Four Output Autoranging DC Power Supply

E36441A

KEYSIGHT

PROGRAMMING GUIDE

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1 Remote Operation

Introduction to the SCPI Language

Programming Ranges and Output Identifiers

Channels and Channel Lists

SCPI Error Messages

Reset and Non-volatile Settings

SCPI Status Registers

This chapter describes the remote operation for the E36441A autoranging DC power supply.

Introduction to the SCPI Language

Standard Commands for Programmable Instruments (SCPI) is an ASCII-based instrument command language designed for test and measurement instruments. Refer to Simplified Programming Overview for basic techniques for programming the power supply over the remote interface.

SCPI commands are based on a hierarchical structure, also known as a tree system. In this system, associated commands are grouped together under a common node or root, thus forming subsystems. A portion of the SOURce subsystem is shown below to illustrate the tree system.

```
[SOURce:]
        CURRent <current> | MIN | MAX|
        CURRent? MIN | MAX
        CURRent:
                TRIGgered <current> | MIN | MAX}
                TRIGgered? MIN | MAX
        VOLTage <voltage> | MIN | MAX
        VOLTage? MIN|MAX
        VOLTage:
                TRIGgered <voltage> | MIN | MAX
                TRIGgered? MIN | MAX
```

SOURce is the root keyword of the command, CURRent and VOLTage are second-level keywords, and TRIGgered is the third-level keyword. A colon (:) separates a command keyword from a lower-level keyword.

Command Format Used in this Manual

The format used to show commands in this manual is shown below:

```
CURRent <current> | MINimum | MAXimum
```

The command syntax shows most commands (and some parameters) as a mixture of upper-case and lower-case letters. The upper-case letters indicate the abbreviated spelling for the command. For shorter program lines, send the abbreviated form. For better program readability, send the long form.

For example, in the above syntax statement, CURR and CURRENT are both acceptable forms. You can use upper-case or lower-case letters. Therefore, CURRENT, curr, and Curr are all acceptable. Other forms, such as CUR and CURREN, will generate an error.

A vertical bar (|) separates multiple parameter choices for a given command string.

Angle brackets (<>) indicate that you must specify a value for the enclosed parameter. For example, the above syntax statement shows the current parameter enclosed in angle brackets. The brackets are not sent with the command string. You must specify a value for the parameter (such as CURR 0.1).

Some parameters are enclosed in square brackets ([]). The brackets indicate that the parameter is optional and can be omitted. The brackets are not sent with the command string. If you do not specify a value for an optional parameter, the power supply chooses a default value.

A colon (:) separates a command keyword from a lower-level keyword. You must insert a blank space to separate a parameter from a command keyword. If a command requires more than one parameter, you must separate adjacent parameters using a comma as shown below:

```
APPLy CH1,3.5,1.5
```

Command Separators

A colon (:) separates a command keyword from a lower-level keyword as shown below:

```
SOURce:CURRent:TRIGgered
```

A semicolon (;) is used to separate two commands within the same subsystem, and can also minimize typing. For example, sending the following command string:

```
SOUR:VOLT MIN;CURR MAX
```

is the same as sending the following two commands:

```
SOUR:VOLT MIN
SOUR:CURR MAX
```

Use a colon and a semicolon to link commands from different subsystems. For example, in the following command string, an error is generated if you do not use the colon and semicolon:

```
DISP:TEXT:CLE;:SOUR:CURR MIN
```

Using the MIN and MAX parameters

You can substitute MINimum or MAXimum in place of a parameter for many commands. For example, consider the following command:

```
CURRent <current> | MIN | MAX
```

Instead of selecting a specific current, you can substitute MINimum to set the current to its minimum value or MAXimum to set the current to its maximum value.

Querying Parameter Settings

You can query the value of most parameters by adding a question mark (?) to the command. For example, the following command sets the output current to 5 A:

```
CURR 5
```

You can query the value by executing:

```
CURR?
```

You can also query the maximum or minimum value allowed with the present function as follows:

```
CURR? MAX; CURR? MIN
```

CAUTION **If you send two query commands without reading the response from the first, and then attempt to read the second response, you may receive some data from the first response followed by the complete second response. To avoid this, do not send a query command without reading the response. When you cannot avoid this situation, send a device clear before sending the second query command.**

SCPI Command Terminators

A command string sent to the power supply must terminate with a <new line> character. The IEEE-488 EOI (end-or-identify) message is interpreted as a <new line> character and can be used to terminate a command string in place of a <new line> character. A <carriage return> followed by a <new line> is also accepted. Command string termination will always reset the current SCPI command path to the root level. The <new line> character has the ASCII decimal code of 10.

IEEE-488.2 Common Commands

The IEEE-488.2 standard defines a set of common commands that perform functions like reset, self-test, and status operations. Common commands always begin with an asterisk (*), are four to five characters in length, and may include one or more parameters. The command keyword is separated from the first parameter by a blank space. Use a semicolon (;) to separate multiple commands as shown below:

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

SCPI Parameter Types

The SCPI language defines several different data formats to be used in program messages and response messages.

Numeric parameters

Commands that require numeric parameters will accept all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation. Special values for numeric parameters like MINimum, MAXimum, and DEFault are also accepted.

You can also send engineering unit suffixes (V, A, or SEC) with numeric parameters. If only specific numeric values are accepted, the power supply will automatically round the input numeric parameters. The following command uses a numeric parameter:

```
CURR <current> | MIN | MAX
```

Discrete parameters

Discrete parameters are used to program settings that have a limited number of values such as BUS and IMM. Query responses will always return the short form in all upper-case letters. The following command uses discrete parameters:

```
TRIG:SOUR BUS | IMM
```

Boolean parameters

Boolean parameters represent a single binary condition that is either true or false. For a false condition, the power supply will accept OFF or 0. For a true condition, the power supply will accept ON or 1. When you query a boolean setting, the power supply will always return 0 or 1. The following command uses a boolean parameter:

```
DISP OFF | ON
```

String parameters

String parameters can contain virtually any set of ASCII characters. A string must begin and end with matching quotes; either with a single quote or with a double quote. You can include the quote delimiter as part of the string by typing it twice without any characters in between. The following command uses a string parameter:

```
DISP:TEXT <quoted string>
```

Device Clear

Device Clear is an IEEE-488.2 low-level bus message that you can use to return the instrument to a responsive state. Different programming languages and IEEE-488.2 interface cards provide access to this capability through their own unique commands. The status registers, error queue, and all configuration states are left unchanged when a Device Clear message is received.

Device Clear performs the following actions:

- The instrument returns to the trigger "idle" state.
- The instrument's input and output buffers are cleared.
- The instrument is prepared to accept a new command string.

Programming Ranges and Output Identifiers

Output setting commands require a parameter for programming ranges and an output name or an output number as the identifier of each output. Most queries will return a parameter. The programming range for a parameter varies according to the selected output of the power supply. The following table lists the programming ranges, output names, and output numbers for each output.

NOTE Refer to this table to identify parameters when programming the power supply.

		Output 1	Output 2	Output 3	Output 4
Output identifier		CH1	CH2	CH3	CH4
Output number		1	2	3	4
Voltage	MAXimum	32.96 V			
	MINimum	0 V			
	DEFault (*RST)	0 V			
Current	MAXimum	10.3 A			
	MINimum	0 A			
	DEFault (*RST)	1 A			

Channels and Channel Lists

The E36441A models have four output channels, referred to as CH1, CH2, CH3 and CH4 respectively.

Channel list parameter

You can also use the channel list parameter to address one or more channels. You can either list channels:

(@1)

(@2)

(@3, 1, 2)

or you can list both channels:

(@1:4)

(@2:3)

A channel list always starts with an @ and is enclosed in parentheses.

For example, (@2) specifies channel 2 and (@1:4) specifies channels 1 and 4. The channel list, shown as <chanlist> throughout this document, must be preceded with the @ symbol and must be enclosed in parentheses (). A maximum of four channels may be specified through a combination of single channels and ranges. Query results are channel list order-sensitive. Results are returned in the order they are specified in the list.

NOTE **When adding a channel list parameter to a query, you must include a space character between the query indicator (?) and the channel list parameter. Otherwise error –103, invalid separator will occur.**

SCPI Error Messages

The instrument returns error messages in accordance with the SCPI standard.

- Up to 20 errors can be stored in the instrument's error queue, and the annunciator turns on when one or more errors are in the error queue.
- Error retrieval is first-in-first-out (FIFO), and errors are cleared as you read them. When you have read all errors from the error queue, the ERR annunciator turns off.
- If more than 20 errors have occurred, the last error stored in the queue (the most recent error) is replaced with -350,"Queue overflow". No additional errors are stored until you remove errors from the queue. If no errors have occurred when you read the error queue, the instrument responds with +0,"No error".
- Send SYSTem:ERRor? to read the most recent error. Each error is in the format: -104,"Data type error".
- To read the error queue from the front panel, press Utilities > Help > Error.
- The error queue is cleared by power cycles and *CLS., but not *RST.

Execution error codes

The instrument's error codes are listed below:

Code	Text
0	No error This is the response to the ERR? query when there are no errors.
-100	Command error A generic syntax error.
-101	Invalid character An invalid character was found in the command string. You may have inserted a character such as #, $, or % in the command keyword or within a parameter. Example: OUTP:TRAC #ON
-102	Syntax error Invalid syntax was found in the command string. You may have inserted a blank space before or after a colon in the command header, or before a comma. Example: VOLT:LEV ,1
-103	Invalid separator An invalid separator was found in the command string. You may have used a comma instead of a colon, semicolon, or blank space – or you may have used a blank space instead of a comma. Example: TRIG:SOUR,BUS or APPL CH1 1.0 1.0
-104	Data type error The wrong parameter type was found in the command string. You may have specified a number where a string was expected, or vice versa.
-105	GET not allowed A Group Execute Trigger (GET) is not allowed within a command string.

Code	Text
-108	Parameter not allowed More parameters were received than expected for the command. You may have entered an extra parameter, or you added a parameter to a command that does not accept a parameter. Example: OUTP? 10
-109	Missing parameter Fewer parameters were received than expected for the command. You omitted one or more parameters that are required for this command. Example: APPL
-112	Program mnemonic too long A command header was received which contained more than the maximum 12 characters allowed.
-113	Undefined header A command was received that is not valid for this power supply. You may have misspelled the command or it may not be a valid command. If you are using the short form of the command, remember that it may contain up to four letters. Example: TRIGG:DEL 3
-114	Header suffix out of range The numeric suffix attached to a command header is not one of the allowable values. Example: STAT:QUES:INST:ISUM4?
-121	Invalid character in number An invalid character was found in the number specified for a parameter value. Example: *ESE #B01010102
-123	Exponent too large A numeric parameter was found whose exponent was larger than 32,000.
-124	Too many digits A numeric parameter was found whose mantissa contained more than 255 digits, excluding leading zeros.
-128	Numeric data not allowed A numeric parameter was received but a character string was expected. Example: DISP:TEXT 123
-131	Invalid suffix A suffix was incorrectly specified for a numeric parameter. You may have misspelled the suffix. Example: TRIG:DEL 0.5 SECS
-134	Suffix too long A suffix for a numeric parameter contained too many characters.
-138	Suffix not allowed A suffix was received following a numeric parameter which does not accept a suffix. Example: STAT:QUES:ENAB 18 SEC (SEC is not a valid suffix).
-141	Invalid character data Either the character data element contained an invalid character or the particular element received was not valid for the header.
-148	Character data not allowed A discrete parameter was received but a character string or a numeric parameter was expected. Check the list of parameters to verify that you have used a valid parameter type. Example: DISP:TEXT ON
-150	String data error A generic string data error.

Code	Text
-151	Invalid string data An invalid character string was received. Check to see if you have enclosed the character string in single or double quotes. Example: DISP:TEXT 'ON
-158	String data not allowed A character string was received but is not allowed for the command. Check the list of parameters to verify that you have used a valid parameter type. Example: TRIG:DEL 'zero'
-161	Invalid block data The number of data bytes sent does not match the number of bytes specified in the header.
-168	Block data not allowed Data was sent in arbitrary block format but is not allowed for this command.
-170	Expression error A generic expression error.
-171	Invalid expression The expression data element was invalid.
-178	Expression data not allowed Expression data element was sent but is not allowed for this command.
-181	Invalid outside macro definition
-183	Invalid inside macro definition
-200	Execution error A generic syntax error.
-211	Trigger ignored
-213	Init ignored
-221	Settings conflict A data element could not be executed because of the present instrument state.
-222	Data out of range A numeric parameter value is outside the valid range for the command. Example: TRIG:DEL -3
-223	Too much data A character string was received but could not be executed because the string length was more than 40 characters. This error can be generated by the CALibration:STRing command.
-224	Illegal parameter value A discrete parameter was received which was not a valid choice for the command. You may have used an invalid parameter choice. Example: DISP:STAT XYZ (XYZ is not a valid choice).
-225	Out of memory The device has insufficient memory to perform the requested operation.
-230	Data corrupt or stale Possible invalid data. A new reading was started but not completed.
-241	Hardware missing The command could not be executed because of missing hardware, such as an option.
-270	Macro error

Code	Text
-272	Macro execution error
-273	Illegal macro label
-276	Macro recursion error
-277	Macro redefinition not allowed
-310	System error
-330	Self-test failed
-350	Queue overflow
-363	Input buffer overrun
-400	Query error A generic error query.
-410	Query INTERRUPTED A command was received which sends data to the output buffer, but the output buffer contained data from a previous command (the previous data is not overwritten). The output buffer is cleared when power has been off, or after a *RST (reset) command has been executed.
-420	Query UNTERMINATED The power supply was addressed to talk (i.e., to send data over the interface) but a command has not been received which sends data to the output buffer. For example, you may have executed an APPLy command (which does not generate data) and then attempted an ENTER statement to read data from the remote interface.
-430	Query DEADLOCKED A command was received which generates too much data to fit in the output buffer and the input buffer is also full. Command execution continues but all data is lost.
-440	Query UNTERMINATED after indefinite response A query was received in the same program message after a query indicating an indefinite response was executed.
291	Unable to recall state: SNPK configuration mismatched
292	Unable to recall state: configuration mismatched
305	Requested operation is unsupported
400	Data storage is disabled
513	LAN invalid IP address
514	LAN duplicate IP address
515	LAN failed to renew DHCP lease
516	LAN failed to configure
517	LAN failed to initialize
518	LAN VXI-11 fault
519	LAN invalid subnet mask or gateway
520	LAN invalid DNS address 1
521	LAN invalid DNS address 2
560	Analog board firmware version mismatched
561	Analog board (CH1) does not respond

Code	Text
562	Analog board (CH2) does not respond
563	Analog board (CH3) does not respond
564	Analog board (CH4) does not respond
565	Analog board (CH1) over temperature
566	Analog board (CH2) over temperature
567	Analog board (CH3) over temperature
568	Analog board (CH4) over temperature
569	Analog board (CH1) command timed out
570	Analog board (CH2) command timed out
571	Analog board (CH3) command timed out
572	Analog board (CH4) command timed out
593	Temperature monitoring failed
594	Current monitoring failed
595	Voltage monitoring failed
600	Analog board (CH1) failed to enter boot loader
601	Analog board (CH2) failed to enter boot loader
602	Analog board (CH3) failed to enter boot loader
603	Analog board (CH4) failed to enter boot loader
610	EEPROM test failed
611	EEPROM load failed
612	EEPROM checksum failed
613	EEPROM save failed
614	EEPROM sanitization failed
615	Flash sanitization failed
616	Internal SPI communication failed
720	CH2/3/4 is not allowed in serial/parallel/track
722	Multiple channels selection is not allowed during calibration Calibration can only be done one channel at a time.
723	Channel 4 is not supported for Output Relay
735	Cannot change while trigger is initiated Data can't be alter as trigger has already been initiated. Abort the trigger to change data.
739	There is not a valid acquisition to fetch from
742	Illegal operation. List system has started for CH1/2/3/4
743	Operation not allowed when in parallel/series mode
744	Operation not allowed; digital port is in SNPK mode
745	Operation not allowed; SNPK is connected

Code	Text
750	USB not connected This may be due to data logger requiring a USB thumb drive to be connected.
751	USB host access failed This may be due to DUT fails to access the USB thumb drive.
752	Insufficient space in USB drive This may be due to the memory size required by data logger is larger than the available free space.
753	Data logger is running Data logger setting can't be changed while it's running.
754	Data logger do not have valid data Fetch is not allowed as data logger doesn't have valid data.
755	Sample period must be less than duration
756	Duration must be more than sample period
757	Insuficient memory for Datalogger
800	CH1, CH2, CH3 and CH4 are coupled by track system
801	Voltage and current in incompatible transient modes
802	This command is not allowed while list is running
803	BOSTep list length does not match dwell list
804	EOSTep list length does not match dwell list
805	Voltage list length does not match dwell list
806	Current list length does not match dwell list
900	Firmware update failed

Calibration error codes

The following errors indicate failures that may occur during a calibration.

Code	Text
577	Analog board (CH1) calibration failed
578	Analog board (CH2) calibration failed
579	Analog board (CH3) calibration failed
580	Analog board (CH4) calibration failed
581	Invalid state. Cal secured
582	Invalid secure code
583	Secure code too long
584	Failed to calibrate voltage DAC
585	Failed to calibrate voltage ADC
586	Failed to calibrate OVP
587	Failed to calibrate current DAC

Code	Text
588	Failed to calibrate current ADC
589	Sanity check on calibration constants failed
590	Invalid Calibration sequence
591	Failed to calibrate low range current
592	Action not allowed as calibration incomplete
721	Calibration is not allowed when serial/parallel is enabled

Self-test error codes

The following errors indicate failures that may occur during a self-test.

Code	Text
530	(CH1) Analog bias output 12V test failed
531	(CH2) Analog bias output 12V test failed
532	(CH3) Analog bias output 12V test failed
533	(CH4) Analog bias output 12V test failed
534	(CH1) System ADC test failed
535	(CH2) System ADC test failed
536	(CH3) System ADC test failed
537	(CH4) System ADC test failed
538	(CH1) System DAC test failed
539	(CH2) System DAC test failed
540	(CH3) System DAC test failed
541	(CH4) System DAC test failed
550	3.3V power lost
551	5.0V power lost
552	12V power lost
553	Real time clock failed

Reset and Non-volatile Settings

The following tables show the reset and non-volatile settings. These parameters are set to the indicated default values at power-on or after *RST.

Reset (*RST) settings

The instrument's reset settings are listed below:

SCPI command	Default value
APPLy	"0.000000,1.000000
CURRent	1 A
CURRent:STEP	Minimum current calibration resolution
CURRent:TRIGgered	MIN (0)
CURRent:PROTection:STATe	OFF
CURRent:PROTection:DELay	50 ms
CURRent:PROTection:DELay:STARt	SCH
CURRent:MODE	FIX
DIGital:OUTPut:DATA	0
DIGital:TOUTput:BUS	OFF
DISPlay	ON
DISPlay:VIEW	METER4
INITiate:CONTinuous	OFF
INSTrument:SELect	CH1
INSTrument:NSELect	1
OUTPut:STATe	OFF
OUTPut:STATe:DELay:FALL	0
OUTPut:STATe:DELay:RISE	0
OUTPut:STATe:PMODe	VOLT
OUTPut:TRACk:STATe	OFF
OUTPut:PAIR	OFF
LIST:VOLTage	0
LIST:CURRent	1
LIST:DWELl	0.01
LIST:COUNt	1
LIST:TERMinate:LAST	OFF
LIST:STEP	AUTO
LIST:TOUTput:BOSTep	OFF
LIST:TOUTput:EOSTep	OFF

SCPI command	Default value
SENSe:DLOG:FUNCtion:CURRent	OFF
SENSe:DLOG:FUNCtion:MINM	OFF
SENSe:DLOG:FUNCtion:VOLTage	ON
SENSe:DLOG:PERiod	0.2 s
SENSe:DLOG:TIME	30 s
SENSe:DLOG:TINTerval	0.2 s
SYSTem:BEEPer:STATe	ON
SYSTem:COMMunicate:RLSTate	LOC
TRIGger:DELay	0
TRIGger:SOURce	BUS
VOLTage	MIN (0)
VOLTage:TRIGgered	MIN (0)
VOLTage:MODE	FIX
VOLTage:PROTection	35.2 V
VOLTage:SLEW:FALLing	+9.90000000E+37
VOLTage:SLEW:FALLing:MAX	ON
VOLTage:SLEW:RISing	+9.90000000E+37
VOLTage:SLEW:RISing:MAX	ON
VOLTage:STEP	Minimum voltage calibration resolution
VOLTage:SENSe	INT

Non-volatile settings

The instrument's non-volatile settings are listed below:

SCPI command	Default value
OUTPut:COUPle:CHANnel (channel grouping)	NONE
OUTPut:STATe: INHibit:MODE (output Inhibit mode)	OFF
OUTPut:PON:STATE	*RST
DIGital:MODE	NORM
DIGital:PIN<1-3>:FUNCtion (digital port function)	DINP
DIGital:PIN<1-3>:POLarity (digital port polarity)	POS
CALibration:ASAVe	OFF
CALibration:DATE	-
CALibration:SECure:CODE	E36441A
CALibration:SECure:STATe	OFF
CALibration:STRing	-
DISPlay:BRIGhtness	80
LXI:IDENtify:STATe	OFF
LXI:MDNS:STATe	ON
SYSTem:BEEPer:STATe	ON
SYSTem:DATE	-
SYSTem:LANGuage	L1
SYSTem:TIME	-

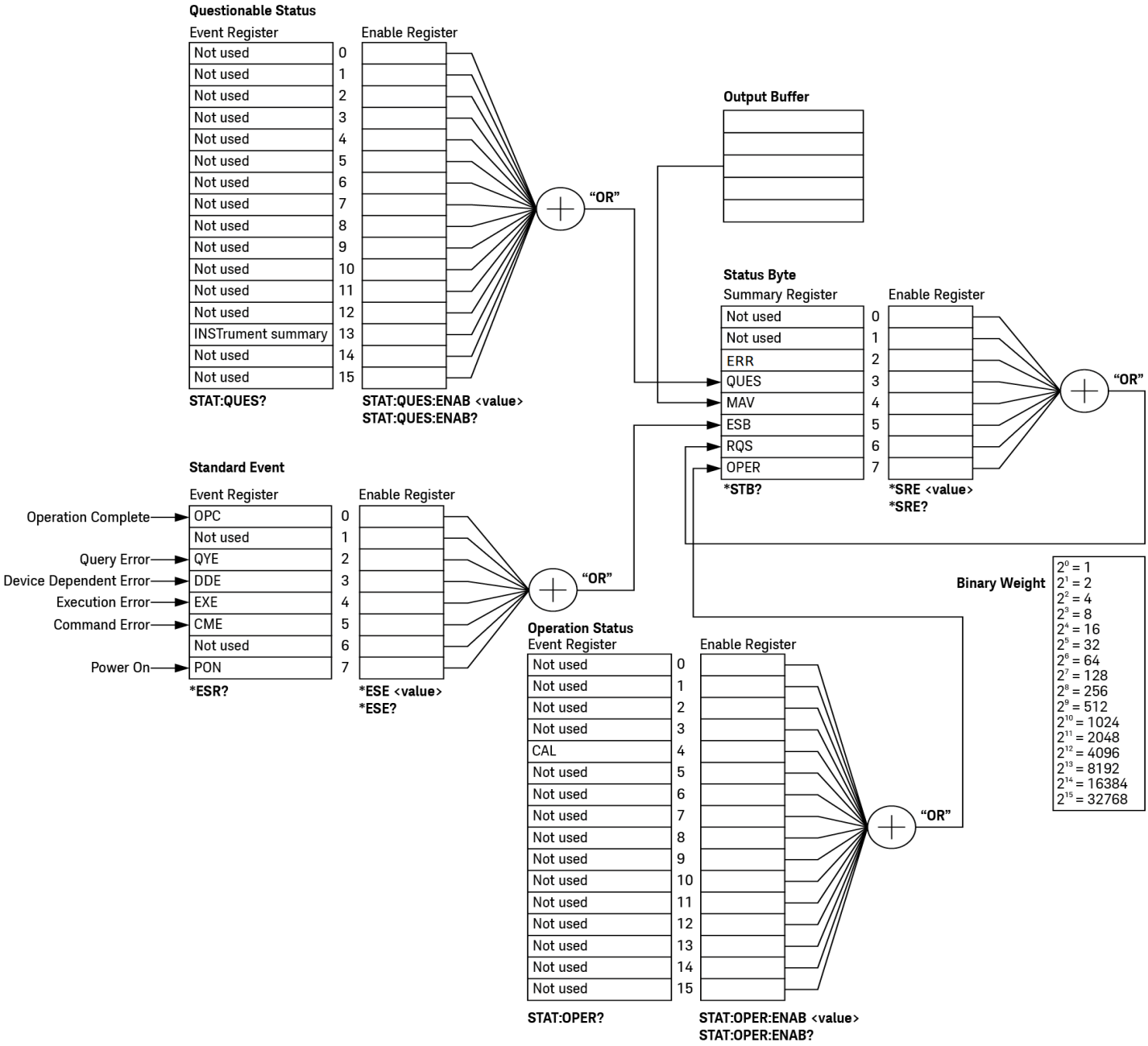
Non-volatile LAN settings

The instrument's non-volatile LAN settings are listed below:

SCPI command	Default value
Get IP Address	Automatic
IP Address	192.168.10.1
Subnet Mask	255.255.255.0
Default Gateway	192.168.10.1
Obtain DNS server from DHCP	Enabled
DNS server	Blank
Host name	K-E36441A-xxxxx
Dynamic DNS naming service	Enabled
Domain name	Blank
Web password	Keysight

SCPI Status Registers

All SCPI instruments implement status registers in the same way. The status system records various instrument conditions in three register groups: the Status Byte register, the Standard Event register, and the Questionable Status register groups. The Status Byte register records high-level summary information reported in the other register groups. The figure below illustrates the SCPI status system used by the power supply.



What is an event register?

An event register is a read-only register that reports defined conditions within the instrument. Bits in an event register are latched. Once an event bit is set, subsequent state changes are ignored. Bits in an event register are automatically cleared by a query of that register (such as *ESR? or STAT:QUES:EVEN?) or by sending the *CLS (clear status) command. A reset (*RST) or device clear will not clear bits in event registers. Querying an event register returns a decimal value of the binary-weighted sum of all bits set in the register.

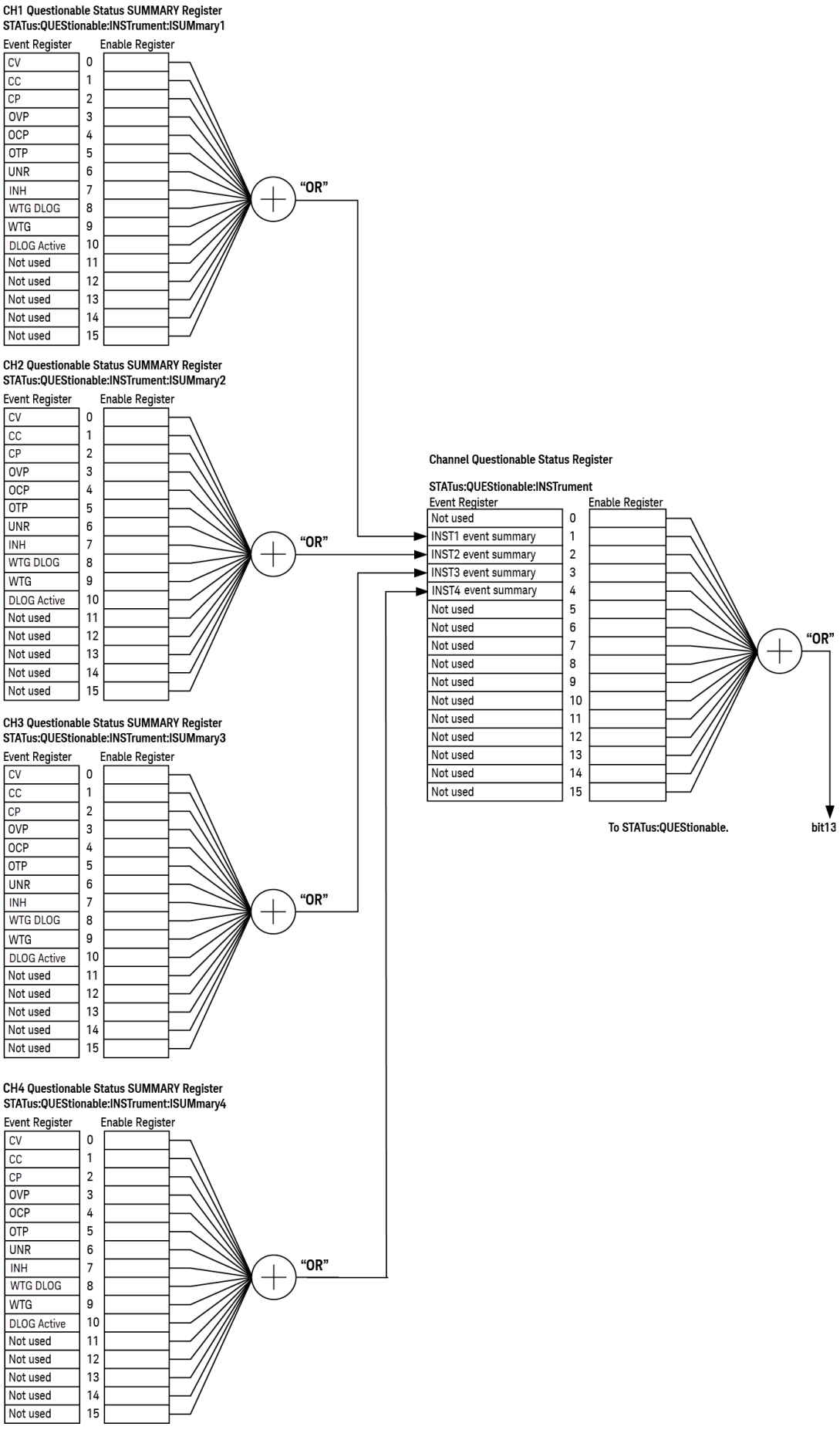
What is an enable register?

An enable register defines which bits in the corresponding event register are logically ORed together to form a single summary bit. Enable registers are both readable and writable. Querying an enable register will not clear it. The *CLS (clear status) command does not clear enable registers but it does clear the bits in the event registers. To enable bits in an enable register, you must write a decimal value which corresponds to the binary-weighted sum of the bits you wish to enable in the register.

What is a multiple logical output?

The four logical outputs of the power supply include an INSTrument summary status register and an individual instrument ISUMmary register for each logical output. The ISUMmary registers report to the INSTrument register, which in turn reports to bit 13 of the Questionable status register, as shown in the diagram below.

This status register configuration allows a status event to be cross-referenced by output and type of event. The INSTrument register indicates which output(s) have generated an event. The ISUMmary register is a pseudo-questionable status register for a particular logical output.


CH1 Questionable Status SUMMARY Register
STATus:QUEStionable:INSTrument:ISUMmary1
Event Register
Enable Register
CV 0
CC 1
CP 2
OVP 3
OCP 4
OTP 5
UNR 6
INH 7
WTG DLOG 8
WTG 9
DLOG Active 10
Not used 11
Not used 12
Not used 13
Not used 14
Not used 15
"OR"
CH2 Questionable Status SUMMARY Register
STATus:QUEStionable:INSTrument:ISUMmary2
Event Register
Enable Register
CV 0
CC 1
CP 2
OVP 3
OCP 4
OTP 5
UNR 6
INH 7
WTG DLOG 8
WTG 9
DLOG Active 10
Not used 11
Not used 12
Not used 13
Not used 14
Not used 15
"OR"
CH3 Questionable Status SUMMARY Register
STATus:QUEStionable:INSTrument:ISUMmary3
Event Register
Enable Register
CV 0
CC 1
CP 2
OVP 3
OCP 4
OTP 5
UNR 6
INH 7
WTG DLOG 8
WTG 9
DLOG Active 10
Not used 11
Not used 12
Not used 13
Not used 14
Not used 15
"OR"
CH4 Questionable Status SUMMARY Register
STATus:QUEStionable:INSTrument:ISUMmary4
Event Register
Enable Register
CV 0
CC 1
CP 2
OVP 3
OCP 4
OTP 5
UNR 6
INH 7
WTG DLOG 8
WTG 9
DLOG Active 10
Not used 11
Not used 12
Not used 13
Not used 14
Not used 15
"OR"
Channel Questionable Status Register
STATus:QUEStionable:INSTrument
Event Register
Enable Register
Not used 0
INST1 event summary 1
INST2 event summary 2
INST3 event summary 3
INST4 event summary 4
Not used 5
Not used 6
Not used 7
Not used 8
Not used 9
Not used 10
Not used 11
Not used 12
Not used 13
Not used 14
Not used 15
"OR"
To STATus:QUEStionable.
bit13

The Questionable Status register

The Questionable Status register provides information about unexpected instrument operation. Bit 13 summarizes questionable outputs. For example, if one output is in constant voltage mode and loses regulation due to an overload, bit 13 is set (latched). Send the STAT:QUES? query to read the register. To make use of bit 13, you must first enable the registers you wish to summarize with bit 13. Send STAT:QUES:INST:ENAB 14 to enable the Questionable Instrument register. Then send STAT:QUES:INST:ISUM<n>:ENAB 4 for each supply to enable the Questionable Instrument Summary register, where n is 1, 2, 3. or 4.

Bit	Bit Name	Decimal Value	Definition
0-3	not used	0	Always set to 0.
4	not used	16	Always set to 0.
5-12	not used	0	Always set to 0.
13	ISUM	8192	Summary of QUES:INST and QUES:INST:ISUM registers.
14-15	not used	0	Always set to 0.

The Questionable Instrument register

The Questionable Instrument register provides information about unexpected operations for each of the four supplies. For example if output 1 supply is in the constant voltage mode and loses regulation, then bit 1 set indicating a possible overload in the output 1 supply. The output 2 supply is reported as bit 2, output 3 supply as bit 3, and the output 4 as bit 4. Send the command STAT QUES:INST? to read the register. The STAT:QUES:INST:ISUM<n> registers must be enabled to make use of the Questionable Instrument register. Send STAT:QUES:INST:ISUM<n>:ENAB 4 to enable output n.

The Questionable Instrument Summary register

There are four Questionable Instrument Summary registers, one for each supply output. These registers provide information about voltage and current regulation. Bit 0 is set when the voltage becomes unregulated, and bit 1 is set if the current becomes unregulated. For example if a supply which is operating as a voltage source (constant voltage mode) momentarily goes to constant current mode, bit 0 is set to indicate that the voltage output is not regulated. To read the register for each supply, send STAT:QUES:INST:ISUM<n>?, where n is 1, 2, 3, or 4.

To determine the operating mode (CV, CC, or CP) for the power supply send STAT:QUES:INST:ISUM<n>:COND?, where n is 1, 2, 3, or 4 depending on the output. Bit 0 true indicates the output is in constant voltage mode, bit 1 true indicates the output is in constant current mode, bit 2 true indicates constant power mode, all bits true indicates neither the voltage, current, or power is regulated, and all bits false indicates the outputs of the power supply are off.

The Questionable Status Event register is cleared when you execute the *CLS (clear status) command or query the event register using the STATus:QUEStionable[:EVENt]? query.

The Questionable Status Enable register is cleared by the STATus:QUEStionable:ENABle 0 command.

Bit	Bit Name	Decimal Value	Definition
0	CV	1	Output is in constant voltage mode.

Bit	Bit Name	Decimal Value	Definition
1	CC	2	Output is in constant current mode.
2	CP	4	Output is in constant power mode.
3	OVP	8	Output is disabled by the over-voltage protection.
4	OCP	16	Output is disabled by the over-current protection.
5	OTP	32	Output is disabled by the over-temperature protection.
6	UNR	64	Output is unregulated.
7	INH	128	Output is inhibited by an external INHibit signal.
8	WTG-DLOG	256	Data logging system is waiting for trigger.
9	WTG	512	Waiting for a trigger
10	DLOG-Active	1024	Data logging system is initiated.
11 -15	not used	not used	Always set to 0.

The Standard Event register

The Standard Event register reports the following types of instrument events: power-on detected, command syntax errors, command execution errors, self-test or calibration errors, query errors, or when an *OPC command is executed. Any or all of these conditions can be reported in the Standard Event Summary bit (ESB, bit 5) of Status Byte register through the enable register. To set the enable register mask, you write a decimal value to the register using the *ESE (Event Status Enable) command.

An error condition (Standard Event register bits 2, 3, 4, or 5) will always record one or more errors in the power supply's error queue. Read the error queue using the SYSTem:ERRor? command.

Bit	Bit Name	Decimal Value	Definition
0	OPC	1	Operation Complete. All commands prior to and including an *OPC command have been executed.
1	not used	0	Always set to 0.
2	QYE	4	Query Error. The power supply tried to read the output buffer but it was empty. Or, a new command line was received before a previous query had been read. Or, both the input and output buffers are full.
3	DDE	8	Device Error. A self-test or calibration error occurred.
4	EXE	16	Execution Error. An execution error occurred.
5	CME	32	Command Error. A command syntax error occurred.
6	not used	0	Always set to 0.
7	PON	128	Power On. Power has been turned off and on since the last time the event register was read or cleared

The Standard Event register is cleared when you execute the *CLS (clear status) command or you query the event register using the *ESR? (Event Status register) command.

The Standard Event Enable register is cleared when you execute the *ESE 0 command or you turn on the power and have previously configured the power supply using the *PSC 1 command.

For example, you must send the *ESE 24 (8 + 16) to enable DDE and EXE bits. Similarly, 24 is returned when you have queried the status of the Standard Event register and the DDE and EXE conditions have occurred.

The Status Byte summary register

The Status Byte summary register reports conditions from the other status registers. Query data waiting in the output buffer is immediately reported through the “Message Available” bit (bit 4) of Status Byte register. Bits in the summary register are not latched. Clearing an event register clears the corresponding Status Byte summary register bits. Reading all messages in the output buffer, including pending queries, clears the message available bit.

Bit	Bit Name	Decimal Value	Definition
0-1	not used	0	Always set to 0.
2	ERR	4	One or more errors have been stored in the Error Queue.
3	QUES	8	One or more bits are set in the questionable status register (bits must be “enabled” in the enable register).
4	MAV	16	Data is available in the power supply output buffer.
5	ESB	32	One or more bits are set in the standard event register (bits must be “enabled” in the enable register).
6	RQS	64	The power supply is requesting service (serial poll).
7	OPER	128	One or more bits are set in the operation status register (bits must be “enabled” in the enable register).

The *CLS (clear status) command clears the Status Byte Summary Register. Querying the Standard Event register (*ESR?) clears only bit 5 in the Status Byte summary register. For example, 24 (8 + 16) is returned when you query the Status Byte register and the QUES and MAV conditions have occurred.

The Status Byte Enable register (Request Service) is cleared when you execute the *SRE 0 command or you turn on the power and have previously configured the power supply using the *PSC 1 command. For example, you must send the *SRE 96 (32 + 64) to enable ESB and RQS bits.

Using Service Request (SRQ) and serial POLL

You must configure your bus controller to respond to the IEEE-488 service request (SRQ) interrupt to use this capability. Use the Status Byte enable register (*SRE command) to select which summary bits will set the low-level IEEE-488 service request signal. When bit 6 (request service) is set in the Status Byte, an IEEE-488 service request interrupt message is automatically sent to the bus controller. The bus controller may then poll the instruments on the bus to identify which one requested service (the instrument with bit 6 set in its Status Byte).

The request service bit is cleared only by reading the Status Byte using an IEEE-488 serial poll or by reading the event register whose summary bit is causing the service request.

To read the Status Byte summary register, send the IEEE-488 serial poll message. Querying the summary register will return a decimal value which corresponds to the binary-weighted sum of the bits set in the register. Serial poll will automatically clear the “request service” bit in the Status Byte summary register. No other bits are affected. Performing a serial poll will not affect instrument throughput.

CAUTION **The IEEE-488 standard does not ensure synchronization between your bus controller program and the instrument. Use the *OPC? command to guarantee that commands previously sent to the instrument have completed. Executing a serial poll before a *RST, *CLS, or other commands have completed can cause previous conditions to be reported.**

Using *STB? to read the Status Byte

The *STB? (Status Byte) query is like a serial poll, but it is processed like any other query. The *STB? command returns the same result as a serial poll, but the “request service” bit (bit 6) is not cleared.

The*STB? query is not handled automatically by the IEEE-488 bus interface hardware and will be executed only after previous commands have completed. Polling is not possible using the *STB? query. The *STB? query does not clear the Status Byte summary register.

Using the message available bit (MAV)

You can use the Status Byte “message available” bit (bit 4) to determine when data is available to read into your bus controller. The power supply subsequently clears bit 4 only after all messages have been read from the output buffer.

To interrupt your bus controller using SRQ

1. Send a device clear message to clear the power supply's output buffer (e.g., CLEAR 705).
2. Clear the event registers with the *CLS (clear status) command.
3. Set up the enable register masks. Execute the *ESE command to set up the Standard Event register and the *SRE command for the Status Byte.
4. Send the *OPC? (operation complete query) command and enter the result to ensure synchronization.
5. Enable your bus controller's IEEE-488 SRQ interrupt.

To determine when a command sequence is completed

1. Send a device clear message to clear the power supply's output buffer (e.g., CLEAR 705).
2. Clear the event registers with the *CLS (clear status) command.
3. Enable the “operation complete” bit (bit 0) in the Standard Event register by executing the *ESE 1 command.
4. Send the *OPC? (operation complete query) command and enter the result to ensure synchronization.
5. Execute your command string to program the desired configuration, and then execute the *OPC (operation complete) command as the last command. When the command sequence is completed, the “operation complete” bit (bit 0) is set in the Standard Event register.
6. Use a serial poll to determine when bit 5 (standard event) is set in the Status Byte summary register. You could also configure the instrument for an SRQ interrupt by sending *SRE 32 (Status Byte enable register, bit 5).

Using *OPC to signal when data is in the output buffer

Generally, it is best to use the “operation complete” bit (bit 0) in the Standard Event register to signal when a command sequence finishes. This bit is set in the register by an *OPC command. If you send *OPC after a command that loads a query response in the instrument's output buffer, you can use the “operation complete” bit to determine when the message is available. However, if too many messages are generated before the *OPC command executes (sequentially), the output buffer will fill and the instrument will stop processing commands.

2 SCPI Programming

ABORt Subsystem

APPLy Subsystem

CALibration Subsystem

CURRent Subsystem

DIGital Subsystem

DISPlay Subsystem

FETCh Subsystem

HCOPy Subsystem

IEEE-488 Subsystem

INITiate Subsystem

INSTrument Subsystem

LIST Subsystem

LXI Subsystem

MEASure Subsystem

MMEMory Subsystem

OUTPut Subsystem

SENSe Subsystem

STATus Subsystem

SYSTem Subsystem

TRIGger Subsystem

Triggering Commands

VOLTage Subsystem

This chapter describes the subsystem commands available to the E36441A autoranging DC power supply.

ABORt Subsystem

ABORt [(@<chanlist>)]

The command clears any pending delayed trigger and returns the trigger system to idle. If INIT:CONT is enabled, ABORt does not turn off continuous triggers.This command also resets the WTG-tran bit in the Operation Condition Status register.

Parameter	Typical return
(none)	(none)
Aborts the triggered action of channel 1: ABOR (@1)	

ABORt:DLOG

The command stops the current data logging session similar to pressing the [Datalog Run/Stop] key on the instrument.

Parameter	Typical return
(none)	(none)
Stops the current data logging session: ABOR:DLOG	

APPLy CH1 | CH2 | CH3 | CH4[,<voltage> | DEFault | MINimum | MAXimum [,<current> | DEFault | MINimum | MAXimum]]
APPLy? [CH1 | CH2 | CH3 | CH4]

The command is combination of INSTrument:SELect, [SOURce:]CURRent, and [SOURce:]VOLTagecommands. The values of the voltage and current of the specified output will change as soon as the command is executed.

For the voltage and current parameters of the APPLy command, the ranges depend on the output currently selected. You can substitute “MINimum”, “MAXimum”, or “DEFault” in place of a specific value for the voltage and current parameters. MIN selects the lowest voltage and current values allowed for the selected output. MAX selects the highest voltage and current values allowed. If you specify only one value for the parameter, the power supply regards it as voltage setting value. If you do not specify any value for the parameter, the APPLy command only selects the output specified and acts as the INSTrument command.

The query returns the power supply's present voltage and current values for each output as a quoted string as shown in the sample string below (the quotation marks are returned as part of the string). If any output identifier is not specified, the voltage and the current of the currently selected output are returned.

"5.00000,1.00000"

Referring to the above string, the first number 5.00000 is the voltage limit value and the second number 1.00000 is the current limit value for the specified output.

Output	Range of values
<voltage>	MAX = 32.96 V | MIN = 0 V | DEF = 0 V
<current>	MAX = 10.3 A | MIN = 0 A | DEF = 1 A

Parameter	Typical return
<voltage> | DEF | MIN | MAX, <current> | DEF | MIN | MAX	<voltage>, <current>
*RST<DEF in Range of values>	
Sets the maximum voltage and current of channel 1 output : APPL CH1, MAX, MAX	

NOTE The calibration can only be done one channel at a time, hence the channel list for all calibration commands will only accept one channel.

CALibration:ASAVE ON | OFF | 1 | 0
CALibration:ASAVE?

The command enables or disables automatic saving of calibration constants. If auto save is enabled, the calibration data will automatically save into the non-volatile memory whenever a point is successfully calibrated.

The query returns 0 (OFF) or 1 (ON).

Parameter	Typical return
ON | OFF | 1 | 0	0 or 1
Enables the CAL auto save feature: `CAL:ASAVE 1`	

Remarks

- System date will be used as calibration date and automatically store into the non-volatile memory when calibration constants are stored. You can overwrite the calibration date using CAL:DATE.
- This setting is non-volatile. It will not be changed by power cycling, or after a Factory Reset (*RST command).

CALibration:COUNt?

The query returns the number of times the power supply has been calibrated. Your power supply was calibrated before it left the factory. When you receive your power supply, read the count to determine its initial value. If auto save is enabled, the value increments by one for each calibration point, a complete calibration for all points will increase the value by eight counts.

If CAL:SAVE is used, the value increments by one for each channel calibration, a complete calibration for four outputs will increase the value by four counts.

Parameter	Typical return
(none)	<count>
Returns the calibration count: `CAL:COUN?`	

Remarks

- The calibration count is stored in non-volatile memory. It will not be changed by power cycling, or after a Factory Reset (*RST command).

CALibration:DATE ["<string>"]
CALibration:DATE?

The command stores the date that the power supply was last calibrated in non-volatile memory. If the input string parameter is not specified, the system date will be stored. This command can saves up to 20 characters.

The query returns the date. If no date is stored, an empty quoted string ("") is returned.

Parameter	Typical return
"<string>"	"<string>"
Enters the calibration date: CAL:DATE "10/10/2020"	

Remarks

- This setting is non-volatile. It will not be changed by power cycling, or after a Factory Reset (*RST command).

CALibration:SAVE

The command saves calibration constants in non-volatile memory after the calibration procedure has been completed. When you exit (CALibration:SECure:STATe OFF) without saving, the previous constants are restored. If the Auto Save feature is not enabled, you need to send CAL:SAVE command to store the new calibration data to non-volatile memory.

Parameter	Typical return
(none)	(none)
Saves calibration constants: CAL:SAVE	

Remarks

- System date will be used as calibration date and automatically store into the non-volatile memory when calibration constants are stored. You can overwrite the calibration date using CAL:DATE.

CALibration:SECure:CODE <new code>

The command enters a new security passcode. To change the passcode, first unsecure the power supply using the old passcode. Then, enter the new passcode. The passcode can be set up to 12 characters. The first character must be a letter (A-Z), remaining may contains letters, numbers (0-9), or underscore "_". Blank spaces are not allowed.

Parameter	Typical return
<new code>	(none)
Sets the new security passcode to E36441A: CAL:SEC:CODE E36441A	

Remarks

- When you first receive your instrument, it is secured, and the default security code is set to "E36441A".
- This setting is non-volatile; it will not be changed by power cycling, or after a factory reset (*RST command).
- If you forget your security code, you can override the security feature. For more information, see *E36441A Service Guide*.

CALibration:SECure:STATe ON | OFF | 1 | 0, <code>
CALibration:SECure:STATe?

The command unsecures or secures the power supply for calibration, using the code specified by CALibration SECure:CODE.

The query returns 0 (calibration unsecured) or 1 (calibration secured).

Parameter	Typical return
ON | OFF | 1 | 0, <code>	1 or 0
Unsecures the power supply for calibration: CAL:SEC:STAT OFF, E36441A	

Remarks

- When you first receive your instrument, it is secured, and the default security code is set to "E36441A".
- This setting is non-volatile. It will not be changed by power cycling or after a Factory Reset (*RST command).

CALibration:STRing "<string>"
CALibration:STRing?

The command saves up to 40 characters of information, such as the calibration message, the next calibration due date, or the power supply's serial number. You must unsecure the instrument before saving the string, but you can read the string regardless of the security status.

The query returns a quoted string.

Parameter	Typical return
"<string>"	"<string>"
Sets the string to "4/22/17": `CAL:STR "4/22/17"`	

Remarks

- If no calibration message has been specified, an empty quoted string ("") is returned.
- Storing a calibration message will overwrite any message previously stored in calibration memory.
- This setting is non-volatile; it will not be changed by power cycling, or after a factory reset (*RST command).

[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude] <current> | MINimum | MAXimum | DEFault | UP | DOWN[, (@<chanlist>)]
[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]? MINimum | MAXimum | DEFault[, (@<chanlist>)]

The command directly programs the immediate current level of the power supply in amperes. The immediate level is the current limit value of the output selected in the "chanlist" parameter or with the INSTrument command if "chanlist" parameter is absent.

This command also increases or decreases the immediate current level using the ‘‘UP’’ or ‘‘DOWN’’ parameter by a predetermined amount. The command CURRent:STEP sets the amount of increase or decrease.

The query returns a number in the form +n.nnnnnnnnE+nn for each channel specified.

Channel	CH1	CH2	CH3	CH4
MINimum			0 A	
MAXimum			10.3 A	
DEFault			1 A	

Parameter	Typical return
0 - maximum | MIN | MAX | DEF | UP | DOWN (The maximum value is dependent on the current rating of the power supply) *RST <DEF in Default value>	<current level>
Sets the output current level to 3 A on channel 1: CURR 3, (@1)	

[SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement] <current> | DEFault[, (@<chanlist>)]
[SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement]? [DEFault,] [(@<chanlist>)]

The command sets the step size for current programming with the CURRent UP and CURRent DOWN commands.

To set the step size to the minimum resolution, set the step size to ''DEFault''. The CURR:STEP? DEF returns the minimum resolution of your instrument. The immediate current level increases or decreases by the value of the step size. For example, the output current will increase or decrease 10 mA if the step size is 0.01.

This command is useful when you program the power supply to the allowed minimum resolution. At *RST, the step size is the value of the minimum resolution.

The query returns a number in the form +n.nnnnnnnnE+nn for each channel specified.

Channel	CH1	CH2	CH3	CH4
MINimum			0 A	
MAXimum			10.3 A	
DEFault			minimum resolution	

Parameter	Typical return
0 - maximum | DEF (The maximum value is dependent on the current rating of the power supply) *RST <DEF in Default value>	<current level>
Sets the output current step size to 3 A on channel 1: CURR:STEP 3, (@1)	

[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude] <current>| MINimum | MAXimum[, (@<chanlist>)]
[SOURce:]CURRent[:LEVel]:TRIGgered[:AMPLitude]? [MINimum | MAXimum,] [(@<chanlist>)]

The command programs the triggered current level of the specified output channel. Units are in amperes. The triggered level is a stored value that is transferred to the output when an output step is triggered.

The query returns the programmed triggered level in the form +n.nnnnnnnnE+nn for each channel specified. Multiple responses are separated by commas.

Channel	CH1	CH2	CH3	CH4
MINimum			0 A	
MAXimum			10.3 A	

Parameter	Typical return
0 - maximum | MIN | MAX (The maximum value is dependent on the current rating of the power supply)	<current level>
*RST MIN	
Sets the triggered current to 1 A on channels 1 and 2: CURR:TRIG 1, (@1,2)	

[SOURce:]CURRent:MODE FIXed | STEP | LIST[, (@<chanlist>)]
[SOURce:]CURRent:MODE? [(@<chanlist>)]

The command determines what happens to the output current when the transient system is initiated and triggered.

The query returns the current mode for each channel specified. Multiple responses are separated by commas.

Mode	Description
FIXed	Nothing happens. The output current remains at the immediate value.
STEP	The output goes to the triggered level when a trigger occurs.
LIST	The output follows the list values when a trigger occurs.

Parameter	Typical return
FIX | STEP | LIST	FIX, STEP, or LIST
*RST FIX	
Sets the current mode of channel 3 to Step: CURR:MODE STEP, (@3)	

[SOURce:]CURRent:PROTection:CLEar [(@<chanlist>)]

The command clears an overcurrent protection event.

Parameter	Typical return
(none)	(none)
Clears an overcurrent protection event for channel 1: CURR:PROT:CLE (@1)	

[SOURce:]CURRent:PROTection:DELay[:TIME] <time> | MINimum | MAXimum[, (@<chanlist>)]
[SOURce:]CURRent:PROTection:DELay[:TIME]? [MINimum | MAXimum,] [(@<chanlist>)]

The command sets the over-current protection delay time in seconds. The over-current protection function will not be triggered during the delay time. After the delay time has expired, the over-current protection function will be active. This prevents momentary changes in output status from triggering the over-current protection function. Delay time can be programmed from 0 to 3600 seconds with the resolution of 1 millisecond.

The query returns the overcurrent protection delay in seconds in the form +n.nnnnnnnnE+nn.

Parameter	Typical return
0 – 3600.000 | MIN | MAX |	<delay value>
*RST 0.050	
Sets the protection delay to 0.2 seconds for channel 1: CURR:PROT:DEL 0.2, (@1)	

Remarks

- The operation of over-current protection is affected by the setting of the current protection delay start event, which is specified by CURRent:PROTection:DELay:STARt.

[SOURce:]CURRent:PROTection:DELay:STARt SCHange | CCTRans[, (@chanlist)]
[SOURce:]CURRent:PROTection:DELay:STARt? [(@chanlist)]

The command specifies the condition that starts the overcurrent protection delay timer.

Mode	Description
SCHange	Transitions into constant current mode are automatically ignored during a programmed settings change in voltage, current, or output state. At the end of the settings change, the delay timer starts, allowing additional protection delay time. There is no protection delay outside of these time windows.
CCTRans	The overcurrent protection delay timer is started by any transition of the output into constant current mode.

The query returns SCH or CCTR.

Parameter	Typical return
SCH | CCTR	SCH or CCTR
*RST SCH	
Sets CCTRans as the current protection delay mode for channel 1: CURR:PROT:DEL:STAR CCTR, (@1)	

[SOURce:]CURRent:PROTection:STATe ON | OFF | 1 | 0[, (@<chanlist>)]
[SOURce:]CURRent:PROTection:STATe? [(@<chanlist>)]

The command enables or disables overcurrent protection, which causes the instrument to go into a protected state when the power supply status is in constant current mode for a time longer than the OCP delay. Output will be OFF after OCP is tripped. An overcurrent condition can be cleared with the CURR:PROT:CLE command after the condition that caused the OCP trip is removed.

The query returns 1 (ON) or 0 (OFF) or the over current protection state.

Parameter	Typical return
ON | 1 | OFF | 0	1 or 0
*RST OFF	
Enable the current protection state for channel 1: CURR:PROT:STAT ON, (@1)	

[SOURce:]CURRent:PROTection:TRIPped? [(@<chanlist>)]

The query indicates whether an overcurrent protection occurred (1) or not (0). This is reset to 0 by CURRent:PROTection:CLEar.

Parameter	Typical return
(none)	1 or 0
Indicates whether an overcurrent protection occurred on channel 1: CURR:PROT:TRIP? (@1)	

[SOURce:]DIGital:INPut:DATA?

The query returns the state of the digital control port pins. It returns the binary-weighted value of the state of pins 1 through 3 in bits 0 through 2 respectively.

Parameter	Typical return
(none)	<bit value>
Returns the state of the digital control port: DIG:INP:DATA?	

[SOURce:]DIGital:MODE NORMal | SNPK
[SOURce:]DIGital:MODE?

The command selects the mode of operation of the digital control port. The mode is saved in non-volatile memory.

The query returns NORM or SNPK.

Mode	Description
Normal	The port is configured as normal digital control port. The pins can be set to various functions. See [SOURce:]DIGital:PIN<1-3>:FUNCtion.
SNPK	The port is configured for Series and Parallel Kit connection.

Parameter	Typical return
NORMal | SNPK	NORM or SNPK
Sets digital control port to SNPK mode: DIG:MODE SNPK	

[SOURce:]DIGital:OUTPut:DATA <value>
[SOURce:]DIGital:OUTPut:DATA?

The command sets the output data on the digital control port when that port is configured for Digital I/O operation. The port has three signal pins and a digital ground pin. In the binary-weighted value that is written to the port, the pins are controlled according to the following bit assignments:

Pin	1	2	3
Bit number	0	1	2
Decimal value	1	2	4

Parameter	Typical return
0 - 7	<bit value>
*RST 0	
Programs pins 1 and 3 with bit number 0 = 1 and bit 2 = 4: DIG:OUTP:DATA 5	

[SOURce:]DIGital:PIN<1-3>:FUNCtion <function>
[SOURce:]DIGital:PIN<1-3>:FUNCtion?

The command sets the functions of the digital port pins. The pin functions are saved in non-volatile memory.

The query returns the setting of pins 1, 2, or 3.

Function	Description
DIO	The pin is a general-purpose ground-referenced digital input/output. The output can be set with [SOURce:]DIGital:OUTPut:DATA.
DINPut	The pin is in digital input-only mode. The digital output data of the corresponding pin is ignored.
TOUTput	The pin is configured as a trigger output. When configured as a trigger output, the pin will only generate output triggers if the List transient system has been configured to generated trigger signals. See [SOURce:]LIST:TOUTput:BOSTep, and [SOURce:]LIST:TOUTput:EOSTep.
TINPut	The pin is configured as a trigger input. When configured as a trigger input, the pin can be selected as the source for transient trigger signals. See TRIGger[:SEQuence]:SOURce.
FAULt	Applies only to pin 1. Setting FAULt means that pin 1 functions as an isolated fault output. The fault signal is true when any output is in a protected state (from OC, OV, OT, INH). Note also that Pin 2 serves as the isolated common for pin 1. When pin 1 is set to the FAULt function, the instrument ignores any commands to program pin 2. Queries of pin 2 will return FAULt. If pin 1 is changed from FAULt to another function, pin 2 is set to DINPut.
INHibit	Applies only to pin 3. When pin 3 is configured as an inhibit input, a true signal at the pin will disable all output channels.
ONCouple	When configured as an On control, the pin will synchronize the output On state between power supplies. Only one pin can be configured as an On control. The pin will function as both an input and an output. The polarity of the pin is fixed and cannot be programmed.
OFFCouple	When configured as an Off control, the pin will synchronize the output Off state between power supplies. Only one pin can be configured as an Off control. The pin will function as both an input and an output. The polarity of the pin is fixed and cannot be programmed.
RELay	The pin is configured as an output relay. See OUTPut:RELay.

Parameter	Typical return
DIO | DINP | TOUT | TINP | FAUL | INH | ONC | OFFC | REL	DIO, DINP, TOUT, TINP, FAUL, INH, ONC, OFFC, or REL
Sets pin 1 to Fault mode: DIG:PIN1:FUNC FAUL	

[SOURce:]DIGital:PIN<1-3>:POLarity POSitive | NEGative
[SOURce:]DIGital:PIN<1-3>:POLarity?

The command sets the polarity of the digital port pins. The pin polarities are saved in non-volatile memory.

The query returns the polarity, POS or NEG.

Polarity	Description
POSitive	Setting a polarity to POSitive means that a logical true signal is a voltage high at the pin. For trigger inputs and outputs, POSitive means a rising edge.
NEGative	Setting the polarity NEGative means that a logical true signal is a voltage low at the pin. For trigger inputs and outputs, NEGative means a falling edge.

Parameter	Typical return
POS | NEG	POS or NEG
Sets pin 1 to negative polarity: DIG:PIN1:POL NEG	

[SOURce:]DIGital:TOUTput:BUS[:ENABle] 0 | OFF | 1| ON
[SOURce:]DIGital:TOUTput:BUS[:ENABle]?

The command allows a BUS trigger to be sent to any digital port pin that has been configured as a trigger output. The state is either ON (1) or OFF (0). A trigger is generated when the state is True (ON). A trigger is not generated when the state is False (OFF). A BUS trigger is generated using the *TRG command.

The query returns 0 (OFF) if the trigger signal will not be generated when a BUS trigger command occurs, and 1(ON) if a trigger signal will be generated when a BUS trigger command occurs.

Pins 1 to 3 must be configured as trigger outputs before they can generate a trigger signal. See [SOURce:]DIGital:PIN<1-3>:FUNCtion and [SOURce:]DIGital:PIN<1-3>:POLarity.

Parameter	Typical return
OFF | 0 | ON | 1	0 or 1
*RST OFF	
Enables BUS-generated trigger signals on the digital pins: DIG:TOUT:BUS ON	

DISPlay[:WINDow][:STATe] ON | OFF | 1 | 0
DISPlay[:WINDow][:STATe]?

The command turns the front-panel display off or on. When the display is disabled, the entire front panel display turns black. The display state is automatically turned on when any key is pressed.

The query returns 0 (OFF) or 1 (ON).

Parameter	Typical return
ON | OFF | 1 | 0	0 or 1
*RST ON	
Turns the front panel display off: DISP OFF	

DISPlay:BRIGhtness <brightness level>
DISPlay:BRIGhtness?

The command sets the brightness level of the front panel display.

Parameter	Typical return
0 - 100	<brightness level>
Sets the front panel display brightness to maximum: DISP:BRIG 100	

Remarks

- The setting is non-volatile, and does not change by power cycling or after a Factory Reset (*RST command).

DISPlay[:WINDow]:VIEW METER1 | METER4
DISPlay[:WINDow]:VIEW?

The command selects 1- or 4-channel meter view. METER1 displays one large output channel with three small less detailed channel. METER4 displays all four output channels.

The query returns METER1, or METER4.

Parameter	Typical return
METER1 | METER4	METER1 or METER4
*RST METER4	
Sets the front panel to display all output channels: DISP:VIEW METER4	

FETCh[:SCALar]:DLOG? <number>[, (@<chanlist>)]

The query returns the specified number of logged data from channel that is enabled with voltage and/or current data logging. The data is fetched start from the data next to the last fetched data in the previous fetch.

Parameter	Typical return
0 - 65536	<value> [,<value>]
Returns 10 logged data from channel 1: FETC:DLOG? 10, (@1)	

HCOPy Subsystem

HCOPy commands return the front panel display image.

HCOPy:SDUMp:DATA?

The query returns the front panel display image ("screen shot").

Parameter	Typical return
(none)	(A definite-length binary block containing the image.) Definite-length block data allows any type of device-dependent data to be transmitted as a series of 8-bit binary data bytes. This is particularly useful for transferring large quantities of data or 8-bit extended ASCII codes.
Capture and return the display image: HCOP:SDUM:DATA?	

Remarks

- The image format (BMP or JPG) is specified by HCOPy:SDUMp:DATA:FORMat.

HCOPy:SDUMp:DATA:FORMat BMP | JPG
HCOPy:SDUMp:DATA:FORMat?

The command specifies the image format for images returned by HCOPy:SDUMp:DATA?.

Parameter	Typical return
BMP | JPG Default: BMP	BMP or JPG
Specify BMP as the image format: HCOP:SDUM:DATA:FORM BMP	

*CLS

The command clears the event registers in all register groups and the error queue.

Parameter	Typical return
(none)	(none)
Clears all event registers, and error queue: *CLS	

*ESE <enable value>
*ESE?

The command enables bits in the Standard Event Enable register. The selected bits are then reported to the Status Byte.

The query returns the decimal value of the binary-weighted sum of all bits in the Standard Event enable register.

Parameter	Typical return
A decimal value that corresponds to the binary-weighted sum of the bits in the register. For example, to enable bit 2 (decimal value = 4), bit 3 (decimal value = 8), and bit 7 (decimal value = 128), the decimal sum would be 140 (4 + 8 + 128). Default: 0	<bit value>
Enable bit 3 (decimal value = 8), and bit 4 (decimal value = 16) in the enable register: *ESE 24	

Standard event status enable register

Bit	Value	Name	Description
0	1	OPC	Operation Complete. All commands prior to and including an *OPC command have been executed.
1	0	(unused)	Always set to 0.
2	4	QYE	Query Error. The power supply tried to read the output buffer but it was empty. Or, a new command line was received before a previous query had been read. Or, both the input and output buffers are full.
3	8	DDE	Device Error. A self-test or calibration error occurred.
4	16	EXE	Execution Error. An execution error occurred.
5	32	CME	Command Error. A command syntax error occurred.
6	0	(unused)	Always set to 0.
7	128	PON	Power On. Power has been turned off and on since the last time the event register was read or cleared

Remarks

- Use *PSC to control whether the Standard Event enable register is cleared at power on. For example, *PSC 0 preserves the enable register contents through power cycles.
- *CLS clears the event register, but does not clear the enable register.
- This setting is non-volatile; it does not change after a Factory Reset (*RST command), Status Preset (STATus:PRESet command) or Clear Status (*CLS command).

*ESR?

The query returns the decimal value of the binary-weighted sum of all bits in the Standard Event register.

Parameter	Typical return
(none)	<bit value>
Read event status enable register: *ESR?	

Remarks

- In order to be reported to the Status Register, the corresponding bits in the event register must be enabled using the *ESE command.
- Once a bit is set, it remains set until cleared by reading the event register or execution of the Clear Status (*CLS command).

*IDN?

The query returns the instrument's identification string. An example is shown below.

Keysight Technologies,E36441A,CN00000001,XX.XX-XX.XX-XX.XX

The four comma-separated fields are the manufacturer's name, the model number, the serial number, and the revision code. The first XX.XX in the revision code is the front panel firmware revision; the second is the controller firmware revision; and the third is the power board firmware revision.

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Parameter	Typical return
(none)	<ASCII string with comma-separated fields>
Return the instrument's identification string: *IDN?	

*OPC
*OPC?

The command sets the “Operation Complete” bit (bit 0) of the Standard Event register when the instrument has completed all pending operations sent before *OPC. This occurs at the completion of the current operation.

The query returns 1 to the output buffer when all pending operations complete. The response is delayed until all pending operations complete.

Parameter	Typical return
(none)	1
Sets the Operation Complete bit: *OPC	
Return a 1 when the command is complete: *OPC?	

Remarks

- These commands are primarily used for program synchronization.
- Used in conjunction with initiated acquisitions, initiated transients, output state changes, and output settling time to provide a way to poll or interrupt the computer when these pending operations complete.
- Other commands may be executed before the operation complete bit is set.
- The difference between *OPC and *OPC? is that *OPC? returns "1" to the output buffer when the current operation completes.

*PSC 0|1
*PSC?

The command clears the Status Byte and the Standard Event register enable masks when power is turned on (*PSC 1). When *PSC 0 is in effect, the Status Byte and Standard Event register enable masks are not cleared when power is turned on.

The query returns a 0 (*PSC 0) or a 1 (*PSC 1).

Parameter	Typical return
0 | 1	0 or 1
Default: 1	
Clear the Status Byte and Standard Event register enable masks: *PSC 1	

Remarks

- This setting is non-volatile; it does not change after a Factory Reset (*RST command), Status Preset (STATus:PRESet command) or Clear Status (*CLS command).

*RCL 0 | 1 | 2 | . . . | 8 | 9

The command recalls a previously stored state from one of ten non-volatile storage locations. To recall a stored state, you must use the same memory location used previously to store the state. If an empty memory location is recalled, power-on default states will be applied to the power supply.

Parameter	Typical return
0 - 9	(none)
Recall the state from location 1: *RCL 1	

Remarks

- Recall will be failed if the recalled code compatibility mode does not match with the code compatibility mode that currently run in the power supply.
- If Series and Parallel Kit is connected, recall will be failed if the recalled pair mode does not match with the kit configuration.

*RST

The command resets the instrument to its power-on default state. Refer to Factory Reset State for a complete listing of the instrument's factory configuration. It does not clear any of the status registers or the error queue. It also does not affect any interface error conditions.

*RST also forces the ABORt commands. This cancels any output trigger actions presently in process and resets the WTG bits in the Status Questionable Instrument Summary Registers. This command also reset the calibration operation.

Parameter	Typical return
(none)	(none)
Reset the instrument: *RST	

Remarks

- If Series and Parallel kit is connected, the power supply will still remain in the Series/Parallel mode after reset.

*SAV 0 | 1 | 2 | . . . | 8 | 9

The command saves the current instrument state using one of ten non-volatile storage locations.

The instrument states includes:

- Voltage, current, OVP, OCP delay, OCP state, and OCP delay start
- Voltage slew, output preference, sense
- Output state, selected output, and couple trigger channel
- Tracking mode
- Operation mode (Independent, Series, or parallel)
- Output on/off sequencing
- Output LIST settings
- Trigger settings
- Digital I/O output data and bus setting
- Data logger trigger source
- Display state, meter view and image capture format

Saving a state overwrites the previous state (if any) stored in that location. When shipped from the factory, storage locations 0 through 9 are empty.

Refer to Factory Reset Settings for a list of instrument settings that can be saved.

Parameter	Typical return
0 - 9	(none)
Save the state to location 1: *SAV 1	

*SRE <enable value>
*SRE?

The command enables the bits in the Status Byte Enable register.

The query returns the decimal value of the binary-weighted sum of all bits set in the register.

Parameter	Typical return
A decimal value that corresponds to the binary-weighted sum of the bits in the register. For example, to enable bit 2 (decimal value = 4), bit 3 (decimal value = 8), and bit 7 (decimal value = 128), the decimal sum would be 140 (4 + 8 + 128). Default: 0	<bit value>
Enable bit 3 (decimal value = 8), and bit 4 (decimal value = 16) in the enable register: *SRE 24	

Remarks

- To enable specific bits, specify the decimal value corresponding to the binary-weighted sum of the bits in the register. The selected bits are summarized in the "Master Summary" bit (bit 6) of the Status Byte Register. If any of the selected bits change from 0 to 1, the instrument generates a Service Request signal.
- *CLS command clears the event register, but does not clear the enable register. An event register is a read-only register that latches events from the condition register. While an event bit is set, subsequent events corresponding to that bit are ignored.
- Use *PSC to control whether the Status Byte enable register is cleared at power-on. For example, *PSC 0 preserves the enable register contents through power cycles.
- This setting is non-volatile; it does not change after a Factory Reset (*RST command), Status Preset (STATus:PRESet command) or Clear Status (*CLS command).

*STB?

The query queries the Status Byte Summary register and returns the same result as a serial poll but the “Request Service” bit (bit 6) is not cleared if a serial poll has occurred.

Parameter	Typical return
(none)	<bit value>
Read the status byte: *STB?	

*TRG

The command generates an event trigger to the trigger system when the trigger system has a BUS (software) trigger as its trigger source (TRIG:SOUR BUS). If the trigger system is not initiated, the *TRG command is simply ignored.

Parameter	Typical return
(none)	(none)
Generates an immediate trigger: `*TRG`	

*TST?

The query returns a 0 if the self-test passes or a non-zero value if it fails. If the self-test fails, the instrument also generates an error message with additional information on why the test failed.

Use SYSTem:ERRor? to read the error queue. See SCPI Error Messages for more information.

Parameter	Typical return
(none)	0 or 1
Performs an instrument self-test: `*TST?`	

*WAI

The command waits for all pending operations to complete before executing any additional remote interface commands.

Parameter	Typical return
(none)	(none)
Waits for all pending operations to complete: `*WAI`	

INITiate[:IMMediate] [(@<chanlist>)]

The command enables the output trigger system. When an output trigger is initiated, an event on a selected trigger source causes the specified triggering action to occur. If the trigger system is not initiated, all triggers are ignored.

Parameter	Typical return
(@<chanlist>)	(none)
Initiates the trigger system on channel 1: INIT (@1)	

INITiate:CONTinuous ON | OFF | 1 | 0[, (@<chanlist>)]
INITiate:CONTinuous ? [(@<chanlist>)]

The command continuously initiates the output trigger system. This allows multiple triggers to generate multiple output transients with no intermediate commands. The enabled state is ON (1); the disabled state is OFF (0). With continuous triggering disabled, the output trigger system must be initiated for each trigger using the INIT command.

The query returns 0 if continuous transients are disabled (OFF), and 1 if continuous transients are enabled (ON).

Parameter	Typical return
ON | OFF | 1 | 0	1 or 0
Initiates the trigger system on channel 1 continuously: INIT:CONT ON, (@1)	

Remarks

- Enabling INIT:CONT will immediately initiate the output trigger when either CURR:MODE or VOLT:MODE is set to STEP or LIST.
- Disabling INIT:CONT will immediately abort the output trigger.
- If INIT:CONT is enabled, output trigger will re-initiate after abort action or Device Clear message is received.
- If INIT:CONT is enabled with both the CURR:MODE or VOLT:MODE set to FIX, either CURR:MODE or VOLT:MODE need to set to STEP or LIST and re-initiate to activate the configuration.

INITiate[:IMMediate]:DLOG <"filename">

The command starts the internal or external data logging session. The filename in which to save the data should be the full path and filename. For internal data logging session, you will have to specify the exact file name, which is either Internal:/log1.dlog or Internal:/log2.dlog. Any other filename is not accepted for the internal data logging session.

Note that the supported path specifier – "External"/"Ext" and "Internal"/"Int" are not case-sensitive.

Parameter	Typical return
<"filename">	(none)
Sets the setting to log the data as “log_1.dlog” file in the drive “External”: `INIT:DLOG "External:/log_1.dlog"` or `INIT:DLOG "ext:/log_1.dlog"`	

INSTrument[:SELect] CH1 | CH2 | CH3 | CH4
INSTrument[:SELect]?

This command selects the output to be programmed among four outputs by the output identifier. The outputs of the E36441A are considered four logical instruments. The INSTrument command provides a mechanism to identify and select an output.

The query returns the currently selected output by the INSTrument [:SELect] or INSTrument:NSELect command.

Parameter	Typical return
CH1 | CH2 | CH3 | CH4	CH1 | CH2 | CH3 | CH4
Selects channel 1 to be programmed: `INST CH1`	

INSTrument:NSELect 1 | 2 | 3 | 4
INSTrument:NSELect?

This command selects the output to be programmed among four outputs by a numeric value instead of the output identifier used in the INSTrument [:SELect] command. The numbers 1 through 4 refer to CH1, CH2, CH3, and CH4 respectively.

The query returns the output currently selected by INSTrument:NSELect or INSTrument[:SELect] command.

Parameter	Typical return
1 | 2 | 3 | 4	1 | 2 | 3 | 4
Selects channel 1 output to be programmed: `INST:NSEL 1`	

[SOURce:]LIST:COUNt <count> | MINimum | MAXimum | INFinity[, (@<chanlist>)]
[SOURce:]LIST:COUNt? [MINimum | MAXimum | INFinity,] [(@<chanlist>)]

The command sets the number of times that the list is executed before it is completed. The list count range is 1 to 9999.

The query returns the list count for each channel specified. Multiple responses are separated by commas. If a repeat count of 9.9E37 is returned, it means the list is set to repeat continuously.

NOTE Use the INFinity parameter to execute a list continuously.

Use ABORt to stop the list at any time. When the list is aborted, the output returns to the settings that were in effect before the list started.

Parameter	Typical return
1 - 9999 | MIN | MAX | INF *RST 1	<list count>
Sets the list count for channel 1 to 10: LIST:COUN 10, (@1)	

[SOURce:]LIST:CURRent[:LEVel] <value>{, <value >}[, (@<chanlist>)]
[SOURce:]LIST:CURRent[:LEVel]]? [(@<chanlist>)]

The command specifies the current setting for each list step in amperes. A comma-delimited list of up to 100 steps may be programmed.

The query returns the programmed current level in the form +n.nnnnnnnnE+nn. Multiple responses are separated by commas.

NOTE The order in which the current values are entered determines the sequence when the list executes. To create a valid list, the Voltage, Current, BOST, EOST, and Dwell lists must either all be the same length, or have a length of 1, which is interpreted as having the same length as the list with the maximum length.

The command overwrites any previously programmed current list; it does not append to the previous list.

Parameter	Typical return
0 to maximum. The maximum value depends on rating of the power supply. *RST 1 step set to the default programmable value.	<list value 1>, <list value 2>, <list value 3>...
Programs a current list containing 5 steps for channel 1: LIST:CURR 5, 4, 3, 2, 1, (@1)	

[SOURce:]LIST:CURRent:POINts? [(@<chanlist>)]

The query returns the number of points (steps) in the current list, not the point values. Multiple responses are separated by commas.

Parameter	Typical return
(none)	<points>
Returns the number of points in the current list for channel 1: LIST:CURR:POIN? (@1)	

[SOURce:]LIST:DWELl <value> {, <value >}[, (@<chanlist>)]
[SOURce:]LIST:DWELl? [(@<chanlist>)]

The command specifies the dwell time for each list step. A comma-delimited list of up to 100 steps may be programmed. Dwell time is the time that the output will remain at a specific step. Dwell times can be programmed from 0.01 through 3600 seconds with the resolution of 1 millisecond.

The query returns the programmed dwell time in the form +n.nnnnnnnnE+nn. Multiple responses are separated by commas.

NOTE

At the end of the dwell time, the output state of the unit depends upon the [SOURce:]LIST:STEP program settings. The order in which the dwell values are entered determines the sequence when the list executes.

To create a valid list, the Voltage, Current, BOST, EOST, and Dwell lists must either all be the same length, or have a length of 1, which is interpreted as having the same length as the list with the maximum length.

This command overwrites any previously programmed dwell list; it does not append to the previous list.

Parameter	Typical return
0.01 – 3600.000 *RST 0.01	<list value 1>, <list value 2>, <list value 3>...
Programs a dwell list containing 5 steps for channel 1: LIST:DWEL 0.2, 0.8, 1.5, 0.8, 0.2, (@1)	

[SOURce:]LIST:DWELl:POINts? [(@<chanlist>)]

The query returns the number of points (steps) in the dwell list, not the point values. Multiple responses are separated by commas.

Parameter	Typical return
(none)	<points>
Returns the number of points in the dwell list: LIST:DWEL:POIN? (@1)	

[SOURce:]LIST:STEP AUTO | ONCE[, (@<chanlist>)]
[SOURce:]LIST:STEP? [(@<chanlist>)]

The command specifies how the list responds to triggers.

The query returns the list step setting. Multiple responses are separated by commas.

Step	Description
AUTO	The output automatically advances to each step, after the receipt of an initial starting trigger. The steps are paced by the dwell list. As each dwell time elapses, the next step is immediately output. This specifies a dwell-paced list.
ONCE	The output remains at the present step until a trigger advances it to the next step. Triggers that arrive during the dwell time are ignored. This specifies a trigger-paced list.

Parameter	Typical return
AUTO | ONCE	AUTO or ONCE
*RST AUTO	
Sets the list step setting of channel 1 to ONCE: LIST:STEP ONCE, (@1)	

[SOURce:]LIST:TERMinate:LAST ON | OFF | 1 | 0[, (@<chanlist>)]
[SOURce:]LIST:TERMinate:LAST? [(@<chanlist>)]

Specifies the value when the list terminates. The state is either 1 (ON) or 0 (OFF). When ON, the output voltage or current remains at the last step value, and that value becomes the IMMediate value when the list completes. When OFF, or when the list is aborted, the output returns to the settings that were in effect before the list started. The query returns 0 (OFF) or 1 (ON).

Parameter	Typical return
OFF | 0 | ON | 1	0 or 1
*RST OFF	
Sets the list to terminate output at the last step value: LIST:TERM LAST ON, (@1)	

[SOURce:]LIST:TOUTput:BOSTep[:DATA] <bool>{, <bool>}[, (@<chanlist>)]
[SOURce:]LIST:TOUTput:BOSTep[:DATA]? [(@<chanlist>)]

The command specifies which list steps generate a trigger signal at the beginning of the step (BOSTep). A comma-delimited list of up to 100 steps may be programmed. The state is either ON (1) or OFF (0).

A trigger is only generated when the state is set to ON. The trigger signal can be used as a trigger source for transients of other channels, and for digital port pins configured as trigger outputs.

The query returns 0 if no trigger is generated, and 1 if a trigger is generated. Multiple responses are separated by commas.

NOTE

The order in which the BOSTep values are entered determines the sequence when the list executes.

To create a valid list, the Voltage, Current, BOST, EOST, and Dwell lists must either all be the same length, or have a length of 1, which is interpreted as having the same length as the list with the maximum length.

This command overwrites any previously programmed BOSTep list; it does not append to the previous list.

Parameter	Typical return
OFF | 0 | ON | 1 *RST 1 step with a value of OFF	<list value 1>, <list value 2>, <list value 3>...
Specifies that triggers will be generated at the beginning of the second step of a 5-step list for channel 1: LIST:TOUT:BOST 0, 1, 1, 1, 1, (@1)	

[SOURce:]LIST:TOUTput:BOSTep:POINts? [(@<chanlist>)]

The query returns the number of points (steps) in the beginning of the step trigger list (BOSTep), not the point values for the specified channels.

Parameter	Typical return
(none)	<points>
Returns the number of points in the BOSTep list for channel 1: LIST:TOUT:BOST:POIN? (@1)	

[SOURce:]LIST:TOUTput:EOSTep[:DATA] <bool>{, <bool>}[, (@<chanlist>)]
[SOURce:]LIST:TOUTput:EOSTep[:DATA]? [(@<chanlist>)]

The command specifies which list steps generate a trigger signal at the end of the step (EOSTep). A comma-delimited list of up to 100 steps may be programmed. The state is either ON (1) or OFF (0).

A trigger is only generated when the state is set to ON. The trigger signal can be used as a trigger source for transients of other channels, and for digital port pins configured as trigger outputs.

The query returns 0 if no trigger is generated, and 1 if a trigger is generated. Multiple responses are separated by commas.

NOTE

The order in which the EOSTep values are entered determines the sequence when the list executes.

To create a valid list, the Voltage, Current, BOST, EOST, and Dwell lists must either all be the same length, or have a length of 1, which is interpreted as having the same length as the list with the maximum length.

This command overwrites any previously programmed EOSTep list; it does not append to the previous list.

Parameter	Typical return
OFF | 0 | ON | 1 *RST 1 step with a value of OFF	<list value 1>, <list value 2>, <list value 3>...
Specifies that triggers will be generated at the end of the second step of a 5-step list for channel 1: LIST:TOUT:EOST 0, 1, 1, 1, 1, (@1)	

[SOURce:]LIST:TOUTput:EOSTep:POINts? [(@<chanlist>)]

The query returns the number of points (steps) in the end of the step trigger list (EOSTep), not the point values for the specified channels.

Parameter	Typical return
(none)	<points>
Returns the number of points in the EOSTep list for channel 1: LIST:TOUT:EOST:POIN? (@1)	

[SOURce:]LIST:VOLTage[:LEVel] <value> {, <value >}[, (@<chanlist>)]
[SOURce:]LIST:VOLTage[:LEVel]? [(@<chanlist>)]

The command specifies the voltage setting for each list step in volts. A comma-delimited list of up to 100 steps may be programmed.

NOTE

The order in which the voltage values are entered determines the sequence when the list executes.

To create a valid list, the Voltage, Current, BOST, EOST, and Dwell lists must either all be the same length, or have a length of 1, which is interpreted as having the same length as the list with the maximum length.

This command overwrites any previously programmed voltage list; it does not append to the previous list.

The query returns the programmed voltage level in the form +n.nnnnnnnnE+nn for each channel specified. Multiple responses are separated by commas.

Parameter	Typical return
0 to maximum. The maximum value depends on rating of the power supply. *RST 1 step set to the default programmable value.	<list value 1>, <list value 2>, <list value 3>...
Programs a voltage list containing 5 steps for channel 1: LIST:VOLT 1, 2, 3, 4, 5, (@1)	

[SOURce:]LIST:VOLTage:POINts? [(@<chanlist>)]

The query returns the number of points (steps) in the voltage list, not the point values. Multiple responses are separated by commas.

Parameter	Typical return
(none)	<points>
Returns the number of points in the voltage list for channel 1: LIST:VOLT:POIN? (@1)	

LXI:IDENtify[:STATe] ON | OFF | 1 | 0
LXI:IDENtify[:STATe]?

The command enables (On) or disables (Off) the LXI identify indicator on the front panel display.

The query returns the state of the LXI identity indicator.

Parameter	Typical return
ON | OFF | 1 | 0 *RST: OFF	0 or 1
Disables the LXI identify indicator: LXI:IDEN 0	

LXI:MDNS:ENABle ON | OFF | 1 | 0
LXI:MDNS:ENABle?

The command enables (On) or disables (Off) the multicast Domain Name System (mDNS), which provides the capabilities of a DNS server for service discovery in a small network that without a DNS server.

The query returns the state of the mDNS service.

Parameter	Typical return
ON | OFF | 1 | 0 Default: ON	0 or 1
Enables mDNS service: LXI:MDNS:ENAB 1	

Remarks

- This setting is non-volatile; it is not changed by power cycling or a Factory Reset (*RST).
- This parameter is set to its default value when the instrument is shipped from the factory.

LXI:MDNS:HNAMe[:RESolved]?

The query returns the resolved (unique) mDNS hostname in the form "K-<model number>-<serial>-N", where <serial> is the last 5 digits of the instrument's serial number. The N is an integer appended if necessary to make the name unique.

The desired name may be truncated, if necessary, to make room for the appended integer.

Parameter	Typical return
(none)	"K-E36441A-yyyyy", where yyyyy is the last five digits of the serial number.
Returns the resolved mDNS hostname: LXI:MDNS:HNAMe:RESolved?	

LXI:MDNS:SNAMe:DESired "<name>"
LXI:MDNS:SNAMe:DESired?

The command sets the desired mDNS service name.

The query returns the mDNS service name.

Parameter	Typical return
<name> = Quoted string of up to 63 characters.	"Keysight E36441A Four Output DC Power Supply - yyyyyyyyyy", where yyyyyyyyyy is the full serial number of 10 digits.
Sets the desired mDNS service name: LXI:MDNS:SNAM:DES "E36441A"	

Remarks

- This setting is non-volatile; it is not changed by power cycling or a Factory Reset (*RST).
- This parameter is set to its default value when the instrument is shipped from the factory.

LXI:MDNS:SNAMe[:RESolved]?

The resolved mDNS service name will be the desired service name (LXI:MDNS:SNAMe:DESired command), possibly with "(<N>)" appended. The N is an integer appended if necessary to make the name unique. The desired name may be truncated, if necessary, to make room for the appended integer.

Parameter	Typical return
(none)	"Keysight E36441A Four Output DC Power Supply yyyyyyyyyy", where yyyyyyyyyy is the full serial number of 10 digits.
Returns the resolved mDNS service: LXI:MDNS:SNAMe:RESolved?	

LXI:MDNS[:STATe] ON | OFF | 1 | 0
LXI:MDNS[:STATe]?

The command enables (On) or disables (Off) the multicast Domain Name System (mDNS), which provides the capabilities of a DNS server for service discovery in a small network without a DNS server.

The query returns the state of the mDNS service.

Parameter	Typical return
ON | OFF | 1 | 0 Default: ON	0 or 1
Enables mDNS service: LXI:MDNS ON	

Remarks

- This setting is non-volatile; it is not changed by power cycling or a Factory Reset (*RST).
- This parameter is set to its default value when the instrument is shipped from the factory.

LXI:RESet

The command resets LAN interface to a known operating state, beginning with DHCP, and clears the Web Interface password. If DHCP fails, it uses Auto-IP.

Parameter	Typical return
(none)	(none)
Resets the LAN interface: LXI:RES	

Remarks

- Depending on your network, the LAN interface may take several seconds to restart after this command is sent.

LXI:RESTart

The command restarts the LAN interface with the current settings as specified by the SYSTem:COMMunicate:LAN commands.

Parameter	Typical return
(none)	(none)
Restarts the LAN interface: LXI:REST	

Remarks

- Depending on your network, the LAN interface may take several seconds to restart after this command is sent.

MEASure[:SCALar]:CURRent[:DC]? [CH1 | CH2 | CH3 | CH4] [(@<chanlist>)]

The query returns the current measured at the specified output. If no output identifier is specified, the current of the currently selected output is returned.

Parameter	Typical return
(none)	<current>
Returns the current measured for channel 1: MEAS:CURR? CH1	

MEASure[:SCALar]:VOLTage[:DC]? [CH1 | CH2 | CH3 | CH4] [(@<chanlist>)]

The query returns the voltage measured at the specified output. If no output identifier is specified, the voltage of the currently selected output is returned.

Parameter	Typical return
(none)	<voltage>
Returns the voltage measured for channel 1: MEAS:VOLT? CH1	

MMEMory:EXPort:DLOG <"filename">

The command saves the logged data in CSV format into the path and filename specified in the <"filename">. This command does not change the saved path and filename settings.

Note that the supported path specifier — "External"/"Ext" and "USB" are not case-sensitive.

Parameter	Typical return
<"filename">	(none)
Exports the logged data into “External:\datalog.csv”: MMEM:EXP:DLOG "External:\datalog.csv"	
Exports the logged data into “usb:\datalog.csv”: MMEM:EXP:DLOG "usb:\datalog.csv"	

OUTPut[:STATe] ON | 1 | OFF | 0 [, (@<chanlist>)]
OUTPut[:STATe]? [(@<chanlist>)]

This command enables or disables the DC source output. The state of a disabled output is a condition of zero output voltage and zero source current. A query returns 0 if the output is off or 1 if it is on. At *RST, the output state is off.

The query returns the output state of the power supply. The returned value is “0” (OFF) or “1” (ON).

NOTE If output sequencing is enabled, the query returns the configuration state instead of the actual output state. For example, if you have a 10 s output delay and query the output state right after you turn the output on, the query will return 1 (ON) even though the actual output will be off until the delay ends.

Enabling or disabling any coupled output causes all coupled outputs to turn on or off according to their user-programmed delays and programming levels. If one coupled channel trips (overvoltage, overcurrent, or over-temperature), the other coupled channels are not impacted.

Parameter	Typical return
ON | 1 | OFF | 0	1 or 0
*RST 0	
Disables channel 1: OUTP 0, (@1)	

OUTPut[:STATe]COUPle:CHANnel ALL | NONE | <list>
OUTPut[:STATe]:COUPle:CHANnel?

The command specifies which output channels are controlled by the output synchronization function. The output channels that have been synchronized or coupled will turn on and off together when any one of them is turned on or off, or when a signal is received from a digital connector pin that has been configured as an On couple or an Off couple pin.

There can be only one set of coupled channels; setting a new coupling replaces an existing coupling.

The query returns the channels that are coupled. Multiple responses are separated by commas.

NOTE When this command is sent, all output channels go to the output OFF state. This parameter is non-volatile and not affected by *RST.

Parameter	Typical return
ALL | NONE | <list>	<coupled channels>
*RST NONE	
Couples channels 1 and 2: OUTP:COUP:CHAN CH1, CH2	

OUTPut[:STATe]:DELay:FALL <delay>[, (@<chanlist>)]
OUTPut[:STATe]:DELay:FALL? [MINimum | MAXimum,] [(@<chanlist>)]

The command sets the delay in seconds that the power supply waits before disabling the specified output. This allows multiple output channels to turn off in sequence. Each output will not turn off until its delay time has elapsed. This command effects on-to-off transitions including changes in the OUTPut[:STATe]. The command does not affect transitions to off caused by protection functions. Delay times can be programmed from 0 to 3600 seconds with the resolution of 1 millisecond.

The query returns the parameter in the form +n.nnnnnnnnE+nn. The parameter returned is the programmed delay time.

Parameter	Typical return
0 – 3600.000 | MIN | MAX	<delay value>
*RST 0	
Sets a delay of 0.5 s for channel 2 before turning the output off: OUTP:DEL:FALL 0.5, (@2)	

OUTPut[:STATe]:DELay:RISE <delay>[, (@<chanlist>)]
OUTPut[:STATe]:DELay:RISE? [MINimum | MAXimum,] [(@<chanlist>)]

The command sets the delay in seconds that the power supply waits before enabling the specified output. This allows multiple output channels to turn on in sequence. Each output will not turn on until its delay time has elapsed. This command affects all off-to-on transitions including changes in the OUTPut[:STATe] as well as transitions due to OUTPut:PROTection:CLEar. Delay times can be programmed from 0 to 3600 seconds with the resolution of 1 millisecond.

The query returns the parameter in the form +n.nnnnnnnnE+nn. The parameter returned is the programmed delay time.

Parameter	Typical return
0 – 3600.000 | MIN | MAX	<delay value>
*RST 0	
Sets a delay of 0.5 s for channel 2 before turning the output on:: OUTP:DEL:RISE 0.5, (@2)	

OUTPut[:STATe]:PMODe VOLTage | CURRent[, (@<chanlist>)]
OUTPut[:STATe]:PMODe? [(@<chanlist>)]

This command sets the preferred mode for output on or output off transitions. It allows output state transitions to be optimized for either constant voltage or constant current operation. Turn-on and turn-off overshoots are minimized for the preferred mode of operation.

VOLTage minimizes output on/off voltage overshoots in constant voltage operation.
CURRent minimizes output on/off current overshoots in constant current operation.

The query returns VOLT or CURR.

Mode	Description
VOLTage	Output on/off voltage overshoots in constant voltage operation are minimized.
CURRent	Output on/off voltage overshoots in constant current operation are minimized.

Parameter	Typical return
VOLTage | CURRent	VOLT | CURR
*RST VOLTage	
Sets the preferred mode of channel 1 to CURRent: OUTP:PMOD CURR, (@1)	

OUTPut:INHibit:MODE LATChing | LIVE | OFF
OUTPut:INHibit:MODE?

The command selects the operation mode of the Inhibit input (INH). The inhibit function shuts down ALL output channels in response to an external signal on the Inhibit input. If an output channel has been turned off by OUTPut [:STATe], the inhibit function does not affect the output channel while it is in the OFF state. The Inhibit mode setting is stored in non-volatile memory.

The query returns LATC, LIVE, or OFF.

Mode	Description
LATChing	A transition to True on the Inhibit input disables all outputs, and they remain disabled until the Inhibit input goes False and the latched INH status bit is cleared by OUTPut:PROTection:CLEar or a front-panel protection clear.
LIVE	The enabled outputs follow the state of the Inhibit input. Outputs are disabled if Inhibit is true and enabled if Inhibit is false.
OFF	The Inhibit input is ignored.

Parameter	Typical return
LATChing | LIVE | OFF	LATC, LIVE, or OFF
Sets the Inhibit input to Live mode: OUTP:INH:MODE LIVE	

OUTPut:PAIR:EXTernal:CONNected?

The query indicates whether an external E364SNP Serial and Parallel kit is connected (1) or not (0)

Parameter	Typical return
none	1 or 0
Indicates whether the E364SNP is connected: OUTP:PAIR:EXT:CONN?	

OUTPut:PAIR OFF | PARallel | SERies
OUTPut:PAIR?

The command specifies the power supply's operation mode. Tracking must not be used when the instrument is operating in parallel or series

Tracking must be disabled, current and voltage mode must not be LIST, and trigger system must not be initiated when setting the operation mode.

The query returns the power supply's operation mode.

Parameter	Typical return
OFF | PAR | SER *RST OFF	OFF, PAR, or SER
Specifies the power supply's operation mode to parallel: OUTP:PAIR PAR	

OUTPut:PON:STATe RST | RCL0 | RCL1 | RCL2 | . . . . | RCL8 | RCL9
OUTPut:PON:STATe?

The command specifies whether the power supply's power-on state is the *RST state (default) or the state stored in one of ten memory locations. Instrument states can be stored using the *SAV command. This parameter is saved in non-volatile memory.

The query returns either RST or RCL#, where # is a digit from 0 to 9.

Parameter	Typical return
RST | RCL0 | RCL1 | RCL2 | RCL3 | RCL4 | RCL5 | RCL6 | RCL7 | RCL8 | RCL9	RST, RCL0, RCL1, RCL2, RCL3, RCL4, RCL5, RCL6, RCL7, RCL8, or RCL9
Sets the power-on state stored in memory location 1 at power on: OUTP:PON:STAT RCL1	

Remarks:

- State will be failed to recall at power on if the recalled code compatibility mode does not match with the code compatibility mode that currently run in the power supply.
- If Series and Parallel Kit is connected, state will be failed to recall at power on if the recalled pair mode does not match with the kit configuration.

OUTPut:PROTection:CLEar [(@<chanlist>)]

The command clears the latch that disables the output due protection condition occurs. Condition that cause the protection must be cleared before executing this command. The output is restored to the state it was in before the protection condition occurred.

Parameter	Typical return
(none)	(none)
Clears the latched protection status on channel 1: OUT:PRO:CLE (@1)	

OUTPut:RELay ON | OFF | 1 | 0[, (@<chanlist>)]
OUTPut:RELay? [(@<chanlist>)]

When the output of the power supply is turned off, it is implemented by setting the output to 0 volts. This gives a zero-output voltage without actually disconnecting the output. To disconnect the output an external relay must be connected between the output and the load. A TTL signal of either low true or high true is provided to control an external relay. This signal can only be controlled with the remote command OUTPut:RELay OFF | ON. The TTL output is available on the Digital IO pin 1 for channel 1, pin 2 for channel 2, and pin 3 for channel 3. The TTL output is not supported for channel 4. When the OUTPut:RELay state is “ON” on channel 1, the TTL output of pin 1 is high if the Polarity is positive and pin 1 is low if the Polarity is negative. The levels are reversed when the OUTPut:RELay state is “OFF”.

The query returns the relay state of the power supply. The returned value is 0 (OFF) or 1 (ON).

Parameter	Typical return
ON | 1 | OFF | 0	1 or 0
*RST 0	
Turns on the relay state for channel 1: OUTP:REL ON, (@1)	

OUTPut:TRACk[:STATe] ON | OFF | 1 | 0
OUTPut:TRACk[:STATe]?

The command enables or disables the power supply to operate in the track mode. When the track mode is first enabled, output channel 2, 3, and 4 will be set to the same voltage level and slew rate as the output channel 1. Once enabled, any change of the programmed voltage level and slew rate in either output channel 1, 2, 3 or 4 will be reflected in the other output channel. The OUTPut:TRACk OFF command returns the power supply to the non-track mode. At *RST, the track mode is disabled.

The query returns the track mode state of the power supply. The returned value is 0 (OFF) or 1 (ON).

Parameter	Typical return
ON | 1 | OFF | 0	1 or 0
*RST 0	
Enables the power supply to operate in the track mode: OUTP:TRAC ON	

SENSe:DLOG:FUNCtion:CURRent ON | OFF | 1 | 0[, (@<chanlist>)]
SENSe:DLOG:FUNCtion:CURRent? [(@<chanlist>)]

The command enables or disables current data logging of the channels stated in (@<chanlist>).

The query returns the status (on or off) of the current data logging enable of the channels stated in (@<chanlist>).

Parameter	Typical return
ON | OFF | 1 | 0	(none)
*RST OFF	
Enables current data logging of channel 1 and 2: SENS:DLOG:FUNC:CURR 1, (@1,2)	

SENSe:DLOG:FUNCtion:MINMax ON | OFF | 1 | 0
SENSe:DLOG:FUNCtion:MINMax?

The command enables or disables the logging of minimum and maximum values for each sample of data.

The query returns whether the logging of minimum and maximum values is enabled.

Parameter	Typical return
ON | OFF | 1 | 0	(none)
*RST OFF	
Enables the logging of the minimum and maximum for each sample of data: SENS:DLOG:FUNC:MINM 1	

SENSe:DLOG:FUNCtion:VOLTage ON | OFF | 1 | 0[, (@<chanlist>)]
SENSe:DLOG:FUNCtion:VOLTage? [(@<chanlist>)]

The command enables or disables voltage data logging of the channels stated in (@<chanlist>).

The query returns the status (on or off) of the voltage data logging of the channels stated in (@<chanlist>).

Parameter	Typical return
ON | OFF | 1 | 0	(none)
*RST ON	
Enables voltage data logging of channel 1 to 2: SENS:DLOG:FUNC:VOLT 1, (@1:2)	

SENSe:DLOG:OFFSet <offset percent> | MINimum | MAXimum
SENSe:DLOG:OFFSet? [MINimum | MAXimum]

The command specifies the datalog trigger offset as a percent of the total datalog duration. This lets you specify the percent of pre-trigger data that will be logged to the datalog file.

A percent of 0 means the trigger occurs at the beginning of the running datalog, while 100 means that the trigger occurs at the end of the running datalog. Any value between 0 and 100 can be set.

The query returns the trigger offset in percent.

Parameter	Typical return
0 - 100	<offset percent>
*RST 0	
Specifies a trigger offset of 50%: SENS:DLOG:OFFS 50	

SENSe:DLOG:PERiod <time> | MINimum | MAXimum
SENSe:DLOG:PERiod? [MINimum | MAXimum]

NOTE This command replaces the previous SENSe:DLOG:TINTerval command and should be used in new applications. SENSe:DLOG:TINTerval is still available for backward compatibility.

The command sets the sample period consisting of the entered value in seconds. For the sample period, the minimum is 200 ms, and it has to be in integral of 200 ms, while the maximum is 60 s. The entered value will be rounded to the nearest 200 ms integral.

The query returns the sample period in seconds.

Parameter	Typical return
0.2 - 60	MIN	MAX	(none)
*RST 0.2	
Sets the sample period to 400 ms: SENS:DLOG:PER 0.4	

SENSe:DLOG:TIME <time> | MINimum | MAXimum
SENSe:DLOG:TIME? [MINimum | MAXimum]

The command sets the sample duration, the entered value is in seconds. For sample duration, the maximum is about 21,845 hours (for single output, depending on the memory size) and up to 5 MB of data.

The query returns the sample duration in seconds.

Parameter	Typical return
1 to 78642000	MIN	MAX	(none)
*RST 30	
Sets the sample duration to 2 minutes: SENS:DLOG:TIME 120	

SENSe:DLOG:TINTerval <time> | MINimum | MAXimum
SENSe:DLOG:TINTerval? [MINimum | MAXimum]

NOTE **This command has been superseded by SENSe:DLOG:PERiod, but is still available for backward compatibility.**

The command sets the sample period consisting of the entered value in seconds. For the sample period, the minimum is 200 ms, and it has to be in integral of 200 ms, while the maximum is 60 s. The entered value will be rounded to the nearest 200 ms integral.

The query returns the sample period in seconds.

Parameter	Typical return
0.2 - 60 | MIN | MAX	<time>
*RST 0.2	
Sets the sample period to 400 ms: SENS:DLOG:TINT 0.4	

STATus:OPERation[:EVENt]?

Returns the sum of the bits in the event register for the Standard Operation Register group. This is a read-destructive register and these bits are cleared when you read the register.

The query returns a decimal value which corresponds to the binary-weighted sum of all bits in the register.

Parameter	Typical return
(none)	<bit value>
Reads the event register: STAT:OPER?	

Remarks

- This register is cleared when it is read, or when you issue a *CLS command.

STATus:OPERation:CONDition?

Queries the condition register for the Standard Operation Register group. This is a read-only register and the bits are not cleared when you read the register.

The query reads the condition register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register.

Parameter	Typical return
A decimal value that corresponds to the binary-weighted sum of the bits in the register.	<bit value>
Reads the condition register: STAT:OPER:COND?	

STATus:OPERation:ENABle <enable value>
STATus:OPERation:ENABle?

The command enables bits in the Operation Status enable register. The selected bits are then reported to the Status Byte.

The query reads the enable register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register.

Parameter	Typical return
A decimal value that corresponds to the binary-weighted sum of the bits in the register.	<bit value>
Enable bit 9 in the enable register: STAT:OPER:ENAB 512	

STATus:PRESet

The command clears all the Operation and Questionable enable registers.

Parameter	Typical return
(none)	(none)
Clears enable register bits: STAT:PRES	

STATus:QUEStionable:CONDition?

Queries the condition register for the Questionable Data Register group. The query reads the condition register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register.

Parameter	Typical return
A decimal value that corresponds to the binary-weighted sum of the bits in the register.	<bit value>
Reads the condition register: STAT:QUES:COND?	

STATus:QUEStionable:[:EVENt]?

Returns the sum of the bits in the event register for the Questionable Data Register group. This is a read-destructive register and the bits are cleared when you read the register.

The query returns a decimal value which corresponds to the binary-weighted sum of all bits in the register.

Parameter	Typical return
(none)	<bit value>
Reads the event register: STAT:QUES?	

Remarks

- This register is cleared when it is read, or when you issue a *CLS command.

STATus:QUEStionable:ENABle <enable value>
STATus:QUEStionable:ENABle?

The command enables bits in the Questionable Status enable register. The selected bits are then reported to the Status Byte.

The query reads the enable register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register.

Parameter	Typical return
A decimal value that corresponds to the binary-weighted sum of the bits in the register.	<bit value>
Enable bit 4 in the enable register: STAT:QUES:ENAB 16	

STATus:QUEStionable:INSTrument[:EVENt]?

The query queries the Questionable Instrument event register and returns a decimal value of the binary-weighted sum of all bits in the register. This is a read-destructive register and the bits are cleared when you read the register.

Parameter	Typical return
(none)	<bit value>
Returns the decimal value of the Questionable Instrument event register: STAT:QUES:INST?	

STATus:QUEStionable:INSTrument:ENABle <enable value>
STATus:QUEStionable:INSTrument:ENABle?

The command sets the value of the Questionable Instrument enable register. This register is a mask for enabling specific bits from the Questionable Instrument event register to set the Instrument Summary bit (ISUM, bit 13) of the Questionable Status register. The “ISUM” bit of the Questionable Status register is the logical OR of all the Questionable Instrument event register bits that are enabled by the Questionable Instrument enable register.

The query reads the enable register and returns a decimal value that corresponds to the binary-weighted sum of all bits set in the register.

Parameter	Typical return
A decimal value that corresponds to the binary-weighted sum of the bits in the register.	<bit value>
Enable bit 4 in the enable register: STAT:QUES:INST:ENAB 16	

STATus:QUEStionable:INSTrument:ISUMmary<n>[:EVENt]?

The query returns the value of the Questionable Instrument Isummary event register for a specific output of the power supply. The particular output must be specified by a numeric value (<n>=1, 2, 3, or 4). See Programming Ranges and Output Identifiers for the output number. The event register is a read-only register which holds (latches) all events. Reading the Questionable Instrument Isummary event register clears it.

Parameter	Typical return
(none)	<bit value>
Returns the value of the Questionable Instrument Isummary event register for output 1: STAT:QUES:INST:ISUM1?	

STATus:QUEStionable:INSTrument:ISUMmary<n>:CONDition?

The query returns the condition of the specified output (<n>=1, 2, 3, or 4). For more information, see The Questionable Instrument Summary register.

Parameter	Typical return
(none)	<bit value>
Returns the condition of the instrument for output 1: STAT:QUES:INST:ISUM1:COND?	

STATus:QUEStionable:INSTrument:ISUMmary<n>:ENABle <enable value>
STATus:QUEStionable:INSTrument:ISUMmary<n>:ENABle?

The command sets the value of the Questionable Instrument Isummary enable register for a specific output of the E36441A four outputs power supply. The particular output must be specified by a numeric value (<n>=1, 2, 3, or 4). See Programming Ranges and Output Identifiers for the output number. This register is a mask for enabling specific bits from the Questionable Instrument Isummary event register to set the Instrument Summary bit (bit 1, 2, 3 and 4) of the Questionable Instrument register. These bits 1, 2, 3, and 4 are the logical OR of all the Questionable Instrument Isummary event register bits that are enabled by the Questionable Instrument Isummary enable register.

The query returns the value of the Questionable Instrument Isummary enable register (<n>=1, 2, 3, or 4).

Parameter	Typical return
A decimal value that corresponds to the binary-weighted sum of the bits in the register.	<bit value>
Returns the value of the Questionable Instrument Isummary enable register for output 1: STAT:QUES:INST:ISUM1:ENAB?	

SYSTem:BEEPer[:IMMediate]

The command issues a single beep immediately.

Parameter	Typical return
(none)	(none)
Issues a single beep immediately: SYST:BEEP	

Remarks

- You can issue a beep with this command regardless of the current beeper state (SYSTem:BEEPer:STATe command).

SYSTem:BEEPer:STATe ON | OFF | 1 | 0
SYSTem:BEEPer:STATe?

The command enables or disables the beeper.

The query returns 0 (OFF) or 1 (ON).

Parameter	Typical return
ON | OFF | 1 | 0	0 or 1
Turns on the beeper: SYST:BEEP:STAT ON	

Remarks

- A beep is always emitted (even with beeper state OFF) when SYSTem:BEEPer is done.
- This setting will not affect the front panel key click.
- The setting is non-volatile, and does not change when power has been off or after a Factory Reset (*RST command).

SYSTem:COMMunicate:LAN:CONTrol?

The query reads and returns the control connection port number for Socket communications. Connection is used to send and receive commands and queries. If 0 is returned, the interface does not support a Socket Control connection.

Parameter	Typical return
(none)	+5000 (0 if sockets are not suported)
Returns the control connection port number: SYST:COMM:LAN:CONT?	

Remarks

- This query is only used when programming over Sockets.
- You can use the Socket Control connection to send a Device Clear to the instrument or to detect pending Service Request (SRQ) events.

SYSTem:COMMunicate:LAN:DHCP ON | OFF | 1 | 0
SYSTem:COMMunicate:LAN:DHCP?

The command enables (On) or disables (Off) the use of the Dynamic Host Configuration Protocol (DHCP) for the instrument.

ON: The instrument will try to obtain an IP address from a DHCP server. If a DHCP server is found, it will assign a dynamic IP address, Subnet Mask, and Default Gateway to the instrument. If a DHCP server is not found, the instrument uses AutoIP to automatically configure its IP setting in the Automatic Private IP Addressing range (169.254.xxx.xxx).

OFF: The instrument will use the static IP address, Subnet Mask, and Default Gateway during power-on.

NOTE **If you change this setting, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.**

Parameter	Typical return
ON | OFF | 1 | 0	0 or 1
Disables DHCP: SYST:COMM:LAN:DHCP OFF SYST:COMM:LAN:UPD	

Remarks

- Most site LANs have a DHCP server.
- If a DHCP LAN address is not assigned by a DHCP server, then an AutoIP address static IP will be assumed after approximately two minutes.
- This setting is stored in non-volatile memory, and does not change when power has been off, or after a Factory Reset (*RST).

SYSTem:COMMunicate:LAN:DNS[1 | 2] "<address>"
SYSTem:COMMunicate:LAN:DNS[1 | 2]? [CURRent | STATic]

The command assigns static IP addresses of Domain Name System (DNS) servers. A primary and a secondary server address may be assigned. If DHCP is available and enabled, DHCP will auto-assign these server addresses. These auto-assigned server addresses take precedence over the static addresses assigned with this command. Contact your LAN administrator for details.

NOTE **If you change this setting, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.**

Parameter	Typical return
<address>: Four-byte dot notation ("nnn.nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range of 0 through 255. [CURRent | STATic] Default: CURRent	"198.105.232.4"
Set a static primary DNS address: SYST:COMM:LAN:DNS "198.105.232.4" SYST:COMM:LAN:UPD	

Remarks

- CURRent - Returns address currently being used by the instrument.
- STATic - Returns address from non-volatile memory. This address is used if DHCP is disabled or unavailable.
- The assigned DNS address is used for the DNS server if DHCP is disabled. Otherwise, the DNS server address is auto-assigned by DHCP.
- This setting is stored in non-volatile memory, and does not change when power has been off, or after a Factory Reset (*RST)

SYSTem:COMMunicate:LAN:DOMain?

The query reads the current network domain name and returns an ASCII string enclosed in double quotes.

Parameter	Typical return
(none)	"example.com"
Returns the domain name being used by the instrument: SYST:COMM:LAN:DOM?	

Remarks

- If Dynamic Domain Name System (DNS) is available on your network and your instrument uses DHCP, the domain name is assigned by the Dynamic DNS service at power-on.
- If a domain name has not been assigned, a null string (" ") is returned.

SYSTem:COMMunicate:LAN:GATeway "<address>"
SYSTem:COMMunicate:LAN:GATeway? [CURRent | STATic]

The command assigns a default gateway for the instrument. The specified IP Address sets the default gateway, which allows the instrument to communicate with systems that are not on the local subnet. Thus, this is the default gateway where packets are sent that are destined for a device not on the local subnet, as determined by the Subnet Mask setting. Contact your LAN administrator for details.

NOTE **If you change this setting, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.**

Parameter	Typical return
<address>: Four-byte dot notation ("nnn.nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range of 0 through 255. [CURRent | STATic] Default: CURRent	"198.105.232.4"
Set a default gateway address: SYST:COMM:LAN:GAT "198.105.232.4" SYST:COMM:LAN:UPD	

Remarks

- CURRent - Returns address currently being used by the instrument.
- STATic - Returns address from non-volatile memory. This address is used if DHCP is disabled or unavailable.
- If DHCP is enabled (SYSTem:COMMunicate:LAN:DHCP ON command), the specified default gateway is not used. However, if the DHCP server fails to assign a valid IP address, the currently configured default gateway is used.
- The setting is non-volatile, and does not change when power has been off or after a Factory Reset (*RST command).
- A gateway value of "0.0.0.0" indicates that subnetting is not being used.

SYSTem:COMMunicate:LAN:HOSTname "<name>"
SYSTem:COMMunicate:LAN:HOSTname? [CURRent | STATic]

The command assigns a hostname to the instrument. A hostname is the host portion of the domain name, which is translated into an IP address. If Dynamic Domain Name System (Dynamic DNS) is available on your network and your instrument uses DHCP, the hostname is registered with the Dynamic DNS service at power-on. If DHCP is enabled (SYSTem:COMMunicate:LAN:DHCP ON), the DHCP server can change the specified hostname.

NOTE **If you change this setting, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.**

Parameter	Typical return
<name>: A string of up to 15 characters. Must start with letter (A-Z) May contain letters, numbers (0-9), or dashes ("-") Default: "K-<*instrument model number*>-nnnnn", where "nnnnn" is the last five digits of the instrument's serial number. [CURRent | STATic] Default: CURRent	"LAB1-E36441A"
Define a hostname: SYST:COMM:LAN:HOST "LAB1-E36441A" SYST:COMM:LAN:UPD	

Remarks

- CURRent - Returns hostname currently being used by the instrument.
- STATic - Returns desired hostname from non-volatile memory, that may not be the actual name used by the instrument if DHCP is enabled.
- If host name has not been assigned, the query returns a null string ("").
- The setting is non-volatile, and does not change when power has been off or after a Factory Reset (*RST command).

SYSTem:COMMunicate:LAN:IPADdress "<address>"
SYSTem:COMMunicate:LAN:IPADdress? [CURRent | STATic]

The command assigns a static Internet Protocol (IP) address for the instrument. If DHCP is enabled (SYSTem:COMMunicate:LAN:DHCP ON), the specified static IP address is not used. Contact your LAN administrator for details.

NOTE **If you change this setting, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.**

Parameter	Typical return
<address>: Four-byte dot notation ("nnn.nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range 0 through 255. [CURRent | STATic] Default: CURRent	"198.105.232.4"
Sets a static IP address: SYST:COMM:LAN:IPAD "198.105.232.4" SYST:COMM:LAN:UPD	

Remarks

- CURRent - Returns address currently being used by the instrument.
- STATic - Returns static address from non-volatile memory. This address is used if DHCP is disabled or unavailable.
- The setting is non-volatile, and does not change when power has been off or after a Factory Reset (*RST command).

SYSTem:COMMunicate:LAN:MAC?

The query returns the instrument's Media Access Control (MAC) address as an ASCII string of 12 hexadecimal characters (0-9 and A-F) enclosed in quotation marks.

NOTE **Your network administrator may need the instrument's MAC address in order to assign a static IP address for this device.**

Parameter	Typical return
(none)	"00:30:D3:00:10:41"
Returns the MAC address: SYST:COMM:LAN:MAC?	

Remarks

- Query reads the MAC address and returns an ASCII string enclosed in double quotes.
- The instrument's MAC address is unique to the instrument. It is set at the factory and cannot be changed.
- The setting is non-volatile, and does not change when power has been off or after a Factory Reset (*RST command).
- MAC address also known as the link-layer address, the Ethernet (station) address, LANIC ID, or Hardware Address. This is an unchangeable 48-bit address assigned by the manufacturer to each unique Internet device.

SYSTem:COMMunicate:LAN:SMASk "<mask>"
SYSTem:COMMunicate:LAN:SMASk? [CURRent | STATic]

The command assigns a subnet mask for the instrument to use in determining whether a client IP address is on the same local subnet. When a client IP address is on a different subnet, all packets must be sent to the Default Gateway. Contact your LAN administrator for details.

NOTE **If you change this setting, you must execute a SYSTem:COMMunicate:LAN:UPDate command to activate the setting.**

Parameter	Typical return
<mask>: Four-byte dot notation ("nnn.nnn.nnn.nnn"), where "nnn" in each case is a byte value in the range 0 through 255. Default: "255.255.0.0" [CURRent | STATic] Default: CURRent	"198.105.232.4"
Sets the subnet mask: SYST:COMM:LAN:SMAS "255.255.254.0" SYST:COMM:LAN:UPDate	

Remarks

- CURRent - Returns subnet mask currently being used by the instrument.
- STATic - Returns subnet mask from non-volatile memory. This address is used if DHCP is disabled or unavailable.
- A value of "0.0.0.0" or "255.255.255.255" indicates that subnetting is not being used.
- The setting is non-volatile, and does not change when power has been off or after a Factory Reset (*RST command).

SYSTem:COMMunicate:LAN:TELNet:PROMpt "<string>"
SYSTem:COMMunicate:LAN:TELNet:PROMpt?

The command sets the command prompt displayed when communicating the instrument with Telnet.

Parameter	Typical return
<string>: A string of up to 15 characters	"Command"
Defines the command prompt: SYST:COMM:LAN:TELN:PROM "Command"	

Remarks

- Query returns the command prompt as ASCII strings enclosed in double quotes.
- Instrument uses LAN port 5024 for SCPI Telnet sessions, and port 5025 for SCPI Socket sessions.
- Telnet port is an alternate way to send SCPI commands to the instrument.
- Telnet session can typically be started as follows from a host computer shell:

  telnet <IP_address> <port>

  For example:

  telnet 169.254.4.10 5024

  To exit a Telnet session, press <Ctrl-D>.
- The setting is non-volatile, and does not change when power has been off or after a Factory Reset (*RST command).

SYSTem:COMMunicate:LAN:TELNet:WMESsage "<string>"
SYSTem:COMMunicate:LAN:TELNet:WMESsage?

The command sets the welcome message displayed when communicating the instrument with Telnet.

Parameter	Typical return
<string>: A string of up to 63 characters Default: "Welcome to Keysight's E36441A Four Output DC Power Supply"	"Welcome to the Telnet Session"
Define a welcome message: SYST:COMM:LAN:TELN:WMES "Welcome to the Telnet Session"	

Remarks

- Query returns the command prompt as ASCII strings enclosed in double quotes.
- Instrument uses LAN port 5024 for SCPI Telnet sessions and port 5025 for SCPI Socket sessions.
- The setting is non-volatile, and does not change when power has been off or after a Factory Reset (*RST command).

SYSTem:COMMunicate:LAN:UPDate

The command stores any changes made to the LAN settings into non-volatile memory and restarts the LAN driver with the updated settings.

Parameter	Typical return
(none)	(none)
Configures the instrument to use statically assigned LAN settings (disables DHCP): SYST:COMM:LAN:DHCP OFF SYST:COMM:LAN:DNS "198.105.232.4" SYST:COMM:LAN:DNS2 "198.105.232.5" SYST:COMM:LAN:GAT "198.105.232.1" SYST:COMM:LAN:HOST "LAB1-E36441A" SYST:COMM:LAN:IPAD "198.105.232.101" SYST:COMM:LAN:UPD Configures the instrument back to use DHCP (enables DHCP): SYST:COMM:LAN:DHCP ON SYST:COMM:LAN.UPD	

Remarks

- Be very careful when you execute this command, because your instrument may not work on the LAN if you update the instrument with invalid LAN settings.
- If your instrument does not work after you execute this command, perform the LAN Reset through instrument's front panel softkey to restore the settings to reset values and reset the LAN, or use another I/O interface, such as USB, to correct the settings.
- This command must be sent after changing the settings for DHCP, DNS, gateway, hostname, IP address, or sub-net mask.

SYSTem:COMMunicate:RLSTate LOCal | REMote | RWLock
SYSTem:COMMunicate:RLSTate?

The command sets the power supply to remote or local mode. The REMote parameter is the same as SYSTem:REMote and the RWLock parameter is the same as SYSTem:RWLock. The LOCal parameter will set the power supply to local mode and maintain in this mode for all incoming remote operations.

The query returns LOC, REM, or RWL.

Parameter	Typical return
LOC | REM | RWL Default: LOC	LOC, REM, or RWL
Sets the power supply to remote: SYST:COMM:RLST REM	

SYSTem:COMMunicate:TCPip:CONTrol?

The command returns the initial socket control connection port number. After the control port number is obtained, a control socket connection can be opened.

Parameter	Typical return
(none)	+5000 (0 if sockets are not supor-ted)
Queries the control connection port number: SYST:COMM:TCP:CONT?	

NOTE The control socket connection can only be used by a client to send a device clear to the instrument or to detect Service Request (SRQ) events.

Refer to "Using Sockets" in the *User's Guide* for more information.

SYSTem:DATE <yyyy>,<mm>,<dd>
SYSTem:DATE?

This command sets the date of the power supply's real-time clock. The range of values for the year is from 2000 – 2099.

The query returns the date in the form +2017,+7,+26.

Parameter	Typical return
<yyyy>,<mm>,<dd>	<yyyy,mm,dd>
Sets the date to April 1, 2020: SYST:DATE 2020,4,1	

Remarks

- The real-time clock is battery-backed and retains the date and time when power is off.
- The real-time clock does not adjust itself for time zone changes or daylight savings time. Be sure to set the date and time when you first receive your instrument.
- This setting is non-volatile. It will not be changed by power cycling or after a Factory Reset (*RST command).

SYSTem:ERRor[:NEXT]?

The query returns the power supply's error queue of up to 20 errors. The power supply beeps once (unless disabled by SYSTem:BEEPer:STATe OFF) and turns on the front-panel error annunciator when an error has been detected. Up to 20 errors can be stored in the error queue. See Error Messages.

NOTE

Errors are retrieved in first-in-first-out (FIFO) order. The ERR annunciator turns off after the last error is read. The power supply beeps once (unless disabled by SYSTem:BEEPer:STATe OFF) each time an error is generated.

If more than 20 errors have occurred, the last error stored in the queue (the most recent error) is replaced with -350, “Queue overflow”. No additional errors are stored until you remove errors from the queue. If no errors have occurred, the SYST:ERR? query returns +0, “No error”.

The error queue is cleared when power has been off or after a *CLS (clear status) command has been executed. The *RST (reset) command does not clear the error queue.

Parameter	Typical return
(none)	<+0,"No error">
Reads and clears the first error in error queue: SYST:ERR?	

SYSTem:LANGuage L1 | L2
SYSTem:LANGuage?

The command provides a code compatibility switch, which allows you to select the R&S HMP4040 code compatibility mode. In this mode, the E36441A instrument emulates the remote commands for the R&S HMP4040.

Language	Description
L1	Normal mode
L2	R&S HMP4040 code compatibility mode

Parameter	Typical return
L1 | L2 Default: L1	L1 or L2
Selects the R&S HMP4040 code compatibility mode: SYST:LANG L2	

Remarks

- Following the language switch, the instrument issues a Factory Reset (*RST command).
- The language setting is stored in non-volatile memory, and does not change when power has been off, or after a Factory Reset (*RST command).
- In R&S HMP4040 code compatibility mode, minimum and maximum of the voltage and current values, step size and OVP are based on the Normal mode. Default values are based on R&S HMP4040.
- In R&S HMP4040 code compatibility mode, LANGuage {L1|L2} is used for mode switching.
- In R&S HMP4040 code compatibility mode, the E36441A supports all the existing R&S HMP4040 commands except stated below:
  - FUSE:LINK {1 | 2 | 3 | 4}
  - FUSE:LINK? {1 | 2 | 3 | 4}
  - FUSE:UNLink {1 | 2 | 3 | 4}
  - ARBitrary:DATA <voltage1,current1,time1,voltage2,current2,time2,...>
  - ARBitrary:TRANsfer {1 | 2 | 3 | 4}
  - ARBitrary:STARt {1 | 2 | 3 | 4}
  - ARBitrary:STOP {1 | 2 | 3 | 4}
  - ARBitrary:SAVE {1 | 2 | 3}
  - ARBitrary:RESTore {1 | 2 | 3}
  - ARBitrary:REPetitions {0...255}
  - ARBitrary:REPetitions?
  - ARBitrary:CLEar
  - SYSTem:MIX
- In R&S HMP4040 code compatibility mode, the E36441A also supports the below commands.
  - [SOURce:]VOLTage:SENSe[:SOURce] INTernal | EXTernal
  - [SOURce:]VOLTage:SENSe[:SOURce]?

SYSTem:LOCal

The command places the power supply in the local mode. All front-panel keys are fully functional.

Parameter	Typical return
(none)	(none)
Sets the power supply in the local mode: SYST:LOC	

Remarks

- This command will not explicitly set the instrument to local mode if the current instrument mode is in RWL mode. See SYSTem:RWLock for more details on how to set instrument mode to local.

SYSTem:REMote

The command places the power supply into remote mode for remote operation. All front-panel keys are disabled except for Lock/Unlock key. You can place the power supply in local mode and unlock the front panel keys by pressing the Lock/Unlock key.

Parameter	Typical return
(none)	(none)
Sets to remote mode: SYST:REM	

SYSTem:RWLock

The command places the power supply in the remote mode. This command is the same as SYSTem:REMote except that all front-panel keys are disabled including the Lock/Unlock key. You can unlock the front-panel keys by using SYSTem:COMMunicate:RLSTate LOCal if you want the instrument to be forced into local mode, or you can use SYSTem:LOCal command after sending SYSTem:REMote command to set instrument into local mode.

Parameter	Typical return
(none)	(none)
Sets to remote mode disabling all front-panel keys: SYST:RWL	

SYSTem:SECurity[:IMMediate]

The command clears all user memory and reboots the instrument. This command is typically used to prepare the instrument for removal from a secure area. It sanitizes all user data by overwriting all addressable locations in flash memory with a single character and then performing a chip erase as per manufacturer's data sheet. For the EEPROM, it overwrites all locations with a random pattern, followed by binary zeros and binary ones. Identification data (instrument firmware, model number, serial number, MAC address and calibration data) is not erased. After the data is cleared, the instrument is rebooted.

This procedure is not recommended for use in routine applications because of the possibility of unintended loss of data.

Parameter	Typical return
(none)	(none)
Sanitizes the power supply: SYST:SEC:IMM	

SYSTem:SET <arbitrary_block_data>
SYSTem:SET?

The command sets the instrument state as defined by the data returned by SYSTem:SET? query.

Parameter	Typical return
<arbitrary_block_data>: The block data returned by SYSTem:SET? query.	#nN<instrument state> where the first digit after the # indicates the number of following digits. The following digits indicate the length of the data.

SYSTem:TIME <hh>,<mm>,<ss>
SYSTem:TIME?

The command sets the real time clock in hours (hh), minutes (mm), and seconds (ss). The values may range from 0,0,0 (midnight) to 23,59,59 (one second before midnight).

The query returns the real time clock in hours (hh), minutes (mm), and seconds (ss).

Parameter	Typical return
<0 - 23>,<0 - 59>,<0 - 59>	+<hh>,+<mm>,+<ss>
Sets the real time clock to 13:30:15: SYST:TIME 13,30,15	

Remarks

- The real-time clock is battery-backed and retains the date and time when power is off.
- The real-time clock does not adjust itself for time zone changes or daylight savings time. Be sure to set the date and time when you first receive your instrument.
- The setting is non-volatile, and does not change when power has been off or after a Factory Reset (*RST command).

SYSTem:VERSion?

The query returns the present SCPI version of the power supply. The returned value is a string in the form of YYYY.V where “YYYY” represent the year of the version, and the “V” represents the current version number of the SCPI.

Parameter	Typical return
(none)	1990.0
Returns the SCPI version: SYST:VERS?	

TRIGger:DLOG[:IMMediate]

The command sends an immediate trigger signal to the data logger. This will trigger the data log regardless of the selected trigger source. You must initiate the data logger before you trigger it.

Parameter	Typical return
(none)	(none)
Triggers the data logger immediately: TRIG:DLOG	

TRIGger:DLOG:SOURce BUS | EXTernal | IMMediate
TRIGger:DLOG:SOURce?

The command selects the trigger source for the data logger.

The query returns BUS, EXT, or IMM.

Source	Description
BUS	Selects a remote interface trigger command.
EXTernal	Selects all connector pins that have been configured as trigger sources.
IMMediate	Sets the trigger source to true. As soon as the data logger is INITiated, it will send the trigger immediately.

Parameter	Typical return
BUS | EXT | IMM *RST IMM	BUS, EXT, or IMM
Selects BUS as the data log trigger source: TRIG:DLOG:SOUR BUS	

TRIGger[:SEQuence]:DELay <seconds> | MINimum | MAXimum[, (@<chanlist>)]
TRIGger[:SEQuence]:DELay? [MINimum | MAXimum] [(@<chanlist>)]

The command sets the time delay between the detection of an event on the specified trigger source and the start of any corresponding trigger action on the power supply output. Select from 0 to 3600 seconds. Minimum value is 0 and maximum value is 3600 seconds.

The query returns the programmed trigger time delay in the form +n.nnnnnnnnE+nn for each channel specified. Multiple responses are separated by commas.

Parameter	Typical return
0 – 3600.000 | MIN | MAX | *RST 0	<delay value>
Sets the trigger time delay to 5 seconds on channels 1 and 2: TRIG:DEL 5, (@1,2))	

TRIGger[:SEQuence]:SOURce BUS | EXTernal | IMMediate | PIN1 | PIN2 | PIN3[, (@<chanlist>)]
TRIGger[:SEQuence]:SOURce? [(@<chanlist>)]

The command selects the trigger source for the output trigger system.

The query returns BUS, EXT, IMM or PIN<n>.

PIN<n> must be configured as trigger input before it can be used as a trigger source. See [SOURce:]DIGital:PIN<n>:FUNCtion and [SOURce:]DIGital:PIN<n>:POLarity.

Source	Description
BUS	Selects a remote interface trigger command.
EXTernal	Selects ALL connector pins that have been configured as trigger sources.
IMMediate	Sets the trigger source to true. As soon as the output is INITiated, it will send the trigger immediately.
PIN<n>	Selects a digital port pin configured as a trigger input where <n> indicates the pin number.

Parameter	Typical return
BUS | EXT | IMM | PIN1 | PIN2 | PIN3 *RST BUS	BUS, EXT, IMM, PIN1, PIN2, or PIN3
Selects pin 1 as the output trigger source for channel 2: TRIG:SOUR PIN1, (@2)	

Program example

The program below sets CH1 to an output of 3 V/1 A immediately:

INST CH1	*Selects CH1 as the output*
VOLT:MODE STEP	*Set the voltage mode to Step*
VOLT:TRIG 3	*Set triggered voltage to 3 V*
CURR:MODE STEP	*Set the current mode to Step*
CURR:TRIG 1	*Set triggered current to 1 A*
TRIG:SOUR IMM	*Select the immediate trigger source*
INIT	*Initiate the trigger system*

Triggering Commands

The instrument's triggering system allows you to change voltage and current output when a trigger is received. The typical process is:

1. Select one or more outputs with the INSTrument:SELect command.
2. Configure the triggered output levels by using CURRent:TRIGgered and VOLTage:TRIGgered.
3. Configure the voltage and current mode to Step by using VOLTage:MODE and CURRent:MODE.
4. Specify the trigger source, either BUS or IMMediate.
5. If you are using the BUS trigger source, you may choose to set a time delay between the detection of the trigger and the start of any corresponding output change.
6. Send an INITiate[:IMMediate]command. If the IMMediate source is selected, the selected output is set to the triggered level immediately. If the BUS trigger source is selected, the output is set to the triggered level after the instrument receives the *TRG command.

[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <voltage>| MINimum | MAXimum | DEFault | UP | DOWN[, (@<chanlist>)]
[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]? MINimum | MAXimum | DEFault[, (@<chanlist>)]

The command programs the immediate output voltage level of the output in volts. The immediate level is the voltage limit value of the selected output in the "chanlist" parameter or with the INSTrument command if "chanlist" parameter is absent.

This command also increases or decreases the immediate voltage level using the ‘‘UP’’ or ‘‘DOWN’’ parameter by a predetermined amount. The command VOLTage:STEP sets the amount of increase or decrease.

The query returns the output voltage level of the output in volts. MAX and MIN return the highest and lowest programmable voltage levels respectively for the selected range.

Channel	CH1	CH2	CH3	CH4
MINimum			0 V	
MAXimum			32.96 V	
DEFault			0 V	

Parameter	Typical return
0 - maximum | MIN | MAX | DEF | UP | DOWN (The maximum value is dependent on the voltage rating of the power supply)	<voltage level>
*RST MIN	
Sets the output voltage level to 20 V on channel 1: VOLT 20, (@1)	

[SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement] <voltage> | DEFault[, (@<chanlist>)]
[SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement]? [DEFault,] [(@<chanlist>)]

The command sets the step size for voltage programming with the VOLTage UP and VOLTage DOWN commands.

To set the step size to the minimum resolution, set the step size to ''DEFault''. The VOLT:STEP? DEF returns the minimum resolution of your instrument. The immediate voltage level increases or decreases by the value of the step size. For example, the output voltage will increase or decrease 10 mV if the step size is 0.01.

This command is useful when you program the power supply to the allowed minimum resolution. At *RST, the step size is the value of the minimum resolution.

The query returns a number in the form +n.nnnnnnnnE+nn for each channel specified.

Channel	CH1	CH2	CH3	CH4
MINimum			0 V	
MAXimum			32.96 V	
DEFault			minimum resolution	

Parameter	Typical return
0 - maximum | DEF (The maximum value is dependent on the voltage rating of the power supply) *RST <DEF in Default value>	<voltage level>
Sets the output voltage step size to 3 V on channel 1: VOLT:STEP 3, (@1)	

[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude] <voltage>| MINimum | MAXimum[, (@<chanlist>)]
[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude]? MINimum | MAXimum[, (@<chanlist>)]

The command programs the triggered voltage level of the specified output channel in volts. The triggered level is a stored value that is transferred to the output when an output step is triggered.

The query returns the programmed triggered level in the form +n.nnnnnnnnE+nn for each channel specified. Multiple responses are separated by commas.

Parameter	Typical return
0 - maximum | MIN | MAX (The maximum value is dependent on the voltage rating of the power supply) *RST MIN	<voltage level>
Sets the triggered voltage level to 5 V on channel 1: VOLT:TRIG 5, (@1)	

[SOURce:]VOLTage:MODE FIXed | STEP | LIST[, (@<chanlist>)]
[SOURce:]VOLTage:MODE? [(@<chanlist>)]

The command determines what happens to the output voltage when the transient system is initiated and triggered.

The query returns the voltage mode for each channel specified. Multiple responses are separated by commas.

Mode	Description
FIXed	Nothing happens. The output voltage remains at the immediate value.
STEP	The output goes to the triggered level when a trigger occurs.
LIST	The output follows the list values when a trigger occurs.

Parameter	Typical return
FIX | STEP | LIST	FIX, STEP, or LIST
*RST FIX	
Sets the voltage mode of channel 2 to Step: VOLT:MODE STEP,(@2)	

[SOURce:]VOLTage:PROTection[:LEVel][:AMPLitude] <voltage> | MINimum | MAXimum[, (@<chanlist>)]
[SOURce:]VOLTage:PROTection[:LEVel][:AMPLitude]? MINimum | MAXimum[, (@<chanlist>)]

The command sets the level at which overvoltage protection trips, in volts.

The query returns +n.nnnnnnnnE+nn in volts.

Parameter	Typical return
1 - maximum | MIN | MAX (The maximum value is dependent on the voltage rating of the power supply, the maximum OVP is 110% more than maximum setting voltage)	<voltage level>
*RST <MAX in Maximum value>	
Sets the level at which overvoltage protection trips to 20 V on channel 1: VOLT:PROT 20, (@2)	

[SOURce:]VOLTage:PROTection:STATe ON | OFF | 1 | 0[, (@<chanlist>)]
[SOURce:]VOLTage:PROTection:STATe? [(@<chanlist>)]

The command enables or disables overvoltage protection, which causes the instrument to go into a protected state when the output voltage exceeds the overvoltage protection (OVP) level. Output will be OFF after OVP is tripped. An overvoltage condition can be cleared with the VOLT:PROT:CLE command after the condition that caused the OVP trip is removed.

The query returns 1 (ON) or 0 (OFF) or the overvoltage protection state.

Parameter	Typical return
ON | 1 | OFF | 0	1 or 0
*RST ON	
Enable the voltage protection state on channel 1: VOLT:PROT:STAT ON, (@1)	

[SOURce:]VOLTage:PROTection:CLEar [(@<chanlist>)]

The command clears an overvoltage protection event.

Parameter	Typical return
(none)	(none)
Clears an overvoltage protection event on channel 1: VOLT:PROT:CLE (@1)	

[SOURce:]VOLTage:PROTection:TRIPped? [(@<chanlist>)]

The query indicates whether an overvoltage protection occurred (1) or not (0). This is reset to 0 by VOLTage:PROTection:CLEar.

Parameter	Typical return
(none)	1 or 0
Indicates whether an overvoltage protection occurred on channel 1: VOLT:PROT:TRIP? (@1)	

[SOURce:]VOLTage:SLEW:RISing[:IMMediate] <slew> | MINimum | MAXimum | INFinity[, (@<chan-list>)]
[SOURce:]VOLTage:SLEW:RISing[:IMMediate]? MINimum | MAXimum [(@<chanlist>)]

The command sets the rising voltage slew rate in volts per second. The slew rate setting affects the rising programmed voltage changes, including those due to the output state turning on. The slew rate can be set from 0.002 up to any value, however, if the value is more than the max slew rate, the DUT will slew based on the max slew rate. For very large values, the slew rate will be limited by the analog performance of the output circuit. The keywords MAXimum or INFinity sets the slew rate to the maximum value. The query returns the value that was sent, unless the value was more than the maximum slew rate, in which case the maximum value is returned.

The query returns the programmed rising slew rate in the form +n.nnnnnnE+nn for each channel specified. Multiple responses are separated by commas. If a slew rate of +9.90000000E+37 is returned, it means that the maximum or fastest slew rate has been set.

Parameter	Typical return
0.002 to +9.90000000E+37 | MIN | MAX | INF	<slew rate>
*RST +9.90000000E+37	
Sets the rising voltage slew rate to 5 volts per second on channel 1: VOLT:SLEW:RIS 5, (@1)	

[SOURce:]VOLTage:SLEW:RISing:MAXimum <bool>[, (@<chanlist>)]
[SOURce:]VOLTage:SLEW:RISing:MAXimum? [(@<chanlist>)]

The command sets the voltage rising slew rate maximum override. When enabled (ON), the power supply's rising slew rate is set to its maximum value. When disabled (OFF), the power supply's rising slew rate is set to the immediate value set by the [SOURce:]VOLTage:SLEW:RISing command. The [SOURce:]VOLTage:SLEW:RISing:MAX command does not affect the [SOURce:]VOLTage:SLEW:RISing setting.

The query returns 0 (OFF) if the rising slew rate override is disabled, and 1 (ON) if the rising slew rate override is enabled.

NOTE **The [SOURce:]VOLTage:SLEW:RISing:MAX command is coupled to the [SOURce:]VOLTage:SLEW:RISing command. If [SOURce:]VOLTage:SLEW:RISing sets the rate to MAX or INFinity, [SOURce:]VOLTage:SLEW:RISing:MAXimum is enabled. If the slew rate is set to any other value, [SOURce:]VOLTage:SLEW:RISing:MAXimum is disabled.**

Parameter	Typical return
ON | 1 | OFF | 0	1 or 0
*RST ON	
Enables the rising slew rate maximum override on channel 1. VOLT:SLEW:RIS:MAX ON, (@1)	

[SOURce:]VOLTage:SLEW:FALLing[:IMMediate] <slew> | MINimum | MAXimum | INFinity[, (@<chan-list>)]
[SOURce:]VOLTage:SLEW:FALLing[:IMMediate]? MINimum | MAXimum [(@<chanlist>)]

The command sets the falling voltage slew rate in volts per second. The slew rate setting affects the falling programmed voltage changes, including those due to the output state turning off. The slew rate can be set from 0.002 up to any value, however, if the value is more than the max slew rate, the DUT will slew based on the max slew rate. For very large values, the slew rate will be limited by the analog performance of the output circuit. The keywords MAXimum or INFinity sets the slew rate to the maximum value. The query returns the value that was sent, unless the value was more than the maximum slew rate, in which case the maximum value is returned.

The query returns the programmed falling slew rate in the form +n.nnnnnnE+nn for each channel specified. Multiple responses are separated by commas. If a slew rate of +9.90000000E+37 is returned, it means that the maximum or fastest slew rate has been set.

Parameter	Typical return
0.002 to +9.90000000E+37 | MIN | MAX | INF	<slew rate>
*RST +9.90000000E+37	
Sets the falling voltage slew rate to 5 volts per second on channel 1: VOLT:SLEW:FALL 5, (@1)	

[SOURce:]VOLTage:SLEW:FALLing:MAXimum <boolean>[, (@<chanlist>)]
[SOURce:]VOLTage:SLEW:FALLing:MAXimum? [(@<chanlist>)]

The command sets the voltage falling slew rate maximum override. When enabled (ON), the power supply's falling slew rate is set to its maximum value. When disabled (OFF), the power supply's falling slew rate is set to the immediate value set by the [SOURce:]VOLTage:SLEW:FALLing command. The [SOURce:]VOLTage:SLEW:FALLing:MAX command does not affect the [SOURce:]VOLTage:SLEW:FALLing setting.

The query returns 0 (OFF) if the falling slew rate override is disabled, and 1 (ON) if the falling slew rate override is enabled.

NOTE **The [SOURce:]VOLTage:SLEW:FALLing:MAX command is coupled to the [SOURce:]VOLTage:SLEW:FALLing command. If [SOURce:]VOLTage:SLEW:FALLing sets the rate to MAX or INFinity, [SOURce:]VOLTage:SLEW:FALLing:MAXimum is enabled. If the slew rate is set to any other value, [SOURce:]VOLTage:SLEW:FALLing:MAXimum is disabled.**

Parameter	Typical return
ON | 1 | OFF | 0	1 or 0
*RST ON	
Enables the falling slew rate maximum override on channel 1. VOLT:SLEW:FALL:MAX ON, (@1)	

[SOURce:]VOLTage:SENSe[:SOURce] INTernal | EXTernal[, (@<chanlist>)]
[SOURce:]VOLTage:SENSe[:SOURce]? [(@<chanlist>)]

The command specifies whether the power supply uses remote or local sensing.

The query returns the selected state of the remote sense relay.

Sense	Description
INTernal	Sets the remote sense relays to local sensing. The rear panel remote sense terminals are internally connected to the output terminals. The 4 wire indicator is off.
EXTernal	Sets the remote sense relays to remote sensing. The rear panel remote sense terminals are not internally connected to the output terminals and must be connected to the external load. The 4 wire indicator is on.

NOTE This command specifies whether the instrument uses remote or local sensing. The query returns 0 (INT) or 1 (EXT). The Internal setting closes a relay within the power supply to short the output and sense connectors. This means that only two wires are used, and remote sensing is disabled. The External setting opens the relay in order to separate the output and remote sensing inputs. The internal setting displays 2wire in the upper right corner of the channel meter view, and the External setting shows 4wire.

Parameter	Typical return
INT | EXT	INT or EXT
*RST INT	
Sets the sense mode of channel 1 to external (4-wire): VOLT:SENS EXT, (@1)	

This information is subject to change without notice.

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