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00909
TRANSMATION
1292/1294

Operator's Manual
Model 1292 & 1294
Automated Pressure Calibrators



Transmation
Instrument Division

USERS' MANUAL:

MODELS 1292 & 1294
AUTOMATED PRESSURE CALIBRATOR

APRIL 1998



977 MT. READ BOULEVARD, ROCHESTER, NEW YORK 14606
PART NUMBER: 100840-900

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CHAPTER 1

GENERAL INFORMATION

SPECIFICATIONS

These specifications are referred to an attached volume of 2.0 cubic inches (33 ml) and an ambient temperature of 77°F ± 2°F (25°C ± 1°C). Both the pneumatic and electrical functions of Models 1292 and 1294 have been characterized over the entire temperature range to minimize temperature effects.

PRESSURE

Input or Output Pressure Range:

-5 to 100 psig (-35 to 690 kPa)

The pressure sensor in use is dependent on the pressure range defined by the user's mode of operation. The Model 1292 will utilize one of the following three sensor ranges to optimize instrument accuracy for the selected range/value:

-5 to 5 psig	(-35 to 35 kPa)
0 to 30 psig	(0 to 207 kPa)
0 to 100 psig	(0 to 690 kPa)

In addition, the Model 1294 can operate with higher input pressures with the addition of an externally mounted pressure sensor. The high pressure sensor is user selected, and available in any one of these ranges:

0 to 30 psig	(0 to 207 kPa)
0 to 300 psig	(0 to 2070 kPa)
0 to 500 psig	(0 to 3450 kPa)
0 to 1000 psig	(0 to 6900 kPa)
0 to 2500 psig	(0 to 17250 kPa)

Maximum Pressure (input direct to instrument input port, or output):

100 psi (690 kPa)

Time to Pressure:

<5 psig:	8 seconds maximum
30 psig:	15 seconds maximum
100 psig:	100 seconds typical

Pressure Accuracy:

0.03% of reading of sensor in use at reference ambient temperature of 25 °C ± 1°C (77°F ± 2°F).

1292 Range	1292 Accuracy
-5 to 5 psi	.03% reading ± 0.0005 psi
30 psi	.03% reading ± 0.003 psi
100 psi	.03% reading ± 0.009 psi

1294 Range	1294 Accuracy
30 psi	.03% reading ± 0.003 psi
300 psi	.03% reading ± 0.03 psi
500 psi	.03% reading ± 0.05 psi
1,000 psi	.03% reading ± 0.09 psi
2,500 psi	.03% reading ± 0.25 psi

Resolution:

0.005% of full scale value of sensor in use (resolution may be reduced or increased by user). See Chapter 3, Diagnostics, page 18.

Overpressure Protection:

Models 1292 and 1294 are standard with no pressure reliefs. However, overpressure protection is an available option as a self-sealing pressure relief system. Overpressure relief occurs at approximately these pressures, listed for each input sensor range:

5 psig sensor	relief at 8 psig
30 psig sensor	relief at 39.5 psig
100 psig sensor	relief at 117 psig

Pressure Connections:

Internal Sensors - Female 1/8" flow Colder Products Corporation (CPC) fittings - NPT adapter fittings supplied.

External Sensor - 1/4" Female.

Filtration:

Common port filter

Media Compatibility:

Internal Sensors - vaporous materials compatible with aluminum, stainless steel and buna N.

External Sensors - materials compatible with 316SS and fluorocarbon rubber.

Unswept Internal Volume:

Less than 1.0 cubic inch (18 ml)

ELECTRICAL

Input Ranges:

Current:	± 50.000 mA
Voltage:	± 99.999 V
Millivolt:	± 99.99 mV

Input/Output Calibrated Accuracy (at reference temperature of 25°C ± 1°C [77°F ± 2°F]):

Current:	±0.01% of reading ± 0.01% FS (Input)
	±0.01% of reading ± 0.02% FS (Output)
Voltage:	±0.01% of reading ± 0.02% FS (Input/Output)
Millivolt:	±0.01% of reading ± 0.02% FS (Input/Output)

Input Calibrated Accuracy 32°F - 104°F (0°C - 40°C):

Current:	±0.03% of reading ± 0.02% FS
Voltage:	±0.03% of reading ± 0.02% FS
Millivolt:	±0.03% of reading ± 0.02% FS

Input Impedance:

Current:	10 ohms nominal
Voltage:	10 megohms nominal
Millivolt:	10 megohms nominal

Output Ranges:

Current:	0 to 22.0000 mA
Voltage:	0 to 11.0000 V
Millivolt:	0 to 110.000 mV

Output Calibrated Accuracy 32°F - 104°F (0°C - 40°C):

Current:	±0.03% of reading ± 0.02% FS
Voltage:	±0.03% of reading ± 0.02% FS
Millivolt:	±0.03% of reading ± 0.02% FS

Output Impedance:

Current Range: 50 megohms, min.

Voltage and Millivolt Ranges: 1 ohm, max.

Maximum Common Mode Voltage:
200 V peak to peak

Normal Mode Rejection:
80 dB @ 60 Hz

Input Protection:
Solid state limit and mA input fuse protected (0.125 A)

Maximum Current Loop Resistance:
1K ohm @ 20 mA

Voltage Output Drive Capability:
≥ 2K Ohm, ≤ 5 mA

Output Protection:
Protected against output short circuit

Isolation (Input-to-Output-to-Case):
200 V maximum

Power:
Rechargeable 12V sealed lead acid battery

Charge Life:
12 hours in typical calibration use

Display:
240 x 64 dot matrix graphics LCD; 8 lines x 40 characters (alphanumeric); with back lighting feature

Input/Output Connections:
Miniature banana jacks; DB9 serial port (for data and handshake)

GENERAL

Housing:
Black ABS (UL 94 V-O)

Dimensions (HWD):
92" x 102" x 142" (230 mm x 260 mm x 360 mm)

Weight:

21 lb. (9.5 kg)

Storage Temperature:

-4°F to 140°F (-20°C to 60°C)

Operating Temperature:

32°F to 104°F (0°C to 40°C)

Safety Considerations

Sudden release of compressed or stored gas can cause personal injury. Always vent the system before making pressure connections or disconnections. The amount of energy stored in a closed system is a function of the pressure and attached volume; the greater the volume, the greater the stored energy. As a result, it is highly recommended that the attached volume be as small as possible to minimize potential injury and/or damage.

Potential Damage to Equipment

To prevent potential damage to the 1292 or 1294 during use, observe the following precautions:

Ensure that the charger input voltage rating matches the specific power system.

Do not apply excessive voltage or current to the calibrator input terminals.

Do not connect the calibrator to high pressure sources greater than 100 psi (690 kPa), except when using the high pressure sensor rated for such pressures.

Do not connect the calibrator to pressure sources other than clean, dry air or clean inert gas.

Contaminated Customer Equipment

Any Model 1292 or 1294 exposed to hazardous process fluids or biological agents cannot be accepted for return without a written certificate of decontamination furnished by the customer.

UNPACKING

Packing materials should be retained in case the calibrator needs to be returned to the factory. Verify that the shipping carton contains:

1 Model 1292 or 1294 Automated Pressure Calibrator
1 Charger of proper input voltage rating
3 Male quick-connect adapter fittings
2 Sets of test leads
1 Spare input fuse assembly
1 Model 1292/1294 User's Guide, Transmation publication #100840-900
1 SHOP LITE™ Calibration Database Software (3 disk set), part number; 100865-003

CHAPTER 2

GETTING STARTED

NOTE!

Do not discard this user's manual. The information provided is essential to proper and safe equipment operation and maintenance. To prevent possible personal injury or equipment damage through misuse, the procedures described here should be performed only by qualified service personnel.

This manual describes Transmation Models 1292 and 1294 Automated Pressure Calibrators. They are field-portable, battery-powered precision test instruments that integrate the ability to measure and generate DC process signals as well as pressure. In addition to having all the functions necessary to test and maintain pressure transmitters, Models 1292 and 1294 automate the generation and control of pressure for improved resolution, accuracy, and convenience.

Models 1292 and 1294 each consist of a case and a detachable keypad. The keypad contains the display and function switches. The I/O terminals and pressure ports are located on the front panel of the case.

Both calibrators can simulate and/or measure current, voltage, and millivolt signals, or generate and measure pressure values, that fall within the ranges indicated in Chapter 1, Specifications. Input and output signal values are displayed on a 40 character, 8 line liquid crystal display located on the calibrator's keypad.

Each electrical signal type has a separate set of terminals for input and output connections, permitting simultaneous input and output operation.

Models 1292 and 1294 are parts of Transmation's SHOP family of calibrators, calibration database management software and accessories. For information about the SHOP family, contact your local Transmation sales representative or the factory directly.

GETTING STARTED QUICKLY

Models 1292 and 1294 are sophisticated instruments, capable of many calibration functions. However, they are easy to use. This chapter describes steps you can take to get into operation quickly.

Measuring Signals (Setup Input)

To simply measure an input signal, perform these steps:

1. Turn the instrument power on.

2. Set the input parameters by doing this: Press the Setup Input key. A data screen will be displayed where you can enter input information relevant to your task (input data type, full scale value, zero scale value, input damping [if needed], display in percent or engineering units). Each parameter is set by either selecting from the options listed (by scrolling through them with the Next key), or by entering numeric information via the keypad. Once a parameter is set, move to the next one by pressing the Step Down key. When the input parameters are all set, press Esc.

Here is an example of how to set the unit to measure a 4-20mA signal:

TABLE 2-1 SETTING THE INPUT TYPE AND RANGE

SETUP INPUT

Model 1294 input parameter setup:

Input data type.	Milliamps	Ports 1 & 2, Port 3, Manual entry, off, volts, millivolts, milliamps
Full scale 100%	20.000 mA	Numeric Entry
Zero scale 0%	4.000 mA	Numeric Entry
Input damping	normal	normal, slow, off, v. fast, fast
Display data in %	normal	normal, %, % squared
Error display mode	linear	(off, linear, logarithmic) Sets bar graph display on main screen.

NOTE: Ports 1 and 2 denotes internal sensors. Port 3 denotes external sensors.
For flow transmitters, set display data to % squared.

Generating Signals (Setup Output)

To simply generate an output signal, perform these steps:

1. Turn the instrument power on.

2. Set the output parameters by doing this: Press the Setup Output key. A data screen will be displayed where you can enter output information relevant to your task (output data type, full scale value, zero scale value, output step size [if needed], display in percent or engineering units, and output damping [if needed]. Each parameter is set by either selecting from the options listed (by scrolling through them with the Next key), or by entering numeric information via the keypad.

Once a parameter is set, move to the next one by pressing the Step Down key. When the output parameters are all set, press Esc.

WARNING!

Model 1292/1294 is capable of generating output signals that can damage attached instruments intended for operation with smaller signals. To avoid such damage, set the calibrator output range to match the test instrument input range before connecting it to the calibrator.

NOTE!

When the pressure output mode is enabled, the attached volume dialog screen will appear. To measure the attached volume, press the Enter key. To bypass measuring the attached volume, sequentially press the Next and Enter keys.

Here is an example of how to set the 1292 to generate a 0-100" H_2O signal.

TABLE 2-2 SETTING THE OUTPUT TYPE AND RANGE

SETUP OUTPUT	
Model 1294 output parameter setup:	
Output data type ..... Ports 1 & 2	Ports 1 & 2, Port 3, Manual entry, off, volts, millivolts, milliamps
Full scale 100% ..... 100.000 in H_2O	Numeric Entry
Zero scale 0% ..... 0.000 in H_2O	Numeric Entry
Output step size % ..... 20.000 %	1-100%
Display data in % ..... normal	normal, %
Output damping ..... normal	normal, slow, off, v. fast, fast

NOTE: Ports 1 and 2 denotes internal sensors. Port 3 denotes external sensors.

USING THE 1292/1294 AS A CALIBRATOR

To perform a simple calibration sequence, without making use of the automated testing and data logging capabilities of the calibrator, use the Setup Input and Setup Output keys to define the signals to be generated and measured. Then, either use the keypad to enter specific numerical or percent of scale values, or make use of the Stepping, Full Scale, and Zero Scale keys to speed up the calibration process.

Automated Testing

Using the automated test capability of the 1292 and 1294, a series of user defined tests can be created, saved for recall at any time, and run automatically. These tests can be configured by using the Setup Input and Setup Output keys to define the signals to be generated and measured. Then, use the Setup Test key to define the parameters of the test itself (test name, tag number, serial number, operator name, number of points, direction of testing, etc.). Once the input, output, and test functions have been defined, press the Shift and Save keys, and the test will be stored in memory for later recall and use.

Setting Up a Test

The test parameter setup criteria are summarized in Table 2-3. (Note that the first 10 test setups stored in memory are default setups and cannot be deleted)

This is an example test procedure for a Rosemount Transmitter (10 point, ascending, 0.1% accuracy).

TABLE 2-3 SETTING UP A TEST

SETUP TEST		
Test parameter setup:		
Test name	P/I 0-100"	alphanumeric (press enter to edit)
Area Tag #	UNIT #4	alphanumeric (press enter to edit)
Process Tag #	PT-101A	alphanumeric (press enter to edit)
Manufacturer..	ROSEMOUNT	alphanumeric (press enter to edit)
Model number..	3051	alphanumeric (press enter to edit)
Serial number.	25732	alphanumeric (press enter to edit)
Operator	SMITH	alphanumeric (press enter to edit)
Data steps per scan	10.	1-10
Direction of testing.	Ascending	ascending, descending, both
Recording delay (sec) ...	5.	1-99 (see below for slow response reference)
Fail limit, % F.S.	0.100 %	pass/fail limit of test - typically DUT accuracy spec
Fail limit, % rdng.	0.000 %	see above
Alert limit, % F.S...	0.080 %	alert limit provides tighter testing tolerance than fail limit
Alert limit, % rdng.	0.00	see above
Ambient Temperature....23.0 °C		ambient test conditions - not required
Barometric Pressure.	412.000 in H2O	ambient test conditions - not required
Relative Humidity..	82.000 %	ambient test conditions - not required

Instruments with slow response speeds require longer delays to respond to an input. The longer the delay, the more time the test instrument has to stabilize. Use the recording delay field to accommodate these devices.

Saving

When the Shift and Save (4) keys are pressed a list of memory storage locations is displayed. The present test setup may be stored for later recall in any available memory location. Note: New tests may be saved over existing tests in memory.

Recalling

When the Shift and Recall (1) keys are pressed, the list of tests stored in memory is displayed for recalling a stored test setup. Use the ▲ or ▼ key to reach the desired test and press enter.

Running a Test

To run a test, do the following:

1. Perform the test setup procedure described in "Setting Up a Test" on the previous page, or recall an existing test setup.

2. Press the Run Test key to run a test. Select the desired type of test to be performed As Found, As Left, or Intermediate. The data for As Found and As Left tests will automatically be stored.

TABLE 2-4 RUNNING A TEST

RUN TEST

Select type of test to run:

1. Initial test...As-Found
2. Intermediate test...data not saved
3. Final test...As Left

3. To run the test, press the Enter key. Press the Esc key to stop and quit the test. Data sets are saved according to tag number, then date/time. Intermediate tests are not saved.

4. Upon completion of the test, the data will be stored automatically and the display will show a graphical representation of the test results. Press next and the tabular test results are displayed.

5. Press ESC to return to the main screen.

TEST RESULTS (DATA)

Test results may be viewed, deleted, exported or printed by using the menu options provided on the data key (shift 7). See Shifted Functions.

TABLE 2-5 RETRIEVING TEST DATA

DATA

Select the data operation to perform:

1. List the last test data
2. Graph the last test data
3. List a saved dataset and setup
4. Graph a saved dataset
5. Delete a saved dataset
6. Output a dataset by the RS232 port
7. Print a saved dataset

The Model 1292/1294 maintains up to 46 data sets in memory. Before the 47th test can be run, a message will be displayed indicating there is no more room, and a saved data set must be deleted before more test results can be stored.

To save As Found and As Left data in the same data set, the test criteria ***must not*** be changed between test runs. Otherwise, the test will be saved as a different data set.

FUNCTIONAL DESCRIPTION

USAGE ORIENTATIONS

Models 1292 and 1294 can be used in any orientation, as illustrated in the photographs below, but do not charge the battery if the calibrator is upside down.



The keypad is detachable and can be positioned on the calibrator in an upright or inverted position, or positioned in a convenient external location, limited only by the connecting cable length.

OPERATING CONTROLS

All electrical connections (input, output, serial port and charger), pressure ports, and the Power Switch are located on the front panel. The keypad and display are a removable unit.

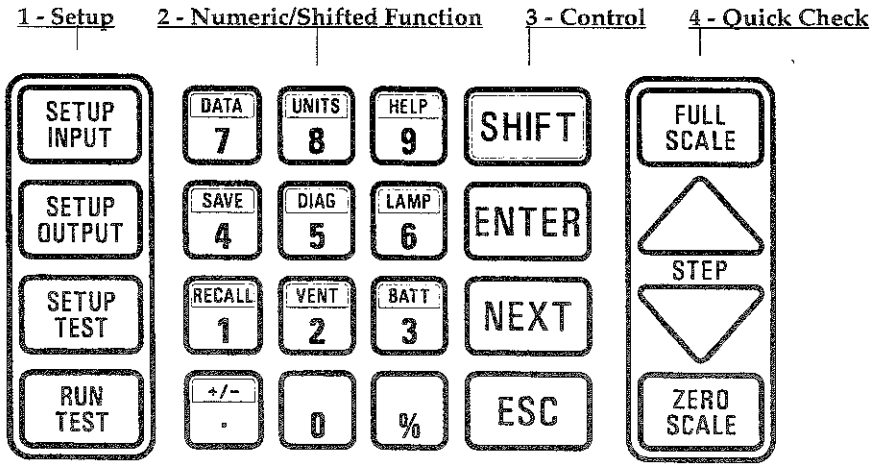
POWER SWITCH

To turn the power on, press and release the spring-return toggle switch. To turn the power off, press the switch again.

To extend battery life, Models 1292 and 1294 automatically turn off after 30 minutes of inactivity. This feature can be disabled through the use of diagnostic #13, as described in Chapter 3, Miscellaneous Setups, page 20.

Keypad Controls

The 1292/1294 Keys are arranged into four groups:



1 - Setup Keys

Setup Keys allow easy definition of input, output and testing functions.



When pressed, the Setup Input key will display a menu which allows definition of the input to the calibrator. See Chapter 2, Measuring Signals, page 8.



When pressed, the Setup Output key will display the menu which allows definition of the output of calibrator. See Chapter 2, Generating Signals, page 8.



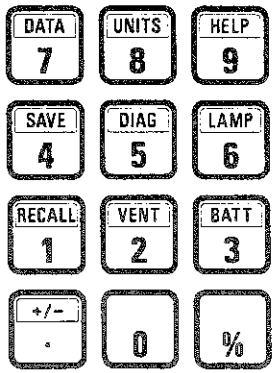
When pressed, the Setup Test key allows the parameters of an automated test (i.e., tag numbers, serial numbers, number of data points, etc.) to be programmed. See Chapter 2, Setting Up a Test, page 10.



When pressed, the Run Test key will initiate a test sequence for data collection at programmed intervals. See Chapter 2, Running a Test, page 11.

2 - Numeric/Shifted Function Keys

Numeric/Shifted Function Keys permit numeric entries, and another controls keypad activities. The numeric keys have a second "shift" activated set of functions. (A detailed description of each keys function is provided in the following paragraphs.)



Numeric Keys

These keys permit direct numerical entry of a desired output. Also, when pressed, the % key allows the entry of a number as a percent of full scale. For example, sequentially pressing the 7, 5, %, and Enter keys will set the output to 75% of full scale.

Shifted Function Keys

NOTE!

If the number of a menu selection is known, a shortcut is available that minimizes the number of keystrokes. To use the shortcut, press the menu selection number, press the **Shift** *key, then press the appropriate shifted function key. The selected menu function will appear on the display.*



When pressed, the Shift key causes the next key pressed to operate the function shown in yellow above the main label of the key.



When the Shift and Data (7) keys are pressed, a menu is displayed for listing, graphing, printing, exporting, and deleting data from stored calibration tests. See table 2-5, Chapter 2.



When the Shift and Save (4) keys are pressed a list of memory storage locations is displayed. The present test setup is stored for later recall in any available memory location. **Note:** *New tests may be saved over existing tests in memory.*



When the Shift and Recall (1) keys are pressed, a menu is displayed for recalling a stored test setup. ▲ or ▼ to the desired test and press enter.



When the Shift and decimal (+/-) point keys are pressed, the sign of the number being entered is toggled (+ to - or - to +).



When the Shift and Units (8) keys are pressed, a menu is displayed for the selection of engineering units for pressure values.



When the Shift and Diag (5) keys are pressed, a menu of programs for specific setup and self-test diagnostics is displayed. Refer to Chapter 3, Diagnostics, page 18 for more information.



When the Shift and Vent (2) keys are pressed, the Vent function is enabled. During normal operation, this causes the pressure sensors to vent to atmosphere. (**Note:** *When using a 1294 Calibrator with a high pressure sensor, high pressure sensor zeroing is optional, using manual vent.*) Pressing any other key produces a screen prompt to zero the electrical functions. (The Calibrator auto-zeros the electrical functions upon startup.)



When the Shift and Help (9) keys are pressed, the Help function is enabled. When first enabled, functional descriptions of all the keys are displayed. Pressing the Esc key provides an alphabetical index of all help topics. Scroll to the desired Help topic and press enter. A detailed description of the topic will be displayed. Pressing ESC twice returns to the main menu.



When the Shift and Lamp (6) keys are pressed, a menu is displayed for turning the display back-light on or off, or locking the back-light on, over riding the automatic shutoff feature.

NOTE!

The back-light will improve the visibility of the display in low ambient light conditions. However, operating the back light continuously will reduce battery life significantly. The back-light turns off after about 10 minutes of inactivity.



When the Shift and Bat (3) keys are pressed, an indication of present battery drain, capacity and charge condition is displayed.

3 - Control Keys

Control Keys allow menu options to be executed.



When pressed, the Enter key accepts the current entry or prompt response.



When pressed, the Next key selects the next available option, when several are listed.



When pressed, the Esc key quits a menu screen (storing the displayed values) or deletes an alphanumeric entry.

4 - Quick Action Keys

Quick Check Keys allow convenient stepping, zero and full scale values to be entered with one key stroke.



When pressed, the Full Scale key sets the output of the calibrator to the value entered in the Setup Output menu for "Full Scale 100%". In addition, when multiple choices or data is displayed, pressing the Full Scale key increments the display by one page (acts as PgUp for the display).



When pressed, the Step Up/Step Down keys increase/decrease the output of the calibrator by the increment programmed in the Setup Output menu for "Output Step Size %". Also, these keys perform a scroll-up or scroll-down function for the display.



When pressed, the Zero Scale key sets the calibrator output to the value entered in the Setup Output menu for "Zero Scale 0%". In addition, when multiple choices or data is displayed, pressing the Zero Scale key moves the display down one page (acts as PgDn for the display).

Diagnostics

When the Shift and Diag (5) keys are pressed, a menu of programs that perform specific setup and self-test diagnostics is displayed. As a shortcut for experienced users, first enter the diagnostic number, followed by Shift and Diag (5).

Last Calibration Date

To determine the 1292/1294's last calibration date, press the Step Up/Down keys to select Diagnostic #1, Display Last Calibration Date, then press the Enter key. The most recent calibration date will be displayed.

Software Revision Level

To determine the current software revision levels, press the Step Up/Down keys to select Diagnostic #2, Display Software Revision, then press the Enter key. The revision levels will be displayed.

Test Display

To test the display, press the Step Up/Down keys to select Diagnostic #3, Test Display, then press the Enter key to run an automatic screen test.

Contrast Adjustment

To adjust the display contrast, press the Step Up/Down keys to select Diagnostic #4, Adjust Display Contrast, then press the Enter key. Press the Step Up and Step Down keys to adjust the contrast. Press the Enter key to save the setting, or press the Esc key to exit without saving the change.

Test Keypad

To test the keypad, press the Step Up/Down keys to select Diagnostic #5, Test Keyboard, then press the Enter key. To check a key's function, press it and verify the value on the display. Turn off the calibrator to exit the Test Keypad utility.

Display Pressure Sensor Temperature

To read the pressure sensor temperature, press the Step Up/Down keys to select Diagnostic #6, Display Pressure Sensor Temperature, then press the Enter key. The temperature at the pressure sensor manifold will be displayed.

Display Present Battery Status

To read the status of the battery, press the Step Up/Down keys to select Diagnostic #7, Display Present Battery Status, then press the Enter key. The battery condition will be displayed. When in other operating modes, battery status can be read by pressing the Shift and Bat (3) keys.

Increase/Decrease Data Resolution

To adjust the resolution, press the Step Up/Down keys to select Diagnostic #8, Increase/Decrease Data Resolution, then press the Enter key. Press the Step Up or Step Down keys to set the resolution. Press the Enter key to save the value, or press the Esc key to exit without saving the change.

Normal resolution is about one part in 10,000. Increased resolution is 1 part in 20,000; decreased resolution is 1 part in 5000. Adjusting the resolution of the calibrator can be helpful in specific applications. For instance, the resolution can be decreased to mask instability caused by noisy signals, or increased to display small data changes. Changing the resolution does not increase or decrease the accuracy of the reading.

Serial Port Setup

To set up the serial port, press the Step Up/Down keys to select Diagnostic #9, Serial Port Setup, then press the Enter key. Press the Step Up or Step Down keys to select the parameter to be set. Press the Next key to toggle through the choices, and press the Enter key to save the changes. Press the Esc key to exit without saving the changes.

Refer to Chapter 3, Information Maintenance, page 22 for information concerning serial port setup and outputting information to a printer or computer.

Set Ambient Barometric Pressure

To set the ambient barometric pressure, press the Step Up/Down keys to select Diagnostic #10, Set Ambient Barometric Pressure, enter the ambient atmospheric pressure as measured by a barometer, then press the Enter key. The pressure value now stored will be displayed. Enter a new pressure value according to the screen prompts. Press the Enter key to save the new value, or press the Esc key to exit without saving the change.

Measure Attached Volume

To measure and display the attached volume, press the Step Up/Down keys to select Diagnostic #11, Measure Attached Volume, then press the Enter key. The attached volume will be displayed. The attached volume is used in maintaining a steady pressure output. Remeasure it whenever the output is connected to a different system.

The speed of the 1292/1294 as a pressure source is improved by using data on the volume attached (external) to the unit. The attached volume data is used by applying the universal gas law (PV=nRT) to reduce the time needed for the calibrator to produce a new output pressure. The calibrator's internal sensors continuously monitor the air volume internal to the instrument. The sum of the internal and external volumes is the total

volume. Its pressure is controlled by the calibrator. For a closed system, the product of the total volume, at any given moment, and its pressure, is a constant - if the temperature is constant and there are no system leaks.

This relationship (known as the universal gas law) is used to measure the attached volume. The internal volume is changed from a known first value to known second value. These known volumes, along with changes in pressure, are used by the calibrator to compute the unknown external volume. If the output pressure does not remain constant after the calibrator has set it, the calibrator indicates that the system has a leak. If there is no leak, the calculated external volume, along with the known internal volume, are used to rapidly establish the required output pressure. Until a new pressure is called for, pressure sensing and feedback are used to maintain the output pressure. The output pressure is therefore independent of trapped air temperature, minor leaks, and the small volume changes encountered during calibration.

Attached volume affects battery life, speed of operation, and leak detection of Models 1292 and 1294. To conserve energy (optimizing battery life) and increase measurement speed, minimize the attached volume by using short connections and small diameter tubing (1/8"). In addition, a small attached volume can help identify unacceptably large leaks.

Set Internal Clock Time

To set the internal clock, press the Step Up/Down keys to select Diagnostic #12, Set Internal Clock Time, then press the Enter key. The current date and time will be displayed. Enter the date and time according to the prompts. Press the Enter key to save the new values, or press the Esc key to exit without saving the changes.

Miscellaneous Setups

To access this diagnostic, press the Step Up/Down keys to select Diagnostic #13, Miscellaneous Setups, then press the Enter key. Press the Step Up or Step Down keys to select the feature to be changed. Press the Next key to toggle through the choices. Press the Enter key to save the changes, or press the Esc key to exit without saving them.

The first selection sets the date display to the DDMMYY format instead of the default MMDDYY format.

The second selection disables the auto-shutoff feature, which turns the calibrator off after 30 minutes of keyboard inactivity. This feature is useful if the calibrator is used with the charger connected to AC power.

The third selection turns the time display on and off in the normal data display.

The fourth selection sets the display back-light on whenever the calibrator is on. It also locks on the back- light to prevent the auto-turnoff after 10 minutes of inactivity. Use caution. Locking the back- light on will significantly reduce battery life between recharges.

Print All Stored Data Sets

To print all stored data sets, press the Step Up/Down keys to select Diagnostic #14, Print All Stored Data Sets, then press the Enter key.

Upload All Stored Data Sets

To upload all stored data sets, press the Step Up/Down keys to select Diagnostic #15, Upload All Stored Data Sets, then press the Enter key.

Models 1292 and 1294 output comma-delimited ASCII files containing all test information, including setup and data. This file can be transferred to a PC and captured using Transmation's SHOP Access Calibration Database Software, or other commercial communications software, allowing the manipulation of the data as desired.

Import Test Setups

To import test setups from a PC, press the Step Up/Down keys to select Diagnostic #16. Refer to Appendix 1 for file definitions.

Export Test Setups

To export test setups to a PC, press the Step Up/Down keys to select Diagnostic #17. Refer to Appendix 1 for file definitions.

Erase All Test Data sets

To erase all test data sets, press the Step Up/Down keys to select Diagnostic #18, Erase All Test Data Sets, then press the Enter key. Press the Next key to toggle the Yes/No response. Press the Enter key to permanently erase the data sets or press the Esc key to exit without erasing the data sets.

WARNING!

If the data sets are erased, they are permanently lost.

Erase All Test Setups

To erase all test setups, press the Step Up/Down keys to select Diagnostic #19, Erase All Test Setups, then press the Enter key. Press the Next key to toggle the Yes/No response. Press the Enter key to permanently erase all but the default setups, or press the Esc key to exit without erasing the setups.

Security/Lockout Functions

To define and implement security functions, press the Step Up/Down keys to select Diagnostic #20. The default access code required to enter the security section is: 0000. Once in, there are four menu items:

1. This item allows you to prevent the operator from making changes to test setups.

2. This item prevents the operator from making changes to the current setup.

3. This item will lockout calibration diagnostics. Refer to Appendix 2.

4. This area allows you to enter a new access code.

WARNING!

If the test setups are erased, they are permanently lost.

Information Maintenance

Transmitting Information to a Computer or Printer

Models 1292 and 1294 are capable of uploading or transmitting test setups and results to a computer or printer via serial communications.

The computer, printer and calibrator have selectable communications parameters. These parameters must be set (Shift, Diag) before any communication can take place. Within the 300 to 9600 baud speed capability of the 1292 and 1294, select the highest speed acceptable to the computer or printer. Set both devices to that speed. Set the rest of the communications parameters as described below so that the calibrator matches the requirements of the computer or printer. The data stored in the calibrator is arranged in fields which may be output in one of the following types:

Plain ASCII text suitable for printers and certain types of databases (such as Microsoft Access™) Carriage return (CR) delimited for special programs Comma delimited for

spreadsheets and BASIC derived programs.

Choose the type which suits your application. Note that when printing is to a printer, rather than a file, the field type selection does not matter.

Typical setup for a serial printer (consult your manual for appropriate printer settings):

1. Press the Shift and Diag (5) keys.

2. Press the Step Down key to select item 9 (Serial port setup), then press the Enter key.

The next items are displayed on the screen. Selection is made by pressing the Step Up/Down keys to place the cursor over each item, pressing the Next key to scroll through the available choices, then pressing the Enter key.

3. Data rate: 9600 baud (Choices: 9600, 4800, 2400, 1200, 600, 300).

4. Enable character echo: off (Choices: off, on).

5. Enable hardware handshake: on (Choices: off, on).

6. Enable command answer back: off (Choices: off, on).

7. Upload data format: Choices: Database, Comma delimited, CR delimited and Fixed Field (the choice does not matter when communicating with a printer). The Fixed Field selection does not put any characters between fields. The comma delimited selection puts a comma character between fields (useful when uploading to a spreadsheet). The CR delimited selection separates fields by carriage returns.

8. Press the Esc key and answer the "Setup store?" prompt with Yes by pressing the Enter key.

Typical setup for uploading to a computer (data is to be inserted into computer database program):

1. Press the Shift and Diag (5) keys.

2. Press the Step Down key to select item 9 (Serial port setup), then press the Enter key.

The next items are displayed on the calibrator screen. Selection is made by pressing the Step Up/Down keys to place the cursor over each item, pressing the Next key to scroll through the available choices, then pressing the Enter key.

3. Data rate: 9600 baud.

4. Enable character echo: off.

5. Enable hardware handshake: off.

6. Enable command answer back: off.

7. Upload data format: Fixed Field or Comma Delimited are most common.

8. Press the Esc key and answer the "Setup store?" prompt with Yes by pressing the Enter key.

Printing Test Information

Establish the necessary connection between the printer and the Model 1292 or 1294.

Once the communications parameters have been set, data sets stored in the calibrator may be printed. All information and data associated with a data set is printed in a fixed format. To start printing, perform these steps:

1. Turn the printer on and verify that sufficient paper is loaded. A full data set with the maximum number of data points and As Found and As Left data will require two pages.

2. Verify that the printer is on line.

3. Press the Shift and Data (7) keys.

4. Press the Step Down key to select item 7 (Print a saved data set), then press the Enter key. Available data records will be listed on the display.

5. Press the Step Down key to select a data record. Identify the record by displayed Tag, Time, and/or Date.

6. Press the Enter key. The printer will print Test Identification, Data Type and Scaling, Error Specifications, As Found data and, if available, As Left data.

The printer will advance to the top of the next page at the end of the transmission and the calibrator will be ready for other tasks.

Uploading Test Information to a Computer

1. Set the communications parameters per Section 5.1.4.1.

2. Establish the connection between the calibrator serial port and the serial port of the computer.

3. Execute the computer communication program's instructions for opening a file to receive serial data from the Model 1292 or 1294.

4. Press the Shift and Data (7) keys.

5. Press the Step Down key to select item 6 (Output a data set by the RS-232 port), then press the Enter key. Available data records will be listed on the display.

6. Press the Step Down key to select a data record. Identify the record by displayed Tag, Time, and/or Date.
7. Press the Enter key. Data transfer will start.

8. Close the file per the computer program instructions. The connection between the calibrator and the computer may now be removed.

Uploaded data is transferred in the following order: Test identification, tag number, serial number of item tested, setup and error parameters, As found test marker, time, date, alternating input and output data values, As left data marker, test time, date and alternating values of input and output data. A null is transmitted for unavailable data, giving the upload file a fixed structure. See Appendix 1.

CABLING INFORMATION

Model 1292 and 1294 RS-232 connector: Female 9 pin D subminiature DB-9

1 IN DCD
2 IN RXD (receive data)
3 OUT TXD (transmit data)
4 OUT DTR
5 Ground
6 IN DSR
7 OUT RTS
8 IN CTS
9 Not used

The proper connection to a 9 pin serial port on a PC is accomplished with a straight through, pin one-to-pin one cable. A "null modem" cable is not required.

To adapt the 9 pin connector to a 25 pin connector, wire as follows:

DB-9		DB-25
1	DCD	8
2	RXD	3
3	TXD	2
4	DTR	20
5	GND	7
6	DSR	6
7	RTS	4
8	CTS	5
9	Not used	22

CHAPTER 4

CONNECTIONS

TEST AND CALIBRATION OVERVIEW

PRELIMINARY INFORMATION

Temperature Considerations

The pressure change of a contained volume of gas is directly proportional to its temperature. Models 1292 and 1294 automatically compensate for temperature related pressure changes.

Leak Prevention and Detection

The sensitivity of Transmation pressure calibrators will detect system leaks. Therefore, it is imperative to avoid leaks for stable pressure indication. If a leak is suspected, set the calibrator output to full scale. When maximum pressure is attained, go to Pressure Input mode. Any pressure changes can now be monitored. If the system is closed, these pressure changes will indicate a leak.

To determine if a leak is internal to Model 1292/1294, disconnect all pressure tubing and enter a pressure value greater than zero. If the Model 1292/1294 is able to maintain the assigned pressure, then the leak is external. If the Model 1292/1294 is not able to maintain the assigned pressure, then contact the factory.

The use of either Teflon® tape or commercial pipe dope at all tapered fittings and connections is recommended. When using Teflon® tape is used, see that the proper amount is applied. Excessive tape may fray and cause plugging of orifices, nozzles, etc. Overuse of pipe dope may have similar results.

External equipment should also be checked carefully for leaks. Process connections, flange bolts, and vents must be tightly closed. Defective gaskets, leaking valves, and damaged diaphragms are all sources of possible leaks.

OPERATING SAFETY CONSIDERATIONS

WARNING!

Pressure must be relieved prior to making any connections or disconnections. Failure to relieve pressure could result in serious personal injury or equipment damage.

Over pressuring is an inherent danger in all pressure applications. Provision must be made for bleed/relief valves. Insure that any media released is captured in a safe manner.

Gas, as a compressible media, is capable of storing large amounts of energy. Consequently, minimum volume and minimum flow are desirable for increased safety as well as improved accuracy. It is good practice to secure all pressure lines and, when dealing with very high pressure, institute the use of a cage to contain the tested equipment in case of equipment failure. Take precautions that potentially hazardous gases are not released into the atmosphere or come into contact with operations personnel or equipment.

Since the 1292 is not designed for use with liquids, use care to keep liquids out of it. Liquids may be used with the high pressure Model 1294. The liquids must be compatible with type 316 stainless steel and fluorocarbon elastomers.

Exercise standard physical protection practices: eye protection, gloves, protective clothing, etc.

Performing a Test Sequence

Before running a calibration test, the input type and range, the output type and range, and the test parameters must be set. Note that they can not all be set to zero.

NOTE!

If the indicated pressure units are different from the units desired, sequentially press the **Esc**, **Shift**, *and* **Units** *keys. Using the* **Step Down/Step Up** *keys, position the cursor next to the desired units and press the* **Enter** *key. Attached volume measurement is recommended, as it improves efficiency of operation.*

Input/Output Terminals

All input and output terminals are miniature banana plugs. Input plugs are located on the left side of the front panel, while output plugs are on the right. The input side is isolated from the output side to permit simultaneous connection of equipment to input and output terminals. The front panel labels indicate shared terminals, where applicable.

Pressure Connection Ports

Pressure connections for signals of 100 psig or less are made to Models 1292 and 1294 via two female 1/8" flow CPC fittings located on the front of the case. Higher pressure connection on the 1294 is female 1/4" NPT.

These fittings are permanently installed in the front of the calibrator case. Attempted

removal of these fittings will result in permanent instrument damage. Adapter fittings are included with the calibrator that provide standard NPT threads (1/4-18, 1/8-27), and straight 10-32 threads, to accommodate common process connections.

WARNING!

Overpressure may result in damage to the calibrator.

Battery Charger Terminal

The battery charger provides a convenient means of charging the calibrator's battery. To charge the battery, simply plug the charger into an AC outlet and connect its DC output cable to the jack on the front of the calibrator. The red indicator light on the charger will glow, indicating charging is in process.

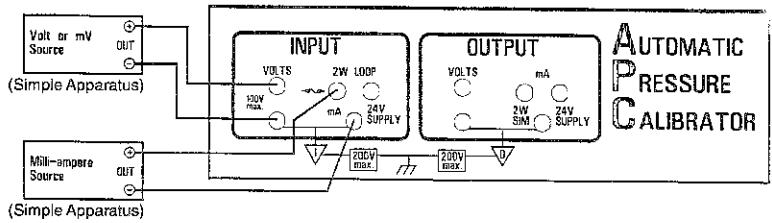
Models 1292 and 1294 can be used while the charging process is underway. However, the 1292/1294 may not charge while in use.

WARNING!

Do not charge the battery in a hazardous location.

CONNECTION DIAGRAMS

TO MEASURE DC VOLTS, MILLIVOLTS, OR CURRENT



1. When measuring volts or millivolts, do the following:

   a. Connect the negative output lead of the instrument under test to the black (-) VOLTS INPUT terminal on the Model 1292/1294.
   b. Connect the positive output lead to the red (+) VOLTS INPUT terminal.

2. When measuring current, do the following:

   a. Connect the negative output lead of the instrument under test to the black (-) mA INPUT terminal on the Model 1292/1294.
   b. Connect the positive output lead to the white (+) mA INPUT terminal.

3. Press the Power switch.

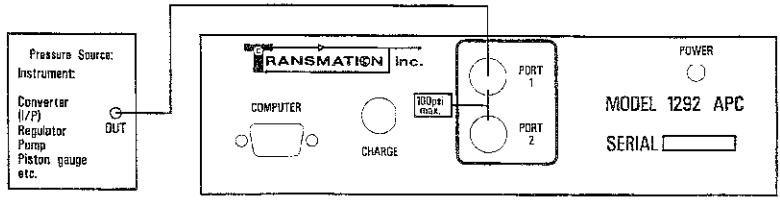
NOTE!

Even when measuring electrical signals, when the pressure output mode is enabled, the attached volume dialog screen will appear. Since measuring the attached volume is not required, press the **Next** *key, then the* **Enter** *key.*

4. Set the appropriate input type and range on the calibrator (See Chapter 2, Measuring a Signal, page 8).

5. Measured input values will be displayed.

TO MEASURE GAUGE PRESSURE



WARNING!

Vent pressure before disconnecting any pressure connections to prevent possible personal injury or equipment damage.

1. Press the Power switch.

NOTE!

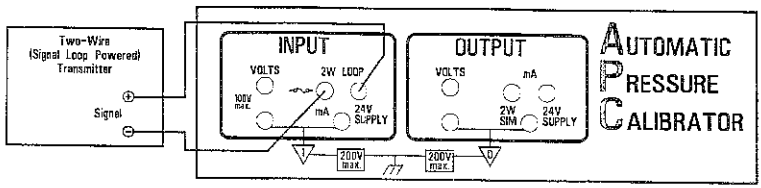
Whenever the pressure output mode is active, the attached volume dialog screen will appear. Press the Next and Enter keys to disable this mode.

2. Press the Shift key, then the Units key.
3. Press the Step Down key until the cursor is positioned next to the proper pressure units, then press the Enter key.
4. Set the appropriate input type and range on the calibrator (refer to Table 2-1).
5. To zero the 1292/1294 (and any connected equipment) to ambient pressure, press the Shift key, then the Vent key, and then the Enter key. When the electrical zero prompt appears, press Enter.
6. Connect the air line from the pressure source being measured to the input pressure port on the front of the calibrator.
7. The input pressure value will be displayed.

WARNING!

Ensure media compatibility when inputting pressures. See page 2, Media Compatibility.

TO POWER A TWO-WIRE TRANSMITTER & MEASURE ITS OUTPUT SIGNAL



WARNING!

This connection is allowed only in nonhazardous locations.

1. Connect the negative lead of the two-wire transmitter to the white 2W LOOP INPUT terminal on the calibrator.

2. Connect the positive lead to the red 24V SUPPLY INPUT terminal.

3. Press the Power switch.

NOTE!

Even when measuring electrical values, when the pressure output mode is enabled, the attached volume dialog screen will appear. Since measuring the attached volume is not required, press the Next key, then the Enter key to disable this mode.

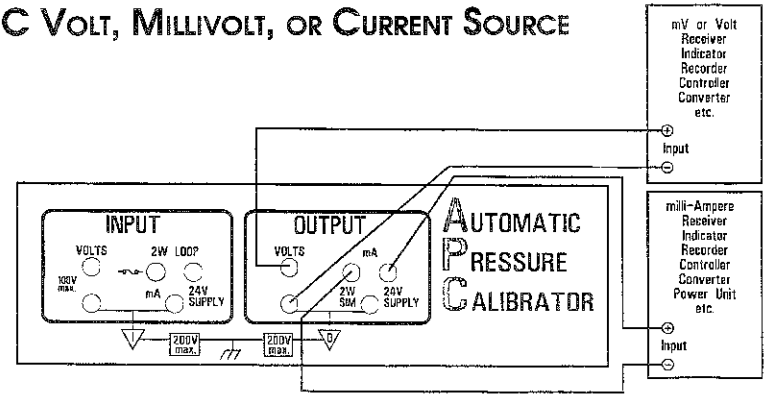
4. On the Model 1292/1294, set the input type to milliamps and the range to 4-20 mA (refer to Table 2-1).

5. The transmitter mA output will be displayed.

NOTE!

The 24V is a nominal value. Exact voltage is a function of the battery charge level.

AS A DC VOLT, MILLIVOLT, OR CURRENT SOURCE



1. Press the Power switch.

NOTE!

Even when measuring electrical values, when the pressure output mode is enabled, the attached volume dialog screen will appear. Since measuring the attached volume is not required, press the Next key, then the Enter key to disable this mode.

2. Set the appropriate output type and range on the calibrator (refer to Table 2-2).

3. When generating volts or millivolts, do the following:

   a. Connect the negative lead of the test instrument to the black VOLTS OUTPUT terminal on the Model 1292/1294.
   b. Connect the positive lead to the red VOLTS OUTPUT terminal.

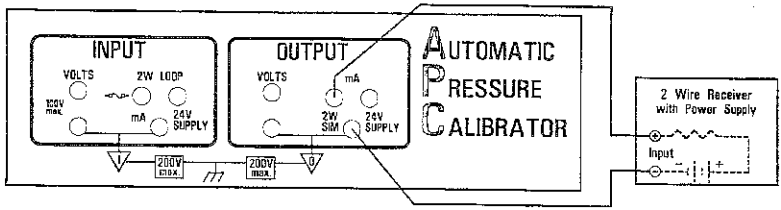
   When generating current, do the following:

   a. Connect the negative lead of the test instrument to the white mA OUTPUT terminal on the Model 1292/1294.
   b. Connect the positive lead to the red mA OUTPUT terminal.

   Set the output by typing the desired value, then pressing the Enter key. Or, use the Step Up, Step Down, Zero Scale, or Full Scale keys.

4. The DC output signal value will be displayed.

AS A TWO-WIRE TRANSMITTER SIMULATOR



WARNING!

This connection is allowed only in nonhazardous locations.

1. Connect the negative lead from the transmitter to the black 2W SIM Common Output terminal on the calibrator.

2. Connect the positive lead to the white 2W SIM Output terminal.

3. Press the Power switch.

NOTE!

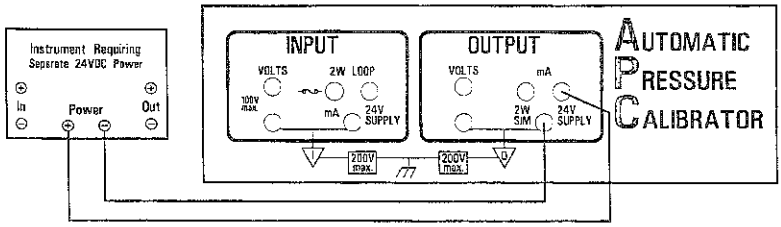
Even when measuring electrical values, when the pressure output mode is enabled, the attached volume dialog screen will appear. Since measuring the attached volume is not required, press the Next key, then the Enter key to disable this mode.

4. Set the milliamp output type and range on the calibrator (refer to Table 2-2).

5. Use the numeric keys or the Step Up, Step Down, Full Scale and Zero Scale keys to set the two-wire transmitter loop current.

6. Loop current will be displayed.

AS A 24 VDC POWER SOURCE



NOTE!

The maximum load current drawn from this supply should not exceed 22 mA.

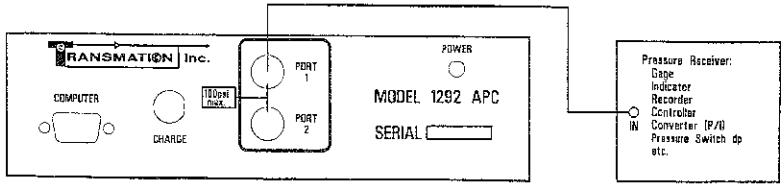
As a utility function, 24 volt power is always available at the Input and Output section 24V SUPPLY terminals on the calibrator. Programming is not necessary.

Note that the 24 volt power supplies on the input and output sections of the Model 1292/1294 are isolated from each other. Either of these may be used to power external instruments, provided the connections do not interfere with the input or output functions of the calibrator.

NOTE!

A device can be powered by either the input or output side of the Model 1292/1294. However, if a four-wire transmitter is used, utilize the configuration illustrated above so that the transmitter output can be connected to the calibrator input.

AS A PRESSURE SOURCE



WARNING!

In the pressure output mode, the Model 1292/1294 is capable of generating pressures up to 100 psi. To avoid damage to the instrument connected to this pressure, set the calibrator output pressure to match the input pressure of the instrument before connecting them together.

1. Press the Power switch.

2. On the Model 1292/1294, set the output to be pressure and set the range to match the instrument under test (refer to Table 2-2).

3. Connect an air line from the device to be pressurized to either pressure port on the front of the calibrator.

NOTE!

When the pressure output mode is enabled, the attached volume dialog screen will appear. Press the Enter key This procedure maximizes the speed to desired pressures, as well as checks for excessive leaks.

NOTE!

When the displayed pressure units are different from those required, press Esc, then Shift, and then Units. Using the Step Down/Step Up keys, position the cursor next to the proper units, then press the Enter key.

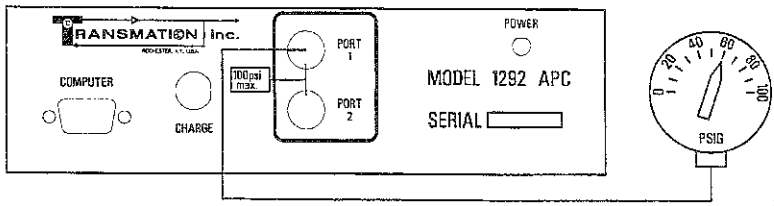
4. To zero the 1292/1294, and equipment connected to it, to ambient pressure, press the Shift key, then the Vent key, and then the Enter key. When the electrical zero prompt appears, press Enter. Note that the high pressure Model 1294 requires external manual venting in some instances.

5. Once the display containing output data appears, other pressures may be generated by numeric entry, followed by pressing the Enter key, or by using the Step Up, Step Down, Zero Scale, or Full Scale keys.

NOTE!

The pressure generated is displayed in bold numerals next to the legend. The smaller numerals below the legend show the target set point for the pressure output signal.

TO CALIBRATE A PRESSURE GAUGE



1. Press the Power switch.

NOTE!

When the pressure output mode is enabled, the attached volume dialog screen will appear. Press the Enter key (see previous page notes).

When the displayed pressure units are different from those required, press Esc, then Shift, and then Units. Using the Step Down/Step Up keys, position the cursor next to the proper units, then press the Enter key.

2. Set the output pressure and range on the Model 1292/1294 (refer to Table 2-2).

3. Set input to be manual entry with a range matching the gauge (refer to Table 2-1).

4. Connect the air line from the instrument being calibrated to either pressure port on the front of the Model 1292/1294.

5. Zero the calibrator to ambient pressure by pressing the Shift key, then the Vent key, and then the Enter key. When the electrical zero prompt appears, press the Next key, then the Enter key.

6. To configure the test, and possibly tag and other data, press the Setup Test key and provide the required information (refer to Table 2-3).

7. Press the Run Test key. Use the Step Up/Step Down keys to position the cursor to the proper test type, then press the Enter key.

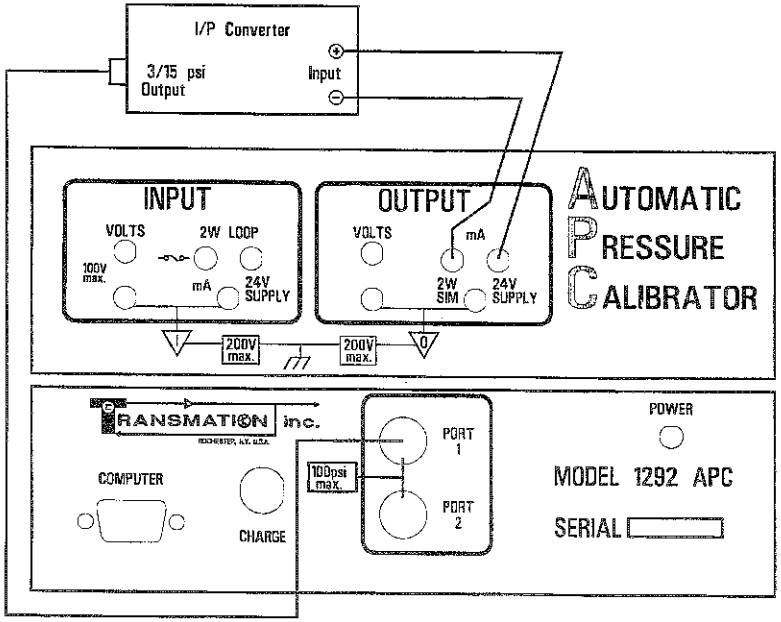
8. To begin the test, press the Enter key again. At the prompt Enter manual data, enter the value displayed on the gauge, and press the Enter key. Repeat this procedure for each defined step.

9. When the manual entry is complete, a graph showing the error will be displayed. Adjust the gauge as required. Repeat the procedure to verify the calibration results. Press the Esc key to complete the test.

WARNING!

Ensure media compatibility when inputting pressures. See page 2, Media Compatibility.

TO CALIBRATE A CURRENT-TO-PRESSURE (I/P) CONVERTER



WARNING!

Decrease supply pressure to zero before disconnecting any pressure connections, to prevent possible personal injury or equipment damage.

1. Connect the negative input lead of the I/P converter to the white mA OUTPUT terminal on the calibrator.

2. Connect the positive input lead to the red mA OUTPUT terminal.

3. Press the Power switch.

NOTE!

When the pressure output mode is enabled, the attached volume dialog screen will appear. Press the Next and Enter keys.

4. Set the output to mA and set the range on the Model 1292/1294 to match the I/P converter (refer to Table 2-2).

5. Press the Shift key, then the Units key.

6. Press the Step Down key until the cursor is positioned next to the proper engineering units, then press the Enter key.

7. Set the input pressure and range on the calibrator to match the I/P converter output (refer to Table 2-1).

8. To zero the calibrator to ambient pressure , press the Shift key, then the Vent key, and then the Enter key. When the on-screen electrical zero prompt appears, press Enter.

9. Connect the air line from the I/P converter being calibrated to the pressure port on the front of the calibrator.

WARNING!

Ensure media compatibility when inputting pressures. See page 2, Media Compatibility.

NOTE!

Verify that the air supply to the I/P converter is connected, operating and set to the proper pressure.

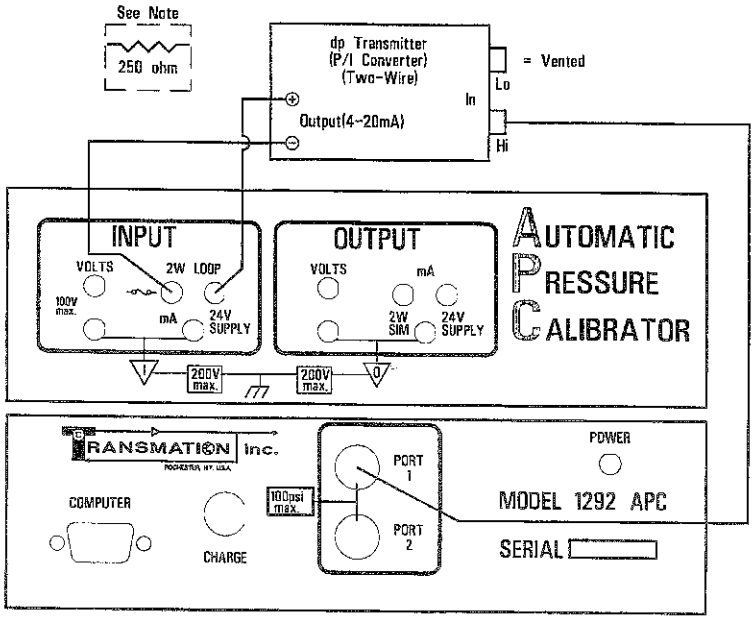
10. Press the Set Up Test key and enter the required information (refer to Table 2-3).

11. Press the Esc key.

12. Press the Run Test key. Use the Step Up/Step Down keys to move the cursor to the proper test type, then press the Enter key.

13. To begin the test, press the Enter key again. Press the Esc key to halt and quit the test.

To Calibrate a Pressure-to-Current (P/I) Converter



Note: Some digital ("smart") transmitters might require that a 250 ohm resistor be installed in series with the transmitter output loop as illustrated above. Consult the transmitter manufacturer's manual for additional information.

WARNING!

This connection is allowed only in nonhazardous locations.

WARNING!

Ensure media compatibility when inputting pressures. See page 2, Media Compatibility.

1. Press the Power switch.

NOTE!

When the pressure output mode is enabled, the attached volume dialog screen will appear. Press the Enter key.

2. Set the proper electrical input type and range on the Model 1292/1294 (refer to Table 2-1).

3. Set the output pressure and range on the calibrator (refer to Table 2-2) to match the P/I transmitter.

4. Connect the air line from the P/I converter to the pressure port on the front of the Model 1292/1294.

NOTE!

Unless the converter is a two-wire type, verify that electric power is applied to the P/I converter.

5. For a two-wire P/I converter, connect the negative loop current lead of the transmitter to the white 2W LOOP INPUT terminal on the Model 1292/1294.

6. Connect the positive loop current lead of the transmitter to the red 2W LOOP INPUT terminal.

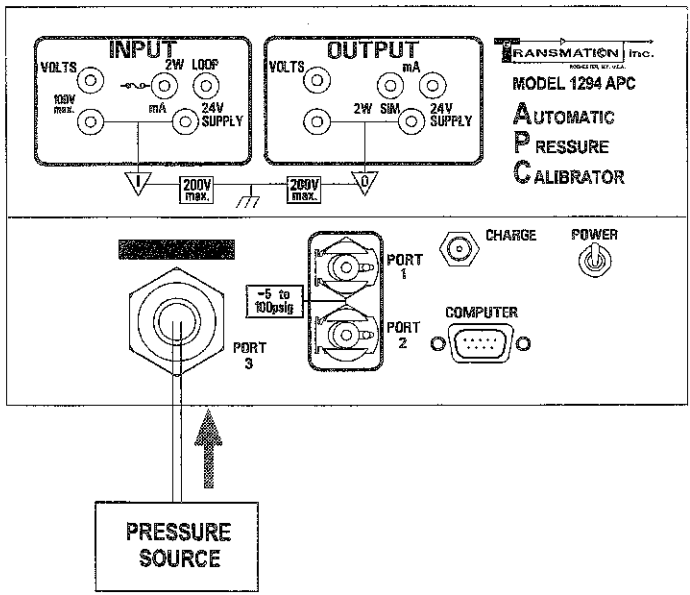
7. Use the Zero Scale, Full Scale, Step, and numeric keys to generate the proper output pressures. Alternately, use the Setup Test procedure as described in Chapter 2, Setting Up a Test, page 10, or recall an existing procedure. Adjust the transmitter as required.

CONNECTION DIAGRAMS FOR MODEL 1294

NOTE!

When using the high pressure external sensor on the Model 1294, make sure that the pressure fitting(s) used to connect to the Model 1294 are not self-sealing. Use of this type of fitting could result in pressure being trapped in the sensor/fitting after the tubing has been disconnected. If a self-sealing fitting is used, ensure that the pressure tubing, fitting and sensor are completely vented before disconnecting the tubing.

USING THE MODEL 1294 TO MEASURE A HYDRAULIC OR HIGH PRESSURE



1. Press the Power switch.

2. Set the input to be pressure - Port 3, and set the range to accept the pressure to be measured. (refer to Table 2-1).

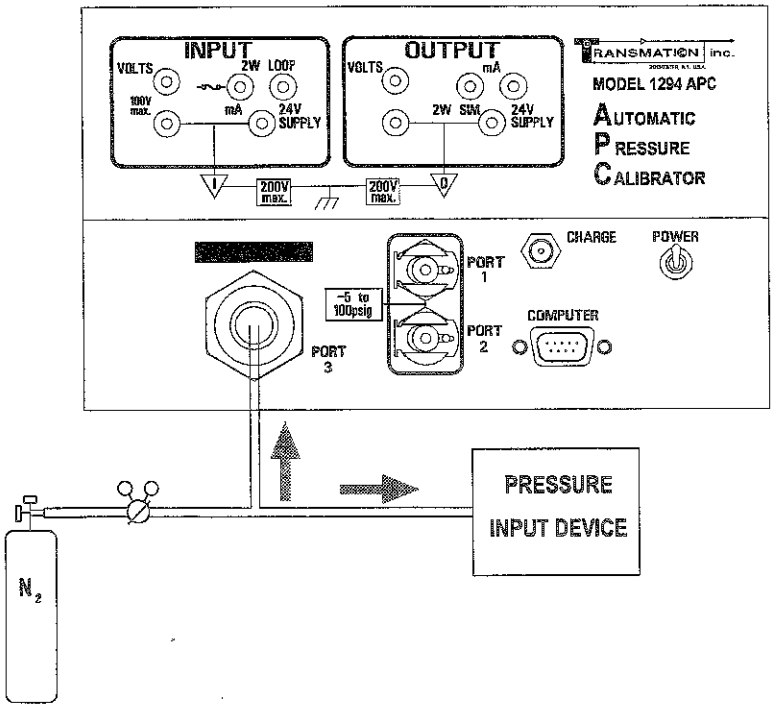
3. Connect a pressure line from the external source to port 3 on the Model 1294.

4. The display should now show the input data type as pressure in the units defined in the Input Setup. Pressures from the external source will now be displayed on the Model 1294.

WARNING!

Pressure Port 3 on the Model 1294 is designed to operate only with media compatible with 316SS and Fluorocarbon rubber.

Using the Model 1294 to Monitor an Externally Generated Pressure Signal



1. Press the power switch.

2. Set the output to be pressure - Port 3, and set the range to match that of the instrument under test (refer to Table 2-2).

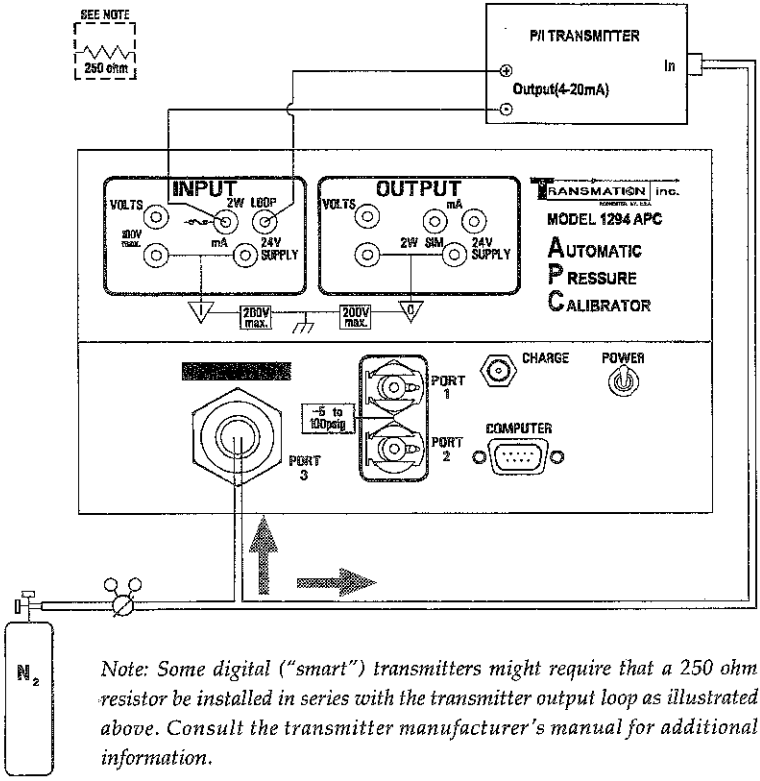
3. Connect a pressure line from the external source to both the device under test and Port 3 on the Model 1294.

4. The display should show the output data type as pressure in the units defined in Output Setup. Pressures generated by the external source to the device under test will now be displayed on the Model 1294.

WARNING!

Pressure Port 3 on the Model 1294 is designed to operate only with media compatible with 316SS and Fluorocarbon rubber.

Using the Model 1294 to Calibrate a High Pressure Transmitter - P/I



Note: Some digital ("smart") transmitters might require that a 250 ohm resistor be installed in series with the transmitter output loop as illustrated above. Consult the transmitter manufacturer's manual for additional information.

1. Press the power switch.

2. Set the input to be milliamps and set the range to match that of the instrument under test.

3. Set the output to be pressure - Port 3, and set the range to match that of the instrument under test (refer to Table 2-2).

4. Connect a pressure line from the external source to both the devise under test and Port 3 on the Model 1294.

NOTE!

Unless the converter is a two-wire type, verify that electrical power is applied to the P/I converter.

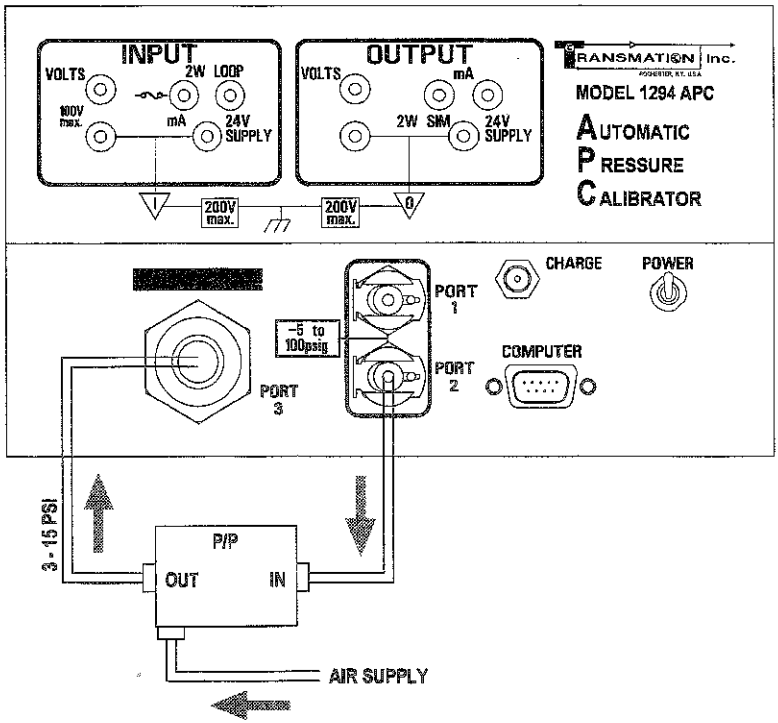
5. For a two-wire P/I converter, connect the negative loop current lead of the transmitter to the white 2W LOOP input terminal on the Model 1294. Connect the positive loop current lead of the transmitter to the red 2W LOOP Input terminal on the Model 1294.

6. Use the External Pressure Source to generate the proper output pressures to the transmitter. The display should show the output data type as pressure in the units defined in Output Setup and the input data type to be milliamp as defined in the Input Setup. Pressures generated by the external source to the device under test will now be displayed on the Model 1294.

7. Alternately, use the Test Setup menu to define and run a test procedure for the transmitter under test.

8. Adjust the transmitter as required.

Using the Model 1294 to Calibrate/Test a Pneumatic Transmitter - P/P



NOTE!

Both the Model 1294's Input and Output may be setup as pressure. This permits calibration and automatic testing of P/P transducers. The units of pressure for both the input and output must be the same. The following example uses the Model 1294's compressor as the output pressure source and the Model 1294's external Port 3 as the input pressure port.

1. Press the power switch.

2. Set the input to be pressure - Port 3 and set the range to match that of the instrument under test.

3. Set the output to be pressure - Ports 1 & 2, and set the range to match that of the instrument under test.

4. Connect a pressure line from the Model 1294 (Port 1 & 2) to the transducers input. Connect another pressure line from the transducer's output to Port 3 on the Model 1294.

5. Use the Zero Scale, Full Scale, Step and Numeric keys to generate the proper output pressures to the transducer. The display should show the output data type as pressure in the units defined in Output Setup and the input data type to be pressure as defined in the Input Setup.

6. Alternately, use the Test Setup menu to define and run a test procedure for the transducer under test.

7. Adjust the transducer as required.

CHAPTER 5

MAINTENANCE AND CALIBRATION

OVERVIEW

Field service procedures for Models 1292 and 1294 include cleaning the case exterior, recharging and/or replacing the battery, replacing the mA input fuse, servicing the pressure port filters, replacing the coiled cord, and adjusting the zero and span.

It is strongly recommended that units requiring service beyond the scope of the procedures listed above be returned to Transmation..

Refer to the Factory Service and Warranty Statement in Chapter 6 for additional information.

CLEANING THE MODEL 1292/1294

The exterior of the calibrator can be cleaned with a damp soft cloth with mild non-abrasive detergent. Solvents or abrasives should not be used since they can damage the display and keypad.

Contact the factory for information concerning specific media contamination removal procedures.

CHARGING THE MODEL 1292/1294

WARNING!

Do not charge the battery in hazardous locations.

The 1292/1294 is powered by a 12V sealed lead acid battery rated for 12 hours nominal use. During normal operation, the battery will discharge. The battery charger provides a convenient means of recharging the battery. When the battery is depleted, simply plug the transformer power lead into a convenient AC outlet and plug the DC lead into the calibrator. The red indicator on the charger will illuminate, indicating that charging is taking place.

The charger is a dual-rate device capable of recharging a totally discharged battery in about 16 hours, and trickle charging a unit indefinitely. For maximum battery life, charge the Model 1292/1294 whenever it is not in use. The calibrator can be used while the charging process is underway; however, the charging period will be longer. Note that, for maximum battery life, do not run the battery below about 60%.

NOTE!

Charge status and battery condition are displayed by pressing the **Shift** *and* **Bat (3)** *keys on the Model 1292/1294 keypad.*

Battery life will be significantly reduced if the battery is completely discharged repeatedly or stored in a fully discharged condition. The recommended charge practice is to recharge the battery after each period of use, and every 3-6 months when stored unused.

NOTE!

Battery capacity is reduced by operation at very cold temperatures.

The 1292/1294 will shut off at about 25% battery capacity to preserve memory and data integrity.

Replacing the Battery

The Model 1292/1294 is powered by a 12V sealed lead acid battery. After a number of charge/discharge cycles, the battery will not hold a reasonable charge and must be replaced.

NOTE!

The life of the battery is reduced by very deep discharge cycles (below about 60%), or operation at extreme temperatures.

NOTE!

Do not charge the battery with the calibrator upside down. In this position, the battery cannot vent properly, and there is the possibility of leaking electrolyte or, in extreme cases, an explosion may occur.

To replace the battery, do the following:

1. Turn off the calibrator and remove all electrical and pneumatic connections.

2. Remove the four button-head screws from the bottom of the calibrator, and lift off the lower exterior case.

3. Remove the four Phillips-head screws from the battery compartment cover, and remove the cover.

NOTE!

The screw on the right side of the battery compartment is shorter than the other three screws. Be sure to replace the short screw in this position to prevent possible battery penetration in the event the calibrator is dropped.

4. Remove the battery from its compartment.
5. Disconnect the battery power lead plug.
6. Connect the plug to the replacement battery.
7. Install the replacement battery in the battery compartment.
8. Install the battery compartment cover and replace the four screws.
9. Install the lower exterior case and replace the four screws.
10. Fully charge the new battery.

Servicing the mA Input Fuse

The input circuit of the Model 1292/1294 is protected by a 125 mA fuse assembly mounted in the white mA INPUT terminal.

Checking the mA Input Fuse

To check the mA input fuse, do the following:

1. Set both the input and output functions of the Model 1292/1294 to mA.
2. Connect the mA OUTPUT terminals (red/white) to the mA INPUT terminals (white/black).
3. Set the output to a nominal current level, such as 4 mA.
4. If the fuse is good, the input and output will both indicate 4.00 mA. If the fuse is blown, both will indicate 0.00 mA.

Replacing the mA Input Fuse

To replace the mA input fuse, do the following:

1. Turn off the Model 1292/1294 and disconnect all electrical connections.

2. Using a 1/4((6 mm) wide flat-blade screwdriver, loosen and remove the mA in put fuse assembly from the calibrator faceplate. Be sure that both the plastic and metal parts of the fuse body rotate together as a unit.

3. Install a replacement fuse assembly into the calibrator faceplate and firmly tighten.

Replacing the Intake/Exhaust Filter & Sensor Vent Filter

After an extended period of usage, the intake/exhaust filter and the sensor vent filter should be replaced. Service intervals are dependent on usage and air supply quality. To replace a filter, do the following:

1. Turn off the Model 1292/1294 and remove all electrical and pneumatic connections.

2. Remove the four button-head screws from the bottom of the calibrator and lift off the lower exterior case to gain access to the filters.

3. The filters are located in the circular recesses in the bottom of the case.

4. Remove the internal snap ring from the lip of the filter bore.

5. Remove the filter.

6. Insert the replacement filter in the bore and apply pressure until it seats.

7. Install the internal snap ring. Ensure that the snap ring is properly seated.

8. Replace the lower exterior case and install the four screws.

WARNING!

Do not operate the Model 1292/1294 without the filters in place to prevent sediment or other harmful contaminants from reaching the sensor and valves.

Replacing the Keypad Coiled Cord

The keypad is connected to the main unit of the Model 1292/1294 by a coiled cord. The cord was designed for easy replacement in case of damage. To replace the cord, do the following:

1. Turn off the calibrator and remove all electrical and pneumatic connections.

2. Disconnect the cord from the keypad. The connector is similar to a modular telephone connector, and a small screwdriver may help in releasing the locking tab.

3. Remove the four button-head screws from the bottom of the calibrator, and lift off the lower exterior case.

4. Locate the second modular connector behind the upper exterior case. Release the locking tab and pull the cord and grommet out through the front of the case.

5. Install the replacement cord through the case. Plug-in the connector and install the grommet.

6. Replace the lower exterior case and install the four screws.

7. Plug the free end of the cord into the keypad connector.

WARNING!

Use of any cord other than the exact Transmation replacement part can cause incorrect operation or damage to the calibrator.

Calibration

Due to the Model 1292/1294's sophisticated electronics and software, calibration beyond adjusting the zero and span of the instrument requires equipment and procedures available only at Transmation. Transmation recommends the calibrator be calibrated at least once every 12 months.

User Calibration

The 1292/1294 is equipped with diagnostics that allow users that have suitable calibration standards to perform zero and span adjustments to maintain instrument calibration. Refer

to Appendix 2 of this manual, User Calibration, or contact the Factory to request service literature for 1292/1294 zero and span calibrations.

Factory Calibration

To ensure optimum instrument operation, the Model 1292/1294 should be returned to Transmation at regular intervals (at least once every 12 months) for calibration to NIST standards. Only Transmation is capable of 1292/1294 calibration.

Troubleshooting

Refer to Table 5-1 for common troubleshooting information.

Recommended Spare Parts

WARNING!

To ensure proper operation of the Model 1292/1294, use only genuine Transmation replacement parts, unless commercially available parts are specified as acceptable. The use of un-approved replacement parts can result in potentially hazardous equipment malfunctions, and may void the Warranty.

Item	Part No.
Input Fuse Assembly	100835-070
Port Filters (set of 6)	500136-046
Keypad Coiled Cord	100839-260
Battery Assembly	100839-240
Battery Charger	502226-103
Fittings - 1/8 flow quick-connect to:	
1/8 NPT	759257-490
1/4 NPT	759257-404
10-32F	759257-491
Test Leads (pair)	500143-003
Shoulder Strap	759995-031
Shoulder Strap Pin	759995-032
Model 1292/1294 User's Guide	100840-900

TABLE 5-1
TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Model 1292/1294 won't power up.	Battery not sufficiently charged	Charge battery
	Defective battery	Replace battery
	Defective charger	Replace charger
	Component failure within Model 1292/1294	Return Model 1292/1294 to Transmation
Battery won't accept charge	Defective battery	Replace battery
	Defective charger	Replace charger
Short battery life	Defective battery	Replace battery
	Defective charger	Replace charger
Model 1292/1294 operates erratically	Battery not sufficiently charged	Charge battery
	Defective battery	Replace battery
Keypad inoperable	Coiled cord damaged	Replace coiled cord
Can't measure milliamps	mA input fuse blown	Replace mA input fuse
Won't generate proper pressure	Battery not sufficiently charged	Charge battery
	Gross leak in pressure line	Correct leak
	Filters clogged	Replace filters
	Transducers damaged	Check transducers in input (measuring) mode

CHAPTER 6

FACTORY SERVICE & WARRANTY

FACTORY SERVICE

Should Factory service become necessary, the Model 1292/1294 should be returned to the nearest service facility for repair or replacement. Do not return any item to Transmation without first contacting us and obtaining an authorization number. This number should appear clearly on the outside of all packages sent to Transmation, and on all associated paperwork.

When calling Transmation for service help, please assist our service department by clearly and thoroughly describing the problem. For additional information, call Transmation's Precision Service Dept. at 1-800-995-9953.

Transmation, Inc.
977 Mt. Read Boulevard
Rochester, New York 14606 USA

WARRANTY

Transmation, Inc. warrants all equipment manufactured by it and bearing its nameplate and all repairs made by Transmation, Inc. to be free from defects in material or workmanship under normal use and service for a period of one year from the date of delivery to the Purchaser. Expendable items such as fuses, batteries, test leads, and carrying cases are not warranted. The Transmation, Inc. will repair or replace, at its option, without charge, F.O.B. Transmation, Inc., any equipment or part thereof found to be defective in material or workmanship if such item is returned to Transmation, Inc., transportation prepaid.

LIMITATION OF WARRANTY AND LIABILITY

The liability of Transmation, Inc. (except as to title) shall in no case exceed the cost of correcting defects in products and shall not extend beyond one year from date of delivery. All claims for defective products or parts under this warranty must be made in writing immediately upon discovery. Transmation, Inc. assumes no liability for the consequences of misuse of products by the Purchaser.

The foregoing is expressly in lieu of all other warranties whatsoever, express, implied, or

statutory, including without limitation the implied warranties of merchantability and fitness for purpose. Any references by Transmation, Inc. to Purchaser's specifications and similar requirements is only to describe products, and no representation or other terms therein shall have any force or effect. Catalogs, circulars, and similar literature of Transmation, Inc. are issued for general information purposes only and shall not be deemed to modify the provision hereof.

The foregoing is Transmation, Inc.'s only obligation and the Purchaser's only remedy for breach of warranty; and except for gross negligence, willful misconduct, and remedies permitted under any other clause of these Terms and Conditions, the foregoing is the Purchaser's only remedy hereunder by way of breach of contract, negligence or otherwise. In no event shall the Purchaser be entitled to incidental, special, or consequential damages. Transmation, Inc. does not authorize any agent or representative to warrant product fitness for any particular use or to make any other warranty, express or implied, or to assume any other liability, except as set forth herein.

Discrepancies in Shipment and Damage to Merchandise

Products manufactured by the Transmation, Inc. are carefully packed and thoroughly inspected before leaving Transmation, Inc.'s factory. Any claim for discrepancies will be honored only if reported within 15 days from receipt of shipment.

Responsibility for safe delivery of products is assumed by the carrier upon acceptance of the shipment. Consequently, claims for loss or damage sustained in transit must be filed with the carrier as follows: Written requests for inspection by the carrier's agent should be made within 15 days of the delivery date when concealed loss or damage is discovered. Concealed loss or damage means loss or damage which is not apparent until merchandise is unpacked; contents may be damaged in transit due to rough handling even though packaging may not show external damage. As to visible loss or damage, any external evidence of loss or damage must be noted on the freight bill or express receipt, and such document should be signed by the carrier's agent at the time of delivery. The Purchaser's failure to adequately describe such external evidence of loss or damage may result in the carrier's refusing to honor a damage claim. The carrier will supply a form for filing such a claim.

Miscellaneous

This Agreement shall be construed and interpreted under the laws of the State of New York. The parties hereby consent to the jurisdiction of the courts of the State of New York and agree that venue shall lie in Monroe County. The invalidity in whole or in part of any provision hereof shall not affect the validity of any other provision.

UPLOAD/DOWNLOAD OF TEST SETUPS AND DATA

OVERVIEW

Transmation has designed Models 1292 and 1294 Automatic Pressure Calibrators to function either as stand-alone devices, or as part of an integrated instrument database system. Some users don't require a PC instrument database, and will usually use the 1292/1294-APC to create and save generic tests which are not instrument specific. When such tests are recalled for use, the operator enters the appropriate instrument specific data at that time (tag number, serial number, manufacturer, etc.)

On the other hand, many facilities require comprehensive calibration and maintenance documentation. This information is collected and maintained in a PC database, such as Transmation's SHOP Access. The 1292/1294 serial port permits easy download of test setups created and maintained on the PC, as well as upload of tests and data to the PC. Thus, the number of user defined test setups is limited only by the PC application in use.

Groups of up to fifty-three test setups can be downloaded to the 1292/1294. After the calibration route is completed, resulting test data, including associated test parameters, can be uploaded to SHOP ACCESS (or another instrument database), and a new set of test setups downloaded for the next calibration route.

COMPUTER REQUIREMENTS

WARNING!

Do not use the RS-232C serial port in hazardous locations.

To import and export information from the 1292/1294, the user will need a computer equipped with the following:

An RS232C serial port.

Communication software capable of sending and receiving ASCII text files (such as Windows Terminal, ProComm, CrossTalk, etc.). Note that SHOP ACCESS instrument database software has its own internal communications utility, and requires no additional communications software.

A spreadsheet or database package (such as SHOP ACCESS) capable of importing and exporting text files in any of the four available formats.

A serial cable with a DB9 Male connector on one end to connect the 1292/1294, and the appropriate pin connection on the other end to connect to the computer's serial port.

For the purposes of this document, it is assumed that the computer in use is a DOS/Windows™ compatible PC. It is also assumed that the user is proficient in the use of the communication package and spreadsheet or database program chosen.

PREPARING FOR FILE TRANSFER

The 1292/1294's Diagnostic 9 permits the user to define communication settings (baud rate, modes, etc.) These settings should match those set in the communication software on the PC. The 1292/1294 can be set for baud rates up to 9600. Diagnostic 9 also allows the user to select from one of the four available formats.

DOWNLOADING TEST SETUPS TO THE 1292/1294-APC

In order to create and maintain test setups for downloading to the 1292/1294, the user must define a database as described in the Test Procedure Format.

Using Diagnostic 16, up to fifty-three test setups can be downloaded from a PC to the 1292/1294 at one time. (Note that the first ten tests are built-in, permanent definitions that cannot be overwritten.)

Download test setups to the 1292/1294-APC as follows (If using Transmation's SHOP ACCESS, refer to its manual, or to its on-screen help for directions):

Using the PC spreadsheet or database, select from one to fifty-three tests to be downloaded.

Export these test setups from the database to an ASCII file in one of the four available formats.

Connect the 1292/1294 serial port to the PC.

Start the PC communication software.

Verify that the communication settings of the 1292/1294 and PC match.

Run Diagnostic 16 on the 1292/1294 to initiate the file transfer.

Initiate the file transfer mode on the PC to send an ASCII text file. The 1292/1294 display will indicate the number of tests received.

The diagnostic will automatically end when all fifty-three tests have been received. If fewer than fifty-three tests are transferred, the 1292/1294 will remain in the diagnostic mode, waiting for further transfer. The operator can manually terminate the transfer by pressing the [ESC] key. This action will erase the test following the last one received. For example, if five tests are sent to the 1292/1294, they will be placed into locations 11 through 15. The operator will manually terminate the transfer from the PC keyboard, and test #16 on the 1292/1294 will be cleared to a "blank" test.

If downloading is manually terminated during a transfer, or if errors occur during the transfer, it may be necessary to flush the buffers of the 1292/1294 and PC before beginning another transfer. On the 1292/1294, this can be done by pressing [SHIFT], then [DIAG], then [ESC], without making any changes to the setup. (This procedure should not be necessary during a normal transfer.)

Uploading Test Setups From The 1292/1294-APC

Diagnostic 17 performs a bulk transfer of the fifty-three user defined test setups to a PC using the Test Procedure Format.

Upload test setups from the 1292/1294-APC to the PC as follows (If using Transmation's SHOP Access, refer to its manual, or to its on-screen help for directions):

Connect the 1292/1294 serial port to the PC.

Start the PC communication software.

Verify that the communication settings of the 1292/1294 and PC match.

Initiate the file transfer mode on the PC to receive an ASCII text file.

Run Diagnostic 17 on the 1292/1294. The display will read "Exporting Test #11," and count upwards as all fifty-three tests are sent. (Note that the first ten tests are built-in. User tests run from #11 to #64). The diagnostic will automatically end after all fifty-three tests are transmitted.

If fewer than fifty-three tests have been saved, the unused tests will be transferred as blanks.

End the transfer in the external computer and close the received file.

The ASCII text file can then be imported, selectively or in full, into the user's database.

Uploading Test Result Data From the 1292/1294-APC

There are two methods of exporting test results from the 1292/1294:

Individual test results can be uploaded using selection 6 in the [SHIFT] [DATA] menu. The user will be prompted to select a saved data set to be sent to the RS-232 port. The data will be exported as a single ASCII text string as defined in the Test Data Format.

Diagnostic 15 performs a bulk transfer of the saved data records, 1 through 46.

Each record contains both As Found and As Left data. The records are exported in alphabetical order by tag name.

Upload the test results from the 1292/1294-APC to the PC as follows (If using Transmation's SHOP Access, refer to its manual, or to its on-screen help for directions):

Connect the 1292/1294 serial port to the PC.

Start the PC communication software.

Verify that the communication settings of the 1292/1294 and PC match.

Initiate the file transfer mode on the PC to receive an ASCII text file.

Run Diagnostic 15 on the 1292/1294. The display will read "Exporting Data 1," and count upwards as all forty-six data records are sent. The diagnostic will automatically end after all forty-six records are transmitted.

End the transfer in the external computer and close the received file.

The ASCII text file can then be imported, selectively or in full, into the user's database.

Available Formats

The 1292/1294-APC will upload or download data in four different file formats: Fixed Field, Database (ASCII CR delimited), Comma Delimited, and Carriage Return Delimited. The user must know which format is compatible with the PC spreadsheet or database software being used.

Final Note

Instrument test data plays an increasingly important role throughout industry. It is a powerful tool that can be used to optimize plant performance, ensure compliance with safety regulations, and maintain Quality. Transmation has designed the 1292 and 1294 Automatic Pressure Calibrators to allow for an open, non-proprietary method of data handling that makes data available to any end user. This allows the user to make the most of the 1292/1294's capabilities, at any level, from simply printing test results, to downloading individual records, to maintaining a comprehensive instrument database used to schedule periodic maintenance and perform historical trending.

File, Test Procedure & Test Data Formats

File Format - The Model 1292/1294 uses a Fixed Field file format. All fields are a predefined fixed length. There are no delimiters between fields. Each test record ends with a carriage return and a linefeed.

Test Procedure Format - The Model 1292/1294 imports Test Procedures with the following field definitions:

Category	Description		Data Type	Field Length
Instrument Specifics	Test Name		Alphanumeric	24
	Area Tag		Alphanumeric	8
	Process Tag		Alphanumeric	12
	Manufacturer		Alphanumeric	12
	Model Number		Alphanumeric	20
	Serial Number		Alphanumeric	20
Test Setup	Calibrator Input Type	00 = Off 01 = Volts 02 = Millivolts 03 = Milliamps 04 = Pressure (1&2)	Byte	2
	*1294 ONLY	05 = Pressure (3) 06 = Manual Entry		
	Calibrator Input Mode	00 = Off	Byte	2
	Input Data Percent Flag	00 = Normal 01 = Display in %	Byte	
	Input Full Scale (data at 100%)		Number	13
	Input Zero Scale (data at 0%)		Number	13
	Calibrator Input Damping	00 = Off 01 = Very Fast 02 = Fast 03 = Normal 04 = Slow	Byte	2
	Error Display Mode		Byte	2
	Calibrator Output Type	00 = Off 01 = Volts 02 = Millivolts 03 = Milliamps 04 = Pressure (1&2)	Byte	2
	*1294 ONLY	05 = Pressure (3) 06 = Manual Entry		
	Calibrator Output Mode	00 = Off	Byte	2
	Output Data Percent Flag	00 = Normal 01 = Display in %	Byte	

Category	Description		Data Type	Field Length
Test Setup	Calibrator Output Damping	00 = Off 01 = Very Fast 02 = Fast 03 = Normal 04 = Slow	Byte	2
	Output Full Scale (data at 100%)		Number	13
	Output Zero Scale (data at 0%)		Number	13
	Output Step Size (% of Full Scale)		Number	13
	Steps per Scan (1-10)		Number	13
	Test Direction	00 = Ascending 01 = Descending 02 = Both	Byte	2
	Seconds Data Delay (0 to 99)		Number	13
	Pressure Units Type	00 = PSI 01 = in. H2O 68F 02 = in. H2O 60F 03 = in. H2O 23C 04 = in. H2O 4C 05 = cm. H2O 4C 06 = mm. H2O 4C 07 = cm H2O 23C 08 = mm H2O 23C 09 = in Hg 32F 0A = cm Hg 32F 0B = mm Hg 0C 0C = Pa 0D = kPa 0E = milliBar 0F = bar 10 = kgf/cm2	Byte	2
	Percent Full Scale Error (0-100%)		Number	13
	Percent Reading Error (0-100%)		Number	13
	Percent Full Scale Alert (0-100%)		Number	13
	Percent Reading Alert (0-100%)		Number	13
End of Record	Carriage Return		ASCII Code	1
	Line Feed		ASCII Code	1

Test Data Format - The Model 1292/1294 exports test data with the following field definitions:

Category	Description		Data Type	Field Length
Calibrator Specifics	RESERVED		Alphanumeric	3
	Manufacturer		Alphanumeric	11
	Model Number		Alphanumeric	8
	Serial Number		Alphanumeric	7
	RESERVED		Alphanumeric	5
Instrument Specifics	Test Name		Alphanumeric	24
	Area Tag		Alphanumeric	8
	Process Tag		Alphanumeric	12
	Manufacturer		Alphanumeric	12
	Model Number		Alphanumeric	20
	Serial Number		Alphanumeric	20
Test Setup	Calibrator Input Type	00 = Off 01 = Volts 02 = Millivolts 03 = Milliamps 04 = Pressure (1&2) 05 = **Pressure (3) 06 = Manual Entry	Byte	2
	Calibrator Input Mode	00 = Off	Byte	2
	Input Data Percent Flag	00 = Normal 01 = Display in %	Byte	
	Input Full Scale (data at 100%)		Number	13
	Input Zero Scale (data at 0%)		Number	13
	Calibrator Input Damping	00 = Off 01 = Very Fast 02 = Fast 03 = Normal 04 = Slow	Byte	2
	Error Display Mode		Byte	2
	Calibrator Output Type	00 = Off 01 = Volts 02 = Millivolts 03 = Milliamps 04 = Pressure (1&2) 05 = **Pressure (3) 06 = *Manual Entry	Byte	2
	Calibrator Output Mode	00 = Off	Byte	2
	Output Data Percent Flag	00 = Normal 01 = Display in %	Byte	
	Calibrator Output Damping	00 = Off 01 = Very Fast 02 = Fast 03 = Normal 04 = Slow	Byte	2
	Output Full Scale (data at 100%)		Number	13
	Output Zero Scale (data at 0%)		Number	13
	Output Step Size (% of Full Scale)		Number	13
	Steps per Scan (1-10)		Number	13
	Test Direction	00 = Ascending 01 = Descending 02 = Both	Byte	2

Category	Description		Data Type	Field Length
Test Setup	Seconds Data Delay (0 to 99)		Number	13
	Pressure Units Type	00 = PSI 01 = in. H2O 68F 02 = in. H2O 60F 03 = in. H2O 23C 04 = in. H2O 4C 05 = cm. H2O 4C 06 = mm. H2O 4C 07 = cm H2O 23C 08 = mm H2O 23C 09 = in Hg 32F 0A = cm Hg 32F 0B = mm Hg 0C 0C = Pa 0D = kPa 0E = milliBar 0F = bar 10 = kgf/cm2	Byte	2
	Percent Full Scale Error (0-100%)		Number	13
	Percent Reading Error (0-100%)		Number	13
	Percent Full Scale Alert (0-100%)		Number	13
	Percent Reading Alert (0-100%)		Number	13
	Manifold Temperature		Number	13
	Attached Volume		Number	13
	Person		Alphanumeric	12
	Ambient Temperature		Number	13
	Ambient Pressure		Number	13
	Relative Humidity		Number	13
	Date of Last Cal of Calibrator		Alphanumeric	8
Test Results First Data Set	Data Type	00 = As Found 02 = As Left 02 = No Test	Byte	2
	Pass/Alert/Fail Flag	00 = Pass 01 = Alert 02 = Fail	Byte	2
	Time (As Found)		Alphanumeric	8
	Date (As Found)		Alphanumeric	8
Repeated 21 Times	Calibrator Input Data		Number	13
	Calibrator Output Data		Number	13
Second Data Set	Data Type	00 = As Found 02 = As Left 02 = No Test	Byte	2
	Pass/Alert/Fail Flag	00 = Pass 01 = Alert 02 = Fail	Byte	2
	Time (As Found)		Alphanumeric	8
	Date (As Found)		Alphanumeric	8
Repeated 21 Times	Calibrator Input Data		Number	13
	Calibrator Output Data		Number	13
End of Record	Carriage Return		ASCII Code	1
	Line Feed		ASCII Code	1

NOTES

Test Results Time Format: HH:MM:SS *example:* 15:30:10 (Three thirty and ten seconds PM)
Test Results Date Format: MM/DD/YY *example:* 07/08/96 (July 8th 1996)

Data Types:

Alphanumeric - Text strings that are always sent with the exact number of characters specified. Leading or trailing spaces are not stripped. Text Strings are transmitted verbatim.

Byte - represents a hexadecimal integer, usually indicating a selection in a list of choices. Bytes are always sent as two digit numeric characters.

Number - All floating point numbers are transferred as ASCII strings made up of digits with an optional embedded decimal point.

ASCII Code - An ASCII control character. (Carriage Return = Hexadecimal D
Linefeed = Hexadecimal A)

USER CALIBRATION

OVERVIEW

When Transmation Models 1292 and 1294-APC are calibrated, correction factors are calculated and stored in non-volatile memory. These corrections are then applied to all readings before display or storage.

The 1292 and 1294-APC Automatic Pressure Calibrators actually store two sets of correction factors. The first is calculated during factory calibration. It provides not only accuracy traceable to NIST standards, but also corrections to compensate for drift with ambient temperature. This insures accuracy over the entire operating temperature range (0 to 40° C or 32° to 104° F). Factory calibration numbers can only be accessed by factory authorized service personnel.

The second set of correction numbers used by Models 1292 and 1294 can be calibrated by the user. This set does not replace the factory calibration, but is used in conjunction to the factory numbers. This allows the user's qualified service personnel to calibrate the 1292/1294 using suitably accurate equipment, without returning the unit to the factory. The effects of noise, temperature variations, and sensor non-linearities require that the 1292/1294 be calibrated with devices which are accurate and traceable to NIST better than .008% full scale in order to maintain factory specified accuracy.

CONDITIONS FOR CALIBRATION

It is important that the 1292/1294 User Calibration Diagnostics be run at an ambient temperature between 20° and 25° C (68° to 77° F). The unit and all its components must also be at this temperature. Do not bring the instrument in from a very cold or hot environment and immediately run a calibration. The 1292/1294 should be left at room temperature for at least four hours before the calibration is run. If the unit has been exposed to temperatures outside the 0° to 40° C range (32° to 104° F), it should be left at room temperature for sixteen hours before the diagnostics are run.

The Model 1292/1294 should be powered only by the internal battery for the calibration. The battery should be fully charged before the calibration, and any external battery charger should be disconnected.

HINT: While the 1292/1294 is acclimating to ambient temperature, use this time to charge the battery completely.

Unlocking User Calibration

User calibration does not require any manual adjustment of pots or knobs on the 1292/1294. All calibration settings are entered using the 1292 keypad and special Calibration Diagnostics. The Calibration Diagnostics are not listed on the Diagnostic Menu. To access these "hidden" diagnostics, type the diagnostic number, press [SHIFT], then [DIAG].

To prevent unauthorized personnel from inadvertently executing calibration and other critical diagnostics, the 1292/1294 has an Operator Lockout feature. A user must know the four-digit unlocking code in order to calibrate the 1292/1294. The calibration diagnostics are unlocked using Diagnostic 20 as follows:

a. Type 20, then press [SHIFT], then [DIAG]. The user will be prompted for the unlocking code.

b. Type in the four-digit code, followed by [ENTER].

c. To enable the User Calibration Diagnostics, set "Lockout Internal Calibration" to "NO".

d. Press [ENTER] for YES save the changes.

HINT: After all calibrations are completed, run Diagnostic 20 again, and change the YES to NO to re-lock the User Calibration Diagnostics.

Electrical Calibration Equipment

The electrical I/O calibration requires a voltage/current source capable of generating values close to (±5%) to 100 mV, 1 V, 10 V, 20 mA, and 50 mA. A low accuracy source with an adequately high accuracy instrument monitoring the value (series or parallel) is a suitable alternative. The accuracy of the reference instrument at the listed values and at the ambient temperature should be better than ±50 ppm (0.005%).

Calibration also requires a shorting plug; a set of test leads with the inputs connected together is adequate.

NOTE:

Full calibration of the Electrical I/O boards requires that Diagnostic 34 be run five times and Diagnostic 35, three times.

Procedures:

Diagnostic 34 calibrates the input board to five ranges. Each calibration requires the following steps:

a. Press [SETUP INPUT] and select the input units and range, using the [NEXT] and [ENTER] keys.
b. Run the calibration diagnostic by typing 34, pressing [SHIFT] then [DIAG].
c. Wait while the zero calibration is performed.
d. When prompted, apply a known input and enter the value of this input on the keypad. This input should be between 90% and 100% of full scale. Wait while the span calibration is performed.

All data collection and computation is performed automatically. When the 1292/1294 display returns to normal, repeat steps (a) through (d) above to complete calibration for each of the electrical input ranges as above.

Diagnostic 35 calibrates the output board to three ranges.

NOTE:

The output capability of the 1292/1294 is calibrated by supplying Volts, millivolts, and milliamps from another device to the output terminals of the calibrator.

Each calibration requires the following steps:

a. Press [SETUP OUTPUT] and select the output units and range, using the [NEXT] and [ENTER] keys.
b. Run the calibration diagnostic by typing 35, pressing [SHIFT] then [DIAG].
c. Wait while the zero calibration is performed.

d. When prompted, apply a known signal to the appropriate output terminals. Enter this value on the keypad. Wait while the span calibration is performed.

All data collection and computations will be performed automatically. When the unit returns to the normal display screen, repeat steps (a) through (d) above until all three output ranges have been calibrated.

Pressure Calibration Equipment

The only equipment required for the pressure calibration is a precision pressure source capable of generating pressures of 5 psi, 30 psi, 100 psi (+0% -10%), and pressure corresponding to the range of the external sensor (1294). A low accuracy source connected to a high accuracy gauge can be used in place of a high precision source.

Procedures:

There are three pressure sensors in the 1292/1294. Each one is calibrated individually. The 1292/1294 requires that only the input calibration be performed, since the it uses the same sensor both to measure pressure input and to measure generated pressure. For the calibration, apply an air pressure between 90% and 100% of each sensor range as above.

Run Diagnostic 31 as follows:

a. Setup the input to Pressure, 100 psi.

b. Vent the 1292/1294 by pressing [SHIFT] then [VENT] to pneumatically zero the unit to atmospheric pressure.

c. Run the first calibration diagnostic by typing 31, pressing [SHIFT] then [DIAG].

d. When prompted, apply an air pressure between 90 and 100 psi through one of the calibrator's front panel CPC fittings.

e. When prompted, type in the exact value of the pressure being applied.

The 1292/1294 will automatically collect data and perform necessary computations. When the display returns to normal, repeat steps (a) through (e) with Diagnostics 32 and 33, using appropriate input setup and applied pressures as above.

NIST Calibration

The 1292/1294 has an NIST calibration flag which can be set to indicate that the present calibration is NIST traceable. If the NIST flag is set, it is indicated on the startup display screen. The flag is set by running Diagnostic 38. The 1292/1294 is shipped with the flag set to reflect the factory NIST calibration.

Reset

If any problems are encountered during a user calibration, the User Calibrations can be reset. Diagnostic 36 erases the User Pressure Calibration and Diagnostic 37 erases the User Electrical I/O Calibration. Running these diagnostics eliminates any user calibration data. The most recent factory calibration correction factors are unchanged. Note that this is not equivalent to a new calibration. If the last factory calibration was one year ago, running Diagnostics 36 and 37 will eliminate any user calibrations and return the instrument to a one year old factory calibration. Only the factory calibration data will be applied to readings.

For obvious reasons, these two diagnostics are locked. User Calibration Reset requires the following steps:

a. Use Diagnostic 20 to make sure that User Calibration Diagnostics are locked.

b. Shut off the 1292/1294. Turn the unit back on.

c. Run Diagnostic 20 again, and unlock the User Calibration Diagnostics.

d. Run Diagnostic 36 to reset the User Pressure Calibration and/or Diagnostic 37 to reset the User Electrical Calibration. Wait thirty seconds for the full reset to occur.

Completion

Once user calibration is completed, don't forget to run Diagnostic 20 to relock the User Calibration.

Final Note

Transmation has supplied the capability to do on site user calibration as a convenience to the customer. However, Transmation's Precision Service Technicians are best qualified return the 1292/1294 to its original factory specifications. They recommend that the unit be returned for in-house calibration annually. This calibration also serves as a checkup.

Our Precision Service department can also inform the customer of any recent product upgrades, retrofits, modifications, or enhancements.

Transmation
Instrument Division
977 Mt. Read Boulevard
Post Office Box 60803
Rochester, New York 14606 USA

Telephone: 1-800-826-1292 Fax: 1-716-254-0273 Internet: Info@Transmation.Com

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