
Remote Commands

RS232/USB Remote Command Format

Serial input to the instrument is buffered in a 256 byte input queue which is filled, under interrupt, in a manner transparent to all other instrument operations. The instrument will send XOFF when approximately 200 characters are in the queue. XON will be sent when approximately 100 free spaces become available in the queue after XOFF was sent. This queue contains raw (un-parsed) data which is taken, by the parser, as required. Commands (and queries) are executed in order and the parser will not start a new command until any previous command or query is complete. In RS232 mode responses to commands or queries are sent immediately; there is no output queue.

USB input conforms with USB 2.0 Full Speed.

LAN input to the instrument is buffered in a 1500 byte input queue which is filled, under interrupt, in a manner transparent to all other instrument operations. LAN interface conforms with 1.4 LXI (LAN eXtensions for Instrumentation) Core 2011.

Commands must be sent as specified in the commands list and must be terminated with the command terminator code 0AH (Line Feed, LF). Commands may be sent in groups with individual commands separated from each other by the code 3BH (;). The group must be terminated with command terminator 0AH (Line Feed, LF).

Responses from the instrument to the controller are sent as specified in the commands list. Each response is terminated by 0DH (Carriage Return, CR) followed by 0AH (Line Feed, LF).

<WHITE SPACE> is defined as character codes 00H to 20H inclusive.

<WHITE SPACE> is ignored except in command identifiers. e.g. '*C LS' is not equivalent to '*CLS'.

The high bit of all characters is ignored.

The commands are case insensitive.

GPIB Remote Command Formats

GPIB input to the instrument is buffered in a 256 byte input queue which is filled, under interrupt, in a manner transparent to all other instrument operations. The queue contains raw (un-parsed) data which is taken, by the parser, as required. Commands (and queries) are executed in order and the parser will not start a new command until any previous command or query is complete. There is no output queue which means that the response formatter will wait, indefinitely if necessary, until the instrument is addressed to talk and the complete response message has been sent, before the parser is allowed to start the next command in the input queue.

Commands are sent as <PROGRAM MESSAGES> by the controller, each message consisting of zero or more <PROGRAM MESSAGE UNIT> elements separated by <PROGRAM MESSAGE UNIT SEPARATOR> elements.

A <PROGRAM MESSAGE UNIT> is any of the commands in the remote commands list.

A <PROGRAM MESSAGE UNIT SEPARATOR> is the semi-colon character ';' (3BH).

<PROGRAM MESSAGES> are separated by <PROGRAM MESSAGE TERMINATOR> elements which may be any of the following:

NL	The new line character (0AH)
NL^END	The new line character with the END message
^END	The END message with the last character of the message

Responses from the instrument to the controller are sent as <RESPONSE MESSAGES>. A <RESPONSE MESSAGE> consists of one <RESPONSE MESSAGE UNIT> followed by a <RESPONSE MESSAGE TERMINATOR>.

A <RESPONSE MESSAGE TERMINATOR> is the new line character with the END message NL^END.

Each query produces a specific <RESPONSE MESSAGE> which is listed along with the command in the remote commands list.

<WHITE SPACE> is ignored except in command identifiers. e.g. '*C LS' is not equivalent to '*CLS'.
<WHITE SPACE> is defined as character codes 00H to 20H inclusive with the exception of the NL character (0AH).

The high bit of all characters is ignored.

The commands are case insensitive.

Command List

This section lists all commands and queries implemented in this instrument. The commands are listed in alphabetical order within the function groups.

Note that there are no dependent parameters, coupled parameters, overlapping commands, expression program data elements or compound command program headers; each command is completely executed before the next command is started. All commands are sequential and the operation complete message is generated immediately after execution in all cases.

The following nomenclature is used:

<RMT>	<RESPONSE MESSAGE TERMINATOR>
<NRF>	A number in any format. e.g. 12, 12·00, 1·2 e1 and 120 e-1 are all accepted as the number 12. Any number, when received, is converted to the required precision consistent with the use then rounded up to obtain the value of the command.
<NR1>	A number with no fractional part, i.e. an integer.
<NR2>	A number in fixed point format e.g. 11·52, 0·78 etc.
<N>	The number of the output or status register to which the command relates. Note that on single output supplies <N>=1 always. Note also that <N>= 3 refers to the AUX output. The AUX output has limited remote control functionality. For clarity, the commands where <N>= 3 can be used are explicitly commented; elsewhere only <N>= 1 or <N>= 2 can be used.
<CPD>	<CHARACTER PROGRAM DATA>
<CRD>	<CHARACTER RESPONSE DATA>

The commands which begin with a * are those specified by IEEE Std. 488.2 as Common commands. All will function when used on the other interfaces but some are of little use.

Instrument Specific Commands

For commands specified as 'WITH VERIFY' the operation is completed when the parameter being adjusted reaches the required value to within $\pm 5\%$ or ± 10 counts, whichever is the greater. If the value fails to settle within these limits within 5 seconds then the Verify Timeout bit (bit 3) is set in the Standard Event Status Register and the operation is completed at the end of the timeout period.

The Operation Complete bit (bit 0) in the Standard Event Status Register is only ever set by the *OPC command. The *OPC (or the *OPC?) command can be used for device synchronisation due to the sequential nature of remote operations.

When the supply is operated in LINK mode, commands which set values and ranges are applied to outputs 1 and 2 simultaneously, regardless of the whether <N> is set to 1 or 2. When the command requests verification then verification will be sought from both outputs before the command is completed. Additionally the SAV<N> and RCL<N> commands operate on non-volatile memory reserved for linked mode set-ups and <N> may be set to 1 or 2 with the same effect. Note however that <N> is part of the command header and must be included.

V<N> <NRF>	Set output <N> to <NRF> Volts. For AUX output <N>=3
V<N>V <NRF>	Set output <N> to <NRF> Volts with verify. For AUX output <N>=3

OVP<N> <NRF>	Set output <N> over voltage protection trip point to <NRF> Volts
I<N> <NRF>	Set output <N> current limit to <NRF> Amps
OCP<N> <NRF>	Set output <N> over current protection trip point to <NRF> Amps
V<N>?	Return the set voltage of output <N> . For AUX output <N>=3 – response is V <N> <NR2><RMT> where <NR2> is in Volts
I<N>?	Return the set current limit of output <N> – response is I <N> <NR2><RMT> where <NR2> is in Amps
OVP<N>?	Return the voltage trip setting for output <N> – response is VP<N> <NR2><RMT> where <NR2> is in Volts
OCP<N>?	Return the current trip setting for output <N> – response is IP<N> <NR2><RMT> where <NR2> is in Amps
V<N>O?	Return the output readback voltage for output <N>. For AUX output <N>=3 – response is <NR2>V<RMT> where <NR2> is in Volts
I<N>O?	Return the output readback current for output <N>. For AUX output <N>=3 – response is <NR2>A<RMT> where <NR2> is in Amps
RANGE<N> <NRF>	Set the voltage range of output <N> to <NRF> where <NRF> has the following meaning: QL355 Models: 0=15V(5A), 1=35V(3A), 2=35V(500mA) QL564 Models: 0=25V(4A), 1=56V(2A), 2=56V(500mA)
RANGE<N>?	Return the set voltage range of output <N> – response is R<N> <NR1><RMT> where <NR1> has the following meaning: QL355 Models: 0=15V(5A), 1=35V(3A), 2=35V(500mA) QL564 Models: 0=25V(4A), 1=56V(2A), 2=56V(500mA)
DELTAV<N> <NRF>	Set the output <N> voltage step size to <NRF> Volts. For AUX output <N>=3
DELTAI<N> <NRF>	Set the output <N> current step size to <NRF> Amps
DELTAV<N>?	Return the output <N> voltage step size. For AUX output <N>=3 – response is DELTAV<N> <NR2><RMT> where <NR2> is in Volts.
DELTAI<N>?	Return the output <N> current step size – response is DELTAI<N> <NR2><RMT> where <NR2> is in Amps.
INCV<N>	Increment the output <N> voltage by the step size set for output <N>. For AUX output <N>=3
INCV<N>V	Increment with verify the output <N> voltage by the step size set for output <N>. For AUX output <N>=3
DECV<N>	Decrement the output <N> voltage by the step size set for output <N>. For AUX output <N>=3
DECV<N>V	Decrement with verify the output <N> voltage by the step size set for output <N>. For AUX output <N>=3
INCI<N>	Increment the output <N> current limit by the step size set for output <N>
DECI<N>	Decrement the output <N> current limit by the step size set for output <N>
OP<N> <NRF>	Set output <N> on/off where <NRF> has the following meaning: 0=OFF, 1=ON For AUX output <N>=3
OP<N>?	Returns output <N> on/off status. For AUX output <N>=3 The response is <NR1><RMT> where 1 = ON, 0 = OFF.

OPALL <NRF>	Simultaneously sets all outputs on/off where <NRF> has the following meaning: 0=All OFF, 1=ALL ON. If OPALL sets all outputs ON then any that were already on will remain ON. If OPALL sets all outputs OFF then any that were already off will remain OFF
SENSE<N> <NRF>	Set the output <N> sense mode where <NRF> has the following meaning: 0=local, 1=remote
MODE <NRF>	Set the instrument operating mode to LINK or assign control to output 1 or 2 <NRF> has the following meaning: 0 = linked, 1 = assign control to output 1, 2 = assign control to output 2. Setting linked mode uniquely affects the way the instrument responds to some remote commands. Commands to set Range, Voltage, Current Limit, OVP or OCP sent to either Output 1 or Output 2 will change the setting on both outputs simultaneously. Similarly, increment/decrement commands sent to either Main output will step V or I on both outputs; however, the step size will be that set for the individual output. Assigning control to outputs 1 or 2 exits linked mode but has no other affect until the instrument is returned to local operation. Any operating mode set in remote operation will be retained when the instrument is returned to local operation.
MODE?	Return the current operating mode – response is LINKED or CTRL<N> (control assigned to output <N>)
TRIPRST	Attempt to clear all trip conditions from all outputs
LSR<N>?	Query and clear LSR<N>, limit status register <N> – response is <NR1><RMT>
LSE<N> <NRF>	Set the value of LSE<N>, limit status enable register <N>, to <NRF>
LSE<N>?	Return the value of LSE<N>, limit status enable register <N> – response is <NR1><RMT>
SAV<N> <NRF>	Save the current set-up of output <N> to the set-up store specified by <NRF> where <NRF> can be 0-49 for the main outputs or 0-9 for the AUX output on TP models. For AUX output <N>=3. If the instrument is operating in linked mode then the entire instrument set-up (excluding auxiliary output) will be stored in the linked mode set-up store specified by <NRF>. The <N> specification is ignored. This has no affect on the individual PSU<N> set-up stores available when not in linked mode
RCL<N> <NRF>	Recall a set up for output <N> from the set-up store specified by <NRF> where <NRF> can be 0-49 for the main outputs or 0-9 for the AUX output on TP models. For AUX output <N>=3. If the instrument is operating in LINK mode then the entire instrument set-up (excluding AUX output) will be recalled from the LINK mode set-up store specified by <NRF>. The <N> specification is ignored.

System and Status Commands

*RST	Resets the instrument to the factory default settings – (see Factory Defaults section) with the exception of all remote interface settings.
EER?	Query and clear Execution Error Register. The response format is nr1<RMT>.
QER?	Query and clear Query Error Register. The response format is nr1<RMT>
*CLS	Clear Status. Clears the Standard Event Status Register, Query Error Register and Execution Error Register. This indirectly clears the Status Byte Register.

*ESE <NRF>	Set the Standard Event Status Enable Register to the value of <NRF>.
*ESE?	Returns the value in the Standard Event Status Enable Register in <NR1> numeric format. The syntax of the response is <NR1><RMT>
*ESR?	Returns the value in the Standard Event Status Register in <NR1> numeric format. The register is then cleared. The syntax of the response is <NR1><RMT>
*IST?	Returns ist local message as defined by IEEE Std. 488.2. The syntax of the response is 0<RMT>, if the local message is false, or 1<RMT>, if the local message is true.
*OPC	Sets the Operation Complete bit (bit 0) in the Standard Event Status Register. This will happen immediately the command is executed because of the sequential nature of all operations.
*OPC?	Query Operation Complete status. The syntax of the response is 1<RMT>. The response will be available immediately the command is executed because of the sequential nature of all operations.
*PRE <NRF>	Set the Parallel Poll Enable Register to the value <NRF>.
*PRE?	Returns the value in the Parallel Poll Enable Register in <NR1> numeric format. The syntax of the response is <NR1><RMT>
*SRE <NRF>	Set the Service Request Enable Register to <NRF>.
*SRE?	Returns the value of the Service Request Enable Register in <NR1> numeric format. The syntax of the response is <NR1><RMT>
*STB?	Returns the value of the Status Byte Register in <NR1> numeric format. The syntax of the response is <NR1><RMT>
*WAI	Wait for Operation Complete true. As all commands are completely executed before the next is started this command takes no additional action.

Interface Management Commands

IFLOCK	Request Instrument 'lock'. This command requests exclusive access control of the instrument. The response is '1' is successful or '-1' if the lock is unavailable either because it is already in use or the user has disabled this interface from taking control using the web interface
IFLOCK?	Query the status of the interface 'lock'. The return value is '1' if the lock is owned by the requesting interface instance; '0' if there is no active lock or '-1' if the lock is unavailable either because it is in use by another interface or the user has disabled the interface from taking control via the web interface.
IFUNLOCK	Release the 'lock' if possible. Returns '0' if successful. If this command is unsuccessful '-1' is returned, 200 is placed in the Execution Error Register and bit 4 of the Event Status Register is set indicating that you do not have the authority to release the lock.
LOCAL	Go to local. This does not release any active interface lock so that the lock remains with the selected interface when the next remote command is received.
ADDRESS?	Returns the bus address <NR1><RMT>. This number can be used to identify the unit
IPADDR?	Returns the present IP address of the LAN interface, provided it is connected. If it is not connected, the response will be the static IP if configured to always use that static IP, otherwise it will be 0.0.0.0 if waiting for DHCP or Auto-IP. The response is nnn.nnn.nnn.nnn<RMT>, where each nnn is 0 to 255.
NETMASK?	Returns the present netmask of the LAN interface, provided it is connected. The response is nnn.nnn.nnn.nnn<RMT>, where each nnn is 0 to 255.

NETCONFIG?	Returns the first means by which an IP address will be sought. The response is <CRD><RMT> where <CRD> is DHCP, AUTO or STATIC.
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The following commands specify the parameters to be used by the LAN interface. **Note:** a power cycle is required after these commands are sent before the new settings are used (or returned in response to the queries listed above). The instrument does not attempt to check the validity of the IP address or netmask in any way other than checking that each part fits in 8 bits. The rear panel LAN RESET switch will override these commands and restore the defaults as described earlier.

NETCONFIG <CPD>	Specifies the means by which an IP address will be sought. <CPD> must be one of DHCP, AUTO or STATIC.
IPADDR <quad>	Sets the potential static IP address of the LAN interface (as on the webpage). The parameter must be strictly a dotted quad for the IP address, with each address part an <NR1> in the range 0 to 255, (e.g. 192.168.1.101).
NETMASK <quad>	Sets the netmask to accompany the static IP address of the LAN interface. The parameter must be strictly a dotted quad for the netmask, with each part an <NR1> in the range 0 to 255, (e.g. 255.255.255.0).

Miscellaneous Commands

*IDN?	Returns the instrument identification. The exact response is determined by the instrument configuration and is of the form <NAME>,<model>, 0, <version><RMT> where <NAME> is the manufacturer's name, <model> defines the type of instrument and <version> is the revision level of the software installed.
*TST?	The PSU has no self test capability and the response is always 0 <RMT>
*TRG	The PSU has no trigger capability.

Error Messages

Each error message has a number; only this number is reported via the remote control interfaces. Error message numbers are not displayed but are placed in the Execution Error Register where they can be read via the remote interfaces, see Status Reporting section.

Calibration Specific Commands

See Service Guide for details of calibration specific commands.