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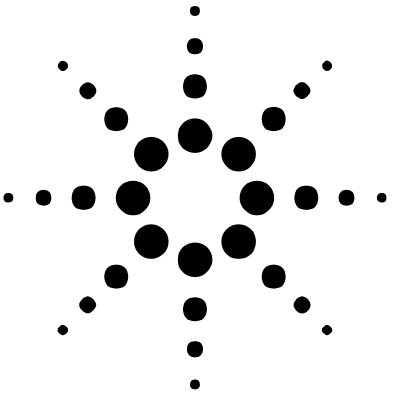
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Reference Guide

Agilent E8305A 250 MHz Pulse Generator



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Notice

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Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your customer engineer through your local Agilent Technologies Service Center. You can find a list of local service representatives on the Web at:

`http://www.agilent.com/Service/English/index.html`

Safety Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

General

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

Environmental Conditions

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters. Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Before Applying Power

Verify that the product is set to match the available line voltage, the correct fuse is installed, and all safety precautions are taken. Note the instrument's external markings described under *"Safety Symbols" on page 5*.

Ground the Instrument

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Fuses

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Safety Symbols



Caution (refer to accompanying documents)



Protective earth (ground) terminal

In the manuals:

WARNING **The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.**

CAUTION The CAUTION sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

About this Book

This guide provides reference information primarily for programming the Agilent E8305A via remote control.

Chapter 1 "Getting Started" on page 11 gives general hints for programming instruments like the Agilent E8305A using SCPI commands.

Chapter 2 "SCPI Programming Reference" on page 19 provides detailed information on the SCPI commands supported by the instrument.

Chapter 3 "Specifications" on page 89 lists the instrument's technical specifications.

Conventions Used in this Book

This book uses certain conventions to indicate elements of the Agilent E8305A's programming interface. The following table shows some examples:

`:VOLTage:HIGH 3V`	Full command for programming a 3 V high level. The upper case letters represent the short form of the command, which results in faster programming times.
`*RST`	Common IEEE 488 command, to reset instrument to default status.

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1 Getting Started

After introducing the basic features and use models of the Agilent E8305A pulse generator, this chapter provides instructions for installing the module and the required software.

Furthermore, general information on programming the Agilent E8305A is provided. For detailed information on the SCPI command set supported by the Agilent E8305A, refer to *Chapter 2 "SCPI Programming Reference" on page 19*.

Introducing the Agilent E8305A Pulse Generator

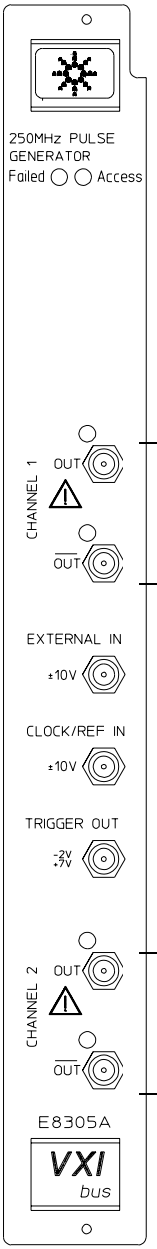
This Pulse Generator generates all standard pulses and digital patterns needed to test all current logic technologies (for example, TTL, CMOS, ECL, PECL, LVDS, GTL) and other digital designs up to 250 MHz. The Agilent E8305A provides a reliable and wide range of signals, which can be used in even more applications than its predecessor, the HP 70330A. This is due to enhancements made in the feature set and the specifications. The glitch and drop out free varying of any timing parameter and the Agilent E8305A's timing calibration feature contributes to more accurate and confident characterizations of the DUTs.

Automated Testing

The Agilent E8305A has the same SCPI conform command structure for the feature sets identical to the Agilent 81110A. As with the Agilent 81110A, the new product can be easily integrated into all phases of test-system development such as planning rack integration and test program generation. These benefits along with the low cost of ownership make the Agilent E8305A an invaluable instrument in a wide range of technical applications.

Frontpanel

The following figure shows the frontpanel of the Agilent E8305A with its input and output connectors.



Please refer to *"Agilent E8305A Specifications" on page 91* for maximum input and external voltage to

Differential Output Channel 1
(OUT and $\overline{\text{OUT}}$ can *not*
be enabled simultaneously)

Differential Output Channel 2
(OUT and $\overline{\text{OUT}}$ can *not*
be enabled simultaneously)

Installing the Agilent E8305A

The Agilent E8305A is a VXI instrument to be plugged into a VXI mainframe. Installing the instrument requires the following steps:

- Select a mainframe slot.
- Set the VXI instrument logical address.
- Install the instrument in the mainframe.
- Install the required software on the control PC.

The first step to install the VXI instrument is to select a free slot in the VXI mainframe. See your Mainframe User's/Service Manual for more information.

When you have selected a slot, enter the instrument model number, name, and serial number for the instrument in the VXI Mainframe Overview table. You should maintain such a table for each mainframe in order to keep track of the installed instruments.

Slot	Model Number	Instrument Name	Logical Address	Serial Number
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

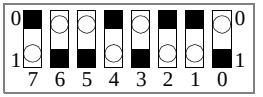
Setting the VXI Instrument Logical Address

When you have selected the slot for the VXI instrument, the next step is to set the instrument logical address (LADDR) as required. In general, you can use the factory-set (default) logical address.

If you need to set another logical address, use the following guidelines (see the applicable Mainframe User's/Service Manual or the VXI Getting Started Guide for more information).

The logical address for each VXI instrument is set by the Logical Address (LADDR) switch on the instrument. The logical address value is the sum of the values of the logical address switches set to the closed position.

The following figure shows the default for the Agilent E8305A (LADDR 105):



Address Switches set to 105

After setting the address switches, record the logical address in the VXI Mainframe Overview table.

Installing the Instrument in the Mainframe

After setting the logical address as required, you can now install the instrument in the mainframe.

1 Turn mainframe power off.

2 Install the instrument in the slot you previously identified.

3 Turn mainframe power on.

Installing the Software

The VXI*plug&play* Drivers must be installed on the control PC. Depending on the system configuration, this may either be an external PC or an embedded PC in the VXI mainframe.

1 If required, connect a CD-ROM drive to the PC.

2. Insert the CD labeled “E8305A/E8306A Documentation and Drivers” (Part No. E8305-10011) into the CD-ROM drive.
3. The installer should automatically start when the CD is inserted. If not, open the Explorer, select the CD-ROM drive, and
   - for the E8305A, run **`E8305a\disk1\Setup.exe`**
   - for the E8306A, run **`E8306a\disk1\Setup.exe`**

   If you would like to install both instruments, run **`\Setup.exe`**.
4. Follow the instructions on screen.

NOTE The Files must be installed in the **`Vxipnp`** directory on the PC.

Programming Overview

The Agilent E8305A can be programmed using the VXI*plug&play* drivers. For detailed information on these drivers, please refer to the online help file **`hpe8305.hlp`**, typically located in the directory **`Vxipnp\Winnt`** or **`Vxipnp\Win95`**, depending on the operating system.

To program the instrument by means of the SCPI commands as described in *Chapter 2 "SCPI Programming Reference" on page 19*, we recommend to use the Passthrough Functions delivered with the VXI*plug&play* drivers.

2 SCPI Programming Reference

This chapter provides all reference information required to program the Agilent E8305A by means of the SCPI command set.

After discussion of some *"General Programming Aspects" on page 20* you will find the following topics:

- *"Agilent E8305A SCPI Command Summary" on page 29*
- *"Default Values, Standard Settings" on page 35*
- *"Programming the Instrument Trigger Modes" on page 39*
- *"SCPI Instrument Command List" on page 43*

General Programming Aspects

The Agilent E8305A can only be programmed by means of the VXI*plug&play* drivers. For using the SCPI command set supported by the instrument, the drivers provide Passthrough Functions (see online help for more information).

Programming Recommendations

Here are some recommendations for programming the instrument:

- Start programming from the default setting. The common command for setting the default setting is:

  `*RST`

- The SCPI standard defines a long and a short form of the commands. For fast programming speed it is recommended to use the short forms. The short forms of the commands are represented by upper case letters. For example the short form of the command to set 100 ns double pulse delay is:

  `:PULS:DOUB:DEL  100NS`

- To improve programming speed it is also allowed to skip optional subsystem command parts. Optional subsystem command parts are depicted in square brackets, e.g.: enable double pulse mode by `[SOURce]:PULSe:DOUBle[1][:STATe] ON|OFF`. Sufficient to use:

  `:PULS:DOUB  ON`

- For the commands to set the timing and level parameters, except of period/ frequency, you can explicitly specify output 1 (for compatibility reasons). If there is no output specified, the commands will set the default output 1.

  So, for setting a high level of 3 Volts for output 1 the commands are:

  ```
  :VOLT:HIGH  3V     # sets high level of 3 V at out 1
  :VOLT1:HIGH  3V    # sets high level of 3 V at out 1
  ```

- When programming a new setting for the instrument, it is recommended to first have the error check system turned on (this is the default) and to send the command for enabling outputs (for example, `:OUTPut ON`) as the last

command. After the correct setting has been found, you can switch off the error check system (`:SYSTem:CHECk OFF`) to increase programming speed.

The error check is enabled again by sending `*RST`.

```
*RST                # set default settings
:SYST:CHEC  OFF     # switch off error check
...                 # other commands to set modes
...                 # and parameters
:OUTP  ON           # enable the output
```

- Selftest of the instrument can be invoked by the common command

  `*TST`

- If it is important to know whether the last command is completed, then send the common command

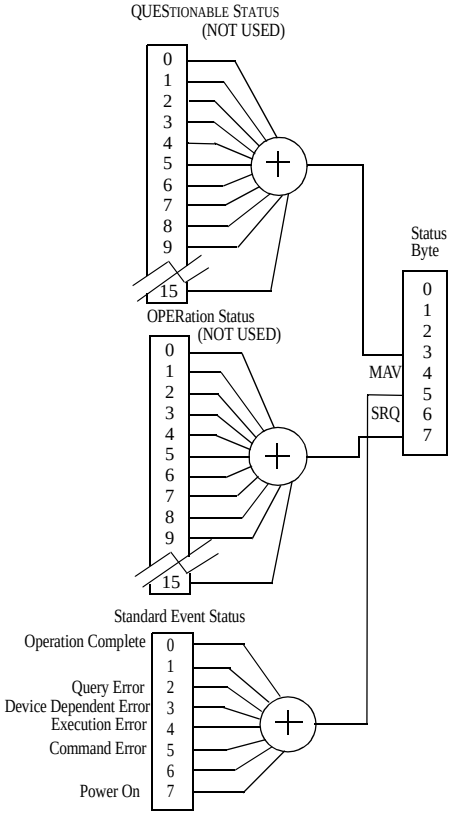
  `*OPC?`

Common Command Summary

This table summarizes the IEEE 488.2 common commands supported by the Agilent E8305A:

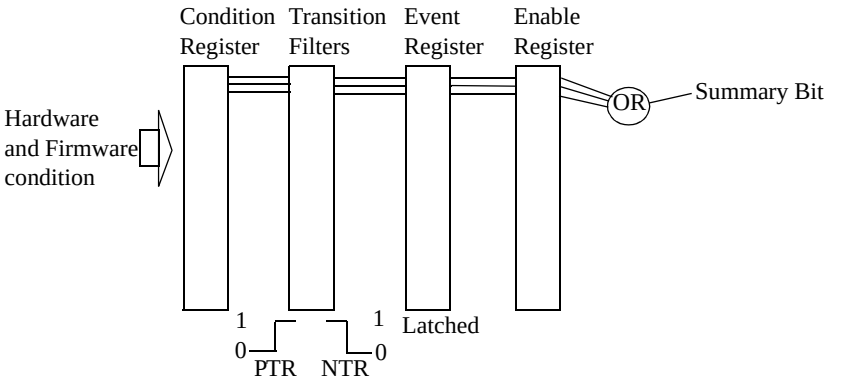
Command	Parameter	Description
*CLS	–	Clear the status structure
*ESE	<0–255>	Set the Standard Event Status register mask
*ESE?	–	Read the state of the Standard Event Status enable register
*ESR?	–	Read the state of the Standard Event Status event register
*IDN?	–	Read the Instrument's Identification string
*LRN?	–	Read the complete Instrument Setting
*OPC	–	Set the Operation Complete bit when all pending actions are complete
*OPC?	–	Read the status of the Operation Complete bit
*OPT?	–	Read the installed options
*RCL	<0–9>	Recall a complete Instrument Setting from memory
*RST	–	Reset the instrument to standard settings
*SAV	<1–9>	Save the complete Instrument Setting to memory
*SRE	<0–255>	Set the Service Request Enable Mask
*SRE?	–	Read the Service Request Enable Mask
*STB?	–	Read the Status Byte
*TRG	–	Trigger
*TST?	–	Execute instrument’s selftest
*WAI	–	Wait until all pending actions are complete

Status Model



The instrument has a status reporting system conforming to IEEE 488.2 and SCPI. The above figure shows the status groups available in the instrument.

Each status group is made up of component registers, as shown in the following figure.



Condition Register

A condition register contains the current status of the hardware and firmware. It is continuously updated and is not latched or buffered. You can only read condition registers. If there is no command to read the condition register of a particular status group, then it is simply invisible to you.

Transition Filters

Transition filters are used to detect changes of state in the condition register and set the corresponding bit in the event register. You can set transition filter bits to detect positive transitions (PTR), negative transitions (NTR) or both. Transition filters are therefore read/write registers. They are unaffected by *CLS.

Event Register

An event register latches transition events from the condition register as specified by the transition filters or records status events. Querying (reading) the event register clears it, as does the *CLS command. There is no buffering, so while a bit is set, subsequent transition events are not recorded. Event registers are read only.

Enable Register

The enable register defines which bits in an event register are included in the logical OR into the summary bit. The enable register is logically ANDed with

the event register and the resulting bits ORed into the summary bit. Enable registers are read/write, and are not affected by ***CLS** or querying.

Although all status groups have all of these registers, not all status groups actually use all of the registers. The following table summarizes the registers used in the instrument status groups.

	Registers in Group				
Status Group	**CONDition**	**NTR**	**PTR**	**EVENt**	**ENABLe**
QUEStionable	√	√	√	√	√
OPERation[1]	**x**	**x**	**x**	**x**	**x**
Standard Event Status	**x**	**x**	**x**	√[2]	√[3]
Status Byte	**x**	**x**	**x**	√[4]	√[5]

1 Present, but not used. COND and EVEN always 0.
2 Use `*ESR?` to query.
3 Use `*ESE` to set, `*ESE?` to query
4 Use `*STB?` to query
5 Use `*SRE` to set, `*SRE?` to query

Status Byte

The status byte summarizes the information from all other status groups. The summary bit for the status byte actually appears in bit 6 (RQS) of the status byte. When RQS is set it generates an SRQ interrupt to the controller indicating that at least one instrument on the bus requires attention. You can read the status byte using a serial poll or *STB?

Bit	Description
0	Unused, always 0
1	Unused, always 0
2	Unused, always 0
3	QUESTionable Status Summary Bit
4	MAV—Message AVailable in output buffer
5	Standard Event Status summary bit
6	RQS; ReQuest Service
7	OPERation Status summary Bit, unused

Standard Event Status Group

Bit	Description
0	Operation Complete, set by *OPC
1	Unused, always 0
2	Query Error
3	Device Dependent Error
4	Execution Error
5	Command Error
6	Unused, always 0
7	Power On

OPERation Status Group

This Status Group is not used in the instrument.

Bit	Description
0	Unused, always 0
1	Unused, always 0
2	Unused, always 0
3	Unused, always 0
4	Unused, always 0
5	Unused, always 0
6	Unused, always 0
7	Unused, always 0
8	Unused, always 0
9	Unused, always 0
10	Unused, always 0
11	Unused, always 0
12	Unused, always 0
13	Unused, always 0
14	Unused, always 0
15	Always 0

QUEStionable Status Group

Bit	QUEStionable
0	Unused, always 0
1	Unused, always 0
2	Unused, always 0
3	Unused, always 0
4	Unused, always 0
5	Unused, always 0
6	Unused, always 0
7	Unused, always 0
8	Unused, always 0
9	Unused, always 0
10	Unused, always 0
11	Unused, always 0
12	Unused, always
13	Unused, always 0
14	Unused, always 0
15	Always 0

The QUEStionable Status group is used to report warning conditions amongst the voltage, current, pulse timing and frequency parameters. Warnings occur when a parameter, although not outside its maximum limits, could be causing an invalid signal at the output because of the actual settings and uncertainties of related parameters.

Agilent E8305A SCPI Command Summary

Command	Parameter	Description	see page
:ARM		(Trigger mode and source)	
[:SEQuence[1] | :STARt]			
[:LAYer[1]]			
:EWIDTh			
[:STATe]	ON | OFF | 1 | 0	Set/read External Width mode	44
:FREQuency	<value>	Set/read trigger frequency, when PLL (INT2) used as source	44
:IMPedance	<value>	Set/read impedance at EXT INPUT	45
:LEVel	<value>	Set/read threshold level at EXT INPUT	45
:PERiod	<value>	Set/read trigger period, when PLL(INT2) used as source	46
:SENSe	EDGE | LEVel	Set/read trigger on edge or gate on level	46
:SLOPe	POS | NEG | EITH	Set/read trigger slope at EXT INPUT	47
:SOURce	IMM | INT | INT2 | EXT | MAN | TTLT0...7 | ECLT0...ECLT1	Set/read trigger source (VCO | PLL | EXT INPUT | *TRG | VXI trigger lines)	47
:CALibration[:ALL]		Set/read calibration of period (VFO), delay and width circuitries	48
:DIGital			
[:STIMulus]			
:PATTern[:STATe]	ON | OFF	Enable/disable PATTERN mode	52
:DATA	<data>	Set/read pattern data	48
:PRBS	<n>,<length>	Set PRBS 2^n–1 data	50
:PRESet	[<n>,]<length>	Set preset pattern with frequency CLOCK÷n	51

Command	Parameter	Description	see page
:UPDate	OFF | ON | ONCE	Update the hardware with pattern data	*52*
:SIGNal[1|2]			
:FORMat	RZ | NRZ	Set/read data format of output channel	*52*
:OUTPut[1|2]			
[:NORMal]			
[:STATe]	OFF | ON | 1 | 0	Set/read normal output state	
:COMPlement			*53*
[STATe]	ON | OFF | 1 | 0	Switch normal outputs on/off	*53*
:IMPedance			
:EXTernal	<value>	Set/read expected external load impedance at output	*54*
:POLarity	NORM | INV	Set/read output polarity	*54*
:TTLTrg<n> | ECLTrg<n>			
[STATe]	ON | OFF | 1 | 0	Enable/disable use of VXI trigger line	*54*
[:SOURce]			
:CURRent[1|2]			
[:LEVel]			
[:IMMediate]			
[:AMPLitude]	<value>	Set/read channel amplitude current	*55*
:OFFSet	<value>	Set/read channel offset current	*56*
:HIGH	<value>	Set/read channel high level current	*57*
:LOW	<value>	Set/read channel low level current	*58*
:LIMit			
[:HIGH]	<value>	Set/read maximum current limits	*59*
:LOW	<value>	Set/read minimum current limits	*59*
:STATe	ON | OFF | 1 | 0	Enable/disable the current limits	*60*
:FREQency			

Command	Parameter	Description	see page
[:CW | :FIXed]	<value>	Set/read frequency of pulses	*60*
:AUTO	ONCE	Measure frequency at CLK-IN	*61*
:HOLD[1|2]	VOLT | CURR	Switch between VOLtage and CURRent command subtrees	*61*
:PHASe[1|2]			
[:ADJust]	<value>	Set/read channel phase	*61*
:PULSe			
:DCYCLe[1|2]	<value>	Set/read channel duty cycle	*62*
:DELay[1|2]	<value>	Set/read channel delay (to leading edge)	*63*
:HOLD	TIME | PRATio	Hold absolute delay | phase delay fixed with varying frequency	*64*
:UNIT	S | SEC | PCT | DEG | RAD	Set/read delay units	*64*
:DOUBle[1|2]			
[:STATe]	OFF | ON	Enable/disable double pulses per pulse period	*65*
:DELay	<value>	Set/read delay between double pulses	*65*
:HOLD	TIME | PRATio	Hold absolute delay|phase delay fixed with varying frequency	*66*
:UNIT	S | SEC | PCT	Set/read delay units	*66*
:HOLD[1|2]	WIDTh | DCYCle | TDELay	Hold Width|Duty cycle|Trailing edge delay fixed with varying frequency	*67*
:PERiod	<value>	Set/read pulse period	*67*
:AUTO	ONCE	Measure pulse period at CLK-IN	*68*
:TDELay[1|2]	<value>	Set/read trailing edge delay	*68*
:TRANsition[1|2]			
:HOLD	TIME | WRATio	Hold absolute transitions|transitions as width ratio fixed with varying width per period	*69*
:UNIT	S | SEC | PCT	Set/read transition time units	*69*
[:LEADing]	<value>	Set/read leading edge transition	*70*

Command	Parameter	Description	see page
:TRAiling	<value>	Set/read trailing edge transition	*71*
:AUTO	OFF | ON | ONCE | 1 | 0	Couple trailing edge to leading edge	*72*
:TRIGger[1]			
:SOURce	TRIG1 | TRIG2	Set/read signal source for TRIGGER OUT connector	*72*
:AUTO	ON | OFF | 1 | 0	Set/read coupling between TRIGGER OUT signal source and operation mode	*73*
:VOLTage	TTL | ECL | STA	Set/read TRIGGER|STROBE OUTput levels	*73*
:WIDTh[1|2]	<value>	Set/read channel pulse width	*74*
[:SOURce]			
:ROSCillator			
:SOURce	INTernal[1] | EXTernal | INTernal2	Set/read PLL reference source	*74*
:EXTernal			
:FREQuency	<value>	Set/read frequency of external PLL reference	*75*
:VOLTage[1|2]			
[:LEVel]			
[:IMMediate]			
[:AMPlitude]	<value>	Set/read channel amplitude voltage	*75*
:OFFset	<value>	Set/read channel offset voltage	*76*
:HIGH	<value>	Set/read channel high level voltage	*77*
:LOW	<value>	Set/read channel low level voltage	*78*
:LIMit			
[:HIGH]	<value>	Set/read maximum voltage limit	*79*
:LOW	<value>	Set/read minimum voltage limit	*79*
:STATe	ON | OFF | 1 | 0	Enable|disable the voltage limits	*80*

Command	Parameter	Description	see page
:STATus			
:OPERation			
[:EVENt]?		Read operation event register	*80*
:PREset		Clear and preset status groups	*81*
:QUEStionable			
[:EVENt]?		Read questionable event register	*81*
:CONDition?		Read Questionable condition register	*82*
:ENABLe	Numeric	Set/Read Questionable enable register	*82*
:NTRansition	Numeric	Set/Read Questionable negative transition register	*82*
:PTRansition	Numeric	Set/Read Questionable positive transition register	*83*
:SYSTem			
:CHECk			
[:ALL]			
[:STATe]	OFF	Switch error checking off	*83*
:ERRor?		Read error queue	*83*
:PRESet		no function	*84*
:SET	Block data	Set/read complete instrument setting	*84*
:VERSion?		Read SCPI compliance setting	*85*
:TRIGger			
[:SEQuence [1] | :STARt]		(Pulse mode and period source)	
:COUNt	<value>	Set/read number of triggered periods to be generated per ARM event	*85*
:IMPedance	<value>	Set/read impedance at CLK-IN	*86*
:LEVel	<value>	Set/read threshold level at CLK-IN	*87*
:SLOPe	POS | NEG	Set/read trigger slope at CLK-IN	*87*

Command	Parameter	Description	see page
:SOURce	IMM | INT[1] | INT2 | EXT2	Set/read trigger source (IMM | VFO | PLL | CLK-IN)	*88*

Default Values, Standard Settings

Parameter	*RST, Default Values
:ARM EWIDth[:STATe]	0
:FREQuency	100 kHz
:IMPedance	50 Ω
:LEVel	+1.00 V
:PERiod	10.00 µs
:SENSe	EDGE
:SLOPe	POS
:SOURce	IMM
:DIGital [:STIMulus]:PATTern[:STATe]	0
:DATA	see *":DIG:PATT:DATA[1|2|3]" on page 48*
:PRBS	not applicable
:PRESet	not applicable
:UPDate	ON
:SIGNal[1|2]:FORMat	RZ
:OUTPut[1|2][:NORMal][:STATe]	0
:COMP[:STATe]	0
:IMPedance:EXTernal	50 Ω
:POLarity	NORM
:TTLTrg<n>[:STATe]	0
:ECLTrg<n>[:STATe]	0
[:SOURce] :CURRent[1|2] [:LEVel] [:IMM] [:AMPL]	20.0 mA (from 50 Ω into 50 Ω)

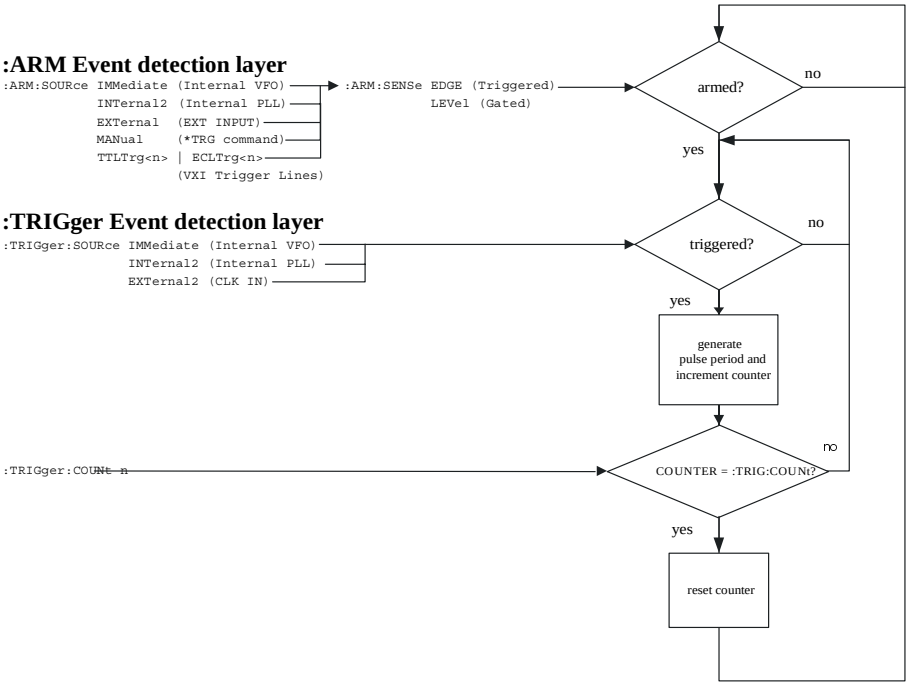
Parameter	*RST, Default Values
:OFFset	0.0 µA (from 50 Ω into 50 Ω)
:HIGH	+10.5 mA (from 50 Ω into 50 Ω)
:LOW	–10.5 mA (from 50 Ω into 50 Ω)
:LIMit[:HIGH]	+10.0 mA
:LOW	–10.0 mA
:STATe	0
[:SOURce]:FREQ [:CW|:FIXed]	1.00 MHz
:AUTO	not applicable
[:SOURce]:HOLD	VOLT
[:SOURce]:PHASe[1|2][:ADJust]	0.0
[:SOURce]:PULSe:	
:DCYCle[1|2]	10.0% (derived from width and period)
:DELay[1|2]	0.0
:HOLD	TIME
:UNIT	SEC
:DOUBle[1|2] [:STATe]	0
:DELay	250.0 ns
:HOLD	TIME
:UNIT	SEC
:HOLD[1|2]	WIDT
:PERiod	1 µs
:AUTO	not applicable
:TDELay[1|2]	100 ns
TRANsition[1|2]:HOLD	TIME

Parameter	*RST, Default Values
:UNIT	SEC
[:LEADing]	1.3 ns
:TRAiling	1.3 ns
:AUTO	1
:TRIGger[1]:SOURce	TRIG1
:TRIGger[1]:SOURce :AUTO	1
:TRIGger[1]:VOLTage	TTL
:WIDTh[1|2]	100ns
[:SOURce]:ROSCillator	
:SOURce	INTernal1
:EXTernal:FREQ	5 MHz
[:SOURce]:VOLTage[1|2][:LEVel] [IMMediate] [:AMPLitude]	1.0 V
:OFFSet	0.0 mV
:HIGH	500 mV
:LOW	–500 mV
:LIMit[:HIGH]	+500 mV
:LOW	–500 mV
:STATe	0
:STATus:OPERation	not applicable
:PRESet	not applicable
:QUEStionable[:EVENt]?	not applicable
:SYSTem:CHECk [:ALL][:STATe]	1
:ERRor?	not applicable
:PRESet	not applicable

Parameter	*RST, Default Values
:SET	not applicable
:VERSion	“1992.0”
:TRIGger:COUNt	+1
:IMPedance	50 Ω
:LEVel	1.0 V
:SLOPe	POS
:SOURce	IMM

Programming the Instrument Trigger Modes

The following figure shows the instrument's arming/triggering model:



You program the comprehensive triggering capabilities of the instrument using the SCPI :ARM and :TRIGger subsystems.

Use the :ARM subsystem to select the overall triggering mode of the instrument (`CONTINUOUS`, `TRIGGERED`, `GATED`, `EXT WIDTH`), and the `:TRIGger` subsystem to select the pulse period source, triggering and number of pulse periods per `:ARM` event (`BURST` or `PATTERN` length).

Continuous

Set Continuous mode by arming the instrument from its internal oscillator:

```
:ARM:SOURce IMMediate          Arm from internal oscillator
```

Triggered

Set Triggered mode by arming the instrument on edges from the EXT INPUT:

```
:ARM:SOURce EXTernal1          Arm from EXT INPUT
:ARM:SENSe EDGE                Arm on edge
:ARM:SLOPe POSitive            Arm on positive edge
:ARM:LEVel 1V                  Set EXT INPUT threshold
```

Triggered mode can also be set by arming the instrument on edges from the VXI trigger lines (TTLTrg0...7, ECLTrg0...1).

You can also arm the instrument from the PLL and set the frequency (or period) of the PLL to the required triggering rate:

```
:ARM:SOURce INTernal2          Arm from PLL
:ARM:SENSe  EDGE               Arm on edge
:ARM:SLOPe  POSitive           Arm on positive edge
:ARM:FREQuency <value>         Set PLL frequency
```

NOTE The PLL (INTernal2) *cannot* be used as `:ARM:SOURce` (triggering rate) if it is already being used as `:TRIGger:SOURce` (pulse period source).

Gated

Set Gated mode by arming the instrument on levels from the EXT INPUT:

```
:ARM:SOURce EXTernal1          Arm from EXT INPUT
:ARM:SENSe LEVel               Arm on signal level
:ARM:SLOPe POSitive            Arm on positive level
```

Gated mode can also be set by arming the instrument on levels from the VXI trigger lines (TTLTrg0...7, ECLTrg0...1).

External Width

Set External Width mode using the `:EWIDth[:STATe]` command:

```
:ARM:EWIDth ON                 Switch on EXT WIDTH mode
:ARM:SOURce EXTernal           Use EXT INPUT
```

This command disables the arm-trigger system. The arm-trigger system is reenabled by switching off `EWIDth` mode.

External width mode can also be set using the VXI trigger lines (TTLTrg0...7, ECLTrg0...1).

Pulses

Set Pulses mode by setting the `:TRIGger:COUNt` to 1 so that a single triggered pulse period is generated for every arm event. The trigger source sets the pulse period:

```
:TRIGger:COUNt 1              Single pulse period per arm event
:TRIGger:SOURce INTernal1     Pulse period from internal osc.
:DIGital:PATTern OFF          Disable pattern data.
:ARM:EWIDth OFF               Switch off EXT WIDTH mode
```

Pulse period Source	:TRIGger SOURce
internal OSC.	`INTernal[1]`
internal PLL	`INTernal2`
CLK-IN	`EXTernal2`

NOTE The internal PLL (INTernal2) *cannot* be used as `:TRIGger:SOURce` (pulse period source) if it is already being used as `ARM:SOURce` (triggering rate).

Note that in triggered pulses mode the pulse period source is not relevant because a single pulse is generated for each ARM event.

Burst

Set Burst mode by setting the `:TRIGger:COUNt` to the burst length required. The trigger source sets the pulse period for the pulses within the burst.

```
:TRIGger:COUNt 16             Burst of 16 pulse periods
:TRIGger:SOURce INTernal1     Pulse period from internal osc.
:DIGital:PATTern OFF          Disable pattern data
:ARM:EWIDth OFF               Switch off EXT WIDTH mode
```

Pattern

Set Pattern mode by setting the :TRIGger:COUNt to the pattern length required, and switching on digital pattern data. The trigger source sets the pulse period for the data pulses:

```
:TRIGger:COUNt 512              Pattern length 512
:TRIGger:SOURce INTernal1       Pulse period from internal osc.
:DIGital:PATTern ON             Enable pattern data
:DIGital:SIGNal1:FORMat NRZ     Set OUTPUT 1 data to NRZ
:ARM:EWIDth OFF                 Switch off EXT WIDTH mode
```

SCPI Instrument Command List

The following reference sections list the instrument commands in alphabetical order. In addition to a command description, the attributes of each command are described under the following headings. Not all of these attributes are applicable to all commands. The commands are conform to the IEEE 488.2 SCPI standard.

Command Shows the short form of the command.

Long Shows the long form of the command.

Form Most commands can be used in different forms:

Set	The command can be used to program the instrument
Query	The command can be used to interrogate the instrument. Add a ? to the command if necessary.
Event	The command performs a one-off action.

Parameter The type of parameter, if any, accepted by the command. The minimum and maximum value of numeric parameters can be accessed by the option MINimum or MAXimum.

Parameter Suffix The suffixes that may follow the parameter.

Functional Coupling Any other commands that are implicitly executed by the command.

Value Coupling Any other parameter that is also changed by the command.

Range Coupling Any other parameters whose valid ranges may be changed by the command.

***RST value** The value/state following a *RST command.

Specified Limits The specified limits of a parameter.

Absolute Limits Some parameters can be programmed beyond their specified limits.

Example Example programming statements.

Command	**:ARM:EWID**
Long	`:ARM[:SEQuence[1]][:LAYer]:EWIDth[:STATe]`
Form	Set & Query
Parameter	ON | OFF | 1 | 0
***RST value**	0
Description	This command enables the EXT WIDTH trigger mode. When EXT WIDTH mode is switched on, the rest of the `:ARM` and `:TRIG` system is disabled. In EXT WIDTH mode a signal applied to the EXT INPUT determines the width and period of the output signal(s) from the instrument. You can still control the edge transition times and levels of the output signal(s).

Command	**:ARM:FREQ**
Long	`:ARM[:SEQuence[1]][:LAYer]:FREQuency[:CW][:FIXed]`
Form	Set & Query
Parameter	Numeric
Parameter Suffix	HZ with engineering prefixes, for example MHZ is Megahertz.
***RST value**	100 kHz
Specified Limits	See *":ARM:PER" on page 46*
Description	Use this command to program the frequency of the PLL (INTernal2) when it is used as the `:ARM:SOURce` for internal triggering of pulses, bursts or patterns. If you are using the PLL as `:TRIGger:SOURce` to set the pulse frequency, use the `[:SOURce]:FREQuency[:CW|:FIXed]` command
Example	To set up bursts of four 100 MHz pulses occurring at a burst-rate of 10 MHz:

```
:TRIG:SOUR INT          Select internal osc. as pulse period source
:FREQ 100MHZ            Set pulse frequency to 100 MHz
:ARM:SOUR INT2          Select PLL as triggering source
:ARM:SENS EDGE          Sense edge of PLL signal
:ARM:FREQ 10 MHZ        Set triggering frequency to 10 MHz
:TRIG:COUNT 4           Set burst length to 4
```

Command	**:ARM:IMP**
Long	`:ARM[:SEQuence[1]][:LAYer]:IMPedance`
Form	Set & Query
Parameter	Numeric
Parameter Suffix	OHM with engineering prefixes, for example MOHM is Megaohms.
***RST value**	50 Ω
Specified Limits	50 Ω or 10 kΩ
Description	Use this command to program the input impedance of the EXT INPUT connector. Note that only two settings are available. If you try to program any other value, it will be rounded to one of the specified values.
Example	`:ARM:IMP 50OHM` Set EXT INPUT impedance to 50 Ω `:ARM:LEV 2.5V` Set EXT INPUT threshold to 2.5 V

Command	**:ARM:LEV**
Long	`:ARM[:SEQuence[1]][:LAYer]:LEVel`
Form	Set & Query
Parameter	Numeric
Parameter Suffix	V with engineering prefixes.
***RST value**	+1.0 V
Specified Limits	–10 V to +10 V
Description	Use this command to program the triggering threshold of the EXT INPUT connector.
Example	`:ARM:IMP 50OHM` Set EXT INPUT impedance to 50 Ω `:ARM:LEV 2.5V` Set EXT INPUT threshold to 2.5 V

Command	**:ARM:PER**
Long	`:ARM[:SEQuence[1]][:LAYer]:PERiod`
Form	Set & Query
Parameter	Numeric
Parameter Suffix	S or SEC with engineering prefixes.
***RST value**	10.00 µs
Specified Limits	8 ns to 1000 s
Description	Use this command to program the period of the PLL (INTernal2) when it is used as the `:ARM:SOURce` for internal triggering of pulses, bursts or patterns. If you are using the PLL as `:TRIGger:SOURce` use the `[:SOURce]:PULSe:PERiod` command to set the pulse period,
Example	To set up bursts of four 10 ns pulses occurring every 100 ns:

```
:TRIG:SOUR INT          Select internal osc. as pulse period source
:PER 10 NS              Set pulse period to 10 ns
:ARM:SOUR INT2          Select PLL as triggering source
:ARM:SENS EDGE          Sense edge of PLL signal
:ARM:PER 100ns          Set triggering period to 100 ns
:ARM:TRIG:COUNT 4       Set burst length to 4
```

Command	**:ARM:SENS**
Long	`:ARM[:SEQuence[1]][:LAYer]:SENSe`
Form	Set & Query
Parameter	EDGE | LEVel
***RST value**	EDGE
Description	Use this command to select triggered or gated mode by choosing whether the instrument arms on the edge(s) or level of the arming signal. When sensing edges, the instrument triggers when the arming signal crosses the selected threshold level (`:ARM:LEV`) in the selected direction (`:ARM:SLOP`). When sensing levels, the instrument triggers as long as the arming signal is above (`:ARM:SLOP POS`), or below (`:ARM:SLOP NEG`) the selected threshold level (`:ARM:LEV`).

Command **:ARM:SLOP**

Long `:ARM[:SEQuence[1]][:LAYer]:SLOPe`

Form Set & Query

Parameter POSitive | NEGative | EITHer

***RST value** POS

Description Use this command to select the trigger slope for the arming signal when triggering on edges. Use `EITHer` to trigger on both the positive and negative edges of the arming signal. This allows you to trigger at twice the frequency of the arming signal.

If you are arming on levels, use this command to select whether the instrument triggers during the positive or negative cycle of the arming signal.

Command **:ARM:SOUR**

Long `:ARM[:SEQuence[1]][:LAYer]:SOURce`

Form Set & Query

Parameter IMMediate | INTernal[1] | INTernal2 | EXTernal[1] | MANual | TTLTrg0...TTLTrg7 | ECLTrg0...ECLTrg1

***RST value** IMM

Description Use this command to select the triggering mode of the instrument by selecting the source of the arming signal:

Triggering source	:ARM:SOURce	Mode
internal osc.	IMMediate|INTernal[1]	Continuous
PLL	INTernal2	Triggered|Gated by PLL
EXT INPUT	EXTernal1	Triggered|Gated by EXT IN
MAN key	MANual	Triggered|Gated by *TRG
VXI trigger lines	TTLTrg<n> | ECLTrg<n>	Triggered|Gated by VXI trigger lines

Use `:ARM:SENSe EDGE | LEVel` to choose between TRIGGERED and GATED

Command **:CALibration**

Long `:CALibration[:ALL]`

Form Set & Query

Parameter none

***RST value** none

Description Use this command to perform a timing calibration of the Agilent E8305A.

The timing circuitries for VCO-period, delay and width are calibrated in reference to the internal PLL reference.

The return values for the query command `:CALibration[:ALL]?` are as follows:

- 0: calibration passed
- >0: calibration failed

When the Agilent E8305A is switched off and on again, the factory calibration data are reactivated.

Command **:DIG:PATT:DATA[1|2|3]**

Long `:DIGital[:STIMulus]:PATTern:DATA[1|2|3]`

Form Set & Query

Parameter [<start>,] <data>

***RST value**

Channel		**Default**		
[1|2|3]	Description	Bit 1	Bit 2	Bits 3 to 4096
1	CH1 (OUTPUT 1)	1	0	0
2	CH2 (OUTPUT 2)	0	1	0
3	STRB (TRIGGER OUT)	1	0	0

Description Use this command to set or read the pattern data of one or all channels starting from Bit 1. The <data> is an arbitrary block of program data as defined in IEEE 488.2 7.7.6.2, for example:

NOTE Note that the optional <start> parameter is ignored by the instrument if you use it

```
#1541213
#           Start of block
1           Length of the length of the data
5           Length of the data
41213       5 bytes of data


#2161000100010001000
#           Start of block
2           Length of the length of the data
16          Length of the data
10...00     16 bytes of data
```

Example 1 `:DIG:PATT:DATA #1541213`

The instrument uses each byte of data to set one bit in the pattern memory. If you do not specify a particular channel, the lowest three bits of each byte are used to set all three channels, and the top five bits are ignored. Note that you can therefore use the ASCII characters ‘0’,‘1’,‘2’ and ‘3’, to program Outputs 1 and 2 in binary with STROBE=0 (or ‘4’,’5’,’6’, and ‘7’ for STROBE=1):

Data																	
	ignored					used											
ASCII	D7		D6		D5		D4		D3	D2		D1		D0		STRB TRIGGER OUT	CH2 OUTPUT2	CH1 OUTPUT 1
4	0		1		1		1		0	1		0		0		1	0	0
1	0		1		1		1		0	0		0		1		0	0	1
2	0		1		1		1		0	0		1		0		0	1	0
1	0		1		1		1		0	0		0		1		0	0	1
3	0		1		1		1		0	0		1		1		0	1	1

Example 2 `:DIG:PATT:DATA2 #1501011`

If you specify a particular channel, the least significant bit of each byte is used to set the selected channel, and the top seven bits are ignored. Note that you can therefore use the ASCII characters “1” and “0” to set individual bits to 1 and 0:

Data										
	ignored							LSB		
ASCII	D7	D6	D5	D4	D3	D2	D1	D0	STRB TRIGGER OUT	CH2 OUTPUT2	CH1 OUTPUT1
0	0	1	1	1	0	0	0	0	X	0	X
1	0	1	1	1	0	0	0	1	X	1	X
0	0	1	1	1	0	1	0	0	X	0	X
1	0	1	1	1	0	0	0	1	X	1	X
1	0	1	1	1	0	0	0	1	X	1	X

X indicates that the bit remains unchanged.

```
:ARM:SOUR IMM                 Set continuous mode
:DIG:PATT:DATA3 #1501011      Set up pattern data for strobe channel
:TRIG:COUN 5                  Set pattern length (lastbit) to 5
:DIG:PATT ON                  Switch on pattern mode
:ARM:EWIDth OFF               Switch off EXT WIDTH mode
```

Command **:DIG:PATT:PRBS[1|2|3]**

Long `:DIGital[:STIMulus]:PATTern:PRBS[1|2|3]`

Form Set

Parameter <n>,<length>

***RST value** Not applicable

Specified Limits <n> 7 to 14 (integer)

<length> 2 to 16384 (integer)

Description Use this command to set up PRBS data starting from bit 1. The parameter <n> is used as the basis to generate a 2^n–1 PRBS. The parameter <length> determines how many bits of the PRBS sequence are used. If <length> is longer than the PRBS, the PRBS is repeated as necessary to achieve the required length.

Example To set up a repeating 2^{10}–1 PRBS on OUTPUT 1:

```
:ARM:SOUR IMM                 Set continuous mode
```

```
:TRIG:COUN 1023              Set pattern length (last bit) to 1023
:DIG:PATT:PRBS1 10,1023      Set up PRBS on OUTPUT 1
:DIG:PATT ON                 Switch on PATTERN mode
```

Command **:DIG:PATT:PRES[1|2|3]**

Long `:DIGital[:STIMulus]:PATTern:PRESet[1|2|3]`

Form Set

Parameter <n>,<length>

***RST value** Not applicable

Specified Limits

<n>	0 to 16384 (integer)
<length>	2 to 16384 (integer)

Description Use this command to set up clock data starting from bit 1 with value 1.

The parameter <n> is used as the divider to generate a CLOCK÷n sequence (squarewave if NRZ data is selected). The parameter <length> determines the length of the sequence.

n=0	Fill with 0
n=1	Fill with 1
n=2	Sequence = 101010101010101....
n=3	Sequence = 100100100100100....
n=4	Sequence = 110011001100110....
n=5	Sequence = 110001100011000....
n=6	Sequence = 111000111000111....
n=7	Sequence = 111000011100001....
n=8	Sequence = 111100001111000....

and so on.

Example To set up a CLOCK ÷ 4 squarewave on TRIGGER OUT:

```
:TRIG:COUN 4096              Set pattern length (last bit) to 4096
:DIG:PATT:PRES3 4,4096       Set up CLOCK÷4 on STRB
:DIG:PATT ON                 Switch on PATTERN mode
:ARM:EWIDth OFF              Switch off EXT WIDTH mode
```

NOTE To produce a CONTINUOUS squarewave the pattern length must be a multiple of the selected divider, in this case a multiple of 4.

Command	**:DIG:PATT**
Long	`:DIGital[:STIMulus]:PATTern[:STATe]`
Form	Set & query
Parameter	ON | OFF | 1 | 0
***RST**	0
Description	Use this command to enable and disable PATTERN mode. Use `:TRIG:COUN` to program the length of the pattern. The pattern length will be fitted when using the `:DIG:PATT:PRES` and `:DIG:PATT:PRBS` commands.

Command	**:DIG:PATT:UPD**
Long	`:DIGital[:STIMulus]:PATTern:UPDate`
Form	Set & query
Parameter	ON | OFF | ONCE
***RST**	ON
Description	Use this command to enable and disable the automatic updating of the pattern generating hardware following a `:DIG:PATT:DATA` command. Disable the automatic updating if you want to set up new pattern data in the instrument without affecting the pattern that is currently being generated. You can then update the hardware with the new pattern data by sending a `:DIG:PATT:UPD ONCE` command.

Command	**:DIG:SIGN[1|2]:FORM**
Long	`:DIGital[:STIMulus]:SIGNal[1|2]:FORMat`
Format	Set & Query
Parameter	RZ | NRZ
Range Coupling	Period, Frequency
***RST value**	RZ

Description Use this command to set and read the data format of channels 1 and 2 when using PATTERN mode. If you do not specify a channel number in the command, channel 1 is assumed.

RZ	Return to Zero. An RZ pulse is generated for each “1” in the data. You can vary the width, edges and levels of the pulse.
NRZ	Non Return to Zero. A pulse of 100% dutycycle is generated for each “1” in the data. You can vary the edges and levels of the pulse.

Example

```
:DIG:SIGN:FORM NRZ          Set channel 1 data format to NRZ
```

Command **:OUTP[1|2]**

Long `:OUTPut[1|2][:NORMal][:STATe]`

Form Set & Query

Parameter ON | OFF | 1 | 0

***RST value** 0

Description Use this command to switch the normal OUTPUTs on or off.

Example

```
:OUTP1 ON                   Switch on OUTPUT 1
:OUTP2 OFF                  Switch off OUTPUT 2
```

NOTE Normal and complement/differential OUTPUTs cannot be activated simultaneously.

Command **:OUTP[1|2]:COMP**

Long `:OUTPut[1|2]:COMPlement[:STATe]`

Form Set & Query

Parameter ON | OFF | 1 | 0

***RST value** 0

Description Use this command to switch the complement/differential OUTPUTs on or off.

Example

```
:OUTP1:COMP ON              Switch on complement OUTPUT 1
:OUTP2:COMP OFF             Switch off complement OUTPUT 2
```

NOTE Normal and complement/differential OUTPUTs cannot be activated simultaneously.

Command **:OUTP[1|2]:IMP:EXT**

Long `:OUTPut[1|2]:IMPedance:EXTernal`

Form Set & Query

Parameter Numeric

Parameter Suffix `OHM` with engineering prefixes, for example `MOHM` is Megaohms.

***RST value** 50.0 Ω

Specified Limits 1 Ω to 999 kΩ

Description Use this command to set the expected load impedance of the device under test at the OUTPUT connectors. If you have a non-50 Ω load, the output levels at the device under test will not be the levels you program *unless* you set the expected load using this command.

Example

```
:OUTP1:IMP:EXT 47.6OHM      Set load impedance at OUTPUT 1 to 47.6 Ω
:OUTP2:IMP:EXT 1M OHMS      Set load impedance at OUTPUT 2 to 1 MΩ
```

Command **:OUTP[1|2]:POL**

Long `:OUTPut[1|2]:POLarity`

Form Set & Query

Parameter NORMal | INVerted

***RST value** NORM

Description Use this command to invert the signal at the OUTPUTs.

Example

```
:OUTP1:POL INV              Inverted signal at OUTPUT1
:OUTP1:POL NORM             Normal signal at OUTPUT 1
```

Command **:OUTP:TTLT<n>|:ECLT<n>**

Long

```
:OUTPut:TTLTrg<n>[:STATe]   n= 0...7
:OUTPut:ECLTrg<n>[:STATe]   n = 0, 1
```

Form	Set & Query
Parameter	ON | OFF | 1 | 0
***RST value**	0
Description	Use this command to enable/disable the use of a specific VXI trigger line.
NOTE	Only one of the available trigger lines may be active at a time.
Example	`:OUTP:TTLT0 ON` Enable VXI trigger line TTL0

Command	**:CURR[1|2]**
Long	`[:SOURce]:CURRent[1|2][:LEVel][:IMMediate][:AMPLitude]`
Form	Set & Query
Parameter	Numeric
Parameter suffix	A with engineering prefixes.
***RST value**	20 mA (50 Ω into 50 Ω)
Specified Limits	100,1 nA to 196 mA
Value coupling	Amplitude = High – Low Offset = $\frac{\text{High} - \text{Low}}{2}$
Range coupling	Offset
Description	This command programs the amplitude current of the OUTPUT signal. Note that to set the OUTPUT levels in terms of current, you first have to execute the `[:SOURce]:HOLD CURRent` command to enable the `[:SOURce]:CURRent` subsystem. The available current range is limited by the combination of: • Specified voltage and current limits • Actual expected load impedance setting: `:OUTPut:IMPedance:EXTernal`
Example	`:HOLD CURR` Enable CURRENT subsystem `:CURR1 75MA` Set OUTPUT 1 amplitude to 75 mA

Command	**:CURR[1|2]:OFFSet**
Long	`[:SOURce]:CURRent[1|2][:LEVel][:IMMediate]:OFFSet`
Form	Set & Query
Parameter	Numeric
Parameter suffix	`A` with engineering prefixes.
***RST value**	0.0 µA (50 Ω into 50 Ω)
Specified Limits	–193 mA to 193 mA
Value coupling	Amplitude = High – Low Offset = $\frac{\text{High} - \text{Low}}{2}$
Range coupling	Amplitude
Description	This command programs the offset current of the OUTPUT signal. Note that to set the OUTPUT levels in terms of current, you first have to execute the `[:SOURce]:HOLD CURRent` command to enable the `[:SOURce]:CURRent` subsystem. The available current range is limited by the combination of: • Specified voltage and current limits • Actual expected load impedance setting

Example

```
:HOLD CURR                Enable CURRENT subsystem
:CURR1:OFF 50MA           Set OUTPUT 1 offset to 50 mA
```

Command	**:CURR[1|2]:HIGH**
Long	`[:SOURce]:CURRent[1|2][:LEVel][:IMMediate]:HIGH`
Form	Set & Query
Parameter	Numeric
Parameter suffix	`A` with engineering prefixes.
Value coupling	Amplitude = High – Low Offset = $\frac{\text{High} - \text{Low}}{2}$
Range coupling	Low level
***RST value**	+10.5 mA (50 Ω into 50 Ω)
Specified Limits	–190 mA to 196 mA
Description	This command programs the high level current of the OUTPUT signal. Note that to set the OUTPUT levels in terms of current, you first have to execute `[:SOURCE]:HOLD CURRent` command to enable the `[:SOURCE]:CURRent` subsystem. The available current range is limited by the combination of: • Specified voltage and current limits • Actual expected load impedance setting: `:OUTPut:IMPedance:EXTernal`

Example

```
:HOLD CURR                  Enable CURRENT subsystem
:CURR1:HIGH 150MA           Set OUTPUT 1 high level to 150 mA
```

Command	**:CURR[1|2]:LOW**
Long	`[:SOURce]:CURRent[1|2][:LEVel][:IMMediate]:LOW`
Form	Set & Query
Parameter	Numeric
Parameter suffix	`A` with engineering prefixes.
Value coupling	Amplitude = High – Low Offset = $\frac{\text{High} - \text{Low}}{2}$
Range coupling	High level
***RST value**	–10.5 mA (50 Ω into 50 Ω)
Specified Limits	–196 mA to 190 mA
Description	This command programs the low level current of the OUTPUT signal. Note that to set the OUTPUT levels in terms of current, you first have to execute the `[:SOURce]:HOLD CURRent` command to enable the `[:SOURce]:CURRent` subsystem. The available current range is limited by the combination of: • Specified voltage and current limits • Actual expected load impedance setting: `:OUTPUT:IMPedance:EXTernal`

Example

```
:HOLD CURR                Enable CURRENT subsystem
:CURR1:LOW 50 MA          Set OUTPUT 1 low level to 50 mA
```

Command	**:CURR[1|2]:LIM**
Long	`[:SOURce]:CURRent[1|2]:LIMit[:HIGH]`
Form	Set & Query
Parameter	Numeric
Parameter suffix	`A` with engineering prefixes.
***RST value**	+10.0 mA
Specified Limits	–196 mA to 200 mA
Description	Use this command to set/read the high level current limit. If you switch on current limiting, the high level current cannot be set above the programmed limit.

NOTE The current is *not* limited by the OUTPUT hardware, this is a software limit.

Example

```
:HOLD CURR                  Enable CURRENT subsystem
:CURR1:LIM 50 MA            Set OUTPUT 1 high level current limit to 50 mA
:CURR1:LIM:STAT ON          Switch on OUTPUT 1 limits
```

Command	**:CURR[1|2]:LIM:LOW**
Long	`[:SOURce]:CURRent[1|2]:LIMit:LOW`
Form	Set & Query
Parameter	Numeric
Parameter suffix	`A` with engineering prefixes.
***RST value**	–10.0 mA
Specified Limits	–200 mA to 196 mA
Description	Use this command to set/read the low level current limit. If you switch on current limiting, the low level current cannot be set below the programmed limit.

NOTE The current is *not* limited by the OUTPUT hardware, this is a software limit.

Example

```
:HOLD CURR                  Enable CURRENT subsystem
:CURR1:LIM:LOW -50MA*       Set OUTPUT 1 low level current limit to -50 mA
:CURR1:LIM:STAT ON          Switch on OUTPUT 1 limits
```

Command	**:CURR[1|2]:LIM:STAT**
Long	`[:SOURce]:CURRent[1|2]:LIMit:STATe`
Form	Set & Query
Parameter	ON | OFF | 1 | 0
***RST value**	0
Description	This command switches the output limits on or off. When you switch on the output limits, you cannot program the output levels beyond the programmed limits, until you switch off the output limits. The limits apply whether you program high/low levels or amplitude/offset levels.
NOTE	You can switch the limits on and off in both the `[:SOURce]:CURRent` and the `[:SOURce]:VOLTage` subsystems but the current and voltage limits are *not* enabled/disabled independently. The voltage and current limits are always enabled/disabled together.

Example

```
:HOLD CURR                  Enable CURRENT subsystem
:CURR1:LIM 50MA             Set OUTPUT 1 high level current limit to 50 m
:CURR1:LIM:LOW -50MA        Set OUTPUT 1 low level current limit to –50m
:CURR1:LIM:STAT ON          Switch on OUTPUT 1 limits
```

Command	**:FREQ**
Long	`[:SOURce]:FREQuency[:CW|:FIXed]`
Form	Set & Query
Parameter	Numeric
Parameter Suffix	`Hz` with engineering prefixes, or `MHZ` for Megahertz.
Value coupling	$\text{Period} = \frac{1}{\text{Frequency}}$
***RST value**	1.00 MHz
Specified limits	See *":PULS:PER" on page 67*
Description	Use this command to set/read the pulse frequency. Select the frequency source for the pulse frequency using `:TRIGger:SOURce`. The currently selected

source is programmed by this command. Note that the specified limits and the available resolution depend on the selected source.

You cannot set the pulse frequency if you have selected the CLK IN connector as the frequency source (`:TRIG:SOUR EXT`).

Example

```
:TRIG:SOUR INT          Select internal osc. as pulse trigger
:FREQ 75MHz             Set pulse frequency to 75 MHz
```

Command **:FREQ:AUTO**

Long `[:SOURce]:FREQuency[:CW|:FIXed]:AUTO`

Form Event

Parameter ONCE

***RST value** Not applicable

Description Use this command to measure the frequency at the CLK IN connector. If the CLK IN connector is the selected pulse frequency source, you can then read the measured value with `:FREQ?`

Example

```
:TRIG:SOUR EXT          Select ext CLK IN as pulse trigger
:FREQ:AUTO ONCE         Measure frequency at CLK IN
:FREQ?                  Query pulse frequency
```

Command **:HOLD**

Long `[:SOURce]:HOLD`

Form Set & Query

Parameter VOLTage | CURRent

***RST value** VOLT

Description Use this command to enable either of the `[:SOURce]:VOLTage` or `[:SOURce]:CURRent` subsystems.

You can control the signal levels of the instrument's OUTPUTs in terms of voltage or current.

Command **:PHAS[1|2]**

Long `[:SOURce]:PHASe[1|2][:ADJust]`

Form	Set & Query
Parameter	Numeric
Parameter suffix	DEG or RAD. A parameter without a suffix is interpreted as RAD.
Functional coupling	Programming the pulse phase also executes [:SOURce]:PULSe:HOLD PHASe so that the pulse phase is held constant when the signal frequency is changed.
Value coupling	$\text{Delay} = \frac{\text{Phase}}{360} \times \text{Period}$
***RST value**	0.0
Specified limits	0 to 360°□□ constrained by delay and period limits.
Description	Use this command to set/read the relative phase delay of the output signal. This is equivalent to setting an absolute or percentage pulse delay with [:SOURce]:PULSe:DELay. If you want the phase delay to remain constant when the pulse period is varied (rather than the absolute pulse delay) use [:SOURce]:PULSe:DELay[1|2]:HOLD PRATio.

Example

:PULS:DEL1 500NS	Set OUTPUT 1 delay to 500ns
:PHAS2 180 DEG	Set OUTPUT 2 phase to 180°
:PULS:DEL1:HOLD TIM	Hold OUTPUT 1 delay constant with varying period
:PULS:DEL2:HOLD PRAT	Hold OUTPUT 2 phase constant with varying period

Command	**:PULS:DCYC[1|2]**
Long	[:SOURce]:PULSe:DCYCle[1|2]
Form	Set & Query
Parameter	Numeric
Value coupling	$\text{Width} = \frac{\text{Dutycycle}}{100} \times \text{Period}$
***RST value**	10.0% (derived from Width and Period)
Specified limits	0.001% – 90%, constrained by Width & Period limits.

Description Use this command to program the dutycycle of the pulse signal. If you want to set an absolute pulse width, use `[:SOURce]:PULSe:WIDTh[1|2].`

If you want the pulse dutycycle to remain constant when the pulse period is varied (rather than the absolute pulse width), use `[:SOURce]:PULSe:HOLD[1|2] DCYCle`

Example

`:PULS:DCYC1 25PCT`	Set OUTPUT 1 dutycycle to 25%
`:PULS:HOLD1 DCYC`	Hold dutycycle constant with varying period

Command **:PULS:DEL[1|2]**

Long `[:SOURce]:PULSe:DELay[1|2]`

Form Set & Query

Parameter Numeric

Parameter suffix `S` with engineering prefixes. You can change the default unit using `[:SOURce]:PULSe:DELay[1|2]:UNIT.`

Value coupling

$$\text{Phase} = \frac{\text{Delay}}{\text{Period}} \times 360$$

$$\text{Delay\%} = \frac{\text{Delay}}{\text{Period}} \times 100$$

***RST value** 0.0

Specified limits 0.00 ns to 900 s (limited by 0.9 × period – 2.6 ns)

Description Use this command to set/read the pulse delay. Delay is the time between the start of the pulse period and the start of the leading edge of the pulse.

If you want the pulse delay to remain constant when the pulse period is varied (rather than the phase delay), use `[:SOURce]:PULSe:DELay[1|2]:HOLD TIME.`

Example

`:PULS:DEL1 500NS`	Set OUTPUT1 delay to 500 ns
`:PHAS2 180 DEG`	Set OUTPUT 2 phase to 180°
`:PULS:DEL1:HOLD TIME`	Hold OUTPUT 1 delay constant with varying period
`:PULS:DEL2:HOLD PRAT`	Hold OUTPUT 2 phase constant with varying period

Command **:PULS:DEL[1|2]:HOLD**

Long `[:SOURce]:PULSe:DELay[1|2]:HOLD`

Form Set & Query

Parameter TIME | PRATio

***RST value** TIME

Description Use this command to set/read the coupling between the pulse period and the pulse delay:

TIME	The absolute pulse delay is held fixed when the pulse period is varied (pulse phase varies).
PRATio	The pulse phase delay (delay as ratio of period) is held fixed when the pulse period is varied (pulse delay varies).

Example

`:PULS:DEL1 500ns`	Set OUTPUT 1 delay to 500ns
`:PHAS2 180DEG`	Set OUTPUT 2 phase to 180°
`:PULS:DEL1:HOLD TIME`	Hold OUTPUT 1 delay constant with varying period
`:PULS:DEL2:HOLD PRAT`	Hold OUTPUT 2 phase constant with varying period

Command **:PULS:DEL[1|2]:UNIT**

Long `[:SOURce]:PULSe:DELay[1|2]:UNIT`

Form Set & Query

Parameter S | SEC | PCT | DEG | RAD

***RST value** SEC

Description Use this command to set/read the default units for the pulse delay parameter. The default unit of a parameter is the unit used when the parameter is programmed to a value without a unit suffix.

Example

`:PULS:DEL1:UNIT PCT`	Set OUTPUT 1 delay unit to %
`:PULS:DEL1 50`	Set OUTPUT 1 delay to 50% of period

Command	**:PULS:DOUB[1|2]**
Long	`[:SOURce]:PULSe:DOUBle[1|2][:STATe]`
Form	Set & Query
Parameter	OFF | ON | 0 | 1
***RST value**	0
Description	Use this command to switch double-pulse mode on or off. In double-pulse mode two pulses are generated per pulse period and the delay between the leading edges of the first and second pulse can be adjusted.

Command	**:PULS:DOUB[1|2]:DEL**
Long	`[:SOURce]:PULSe:DOUBle[1|2]:DELay`
Form	Set & Query
Parameter	Numeric
Parameter suffix	`S` with engineering prefixes. You can change the default unit using `[:SOURce]:PULSe:DOUBle:DELay[1|2]:UNIT`.
Value coupling	$\text{blDel\%} = \frac{\text{DblDel}}{\text{Period}} \times 100$
***RST value**	250.0 ns
Specified limits	4 ns to 900 s (4 ns to 0.9 × Period – 3.2 ns at min. width)
Description	Use this command to set/read the delay between the leading edges of the two pulses in double-pulse mode. The first pulse always starts at the start of the pulse period. If you want the double delay to remain constant when the pulse period is varied (rather than the double delay as percentage of period), use `[:SOURce]:PULSe:DOUBle[1|2]:DELay:HOLD TIME`.

Example

`:PULS:DOUB1 ON`	Switch on Double pulses on OUTPUT 1
`:PULS:DOUB1:DEL 500NS`	Set inter-pulse delay to 500 ns
`:PULS:DOUB1:DEL:HOLD TIME`	Hold inter-pulse delay fixed with varying pulse period

Command **:PULS:DOUB[1|2]:DEL:HOLD**

Long `[:SOURce]:PULSe:DOUBle[1|2]:DELay:HOLD`

Form Set & Query

Parameter TIME | PRATio

***RST value** TIME

Description Use this command to set/read the coupling between the pulse period and the double-pulse delay:

TIME	The absolute double-pulse delay is held fixed when the pulse period is varied.
PRATio	The double-pulse delay as percentage of period is held fixed when the pulse period is varied.

Example

`:PULS:DOUB1 ON`	Switch on Double pulses on OUTPUT 1
`:PULS:DOUB1:DEL 50 PCT`	Set inter-pulse delay to 50% of pulse period
`:PULS:DOUB1:DEL:HOLD PRAT`	Hold inter-pulse delay as fixed percentage of pulse period

Command **:PULS:DOUB[1|2]:DEL:UNIT**

Long `[:SOURce]:PULSe:DOUBle[1|2]:DELay:UNIT`

Form Set & Query

Parameter S | SEC | PCT

***RST value** SEC

Description Use this command to set/read the default units for the double delay parameter. The default unit of a parameter is the unit used when the parameter is programmed to a value without a unit suffix.

Example

`:PULS:DOUB1:DEL:UNIT PCT`	Set OUTPUT 1 double delay unit to %
`:PULS:DOUB1:DEL 50`	Set OUTPUT 1 inter-pulse delay to 50% of period

Command	**:PULS:HOLD[1|2]**
Long	`[:SOURce]:PULSe:HOLD[1|2]`
Form	Set & Query
Parameter	WIDTh | DCYCle | TDELay
***RST value**	WIDT
Description	Use this command to set whether the pulse width, the pulse dutycycle or the pulse trailing edge delay is held constant when the pulse period is changed.

Example

`:PULS:DEL:HOLD1 TIME`	Hold OUTPUT 1 delay fixed when frequency varies
`:PULS:DEL 20NS`	Set OUTPUT 1 delay to 20 ns
`:PULS:HOLD1 DCYC`	Hold OUTPUT 1 dutycycle fixed when frequency varies
`:PULS:DCYC 25PCT`	Set OUTPUT 1 dutycycle to 25%

Command	**:PULS:PER**
Long	`[:SOURce]:PULSe:PERiod`
Form	Set & Query
Parameter	Numeric
Parameter Suffix	S with engineering prefixes.
Value coupling	$\text{Frequency} = \frac{1}{\text{Period}}$
***RST value**	1 µs
Specified limits	4 ns to 1000 s
Description	Use this command to set/read the pulse period. Select the pulse period source using `:TRIGger:SOURce`. The currently selected source is programmed by this command. Note that the specified limits and the available resolution depend on the selected source. You cannot set the pulse period if you have selected the CLK IN connector as the frequency source (`:TRIG:SOUR EXT`).

Example

`:TRIG:SOUR INT`	Select internal osc. as pulse trigger
`:PULS:PER 25NS`	Set pulse frequency to 25 ns

Command	**:PULS:PER:AUTO**
Long	`[:SOURce]:PULSe:PERiod:AUTO`
Form	Event
Parameter	ONCE
***RST value**	Not applicable
Description	Use this command to measure the period at the CLK IN connector. If the CLK IN connector is the selected pulse period source, you can then read the measured value with `:PULS:PER?`

Example

```
:TRIG:SOUR EXT          Select ext CLK IN as pulse trigger
:PULS:PER:AUTO ONCE     Measure period at CLK IN
:PULS:PER?              Query pulse period
```

Command	**:PULS:TDEL[1|2]**
Long	`[:SOURce]:PULSe:TDELay[1|2]`
Form	Set & Query
Parameter	Numeric
Parameter Suffix	`S` with engineering prefixes.
***RST value**	100 ns
Specified Limits	2 ns to 900 s
Description	Use this command to program the delay of the trailing edge of the pulse relative to the start of the pulse period. This is an alternative method of programming the pulse width.

Example

```
:PULS:DEL1 500NS          Set OUTPUT 1 delay to 500 ns
:PULS:DEL1:HOLD TIME      Hold OUTPUT 1 delay constant with varying period
:PULS:TDEL1 750NS         Set OUTPUT 1 trailing delay to 750 ns
```

Command **:PULS:TRAN[1|2]:HOLD**

Long `[:SOURce]:PULSe:TRANsition[1|2]:HOLD`

Form Set & Query

Parameter TIME | WRATio

***RST value** TIME

Description Use this command to set the coupling between transition times and the pulse width:

TIME	The absolute transition times are held when the pulse width is varied.
WRATio	The ratio of transition time to pulse width is held when the pulse width is varied.

Example

`:PULS:TRAN1:HOLD TIME`	Hold OUTPUT 1 transitions fixed when pulse width varies
`:PULS:TRAN2:HOLD WRAT`	Hold OUTPUT 2 transition:width ratio when pulse width varies

Command **:PULS:TRAN[1|2]:UNIT**

Long `[:SOURce]:PULSe:TRANsition[1|2]:UNIT`

Form Set & Query

Parameter S | SEC | PCT

***RST value** SEC

Description Use this command to set the default units for the pulse transition times. The default unit is used when the parameter is programmed to a value without a unit suffix.

Command	**:PULS:TRAN[1|2]**
Long	`[:SOURce]:PULSe:TRANsition[1|2][:LEADing]`
Form	Set & Query
Parameter	Numeric
Parameter suffix	S with engineering prefixes, or PCT
***RST value**	1.3 ns
Specified limits	1.3 ns to 200 µs
Parameter coupling	Trailing edge = Leading edge with `:PULS:TRAN:TRA:AUTO ON`. This is the default condition. Use `:PULS:TRAN:TRA:AUTO OFF` to enable independent programming of the trailing edge within a 1:20 ratio for the ranges.
Description	Use this command to set/read the transition time of the pulse leading edge. Note that the leading and trailing edges of the pulse have to fit within the defined pulse width

Example

`:PULS:TRAN1 3NS`	Set OUTPUT 1 leading edge to 3 ns
`:PULS:TRAN1:TRA:AUTO OFF`	Enable independent setting of trailing edge
`:PULS:TRAN1:TRA 15NS`	Set OUTPUT 1 trailing edge to 15 ns

Command	**:PULS:TRAN[1|2]:TRA**
Long	`[:SOURce]:PULSe:TRANsition[1|2]:TRAiling`
Form	Set & Query
Parameter	Numeric
Parameter suffix	`S` with engineering prefixes, or `PCT`
***RST value**	1.3 ns
Specified limits	1.3 ns to 200 µs
Parameter coupling	Trailing edge = Leading edge with `:PULS:TRAN:TRA:AUTO ON`. This is the default condition. Use `:PULS:TRAN:TRA:AUTO OFF` to enable independent programming of the trailing edge within a 1:20 ratio for the ranges.
Description	Use this command to set/read the transition time of the pulse trailing edge. Note that the leading and trailing edges of the pulse have to fit within the defined pulse width.

Example

`:PULS:TRAN1 3NS`	Set OUTPUT 1 leading edge to 3 ns
`:PULS:TRAN1:TRA:AUTO OFF`	Enable independent setting of trailing edge
`:PULS:TRAN1:TRA: 15NS`	Set OUTPUT 1 trailing edge to 15 ns

Command **:PULS:TRAN[1|2]:TRA:AUTO**

Long `:[SOURce]:PULSe:TRANsition[1|2]:TRAiling:AUTO`

Form Set & Query

Parameter ON | OFF | ONCE | 1 | 0

***RST value** 1

Description Use this command to set/read the automatic coupling of the pulse trailing edge transition time to the leading edge transition time.

ON	The trailing edge transition time is automatically set to the same value as the leading edge, and is updated automatically each time the leading edge transition time changes.
OFF	The trailing edge transition time is independently programmable.
ONCE	The trailing edge transition time is set ONCE to the same value as the leading edge.

Example

```
:PULS:TRAN1 3NS                Set OUTPUT 1 leading edge to 3 n
:PULS:TRAN1:TRA:AUTO OFF       Enable independent setting of trailing edge

:PULS:TRAN1:TRA 15NS           Set OUTPUT 1 trailing edge to 15 ns
```

Command **:PULS:TRIG[1]:SOUR**

Long `[:SOURce]:PULSe:TRIGger[1]:SOURce`

Form Set & Query

Parameter TRIG1 | TRIG2

***RST value** TRIG1

Description Use this command to set/read the signal source for the TRIGGER OUT connector (for `:PULS:TRIG:SOUR:AUTO:OFF`).

Command **:PULS:TRIG[1]:SOUR:AUTO**

Long `[:SOURce]:PULSe:TRIGger[1]:SOUR:AUTO`

Form Set & Query

Parameter OFF | ON | 0 | 1

***RST value** 1

Description Use this command to set/read the coupling between the TRIGGER OUT signal source and the currently used operation mode.

Mode	Signal Source for TRIGGER OUTPUT	Description
External Width	TRIG1	Every pulse period generates a trigger signal
Pulses (`:TRIG:COUNt 1`)	TRIG1	
Burst (`:TRIG:COUNt > 1`)	TRIG2	Marks start/end of a burst and is programmable in pattern mode (third data channel). No signal in external width and pulse mode.
Pattern	TRIG2	

Command **:PULS:TRIG[1]:VOLT**

Long `[:SOURce]:PULSe:TRIGger[1|2]:VOLTage[:LEVel][:IMMediate][:AMPlitude]`

Form Set & Query

Parameter TTL | ECL | STA

***RST value** TTL

Description Use this command to set/read the output levels at the TRIGGER OUT connector.

NOTE Parameter STA sets the high level to 0 V and the low level to –1 V.

Command **:PULS:WIDT[1|2]**

Long `[:SOURce]:PULSe:WIDTh[1|2]`

Form Set & Query

Parameter Numeric

Parameter suffix S with engineering prefixes

***RST value** 100 ns

Specified limits 2 ns to 900 s (2 ns to 0.9 × period – 1.6 ns)

Description Use this command to program the width of the pulse signal. If you want to set width as dutycycle use `[:SOURce]:PULSe:DCYCle[1|2]`.

If you want the pulse width to remain constant when the pulse period isvaried (rather than the dutycycle), use `[:SOURce]:PULSe:HOLD[1|2] WIDTh`.

Example

```
:PULS:WIDT1 50NS          Set OUTPUT 1 pulse width to 50 ns
:PULS:HOLD1 WIDTH         Hold pulse width constant with varying period
```

Command **:ROSC:SOUR**

Long `[:SOURce]:ROSCillator:SOURce`

Form Set & Query

Parameter INTernal[1] | INTernal2 | EXTernal

***RST value** INT

Description Use this command to set/read the reference source for the PLL. If you select the external reference (CLK IN connector) you can choose to use a 5 MHz or 10 MHz reference signal using `:ROSC:EXT:FREQ`.

INTernal1	Lock the PLL to its internal reference.
INTernal2	Lock the PLL to the VXI clock signal (10 MHz).
EXTernal	Lock the PLL to a reference signal at the CLK IN connector. The external reference signal can be 5 or 10 MHz.

Example

```
:ROSC:SOUR EXT            Set external PLL reference (CLK IN)
:ROSC:EXT:FREQ 10 MHZ     Set expected PLL reference frequency to 10 MHz
```

Command	**:ROSC:EXT:FREQ**
Long	`[:SOURce]:ROSCillator:EXTernal:FREQuency`
Form	Set & Query
Parameter	Numeric
***RST value**	5 MHz
Specified limits	5 MHz or 10 MHz
Description	Use this command to set/read the expected reference frequency for the PLL at the CLK IN connector. The external reference can be a 5 or 10 MHz signal. Note that if you program any value other than the two specified values, the value will be set to the nearest of the two specified values.
Example	`:ROSC:SOUR EXT` Set external PLL reference (CLK IN) `:ROSC:EXT:FREQ 10MHZ` Set expected PLL reference frequency to 10 MHz

Command	**:VOLT[1|2]**
Long	`[:SOURce]:VOLTage[1|2][:LEVel][:IMMediate][:AMPLitude]`
Form	Set & Query
Parameter	Numeric
Parameter suffix	V with engineering prefixes.
Value coupling	$\text{High} = \text{Offset} + \frac{\text{Amplitude}}{2}$ $\text{Low} = \text{Offset} - \frac{\text{Amplitude}}{2}$
Range coupling	With Offset, see *":VOLT[1|2]:OFFSet" on page 76*
***RST value**	1.00 V
Specified limits	100 mV to 5.0 V
Description	This command programs the amplitude voltage of the OUTPUT signal. Note that to set the OUTPUT levels in terms of voltage, you first have to execute the `[:SOURce]:HOLD VOLTage` command to enable the `[:SOURce]:VOLTage` subsystem.

The available voltage range is limited by the combination of:

- Specified current and voltage limits
- Actual expected load impedance setting:
  `:OUTput:IMPedance:EXTernal`

Example

```
:HOLD VOLT          Enable VOLTAGE subsystem
:VOLT1 5V           Set OUTPUT 1 amplitude to 5 V
```

Command **:VOLT[1|2]:OFFSet**

Long `[:SOURce]:VOLTage[1|2][:LEVel][:IMMediate]:OFFSet`

Form Set & Query

Parameter Numeric

Parameter suffix V with engineering prefixes.

Value coupling

$$\text{High} = \text{Offset} + \frac{\text{Amplitude}}{2}$$

$$\text{Low} = \text{Offset} - \frac{\text{Amplitude}}{2}$$

Range coupling With Amplitude, see *":VOLT[1|2]" on page 75*

***RST value** 0.0 mV

Specified Limits –4.95 V to 4.95 V

NOTE When using the Level Window the amplitude has to be taken into account.

Description This command programs the offset voltage of the OUTPUT signal. Note that to set the OUTPUT levels in terms of voltage, you first have to execute the `[:SOURce]:HOLD VOLTage` command to enable the `[:SOURce]:VOLtage` subsystem.

The available voltage range is limited by the combination of:

- Specified current limits
- Actual expected load impedance setting
  `:OUTput:IMPedance:EXTernal`

Example

```
:HOLD VOLT          Enable VOLTAGE subsystem
:VOLT1:OFF -800MV   Set OUTPUT 1 offset to -800mV
```

Command	**:VOLT[1|2]:HIGH**
Long	`[:SOURce]:VOLTage[1|2][:LEVel][:IMMediate]:HIGH`
Form	Set & Query
Parameter	Numeric
Parameter suffix	V with engineering prefixes.
Value coupling	Amplitude = High – Low $\text{Offset} = \frac{\text{High} - \text{Low}}{2}$
Range coupling	With low level
***RST value**	500 mV
Specified limits	–4.9 V to 5.0 V
Description	This command programs the high level voltage of the OUTPUT signal. Note that to set the OUTPUT levels in terms of voltage, you first have to execute the `[:SOURce]:HOLD VOLTage` command to enable the `[:SOURce]:VOLTage` subsystem. The available voltage range is limited by the combination of: • Specified current and voltage limits • Actual expected load impedance setting `:OUTPut:IMPedance:EXTernal`

Example

```
:HOLD VOLT                  Enable VOLTAGE subsystem
:VOLT1:HIGH 4.8V            Set OUTPUT 1 high level voltage to 4.8V
```

Command	**:VOLT[1|2]:LOW**
Long	`[:SOURce]:VOLTage[1|2][:LEVel][:IMMediate]:LOW`
Form	Set & Query
Parameter	Numeric
Parameter suffix	V with engineering prefixes.
Value coupling	Amplitude = High – Low $\text{Offset} = \frac{\text{High} - \text{Low}}{2}$
Range coupling	With high level
***RST value**	–500 mV
Specified limits	–5.0 V to 4.9 V
Description	This command programs the low level voltage of the OUTPUT signal. Note that to set the OUTPUT levels in terms of voltage, you first have to execute the `[:SOURce]:HOLD VOLTage` command to enable the `[:SOURce]:VOLTage` subsystem. The available voltage range is limited by the combination of: • Specified current and voltage limits • Actual expected load impedance setting `:OUTPut:IMPedance:EXTernal`

Example

```
:HOLD VOLT                Enable VOLTAGE subsystem
:VOLT1:LOW 500MV          Set OUTPUT 1 low level to 500mV
```

Command	**:VOLT[1|2]:LIM**
Long	`[:SOURce]:VOLTage[1|2]:LIMit[:HIGH]`
Form	Set & Query
Parameter	Numeric
Parameter suffix	`V` with engineering prefixes.
***RST value**	+500 mV
Specified Limits	–4.9 V to +5.0 V
Description	Use this command to set/read the high level voltage limit. If you switch on voltage limiting, the high level voltage cannot be set above the programmed limit. Note that the voltage is *not* limited by the OUTPUT hardware, this is a software limit.

Example

`:HOLD VOLT`	Enable VOLTAGE subsystem
`:VOLT1:LIM 3V`	Set OUTPUT 1 high level limit to 3 V
`:VOLT1:LIM:STAT ON`	Switch on OUTPUT 1 limits

Command	**:VOLT[1|2]:LIM:LOW**
Long	`[:SOURce]:VOLTage[1|2]:LIMit:LOW`
Form	Set & Query
Parameter	Numeric
Parameter suffix	`V` with engineering prefixes.
***RST value**	–500 mV
Specified Limits	–5.0 V to +4.9 V
Description	Use this command to set/read the low level voltage limit. If you switch on voltage limiting, the low level voltage cannot be set below the programmed limit. Note that the voltage is *not* limited by the OUTPUT hardware, this is a software limit.

Example

`:HOLD VOLT`	Enable VOLTAGE subsystem
`:VOLT1:LIM:LOW 0V`	Set OUTPUT 1 low level voltage
`:VOLT1:LIM:STAT ON`	Switch on OUTPUT 1 limits

Command **:VOLT[1|2]:LIM:STAT**

Long `[:SOURce]:VOLTage[1|2]:LIMit:STATe`

Form Set & Query

Parameter ON | OFF | 1 | 0

***RST value** 0

Description This command switches the output limits on or off. When you switch on the output limits, you cannot program the output levels beyond the programmed limits, until you switch off the voltage limits. The limits apply whether you program high/low levels or amplitude/offset levels.

NOTE You can switch the limits on and off in both the `[:SOURce]:CURRent` and the `[:SOURce]:VOLTage` subsystems but the current and voltage limits are *not* enabled/disabled independently. The voltage and current limits are always enabled/disabled together.

Example

`:HOLD VOLT`	Enable VOLTAGE subsystem
`:VOLT1:LIM 3V`	Set OUTPUT 1 High level voltage limit to 3 V
`:VOLT1:LIM:LOW 0V`	Set OUTPUT 1 low level voltage limit to 0V
`:VOLT1:LIM:STAT ON`	Switch on OUTPUT 1 limits

Command **:STATus:OPERation**

This command tree accesses the `OPERation` status group. The OPERation status group is *not* used by the instrument therefore this command tree is redundant.

- `:STATus:OPERation[:EVENt]?`
- `:STATus:OPERation:CONDition?`
- `:STATus:OPERation:ENABle`
- `:STATus:OPERation:NTRansition`
- `:STATus:OPERation:PTRansition`

Command **:STATus:PRESet**

Long `:STATus:PRESet`

Form Event

***RST value** Not Applicable

Description This command

- Clears all status group event-registers
- Clears the error queue
- Presets the status group enable-, PTR-, and NTR-registers as follows:

Status Group	Register	Preset value
OPERation	ENABle	0000000000000000
	PTR	0111111111111111
	NTR	0000000000000000
QUEStionable	ENABle	0000000000000000
	PTR	0111111111111111
	NTR	0000000000000000

Command **:STATus:QUEStionable**

Long `:STATus:QUEStionable[:EVENt]?`

Form Query

***RST value** Not Applicable

Description This command tree accesses the QUEStionable status group. The QUEStionable status group contains warning bits for voltage, current, time and frequency parameters. A warning occurs when the output signal *could* be out of specification due to the combined specification uncertainties of many parameters, although all parameters are set within their individually specified limits. If a parameter is set outside its specified limits an error is generated.

This command reads the event register in the QUEStionable status group.

Command	**:STATus:QUEStionable:CONDition?**
Long	`:STATus:QUEStionable:CONDition?`
Form	Query
***RST value**	Not Applicable
Description	This command reads the condition register in the QUEStionable status group.

Command	**:STATus:QUEStionable:ENABle**
Long	`:STATus:QUEStionable:ENABle`
Form	Set & Query
Parameter	Numeric
***RST value**	Not affected by *RST
Specified limits	0 to 32767
Description	This command sets or queries the enable register in the QUEStionable status group.

Command	**:STATus:QUEStionable:NTRansition**
Long	`:STATus:QUEStionable:NTRansition`
Form	Set & Query
Parameter	Numeric
***RST value**	Not applicable
Specified limits	0 to 32767
Description	This command sets or queries the negative-transition register in the QUEStionable status group.

Command	**:STATus:QUEStionable:PTRansition**
Long	`:STATus:QUEStionable:PTRansition`
Form	Set & Query
Parameter	Numeric
***RST value**	Not applicable
Specified limits	0 to 32767
Description	This command sets or queries the positive-transition register in the QUEStionable status group.

Command	**:SYST:CHEC**
Long	`:SYSTem:CHECk[:ALL][:STATe]`
Form	Set & Query
Parameter	OFF | 0
***RST value**	1
Description	Use this command to switch the instrument's error checking off. Switch off the error checking if you want to improve the programming speed of the instrument, but remember that no invalid parameter or mode settings will be detected and reported. Error checking is switched on by the *RST command, or when default setting is invoked (*RCL 0).

Command	**:SYST:ERR?**
Long	`:SYSTem:ERRor?`
Form	Query
***RST value**	Not Applicable
Description	Use this command to read the instrument error queue. The instrument error queue can store up to 30 error codes on a first-in-first-out basis. When you read the error queue, the error number and associated message are put into the instrument's output buffer.

If the queue is empty, the value 0 is returned, meaning “No Error”. If the queue overflows at any time, the last error code is discarded and replaced with -350 meaning “Queue overflow”.

Example

```
:SYS:ERR?                    Query for errors
```

Printer output example:

```
-222 "Data out of range" overlap at output 1: Width>Double
Delay
```

The above message is an example of a customized description. Generic descriptions are available in the SCPI 1995 Command Reference, items 21.8.4 to 21.8.11.

Command **:SYST:PRES**

Long `:SYSTem:PRESet`

Description Same as *RST

Command **:SYST:SET**

Long `:SYSTem:SET`

Form Set & Query

Parameter Block data

***RST value** Not applicable

Description In query form, the command reads a block of data containing the instrument's complete set-up. The set-up information includes all parameter and mode settings, but does not include the contents of the instrument setting memories, or the status group registers. The data is in a binary format, not ASCII, and cannot be edited.

In set form, the block data must be a complete instrument set-up read using the query form of the command.

Command **:SYST:VERS?**

Long `:SYSTem:VERSion?`

Form Query

***RST value** "1992.0"

Description This command reads the SCPI revision to which the instrument complies.

Command **:TRIG:COUNt**

Long `:TRIGger[:SEQuence[1]]:COUNt`

Form Set & Query

Parameter Numeric

***RST value** +1

Specified limits

`:DIG:PATT OFF:`	1 to 65536
`:DIG:PATT ON:`	2 to 16384

Description Use this command to set/read the number of trigger events (pulse periods) to be generated for each arming event.

Pulse (stream) mode	Set a **trigger count of 1** so that a single pulse period is generated for each arming event.
Burst mode	Set a **trigger count of 2 to 65536** so that a burst of 2 to 65536 pulse periods is generated for each arming event. Switch off pattern mode so that a pulse (or double pulse) is generated in each pulse period (`:DIG:PATT OFF`).
Pattern mode	Set a **trigger count of 2 to 16384** so that a burst of 2 to 16384 pulse periods is generated for each arming event. Switch on pattern mode so that the pattern memory is used to generate the pulses (`:DIG:PATT ON`).

Examples To set up a continuous pattern of NRZ pulses at Out1, with a 512 bit pattern length:

`:ARM:SOUR IMM`	Set CONTINUOUS arming
`:TRIG:COUN 512`	Pattern length 512
`:TRIG:SOUR INT1`	Pulse-period trigger from internal osc
`:DIG:PATT ON`	Enable pattern operating mode
`:DIG:SIGN1:FORM NRZ`	Set OUTPUT 1 data to NRZ

To set up a triggered burst of 16 single pulses at Out1, each burst triggered by a positive edge at the EXT INPUT:

`:ARM:SOUR EXT1`	Set arming from EXT INPUT
`:ARM:SENS EDGE`	Set arming on edges
`:ARM:SLOP POS`	Set arming on positive edges
`:TRIG:COUN 16`	Burst length 16
`:TRIG:SOUR INT1`	Pulse-period trigger from internal osc.
`:DIG:PATT OFF`	Disable pattern operating mode
`:PULS:DOUB1 OFF`	Ensure single pulses at OUTPUT 1

To set up gated pulses single pulses at Out1, gated by a positive level at the EXT INPUT:

`:ARM:SOUR EXT1`	Set arming from EXT INPUT
`:ARM:SENS LEV`	Set arming on levels
`:ARM:SLOP POS`	Set arming on positive level 1 pulse period
`:TRIG:COUN 1`	Single pulse output mode
`:TRIG:SOUR INT1`	Pulse-period trigger from internal osc.
`:DIG:PATT OFF`	Disable pattern data
`:PULS:DOUB1 OFF`	Ensure single pulses at OUTPUT 1

Command **:TRIG:IMP**

Long `:TRIGger:IMPedance`

Form Set & Query

Parameter Numeric

Parameter Suffix OHM with engineering prefixes, for example MOHM is Megaohms.

***RST value** 50 Ω

Specified Limits 50 Ω or 10 kΩ

Description Use this command to program the input impedance of the CLK IN connector. Note that only two settings are available. If you try to program any other value, it will be rounded to one of the specified values.

Example

`:TRIG:IMP 50OHM`	Set CLK IN impedance to 50 Ω
`:TRIG:LEV 2.5V`	Set CLK IN threshold to 2.5 V
`:TRIG:SOUR EXT2`	Pulse-period trigger from CLK IN

Command	**:TRIG:LEV**
Long	`:TRIGger:LEVel`
Form	Set & Query
Parameter	Numeric
Parameter Suffix	V with engineering prefixes.
***RST value**	1.0 V
Specified Limits	–10 V to +10 V
Description	Use this command to program the triggering threshold of the CLK IN connector.
Example	`:TRIG:IMP 50OHM` Set CLK IN impedance to 50 Ω `:TRIG:LEV 2.5V` Set CLK IN threshold to 2.5 V

Command	**:TRIG:SLOP**
Long	`:TRIGger:SLOPe`
Form	Set & Query
Parameter	POSitive | NEGative
***RST value**	POS
Description	Use this command to select the trigger slope for the pulse period triggering signal applied to the CLK IN connector.

Command **:TRIG:SOUR**

Long :TRIGger:SOURce

Form Set & Query

Parameter IMMediate | INTernal[1] | INTernal2 | EXTernal2

***RST value** IMM

Description Use this command to select the pulse period source by selecting the source of the pulse period trigger signal:

Pulse-period sources set by `:TRIG:SOUR`

Pulse-period source	**:TRIG:SOURce**
`internal osc`	IMMediate INTernal[1]
`internal PLL`	INTernal2
`CLK IN`	EXTernal2

3 Specifications

In this chapter you will find the specifications of the Agilent E8305A Pulse Generator.

NOTE **Warranted Performance**

Specifications describe the instrument's warranted performance. Non-warranted values are described as typical. All specifications apply after a 30 minute warm-up phase with a 50 Ohm or a 75 Ohm load resistance. They are valid from 0 °C to 50 °C ambient temperature.

Declaration of Conformity

Manufacturer

Agilent Technologies
Boeblingen Verification Solutions
Herrenberger Str.130

D-71034 Boeblingen, Germany

We declare that the system:

HP E8305A 250 MHz Pulse Generator (VXI-Plugin)

conforms to the following standards:

Safety Standard

IEC 1010-1:1990 +A1:1992 +A2:1995 EN61010-1:1993

EMC Standard

EN 55011:1991 / CISPR 11 Group 1, Class B
EN 55011:1991 / CISPR 11 Group 1, Class A
EN 61000-4-2:1995 ESD: 4kVcd; 8 kVad; 4kV c.p.
EN 61000-4-3:1995 Radiated Immunity: 3V/m 80%AM
ENV 50204: 1995 Radiated Immunity: 3V/m; 50%Dty

Supplementary Information

The product herewith complies with the requirements of the

- Low Voltage Directive (73/23/EEC) and the
- EMC Directive (89/336/EEC).

During the measurements against EN55011, the I/O ports were terminated with their nominal impedance, the GP-IB connection was terminated with the cable Agilent 10833B.

When the product is connected to other devices, the user must ensure that the connecting cables and the other devices are adequately shielded to prevent radiation.

A Technical Construction File (TCF) got a certificate (#B800300-1/98) from a Competent Body. For installations in an EU country, the site attenuation requirements must be attended to.

Boeblingen, March 09th 1999

Wolfgang Fenske
Regulation Consultant

Agilent E8305A Specifications

General

Environmental Conditions

Operating temperature range:	0 °C to +50 °C
Specified temperature range:	0 °C to +50 °C
Storage temperature:	–40 °C to +70 °C
Humidity:	35% to 95% r.h. up to 40 °C ambient temperature
Non-operating altitude range:	up to 12000 m
Operating altitude range:	up to 3000 m
Installation:	Category II
Pollution:	Degree 2
EMC:	Radiated interference is compliant with MIL/STD461C plus 10dB at frequencies > 200 MHz

Safety

IEC1010, CSA1010

Power requirements

DC Volts	Maximum Currents (Dynamic Currents)
+24 V	0.65 A (0.02 A)
+12 V	1.2 A (0.50 A[a])
+5 V	1.5 A (0.25 A)
–2.0 V	0.6 A (0.05 A)
–5.2 V	5.0 A (0.35 A)
–12 V	0.85 A (0.04 A)
–24 V	0.7 A (0.50 A[a])

[a] The dynamic current is typically 1.25 of the sum of the currents at the main outputs.

Power consumption: 82 VA max.

Size

VXI One-Slot C-size

Weight

Net

1.8 kg

Shipping

2.7 kg

Recalibration period

1 year recommended

Warranty

3 years standard

Cooling Requirements

For 15 °C rise 4.5 liters/second 0.9 mm H_2O.

Timing

Glitch-free timing changes

You can sweep your timing values without danger of spurious pulses or drop-outs that could cause measurement errors. This applies to continuous mode with timing values < 100 ms (frequency: > 10 Hz), and consecutive values between one-half and twice the previous value.

Period

Period can also be entered as frequency.

Period	Value
Range:	4 ns to 1000 s
Resolution:	3.5 digits, 5 ps best case for VFO 4 digits, 1 ps best case for PLL
Accuracy: (add ± 100 ps in burst mode)	PLL: 0.01% VFO: 0.5% after selfcal, typical 5% w/o selfcal
RMS-jitter:	PLL: 0.001% + 15 ps VFO: 0.01% + 15 ps
Frequency range:	1.00 mHz to 250 MHz

There are 2 period generation sources available:

- startable oscillator (variable frequency oscillator VFO) with fixed latency from trigger input to outputs.
- high-accuracy frequency generator (PLL) .

Width

Range:	2 ns to 900 s (2 ns to 0.9 * Period – 1.6 ns)
Resolution:	3.5 digits, best case 5 ps
Accuracy:	± 0.5% ± 250 ps after selfcal, typical ± 5.0% ± 250 ps w/o selfcal
RMS-jitter:	0.01% + 15 ps
Duty cycle:	0.1% to 90% (width and period limitations apply)

Delay

Measured between trigger output at frontpanel and main output.

Fixed delay:	11 ns typical
Additional variable range:	0.00 ns to 900.0 s (0 ns to 0.9*Period – 2.6 ns)
Resolution:	3.5 digits, best case 5 ps
Accuracy:	± 0.5% ± 1.0 ns after selfcal, typical ± 5.0% ± 1.0 ns w/o selfcal
RMS Jitter:	0.01% + 15 ps

Double Pulse Delay

Double pulse delay and delay are mutually exclusive. Double pulse delay is the delay between the two pulses in Double Pulse mode.

Double pulse delay range:	4 ns to 900 s (4 ns to 0.9*Period – 3.2 ns at min. width)
Accuracy:	± 0.5% ± 250 ps after selfcal, typical ± 5.0% ± 250 ps w/o selfcal
Resolution:	3.5 digits, best case 5 ps
RMS Jitter:	0.01% + 15 ps
Minimum period:	8 ns

Specifications for Output Channels

All parameters are measured in Continuous mode at 75 Ω differential load impedance and 35 mA (typical) bias current.

Level Parameters	
Type:	differential outputs (only normal *or* complement output can be enabled at the same time)
Source impedance:	50 Ω ± 1 Ω
Maximum external voltage:	±12 V
Short circuit current:	±200 mA
Normal/complement:	selectable
ON/OFF:	relays connect/disconnect output (HiZ)
Limits:	high and low levels can be limited to protect the DUT
Level Specifications	
Amplitude:	100 mVpp to 5.0 Vpp (doubles into open)
Level Window:	–5.0 V to +5.0 V (doubles into open)
Level Accuracy:	± (1% of Amplitude + 50 mV)
Resolution:	10 mV

NOTE Instrument disables outputs if levels exceed ±12V

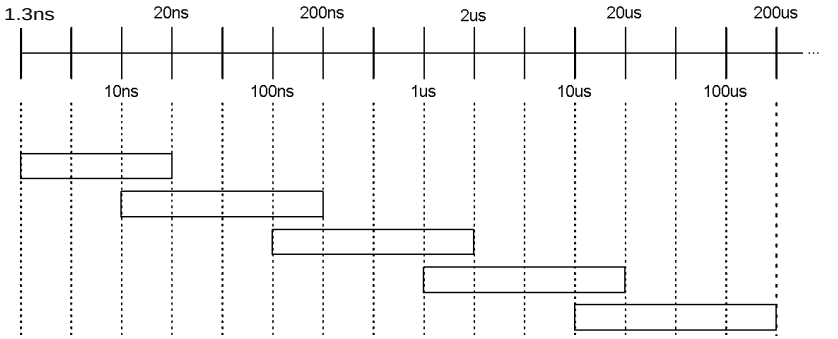
For loads ≠ 50 Ω, the actual load impedance can be entered to correct the output values into a static load.

Transition Times	
Range:	1.3 ns to 200 µs
Min. transition:	≤ 1.5 ns 900 ps typical for ECL levels (20% to 80% of amplitude)
Accuracy:	±10% ± 300 ps
Linearity:	3% typical for transitions > 100 ns
Resolution:	3 digits

Skew between differential outputs of one channel	< 200 ps (fastest transition)
Pulse Performance	
Overshoot:	± 10% of amplitude ± 20 mV
Ringing:	± 10% of amplitude ± 20 mV
Preshoot:	± 5% of amplitude ± 20 mV
Settling time:	30 ns typical

NOTE At pulses smaller than the settling time the output amplitude may decrease by 10 % of programmed value.

Leading and trailing edges can be programmed independently within the following ranges (maximum ratio 1:20):



PLL Ref In/CLK In

It is possible to select between three clock sources: the startable oscillator (VFO), the PLL, or External Clock. In Triggered Mode the PLL can be used as the trigger source for the VFO, without the need of an additional source.

Clock Input/ PLL Reference Inputs

Input impedance (selectable):	50 Ω ± 2.5 Ω; 10 kΩ typical
Threshold:	–10 V to + 10 V
Threshold resolution:	10 mV
Maximum input voltage:	± 10 V
Input transitions:	< 100 ns
Input Frequency:	dc to max 250 MHz
Minimum pulse width:	1.5 ns
Input sensitivity:	≤ 300 mVpp
Delay clock input to trigger out frontpanel:	12 ns typical

Phase Locked Loop (PLL)

- Locks either to an external frequency reference at the PLL Ref Input Clk In (5 MHz or 10 MHz selectable) or to its internal reference.
- High accuracy period (frequency) source.
  - When locked to the internal reference, period accuracy, range, resolution, and jitter are improved.
  - When locked to an external frequency reference, the external frequency affects these accuracies.
- Internal triggering of bursts and patterns: the internal PLL can replace an external trigger source, while the output period is determined by the normal internal oscillator.

External Clock

- The output period is determined by the signal at clock input. Frequency accuracy can be increased by using a precise external clock.
- The input frequency can be measured.

Output Modes

Pulses Mode

The output signal consists of single or double pulses, controlled by the Trigger mode.

Burst Mode

The output signal consists of bursts of single or double pulses, controlled by the Trigger mode.

Burst count:	2, 3, 4 to 65.536
Format:	single or double pulses
Space between bursts:	> 5 ns typical

Pattern Mode

The output signal consists of patterns of RZ or NRZ pulses, controlled by the Trigger mode.

Pattern length:	2, 3, 4 to 16.384 bits/channel and TRIGGER OUT
Format:	RZ (return-to-zero) NRZ (non-return-to-zero)
Random pattern:	PRBS 2^n –1, n = 7 to 14

Trigger Modes

Continuous

Generate continuous pulses, double pulses, bursts or patterns.

Externally Triggered

Each active input transition (rising, falling or both) triggers a single or double pulse, a burst or a pattern.

The trigger source can be selected from:

- External Input
- µP (*TRG)
- internal PLL
- 8 VXI backplane trigger lines TTL
- 2 VXI backplane trigger lines ECL

Externally Gated

The active input level (high or low) enables pulses, double pulses, bursts or patterns. The last pulse, double pulse, burst or pattern is always completed.

The gate source can be selected from:

- External Input
- µP (*TRG Command)
  After the command is sent to the instrument, the gate will be open for 10 ns typically.
- 8 VXI backplane trigger lines TTL
- 2 VXI backplane trigger lines ECL

External Width

To recover a pulse shape of an external signal, applied to the External Input or to the VXI trigger lines, the period and width are maintained, levels and transitions can be set.

External Input

Input impedance (selectable):	50 Ω ± 2.5 Ω; 10 kΩ typical
Threshold:	–10 V to +10 V
Maximum input voltage:	±10 V
Input transitions:	< 100 ns
Input Frequency:	dc to max. 250 MHz
Minimum pulse width:	1.5 ns
Input sensitivity:	≤ 300 mVpp
Delay to Trigger out Frontpanel	
External width	9 ns typical
Triggered, gated with internal VCO	12 ns typical

Trigger Output

The trigger output signal can be sent to:

- Trigger out frontpanel
- 8 VXI backplane trigger lines TTL
- 2 VXI backplane trigger lines ECL

NOTE Only one of the VXI trigger lines can be active at a time.

NOTE The TTL trigger lines on the VXI backplane are low-active.

Level (selectable only for trigger output at frontpanel):	TTL (HIL: 2.45 V LOL: 0.00 V typical) ECL (HIL: 0.75 V LOL: –1.75 V typical) STA (HIL: 0.00 V LOL: –1.00 V typical)
Output impedance:	50 Ω ± 2.5 Ω
Trigger pulse width:	
Continuous mode	50% of period typical
Triggered mode	2 ns typical
External Width mode	Recovered from External Input
Maximum external voltage:	–2 V / +7 V
Transition times:	< 1 ns
Modes:	
Continuous	Marks each pulse generated
Burst (selectable)	Marks each pulse generated or each burst
Pattern	Marks each pulse generated or each pattern up to 6,384 bits NRZ

VXI Backplane Trigger Lines

Delay from Trigger out Frontpanel to next slot	
Backplane ECL	1 ns typical
Backplane TTL	11 ns typical

NOTE Delay will vary with the load of the connected modules at the backplane.

NOTE The TTL trigger lines on the VXI backplane are low-active.

Remote Control

Register-based VXI interface. Access only by message-based driver library.

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