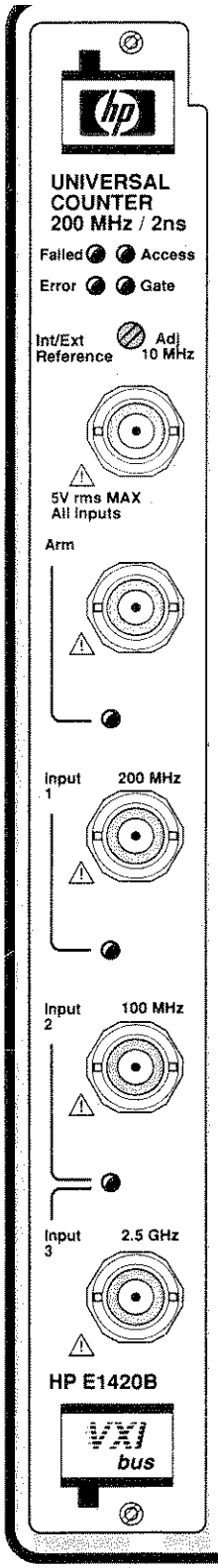

HP E1420B

QUICK REFERENCE GUIDE

Provides the following:

- **START-UP/VERIFICATION**
- **PARAMETER TYPES**
- **ERROR MESSAGES AND CODES**
- **INITIALIZATION DEFAULTS**
- **COMMON COMMAND SUMMARY**
- **SCPI COMMAND SUMMARY**

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HP PART NUMBER: E1420-90022

HP E1420B SCPI Command Summary

:(ROOT)	KEYWORD/SYNTAX	PARAMETER FORM	CHANNEL NUMBER
	ABORt[1|2|3]		1,2,3
ARM Subsystem	**ARM**		
	[:SEQuence[1]|:STAt|]		
	:SEQuence2|:STOP		
	[:LAYer[1]]		
	[:IMMediate]		
	:LEVel	<value|MINimum|MAXimum|DEFault>	
	:LEVel?	[<MINimum|MAXimum|DEFault>]	
	:SLOPe	<POSitive|NEGative>	
	:SLOPe?		
	:SOURce	<EXTernal|IMMediate|BUS| HOLD|TTLTrig<n>> n= 0-7	
	:SOURce?		
CONFigure Subsystem	**CONFigure[1|2|3]**		
	[:VOLTage]		
	:AC	[<expected value>[,<resolution>]]	1,2
	:DC	[<expected value>[,<resolution>]]	1,2
	:FREQuency	[<expected value>[,<resolution>]]	1,2,3
	RATio	[<expected value>[,<resolution>]]	1,2,3
	:FTIMe		
	-or-		
	:FALL		
	:TIME	[<lower reference>[,<upper reference> [,<expected value>[,<resolution>]]]]	1
	:MAXimum	[<expected value>[,<resolution>]]	1,2
	:MINimum	[<expected value>[,<resolution>]]	1,2
	:NWIDth	[<reference>[,<expected value> [,<resolution>]]]	1,2
	:PERiod	[<expected value>[,<resolution>]]	1,2,3
	:PWIDth	[<reference>],<expected value> [,<resolution>]]]	1,2
	:RTIMe		
	-or-		
	:RISE		
	:TIME	[<lower reference>[,upper reference> [,<expected value>[,<resolution>]]]]	1
	:TINTerval	[<expected value>[,resolution>]]	1
	:TOTalize	[<expected value>[,resolution>]]	1
	CONFigure[1|2|3]?		

DIAGnostics Subsystem

DIAGnostics		
:CALibrate		
:OFFSet?	<BOTH>	
:FULLscale?	<BOTH>	
:ASSembly		
[:ALL]?		
:A1?		
:A2?		
:BLOCk		
[:ALL]?		
:CALRam?		
:ROM?		
:RAM?		
:COUNtchain		
[:ALL]?		
:CONNector?		
:INTerpolat?		
:DINTerpolat?		
:MRC?		
:TIMebase?		
:READ		
:INT?	<STS|SPS|STL|SPL|STARt|STOP|CAL|ALL>	
:MRC?	<EREG|TREG|ALL>	
:UFAIL[?]	<OFF|0|ON|1>	

FETCh Subsystem

FETCh[1|2|3]		
[:<function>]?		1,2,3

INITiate Subsystem

INITiate[1|2|3]		
[:IMMediate]		
:CONTinuous	<OFF|0|ON|1>	
:CONTinuous?		

INPut Subsystem

INPut[1|2]		
:ATTenuation	<value|MINimum|MAXimum|DEFault>	1,2
:ATTenuation?	[<MINimum|MAXimum|DEFault>]	1,2
:COUPling	<AC|DC>	1,2
:COUPling?		1,2
:IMPedance	<value|MINimum|MAXimum|DEFault>	1,2
:IMPedance?	[<MINimum|MAXimum|DEFault>]	1,2
:ROUTe	<COMMon|SEParate>	1
:ROUTe?		1,2

MEASure Subsystem

MEASure[1|2|3]

[:VOLTage]		
:AC?	[<expected value>[,<resolution>]]	1,2
:DC?	[<expected value<[,<resolution>]]	1,2
:FREQuency?	[<expected value>[,<resolution>]]	1,2,3
:RATio?	[<expected value>[,<resolution>]]	1,2,3
:FTIMe?		
-or-		
:FALL		
:TIME?	[<lower reference>[,<upper reference>[,expected value>,[<resolution>]]]]	1
:MAXimum?	[<expected value>[,<resolution>]]	1,2
:MINimum?	[<expected value>[,<resolution>]]	1,2
:NWIDth?	[<reference>[,<expected value>[,<resolution>]]]	1,2
:PERiod?	[<expected value>[,<resolution>]]	1,2,3
:PWIDth?	[<reference>[,<expected value>[,<resolution>]]]	1,2
:RTIMe?		
-or-		
:RISE		
:TIME?	[<lower reference>[,<upper reference>[,<expected value>[,<resolution>]]]]	1
:TINTerval?	[<expected value>[,<resolution>]]	1

MEMory Subsystem

Option 040, Shared Memory (Refer to the E1420B User's Manual, E1420-90014)

OUTPut Subsystem

OUTPut

:TTLTrg<n> N= 0-7		Backplane
[:STATe]	<OFF|0|ON|1>	Trigger Lines
[:STATe]?		
:ROSCillator		Int/Ext
[:STATe]	<OFF|0|ON|1>	Reference
[:STATe]?		

READ Subsystem

READ[1|2|3]

[:<function>]?		1,2,3

SENSe Subsystem

[SENSe[1|2|3]]		
:AVERage		
[:STATe]	<OFF|0|ON|1>	
[:STATe]?		
:COUNt?		
:EVENt		
:LEVel		
[:ABSolute]	<value|MINimum|MAXimum|DEFault>	
[:ABSolute]?	[<MINimum|MAXimum|DEFault>]	
:AUTO	<OFF|0|ON|1|ONCE>	
:AUTO?		
:RELative	<value|MINimum|MAXimum|DEFault>	
:RELative?	[<MINimum|MAXimum|DEFault>]	
:SLOPe	<POSitive|NEGative>	
:SLOPe?		
:HYSTeresis	<MINimum|MAXimum|DEFault>	
:HYSTeresis?		
:FREQuency		
:APERture	<value|MINimum|MAXimum|DEFault>	1,2,3
:APERture?	[<MINimum|MAXimum|DEFault>]	1,2,3
:RANGe		1
[:UPPer]	<value|MINimum|MAXimum|DEFault>	
[:UPPer]?	[<MINimum|MAXimum|DEFault>]	
:AUTO	<OFF|0|ON|1>	
:AUTO?		
:FUNCtion	"[VOLTage:]AC"	1,2
	"[VOLTage:]DC"	1,2
	"[VOLTage:]FREQuency"	1,2,3
	"[VOLTage:]FREQuency:RATio"	1,2,3
	"[VOLTage:]FTIMe"	1
	"[VOLTage:]FALL:TIME"	1
	"[VOLTage:]MAXimum"	1,2
	"[VOLTage:]MINimum"	1,2
	"[VOLTage:]NWIDth"	1,2
	"[VOLTage:]PERiod"	1,2,3
	"[VOLTage:]PWIDth"	1,2
	"[VOLTage:]RTIMe"	1
	"[VOLTage:]RISE:TIME"	1
	"[VOLTage:]TINTerval"	1,2
	"[VOLTage:]TOTalize"	1,2
:FUNCtion?		1,2,3
:PERiod		
:APERture	<value|MINimum|MAXimum|DEFault>	1,2,3
:APERture?	[<MINimum|MAXimum|DEFault>]	1,2,3
:RATio		
:APERture	<value|MINimum|MAXimum|DEFault>	1,2,3
:APERture?	[<MINimum|MAXimum|DEFault>]	1,2,3
:ROSCillator		
:SOURce	<INTernal|EXTernal|CLK10>	Int/Ext Reference
:SOURce?		
:TINTerval		
:DELay		
[:STATe]	<OFF|0|ON|1>	
[:STATe]?		
:TIME	<value|MINimum|MAXimum|DEFault>	
:TIME?	[<MINimum|MAXimum|DEFault>]	
:TOTalize		
:GATE		
[:STATe]	<OFF|0|ON|1>	
[:STATe]?		
:POLarity	<NORMal|INVerted>	
:POLarity?		
:SOURce?		

STATus Subsystem

STATus	
:OPERation	
:CONDition?	
:ENABle	<value>|<non-decimal numeric>
:ENABle?	
[:EVENt]?	
:QUEStionable	
:CONDition?	
:ENABle	<value>|<non-decimal numeric>
:ENABle?	
[:EVENt]?	
:PRESet	

SYSTem Subsystem

SYSTem	
:ERRor?	
:PIMacro	<string>
:VERSion?	<string>

— See other side for IEEE 488.2 Common Commands (available at any time). —

Start-Up/Verification

Verify the counter with the following procedures:

1. Power-up the controller if this is separate from the VXIbus mainframe.
2. Power-up the VXIbus mainframe and verify Slot 0 functionality. (If present, the Slot 0 module must be correctly set-up, functional, and pass its own self-test.
3. Observe that the "Failed" LED on the HP E1420B is lit, then extinguishes after a few seconds indicating successful completion of Self-test. The counter is now in the power-on state and is ready for use.

In Case Of Difficulty

If the counter fails to successfully complete Self-test, doublecheck the following items:

- System controller present and operational (passes own self-test),
- Slot 0 module present and operational (passes own self-test),
- VXIbus C sized cardcage present and operational (cooling and power supplies OK),
- HP-IB connection between controller and VXIbus cardcage present and operational.
- HP E1420B front-panel Access LED is lit momentarily to indicate correct Bus addressing of the E1420B Universal Counter.
- HP E1420B present and operational (passes own self-test and reports results back to Slot 0 module/systems controller),
- Syntactically correct Common/SCPI command messages sent to HP E1420B via BASIC over the HP-IB and VXIbus interface.
- Correct use of the particular instrument control language to transfer commands from the controller to the HP E1420B counter. (Refer to pg. 3-2/4 of the HP E1420B User's Manual for more information.)
- Verify that the signal inputs to the counter's front-panel BNC connectors are present and that a 10-MHz reference timebase signal is connected to the Int/Ext Reference BNC.
- Ensure that the programmed SCPI commands are in fact triggering counter measurements as input signal events occur indicated by associated Input BNC trigger LEDs.

HP E1420B Parameter Types

TYPE	EXPLANATIONS AND EXAMPLES
Numeric:	Accepts all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation: 123, 123E2, -123, -1.23E2, .123, 1.23E-2, 1.23000E-01. Special cases include MIN, MAX, and DEF. MIN selects minimum value available, MAX selects maximum value available, and DEF selects the default or reset value. Queries on MIN, MAX, or DEF results in an associated numeric value. All decimal types also accept MIN, MAX, or DEF, and can be queried with them to produce a numeric value.
Boolean:	Represents a single binary condition that is either true or false: 1 or ON, 0 or OFF.
Discrete:	Selects from a finite number of values. These parameters use mnemonics to represent each valid setting. An example is the ARM:SOURce <source> command where source can be BUS, TTLTrg<n>, Hold, IMMediate, or EXTernal.

HP E1420B Error Messages and Codes

CODE	MESSAGE	CAUSE
-100	Command error	
-101	Invalid character	Unrecognized character in specified parameter
-102	Syntax error	Command missing space/comma between parameters
-103	Invalid separator	Command parameter separately by space not comma
-104	Data type error	Wrong data type specified in parameter
-105	GET not allowed	Group Execute Trigger was received
-108	Parameter not allow	Parameter specified in parameterless command
-109	Missing parameter	Parameter missing in entered command
-112	Program mnemonic too long	Header contains more than 12 characters
-113	Undefined header	Command header incorrectly specified
-121	Invalid character in number	Entered character for numeric data is incorrect
-123	Numeric overflow	Exponent larger than 32000
-124	Too many digits	More than 256 digits specified
-128	Numeric data not allowed	Number specified for parameter not letter
-131	Invalid suffix	Parameter suffix incorrectly specified, (e.g. 50 M instead of 50 MHz)
-138	Suffix not allowed	Parameter suffix specified when not allowed
-141	Invalid character data	Parameter type specified not allowed (e.g. data "MEAS:FREQ HIGH" instead of "MEAS:FREQ MAX")
-144	Character data too long	Character data element has more than 12 characters
-148	Character data not allowed	Entered character data not recognized by counter
-150	String data error	Entered string data contained a non-specific error
-151	Invalid string data	Entered string data syntax invalid
-158	String data not allowed	String data encountered but not allowed
-160	Block data error	Entered block data contained a non-specific error
-161	Invalid block data	Entered block data syntax invalid
-168	Block data not allowed	Block data encountered but not allowed
-170	Expression error	Entered expression contained a non-specific error
-171	Invalid expression	Entered block data syntax invalid
-178	Expression data not allowed	Expression data encountered but not allowed
-180	Macro error	Entered macro command or parameter contained a non-specific error
-181	Invalid outside macro definition	Macro parameter placeholder encountered outside a macro definition
-183	Invalid inside macro definition	Program message sent with *DMC is syntactically invalid
-200	Execution error	Requested measurement is not available
-201	Invalid while in local	Command not executeable while device in local
-204	Channel not configured for measurement	Appropriate channel was not set up for the requested measurement
-205	Arming configuration conflict	External arm source inconsistent for start and stop within the same program message
-206	Measurement has not been initiated	Executed FETCh? without initiating measurement for new configuration
-207	Invalid totalize	Totalize on channel 2 (totalize on 1 or totalize 2 by 1)
-208	Value out of range	Calculated parameter outside allowed range
-209	Data clipped to limit	Entered parameter(s) outside of range - data truncated at limit
-212	ARM ignored	ARM:IMMediate set without being INITialized
-213	INIT ignored	Another measurement already in progress
-215	Arm deadlock	Attempted FECh? while arming was in HOLD or BUS mode
-221	Settings Conflict	Requested configuration conflicts with one or more current setting(s)
-222	Data out of range	Specified parameter value too large/small
-223	Too much data	Excess data for memory/device-specific process requirements
-224	Illegal parameter value	Specific numeric value not allowed
-230	Data corrupt or stale	New measurement started but not completed since last access
-231	Data questionable	Measurement accuracy is suspect
-240	Hardware error	Execution error due to hardware fault
-241	Hardware missing	Option 010 or 030 not installed
-270	Macro error	Non-specific execution related macro error
-271	Macro syntax error	Illegal macro syntax entered
-272	Macro execution	Macro execution error due to macro definition error
-273	Illegal macro label	Entered macro label not accepted by device
-274	Macro parameter error	Macro definition contains improperly used macro parameter
-276	Macro recursion error	Device found macro recursive
-277	Macro redefinition not allowed	Macro label already defined
-301	Exceeded shared memory	Allotted VXIbus shared memory space is full
-310	System error	Non-specific system error has occured
-331	Selftest failed; EPROM checksum failure	Specific hardware failed
-332	Selftest failed; RAM failure	Specified hardware failed
-333	Selftest failed; Clock 10 failed	Specified hardware failed
-334	Selftest failed; Front-end failed	Specified hardware failed
-335	Seltest failed; Calibration RAM failure	Specified hardware failed
-350	Too many errors	The error queue is full - more than 30 errors have occured
-400	Query error	
-410	Query interrupted	Data not read from output buffer before another command was executed
-420	Query unterminated	Command generating data unable to complete due to configuration error
-430	Query deadlock	Command cannot complete output due to controller request for input

HP E1420B Initialization State

SUBSYSTEM	COMMAND/ PARAMETER	STATE
INPut	ATTenuation	x1
	COUPling	dc
	IMPedance	50Ω
	ROUTe	SEParate
ARM	EXTernal:LEVel	1.6V (TTL)
	STARt:SLOPe	NEGative
	STARt:SOURce	IMMediate
	STOP:SLOPe	NEGative
	STOP:SOURce	IMMediate
SENSe (also, CONFigure and MEASure)	APERture	100 ms
	Auto Trigger State	OFF
	AVERage:STATe	OFF
	TINT:DELay:STATe	OFF
	TINT:DELay:TIME	100 ms
	EVENt:LEVel (Trigger level)	0 volts
	EVENt:SLOPe	POSitive
	FUNCtion	FREQuency
	HYSTeresis	"DEF"
	Input Channel	1
	CH1 Prescaling	OFF
	RANGe:AUTO	OFF
	RELative (trigger level)	50%
	ROSCillator:SOURce	CLK10
	TOTalize:GATE:POLarity	NORMAL
	TOTalize:GATE:STATe	OFF
OUTPut	ROSCillator:STATe	OFF
	TTLTrg<n>:STATe	OFF

COMMAND	DESCRIPTION
*CLS	Clears the Status Byte Register, Standard Event Status Register, and error queue.
*DMC	Assigns a sequence of program elements to a Macro label.
*EMC	Enables/disables the execution of macros.
*EMC?	Returns the current enable/disable status of a macro.
*ESE	Enable events in Standard Event Status Register to be reported.
*ESE?	Returns the sum of all enabled bits in the Standard Events Status Register.
*ESR?	Returns the sum of all set bits in the Standard Event Status Register.
*GMC?	Returns the current definition of a macro.
*IDN?	Returns identification string.
*LMC?	Returns the labels of all currently defined macros.
*OPC	Sets bit 0 in the Standard Event Status Register after all pendinding operations complete.
*OPC?	Returns ASCII "1" after all pending operations complete.
*PMC	Purges all currently defined macros.
*RCL	Recalls configuration previously stored via the *SAV command.
*RST	Resets the counter to a known power-on/reset status.
*SAV	Saves the current counter module configuration.
*SRE	Enable Status Register bits to assert SRQ.
*SRE?	Returns sum of enabled status register bits.
*STB?	Returns sum of all bits set in Status Byte Register.
*TRG	Triggers the counter.
*TST?	Executes the counter's internal self-test.
*WAI	Causes the counter to wait until all previous commands or queries complete.