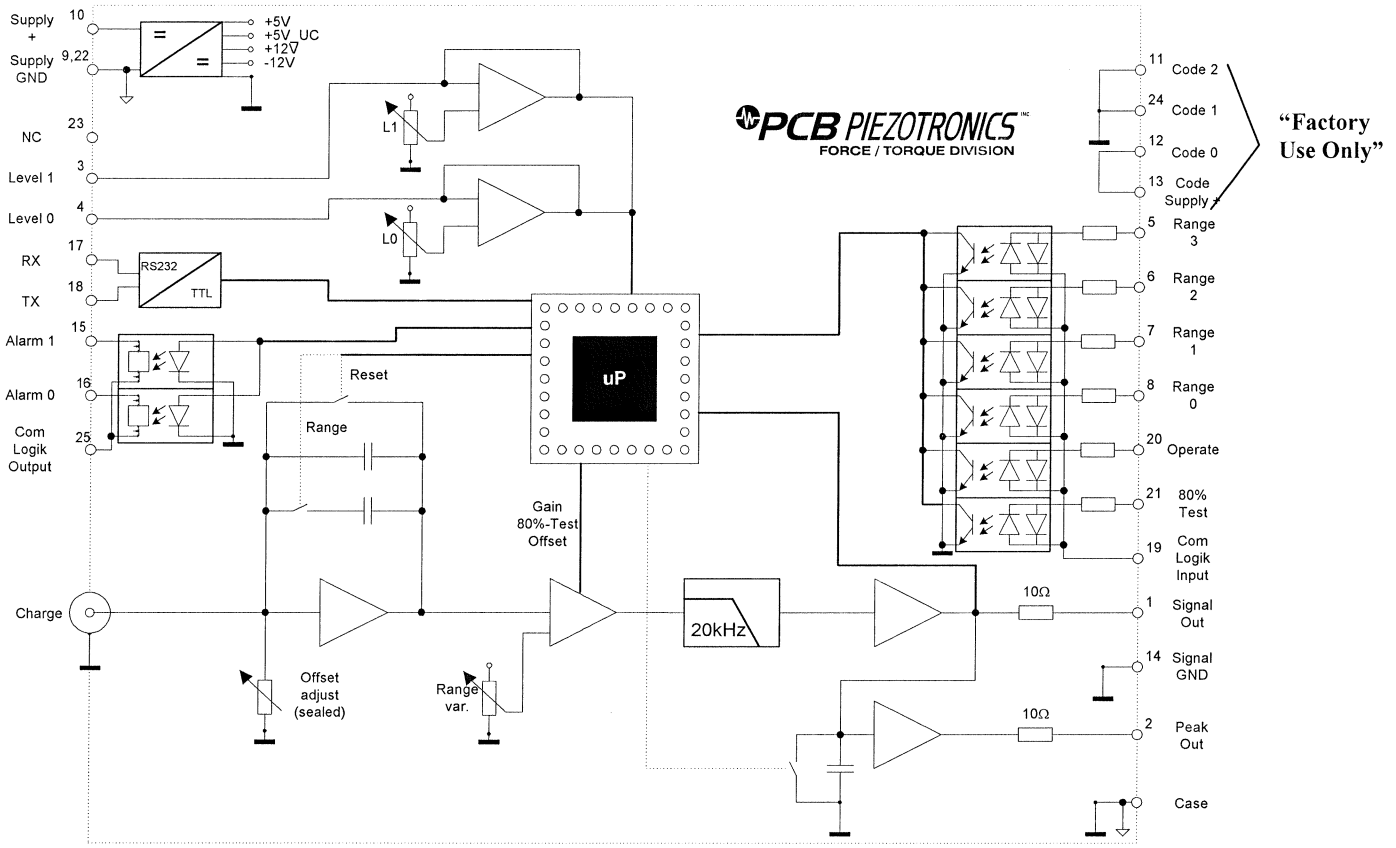

Figure 2 - Block Diagram

25-Pin D-Sub Connections	
Pin	**Function**
1	Signal out
2	Peak out
3	Level 1 (In or Out)
4	Level 0 (In or Out)
5	Range 3
6	Range 2
7	Range 1
8	Range 0
9	Supply GND
10	+ Supply
11	Code 2
12	Code 0
13	Code Supply +
14	Signal GND
15	Alarm 1
16	Alarm 0
17	RX
18	TX
19	Com Logic Input
20	Operate
21	80% Test
22	Supply GND
23	NC
24	Code 1
25	Com Logic Output (Alarm)

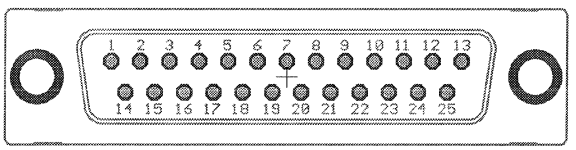

Figure 3

6.0 START UP

Note: Check all electrical connections prior to system operation.

Controller Side Connections
The inputs and outputs are galvanically separated and can be connected as both positive and negative logic. The inputs have the common connection on Pin 19 (Com Logic Input). The two outputs are on Pin 25 (Com Logic Output).

Examples of the *OPERATE* Signal:

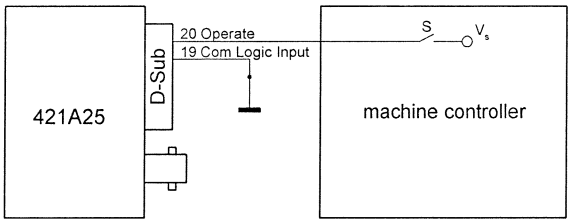

Figure 4 - Positive logic, operate active, closed S switch

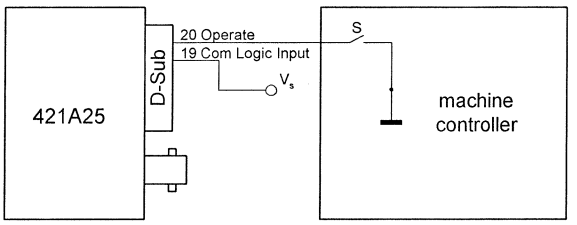

Figure 5 - Negative logic, operate active, closed S switch

Note: If the charge range will remain unchanged during operation, the required range inputs can be permanently connected to the supply voltage. The Com Logic Input is then connected to the Supply GND.

Sensor Side Connections
To connect a sensor, high-insulation cables must always be used. If possible, short-circuit the sensor before connecting it, because piezoelectric sensors can generate high voltages, which could damage the electronics of the charge amplifier. Avoid touching the insulation of the BNC plug, and ensure that no dust or humidity can penetrate it. Humidity and other contamination may reduce the insulation and cause increased drift.

Setting the Measurement Ranges
The measurement ranges are selected via the four range inputs. See **Figure 6**.

Measuring Range Codes					
Range Pin Name	3	2	1	0	
Corresponding Pin Nr.	5	6	7	8	
Range	Code				pC/10V
1	0	0	0	0	1,000,000
2	0	0	0	1	500,000
3	0	0	1	0	200,000
4	0	0	1	1	100,000
5	0	1	0	0	50,000
6	0	1	0	1	20,000
7	0	1	1	0	10,000
8	0	1	1	1	5,000
9	1	0	0	0	2,000
10	1	0	0	1	1,000
11	1	0	1	0	500
12	1	0	1	1	200
13	1	1	0	0	100
14	1	1	0	1	100,000 to 1,000,000
15	1	1	1	0	10,000 to 100,000
16	1	1	1	1	100 to 10,000

Figure 6- Also see Fig. 2, Pg 3

Fixed Ranges
13 fixed ranges from 100pC to 1,000,000pC are available. Select the suitable measurement range according to the expected charge.

Example:
Measuring a maximum 8kN force using a piezoelectric force sensor with a sensitivity of -4.2pC/N.

The maximum charge is calculated as:

$$Q_{max} = -4.2\,{}^{pC}/_{N} * 8kN = -33600pC$$

Select the measurement range: (-) 50,000pC/10V.

Set Range 2 (Pin 6) input to high (with positive logic).

Notes:
The other range inputs must not be connected!

The measurement yields an output voltage of 6.25V on the charge amplifier.

The applied force is calculated as:

$$F = 6.25V * (-)50000\,{}^{pC}/_{10V} \div (-)4.2\,{}^{pC}/_{N} = 7.44kN$$

Variable Range
With the variable range, the measurement system can be adjusted for any output signal with a known measured magnitude. Select the suitable measurement range according to the charge to be expected. Now put the system into operation, apply load required to generate the pC, and set the output signal to the desired voltage value using the range potentiometer (see Figure 7). To do this, the lid of the charge amplifier must be opened.

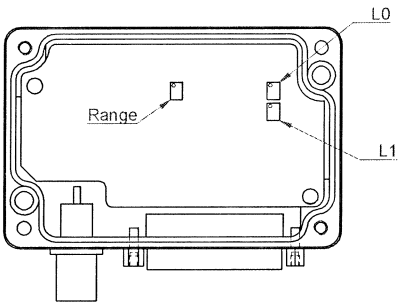

Figure 7 - Potentiometers

Example:
Adjusting a measurement system that has a sensor with a maximum force capacity of -200,000pC to an output voltage of 8V.

Select the measurement range: (-) 100,000pC/10V to 1,000,00pC/10V

Set Input Range 0, 2 and 3 (Pins 8, 6 and 5) to high (for positive logic)

Notes:
Range 1 must not be connected!

Put the system into operation, apply known load, and set the output signal to 8V using the range potentiometer (see **Figure 7**) for maximum force.

Alarm Outputs
The two alarm outputs monitor the output signal, and can be used to signal limits or to define measurement windows. The threshold voltage of 0 to 10V can be set in two ways:

1. Externally, supplied from an external signal generator. The threshold voltage would be applied to the input on Pin 3 or Pin 4, or

2. Internally, supplied by the charge amplifier itself. Once the lid is removed from the unit, the two potentiometers L0 and L1 (see **Figure 7**) can be used to set the threshold.

The threshold voltage can be measured on Pin 3 or Pin 4.

Both alarm outputs close the contact as soon as the set threshold value is exceeded, and remain set until the next reset.

Notes:
Two Photo-Mos relays are used as circuit elements. The outputs are galvanically separated and suitable for AC and DC. However, they are not short-circuit-proof and must not be operated beyond the specification.

The Photo-Mos relays can be replaced quickly in the event of a defect (socketed).

RESET Function
Because of the finite insulation resistance of each component of the measurement system (i.e. sensor, cables and electronic components), part of the sensor's output charge is lost. This means that with a constant measured force, the output signal changes in the positive or negative direction. Because of this "drift", static measurements can only be carried out to a limited extent, or over short periods. It is therefore necessary to reset the charge amplifier cyclically.

The charge amplifier is switched to active periodically via the *OPERATE* input.

Note:
The charge amplifier should always be switched to *RESET* if no measurement result is required.

PEAK Function
For the duration of one measurement cycle, the peak function supplies the maximum value of the output signal. It is reset automatically using the control input *OPERATE*.

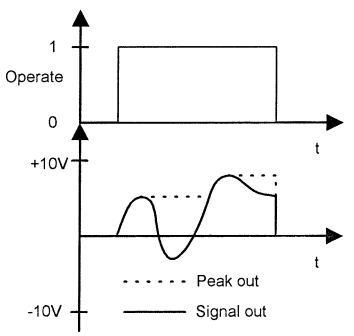

Figure 8

80% Test

The 80% Test function makes it possible to check the measurement system without a sensor being connected, and can thus be used to limit errors. The amplitude is approximately 8V +/- 10%, which is 80% of full scale output.

Example:

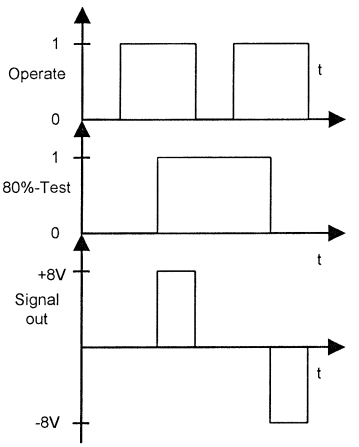

Figure 9

7.0 SERIAL INTERFACE

Description
The Model 421A25 has an implemented RS232 serial interface. With the corresponding commands it is possible to set the charge amplifier and read out the output signal (CH1).

Transmission Format
The information is transmitted serially using 10-bit communication (default is 9600,8,N,1) with the following format:

- 9,600 up to 115,200 Baud Rate
- 1 Start Bit
- 8 Data-Bits (the low order first)
- 1 Stop-Bit

Data Format Master
The command starts with the character STX (02h), followed by a command, then a fixed number of parameters, and finally a checksum. After checking the checksum and the execution of the command, the Model 421A25 Charge Amplifier returns an ACK (06h) back to the master.

Messages of the master always have the following format:

ASCII	Start Character
ASCII	Command
ASCII	n-Parameter
ASCII	Checksum

Checksum = Sum of all ASCII-characters, always 1Byte long (lowest order 4 Bit in ASCII converted).

REMOTE Function
Enables and disables the *REMOTE* function of the charge amplifier. When the *REMOTE* function is enabled, the control functions (*OPERATE*, *RESET*, *RANGE*, etc...) are disabled.

An interruption of the power supply, or a power up, will disable the *REMOTE* function. After each enabling of the function, the settings are loaded from the E^2Prom.

Parameter 1: 0 = Remote inactive, control by the Sub-D connection

1 = Remote active, control by RS232

Example: Activating the REMOTE Function:

Start	02h	STX
Command	61h	a
Parameter 1	31h	1
Checksum	34h	4 (94h)

Note: After each power up of the charge amplifier, the transmission rate is set to 9,600 Baud (default). The baud rate can be set as explained in the **Baud Rate** section of this manual.

OPERATE, RESET Functions
Sets the charge amplifier to *RESET* or *OPERATE*.
Variable Range
Sets a variable range between 100pC and 1,000,000pC. Reference **Figure 6**.

Parameter 1: 0 = CH1

Parameters 2 thru 7: Numerical value in ASCII-Format

Example: (0) 23,500pC

Start	02h	STX
Command	64h	d
Parameter 1	30h	0
Parameter 2	30h	0
Parameter 3	32h	2

Parameter 1: 0 = Reset
1 = Operate

Example: Setting the *OPERATE* function.

Start	02h	STX
Command	62h	b
Parameter 1	31h	1
Checksum	35h	5 (95h)

Fixed Range
Sets a fixed measurement range. Reference **Figure 6**.

Parameter 1: 0 = CH1

Parameters 2,3: 0,1 = Range 1 (1,000,000pC)
0,2 = Range 2 (500,000pC)
0,3 = Range 3 (200,000pC)
0,4 = Range 4 (100,000pC)
0,5 = Range 5 (50,000pC)
0,6 = Range 6 (20,000pC)
0,7 = Range 7 (10,000pC)
0,8 = Range 8 (5,000pC)
0,9 = Range 9 (2,000pC)
1,0 = Range 10 (1,000pC)
1,1 = Range 11 (500pC)
1,2 = Range 12 (200pC)
1,3 = Range 13 (100pC)

Example: 50,000pC

Start	02h	STX
Command	63h	c
Parameter 1	30h	0
Parameter 2	30h	0
Parameter 3	35h	5
Checksum	41h	A (FAh)

Parameter 4	33h	3
Parameter 5	35h	5
Parameter 6	30h	0
Parameter 7	30h	0
Checksum	30h	0 (1C0h)

Setting Alarm Outputs
Setting the threshold for the alarm output.

Example: Alarm 2 on at (0) 8,500mV

Start	02h	STX
Command	65h	e
Parameter 1	31h	1
Parameter 2	30h	0
Parameter 3	38h	8

Parameter 4	35h	5
Parameter 5	30h	0
Parameter 6	30h	0
Checksum	35h	5 (195h)

Parameter 1: 0 = Alarm 1
1 = Alarm 2

Parameters
2 thru 6: Numerical value in ASCII-Format

80% TEST Function
Performs a test check of the measurement system.

Output value = 8V

Parameter 1: 0 = Test Off
1 = Test On

Example: Activating the Test Function.

Start	02h	STX
Command	66h	f
Parameter 1	31h	1
Checksum	39h	9 (99h)

Signal
Read out of the actual measurement value.

Parameter 1: 0 = Read out of measurement value CH1
1 = Continuous read out of measurement value CH1

Example: Setting for continuous read out.

Start	02h	STX
Command	67h	g
Parameter 1	31h	1
Checksum	41h	A (9Ah)

Note:
Changing Parameter 1 from 1 to 0 can stop the continuous read out of the measurement values.

Baud Rate
The Model 421A25 sends the answer (ACK;06h) with the previous baud rate back to the master and changes afterwards to the new baud rate.

Parameter 1: 5 = 9,600 (default)
6 = 19,200
7 = 38,400
8 = 57,600
9 = 115,200

Example: Setting a 38,400Baud Rate

Start	02h	STX
Command	68h	h
Parameter 1	37h	7
Checksum	31h	1 (A1h)

Baud	Sampling Rate [Hz]	Time Frame [ms]
9,600	40	25
19,200	50	20
38,400	50	20
57,600	100	10
115,200	200	5

Table 1 - Transmission Rates

Save Settings
Saves the following actual settings in the E^2Prom:

- Fixed range or variable range
- Level of alarm output

The values will be reloaded after enabling the *REMOTE* function.

Parameter 1: 0 (always)

Example: Set Parameter 1 to "0".

Start	02h	STX
Command	73h	s
Parameter 1	30h	0
Checksum	35h	5 (A5h)

Data Format Slave

Measurement Values
Sends the actual measurement value to the master. The measurement values are sent as hex values. Negative values are send as twos complement.

Checksum: Sum of all hex values, always 1Byte long as ASCII-character

Answer Data Structure:

Parameter 1		
Parameter 2		
Parameter 3		
Parameter 4		
Parameter 5		
Checksum		

Parameter 1: a = Measurement value CH1

Parameters
2 thru 5: Measurement value as Hex value

Example 1: Measurement value: 7,685mV
Hex: 1E05h, Checksum 13C

Parameter 1	61h	a
Parameter 2	31h	1
Parameter 3	45h	E
Parameter 4	30h	0
Parameter 5	35h	5
Checksum	43h	C (13Ch)

Example 2: Measurement value: -300mV
Hex: FED4h, Checksum 164h

Parameter 1	61h	a
Parameter 2	46h	F
Parameter 3	45h	E
Parameter 4	44h	D
Parameter 5	34h	4
Checksum	34h	4 (164h)

8.0 SERVICE

For product application, technical information, or service, contact the Force/Torque Division of PCB Piezotronics, Inc.

PCB Piezotronics, Inc.
Force/Torque Division
3425 Walden Avenue, Depew, New York 14043-2495 USA
Toll-free telephone: 888-684-0004 or 716-684-0001
Fax: 716-684-8877
24-hour SensorLine[SM]: 716-684-0001
E-mail: force@pcb.com
Web site: www.pcb.com

MANUAL NUMBER: 29335
MANUAL REVISION: B
ECN NUMBER: 23458

9.0 OPTIONAL ACCESSORIES

1) Photo-Mos Relay
   Model 070M104
2) 25 Pin D-sub connector
   Model JC
3) Cable, 25 Pin D-sub to pigtails, 5ft. long
   Model 009M146

Model Number	1 CHANNEL INDUSTRIAL CHARGE AMPLIFIER	Revision: C
421A25		ECN #: 23458

ELECTRICAL			
Supply Voltage Range	VDC	15 to 35	
Current Draw	mA	<70	
Measurment Range	pC	±100 to ±1,000,000	
Output Signal- Instantaneous	V	±10	
Output Signal- Peak	V	0 to 10	
Accuracy	% FS	<±1	
Linearity	% FS	<0.02	
Output Offset	mV	<±10	
Noise (0.1 Hz to 100 kHz)	mVpp	<20	[1]
Output Resistance	Ohm	10	
Reset Operate Offset		Electrically Compensated	
Drift (73°F, 23°C)	pC/s	<0.03	[2]
Offset Voltage Q-input	µV	<50	
Frequency Response (-3dB) ≤100,000pC	kHz	~0 to 20	
>100,000pC	kHz	>2	
Control Input (galvanically separated)	±V	5 to 45	
Switching Output (maximum) (galvanically separated)	mA	100	
	V	45	
ENVIRONMENTAL			
Operating Temperature	°F(°C)	+23 to +140 (-5 to +60)	
Storage Temperature	°F(°C)	-4 to +176 (-20 to +80)	
Protection Class		IP40	
EMC		EN 61000-6-2 immunity	[3]
		EN 61000-6-4 emission	[3]
PHYSICAL			
Dimensions	in(mm)	3.1 x 3.9 x 1.3 (79 x 98 x 34)	
Weight	lbs(gms)	0.6 (272.2)	
Housing		Aluminum	
Input Connector		BNC Jack	
Position		Side	
Output Connector		25-Pin D-sub	
Position		Side	

NOTES:

[1] <30 mV_{pp} in 100 pC range.

[2] Scope: charge input open and screened, charge amplifier connected to operating voltage for min. 30 min, in "operate" mode, lid tightly closed.

[3] See PCB Declaration of Conformance PS056 for details.

SUPPLIED ACCESSORIES:

-NONE-

CE

In the interest of constant product improvement, we reserve the right to change specifications without notice.

3]

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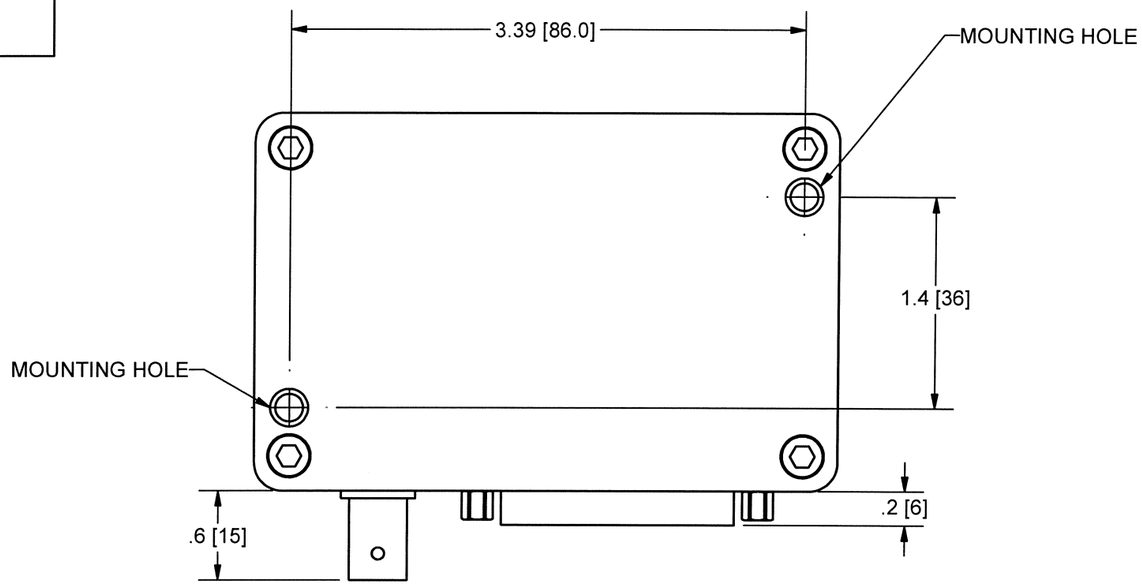
PCB PIEZOTRONICS INC.
FORCE / TORQUE DIVISION

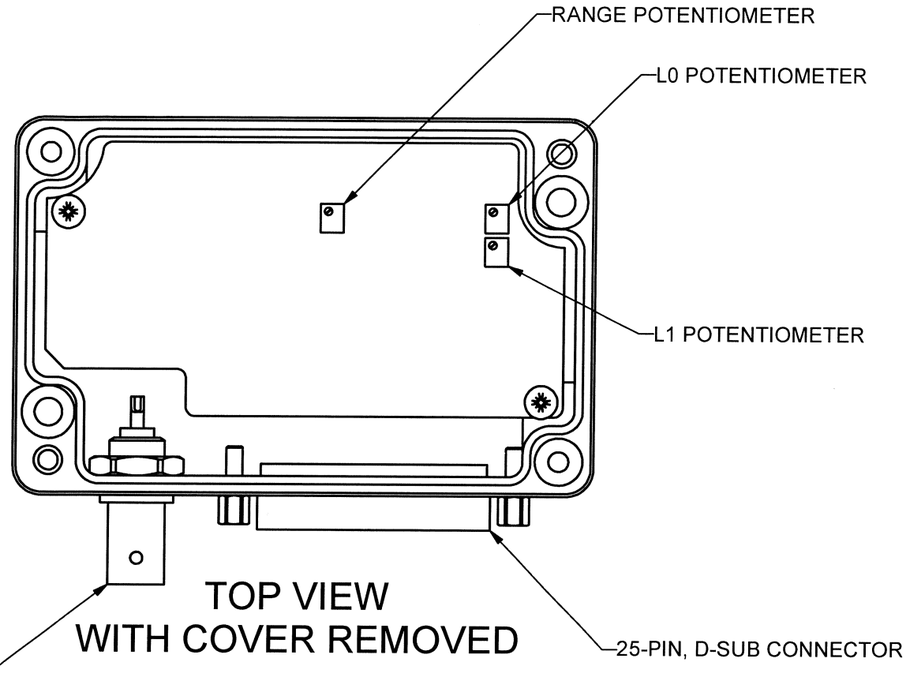
Drawn	[signature]	1-17-06	Spec No. 29412
Engineer	[signature]	1/18/06	
Sales	[signature]	1/17/06	
Approved	[signature]	1-17-06	Sheet 1 of 1

29411

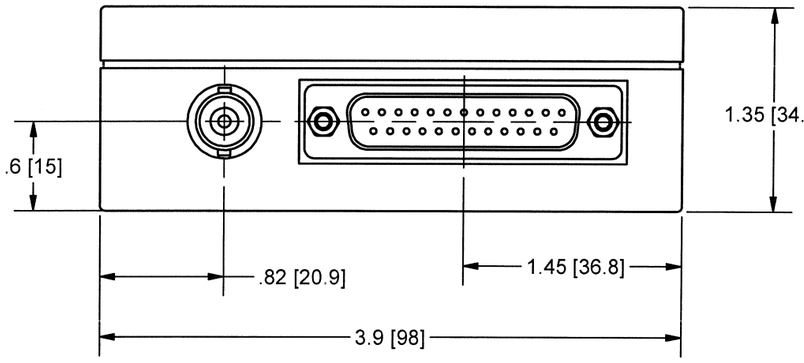
APPLICATION		
NEXT ASS'Y	USED ON	VAR
	421A25	

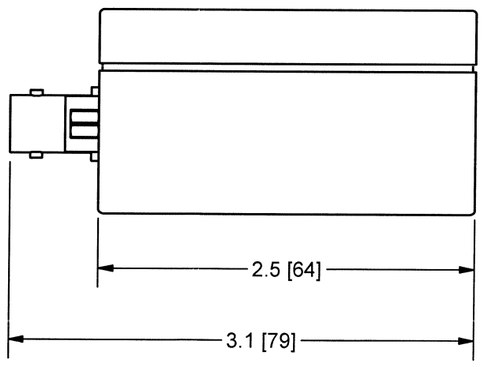
REVISIONS			
REV	DESCRIPTION	ECN	APP'D
NR	RELEASED TO DRAFTING		DM 3/05
A	UPDATE METRIC DIMENSIONS	23026	ECR 10/17/05





TOP VIEW
WITH COVER REMOVED





UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:	
DIMENSIONS IN INCHES DECIMALS XX ± .03 XXX ± .010 ANGLES ± 2 DEGREES	DIMENSIONS IN MILLIMETERS [IN BRACKETS] DECIMALS X ± 0.8 XX ± 0.25 ANGLES ± 2 DEGREES
FILLETS AND RADII .003 - .005	FILLETS AND RADII [0.07 - 0.13]

DRAWN	mDF	10/17/05	MFG		10/17/05
CHK'D	ECR	w/ECR	ENGR	mDF	10-19-05
APP'D	DMR	ECR/DMR	SALES	REWM	10/19/05

TITLE
OUTLINE DRAWING
MODEL 421A25
INDUSTRIAL CHARGE AMPLIFIER

PCB PIEZOTRONICS INC.
3425 WALDEN AVE. DEPEW, NY 14043
(716) 684-0001 E-MAIL: sales@pcb.com

CODE IDENT. NO.	DWG. NO.
52681	29411
SCALE: FULL	SHEET 1 OF 1