

Programmable DC Electronic Load

PEL-2000A Series

PROGRAMMING MANUAL

GW INSTEK PART NO. Version 1.10



ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

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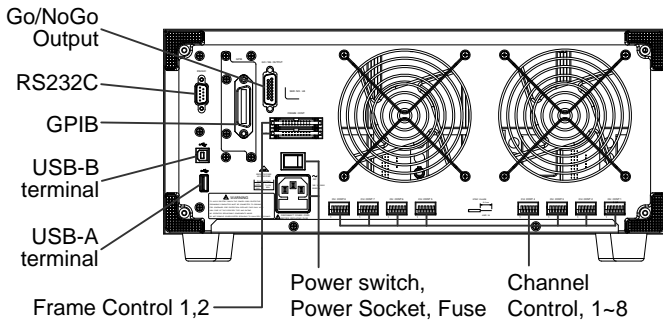
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INTERFACE OVERVIEW

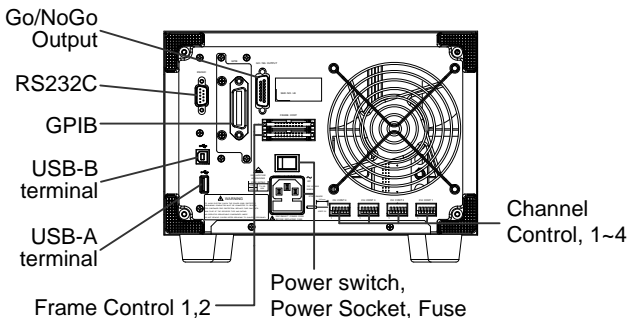
This manual describes how to use the PEL-2000A's remote command functionality and lists the command details. The Overview chapter describes how to configure the PEL-2000A USB/RS232/GPIB remote control interface.

Rear Panel Overview

PEL-2004A



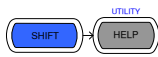
PEL-2002A



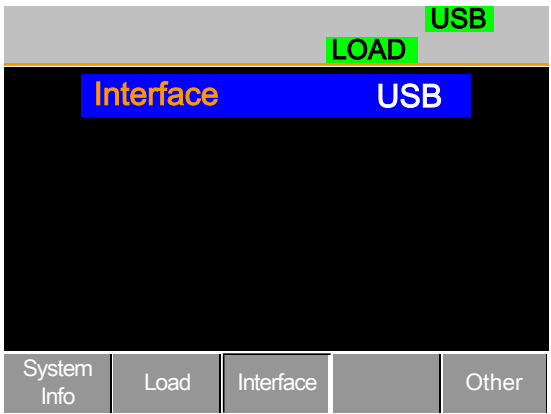
Configuring the USB Interface

USB connection	PC side connector	Type A, host
	PEL-2000A side connector	Type B, device
	Speed	1.1/2.0 (full speed)

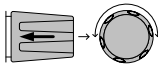
Panel operation 1. Press the Shift Key then the Help key to access the Utility menu.



2. Press F3(Interface Menu).



3. If the interface is not USB, use the selector knob to choose USB.



4. Connect the USB cable to the USB-B slave port on the rear.



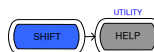
5. When the PC asks for the USB driver, select `pel_cdc_2000.inf` (downloadable from the GW website, www.gwinstek.com, PEL-2000A product corner).
6. On the PC, activate a terminal application such as MTTY (Multi-Threaded TTY). To check the COM port No., see the Device Manager in the PC. For WindowsXP, select Control panel → System → Hardware tab.
7. Run this query command via the terminal application.
`*idn?`
This command should return the manufacturer, model number, serial number, and firmware version in the following format.
GW, PEL-2002/2004, 00000001, V1.00
8. Configuring the command interface is completed. Refer to the other chapters for more details.

RS-232C Interface Configuration

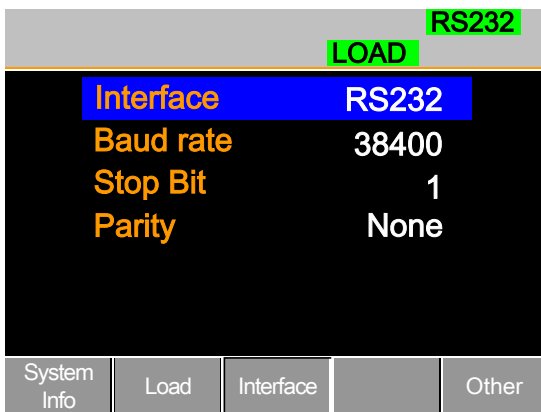
RS-232C configuration	Connector	DB-9, Male
	Baud rate	2400, 4800, 9600, 19200, 38400
	Parity	None, Odd, Even
	Data bit	8 (fixed)
	Stop bit	1, 2

Panel operation

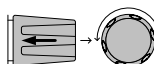
1. Press the Shift Key then the Help key to access the Utility menu.



2. Press the Shift Key then the Help key to access the Utility menu.



3. If the interface is not set to RS232, use the selector knob to change the interface to RS232.



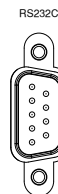
4. Edit the Baud rate, Stop bit and parity.

Baud rate 2400, 4800, 9600, 19200, 38400

Stop Bit Range 1,2

Parity Range None, Odd, Even

5. Connect the RS-232C cable to the rear panel port: DB-9 male connector.



Terminal application

Invoke a terminal application such as MTTTY (Multi-Threaded TTY).

- For RS-232C, set the COM port, baud rate, stop bit, data bit, and parity accordingly.

To check the COM port No. for RS-232C, see the Device Manager in the PC. For WinXP, Control panel → System → Hardware tab.

6. Ensure the terminal application has the following settings;
7. Baud rate – as per PEL-2000A settings
8. Com Port – as per PC settings (Device Manager)
9. Parity – None
10. Data bits – 8
11. Stop bits – None

Functionality check

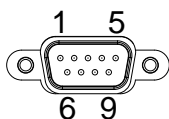
Run this query command via the terminal.

`*idn?`

This should return the Manufacturer, Model number, Serial number, and Firmware version in the following format.

GW, PEL-2002/2004, 00000001, V1.00

Pin assignment



2: RxD (Receive data)

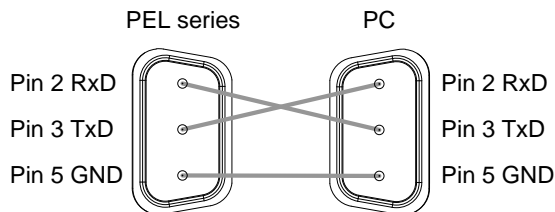
3: TxD (Transmit data)

5: GND

1, 4, 6, 7,8, 9: No connection

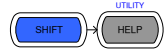
PC connection

Use the Null Modem connection as shown in the diagram below.

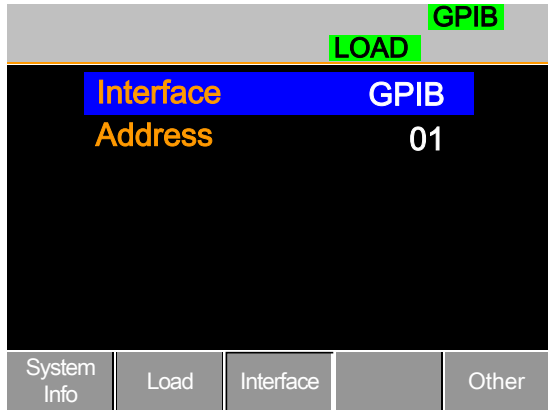


GPIB Interface Configuration

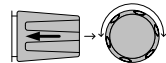
Panel operation 1. Press the Shift Key then the Help key to access the Utility menu.



2. Press F3(Interface Menu).



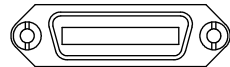
3. If the interface is not set to GPIB, use the selector knob to change the interface to GPIB.



4. Edit the GPIB address.

Range 1 ~ 30

5. Connect the GPIB cable to the rear panel port: 24-pin female connector



- GPIB constraints
- Maximum 15 devices altogether, 20m cable length, 2m between each device
 - Unique address assigned to each device
 - At least 2/3 of the devices turned On
 - No loop or parallel connection

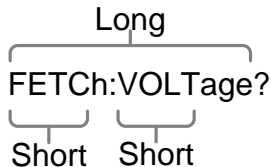
C COMMAND OVERVIEW

The Command overview chapter lists all the PEL-2000A commands and command queries. The command syntax section shows you the basic rules you have to apply when using commands.

Command Syntax

Compatible standard	<ul style="list-style-type: none"> • IEEE488.2, 1992 (fully compatible) • SCPI, 1994 (partially compatible)
Command types	There are a number of different instrument commands and queries. A command sends instructions or data to the electronic load and a query receives data or status information from the electronic load.
Command Types	
Simple	A single command with/without a parameter
Example	*OPC
Compound	Two or more commands separated by a colon (:) with/without a parameter
Example	UTILITY:SOUND 1
Query	A query is a simple or compound command followed by a question mark (?). A parameter (data) is returned.
Example	UTILITY:SOUND?

Command forms Commands and queries have two different forms, long and short. The command syntax is written with the short form of the command in capitals and the remainder (long form) in lower case.



The commands can be written in capitals or lower-case, just so long as the short or long forms are complete. An incomplete command will not be recognized.

Below are examples of correctly written commands.

LONG FETCH:VOLTage? FETCH:VOTAGE?
 fetch:voltage?

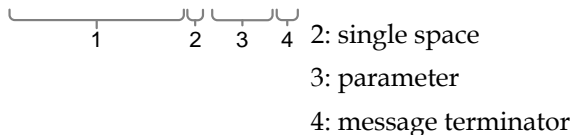
SHORT FETC:VOLT? fetc:volt?

Square Brackets Commands that contain squares brackets indicate that the contents are optional. The function of the command is the same with or without the square bracketed items, as shown below.

Example:

:LOAD[:STATe]
 = :LOAD:STATe
 = :LOAD

Command format :PROGram:CHAIin <NR1>LF 1: command header



Parameter	Type	Description	Example
	<Boolean>	Boolean logic	0, 1
	<NR1>	integers	0, 1, 2, 3
	<NR2>	decimal numbers	0.1, 3.14, 8.5
	<NR3>	floating point	4.5e-1, 8.25e+1
	<NRf>	any of NR1, 2, 3	1, 1.5, 4.5e-1
	<NRf+>	NRf type including MIN (minimum) and MAX (maximum) limits of the parameter.	1, 1.5, 4.5e-1 MAX, MIN
	<aard>	Arbitrary ascii characters.	
	<block data>	IEEE-488.2 binary block data. The block data is comprised of five parts:	
		<pre> #216<16_bytes_data><NL> a b c d e </pre>	
		<ul style="list-style-type: none"> a. Initialization character (#) b. Digit length (in ASCII) of the number of bytes c. Number of bytes d. Binary data e. New line character 	
Message terminator	LF^END	line feed code (hexadecimal 0A) with END message	
	LF	line feed code	
	<dab>^END	last data byte with END message	

List of Commands in Functional Order

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C COMMAND DETAILS

The Command details chapter shows the detailed syntax, equivalent panel operation, and example for each command. For the list of all commands, see page16. Before programming the PEL-2000A electronic load, please become familiar with the Status registers, detailed on page163.

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*RDT?	28
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*STB?	30
*TST?	30

*CLS

Status Command

Description	<p>Clears:</p> <ul style="list-style-type: none"> Channel Status Register Channel Summary Register Questionable Status Register Standard Events Register Operation Status Register Error Queue <p>When the *CLS command follows a program message terminator <nl>, the following is cleared:</p> <ul style="list-style-type: none"> Output Queue MAV bit <p>See page163.</p>
Syntax	*CLS
Example	*CLS

***ESE** Status Command

Description The Standard Event Status Enable command determines which events in the Standard Event Status Event register can set the Event Summary Bit (ESB) of the Status Byte register. Any bit positions set to 1 enable the corresponding event. Any enabled events set bit 5 (ESB) of the Status Byte register. See page170.

Syntax *ESE <Nrf>

Parameter	<Nrf>	Bit(s) Set	<Nrf>	Bit(s) Set
	4	QYE	32	CME
	8	DDE	64	~
	16	EXE	128	~

Example *ESE 40 Sets CME and DDE events in the Standard Event Status Event Register.

Query Syntax *ESE?

Return Parameter	<NR1>	Bit(s) Set	<NR1>	Bit(s) Set
	4	QYE	32	CME
QYE	8	DDE	64	~
	16	EXE	128	~

Example *ESE? 40 Returns the settings in the Standard Event Status Enable Register. Here CME and QYE are enabled.

***ESR?** Status Command

Description Reads the Standard Event Status Register. This command also clears the Standard Event Status Register. Page169.

Query Syntax *ESR?

Return Parameter	<NR1>	Bit(s) Set	<NR1>	Bit(s) Set
	4	QYE	32	CME
	8	DDE	64	~
	16	EXE	128	~
Example	*ESR? 48		The return value is the status reading of the standard Event Status Register.	

***IDN?** System Command

Description	Returns the load generator identification.			
Query Syntax	*IDN?			
Return Parameter	<aard>	Data	<aard>	Data
	GW	Manufacturer	XXXXXXXX	Serial No.
	PEL-2002	Model	V1.00	Firmware Version
Example	*IDN? GW, PEL-2002/2004, 00000001, V1.00		Returns the mainframe identification string.	

***OPC** Status Command

Description	This command sets the OPC (Operation Command Bit) bit (bit 0) of the Standard Event Status Register after the mainframe has completed all pending operations. Page169.			
Syntax	*OPC			
Example	*OPC		Sets the OPC bit.	
Query Syntax	*OPC?			
Return Parameter	<NR1>	Operation	<NR1>	Operation
	0	Pending	1	Complete

Query Example	*OPC? 1	All pending operations are completed.
---------------	------------	---------------------------------------

***RCL** Status Command

Description	The Recall Instrument State command restores the instrument settings from a previously saved memory setting.
-------------	--

Syntax	*RCL <NRf>
--------	------------

Parameter	<NRf> 1~120	Recall Memory Setting 1~120
-----------	----------------	--------------------------------

Example	*RCL 1	Recalls Setting memory 1
---------	--------	--------------------------

***RDT?** System Command

Description	Returns the load module type in each channel in order from 1~8. If no frame is present a 0 is returned.
-------------	---

Query Syntax	*RDT?
--------------	-------

Return Parameter	<aard> 2020L 0	Occupied Channel PEL-2020A left channel Empty channel
------------------	----------------------	---

Query Example	*RDT? 0,0,2020L,2020R,0,0,0,0	Channels 1-2 and 5-8 are empty; 3-4 is occupied by the PEL-2020A load module.
---------------	----------------------------------	---

***RST** Status Command

Description	Resets the mainframe by forcing the ABORT, *CLS, and LOAD:PROT:CLE command.
-------------	---

Syntax	*RST
--------	------

Example	*RST
---------	------

***SAV** All Channels

Description	Saves the data memory into the specified save slot.		
Syntax	*SAV <NR1>		
Parameter	<NR1>	Save slot	
	1~120	1~120	
Example	*SAV 2	Saves data memory to save slot 2	

***SRE** Status Command

Description The Service Request Enable Command determines which events in the Status Byte Register are allowed to set the MSS (Master summary bit) Any bit that is set to “1” will cause the MSS bit to be set. See page171 for details.

Syntax	*SRE <NRf>			
Parameter	<NRf>	Bit(s) Set	<NRf>	Bit(s) Set
	4	CSUM	32	ESB
	8	QUES		
	16	MAV		
Example	*SRE 12	Sets bits CSUM and QUES in the Service Request Enable register.		

Query Syntax	*SRE?			
Return Parameter	<NR1>	Bit(s) Set	<NRf>	Bit(s) Set
	4	CSUM	32	ESB
	8	QUES		
	16	MAV		

Example	*SRE? 48	Returns settings of the Service Request Enable Register. Here ESB and MAV are returned.
---------	-------------	---

***STB?** Status Command

Description	<p>Reads the Status Query Byte Register. The *STB? command does not clear the register.</p> <p>If the Master Summary Status bit (MSS) is set, it indicates that there is a reason for a service request.</p>
-------------	--

Query Syntax *STB

Return Parameter	<NRf>	Bit(s) Set	<NRf>	Bit(s) Set
	4	CSUM	32	ESB
	8	QUES	64	MSS
	16	MAV		

Query Example	*STB? 36	Returns status of a byte query in the Status Byte Register. Here CSUM and ESB are returned.
---------------	-------------	---

***TST?** Status Command

Description	Performs a system self-test and returns 0 if all tests passed. 1 is returned if a test failed.
-------------	--

Query Syntax *TST?

Return Parameter	<NR1>	Test result	<NR1>	Test result
	0	Pass	1	Fail

Example	*TST? >0
---------	-------------

Abort Subsystem

:ABORt31

:ABORt All
Channel Command

Description Turns all electronic loads to OFF.

Syntax :ABORt

Example :ABORt

Channel Subsystem

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:CHANnel[:LOAD]		Channel Specific Command
Description	Selects the channel that the channel specific commands use. This command will not change the channel in the display screen.	
Syntax	:CHANnel[:LOAD] <NRf+>	
Parameter	<NRf+>	Channel selected
	1~8	CH1 ~ CH8
	MAX	CH8
	MIN	CH1
Example	:CHAN 1	Sets channel 1 as the specific channel.
	:CHAN:LOAD 1	Sets channel 1 as the specific channel.
Query Syntax	:CHANnel? [LIST]	
Return Parameter	<NR1>	Current specific channel
	1~8	CH1 ~ CH8
	LIST	Lists available channels
Query Example	:CHAN? LIST	Channel 1 and 2 is available.
	1, 2	

:CHANnel:ACTive Channel Specific Command

Description	This command is for compatibility with other instruments only and has no action.	
Syntax	:CHANnel ACTive {ON 1 OFF 1}	
Parameter	ON/1	Enabled
	OFF/0	Disabled
Example	:CHAN:ACT ON	Enables the specific channel.

:CHANnel:SYNCon Channel Specific Command

Description	Turns independent mode on or off for the channel.	
Syntax	:CHANnel:SYNCon {ON 1 OFF 0}	
Parameter	ON/1	ON
	OFF/0	OFF
Example	:CHAN:SYNC ON	Enables the current channel to receive synchronized commands
Query Syntax	:CHANnel:SYNCon?	
Return Parameter	<NR1>	Sync Status
	0	Independent mode is OFF
	1	Independent mode is ON
Query Example	:CHAN:SYNC? 0	Independent mode is set to OFF for the channel.

:CHANnel:SYNCon:ALL All Channels

Description	Turns independent mode on or off for all the channels.	
Syntax	:CHANnel:SYNCon:ALL {ON 1 OFF 0}	
Parameter	ON/1 OFF/0	ON for all channels OFF for all channels
Example	:CHAN:SYNCon:ALL ON	Enables all channels to receive synchronized commands

:CHANnel:ID? Channel Specific Command

Description	Queries the load module identity.			
Query Syntax	:CHANnel:ID?			
Return Parameter	<aard> GW PEL2020R	Data Manufacturer Channel load id	<aard> 00000001 1.00	Data Serial No. Firmware Version.
Query Example	:CHAN:ID? GW, PEL2020R, 00000001, V1.00		Returns the load module identification string.	

:CHANnel:DISPlay Channel Specific Command

Description	Sets or queries which channel is active on the mainframe display.	
Syntax	:CHANnel:DISPlay <NRf+>	
Parameter	<NRf+> 1~8	Channel displayed CH1 ~ CH8

	MAX	Last channel
	MIN	First channel
Example	:CHAN:DISP 1	Sets to the active channel on the display to ch1.
Query Syntax	:CHANnel:DISPlay? [MAX MIN]	
Return Parameter	<NR1> 1~8 MAX/MIN	Channel displayed CH1 ~ CH8 Returns the allowable maximum or minimum.
Query Example	:CHAN:DISP? 1	Channel 1 is currently active on the display.

:CHANnel:MEMo Channel Specific Command

Description	Creates or returns the “memo” that is displayed in the “System Information” screen in the Utility Menu. This memo only applies to this specific channel. The memo will replace the serial number information in the “System Information” screen.	
Syntax	:CHANnel:MEMo <string>	
Parameter/ Return parameter	<string>	String containing memo.
Example	:CHAN:MEM “this is a memo”	Sets to the memo to “this is a memo”.
Query Syntax	:CHANnel:MEMo?	
Query Example	:CHAN:MEM? this is a memo	Returns the memo message.

		Channel Specific Query
:MEMo?		
Description	Creates or returns the “memo” that is displayed in the “System Information” screen in the Utility Menu. This memo applies to the mainframe. The memo will replace the serial number information in the “System Information” screen.	
Syntax	:MEMo <string>	
Parameter/ Return parameter	<string>	String containing memo.
Example	:MEM “this is a memo”	Set the memo to “this is a memo”
Query Syntax	:MEMo?	
Query Example	:MEM? this is a memo	Returns the memo message.

CONFIGURE Subsystem

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:CONFigure:VOLTage:ON	Channel Specific Command
-----------------------	--------------------------

Description	Sets Von (voltage on value). The allowable Von values are channel and load module specific.
-------------	---

Syntax	:CONFigure:VOLTage:ON <NRF>[MV V KV]
--------	--------------------------------------

Parameter	<NRF> [MV V KV]	Von
	3	3 volts
	30MV	30 millivolts
	30V	30 volts

Example	:CONF:VOLT:ON 30MV	Set Von to 30 millivolts.
Query Syntax	:CONF:VOLTage:ON?	
Return Parameter	<NR2> unit = 1 volt	Von value (volts)
	1	1 volts
Query Example	:CONF:VOLT:ON? 0.03	Von is set as 30 millivolts (0.03 volts).

Channel Specific Command

:CONF:VOLTage:RANGe

Description	Sets Voltage range for CC mode.	
Syntax	:CONF:VOLTage:RANGe <NRf>[V] L H	
Parameter	<NRf>[V], L, H	Range
	16	Low range*
	80V	High range*
	L	Low range
	H	High range
	*Load module dependent, PEL-2020A shown.	

Example	:CONF:VOLT:RANG L	Sets the range to Low for the channel.
---------	-------------------	--

Query Syntax	:CONF:VOLTage:RANGe?	
Return Parameter	<NR2>	Range
	16	Low PEL-2020A,2030A,2040A
	125	Low PEL-2041A
	80	High PEL-2020A,2030A,2040A
	500	High PEL-2041A

Query Example	:CONF:VOLT:RANG? 500	Returns the voltage range. In this case high for the PEL-2041A.
---------------	-------------------------	---

:CONFigure:VOLTage:LATch Channel Specific Command

Description	Turn Von Latch on or off for the specific channel.	
Syntax	:CONFigure:VOLTage:LATch {OFF 0 ON 1}	
Parameter	{OFF 0 ON 1}	Von Latch
	OFF/0	Off
	ON/1	On
Example	:CONF:VOLT:LAT 1	Sets Von latch to ON.
Query Syntax	:CONFigure:VOLTage:LATch?	
Return Parameter	<NR1>	Von latch status
	0	Latched Off
	1	Latched On
Query Example	:CONF:VOLT:LAT? 1	Von latch is set to ON.

:CONFigure:AUTO:LOAD All channels

Description	Configures the load generator for Auto Load On or Off at start up.	
Syntax	:CONFigure:AUTO:LOAD {OFF 0 ON 1}	
Parameter	{OFF 0 ON 1}	Auto Load
	OFF/0	Off
	ON/1	On
Example	:CONF:AUTO:LOAD ON	Configures Auto Load to On
Query Syntax	:CONFigure:AUTO:LOAD?	
Return Parameter	<NR1>	Auto Load Status
	0	Off
	1	On

Query Example :CONF:AUTO:LOAD? Auto load is On.
1

:CONFigure:AUTO:MODE All channels

Description Configures the Auto Load mode as (run) Program or Load.

Syntax :CONFigure:AUTO:MODE PROGRAM/0, LOAD/1

Parameter	PROGRAM/0, LOAD/1	Auto Load Mode
	PROGRAM/0	PROGRAM
	LOAD/1	LOAD

Example :CONF:AUTO:MODE 1 Configures Auto Load to LOAD

Query Syntax :CONFigure:AUTO:MODE?

Return Parameter	<NR1>	Auto Load Type Status
	0	PROGRAM MODE
	1	LOAD MODE

Query Example :CONF:AUTO:MODE? Auto load mode is to LOAD mode.
1

:CONFigure:SOUND Channel Specific Command

Description Sets the sound of each load module on or off.

Syntax :CONFigure:SOUND {OFF|0|ON|1}

Parameter	OFF/0	Off
	ON/1	On

Example :CONF:SOUND ON Configures the sound for the specific channel to On.

Query Syntax :CONFigure:SOUND?

Return Parameter	<NR1>	SOUND Status
	0	Off
	1	On

Query Example :CONF:SOUND?
0
Sound is off for the specific channel.

:CONFigure:REMOte All Channels

Description Turns remote control on or off for all interfaces.

Syntax :CONFigure:REMOTe {OFF|0|ON|1}

Parameter	OFF/0	Off
	ON/1	On

Example :CONF:REM 1
Turns Remote control on.

:CONFigure:SAVE All Channels

Description This command is for compatibility with other instruments only and has no action.

Syntax :CONFigure:SAVE

Example :CONF:SAVE
Saves the configuration data for all channels into internal memory.

:CONFigure:LOAD System Command

Description Configures the load module selector knob as OLD or Updated.

Syntax :CONFigure:LOAD {OLD|0|UPDATED|1}

Example :CONF:LOAD UPDATED
Sets the load module selector knob as Updated.

Parameter	OLD/0 UPDATED/1	Old Updated
Example	:CONF:LOAD OLD	Configuration type set as OLD.
Query Syntax	:CONFigure:LOAD?	
Return Parameter	<NR1> 0 1	Configuration type Old Updated
Query Example	:CONF:LOAD? 0	Sets the load module selector configuration type as OLD.

:CONFigure:PROTection:CURRent:STATe Channel Specific Command

Description	Sets the current protection for the specific channel on or off. The current protection can also be cleared.	
Syntax	:CONFigure:PROTection:CURRent:STATe {OFF 0 ON 1 CLEAR 2}	
Parameter	CLEAR/2 OFF/0 ON/1	Cleared Off On
Example	:CONF:PROT:CURR:STAT 1	Turns on current protection.
Query Syntax	: CONFigure:PROTection:CURRent:STATe?	
Return Parameter	<NR1> 0 1 2	Current Protection Off On Clear
Query Example	:CONF:PROT:CURR:STAT? 1	Current protection is turned on.

:CONFigure:PROTection:CURRent:LEVel Channel Specific Command

Description	Sets the current protection level for the current/specific channel. The level can be set to any applicable level or to the channel maximum/minimum.	
Syntax	:CONFigure:PROTection:CURRent:LEVel <NRf>[A] MIN MAX	
Parameter	<NRf> .3 0.3A 300MA MIN MAX	Current Protection Level 300mA 300mA 300mA Sets to the minimum level Sets the current limit to the maximum level
Example	:CONF:PROT:CURR:LEV MAX	Sets the current limit to 20.40A (PEL2020A)
Query Syntax	: CONFigure:PROTection:CURRent:LEVel? [MIN MAX]	
Return Parameter	<NRf> 1 unit = 1 amp 1 MAX/MIN	Current protection level 1 amp. Returns the allowable maximum and minimum.
Query Example	:CONF:PROT:CURR:LEV? 0.30	Current protection level is at 300mA.

:CONFigure:PROTection:VOLTage:STATe Channel Specific Command

Description Sets the voltage protection for the current/specific channel on or off. The voltage protection can also be cleared.

Syntax :CONFigure:PROTection:VOLTage:STATe
{OFF|0|ON|1|CLEAR|2}

Parameter	CLEAR/2	Clear
	OFF/0	Off
	ON/1	On

Example :CONF:PROT:VOLT:STAT 1 Turns on voltage protection.

Query Syntax : CONFigure:PROTection:VOLTage:STATe?

Return Parameter	<NR1>	Voltage Protection state
	0	Off
	1	On
	2	Clear

Query Example :CONF:PROT:VOLT:STAT? Voltage protection is currently off.
0

:CONFigure:PROTection:VOLTage:LEVel Channel Specific Command

Description Sets the voltage protection level for the current/specific channel. The level can be set to any applicable level or to the channel maximum/ minimum.

Syntax :CONFigure:PROTection:VOLTage:LEVel
<NRf>[V]|MIN|MAX

Parameter	<NRf>	Voltage Protection Level
	30	30 volts
	30V	30 volts

	MIN	Sets to the minimum level
	MAX	Sets the voltage limit to the maximum level
Example	:CONF:PROT:VOLT:LEV MAX	Sets the voltage limit to 81.6V (PEL2020A)
Query Syntax	: CONFIgure:PROTEction:VOLTAge:LEVel? [MIN MAX]	
Return Parameter	<NRf> 1 unit = 1 volt	Voltage protection level
	1.00	1.00 volts.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:CONF:PROT:VOLT:LEV? 81.6000	Voltage protection level is at 81.6V.

:CONFIgure:PROTEction:POWEr:STATe Channel Specific Command

Description	Sets the power protection for the current/specific channel on or off. The power protection can also be cleared.	
Syntax	:CONFIgure:PROTEction:POWEr:STATe {OFF 0 ON 1 CLEAR 2}	
Parameter	CLEAR/2	Cleared
	OFF/0	Off
	ON/1	On
Example	:CONF:PROT:POW:STAT 1	Turns on power protection.
Query Syntax	: CONFIgure:PROTEction:POWEr:STATe?	
Return Parameter	<NR1>	Power Protection
	0	Off
	1	On
	2	Clear
Query Example	:CONF:PROT:POW:STAT? 1	Power protection is currently on.

:CONFigure:PROTection:POWEr:LEVel Channel Specific Command

Description	Sets the power protection level for the current/specific channel. The level can be set to any applicable level or to the channel maximum/ minimum.	
Syntax	:CONFigure:PROTection:POWEr:LEVel <NRf>[W] MIN MAX	
Parameter	<NRf>	Power Protection Level
	200	200Watts
	200W	200Watts
	MIN	Sets to the minimum level
	MAX	Sets the power limit to the maximum level
Example	:CONF:PROT:POW:LEV MAX	Sets the power limit to 102W (PEL2020A)
Query Syntax	: CONFigure:PROTection:POWEr:LEVel? [MIN MAX]	
Return Parameter	<NRf>	Power protection level
	1 unit = 1 watt	Returns the power protection level in Watts.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:CONF:PROT:POW:LEV? 75	Power protection level is at 75 watts.

:CONFigure:PROTection:UVP:CLEar All Channel Command

Description	Clears the under voltage power protection status.	
Syntax	:CONFigure:PROTection:UVP:CLEar	
Example	:CONF:PROT:UVP:CLE	Clears the under voltage protection.

:CONFigure:PROTection:UVP:LEVel Channel Specific Command

Description	Sets the under voltage protection level for the current/specific channel. The level can be set to any applicable level or to the channel maximum/minimum.	
Syntax	:CONFigure:PROTection:UVP:LEVel <NRf>[W] MIN MAX	
Parameter	<NRf>	UVP Level
	20	20 Volts
	20V	20 Volts
	MIN	Sets to the minimum level (OFF)
	MAX	Sets the voltage limit to the maximum level
Example	:CONF:PROT:UVP:LEV MIN	Sets the UVP limit to OFF
Query Syntax	:CONFigure:PROTection:UVP:LEVel? [MIN MAX]	
Return Parameter	<NRf>	Power protection level
	1 unit = 1 volt	Returns the UVP level as volts.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:CONF:PROT:UVP:LEV? 75	UVP level is at 75 volts.

:CONFigure:RESPonse Channel Specific Command

Description	Sets or queries the response rate for the specific channel.	
Syntax	:CONFigure:RESPonse {NORMAL 0 FAST 1}	
Parameter	NORMAL/0	Normal
	FAST/1	Fast

Example	:CONF:RESP 0	Response set to normal.
Query Syntax	: CONFigure:RESPonse?	
Return Parameter	<NR1>	Response
	0	Normal
	1	Fast
Query Example	:CONF:RESP? 1	Response is Fast.

:CONFigure:RESEt Channel Specific Command

Description	Recalls the original factory default settings.	
Syntax	:CONFigure:RESEt	
Example	:CONF:RESE	

:CONFigure:GROup:UNITs Channel Specific Command

Description	Sets or queries the number of single channel load modules (PEL-2040A or PEL-2041A) that can be used in the parallel mode.	
Syntax	CONFigure:GROup:UNITs <NRf>[MIN MAX]	
Parameter	<NRf>	Number of units
	MIN	Sets to the minimum number
	MAX	Sets to the maximum number
Example	CONF:GRO:UNIT 2	Sets the parallel mode to 2 units.
Query Syntax	CONFigure:GROup:UNITs? [MIN MAX]	
Return Parameter	<NR1>	Returns the number of units
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example	: CONF:GRO:UNIT? 2	2 units are set for the parallel mode.
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	:CONFigure:GROup:MODE	Channel Specific Command
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Description	Sets or queries the parallel mode.	
Syntax	:CONFigure:GROup:MODE {SYNC 0 PARALLEL 1}	
Parameter	SYNC, 0	Sync mode
	PARALLEL, 1	Parallel mode
Example	:CONF:GRO:MODE 0	Sets the parallel mode to SYNC.
Query Syntax	:CONFigure:GROup:MODE?	
Return Parameter	0	Sync mode
	1	Parallel mode
Query Example	:CONF:GRO:MODE? 0	The parallel mode is currently set to SYNC.

Utility Subsystem

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:UTILity:AUTO:LOAD System Command

Description	Sets the mainframe to auto mode. Upon startup the mainframe will turn loads/ programs on.	
Syntax	:UTILity:AUTO:LOAD {OFF 0 ON 1}	
Parameter	OFF/0	Turns auto loading off
	ON/1	Turns auto loading on
Example	:UTIL:AUTO:LOAD 1	Turns auto loading on
Query Syntax	:UTILity:AUTO:LOAD?	
Return Parameter	<NR1>	Auto load status
	0	Auto loading is off
	1	Auto loading is on
Query Example	:UTIL:AUTO:LOAD? 1	The main frame is currently configured to auto load.

:UTILity:AUTO:MODE

System Command

Description	Sets the mainframe auto mode as load or program. Upon startup the mainframe can automatically turn on loads or automatically run the last program.	
Syntax	:UTILity:AUTO:MODE {PROGRAM 0 LOAD 1}	
Parameter	PROGRAM/0	Sets the auto load mode to program
	LOAD/1	Sets the auto load mode to load.
Example	:UTIL:AUTO:MODE 1	Auto load mode is set to load.
Query Syntax	:UTILity:AUTO:MODE?	
Return Parameter	<NR1>	Auto load mode
	0	Program
	1	Load
Query Example	:UTIL:AUTO:MODE? 0	Auto load mode is set to Program.

:UTILity:SOUND

System Command

Description	Turns the sound on/off for the mainframe/load modules.	
Syntax	:UTILity:SOUND {OFF 0 ON 1}	
Parameter	OFF/0	Turns sound off
	ON/1	Turns sound on
Example	:UTIL:SOUN 1	Turns sound on.
Query Syntax	:UTILity:SOUND?	
Return Parameter	<NR1>	Sound
	0	Off

	1	On
Query Example	:UTIL:SOUN?	Sound is currently set to off.
	0	

:UTILity:REMOte System Command

Description	Turns the remote control on or off.	
Syntax	:UTILity:REMOte {OFF 0 ON 1}	
Parameter	OFF/0	Turns Remote control off
	ON/1	Turns remote control on
Example	:UTIL:REM 1	Turns remote control on.

:UTILity:REMOte:MODE System Command

Description	Sets the remote mode to fast or normal. When in fast mode, the panel interface is deactivated with an interface time of no more than 10ms. Normal mode has an interface time of 30~130ms. In normal mode the display interface continues to update the screen in real-time.	
Syntax	:UTILity:REMOte:MODE {NORMAL 0 FAST 1}	
Parameter	NORMAL/0	NORMAL
	FAST/1	FAST
Example	:UTIL:REM:MODE 1	Turns remote mode to fast.

:UTILity:TIME System Command

Description	Sets the date and time on the mainframe.		
Syntax	:UTILity:TIME [aard]		
Parameter	[aard]		
		1	Year
		2	Month/Day
		3	Time (24 hours)

Example	:UTIL:TIME "201501031343"	
	Sets the time to 1:00 pm, January 3 rd , 2015.	

Query Syntax	:UTIL:TIME?	
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Return Parameter	[aard]		
		1	Year
		2	Month/Day
		3	Time (24 hours)

Query Example	:UTIL:TIME? 2015/11/13/13:00	The date is November 13 th , 2015. The time is 1:00 pm.
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:UTILity:LOAD System Command

Description	Sets the knob control style. The load module control knobs can be set to operate independently (OLD style) to the mainframe or with the mainframe (UPDATED).	
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Syntax	:UTILity:LOAD {OLD 0 Updated 1}	
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Parameter	OLD/0	Old
	UPDATED/1	Updated

Example	:UTIL:LOAD 1	Set the knob style to independent.
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Query Syntax	:UTILity:LOAD?	
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Return Parameter	<NR1>	Knob style
	0	Old
	1	Updated
Query Example	:UTIL:LOAD? 1	The knob style is set to Updated.

:UTILity:IDENTify System Command

Description	Flashes a message "I am Here!" on the mainframe display. This command is useful to identify a PEL-2000A mainframe in a group. Pressing any key on the mainframe will also turn the message off.	
Syntax	:UTILity:IDENTify {OFF 0 ON 1}	
Parameter	OFF/0	Turns message off
	ON/1	Turns message on
Example	:UTIL:IDEN 1	Turns the message on.

:UTILity:FRAMe System Command

Description	Turns Frame Link on or off.	
Syntax	:UTILity:FRAMe {OFF 0 ON 1}	
Parameter	{OFF 0 ON 1}	Frame Link
	OFF/0	off
	ON/1	on
Example	:UTIL:FRAM 1	Turns Frame Link on.
Query Syntax	:UTILity:FRAMe?	
Return Parameter	<NR1>	Frame Link
	0	Off
	1	On
Query Example	:UTIL:FRAM? 0	Frame Link is on.

Current Subsystem

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:CURRent:STATic:RECall		Channel Specific Command
Description	Sets or queries whether A Value or B Value is the currently active value in CC static mode.	
Syntax	:CURRent:STATic:RECall {A 0 B 1}	
Parameter	A/0	A
	B/1	B
Example	:CURR:STAT:REC 1	Makes B Value the active value.
Query Syntax	:CURRent:STATic:RECall?	
Return Parameter	<NR1>	Value
	0	A
	1	B

Query Example :CURR:STAT:REC? A Value is active.
0

:CURRent:STATic:L1/L2 Channel Specific Command

Description Sets the A/B Value for constant current static mode, where L1 is A Value and L2 is B Value. The command is range dependant. If the current range is Low, then the command will only apply to the low range settings.

Syntax :CURRent:STATic:L1|L2 <NRf+>[A]

Parameter	<NRf+>[A]	
	L1 1	Sets A Value to 1 Amp.
	L2 2	Sets B Value to 2 Amps.
	L1 1A	Sets A Value to 1 Amp. (single channel only)
	L1 MIN	Sets A Value to the minimum level for the specific channel.
	L1 MAX	Sets A Value to the maximum Level for the specific channel.

Example :CURR:STAT:L1 1 Sets A Value to 1 amp for the current range

Query Syntax :CURRent:STATic:L1?/L2? [MAX|MIN]

Return Parameter	<NR2> [MAX MIN]	Current
	1 unit = 1 amp	Returns the current of the A Value (L1) or B Value (L2).
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example :CURR:STAT:L2? MAX
10.2 Returns the maximum current allowed for the channel. (PEL-2020A)

Query Example :CURR:STAT:L2? 2 Returns the current setting (2 A) for B Value.

:CURRent:STAtic:RISE/FALL Channel Specific Command

Description Sets the slew rate for constant current static mode. The command is range dependant. If the current range is Low, then the command will only apply to the low range settings.

Syntax :CURRent:STAtic:RISE/FALL <NRf+>[A/uS]

Parameter	<NRf+>[A/uS]	Slew Rate
	RISE/FALL 0.078A/uS	Sets the rising/falling slew rate to 0.078A/uS
	RISE/FALL 1	Sets the rising/falling slew rate to 1A/uS
	RISE/FALL MIN	Sets to the slowest rising/falling slew rate.
	RISE/FALL MAX	Sets to the fastest rising/falling slew rate.

Example :CURR:STAT:RISE .01 Sets the rising slew rate to 0.01A/uS.

Query Syntax : CURRent:STAtic:RISE/FALL? [MIN|MAX]

Return Parameter	<NR2> [MAX MIN]	Slew rate
	1 Unit=1 amp/uS	Returns the slew rate.
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example :CURR:STAT:RISE? MIN 0.078 the Minimum value for the rising slew rate is 0.078 A/uS for the specific channel.

Query Example :CURR:STAT:RISE? 0.16800 The rising slew rate is 0.168 A/uS for the specific channel.

:CURRent:STATic:LOW:AVALue/BVALue Channel Specific Command

Description	Sets the low range A/B Value for constant current static mode.	
Syntax	:CURRent:STATic:LOW:AVALue/BVALue <NRf+>[A]	
Parameter	NRf+[A]	
	AVALue 1	Sets A Value to 1 Amp. (Low range only)
	BVALue 2	Sets B Value to 2 Amps. (Low Range only)
	AVALue 1A	Sets A Value to 1 Amp. (Low range only)
	AVALue MIN	Sets A Value to the minimum level for the specific channel.
	AVALue MAX	Sets A Value to the maximum Level for the specific channel.
Example	:CURR:STAT:LOW:AVAL 1	Sets low range CC static mode A Value to 1 amp.
Query Syntax	:CURRent:STATic:LOW:AVALue/BVALue? [MAX MIN]	
Return Parameter	<NR2> [MAX MIN]	Current
	1 unit = 1 amp	Returns the current of the A or B Value.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:CURR:STAT:LOW:BVAL? MAX	Returns the maximum current allowed for the channel. (PEL-2020A)
	2	

:CURRent:STATic:LOW:RISE/FALL Channel Specific Command

Description	Sets the low range rising/falling slew rates.	
Syntax	:CURRent:STATic:LOW:RISE/FALL <NRf+>[A/uS]	
Parameter	<NRf+>[A/uS]	Slew Rate
	RISE/FALL 0.078A/uS	Sets the rising/falling slew rate to 0.078A/uS
	RISE/FALL 1	Sets the rising/falling slew rate to 1A/uS
	RISE/FALL MIN	Sets to the slowest rising/falling slew rate.
	RISE/FALL MAX	Sets to the fastest rising/falling slew rate.
Example	:CURR:STAT:LOW:RISE .001	Sets the rising slew rate to 0.001A/uS.
Query Syntax	: CURRent:STATic:LOW:RISE/FALL? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN]	Slew rate
	1 Unit=1 amp/uS	Returns the slew rate.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:CURR:STAT:LOW:RISE? MIN 0.078	For low range CC mode, the Minimum value for the rising slew rate is 0.078 A/uS for the specific channel.

:CURRent:STATic:HIGh:AVALue/BVALue Channel Specific Command

Description	Sets the high range A/B Value for constant current static mode.	
Syntax	:CURRent:STATic:HIGh:AVALue/BVALue <NRf+>[A]	
Parameter	NRf+[A]	

	AVALue 10	Sets A Value to 10 Amps. (high range only)
	BVALue 20	Sets B Value to 20 Amps. (high Range only)
	AVALue MIN	Sets A Value to the minimum level for the specific channel.
	A Value MAX	Sets A Value to the maximum Level for the specific channel.
Example	:CURRent:STATic:HIGH:AV ALue 10	Sets high range CC static mode A Value to 10 amps.
Query Syntax	:CURRent:STATic:HIGH:AV ALue/BVALue? [MAX MIN]	
Return Parameter	<NR2> [MAX MIN] MAX/MIN 1 unit= 1 amp	Auto load mode Returns the allowable maximum and minimum. Returns the current of the A or B Value.
Query Example	:CURR:STAT:HIGH:BVALue? MAX 20.4000	Returns the maximum current allowed for the channel in high range mode. (PEL-2020A)
:CURRent:STATic:HIGH:RISE/FALL		Channel Specific Command
Description	Sets the high range rising/falling slew rate.	
Syntax	:CURRent:STATic:HIGH:RISE/FALL <NRf+>[A/uS]	
Parameter	<NRf+>[A/uS] RISE/FALL 0.8A/uS RISE/FALL 1	Slew Rate Sets the rising/falling slew rate to 0.8A/uS Sets the rising/falling slew rate to 1A/uS

	RISE/FALL MIN	Sets to the slowest rising/falling slew rate.
	RISE/FALL MAX	Sets to the fastest rising/falling slew rate.
Example	:CURR:STAT:HIGH:RISE 1.1	Sets the rising slew rate to 1.1A/uS.
Query Syntax	:CURRent:STATic:HIGH:RISE/FALL? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN] 1 Unit=1 amp/uS MAX/MIN	Slew rate Returns the slew rate. Returns the allowable maximum and minimum.
Query Example	:CURR:STAT:HIGH:RISE? MAX 0.8000	For high range CC mode, the maximum value for the rising slew rate is 0.8000 A/uS for the specific channel.

:CURRent:DYNamic:L1/L2 Channel Specific Command

Description	Sets the current levels (Level 1 & 2) for CC dynamic mode. The command is range dependant. If the current range is Low, then the settings will only apply to low range.	
Syntax	:CURRent:DYNamic:L1/L2 <NRf+>[A]	
Parameter	NRf+[A] L1 1 L2 2 L2 2A L1/L2 MIN	Current Sets L1 to 1 Amp. Sets L2 to 2 Amps. Sets L2 to 2 Amps. Sets L1 or L2 to the minimum level for the specific channel.

	L1/L2 MAX	Sets L1 or L2 to the maximum Level for the specific channel.
Example	:CURR:DYN:L1 10	In CC dynamic mode, Set L1 (level 1) to 10 amps.
Query Syntax	:CURRent:DYNamic:L1/L2? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN] MAX/MIN 1 unit= 1 amp	Current Returns the allowable maximum and minimum. Returns the current of L1/L2, or the maximum or minimum current allowed.
Query Example	:CURR:DYN:L2? 2.0400	Returns current for the specific channel.

:CURRent:DYNamic:RISE/FALL Channel Specific Command

Description	Sets the rising/falling slew rate for CC dynamic mode for the specific channel and range.	
Syntax	:CURRent:DYNamic:RISE/FALL <NRf+>[A/uS]	
Parameter	<NRf+>[A/uS] RISE/FALL 0.8A/uS RISE/FALL 1 RISE/FALL MIN RISE/FALL MAX	Slew Rate Sets the rising/falling slew rate to 0.8A/uS Sets the rising/falling slew rate to 1A/uS Sets to the slowest rising/falling slew rate. Sets to the fastest rising/falling slew rate.
Example	:CURR:DYNA:RISE 1.1	Sets the rising slew rate to 1.1A/uS.
Query Syntax	: CURRent:DYNamic:RISE/FALL? [MIN MAX]	

Return Parameter	<NR2> [MAX MIN] 1 Unit=1 amp/uS MAX/MIN	Slew rate Returns the slew rate. Returns the allowable maximum or minimum.
Query Example	:CURR:DYN:FALL? MIN 0.0003	Shows the minimum allowable value for the falling slew rate as 0.0003 A/uS for the specific channel and range.
:CURRent:DYNamic:T1/T2		Channel Specific Command
Description	Sets the timers T1 or T2 for CC dynamic mode for the specific channel and range.	
Syntax	:CURRent:DYNamic:T1/T2 <NRf+>[S ms]	
Parameter	<NRf+>[S] T1/T2 0.1S T1/T2 1 T1/T2 MIN T1/T2 MAX	Time Sets the T1/T2 time to 0.1 seconds. Sets T1/T2 to 1 second. Sets the T1/T2 to the minimum value. Sets the T1/T2 time to the maximum time
Example	:CURR:DYNA:T1 .1S	Sets the T1 time to 100 milliseconds for the specific channel.
Query Syntax	: CURRent:DYNamic:T1/T2? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN] 1 Unit=1 second MAX/MIN	Time Returns T1/T2 time. Returns the allowable maximum and minimum.

Query Example	:CURR:DYN:LOW:T1? 2.5	Returns the T1 time of 2.5 seconds.
	:CURR:DYN:LOW:T1? MIN 0.000025	Returns the minimum T1 time allowable for the specific channel and range.
:CURRent:DYNamic:LOW:L1/L2		Channel Specific Command

Description Sets the low range current levels (Level 1 & 2) for CC dynamic mode.

Syntax :CURRent:DYNamic:LOW:L1/L2 <NRf+>[A]

Parameter	NRf+[A]	Current
	L1 1	Sets L1 to 1 Amp. (low range only)
	L2 2	Sets L2 to 2 Amps. (low Range only)
	L2 2A	Sets L2 to 2 Amps. (low Range only)
	L1/L2 MIN	Sets L1 or L2 to the minimum level for the specific channel.
	L1/L2 MAX	Sets L1 or L2 to the maximum Level for the specific channel.

Example :CURR:DYN:LOW:L1 10 In low range CC dynamic, Set L1 (level 1) to 10 amps.

Query Syntax :CURRent:DYNamic:LOW:L1/L2? [MIN|MAX]

Return Parameter	<NR2> [MAX MIN] 1 unit= 1 amp	Current Returns the current of L1/L2, or the maximum or minimum current allowed.
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	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:CURR:DYN:LOW:L2? 2.0400	Returns current for the specific channel.
	:CURRent:DYNamic:LOW:RISE/FALL	Channel Specific Command
Description	Sets the low range rising/falling slew rate for CC dynamic mode for the specific channel.	
Syntax	:CURRent:DYNamic:LOW:RISE/FALL <NRf+>[A/uS]	
Parameter	<NRf+>[A/uS]	Slew Rate
	RISE/FALL 0.8A/uS	Sets the rising/falling slew rate to 0.8A/uS
	RISE/FALL 1	Sets the rising/falling slew rate to 1A/uS
	RISE/FALL MIN	Sets to the slowest rising/falling slew rate.
	RISE/FALL MAX	Sets to the fastest rising/falling slew rate.
Example	:CURR:DYNA:LOW:RISE 1.1	Sets the rising slew rate to 1.1A/uS.
Query Syntax	: CURRent:DYNamic:LOW:RISE/FALL? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN]	Slew rate
	1 Unit=1 amp/uS	Returns the slew rate.
	MAX/MIN	Returns the allowable maximum or minimum.
Query Example	:CURR:DYN:LOW:FALL? MIN 0.0003	For low range dynamic CC mode, the minimum allowable value for the falling slew rate is 0.0003 A/uS for the specific channel.

:CURRent:DYNamic:LOW:T1/T2 Channel Specific Command

Description Sets the low range timers T1 or T2 for CC dynamic mode for the specific channel.

Syntax :CURRent:DYNamic:LOW:T1/T2 <NRf+>[S/ms]

Parameter	<NRf+>[S/ms]	Time
	T1/T2 0.1S	Sets the T1/T2 time to 0.1 seconds.
	T1/T2 1	Sets T1/T2 to 1 second.
	T1/T2 MIN	Sets the T1/T2 to the minimum value.
	T1/T2 MAX	Sets the T1/T2 time to the maximum time

Example :CURR:DYNA:LOW:T1 .1S Sets the T1 time to 100 milliseconds for the specific channel.

Query Syntax : CURRent:DYNamic:LOW:T1/T2? [MIN|MAX]

Return Parameter	<NR2> [MAX MIN]	Time
	1 Unit=1 second	Returns T1/T2 time.
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example :CURR:DYN:LOW:T1? Returns the T1 time of 2.5 seconds.
 2.5
 :CURR:DYN:LOW:T1? Returns the minimum T1 time allowable for the specific channel.
 MIN
 0.000025

:CURRent:DYNamic:HIGH:L1/L2 Channel Specific Command

Description Sets the high range current levels (Level 1 & 2) for CC dynamic mode.

Syntax	:CURRent:DYNamic:HIGH:L1/L2 <NRf+>[A]	
Parameter	NRf+[A]	
	L1 10	Sets L1 to 10 Amps. (High range only)
	L2 20	Sets L2 to 20 Amps. (High Range only)
	L1/L2 MIN	Sets L1 or L2 to the minimum level for the specific channel.
	L1/L2 MAX	Sets L1 or L2 to the maximum Level for the specific channel.
Example	:CURR:DYN:HIGH:L1 10	In high range CC dynamic mode, Set L1 (level 1) to 10 amps.
Query Syntax	:CURRent:DYNamic:HIGH:L1/L2? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN]	Return value
	1 unit= 1 amp	Returns the current of Level 1/ 2 (L1/L2).
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:CURR:DYN:HIGH:L2? MAX 20.4000	Returns the maximum current allowed for the channel. (PEL-2020A)

:CURRent:DYNamic:HIGH:RISE/FALL Channel Specific Command

Description	Sets the high range rising/falling slew rate for CC dynamic mode for the specific channel.	
Syntax	:CURRent:DYNamic:HIGH:RISE/FALL <NRf+>[A/uS]	
Parameter	<NRf+>[A/uS]	Slew Rate
	RISE/FALL 0.8A/uS	Sets the rising/falling slew rate to 0.8A/uS

	RISE/FALL 1	Sets the rising/falling slew rate to 1A/uS
	RISE/FALL MIN	Sets to the slowest rising/falling slew rate.
	RISE/FALL MAX	Sets to the fastest rising/falling slew rate.
Example	:CURR:DYNA:HIGH:RISE 1.1	Sets the rising slew rate to 1.1A/uS.
Query Syntax	: CURR:ent:DYNamic:HIGH:RISE/FALL? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN]	Slew rate
	1 Unit = 1 amp/uS	Returns the slew rate.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:CURR:DYN:HIGH:FALL? MAX 0.8	For high range dynamic CC mode, the maximum value for the falling slew rate is 0.8 A/uS for the specific channel.

:CURR:ent:DYNamic:HIGH:T1/T2 Channel Specific Command

Description	Sets the timers T1 or T2 for CC dynamic mode for the specific channel in high range.	
Syntax	:CURR:ent:DYNamic:HIGH:T1/T2 <NRf+>[S][ms]	
Parameter	<NRf+>[S]	Time
	T1/T2 0.1S	Sets the T1/T2 time to 0.1 seconds.
	T1/T2 1	Sets T1/T2 to 1 second.
	T1/T2 MIN	Sets the T1/T2 to the minimum value.
	T1/T2 MAX	Sets the T1/T2 time to the maximum time

Example	:CURR:DYNA:HIGH:T1 10S	Sets the high range T1 time to 10 seconds for the specific channel.
Query Syntax	:CURRent:DYNamic:HIGH:T1/T2? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN] 1 Unit=1 second MAX/MIN	Time Returns T1/T2 time. Returns the allowable maximum and minimum.
Query Example	:CURR:DYN:HIGH:T1? 2.5 :CURR:DYN:HIGH:T1? MIN 0.000025	Returns the T1 time of 2.5 seconds. Returns the minimum T1 time allowable for the specific channel.

FETCH Subsystem

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:FETCh:VOLTage? Channel Specific Status Command

Description	This query returns the real-time voltage of the load module input for the specific channel.	
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Syntax	:FETCh:VOLTage? <NR2>	
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Parameter	<NR2> 1 unit = 1 volt	Voltage
	8	8 volts

Query Example	:FETC:VOLT? 11.2	The specific channel has a voltage of 11.2 volts at the input.
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:FETCh:CURRent? Channel Specific Status Command

Description	This query returns the real-time current of the load module input for the specific channel.	
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Syntax	:FETCh:CURRent? <NR2>	
--------	-----------------------	--

Parameter	<NR2> 1 unit= 1 amp	1 amp
	1	1 amp

Query Example	:FETC:CURR? 1.2	The specific channel has a current of 1.2 amps at the load module input.
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:FETCh:POWer? Channel Specific
Status Command

Description	This query returns the real-time power of the load module input for the specific channel.	
Syntax	:FETCh:CURRent? <NR2>	
Parameter	<NR2> 1 unit= 1 amp	
	1	1 amp
Query Example	:FETC:POW? 1.2	The specific channel is at 1.2 watts.

:FETCh:STATus? Status Command

Description	This query returns the status of the load module. The returned value is the bit weight of the Channel Status Register. See page 163.			
Syntax	:FETCh:STATus? <NR1>			
Parameter	<NR1>	Condition	<NR1>	Condition
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	16-128	Not Used
Query Example	:FETC:STAT? 2	Over voltage (OV) protection has been triggered for the specific channel.		

:FETCh:ALLVoltage? All Channel Status
Command

Description	This query returns the voltage values of all the load modules/channels in order from 1-8(PEL-2004A)/1-4(PEL2002A).
Syntax	:FETCh:ALLVoltage?

Parameter	<aard> CH1,CH2,CH3,CH4,CH5, CH6,CH7,CH8	Returns all the voltage values from all the channels, 1-8(PEL-2004A)/1-4(PEL-2002A).
Query Example	:FETC:ALLV? 2.5000, 3.0000, 0.0000, 0.0000, 0.0000, 0.0000, 5.500, 0.0000	Channel 1 and 2 have voltages of 2.5 and 3 volts respectively. Channels 3-6 and 8 have no voltage and channel 7 is 5.5 volts

All Channel Status Command

:FETCh:ALLCurrent?

Description	This query returns the current values of all the load modules/channels in order from 1-8(PEL-2004A)/1-4(PEL2002A).	
Syntax	:FETCh:ALLCurrent? <aard>	
Parameter	<aard> CH1,CH2,CH3,CH4,CH5, CH6,CH7,CH8	Returns all the current values from all the channels, 1-8(PEL-2004A)/1-4(PEL-2002A).
Query Example	:FETC:ALLC? 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 1.2000, 3.5600	Channels 1 to 6 have no current. Channels 7 & 8 have 1.2 and 3.56 amps, respectively.

All Channel Status Command

:FETCh:ALLPower?

Description	This query returns the power values of all the load modules/channels in order from 1-8(PEL-2004A)/1-4(PEL2002A).	
Syntax	:FETCh:ALLPower? <aard>	

Parameter	<p><aard></p> <p>CH1,CH2,CH3,CH4,CH5, CH6,CH7,CH8</p>	<p>Returns all the power values from all the channels, 1-8 (PEL-2004A)/1-4 (PEL-2002A).</p>
Query Example	<p>:FETC:ALLP?</p> <p>0.0000, 0.0000, 10.200, 5.5000</p>	<p>Channels 1 to 2 have no power. Channels 3 & 4 have 10.2 and 5.5 watts, respectively.</p>

LOAD Subsystem

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Channel

:LOAD[:STATe] Specific Command

Description	This command turns the electronic load on/off for the specific channel.	
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Syntax	:LOAD[:STATe] {ON 1 OFF 0}	
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Parameter	ON/1	Load On
	OFF/0	Load Off

Example	:LOAD ON	Turns the specific channel load on.
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Query Syntax	:LOAD[:STATe]?	
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Return Parameter	<NR1>	Load module
	1	Load is On
	0	Load is Off

Query Example	:LOAD?	Turns the specific channel load on.
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Channel Specific Command

:LOAD:SHORT[:STATe] Command

Description	This command shorts the electronic load on/off for the specific channel.	
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Syntax	:LOAD:SHORT[:STATe] {ON 1 OFF 0}	
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Parameter	ON/1 OFF/0	Shorting is On Shorting is Off
Example	:LOAD:SHOR ON	Short circuits the load module channel.
Query Syntax	:LOAD:SHORT[:STATe]?	
Return Parameter	<NR1> 1 0	Short Load module Shorting is activated Shorting is deactivated
Query Example	:LOAD:SHOR? 0	Shorting is deactivated on the specific channel.

:LOAD:SHORT:KEY Channel Specific Command

Description	The SHORT key can be set to Toggle or Hold mode.	
Syntax	:LOAD:SHORT:KEY {TOGGLE 1 HOLD 0}	
Parameter	TOGGLE/1 HOLD/0	Sets the SHORT key to toggle mode Sets the SHORT key to hold mode
Example	:LOAD:SHOR:KEY 1	Set the SHORT key to toggle.
Query Syntax	:LOAD:SHORT:KEY?	
Return Parameter	<NR1> 1 0	Mode Toggle mode is active Hold mode is active
Query Example	:LOAD:SHOR:KEY? 0	Hold mode is active for the specific channel.

:LOAD:PROTection? Channel Specific Command

Description Returns the protection levels for electronic load

Query Syntax :LOAD:PROTection?

Query Example :LOAD:PROT? Clears the Channel Status Register.

Return Parameter	<NR1>	Condition	<NR1>	Condition
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	16-128	Not Used

Query Example :LOAD:PROT?
0 Returns the status of the Channel Status Register. Here 0 is returned indicating no protection settings have been tripped.

:LOAD:PROTection:CLEAr Channel Specific Command

Description This command clears the Channel Status Register for the specific channel. See page163.

Syntax :LOAD:PROTection:CLEAr

Example :LOAD:PROT:CLE Clears the Channel Status Register.

:LOAD:TIME? Channel Specific Command

Description This command displays the total load on time. If the load is on, the load time when the command was issued is displayed.

Query Syntax :LOAD:TIME?

Return Parameter	<NR1>1unit = 1 second 2.2	Load on time 2.2 seconds
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Query Example	:LOAD:TIME? 5.1	Returns the load on time as 5.1 seconds.
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:LOAD:DELaY Channel Specific Command

Description	Sets or queries the load delay time for the specific channel.	
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Syntax	:LOAD:DELaY <NRf>[S]	
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Parameter	<NRf>[S] 0.1S	Time Sets the delay time to 0.1 seconds.
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Example	:LOAD:DEL 0.1s	Sets the delay time to 0.1s.
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Query Syntax	:LOAD:DEL?	
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Return Parameter	<NR2>	Delay time in seconds.
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Query Example	:LOAD:DEL? 0.10000	Returns the delay time for the current channel.
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:LOAD:TYPE All Channels

Description	Sets or queries which load type is the active type.	
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Syntax	:LOAD:TYPE {LOAD 0 PROGRAM 1 SEQUENCE 2}	
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Parameter	LOAD/0 PROGRAM/1 SEQUENCE/2	Normal load Program Sequence
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Example	:LOAD:TYPE: 1	Program is active.
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Query Syntax	:LOAD:TYPE?	
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Return Parameter	<NR1>	Type
	0	Normal load
	1	Program
	2	Sequence
Query Example	:LOAD:TYPE?	The normal load type is active
	0	

Measure Subsystem

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:MEASure:VOLTage? Channel Specific Command

Description	This query returns the measured voltage of the specific channel.	
Query Syntax	:MEASure:VOLTage? <NR2>	
Return Parameter	<NR2> 1 unit = 1 volt	Voltage at the load input
	0.5000	0.5000 volts
Query Example	:MEAS:VOLT? 8.5600	A voltage of 8.56 volts is measured at the specific channel load input.

:MEASure:CURRent? Channel Specific Command

Description	This query returns the measured current of the specific channel.	
Query Syntax	:MEASure:CURRent? <NR2>	
Return Parameter	<NR2> 1 unit = 1 amp	Current at the load input
	1.0000	1.0000 amps
Query Example	:MEAS:CURR? 1.5	A current of 1.5 amps is measured at the specific channel load input.

:MEASure:POWer? Channel Specific Command

Description	This query returns the measured power of the specific channel.	
Query Syntax	:MEASure:POWer? <NR2>	
Return Parameter	<NR2> 1 unit = 1 watt 1.0000	Power at the load input 1.0000 watts
Query Example	:MEAS:POW? 1.5	1.5 watts is measured at the specific channel load input.

:MEASure:INPut Channel Specific Command

Description	This command is for compatibility with other instruments only and has no action.	
Syntax	:MEASure:INPut {LOAD 0 UUT 1}	
Parameter	LOAD/0 UUT/1	Disabled Enabled
Example	:MEAS:INP 0	Disable voltage sense.
Query Syntax	:MEASure:INPut? <NR1>	
Return Parameter	<NR1> 0 1	Voltage Sense Disabled Enabled
Query Example	:MEAS:INP? 1	Returns the voltage input status. Voltage sense is enabled.

:MEASure:SCAN Channel Specific Command

Description	This command allows the mainframe to scan all the load modules.	
Syntax	:MEASure:SCAN {OFF 0 ON 1}	
Parameter	OFF/0	Disabled
	ON/1	Enabled
Example	:MEAS:SCAN 0	Disable scanning.
Query Syntax	:MEASure:SCAN? <NR1>	
Return Parameter	<NR1>	Scan
	0	Disabled
	1	Enabled
Query Example	:MEAS:SCAN? 1	Returns the scanning status. Here scanning is enabled.

:MEASure:ALLVoltage? All Channel Command

Description	This query measures the voltage values of all the load modules/channels in order from 1-8 (PEL-2004A)/1-4(PEL2002A).	
Query Syntax	:MEASure:ALLVoltage? <aard>	
Query Parameter	<aard> 1 unit = 1 volt CH1,CH2,CH3,CH4,CH5, CH6,CH7,CH8	Returns all the voltage values from all the channels, 1-8(PEL-2004A)/1-4(PEL-2002A).

Query Example	:MEAS:ALLV? 2.5000, 3.0000, 0.0000, 0.0000, 0.0000, 0.0000, 5.500, 0.0000	Channel 1 and 2 have voltages of 2.5 and 3 volts respectively. Channels 3-6 and 8 have no voltage and channel 7 is 5.5 volts
---------------	--	--

All Channel
Command

Description	This query returns the current measured of all the load modules/channels in order from 1-8 (PEL-2004A)/1-4(PEL2002A).
-------------	---

Query Syntax	:MEASure:ALLCurrent? <aard>
--------------	-----------------------------

Query Parameter	<aard> 1 unit = 1 amp CH1,CH2,CH3,CH4,CH5, CH6,CH7,CH8	Returns all the current values from all the channels, 1-8(PEL-2004A)/1-4(PEL-2002A).
-----------------	--	--

Query Example	:MEAS:ALLC? 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 1.2000, 3.5600	Channels 1 to 6 have no current. Channels 7 & 8 have 1.2 and 3.56 amps, respectively.
---------------	---	---

All Channel
Command

Description	This query returns the power measured of all the load modules/channels in order from 1-8 (PEL-2004A)/1-4(PEL2002A).
-------------	---

Query Syntax	:MEASure:ALLPower? <aard>
--------------	---------------------------

Query Parameter	<aard> 1 unit = 1 watt CH1,CH2,CH3,CH4,CH5, CH6,CH7,CH8	Returns all the power values from all the channels, 1-8(PEL-2004A)/1-4(PEL-2002A).
-----------------	---	--

Query Example	:MEAS:ALLP? 0.0000, 0.0000, 0.0000 ,0.0000, 0.0000, 0.0000, 1.5000, 3.2000	Channels 1 to 6 have no power. Channels 7 & 8 have 1.5 and 3.2 watts, respectively.
---------------	---	---

MODE Subsystem

:MODE84

:MODE Channel Specific
Command

Description This command sets the operating mode of the specific channel. Some modes are load module dependant.

Syntax :MODE {CCL|CCH|CCDL|CCDH|CRL|CRH|CRDL|CRDH|CV|CPL|CPH|CVL|CVH}

Parameter	CCL	CC static mode, low range
	CCH	CC static mode, high range
	CCDL	CC dynamic mode, low range
	CCDH	CC dynamic mode, high range
	CRL	CR static mode, low range
	CRH	CR static mode, high range
	CRDL	CR dynamic mode, low range
	CRDH	CR dynamic mode, high range
	CV	CV mode
	CPL	CP static mode, low range
	CPH	CP static mode, high range
	CVL	CV static mode, low range
	CVH	CV static mode, low range

Example :MODE CCL Set the specific channel to low range constant current static mode.

Query Syntax :MODE?

Return Parameter	CCL	CC static mode, low range
	CCH	CC static mode, high range

	CCDL	CC dynamic mode, low range
	CCDH	CC dynamic mode, high range
	CRL	CR static mode, low range
	CRH	CR static mode, high range
	CRDL	CR dynamic mode, low range
	CRDH	CR dynamic mode, high range
	CV	CV mode
	CPL	CP static mode, low range
	CPH	CP static mode, high range
	CVL	CV static mode, low range
	CVH	CV static mode, low range

Query Example	:MODE? CCH	The specific channel is currently set to CC static mode, high range.
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OCP Test Automation Commands

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		Channel Specific Command
:OCP:EDIT:CHANnel?		
Description	Sets or queries which channel is used to apply the OCP Test Automation parameters. Also see page 91 for setting the active channel.	
Syntax	:OCP:EDIT:CHANnel <NR1>	
Parameter	<NR1>	1-8
Example	:OCP:EDIT:CHAN 1	Sets channel 1 as the chosen channel.
Query Syntax	:OCP:EDIT:CHANnel?	
Return Parameter	<NR1>	1-8
Query Example	:OCP:EDIT:CHAN? 1	Channel 1 is the chosen channel.

:OCP:CHANnel:RANGe Channel Specific Command

Description Sets or queries the channel range. High(CC Mode High) or Low(CC Mode Low)

Syntax :OCP:CHANnel:RANGe {LOW|0|HIGH|1}

Parameter	LOW/0	CC Mode Low range
	HIGH/1	CC Mode High range

Example :OCP:CHAN:RANG 0 Sets the range to LOW.

Query Syntax :OCP:CHANnel:RANGe?

Return Parameter	0	CC Mode Low range
	1	CC Mode High range

Query Example :OCP:CHAN:RANG? 0 The range is CC Mode Low.

:OCP:CHANnel:STARt Channel Specific Command

Description Sets or queries the starting current value.

Syntax :OCP:CHANnel:STARt {<NRF>[A] | MIN | MAX}

Parameter	<NRF>[A]	The current value in Amps.
	MAX	The maximum current value.
	MIN	The minimum current value.

Example :OCP:CHAN:STAR MIN Set the start current to the minimum.

Query Syntax :OCP:CHANnel:STARt? [MIN | MAX]

Return Parameter <NR2> Returns the starting current in Amps.

Query Example :OCP:CHAN:STAR? MIN 1.5 Returns the minimum starting current.

:OCP:CHANnel:END Channel Specific Command

Description	Sets the ending current value for the test. The value must be higher than the DUT OCP value.	
Syntax	:OCP:CHANnel:END {<NRF>[A] MIN MAX}	
Parameter	<NRF>[A]	The current value in Amps.
	MAX	The maximum current value.
	MIN	The minimum current value.
Example	:OCP:CHAN:END MIN	Set the ending current to the minimum.
Query Syntax	:OCP:CHANnel:END?	
Return Parameter	<NR2>	Returns the ending current in Amps.
Query Example	:OCP:CHAN:END? 10.0	Returns the ending current.

:OCP:CHANnel:STEP:CURRent Channel Specific Command

Description	Sets the current step resolution for the OCP Test Automation.	
Syntax	:OCP:CHANnel:STEP:CURRent {<NRF>[A] MIN MAX}	
Parameter	<NRF>[A]	The current value in Amps.
	MAX	The maximum current value.
	MIN	The minimum current value.
Example	:OCP:CHAN:STEP:CURRent MIN	Set the step resolution to the minimum value.
Query Syntax	:OCP:CHANnel:STEP:CURRent?	
Return Parameter	<NR2>	Returns the current step resolution in Amps.
Query Example	:OCP:CHAN:STEP:CURR? 0.5	Returns the step resolution.

:OCP:CHANnel:LAST Channel Specific Command

Description	Queries or sets the current value for after the DUT OCP protection has been activated.	
Syntax	:OCP:CHANnel:LAST {<NRF>[A] MIN MAX}	
Parameter	<NRF>[A]	The current value in Amps.
	MAX	The maximum current value.
	MIN	The minimum current value.
Example	:OCP:CHAN:LAST MAX	Set the current value to the maximum value.
Query Syntax	:OCP:CHANnel:LAST?	
Return Parameter	<NR2>	Returns the current value in Amps.
Query Example	:OCP:CHAN:LAST? 3.0	Returns the current value.

:OCP:CHANnel:STEP:TIME Channel Specific Command

Description	Queries or sets how long the step time is for the OCP Test Automation.	
Syntax	:OCP:CHANnel:STEP:TIME {<NRF>[S] MIN MAX}	
Parameter	<NRF>[S]	The step time in seconds (50mS~1600S).
	MAX	The maximum step time.
	MIN	The minimum step time.
Example	:OCP:CHAN:STEP:TIME MIN	Set the step time to the maximum value.
Query Syntax	:OCP:CHANnel:STEP:TIME?	
Return Parameter	<NR2>	Returns the step time in seconds.
Query Example	:OCP:CHAN:STEP:TIME? 10.0	Returns the step time.

		Channel Specific Command
:OCP:CHANnel:DElay		
Description	Queries or sets the test delay time for the OCP Test Automation function.	
Syntax	:OCP:CHANnel:DElay {<NRF>[S] MIN MAX}	
Parameter	<NRF>[S]	The delay time in seconds (5mS~160S).
	MAX	The maximum delay time.
	MIN	The minimum delay time.
Example	:OCP:CHAN:DEL MAX	Set the delay time to the maximum value.
Query Syntax	:OCP:CHANnel:DElay?	
Return Parameter	<NR2>	Returns the delay time in seconds.
Query Example	:OCP:CHAN:DEL? 5.0	Returns the delay time.

		Channel Specific Command
:OCP:CHANnel:TRIGger		
Description	Queries or sets the voltage trigger for when the power supply OCP has been triggered.	
Syntax	:OCP:CHANnel:TRIGger {<NRF>[V] MIN MAX}	
Parameter	<NRF>[V]	The trigger voltage level.
	MAX	The maximum trigger voltage.
	MIN	The minimum trigger voltage.
Example	:OCP:CHAN:TRIG MAX	Set the trigger voltage level to the maximum value.
Query Syntax	:OCP:CHANnel:TRIGger?	
Return Parameter	<NR2>	Returns the trigger voltage level in volts.
Query Example	:OCP:CHAN:TRIG? 5.0	Returns the trigger level.

:OCP:CHANnel:ACTIVE Channel Specific Command

Description Queries or sets which bit(s) are the active channel for the OCP Test Automation function. More than one channel can be activated based on the bit weight of the parameter.

Syntax :OCP:CHANnel:ACTIVE {<NR1>0~255}

Parameter	<NR1> (BIT WEIGHT)	Channel number	<NR1> (BIT WEIGHT)	Channel number
	1	1	16	5
	2	2	32	6
	4	3	64	7
	8	4	128	8

Example :OCP:CHAN:ACT 3 Activates channel 1 and 2.

Query Syntax :OCP:CHANnel:ACTIVE?

Return Parameter	<NR1> (BIT WEIGHT)	Channel number	<NR1> (BIT WEIGHT)	Channel number
	1	1	16	5
	2	2	32	6
	4	3	64	7
	8	4	128	8

Query Example :OCP:CHAN:ACT? 4 Returns channel 4 as the active channel.

:OCP:STATus? Query

Description Queries the status of the OCP Test Automation function.

Query Syntax :OCP:STATus? {0 | 1}

Return Parameter 0 Test ended

	1	OCP test active
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Query Example	:OCP:STAT? 0	The test has ended.
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:OCP:SAVE		Channel Specific Command
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Description	Saves the current COP Test Automation parameters.
-------------	---

Syntax	:OCP:SAVE
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:OCP:RESult?		Query
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Description	Returns the OCP Test Automation results.
-------------	--

Query Syntax	:OCP:RESult?
--------------	--------------

Query Example	:OCP:RES? Ch1 OCP Voltage, Ch1 OCP Current, Ch2 OCP Voltage, Ch2 OCP Current, Ch3 OCP Voltage, Ch3 OCP Current, Ch4 OCP Voltage, Ch4 OCP Current, Ch5 OCP Voltage, Ch5 OCP Current, Ch6 OCP Voltage, Ch6 OCP Current, Ch7 OCP Voltage, Ch7 OCP Current, Ch8 OCP Voltage, Ch8 OCP Current	This is an example of the results that are returned for the PEL-2004A.
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:OCP:RUN		Command
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Description	Turns the OCP Test Automation function on or off.
-------------	---

Syntax	:OCP:RUN { 0 OFF 1 ON }
--------	-------------------------------

Parameter	0/OFF	Turn off.
	1/ON	Turn on.

Example	:OCP:RUN OFF	Turn the test off.
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Program Subsystem

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:PROGram:STATe

Set →

→ Query

Description	Sets or queries the state of the program function.	
Syntax	:PROGram:STATe {ON OFF PAUSE CONTINUE NEXT}	
Query Syntax	:PROGram:STATe? [{ON,STOP RUN PAUSE} OFF]	
Parameter	ON	Turn program on
	OFF	Program off
	PAUSE	Program pause
	RUN	Program running
	NEXT	Next step in the program
	CONTINUE	Program continue
Return Parameter	ON,STOP	Program is on, stopped
	ON,PAUSE	Program is paused
	ON,RUN	Program is running
	OFF	Program is off

Example :PROGRAM:STATe ON
Turns “Program” on.

Query example :PROGRAM:STATe?
>OFF
“Program” is off.

:PROGRAM:FILE Program Number Specific

Description Sets the program number.

Syntax :PROGRAM:FILE <NR1>

Parameter	<NR1>	Program number
	1~12	Number 1~12

Example :PROG:FILE 5 Sets the program number to 5.

Query Syntax :PROGRAM:FILE?

Return Parameter	<NR1>	Mainframe Scanning
	1-12	Returns the current program number

Query Example :PROG:FILE?
5 The set program number is 5.

:PROGRAM:SEQuence Program Number Specific

Description Sets the Sequence number for the current program number.

Syntax :PROGRAM:SEQuence <NR1>

Parameter	<NR1>	Sequence number
	1~10	Number 1~10

Example :PROG:SEQ 1 Sets the sequence number to 1 for the current program number.

Query Syntax	:PROG:SEQ?	
Return Parameter	<NR1> 1-10	Mainframe Scanning Returns the current sequence number
Query Example	:PROG:SEQ? 1	The set sequence number is 1.

:PROG:MEM Program Number Specific

Description	Sets the memory number used for the current program/sequence.	
Syntax	:PROG:MEM <NR1>	
Parameter	<NR1> 1~120	Memory number Number 1~120
Example	:PROG:MEM 1	Sets the memory number to 001.
Query Syntax	:PROG:MEM?	
Return Parameter	<NR1> 1-120	Mainframe Scanning Returns the current program number
Query Example	:PROG:MEM? 1	The memory number for the current program/sequence is 001.

:PROG:SEQ:SHORT:CHAN Program Number Specific

Description	Simulates short circuits for load channels for the current sequence number.	
Syntax	:PROG:SEQ:SHORT:CHAN <NR1>	

Parameter	<NR1> (BIT WEIGHT)	Channel number	<NR1> (BIT WEIGHT)	Channel number
	1	1	16	5
	2	2	32	6
	4	3	64	7
	8	4	128	8

Example :PROG:SEQ:SHOR:CHAN 12 Simulates a short circuit for channels 3 and 4.

Query Syntax :PROGRAM:SEQuence:SHORt:CHANnel? <NR1>

Return Parameter	<NR1> (BIT WEIGHT)	Short Channel number	<NR1> (BIT WEIGHT)	Short Channel number
	1	1	16	5
	2	2	32	6
	4	3	64	7
	8	4	128	8

Query Example :PROG:SEQ:SHOR:CHAN? 12 Returns channels 3 and 4 are set as shorted for the program sequence.

:PROGRAM:SEQuence:SHORt:TIME Program Number Specific

Description Sets the short time (seconds) for the current program sequence.

Syntax :PROGRAM:SEQuence:SHORt:TIME <NRF>[S]

Parameter	<NRF>[S]	Short Time
	0.0	0 seconds = OFF
	0.1~60	0.1~60 seconds
	0.1~60S	0.1~60 seconds

Example :PROG:SEQ:SHOR:TIME 0.5 The short time for the program sequence is set to .5 seconds

Query Syntax	:PROG:SEQ:SHORT:TIME? <NR2>	
Return Parameter	<NR2> 1 unit = 1 second 0.0~60	Short Time Returns the short time for the program sequence.
Query Example	:PROG:SEQ:SHOR:TIME? 5	The short time for the program sequence is 5 seconds.

Program Number Specific

:PROG:SEQ:MODE

Description	Sets the program sequence to Auto, Manual or Skip mode.	
Syntax	:PROG:SEQ:MODE {MANUAL AUTO SKIP}	
Parameter	MANUAL AUTO SKIP	Manual mode: program sequence is run manually Auto mode: program sequence is run automatically Skip mode: current program sequence is skipped.
Example	:PROG:SEQ:MODE: AUTO	The current program sequence is set to Automatic mode.
Query Syntax	:PROG:SEQ:MODE?	
Return Parameter	MANUAL AUTO SKIP	Manual mode Auto mode Skip mode
Query Example	:PROG:SEQ:MODE? AUTO	The current program sequence is set to AUTO.

:PROG:ACTive Program Number Specific

Description Activates or selects the active load modules.

Syntax :PROG:ACTive <NR1>

Parameter	<NR1> (BIT WEIGHT)	Active Channel	<NR1> (BIT WEIGHT)	Active Channel
	1	1	16	5
	2	2	32	6
	4	3	64	7
	8	4	128	8

Example :PROG:ACT 4 Activates channel three.

Query Syntax :PROG:ACTive? <NR1>

Return Parameter	<NR1> (BIT WEIGHT)	Active Channel	<NR1> (BIT WEIGHT)	Active Channel
	1	1	16	5
	2	2	32	6
	4	3	64	7
	8	4	128	8

Query Example :PROG:ACT? Channels 3 and 4 are active.
12

:PROG:CHAI Program Number Specific

Description Chains the current program number to a specified program number.

Syntax :PROG:CHAI <NR1>

Parameter	<NR1>	Program
	1-12	1-12
	0	No chain/End chain

Example	:PROG:CHA 6	Chains the current program number to program number 6
Query Syntax	:PROG:CHAIn? <NR1>	
Return Parameter	<NR1> 1-12 0	Program 1-12 No chain/End chain
Query Example	:PROG:CHA? 6	Returns the program number the current program is chained to.

Program Number Specific

:PROG:ONTime

Description	Sets the on-time for the program number. 0.1~60 seconds.	
Syntax	:PROG:ONTime <NRf>[S]	
Parameter	<NRf>[S] 0.1-60 0.1-60s	Program On Time 0.1~60 seconds 0.1~60 seconds
Example	:PROG:ONT 10S	Set the on-time for the current program number to 10 seconds.
Query Syntax	:PROG:ONTime? <NR2>	
Return Parameter	<NR2> 0.1-60	Program On Time 0.1~60 seconds
Query Example	:PROG:ONT? 10	Returns the on-time for the current program number in seconds.

Program Number Specific

:PROG:OFFTime

Description	Sets the off-time for the program number. 0.1~60 seconds.
-------------	---

Syntax	:PROG:OFFTime <NRf>[S]	
Parameter	<NRf>[S]	Program Off Time
	0.0	0 seconds = OFF
	0.1~60	0.1~60 seconds
	0.1~60s	0.1~60 seconds
Example	:PROG:OFFT 10S	Set the off-time for the current program number to 10 seconds.
Query Syntax	:PROG:OFFTime? <NR2>	
Return Parameter	<NR2> unit = 1 second	Program Off Time
	0.0~60	0.0~60 seconds
Query Example	:PROG:OFFT? 10	Returns the off-time for the current program number in seconds.

All Channel Command

:PROG:RUN

Description	Runs the current program number when set to on, and when set to off will allow all the program/sequence data to be programmed.	
Syntax	:PROG:RUN {OFF 0 ON 1}	
Parameter	OFF/0	OFF
	ON/1	ON
Example	:PROG:RUN 1	Runs the program.

All Channel Command

:PROG:SAVE

Description	Saves the current program to memory.	
Syntax	:PROG:SAVE	
Example	:PROG:SAVE	Saves the program to memory.

:PROG:PFTime Program Number Specific

Description Sets the P/F-Time (pass/fail time) for the current program sequence in seconds.

Syntax :PROG:PFTime <NRf>[S]

Parameter	<NRf>[S]	P/F Time
	0.0	0 seconds = OFF
	0.1~119.9	0.1~119.9 seconds
	0.1~119.9S	0.1~119.9 seconds

Example :PROG:PFTime 0.5 Sets the P/F-Time to .5 seconds

Query Syntax :PROG:PFTime? <NR2>

Return Parameter	<NR2> 1 unit = 1 second	Short Time
	0.0~119.9	Returns the P/F-Time for the program sequence.

Query Example :PROG:PFTime?
5 The P/F-Time is 5 seconds.

:PROG:CHAI:STARt Program Number Specific

Description Sets or queries which program number is used as the “start” program in a program chain.

Syntax :PROG:CHAI:STARt <NR1>

Parameter	<NR1>	Program number
	1-12	1~12

Example :PROG:CHA:STAR 1 Set program #1 to start the chain.

Query Syntax :PROG:CHAI:STARt? <NR1>

Return Parameter	<NR1>	Program number
	1-12	1~12

Query Example	:PROG:CHA:STAR? 5	Program #5 starts the chain.
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Resistance Subsystem

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:RESistance[:STATic]:L1/L2	Channel Specific Command
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Description	Sets A/B Value for constant resistance mode, where L1 is A Value and L2 is B Value. This command only applies to current mode (static).
-------------	---

Syntax	:RESistance[:STATic]:L1/L2 <NRf+>[OHM]
--------	--

Parameter	NRf+[OHM]	Resistance
	L1 10	Sets A Value to 10 ohms
	L2 20	Sets B Value* to 20 ohms
		*Single Channel
	L1 MIN	Sets A Value to the minimum level for the specific channel.
	L1 MAX	Sets A Value to the maximum level for the specific channel.

Example	:RES:L1 10	Sets CR static mode A Value to 10 ohms, depending on the specific range
Query Syntax	:RESistance[:STATic]:L1/L2? [MAX MIN]	
Return Parameter	<NR2> [MAX MIN]	Resistance
	1 unit = 1 ohm/1 k ohm	Returns the resistance of the A or B Value.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:RES:L1? MAX 300	Returns the maximum resistance allowed for the channel. (PEL-2020A)

:RESistance[:STATic]:RISE/FALL Channel Specific Command

Description	Sets the rising/falling slew rate for CR mode. The command applies to the current mode (static/dynamic) and the current range (High/Low)	
Syntax	:RESistance[:STATic]:RISE/FALL <NRf+>[A/uS]	
Parameter	<NRf+>[A/uS]	Slew rate
	RISE/FALL 0.8A/uS	Sets the rising/falling slew rate to 0.8A/uS
	RISE/FALL .8	Sets the rising/falling slew rate to 0.8A/uS
	RISE/FALL MIN	Sets to the slowest rising/falling slew rate.
	RISE/FALL MAX	Sets to the fastest rising/falling slew rate.
Example	:RES:RISE 0.1	Sets the rising slew rate to 0.1A/uS.
Query Syntax	:RESistance:RISE/FALL? [MIN MAX]	

Return Parameter	<NR2> [MAX MIN] 1 Unit =1 amp/uS MAX/MIN	Slew rate Returns the slew rate. Returns the allowable maximum and minimum.
------------------	--	---

Query Example	:RES:RISE? MAX 0.8000	Returns the maximum value for the rising slew rate (0.8 A/uS).
---------------	--------------------------	--

:RESistance:STATic:RECall Channel Specific Command

Description	Sets or queries whether A Value or B Value is the currently active value in CR static mode.	
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Syntax	:RESistance:STATic:RECall {A 0 B 1}	
--------	-------------------------------------	--

Parameter	A/0 B/1	A B
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Example	:RES:STAT:REC 1	Makes B Value the active value.
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Query Syntax	:RES:STATic:RECall?	
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Return Parameter	<NR1> 0 1	Value A B
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:RESistance:STATic:LOW:AVALue/BVALue Channel Specific Command

Description	Sets the low range A/B Value for constant resistance static mode.	
-------------	---	--

Syntax	:RESistance:STATic:LOW:AVALue/BVALue <NRf+>[OHM]	
--------	---	--

Parameter	NRF+[OHM] AVALue 10	Resistance Sets A Value to 10 ohms. (Low range only)
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	BVALue 20	Sets B Value to 20 ohms. (Low Range only)
	AVALue MIN	Sets A Value to the minimum level for the specific channel.
	AVALue MAX	Sets A Value to the maximum level for the specific channel.

Example :RES:STAT:LOW:BVAL 10 Sets low range CR static mode B Value to 10 ohms.

Query Syntax :RESistance:STATic:LOW:AVALue/BVALue?

Return Parameter <NR2> [MAX|MIN] Resistance
 1 unit = 1 ohm Returns the resistance of the A or B Value.

Query Example :RES:STAT:LOW:AVAL? Returns the maximum resistance allowed for the channel. (PEL-2020A)
 MAX
 300

:RESistance:STATic:LOW:RISE/FALL Channel Specific Command

Description Sets the low range rising/falling slew rate.

Syntax :RESistance:STATic:LOW:RISE/FALL <NRf+>[A/uS]

Parameter	<NRf+>[A/uS]	Slew rate
	RISE/FALL 0.8A/uS	Sets the rising/falling slew rate to 0.8A/uS
	RISE/FALL .8	Sets the rising/falling slew rate to 0.8 A/uS
	RISE/FALL MIN	Sets to the slowest rising/falling slew rate.
	RISE/FALL MAX	Sets to the fastest rising/falling slew rate.

Example	:RES:STAT:LOW:RISE 0.1	Sets the rising slew rate to 0.1A/uS.
Query Syntax	:RESistance:STATic:LOW:RISE/FALL? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN] 1 Unit =1 amp/uS MAX, MIN	Slew rate Returns the slew rate. Returns the allowable maximum and minimum.
Query Example	:RES:STAT:LOW:RISE? MAX 0.8000	For low range CR mode, the maximum value for the rising slew rate is 0.8 A/uS for the specific channel.

Channel Specific Command

:RESistance:STATic:HIGH:AVALue/BVALue

Description	Sets the high range A/B Value for constant resistance static mode.	
Syntax	:RESistance:STATic:HIGH:AVALue/BVALue <NRF+>[OHM]	
Parameter	NRF+[OHM] AVALue 10 BVALue 20OHM AVALue MIN AVALue MAX	Sets A Value to 10 ohms. (high range only) Sets B Value to 20 ohms. (high Range only) Sets A Value to the minimum level for the specific channel. Sets A Value to the maximum level for the specific channel.
Example	:RES:STAT:HIGH:BVAL 10	Sets high range CR static mode B Value to 10 ohms.

Query Syntax	:RESistance:STATic:HIGH:AVALue/BVALue? [MAX MIN]	
Return Parameter	<NR2> [MAX MIN] 1 unit= 1 ohm	Resistance Returns the resistance of the A or B Value.
Query Example	:RES:STAT:HIGH:BVAL? MAX 15000.0	Returns the maximum resistance allowed for the channel for B Value. (PEL-2020A)
:RESistance:STATic:HIGH:RISE/FALL		Channel Specific Command

Description	Sets the high range rising/falling slew rate.	
Syntax	:RESistance:STATic:HIGH:RISE/FALL <NRF+>[A/uS]	
Parameter	<NRF+>[A/uS] RISE/FALL 0.8A/uS RISE/FALL 0..5 RISE/FALL MIN RISE/FALL MAX	Slew rate Sets the rising/falling slew rate to 0.8A/uS Sets the rising/falling slew rate to 0.5A/uS Sets to the slowest rising/falling slew rate. Sets to the fastest rising/falling slew rate.
Example	:RES:STAT:HIGH:RISE 1.1	Sets the rising slew rate to 1.1A/uS.
Query Syntax	:RESistance:STATic:HIGH:RISE/FALL? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN] 1 Unit=1 amp/uS MAX/MIN	Slew rate Returns the slew rate. Returns the allowable maximum and minimum.

Query Example	:RES:STAT:HIGH:RISE? MIN 0.8000	For high range CR mode, the minimum value for the rising slew rate is 0.8 A/uS for the specific channel.
	:RESistance:DYNamic:LOW:L1/L2	Channel Specific Command
Description	Sets the low range resistance levels (Level 1 & 2) for CR dynamic mode.	
Syntax	:RESistance:DYNamic:LOW:L1/L2 <NRf+>[OHM]	
Parameter	NRf+[OHM]	Ohms
	L1 10	Sets L1 to 10 ohms. (low range only)
	L2 20OHM	Sets L2 to 20 ohms. (low range only)
	L1/L2 MIN	Sets L1 or L2 to the minimum level for the specific channel.
	L1/L2 MAX	Sets L1 or L2 to the maximum Level for the specific channel.
Example	:RES:DYN:LOW:L1 10	In low range CR dynamic mode, Set L1 (level 1) to 10 ohms.
Query Syntax	:RESistance:DYNamic:LOW:L1/L2? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN]	Resistance
	1 unit= 1 ohm	Returns the resistance of L1/L2.
Query Example	:RES:DYN:LOW:L2? MAX 300	Returns the maximum resistance allowed for the channel. (PEL-2020A)

:RESistance:DYNamic:LOW:RISE/FALL Channel Specific Command

Description Sets the low range rising/falling slew rate for CR dynamic mode for the specific channel.

Syntax :RESistance:DYNamic:LOW:RISE/FALL <NRf+>[A/uS]

Parameter	<NRf+>[A/uS]	Slew Rate
	RISE/FALL 0.8A/uS	Sets the rising/falling slew rate to 0.8A/uS
	RISE/FALL .1	Sets the rising/falling slew rate to 0.1A/uS
	RISE/FALL MIN	Sets to the slowest rising/falling slew rate.
	RISE/FALL MAX	Sets to the fastest rising/falling slew rate.

Example :RES:DYNA:LOW:RISE 0.1 Sets the rising slew rate to ~ 0.1A/uS.

Query Syntax :RESistance:DYNamic:LOW:RISE/FALL? [MIN|MAX]

Return Parameter	<NR2> [MAX MIN]	Slew rate
	1 Unit=1 amp/uS	Returns the slew rate.
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example :RES:DYN:LOW:FALL?
MIN
0.8000 For low range dynamic CR mode, the minimum value for the falling slew rate is 0.8 A/uS for the specific channel.

:RESistance:DYNamic:LOW:T1/T2 Channel Specific Command

Description Sets the timers T1 or T2 for CR dynamic mode for the specific channel in low range.

Syntax :RESistance:DYNamic:LOW:T1/T2 <NRf+>[S|ms]

Parameter	<NRf+>[S] T1/T2 0.1S T1/T2 1 T1/T2 MIN T1/T2 MAX	Time T1/T2 Sets the T1/T2 time to 0.1 seconds. Sets T1/T2 to 1 second. Sets the T1/T2 to the minimum value. Sets the T1/T2 time to the maximum time
Example	:RES:DYNA:LOW:T1 10S	Sets the T1 time to 10 seconds for the specific channel.
Query Syntax	:RESistance:DYNamic:T1/T2? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN] 1 Unit=1 second MAX/MIN	Time T1/T2 Returns T1/T2 time. Returns the allowable maximum and minimum.
Query Example	:RES:DYN:LOW:T1? 2.5 :CURR:DYN:LOW:T1? MIN 0.00025	Returns the T1 time of 2.5 seconds. Returns the minimum T1 time allowable for the specific channel.

:RESistance:DYNamic:HIGH:L1/L2 Channel Specific Command

Description	Sets the high range resistance levels (Level 1 & 2) for CR dynamic mode.	
Syntax	:RESistance:DYNamic:HIGH:L1/L2 <NRf+>[OHM]	
Parameter	NRf+[OHM] L1 10 L2 20OHM	Resistance Sets L1 to 10 ohms. (high range only) Sets L2 to 20 ohms. (high range only)

	L1/L2 MIN	Sets L1 or L2 to the minimum level for the specific channel.
	L1/L2 MAX	Sets L1 or L2 to the maximum level for the specific channel.
Example	:RES:DYN:HIG:HL1 10	In high range CR dynamic mode, Set L1 (level 1) to 10 ohms.
Query Syntax	:RESistance:DYNamic:HIG:HL1/L2? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN] 1 unit= 1 ohm	Resistance Returns the resistance of Level 1 / 2 (L1/L2).
Query Example	:RES:DYN:HIG:L2? MAX 15000.0	Returns the maximum resistance allowed for the channel. (PEL-2020A)

:RESistance:DYNamic:HIG:RISE/FALL Channel Specific Command

Description	Sets the high range rising/falling slew rate for CR dynamic mode for the specific channel.	
Syntax	:RESistance:DYNamic:HIG:RISE/FALL <NRf+>[A/uS]	
Parameter	<NRf+>[A/uS]	Slew Rate
	RISE/FALL 0.8A/uS	Sets the rising/falling slew rate to 0.8A/uS
	RISE/FALL 1	Sets the rising/falling slew rate to 1A/uS
	RISE/FALL MIN	Sets to the slowest rising/falling slew rate.
	RISE/FALL MAX	Sets to the fastest rising/falling slew rate.
Example	:RES:DYN:HIG:RISE 1.1	Sets the rising slew rate to 1.1A/uS.

Query Syntax	:RESistance:DYNamic:HIGH:FALL? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN]	Slew rate
	1 Unit=1 amp/uS	Returns the slew rate.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:RES:DYN:HIGH:FALL? MAX 0.8000	For high range dynamic CR mode, the minimum value for the falling slew rate is 0.8 A/uS for the specific channel.

:RESistance:DYNamic:HIGH:T1/T2 Channel Specific Command

Description	Sets the timers T1 and T2 for high range dynamic CR mode.	
Syntax	:RESistance:DYNamic:HIGH:T1/T2 <NRf+>[S ms]	
Parameter	<NRf+>[S]	Timer T1/T2
	T1/T2 0.1S	Sets the T1/T2 time to 0.1 seconds.
	T1/T2 1	Sets T1/T2 to 1 second.
	T1/T2 MIN	Sets the T1/T2 to the minimum value.
	T1/T2 MAX	Sets the T1/T2 time to the maximum time
Example	:RES:DYNA:HIGH:T1 10S	Sets the high range T1 time to 10 seconds for the specific channel.
Query Syntax	:RESistance:DYNamic:HIGH:T1/T2? [MIN MAX]	
Return Parameter	<NR2> [MAX MIN]	T1/T2 time.
	1 Unit=1 second	Returns T1/T2 time.
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example	:RES:DYN:HIG:TI?	Returns the T1 time of
	2.5	2.5 seconds.
	:RES:DYN:LOW:TI? MIN	Returns the minimum T1
	0.000025	time allowable for the
		specific channel.

RUN Subsystem

:RUN115

:RUN All Channel
Command

Description	Turns on all the electronic loads.
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Syntax	:RUN
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Example	:RUN	Turns on all electronic loads.
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SHOW Subsystem

:SHOW[:DISPlay] dual channel116
 :SHOW[:DISPlay] single channel117

:SHOW[:DISPlay] dual channel Channel Specific Command
 (Dual channel module)

Description	Sets the display mode of the load module of the specific channel.	
Syntax	:SHOW:DISPlay {LVI LVW LIW RVI RVW RIW LRV LRI LRW LRS LIRV LVRI LVRI}	
Parameter	LVI	Left channel, voltage/current
	LVW	Left channel, voltage/power
	LIW	Left channel, current/power
	RVI	Right channel, voltage/current
	RVW	Right channel, voltage/power
	RIW	Right channel, current/power
	LRV	Left and right channel voltage
	LRI	Left and right channel current
	LRW	Left and right channel power
	LRS	Left and right channel load on time
	LIRV	Left channel current, right channel voltage
	LVRI	Left channel voltage, right channel current
Example	:SHOW:DISP LVI	Show the left channel voltage and current on the load module display.

:SHOW[:DISPlay] single channel Channel Specific Command
 (Single channel module)

Description Sets the display mode of the load module of the specific channel.

Syntax :SHOW:DISPlay {VI, VW, IW, S}

Parameter	VI	Voltage/current
	VW	Voltage/power
	IW	Current/power
	S	Load on time

Example	:SHOW:DISP VI	Shows voltage and current on the load module display.
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SPECIFICATION Subsystem

:SPECification:UNIT 118
 :SPECification[:PASS]? 119
 :SPECification[:PASS]:CHANnel/
 ALLChannel/VOLTage/CURRent? 119
 :SPECification:VOLTage:H/L/C 120
 :SPECification:CURRent:H/L/C..... 120
 :SPECification:TEST:..... 121

:SPECification:UNIT Channel Specific Command

Description	Sets the Go/NoGo (specification) units as percentages or values.	
Syntax	:SPECification:UNIT {PERCENT 0 VALUE 1}	
Parameter	PERCENT/0 VALUE/1	Percentages Values
Example	:SPEC:UNIT PERCENT	Sets the Go/NoGo limits as percentages
Query Syntax	:SPECification:UNIT? <NR1>	
Return Parameter	<NR1> 0 1	Go/NoGo Unit Percent Value
Query Example	:SPEC:UNIT? 0	The Go/NoGo (specification) units are set as percent.

:SPECification[:PASS]?		Channel Specific Command
Description	Displays if the Go/NoGo (specification) limit has passed/failed for the current channel used.	
Query Syntax	:SPECification[:PASS]?	
Return Parameter	<NR1>	Go/NoGo Specification
	0	Fail
	1	Pass
Query Example	:SPEC:PASS?	Go/NoGo has failed
	0	
Query Example	:SPEC?	Go/NoGo has failed
	0	

:SPECification[:PASS]:CHANnel/ ALLChannel/VOLTage/CURRent?		Channel Specific Command
Description	Queries if the voltage, current, current channel or all channels have passed/failed the Go/NoGo (specification) limits. VOLTage→CC, CR mode, CURRent→CV, CP mode	
Query Syntax	:SPECification[:PASS]:CHANnel/ALLChannel/VOLTage/CURRent?	
Return Parameter	<NR1>	Go/NoGo Specification
	0	Fail
	1	Pass
Query Example	:SPEC:PASS:VOLT?	The test has exceeded the Go/NoGo voltage limits.
	0	
Query Example	:SPEC:VOLT?	The test has exceeded the Go/NoGo voltage limits.
	0	

:SPECification:VOLTage:H/L/C		Channel Specific Command
Description	Sets the high(H), low(L) and center(C) Go/NoGo voltage limit specifications. Applicable to CC and CR mode only.	
Syntax	:SPECification:VOLTage:H/L/C <NRf+>[V]	
Parameter	<NRf+>[V] 1 unit = 1 volt	Go/NoGo voltage limit
	1	1 volt
	1V	1 volt
Example	:SPEC:VOLT:H 2V	Sets the Go/NoGo high voltage limit to 2 volts.
Query Syntax	:SPECification:VOLTage:H/L/C? <NR2>	
Return Parameter	<NR2> 1 unit = 1 volt	Go/NoGo voltage Returns the limit voltage
Query Example	:SPEC:VOLT:H? 2.000	The voltage limit is 2 volts.

:SPECification:CURRent:H/L/C		Channel Specific Command
Description	Sets the high(H), low(L) and center(C) Go/NoGo current limit specifications. Applicable to CV mode only.	
Syntax	:SPECification:CURRent::H/L/C <NRf+>[A]	
Parameter	<NRf+>[A] 1 unit = 1 amp	Go/NoGo current limit
	1	1 amp
	1A	1 amp
Example	:SPEC:CURR:H 1A	Sets the Go/NoGo high current limit to 1 amp.
Query Syntax	:SPECification:CURRent:H/L/C? <NR2>	

Return Parameter	<NR2> 1 unit = 1 amp	Go/NoGo voltage Returns the limit current
Query Example	:SPEC:CURR:H? 5.120	The current limit is 5.12 amps.
:SPECification:TEST:		Channel Specific Command
Description	Turns the Go/NoGo specification (SPEC) limits on/off.	
Syntax	:SPECification:TEST {OFF 0 ON 1}	
Parameter	OFF/0 ON/1	OFF ON
Example	:SPEC:TEST OFF	Turn Go/NoGo SPEC off for the specific channel.
Query Syntax	:SPECification:TEST?	
Return Parameter	<NR1> 0 1	Go/NoGo SPEC status Off On
Query Example	:SPEC:TEST? 1	Go/NoGo SPEC limits is on.

STATUS Subsystem

:STATus:CHANnel:CONDition?	122
:STATus:CHANnel:ENABLE	123
:STATus:CHANnel:EVENT?	123
:STATus:CHANnel:NTRansition/PTRansition	124
:STATus:CSUMmary:ENABLE	125
:STATus:CSUMmary:EVENT?	126
:STATus:QUEStionable:CONDition?	126
:STATus:QUEStionable:ENABLE	127
:STATus:QUEStionable[:EVENT]?	127
:STATus:QUEStionable:NTRansition/PTRansition	128
:STATus:PREset	129

:STATus:CHANnel:CONDition?	Channel Specific Command
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Description	Returns the status of the Channel Status Condition Register. The returned value is the bit weight of the Channel Status Condition Register. See page 165 for details.
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Query Syntax	:STATus:CHANnel:CONDition?<NR1>
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Return Parameter	<NR1>	Condition	<NR1>	Condition
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not Used

Query Example	:STAT:CHAN:COND? 3	Indicates OC and OV conditions are true.
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:STATus:CHANnel:ENABle Channel Specific Command

Description Sets which events are enabled in the Channel Status Enable register. The mask values are the bit weights of the Channel Status Enable Register. See page 165 for details.

Syntax :STATus:CHANnel:ENABle <NR1>

Parameter	<NR1>	Event	<NR1>	Event
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not Used

Example :STAT:CHAN:ENAB 12 Events OP (Bit 3) and RV (Bit 4) are enabled in the Channel Status Enable register.

Query Syntax :STATus:CHANnel:ENABle? <NR1>

Return Parameter	<NR1>	Event	<NR1>	Event
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not Used

Query Example :STAT:CHAN:ENAB? 4 The OP event is enabled.

:STATus:CHANnel:EVENT? Channel Specific Command

Description Returns the status of the Channel Status Event register for the specific channel. The Channel Status Event register is cleared upon reading.

Query Syntax :STATus:CHANnel:EVENT? <NR1>

Return Parameter	<NR1>	Event	<NR1>	Event
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not Used

Query Example :STAT:CHAN:EVEN?
1
An over current (OC) event occurred since the last time the Channel Status Event register was read.

**:STATus:CHANnel:NTRansition/
PTRansition** Channel Specific
Command

Description Determines whether a negative transition (NTR 1→0) or positive (PTR 0→1) transition in the Channel Status Condition register will set the corresponding event in the Channel Status Event register.

The mask values are the bit weights of the Channel Status PTR/NTR filters. See page 165 for details.

Syntax :STATus:CHANnel:NTRansition/PTRansition <NR1>

Parameter	<NR1>	Condition	<NR1>	Condition
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not Used

Example :STAT:CHAN:NTR 12
OP (Bit 3) and RV (Bit 4) are set as negative transitions.

:STAT:CHAN:PTR 1
OC (Bit 1) is set as a positive transition.

Query Syntax :STATus:CHANnel:NTRansition/PTRansition? <NR1>

Return Parameter	<NR1>	Event	<NR1>	Event
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not Used

Query Example :STAT:CHAN:NTR? 4
OP is set as a negative transition.

:STATus:CSUMmary:ENABLE Channel Specific Command

Description Determines which channels in the Channel Summary Register group can set the CSUM bit of the Status Byte Register. The mask values are the bit weights of each corresponding channel in the Channel Summary Enable Register. See page 166 for details.

Syntax :STATus:CSUMmary:ENABLE <NR1>

Parameter	<NR1>	Event	<NR1>	Event
	1	CH1	16	CH5
	2	CH2	32	CH6
	4	CH3	64	CH7
	8	CH4	128	CH8

Example :STAT:CSUM: 3
Events from channel 1 and 2 are enabled

Query Syntax :STATus:CSUMmary:ENABLE? <NR1>

Return Parameter	<NR1>	Event	<NR1>	Event
	1	CH1	16	CH5
	2	CH2	32	CH6
	4	CH3	64	CH7
	8	CH4	128	CH8

Query Example :STAT:CSUM:ENAB?
4

Only the events from channel 3 can set the CSUM bit in the Status Byte Register.

:STATus:CSUMmary:EVENT? Channel Specific Command

Description Returns the status of the Channel Summary Event register. The Channel Summary Event register is cleared upon reading.

Query Syntax :STATus:CSUMmary:EVENT? <NR1>

Return Parameter	<NR1>	Event	<NR1>	Event
	1	CH1	16	CH5
	2	CH2	32	CH6
	4	CH3	64	CH7
	8	CH4	128	CH8

Query Example :STAT:CSUM:EVEN?
4

An event from channel 3 occurred since the last time the Channel Summary Event register was read.

:STATus:QUEStionable:CONDition? Channel Specific Command

Description Returns the status of the Questionable Status Condition register for the specific channel. See page 167 for details.

Query Syntax :STATus:QUEStionable:CONDition? <NR1>

Return Parameter	<NR1>	Condition	<NR1>	Condition
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128-65535	Not used

Query Example :STAT:QUES:COND? 2 OV (overvoltage) error.

:STATus:QUEStionable:ENABLE Channel Specific Command

Description Sets which events are enabled in the Questionable Status Enable register. The mask values are the bit weights of the events. See page 167 for details.

Syntax :STATus:QUEStionable:ENABLE <NR1>

Parameter	<NR1>	Event	<NR1>	Event
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not used

Example :STAT:QUES:ENAB 12 Events OP (Bit 3) and RV (Bit 4) are enabled in the Questionable Status Enable register.

Query Syntax :STATus:QUEStionable:ENABLE? <NR1>

Return Parameter	<NR1>	Event	<NR1>	Event
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not used

Query Example :STAT:QUES:ENAB? 4 The OP event is enabled.

:STATus:QUEStionable[:EVENTt]? Channel Specific Command

Description Returns the status of the Questionable Status Event register. The Questionable Status Event register is cleared upon reading.

Query Syntax :STATus:QUEStionable[:EVENTt]? <NR1>

Return Parameter	<NR1>	Event	<NR1>	Event
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not used

Query Example :STAT:QUES:EVEN?
1
An over current (OC) event occurred since the last time the Questionable Status Event register was read.

:STATus:QUEStionable:NTRansition/
PTRansition Channel Specific
Command

Description Determines whether a negative transition (NTR 1→0) or positive (PTR 0→1) transition in the Questionable Status Condition register will set the corresponding event in the Questionable Status Event register.

The mask values are the bit weights of the Questionable Status PTR/NTR filters. See page 167 for details.

Syntax :STATus:QUEStionable:NTRansition/PTRansition <NR1>

Parameter	<NR1>	Condition	<NR1>	Condition
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not used

Example	:STAT:QUES:NTR 5	OC (Bit 1) and OP (Bit 3) are set as negative transitions.
	:STAT:CHAN:PTR 2	OV (Bit 2) is set as a positive transition.

Query Syntax :STATus:QUESTionable:NTRansition/PTRansition? <NR1>

Return Parameter	<NR1>	Event	<NR1>	Event
	1	OC	16	OT
	2	OV	32	G/N
	4	OP	64	UVP
	8	RV	128~65535	Not used

Query Example :STAT:QUES:NTR? 4
Returns which conditions (OP) have negative transitions.

:STATus:PREset Channel Specific Command

Description The status preset command resets the Enable registers and NTR/PTR registers from the Channel Status and Questionable Status Register groups.

Preset	Register	Preset
	Channel Status Enable	All bits set to 1
	Channel Status PTR	All bits set to 1
	Channel Status NTR	All bits set to 0
	Questionable Status Enable	All bits set to 0
	Questionable Status PTR	All bits set to 1
	Questionable Status NTR	All bits set to 0

Syntax :STATus:PREset

Example :STAT:PRE

Voltage Subsystem

:VOLTage:L1/L2.....	130
:VOLTage:RECall.....	131
:VOLTage:AVALue/BVALue.....	131
:VOLTage:CURRent	132
:VOLTage:MODE.....	133

:VOLTage:L1/L2		Channel Specific Command
Description	Sets the voltage of A Value or B Value in CV mode, where L1 is A Value and L2 is B Value.	
Syntax	:VOLTage:L1/L2 <NRf+>[V]	
Parameter	<NRf+>[V]	Voltage
	10	10 volts
	10V	10 volts
	MIN	Sets the voltage to the minimum value for the channel
	MAX	Sets the voltage to the maximum value for the channel
Example	:VOLT:L1 10V	Sets A Value to 10 volts for the specific channel
	:VOLT:L2 MAX	Sets B Value to the maximum allowed voltage for the specific channel.
Query Syntax	:VOLTage:L1/L2? [MAX MIN]	
Return Parameter	<NR2> 1 unit = 1 volt	Voltage
	10	Returns the voltage of the specific channel.

	MAX/MIN	Returns the allowable maximum and minimum.
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Query Example :VOLT:L1?
5

A Value is set to 5 volts.

:VOLT:L1? MAX
81.6000

Returns the maximum settable voltage.

:VOLTage:RECall Channel Specific Command

Description Sets or queries whether A Value or B Value is the currently active value in CV mode.

Syntax :VOLTage:RECall {A|0|B|1}

Parameter	A/0	A
	B/1	B

Example :VOLT:REC 1
Makes B Value the active value.

Query Syntax :VOLTage:RECall?

Return Parameter	<NR1>	Value
	0	A
	1	B

:VOLTage:AVALue/BVALue Channel Specific Command

Description Sets the voltage of A Value or B Value in CV mode.

Syntax :VOLTage:AVALue/BVALue <NRf+>[V]

Parameter	<NRf+>[V]	Voltage
	10	10 volts
	10V	10 volts
	MIN	Sets the voltage to the minimum value for the channel

	MAX	Sets the voltage to the maximum value for the channel
Example	:VOLT:AVAL 10V	Sets A Value to 10 volts for the specific channel
	:VOLT:BVAL MAX	Sets B Value to the maximum allowed voltage for the specific channel. (single channel only)
Query Syntax	:VOLTage:AVALue/BVALue? [MAX MIN]	
Return Parameter	<NR2> 1 unit = 1 volt	Voltage
	10	Returns the voltage of the specific channel.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:VOLT:AVAL?	A Value is set to 5 volts.
	5	
	:VOLT:AVAL? MAX	Returns the maximum
	81.6000	settable voltage.

:VOLTage:CURRent Channel Specific Command

Description	Sets the current limit in CV mode.	
Syntax	:VOLTage:CURRent <NRf+>[A]	
Parameter	<NRf+>[A]	Current limit
	1	1 Amp
	1A	1 Amp
	MIN	Sets the current limit to the minimum value for the channel

	MAX	Sets the current limit to the maximum value for the channel
Example	:VOLT:CURREN 1A	Sets the current limit to 1 Amp for the specific channel.
	:VOLT:CURREN MAX	Sets the current limit to the maximum limit for the specific channel.
Query Syntax	:VOLTage:CURREnt? [MAX MIN]	
Return Parameter	<NR2> 1 unit = 1 amp	Current limit
	1	Returns the current limit of the specific channel.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:VOLT:CURREN? 5	The current limit is 5 amps for the specific channel.

:VOLTage:MODE Channel Specific Command

Description	Set the constant voltage response time for the specific channel.	
Syntax	:VOLTage:MODE {SLOW 0 FAST 1}	
Parameter	SLOW/0	Slow response time
	FAST/1	Fast response time
Example	:VOLT:MODE SLOW	Sets the response time to SLOW for the specific channel.
	:VOLT:MODE 1	Sets the response time to FAST for the specific channel.
Query Syntax	:VOLTage:MODE? <NR1>	

Return Parameter	<NR1>	Response Time
	0	Slow
	1	Fast

Query Example	:VOLT:MODE?	The specific channel is set to SLOW response time.
	0	

Power Subsystem

:POWer:L1/L2	135
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:POWer:L1/L2	Channel Specific Command
--------------	-----------------------------

Description	Sets the A/B Value for constant power mode, where L1 is A Value and L2 is B Value. The command is range dependant. If the current range is Low, then the command will only apply to the low range settings.
-------------	---

Syntax	:POWer:L1 L2 <NRf+>[W]
--------	------------------------

Parameter	<NRf+>[W]	
	L1 1	Sets A Value to 1 Watt.
	L2 2	Sets B Value to 2 Watts.
	L1 1W	Sets A Value to 1 Watt. (single channel only)
	L1 MIN	Sets A Value to the minimum level for the specific channel.
	L1 MAX	Sets A Value to the maximum Level for the specific channel.

Example	:POW:L1 1	Sets A Value to 1 watt
---------	-----------	------------------------

Query Syntax	:POW:L1?/L2? [MAX MIN]
--------------	------------------------

Return Parameter	<NR2> [MAX MIN]	Current
------------------	-----------------	---------

	1 unit = 1 watt	Returns the power of the A Value (L1) or B Value (L2).
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:POW:L2? MAX 357.000	Returns the maximum power allowed for the channel. (PEL-2040A)
:POWer:CURRent		Channel Specific Command
Description	Sets the current limit for constant power mode. The command is range dependant. If the current range is Low, then the command will only apply to the low range settings.	
Syntax	:POWer:CURRent <NRf+>[A]	
Parameter	<NRf+>[A]	
	1	Sets the current limit to 1A.
	1A	Sets the current limit to 1A.
	MIN	Sets the current limit to the minimum level for the specific channel.
	MAX	Sets the current limit to the maximum level for the specific channel.
Example	:POW:CURR 1	Sets the current limit to 1A.
Query Syntax	:POW:CURRent? [MAX MIN]	
Return Parameter	<NR2> [MAX MIN]	Current
	1 unit = 1 amp	Returns the current limit.
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example :POW:CURR?
7.0 Returns the current limit for the specific channel.

:POWer:RECall Channel Specific Command

Description Sets or queries whether A Value or B Value is the currently active value in CP mode.

Syntax :POWer:RECall A/0, B/1

Parameter	A/0, B/1	Value
	A/0	A
	B/1	B

Example :POW:REC 1 Makes B Value the active value.

Query Syntax :POWer:RECall?

Return Parameter	<NR1>	Value
	0	A
	1	B

Query Example :POW:REC?
0 A Value is active.

:POWer:LOW:AVALue/BVALue Channel Specific Command

Description Sets the low range A/B Value for constant power mode.

Syntax :POWer:LOW:AVALue/BVALue <NRf+>[W]

Parameter	NRf+[W]	
	AVALue 1	Sets A Value to 1 watt.
	BVALue 1W	Sets B Value to 1 watt.
	AVALue MIN	Sets A Value to the minimum level for the specific channel.

	AVALue MAX	Sets A Value to the maximum Level for the specific channel.
Example	:POWer:LOW:AVAL 1	Sets A Value to 1 watt for the low range.
Query Syntax	:POWer:LOW:AVALue/BVALue? [MAX MIN]	
Return Parameter	<NR2> [MAX MIN] 1 unit = 1 watt MAX/MIN	Current Returns the power of the A or B Value. Returns the allowable maximum and minimum.
Query Example	:POWer:LOW:BVAL? MAX 2	Returns the maximum power allowed for the channel/range.

:POWer:LOW:CURRent Channel Specific Command

Description	Sets the current limit for constant power mode for the low range only.	
Syntax	:POWer:LOW:CURRent <NRf+>[A]	
Parameter	<NRf+>[A] 1 1A MIN MAX	Sets the current limit to 1A. Sets the current limit to 1A. Sets the current limit to the minimum level for the specific channel. Sets the current limit to the maximum level for the specific channel.
Example	:POW:CURR 1	Sets the current limit to 1A.

Query Syntax	:POW:LOW:CURRent? [MAX MIN]	
Return Parameter	<NR2> [MAX MIN]	Current
	1 unit = 1 amp	Returns the current limit.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:POW:LOW:CURR? 7.0	Returns the current limit for the specific channel.

:POWER:HIGH:AVALue/BVALue Channel Specific Command

Description	Sets the high range A/B Value for constant power mode.	
Syntax	:POWER:HIGH:AVALue/BVALue <NRF+>[W]	
Parameter	NRF+[W]	
	AVALue 1	Sets A Value to 1 watt.
	BVALue 1W	Sets B Value to 1 watt.
	AVALue MIN	Sets A Value to the minimum level for the specific channel.
	AVALue MAX	Sets A Value to the maximum Level for the specific channel.
Example	:POWER:HIGH:AVAL 1	Sets A Value to 1 watt for the high range.

Query Syntax	:POWER:LOW:AVALue/BVALue? [MAX MIN]	
Return Parameter	<NR2> [MAX MIN]	Current
	1 unit = 1 watt	Returns the power of the A or B Value.
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example :POWer:HIGH:BVAL? AX 2 Returns the maximum power allowed for the channel/range.

:POWer:HIGH:CURRent Channel Specific Command

Description Sets the current limit for constant power mode for the high range only.

Syntax :POWer:HIGH:CURRent <NRf+>[A]

Parameter	<NRf+>[A]	
	1	Sets the current limit to 1A.
	1A	Sets the current limit to 1A.
	MIN	Sets the current limit to the minimum level for the specific channel.
	MAX	Sets the current limit to the maximum level for the specific channel.

Example :POW:HIGH:CURR 1 Sets the current limit to 1A.

Query Syntax :POW:HIGH:CURREnt? [MAX|MIN]

Return Parameter	<NR2> [MAX MIN]	Current
	1 unit = 1 amp	Returns the current limit.
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example :POW:HIGH:CURR? 7.0 Returns the current limit for the specific channel.

SYSTEM Subsystem

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:SYSTem:ERRor? System Command

Description The System Error command returns all the system errors. Please see the Error codes section for a full description. (page142)

Query Syntax :SYSTem:ERRor?

Return Parameter	<character string>	Error
	-102, "Syntax error"	1 Error code number
		2 Error code description

Query Example :SYST:ERR? Returns the next error in the Error Queue.
 -102, "Syntax error"

:SYSTem:VERSion? System Command

Description The system version command returns the SCPI version: year and SCPI version of that year.

Query Syntax :SYSTem:VERSion?

Return Parameter	<NRf>	
	2008.0	Year/ version

:SYSTem:SETup System Command

Description	Sets or returns the system setup for the current settings using block data. See the command syntax on page 13 for more details.	
Syntax	:SYSTem:SETup <block data>	
Parameter	<block data>	System setup data
Example	:SYST:SET <block data>	Loads the system setup using block data.
Query Syntax	:SYSTem:SETup?	
Return Parameter	<block data>	Returns the system setup as block data.
Query Example	:SYST:SET? #<digits><byte count><data><NL>	Returns the system settings as block data.

Memory Subsystem

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:MEMory:SAVE:PREset Channel Specific Command

Description	Saves preset data for the specific channel to internal memory slots P0~P9.	
Syntax	:MEMory:SAVE:PREset: <NR1>	
Parameter	<NR1> 0~9	Preset no. P0~P9
Example	:MEM:SAVE:PRE 0	Saves the preset settings to (P0).

:MEMory:SAVE:PROGram Channel Specific Command

Description	Saves the specific channel into memory.	
Syntax	:MEMory:SAVE:PROGram <NR1>	
Parameter	<NR1> 001~120	Memory number M001~M120

Example :MEM:SAVE:PROG 100 Saves the channel to Memory M100.

:MEMory:SAVE:ALLPreset All Channels

Description Saves preset data to internal memory for all channels.

Syntax :MEMory:SAVE:ALLPreset: <NR1>

Parameter	<NR1>	Preset no.
	0~9	P0~P9

Example :MEM:SAVE:ALLP 0 Saves the preset settings to (P0) for all channels.

:MEMory:SAVE:SETup All Channels

Description Saves setup data for all channels to internal memory slots S1~S4.

Syntax :MEMory:SAVE:SETup: <NR1>

Parameter	<NR1>	Setup data
	1~4	S1~S4

Example :MEM:SAVE:SET 1 Saves the setup data to S1 (applicable to all channels).

:MEMory:RECall:PREset Channel Specific Command

Description Recalls preset data for the specific channel from internal memory slots P0~P9.

Syntax :MEMory:RECall:PREset: <NR1>

Parameter	<NR1>	Preset no.
	0~9	P0~P9

Example	:MEM:REC:PRE 0	Recalls the preset settings from (P0).
		Channel Specific Command
:MEMory:RECall:PROGram		

Description	Recalls memory data to the current channel.	
Syntax	:MEMory:RECall:PROGram <NR1>	
Parameter	<NR1> 001~120	Memory number M001~M120
Example	:MEM:REC:PROG 100	Recalls the memory M100 for the current channel.

:MEMory:RECall:ALLPreset All Channels

Description	Recalls preset data from internal memory for all channels.	
Syntax	:MEMory:RECall:ALLPreset: <NR1>	
Parameter	<NR1> 0~9	Preset no. P0~P9
Example	:MEM:REC:ALLP 0	Recalls the preset settings from (P0) for all channels.

:MEMory:RECall:SETup All Channels

Description	Recalls setup data for all channels from internal memory slots S1~S4.	
Syntax	:MEMory:RECall:SETup: <NR1>	
Parameter	<NR1> 1~4	Setup data S1~S4

Example	:MEM:REC:SET 1	Recalls the setup data from S1 (applicable to all channels).
Example	:MEM:REC:100	Recalls memory data M100 to the current channel.

:MEMory:FILE:PRESet System Command

Description	Sets or returns the preset settings using block data. See the command syntax on page 13 for more details on block data.	
Syntax	:MEMory:FILE:PREset <block data>	
Parameter	<block data>	Preset data
Example	:MEM:FILE:PRE <block data>	Loads the preset settings block data.
Query Syntax	:MEMory:FILE:PREset?	
Return Parameter	<block data>	Returns the preset settings as block data.
Query Example	:MEM:FILE:PRE? #<digits><byte count><data><NL>	Returns the preset settings as block data.

:MEMory:FILE:PROGram System Command

Description	Sets or returns the program data using block data. See the command syntax on page 13 for more details on block data.	
Syntax	:MEMory:FILE:PROGram <block data>	
Parameter	<block data>	Program data
Example	:MEM:FILE:PROG <block data>	Loads the program data using block data.
Query Syntax	:MEMory:FILE:PROGram?	

Return Parameter	<block data>	Returns the program data as block data.
------------------	--------------	---

Query Example	:MEM:FILE:PROG? #<digits><byte count><data><NL>	Returns the program data as block data.
---------------	---	---

:MEMory:FILE:SETup System Command

Description	Sets or returns the setup data using block data. See the command syntax on page 13 for more details on block data.	
-------------	--	--

Syntax	:MEMory:FILE:SETup <block data>	
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Parameter	<block data>	Setup data
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Example	:MEM:FILE:SET <block data>	Loads the setup data using block data.
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Query Syntax	:MEMory:FILE:SETup?	
--------------	---------------------	--

Return Parameter	<block data>	Returns the setup data as block data.
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Query Example	:MEM:FILE:SET? #<digits><byte count> <data><NL>	Returns the setup data as block data.
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:MEMory:FILE:SEQuence System Command

Description	Sets or returns the sequence data using block data. See the command syntax on page 13 for more details on block data.	
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Syntax	:MEMory:FILE:SEQuence <block data>	
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Parameter	<block data>	Sequence data
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Example	:MEM:FILE:SEQ <block data>	Loads the sequence data using block data.
---------	----------------------------	---

Query Syntax	:MEMory:FILE:SEQuence?	
--------------	------------------------	--

Return Parameter	<block data>	Returns the sequence data as block data.
Query Example	:MEM:FILE:SEquence? #<digits><byte count> <data><NL>	Returns the sequence data as block data.

SEquence Subsystem

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:SEquence:STATe Channel Specific Command

Description	Turns on/off the Sequence Function mode.	
Syntax	:SEquence:STATe {OFF 0 ON 1}	
Parameter	ON/1	Turn sequence mode on
	OFF/0	Turn sequence mode off
Example	:SEquence:STATe 1	Turn sequence on
Query Syntax	:SEquence:STATe?	
Return Parameter	ON,STOP	Sequence is on, stopped
	ON,RUN	Sequence is on, running
	OFF	Sequence is off

Query Example :SEquence:STATe? Sequence is on, stopped.
ON,STOP

:SEquence:EDIT:POINt Channel Specific Command

Description Sets the current point in the sequence. The SEquence:END command should first be used to set the number of points.

Syntax :SEquence:EDIT:POINt <NR1>

Parameter	<NR1>	Points
	1~last point	1~ last point.

Example :SEQ:EDIT:POIN 3 Sets the point to number 3.

Query Syntax :SEquence:EDIT:POINt?

Return Parameter	<NR1>	Points
	1~last point	Returns the current point.

Query Example :SEQ:EDIT:POIN? The current point is 3.
3

:SEquence:END Channel Specific Command

Description Sets the number of points in the sequence.

Syntax :SEquence:END <NR1>

Parameter	<NR1>	Points
	1~120	1~120.

Example :SEQ:END 5 Sets the max number of points to 5.

Query Syntax :SEquence:END?

Return Parameter	<NR1>	Points
	1~120	1~120

Query Example	:SEQ:END? 5	There are 5 points in the sequence.
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Channel Specific Command

:SEQ:END:LOAD

Description	Sets or queries the value of On End Load.	
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Syntax	:SEQ:END:LOAD <NRf+> MIN MAX	
--------	------------------------------	--

Parameter	<NRf+>	current value(CC), resistance value(CR).
	0	On End Load = Off.
	MIN/MAX	Maximum or minimum value.

Example	:SEQ:END:LOAD 1.000	Sets the value of On End Load to 1.000
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Query Syntax	:SEQ:END:LOAD?	
--------------	----------------	--

Return Parameter	OFF	On End Load is Off
	<NRf>	On End Load value

Query Example	:SEQ:END:LOAD? 1,000	On End Load value is 1.000.
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Channel Specific Command

:SEQ:POINt:RESistance

Description	Sets the resistance value for the current point. CR mode only.	
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Syntax	:SEQ:POINt:RESistance <NRf>[OHM] MIN MAX	
--------	---	--

Parameter	<NRf>[OHM], MIN, MAX	Resistance value
	100	100Ω
	100 OHM	100Ω
	MAX/MIN	Maximum or minimum value.

Example	:SEQ:POIN:RES 100	Sets the resistance to 100.
---------	-------------------	-----------------------------

Query Syntax	:SEquence:POINt::RESistance? [MAX MIN]	
Return Parameter	<NR1>	Resistance Value
	1 unit = 1 ohm	Returns the resistance value.
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example :SEQ:POIN:RES?
100
The resistance value is 100 ohm.

Channel Specific Command

:SEquence:POINt:CURRent

Description Sets the current value for the current point. CC mode only.

Syntax :SEquence:POINt:CURRent <NRf>[A]|MIN|MAX

Parameter	<NRf>[A], MIN, MAX	Current value
	10	10A
	100 A	100A
	MAX/MIN	Maximum or minimum value.

Example :SEQ:POIN:CURR 1 Sets the current to 1.

Query Syntax :SEquence:POINt::CURRent? [MAX|MIN]

Return Parameter	<NR1>	Current Value
	1 unit = 1 A	Returns the current value.
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example :SEQ:POIN:CURR?
1
The current value is 1 amp.

Channel Specific Command

:SEquence:POINt:RISE/FALL

Description Sets the rising and falling slew rates for the current point.

Syntax	:SEQuence:POINt:RISE/FALL<NRf>[A/us] MIN MAX	
Parameter	<NRf>[A/us], MIN, MAX	Slew rate
	1.2	1.2A/us
	1.2 A/us	1.2A/us
	MAX/MIN	Maximum or minimum value.
Example	:SEQ:POIN:RISE .3 A	Sets the rising slew rate to 0.3 A/us
	:SEQ:POIN:FALL .4 A	Sets the falling slew rate to 0.4 A/us
Query Syntax	:SEQuence:POINt::RISE/FALL? [MAX MIN]	
Return Parameter	<NR1>	Slew Rate
	1 unit = 1 A/us	Returns the slew rate.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:SEQ:POIN:RISE? 0.30000	Returns the rising slew rate (0.3 A/us).
	:SEQ:POIN:FALL? 0.40000	Returns the falling slew rate (0.4 A/us).

:SEQuence:POINt:TIME Channel Specific Command

Description	Sets the duration time of the current point in seconds.	
Syntax	:SEQuence:POINt:TIME <NRf>[S] MIN MAX	
Parameter	<NRf>	Duration Time
	0.0001~60000	0.0001~60,000.0 seconds
	0.0001~60000S	0.0001~60,000.0 seconds
	MIN	0.0001seconds
	MAX	60,000 seconds

Example	:SEQ:POIN:TIME 10	Sets the point duration time to 10 seconds.
Query Syntax	:SEquence:POIN:TIME? [MAX MIN]	
Return Parameter	<NR2>	Point
	0.0001~60000	Returns the point duration time.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:SEQ:POIN:TIME? 0.00100	The point duration time is 0.001 seconds.

:SEquence:REPeat Channel Specific Command

Description	Sets the number of times the sequence can be repeated (looped).	
Syntax	:SEquence:REPeat <NR1>	
Parameter	<NR1>	Repeat setting
	1~9999	1~9999
	0	Infinite repeats
Example	:SEQ:REP 10	Repeat 10 times
	:SEQ:REP 0	Repeat infinitely
Query Syntax	:SEquence:REPeat?	
Return Parameter	<NR1>	Repeat setting
	1~9999	1~9999
	0	Infinite
Query Example	:SEQ:REP? 10	Repeats the sequence 10 times

:SEquence:VOLTage:RANGe Channel Specific Command

Description	Sets the sequence CC voltage range.	
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Syntax :SEQuence:VOLTage:RANGe <NRf>[V]|L|H

Parameter	<NRf>[V] , L, H	Range
	16	Low range*
	80V	High range*
	L	Low range
	H	High range

*Load module dependent, PEL-2020A shown.

Example :SEQ:VOLT:RANG L Sets the range to Low for the channel.

Query Syntax :SEQuence:VOLTage:RANGe?

Return Parameter	<NR2>	Range
	16	Low PEL-2020A,2030A,2040A
	125	Low PEL-2041A
	80	High PEL-2020A,2030A,2040A
	500	High PEL-2041A

Query Example :SEQ:VOLT:RANG? Returns the voltage range. In this case high for the PEL-2041A.
500

:SEQuence:LOOP:STARt Channel Specific Command

Description Determines from which point to start repeating (looping) the sequence from when using the SEQuence:REPeat command.

Syntax :SEQuence:LOOP:STARt <NR1>

Parameter	<NR1>	Start loop from
	1~last point	1st~ last point.

Example :SEQ:LOOP:STAR 2 Loop from point 2.

Query Syntax :SEQuence:LOOP:STARt?

Return Parameter	<NR1> 1~last point	Point Returns the point that the loop will start from.
Query Example	:SEQ:LOOP:STAR? 2	The loop starts at point 2.

:SEquence:CHANnel:TIME Channel Specific Command

Description	Sets which channel duration time the specific channel will use.	
Syntax	:SEquence:CHANnel:TIME <NR1>	
Parameter	<NR1>1~max channels 1 2 etc	Duration Time Settings Use channel 1 Use channel 2 etc
Example	:SEQ:CHAN:TIME 3	Set the specific channel to use the channel duration time of channel 3.

Query Syntax	:SEquence:CHANnel:TIME?	
Return Parameter	<NR1> 1~max channels	Point Returns the channel duration time that the specific channel is using.
Query Example	:SEQ:CHAN:TIME? 2	The specific channel is using the channel duration setting of channel 2.

:SEquence:RUN Channel Specific Command

Description	Turns the sequence On/Off.	
Syntax	:SEquence:RUN {OFF 0 ON 1}	

Parameter	OFF/0 ON/1	Off On
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Example :SEQ:RUN ON Run the sequence.

:SEQuence:SAVE Channel Specific Command

Description Saves the sequence for the specific channel.

Syntax :SEQuence:SAVE

Example :SEQ:SAVE Saves the sequence.

:SEQuence:TRIGger:IN Channel Specific Command

Description Turns the trigger input on/off for sequences. See the :SEQuence:TRIGger:IN:CHANnel command to set which channels this command applies to.

Syntax :SEQuence:TRIGger:IN {OFF|0|ON|1}

Parameter	OFF/0 ON/1	Off On
-----------	---------------	-----------

Example :SEQ:TRIG:IN 0 Trigger IN is on.

Query Syntax :SEQuence:TRIGger:IN?

Return Parameter	<NR1> 0 1	Trigger IN Off On
------------------	-----------------	-------------------------

Query Example :SEQ:TRIG:IN?
1 Trigger IN is on.

:SEQuence:TRIGger:OUT Channel Specific Command

Description Turns the trigger output on for the selected channel for sequences. Note that one channel must be set for trigger out.

Syntax :SEQuence:TRIGger:OUT <NR1>|MIN|MAX

Parameter	<NR1> MAX MIN	Channel number Sets TRIG OUT to the last channel Sets TRIG OUT to the first channel
Example	:SEQ:TRIG:OUT 1	Sets TRIG OUT to CH1.
Query Syntax	:SEQuence:TRIGger:OUT?	
Return Parameter	<NR1> MAX/MIN	Channel number Last or first channel.
Query Example	:SEQ:TRIG:OUT? 1	CH1 is set to TRIG OUT.

:SEQuence:TRIGger:IN:CHANnel Channel Specific Command

Description	Selects which channels are turned on/off with the :SEQuence:TRIGger:IN command. The bit weight of the <NR1> value determines which channels are used.			
Syntax	:SEQuence:TRIGger:IN:CHANnel <NR1>			
Parameter	<NR1>	Channel	<NR1>	Channel
	1	CH1	32	CH 6
	2	CH2	64	CH 7
	4	CH3	128	CH 8
	8	CH 4	256~65535	Not used
	16	CH 5		
Example	:SEQ:TRIG:IN:CHAN 9	Sets TRIG IN to CH1 and CH4.		
Query Syntax	:SEQuence:TRIGger:IN:CHANnel?			

Return Parameter	<NR1>	Channel	<NR1>	Channel
	1	CH1	32	CH 6
	2	CH2	64	CH 7
	4	CH3	128	CH 8
	8	CH 4	256~65535	Not used
	16	CH 5		

Query Example	:SEQ:TRIG:IN:CHAN? 14	Sets TRIG IN to CH4 and CH5.
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GLOBAL Subsystem

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:GLOBal:CONFigure:VOLTage:RANGe .....160
:GLOBal:LOAD:SHORT.....160
:GLOBal:MODE .....160
```

:GLOBal:CONFigure:VOLTage:RANGe Global Command

Description	Sets the CC Voltage range high or low. This command applies to all channels.	
Syntax	:GLOBal:CONFigure:VOLTage:RANGe {L H}	
Parameter	L	Low range
	H	High range
Example	:GLOB:CONF:VOLT:RANG L Sets the range to low.	

:GLOBal:LOAD:SHORT Global Command

Description	Shorts all the input terminals.	
Syntax	:GLOBal:LOAD:SHORT {OFF 0 ON 1}	
Parameter	{OFF 0 ON 1}	SHORT
	OFF/0	Off
	ON/1	On
Example	:GLOB:LOAD:SHOR 0 Short on.	
Query Syntax	:GLOBal:LOAD:SHORT?	

:GLOBal:MODE Global Command

Description	Sets the mode for all the load modules in the mainframe.
-------------	--

Syntax	:GLOBal:MODE {CCL CCH CCDL CCDH CRL CRH CRDL CRDH CV CPL CPH}	
Parameter	CCL	CC static mode, low range
	CCH	CC static mode, high range
	CCDL	CC dynamic mode, low range
	CCDH	CC dynamic mode, high range
	CRL	CR static mode, low range
	CRH	CR static mode, high range
	CRDL	CR dynamic mode, low range
	CRDH	CR dynamic mode, high range
	CV	CV mode
	CPL	CP static mode, low range
	CPH	CP static mode, high range
Example	:SEQ:VOLT:RANG L	Sets the range to Low for the channel.

Command Error Codes

Description	The PEL has a number of specific error codes. Use the SYSTem:ERRor command to recall the error codes.
-102	Syntax error. An unrecognized command or data type was encountered.
-109	Missing parameter The command header requires more parameters than was received.
-122	Data out of range The data is outside the allowed range.
-128	Numeric data not allowed The command does not accept numerical data/parameters
-200	Execution error Generic execution error.
-144	Character Data too long The character data contains more than twelve characters
-151	Invalid String The string data received is invalid
-148	Character data not allowed The command does not accept character data
-138	Suffix not allowed A command does not accept suffixes/the suffix type.

S STATUS REGISTERS

To program the PEL-2000A Series effectively, the Status Register structure needs to be understood. This chapter explains in detail the structure of the status registers.

Status Register Overview

Description The status registers are used to determine the status of the electronic load. The status registers maintain the status of the protection conditions, load conditions and channel conditions of the load modules.

The PEL-2000A series have a number of register groups:

Channel Status Registers (one for each channel)

Channel Summary Registers

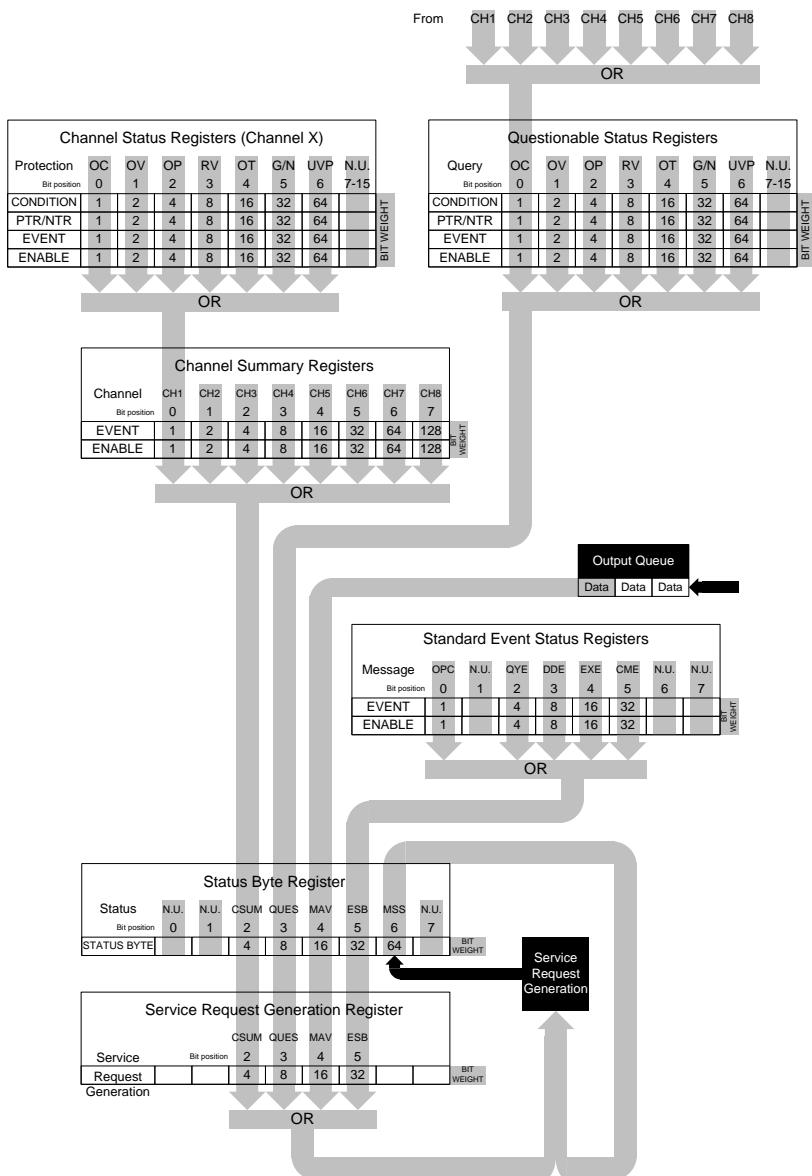
Questionable Status Registers

Standard Event Status Registers

Status Byte Register

Service Request Generation Register

The structure of the status registers is shown on the next page.



Channel Status

Description Each channel has a dedicated Channel Status Register group. These registers show if any errors or faults have occurred to a specific channel.

The Channel Status Register group consists of: the Condition, EVENT and ENABLE registers as well as PTR/NTR (positive and negative transition) filters.

Channel Status Registers								
Bit Position	7-15	6	5	4	3	2	1	0
Condition	0	UVP	G/N	OT	RV	OP	OV	OC
PTR/NTR	0	UVP	G/N	OT	RV	OP	OV	OC
EVENT	0	UVP	G/N	OT	RV	OP	OV	OC
ENABLE	0	UVP	G/N	OT	RV	OP	OV	OC
Bit weight		64	32	16	8	4	2	1

- Protection Bits**
- OC** If an over current condition occurs the OC bit (bit 0) is set. The OC bit can only be cleared with the :LOAD:PROTEction:CLEar command.

 - OV** If an over voltage condition occurs the OV bit (bit 1) is set. The OV bit can only be cleared with the :LOAD:PROTEction:CLEar command.

 - OP** If an over power condition occurs the OP bit (bit 2) is set. The OP bit can only be cleared with the :LOAD:PROTEction:CLEar command.

 - RV** If a reverse voltage condition occurs the RV bit (bit 3) is set. The RV bit is automatically cleared after the reverse voltage is removed.

 - OT** When the internal temperature exceeds 85°C the OT bit will be set. The OT bit is automatically cleared after the temperature goes below 85°C.

G/N	The Go/NoGo bit is set when Go/NoGo limits have been exceeded, when Go/NoGo SPEC has been enabled.
UVP	If the under voltage condition occurs the UVP bit is set.
Condition Register	The condition register indicates the status of the electronic load. The condition register can only be changed by a change in the condition of the electronic load. Reading the condition register does not change the state of the condition register.
PTR/NTR Register	The PTR/NTR (Positive/Negative transition) register determines the type of transition conditions that will trigger an event. Only the Channel Status Register and Questionable Status Register can be transition programmed
	Positive Transition 0→1
	Negative Transition 1→0
Event Register	The Event Register indicates if an event has been triggered according to the transition settings from the PTR/NTR Register.
Enable Register	The Enable register determines which status event(s) are enabled. Any status events (OC, OV, OP, RV, OT, G/N, UVP) that are enabled will set the corresponding channel bit in the Channel Summary Event Register.

Channel Summary

Description	The Channel Summary Registers consolidate the channel status of all 4/8 channels, depending on the electronic load.
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Channel Summary Registers								
Bit Position	7	6	5	4	3	2	1	0
EVENT	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
ENABLE	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Bit weight	128	64	32	16	8	4	2	1

Event Register If an event has been enabled and set in the Channel Status Registers, then the corresponding channel bit will be set in the Channel Summary Event Register. If the Event Register is read, it will be cleared to 0.

Enable Register The Enable Register is used to determine which channel events will be used to set the CSUM bit of the Status Byte Register.

Questionable Status

Description The Questionable Status Registers will show if any faults or errors have occurred. The Questionable Status Registers have the same events as the Channel Status Registers.

Questionable Status Register								
Bit Position	7-15	6	5	4	3	2	1	0
Condition	0	UVP	G/N	OT	RV	OP	OV	OC
PTR/NTR	0	UVP	G/N	OT	RV	OP	OV	OC
EVENT	0	UVP	G/N	OT	RV	OP	OV	OC
ENABLE	0	UVP	G/N	OT	RV	OP	OV	OC
Bit weight		64	32	16	8	4	2	1

- Bit Summary**
- OC Over Current

 - OV Over voltage

 - OP Over Power

 - RV Reverse Voltage

 - OT Over Temperature

 - G/N Go/NoGo

UVP Under Voltage Protection

Condition Register The Questionable Status Condition Register indicates the status of the electronic load. If a bit is set in the Condition register (OC, OV, OP, RV) indicates that the event is true. Reading the condition register does not change the state of the condition register.

PTR/NTR Register The PTR/NTR (Positive/Negative transition) register determines the type of transition conditions will set the corresponding bit in the Event Registers. Only the Channel Status Register and Questionable Status Register can be transition programmed.

Positive Transition 0→1

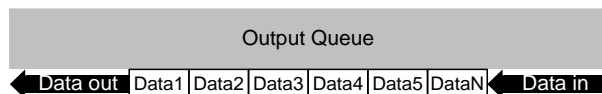
Negative Transition 1→0

Event Register The PTR/NTR Register will dictate the type of transition conditions will set the corresponding bits in the Event Register. If the Event Register is read, it will be cleared to 0.

Enable Register The Enable Register is used to determine which channel events will be used to set the QUES bit of the Status Byte Register.

Output Queue

Description The Output queue stores output messages in a FIFO buffer until read. If the Output Queue has data, the MAV bit in the Status Byte Register is set.



Standard Event Status

Description The Standard Event Status Registers indicate any programming errors that occur. The Standard Event Status Register group comprises of the Event and Enable registers.

Standard Event Status Registers								
Bit Position	7	6	5	4	3	2	1	0
EVENT	0	0	CME	EXE	DDE	QYE	OPC	0
ENABLE	0	0	CME	EXE	DDE	QYE	OPC	0
Bit weight	128	64	32	16	8	4	2	1

Error Bits **OPC** The operation complete bit is set when all selected pending operations are complete. This bit is set in response to the *OPC command.

QYE The Query Error bit is set in response to an error reading the Output Queue. This can be caused by trying to read the Output Queue when there is no data present.

DDE The Device Dependent Error indicates a memory error/lost memory or failure of the self-test.

EXE The Execution bit indicates an execution error due to one of the following
 Illegal command parameter
 Parameter out of range
 Invalid parameter
 Command didn't execute due to an overriding operation condition.

CME The Command Error bit is set when a syntax error has occurred. The CME bit can also be set when a <GET> command is received within a program message. (Group Execute Trigger) as defined in IEEE 488.1.

Event Register The Event Register will be set to 0 when read.

Enable Register The Enable Register determines which events will set the ESB Bit (bit 5) in the Status Byte Register.

Status Byte Register

Description The Status Byte register consolidates the status events of all the status registers. The Status Byte register can be read with the *STB? query or a serial poll and can be cleared with the *CLS command.

Status Byte Register								
Bit Position	7	6	5	4	3	2	1	0
Condition	0	MSS	ESB	MAV	QUES	CSUM	0	0
Bit weight	128	64	32	16	8	4	2	1

Status Bits **CSUM** The CSUM bit is set when an Enabled event has occurred on a channel. The Channel Condition, Channel Event and Channel Summary Event Registers all determine if the CSUM bit is set.

QUES The Questionable bit is set when a questionable event has occurred.

MAV The Message Available bit is set when there is outstanding data in the Output Queue.

ESB The Event Status bit is set if an enabled event in the Standard Event Status Event Register has occurred.

MSS & RQS The Master Summary Status is used with the *STB? query. When the *STB? query is read the MSS bit is not cleared. The Request Service bit is cleared when it is polled during a serial poll.

Service Request Register

Description The Service Request Generation Register determines which events in the Status Byte Register will generate Service Requests. It is essentially the Status Byte Enable Register. The bit events are the same as the Status Byte Register, minus the MSS/RQS bit.

Service Request Generation Register (Status Byte Enable)								
Bit Position	7	6	5	4	3	2	1	0
Condition	0	0	ESB	MAV	QUES	CSUM	0	0
Bit weight	128	64	32	16	8	4	2	1