

Fermilab

**Particle Physics Division
Mechanical Department Calibration
Standards/Procedures**

Number: MD-CALPROC-017

Date: 6/26/2009

Manufacturer: Setra

Model: Operating Instructions for Model 205-2 Pressure
Transducer Four-Wire, Voltage Output

Reviewer(s): *James E. Tweed*

This Procedure is used for:

Calibration of Setra Pressure Transmitters.

setra

OPERATING INSTRUCTIONS
MODEL 205-2 PRESSURE TRANSDUCER
FOUR-WIRE, VOLTAGE OUTPUT

GENERAL INFORMATION

Your Setra transducer has been carefully calibrated before shipment to you, and it should be handled with the same care given any precision instrument. Pressure ranges and dimensions are reported on the specification bulletin for the transducer.

INSTALLATION

Do not use in ambient conditions corrosive to polyvinyl chloride (cable) or stainless steel, submerged in liquids, subject to spray or drip, or in a high vibration environment. The 205-2 Series is very slightly sensitive to acceleration in the pressure fitting axis, less than 0.05 psi/g typical. Factory calibrated in the vertical position, with pressure port downward, this position often minimizes damage from dripping of pressure system piping.

Installation of pressure fitting:

For very high pressure use of sealant such as Loctite hydraulic sealant is suggested.

For other pressure ranges, standard sealants such as Teflon tape generally are satisfactory.

For the most sensitive pressure ranges, excessive high torquing of a metal pressure fitting may cause a slight zero shift which may be trimmed out using the zero adjustment. Use of plastic fittings often shows no noticeable zero shift. The torquing effect does not appreciably affect linearity or sensitivity. Use the wrench flats on the 205-2 when attaching to fittings.

Installation with FM approved Explosionproof/Weatherproof enclosure:

1. Conduit seals shall be placed no more than 18" from the enclosure.
2. Cables with gas/vapor tight continuous sheath, capable of transmitting gas or vapor through the cable core, shall be sealed per National Electric Code (NEC) for Class 1, Division 1 (most current revision).
3. Caution: Do Not open cover while circuits are live.

ATMOSPHERIC REFERENCE (*Gage pressure transducers only*)

Lower range units are subject to excessive thermal zero shift unless vented to atmosphere. The electrical cable provides this equalization vent.

ELECTRICAL CONNECTIONS:

<u>CABLE LEAD</u>	<u>FUNCTION</u>
Red	positive excitation
Green	positive output
White	negative output
Black	negative excitation
Shield	case

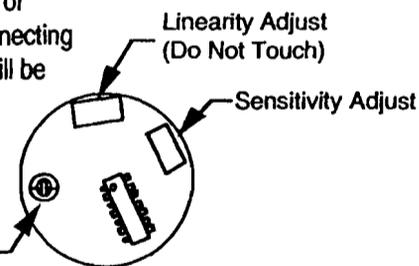
ELECTRICAL

The electrical circuit is equivalent to a 4 terminal network, which can be grounded at only one point, either at the negative excitation or the negative output lead, but must not be commoned or grounded at more than one point. The negative output lead is approximately 1.66 VDC above the negative excitation lead. The positive output lead is at this same 1.66 VDC common mode voltage plus the output signal from applied pressure (thus goes from approximately 1.66 VDC up to 6.66 VDC above the negative excitation).

The pressure transducer must be operated with the case connected either to the negative excitation terminal or to the negative output terminal. Failure to do this may result in damage to or unsatisfactory operation of the unit. This connection may be made by connecting the shield to white or shield to black leads. Best shielding against noise will be obtained by connecting the shield and negative excitation (black) leads.

Circuit is reversed voltage protected for at least 5 minutes. Internal transient suppression network is provided for short duration transients to 150 volts.

In some instances, use of long cables (several hundred feet length) may introduce enough cable capacitance into the



output circuit to cause output oscillation. If encountered, this oscillation may be eliminated by connecting a 100 ohm resistor (1/8 watt or larger) in series in each of the output leads at the end of the 2 foot transducer cable. These series resistors, of course, add to the output resistance.

CAUTION: Excitation power, or voltage in excess of 15 VDC, inadvertently applied to the output leads may damage the electrical circuit. Care must be taken when installing this transducer that the excitation voltage is not applied to the output leads by mistake. Shielding or other precaution should be provided to assure that transient voltages in excess of 15 VDC are not applied to the output leads.

ADJUSTMENTS (with cover removed)

CAUTION: TURN OFF EXCITATION POWER DURING COVER REMOVAL OR REPLACEMENT.

ZERO PRESSURE OUTPUT

Unit factory adjusted to within ± 50 mV. Can be adjusted by the air trim capacitor as shown in the diagram. Any adjustments will begin to change sensitivity.

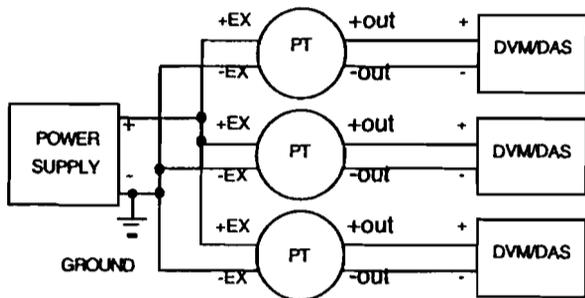
SENSITIVITY

Can be adjusted by potentiometer as shown on diagram. Unit factory adjusted to order specifications.

OTHER ADJUSTMENT

Adjusted at factory. Touching any adjustments other than zero output or sensitivity may necessitate recalibration. Do not touch.

INSTALLATION INSTRUCTIONS FOR MULTIPLE HOOK UP OF A 4-WIRE SETRA PRESSURE TRANSDUCER



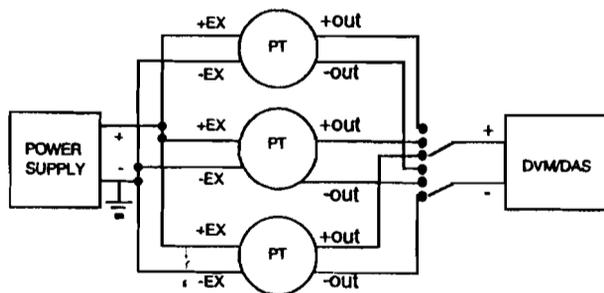
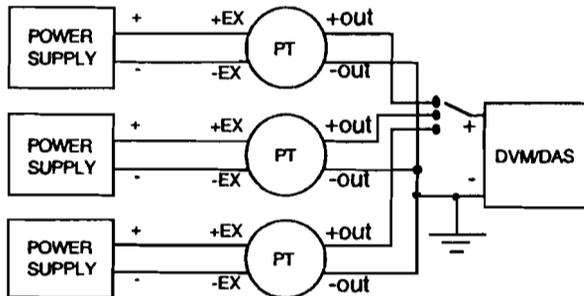
Option #1

Uses a single, ground referenced power supply for excitation and separate, isolated, (not ground referenced), readout or "differential input" to a data acquisition system for each pressure transducer output.

Option #2

Uses a separate, isolated power supply for each pressure transducer's excitation and a single, ground referenced readout or "single-ended input" to a data acquisition system for all of the outputs.

PS - Power Supply (Nominal 24 VDC)
 PT - Pressure Transducer (4 Wire Circuit)
 DVMDAS - Digital Volt Meter or Data Acquisition System



Option #3

Uses a single, ground referenced power supply for excitation and either a single, isolated readout with a bipolar switch that "breaks before makes" both the + output and - output of each pressure transducer, or a single data acquisition system with a multiplexer (MUX).

NOTE: The shield is internally commoned to the case and pressure port of the transducer. When the shield is connected to ground, the case and pressure port of the transducer will also be commoned to that ground.

CALIBRATION SERVICES

Setra maintains a complete calibration facility that is traceable to the National Institute of Standards & Technology (NIST). If you would like to recalibrate or recertify your Setra pressure transducers please call our Repair Department at 1-800-257-3872 (978-263-1400) for scheduling, cost and turnaround estimates.

RETURNING PRODUCTS FOR REPAIR

Please contact Setra (1-800-257-3872 or 978-263-1400) before returning unit for repair to review information relative to your application. Many times, only minor field adjustments may be necessary.

When returning a product to Setra, the material should be carefully packaged and shipped prepaid to:

Setra Systems, Inc.
159 Swanson Road
Boxborough, MA 01719
Attn: Repair Department

To assure prompt handling, please supply the following information and include it inside the package of returned material:

1. Name and phone number of person to contact.
2. Shipping and billing instructions.
3. Full description of the malfunction.
4. Identify any hazardous material used with product.

Notes: Please remove any pressure fittings and plumbing that you have installed and enclose any required mating electrical connectors and wiring diagrams.

Allow approximately 3 weeks after receipt at Setra for the repair and return of the unit.

Non-warranty repairs will not be made without customer approval and a purchase order to cover repair charges.

LIMITED WARRANTY AND LIMITATION OF LIABILITY

SETRA warrants its products to be free from defects in materials and workmanship, subject to the following terms and conditions: Without charge, SETRA will repair or replace products found to be defective in materials or workmanship within the warranty period; provided that:

- a) the product has not been subjected to abuse, neglect, accident, incorrect wiring not our own, improper installation or servicing, or use in violation of instructions furnished by SETRA;
- b) the product has not been repaired or altered by anyone except SETRA or its authorized service agencies;
- c) the serial number or date code has not been removed, defaced, or otherwise changed; and
- d) examination discloses, in the judgment of SETRA, the defect in materials or workmanship developed under normal installation, use and service;
- e) SETRA is notified in advance of and the product is returned to SETRA transportation prepaid.

Unless otherwise specified in a manual or warranty card, or agreed to in a writing signed by a SETRA officer, SETRA pressure and acceleration products shall be warranted for one year from date of sale.

The foregoing warranty is in lieu of all warranties, express, implied or statutory, including but not limited to, any implied warranty of merchantability for a particular purpose.

SETRA's liability for breach of warranty is limited to repair or replacement, or if the goods cannot be repaired or replaced, to a refund of the purchase price. SETRA's liability for all other breaches is limited to a refund of the purchase price. In no instance shall SETRA be liable for incidental or consequential damages arising from a breach of warranty, or from the use or installation of its products.

No representative or person is authorized to give any warranty other than as set out above or to assume for SETRA any other liability in connection with the sale of its products.

Setra Systems, Inc.

Product Line Summary

Pressure Transducers/Transmitters/Gages & Accelerometers

Model	Applications	Type of Pressure Measurement	Pressure Ranges	Accuracy (RSS Method) ± % FS	Thermal Effect ± % FS/100°F (± % FS/100°C)	Media Compatibility	Output
204/204D	Hazardous Environments R & D Laboratories Vacuum Systems	Absolute Gage Vacuum	25 to 5000 psia 25 to 10000 psig 0-14.7 psiv	0.11 .073 (opt.)	0.4 (.72) max Zero 0.3 (.54) max Span	Gas or liquid compatible with stainless steel	204 0-5 VDC C-204 4-20 mA
205-2	High Accuracy General Purpose R & D Test & Measurement Vacuum Systems Dynamometers Engine Test Cells	Absolute Gage	25 to 5000 psia 25 to 5000 psig	0.11	0.02 (3.6) max Zero 1.5 (2.7) max Span	Gas or liquid compatible with stainless steel	0-5 VDC
206/207	Equipment Automation Compressor Control Chillers Paper Converting Machines Hydraulics & Pneumatics	Gage	25 to 5000 psig M206 Avail. in 1.6 to 400 bar	0.13	1.0 (1.8) max Zero 1.5 (2.7) max Span	Gas or liquid compatible with stainless steel	206/207 0.1-5.1 VDC C-206/C-207 4-20 mA
209	Off Road Equipment Hydraulic Equipment Compressor Control HVAC/R Equipment Industrial Engines	Gage	50 to 5000 psig Common bar ranges	0.25	2.0 (3.6) max Zero 1.5 (2.7) max Span	Gas or liquid compatible with stainless steel	1.0-6.0 VDC 0.2-5.2 VDC 0.5-4.5 VDC 1.0-5.0 VDC 4-20 mA
212 212FT	Specialty Gas Handling Semiconductor Process Gas Bottle Filling Equipment Pharmaceutical & Biotechnology Process High Press. Liquid Chromatography	Gage Compound Absolute (212)	-14.7 - 3000 psig 100 - 3000 psig 100 - 3000 psia	0.14 (212FT) 0.22 (212)	1.5 (2.7) max Zero 1.0 (1.8) max Span	Corrosive liquids or gases (Ultra-High Purity Gas & Liquid Compatible)	212/212FT 0.2-5.2 VDC C212/C212FT 4-20 mA
280E 280E-XP 	Process Instrument Signals Explosionproof/weatherproof Natural Gas Lines Chemical Processing Off-Shore Drilling	Gage Absolute Compound P/I	15 - 10000 psig 25 - 5000 psia -14.7 to 100 psig 3 - 15 psig	0.11	0.75 (1.4) Zero 1.5 (2.7) Span (Typ.) 2.0 (3.6) max Zero 2.0 (3.6) max Span	Gas or liquid compatible with stainless steel	280E 0-5 VDC C280E 4-20 mA
270	Weather Data Systems Laser Interferometers Altimeter Setting Indicators Transfer Pressure Standard	Barometric Gage Absolute	600-1100 mbars 800-1100 mbars 10 to 100 psia 5 to 100 psig	0.05 Option .03	0.1 (.18) max Zero (0.2 (.36) Baro.) 0.1 (.18) max Span	Wet or Dry Air	0-5 VDC
C290	Sanitary Pressure Lines Food & Beverage Processing Tank Level Measurement Pharmaceutical Processing Sanitary Filtration Systems	Gage	1 to 1000 psig	0.20	2.0 (3.6) max Zero 2.0 (3.6) max Span	Gas or liquid compatible with stainless steel	4-20 mA
228-1	Process Control Filter Condition Monitoring Refrigeration Equipment Pump Speed Control HVAC Equipment	Differential (can be wet both sides)	1 to 100 psid ±0.5 to ±50 psid	Low Ranges 0.15 High Ranges 0.21	2.0 (3.6) max Zero 2.0 (3.6) max Span	Gas or liquid compatible with stainless steel (both pressure & reference sides)	228-1 0-5 VDC Bidirectional ±2.5 VDC C228-1 4-20 mA
239	HVAC Control Leak Detection Environmental Testing R & D Scientific Fume Hood Control	Differential	0.5" to 30" WC ±0.25" to ±15" WC 5 to 10 psid ±2.5 to ±5 psid	0.14 Option .073	1.0 (1.8) max Zero 1.0 (1.8) max Span	High Pressure Port Gas or liquid compatible with SS, aluminum & Buna-N Low Pressure Port Clean dry air or inert gas	239 0-5 VDC Bidirectional ±2.5 VDC C-239 4-20 mA
264	HVAC and VAV Control Energy Management Systems Clean Room Control Medical Instrumentation Filter Condition Monitoring	Very low Differential	0.1" to 25" WC ±0.1" to ±5" WC (Pa, mbar & mmWC ranges available)	1.00 Option 0.25 & 0.4	3.3 (5.9) Zero & Span combined	Air or inert gases	264 0-5 VDC C-264 4-20 mA
370 470	Altimeter Certification Pressure Transfer Standard Laser Interferometers Min/Max Tracking Hi/Lo Alarming Automatic Weather Systems High Accuracy Altimeter Weather Data Buoy Hydrological (SDI-12) option	Absolute Barometric	600-1100 mbar 800-1400 mbar 0 to 10, 20, 50, 100 psia	±0.02	0.2 max Zero 0.1 max Span	Air or inert gases	RS-232
Accelerometer 141	Transportation Equipment Position Sensing Robotics Shock & Vibration Testing	G Ranges (Full Scale Ranges ±G)	±2,±4,±8,±15,±30, ±60,±150,±600g Response: DC to 3000 Hz	1.00	2.0 (3.6) max Zero 2.0 (3.6) Max Span	N/A	141A ±500mv (nom.) 141B ±1000mv (nom.)

159 Swanson Road, Boxborough, MA 01719/1-800-257-3872, (978)263-1400
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