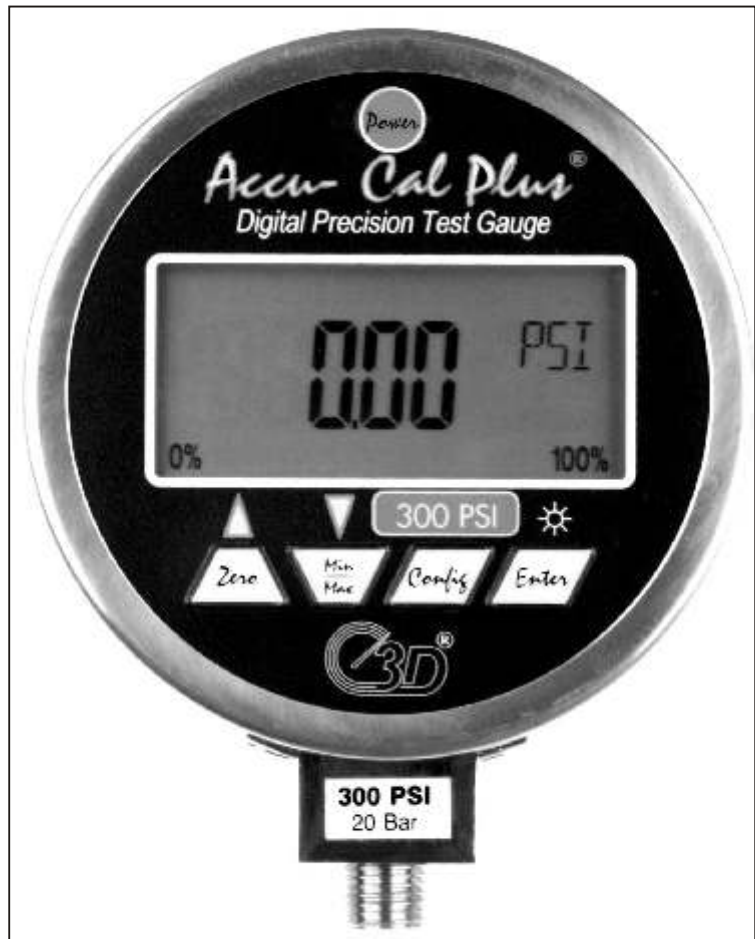




Accu-Cal Plus Digital Test Gauge

Features

- **Intrinsically Safe** - Built to comply with requirements for Class 1, Division 1, Groups A, B, C and D hazardous areas (approval pending)
- **Precise Measurements** - 0.05% FS accuracy. Vacuum accuracy: 0.25% FS for ranges 0-500 psi and below
- **Temperature Compensation** - accuracy not de-rated over the temp. range of 32-122 deg F with rigorous 3 temperature calibration
- **Rugged enclosure** - 300 Series Stainless Steel case with NEMA-4 waterproof rating
- **Security** - Password protected "through the keypad" Zero and Calibration information
- **Analog/Digital Display** - Large, backlit, 5 1/2 digit display with 0.65" high digits and complimentary 20 segment bar graph
- **Low Power consumption** - 2000 hours battery life @ slow sample rate from three (3) size AA alkaline batteries; adjustable sample rates
- **Versatile** - 9 pressure ranges available. Displays to 15 standard or fully custom Engineering Units
- **Communication** - RS-232 output of ASCII data (optional cable required)
- **Peak/Valley measurements** - MIN/MAX function permits storage and retrieval of Min and MAX pressure values
- **Tare** - allows re-zeroing of the gauge anywhere across the span of the gauge
- **Options** - 24vdc power, mounting flanges, RS-232 output and chemical/sanitary seals



Product Description

The Accu-Cal Plus Digital Test Gauge from 3D Instruments incorporates the ultimate in pressure measurement technology to address the calibration requirements of current process monitoring and control instrumentation. The Accu-Cal Plus combines the accuracy of digital technology with the simplicity of an analog gauge and achieves performance, ease-of-use and a feature set unmatched in the pressure measurement world!

Outstanding SS pressure sensors from 0-15 to 0-10,000 psig provide for an accuracy of 0.05% full scale. Temperature compensation circuitry coupled with a rigorous multi-temperature calibration routine maintains this astounding accuracy over a temperature range of 32° to 122° F!!

A 5 1/2 digit LCD with oversized 0.65" digits, high contrast, rotatable display and backlighting provides for superior resolution and excellent readability...even at a distance or in poor light or at a bad viewing angle!! As the perfect complement to the digital display, the Accu-Cal Plus offers a 20 segment bar graph scaled to 0-100% FS. This safety oriented feature gives the user a visual reference of their process pressure relative to scale of the gauge.

The Accu-Cal Plus is housed in a polished 300 Series Stainless Steel case, which is rated waterproof according to NEMA-4/IP-65 specifications. All device controls including: POWER, ZERO, MIN/MAX and CONFIGURATION are selectable via a Lexan keypad for reliable operation in adverse weather conditions. To reduce maintenance, low power circuitry provides for a 2000 hour battery life at a sample rate of 0.5/sec with no backlighting.

This high-end pressure instrument provides for numerous user-configurable features such as: adjustable sample rates, damping (smoothing of data on LCD), Tare (re-zero across span of the gauge), custom Engineering Units, Min/Max and "password protected" field calibration. Other features include ambient temperature measurement and an optional RS-232 cable for streaming real-time ASCII data.

The combination of sophisticated precision pressure measurement technology; robust design, ease-of-use, feature set, and a wide array of pressure ranges makes the Accu-Cal Plus from 3D Instruments the ideal choice for your demanding pressure monitoring or test and calibration applications.

GENERAL SPECIFICATIONS

FEATURES

Accuracies:

Positive Pressure: 0.05% of Full Scale (FS)
 Vacuum: 0.25% of FS for ranges to 500 psi and 2% FS for ranges > 500 psi
 Accuracy includes all variations due to: non-linearity, hysteresis, repeatability and temperature over the compensated temperature range.

Ranges/Resolutions/Proof Pressure:

Range (Bar)	Resolution	Proof Pressure
-5-0-15 psi (1 Bar)	.001	90 psi
-5-0-30 psi (2 Bar)	.001	90 psi
-14.5-0-100 psi (7 Bar)	.01	300 psi
-14.5-0-300 psi (20 Bar)	.01	3000 psi
-14.5-0-500 psi (35 Bar)	.01	3000 psi
-14.5-0-1,000 psi (70 Bar)	.1	3000 psi
-14.5-0-3,000 psi (200 Bar)	.1	10000 psi
-14.5-0-5,000 psi (350 Bar)	.1	10000 psi
-14-0-10,000 psi (700 Bar)	1	15,000 psi

Environmental:

Operating range: -10 °C-55 °C (14 °F-131 °F)
 Compensated range: 0-50 °C (32 °F-122 °F)
 Storage range: -20 °C-70 °C (-4 °F-158 °F)

Agency Approvals: (75514 Battery Power versions only)

Built to comply with requirements for Class 1, Division 1, Groups A, B, C & D operation
 - CSA and ATEX Intrinsic Safety Approvals (pending)
 - CE Mark

Power:

3 x AA alkaline batteries. Delivers 1500 hours service @ 3 samples/sec @ 72 °F without backlight or 2000 hours at the 1 sample/2 secs w/o backlight @ 72 °F

Display:

High contrast - LED backlight 5 ½ digit, 0.65" high; 20 segment analog bargraph scaled to 0-100% of FS. LCD includes: Engr. Unit indication, Min/Max icons, low battery icon and backlight icon

Case:

Polished 304 Stainless Steel, NEMA-4/IP-65 rated

Mounting flanges (optional):

Front or back 300 series SS welded to case ANSI bolt pattern for 4 ½" gauge

RS-232 (optional):

Custom cable - ASCII data

Graphic Overlay:

Polycarbonate

Pressure Sensors:

316 SS - wetted parts are 316SS

Process Connection:

¼" NPT male 316SS

Dimensions (w/o flange):

4.375" x 5.0" x 1.5"

Weight (w/o flange):

1.09 lbs (495 gms)

Standard Engineering Units:

PSI, Bar, Kg/cm², inH₂O(4 °C, 20 °C or 60°F), ftH₂O(4 °C, 20 °C or 60°F), cmH₂O(4 °C & 20 °C), mH₂O (4 °C & 20 °C), Kpa, mBar, inHg, mmHg, Torr and custom Engineering Units

*Not all Engineering Units enabled for all ranges

Password Protection:

"Tamper-proof" password protection of Zero and Calibration data is easily achieved via the keypad

LCD Bargraph:

20 segment bargraph is scaled at: 0-100% FS Provides a convenient visual reference of pressure readings relative to the pressure range of the gauge

Sample Rates:

User configurable 0.5/sec, 1/sec, 3/sec & 10/sec. 10/sec sampling good for QA/QC destructive tests

Power Management:

Adjustable auto power shut-off: 1-30 minutes - shutoff feature when enabled extends battery life

Damping:

Damping can be enabled to integrate readings and "smooth" LCD display: good for pulsation sources

Min/Max:

Capture & query Min/Max values: many applications in process monitoring and control

Tare:

0-100% FS zero offset: when used with custom Engr. Units, the gauge can be used in liquid level, volume and weighing applications.

ORDERING INFORMATION

① ② ③ ④ ⑤
PART NUMBER: 7XXXX - XX B XX XXX

Example:

75514-33B55 Battery Powered Accu-Cal Plus with 300 series SS case, 3000 psig sensor, bottom ¼" NPT male fitting without mounting flange

① **Product Description:** **75514** - Accu-Cal Plus: 3 x AA battery powered **76514** - Accu-Cal Plus: 24 VDC version (**does not include a 24 VDC adapter**) Refer below for part number information.

② **Pressure Ranges Codes:** (all ranges include vacuum measurement)
15: -5-0-15 psig **23:** -14.5-0-100 psig **27:** -14.5-0-500 psig **33:** -14.5-0-3,000 psig **38:** -14-0-10,000 psig
21: -5-0-30 psig **26:** -14.5-0-300 psig **29:** -14.5-0-1,000 psig **35:** -14.5-0-5,000 psig

③ Process connection:

B: ¼" NPT male

④ Connection Position and Mounting Flange Codes: (Codes 35 and 45 not available on 76514 series)

15: Flange front, bottom fitting **35:** Flange back, bottom fitting **55:** Flange none, bottom fitting
25: Flange front, back fitting **45:** Flange back, back fitting **65:** Flange none, back fitting

⑤ Option Codes: leave blank if no options are required

PNO: Accu-Cal Plus Cal Kit #1 includes an Accu-Cal Plus Digital Test Gauge, Model 8110-300: 0-300 psi Pneumatic Handpump, Hose Kit and Series-200 ABS waterproof case

PRO: Accu-Cal Plus Cal Kit #2 includes an Accu-Cal Plus Digital Test Gauge, Model 8111-300: Vac/0-300 psi Duplex Handpump, Hose Kit and Series-200 ABS waterproof case

PUO: Accu-Cal Plus Cal Kit #3 includes an Accu-Cal Plus Digital Test Gauge, Model 8112-3000: 0-3000 psi Hydraulic Handpump, Hose Kit and Series-200 ABS waterproof case

GCO: NIST traceable Calibration Certificate w/data. A NIST traceable Certificate of Conformance is supplied standard with each unit.

RAA: Custom RS-232 cable – 3D Instruments Part Number: 2025-0004

RAC: 12-24 VDC (110 VAC version; 200 mA) – 3D Instruments Part Number: 2001-0091



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Accu-Cal Plus Instruction Booklet

The "Direct Drive Difference" in Digital

INTRODUCTION

Thank you for choosing the Accu-Cal Plus Digital Precision Test Gauge from 3D Instruments. The Accu-Cal Plus is very much like the 3D Direct Drive Test Gauge; Rugged, accurate and easy to use. The **Difference** is the greater accuracy possible with a digital display and, through an advanced design, **accuracy that is specified to be 0.05% full scale over the temperature range of 0 °C (32 °F) to 50 °C (122 °F).**



The large LCD was designed to be reliable and easy to read under a variety of environmental conditions. The Accu-Cal Plus display, complete with a 20 segment bar graph for visual reference, is a full five and a half digits (199999), so auto-ranging is not required to have sufficient display resolution for the rated accuracy.

The silicon chip pressure sensors used are highly repeatable over pressure and temperature. Accu-Cal Plus sensors incorporate a permanently filled oil isolated stainless steel diaphragm in an all-welded fitting. The only wetted materials are 316 stainless steel.

Other features include the ability to select from up to 18 different pressure units (depending on pressure range), High and Low pressure reading detection, adjustable auto shutdown with 1500 hour battery life (continuous use) on 3 standard alkaline AA batteries, damping, configurable sample rate and password protection of zero and cal data. The case is polished 300 series stainless steel and is rated NEMA-4 for weather and corrosion resistance.

And finally, the Accu-Cal Plus is manufactured and serviced by the company that makes THE Premier Pressure Gauge on the market today. **Get The Direct Drive Difference in Digital Today!**

PRODUCT INTRODUCTION

OVERVIEW

The Accu-Cal Plus Digital Precision Test Gauge combines the high accuracy of digital electronics with the convenience and ease of use of an analog test gauge. Accurate to $\pm 0.05\%$ FS, the Accu-Cal Plus can be used as a calibration reference, or in any application where high accuracy pressure measurement is required.

Many user configurable functions have been designed into the Accu-Cal Plus including sampling rate, TARE, damping, auto shut off, and Max/Min. Once the gauge is configured, settings can be locked and password protected to prevent unauthorized changes to configuration.

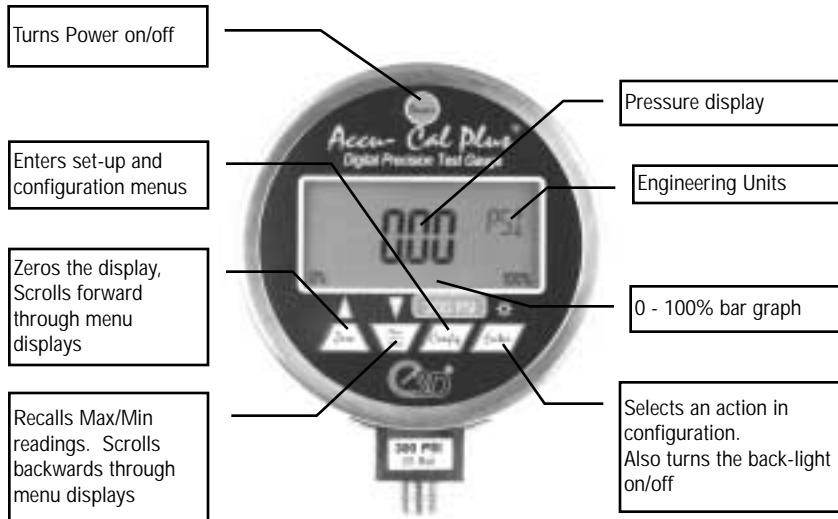
UNPACKING

Check to see that your Accu-Cal Plus has arrived intact. Batteries are factory installed unless you have purchased the optional 24V powered version, in which case batteries are not supplied or installed. Save the packing materials at least until you have verified that there is no concealed damage.

INSTALLATION

Prior to installing the gage into a process connection, please ensure all pressure is relieved from the system. Ensure that you use proper fittings to mate with the gauge. Failure to utilize proper fittings will result in leaks. Never attempt to tighten the unit by turning the gauge housing by hand. **This may result in permanent damage to this gauge.**

ACCUCAL PLUS DISPLAYS AND CONTROLS



OPERATING INSTRUCTIONS

UNIT POWER-UP

The standard Accu-Cal Plus is supplied with 3 AA batteries installed. If you purchased the optional 24Volt powered version, batteries are not installed. Connect a 24V power supply to the terminal block on the rear of the gauge noting proper polarity - refer to page 5 for detailed instructions and warnings..

Push and hold down the POWER key for 2 - 3 seconds to turn the unit on. The LCD will briefly display the firmware version, test the bar graph display segments and then cycle to the "normal operation" screen. The gauge is now ready for service. To turn off the gauge, press the POWER key.

Note: The gauge will read to 120% of full scale. After that point, the gauge will display: OL (over limit). **The gauge is only calibrated to 100% of full scale.**

SET-UP AND CONFIGURATION

Push the CONFIG key to access the user-settable functions on the gauge. Each time the CONFIG key is pressed, the display advances to the next function. Once a function has been set, press ENTER to exit the configuration menu, or CONFIG to continue with further configuration. In sequential order, the configuration menu and operation is as follows:

1. Set Engineering Units.

The unit is shipped configured to display PSI. By pressing the \blacktriangle and \blacktriangledown (ZERO and MAX/MIN) keys you can scroll forward and backwards through the 18 standard engineering units plus a one custom unit/ scale. When the desired unit is displayed, press ENTER or CONFIG. Pressure will now be displayed in the chosen engineering units. Refer to page 11 of this manual for a list of available engineering units. See the Supervisory Mode section for details on setting up custom units.

2. Set Auto Off.

The auto shut-off can be set in 1 minute increments from 1 to 30 minutes or "off" (continuous operation). The factory default is 30 minutes. Use the \blacktriangle and \blacktriangledown keys to set the desired interval. The "off" setting is at the low end of the choices, below 1 minute. With the auto shut-off disabled, it will remain on until manually switched off.

3. Display battery voltage.

Displays actual voltage of battery "pack" and a "percent of life" bargraph indicating battery condition.

4. Display actual temperature.

A PN junction based temperature sensor is built into the microprocessor, which is mounted on the PC board. It can accurately read the temperature inside the gauge case. The value can be set to $^{\circ}$ F or $^{\circ}$ C using the \blacktriangle and \blacktriangledown keys.

5. Set Damping.

Choices are "on" and "off" set with the \blacktriangle and \blacktriangledown keys. Turning damping on will smooth readings from pulsating pressure sources. The Damping function averages 10 successive measurements prior to updating the LCD display and MAX/MIN registers.

6. Set Sample Rate.

This determines how often pressure is sampled and both the display and MAX/MIN registers are updated. Choices are 0.5, 1, 3, and 10 samples/second with 10/sec being fastest.

7. Set TARE.

This function allows you to build in a constant offset value, which is then subtracted from the measured pressure. Example: if a TARE is set at 30 PSI and the measured pressure is 37 PSI, the displayed value will be 7 PSI. A pressure of 27 PSI would be displayed as -3 PSI. TARE is settable across the entire span of the gauge.

OPERATING INSTRUCTIONS

The TARE value is set manually with the ▲ and ▼ keys, and is based on the engineering units and resolution selected for display. TARE value can be set to the maximum range of the gauge.

Note: The bar graph will always display the actual pressure based on the full range of the gauge regardless of the TARE setting. This is done for safety to insure that even with a “0” reading that pressure is being applied to the gauge.

8. FUNc Lock

Access to each of the settable parameters above can be turned “off” once set, to prevent unauthorized changes to configuration. This is accomplished through a password protected “supervisory mode”. This function is accessed through the Configuration menu - refer to the next section.

SUPERVISORY MODE

Press the ENTER key when “FUNc LOCK” is displayed, 0 PWRD will be displayed on the gauge display. The password to enter supervisory mode is 101, set using the ▲ and ▼ keys. Holding a key continuously will cause the display to advance quicker for faster setting. Press the ENTER key to reach the supervisory mode.

Note: The password is factory set and cannot be changed.

1. The Accu-Cal Plus is shipped from the factory with all accessible settings “unlocked” or available to be changed.
2. In order, the functions that can be unlocked, locked or accessed are:
 - Zero function (enable/disable)
 - Set pressure units (enable/disable)
 - Auto shutdown adjustment (enable/disable)
 - Damping settings (enable/disable)
 - Sample rate setting (enable/disable)
 - TARE setting (enable/disable)
 - Custom engr. units (set scale factor)

3. In supervisory mode each of the parameters can be locked or unlocked individually using the ▲ and ▼ keys. Select LOC (lock) for those parameters you do not want to be accessible, and UnLOC (unlock) for those that can be accessed.
4. Use the CONFIG key to scroll through the above choices, and the ▲ and ▼ keys to lock and unlock features. Press CONFIG to continue scrolling through the parameters, pressing ENTER at any point saves your settings and returns the gauge to normal operation. When a function is “locked, it cannot be accessed or changed from its current state. To change a locked function, enter the supervisory mode, and unlock the function. Once it is changed, you may enter supervisory mode to lock access again.
5. Setting a custom engineering unit or scale: The last menu choice in supervisory mode is SET FACTR. This allows you to set a multiplier factor from 0.001 to 100, creating a custom scale. The set factor will be multiplied by the PSI measured, the result will be displayed. By setting a factor of 25, a 40 PSI pressure would display as 1000 (40 x 25). The engr. unit displayed on the Accu-Cal Plus will be “Cust”.

Backlight Operation

Press the ENTER key to enable the backlight. Press the ENTER key to turn it off.

Zeroing the Gauge

Press and hold the ZERO key for 1 - 2 seconds. **To ensure accurate measurements, the extent of unit zero adjustment is approx. ± 5% of full scale.**

Note: The gauge should always be zeroed immediately before measurements are taken. The zero will fluctuate until the temperature is stable. This will be more noticeable on low pressure ranges. If the gauge can not be zeroed, contact factory for assistance.

OPERATING INSTRUCTIONS

MAX/MIN function

The Accu-Cal Plus stores minimum and maximum pressure values in memory. Pressing the MAX/MIN key once will display the maximum pressure stored in memory. Pressing the MAX/MIN key again will display the minimum pressure stored in memory. Press the MAX/MIN key again to return to normal (live display) operation. To clear the MAX/MIN memory registers, press and hold the MAX/MIN key for 2 or more seconds until “CLr” is displayed. If a value of “OL” (over limit) appears in the MAX register, this indicates that the gauge experienced pressure above 120% of span. **Note:** The rate of MAX/MIN register updates is determined by sample rate and values will be lost when the unit is shut off.

Analog Bar Graph

The 20 segment analog bar graph located at the bottom of the LCD display indicates the applied pressure level expressed as a percentage of the full range of the gauge. **Note:** If a TARE value has been programmed into the gauge, the numeric value indicated on the LCD display **will not** reflect the true pressure being applied to the gauge.

Battery Life

Battery life is approximately 1500 hours (60 days) of continuous use with the backlight off and at a sample rate of 3/sec. With intermittent use, batteries could last a year or more. There is a “low battery” icon in the upper left of the display. It will appear when battery level is low at approximately 3.3 volts. The unit will shut itself off when the battery voltage drops to 3.0 volts. Replace batteries per recommendations found in the next section of this manual.

Changing the Batteries

Grasp the face ring on the Accu-Cal Plus, turn it approximately ¼ turn counterclockwise and remove. The face of the gauge can now be lifted to expose the battery holder. Install three AA batteries noting proper polarity. Reassemble the case making certain that the face is properly oriented.

RS-232 Interface

A RS-232 interface is provided standard on the Accu-Cal Plus. Serial communication can be used for configuration, calibration, and to transfer measurement data from the gauge. An optional RS-232 communication cable is required for this operation and can be obtained from the factory. For information on the optional RS-232 cable and required software communication protocol, refer to pages 9 and 12.

24 VDC Power Version (optional)

If you purchased the optional 24 Volt version, the terminals for power input are located on the rear of the gauge. To apply power simply connect a 24 volt source to the rear terminal block taking care to observe proper polarity. Refer to page 13.

WARNING

Gauges ordered with the external 24 volt power option will not come with batteries installed. **Batteries MUST NOT be installed when operating on external power. The use of batteries in conjunction with a power adapter can cause batteries to leak or explode, thereby damaging electronics and voiding the warranty.**

If you lack a 24 VDC power source, to power the unit, one may be obtained from 3D Instruments - contact factory for details.

The 24 volt version can be operated on 3 x AA batteries provided the unit is not already being powered by a 24 volt source. If the gauge is currently hooked to a 24 volt source, disconnect it and install the batteries per the instructions outlined in the “Changing the Batteries” section.

Mounting (optional)

An optional front or rear 300 Series Stainless Steel mounting flange, which is welded to the case, is available for the Accu-Cal Plus. Outline drawings for both flanged versions are provided on page 8.

ACCU-CAL PLUS CALIBRATION PROCEDURE

Overview

Calibration adjustment of the Accu-Cal Plus is performed electronically via internal software with the case closed. There are no mechanical adjustments; all calibration commands and adjustments are done via the keypad, using the display to guide the user through the calibration process.

Ten calibration points are used in the adjustment program, working from full scale to zero at pressures equaling 100%, 87.5%, 75%, 62.5%, 50%, 37.5%, 25%, 12.5%, and 0% of full scale plus vacuum.

Note: This is an ambient temperature calibration and should be performed at an ambient temperature of $23\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ ($72\text{ }^{\circ}\text{F} \pm 5\text{ }^{\circ}\text{F}$). Calibration outside this temperature range will invalidate the temperature compensation program in the Accu-Cal Plus.

Calibration Interval

You should check performance of the gauge at the interval required by your calibration program. We recommend adjustment when measurement deviates by more than 75% of the specified accuracy, or 0.04%

Test Equipment

Verification and calibration of the Accu-Cal Plus requires pressure and/or vacuum standards able to produce and indicate pressures from vacuum to the full-scale range of the unit under test. In order to maintain the specified accuracy of the Accu-Cal Plus, standards should have a TUR of 4: 1 or better.

Connections

The Accu-Cal Plus uses a 1/4 NPT male connection in the pressure input port. Various adapters may or may not be needed to connect to the pressure standard.

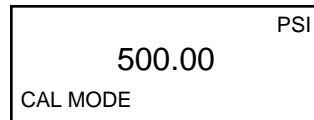
Always make sure the hose, tubing, and fittings etc have a rated working pressure at or above the pressure of the unit. Also it is important that there be no leaks when performing calibration; use Teflon tape where appropriate.

Entering Calibration Mode

After you have made your connections, turn the power on while holding the CONFIG key. Use the arrow keys to enter the password. The password is 101. If you have entered the calibration mode correctly, the display should look as shown below. The pressure value displayed will be the full-scale value of the gauge.

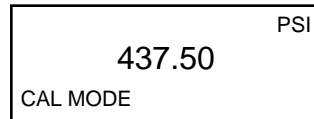
Procedure

Screens shown in this manual represent the displays shown with a 500 psi gauge. The Accu-Cal Plus will prompt the technician for the appropriate pressure at each calibration point.



500.00 PSI
CAL MODE

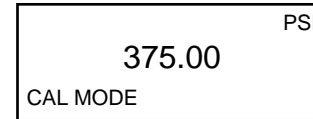
Use the Pressure Standard to output 500.00 psi (100%). After the output has stabilized, press the ENTER key to continue. As the unit takes readings, the screen will illustrate that follows.



437.50 PSI
CAL MODE

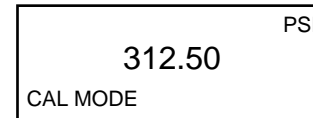
Use the Pressure Standard to output 437.50 psi (87.5%). After the output has stabilized, press the ENTER key to continue. As the unit takes readings, the screen will show -----. When the readings are complete, the screen should look as shown below.

ACCU-CAL PLUS CALIBRATION PROCEDURE



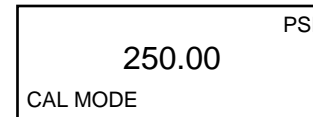
375.00 PSI
CAL MODE

Use the Pressure Standard to output 375.00 psi (75%). After the output has stabilized, press the ENTER key to continue. As the unit takes readings, the screen will show -----. When the readings are complete, the screen should look as shown below.



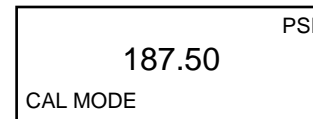
312.50 PSI
CAL MODE

Use the Pressure Standard to output 312.50 psi (62.5%). After the output has stabilized, press the ENTER key to continue. As the unit takes readings, the screen will show -----. When the readings are complete, the screen should look as shown below.



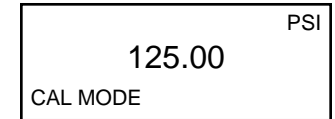
250.00 PSI
CAL MODE

Use the Pressure Standard to output 250.00 psi (50%). After the output has stabilized, press the ENTER key to continue. As the unit takes readings, the screen will show -----. When the readings are complete, the screen should look as shown below.



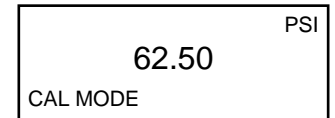
187.50 PSI
CAL MODE

Use the Pressure Standard to output 187.50 psi (37.5%). After the output has stabilized, press the ENTER key to continue. As the unit takes readings, the screen will show -----. When the readings are complete, the screen should look as shown below.



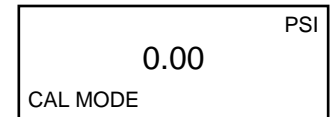
125.00 PSI
CAL MODE

Use the Pressure Standard to output 125.00 psi (25%). After the output has stabilized, press the ENTER key to continue. As the unit takes readings, the screen will show -----. When the readings are complete, the screen should look as shown below.



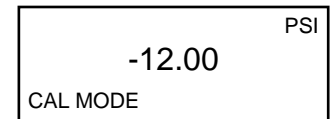
62.50 PSI
CAL MODE

Use the Pressure Standard to output 62.50 psi (12.5%). After the output has stabilized, press the ENTER key to continue. As the unit takes readings, the screen will show -----. When the readings are complete, the screen should look as shown below.



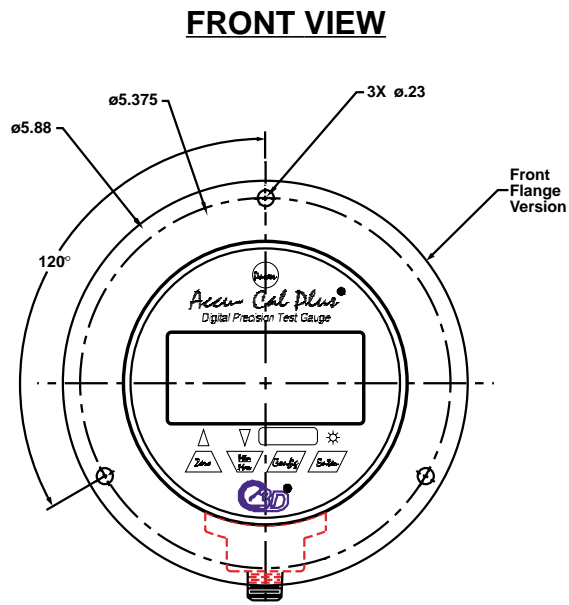
0.00 PSI
CAL MODE

Use the Pressure Standard to output 0.00 psi. After the output has stabilized, press the ENTER key to continue. As the unit takes readings, the screen will show -----. When the readings are complete, the screen should look as shown below.

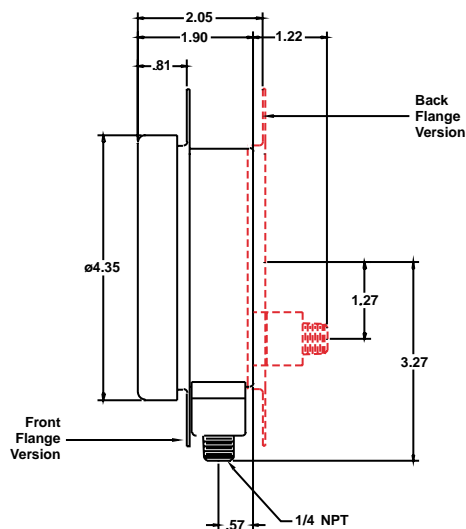


-12.00 PSI
CAL MODE

Use the Pressure Standard to output -12.00 psi. After the output has stabilized, press the ENTER key to continue. As the unit takes readings, the screen will show -----. When the readings are complete, the unit will reset and power up in normal mode.



SIDE VIEW



(Both front view and side view pictured with optional mounting flange)
All dimensions in inches.

① ② ③ ④ ⑤
PART NUMBER: XXXXX - XX **B** XX XXX

Example: 75514-33B55 Battery Powered Accu-Cal Plus with 300 series SS case, 3000 psig sensor, bottom 1/4" NPT male fitting, without mounting flange

- ① **Product Description:**
75514 - Accu-Cal Plus: 3 x AA battery powered version,
76514 - Accu-Cal Plus: 24VDC version (**does not include 24 volt adapter**)
- ② **Pressure Ranges Codes:** (all pressure ranges include vacuum measurement)
15: -5-0-15 psig 26: -14.5-0-300 psig 33: -14.5-0-3,000 psig
21: -5-0-30 psig 27: -14.5-0-500 psig 35: -14.5-0-5,000 psig
23: -14.5-0-100 psig 29: -14.5-0-1,000 psig 38: -14-0-10,000 psig
- ③ **Process Connection:**
B: 1/4" NPT male
- ④ **Connection Position and Mounting Flange Codes:**
15: Flange front, bottom fitting 45: Flange back, back fitting*
25: Flange front, back fitting 55: Flange none, bottom fitting
35: Flange back, bottom fitting* 65: Flange none, back fitting

* Codes 35 and 45 not available on 76514 series.
- ⑤ **Option Codes:** (leave blank if no options are required)
PNO: Accu-Cal Plus Cal Kit #1—includes an Accu-Cal Plus digital gauge, Model 8110-300: 0-300 psi Pneumatic Handpump, Hose Kit and Series-200 ABS waterproof case
PRO: Accu-Cal Plus Cal Kit #2—includes an Accu-Cal Plus digital gauge, Model 8111-300: Vac/0-300 psi Duplex Handpump, Hose Kit and Series-200 ABS waterproof case
PUO: Accu-Cal Plus Cal Kit #3—includes an Accu-Cal Plus digital gauge, Model 8112-3000: 0-3000 psi Hydraulic Handpump, Hose Kit and Series-200 ABS waterproof case
GCO: NIST traceable Calibration Certificate w/data. **A NIST traceable Certificate of Conformance is supplied standard with each unit.**
RAA: Custom RS-232 cable - 3D Instruments Part Number: 2025-0004
RAC: 9 VDC power adapter - 3D Instruments Part Number: 2001-0091 (110 VAC to 9 VDC 200 mA - wall mount style; 6 foot powercord)

SPECIFICATIONS

All specifications cover the temperature range from 0° C to +50° C, unless otherwise noted.

Available Input Ranges

See page 11 for a table of available ranges in PSI plus equivalent ranges and resolution for all Engineering Units.

Accuracy

Positive Pressure: ±0.05% FS (full scale)
Vacuum: ±0.25% FS (500 PSI pressure range and below); 2% FS accuracy for ranges above 500 PSI. Includes all effects due to hysteresis, repeatability, non-linearity and temperature.

Temperature Compensation

0 °C to +50 °C (32 °F to +122 °F) to rated accuracy

Over Pressure Protection

Proof Pressures for the various pressure sensors are detailed on page 11.

Burst Pressures for the various pressure sensors are as follows:

Range	Pressure (PSI)
0-15	150
0-30	150
0-100	500
0-300	5000
0-500	5000
0-1000	5000
0-3000	15000
0-5000	15000
0-10000	15000

Standard Engineering Units*

PSI, Bar, mBar, kPa, kg/cm², inH₂O (4 °C, 20 °C or 60 °F), ftH₂O (4 °C, 20 °C or 60 °F), cmH₂O (4 °C and 20 °C), mH₂O (4 °C and 20 °C), inHg, mmHg, Torr
One custom unit (user programmable)
* Not all units available for all ranges.

Materials of Construction

Case: 300 Series Stainless Steel
Wetted parts: 316 Stainless Steel
Overlay: Polycarbonate
Sensor bracket: Nickel plated brass

KT-085

12/04

Page 10 of 16

Sensors

Piezoresistive semiconductor sensor chip in an oil isolated housing incorporating a 316 SS isolation diaphragm. Media compatibility: liquids and gases compatible with 316 SS.

Environmental

Operating: -10 °C to +55 °C (14 °F - 131 °F)
Storage: -20 °C to +70 °C (- 4 °F to +158 °F)
Rel. Humidity: 10 to 95% non condensing

Mechanical

Dimensions: 5.39" (height) x 4.355" (diameter) x 1.95" (depth)
Pressure Connection: 1/8" NPT Male
Housing: 300 Series Stainless Steel, qualifies as NEMA 4/ IP65 waterproof
Weight: 1.09 lbs (495 gms)

LCD Display

Digits: 5 1/2, 0.65" (16.53 mm) high
Bar graph: 20 segment, 0 to 100% FS
Backlight: Fiber optic

Power

Battery: three (3) AA alkaline batteries, optional 24 VDC power
Battery Life: 1,500 hours without backlight @ 3/sec sample rate
2,000 hours at slow sample rate
"Low Battery" indicator icon is displayed near the end of battery life
Auto shutoff: adjustable from 1 - 30 mins

Agency Approvals

CE Mark
EN 55022: 1998 and
EN 61000-4-2/3: 1995
Meets EMI/RFI and ESD conditions outlined in above EN standards: 30 mHz to 1 GHz with a field strength of 3 v/m.
Intrinsic Safety
The battery powered version of the Accu-Cal Plus (Series 75514) is designed to conform with all requirements for Class 1, Division 1, Groups A, B, C and D hazardous area locations. Specific approvals are as follows:

CSA (pending)

CENELEC and ATEX (pending)



PRESSURE RANGES / DISPLAY RESOLUTIONS

Pressure Range PSI		15	30	100	300
Unit/Proof Pressure PSI	Conversion	90	90	300	3000
psi	1	15.000	30.000	100.00	300.00
bar	0.06894747	1.0342	2.0684	6.8947	20.684
mbar	68.94757	1034.2	2068.4	6894.8	20684
kPa	6.894757	103.42	206.84	689.48	2068.4
kg/cm2	0.07030697	1.0546	2.1092	7.0307	21.092
cmH2O@4°C	70.3089	1054.6	2109.3	7030.9	21093
cmH2O@20°C	70.4336	1056.5	2113.0	7043.4	21130
mH2O@4°C	0.703089	10.546	21.093	70.309	210.93
mH2O@20°C	0.704336	10.565	21.130	70.434	211.30
inH2O@4°C	27.68067	415.21	830.42	2768.1	8304.2
inH2O@20°C	27.72977	415.95	831.89	2773.0	8318.9
inH2O@60°F	27.70759	415.61	831.23	2770.8	8312.3
mmHg@0°C	51.71508	775.73	1551.5	5171.5	15515
inHg@0°C	2.03602	30.540	61.081	203.60	610.81
ftH2O@4°C	2.306726	34.601	69.202	230.67	692.02
ftH2O@20°C	2.310814	34.662	69.324	231.08	693.24
ftH2O@60°F	2.308966	34.634	69.269	230.90	692.69
Torr	51.71508	775.73	1551.5	5171.5	15515

Pressure Range PSI	500	1000	3000	5000	10000
Unit/Proof Pressure PSI	3000	3000	10000	10000	15000
psi	500.00	1000.0	3000.0	5000.0	10000
bar	34.474	68.947	206.84	344.74	689.47
mbar	34474	68948	NA	NA	NA
kPa	3447.4	6894.8	20684	34474	68948
kg/cm2	35.153	70.307	210.92	351.53	703.07
cmH2O@4°C	35154	70309	NA	NA	NA
cmH2O@20°C	35217	70434	NA	NA	NA
mH2O@4°C	351.54	703.09	2109.3	3515.4	7030.9
mH2O@20°C	352.17	704.34	2113.0	3521.7	7043.4
inH2O@4°C	13840	27681	83042	NA	NA
inH2O@20°C	13865	27730	83189	NA	NA
inH2O@60°F	13854	27708	83123	NA	NA
mmHg@0°C	25858	51715	NA	NA	NA
inHg@0°C	1018.0	2036.0	6108.1	10180	20360
ftH2O@4°C	1153.4	2306.7	6920.2	11534	23067
ftH2O@20°C	1155.4	2310.8	6932.4	11554	23108
ftH2O@60°F	1154.5	2309.0	6926.9	11545	23090
Torr	25858	51715	NA	NA	NA

NA = Engineering Unit not enabled for particular pressure range

Proof Pressure - maximum allowable pressure without a shift in calibration.



KT-085

12/04

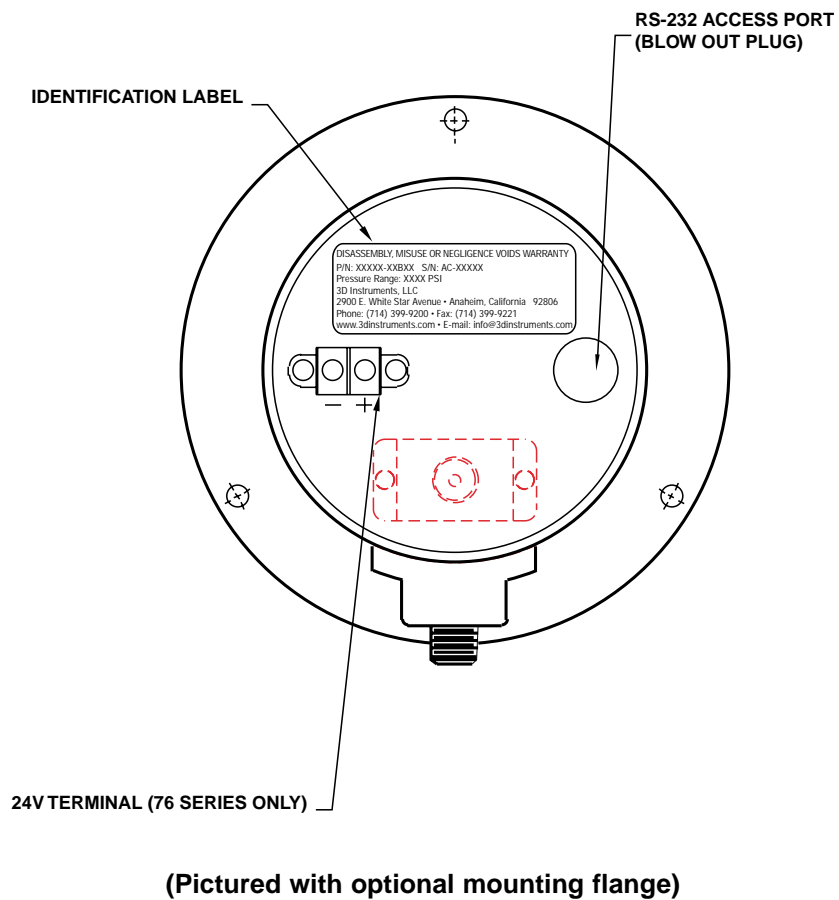
Page 11 of 16

LIST OF SERIAL COMMANDS FOR ACCU-CAL PLUS

No.	Command	Function
1		Get calibration mode (contact factory for command)
2	*CLS	Clear fault queue
3	FAULT?	Return fault code (0 for no fault)
4	*IDN?	Return ID string
5	TARE	Used to set TARE value in current units
6	TARE?	Used to read TARE value in current units
7	PRES_UNIT	To set Engineering Units (i.e. PRESS_UNIT PSI = Set Engineering unit to be PSI)
8	PRES_UNIT?	To read Engineering Units
9	VAL?	To read the current pressure value in the current unit
10	ZERO_MEAS	Zero the unit
11	ZERO_MEAS?	Read the Zero in current units
12	MINMAX_RST	Reset Min / Max.
13	MIN?	Read Min. value in current units
14	MAX?	Read Max. value in current units
15	TEMP?	Read temperature in current units
16	TEMP_UNIT	To set temperature units (i.e.: TEMP_UNIT CEL or FAR)
17	HC_COMP_OFF	Turn temperature compensation OFF (until the unit is re-powered)
18	HC_OFF	Power OFF
19	HC_AUTO_OFF	Auto power OFF
20	HC_AUTO_ON	Auto power ON
21	CAL_STORE	Store calibration constants
22	CUST_MULT	To set customer multiplier in Cust / PSI
23	CUST_MULT?	Returns multiplier
24	STREAM_OFF	Turn OFF streaming data
25	STREAM_ON	Turn ON streaming data
26	HC_SET_UNIT2	Enable/disable delay for keypad button (0 = enable / 2 = disable)

Serial Communication Specifications: ~ 9600 Bit/Sec.
 ~ 8 Data Bits.
 ~ No Parity.
 ~ 1 Stop Bit
 ~ Xon / Xoff Flow Control.

ACCU-CAL PLUS 24VDC WIRING DETAIL



WARRANTY

3D Instruments, LLC warrants the Accu-Cal Plus to be free from defects in material and workmanship under normal use and service for one (1) year from date of purchase to the original purchaser. It does not apply to batteries or when the product has been misused, altered or damaged by accident or abnormal conditions of operation.

Within one (1) year from date of purchase, 3D Instruments will, at our option, repair or replace a defective device free of charge and the device will be returned, transportation prepaid. However, if we determine the failure was caused by misuse, alteration, accident or abnormal condition of operation, you will be billed for the repair.

3D INSTRUMENTS, LLC MAKES NO WARRANTY OTHER THAN THE LIMITED WARRANTY STATED ABOVE. ALL WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, ARE LIMITED TO A PERIOD OF ONE (1) YEAR FROM THE DATE OF PURCHASE. 3D INSTRUMENTS, LLC SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, TORT OR OTHERWISE.

For warranty or non-warranty service, we can be reached at:

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U.S.A.

Web.....www.3dinstruments.com

Return Authorization numbers are not required for servicing. Please return, **freight prepaid**, to the address above and include a Contact Name, Address, Phone and Fax Number. If you wish to be notified of the charges before any service is done, 3D Instruments will contact you after evaluating the unit. Units evaluated but not serviced are subject to an evaluation charge. Defective units need to be returned to 3D Instruments, LLC within 90 days of identification of a problem.

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