TABOR ELECTRONICS

LUCID SERIES

Lucid-X Series RF Analog Signal Generator Programming Manual

Rev. 1.0

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Revision History

Table Document Revision History

Revision	Date	Description	Author
1.0	26-Nov-2024	• Original release. • Release supporting Lucid Control Panel Ver. 1.3.530, TE Update Tool Ver. 1.1.212, Lucid-X SCPI 1.017, and Lucid-X FPGA version 1.15, FW 1.0.32 or higher.	Jakob Apelblat Eyal Retter

Acronyms & Abbreviations

Table Acronyms & Abbreviations

Acronym	Description
µs or us	Microseconds
ADC	Analog to Digital Converter
AM	Amplitude Modulation
ASIC	Application-Specific Integrated Circuit
ATE	Automatic Test Equipment
AWG	Arbitrary Waveform Generators
AWT	Arbitrary Waveform Transceiver
BNC	Bayonet Neill–Concelm (coax connector)
BW	Bandwidth
CW	Carrier Wave
DAC	Digital to Analog Converter
dBc	dB/carrier. The power ratio of a signal to a carrier signal, expressed in decibels
dBm	Decibel-Milliwatts. E.g., 0 dBm equals 1.0 mW.
DDC	Digital Down-Converter
DHCP	Dynamic Host Configuration Protocol
DSO	Digital Storage Oscilloscope
DUC	Digital Up-Converter
DUT	Device Under Test
ENoB	Effective Number of Bits
ESD	Electrostatic Discharge
EVM	Error Vector Magnitude
FPGA	Field-Programmable Gate Arrays
FW	Firmware
GHz	Gigahertz
GPIB	General Purpose Interface Bus
GS/s	Giga Samples per Second
GUI	Graphical User Interface
HP	Horizontal Pitch (PXIe module horizontal width, 1 HP = 5.08mm)
Hz	Hertz
IF	Intermediate Frequency
I/O	Input / Output
IP	Internet Protocol
IQ	In-phase Quadrature
IVI	Interchangeable Virtual Instrument
JSON	JavaScript Object Notation
kHz	Kilohertz
LCD	Liquid Crystal Display
LO	Local Oscillator
MAC	Media Access Control (address)
MDR	Mini D Ribbon (connector)
MHz	Megahertz

Acronym	Description
ms	Milliseconds
NCO	Numerically Controlled Oscillator
ns	Nanoseconds
PC	Personal Computer
PCAP	Projected Capacitive Touch Panel
PCB	Printed Circuit Board
PCI	Peripheral Component Interconnect
PXI	PCI eXtension for Instrumentation
PXIe	PCI Express eXtension for Instrumentation
QC	Quantum Computing
Qubits	Quantum bits
R&D	Research & Development
RF	Radio Frequency
RT-DSO	Real-Time Digital Oscilloscope
s	Seconds
SA	Spectrum Analyzer
SCPI	Standard Commands for Programmable Instruments
SFDR	Spurious Free Dynamic Range
SFP	Software Front Panel
SINAD	Signal-to-Noise-And-Distortion Ratio
SMA	Subminiature version A connector
SMP	Subminiature Push-on connector
SPI	Serial Peripheral Interface
SRAM	Static Random-Access Memory
TFT	Thin Film Transistor
T&M	Test and Measurement
TPS	Test Program Sets
UART	Universal Asynchronous Receiver-Transmitter
USB	Universal Serial Bus
VCP	Virtual COM Port
Vdc	Volts, Direct Current
V p-p	Volts, Peak-to-Peak
VSA	Vector Signal Analyzer
VSG	Vector Signal Generator
WDS	Wave Design Studio

Contents

Tables

1 Introduction

This manual lists and describes the set of SCPI-compatible (Standard Commands for Programmable Instruments) remote commands used to operate the Tabor Lucid-X series RF analog signal generator. The complete listing of all commands used for programming the Lucid-X is given in chapter 2 SCPI Commands List Summary, page 13. Refer to the Lucid-X User Manual to find additional information about the SCPI parameters and a description of the functionality of the device.

1.1 SCPI Syntax and Styles

Where possible, the syntax and styles used in this section follow those defined by the SCPI consortium. The commands on the following pages are broken into three columns; the Keyword, the Parameter Form, Default and HS command equivalent.

The Keyword column provides the name of the command. The actual command consists of one or more keywords, since SCPI commands are based on a hierarchical structure, also known as the tree system. Square brackets ([ ]) are used to enclose a keyword that is optional when programming the command. Therefore, the device will process the command to have the same effect whether the optional node is omitted by the programmer, or not. Letter case in tables is used to differentiate between the accepted short form (upper case) and the long form (upper and lower case).

The Parameter Form column indicates the number and order of a parameter in a command and their legal value. Parameter types are distinguished by enclosing the type in angle brackets (< >). If parameter form is enclosed by square brackets ([ ]) these are then optional (pay attention to be sure that optional parameters are consistent with the intention of the associated keywords). The vertical bar (|) can be read as "or" and is used to separate alternative parameter options.

Table 1.1 SCPI Syntax and Styles

Convention	Description	Example
<>	Angle brackets indicate that their contents are not to be used literally in the command. They represent the required parameters.	:FREQuency:STARt <val><unit> In this command, the words <val> and <unit> should be replaced by the actual frequency and unit. :FREQuency:STARt 2.5,GHZ
[]	Square brackets indicate that the enclosed keywords or parameters are optional when composing the command. The commands will be executed even if they are omitted.	:FREQuency[:CW]? SOURce and CW are optional items.
|	A vertical stroke between keywords or parameters indicates alterative choices. For parameters, the effect of the command varies depending on the choice.	:AM:MOD DEEP|NORMal DEEP or NORMal are the choices.

1.2 IEEE-STD-488.2 Common Commands and Queries

Since most instruments and devices in an ATE (Automatic Test Equipment) system use similar commands that perform similar functions, the IEEE-STD-488.2 document has specified a common set

of commands and queries that all compatible devices must use. This avoids situations where devices from various manufacturers use different sets of commands to enable functions and report status.

The IEEE-STD-488.2 treats common commands and queries as device dependent commands. For example, *TRG is sent over the bus to trigger the instrument. Some common commands and queries are optional, but most of them are mandatory. Refer to Table 2.8 SCPI Common Mode Commands, page 24.

1.3 SCPI Parameter Type

The SCPI language defines four different parameter types to be used in program messages and response messages: numeric, discrete, Boolean, binary block, and string.

1.3.1 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 and MAXimum are also accepted.

Engineering units using numeric parameters (e.g., MHz or kHz) can also be sent. If only specific numeric values are accepted, the function generator will ignore values which are not allowed and will generate an error message. The following command is an example of a command that uses a numeric parameter:

VOLT:AMPL <amplitude>

1.3.2 Discrete Parameters

Discrete parameters are used to program settings that have a limited number of values (i.e., EXTernal | BUS | TIMer | SPI). They have short and long form command keywords. Upper and lowercase letters can be mixed. Query responses always return the short form in all uppercase letters. The following command uses discrete parameters:

:TRIGger:SOURce <EXTernal|BUS|TIMer|SPI>

1.3.3 Boolean Parameters

Boolean parameters represent a single binary condition that is either true or false. The generator accepts "OFF" or "0" for a false condition. The generator accepts "ON" or "1" for a true condition. The instrument always returns "0" or "1" when a Boolean setting is queried. The following command uses a Boolean parameter:

OUTP:FILT OFF | ON

The same command can also be written as follows:

OUTP:FILT 0 | 1

1.3.4 Binary Block Parameters

Binary block parameters are used for transferring data blocks to the generator, for example, waveforms, segment table, sequence table etc. The binary block parameter format is

#<header><binary data>

Where the header, holds the data size, followed by the data itself. For example, the following command uses the binary block parameter `#42048<binary data>` to transfer a 1024 points waveform to the generator

`TRAC:DATA#42048<binary_block>`

Information on commands using binary blocks is given later in this chapter.

1.3.5 String Parameters

String parameters are used to convey arbitrary information like IP addresses and file names. They are place between quotation marks (“”).
For example:
:SYST:COMM:LAN:IPAD “192.168.7.1”

2 SCPI Commands List Summary

2.1 Channel and Group Control Commands

Table 2.1 Channel and Group Control Commands

Keyword	Parameter Form	Default	Notes
:INSTrument			
[:SELect]	CH1 | CH2 | CH3 | CH4 | 1 | 2 | 3 | 4	1	Set the active channel, only Lucid-X Benchtop.

2.2 Run Mode Commands

Table 2.2 Run Mode Commands

Keyword	Parameter Form	Default	Notes
:INITiate			
:CONTinuous			
[:STATe]	OFF | ON | 0 | 1	1	Set or query the run mode status.
:GATE			
[:STATe]	OFF | ON | 0 | 1	0	Set or query the gated run mode status.
:TRIGger			Applies to trigger input.
:SOURce	EXTernal | BUS | TIMer | SPI	EXT	Selects trigger source.
:COUPle	NONE | 2 | 3 | 4 | ALL	ALL	For benchtop and rackmount instruments. Selects whether TRIG INPUT 1 is shared between channels or not. It is possible to couple only selected channels to TRIG IN CH1.
:EDGe	POSitive | NEGative	POS	Define or query the valid edge for the Lucid-X trigger input.
:ADVance	ONCe | STEP | 0 | 1	ONCe	Define or query the trigger advance mode.
:COUNt	1 to 16,777,215	1	Counted bursts.
:DELay	0 to 562.499e3	0	Define or query the trigger advance mode.
:TIMer			
:TIME	8e-9 to 562.499e3	1e-3	

2.3 CW Mode Commands

Table 2.3 CW Mode Commands

Keyword	Parameter Form	Default	Notes
:OUTPut			
[:STATe]	OFF | ON | 0 | 1	0	Toggles output on/off.
[:SOURce]			
:FREQuency	50e3 to 40e9	1e9	Set the frequency of the signal in Hz.
:POWer	-130.00 to 30.00	5	Set or query the power of the generated signal in units of 0.01 dBm.
:PHASe	0 to 360.00	0	Set or query the phase of the generated signal in units of 0.01 degrees.
:ROSCillator			
:SOURce?	INTernal | EXTernal	INT	Query only. The status of the reference signal is detected automatically. The input signal must be 10 MHz or 100 MHz.
:OUTP			
:FREQuency	10e6 | 100e6	10e6	Set the external reference clock to 10 MHz or 100 MHz.

2.4 List Mode Commands

Table 2.4 List Mode Commands

Keyword	Parameter Form	Default	Notes
[:SOURce]			
:LIST			
[:STATe]	OFF | ON | 0 | 1	0	Set or query the state of the list mode of the Lucid-X unit.
:DATA	#<header><binary_block>		Download list data to the Lucid-X unit.
:DEFine	<step>,<frequency>,<power>,<last _entry>,<advance>, <dwell>		Define an entry in the list table.
:DELete			
[:NAME]	1 to 4,096	1	Delete specified step from the list.
:ALL			Delete all predefined list steps and clear the entire list.

2.5 Modulation Mode Commands

Table 2.5 Modulation Mode Commands

Keyword	Parameter Form	Default	Notes
[:SOURce]			
:AM			
[:STATe]	OFF | ON | 0 | 1	0	Set or query the state of the amplitude modulation mode in the Lucid-X unit
:SOURce	INTernal | EXTernal	INT	Set or query the source of the amplitude modulation in the Lucid-X unit.
:INTernal			
:FREQuency	0 to 100e3	1e4	Set or query the internal amplitude modulation frequency of the Lucid-X unit
:DEPTh	0 to 100	50	Set or query the internal amplitude modulation in percent of the carrier wave amplitude
:FM			
[:STATe]	OFF | ON | 0 | 1	0	Set or query the state of the frequency modulation mode.
:SOURce	INTernal | EXTernal	INT	Set or query the source of the frequency modulation.
:INTernal			
:FREQuency	1 to 1e6	1e5	Set or query the internal modulation frequency (Hz).
:DEViation	1 to 5e6	1e6	Set or query the deviation of the frequency modulation.
:PM			
[:STATe]	OFF | ON | 0 | 1	0	Set or query the state of the phase modulation mode.

Keyword	Parameter Form	Default	Notes
:INTernal			
:FREQuency	1 to 10e6	1e6	Set or query the modulation frequency of the phase modulation.
:DEViation	0 to 18000 units of 0.01 deg	0	Set or query the deviation of the internal phase modulation.
:PULSe			Pulse Modulation
[:STATe]	OFF | ON | 0 | 1	0	Set the pulse modulation on/off.
:SOURce	INTernal | EXTernal	INT	Set or query the source of the pulse modulation.
:FREQuency	1 to 10e6	1e6	Set or query the internal pulse modulation frequency.
:WIDTh	32e-9 to 100e-3	320 e-9	Set or query the pulse width of the internal pulse modulation.
:PATTern			Pulse pattern
[:STATe]	OFF | ON | 0 | 1	0	Set or query the state of the pattern mode.
:DATA	#<header><binary_block>		Download pattern data to the Lucid-X unit.
:DEFine	<step>,<ontime>,<offtime>, <repetitions>,<last_entry>		Define an entry in the pattern table.
:DELete			
[:NAME]	1 to 2047		Delete specified step from the pattern.
:ALL			Delete all predefined pattern steps and clear the entire pattern.

2.6 Sweep Mode Commands

Table 2.6 Sweep Mode Commands

Keyword	Parameter Form	Default	Notes
[:SOURce]			
:FRSWeep			Frequency Sweep
[:STATe]	OFF | ON | 0 | 1	0	Set or query the state of the frequency sweep mode
:STARt	50e3 to 40e9	1e9	Set or query the start frequency of the frequency sweep.
:STEPs	2 to 4096	1000	Set or query the number of steps in the frequency sweep.
:STOP	50e3 to 40e9	2e9	Set or query the stop frequency of the frequency sweep.
:TIME	10e-6 to 562.499e3	1e-3	Set or query the sweep time of each step of the frequency sweep.
:DIRection	NORMAL | UPDOWN | 0 | 1	NORMAL	Set or query the direction of the frequency sweep mode.
:PRSWeep			Power sweep
[:STATe]	OFF | ON | 0 | 1	0	Set or query the state of the power sweep mode.
:STARt	-130.00 to 30.00	-5	Set or query the start power of the power sweep.
:STEPs	2 to 4096	10	Set or query the number of steps in the power sweep.
:STOP	130.00 to 30.00	5	Set or query the stop power of the power sweep.
:TIME	10e-6 to 562.499e3	1e-3	Set or query the sweep time of each step of the power sweep.

Keyword	Parameter Form	Default	Notes
:DIRection	NORMAL | UPDOWN | 0 | 1	NORMAL	Set or query the direction of the power sweep mode.

2.7 System Commands

Table 2.7 System Mode Commands

Keyword	Parameter Form	Default	Notes
:SYSTem			
:UPDate			
:FPGA	#<header><binary_block>		Update the current FPGA. The binary block must contain a valid FPGA BIN file, otherwise it will result in an error.
:SOFTware	#<header><binary_block>		Update the current SW. The binary block must contain a valid SW TGZ file, otherwise it will result in error.
:CLOCk	<time>		Set the system clock using the following format “DD.MM.YYYY HH:MM”.
:SETup			
:TARGet	INTernal | USB	INT	Select the target for store, clear and recall operations.
:STORe	1 to 5		Save the setup in specified setup file.
:CLEar	1 to 5		Clear specified setup file.
:RECall	1 to 5		Recall the specified setup file.
:FILE			
:CATalog			
:LIST?			This query returns a list of files of LIST type stored in the unit.
:PATTern?			This query returns a list of files of PATTERN type (On and Off time) stored in the unit
:STORe			
:LIST	<file name>		This command stores the current list data to a file. The file name is specified by the user.

Keyword	Parameter Form	Default	Notes
:PATTern	<file name>		This command stores the current pattern data to a file. The file name is specified by the user.
:LOAD			
:LIST	<file name>		This command loads a list file.
:PATTern	<file name>		This command loads a pattern file.
:SIZE?			This query returns the size of the frequency and pattern lists uploaded in the Lucid-X memory.
:DELete			
:FILE	<file name>		Delete the specified file.
:LIST			Delete all list files.
:PATTern			Delete all pattern files.
:ALL			Delete all files.
:POWerup			
:SETup	0 to 5	0	Specify the setup file to be used at power-up.
:EMULator			
:MODel For future use.	<TABOR|ANAPICO|KEYSIGHT|R&S|HOLZWORTH>	TABOR	Select the 3rd party signal generator SCPI commands to emulate.
:ERRor?			Query the device error FIFO queue.
:TEMPerature?			Query the device temperature.
:INFormation			
:CALibration?			Query the calibration date.
:MODel?			Query the model.
:SERial?			Query the serial number.
:HARDware?			Query the hardware board version.

Keyword	Parameter Form	Default	Notes
:FPGA?			Query the FPGA firmware version.
:FIRMware?			Query the Lucid-X BSP firmware version.
:SCPIrevision?	xx.xx.xx		Query the Tabor SCPI version.
:COMMunicate			
:LAN			
:DHCP	OFF|ON|0|1		Enable DHCP (not for Lucid-X Desktop)
:IPADdress	<address>		Set the IPv4 address.
:MASK	<mask>		Set the network mask.
:GATeway	<address>		Set the gateway.
:HOSTname	<name>		Set the Lucid-X device host name.
:DNS	<1|2>,<address>		Set the DNS server 1 or 2, and IP address.
:PORT	<port_number> 0 to 65535	10000	Set the TCP/IP port for the SCPI service.
:BATtery? For future use.	0 to 100		Query the battery charging status, %. Only Lucid-X Portable.

2.8 Common Commands

Table 2.8 SCPI Common Mode Commands

Keyword	Notes
*CLS	The Clear Status command clears the Status Byte Register, the Data Questionable Event Register, the Standard Event Status Register, the Standard Operation Status Register and any other registers that are summarized in the status byte.
*ESE	Standard event status enable command.
*ESE?	Standard Event Status enable query.
*ESR?	Standard event status register query.
*IDN?	The Identification query outputs an identifying string. The response will show the following information: <company name>, <model number>, <serial number>, <firmware revision>
*OPC	The Operation Complete command sets bit 0 in the Standard Event Status Register when all pending operations have finished.
*OPC?	Returns the ASCII character "1" to the output buffer after all the previous commands have been executed. The command is used for synchronization between a controller and the instrument using the MAV bit in the Status Byte or a read of the Output Queue. Reading the response to the *OPC? query has the advantage of removing the complication of dealing with service requests and multiple polls to the instrument. However, both the system bus and the controller handshake are in a temporary hold-off state while the controller is waiting to read the *OPC? query response.
*OPT?	The options query returns a comma-separated list of all of the instrument options currently installed on the signal generator.
*RST	Reset Command.
*SRE	Service request enable command.
*SRE?	Service request enable query.
*STB?	Query the status byte summary register. The *STB? command is similar to a serial poll but is processed like any other instrument command. The *STB? command returns the same result as a serial poll, but the "request service" bit (bit 6) is not cleared if a serial poll has occurred.
*TRG	Triggers the generator from the remote interface. This command affects the generator if it is first placed in the Trigger or Burst mode of operation and the trigger source is set to "BUS". If BUS is not the selected trigger source, then the command is ignored.
*TST? For future use.	The Self-Test query initiates the internal self-test and returns one of the following results:

Keyword	Notes
	0 – All tests passed. 1 – One or more tests failed.
*WAI	Wait-to-Continue Command.

3 Channel and Group Control Commands

3.1 :INSTrument[:SELect] <CH1|CH2|CH3|CH4|1|2|3|4>(?)

Description

This command will set the active channel (for a given module) or device (for standalone devices) for future programming command sequences. Subsequent commands affect the selected channel only.

Parameters

Range	Type	Default	Description
1 to 4	Discrete	1	Sets the active channel for programming.

Response

The Lucid-X unit will return 1 to 4 depending on the present active module setting.

Example

Command `:INST 4`

Query `:INST?`

4 Run Mode Commands

4.1 Introduction

Refer to chapter “Run Mode Tab” in the “Lucid Control Panel User Manual” for a detailed description of the trigger options.

4.2 :INITiate:CONTinuous [:STATe] <OFF|ON|0|1>(?)

Description

Use this command to set or query the run mode status.

Parameters

Range	Type	Default	Description
0 - 1	Boolean	1	“0” disables the continuous operation and forces the triggered run mode. Trigger signal is applied to the trigger input only and output waveforms will be generated only when the trigger signal is valid and true. “1 selects the continuous run mode.

Response

Lucid-X unit returns 1 or 0 depending on the current run mode setting.

Example

Command `:INIT:CONT OFF`

Query `:INIT:CONT?`

4.3 :INITiate:GATE[:STATe] <OFF|ON|0|1>(?)

Description

Use this command to set or query the gated run mode status.

Parameters

Range	Type	Default	Description
0 - 1	Boolean	1	“0” forces the continuous run mode. “1” selects the gated run mode. Gating signal is applied to the trigger input only and output waveforms will be generated only when the gate signal is valid and true. The slope and level of the gating entry are programmable.

Response

Lucid-X unit returns 1 or 0, depending on the current run mode setting

Example

Command `:INIT:GATE OFF`

Query `:INIT:GATE?`

4.4 :TRIGger:SOURce <EXTernal|BUS|TIMer|SPI>(?)

Description

Use this command to set or query the source of the trigger event that will stimulate the Lucid-X to generate waveforms. The source advance command will affect the generator only after it has been programmed to operate in the Trigger Run mode. Modify the Lucid-X to trigger run mode using the *init:cont off* command.

Parameters

Name	Type	Default	Description
<EXT>	Discrete	EXT	Selects the TRIG IN connector as the input source. All other inputs are ignored.
<BUS>	Discrete		Selects the reception of the *TRIGger* (or the common **TRG*) command as the source.
<TIM>	Discrete		Internally generated trigger
<SPI>	Discrete		Selects the SPI connector as the input source, only for Lucid-X Desktop.

Response

Lucid-X returns EXT, BUS, TIM or SPI, depending on the selected trigger source setting.

Example

Command `:TRIG:SOUR BUS`

Query `:TRIG:SOUR?`

4.5 :TRIGger:COUPle <NONE|2|3|4|ALL>(?)

Description

For benchtop and rackmount instruments. Selects whether TRIG INPUT 1 is shared between channels or not. It is possible to couple only selected channels to TRIG IN CH1.

Parameters

Value	Type	Default	Description
NONE	Discrete	ALL	Each channel receives an external trigger from its dedicated rear panel connector.

Value	Type	Default	Description
2/3/4	Discrete	ALL	Couples CH2/3/4 source with CH1 so that TRIG IN 1 triggers both CH1 and CH2/3/4.
ALL	Discrete	ALL	All channels receive a trigger from TRIG IN 1.

Response

The Lucid-X unit returns its couple state.

Example

Command `:TRIG:COUP 2`

Query `:TRIG:COUP?`

4.6 :TRIGger:EDGe <POSitive|NEGative>(?)

Description

Use this command to define or query the valid edge for the Lucid-X trigger input. The selection is between positive (up) and negative (down) independently for each trigger input.

Parameters

Name	Type	Default	Description
<POSitive>	Discrete	POS	Selects the positive (up) slope for trigger.
<NEGative>	Discrete		Selects the negative (down) slope for trigger.

Response

Lucid-X returns the current selection for the valid trigger slope.

Example

Command `:TRIG:EDG NEG`

Query `:TRIG:EDG?`

4.7 :TRIGger:ADVance <ONCe|STEP|0|1>(?)

Description

Use this command to define or query the trigger advance mode. In the ONCE mode whenever a valid trigger is received, the entire waveform is generated. When the STEP mode is selected, each trigger advances through the waveform sequence generating the current step.

Parameters

Name	Type	Default	Description
<ONCe|0>	Discrete	ONCe	Selects the once advance mode. Every trigger generates the entire sweep or list.

Name	Type	Default	Description
<STEP|1>	Discrete		Selects the step advance mode. Every trigger generates the current step and advances to the next step in the sweep or list.

Response

Lucid-X returns the current selection for the trigger advance mode.

Example

Command `:TRIG:ADV STEP`

Query `:TRIG:ADV?`

4.8 :TRIGger:COUNt <burst>(?)

Description

Use this command to set or query the burst counter setting. This command is effective only when the Lucid-X unit is programmed to operate in triggered run mode (*init:cont 0*) and in trigger advance mode once (trig:adv onc).

Parameters

Name	Range	Type	Default	Description
<burst>	0 to 16,777,215	Numeric	1	Programs the burst count. Following a valid trigger signal, the Lucid-X generates a pre-programmed number of cycles, and then resumes an idle state. The counted burst can be initiated using one of the following remote command such as **trg*, or a transition at any of the trigger input connectors.

Response

Lucid-X returns the present burst count value.

Example

Command `:TRIG:COUN 1000`

Query `:TRIG:COUN?`

4.9 :TRIGger:DELay <interval>(?)

Description

Use this command to set or query the trigger delay setting for a given trigger. The trigger delay parameter defines the interval that will elapse from a valid trigger signal to the initiation of the first output waveform. Trigger delay is turned off using the *trig:del 0* command. The trigger delay command affects the generator unit, only after it has been programmed to operate in triggered run

mode. Modify the Lucid-X unit to triggered run mode using the *init:cont 0* command. The delay interval is programmed in time.

Parameters

Name	Range	Type	Default	Description
<interval>	0 to 562.499e3	Numeric	0	"0" turns OFF the delayed trigger function. Delay is programmed in time increments. The delay resolution is 8 ns. The programmed value will be rounded to the nearest multiple of 8 ns.

Response

Lucid-X returns the current trigger delay interval value.

Example

Command `:TRIG:DEL 1000`

Query `:TRIG:DEL?`

4.10 :TRIGger:TIMer:TIME <time>(?)

Description

Use this command to set or query the period of the internal timed trigger generator. This value is associated with the internal trigger run mode only and has no effect on other trigger modes. The internal trigger generator is a free-running oscillator, asynchronous with the frequency of the output waveform. The timer intervals are measured from waveform start to waveform start.

Parameters

Name	Range	Type	Default	Description
time	8e-9 to 562.499e3	Numeric	1e-03	Time is programmed in time increments. The time resolution is 8 ns. The programmed value will be rounded to the nearest multiple of 8 ns.

Response

Lucid-X returns the current internal timed trigger period value in units of seconds.

Example

Command `:TRIG:TIMER:TIM 1e-04`

Query `:TRIG:TIMER:TIM?`

5 CW Mode Commands

5.1 :OUTPut[:STATe] OFF|ON|0|1(?)

Description

This command will set or query the output state of the Lucid-X unit. For safety considerations, the output is always set to off by default, even if the last instrument setting before power down was set to on.

Parameters

Range	Type	Default	Description
0-1	Boolean	0	Sets the outputs to on or off.

Response

Lucid-X returns 1 if the output is on, or 0 if the output is off.

Example

Command `:OUTP ON`

Query `:OUTP?`

5.2 [:SOURce]:FREQuency <frequency>(?)

Description

The command sets the frequency of the signal in Hertz. The frequency command can be programmed with resolutions up to 1mHz.

> **Note**
> The range is model dependent. Refer to the instrument's user manual or datasheet.

Parameters

Name	Range	Type	Default	Description
< frequency >	50e3 to 40e9	Numeric (Double)	1e9	The frequency of the signal in Hertz. The frequency command can be programmed with resolutions up to 1 mHz.

Response

Lucid-X returns the current signal frequency value. The returned value will be in standard scientific format (for example: 1 GHz would be returned as 1e9 – positive numbers are unsigned).

Example

Command `:FREQ 5.0e9`

Query `:FREQ?`

5.3 [:SOURce]:POWer <power>(?)

Description

Use this command to set or query the power of the generated signal in units of dBm.

Parameters

Name	Range	Type	Default	Description
< power >	-130.00 to 30.00	Numeric	5	Sets the power of the signal in decibels. The power command can be programmed with a resolutions of 0.01 dBm. Default -70 dBm to +20 dBm LP option -80 dBm to +20 dBm ELP option -130 dBm to +20 dBm EPR option -130 dBm to +30 dBm

Response

Lucid-X returns the current signal power value.

Example

Command `:POW 5`

Query `:POW?`

5.4 [:SOURce]:PHASe <phase>(?)

Description

Use this command to set or query the phase of the generated signal in units of degrees.

Parameters

Name	Range	Type	Default	Description
< phase >	0 to 360	Numeric	0	Sets the phase of the signal in degrees. The phase command can be programmed with resolutions up to 0.01 degrees.

Response

Lucid-X returns the current phase of the signal.

Example

Command `:PHAS 120`

Query `:PHAS?`

5.5 [:SOURce]:ROSCillator:SOURce?

Description

Query only if reference clock is internal or external. The reference signal is detected automatically. The input signal must be 10 MHz or 100 MHz.

Response

Lucid-X returns INT/EXT if an internal/external reference clock is used.

Example

Query `:ROSC:SOUR?`

5.6 [:SOURce]:ROSCillator:OUTP:FREQuency <10e6|100e6>(?)

Description

Use this command to set the external reference clock to 10 MHz or 100 MHz.

Parameters

Value	Discrete	Default	Description
< 10e6 | 100e6>	10e6 or 100e6	10e6	Set the external reference clock to 10 MHz or 100 MHz.

Response

Lucid-X returns the frequency of the external reference clock.

Example

Command `:ROSC:OUTP:FREQ 100e6`

Query `:ROSC:OUTP:FREQ?`

6 List Mode Commands

6.1 [:SOURCE]:LIST[:STATe] OFF|ON|0|1(?)

Description

This command will set or query the state of the list mode in the Lucid-X unit.

Parameters

Range	Type	Default	Description
0-1	Boolean	0	Sets the list state on and off.

Response

Lucid-X returns 1 if the list is being generated, or 0 if it is off.

Example

Command `:LIST ON`

Query `:LIST?`

6.2 [:SOURCE]:LIST:DATA #<header><binary block>(?)

Description

This command will download list data to the Lucid-X unit. List data is loaded to the Lucid-X unit using high-speed binary data transfer. High-speed binary data transfer allows any number of 8-bit bytes to be transmitted in a message. This command is particularly useful for sending large quantities of data. As an example, the next command will download to the generator a block of list-related data of 40 entries:

LIST:DATA #3600<binary_block>

This command causes the transfer of 600 bytes of data (40 list entries). The <header> is interpreted this way:

- The ASCII "#" ($23) designates the start of the binary data block.
- "3" designates the number of digits that follow representing the binary data block size in bytes.
- "600" is the number of bytes to follow.
- <binary_block> represents list-related data. Each entry in the list is represented by 15 bytes as follows:

Bit	Value
119:88	Dwell time in units of 1 µsec
87:82	N/A
81	Advance 0 –False 1 – True

Bit	Value
80	Last Entry 0 – False 1 – True
79:64	Power in units of 0.01 dBm
63:16	Frequency in units of 1 mHz
15:0	Step number, 1 – 4096

Parameters

Name	Type	Description
#<header><binary_block>	Binary	header: Contains information on the size of the binary block that follows. binary_block: Block of binary data that contains list-related data, as explained above.

Example

Command `:LIST:DATA #3600<binary_block>`

6.3 [:SOURCE]:LIST:DEFine <step>,<frequency>,<power>,<last_entry>,<advance>,<dwell>(?)

Description

Use this command to fully define an entry in the list table.

Parameters

Name	Range	Type	Default	Description
< step >	2 to 4096	Numeric	1	Set the list step #.
<frequency>	50e3 to 40e9	Numeric (Double)	1e-3	Frequency of the signal to be generated in the current step
<power>	-130.00 to 30.00	Numeric (Double)	1e-2	Power of signal to be generated in the current step. Default -70 dBm to +20 dBm LP option -80 dBm to +20 dBm ELP option -130 dBm to +20 dBm EPR option -130 dBm to +30 dBm
<last_entry>	0 or 1	Discrete	1	Define whether this is the last step in the list.
<advance>	0 or 1	Discrete	0	Define the behavior of the step with respect to trigger. 0 – Step is generated and advances automatically to the next step.

Name	Range	Type	Default	Description
				1 – Current step is generated only when a valid trigger is received.
<dwell>	10e-6 to 562.499e3	Numeric (Double)	1e-3	Specify the amount of time to generate the current signal.

Response

Lucid-X returns the state of all parameters for the selected step.

Example

Command `:LIST:DEF 1, 2e9, 0, 0, 1e-3`

Query `:LIST:DEF? 1`

6.4 [:SOURCE]:LIST:DELete[:NAME] <step>

Description

This command will delete specified step from the list.

Parameters

Name	Range	Type	Description
< step >	1 to 4096	Numeric (integer)	Selects the step number that will be deleted.

Example

Command `:LIST:DEL 1`

6.5 [:SOURCE]:LIST:DELete:ALL

Description

This command will delete all predefined list steps and clear the entire list. This command is particularly useful in case you want to start defining a new list from scratch.

Example

Command `:LIST:DEL ALL`

7 Modulation Mode Commands

7.1 [:SOURCE]:AM:[STATe] <OFF|ON|0|1>(?)

Description

This command will set or query the state of the amplitude modulation mode in the Lucid-X unit.

Parameters

Range	Type	Default	Description
0-1	Boolean	0	Set the AM state on or off.

Response

Lucid-X returns 1 if the AM is being generated or 0 if it is off.

Example

Command `:AM ON`

Query `:AM?`

7.2 [:SOURCE]:AM:SOURce <INTernal/EXTernal>(?)

Description

This command will set or query the source of the amplitude modulation in the Lucid-X unit.

Parameters

Name	Type	Default	Description
<INT>	Discrete	INT	Sets the AM source to internal.
<EXT>	Discrete		Sets the AM source to external.

Response

The Lucid-X will return INT or EXT depending on the selected source of the amplitude modulation.

Example

Command `:AM:SOUR EXT`

Query `:AM:SOUR?`

7.3 [:SOURCE]:AM:INTernal:FREQuency <frequency>(?)

Description

This command will set or query the internal amplitude modulation frequency of the Lucid-X unit.

Parameters

Name	Range	Type	Default	Description
<frequency>	1 to 100e3, resolution 1 Hz	Numeric (Double)	1e4	Sets the internal amplitude modulation frequency (Hz).

Response

The Lucid-X will return the value of the internal amplitude modulation frequency.

Example

Command **:AM:INT:FREQ 1e3**

Query **:AM:INT:FREQ?**

7.4 [:SOURCE]:AM:DEPTh <depth>(?)

Description

This command will set or query the internal amplitude modulation in percent of the carrier wave amplitude.

Parameters

Name	Range	Type	Default	Description
< depth >	0 to 100%, resolution	Numeric (Double)	50	Sets the internal amplitude modulation depth in %.

Response

The Lucid-X will return the value of the internal amplitude modulation depth.

Example

Command **:AM:DEPT 47.3**

Query **:AM:DEPT?**

7.5 [:SOURCE]:FM[:STATe] <OFF|ON|0|1>(?)

Description

This command will set or query the state of the frequency modulation mode in the Lucid-X unit.

Parameters

Range	Type	Default	Description
0-1	Boolean	0	Sets the FM state on and off.

Response

Lucid-X returns 1 if the FM is being generated, or 0 if it is off.

Example

Command **:FM ON**

Query **:FM?**

7.6 [:SOURCE]:FM:SOURce <INTernal|EXTernal>(?)

Description

This command will set or query the source of the frequency modulation in the Lucid-X unit.

Parameters

Name	Type	Default	Description
<INT>	Discrete	INT	Sets the FM source to internal.
<EXT>	Discrete		Sets the FM source to external.

Response

The Lucid-X will return INT or EXT depending on the selected source of the frequency modulation.

Example

Command `:FM:SOUR EXT`

Query `:FM:SOUR?`

7.7 [:SOURCE]:FM:INTernal:FREQuency <frequency>(?)

Description

This command will set or query the modulation frequency (Hz).

Parameters

Name	Range	Type	Default	Description
< frequency >	1 to 1e6, resolution 1 Hz	Numeric (Double)	1e5	Set the modulation frequency (Hz).

Response

The Lucid-X will return the value of the internal modulation frequency.

Example

Command `:FM:INT:FREQ 1e3`

Query `:FM:INT:FREQ?`

7.8 [:SOURCE]:FM:DEViation <deviation>(?)

Description

Set or query the frequency deviation of the carrier wave in (Hz).

This command will set or query the deviation of the internal frequency modulation of the Lucid-X unit.

Parameters

Name	Range	Type	Default	Description
< deviation >	1 to 5e6, resolution 1 Hz	Numeric (Double)	1e6	Sets the deviation frequency of the internal frequency modulation.

Response

The Lucid-X will return the value of the deviation of the internal frequency modulation.

Example

Command `:FM:DEV 10000`

Query `:FM:DEV?`

7.9 [:SOURCE]:PM[:STATe] <OFF|ON|0|1>(?)

Description

This command will set or query the state of the phase modulation mode.

Parameters

Range	Type	Default	Description
0-1	Boolean	0	Sets the PM state on and off.

Response

Lucid-X returns 1 if the PM is being generated, or 0 if it is off.

Example

Command `:PM ON`

Query `:PM?`

7.10 [:SOURCE]:PM:INTernal:FREQuency <frequency>(?)

Description

Set or query the modulation frequency of the phase modulation.

Parameters

Name	Range	Type	Default	Description
< frequency >	1 to 10e6, resolution 1 Hz	Numeric (Double)	1e6	Sets the internal modulating frequency of the phase modulation.

Response

The Lucid-X will return the value of the internal modulating frequency.

Example

Command `:PM:INT:FREQ 1e3`

Query `:PM:INT:FREQ?`

7.11 [:SOURCE]:PM:DEViation <deviation>(?)

Description

Set or query the deviation of the internal phase modulation.

Parameters

Name	Range	Type	Default	Description
< deviation >	0 to 18000 units 0.01 deg.	Numeric (Double)	0	Sets the deviation of the internal phase modulation in degrees.

Response

The Lucid-X will return the value of the deviation of the internal phase modulation.

Example

Command `:PM:DEV 100`

Query `:PM:DEV?`

7.12 [:SOURCE]:PULSe[:STATe] <OFF|ON|0|1>(?)

Description

This command will set or query the state of the pulse modulation mode in the Lucid-X unit.

Parameters

Range	Type	Default	Description
0-1	Boolean	0	Sets the pulse modulation state on or off.

Response

Lucid-X returns 1 if the pulse modulation is being generated, or 0 if it is off.

Example

Command `:PULS ON`

Query `:PULS?`

7.13 [:SOURCE]:PULSe:SOURce <INTernal/EXTernal>(?)

Description

Set or query the source of the pulse modulation.

Parameters

Value	Type	Default	Description
<INT>	Discrete	INT	Sets the pulse modulation source to internal.
<EXT>	Discrete		Sets the pulse modulation source to external.

Response

The Lucid-X will return INT or EXT depending on the selected source of the pulse modulation.

Example

Command `:PULS:SOUR EXT`

Query `:PULS:SOUR?`

7.14 [:SOURCE]:PULSe:FREQuency <frequency>(?)

Description

Set or query the internal pulse modulation frequency.

Parameters

Name	Range	Type	Default	Description
< frequency >	1 to 10e6, resolution 1 Hz	Numeric (Double)	1e6	Sets the internal pulse modulation frequency in Hz.

Response

The Lucid-X will return the value of the internal amplitude modulation frequency.

Example

Command `:PULS:FREQ 1e3`

Query `:PULS:FREQ?`

7.15 [:SOURCE]:PULSe:WIDTh <width>(?)

Description

Set or query the pulse width of the internal pulse modulation.

Parameters

Name	Range	Type	Default	Description
< width >	32e-9 to 100e-3	Numeric (Double)	320e-9	Sets the width of the pulse. Resolution is 8 ns.

Response

The Lucid-X will return the value of the pulse width of the internal pulse modulation.

Example

Command `:PULS:WIDT 1e-4`

Query `:PULS:WIDT?`

7.16 [:SOURCE]:PATTern[:STATe] <OFF|ON|0|1>(?)

Description

Set or query the state of the pattern mode.

Parameters

Range	Type	Default	Description
0-1	Boolean	0	Sets the pattern state on and off.

Response

Lucid-X returns 1 if the pattern is being generated, or 0 if it is off.

Example

Command **:PATT ON**

Query **:PATT?**

7.17 [:SOURCE]:PATTern:DATA #<header><binary block>(?)

Description

This command will download pattern configuration data to the Lucid-X unit. Pattern data is loaded to the Lucid-X unit using high-speed binary data transfer. High-speed binary data transfer allows any number of 8-bit bytes to be transmitted in a message. This command is particularly useful for sending large quantities of data. As an example, the next command will download to the generator a block of pattern-related data of 40 entries:

LIST:DATA#3640<binary_block>

This command causes the transfer of 640 bytes of data (40 pattern entries). The <header> is interpreted this way:

- The ASCII "#" ($23) designates the start of the binary data block.
- "3" designates the number of digits that follow representing the binary data block size in bytes.
- "560" is the number of bytes to follow.
- <binary_block> represents pattern-related data. Each entry in the pattern is represented by 14 bytes as follows:

Bytes	Bits	Value
16	127:80	On Time
	79:32	Off Time
	31:16	Number of repetitions
	15:0	Step number, 1 – 2048

Parameters

Name	Type	Description
#<header><binary_block>	Binary	header: Contains information on the size of the binary block that follows. binary_block: Block of binary data that contains list-related data, as explained above.

Response

The query returns the data block from the Lucid.

Example

Command **:PATT:DATA #3640<binary_block>**

Query **:PATT:DATA?**

7.18 [:SOURCE]:PATTern:DEFine <step>,<ontime>,<offtime>,<repetitions>,<last_entry>(?)

Description

Define an entry in the pattern table.

Parameters

Name	Range	Type	Default	Description
< step >	1 to 2048	Numeric	1	Will set the pattern step #.
<ontime>	32e-9 to 1.8e6	Numeric	5e-4	Sets the on time of the pulse to be generated in the current step. Resolution is 1 µs.
<offtime>	32e-9 to 1.8e6	Numeric(int)	5e-4	Sets the off time of the pulse to be generated in the current step. Resolution is 1 µs.
<repetitions>	1 to 65535	Numeric	1	Sets the number of repetitions of the pulse to be generated in the current step
<last_entry>	0 or 1	Discrete	0	Defines whether this is the last step in the pattern.

Response

Lucid-X returns the state of all parameters for the selected step.

Example

Command `:PATT:DEF 1, 2e-3, 1e-4, 1, 0`

Query `:PATT:DEF? 1`

7.19 [:SOURCE]:PATTern:DELete[:NAME] <step_#>

Description

Delete specified step from the pattern.

Parameters

Name	Range	Type	Description
< step >	1 to 2047	Numeric(int)	Selects the step number that will be deleted.

Example

Command `:PATT:DEL 1`

7.20 [:SOURCE]:PATTern:DELete:ALL

Description

Delete all predefined pattern steps and clear the entire pattern. This command is particularly useful in case you want to start defining a new pattern from scratch.

Example

Command **:PATTERN:DEL:ALL**

8 Sweep Mode Commands

8.1 [:SOURCE]:FRSWeep[:STATe] <OFF|ON|0|1>(?)

Description

Set or query the state of the frequency sweep mode.

Parameters

Range	Type	Default	Description
0-1	Boolean	0	Sets the frequency sweep state on or off.

Response

Lucid-X returns 1 if the frequency sweep is being generated, or 0 if it is off.

Example

Command `:FRSW ON`

Query `:FRSW?`

8.2 [:SOURCE]:FRSWeep:STARt <start_frequency>(?)

Description

This command will set or query the start frequency of the frequency sweep of the Lucid-X unit.

> **Note**
> The range is model dependent. Refer to the instrument's user manual or datasheet.

Parameters

Name	Range	Type	Default	Description
< start_frequency >	50e3 to 40e9	Numeric (Double)	1e9	Sets the start frequency of the frequency sweep. Resolution is 0.01 Hz.

Response

The Lucid-X will return the frequency of the first step in the frequency sweep.

Example

Command `:FRSW:STAR 1e8`

Query `:FRSW:STAR?`

8.3 [:SOURCE]:FRSWeep:STEPs <steps>(?)

Description

This command will set or query the number of steps in the frequency sweep of the Lucid-X unit.

Parameters

Name	Range	Type	Default	Description
< steps >	2 to 4096, resolution 1 step	Numeric(int)	1000	Sets the number of steps in the frequency sweep.

Response

The Lucid-X will return the frequency of steps in the frequency sweep.

Example

Command `:FRSW:STEP 100`

Query `:FRSW:STEP?`

8.4 [:SOURCE]:FRSWeep:STOP <stop_frequency>(?)

Description

This command will set or query the stop frequency of the frequency sweep of the Lucid-X unit.

> **Note**
> The range is model dependent. Refer to the instrument's user manual or datasheet.

Parameters

Name	Range	Type	Default	Description
<stop_frequency>	50e3 to 40e9	Numeric (Double)	2e9	Sets the stop frequency of the frequency sweep. Resolution is 0.01 Hz.

Response

The Lucid-X will return the frequency of the last step in the frequency sweep.

Example

Command `:FRSW:STOP 1e10`

Query `:FRSW:STOP?`

8.5 [:SOURCE]:FRSWeep:TIME <sweep_time>(?)

Description

This command will set or query the sweep time of each step of the frequency sweep of the Lucid-X unit.

Parameters

Name	Range	Type	Default	Description
< sweep_time >	10e-6 to 562.499e3	Numeric (Double)	1e-3	Sets the sweep time of the frequency sweep. Resolution is 8 ns.

Response

The Lucid-X will return the sweep time of the frequency sweep.

Example

Command `:FRSW:TIME 10e-3`

Query `:FRSW:TIME?`

8.6 [:SOURCE]:FRSWeep:DIRection <NORMAL|UPDOWN|0|1>(?)

Description

This command will set or query the direction of the frequency sweep mode in the Lucid-X unit.

Parameters

Range	Type	Default	Description
<NORMAL>	Discrete	NORMAL	Sets the frequency sweep direction from start frequency to stop frequency.
<UPDOWN>	Discrete		Sets the frequency sweep direction from start frequency to stop frequency and back to start frequency.

Response

The Lucid-X will return NORMAL, UPDOWN depending on the selected direction of the frequency sweep.

Example

Command `:FRSW:DIR UPDOWN`

Query `:FRSW:DIR?`

8.7 [:SOURCE]:PRSWeep[:STATe] <OFF|ON|0|1>(?)

Description

This command will set or query the state of the power sweep mode in the Lucid-X unit.

Parameters

Range	Type	Default	Description
0-1	Boolean	0	Sets the power sweep state on and off.

Response

Lucid-X returns 1 if the power sweep is being generated, or 0 if it is off.

Example

Command `:PRSW ON`

Query `:PRSW?`

8.8 [:SOURCE]:PRSWeep:STARt <start_power>(?)

Description

This command will set or query the start power of the power sweep of the Lucid-X unit.

Parameters

Name	Range	Type	Default	Description
< start_power >	130.00 to 30.00 dBm, resolution 0.01	Numeric (Double)	-5	Sets the start power of the power sweep. Default -70 dBm to +20 dBm LP option -80 dBm to +20 dBm ELP option -130 dBm to +20 dBm EPR option -130 dBm to +30 dBm

Response

The Lucid-X will return the power of the first step in the power sweep.

> **Note**
> The range is model dependent. Refer to the instrument's user manual or datasheet.

Example

Command `:PRSW:STAR 10`

Query `:PRSW:STAR?`

8.9 [:SOURCE]:PRSWeep:STEPs <steps>(?)

Description

This command will set or query the number of steps in the power sweep of the Lucid-X unit.

Parameters

Name	Range	Type	Default	Description
< steps >	2 to 4096, resolution 1 step	Numeric (integer)	10	Sets the number of steps in the power sweep.

Response

The Lucid-X will return the number of steps in the power sweep.

Example

Command `:PRSW:STEP 100`

Query `:PRSW:STEP?`

8.10 [:SOURCE]:PRSWeep:STOP <stop_power>(?)

Description

This command will set or query the stop power of the power sweep of the Lucid-X unit.

Parameters

Name	Range	Type	Default	Description
<stop_power>	130.00 to 30.00 dBm, resolution 0.01 dBm	Numeric (Double)	5	Sets the stop power of the power sweep. Default -70 dBm to +20 dBm LP option -80 dBm to +20 dBm ELP option -130 dBm to +20 dBm EPR option -130 dBm to +30 dBm

Response

The Lucid-X will return the stop power of the last step in the power sweep.

Example

Command `:PRSW:STOP 10`

Query `:PRSW:STOP?`

8.11 [:SOURCE]:PRSWeep:TIMe <sweep_time>(?)

Description

This command will set or query the sweep time of each step of the power sweep of the Lucid-X unit.

Parameters

Name	Range	Type	Default	Description
< sweep_time >	10e-6 to 562.499e3, resolution 8 ns	Numeric (Double)	1e-3	Sets the sweep time of the power sweep.

Response

The Lucid-X will return the sweep time of the power sweep.

Example

Command `:PRSW:TIM 10e-3`

Query `:PRSW:TIM?`

8.12 [:SOURCE]:PRSWeep:DIRection <NORMAL|UPDOWN|0|1>(?)

Description

This command will set or query the direction of the power sweep mode in the Lucid-X unit.

Parameters

Range	Type	Default	Description
<NORMAL>	Discrete	NORMAL	Sets the power sweep direction from start power to stop power.

Range	Type	Default	Description
<UPDOWN>	Discrete		Sets the power sweep direction from start power to stop power and back to start power.

Response

The Lucid-X will return NORMAL, UPDOWN depending on the selected direction of the power sweep.

Example

Command **`:PRSW:DIR UPDOWN`**

Query **`:PRSW:DIR?`**

9 System Commands

9.1 :SYSTem:UPDate:FPGA #<header><binary_block>(?)

Description

Update the current FPGA. The binary block must contain a valid Tabor FPGA BIN file, otherwise it will result in an error.

> **Note**
> You need to reboot the system for the update to take effect.

Example

:SYSTem:UPDate:FPGa #3600<binary_block>

This command causes the transfer of 600 bytes of data. The <header> is interpreted this way:

- The ASCII "#" ($23) designates the start of the binary data block.
- "3" designates the number of digits that follow representing the binary data block size in bytes.
- "600" is the number of bytes to follow.

Parameters

Name	Type	Description
#<header><binary_block>	Binary	header: Contains information on the size of the binary block that follows. binary_block: Block of binary data that contains list-related data, as explained above.

Response

The Lucid-X unit will return the FPGA CRC checksum validity, OK or Error.

Example

Command **`:SYST:UPD:FPGA #72192012FFFF0001FB0C.....`**

Query **`:SYST:UPD:FPGA?`**

9.2 :SYSTem:UPDate:SOFTware #<header><binary_block>(?)

Description

Update the current SW. The binary block must contain a valid SW TGZ file, otherwise it will result in error.

> **Note**
> You need to reboot the system for the update to take effect.

Example

:SYST:UPD:SOFT #3600<binary_block>

This command causes the transfer of 600 bytes of data. The <header> is interpreted this way:

- The ASCII "#" ($23) designates the start of the binary data block.
- "3" designates the number of digits that follow representing the binary data block size in bytes.
- "600" is the number of bytes to follow.

Parameters

Name	Type	Description
#<header><binary_block>	Binary	header: Contains information on the size of the binary block that follows. binary_block: Block of binary data that contains list-related data, as explained above.

Response

The Lucid-X unit will return the BSP (Board Support Package) SW CRC checksum validity, OK, and Error.

Example

Command **:SYST:UPD:SOFT #72192012FFFF0001FB0C.....**

Query **:SYST:UPD:SOFT?**

9.3 :SYSTem:CLOCK <time>(?)

Description

Set the system clock for the Lucid-X device using the following format “DD.MM.YYYY HH:MM”.

Note
You need to set the system clock so it will not stay invalid.

Parameters

Name	Range	Type	Description
<time>	0 – 16	String	Set the system clock using the following format “DD.MM.YYYY HH:MM”.

Response

The Lucid-X unit returns its system clock.

Example

Command **:SYST:CLOCK ”29.10.2024 19:01”**

Query **:SYST:CLOCK?**

9.4 :SYSTem:SETup:TARGet <INTernal|USB>(?)

Description

Select the target for store, clear and recall operations. You may select between an internal flash memory and disk-on-key flash that you can attach to the front panel input (valid only for Lucid-X benchtop/rackmount models).

Parameters

Name	Type	Default	Description
INTernal	Discrete	INT	Selects the internal flash memory as the target for the store/clear/recall operation.
USB	Discrete		Selects the front panel USB input as the target for the store/clear/recall operation.

Response

The Lucid-X unit will return INT or USB, depending on the current store/clear/recall target setting.

Example

Command `:SYST:SET:TARG INT`

Query `:SYST:SET:TARG?`

9.5 :SYSTem:SETup:STORe <setup_number>(?)

Description

This command stores the current setup of the Lucid-X unit in the specified setup number.

Parameters

Name	Type	Type	Description
<setup_number>	1 to 5	Numeric (integer only)	Stores the current setup of the Lucid-X unit in the specified setup number.

Response

The Lucid-X unit will return the active setup value.

Example

Command `:SYST:SET:STOR 2`

Query `:SYST:SET:STOR?`

9.6 :SYSTem:SETup:CLEar <setup_number>(?)

Description

Clear specified setup file.

Parameters

Name	Type	Type	Description
<setup_number>	1 to 5	Numeric (integer only)	Clear specified setup file.

Response

The Lucid-X unit will return OK, or Error.

Example

Command `:SYST:SET:CLE 3`

Query `:SYST:SET:CLE? 3`

9.7 :SYSTem:SETup:RECall <setup_number>(?)

Description

This command recalls the specified setup of the Lucid-X unit.

Parameters

Name	Type	Type	Description
<setup_number>	1 to 5	Numeric (integer only)	Recalls the specified setup of the Lucid-X unit.

Response

The Lucid-X unit returns the active setup value.

Example

Command `:SYST:SET:REC 2`

Query `:SYST:SET:REC? 2`

9.8 :SYSTem:FILE:CATalog:LIST?

Description

This query returns a list of files of LIST type (frequencies) stored in the unit.

Response

The return data will be "<file name, file type and size>, <Total space>, <Free space>", Query status.
Response example:

list_002.flst 112 bytes, list_001.flst 80 bytes,Total space: 3223482368 bytes, Free space: 1290264576 bytes;+OK

Example

Query `:SYST:FILE:CAT:LIST?`

9.9 :SYSTem:FILE:CATalog:PATTern?

Description

This query returns a list of files of PATTERN type (On and Off time) stored in the unit.

Response

The return data will be "<file name, file type and size>, <Total space>, <Free space>", Query status.
Response example:

```
list_002.plst   112 bytes, list_001.plst 80 bytes,Total space:
3223482368 bytes, Free space: 1290264576 bytes;+OK.
```

Example

Query **:SYST:FILE:CAT:PATT?**

9.10 :SYSTem:FILE:STORe:LIST <file name>

Description

This command stores the current list data to a file. The file name is specified by the user.

Parameters

Name	Type	Description
<file name>	String	Full path name for the file in ASCII coded as an unsigned short integer array.

Example

Command **:SYST:FILE:STOR:LIST "list_01"**

9.11 :SYSTem:FILE:STORe:PATTern <file name>

Description

This command stores the current list data to a file. The file name is specified by the user.

Parameters

Name	Type	Description
<file name>	String	The name for the file in ASCII coded as an unsigned short integer array.

Example

Command **:SYST:FILE:STOR:PATT "patt_01"**

9.12 :SYSTem:FILE:LOAD:LIST <file name>

Description

This command loads a list data file. The file name without file type is specified by the user.

Parameters

Name	Type	Description
<file name>	String	Full path name for the file in ASCII coded as an unsigned short integer array.

Example

Command `:SYST:FILE:LOAD:LIST "list_001"`

9.13 :SYSTem:FILE:LOAD:PATTern <file name>

Description

This command loads a pattern data file. The file name is specified by the user.

Parameters

Name	Type	Description
<file name>	String	Full path name for the file in ASCII coded as an unsigned short integer array.

Example

Command `:SYST:FILE:LOAD:PATT myfile.dat`

9.14 :SYSTem:FILE:SIZE?

Description

This query returns the size of the frequency and pattern lists uploaded in the Lucid-X memory.

Response

Response example:

list sizes: frequency 80 bytes pattern 60 bytes;+OK.

Example

Query `:SYST:FILE:SIZE?`

9.15 :SYSTem: DELete:FILE <file name>

Description

Delete the specified file.

Parameters

Name	Type	Description
<file name>	String	Specify the file to be deleted.

Example

Command `:SYST:DEL:FILE "list_01.flst"`

9.16 :SYSTem: DELete:LIST

Description

Delete all list files.

Example

Command `:SYST:DEL:LIST`

9.17 :SYSTem: DELete:PATTern

Description

Delete all pattern files.

Example

Command `:SYST:DEL:PATT`

9.18 :SYSTem: DELete:ALL

Description

Delete all files.

Example

Command `:SYST:DEL:ALL`

9.19 :SYSTem:POWer:SETup <setup_number>(?)

Description

This command specifies the internal memory setup file to be used at power-up of the device.

Parameters

Name	Type	Type	Default	Description
<setup_number>	0 to 5	Numeric (integer only)	0	Recalls the specified setup from internal memory when the Lucid-X unit is powered up. 0 is the factory default setup.

Response

The Lucid-X unit returns the active power-up setup value.

Example

Command `:SYST:POW:SET 2`

Query `:SYST:POW:SET?`

9.20 :SYSTem:EMULator:MODel <TABOR|ANAPICO|KEYSIGHT|R&S|HOLZWORTH>(?)

Description

This command selects the 3rd party signal generator SCPI commands to emulate. For future use.

Parameters

Name	Type	Default	Description
TABOR	Discrete	TABOR	Select the native Tabor SCPI command set.
ANAPICO	Discrete		
KEYSIGHT	Discrete		
R&S	Discrete		
HOLZWORTH	Discrete		

Response

The Lucid-X unit returns the selected SCPI emulator.

Example

Command `:SYST:EMUL:MOD ANAPICO`

Query `:SYST:EMUL:MOD?`

9.21 :SYSTem:ERRor?

Description

Query the Lucid-X unit for any error.

Response

The Lucid-X will return an error message, refer to 10 Error Messages.

Example

Query `:SYST:ERR?`

9.22 :SYSTem:TEMPerature?

Description

Query the Lucid-X unit for the internal temperature.

Response

The Lucid-X will return the internal temperature.

Example

Query `:SYST:TEMP?`

9.23 :SYSTem:INFormation:CALibration?

Description

Query the instrument for its last calibration date.

Response

The Lucid-X unit will return the last calibration date in a format similar to the following:
20/08/2023 11:33; +OK.

Example

Query `:SYST:INF:CAL?`

9.24 :SYSTem:INFormation:MODel?

Description

Query the instrument for its model number in a format similar to the following: LSxxxxx. The model number is programmed to a secure location in the flash memory and cannot be modified by the user.

Response

The Lucid-X unit will return its model number LSxxxxx

Example

Query `:SYST:INF:MOD?`

9.25 :SYSTem:INFormation:SERial?

Description

Query the instrument for its serial number. The serial number is programmed to a secure location in the flash memory and cannot be modified by the user.

Response

The generator will return its serial number in a format similar to the following: 2xxxxx

Example

Query `:SYST:INF:SER?`

9.26 :SYSTem:INFormation:HARDware?

Description

Query the instrument for its hardware revision level. The hardware revision includes the PCB revision. It is programmed to a secure location in the flash memory and cannot be modified by the user.

Response

The generator will return its hardware revisions in a format similar to the following: D

Example

Query `:SYST:INF:HARD?`

9.27 :SYSTem:INFormation:FPGA?

Description

Query the FPGA firmware version.

Response

The generator will return its FPGA firmware version using the format DDMMYYYY X.XX.

Example

Query `:SYST:INF:FPGA?`

9.28 :SYSTem:INFormation:FIRMware?

Description

Query the instrument for its BSP (Board Support Package) firmware revision level. It is programmed to a secure location in the flash memory and cannot be modified by the user.

Response

The instrument will return its firmware revisions using the format X.Y.ZZ.

Example

Query `:SYST:INF:FIRM?`

9.29 :SYSTem:INFormation:SCPirevision?

Description

Query the instrument for its Tabor SCPI commands revision. It is programmed to a secure location in the flash memory and cannot be modified by the user.

Response

The generator will return its SCPI revision in a format similar to the following: xx.xx.xx

Example

Query `:SYST:INF:SCP?`

9.30 :SYSTem:COMMunicate:LAN:DHCP <OFF|ON|0|1>(?)

Description

This command enables DHCP service for the Lucid-X device (not for Lucid-X Desktop).

Parameters

Range	Type	Default	Description
0 - 1 >	Boolean	1	DHCP service. 0 – Disable DHCP. 1 – Enable DHCP.

Response

The Lucid-X unit returns 1 if the DHCP service is enabled.

Example

Command `:SYST:COMM:LAN:DHCP 1`

Query `:SYST:COMM:LAN:DHCP?`

9.31 :SYSTem:COMMunicate:LAN:IPADdress <address>(?)

Description

This command sets the IPv4 address for the Lucid-X device.

Parameters

Name	Range	Type	Description
< address>	0 – 255	String	IPv4 address.

Response

The Lucid-X unit returns its IP address.

Example

Command `:SYST:COMM:LAN:IPAD "10.0.0.9"`

Query `:SYST:COMM:LAN:IPAD?`

9.32 :SYSTem:COMMunicate:LAN:MASK <mask>(?)

Description

This command sets the subnet mask for the Lucid-X device.

Parameters

Name	Range	Type	Description
< mask>	0 – 255	String	IPv4 subnet mask.

Response

The Lucid-X unit returns its subnet mask.

Example

Command `:SYST:COMM:LAN:MASK "255.255.255.0"`

Query `:SYST:COMM:LAN:MASK?`

9.33 :SYSTem:COMMunicate:LAN:GATeway <address>(?)

Description

This command sets the gateway for the Lucid-X device.

Parameters

Name	Range	Type	Description
< address>	0 – 255	String	IPv4 gateway.

Response

The Lucid-X unit returns its gateway.

Example

Command `:SYST:COMM:LAN:GAT "10.0.0.138"`

Query `:SYST:COMM:LAN:GAT?`

9.34 :SYSTem:COMMunicate:LAN:HOSTname <name>(?)

Description

This command sets the host name for the Lucid-X device.

Parameters

Name	Range	Type	Description
< name>	0 – 253	String	Host name.

Response

The Lucid-X unit returns its host name.

Example

Command `:SYST:COMM:LAN:HOST "Lucid_Benchtop"`

Query `:SYST:COMM:LAN:HOST?`

9.35 :SYSTem:COMMunicate:LAN:DNS <1|2>,<address>(?)

Description

This command sets the IP address for DNS server 1 or 2 for the Lucid-X device.

Parameters

Name	Range	Type	Description
1|2	1, 2	Discrete	The DNS server.
address	0 – 255	String	IPv4 DNS address.

Response

The Lucid-X unit returns its DNS server.

Example

Command `:SYST:COMM:LAN:DNS 1,"10.0.0.138"`

Query `:SYST:COMM:LAN:DNS?`

9.36 :SYSTem:COMMunicate:LAN:PORT <port_number>(?)

Description

This command sets the port number for the Lucid-X device SCPI port.

Parameters

Name	Range	Type	Description
port_number	0 to 65535	Numeric (nteger)	Lucid-X device SCPI port.

Response

The Lucid-X unit returns its SCPI communication port.

Example

Command `:SYST:COMM:LAN:PORT 10000`

Query `:SYST:COMM:LAN:PORT?`

9.37 :SYSTem:BATtery?

Description

Query the Lucid-X unit for the battery charging status. Only for Lucid-X Portable.
For future use.

Response

The Lucid-X will return the Lucid-X battery charging status.

Example

Query `:SYST:BAT?`

10 Error Messages

Table 10.1 SCPI Error Messages

Value	Description
0	"No error"
-100	"Command error"
-101	"Invalid character"
-102	"Syntax error"
-103	"Invalid separator"
-104	"Data type error"
-105	"GET not allowed"
-108	"Parameter not allowed"
-109	"Missing parameter"
-110	"Command header error"
-111	"Header separator error"
-112	"Program mnemonic too long"
-113	"Undefined header"
-114	"Header suffix out of range"
-115	"Unexpected number of parameters"
-120	"Numeric data error"
-121	"Invalid character in number"
-123	"Exponent too large"
-124	"Too many digits"
-128	"Numeric data not allowed"
-130	"Suffix error"
-131	"Invalid suffix"
-134	"Suffix too long"
-138	"Suffix not allowed"
-140	"Character data error"
-141	"Invalid character data"
-144	"Character data too long"
-148	"Character data not allowed"
-150	"String data error"
-151	"Invalid string data"
-158	"String data not allowed"
-160	"Block data error"
-161	"Invalid block data"
-168	"Block data not allowed"
-170	"Expression error"
-171	"Invalid expression"
-178	"Expression data not allowed"
-180	"Macro error"
-181	"Invalid outside macro definition"
-183	"Invalid inside macro definition"

Value	Description
-184	"Macro parameter error"
-200	"Execution error"
-201	"Invalid while in local"
-202	"Settings lost due to rtl"
-203	"Command protected"
-210	"Trigger error"
-211	"Trigger ignored"
-212	"Arm ignored"
-213	"Init ignored"
-214	"Trigger deadlock"
-215	"Arm deadlock"
-220	"Parameter error"
-221	"Settings conflict"
-222	"Data out of range"
-223	"Too much data"
-224	"Illegal parameter value"
-225	"Out of memory"
-226	"Lists not same length"
-230	"Data corrupt or stale"
-231	"Data questionable"
-233	"Invalid version"
-240	"Hardware error"
-241	"Hardware missing"
-250	"Mass storage error"
-251	"Missing mass storage"
-252	"Missing media"
-253	"Corrupt media"
-254	"Media full"
-255	"Directory full"
-256	"File name not found"
-257	"File name error"
-258	"Media protected"
-260	"Expression error"
-261	"Math error in expression"
-270	"Macro error"
-271	"Macro syntax error"
-272	"Macro execution error"
-273	"Illegal macro label"
-274	"Macro parameter error"
-275	"Macro definition too long"
-276	"Macro recursion error"
-277	"Macro redefinition not allowed"
-278	"Macro header not found"
-280	"Program error"

Value	Description
-281	"Cannot create program"
-282	"Illegal program name"
-283	"Illegal variable name"
-284	"Program currently running"
-285	"Program syntax error"
-286	"Program runtime error"
-290	"Memory use error"
-291	"Out of memory"
-292	"Referenced name does not exist"
-293	"Referenced name already exists"
-294	"Incompatible type"
-300	"Device specific error"
-310	"System error"
-311	"Memory error"
-312	"PUD memory lost"
-313	"Calibration memory lost"
-314	"Save/recall memory lost"
-315	"Configuration memory lost"
-320	"Storage fault"
-321	"Out of memory"
-330	"Self-test failed"
-340	"Calibration failed"
-350	"Queue overflow"
-360	"Communication error"
-361	"Parity error in program message"
-362	"Framing error in program message"
-363	"Input buffer overrun"
-365	"Time out error"
-400	"Query error"
-410	"Query INTERRUPTED"
-420	"Query UNTERMINATED"
-430	"Query DEADLOCKED"
-440	"Query UNTERMINATED after indefinite response"
-500	"Power on"
-600	"User request"
-700	"Request control"
-800	"Operation complete"