Programmable DC Electronic Load

PEL-2000 Series

PROGRAMMING MANUAL

GW INSTEK PART NO. 82EL-20040I01

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ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

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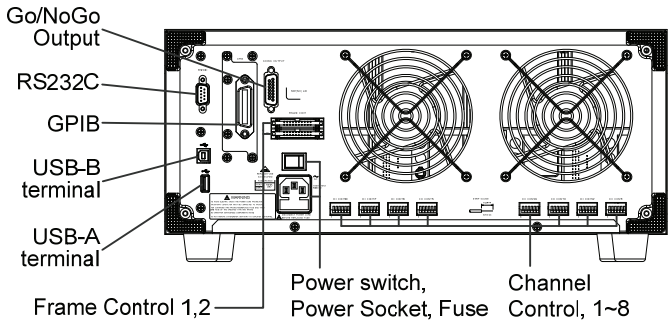
Table of Contents

INTERFACE OVERVIEW

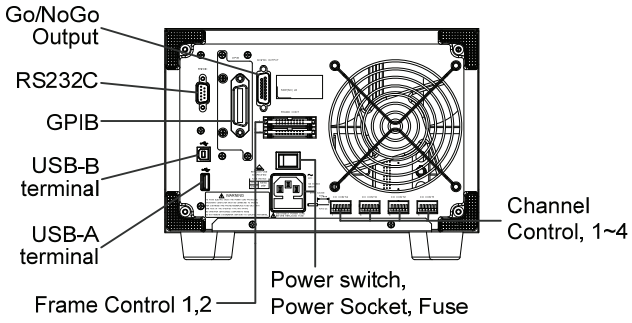
This manual describes how to use the PEL-2000's remote command functionality and lists the command details. The Overview chapter describes how to configure the PEL-2000 USB/RS232/GPIB remote control interface.

Rear Panel Overview

PEL-2004



PEL-2002

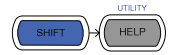


Configuring the USB Interface

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

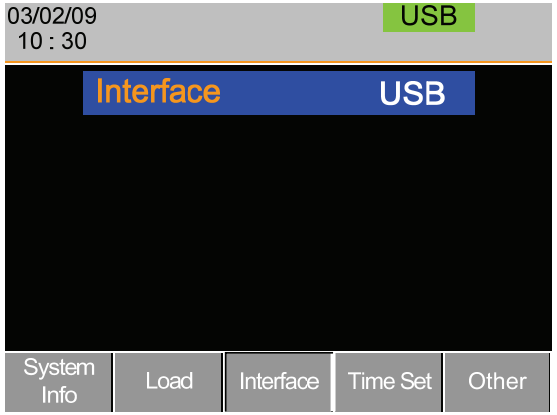
Panel operation

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

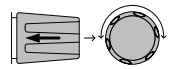


2. Press F3(Interface Menu).

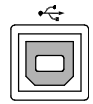
3.



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



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



6. When the PC asks for the USB driver, select pel_cdc_2000.inf (downloadable from the GW website, www.gwinstek.com, PEL-2000 product corner).

7. On the PC, activate a terminal application such as MTTTY (Multi-Threaded TTY). To check the COM port No., see the Device Manager in the PC. For WindowsXP, select Control panel → System → Hardware tab.

8. 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

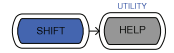
9. Configuring the command interface is completed. Refer to the other chapters for more details.

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

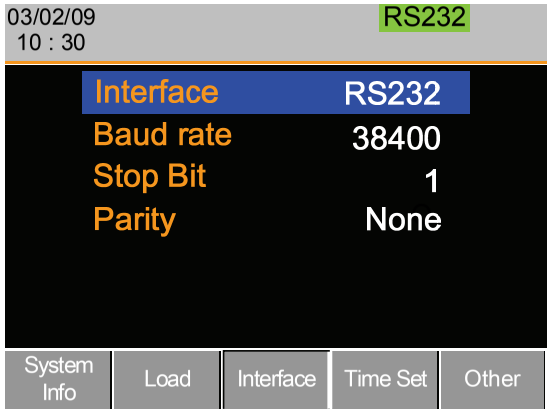
Panel operation

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

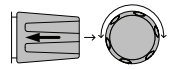


2. Press the Shift Key then the Help key to access the Utility menu.

3.



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



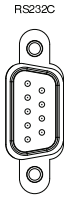
5. Edit the Baud rate, Stop bit and parity.

   Baud rate 2400, 4800, 9600, 19200, 38400

   Stop Bit Range 1,2

   Parity Range None, Odd, Even

6. 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.

7. Ensure the terminal application has the following settings;

8. Baud rate – as per PEL-2000 settings

9. Com Port – as per PC settings (Device Manager)

10. Parity – None

11. Data bits – 8

12. Stop bits – None

Functionality check

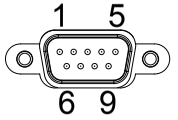
Run this query command via the terminal.

*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)

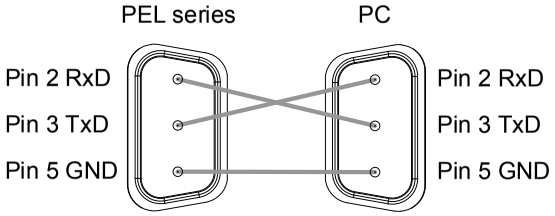
3: TxD (Transmit data)

5: GND

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

PC connection

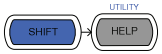
Use the Null Modem connection as shown in the diagram below.



GPIB Interface Configuration

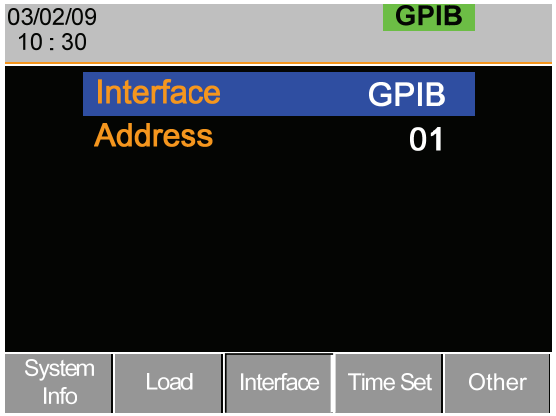
Panel operation

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

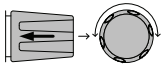


2. Press F3(Interface Menu).

3.



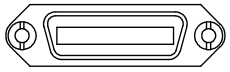
4. If the interface is not set to GPIB, use the selector knob to change the interface to GPIB.



5. Edit the GPIB address.

   Range 1 ~ 30

6. 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

COMMAND OVERVIEW

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

Command Syntax

Compatible standard

- IEEE488.2, 1992 (fully compatible)
- SCPI, 1994 (partially compatible)

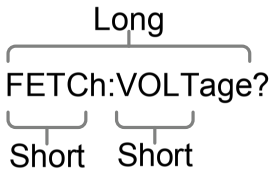
Command types

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

1: command header
2: single space
3: parameter
4: message terminator

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.	
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

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-2000 electronic load, please become familiar with the Status registers, detailed on page131.

Common commands

*CLS — Status Command

Description	Clears: Channel Status Register Channel Summary Register Questionable Status Register Standard Events Register Operation Status Register Error Queue When the *CLS command follows a program message terminator <nl>, the following is cleared: Output Queue MAV bit See page131.
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 page138.			
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?		Returns the settings in the Standard Event Status Enable Register. Here CME and QYE are enabled.	
	40			

*ESR?

Status Command

Description	Reads the Standard Event Status Register. This command also clears the Standard Event Status Register. Page137.			
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?		The return value is the status reading of the standard Event Status Register.	
	48			

*IDN?

System Command

Description	Returns the load generator identification.			
Query Syntax	*IDN?			
Return Parameter	<aard>	Data	<aard>	Data
	GW	Manufacturer	XXXXXXXX	Serial No.
	PEL-2000	Model	V1.00	Firmware Version
Example	*IDN?		Returns the mainframe identification string.	
	GW, PEL-2002/2004, 00000001, V1.00			

*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. Page137.			
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>	Recall Memory Setting
	1~120	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>	Occupied Channel
	2020L	PEL-2020 left channel
	0	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-2020 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 page139 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	Reads the Status Query Byte Register. The *STB? command does not clear the register. If the Master Summary Status bit (MSS) is set, it indicates that there is a reason for a service request.			
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.	

*TRG

Status Command

Description	Trigger command. This command mimics GET (Group Execute Trigger) as defined in IEEE 488.1.
Syntax	*TRG
Example	*TRG

Abort Subsystem

:ABORt

All Channel Command

Description	Turns all electronic loads to OFF.
Syntax	:ABORt
Example	:ABORt

Channel Subsystem

: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?	
Return Parameter	<NR1>	Current specific channel
	1~8	CH1 ~ CH8
Query Example	:CHAN?	Channel 1 is the current specific channel.
	1	

: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, OFF/0	Active
	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, OFF/0	Independent Mode
	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?	Independent mode is set to OFF for the channel.
	0	

:CHANnel:ID?

Channel Specific Command

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

CONFIGURE Subsystem

: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	:CONFigure:VOLTage:ON?	

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

:CONFigure:VOLTage:RANGe

Channel Specific Command

Description	Sets Voltage range for CC mode.	
Syntax	:CONFigure: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-2020 shown.	
Example	:CONF:VOLT:RANG L	Sets the range to Low for the channel.
Query Syntax	:CONFigure:VOLTage:RANGe?	
Return Parameter	<NR2>	Range
	16	Low PEL-2020,2030,2040
	125	Low PEL-2041
	80	High PEL-2020,2030,2040
	500	High PEL-2041
Query Example	:CONF:VOLT:RANG?	Returns the voltage range. In this case high for the PEL-2041.
	500	

: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?	Von latch is set to ON.
	1	

: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, ON/1	Sound
	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?	Sound is off for the specific channel.
	0	

:CONFigure:REMote — All Channels

Description	Turns remote control on or off for all interfaces.	
Syntax	:CONFigure:REMOTE OFF/0, ON/1	
Parameter	OFF/0, ON/1	Remote Control
	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	Configuration type
	OLD/0	Old
	UPDATED/1	Updated
Example	:CONF:LOAD OLD	Configuration type set as OLD.
Query Syntax	:CONFigure:LOAD?	
Return Parameter	<NR1>	Configuration type
	0	Old
	1	Updated
Query Example	:CONF:LOAD?	Sets the load module selector configuration type as OLD.
	0	

: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	OFF/0, ON/1, CLEAR/2	Current Protection
	CLEAR/2	Cleared
	OFF/0	Off
	ON/1	On
Example	:CONF:PROT:CURR:STAT 1	Turns on current protection.
Query Syntax	: CONFigure:PROTection:CURRent:STATe?	
Return Parameter	<NR1>	Current Protection
	0	Off

	1	On
	2	Clear
Query Example	:CONF:PROT:CURR:STAT?	Current protection is turned on.
	1	

: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>	Current Protection Level
	.3	300mA
	0.3A	300mA
	300MA	300mA
	MIN	Sets to the minimum level
	MAX	Sets the current limit to the maximum level
Example	:CONF:PROT:CURR:LEV MAX	Sets the current limit to 20.40A (PEL2020)
Query Syntax	: CONFigure:PROTection:CURRent:LEVel?	
Return Parameter	<NRf> 1 unit = 1 amp	Current protection level
	1	1 amp.
Query Example	:CONF:PROT:CURR:LEV?	Current protection level is at 300mA.
	0.30	

: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	OFF/0, ON/1, CLEAR/2	Voltage Protection
	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 (PEL2020)
Query Syntax	: CONFigure:PROTection:VOLTage:LEVel?	
Return Parameter	<NRf> 1 unit = 1 volt	Voltage protection level
	1.00	1.00 volts.
Query Example	:CONF:PROT:VOLT:LEV?	Voltage protection level is at 81.6V.
	81.6000	

: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	OFF/0, ON/1, CLEAR/2	Power Protection
	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?	Power protection is currently on.
	1	

: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 (PEL2020)
Query Syntax	: CONFigure:PROTection:POWEr:LEVel?	
Return Parameter	<NRf>	Power protection level
	1 unit = 1 watt	Returns the power protection level in Watts.
Query Example	:CONF:PROT:POW:LEV?	Power protection level is at 75 watts.
	75	

: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>	Under Voltage Protection 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?	
Return Parameter	<NRf>	Power protection level
	1 unit = 1 volt	Returns the UVP level as volts.
Query Example	:CONF:PROT:UVP:LEV?	UVP level is at 75 volts.
	75	

Utility Subsystem

: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, ON/1	Auto load
	OFF/0	Turns auto loading off
	ON/1	Turns auto loading on
Example	:UTILITY: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	:UTILITY: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, LOAD/1	
	PROGRAM/0	Sets the auto load mode to program
	LOAD/1	Sets the auto load mode to load.
Example	:UTILITY: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	:UTILITY: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, ON/1	
	OFF/0	Turns sound off
	ON/1	Turns sound on
Example	:UTILITY:SOUN 1	Turns sound on.
Query Syntax	:UTILITY:SOUNd?	

Return Parameter	<NR1>	Sound
	0	Off
	1	On
Query Example	:UTILITY: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, ON/1	
	OFF/0	Turns Remote control off
	ON/1	Turns remote control on
Example	:UTILITY: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, FAST/1	Mode
	NORMAL/0	NORMAL
	FAST/1	FAST
Example	:UTILITY: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]		
	“200811131300” 1 2 3	1	Year
		2	Month/Day
		3	Time (24 hours)
Example	:UTILITY:TIME “200901031343”		
	Sets the time to 1:00 pm, January 3rd, 2009.		
Query Syntax	:UTILITY:TIME?		
Return Parameter	[aard]		
	2008/11/13 13:00 1 2 3	1	Year
		2	Month/Day
		3	Time (24 hours)
Query Example	:UTILITY:TIME? 2009/11/13/13:00	The date is November 13th, 2009. The time is 1:00 pm.	

: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).	
Syntax	:UTILITY:LOAD OLD/0, Updated/1	
Parameter	OLD/0, UPDATED/1	Knob style
	OLD/0	Old
	UPDATED/1	Updated
Example	:UTILITY:LOAD 1	Set the knob style to independent.
Query Syntax	:UTILITY:LOAD?	

Return Parameter	<NR1>	Knob style
	0	Old
	1	Updated
Query Example	:UTILITY:Load? 1	The knob style is set to Updated.

Current Subsystem

: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).
Query Example	:CURR:STAT:L2? MAX 10.2	Returns the maximum current allowed for the channel. (PEL-2020)
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?	
Return Parameter	<NR2>[MAX, MIN]	Current
	1 unit = 1 amp	Returns the current of the A or B Value.
Query Example	:CURR:STAT:LOW:BVAL? MAX 2	Returns the maximum current allowed for the channel. (PEL-2020)

: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:AVALue 10	Sets high range CC static mode A Value to 10 amps.
Query Syntax	:CURRent:STATic:HIGH:AVALue/BVALue?	
Return Parameter	<NR2>[MAX, MIN]	Auto load mode
	1 unit= 1 amp	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-2020)

: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]	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: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]	Slew rate
	1 Unit=1 amp/uS	Returns the slew rate.
	MAX/MIN	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]	Current
	L1 1	Sets L1 to 1 Amp.
	L2 2	Sets L2 to 2 Amps.
	L2 2A	Sets L2 to 2 Amps.
	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: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]	Current
	1 unit= 1 amp	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]	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: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]	Slew rate
	1 Unit=1 amp/uS	Returns the slew rate.
	MAX/MIN	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]	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: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]	Time
	1 Unit=1 second	Returns T1/T2 time.
	MAX/MIN	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]	Current
	1 unit= 1 amp	Returns the current of L1/L2, or the maximum or minimum current allowed.
Query Example	:CURR:DYN:LOW:L2?	Returns current for the specific channel.
	2.0400	

: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	For low range dynamic CC mode, the minimum allowable value for the falling slew rate is 0.0003 A/uS for the specific channel.
	0.0003	

: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? 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.

: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).
Query Example	:CURR:DYN:HIGH:L2? MAX 20.4000	Returns the maximum current allowed for the channel. (PEL-2020)

: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	: CURRent: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.

:CURRent: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	:CURRent: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]	Time
	1 Unit=1 second	Returns T1/T2 time.
	MAX/MIN	Returns the allowable maximum and minimum.
Query Example	:CURR:DYN:HIGH:T1? 2.5	Returns the T1 time of 2.5 seconds.
	:CURR:DYN:HIGH:T1? MIN 0.000025	Returns the minimum T1 time allowable for the specific channel.

FETCH Subsystem

:FETCh:VOLTage?

Channel Specific Status Command

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

:FETCh:CURRent?

Channel Specific Status Command

Description	This query returns the real-time current 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:CURR? 1.2	The specific channel has a current of 1.2 amps at the load module input.

: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?	The specific channel is at 1.2 watts.
	1.2	

: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 131.			
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?		Over voltage (OV) protection has been triggered for the specific channel.	
	2			

: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-2004)/1-4(PEL2002).	
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-2004)/1-4(PEL-2002).
Query Example	:FETC:ALLV?	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
	2.5000, 3.0000, 0.0000, 0.0000, 0.0000, 0.0000, 5.500, 0.0000	

:FETCh:ALLCurrent?

All Channel Status Command

Description	This query returns the current values of all the load modules/channels in order from 1-8(PEL-2004)/1-4(PEL2002).	
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-2004)/1-4(PEL-2002).
Query Example	:FETC:ALLC?	Channels 1 to 6 have no current. Channels 7 & 8 have 1.2 and 3.56 amps, respectively.
	0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 0.0000, 1.2000, 3.5600	

:FETCh:ALLPower?

All Channel Status Command

Description	This query returns the power values of all the load modules/channels in order from 1-8(PEL-2004)/1-4(PEL2002).
Syntax	:FETCh:ALLPower? <aard>

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

LOAD Subsystem

:LOAD:[STATe]

Channel Specific Command

Description	This command turns the electronic load on/off for the specific channel.	
Syntax	:LOAD:[STATe] [ON/1, OFF/0]	
Parameter	ON/1, OFF/0	Load module
	ON/1	Load On
	OFF/0	Load Off
Example	:LOAD ON	Turns the specific channel load on.
Query Syntax	:LOAD:[STATe]?	
Return Parameter	<NR1>	Load module
	1	Load is On
	0	Load is Off
Query Example	:LOAD?	Turns the specific channel load on.

:LOAD:SHORt:[STATe]

Channel Specific Command

Description	This command shorts the electronic load on/off for the specific channel.
Syntax	:LOAD:SHORt:[STATe] [ON/1, OFF/0]

Parameter	ON/1, OFF/0	Short Load module
	ON/1	Shorting is On
	OFF/0	Shorting is Off
Example	:LOAD:SHOR: ON	Short circuits the load module channel.
Query Syntax	:LOAD:SHORt[STATe]?	
Return Parameter	<NR1>	Short Load module
	1	Shorting is activated
	0	Shorting is deactivated
Query Example	:LOAD:SHOR?	Shorting is deactivated on the specific channel.
	0	

: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	Mode
	TOGGLE/1	Sets the SHORT key to toggle mode
	HOLD/0	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>	Mode
	1	Toggle mode is active
	0	Hold mode is active
Query Example	:LOAD:SHOR:KEY?	Hold mode is active for the specific channel.
	0	

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

:LOAD:PROTection:CLEar

Channel Specific Command

Description	This command clears the Channel Status Register for the specific channel. See page131.	
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
Query Example	:LOAD:TIME? 5.1	Returns the load on time as 5.1 seconds.

Measure Subsystem

: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 0.5000	Voltage at the load input 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 1.0000	Current at the load input 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	Power at the load input
	1.0000	1.0000 watts
Query Example	:MEAS:POW?	1.5 watts is measured at the specific channel load input.
	1.5	

: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	Voltage Sense
	LOAD/0	Disabled
	UUT/1	Enabled
Example	:MEAS:INP 0	Disable voltage sense.
Query Syntax	:MEASure:INPut? <NR1>	
Return Parameter	<NR1>	Voltage Sense
	0	Disabled
	1	Enabled
Query Example	:MEAS:INP?	Returns the voltage input status. Voltage sense is enabled.
	1	

: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, ON/1	Scan
	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?	Returns the scanning status. Here scanning is enabled.
	1	

:MEASure:ALLVoltage?

All Channel Command

Description	This query measures the voltage values of all the load modules/channels in order from 1-8 (PEL-2004)/1-4(PEL2002).	
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-2004)/1-4(PEL-2002).

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

:MEASure:ALLCurrent?

All Channel Command

Description	This query returns the current measured of all the load modules/channels in order from 1-8 (PEL-2004)/1-4(PEL2002).	
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-2004)/1-4(PEL-2002).
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.

:MEASure:ALLPower?

All Channel Command

Description	This query returns the power measured of all the load modules/channels in order from 1-8 (PEL-2004)/1-4(PEL2002).	
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-2004)/1-4(PEL-2002).

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

: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]	
Parameter	<aard>	
	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
Example	:MODE: CCL	Set the specific channel to low range constant current static mode.
Query Syntax	:MODE?	
Return Parameter	<aard>	Mode
	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
Query Example	:MODE? CCH	The specific channel is currently set to CC static mode, high range.

Program Subsystem

: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?	The set program number is 5.
	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	:PROGram:SEQuence?	
Return Parameter	<NR1>	Mainframe Scanning
	1-10	Returns the current sequence number
Query Example	:PROG:SEQ?	The set sequence number is 1.
	1	

:PROGram:MEMory

Program Number Specific

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

Query Example	:PROG:MEM? 1	The memory number for the current program/sequence is 001.

:PROGram:SEQuence:SHORt:CHANnel

Program Number Specific

Description	Simulates short circuits for load channels for the current sequence number.			
Syntax	:PROGram:SEQuence:SHORt:CHANnel <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
	0.1~60	0.1~60 seconds
	0.1~60S	0.1~60 seconds
Example	:PROG:SEQ:SHOR:TIME 0.5	The short time for the program sequece is set to .5 seconds
Query Syntax	:PROGram:SEQuence:SHORt:TIME? <NR2>	
Return Parameter	<NR2> 1 unit = 1 second	Short Time
	0.1-60	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:SEQuence:MODE

Program Number Specific

Description	Sets the program sequence to Auto, Manual or Skip mode.	
Syntax	:PROGram:SEQuence:MODE [MANUAL, AUTO, SKIP]	
Parameter	[MANUAL, AUTO, SKIP]	MODE
	MANUAL	Manual mode: program sequence is run manually
	AUTO	Auto mode: program sequence is run automatically

	SKIP	Skip mode: current program sequence is skipped.
Example	:PROG:SEQ:MODE: AUTO	The current program sequence is set to Automatic mode.
Query Syntax	:PROGram:SEQuence:MODE? [MANUAL, AUTO, SKIP]	
Return Parameter	[MANUAL, AUTO, SKIP]	Current mode
	MANUAL	Manual mode
	AUTO	Auto mode
	SKIP	Skip mode
Query Example	:PROG:SEQ:MODE?	The current program sequence is set to AUTO.
	AUTO	

:PROGram:ACTive

Program Number Specific

Description	Activates or selects the active load modules.			
Syntax	:PROGram: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	:PROGram: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			

:PROGram:CHAin

Program Number Specific

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

:PROGram:ONTime

Program Number Specific

Description	Sets the on-time for the program number. 0.1~60 seconds.	
Syntax	:PROGram:ONTime <NRf>[S]	
Parameter	<NRf>[S]	Program On Time
	0.1-60	0.1~60 seconds
	0.1-60s	0.1~60 seconds

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

:PROGram:OFFTime

Program Number Specific

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

:PROGram:RUN

All Channel Command

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	:PROGram:RUN [OFF/0, ON/1]	
Parameter	OFF/0, ON/1	Run Program
	OFF/0	OFF
	ON/1	ON
Example	:PROG:RUN 1	Runs the program.

:PROGram:SAVE

All Channel Command

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

Resistance Subsystem

:RESistance:L1/L2

Channel Specific Command

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: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:L1/L2?	
Return Parameter	<NR2>[MAX, MIN]	Resistance
	1 unit = 1 ohm/1 k ohm	Returns the resistance of the A or B Value.
Query Example	:RES:L1? MAX 300	Returns the maximum resistance allowed for the channel. (PEL-2020)

:RESistance: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::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]	Slew rate
	1 Unit =1 amp/uS	Returns the slew rate.
	MAX/MIN	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: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]	Resistance
	AVALue 10	Sets A Value to 10 ohms. (Low range only)
	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? MAX 300	Returns the maximum resistance allowed for the channel. (PEL-2020)

: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]	Slew rate
	1 Unit =1 amp/uS	Returns the slew rate.
	MAX, MIN	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.

:RESistance:STATic:HIGH:AVALue/BVALue

Channel Specific Command

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	Sets A Value to 10 ohms. (high range only)
	BVALue 20OHM	Sets B Value to 20 ohms. (high 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:HIGH:BVAL 10	Sets high range CR static mode B Value to 10 ohms.
Query Syntax	:RESistance:STATic:HIGH: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:HIGH:BVAL? MAX 15000.0	Returns the maximum resistance allowed for the channel for B Value. (PEL-2020)

: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]	Slew rate
	RISE/FALL 0.8A/uS	Sets the rising/falling slew rate to 0.8A/uS
	RISE/FALL 0..5	Sets the rising/falling slew rate to 0.5A/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: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]	Slew rate
	1 Unit=1 amp/uS	Returns the slew rate.
	MAX/MIN	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 resitance 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-2020)

: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]	Time 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: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]	Time T1/T2
	1 Unit=1 second	Returns T1/T2 time.
	MAX/MIN	Returns the allowable maximum and minimum.

Query Example	:RES:DYN:LOW:T1? 2.5 :CURR:DYN:LOW:T1? MIN 0.000025	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]	Resistance
	L1 10	Sets L1 to 10 ohms. (high range only)
	L2 20OHM	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:HIGH:L1 10	In high range CR dynamic mode, Set L1 (level 1) to 10 ohms.
Query Syntax	:RESistance:DYNamic:HIGH:L1/L2? MIN, MAX	
Return Parameter	<NR2>[MAX, MIN]	Resistance
	1 unit= 1 ohm	Returns the resistance of Level 1/ 2 (L1/L2).
Query Example	:RES:DYN:HIGH:L2? MAX 15000.0	Returns the maximum resistance allowed for the channel. (PEL-2020)

:RESistance:DYNamic:HIGH: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: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	:RES:DYN:HIGH: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:HIGH:T1?	Returns the T1 time of 2.5 seconds.
	2.5	
	:RES:DYN:LOW:T1? MIN	Returns the minimum T1 time allowable for the specific channel.
	0.000025	

RUN Subsystem

:RUN

All Channel Command

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

SHOW Subsystem

:SHOW[:DISPlay] single 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	<aard>	Load module display (dual channel)
	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] dual 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	<aard>	Load module display (single channel)
	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.

SPECIFICATION Subsystem

: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	Go/NoGo Unit
	PERCENT/0	Percentages
	VALUE/1	Values
Example	:SPEC:UNIT PERCENT	Sets the Go/NoGo limits as percentages
Query Syntax	:SPECification:UNIT? <NR1>	
Return Parameter	<NR1>	Go/NoGo Unit
	0	Percent
	1	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? 0	Go/NoGo has failed
Query Example	:SPEC? 0	Go/NoGo has failed

:SPECification[:PASS]:CHANnel/VOLTage/CURRent?

Channel Specific Command

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

: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>	Go/NoGo voltage
	1 unit = 1 volt	Returns the limit voltage
Query Example	:SPEC:VOLT:H?	The voltage limit is 2 volts.
	2.000	

: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>	Go/NoGo voltage
	1 unit = 1 amp	Returns the limit current
Query Example	:SPEC:CURR:H?	The current limit is 5.12 amps.
	5.120	

: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	Go/NoGo limits (SPEC)
	OFF/0	OFF
	ON/1	ON
Example	:SPEC:TEST OFF	Turn Go/NoGo SPEC off for the specific channel.
Query Syntax	:SPECification:TEST?	
Return Parameter	<NR1>	Go/NoGo SPEC status
	0	Off
	1	On
Query Example	:SPEC:TEST?	Go/NoGo SPEC limits is on.
	1	

STATUS Subsystem

:STATus:CHANnel:CONDition?

Channel Specific Command

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 133 for details.			
Query Syntax	:STATus:CHANnel: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:CHAN:COND? 3		Indicates OC and OV conditions are true.	

: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 133 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?		An over current (OC) event occurred since the last time the Channel Status Event register was read.	
	1			

: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 133 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?		OP is set as a negative transition.	
	4			

: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 134 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 135 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 135 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[:EVENt]?

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[: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: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 135 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

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?	
Return Parameter	<NR2> 1 unit = 1 volt	Voltage
	10	Returns the voltage of the specific channel.

Query Example	:VOLT:L1?	A Value is set to 5 volts.
	5	
	:VOLT:L1? MAX	Returns the maximum settable voltage.
	81.6000	

: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?	
Return Parameter	<NR2> 1 unit = 1 volt	Voltage
	10	Returns the voltage of the specific channel.

Query Example	:VOLT:AVAL? 5	A Value is set to 5 volts.
	:VOLT:AVAL? MAX 81.6000	Returns the maximum 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:CURR 1A	Sets the current limit to 1 Amp for the specific channel.
	:VOLT:CURR MAX	Sets the current limit to the maximum limit for the specific channel.
Query Syntax	:VOLTage:CURRent?	
Return Parameter	<NR2> 1 unit = 1 amp	Current limit
	1	Returns the current limit of the specific channel.
Query Example	:VOLT:CURR? 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, FAST/1	Response Time
	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? 0	The specific channel is set to SLOW response time.

SYSTEM Subsystem

:SYSTem:ERRor? System Command

Description	The System Error command returns all the system errors. Please see the Error codes section for a full description. (page118)		
Query Syntax	:SYSTem:ERRor?		
Return Parameter	<character string>	Error	
	-102, "Syntax error"	1	Error code number
	1 2	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

Memory Subsystem

: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>	Preset no.
	0~9	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>	Memory number
	001~120	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).

:MEMory:RECall:PROGram — Channel Specific Command

Description	Recalls memory data to the current channel.	
Syntax	:MEMory:RECall:PROGram <NR1>	
Parameter	<NR1>	Memory number
	001~120	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>	Preset no.
	0~9	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>	Setup data
	1~4	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.

SEQuence Subsystem

: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?	There are 5 points in the sequence.
	5	

:SEQuence:POINt:RESistance

Channel Specific Command

Description	Sets the resistance value for the current point. CR mode only.	
Syntax	:SEQuence: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?	
Return Parameter	<NR1>	Resistance Value
	1 unit = 1 ohm	Returns the resistance value.

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

:SEQuence:POINt:CURRent

Channel Specific Command

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?	
Return Parameter	<NR1>	Current Value
	1 unit = 1 A	Returns the current value.
Query Example	:SEQ:POIN:CURR?	The current value is 1 amp.
	1	

:SEQuence:POINt:RISE/FALL

Channel Specific Command

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?	
Return Parameter	<NR1>	Slew Rate
	1 unit = 1 A/us	Returns the slew rate.
Query Example	:SEQ:POIN:RISE?	Returns the rising slew rate (0.3 A/us).
	0.30000	
	:SEQ:POIN:FALL?	Returns the falling slew rate (0.4 A/us).
	0.40000	

: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?	
Return Parameter	<NR2>	Point
	0.0001~60000	Returns the point duration time.
Query Example	:SEQ:POIN:TIME?	The point duration time is 0.001 seconds.
	0.00100	

: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?	Repeats the sequence 10 times
	10	

:SEQuence:END:LOAD

Channel Specific Command

Description	Sets On End Load to On or Off. On End Load determines if the channel will set the load on or off at the end of its sequence until the end of the last sequence (of ALL other channels).	
Syntax	:SEQuence:END:LOAD OFF/0, ON/1	
Parameter	OFF/0, ON/1	On End Load
	OFF/0	Off
	ON/1	On
Example	:SEQ:END:LOAD 0	On End Load = Off.
Query Syntax	:SEQuence:END:LOAD?	

Return Parameter	<NR1>	On End Load
	0	Off
	1	On
Query Example	:SEQ:END:LOAD?	On End Load is On.
	1	

:SEQuence:VOLTage:RANGe

Channel Specific Command

Description	Sets the sequence CC voltage range.	
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-2020 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-2020,2030,2040
	125	Low PEL-2041
	80	High PEL-2020,2030,2040
	500	High PEL-2041
Query Example	:SEQ:VOLT:RANG?	Returns the voltage range. In this case high for the PEL-2041.
	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>	Point
	1~last point	Returns the point that the loop will start from.
Query Example	:SEQ:LOOP:STAR?	The loop starts at point 2.
	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	Duration Time Settings
	1	Use channel 1
	2 etc	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	Sequence
	OFF/0	Off
	ON/1	On
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.

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.

STATUS REGISTERS

To program the PEL-200 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-2000 series have a number of register groups:

Channel Status Registers (one for each channel)

Channel Summary Registers

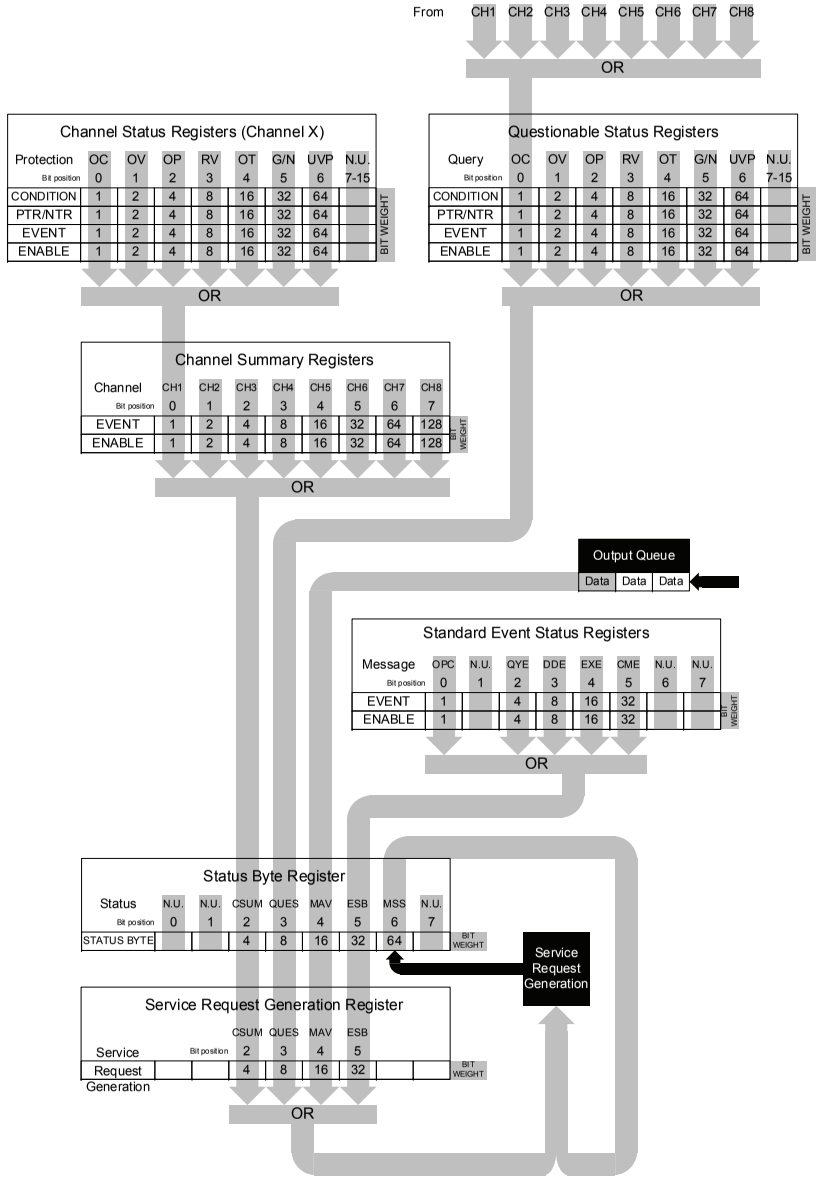
Questionable Status Registers

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.

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.

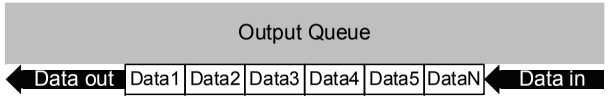
Enable Register

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 is 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