Contents

About this Manual

This manual describes how to use the Standard Commands for Programming Instruments (SCPI) to communicate with the HVL Series.

1.1 Intended Audience

This document is designed for instrument programmers tasked with creating SCPI-based programs for the HVL Series.

1.2 Related Documents

Refer to the following documents for more information:

- HVL Series User's Manual. This manual describes the operation of the HVL Series.
- Standard Commands for Programming Instruments (SCPI), Volume1-4, Version 1990.0 May 1999, SCPI Consortium, 2515 Camino del Rio South, Suite 340, San Diego, Ca 92108.
- IEEE Std 488.2-1992, The Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017-2394, USA (ISBN 1-55937-238-9)

Syntax Convention

2.1 Introduction

SCPI (Standard Commands for Programmable Instruments) serves as a universal programming language designed for electronic test and measurement instruments. It is grounded in the IEEE 488.1 and IEEE 488.2 standards. The HVL series aligns with the SCPI language and incorporates the IEEE 488.2 STD status structure.

The commands can be issued over VISA or socket using TCP port 5025.

2.1.1 Types of SCPI Messages

In order to program an HVL instrument, it is necessary to create a program message. This message comprises one or more appropriately formatted SCPI commands transmitted from the controller to the HVL instrument. The program message, which can be sent at any time, requests the instrument to execute a specific action or provide data or status information. These requests are also referred to as queries.

Upon receiving a query, the HVL instrument responds by sending a response message back to the controller. This response message contains data formatted in a specific SCPI format.

The following documents provide more information about SCPI programming:

- Standard Commands for Programming Instruments (SCPI), Volume1-4, Version 1990.0 May 1999, SCPI Consortium, 2515 Camino del Rio South, Suite 340, San Diego, Ca 92108.
- IEEE Std 488.2-1992, The Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017-2394, USA (ISBN 1-55937-238-9)

2.2 Types of SCPI Commands

Two types of SCPI commands are available: common commands, described below, and device-specific subsystem commands, described in section ??.

2.2.1 Common Commands

Common SCPI commands, as defined by IEEE 488.2, are responsible for controlling and managing generic system functions like reset, self-test, configuration storage, and device identification. Typically, common commands start with an asterisk (*), have a length of four to five characters, and may involve one or more parameters. The command keyword is separated from the initial parameter by a space. Multiple commands can be separated using a semicolon (;), as demonstrated below:

*RST; *CLS; *ESE 32; *OPC?

Refer to **Table 2.1** for a summary of these common SCPI commands applicable to programming the HVL series. For a detailed description of these commands, consult **Chapter 5**.

Command	Description
*CLS	Clears all Event Registers summarized in the status byte.
*ESR?	Returns an <NR1>, representing the value of the Standard Event Status Register. Reading the value of the register will result in its clearance.
*IDN?	Returns the unique identification string of the instrument.
*TRG	Generates a bus trigger to the instrument.
*SAV	Stores the present state and calibration data to the internal nonvolatile memory.

Table 2.1 Common SCPI Commands

2.3 Syntax of Program Messages

A program message consist of one or more properly formatted SCPI commands, a parameter (if necessary, and a terminator sent from the controller to the HVL instrument to request some action or to query the instrument for a response.

Figure 2.3 shows the syntax of a program message:

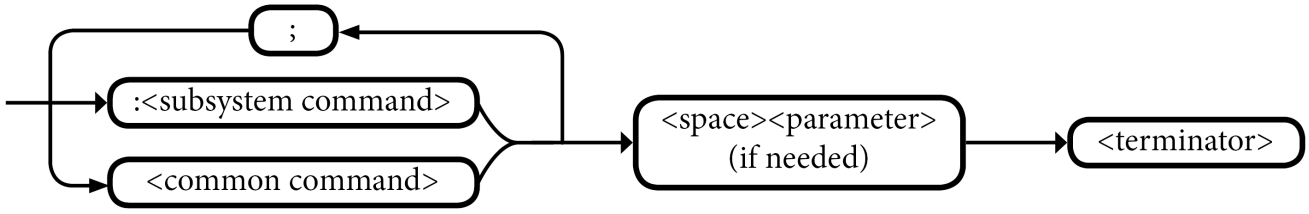

Figure 2.1 Syntax of Program Messages

A semicolon (;) is used to link commands from different groups.

SCPI Data Types

SCPI defines various data types for use in program messages and response messages.

The HVL series uses the following subset of SCPI data types:

- Character
- <NR1>
- <NR2>
- <NRf>
- <Boolean>

This section summarizes these data types. Refer to the SCPI standards document for more information about 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 command MODE the user can specify one of the following character data types:

{ UI | UIP | UIR | PVSIM | USER | SKRIPT }

Character data types have the following characteristics:

- Can be expressed in either the short or long form, while response messages return them exclusively in the short form.
- Are case insensitive in program messages but in response messages are standardized to uppercase.
- Must have a specific length.

3.2 <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

3.3 <NR2> Value Data Type

The data type <NR2> is utilized to indicate zero, positive, and positive and negative decimal values, including optional signs and decimal points.

The difference between <NR1> and <NR2> is the explicit decimal point.

The following values are examples of the <NR1> data types:

200.50 100.0 0.0

NOTICE 0 is a special case and redundant decimal points are ignored.

3.4 <NRf> Value Data Type

The <NRf> data type is employed to define floating-point values. These values encompass digits with an implied decimal point, an explicit decimal point, or an explicit decimal point along with an exponent.

The following values are examples of the <NRf> data types:

200 15.000e-3 0.015

3.5 Boolean Data Type

A Boolean data type for a parameter and response represents a single binary condition that is either True or False. Boolean values are defined as follows:

- **0 or OFF** : Indicates that the condition is False.
- **1 or ON** : Indicates that the condition is True.

NOTICE The characters OFF and ON are not case sensitive.

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.

Common SCPI Commands

IEEE standard defines the common commands used for querying the basic inSyntaxion of the instrument or executing basic operations. These commands usually start with "*" and the length of the keywords of the command is usually 3 characters.

5.1 *CLS

Description This command clears all status data structures in a device.
For a device which minimally complies with SCPI, these registers are:

SESR	
OPERation Status	
Register	**(IEEE 488.2)**
QUEStionable Status	**(SCPI)**
Register	**(SCPI)**
Error/Event Queue	**(SCPI)**

Execution of *CLS shall also clear any additional status data structures implemented in the device.
The corresponding enable registers are unaffected.

***CLS** forces the device into OCIS and OQIS without setting the **No Operation Pending** flag TRUE and without setting the OPC bit of the SESR TRUE and without placing a “1”
into the Output Queue.

For example, suppose a device implements **INITiate[:IMMediate]** as an overlapped command.
Assuming that the trigger model is programmed so that it will eventually return to the IDLE state,
and that INITiate[:IMMediate] takes longer to execute than *OPC, sending these commands to this
device:

INITiate;*OPC

results in initiating the trigger model and, after some time, setting the OPC bit in the SESR. However, sending these commands:

INITiate;*OPC;*CLS

still initiates the trigger model. Since the operation is still pending when the device executes ***CLS**,
the device does not set the OPC bit until it executes another ***OPC** command.

Example *CLS

5.2 *ESR?

Description Query the Standard Event Status Register. Once a bit is set, it remains set until cleared by a ***CLS**
(clear status) command or queried by this command. A query of this register returns a decimal value
which corresponds to the binary-weighted sum of all bits set in the register.

Syntax *ESR <value>
<value> := 0 to 255

Query *ESR?

Example *ESR?

Return: 0

Related *CLS, *ESE

5.3 *IDN?

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

Query *IDN?

Response *IDN, <device id>,<model>,<serial number>, <software version>,
<hardware version>.

<device id>:="BK" 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.

<firmware version>:= Firmware revision number.

<hardware version>:= Hardware revision number.

Example *IDN?

Returns: B&K Precision,HVL6003008K,000000000,0.13-2.12-2-1-A1.23

5.4 *SAV

Description Store (save) the current instrument state in the specified non-volatile storage location. Any state previously stored in the same location will be overwritten. The instrument state can be stored in any of the
10 storage locations (0-9).

An instrument reset (*RST command) does not affect the configurations stored in memory.
Once a state is stored, it remains until it is overwritten or specifically deleted.

If OUTPut:PN:STATe is set to LAST the settings set when the instrument is powered off will be save in the selected User Settings, overwriting any previous saved settings in theis location.

Syntax *SAV <memory address>
<memory address> := {0 to 9}

Example *SAV 0

Related *RCL

5.5 *TRG

Description The *TRG command generates an immediate trigger when the trigger source is set to **BUS**.

Syntax *TRG

Example *TRG

Related TRIGger:SOURce

Input Subsystem

The INPut subsystem controls the characteristics of the load's input port.

6.1 INPut[:STATe] <Boolean>

Description Enables/Disables the input. When the input is disabled, it signifies a state of zero input voltage and zero source current.

The query returns the electronic load's input state, with the returned value being "0" (OFF) or "1" (ON).

NOTICE Upon resetting the instrument, the input state is off.

Syntax

Command	INPut[:STATe] <Boolean>	
Query	INPut[:STATe]?	

Parameters <Boolean> := { 0 | 1 | OFF | ON }

Example

Command	INP 1	Enables the input
Query	INP?	Query the input's state

Current System

The CURRent subsystem controls the current's amplitude characteristics of the source.

7.1 CURRent:DUTY <NR1>

Description The command sets the duty cycle of the continuous transient operation in constant current mode. Units are in percentage.

The query returns the programmed duty cycle for the continuous transient function in CC mode. The data is returned in the <NR1> data type.

Syntax

Command	CURRent:DUTY <NR1>
Query	CURRent:DUTY?

Parameters <**NR1**> := { 1 to 99 | MIN | MAX }

Example

Command	CURR:DUTY 50	Sets the duty cycle to 50%
Query	CURR:DUTY?	Query the set duty cycle.

7.2 CURRent:FREQuency <NRf>

Description The command sets the pulse frequency for the continuous transient operation in constant current mode. Units are in hertz .

The query returns the programmed frequency for the continuous transient function in CC mode. The data is returned in the <NRf> data type.

Syntax

Command	CURRent:FREQuency <NRf>
Query	CURRent:FREQuency?

Parameters <**NRf**> := { 0.03 to 10000 }

Example

Command	CURR:FREQ 1000	Sets the frequency to 1kHz%
Query	CURR:FREQ?	Query the set frequency.

7.3 CURRent[:LEVel]:[IMMediate] <NRf>

Description The command sets the immediate current level when the input is in constant current mode. Units are in amperes.

The query returns the programmed current level in the <NRf> data type.

NOTICE If the electronic is not in CC mode, the programmed value that is saved will apply when the electronic load is changed to CC mode.

Syntax **Command** CURRent[:LEVel][:IMMediate] <NRf>

Query CURRent[:LEVel][:IMMediate]?

Parameters <**NRf**> := { 0.000 to max current range }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CC Mode							
Range	Low	0 - 15 A	0 - 7.5 A	0 - 2.5 A	0 - 30 A	0 - 15 A	0 - 5 A
	High	0 - 150 A	0 - 75 A	0 - 25 A	0 - 300 A	0 - 150 A	0 - 50 A
Resolution		10 mA	5 mA	1.7 mA	20 mA	10 mA	3.3 mA

Table 7.1 Current Ranges

Example **Command** CURR 300.00 Sets the current level to 300 A.

Query CURR? Query the set current level.

7.4 CURRent:LIMit:MAXimum <NRf>

Description The command sets the maximum current limit level when the input is in constant current mode. Units are in amperes.

The query returns the programmed maximum current limit in the <NRf> data type.

NOTICE If the electronic is not in CC mode, the programmed value that is saved will apply when the electronic load is changed to CC mode.

Syntax **Command** CURRent:LIMit:MAXimum <NRf>

Query CURRent:LIMit:MAXimum?

Parameters <**NRf**> := { 0.000 to max current range | MIN | MAX }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CC Mode							
Range	Low	0 - 15 A	0 - 7.5 A	0 - 2.5 A	0 - 30 A	0 - 15 A	0 - 5 A
	High	0 - 150 A	0 - 75 A	0 - 25 A	0 - 300 A	0 - 150 A	0 - 50 A
Resolution		10 mA	5 mA	1.7 mA	20 mA	10 mA	3.3 mA

Table 7.2 Current Ranges

Example **Command** CURR:LIM:MAX 300 Sets the max adjustable current level.

Query CURR:LIM:MAX? Query the max adjustable current level.

7.5 CURRent:LIMit:MINimum <NRf>

Description The command sets the minimum current limit level when the input is in constant current mode. Units are in amperes.

The query returns the programmed minimum current limit in the <NRf> data type.

NOTICE If the electronic is not in CC mode, the programmed value that is saved will apply when the electronic load is changed to CC mode.

Syntax **Command** CURRent:LIMit:MINimum <NRf>

Query CURRent:LIMit:MINimum?

Parameters <**NRf**> := { 0.000 to min current range | MIN | MAX }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CC Mode							
Range	Low	0 - 15 A	0 - 7.5 A	0 - 2.5 A	0 - 30 A	0 - 15 A	0 - 5 A
	High	0 - 150 A	0 - 75 A	0 - 25 A	0 - 300 A	0 - 150 A	0 - 50 A
Resolution		10 mA	5 mA	1.7 mA	20 mA	10 mA	3.3 mA

Table 7.3 Current Ranges

Example **Command** CURR:LIM:MIN 10 Sets the min adjustable current level.

Query CURR:LIM:MIN? Query the min adjustable current level.

7.6 CURRent:PROTection:OVER <NRf>

Description The command sets the output level at which the output's over current protection function will trip. Units are in amperes.

The query returns the programmed level at which the output's over current protection function will trip in the <NRf> data type.

Syntax **Command** CURRent:PROTection:OVER <NRf>

Query CURRent:PROTection:OVER?

Parameters <**NRf**> := { 0 to maximum current | MIN | MAX }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CC Mode							
Range	Low	0 - 15 A	0 - 7.5 A	0 - 2.5 A	0 - 30 A	0 - 15 A	0 - 5 A
	High	0 - 150 A	0 - 75 A	0 - 25 A	0 - 300 A	0 - 150 A	0 - 50 A
Resolution		10 mA	5 mA	1.7 mA	20 mA	10 mA	3.3 mA

Table 7.4 Current Ranges

Example **Command** CURR:PROT:OVER 300 Sets the OCP value to 300 A

Query CURR:PROT:OVER? Query the OCP value

7.7 CURRent:PROTection:OVER:DELay <NR1>

Description The command sets the over current protection delay time in milliseconds. The output protection function will not trip during the delay time. After the delay time elapses, the protection function will trip.

The query returns the programmed delay time in the <NR1> data type.

Syntax

Command	CURRent:PROTection:OVER:DELay <NR1>
Query	CURRent:PROTection:OVER:DELay?

Parameters <**NR1**> := { 10 to 10000 | MIN | MAX }

Example

Command	CURR:PROT:OVER:DEL 100	Sets the OCP delay to 300 ms
Query	CURR:PROT:OVER:DEL?	Query the OCP delay

7.8 CURRent:PROTection:OVER:STATe <boolean>

Description The command enables/disabled the output's over current protection function.

The query returns the over current protection state, with the retuned value being "0" (OFF) or "1" (ON).

Syntax

Command	CURRent:PROTection:OVER:STATe <boolean>
Query	CURRent:PROTection:OVER:STATe?

Parameters <**boolean**> := { 0 | 1 | OFF | ON }

Example

Command	CURR:PROT:OVER:STAT 1	Enables OCP
Query	CURR:PROT:OVER:STAT?	Query the OCP state

7.9 CURRent:SLEW:NEGative <NRf>

Description The command sets the negative slew rate from transient level to main level in CC mode. Units are in amperes per milliseconds.

The query returns the programmed negative slew rate of the transient operation in CC mode. The returned value is in the <NRf> data type.

Syntax

Command	CURRent:SLEW:NEGative <NRf>
Query	CURRent:SLEW:NEGative?

Parameters <**NRf**> := { 0.1 to 5400 | MIN | MAX}

Example

Command	CURR:SLEW:NEG 1	Sets the fall time to 1 A/ms
Query	CURR:SLEW:NEG?	Query the fall time

7.10 CURRent:SLEW:POSitive <NRf>

Description The command sets the positive slew rate from main level to transient level in CC mode. Units are in amperes per milliseconds.

The query returns the programmed positive slew rate of the transient operation in CC mode. The returned value is in the <NRf> data type.

Syntax

Command	CURRent:SLEW:POSitive <NRf>
Query	CURRent:SLEW:POSitive?

Parameters <**NRf**> := { 0.1 to 5400 | MIN | MAX}

Example

Command	CURR:SLEW:POS 1	Sets the rise time to 1 A/ms
Query	CURR:SLEW:POS?	Query the rise time

7.11 CURRent:TLEVel <NRf>

Description The command specifies the transient of the input current level. The transient function switches between the **immediate setting** and the transient level. Units are in amperes.

The query returns the programmed transient current level in the <NRf> data type.

Syntax **Command** CURRent:TLEVel <NRf>

Query CURRent:TLEVel?

Parameters <**NRf**> := { 0 to maximum | MIN | MAX}

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CC Mode							
Range	Low	0 - 15 A	0 - 7.5 A	0 - 2.5 A	0 - 30 A	0 - 15 A	0 - 5 A
	High	0 - 150 A	0 - 75 A	0 - 25 A	0 - 300 A	0 - 150 A	0 - 50 A
Resolution		10 mA	5 mA	1.7 mA	20 mA	10 mA	3.3 mA

Table 7.5 Current Ranges

Example **Command** CURR:TLEV 25 Sets the current transient level to 25 A
Query CURR:TLEV? Query the transient current level

7.12 CURRent:TWIDth <NRf>

Description The command sets the pulse width of transient pulse operation in CC mode. Units are in milliseconds.

The query returns the programmed pulse width of the transient pulse operation in CC mode. The value returned is in the <NRf> data type.

Syntax **Command** CURRent:TWIDth <NRf>

Query CURRent:TWIDth?

Parameters <**NRf**> := { 1 to 17500 | MIN | MAX}

Example **Command** CURR:TWID 1000 Sets the pulse width to 1 s
Query CURR:TWID? Query the set pulse width

Voltage Subsystem

The VOLTage subsystem controls the voltage's amplitude characteristics of the source.

8.1 VOLTage:DUTY <NR1>

Description The command sets the duty cycle of the continuous transient operation in constant voltage mode. Units are in percentage.

The query returns the programmed duty cycle for the continuous transient function in CV mode. The data is returned in the <NR1> data type.

Syntax

Command	VOLTage:DUTY <NR1>
Query	VOLTage:DUTY?

Parameters <**NR1**> := { 1 to 99 | MIN | MAX }

Example

Command	VOLT:DUTY 50	Sets the duty cycle to 50%
Query	VOLT:DUTY?	Query the set duty cycle.

8.2 VOLTage:FREQuency <NRf>

Description The command sets the pulse frequency for the continuous transient operation in constant voltage mode. Units are in hertz .

The query returns the programmed frequency for the continuous transient function in CV mode. The data is returned in the <NRf> data type.

Syntax

Command	VOLTage:FREQuency <NRf>
Query	VOLTage:FREQuency?

Parameters <**NRf**> := { 0.03 to 10000 }

Example

Command	VOLT:FREQ 1000	Sets the frequency to 1kHz%
Query	VOLT:FREQ?	Query the set frequency.

8.3 VOLTage[:LEVel]:[IMMediate] <NRf>

Description The command sets the immediate voltage level when the input is in constant voltage mode. Units are in volts.

The query returns the programmed voltage level in the <NRf> data type.

NOTICE If the electronic is not in CV mode, the programmed value that is saved will apply when the electronic load is changed to CV mode.

Syntax

Command VOLTage[:LEVel][:IMMediate] <NRf>

Query VOLTage[:LEVel][:IMMediate]?

Parameters <**NRf**> := { 0.000 to max voltage range }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CV Mode							
Range	Low	0 - 60 V	0 - 80 V	0 - 100 V	0 - 60 V	0 - 80 V	0 - 100 V
	High	0 - 600 V	0 - 800 V	0 - 1000 V	0 - 600 V	0 - 800 V	0 - 1000 V
Resolution		400 mV	50 mV	100 mV	40 mV	50 mV	100 mV

Table 8.1 Voltage Ranges

Example

Command	VOLT 50.00	Sets the voltage level to 50 V.
Query	VOLT?	Query the set voltage level.

8.4 VOLTage:LIMit:MAXimum <NRf>

Description The command sets the maximum voltage limit level when the input is in constant voltage mode. Units are in volts.

The query returns the programmed maximum voltage limit in the <NRf> data type.

NOTICE If the electronic is not in CV mode, the programmed value that is saved will apply when the electronic load is changed to CV mode.

Syntax **Command** VOLTage:LIMit:MAXimum <NRf>

Query VOLTage:LIMit:MAXimum?

Parameters <**NRf**> := { 0.000 to max voltage range | MIN | MAX }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CV Mode							
Range	Low	0 - 60 V	0 - 80 V	0 - 100 V	0 - 60 V	0 - 80 V	0 - 100 V
	High	0 - 600 V	0 - 800 V	0 - 1000 V	0 - 600 V	0 - 800 V	0 - 1000 V
Resolution		400 mV	50 mV	100 mV	40 mV	50 mV	100 mV

Table 8.2 Voltage Ranges

Example **Command** VOLT:LIM:MAX 100.00 Sets the max configurable voltage.

Query VOLT:LIM:MAX? Query the min configurable voltage level.

8.5 VOLTage:LIMit:MINimum <NRf>

Description The command sets the minimum voltage limit level when the input is in constant voltage mode. Units are in volts.

The query returns the programmed minimum voltage limit in the <NRf> data type.

NOTICE If the electronic is not in CV mode, the programmed value that is saved will apply when the electronic load is changed to CV mode.

Syntax **Command** VOLTage:LIMit:MINimum <NRf>

Query VOLTage:LIMit:MINimum?

Parameters <**NRf**> := { 0.000 to min voltage range | MIN | MAX }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CV Mode							
Range	Low	0 - 60 V	0 - 80 V	0 - 100 V	0 - 60 V	0 - 80 V	0 - 100 V
	High	0 - 600 V	0 - 800 V	0 - 1000 V	0 - 600 V	0 - 800 V	0 - 1000 V
Resolution		400 mV	50 mV	100 mV	40 mV	50 mV	100 mV

Table 8.3 Voltage Ranges

Example **Command** VOLT:LIM:MIN 10.00 Sets the min configurable voltage

Query VOLT:LIM:MIN? Query the min configurable voltage

8.6 VOLTage:PROTection:OVER <NRf>

Description The command sets the output level at which the output's over voltage protection function will trip. Units are in volts.

The query returns the programmed level at which the output's over voltage protection function will trip in the <NRf> data type.

Syntax **Command** VOLTage:PROTection:OVER <NRf>

Query VOLTage:PROTection:OVER?

Parameters <**NRf**> := { 0 to maximum voltage | MIN | MAX }

MODEL	HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
Programmable Protection						
Over Voltage	630 ±12 V	840 ±16 V	1050 ±20 V	630 ±12 V	840 ±16 V	1050 ±20 V

Table 8.4 Over Voltage Protection

Example

Command	VOLT:PROT:OVER 800	Sets the OVP value to 800 V
Query	VOLT:PROT:OVER?	Query the OVP value

8.7 VOLTage:PROTection:OVER:DELay <NR1>

Description The command sets the over voltage protection delay time in milliseconds. The output's voltage protection function will not trip during the delay time. After the delay time elapses, the protection function will trip.

The query returns the programmed delay time in the <NR1> data type.

Syntax

Command	VOLTage:PROTection:OVER:DELay <NR1>
Query	VOLTage:PROTection:OVER:DELay?

Parameters <**NR1**> := { 10 to 10000 | MIN | MAX }

Example

Command	VOLT:PROT:OVER:DEL 100	Sets the OVP delay to 300 ms
Query	VOLT:PROT:OVER:DEL?	Query the OVP delay

8.8 VOLTage:PROTection:OVER:STATe <boolean>

Description The command enables/disabled the output's over voltage protection function.

The query returns the over voltage protection state, with the retuned value being "0" (OFF) or "1" (ON).

Syntax

Command	VOLTage:PROTection:OVER:STATe <boolean>
Query	VOLTage:PROTection:OVER:STATe?

Parameters <**boolean**> := { 0 | 1 | OFF | ON }

Example

Command	VOLT:PROT:OVER:STAT 1	Enables OVP
Query	VOLT:PROT:OVER:STAT?	Query the OVP state

8.9 VOLTage:PROTection:UNDer:HIGH <boolean>

Description The command sets the output high level at which the output's under voltage protection function will trip. Units are in volts.

The query returns the programmed high level at which the output's under voltage protection function will trip in the <NRf> data type.

Syntax **Command** VOLTage:PROTection:UNDer:HIGH <NRf>

Query VOLTage:PROTection:UNDer:HIGH?

Parameters <**NRf**> := { 0 to maximum voltage| MIN | MAX }

MODEL	HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
Programmable Protection						
Under Voltage	0.45 - 600 V	0.6 - 800 V	0.75 - 1000 V	0.45 - 600 V	0.6 - 800 V	0.75 - 1000 V

Table 8.5 Programmable Under Voltage Protection

Example **Command** VOLT:PROT:OVER:UNDer:HIGH 750 Sets the UVP high level

Query VOLT:PROT:UNDer:HIGH? Query the UVP high level value

8.10 VOLTage:SLEW:NEGative <NRf>

Description The command sets the negative slew rate from transient level to main level in CV mode. Units are in volts per milliseconds.

The query returns the programmed negative slew rate of the transient operation in CV mode. The returned value is in the <NRf> data type.

Syntax

Command	VOLTage:SLEW:NEGative <NRf>
Query	VOLTage:SLEW:NEGative?

Parameters <**NRf**> := { 0.1 to 5400 | MIN | MAX}

Example

Command	VOLT:SLEW:NEG 1	Sets the fall time to 1 V/ms
Query	VOLT:SLEW:NEG?	Query the fall time

8.11 VOLTage:SLEW:POSitive <NRf>

Description The command sets the positive slew rate from main level to transient level in CV mode. Units are in volts per milliseconds.

The query returns the programmed positive slew rate of the transient operation in CV mode. The returned value is in the <NRf> data type.

Syntax

Command	VOLTage:SLEW:POSitive <NRf>
Query	VOLTage:SLEW:POSitive?

Parameters <**NRf**> := { 0.1 to 5400 | MIN | MAX}

Example

Command	VOLT:SLEW:POS 1	Sets the rise time to 1 V/ms
Query	VOLT:SLEW:POS?	Query the rise time

8.12 VOLTage:TLEVel <NRf>

Description The command specifies the transient of the input voltage level. The transient function switches between the **immediate setting** and the transient level. Units are in volts.

The query returns the programmed transient voltage level in the <NRf> data type.

Syntax **Command** VOLTage:TLEVel <NRf>

Query VOLTage:TLEVel?

Parameters <**NRf**> := { 0 to maximum | MIN | MAX}

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CV Mode							
Range	Low	0 - 60 V	0 - 80 V	0 - 100 V	0 - 60 V	0 - 80 V	0 - 100 V
	High	0 - 600 V	0 - 800 V	0 - 1000 V	0 - 600 V	0 - 800 V	0 - 1000 V
Resolution		400 mV	50 mV	100 mV	40 mV	50 mV	100 mV

Table 8.6 Voltage Ranges

Example

Command	VOLT:TLEV 25	Sets the voltage transient level to 25 A
Query	VOLT:TLEV?	Query the transient voltage level

8.13 VOLTage:TWIDth <NRf>

Description The command sets the pulse width of transient pulse operation in CV mode. Units are in milliseconds.

The query returns the programmed pulse width of the transient pulse operation in CV mode. The value returned is in the <NRf> data type.

Syntax **Command** VOLTage:TWIDth <NRf>

Query VOLTage:TWIDth?

Parameters <**NRf**> := { 1 to 17500 | MIN | MAX}

Example

Command	VOLT:TWID 1000	Sets the pulse width to 1 s
Query	VOLT:TWID?	Query the set pulse width

8.14 VOLTage:PROTection:UNDer:LOW <boolean>

Description The command sets the output low level at which the output's under voltage protection function will trip. Units are in volts.

The query returns the programmed low level at which the output's under voltage protection function will trip in the <NRf> data type.

Syntax

Command VOLTage:PROTection:UNDer:LOW <NRf>

Query VOLTage:PROTection:UNDer:LOW?

Parameters <**NRf**> := { minimum to maximum voltage | MIN | MAX }

MODEL	HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
Programmable Protection						
Under Voltage	0.45 - 600 V	0.6 - 800 V	0.75 - 1000 V	0.45 - 600 V	0.6 - 800 V	0.75 - 1000 V

Table 8.7 Programmable Under Voltage Protection

Example

Command	VOLT:PROT:OVER:UNDer:LOW 0.45	Sets the UVP low level
Query	VOLT:PROT:UNDer:LOW?	Query the UVP low level

8.15 VOLTage:PROTection:UNDer:STATe <boolean>

Description The command enables/disabled the output's under voltage protection function.

The query returns the under voltage protection state, with the retuned value being "0" (OFF) or "1" (ON).

Syntax

Command	VOLTage:PROTection:UNDer:STATe <boolean>
Query	VOLTage:PROTection:UNDer:STATe?

Parameters <**boolean**> := { 0 | 1 | OFF | ON }

Example

Command	VOLT:PROT:UND:STAT 1	Enables UVP
Query	VOLT:PROT:UND:STAT?	Query the UVP state

Power Subsystem

The POWer subsystem controls the power's characteristics of the source.

9.1 POWer:DUTY <NR1>

Description The command sets the duty cycle of the continuous transient operation in constant power mode. Units are in percentage.

The query returns the programmed duty cycle for the continuous transient function in CW mode. The data is returned in the <NR1> data type.

Syntax

Command	POWer:DUTY <NR1>
Query	POWer:DUTY?

Parameters <**NR1**> := { 1 to 99 | MIN | MAX }

Example

Command	POW:DUTY 50	Sets the duty cycle to 50%
Query	POW:DUTY?	Query the set duty cycle.

9.2 POWer:FREQuency <NRf>

Description The command sets the pulse frequency for the continuous transient operation in constant power mode. Units are in hertz .

The query returns the programmed frequency for the continuous transient function in CW mode. The data is returned in the <NRf> data type.

Syntax

Command	POWer:FREQuency <NRf>
Query	POWer:FREQuency?

Parameters <**NRf**> := { 0.03 to 10000 }

Example

Command	POW:FREQ 1000	Sets the frequency to 1kHz%
Query	POW:FREQ?	Query the set frequency.

9.3 POWer[:LEVel]:[IMMediate] <NRf>

Description The command sets the immediate power level when the input is in constant power mode. Units are in watts.

The query returns the programmed power level in the <NRf> data type.

NOTICE If the electronic is not in CW mode, the programmed value that is saved will apply when the electronic load is changed to CW mode.

Syntax **Command** POWer[:LEVel][:IMMediate] <NRf>

Query POWer[:LEVel][:IMMediate]?

Parameters <**NRf**> := { 0.000 to max power range }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CP Mode							
Range	Low	0 to 400 W			0 - 800 W		
	High	0 to 4000 W			0 - 8000 W		
Resolution		25 mW / 250 mW			50 mW / 500 mW		

Table 9.1 Power Ranges

Example **Command** POW 400.00 Sets the power level to 400 W.

Query POW? Query the set power level.

9.4 POWer:LIMit:MAXimum <NRf>

Description The command sets the maximum power limit level when the input is in constant power mode. Units are in watts.

The query returns the programmed maximum power limit in the <NRf> data type.

NOTICE If the electronic is not in CW mode, the programmed value that is saved will apply when the electronic load is changed to CW mode.

Syntax **Command** POWer:LIMit:MAXimum <NRf>

Query POWer:LIMit:MAXimum?

Parameters <**NRf**> := { 0.000 to max power range | MIN | MAX }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CP Mode							
Range	Low	0 to 400 W			0 - 800 W		
	High	0 to 4000 W			0 - 8000 W		
Resolution		25 mW / 250 mW			50 mW / 500 mW		

Table 9.2 Power Ranges

Example **Command** POW:LIM:MAX 4000.00 Sets the maximum configurable power

Query POW:LIM:MAX? Query the maximum configurable power

9.5 POWer:LIMit:MINimum <NRf>

Description The command sets the minimum power limit level when the input is in constant power mode. Units are in watts.

The query returns the programmed minimum power limit in the <NRf> data type.

NOTICE If the electronic is not in CW mode, the programmed value that is saved will apply when the electronic load is changed to CW mode.

Syntax **Command** POWer:LIMit:MINimum <NRf>

Query POWer:LIMit:MINimum?

Parameters <**NRf**> := { 0.000 to min power range | MIN | MAX }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CP Mode							
Range	Low	0 to 400 W			0 - 800 W		
	High	0 to 4000 W			0 - 8000 W		
Resolution		25 mW / 250 mW			50 mW / 500 mW		

Table 9.3 Power Ranges

Example **Command** POW:LIM:MIN 100.00 Sets the min configurable power

Query POW:LIM:MIN? Query the min configurable power level

9.6 POWer:PROTection:OVER <NRf>

Description The command sets the output level at which the output's over power protection function will trip. Units are in watts.

The query returns the programmed level at which the output's over power protection function will trip in the <NRf> data type.

Syntax **Command** POWer:PROTection:OVER <NRf>

Query POWer:PROTection:OVER?

Parameters <**NRf**> := { 0 to maximum power| MIN | MAX }

MODEL	HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
Programmable Protection						
Over Current	4200 ±62.86 W			8400 ±125.72 W		

Table 9.4 Over Power Protection

Example **Command** POW:PROT:OVER 800 Sets the OPP value to 800 V
Query POW:PROT:OVER? Query the OPP value

9.7 POWer:PROTection:OVER:DELay <NR1>

Description The command sets the over power protection delay time in milliseconds. The output's power protection function will not trip during the delay time. After the delay time elapses, the protection function will trip.

The query returns the programmed delay time in the <NR1> data type.

Syntax

Command	POWer:PROTection:OVER:DELay <NR1>
Query	POWer:PROTection:OVER:DELay?

Parameters <**NR1**> := { 10 to 10000 | MIN | MAX }

Example

Command	POW:PROT:OVER:DEL 100	Sets the OPP delay to 300 ms
Query	POW:PROT:OVER:DEL?	Query the OPP delay

9.8 POWer:PROTection:OVER:STATe <boolean>

Description The command enables/disabled the output's over power protection function.

The query returns the over power protection state, with the retuned value being "0" (OFF) or "1" (ON).

Syntax

Command	POWer:PROTection:OVER:STATe <boolean>
Query	POWer:PROTection:OVER:STATe?

Parameters <**boolean**> := { 0 | 1 | OFF | ON }

Example

Command	POW:PROT:OVER:STAT 1	Enables OPP
Query	POW:PROT:OVER:STAT?	Query the OPP state

9.9 POWer:SLEW:NEGative <NRf>

Description The command sets the negative slew rate from transient level to main level in CW mode. Units are in amperes per milliseconds.

The query returns the programmed negative slew rate of the transient operation in CW mode. The returned value is in the <NRf> data type.

Syntax

Command	POWer:SLEW:NEGative <NRf>
Query	POWer:SLEW:NEGative?

Parameters <**NRf**> := { 0.1 to 5400 | MIN | MAX}

Example

Command	POW:SLEW:NEG 1	Sets the fall time to 1 A/ms
Query	POW:SLEW:NEG?	Query the fall time

9.10 POWer:SLEW:POSitive <NRf>

Description The command sets the positive slew rate from main level to transient level in CW mode. Units are in amperes per milliseconds.

The query returns the programmed positive slew rate of the transient operation in CW mode. The returned value is in the <NRf> data type.

Syntax

Command	POWer:SLEW:POSitive <NRf>
Query	POWer:SLEW:POSitive?

Parameters <**NRf**> := { 0.1 to 5400 | MIN | MAX}

Example

Command	POW:SLEW:POS 1	Sets the rise time to 1 A/ms
Query	POW:SLEW:POS?	Query the rise time

9.11 POWer:TLEVel <NRf>

Description The command specifies the transient of the input power level. The transient function switches between the **immediate setting** and the transient level. Units are in amperes.

The query returns the programmed transient power level in the <NRf> data type.

Syntax **Command** POWer:TLEVel <NRf>

Query POWer:TLEVel?

Parameters <**NRf**> := { 0 to maximum | MIN | MAX}

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CP Mode							
Range	Low	0 to 400 W			0 - 800 W		
	High	0 to 4000 W			0 - 8000 W		
Resolution		25 mW / 250 mW			50 mW / 500 mW		

Table 9.5 Power Ranges

Example **Command** POW:TLEV 25 Sets the power transient level to 25 A
Query POW:TLEV? Query the transient power level

9.12 POWer:TWIDth <NRf>

Description The command sets the pulse width of transient pulse operation in CW mode. Units are in milliseconds.

The query returns the programmed pulse width of the transient pulse operation in CW mode. The value returned is in the <NRf> data type.

Syntax **Command** POWer:TWIDth <NRf>

Query POWer:TWIDth?

Parameters <**NRf**> := { 1 to 17500 | MIN | MAX}

Example **Command** POW:TWID 1000 Sets the pulse width to 1 s
Query POW:TWID? Query the set pulse width

Resistance Subsystem

The RESistance subsystem controls the resistance's characteristics of the source.

10.1 RESistance:DUTY <NR1>

Description The command sets the duty cycle of the continuous transient operation in constant resistance mode. Units are in percentage.

The query returns the programmed duty cycle for the continuous transient function in CR mode. The data is returned in the <NR1> data type.

Syntax

Command RESistance:DUTY <NR1>

Query RESistance:DUTY?

Parameters <**NR1**> := { 1 to 99 | MIN | MAX }

Example

Command	RES:DUTY 50	Sets the duty cycle to 50%
Query	RES:DUTY?	Query the set duty cycle.

10.2 RESistance:FREQuency <NRf>

Description The command sets the pulse frequency for the continuous transient operation in constant resistance mode. Units are in hertz .

The query returns the programmed frequency for the continuous transient function in CR mode. The data is returned in the <NRf> data type.

Syntax

Command RESistance:FREQuency <NRf>

Query RESistance:FREQuency?

Parameters <**NRf**> := { 0.03 to 10000 }

Example

Command	RES:FREQ 1000	Sets the frequency to 1kHz%
Query	RES:FREQ?	Query the set frequency.

10.3 RESistance[:LEVel]:[IMMediate] <NRf>

Description The command sets the immediate resistance level when the input is in constant resistance mode. Units are in ohms.

The query returns the programmed resistance level in the <NRf> data type.

NOTICE If the electronic is not in CR mode, the programmed value that is saved will apply when the electronic load is changed to CR mode.

Syntax **Command** RESistance[:LEVel][:IMMediate] <NRf>

Query RESistance[:LEVel][:IMMediate]?

Parameters <**NRf**> := { 0.000 to max resistance range }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CR Mode							
Range	Low	0.03 to 4 Ω	0.03 to 10.66 Ω	0.2 to 40 Ω	0.015 - 2 Ω	0.015 - 5.33 Ω	0.1 - 20 Ω
	High	4 to 3200 Ω	10.66 to 5000 Ω	40 to 10 kΩ	2 - 1600 Ω	5.33 - 4000 Ω	20 - 5 kΩ
Resolution		0.5 mΩ	1.33 mΩ	5 mΩ	0.25 mΩ	0.666 mΩ	2.5 mΩ

Table 10.1 Resistance Ranges

Example **Command** RES 100.00 Sets the resistance level to 100 Ω

Query RES? Query the set resistance level

10.4 RESistance:LIMit:MAXimum <NRf>

Description The command sets the maximum resistance limit level when the input is in constant resistance mode. Units are in ohms.

The query returns the programmed maximum resistance limit in the <NRf> data type.

NOTICE If the electronic is not in CR mode, the programmed value that is saved will apply when the electronic load is changed to CR mode.

Syntax **Command** RESistance:LIMit:MAXimum <NRf>

Query RESistance:LIMit:MAXimum?

Parameters <**NRf**> := { 0.000 to max resistance range | MIN | MAX }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CR Mode							
Range	Low	0.03 to 4 Ω	0.03 to 10.66 Ω	0.2 to 40 Ω	0.015 - 2 Ω	0.015 - 5.33 Ω	0.1 - 20 Ω
	High	4 to 3200 Ω	10.66 to 5000 Ω	40 to 10 kΩ	2 - 1600 Ω	5.33 - 4000 Ω	20 - 5 kΩ
Resolution		0.5 mΩ	1.33 mΩ	5 mΩ	0.25 mΩ	0.666 mΩ	2.5 mΩ

Table 10.2 Resistance Ranges

Example **Command** RES:LIM:MAX 10000.00 Sets the max configurable resistance

Query RES:LIM:MAX? Query the min configurable resistance

10.5 RESistance:LIMit:MINimum <NRf>

Description The command sets the minimum resistance limit level when the input is in constant resistance mode. Units are in ohms.

The query returns the programmed minimum resistance limit in the <NRf> data type.

NOTICE If the electronic is not in CR mode, the programmed value that is saved will apply when the electronic load is changed to CR mode.

Syntax **Command** RESistance:LIMit:MINimum <NRf>

Query RESistance:LIMit:MINimum?

Parameters <**NRf**> := { 0.000 to min resistance range | MIN | MAX }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CR Mode							
Range	Low	0.03 to 4 Ω	0.03 to 10.66 Ω	0.2 to 40 Ω	0.015 - 2 Ω	0.015 - 5.33 Ω	0.1 - 20 Ω
	High	4 to 3200 Ω	10.66 to 5000 Ω	40 to 10 kΩ	2 - 1600 Ω	5.33 - 4000 Ω	20 - 5 kΩ
Resolution		0.5 mΩ	1.33 mΩ	5 mΩ	0.25 mΩ	0.666 mΩ	2.5 mΩ

Table 10.3 Resistance Ranges

Example **Command** RES:LIM:MIN 100.00 Sets the minimum configurable resistance
Query RES:LIM:MIN? Query the minimum configurable resistance

10.6 RESistance:TRACking <NRf>

Description Enables/Disables fine tune tracking method used for the loop control.

The query provides the electronic load's fine tune tracking state, with the returned value being "0" (fine tune off) or "1" (fine tune on).

Syntax **Command** RESistance:TRACking <NR1>

Query RESistance:TRACking?

Parameters <**NR1**> := { 0 | 1}

Example **Command** RES:TRAC 1 Enables fine tune tracking method
Query RES:TRAC? Query the fine tune tracking state

10.7 RESistance:SLEW:NEGative <NRf>

Description The command sets the negative slew rate from transient level to main level in CR mode. Units are in amperes per milliseconds for CRH mode and volts pre milliseconds for CRL mode.

The query returns the programmed negative slew rate of the transient operation in CR mode. The returned value is in the <NRf> data type.

Syntax

Command RESistance:SLEW:NEGative <NRf>

Query RESistance:SLEW:NEGative?

Parameters <**NRf**> := { 0.1 to 5400 | MIN | MAX}

Example

Command	RES:SLEW:NEG 1	Sets the fall time to 1 A/ms
Query	RES:SLEW:NEG?	Query the fall time

10.8 RESistance:SLEW:POSitive <NRf>

Description The command sets the positive slew rate from main level to transient level in CR mode. Units are in amperes per milliseconds for CRH mode and volts pre milliseconds for CRL mode.

The query returns the programmed positive slew rate of the transient operation in CR mode. The returned value is in the <NRf> data type.

Syntax

Command RESistance:SLEW:POSitive <NRf>

Query RESistance:SLEW:POSitive?

Parameters <**NRf**> := { 0.1 to 5400 | MIN | MAX}

Example

Command	RES:SLEW:POS 1	Sets the rise time to 1 A/ms
Query	RES:SLEW:POS?	Query the rise time

10.9 RESistance:TLEVel <NRf>

Description The command specifies the transient of the input resistance level. The transient function switches between the **immediate setting** and the transient level. Units are in ohms.

The query returns the programmed transient resistance level in the <NRf> data type.

Syntax **Command** RESistance:TLEVel <NRf>

Query RESistance:TLEVel?

Parameters <**NRf**> := { 0 to maximum | MIN | MAX}

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CR Mode							
Range	Low	0.03 to 4 Ω	0.03 to 10.66 Ω	0.2 to 40 Ω	0.015 - 2 Ω	0.015 - 5.33 Ω	0.1 - 20 Ω
	High	4 to 3200 Ω	10.66 to 5000 Ω	40 to 10 kΩ	2 - 1600 Ω	5.33 - 4000 Ω	20 - 5 kΩ
Resolution		0.5 mΩ	1.33 mΩ	5 mΩ	0.25 mΩ	0.666 mΩ	2.5 mΩ

Table 10.4 Resistance Ranges

Example **Command** RES:TLEV 25 Sets the resistance transient level to 25 A
Query RES:TLEV? Query the transient resistance level

10.10 RESistance:TWIDth <NRf>

Description The command sets the pulse width of transient pulse operation in CR mode. Units are in milliseconds.

The query returns the programmed pulse width of the transient pulse operation in CR mode. The value returned is in the <NRf> data type.

Syntax **Command** RESistance:TWIDth <NRf>

Query RESistance:TWIDth?

Parameters <**NRf**> := { 1 to 17500 | MIN | MAX}

Example **Command** RES:TWID 1000 Sets the pulse width to 1 s
Query RES:TWID? Query the set pulse width

Measure Subsystem

The MEASure subsystem acquires data from the dc load using a set of high-level instructions.

11.1 MEASure:VOLTage[:DC]?

Description The query returns the averaged measured input current. The averaging parameter is allowing the adjustment of the sample count utilized for computing the average values.

Values are returned in the <NRf> data type, with units in amperes.

Syntax **Query** MEASure:CURRent[:DC]?

Parameters <**NRf**> := { 0.000 to max current range }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CC Mode							
Range	Low	0 - 15 A	0 - 7.5 A	0 - 2.5 A	0 - 30 A	0 - 15 A	0 - 5 A
	High	0 - 150 A	0 - 75 A	0 - 25 A	0 - 300 A	0 - 150 A	0 - 50 A
Resolution		10 mA	5 mA	1.7 mA	20 mA	10 mA	3.3 mA

Table 11.1 Current Ranges

Example **Query** MEAS:CURR? Query the measured current level

11.2 MEASure:VOLTage[:DC]?

Description The query returns the averaged measured input voltage. The averaging parameter is allowing the adjustment of the sample count utilized for computing the average values.

Values are returned in the <NRf> data type, with units in volts.

Syntax **Query** MEASure:VOLTage[:DC]?

Parameters <**NRf**> := { 0.000 to max voltage range }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CV Mode							
Range	Low	0 - 60 V	0 - 80 V	0 - 100 V	0 - 60 V	0 - 80 V	0 - 100 V
	High	0 - 600 V	0 - 800 V	0 - 1000 V	0 - 600 V	0 - 800 V	0 - 1000 V
Resolution		400 mV	50 mV	100 mV	40 mV	50 mV	100 mV

Table 11.2 Voltage Ranges

Example **Query** MEAS:VOLT? Query the measured voltage level

Mode Subsystem

The MODe subsystem controls the load's input operation mode.

12.1 MODe <character>

Description The command sets the load's **Fixed** operation mode.

The query returns the set operation mode in the <character> data type.

Syntax **Command** MODe <character>

Query MODe?

Parameters <**character**> := { CURRent | VOLTage | POWer | RESistance }

Mode	Description
CURRent	Constant current mode (CC)
VOLTage	Constant voltage mode (CV)
RESistance	Constant resistance mode (CR)
POWer	Constant power mode (CW)

Table 12.1 Operation Mode Parameters

Example **Command** MOD CURR Sets the load's operation mode to constant current
Query MOD? Query the set operation mode

12.2 MODe:RANGe <boolean>

Description The command sets the range of the currently selected operation mode.

The query returns the set range of the active operation mode in the <boolean> data type. A returned value of "0" indicates the operation mode is operating in low range, while "1" indicates the operation mode is operating in high range.

Syntax **Command** MODe <boolean>

Query MODe?

Parameters <**boolean**> := { 0 (low range) | 1 (high range)}

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CC Mode							
Range	Low	0 - 15 A	0 - 7.5 A	0 - 2.5 A	0 - 30 A	0 - 15 A	0 - 5 A
	High	0 - 150 A	0 - 75 A	0 - 25 A	0 - 300 A	0 - 150 A	0 - 50 A
CV Mode							
Range	Low	0 - 60 V	0 - 80 V	0 - 100 V	0 - 60 V	0 - 80 V	0 - 100 V
	High	0 - 600 V	0 - 800 V	0 - 1000 V	0 - 600 V	0 - 800 V	0 - 1000 V
CR Mode							
Range	Low	0.03 - 4 Ω	0.03 - 10.66 Ω	0.2 - 40 Ω	0.015- 2 Ω	0.015 - 5.33 Ω	0.1 - 20 Ω
	High	4 - 3200 Ω	10.66 - 5 kΩ	40 - 10 kΩ	2 - 1600 Ω	5.33 - 4 kΩ	20 - 5 kΩ
CW Mode							
Range	Low	0 - 300 W			0 - 600 W		
	High	0 - 3 kW			0 to 6 kW		

Table 12.2 Low and High Ranges

Example

Command	MOD:RANG 1	Sets the load's active operation mode range
Query	MOD:RANG?	Query the range of the active mode

NOTICE The **SYSTem:RANGe?** query can be used to return the set ranges of all four modes.

12.3 OUTPut:MODE <character>

Description Configures the operation mode of the instruments. If List mode is selected the list to be executed must be specified in the command's parameter.

The query returns the electronic load's operation mode in the <character> data type.

Syntax

Command OUTPut:MODE <character>

Query OUTPut:MODE?

Parameters <**character**> := { FIX | LIST,<NR1> }

Example

Command	OUTP:MODE LIST,1	Enables list mode and set list 1
Query	OUTP:MODE?	Query the load's operation mode

Utility Subsystem

The UTILity subsystem configures the additional functions the HVL series provides.

13.1 LOOP:CONTrol <NR1>

Description The command sets the loop response speeds to adjust the system bandwidth.

The query returns the programmed loop control mode, with the returned value being "0" (fast), "1" (normal), "2" (slow), and "3" (slowest).

Syntax

Command LOOP:CONTrol <NR1>

Query LOOP:CONTrol?

Parameters <**NR1**> := { 0 | 1 | 2 | 3 }

Mode	Description
0	fast
1	normal
2	slow
3	slowest

Table 13.1 Loop Control Parameters

Example

Command	LOOP:CONT 1	Sets loop control to fast
Query	LOOP:CONT?	Query the set loop control

13.2 [UTILity:]MEASure:SENSe <NR1>

Description The command sets sense to either local or remote mode.

The query returns the programmed sense mode, with the returned value being "0" (local) or
"1" (remote).

Syntax

Command [UTILity:]MEASure:SENSe <NR1>

Query [UTILity:]MEASure:SENSe?

Parameters <**NR1**> := { 0 | 1 }

Mode	Description
0	Local Sense Mode
1	Remote Sense Mode

Table 13.2 Sense Mode Parameters

Example

Command	MEAS:SENS 1	Sets sense mode to remote
Query	MEAS:SENS?	Query the set sense mode

13.3 [UTILity:]TRIGger:SOURce <NR1>

Description The commands sets the trigger source that will be used to trigger events.

The query returns the programmed trigger source, with the returned value being "0" (hold),
"1" (bus), or "2" (external).

Syntax **Command** [UTILity:]TRIGger:SOURce <NR1>

Query [UTILity:]TRIGger:SOURce?

Parameters <**NR1**> := { 0 | 1 | 2 }

Mode	Description
0	Hold
1	Bus
2	External

Table 13.3 Trigger Source Parameters

Example **Command** TRIG:SOUR 1 Sets the trigger source to bus
Query TIRG:SOUR? Query the set trigger source

13.4 [UTILity:]TRANsient[:STATe] <boolean>

Description Enables/Disables the transient function.

The query returns the transient state, with the returned value being "0" (OFF) or "1" (ON).

Syntax **Command** [UTILity:]TRANsient[:STATe] <boolean>

Query [UTILity:]TRANsient[:STATe]?

Parameters <**boolean**> := { 0 | 1 | OFF | ON }

Example **Command** TRAN 1 Enables transient mode
Query TRAN? Query the transient mode state

13.5 [UTILity:]TRANsient:MODe <NR1>

Description The command sets the transient's operation mode.

The query returns the set transient operation mode in the <NR1> data type.

Syntax

Command [UTILity:]TRANsient:MODe <character>

Query [UTILity:]TRANsient:MODe?

Parameters <**character**> := { 0 | 1 | 2 | 3 }

Mode	Description
1	Normal Operation Mode
2	Continuous Mode
3	Toggle Mode
4	Pulse Mode

Table 13.4 Transient Operation Mode Parameters

Example

Command	TRAN:MOD 2	Sets transient mode to toggle
Query	TRAN?	Query the set transient mode

Digital Subsystem

The Digital Subsystem allows for configuration of the digital functions. This subsystem allows users to control, query, and configure digital parameters such as digital output lines, trigger settings.

14.1 DIGital:OUTPut:STATe <NR1>

Description The command sets the state of the digital output (pin 4 on the analog DIO connector).

The query returns the programmed digital output state in the <NR1> data type.

Syntax **Command** DIGital:OUTPut:STATe <NR1>

Query DIGital:OUTPut:STATe?

Parameters <**NR1**> := { 0 | 1 | 2 | 3 }

State	Description
0	force low
1	force high
2	low on load's input ON
3	high on load's input ON

Table 14.1 Digital Output States

NOTICE State "0" and "1" force the output to a specific state regardless of any other parameters. State "2" and "3" cause the digital output to be control by the input state of the electronic load.

Example

Command	DIG:OUTP:STAT 0	Sets the digital output state to force low
Query	DIG:OUTP:STAT?	Query the digital output state

14.2 DIGital:OUTPut:DELay <NR1>

Description The command sets the digital output delay time in milliseconds. The digital output will not output for the specified delay time. After the delay time elapses, the digital output signal will be available.

The query returns the programmed digital output delay time in the <NR1> data type.

Syntax

Command	DIGital:OUTPut:DELay <NR1>
Query	DIGital:OUTPut:DELay?

Parameters <**NR1**> := { 0 to 500 ms }

Example

Command	DIG:OUTP:DEL 10	Sets the digital output delay to 10 ms
Query	DIG:OUTP:DEL?	Query the digital output delay

Initiate Subsystem

The INITiate subsystem allows users to issue commands that trigger specific actions, such as starting the list function.

15.1 INITiate[:IMMediate]

Description The command issues the trigger to run the selected programmed list. Refer to section **OUTPut:MODE <NR1>** for more information on selecting a list.

Syntax **Command** INITiate[:IMMediate]

Parameters none

Example **Command** INIT Initiates the selected list.

15.2 INITiate:CONTinuous

Description The command issues the trigger to run the selected programmed list with a continuous trigger enabled. Refer to section **OUTPut:MODE <NR1>** for more information on selecting a list.

Syntax **Command** INITiate:CONTinuous

Parameters none

Example **Command** INIT:CONT Initiates the selected list.

List Subsystem

The LIST subsystem controls automatic sequencing through associated lists of specified signal values.

16.1 ABORt

Description The command resets the trigger system and places all trigger sequences in the IDLE state. The list will not resume until the INITiate[:IMMediate] command is sent.

Syntax **Command** ABORt

Parameters none

Example **Command** ABORt Abort the list function.

16.2 [SOURce:]LIST:CLEar

Description The command clears all the step and List Run parameters of the selected list.

Syntax **Command** [SOURce:]LIST:CLEar

Parameters none

Example **Command** LIST:CLE Clears all list parameters.

16.3 [SOURce:]LIST:COUNt <NR1>

Description The command configures the count parameter of the selected list. The count parameter dictates the number of repetitions the list will undergo. The list can be programmed to run infinitely by using the parameter INFinity. The command can only be used once the **Edit List** mode is enabled. Refer to section [SOURce:]LIST:NUMBer <NR1>.

The query returns the programmed count for the selected list in the <NR1> data type.

NOTICE Changes made in **Edit List** will not be saved until the command [SOURce:]LIST:SAVELIST:SAVE] is sent.

Syntax **Command** [SOURce:]LIST:MODe <NR1>

Query [SOURce:]LIST:MODe?

Parameters <**NR1**> := { 0 to 100000 | INFinity }

Example

Command	LIST:COUN 0	Configures the list to run once.
Query	LIST:COUN?	Query the list's run count.

16.4 [SOURce:]LIST:DELete

Description The command deletes the selected list.

Syntax **Command** [SOURce:]LIST:DELete

Parameters none

Example

Command	LIST:DEL	Deletes the selected list.

16.5 [SOURce:]LIST:DWELI <NR1>

Description The command sets the dwell time of the step whose **Edit Step** mode is currently active. Units are in seconds. Configuring the step's dwell time requires the instrument to be in **Edit Step** mode initially. Refer to section **[SOURce:]LIST:STEP:NUMBer <NR1>**

The query returns the set dwell time of the step whose **Edit Step** mode is currently active. The returned value is in the <NRf> data type.

Syntax

Command	[SOURce:]LIST:DWELI <NRf>
Query	[SOURce:]LIST:STEP:DWELI?

Parameters <**NR1**> := { 0 to 9999 s }

Example

Command	LIST:STEP:DWEL 10	Sets the dwell time
Query	LIST:STEP:DWEL?	Query the step's set dwell time

16.6 [SOURce:]LIST:LEVel <NRf>

Description The command sets the level of the step whose **Edit Step** mode is currently active. Configuring the step's level requires the instrument to be in **Edit Step** mode initially. Refer to section **[SOURce:]LIST:STEP:NUMBer <NR1>**

The query returns the set level of the step whose **Edit Step** mode is currently active. The returned value is in the <NRf> data type.

Syntax **Command** [SOURce:]LIST:LEVel <NRf>

Query [SOURce:]LIST:STEP:LEVel?

Parameters <**NRf**> := { 0 to max range of selected mode }

MODEL		HVL-600-150	HVL-800-75	HVL-1000-25	HVL-600-300	HVL-800-150	HVL-1000-50
CC Mode							
Range	Low	0 - 15 A	0 - 7.5 A	0 - 2.5 A	0 - 30 A	0 - 15 A	0 - 5 A
	High	0 - 150 A	0 - 75 A	0 - 25 A	0 - 300 A	0 - 150 A	0 - 50 A
CV Mode							
Range	Low	0 - 60 V	0 - 80 V	0 - 100 V	0 - 60 V	0 - 80 V	0 - 100 V
	High	0 - 600 V	0 - 800 V	0 - 1000 V	0 - 600 V	0 - 800 V	0 - 1000 V
CR Mode							
Range	Low	0.03 - 4 Ω	0.03 - 10.66 Ω	0.2 - 40 Ω	0.015- 2 Ω	0.015 - 5.33 Ω	0.1 - 20 Ω
	High	4 - 3200 Ω	10.66 - 5 kΩ	40 - 10 kΩ	2 - 1600 Ω	5.33 - 4 kΩ	20 - 5 kΩ
CW Mode							
Range	Low	0 - 300 W			0 - 600 W		
	High	0 - 3 kW			0 to 6 kW		

Table 16.1 Ranges

Example

Command	LIST:STEP:LEV 10	Sets the steps level
Query	LIST:STEP:LEV?	Query the step's set level

16.7 [SOURce:]LIST:MODe <NR1>

Description The command configures the operation mode to be used in the selected list. The command can only be used once the **Edit List** mode is enabled. Refer to section [SOURce:]LIST:NUMBer <NR1>.

The query returns the programmed operation mode for the selected list in the <NR1> data type.

NOTICE Changes made in **Edit List** will not be saved until the command [SOURce:]LIST:SAVELIST:SAVE] is sent.

Syntax **Command** [SOURce:]LIST:MODe <NR1>

Query [SOURce:]LIST:MODe?

Parameters <**NR1**> := { 0 | 1 | 2 | 3 }

Mode	Description
0	Constant Current (CC)
1	Constant Voltage (CV)
2	Constant Resistance (CR)
3	Constant Power (CW

Table 16.2 List Operation Mode

Example

Command	LIST:MODE 0	Configures the set list for CV mode.
Query	LIST:MODE?	Query the list's set operation mode.

16.8 [SOURce:]LIST:NEXT<NR1>

Description The command configures the list to be executed once the selected list elapses. This allows for chaining of multiple list. The command can only be used once the **Edit List** mode is enabled. Refer to section [SOURce:]LIST:NUMBer <NR1>.

The query returns the programmed list to be executed upon completion of the current list. The value is returned in the <NR1> data type.

NOTICE

Changes made in **Edit List** will not be saved until the command [SOURce:]LIST:SAVELIST:SAVE] is sent.

Syntax

Command	[SOURce:]LIST:NEXT <NR1>
Query	[SOURce:]LIST:NEXT?

Parameters <**NR1**> := { 1 to 10 }

Example

Command	LIST:NEXT 1	Configures list 1 as the next list.
Query	LIST:COUN?	Query the list that will be executed next.

16.9 [SOURce:]LIST:NUMBer <NR1>

Description The command enables **Edit List** mode for the selected list. When edit list mode is enabled the list's; **Mode**, **Next**, and **Repeat** parameters can be configured. The instrument can enter **Edit Step** mode once Edit List mode has been enabled.

The query returns the programmed list number in the <NR1> data type.

NOTICE Changes made in **Edit List** will not be saved until the command [SOURce:]LIST:SAVELIST:SAVE] is sent.

Syntax **Command** [SOURce:]LIST:NUMBer <NR1>

Query [SOURce:]LIST:NUMBer?

Parameters <**NR1**> := { 1 to 10 }

Example **Command** LIST:NUMB 1 Enables **Edit List** mode for list 1.
Query LIST:NUMB? Query the selected list.

16.10 [SOURce:]LIST:SAVE

Description The command saves all set parameters of the list being configured. Prior to sending the save command all changes are stored in temporary memory.

Syntax **Command** [SOURce:]LIST:SAVE

Parameters none

Example **Command** LIST:SAVE Saves all list changes.

16.11 [SOURce:]LIST:STATe?

Description The query returns the operation status of list mode in the <boolean> data type.

Syntax **Query** [SOURce:]LIST:STATe?

Parameters none

Example **Query** LIST:STATe? Clears all list parameters.

16.12 [SOURce:]LIST:STEP <NR1>

Description The command configures the triggering mode (pace) of the set list.
When the pace is set to **Dwell** the next step will be initiated once the dwell time of the current step has elapsed.
When the pace is set to **Trigger** the list will remain in the current step even after the dwell time has elapsed. To proceed to the next step the user must input a trigger signal.

NOTICE The required trigger signal will vary based on the list's programmed trigger source.

The query returns the programmed paced in the <NR1> data type.

Syntax

Command [SOURce:]LIST:STEP <NR1>

Query [SOURce:]LIST:STEP?

Parameters <**NR1**> := { 0 to 1 }

Mode	Description
0	Dwell
1	Trigger

Table 16.3 List Trigger Mode

Example

Command	LIST:STEP 1	Sets the list's pace to trigger.
Query	LIST:STEP?	Query the selected pace.

16.13 [SOURce:]LIST:STEP:NUMBer <NR1>

Description The command enables **Edit Step** mode for the designated step, allowing for configuration of parameters such as **Voltage, Current, BOST, EOST, and Dwell**. Accessing **Edit Step** requires the instrument to be in **Edit List** mode initially. Refer to section **[SOURce:]LIST:NUMBer <NR1>**

The query returns the step currently being modified. The returned value is in the <NR1> data type.

Syntax

Command	[SOURce:]LIST:STEP:NUMBer <NR1>
Query	[SOURce:]LIST:STEP:NUMBer?

Parameters <**NR1**> := { 0 to 100 }

Example

Command	LIST:STEP:NUMB: 1	Enables **Edit Step** mode for step 1
Query	LIST:STEP:NUMB?	Query the configurable step.

16.14 [SOURce:]LIST:TERMinate:LAST <NR1>

Description The command configures the **After List** parameter which determines the load's input level upon the completion of any list.
When the after list state is set to **"Last"**, the input's level will retain the last list value.
When the after list state is set to **"DC"**, the output parameters will revert to the DC value that was in effect before the commencement of the list.

The query returns the configured after list parameter in the <NR1> data type.

Syntax **Command** [SOURce:]LIST:TERMinate:LAST <NR1>

Query [SOURce:]LIST:TERMinate:LAST?

Parameters <**NR1**> := { 0 | 1 }

Mode	Description
0	DC
1	Last

Table 16.4 After List Mode

Example

Command	LIST:TERM:LAST 1	Sets the list's after list to Last.
Query	LIST:TERM:LAST?	Query the set after list parameter.

16.15 [SOURce:]LIST:TOUTput:BOSTep:DATA <boolean>

Description The command enables/disabled a TTL trigger-out signal at the beginning of the selected step (BOST). Configuring the BOST requires the instrument to be in **Edit Step** mode initially. Refer to section **[SOURce:]LIST:STEP:NUMBer <NR1>**

The query returns the state of the BOST for the step whose **Edit Step** mode is currently active. The returned value is in the <boolean> data type.

Syntax

Command [SOURce:]LIST:TOUTput:BOSTep:DATA <boolean>

Query [SOURce:]LIST:TOUTput:BOSTep:DATA?

Parameters <**boolean**> := { 0 | 1 }

Mode	Description
0	OFF
1	ON

Table 16.5 BOST State

Example

Command	LIST:TOUT:BOST:DATA 1	Enables BOST
Query	LIST:TOUT:BOST:DATA?	Query the BOST state

16.16 [SOURce:]LIST:TOUTput:EOSTep:DATA <boolean>

Description The command enables/disabled a TTL trigger-out signal at the end of the selected step (EOST). Configuring the EOST requires the instrument to be in **Edit Step** mode initially. Refer to section **[SOURce:]LIST:STEP:NUMBer <NR1>**

The query returns the state of the EOST for the step whose **Edit Step** mode is currently active. The returned value is in the <boolean> data type.

Syntax

Command [SOURce:]LIST:TOUTput:EOSTep:DATA <boolean>

Query [SOURce:]LIST:TOUTput:EOSTep:DATA?

Parameters <**boolean**> := { 0 | 1 }

Mode	Description
0	OFF
1	ON

Table 16.6 EOST State

Example

Command	LIST:TOUT:EOST:DATA 1	Enables EOST
Query	LIST:TOUT:EOST:DATA?	Query the EOST state

Protection Subsystem

The PROTection subsystem configures the protection features.

17.1 PROTection:OSCillation:STATe <boolean>

Description The command enables/disables the oscillation protection feature.

The query returns the state of the oscillation protection feature. The state is returned in the <boolean> data type.

Syntax

Command	PROTection:OSCillation:STATe <boolean>
Query	PROTection:OSCillation:STATe?

Parameters <**boolean**> := { 0 | 1 | OFF | ON }

Example

Command	PROT:OSC:STAT 1	Enables oscillation protection
Query	PROT:OSC:STAT?	Query the oscillation protection state

17.2 PROTection:OSCillation:DELay <NR1>

Description The command sets the oscillation delay time in milliseconds. The oscillation protection function will not trip during the delay time. After the delay time elapses, the protection function will trip.

The query returns the programmed oscillation protection delay. The state is returned in the <NR1> data type.

Syntax

Command PROTection:OSCillation:DELay <NR1>

Query PROTection:OSCillation:DELay?

Parameters <**NR1**> := { 10 to 10000 | MIN | MAX }

Example

Command	PROT:OSC:DEL	Sets the oscillation protection delay
Query	PROT:OSC:DEL?	Query the oscillation protection delay

System Subsystem

The SYSTem subsystem collects the functions that are not related to instrument performance.

18.1 SYSTem:RANGe?

Description The query returns the number of available ranges for each fix operation mode in the order CV/ CC/CR/CP.

Syntax **Query** SYSTem:RANGe?

Parameters none

Example **Query** SYST:RANG? Query the available ranges

18.2 SYSTem:ERRor?

Description The query returns the system-defined error/event.

Syntax **Query** SYSTem:ERR?

Parameters none

Example **Query** SYST:ERR? Query the reported errors