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Contents

About this Manual

This manual describes how to use the serial based remote commands to communicate with the 1820B Series.

1.1 Intended Audience

This document is designed for instrument programmers tasked with creating serial based programs for the 1820BSeries.

Syntax Convention

2.1 Introduction

The USB interface allows the instrument to be controlled using serial communications via a computer's USB port.

The instrument's USB interface uses a USB to UART device that communicates with the main processor's UART. Once the device drivers are installed on a PC, it appears as a standard COM port. Windows applications can access this port like any other.

When the instrument is first connected via USB, Windows' plug-and-play function will detect it and install the required driver. The 1820B uses Future Technology Devices International Ltd.'s (FTDI) VCP driver. The latest Windows version is 2.12.36.4. If the driver is not installed when the instrument is initially connected the driver can be downloaded from **ftdichip.com**

Each instrument has a unique code that assigns the same COM port number each time it's connected, regardless of the USB port. A new unit will require driver installation and get a different COM port number.

The COM port must be configured with the instrument's settings: **baud rate 115200**, 8 bits, no parity. While default values are set in Device Manager, communication programs may need manual configuration.

2.1.1 Remote Mode

When powered on, the instrument starts in the local state, allowing all front panel operations. Upon receiving a command, the instrument switches to the remote state, indicated by the "Rem" display, locking the keyboard except for the **Local/Reset** keys.

Pressing and holding the **Local/Reset** key returns the instrument to the local state, turning off the **Rem** display. However, it will re-enter the remote state if another command is received. Sending the **LOCAL** command also exits the remote state.

2.1.2 Command Format

Serial input to the instrument is buffered in an input queue that operates transparently to other functions. When the queue is nearly full, the instrument sends XOFF and later sends XON when space becomes available. The queue holds raw data, which is parsed and executed in order. A new command or query will not begin until the previous one is complete, and responses are sent immediately without an output queue.

Commands must follow the specified format, ending with the terminator code 0AH (Line Feed, LF). Multiple commands can be sent in a group, separated by 3BH (;) and terminated by 0AH. Responses are also formatted according to the command list and end with 0DH (Carriage Return, CR) followed by 0AH.

Whitespace (character codes 00H to 20H, except for 0AH) is ignored, except in command identifiers, and commands are case insensitive. Each query generates a specific response message, as listed in the remote commands list.

SCPI Data Types

The 1820B series' remote commands have various data types for use in program messages and response messages.

The following subset of data types are used for th1820B series :

* ‹Character›

* ‹String›

* ‹NR1›

This section summarizes these data types.

3.1 Character Data Types

If a command parameter takes data type, a specific number of settings are allowed for the parameter.

Example   In the function selection command the user can specify one of the follwoing character to assign the coresponding function:

{ 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | C | D }

Character data types have the following characteristics:

•   Are case insensitive in program messages but in response messages are standardized to uppercase.

•   Must have a specific length.

3.2 String Data Types

Strings used in command parameters and responses may contain any character between 20H and FFH inclusive except 3BH (;).

3.3 ‹NR1› Value Data Type

The data type ‹NR1› is utilized to indicate zero, positive, and negative integer values, including optional signs.

The following values are examples of the ‹NR1› data types:

0   100   -10

About Commands & Queries

This section lists and describes the remote control commands and queries recognized by the instrument. All commands and queries can be executed in either local or remote state.

The description, command syntax, query syntax, example and respond can be found in a section. The commands are given in both long and short form. All examples are shown in short form. Queries perform actions such as obtaining information, and are recognized by the question mark (?) following the header.

4.1 How They are Listed

The commands are listed by subsystem and alphabetical order according to their short form.

4.2 How They are Described

In the descriptions themselves, a brief explanation of the function performed is given. This is followed by a presentation of the formal syntax, with the header given in Upper-and-Lower-Case characters and the short form derived from it in ALL UPPER-CASE characters. Where applicable, the syntax of the query is given with the format of its response.

4.3 When can they be used?

The commands and queries listed here can be used for the HVL seires.

4.4 Command Notation

The following notation is used in the commands:

⟨ ⟩ Angular brackets enclose words that are used as placeholders, of which there are two types: the header path and the data parameter of a command.

:= A colon followed by an equals sign separates a placeholder from the description of the type and range of values that may be used in a command instead of the placeholder.

{ } Braces enclose a list of choices, one of which one must be made.

[ ] Square brackets enclose optional items.

… An ellipsis indicates that the items both to its left and right may be repeated a number of times.

Miscellaneous Commands

The miscellaneous commands encompass a variety of functions that don't fall under primary categories but are essential for device configuration, status reporting, and utility operations. These commands include:

5.1 *IDN?

Description The *IDN? query causes the instrument to identify itself. The response comprises manufacturer, model, serial number, software version and firmware version.

Syntax **Query** *IDN?

Response *IDN, ⟨device id⟩,⟨model⟩,⟨serial number⟩,⟨hardware version⟩.

⟨device id⟩:="B&K Precision" is used to identify instrument.

⟨model⟩:= A model identifier less than 14 characters will contain the model number.

⟨serial number⟩:= Number that uniquely identifies the instrument.

⟨hardware version⟩:= Hardware revision number.

Example *IDN?

Returns: B&K PRECISION,BK1823B,0,1.00

5.2 I?

Description Identify Query. Returns the instrument model number only.

Syntax **Query** I?

5.3 *RST

Description The Reset command performs a device reset, resets the instrument to its power-on default values and sets the Threshold Level to the midway **'AC'** position. Also empties remote I/O queues and clears error status.

Syntax **Command** *RST

Example **Command** *RST

5.4 R

Description   Reset measurement. Performs the same operation as pressing the front panel RESET key under the same conditions.

Syntax   **Command**   R

Example   **Command**   R

5.5 S?

Description   Reads and returns the instrument status. The response is sent immediately. The response is xy<rmt>, where x and y are numeric digits expressed in ASCII format. The first digit is the status byte and is a bit significant value in the range 0 to 7. The meaning of each bit is as follows:

- bit 0 External standard connected.

- bit 1 An error has occurred.

- bit 2 A continuously updated bit indicating that an input signal is being counted. It does not necessarily guarantee that there is sufficient signal for an accurate result.

The second byte contains the error number of the last error that occurred. The value is cleared to zero after each status query. Error numbers are as follows:

- 0 No error has occurred since the last status query.

- 1 A command syntax error – one or more commands ignored.

Syntax   **Query**   S?

Example   **Query**   S?

5.6 LOCAL

Description   The command returns the instrument to local state, unlocking the controls of the instruments. This includes any front panel, keyboard, or other local interfaces that are locked in remote mode.

Syntax   **Command**   LOCAL

Example   **Command**   LOCAL

5.7 UD ‹string›

Description   Store user data with a maximum length of 250 characters. The string can include any character from 20H to FFH, except 3BH (;). This can be used to assign an identifying or informational string, such as a serial number, calibration date, or owner's name, which can be queried using the UD? query.

Syntax   **Command**   UD ‹string›

Query   UD?

Example   **Command**   UD 1823B

Query   UD?

Function Subsystem

The function subsystem is responsible for controlling the primary operation mode or function of the instrument. This subsystem allows users to select and configure the specific measurement or output function of the device.

6.1 F‹character›

Description   Sets the measurement function.

Syntax   **Command**   F‹character›

Parameters   **‹character›** := { 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | C | D }

characters	Description
0	Sets the Period function for input B
1	Sets the Period function for input A
2	Sets the Frequency function for input A
3	Sets the Frequency function for input B
4	Sets the Frequency ratio B:A function
5	Sets the function to Width High Polarity for input A
6	Sets the function to Width Low Polarity for input A
7	Sets the Cound function for input A
8	Sets the Ratio H:L function for input A
9	Sets the Duty Cycle function for input A
C	Sets the Frequency function for input A
D	Sets the Period function for input C

Table 6.1   Functions

Example   **Command**   F9

6.2 AC

Description   Configures input A for AC coupling.

Syntax   **Command**   AC

Parameters   none

Example   **Command**   AC

6.3 DC

Description   Configures input A for DC coupling.

Syntax   **Command**   DC

Parameters   none

Example   **Command**   DC

6.4 Z1

Description   Configures input A for $1M\Omega$ impedance.

Syntax   **Command**   Z1

Parameters   none

Example   **Command**   Z1

6.5 Z5

Description   Configures input A for 50Ω impedance.

Syntax   **Command**   Z5

Parameters   none

Example   **Command**   Z5

6.6 A1

Description   Configures input A to 1:1 attenuation.

Syntax   **Command**   A1

Parameters   none

Example   **Command**   A1

6.7 A5

Description   Configures input A to 5:1 attenuation.

Syntax   **Command**   A5

Parameters   none

Example   **Command**   A5

6.8 ER

Description   Configures the rising edge of the waveforma s the start of the measurement.

Syntax   **Command**   ER

Parameters   none

Example   **Command**   ER

6.9 EF

Description   Configures the falling edge of the waveforma s the start of the measurement.

Syntax   **Command**   EF

Parameters   none

Example   **Command**   EF

6.10 FI

Description   Enables the Low Pass filter.

Syntax   **Command**   FI

Parameters   none

Example   **Command**   FI

6.11 FO

Description   Disables the Low Pass filter

Syntax   **Command**   FO

Parameters   none

Example   **Command**   FO

Threshold Subsystem

The Trigger Threshold subsystem controls the voltage level at which the instrument recognizes and registers an input signal as a valid trigger. This subsystem is crucial for defining the sensitivity of the counter to incoming signals and ensuring accurate event counting or time interval measurements.

7.1 TT ‹NR1›

Description   Configures the DC coupling trigger threshold.

The query returns the set DC trigger threshold. The returned value is in the ‹**NR1**

Syntax   **Command**   TT ‹NR1›

Query   TT?

Parameters   ‹**NR1**› := { -300 to 2100 mV }

NOTICE   Values for TT assume an input attenuation setting of 1:1; for 5:1 attenuation the effective levels will be the set value x 5.

Example   **Command**   TT 100
Query   TT?

7.2 TO ‹NR1›

Description   Configures the AC coupling trigger threshold.

The query returns the set AC trigger threshold. The returned value is in the ‹**NR1**

Syntax   **Command**   TO ‹NR1›

Query   TO?

Parameters   ‹**NR1**› := { -60 to 60 mV }

NOTICE   Values for TO assume an input attenuation setting of 1:1; for 5:1 attenuation the effective levels will be the set value x 5.

Example   **Command**   TO 5
Query   TO?

7.3 TA

Description   Enables auto triggering for the DC coupling trigger threshold. The threshold automatically adjusts to the average level of the waveform being measured (no offset).

The trigger threshold is configured independently of the front panel control. Upon entering the remote state, the trigger level is retained as previously set via the front panel (the TO? or TT? commands can be used to verify this, depending on whether AC or DC coupling is applied). When exiting the remote state, the trigger level reverts to the value determined by the front panel control position.

While mV resolution is available, internal offsets may result in the actual value being approximate, though sufficiently accurate for setting standard logic thresholds. For applications requiring maximum sensitivity to small signals in DC coupling, some experimentation may be necessary.

It is important to note that using TO ⟨NR1⟩ with DC coupling or TT ⟨NR1⟩ with AC coupling may lead to unpredictable behavior. Users should ensure that the settings are consistent with each other and appropriate for the measurement application. The TA command, which requires prior selection of DC coupling, can be useful for automatically determining a suitable measurement threshold for low-frequency waveforms or high-frequency waveforms with small duty cycles. There is no equivalent setting on the front panel for this function.

Syntax   **Command**   TA

Parameters   none

Example   **Command**   TA

Measure Subsystem

The MEASure subsystem configureas the acdquisition settings of the instrument as well as acquires data from the instrument.

8.1 M‹character›

Description   Configures the measurement time.

Syntax   **Command**   M‹character›

Parameters   ‹character› := {1 | 2 | 3 | 4 }

characters	Description
1	0.3 s
2	1 s
3	10 s
4	100 s

Table 8.1   Gate Time

Example   **Command**   M1

8.2 E?

Description   The query continuously returns measurements at the set intervals (0.3s, 1s, 10s, or 100s), ensuring all are valid. The process can be stopped by **STOP** or any other command.

Values are returned in the ‹ data type.

Syntax   **Query**   E?

Parameters   none

Example   **Query**   E?

8.3 N?

Description   The query continuously returns measurements at the LCD update rate based on the selected measurement time (2s, 1s, 0.5s, or 0.3s for 100s, 10s, 1s, or 0.3s, respectively). Results are sent regardless of the **Measure** annunciator, meaning some may be invalid. The process can be stopped by **STOP** or any other command.

Values are returned in the ‹ data type.

Syntax   **Query**   N?

Parameters   none

Example   **Query**   N?

8.4 ?

Description   The query returns most recent measurement from the LCD is sent, whether or not the ‹Measure› annunciator was flashing, so it may be invalid.

Values are returned in the ‹ data type (NNNNNNN.NNNeSEuu) where:

Symbol	Description
NNNNNNN.NNN	Displayed value (11 characters)
e	Exponent indicator
S	Sign of the exponent (+ or -)
E	Exponent value (Hz or seconds)
uu	Units (Hz, s_, %, or _ _)

Table 8.2   Measurement Format

If no measurement is available, the response is `0000000000.e+0 `.

Syntax   **Query**   ?

Parameters   none

Example   **Query**   ?

8.5 STOP

Description	Stops further measurements being sent in response to E? or C?; any other command will also stop further measurements being sent, as well as initiating the action of that command.	
Syntax	**Command**	STOP
Parameters	none	
Example	**Command**	STOP

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