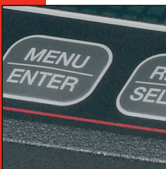


Remote Manual
Advanced Signal Calibrators
JOFRA ASC301 & ASC321

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Remote Operation

The calibrator can be remotely controlled using a PC terminal, or by a computer program running the calibrator in an automated system. It uses an RS232 serial port connection for remote operation. With this connection the user can write programs on the PC, with Windows languages like Visual Basic to operate the calibrator, or use a Windows terminal, such as Hyper Terminal, to enter single commands. Typical RS232 remote configurations are shown in Figure 1.

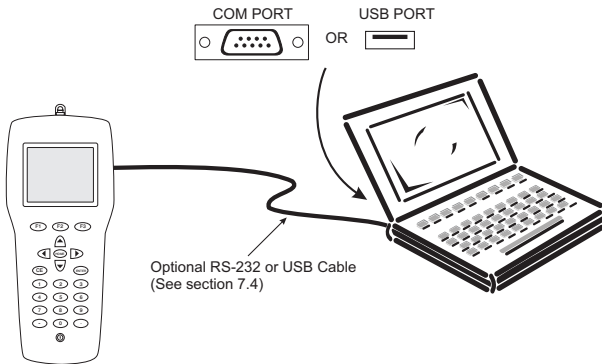


Figure 1. Calibrator-to-Computer Connection

1. Setting up the RS232 Port for Remote Control

Note: The RS232 connection cable should not exceed 15m unless the load capacitance measured at connection points is less than 2500pF.

Serial parameter values:

9600 baud

8 data bits

1 stop bit

no parity

Xon/Xoff

EOL (End of Line) character or CR (Carriage Return) or both

To set up remote operation of the calibrator on the Windows Hyper Terminal, connected to a COM port on the PC as in Figure 1, use the following procedure:

1. Start Hyper Terminal (located in Accessories/Communications of the Windows Start menu)
2. Select New Connection.

3. For Name enter ASC301. Select the serial port that the unit is connected to.
4. Enter the above information for port settings.
5. Select ASCII setup from File/Properties/Settings and mark these choices:
 - Echo typed characters locally
 - Wrap lines that exceed terminal width
6. Select Ok
7. To see if the port works enter *IDN?. This command will return information on the unit.

2. Changing Between Remote and Local Operation

There are three modes of operation of the calibrator, Local, Remote, and Remote with Lockout. Local mode is the default mode. Commands may be entered using the keypad on the unit or using a computer. In Remote mode the keypad is disabled, and commands may only be entered using a computer, but choosing [GO TO LOCAL] from the menu on the calibrator display will restore keypad operation. In Remote with Lockout, the keypad can not be used at all. To switch modes proceed as follows:

1. To enable Remote mode, type in the serial command REMOTE at the computer terminal.
2. To enable Remote with Lockout, type in REMOTE and LOCKOUT in either order.
3. To switch back to local operation enter LOCAL at the terminal. This command also turns off LOCKOUT if it was on. For more information on commands refer to the Remote Commands section.

3. Using Commands

3.1 Command types

Refer to the Section on Remote Commands for all available commands.

The calibrator may be controlled using commands and queries. All commands may be entered using upper or lower case. The commands are divided into the following categories:

Calibrator Commands

Only the calibrator uses these commands. For example

LOWER_MEAS DCV

tells the calibrator to measure voltage on the lower display.

Common Commands

Standard commands used by most devices. These commands always begin with an "*". For example

*IDN?

tells the calibrator to return its identification.

Query Commands

Commands that ask for information. They always end with a "?". For example:

FUNC?

Returns the current modes of the upper and lower displays.

Compound Commands

Commands that contain more than one command on one line. For example:

LOWER_MEAS RTD; RTD_TYPE CU10

Sets the calibrator to measure RTD in the lower display and sets RTD type to Cu 10.

Overlapped Commands

Commands that require more time to execute than normal. The command *WAI can be used after the overlapped command to tell the calibrator to wait until the command finishes before executing the next command. For example:

TRIG; *WAI

Triggers the pulse train. Once the pulse train has been triggered, the calibrator can proceed to the next command.

Sequential Commands

Commands that are executed immediately after they are entered. This type includes most of the commands.

3.2 Character Processing

The data entered into the calibrator is processed as follows:

- ASCII characters are discarded if their decimal equivalent is less than 32 (space), except 10 (LF) and 13 (CR):
- Data is taken as 7-bit ASCII

- The most significant data bit is ignored.
- Upper or lower case is acceptable.

3.3 Response Data Types

The data returned by the calibrator can be divided into four types:

Integer

For most computers and controllers they are decimal numbers ranging from -32768 to 32768. For example:

*ESE 140; *ESE? returns 140

Floating

Numbers that have up to 15 significant figures and exponents. For example:

CPRT_COEFA? returns 3.908000E-03

Character Response Data (CRD)

Data returned as keywords. For example:

RTD_TYPE? returns PT385_10

Indefinite ASCII (IAD)

Any ASCII characters followed by a terminator. For example:

*IDN? returns AMETEK, ASC301, 250, 1.00

3.4 Calibrator Status

Status registers, enable registers, and queues provide status information on the calibrator. Each status register and queue has a summary bit in the Serial Poll Status Byte. Enable registers generate summary bits in the Serial Poll Status Byte. The following is a list of registers and queues along with their function.

Serial Poll Status Byte (STB)

The STB is sent when the calibrator responds to the *STB? command. Cleared when power is reset.

Service Request Enable Register (SRE)

Enables or disables the bits of the STB. Cleared when power is reset.

Setting bits to 0 disables them in the STB. Setting the bits to 1 enables them. Bit assignments for the SRE and the STB are shown below.

| | | | | | | | |
|---|-----|-----|---|-----|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0 | MSS | ESB | 0 | EAV | 0 | 0 | 0 |

MSS

Master Summary Status. Set to 1 when ESB or EAV are 1 (enabled). Read using the *STB? command.

ESB

Set to 1 when at least one bit in ESR is 1.

EAV

Error Available. An error has been entered into the error queue, and may be read using the Fault? command.

Event Status Register (ESR)

A two-byte register, in which the lower bits represent conditions of the Calibrator. Cleared when read and when power is reset.

Event Status Enable Register (ESE)

Enables and disables bits in the ESR. Setting a bit to 1 enables the corresponding bit in the ESR, and setting it to 0 disables the corresponding bit. Cleared at power reset. Bit assignments for the ESR and the ESE respectively are shown below.

| | | | | | | | |
|----|----|----|----|----|----|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | |
|-----|---|-----|-----|-----|-----|---|-----|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PON | 0 | CME | EXE | DDE | QYE | 0 | OPC |

PON

Power On. Set to 1 if power was turned on and off before the Event Status Register was read.

CME

Command Error. Set to 1 when the calibrator receives an invalid command. Entering an unsupported RTD type may cause such an error.

EXE

Execution Error. Set to 1 when the calibrator runs into an error while executing its last command. A parameter that has too significant figures may cause such an error.

DDE

Device-dependent Error. Set to 1 when, for example, the output of the calibrator is overloaded.

QYE

Query Error.

OPC

Operation Complete. Set to 1 when the calibrator has finished executing all commands before the command *OPC was entered.

Error Queue

If an error occurs due to invalid input or buffer overflow, its error code is sent to the error queue. The error code can be read from the queue with the command FAULT?. The error queue holds 15 error codes. When it is empty, FAULT? returns 0. The error queue is cleared when power is reset or when the clear command *CLS is entered.

Input Buffer

Calibrator stores all received data in the input buffer. The buffer holds 250 characters. The characters are processed on a first in, first out basis.

4. Remote Commands and Error Codes

The following tables list all commands, and their descriptions, that are accepted by the calibrator.

Table 1: Common Commands

| Command | Description |
|---------|--|
| *CLS | *CLS (Clear status.) Clears the ESR, the error queue, and the RQS bit in the status byte. Terminates pending Operation Complete commands |
| *ESE | Loads a byte into the Event Status Enable register. |
| *ESE? | Returns the contents of the Event Status Enable register. |
| *ESR? | Returns the contents of the Event Status register and clears the register. |
| *IDN? | Identification query. Returns the manufacturer, model number, and firmware revision level of the Calibrator. |
| *OPC | Enables setting of bit 0 (OPC for "Operation Complete") in the Event Status Register to 1 when all pending device operations are complete. |
| *OPC? | Returns a 1 after all pending operations are complete. This command causes program execution to pause until all operations are complete. |
| *RST | Resets the state of the instrument to the power-up state. This command holds off execution of subsequent commands until it is complete. |
| *SRE | Loads a byte into the Service Request Enable register. |
| *SRE? | Returns the byte from the Service Request Enable register. |
| *STB? | Returns the status byte. |
| *WAI | Prevents further remote commands from being executed until all previous remote commands have been executed. |

Table 2: Calibrator Commands

| Command | Description |
|-------------|---|
| CAL_START | Puts the calibrator in calibration mode |
| CJC_STATE | Turns CJC on or off. |
| CJC_STATE? | Returns the state of the CJC |
| CPRT_COEFA | Sets the custom RTD coefficient A |
| CPRT_COEFA? | Returns the custom RTD coefficient A |
| CPRT_COEFB | Sets the custom RTD coefficient B |
| CPRT_COEFB? | Returns the custom RTD coefficient B |
| CPRT_COEFC | Sets the custom RTD coefficient C |

| | |
|--------------|--|
| CPRT_COEFC? | Returns the custom RTD coefficient C |
| CPRT_MIN_T | Sets the custom RTD minimum temperature |
| CPRT_MIN_T? | Returns the custom RTD minimum temperature |
| CPRT_MAX_T | Sets the custom RTD maximum temperature |
| CPRT_MAX_T? | Returns the custom RTD maximum temperature |
| CPRT_R0 | Sets the custom RTD R0 resistance |
| CPRT_R0? | Returns the custom RTD R0 resistance |
| FAULT? | Returns the error code of an error that has occurred |
| FREQ_LEVEL | Sets the frequency and pulse amplitude |
| FREQ_LEVEL? | Returns the frequency and pulse amplitude |
| FREQ_TYPE | Set the frequency output to continuous (frequency) or pulse. |
| FREQ_TYPE? | Returns frequency output type, continuous or pulse |
| FREQ_UNIT | Sets the unit for frequency and pulse |
| FREQ_UNIT? | Returns the unit for frequency and pulse |
| FUNC? | Returns the current mode of the upper and lower display |
| HART_ON | Turns the HART resistor on |
| HART_OFF | Turns the HART resistor off |
| HART? | Returns the state of the HART resistor |
| LOCAL | Returns user to manual operation of the calibrator |
| LOCKOUT | Locks out the keypad of the calibrator, and allows for remote operation only |
| LOOP_PWR_OFF | Turns 24V loop power off. |
| LOOP_PWR_ON | Turns 24V loop power on. |
| LOOP_PWR? | Returns the state of 24V loop power. |
| LOWER_MEAS | Sets the mode for measuring on the lower display. |
| LT_START | Begin a leak test |
| LT_STOP | Stop a leak test |
| LT_INITIAL? | Returns the initial leak test value |
| LT_FINAL? | Returns the final leak test value |
| LT_RATE? | Returns the leak rate |
| L_PRES_UNIT | Sets the pressure unit on the lower display |
| OUT | Sets the output of the calibrator |
| OUT? | Returns the output of the calibrator |
| PRES? | Returns the model and serial number of the attached pressure module |
| PRES_UNIT? | Returns the pressure unit for the upper and lower display |

| | |
|-------------|--|
| PULSE_CNT | Sets the number of pulses for the pulse train |
| PULSE_CNT? | Returns the number of pulses in the pulse train |
| REMOTE | Puts the calibrator in remote mode |
| RTD_TYPE | Sets the RTD type |
| RTD_TYPE? | Returns the RTD type |
| RTD_WIRE | Sets the number of wires used by the RTD mode. |
| RTD_WIRE? | Returns the wire number setting used in the RTD mode |
| SCALE_FUNC | Sets the scaling function to volts or mA |
| SCALE_FUNC? | Returns the scaling function |
| SCL_MA_HI | Sets 100% value for mA scaling |
| SCL_MA_HI? | Returns 100% value for mA scaling |
| SCL_MA_LO | Sets 0% value for mA scaling |
| SCL_MA_LO? | Returns 0% value for mA scaling |
| SCL_V_HI | Sets 100% value for volts scaling |
| SCL_V_HI? | Returns 100% value for volt scaling |
| SCL_V_LO | Sets 0% value for volts scaling |
| SCL_V_LO? | Returns 0% value for volt scaling |
| SCL_ERR_HI | Sets 100% value for scaling and %error |
| SCL_ERR_HI? | Returns 100% value for scaling and %error |
| SCL_ERR_LO | Sets 0% value for scaling and %error |
| SCL_ERR_LO? | Returns 0% value scaling and %error |
| SIM | Sets the output for mA simulation |
| SIM? | Returns the output of the mA simulation |
| ST_START | Starts a new switch test if the unit is in switch test mode |
| ST_CLOSE? | Returns the value at which the switch closed |
| ST_OPEN? | Returns the value at which the switch opened |
| ST_DEAD? | Returns the value of the dead band of the switch |
| TC_TYPE | Sets the thermocouple type |
| TC_TYPE? | Returns the thermocouple type |
| TEMP_UNIT | Sets input/output temperature unit for RTD and TC |
| TEMP_UNIT? | Returns the temperature unit for RTD and TC |
| TRIG | Starts and stops the pulse train in pulse mode |
| TRIG? | Returns TRIGGERED when a pulse train is on. Returns UNTRIGGERED when the pulse train is off. |
| TSENS_TYPE | Sets temperature sensor type. |
| TSENS_TYPE? | Returns temperature sensor type |

| | |
|-------------|--|
| UPPER_MEAS | Sets the measuring mode for the upper display. |
| U_PRES_UNIT | Sets the upper pressure unit |
| VAL? | Returns the measured values |
| ZERO_MEAS | Zeros the pressure module |
| ZERO_MEAS? | Returns the zero offset of the pressure module |

Table 3: Parameter units

| Units | Meaning |
|--------------|---|
| MA | milliamps of current |
| MV | Voltage in millivolts |
| V | Voltage in volts |
| CPM | Frequency in cycles per minute |
| Hz | Frequency in Hertz |
| KHz | Frequency in kiloHertz |
| Ohms | Resistance in Ohms |
| Cel | Temperature in Celsius |
| Far | Temperature in Fahrenheit |
| Psi | Pressure in pounds per square-inch |
| InH2O4C | Pressure in inches of water at 4°C |
| InH2O20C | Pressure in inches of water at 20°C |
| CmH2O4C | Pressure in centimeters of water at 4°C |
| CmH2O20C | Pressure in centimeters of water at 20°C |
| Bar | Pressure in bars |
| Mbar | Pressure in millibars |
| KPaI | Pressure in kiloPascals |
| InHg | Pressure in inches of mercury at 0°C |
| MmHg | Pressure in millimeters of mercury at 0°C |
| Kg/cm2 | Pressure in kilograms per square-centimeter |

Table 4: Error codes

| Error Number | Error Description |
|---------------------|---|
| 100 | A non-numeric entry was received where it should be a numeric entry |
| 101 | Too many significant digits entered |
| 102 | Invalid units or parameter value received |

| | |
|-----|---|
| 103 | Entry is above the upper limit of the allowable range |
| 104 | Entry is below the lower limit of the allowable range |
| 105 | A required command parameter was missing |
| 106 | An invalid pressure unit was received |
| 107 | An invalid CJC_STATE was received |
| 108 | An invalid TSENS_TYPE was received |
| 109 | Pressure module not connected |
| 110 | An unknown command was received |
| 111 | An invalid RTD or TC parameter value was received |
| 112 | The serial input buffer overflowed |
| 113 | Too many entries in the command line |
| 114 | The serial output buffer overflowed |
| 115 | Output is overloaded |
| 116 | Calibrator not in pulse train mode when TRIG was received |
| 117 | An invalid FREQ_TYPE was received |

5. Entering Commands

Commands for the calibrator may be entered in upper or lower case. There is at least one space required between the command and parameter, all other spaces are optional. Almost all commands for the calibrator are sequential, any overlapped commands will be indicated as such. This section will briefly explain each of the commands and describe their general use, which will include any parameters that may be entered with the command as well as what the output of the command is.

5.1 Common Commands

***CLS**

Clears the ESR, the error queue and the RQS bit. Also terminates all pending operations. When writing programs, use before each procedure to avoid buffer overflow.

***ESE**

Loads a byte into the Event Status Enable register. The command is entered with a decimal number that, when converted to binary, enables the right bits in the Event Status Register. For example:

*ESE 133

When 133 is converted to binary it is 10000101. Bits 7, 2, and 0 will be enabled.

***ESE?**

Returns the contents of the Event Status Enable register. The value returned is a decimal. For example, if the register has the following settings:

10000101 than the value returned will be 133.

***ESR?**

Returns the contents of the Event Status Register in decimal form. For example:

If the ESR contains 10111001, *ESR? will return 185.

***IDN?**

Returns the manufacturer, model number, and firmware revision of the Calibrator. For example:

*IDN? will return AMETEK, ASC301, 250, 1.00

***OPC**

Enables the Operation Complete setting in the ESR. This setting makes it possible to check if an operations is complete after it has been initialized.

For example this operation could be used with the command TRIG.

***OPC?**

Returns 1 when all operations are complete, and causes program execution to pause until all the operations are complete. For example:

TRIG ; *OPC? will return a 1 when the pulse train initiated by TRIG is complete.

***RST**

Resets the state of calibrator to the power-up state. All subsequent commands are held off until the execution of the command is complete.

***SRE**

Loads a byte into the Service Request Enable register. A decimal number must be entered, which when converted to binary, corresponds to the correct settings.

For example:

*SRE 8 enters the binary number 00001000 to the SRE. This enables bit 3. Bit 6 is not used.

***SRE?**

Returns a byte from the SRE. The byte is returned in decimal format. For example:

If 40 is returned, bits 5 and 3 are enabled.

***STB**

Returns the status byte in decimal form from the Serial Poll Status Byte. For example;

If 72 is returned, bits 6 and 3 are enabled.

***WAI**

Prevents further remote commands from being executed until all previous commands are executed. For example:

OUT 10 MA ; *WAI ; OUT 5 V will output 10mA and wait until output settles, then volts command will be processed.

5.2 Calibrator Commands

CAL_START

Puts the calibrator in calibration mode. The main display will say CALIBRATION MODE and a calibration menu will be displayed on the terminal.

CJC_STATE

Turns Cold Junction Compensation (CJC) on or off, when the calibrator is in thermocouple (TC) mode. The command is used by adding ON or OFF after it.

For example:

CJC_STATE OFF turns CJC off.

CJC_STATE?

Tells whether the Cold Junction Compensation in thermocouple mode is turned on or turned off. The calibrator returns OFF if CJC is off, and ON if CJC is on.

CPRT_COEFA

This command is used for entering a custom RTD into the calibrator. The numeric value entered after the command will be set as the first coefficient of the polynomial used by the custom RTD.

For example:

CPRT_COEFA 3.9083E-3 enters 3.9083E-3 as coefficient A.

CPRT_COEFA?

Returns the number which was entered for the first coefficient of the polynomial used in the custom RTD. Using the example above CPRT_COEFA? Would return:

3.9083E-3

CPRT_COEFB

This command is used for entering a custom RTD into the calibrator. The numeric value entered after the command will be set as the second coefficient of the polynomial used by the custom RTD.

For example:

CPRT_COEFB -5.775x10-7 enters -5.775x10-7 as coefficient B.

CPRT_COEFB?

Returns the number, which was entered for the first coefficient of the polynomial used in the custom RTD. Using the example above, CPRT_COEFB? Would return:

-5.775x10-7

CPRT_COEFC

This command is used for entering a custom RTD into the calibrator. The numeric value entered after the command will be set as the first coefficient of the polynomial used by the custom RTD.

For example:

CPRT_COEFC -4.183x10-12 enters -4.183x10-12 as coefficient C.

CPRT_COEFC?

Returns the number which was entered for the first coefficient of the polynomial used in the custom RTD. Using the example above CPRT_COEFC? Would return:

-4.183x10-12

CPRT_MIN_T

Sets the minimum temperature of the custom RTD range. The temperature value must be entered with a degrees label, CEL for Celsius and FAR for Fahrenheit.

For example:

CPRT_MIN_T -260 CEL enters -260°C as the minimum temperature.

CPRT_MIN_T?

Returns the value entered for minimum temperature in the range for a custom RTD. Note that the Calibrator always returns numbers in scientific notation. The above example would return:

-2.600000E+02, CEL

CPRT_MAX_T

Sets the maximum temperature of the custom RTD range. The temperature value must be entered with a degrees label, CEL for Celsius and FAR for Fahrenheit.

For example:

CPRT_MAX_T 0.0 CEL enters 0.0°C as the maximum temperature.

CPRT_MIN_T?

Returns the value entered for minimum temperature in the range for a custom RTD. The above example would return:

0.000000E+00, CEL

CPRT_R0

Sets the 0° resistance, R0, in the custom RTD. The value must be entered with a units label. Refer to the Parameter Units table for assistance.

For example:

CPRT_R0 100 OHM sets R0 to 100 ohms.

CPRT_R0?

Returns the value for the resistance in custom RTD. The above example would return:

1.000000E+02, OHM

FAULT?

Returns the error code number of an error that has occurred. The command may be entered when the previous command did not do what it was meant to do.

For example, if a value for current output is entered that is bigger than the supported range (0-24mA) FAULT? Would return:

103 which is the code number for an entry over range.

Refer to the Error Codes table for more information on error code numbers.

FREQ_LEVEL

Sets the amplitude of the wave used in the Frequency Out and Pulse modes. The range for amplitude entered may be found in the Specifications section.

For example:

FREQ_LEVEL 5 V sets the amplitude at 5Vpp.

FREQ_LEVEL?

Returns the amplitude of the wave used in Frequency Out and Pulse modes.

FREQ_LEVEL? with the above example would return:

5.000000E+00, V

FREQ_TYPE

When in frequency mode, sets the calibrator to output a continuous wave (Frequency Out), or a pulse train. To set the calibrator to continuous wave enter CONT after the command. To set the calibrator to pulse enter PULSE after the command. For example:

FREQ_TYPE CONT will set the calibrator to FREQ OUT.

Note: This command does not put the calibrator in frequency mode. Use the OUT command to put the calibrator in frequency mode.

FREQ_TYPE?

Tells whether calibrator is sourcing a pulse or a continuous wave. The command will return CONT if the calibrator is in FREQ OUT mode, and PULSE if the calibrator is in PULSE mode.

FREQ_UNIT

Sets the unit for frequency. There are three ranges of frequencies for frequency and pulse modes, CPM (cycles per minute), Hz, and kHz. Use this command to select the right range. For example:

FREQ_UNIT HZ sets the frequency to Hz range

FREQ_UNIT?

Returns the frequency unit currently being used by the frequency and pulse modes.

FUNC?

Returns the current mode of the upper and lower displays. For example if the calibrator is set to volts on the upper display, and pressure on the lower display, FUNC? Would return:

DCV, PRESSURE

HART_ON

Puts a 250 Ω Hart resistor in series with the mA source circuit and the isolated mA read with loop power circuit.

HART_OFF

Removes the 250 Ω Hart resistor from the mA source circuit and the isolated mA read with loop power circuit.

HART?

Returns the state of the Hart resistors.

LOCAL

Restores the calibrator to local operation if it was in remote mode. Also clears LOCKOUT if the unit was in lockout mode.

LOOP_PWR_OFF

Turns 24V loop power off for isolated mA read functions including %Error and Scaled mA.

LOOP_PWR_ON

Turns 24V loop power on for isolated mA read functions including %Error and Scaled mA.

LOOP_PWR?

Returns the state of the 24V loop power supply for isolated mA read functions including %Error and Scaled mA, either ON or OFF.

LOWER_MEAS

Sets the lower display to measure mode. The command is followed by any of the parameters except for pulse and mA sim, which are source only. Enter DCI for mA, DCV for volts, TC for thermocouple, RTD for RTD, FREQUENCY for frequency, and PRESSURE for pressure. For example:

LOWER_MEAS DCV sets the lower display mode to VOLTS IN

LT_START

Starts a leak test if you are in leak test mode.

LT_STOP

Stops the leak test timer and puts the unit in leak test recall mode.

LT_INITIAL?

If the unit is in leak test recall mode the query returns the pressure at the start of the leak test.

LT_FINAL?

If the unit is in leak test recall mode the query returns the pressure at the end of the leak test.

LT_RATE?

If the unit is in leak test recall mode the query returns the leak rate.

L_PRES_UNIT

Sets the unit for measuring pressure on the lower display. Add the unit after the command. The available pressure units and their syntax are shown in the Table 7. (Parameter Units).

For example:

L_PRES_UNIT KPAL sets the pressure unit to kiloPascals

OUT

Sets the output of the calibrator. This command may be used to output mA, volts, frequency, temperature, and ohms. Frequency output, which is set by the command `FREQ_TYPE`, is either continuous or pulse. The calibrator is automatically set to source mode when `OUT` is entered. A number and its unit must follow the command. See Table 7. (Parameter Units) for a list of available units. For example:

OUT 10 MA sets the calibrator to mA OUT mode and sets the output to 10mA.

OUT?

Returns the output of the calibrator. Using the above example, `OUT?` Would return:

1.000000E-02, A

PRES?

Returns the model and serial number of the attached pressure unit. Returns NONE if no pressure unit is attached. For example:

PRES? Will return AMETEK,001PNS,3,0

PRES_UNIT?

Returns the pressure units of both the upper and the lower display. For example if the unit on the upper display is bars, and on the lower it is psi, the command will return:

BAR, PSI

PULSE_CNT

Sets the number of pulses the calibrator will produce when it is triggered while in pulse mode. For example;

PULSE_CNT 3000 will set the number of pulses to 3000.

PULSE_CNT?

Returns the number of pulses in the pulse train. Using the above example, the returned value would be:

3000

REMOTE

Puts the calibrator in remote mode. From the remote mode the user can still use the keypad to get back to local unless the command LOCKOUT was entered before REMOTE. Than the keypad is totally locked out, and the user has to send the LOCAL command to get back to local operation.

RTD_TYPE

Sets the RTD type. The following is a list of RTD types they way they should be entered after the command:

| | | |
|-------------|-------------|-------------|
| P10(90)385 | P50(90) 385 | P100(90)385 |
| P200(90)385 | P400(90)385 | P500(90)385 |
| P1K(90)385 | P50(90)391 | P100(90)391 |
| P100(90)392 | M10(90)427 | M50(90)428 |
| M100(90)428 | H120(90)672 | P100(90)JIS |
| YSI(90)400 | OHMS | CUSTOM |

For example:

RTD_TYPE P10(90)385 sets RTD type to Pt385-10

RTD_TYPE?

Returns the RTD type.

RTD_WIRE

Sets the number of wires used for connection in measuring RTDs. The calibrator measures RTDs using 2-, 3-, and 4-wire connections. After the command, enter 2W for 2- wire, 3W for 3-wire, and 4W for 4-wire. For example:

RTD_WIRE 4W sets the connection to 4-wire

RTD_WIRE?

Returns the number of wires used in the RTD connection.

SCALE_FUNC

Sets the scaling function to volts or mA.

SCALE_FUNC?

Returns the scaling function.

SCL_MA_HI

Sets 100% value for mA scaling calculation. E.g. SCL_MA_HI 20 mA

SCL_MA_HI?

Returns 100% value for mA scaling

SCL_MA_LO

Sets 0% value for mA scaling calculation. E.g. SCL_MA_LO 4 mA

SCL_MA_LO?

Returns 0% value for mA scaling calculation.

SCL_V_HI

Sets 100% value for volts scaling calculation. E.g. SCL_V_HI 10 V

SCL_V_HI?

Returns 100% value for volt scaling

SCL_V_LO

Sets 0% value for volts scaling calculation. E.g. SCL_V_HI 10 V

SCL_V_LO?

Returns 0% value for volt scaling calculation.

SCL_ERR_HI

Sets 100% value for scaling and %error calculation. E.g. SCL_ERR_HI 100 CEL

SCL_ERR_HI?

Returns 100% value for scaling and %error calculation.

SCL_ERR_LO

Sets 0% value for scaling and %error calculation. E.g. SCL_ERR_LO 0 CEL

SCL_ERR_LO?

Returns 0% value scaling and %error calculation.

SIM

Sets the output for current simulation. This command also switches the calibrator into mA simulation mode. A number and a unit must be entered after the command. For example:

SIM 5 MA sets the current simulation at 5 mA

SIM?

Returns the output of the current simulation. With the example above, the output would be:

5.000000E-03, A

ST_START

Starts a new switch test if the unit is in switch test mode.

ST_CLOSE?

In switch test recall mode this command returns the value at which the switch closed.

ST_OPEN?

In switch test recall mode this command returns the value at which the switch opened.

ST_DEAD?

In switch test recall mode this command returns the dead band of the switch.

TC_TYPE

Sets the type of the thermocouple. All available types are shown in the TC Types table in Section 8. (Specifications). For example:

TC_TYPE B sets thermocouple type to B

TC_TYPE?

Returns the type of thermocouple the calibrator is set to.

TEMP_UNIT

Sets the temperature unit for sourcing and measuring RTD and TC. Add CEL after the command for Celsius, and FAR for Fahrenheit. For example:

TEMP_UNIT CEL sets the temperature to be measured or sourced to Celsius.

TEMP_UNIT?

Returns the temperature unit that is currently used for measuring and sourcing RTD and TC.

TRIG

Starts and stops the pulse train when the calibrator is in pulse mode. The parameters of the pulse train are set by commands PULSE_CNT, and FREQ_LEVEL. Entering TRIG initializes the train. Entering the command while the pulse train is running stops it.

TRIG?

Returns TRIGGERED if the pulse train is running, and returns UNTRIGGERED when the pulse train is not running. Returns NONE when the calibrator is not in pulse mode.

TSENS_TYPE

Sets the temperature sensor type to thermocouple, or to RTD for temperature measurement. After the command add TC for thermocouple, or RTD for RTDs. For example:

TSENS_TYPE TC sets the sensor type to thermocouple

TSENS_TYPE?

Returns the type of sensor that is currently set to measure temperature, either TC or RTD.

UPPER_MEAS

Sets the measuring mode for the upper display. After the command enter DCI for mA, DCI_LOOP for mA with loop power, DCV for volts, and PRESSURE for pressure. For example:

UPPER_MEAS DCV sets the upper display to measure volts

U_PRES_UNIT

Sets the unit for measuring pressure on the upper display. Add the unit after the command. The available pressure units and their syntax are shown in Table 7. (Parameter Units). For example:

U_PRES_UNIT MMHG sets the pressure unit to millimeters of mercury at 0°C

VAL?

Returns the value of any measurement taking place on the upper and lower display. For example, if the upper display is measuring 5mA, and the lower display is measuring 10V, then VAL? will return:

5.000000E-03, A, 1.000000E+01, V

ZERO_MEAS

Zeroes the attached pressure module. Enter the zeroing value in PSI after the command when zeroing an absolute pressure module.

ZERO_MEAS?

Returns the zero offset or the reference value for absolute pressure modules.

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